

MINERVA

STOMATOLOGICA

VOLUME 67 · SUPPL. I · No. 2 · APRIL 2018

**XXV Congresso Nazionale  
Collegio dei Docenti Universitari  
di discipline Odontostomatologiche**

Roma, 12-14 aprile 2018



EDIZIONI · MINERVA · MEDICA

# CHIRURGIA MAXILLO FACCIALE

## Conservative surgical management of a large maxillary intrasinus ameloblastoma with adipose bichat bulla flap

B. Poletti de Chaurand, G. Patianna, A. Bianco, L. Casula, R. Vinci

Oral and Maxillofacial Department, Vita-Salute San Raffaele University, Milan, Italy

**BACKGROUND:** “Ameloblastoma” descends from the early English word “amel”, meaning enamel, plus the Greek word “blastos”, meaning germ. It is a rare tumor of odontogenic epithelium and can cause severe abnormalities of the face and jaw. It is rarely malignant or metastatic. There are six different histopathological variants of ameloblastoma: desmoplastic, granular cell, plexiform, follicular, acanthomatous and basal cell. One-third of ameloblastomas are plexiform, one-third are follicular. Considering their growing capacity without being symptomatic in mostly of all the clinical cases, the purpose of this study was to report a case of a large intrasinus ameloblastoma and to stress the importance of a conservative treatment. **METHODS:** We report a case of a 52 year old Italian female who was referred to the Oral and Maxillofacial department of San Raffaele Institute. The patient was asymptomatic. Pre-operative orthopantomography disclosed a well corticated radiolucent lesion approximately 5x5cm on the right maxilla. The presence of the osteolytic lesion was confirmed by a CT. In order to expose the entire lesion, a trap door was created by osteotomy and the surgical enucleation of the ameloblastoma was performed without including the nearby implant. An adipose Bichat bulla flap was performed to allow an appropriate and primary healing closure.

**RESULTS:** The histological examination revealed a basal cell type ameloblastoma. The patient has referred no post-operative pain and the lesion healed without any complication. There has been no signs of recurrence or metastasis within a period of six months after the operation, but the patient continues under observation.

**CONCLUSIONS:** A systematic review of the literature of the basal cell ameloblastoma was made too. Till date only 10 cases of basal cell ameloblastoma has been reported in literature out of which nine described a non-conservative treatment with partial maxillectomy or mandibulectomy. Due to a lack of organization of the studies present in literature and a poor strength of evidences, in order to better understand the best surgical approach to perform, randomized clinical trials based on treatment modality and histological subtypes are necessary. The recurrence rates of basal cell ameloblastoma have not been reported due to the limitation in the number of cases. On the available information the basal cell variant needs an appropriate diagnosis based not only on clinical and radiological appearance but also on histopathologic analysis. Follow up should occur at regular intervals for at least 10 years because 50% of all ameloblastoma recurrences occur within 5 years postoperatively. Long-term follow-up after surgery is strongly recommended also to establish the recurrence rate.

## Primary intraosseous squamous cell carcinoma

M. Vasselli <sup>1</sup>, A. Camurri Piloni <sup>1</sup>, R. Rizzo <sup>1</sup>, R. Bussani <sup>2</sup>, G. Tirelli <sup>3</sup>, M. Maglione <sup>1</sup>

<sup>1</sup>ASUITS, SC Clinica di Chirurgia Maxillofacciale e Odontostomatologica; <sup>2</sup>ASUITS, SC Clinica Otorinolaringoiatrica; <sup>3</sup>ASUITS, SC Anatomia ed Istologia Patologica

**BACKGROUND:** The aim of this work is reporting a rare case of Primary intraosseous squamous cell carcinoma that is a cyst-like lesions in the mandible rarely develop into malignancies, and the reported incidence is between 0.3 and 2%. The case here described is a rare case of primary intraosseous squamous cell carcinoma of the mandible arising from an odontogenic cysts.

**METHODS:** A 80-year-old male with history of diabetes type II, chronic renal insufficiency and cardiac issues, was referred to Trieste University Maggiore Hospital (Trieste, Italy), with acute pain in the left retromolars area. At the moment of the first visit was reported also a Warthin's tumor affecting the left parotid gland. An initial examination revealed extra oral swelling without paresthesia of the omolateral NAI. Following an intraoral examination, the oral mucosa was edematous, percussion pain was experienced on the lower left second molar. Panoramic radiography revealed a retained lower left third molar and an irregular radiolucent area between the lower left second molar and a mandibular angle with mostly clear margins based on the bidimensional radiology. In addition computer tomography revealed diffuse bone resorption and an extensive loss of cortical bone on the lingual side. During the surgery aimed to remove the second and third lower left molars, a biopsy was performed and the pathological diagnosis was of a squamous cell carcinoma arising from the epithelial lining of the odontogenic cyst. Computed tomography with contrast agent was performed that showed a primitive neof ormation located into the horizontal branch of the left mandible eroding both the cortical and lingual walls and it extends from the lower left retromolar region towards the omolateral lower cuspid, infiltrating the buccinator and medial pterygoid muscles. To the patient has been proposed a segmented mandibulectomy with laterocervical radical neck dissection associated with plastic reconstruction using the fibula and radial flap. During the surgical procedure it was assessed that was not possible to use the fibula flap.

**RESULTS:** The histopathological analysis showed a primary squamous cell carcinoma staged as follows: pG2. C2. T4a. N1.

**CONCLUSIONS:** Primary Intraosseous squamous cell carcinoma has a predilection for adult men, occurs most frequently in the mandible and is associated mainly with an odontogenic cyst. Surgery alone or combined therapy of surgery and radiation are the most common approach. Following enucleation of a cystic jaw lesion, the entire surgical specimen should be examined histopathologically.

## ABSTRACT

**Frey's syndrome treatment with botulinum neurotoxin: our experience**

W. Colangeli, Novembre, I. Barca, C.E. Boschetti, R. Cordaro, A. Cirelli, M.G. Cristofaro

*University "Magna Graecia" of Catanzaro, Department of Experimental and Clinical Medicine, Unit of Oral and Maxillofacial Surgery, Catanzaro, Italy*

**BACKGROUND:** Frey's Syndrome (FS) can occur after parotid gland surgery or facelift and is characterized by sweating, erythema and warm sensation in the parotid gland region after eating certain foods (especially acid foods). This syndrome is caused by the disruption of the auriculotemporal nerve branches, followed by an aberrant regeneration resulting in a parasympathetic reinnervation with sympathetic receptors. Numerous medical and surgical treatments have been proposed to treat this condition, but there are various drawbacks. Botulinum toxin type A intracutaneous injection is a relatively new treatment modality, and could be considered the gold standard treatment. Frey's syndrome management with BoNT (botulinum neurotoxin), was first proposed in 1995 by Drobnik and Laskawi.

**METHODS:** Between January 2012 and December 2016, five patients affected with gustatory sweating were treated with intracutaneous injection of botulinum toxin type A. Gustatory sweating and extension of the affected area was assessed by starch-iodine Minor test. Patients ate an orange, provoking the immediate appearance of brownish spots and adjacent erythema, confirming the clinical picture of gustatory sweating. BoNT mean dose 30 U (at a concentration of 2.5 U/0,1 mL) was injected in minor test positive areas. We performed 5 U BoNT injection for cm<sup>2</sup>, with a total of six injection for each patient. The potential for this long-delayed clinical presentation should be discussed with the patient before surgery in the parotid gland.

**RESULTS:** All patients underwent 3 BoNT treatments in 12 months, 1 every 4 months. No adverse effects were observed. Symptomatic improvement was reported a few days after the injection, by all the patients. Three weeks after BoNT injection a starch iodine minor test was performed for each patient confirming gustatory sweating and a flushing improvement.

**CONCLUSIONS:** Various prophylactic and therapeutic surgical strategies have been proposed to minimize the incidence or severity of Frey syndrome following parotidectomy, including temporal fascia grafting, the application of synthetic material to the surgical field at the time of surgery and ligation of the auriculotemporal and chorda tympani nerves. Our data suggest that the Botulinum toxin type A intracutaneous injection can be recommended as that of choice in patients affected by Frey's syndrome because it is an effective, safe, minimally invasive and well-tolerated treatment and can be repeated if symptoms recur, with no loss of efficacy. In managing symptomatic complaints of Frey's syndrome, BoNT injection, although not definitive therapy can significantly decrease the severity and thus morbidity Frey's syndrome. Surgical management post parotidectomy Frey's syndrome should be reserved for severe and refractory cases, as there are limited data to support its use.

**Metachronous malt lymphoma and mcc: could the two neoplasms share a common pathogenesis?**

I. Barca, W. Colangeli, C. Tortosa, D. Caruso, D. Novembre, A. Cirelli, M. G. Cristofaro

*Department of Experimental and Clinical Medicine "Magna Graecia" University of Catanzaro, Catanzaro, Italy*

**BACKGROUND:** Merkel cell carcinoma (MCC) is a rare and aggressive cutaneous neuroendocrine carcinoma in older

patients with a propensity for the head and neck. MCC occurs mainly in immunosuppressed patients and its clinical prognosis is very poor. These tumors tend to local invasiveness, recurrence and to distant metastasization. Merkel cells are afferent sensory receptors found in the basal layer of the epidermis that function as mechanoreceptors. Recent studies have questioned the theory that MCC originates in Merkel cells, originally described as "tactile epithelial cells" by Friedrich Sigmund Merkel in 1875. MCC and Merkel cell polyomavirus (MCPyV) association has been observed by numerous studies and it seems to be linked approximately in 80% of the cases. Evermore, the presence of MCC associated with an increased risk of non-Hodgkin lymphoma (NHL) or chronic lymphocytic leukemia (CLL) occurrence has been highlighted in the last years. MCC incidence varies between 0.1 and 0.88 per 100.000 person-years. We present the case of a 71-year-old male patient with a history of MALT lymphoma occurring 5 years earlier that was referred to our hospital for a painless swollen mass in the right parotid region. Parotid gland lesion was clinically related to progressive MALT lymphoma and only surgical enucleoresection demonstrated MCC diagnosis.

**METHODS:** Ultrasound examination showed a mass in the superficial portion of the right parotid gland (4,0cm x 2,5cm) hypoechoic and homogeneous, fine needle aspiration cytology (FNAC) was performed and revealed a lymphoid neoplasm, susceptible to immunophenotypic typing. Total body computed tomography (CT) was unremarkable and the PET/CT with 18-fluorodeoxyglucose (18-FDG) showed increase standardized uptake value (SUV) of the lesion. A contrast-enhancement computed tomography (CT) revealed a 4,6 cm x 2,6 cm homogeneously hyperdense enhanced mass in the superficial lobe of the salivary gland.

**RESULTS:** Surgical enucleoresection was performed and tumor histological examination demonstrated a deep atypical homogeneous infiltrated of medium large cells with regular round nuclear contours and vesicular to granular chromatin. Tumor immunohistochemical analysis revealed positivity for cytokeratin 20 (CK20). In addition, MCCs express early B-cell lineage markers, such as paired box gene 5 (PAX 5) and terminal desoxynucleotidyl transferase (TdT).

**CONCLUSIONS:** Tumor immunohistochemical analysis revealed the presence of markers for CK 20, PAX5 and TdT, the last two ones are specific to early B-cells. It is important to define the true origin of MCCs, because the identification of new markers in MCCs could be the starting point for new target therapies.

**The use of three-dimensional reconstructions of CT scan data to evaluate anomalies of hyoid bone in Pierre Robin sequence: a retrospective study**

S. Barone <sup>1</sup>, F. Bennardo <sup>1</sup>, K. Belhous <sup>2</sup>, M.P. Vazquez <sup>2</sup>, V. Abadie <sup>2</sup>, A. Picard <sup>2</sup>, A. Giudice <sup>1,3</sup>

<sup>1</sup>School of Dentistry, Department of Health Sciences, Magna Graecia University of Catanzaro, Catanzaro Italy; <sup>2</sup>Department of Maxillo-facial and Plastic Surgery, Necker-Enfants Malades Hospital, Paris Descartes University, Paris, France; <sup>3</sup>Unit of Oral and Maxillofacial Surgery, Magna Graecia University of Catanzaro, Catanzaro, Italy

**BACKGROUND:** The aim of the study was to investigate hyoid bone anomalies in patients with isolated and syndromic Pierre Robin sequence (PRS) compared to the control group, using computed tomography (CT) examination and three-

dimensional reconstruction of the hyoid bone and mandible. METHODS: A retrospective study was performed of patients between birth and 12 months old with isolated PRS (ns-PRS) and syndromic PRS (s-PRS), who had undergone CT examination and whose results were compared to the control group of the same age. Digital Imaging and communications in Medicine (DICOM) data was processed using the Materialise interactive medical image control system (MIMICS) Innovation Suite (Materialise, Leuven, Belgium) software to highlight bone tissue. The mandible and hyoid bones were the main targets of the three-dimensional reconstruction. The study outcomes were the ossification of the hyoid bone defined by the body's maturation and distinguished in three degrees: full ossification (correct development of body and greater horns), moderate abnormalities (reduced development of all or parts of the hyoid bone), severe anomalies (absence of the hyoid bone or significant lack of ossification of its parts); the position of hyoid bone evaluated using the distance between the anterior edge of hyoid bone and posterior edge of the mandible; the volume of the hyoid bone calculated by a specific function of the software after segmentation and 3D reconstruction of the hyoid. Univariate and multivariate statistical analyses were performed with  $\alpha = 0.05$  as level of significance.

RESULTS: Hyoid bone ossification was present in 26 of the 50 PRS patients (14 ns-PRS and 12 s-PRS: 52%) and in 31 infants of the 43 controls (72%). Statistical analysis showed that absence of hyoid bone ossification was significantly associated with a diagnosis of PRS ( $p < 0.05$ ). Furthermore, comparison to the control group showed that the syndromic form of PRS had worse development of the hyoid body ( $p < 0.05$ ) than the ns-PRS group did. The mean distance was  $21.5 \pm 4.9$  mm in the PRS group and  $25.8 \pm 5.5$  mm in the control group. Only s-PRS patients showed a statistically significant reduction of the distance between hyoid and mandible compared to the control group ( $p < 0.001$ ). The mean value of the volume was  $86.8 \text{ mm}^3$  in the PRS group and  $140.7 \text{ mm}^3$  in the control group. The hyoid volume was significantly lower in the s-PRS group than in controls ( $p < 0.001$ ), whereas ns-PRS patients did not differ from the control group ( $p > 0.05$ ).

CONCLUSIONS: Isolated and syndromic PRS patients differ not only etiologically but also clinically. S-PRS patients confirmed their worst clinical condition with a deeper involvement of craniofacial anomalies. Because hyoid bone alterations usually result from abnormalities of the second and third branchial arches, s-PRS pathogenesis is not related solely to problems of the first branchial arch from which maxillary bones develop.

### Ascher's syndrome - a rare variant of a rare syndrome

D. Caruso, I. Barca, A. Giudice, E. Giofrè, A. Cirelli, L. Brizzi, M.G. Cristofaro

University "Magna Graecia" of Catanzaro, Department of Experimental and Clinical Medicine, Oral and Maxillofacial Surgery Unit, Catanzaro, Italy

BACKGROUND: Ascher's syndrome (Laffer-Ascher syndrome) is a disease of unknown etiology. It was first described in 1920. Typical presentation includes recurrent edema of the upper lip, upper eyelid resulting in a double lip and blepharofaxia. In 10% of cases, non-toxic idiopathic thyroid enlargement also occurs. In about 5% of cases there is the involvement of both the upper and lower lips. this syndrome can have

an important psychological impact by having the puberty of onset. This work describes surgical management and an overview of the syndrome. The importance of the knowledge of this rare framework allows to avoid a missed or wrong diagnosis, translating a more rapid and correct patient management. METHODS: In this article we report two infrequent cases, one of classical Ascher syndrome, and one with a rare variant of this syndrome involving upper and lower lips. Both patients referred to the Maxillofacial Surgery Unit of the "Magna Graecia" University of Catanzaro. Surgery was performed removing mucosa and structures of submucosal layer (minor salivary glands), by transversal elliptical incision and by blunt dissection. Case 1. A 22-year-old man presented at the Maxillofacial Surgery Clinic with an asymmetrical upper lip duplication. This abnormality of the upper lips began to be evident during childhood. Upper eyelids bilaterally showed a dropping like a blepharochalasis. No evidence of thyroid goiter was highlighted. Case 2. A 27-year-old man presented at the Maxillofacial Surgery Clinic with a congenital symmetrical lip duplication of upper and lower lips that was present from birth. The upper lips showing a horizontal furrow on mucosal side with mucosal protrusions. He don't refer to problems other than cosmetic ones. Careful clinical evaluation revealed no abnormalities of the oral mucosa or the presence of palpable masses. Face and neck inspection highlighted the presence of blepharochalasis and likely goiter. Blood test and neck's ultrasound examination confirmed presence of a euthyroid goiter.

RESULTS: Both patients well tolerated surgery. No alteration of sensibility was reported Maintenance of adegue lips profile. Both patients achieved great satisfaction for the improvement of relational life and facial aesthetics. No recurrence was observed at 1 year of follow-up

CONCLUSIONS: The scientific literature actually describes less than 60 cases. Differential diagnosis for Asher's syndrome should also include vascular tumors, lymphangioma, angioedema, cheilitis granulomatosa, Miescher's syndrome, salivary gland tumors, inflammatory fibrous hyperplasia, sarcoidosis and plasmacell cheilitis. Early diagnosis in Ascher's syndrome prevents therapeutic delays. Adequate esthetic correction is possible and sufficient to bring the patient back to "normality", with a minimum risk of recurrence. Findings, blepharochalasis, double lips and goiter reported in this case are consistent with diagnosis of Ascher syndrome. Importance of recognition this signs have to alert surgeon to propose a diagnosis of ascher's syndrome and so avoid unnecessary investigations and inappropriate surgery.

### Intraoral approach to removal of Wharton duct large sialolith

D. Caruso, E. Giofrè, D. Novembre, C. Tortosa, R. Cordaro, C. E. Boschetti, M.G. Cristofaro

University "Magna Graecia" of Catanzaro, Department of Experimental and Clinical Medicine, Oral and Maxillofacial Surgery Unit, Catanzaro, Italy

BACKGROUND: Sialolith is a calcareous concretion "calculus" in the salivary ducts or glands, frequently submandibular gland and its duct. The presence of a sialolith predisposes for onset of a sialolithiasis, this is a benign infectious-inflammatory condition. Based on size and degree of calcification, calcification can be visible at x-ray examinations. Patients typically report remitting tumefaction, pain, edema, redness of oral floor and the submandibular



## ABSTRACT

region. Large sialoliths can be removed with different types of approaches, intraoral, extraoral, endoscopic depending on its position, shape and size, as well as on the basis of the surgeon's experience.

**METHODS:** In this paper we report two cases of large sialolith located in submandibular gland duct removed with intraoral approach, and explain risks and benefits of intraoral approach. The cases described concern two men of 58 and 62 years, both affected by sialolithiasis of the submandibular gland duct, treated at Maxillofacial Surgery Unit of "Magna Graecia" University of Catanzaro. Clinical history of the two patients is practically superimposable, with repeated episodes of tumefaction and pain in submandibular region that increased during meals. Clinical diagnosis was confirmed by radiological diagnosis, (echography, orthopantomography, tc scan). Patients underwent excision of the calcula with intraoral approach in local anesthesia. Surgery was conducted highlighting distal duct tract and dissecting it with the scalpel. Duct cavity was gently dilating until calculus is found, pay attention to point where duct inclines downwards "comma". The procedure ends with the sialoliths removal and packaging of a "neo-stoma". Postoperative radiographic evaluation was performed confirming complete sialolith removal. Clinical follow-up were performed at 7 days, 1 and 6 months and 1 year.

**RESULTS:** Procedure was well tolerated, good healing of surgical wound was observed; no infection and well controlled pain. Both patients tolerated the procedure well. No hematomas or sialoceles were found in the submandibular and sublingual region. No sequelae were reported to the ductal apparatus of Wharton or lesion of the lingual and / or hypoglossal nerves. Maintenance of salivary gland activity has been reported in both patients.

**CONCLUSIONS:** We believe that the intraoral approach is a suitable alternative for removal sialoliths of localized also in the proximal portion of the Wharton duct. Intraoral approach appears to have a good prognosis without neurological deficit and with the recovery / maintenance of the residual function of the salivary gland.

### Medication-related osteonecrosis of the upper jaw associated with sinusitis: new surgical combined approach with reconstruction by bichat fat pad

S. Orlandi, S. Bonetti, M. Magi, E. Simeoni, M. Marostegan, L. Lanaro, F. Lonardi, F. Zotti

*Department of Surgery, Dentistry, Pediatrics and Gynecology of University of Verona, Verona, Italy*

**BACKGROUND:** To assess the effectiveness of the new combined surgical intraoral and endoscopic transnasal approach, associated with immediate maxillary reconstruction by means of facial adipose fat pad, in patients suffering by Medical Related Osteonecrosis of Jaws (MRONJ) and subsequent odontogenic sinusitis.

**METHODS:** Seven patients eligible for combined intraoral and endoscopic surgery were enrolled in the study from 2014 to 2017. Staging of osteonecrosis and sinusitis was performed according to current guidelines at baseline (Pre-surgery, T<sub>0</sub>). Evaluation of signs and symptoms of osteonecrosis and sinusitis was carried out by using SNOT20, VAS scale and Lund-Mackay CT Score at baseline and 3 months after surgery (T<sub>1</sub>). The cutting-edge surgery procedure was performed by the

same blind operator and records at T<sub>0</sub> and T<sub>1</sub> have been collected by the same student of Dental School of Department of Surgery, Dentistry, Pediatrics and Gynecology of University of Verona. The procedure proposed in this work consists of two different surgical steps. The first step is the endoscopic transnasal intervention, the Functional Endoscopic Sinus Surgery (FESS), in order to treat the sinusitis. The second one is an open intraoral surgical approach in order to remove the osteonecrotic bone. During the intraoral step, the residual oro-antral bone defect is corrected and closed using the Bichat fat pad. These two steps are performed in the same intraoperative session.

**RESULTS:** In T<sub>0</sub> the average Lund-Mackay CT score was 6.5 and in T<sub>1</sub> 1.125. T<sub>0</sub> average SNOT20 value was 74.25 whereas it decreased to 14 in T<sub>1</sub>. VAS average at T<sub>0</sub> was 7.34 and 0 in all patients in T<sub>1</sub>. The major potential of this technique is found in the use of Bichat adipose pad because of its particular anatomical position and composition: 6 ligaments, 1 artery and 2 veins. The high mobility of Bichat pad allows to use it as a rotation flap as well as a revascularized flap.

**CONCLUSIONS:** This work suggests that the combined treatment for odontogenic sinusitis caused by MRONJ might be a valid surgical approach. It could be so possible to treat MRONJ and the consequent sinusitis by a combination of two kind of surgical techniques never matched before. Further evaluations, greater patients enrollment and a longer follow-up could be recommended to confirm these encouraging results.

### Middle meatal antrostomy prevents sinusitis after zygomatic implants placement

V. Favero<sup>1</sup>, A. D'Agostino<sup>2</sup>, L. Trevisiol<sup>2</sup>, J. Venco<sup>3</sup>, L. Lanaro<sup>1</sup>, P. Procacci<sup>4</sup>, P.F. Nocini<sup>5</sup>

*<sup>1</sup>MD, Clinical Assistant; <sup>2</sup>MD, Associate Professor; <sup>3</sup>Student, Dental School; <sup>4</sup>MD, Assistant Professor; <sup>5</sup>MD, DDS, Full Professor and Head of Department, Unit of Maxillo-Facial Surgery and Dentistry - University of Verona, Verona, Italy*

**BACKGROUND:** To evaluate the role of middle meatal antrostomy in preventing the occurrence of maxillary sinusitis following zygomatic implants placement. The Authors hypothesize that middle meatal antrostomy may help reduce the incidence of this frequent and potentially serious complication.

**METHODS:** A prospective longitudinal study on patients enrolled in a single maxillo-facial surgery unit was performed. Patients underwent 4 zygomatic implants placement with intrasinus technique and simultaneous middle meatal antrostomy with endoscopic approach. Inclusion criteria were being eligible for extreme maxillary atrophy rehabilitation with zygomatic implants. Exclusion criteria were positive personal history for allergic rhinitis, previous sinus surgery, nicotine addiction, or radiological evidence of thickened mucosa or opacification of the maxillary sinuses, evaluated by means of cone beam CT scans. Radiologic findings of thickened mucosa or opacification of the maxillary sinuses were evaluated on computed tomograms performed 12 months after surgery using the Lund-Mackay Staging System. Clinical symptoms were evaluated both preoperatively and postoperatively 12 months after surgery using the Sino-Nasal Outcome Test-20 (SNOT-20), which is a questionnaire evaluating the relevance in everyday life of a series of symptoms that may be related to the health status of paranasal sinuses. The occurrence of intraoperative shearing of the Schneiderian membrane was recorded.

**RESULTS:** Preliminary results of the study are referring to 11 patients. 9 patients were female and 2 patients were male. Mean age was 57 years. Mucosal thickening was found in a single maxillary sinus. Average preoperative SNOT-20 score was 13. Average post-operative SNOT-20 score was 4. Schneiderian membrane was sheared in 10 sinuses (6 patients).

**CONCLUSIONS:** The radiological evidence of postoperative maxillary sinus opacification or mucosal thickening was remarkably low when compared to historical controls performed in the same unit and to the current findings in the literature. The SNOT-20 score decreased in the majority of patients and increased in none. Narrowing of the ostiomeatal complex may play a pivotal role in the occurrence of maxillary sinusitis following zygomatic implants placement. Middle meatal antrostomy seems to be an effective prophylactic maneuver in the prevention of this complication.

### Long-term outcomes of dental implants in oncologic patients reconstructed with fibula free flaps

G. Pellegrino <sup>1</sup>, A. Tarsitano <sup>1</sup>, A. Ferri <sup>1</sup>, G. Corinaldesi <sup>1</sup>, A. Bianchi <sup>1</sup>, L. Montebugnoli <sup>2</sup>, C. Marchetti <sup>3</sup>

<sup>1</sup>Oral of Maxillofacial Surgery Department, University of Bologna, Bologna, Italy; <sup>2</sup>Section of Oral Science, University of Bologna, Bologna, Italy; <sup>3</sup>Maxillo-facial Surgery and Oral and Maxillofacial Division, DIBINEM, University of Bologna, Bologna, Italy

**BACKGROUND:** The aim of this retrospective study was to evaluate the long-term survival and success rates of implants placed in patients who underwent mandibular or maxillary reconstruction with a fibula free flap and the influence of variables as radiotherapy and surgical techniques.

**METHODS:** Between 1998 and 2015, 21 patients underwent

maxillary or mandibular resections for benign or malignant oral tumours and simultaneous microvascular reconstructions with fibula free flaps. 20.8 (8–38) months after the reconstructive surgery 108 dental implants were placed. Eighteen patients received a fixed prosthesis while three received an implant-supported overdenture. Clinical data as the probing pocket depth, the presence of suppuration and bleeding on probing and the occurrence of hyperplastic tissue formation were collected from medical records and implant bone loss was measured on radiographs to determine survival and success rates. The possible influence of radiation therapy, the reconstructive technique and the use of soft tissue grafts as prognostic factors were determined.

**RESULTS:** The mean follow-up after implant insertion was 90.2 (20–204) months. The implant survival rate was 97.2% at the 12-month follow-up, 86.5% at 60 months, and 79.3% at 120 months. The rate of implant success was 95.4% at the 12-month follow-up, 73.5% at 60 months, and 64.7% at 120 months. Implant failure was more common in patients that had implants placed after they underwent radiation therapy ( $p = 0.001$ ) versus those who did not. Peri-implant bone loss ranged from a minimum of 0.5 mm to a maximum of 8.1 mm (mean  $2.2 \pm 1$  mm) at the 10-year follow-up. Peri-implant probing depth measures ranged from a minimum of 2 mm to a maximum of 9 mm (mean  $3.8 \pm 2$  mm). Peri-implant hyperplastic tissue was identified in 20.3% of the surviving implants at the 10-year follow-up and its presence impacted the rate of peri-implant bone loss. Connective tissue and skin grafts positively influenced both survival and success of implants and reduced the risk of peri-implant hyperplastic tissue formation.

**CONCLUSIONS:** The overall implant survival rate was acceptable. However, a relevant number of implants was identified as unsuccessful at a long-term follow-up. The use of soft tissue grafts can be considered a reliable procedure to significantly improve the long-term outcomes.

## CHIRURGIA ORALE

### Influence of maxillary sinus width on new bone formation after transcresal sinus floor elevation: a prospective histologic and histomorphometric study

C. Stacchi<sup>1</sup>, T. Lombardi<sup>2</sup>, A. Rapani<sup>1</sup>, F. Berton<sup>1</sup>, G. Perinetti<sup>1</sup>, T. Traini<sup>3</sup>, R. Di Lenarda<sup>1</sup>

<sup>1</sup>Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy; <sup>2</sup>Private Practice, Cassano allo Jonio, Italy; <sup>3</sup>Department of Medical, Oral and Biotechnological Sciences, University of Chieti-Pescara, Chieti, Italy

**BACKGROUND:** The aim of this multicenter prospective study was to analyze clinically and histologically the influence of bucco-palatal sinus width on new bone formation after transcresal sinus floor elevation (tSFE).

**METHODS:** Patients needing maxillary sinus augmentation (residual crest height <5 mm) were treated with tSFE without simultaneous implant insertion. The crestal access through the sinus floor was performed by using calibrated drills with stops (Mica, MegaGen Implant Co. Ltd, Gyeongbuk, South Korea) and, after checking Schneiderian membrane integrity, sinus was grafted by condensing gradual increments of xenogeneic granules (Smartbone, IBI SA, Mezzovico-Vira, Switzerland), until a minimum height of 10 mm was obtained (comprising the residual bone crest). Six months later, bone-core biopsies were retrieved from implant insertion sites by using trephine drills in order to perform histological and histomorphometric analyses. Histological slides were multistained with Ladewig fibrin stain, toluidine blue/Azure II counterstained with acid fuchsin or double stained with toluidine blue/pironine G at 1% and Azure II. Sinus width (SW) between buccal and palatal walls at 10-mm level (comprising the residual alveolar crest) and number of sinus bone walls in contact with the graft (WGC) (2: graft in contact with both lateral and medial walls; 1: graft in contact with lateral or medial wall; 0: graft not in contact with both lateral and medial bone walls) were measured on post-operative cone beam computed tomography by two independent calibrated examiners. Differences in NFB among cases grouped according to either SW (as <12 mm, 12-15 mm and >15 mm) or WGC (as 0-wall, 1-wall and 2-wall) were evaluated by means of one-way analysis of variance (ANOVA), followed by Bonferroni-corrected independent sample t-test. Finally, forward multiple linear regression was performed to identify other variables influencing NFB (age, gender, smoking habits, history of periodontitis, residual crestal height). **RESULTS:** Fifty consecutive patients (25 males and 25 females, age range between 31 and 84, mean 58.3 ± 9.8, 13 smokers, 37 no smokers) were enrolled in this study and underwent tSFE procedures. Six patients dropped out from the study (three for membrane perforation, one for post-operative infection, two for late dissemination of the biomaterial) and forty-four patients were included in the final analysis. Mean percentage of NFB at 6 months was 21.2 ± 16.9% (range

0-62.1%). Multivariate analysis showed a strong negative correlation between SW and NFB ( $R^2=0.793$ ), and a strong positive correlation between WGC and NFB ( $R^2=0.781$ ). Furthermore, when SW was stratified into three groups (<12 mm, 12 to 15 mm, and >15 mm), NFB percentages after six months of healing (36%, 13% and 3%, respectively) resulted significantly different ( $p<0.0001$ ).

**CONCLUSIONS:** This study represented the first statistically significant confirmation based on histomorphometric data that NFB after tSFE was strongly influenced by sinus bucco-palatal width, being a predictable outcome only in narrow sinus cavities (SW <12 mm, measured between buccal and palatal walls at 10-mm level, comprising the residual alveolar crest). During pre-surgical planning, bucco-palatal sinus width should be regarded as a crucial parameter when choosing sinus floor elevation with transcresal approach as a treatment option.

### Computer-guided bone lid osteotomy: a case report

S. Giovannini<sup>1</sup>, A. Fincato<sup>1</sup>, G. Brunello<sup>1,2</sup>, A. Quercia<sup>3</sup>, E. Stellini<sup>1</sup>, L. De Stavola<sup>1</sup>, S. Sivoletta<sup>1</sup>

<sup>1</sup>University of Padua, Department of Neurosciences, Section of Dentistry, Padua, Italy; <sup>2</sup>University of Padua, Department of Management and Engineering, Vicenza, Italy; <sup>3</sup>ULSS 2- Marca Trevigiana - Regione Veneto

**BACKGROUND:** The aim of this paper is to present a case of dentigerous cyst associated with an impacted mandibular third molar successfully treated with computer-guided bone lid technique.

**METHODS:** A healthy 46-year-old male patient was referred to our department with an asymptomatic unilocular well-defined radiolucent lesion in the posterior portion of the left mandible associated to a horizontally impacted third molar. The patient underwent a cone-beam computed tomography (CBCT) and the bone lid was planned through a computer-aided design (CAD) process (3Diagnosisys 4.0, 3DIEMME). Virtually planned ideal bone osteotomy planes were defined in order to provide an adequate access to the tooth and to avoid damage to anatomical structures. A surgical template was then produced to guide the piezoelectric tips on the planned osteotomy planes. The design of the template was made in such a way as to have both a bone and a dental support on tooth 37. The final guide design, including holes for screwing the guide to the bone, was created with CAD software (PlastyCAD, 3DIEMME). The surgical guide was produced in medical polyamide by a CAM process (3Dfast). The surgery was performed under local anaesthesia and sedation. A full-thickness flap was reflected buccally, the polyamide surgical guide was inserted and stabilized with a screw. The cystic lesion and the impacted tooth 38 were accessed through a buccal bone lid fashioned using a piezoelectric device (Piezosurgery®, Mectron S.p.a., Carasco, Italy). The



tooth was easily extracted without sectioning and the lesion removed, leaving the inferior alveolar nerve intact. The buccal bone lid was returned to its original position and stabilized with a 1.3 mm fixation microplate (Synthes GmbH). Finally, the flap was put back in place and sutured.

**RESULTS:** Any immediate or late complications were recorded. The histopathological findings were consistent with follicular cyst with calcifications of the wall, confirming clinical and radiological pre-surgical diagnosis. Bone healing and any signs of recurrence of cyst were assessed at 6-month clinical and radiographic follow-up.

**CONCLUSIONS:** In conclusion, the bone lid technique for the removal of dentigerous cysts associated with impacted lower third molars demonstrated to be a safe and reliable technique. This approach provides better access and visibility of the surgical field and allows bone lid repositioning at the end of the surgery, minimizing the loss of bone. Even though there is limited literature addressing the effectiveness of customized surgical guides for fashioning osteotomies and for bone harvesting, it seems that an adequate preoperative planning in combination with a computer-guided surgery further simplifies the surgical intervention and reduces the risk of damage to anatomical structures. Adequate planning of bone pathology removal through a conservative approach, such the bone lid technique implemented using piezoelectric devices and computer-guided surgery, can allow the "restitution ad integrum" of the bone tissue.

### A classification for assessing surgical difficulty in the extraction of mandibular impacted third molars: description and clinical validation

E. Rizzato <sup>1</sup>, C. Stacchi <sup>1</sup>, P. Daugela <sup>2</sup>, F. Berton <sup>1</sup>, T. Lombardi <sup>3</sup>, T. Andriulionis <sup>2</sup>, G. Perinetti <sup>1</sup>, G. Juodzbalys <sup>2</sup>, R. Di Lenarda <sup>1</sup>

<sup>1</sup>Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy; <sup>2</sup>Department of Oral and Maxillofacial Surgery, Lithuanian University of Health Sciences, Kaunas, Lithuania; <sup>3</sup>Private Practice, Cassano allo Ionio, Italy

**BACKGROUND:** Assessment of the surgical difficulty of mandibular impacted third molar extraction is an important part of the pre-surgical analysis, in order to plan correctly both clinical and organisational aspects. Many classifications have been proposed over time, but their accuracy in predicting surgical complexity and risk of intra-operative complications remain questionable. The present prospective study introduces and clinically validates a modification of Juodzbalys and Daugela classification (JD), maintaining the original indexes and their evaluation, but with a different interpretation of the final score, in order to improve its effectiveness in predicting surgical difficulty of impacted mandibular third molar extraction.

**METHODS:** Patients needing a surgical extraction of an impacted mandibular third molar with formed roots were enrolled for the study in three centres. Common inclusion and exclusion criteria for oral surgery procedures were applied for eligibility. Surgical procedures were performed following a standardised approach by one expert surgeon in each centre. Surgical time from flap incision to the complete tooth removal was recorded, together with the technical variables of each intervention (flap design, osteotomy, coronectomy, roots separation) and possible intraoperative complications (e.g. apex fracture, profuse bleeding). Extracted third molars were evaluated according to the original and modified JD classifica-

tions, then obtained scores were compared. The sample size was calculated by considering the duration of the procedure as the main parameter to evaluate surgical difficulty. Power was set at 80% and alpha at 0.05. A p-value <0.05 was considered as being statistically significant.

**RESULTS:** One hundred and twenty-four patients were treated by three centres with mandibular third molar extraction, and each tooth was assigned with a score according to JD original and modified classifications. Mean surgical time was 24.1 ±22.2 min, with significant differences among the centres (p=0.001). Surgical time between groups derived from both former and modified JD classifications resulted significantly different (p=0.002 and p=0.001, respectively). In the multivariate analysis, the statistical model including modified JD score was more efficient than the model with original JD score in predicting surgical time (R<sup>2</sup>=0.204 and R<sup>2</sup>=0.126, respectively). Although both classifications have specific items to evaluate the risk of neurologic lesions, in the present study it was not possible to perform any statistical evaluation of this parameter due to the low number of cases with neurological complications: further investigations are needed to answer this issue.

**CONCLUSIONS:** The modified JD classification resulted as a reliable tool for predicting surgical time of impacted lower third molar extraction: this could be an adjunctive help for the clinician and the patient in the decision making process and to manage a more efficient daily planning both in hospital departments and in dental offices. Moreover, the future scientific works on impacted mandibular tooth could benefit of this classification to stratify surgical difficulty in order to standardise recorded data and to analyse them in a more reliable and predictable way.

### Cavernous hemangioma of the oral mucosa: a rare case report and literature review

F. Di Francesco, S. Ferrara, C. Maietta, R. Rullo

Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania "Luigi Vanvitelli", School of Oral Surgery

**BACKGROUND:** Hemangioma is considered a benign vascular lesion of congenital origin, which develops after abnormal proliferation of endothelial cells of blood vessels. The head and neck are commonly affected and the oral cavity is the most frequent site. Hemangiomas occur more frequently in the female with a male-female relationship between 1: 3 and 1: 5. The causes of onset are still unknown, but excessive muscle contraction, repeated trauma and hormonal factors seem to play a predominant role. In adults, cavernous hemangiomas usually do not regress and have a chronic course with slow and progressive growth. This paper reports a case of buccal cavernous hemangioma, diagnosed on the basis of clinical, instrumental and histopathological findings and treated surgically.

**METHODS:** A 20-year-old woman presented with a swelling, involving 2/3 of the left anterior part of the buccal mucosa, which has been reported for about 10 years. There were no associated characteristics of pain, fever, difficulty in phonation and swallowing. Intraoral examination revealed a single large intramural and non mobile neof ormation on the left anterior part of the buccal mucosa. The mucosal surface appeared grainy, bluish-violet in color with well-defined edges and surrounding area was normal appearance. On palpation the neof ormation had a soft consistency, and blanched



## ABSTRACT

on compression. Magnetic resonance imaging was used for diagnosis and volumetric analysis, showing a mass with distinct edges, an isointense signal on T1-weighted images and a hyperintense signal on T2-weighted images. In addition, EcoDoppler method was employed, which did not show any major tributary arterial branch feeding the lesion. Depending on the clinical and instrumental features, a provisional diagnosis of hemangioma was made. The employed instrumental investigations were fundamental to obtain diagnostic and surgical guidelines, and to avoid complications during planned surgery. Under general anesthesia, an intraoral approach was used, as the tumor was located in front of the masseter muscle and on a plane inside the buccinator muscle, below the oral mucosa. The excision of a large hemangioma can lead hemorrhages difficult to manage, especially in cases of hemangiomas of the buccal-masseteric region, which could be fed by a branch of the facial artery. Another anatomical-surgical relationship to consider is the one with the Steno's duct. The excised mass was about 3.5 x 2 x 1.5 cm, showing macroscopically nodular areas with an adipose, spongy and hemorrhagic appearance.

**RESULTS:** Histopathological examination confirmed the definitive diagnosis of cavernous hemangioma. Microscopic examination revealed large sinusoidal spaces covered by flat endothelial cells, interstitial fibroialinosis, the presence of lymphocytic inflammatory and hemorrhagic foci. Patient follow-up was performed for two years and there was no relapse of the lesion or outcomes involving neuromuscular function.

**CONCLUSIONS:** Although hemangioma is considered one of the most common soft-tissue tumors of the head and neck, it is relatively rare in the oral cavity. The identification of hemangioma is a challenge because these lesions clinically resemble other entities such as other vascular malformations (lymphangioma and varices), pyogenic granuloma, gigantocellular epulis, and oral carcinoma in its clinical varieties. The treatment is based on several factors such as size, position, accessibility, depth of invasion, patient age and aesthetic aspects. Most non-surgical treatments have been suggested as watch-and-wait, cryotherapy, laser therapy, isolated embolization, sclerosing agents or steroid injection. However, the results of these treatments are controversial, so they are recommended only when surgical treatment is contraindicated. In this case, surgical treatment was preferred, after careful clinical and instrumental analysis.

### A rare case of mucosal pigmentation of the hard palate in a patient taking imatinib

C. Bacci<sup>1</sup>, A. Angelini<sup>2</sup>, M. L. Mariuzzi<sup>1</sup>, G. Zanette<sup>1</sup>, A. Grigoletto<sup>1</sup>, A. Cerrato<sup>1</sup>, M. Cocco<sup>1</sup>, M. Valente<sup>2</sup>

<sup>1</sup>Oral Medicine, Pathology and Surgery (dott. C. Bacci) Clinical Dentistry, Department of Neurosciences, Padua, Italy; <sup>2</sup>Department of Cardiac, Thoracic and Vascular Sciences, University of Padua, Padua, Italy

**BACKGROUND:** To describe a rare case of oral mucosal pigmentation due to effect of Imatinib.

**METHODS:** Imatinib (brand names Gleevec or Glivec) is a tyrosine kinase inhibitor used as first line treatment of chronic myeloid leukaemia (CML) as stated by National Institute for Health and Care Excellence (NICE). Prescribing information for Imatinib lists the possible side effects, with skin hyperpigmentation risk as 0.1–1% while oral pigmentation aren't mentioned. There are few reports in the literature concerning

this clinical finding. In the august of 2017, the patient, male, 25 years old, was referred by the Oncohematologist because she noted a pigmentation of the hard palate. The patient was affected by CML since 2005, successfully treated with Imatinib, he present a kidney stone in 2015, was previously treated with ansiolotic therapy. At the time of the objective examination, the patient was in a state of general agitation thinking that the palatal lesion could be of neoplastic origin. For this reason the incisional biopsy (punch 0.5cm) of the palate was programmed under local anesthesia and conscious sedation as the usual protocol (Manani's protocol). The specimen was fixed in formalin and sent for histopathological examination, showing melanin deposition below the basal membrane.

**RESULTS:** Given histological examination pattern, the patient's history and the clinical appearance of the lesion, the diagnosis of pigmentation secondary to the use of Imatinib of the mucosa of the hard palate, was formulated. Similarly to what is described in the reports in the literature the risk of developing pigmenting intra-oral is very low even if probably underdiagnosed because, unfortunately, the intraoral examination is often not performed by non-dentist medical colleagues, contrary to what happened in this case. Moreover, the risk of pigmentations of this type increases if exposure is prolonged over time as in this case.

**CONCLUSIONS:** This case report describes an infrequent manifestation of side effect related to a drug widely used in the treatment of CML. The patient was looked not only for his pathology and to the contingent manifestation, but also in its entirety, also offering a pharmacological help to his understandable anxiety. The collaboration between various professional figures involved in order to reach a diagnosis that is not immediate as in this case is fundamental.

### Modified surgical extrusion of severely compromised teeth for rehabilitative and/or regenerative purposes

D. Angerame, M. De Biasi, B. Kalaj, M. Maglione

Clinical Department of Medical Science, Surgery and Health, University of Trieste, Trieste, Italy

**BACKGROUND:** The present work reports the possible advantages of a modified surgical technique to extrude severely damaged teeth for their early functional and aesthetic rehabilitation or to develop the implant site, highlighting the global advantages that this technique provides over the traditional surgical, orthodontic and combined techniques.

**METHODS:** We report a representative case to present the peculiar technical aspects of a modified surgical technique. An adult woman with an extensively decayed lower second premolar was treated as follows. Under local anaesthesia, an intrasulcular incision was performed on both the buccal and lingual sides; then, vertical releasing incisions were made up to the mucogingival junction. Full-thickness flap elevation was carried out coronally to the mucogingival junction. To allow a firm grip of the forceps on the root, a 3 mm-deep groove was prepared between the root to be extruded and the surrounding bone by using a fine-grit tapered point diamond bur mounted on a high-speed handpiece. Once luxated with rotational movements without being removed from the alveolar socket, the root was positioned 4-5 mm coronally to the alveolar crest, with the aim of respecting the biologic width and offering adequate ferrule for the final restoration.

Stabilization of the root was accomplished by triple composite resin-metal splinting on the buccal, lingual, and occlusal aspects after standard adhesive procedures. One and a half months later, the splint was removed and the final rehabilitation performed by means of a conventional metal-ceramic prosthetic bridge involving partial preparation of the adjacent abutment teeth.

**RESULTS:** No complications occurred during the follow-up period. During the first postoperative week, the patient complained mild symptoms that were compatible with the limited surgical trauma caused by the intervention. At the time of splint removal, no mobility of the extruded root was present. In this case and in our experience, preparing a groove between the root and the alveolar bone eased the luxation phase and did not jeopardise the healing process of hard and soft tissues, even in case of substantial changes of the original root position.

**CONCLUSIONS:** The modified surgical extrusion (double minimally invasive full-thickness flap, periradicular groove, rotational luxation movements, root permanence in the alveolar socket, extended extrusion and repositioning, triple splint) is a viable option in the restoration of severely compromised single-rooted teeth or in the management of nonrestorable roots. Its advantages include limited postoperative symptoms, low risk of complications, reduced chair-side time, and acceptable aesthetics. Further studies should take into account whether the technique has the potential to be standardised for implant site development, similarly to what can be made with orthodontic extrusion to improve bone and gingival characteristics of implant recipient sites.

### Bleeding evaluation in oral surgery patients treated with new oral anticoagulants

A. Accarino<sup>1</sup>, D. Izzo<sup>1</sup>, V.P. Cozzolino<sup>1</sup>, P. Nuzzolo<sup>1</sup>, R. Buccì<sup>2</sup>, G. de Paolis<sup>3</sup>, L. Ramaglia<sup>4</sup>, P. Buccì<sup>5</sup>

<sup>1</sup>Oral Surgery School, Department of Neurosciences, Reproductive and Odontostomatological Sciences, University of Naples Federico II, Naples, Italy; <sup>2</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University of Naples Federico II, Naples, Italy; <sup>3</sup>Department of Medicine and Pharmacy, Dentistry School, University of "Grigore T. Popa", Iasi, Romania; <sup>4</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University of Naples Federico II, Naples, Italy; <sup>5</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University of Naples Federico II, Naples, Italy

**BACKGROUND:** In the last few years, new orally administered anticoagulants drugs (NOAs) have been introduced in the clinical practice for patients that require prolonged use of anticoagulant drugs. Three types of NOAs have been recently approved in the USA and in several European countries, including Italy: dabigatran etexilate (Pradaxa®), rivaroxaban (Xarelto®) and apixaban (Eliquis®). Several advantages have been reported with NOAs, such as stable effect at a fixed dose without the necessity to monitor the coagulation with routine laboratory exams (INR), and rapid onset. Furthermore, unlike vitamin K antagonists, NOAs show a wide therapeutic margin, low drug to drug interactions and no significant food interactions. The use of NOAs has found several applications in different dentistry specialties, especially in oral surgery patients. The aim of this study is to evaluate the bleeding events after multiple dental extraction in patients taking NOAs, compared with patients taking conventional anticoagulants (warfarin).

**METHODS:** Thirty consecutive patients in treatment with oral anticoagulants were selected among the patients attending the Department of Special Oral Pathology of the "A.O.U. Federico II di Napoli" for multiple dental extractions. The patients were divided into two groups: Group A consisted of 15 patients in treatment with NOAs (7 males and 8 females, mean age 67.47 years), while Group B consisted of 15 patients in treatment with warfarin (6 males and 9 females, mean age 69.14 years), showing an INR ≤ 2.5. The inclusion criteria were: direct or indirect anticoagulants taking for heart disease (atrial fibrillation) or vascular disease (pulmonary embolism and deep vein thrombosis); over 60 years of age; need of multiple dental extractions. The exclusion criteria were: liver disease, severe renal failure, disorders of the hemostasis and coagulation, valvular prosthesis, history of prolonged bleeding events. The following conditions were applied in both groups: no changes of the current pharmacological therapy, antibioprophylaxis, tooth extractions between one and three teeth, use of sutures and hemostatic aids (oxidate cellulose). Bleeding evaluation was performed in the immediate post surgical phase (T0), 12 hours later (T1) and 72 hours later (T2). The between-group difference (Group A vs. Group B) was measured with an Analysis of variance (ANOVA) for repeated measurements, with Bonferroni correction. The significance level was set at P < 0.05.

**RESULTS:** Bleeding events were significantly reduced in Group A, as compared to Group B. Statistically significant difference was found at all the three time points measured (T0: P < 0.005, T1: P < 0.05; T2: p < 0.05).

**CONCLUSIONS:** This study demonstrated an easier bleeding management in patients treated with NOAs, when compared with patients treated with warfarin, after oral surgery procedures.

### Grinded teeth as a source of bone graft: a brief narrative review of the literature

E. Ernesti Moro<sup>1</sup>, S. Giovannini<sup>1</sup>, G. Brunello<sup>1,2</sup>, E. Stellini<sup>1</sup>, B. Zavan<sup>3,4</sup>, S. Sivoletta<sup>1</sup>

<sup>1</sup>University of Padua, Department of Neurosciences, Section of Dentistry, Padua, Italy; <sup>2</sup>University of Padua, Department of Management and Engineering, Vicenza, Italy; <sup>3</sup>Department of Biomedical Sciences, University of Padua, Padua, Italy; <sup>4</sup>Maria Cecilia Hospital, GVM Care & Research, Cotignola (RA), Italy

**BACKGROUND:** Teeth have been proposed as a source of grafting material for the treatment of alveolar bone defects. The aim of this brief narrative review is to present the different methodologies for the preparation of autogenous tooth graft: one involves the preparation of the graft at the dental office right after the extraction (chairside), whereas another method involves sending teeth to a tissue bank, where they are prepared according to a precise protocol and then sent back to the dentist for use.

**METHODS:** The PubMed database was searched for relevant literature. Combinations of the following key words were used as search terms: autogenous[All Fields] AND ("tooth"[MeSH Terms] OR "tooth"[All Fields] OR "teeth"[All Fields]) AND ("bone transplantation"[MeSH Terms] OR ("bone"[All Fields] AND "transplantation"[All Fields]) OR "bone transplantation"[All Fields] OR ("bone"[All Fields] AND "grafting"[All Fields]) OR "bone grafting"[All Fields]). Articles were restricted to those published in English from 2010 to January 2018. A secondary review of the reference lists of these articles was performed. The grey literature was

## ABSTRACT

also searched for relevant material. Clinical trials, case cases series, prospective clinical trials, cases reports and systematic review of literature regarding the clinical validity of autogenous tooth bone graft were considered. Animal and *in vitro* studies were excluded.

**RESULTS:** After title and abstract screening, 22 articles were obtained from the electronic search, ranging from 2010 up to January 2018. After full text analysis, 16 articles were included in the present review: 10 articles were about the tissue bank method (9 Auto-BT according Korea Tooth Bank processing, one Tissue Bank at TMH, Mumbai, India), 6 articles concerned the chairside method. The tooth graft material was used in several procedures such as: sinus floor augmentation, guided bone regeneration, socket graft, vertical and horizontal ridge augmentation for dental implant treatment. In the histological analysis, most of the studies reported new bone formation, angiogenesis and resorption of the graft material. SEM observations revealed the absence of enamel and cementum and the presence of distinct dentinal tubules surrounded by a dense collagen matrix. The dentinal tubules on the surface of the graft material were wider than those observed in untreated teeth. The survival rate of osseointegrated implants in studies with a follow-up of at least 1 year after loading was higher than 95%. When reported, secondary stability of dental implants placed in regenerated bone was higher than primary stability, in terms of ISQ. The dehiscence of the wound and hematoma were the most frequent complications. No difference between tissue bank and chairside methods was observed in terms of new bone formation and dental implant osseointegration.

**CONCLUSIONS:** Autogenous tooth bone graft seems to be a clinically safe material for bone augmentation procedures.

### Molecular biomarkers related to oral carcinoma: evaluation of recent findings of clinical trials in a systematic literature review

G. Amoroso, L. Fiorillo, C. D'amico, S. Marino, F. Lauritano, G. Cervino, M. Ciccù

*Department of Biomedical and Dental Sciences and Morphological and Functional Imaging, Messina University, Messina, Italy*

**BACKGROUND:** The objective of the present research was to systematically revise the recent literature about the recent genetic and proteomic biomarkers related to the oral cancer (OC) evaluating the recent findings in clinical studies. OC is a disease that often leads to a poor prognosis, from this arises the need to know any factors or markers that can guide the clinician in a way that is not or minimally invasive to an early diagnosis.

**METHODS:** A comprehensive review of the current literature was conducted according to the PRISMA guidelines by accessing the NCBI PubMed database. Authors conducted the search of articles in English language published from 2008 to 2018. A total of 8 relevant studies were included in the review. They concerned proteomic and genetic alterations in OC. The present systematic review included only papers with significant results about correlation between genetic alteration and oc but novel oc biomarkers cannot be defined. Prognostic capacity of genetic markers was not evaluated *in vivo*.

**RESULTS:** The first analysis with filters recorded about 1884 published papers. Beyond reading and considering of suitability, only 20 and then 8 papers, with case report exclusion,

were recorded for the revision. The clinical studies evaluated reflected how there are alterations in the expression of some genes that may influence a predisposition by the patient in developing oral cancer. In the studies taken into consideration, all on human samples, soft tissue biopsies affected by oral cancer are performed, and the genetic expression of these biopsies is evaluated, evaluating any alterations. Alterations on the EGFR gene copy number, or alterations on miR-7, miR21, mRNA-KIFGA, OPN, DEPDC1B, EZH2, deltaNp63 and DNMT3B were important for early evaluation and correlation with oral cancer. In the 8 studies the degree of significance of these data was never higher than  $p < 0.05$ .

**CONCLUSIONS:** All the researches recorded the proteomic and genetic alterations in oc human biopsy cells. Genes alterations level in the different studies, compared with samples of healthy tissues, has always been statistically significant, but it is not possible to associate publications with each other because each job is based on the measurement of different biomarkers and gene targets. Further investigations should be required in order to state scientific evidence about a clear advantage of using these biomarkers for diagnostic purpose.

### Postoperative hemostasis in patients treated with local anesthetics with and without vasoconstrictors (adrenalin)

R. Nammour, G. Chessa, A. Lumbau, B. Piunti, F. Maucione

**BACKGROUND:** The main characteristics of a local anesthetic are the latency, the diffusion capacity, the power of action, the duration and the toxicity. Latency is the time between local anesthetic administration and nerve conduction blocking. The diffusion capacity of a local anesthetic depends on the degree of concentration as in the reaching and crossing of the tissues and nerve fibers there is a dispersion of anesthetic substance and, therefore, a decrease of its concentration. The power of action depends on the capacity of the substance to bind to the lipoproteins of the nerves. This capacity depends on the partition coefficient (fat-solubility) and protein binding, greater the partition coefficient mean greater toxicity. The duration of the anesthetic effect depends on the permanence of a sufficient degree of concentration in contact with the nerve. If there is a high blood vessel around the nerve the anesthetic will be more quickly eliminated through these. All clinically effective injectable local anesthetics are vasodilators, the degree of vasodilation varying from significant (procaine) to minimal (prilocaine, mepivacaine) and also possibly with both the injection site and individual patient response. Vasoconstrictors are drugs that constrict blood vessels and thereby control tissue perfusion. Vasoconstrictors are important additions to a local anesthetic solution for the following reasons: 1. By constricting blood vessels, vasoconstrictors decrease blood flow (perfusion) to the site of drug administration. 2. Absorption of the local anesthetic into the cardiovascular system is slowed, resulting in lower anesthetic blood levels. 3. Local anesthetic blood levels are lowered, thereby decreasing the risk of local anesthetic toxicity. 4. More local anesthetic enters into the nerve, where it remains for longer periods, thereby increasing the duration of action of most local anesthetics. 5. Vasoconstrictors decrease bleeding at the site of administration; therefore they are useful when increased bleeding is anticipated. Adrenalin is the most vasoconstrictor used in local anesthetics in medicine and dentistry, but isn't an ideal drug. The benefits to be gained from adding



adrenalin (or any vasoconstrictor) to a local anesthetic solution must be weighed against any risks that might be present. Adrenalin is absorbed from the site of injection, just as is the local anesthetic.

**METHODS:** Our study includes a postoperative evaluation of 30 patients, 15 of them treated with vasoconstrictors and 15 without vasoconstrictors, who have compiled a diary of the problems for 7 days, noting their intensity, day and time. **RESULTS:** All patients successfully completed the study. From the analysis of the data reported in the questionnaires compiled by the patients, it emerges how much it follows, of the 15 patients in whom the operation was performed with vasoconstrictor anesthesia, 9 have reported strong pain and bleeding in the first day and a progressive decreasing symptomatology in the following days; the remaining 6 don't report symptoms worthy of note. Of the 15 patients in whom anesthesia was performed without vasoconstrictor, all did not report bleeding, 11 reported mild pain and 4 no pain. **CONCLUSIONS:** Adrenalin acts directly on both  $\alpha$ - and  $\beta$ -adrenergic receptors;  $\beta$  effects predominate. The primary action of adrenalin is on smaller arterioles and precapillary sphincters. Blood vessels supplying the skin, mucous membranes, and kidneys primarily contain  $\alpha$  receptors. Adrenalin produces constriction in these vessels. Injection of adrenalin directly into surgical sites rapidly produces high tissue concentrations, predominant  $\alpha$  receptor stimulation, and hemostasis. As adrenalin tissue levels decrease over time, its primary action on blood vessels reverts to vasodilation because  $\beta$  actions predominate. Additional findings of increased post-surgical pain and delayed wound healing were noted in the adrenalin receiving group.

### Conscious sedation decreases post-operative pain after oral surgery: a pre-emptive mechanism?

F. Dell'Olio<sup>1</sup>, P. Lorusso<sup>2</sup>, I. Sorrentino<sup>2</sup>, M. Massaro<sup>2</sup>, S. Grasso<sup>2</sup>, G. F. Favia<sup>1</sup>

<sup>1</sup>Unit of Odontostomatology, DIM, Interdisciplinary Department of Medicine, Aldo Moro University of Bari, Bari, Italy; <sup>2</sup>Unit of Anesthesiology, DAE, Emergency Department, Aldo Moro University of Bari, Bari, Italy

**BACKGROUND:** The objective of this study is to assess the impact of conscious sedation on post-operative analgesia after oral surgery.

**METHODS:** 35 randomly enrolled patients of the oral surgery section of the Unit of Odontostomatology of Bari University were involved in this study. Each patient underwent to RX-OPT, standard blood tests, ECG and anesthesiological evaluation. During the anesthesiologist's interview, each patient was classified according to the American Society of Anesthesiologists (ASA) and Modified Dental Anxiety Scale's test (MDAS). Conscious sedation was induced in anxious (MDAS  $\geq$  14) and phobic (MDAS  $\geq$  18) patients. The surgical procedures included extractions, biopsies (oncological and non-oncological), cystectomies, laser photocoagulations and sialolithiasis excisions. Local anesthesia with mepivacaine 3% (without adrenaline) was administered to each patient. After surgery, acetaminophen 1000 mg tablets was administered as rescue analgesic on patients request. Type and length of surgery, total amount of mepivacaine 3% were recorded. After 2 days, all patients were interviewed to assess the post-surgical pain through the Visual Analogical Scale (VAS) (from 1 to 10) and to record the total consumption

of acetaminophen. Statistical analysis was performed with a first type of bias estimated at 5% ( $\alpha=0,05$ ), using t-student and F-Fisher tests.

**RESULTS:** According to the MDAS score, 8 patients were phobic, 15 were anxious and 12 had a MDAS score lower than 14. According to ASA classification, 4 patients were ASA1, 13 ASA2, 16 ASA3 and 2 were ASA4. Conscious sedation was induced in the 23 anxious or phobic patients, with nitrous oxide in 14 and with e.v. diazepam in 9. At the 2 days postoperative follow up the "not-sedated group" had a mean V.A.S. score of 2,583 (C.I. 1,285;3,881) whereas the "sedated" group had a mean V.A.S. score of 1,300 (C.I. 0,884;1,716);  $p < 0,05$ . There was no statistical difference between the two groups in terms of surgical procedure, length of surgery, total amount of administered mepivacaine 3% and cumulative dose of post-operative acetaminophen.

**CONCLUSIONS:** Our preliminary data suggest that that conscious sedation during oral surgery decreases post-operative pain, according to the V.A.S. score. We speculate that the "pre-emptive" analgesic effect of conscious sedation could be related to the effects of nitrous oxide and diazepam on the GABA-receptors.

### Neurological complications following lower third molar surgical extractions: a 9 year case-series study

S. Bigagnoli, V. Picciano, M. Maglione

Department of Medicine, Surgery and Health Sciences, University of Trieste, Trieste, Italy

**BACKGROUND:** The aim of this observational retrospective study is to evaluate the rate and the types of neurological complications in lower third molars' surgical extractions.

**METHODS:** Analysing Università di Trieste Dental Clinic database from January 2008 to June 2017, all patients that underwent surgical extraction procedure of at least one lower third molar were considered. Patient data were extrapolated from Dental clinic management system and then analyzed by the means of a file seeker software. Key words like "extraction 48" and "extraction 38", "Paresthesia" and "Dysaesthesia" were used to find the cases in which neurologic symptoms were reported. Patients with neurological symptoms not related to third molar surgery (pre-existing conditions, trauma, involvement of other neural branches) were excluded. All remaining patients data were organized in a spreadsheet and for each subject different parameters were considered, like gender, age, extracted tooth, extraction cause. The involved nerve branch (Inferior alveolar nerve, Lingual nerve or Buccal nerve), the type of Paresthesia considering healing (temporary or permanent) and Symptoms (dysaesthesia, paresthesia, anesthesia), the type of surgery involving osteotomy, odontotomy procedures were all taken into account. Pell&Gregory, Winter and Maglione classification were considered when Orthopantomography or CBCT were available. The type of anesthesia and operator experience were also evaluated.

**RESULTS:** 59(91,29%) patient out of 3493 who underwent the surgical procedure showed a neurological complication. 23,7% of those complications were permanent (0,4% of all patients). 8 patients reported a Lingual nerve lesion (3 of them permanently), 48 patients reported an Inferior alveolar nerve lesion (11 of them permanently), 2 patients reported a Buccal nerve lesion. One patient reported both a lingual and



## ABSTRACT

an inferior alveolar nerve lesion. 14 patients (23,7%) referred dysaesthesia, always associated with sensitivity lessening or loss in areas of the involved region. 35 patients (59,3%) were females, while 24 were males (40,2%). 71,2% of the patients were more than 30 years old at the moment of surgery. There was no substantial difference between right and left side, while the most common causes of extraction in this sample were pericoronaritis (by far), cyst associated with third molar and third molar abscess. In all cases a full thickness flap was raised and a marginal osteotomy procedure was performed. Only in 6 cases (10,2%) it wasn't necessary to cut the tooth. The most common tooth position, according to Winter, was the vertical one, followed by horizontal teeth, while according to Pell&Gregory Classification the most common position were 2B and 2C, followed by 3C and 2A. Patients were treated in most cases with a local anesthesia (81,4%) and in 59,3% by a surgeon with more than 5 years of experience. Although it wasn't possible to contact or collect the CBCT of 18 patients (30%), 22% of patients in this sample didn't have a CBCT at the moment of the surgery. Most patients with pre-surgical CBCT had a type 3 or 4 position following Maglione classification. In 60,7% of the analysed CBCT, IAN was in a close relationship with the roots, showing an interruption of the corticalization or a smaller calibre.

**CONCLUSIONS:** Neurological complications rate in this sample seems not to differ from current reported rates. Dysaesthetic symptoms like pain and hypersensitivity were found approximately in one out of four cases of nerve damage. Vertical position of the tooth, advanced age of the patient at the moment of surgery and close relationships of the roots with IAN were found to be common features of the subjects included in this sample.

### Inferior alveolar nerve decompression after implant injury: microsurgical approach

M. Cocco, L. Tomasin, E. Bardhi, C. Bacci

*Oral Medicine, Pathology and Surgery (dott C Bacci), Clinical Dentistry (head Prof. E. Stellini), Department of Neurosciences (head Prof. A. Martini)*

**BACKGROUND:** The authors report the case of a 40 years old woman, who underwent implant treatment of the left second mandibular premolar edentulism with compression of inferior alveolar nerve (INA) due to the fracture of mandibular canal (MC) roof.

**METHODS:** The patient, presented at the Dental Clinic of Padua University Hospital, has been object to the immediate fresh sockets implant position in left second mandibular premolar edentulism by her dentist, who removed the implant after 24 hours because she referred an altered sensation and anesthesia, he also prescribed steroid treatment. In the 3<sup>rd</sup> day post-op, our examination showed persistent total anesthesia of the lower lip and chin. Ortopantomography and CBCT highlighted how the implant site preparation was involving the MC, the fracture of MC roof and two fragments of bone into the MC near the mental foramen. The surgeon decided to explore the site according to the patient. A conscious sedation and local anesthesia have been realized (paraperiosteal injections with Mepivacaine 2% with 1:100000 epinephrine and Bupivacaine, mental block, inferior alveolar nerve block and buccal block with Mepivacaine 2%). A mucoperiosteal flap was elevated with an intrasulcular incision and a mesial release flap. Under surgical microscope (Leica, Wetzlar,

Germany, 5 to 40x magnification) a mental nerve was isolated and a bone lid was performed cranial to the mental foramen with piezoelectric device (Piezosurgery, MectronSpA, Carasco, Italy). The nerve appeared undamaged and pieces of bone were removed. The nerve was irrigated with a sterile saline solution and 8mg of Betametasona. A monofilament non absorbable suture (Nylon 5/0) was applied. Antibiotic therapy (Amoxicillin/ Clavulanate 1g orally every 12hrs), antalgic treatment (Acetaminophen 1000mg orally every 8hrs), and Nicetile (Acetylcarnitinehydrochloride) have been prescribed after surgery.

**RESULTS:** After a 7 days period, the anesthesia was still present. After 3 months, the anesthesia disappeared, but a persistent sensation, called Numb Chin, occurred on the lower lip and chin.

**CONCLUSIONS:** In the literature, Iatrogenic injury in oral surgery is the most frequent case of sensory disturbance in the distribution of the inferior alveolar and mental nerve. INA damage can occur during the third molar extraction, implant location, orthognathic surgery, preprosthetic surgery, salivary gland surgery, local anesthetic injections or during the resection of benign and malignant tumors. The sensory disturbance, which could follow a damage of the INA, could be hypoesthesia, dysesthesia, hyperesthesia and anesthesia. These complications can be treated in two different ways: through observation or with the surgical decompression of the involved nerve. In this case report the surgeon decided to intervene immediately because the CBCT showed, that the fragments of bone were involving the MC and compressing the nerve.

### Observational preliminary study of chlordesmethyldiazepam and triazolam clinical effects

E. Audino, M. Riviera, R. Zotti, S. Salgarello

*Clinica Odontoiatrica-Università degli Studi di Brescia, Chirurgia Orale, Brescia, Italy*

**BACKGROUND:** Benzodiazepines in dentistry are the gold standard to induce intravenous anxiolysis. Nowadays, the protocol has a main disadvantage: side effects duration. Using two long-acting benzodiazepines (>24 hours) extends the anxiolytic effect until evening, or even longer, preventing daily activities. This study wants to find the elective drug to induce intravenous anxiolysis in outpatient clinic. Triazolam (SONGAR®, short-acting) and Chlordesmethyldiazepam (EN®, long-acting) have been considered and used alternatively in bilateral extraction of inferior third molars in the same patient. For both drugs we compared clinical effects, duration, patients' sensations after the administration.

**METHODS:** We selected 10 patients who have to undergo bilateral extraction procedure for third molar with intravenous anxiolysis. The resulted sample is composed by patients between 18 and 50 years, ASA I, non-alcohol/drugs dependent. During the first session patients were told to answer the Corah modified test and the VAS test. They were also explained the procedure, instructions pre- and post- anxiolysis and caution post-surgery. Premedications were different for each session and we used 2mg/52 droplets Chlordesmethyldiazepam (EN®) and 0,250mg/20 droplets of Triazolam (SONGAR®). The drugs administration followed the double blind method. After 45 minutes, Diazepam 2mg in bolo was injected in vein in order to reach patient's subjective maximum tranquillity (10 on VAS Test). We also col-

lected data about Blood Pressure, Heart Frequency, Oxygen Saturation and Diazepam injected dose. The post-surgical course was evaluated by our own tests. For each surgical intervention we prescribed intra-operative anti-inflammatory therapy intravenous and antibiotal and anti-inflammatory therapy to be administered at home.

**RESULTS:** This trial show that the most effective reduction of preoperative anxiety was obtained with Chlordesmethyldiazepam (DMVAS=1,1) versus Triazolam (DMVAS=0,8). Mean administered dose after premedication with Chlordesmethyldiazepam is equal to 10,3 mg (11,5 mg for Triazolam). Triazolam-induced anxiolysis also caused an extension of effects until 7 hours after the intervention against the 9 hour effects extension obtained with Chlordesmethyldiazepam -induced anxiolysis. 7 patients out of 10 reported that EN®-induced anxiolysis was the best. The reason why most of the patients chose EN® is due to a more comfortable and quiet sedation, without feeling sleepy, contrariwise SONGAR®-induced anxiolysis. Premedications with SONGAR® also induced incomplete anxiolysis: the patient did not feel comfortable and felt more sleepy, dizzy and sedated.

**CONCLUSIONS:** Chlordesmethyldiazepam (EN®) results to still be the elective premedication drug. Side effects show up faster, it has a better anxiolytic effect and it causes less dizziness and drowsiness than Triazolam. But instead, EN® anxiolytic effects are more durable.

### Alveolar ridge preservation using l-prf. Clinical and histological evaluation: preliminary study

G. Serafini, L. Fortunato, G. Mazzucchi, M. Lollobrigida, A. De Biase

*Scuola di Specializzazione in Chirurgia Orale, Dipartimento di Scienze Odontostomatologiche e Maxillo Facciali, Sapienza Università di Roma, Rome, Italy*

**BACKGROUND:** The alveolar ridge resorption following tooth extraction is a frequently observed phenomenon that may reduce the possibility of a dental implant placement and/or compromising the aesthetic results following prosthetic rehabilitation. Several techniques and biomaterials have been introduced over the years to prevent or reduce post-extraction bone loss. Among biomaterials, in this study it was used the leukocyte- and platelet-rich fibrin (L-PRF), an autologous platelet concentrate rich in growth factors and plasma proteins obtained by the centrifugation of patient's blood. The aims of this experimental preliminary study were to investigate if the use of L-PRF membranes for socket filling could improve hard and soft tissue healing after dental extraction and to assess the effects of this platelet concentrate in the Alveolar Ridge Preservation procedure before implant placement through clinical and histological analysis.

**METHODS:** Five patients requiring tooth extraction (non-restorable caries, advanced periodontal disease, vertical root fractures) followed by implant placement were treated with an atraumatic extraction and socket filling with L-PRF membranes. Periodontal flogosis indexes have been recorded at baseline, 28-day control and at implant placement. Implant placement was performed at twelve weeks and a bone biopsy was obtained for histomorphometric analysis.

**RESULTS:** Clinical analysis showed a reduction in periodontal flogosis indexes between baseline and 28-day control; this result confirm the biocompatibility of the grafted material

and is attributable both to the post-extraction oral hygiene maneuvers and to the antimicrobial action of the leucocytes in the L-PRF. As far as the dimensional variation of the ridge is concerned, a slight reduction in the buccal-oral width has been found, confirming that a total preservation of the original dimensions is not possible, but it is certainly greater by implementing the Ridge Preservation techniques compared to cases where these procedures are not applied. The histological analysis of hard tissues shows the presence of newly formed bone tissue for 42% and of connective tissue for the remaining part.

**CONCLUSIONS:** These results show that the use of a fibrin membrane rich in platelets and leucocytes results in a good quantity and quality of newly formed bone and good healing of soft tissues. This procedure helps the clinician to preserve bone volumes and obtain satisfactory aesthetics. Unlike other Ridge Preservation procedures, the use of L-PRF is a simple method that requires minimal cost and reduces the need for specific grafting materials. Moreover, being an autologous product, there is no risk of transmission of diseases nor the risk of a possible infection of the graft.

### Long-term evaluation of autologous extraoral bone grafts as bone substitute in maxillary vertical augmentation

G. Tetè, C. Manenti, F. Mottola, A. Cataldi, S. Zara, R.Vinci

*Università Vita-Salute San Raffaele, Reparto di Chirurgia Orale, Odontoiatria, Milan, Italy; Università G. D'Annunzio, Dipartimento di Farmacia, Anatomia Patologica, Chieti, Italy*

**BACKGROUND:** Reconstruction of maxillary and mandibular bone defects due to accidents, tumors or atrophy from edentulism represents an important clinical challenge for oral surgeons and the knowledge of bone tissue and native bone substitutes biological properties is important in order to repair such defects. Actually, autologous bone, switching on osteogenesis, osteoinduction and osteoconduction, which can be paralleled by inflammatory events, driven by specific intracellular signalling molecule is considered the gold standard among substitutes. Thus, basing on previously reported evidences the aim of this study was to evaluate the morphological and molecular mechanisms characterizing the integration of autologous calvaria bone grafts after 4 months (T1), 6 months (t2) and 15 years (T3) and the remodeling of the implant site.

**METHODS:** Three patients (45/65 yrs) were included: two needing oral bone rehabilitation through calvaria graft and implantsupported prosthesis, one needing implant insertion in the adjacent area to a site regenerated with calvaria graft 15 yrs before. In the first two patients, bone samples were obtained from donor site (T0), from regenerated area 4 months after grafting (T1), and 6 months after implant insertion (T2). Moreover, a bone sample was obtained from a third patient, 15 yrs after grafting (T3). Morphostructural analysis and immunohistochemical analyses of BSP2, osteogenic marker, Collagen I, organizer bone matrix, VEGF, angiogenic regulator, ERK ½, regulating both osteogenic and angiogenic activity, and iNOS inflammatory protein, expression were carried out.

**RESULTS:** T1 and T2 samples show the presence of important remodeling phenomena, with area of bone resorption and apposition, together with new blood vessels formation. T3 sample shows morphological features very close

## ABSTRACT

to native bone, as shown by the disappearance of welding lines. However, small polygonal cells resembling osteoblasts are close to Havers channels. Immunohistochemical analyses show a drastic decrease of Collagen expression, in T1 and T2, stabilized in T3, in parallel to BSP2 expression increase, which however is considerably reduced in T3. Moreover VEGF angiogenic factor is increased in T2, with respect to T0, T1 and T3 which are quite similar. The highest level of Erk1/2 is evidenced in T2 sample, basal levels of iNOS, related to inflammatory events is evidenced in T0 and T3, with respect to T1.

**CONCLUSIONS:** This data, combined with clinical observations, suggest that the graft of extraoral source, is perfectly integrated after 15 years. Moreover, this is confirmed by the presence of polygonal cells around the Havers channels and by the trend through the years of BSP2, paralleled by VEGF and ERK1/2 expression, suggesting that there is a residual new bone formation. Thus, autologous extraoral bone grafts, in particular calvaria ones, seem particularly suitable as biomaterial for bone regeneration of extensive defects prior to a subsequent implant-supported prosthetic therapy.

## Central giant cell lesion (CGCL) in adult patient

S. Rania, R. Pertile, A. Cugno Garrano, M. Santoro  
SSD Odontostomatologia, ASST Valle Olona (Va), Varese, Italy

**BACKGROUND:** Show a clinical case of a surgical treatment, of a central's lesion of Giant Cells (CGCL) Clinic's and radiographic's attributes: 1) Spawning non-malignant and asymptomatic, with possible aggressive osteolysis, which is largely located in the premolars and molars's area; 2) The shape is Radiotranslucent, often is multiloculated, it seems to have the existence of simil-osteoclastic's Giant Cells, lymphocytes, granulocytes, plasma cells, macrophages, located in fibrous tissue with hemosiderin's reservoir and also hemorrhagic's areas and reactive bones.

**EPIDEMIOLOGY:** Subjects under 30 y.o., predominantly female, incidence 1.1 for million/a y.

**DIFFERENTIAL DIAGNOSIS:** 1) Dark Tumor similar to hyperparathyroidism from which it is histologically indistinguishable; 2) Giant's cells tumor (osteoclastoma, a primitive isolated tumor): normally damages large bones, and it's very unusual in maxillary bone, malignant in 10-30%, high risk of relapse, it must be treated as malignant (RT).

**THERAPY:** 1) surgical extirpation (frequently relapse); 2) Medical (calcitonin, glucocorticoids, antiangiogenic drugs); 3) Partial resection on the maxillary bone.

**CASE REPORT:** Female patient, 40 y.o., caucasian with a lesion situated in the inferior maxillary bone, located in 4.3 and 4.6 zones. During the physical examination, we can observe an abscess, that takes its origins near the tooth pieces of 4.4 (lower premolar) which has a massive cavity, with an asymptomatic and unilocular's shape. Vitality of 4.3 (canine) is positive. During the radiographic's inspection, with an orthopantomography, we can see the evidence of radiolucent lesion of NDD. We demand an extra exam with mandibular's Tac Cone Beam, in which we can see a simil-cystic lesion with cell nucleus of ossification, which is enlarged till the cortical's area with a huge bone's reabsorption. We proceed with surgical extirpation with narcosis, and we start the evulsion of the dental pieces 4.4 (premolar inferior), 4.5 (second premolar

inferior), and 4.6 (first inferior molar). The lesion appears with a fibrous shape, without any liquids or purulent substance. In case of doubt, the diagnostic's clinician can be confirmed by the histological's exam of CGCL.

**RESULTS:** histological diagnosis: Cellulars spawning, principal made of fibroblastic mononuclear elements, with some groups of giant cells, plurinuclears with neoborn spots of re-ossification. Mitotic's index: Less than 1 mitosis/10HPF (high power field). Proliferative's index: about 5%. The histological case is compatible with central's granuloma of giant cells.

**CONCLUSIONS:** The right definition of central lesion of giant cells (CGCL), in the old classification of ICD-9-CM, also included both Granuloma and tumors of Giant cells, which can be exclusively diagnosed by the mitotic and proliferative's index, so we can say that the diagnosis is revealed by the histological. The treatment is surgical, and the extension of the resection depends by the histological's diagnosis.

## Surgical management of a zygomaticomaxillary complex fracture with an underlying maxillary sinus odontogenic cyst

F. Dotto, A. Rapani, F. Berton, R. Rizzo, M. Maglione  
Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy

**BACKGROUND:** Pathologic fracture is defined as a fracture caused by an underlying pathologic lesion. This because the pathologic process weakens the bone and the fracture results from normal function or inadequate trauma. While the open reduction of a fracture has the objective of re-alignment and fixation of the bone stumps, the bone weakness of the cortical walls due to the underlying lesion may hamper this procedure. Similarly, single-step surgical approach brings the advantages of lower morbidity and a better access of the lesion without further bone demolitions. The present report describes the surgical management of a zygomaticomaxillary complex (ZMC) fracture and a coexisting odontogenic cyst.

**METHODS:** A 54-years-old otherwise healthy female patient was referred to the Department of Dental and Maxillo-facial Surgery of Trieste for a ZMC fracture caused by an accidental fall. From the CT scans a fracture of the right ZMC with orbital frame and floor involvement, including antero-lateral and posterior right maxillary sinus was detected. As occasional finding, a large right intrasinus cystic like lesion with osteosclerotic lining, expanding the anterior and lateral wall of the right maxillary sinus was identified. The lesion was unilocular, with a diameter of 22,5 mm x 28,8 mm enclosing 1.5 and 1.6 apex. On clinical examination, periorbital edema and ecchymosis and misalignment of the right orbital frame were present. The patient did not report any sensitivity alteration of the area nor *visus* impairment. 1.5 and 1.6 did not respond to the vitality test, and were characterized by huge carious lesions. After an ophthalmological evaluation, that excluded any ocular extrinsic muscle involvement, the patient received a broad-spectrum oral antibiotic therapy and was prepared for the surgical intervention, under general anesthesia, scheduled four days later. A linear incision from 2.1 to the tuber maxillae was made and a full thickness envelope flap was raised.



The right maxillary buccal cortical appeared macroscopically deformed from the lesion expansion. After isolation of the right infraorbital nerve, the coronal maxillary fracture was reduced and fixed with micro titanium plate and screws. Teeth 1.5 and 1.6 were extracted together with the cystic lesion that was easily detachable thanks to the fracture gap to the maxillary sinus. The thin deformed maxillary anterior wall was thereafter repositioned. To overcome the bone fragility a large titanium plate was fixed with screws. The procedure ended with the management of the orbital frame and floor fractures: floor reconstruction, fracture alignment and fixation. Accurate primary intention wound closure was reached both for cutaneous and mucosal access specifically to avoid oro-sinusal fistula creation.

**RESULTS:** Postoperative wound healing was uneventful and no further complications were encountered at 1 month follow-up.

The histological examination revealed a cystic section with stratified squamous epithelium with fibrosis phenomena and lymphoplasmacellular infiltrate.

**CONCLUSIONS:** Cyst enucleation and primary closure with fracture reduction was performed in single step surgical approach to reduce the post-operative morbidity. Since the bone alteration, due to the cystic lesion and the increased surgical time and difficulty, the approach should be chosen thoroughly in the preoperative phase. In conclusion, underlying bone lesions may cause pathological fracture or worse traumatic fractures, like in the presented case. The opportunity of taking advantage of the maxillary fracture gap to gain a better access to the cystic lesion without opening a trap-door and the possibility of a single surgical procedure should be taken into account.

### Intraoral maxillary nerve block: comparison of 2 techniques

G. Zanette <sup>1</sup>, R. Vianello <sup>2</sup>, F. Golin <sup>2</sup>, A. Camurri Piloni <sup>2</sup>, S. Sivoletta <sup>3</sup>, C. Bacci <sup>2</sup>

<sup>1</sup>Department of Neurosciences, Dentistry Section, Chair of Dental Anesthesia, University of Padua, Padua, Italy; <sup>2</sup>Department of Neurosciences, Dentistry Section, University of Padua, Padua, Italy; <sup>3</sup>Department of Neurosciences, Dentistry Section, University of Padua, Padua, Italy

**BACKGROUND:** Patient comfort during surgery is mandatory and a single anesthetic block is superior than multiple local anesthetic infiltrations. This study aims to compare two classical maxillary nerve block (MNB) techniques: the greater palatine canal (GPC) approach versus high tuberosity (HT) approach, in ambulatory patients scheduled for maxillary sinus lift surgery at the University of Padua Dental Clinic.

**METHODS:** The research was conducted on a sample of 30 patients randomly divided into two groups: GPC 15 patients and HT 15 patients. Local anesthetic used was 1.8 ml of mepivacaine 2% with epinephrine 1:200.000, anxietyolysis was provided, when indicated on the base of preoperative patient anxiety evaluation, following our institutional protocol. The patient's feelings and experiences, the anesthesia features and the operator's opinion were registered by the authors. Data are expressed as mean±SD, the statistical analysis was conducted with ANOVA,  $\chi^2$  following Yates and linear regression, for a significance level of  $P < .05$ .

**RESULTS:** Each group had reached a continuous and intense

local anesthesia in the posterior area, behind the first upper premolar, slight and discontinuous in the area anterior to this tooth. Some additive supra-periosteal infiltration was necessary in vestibular and palatal regions in GPC and HT groups, respectively. The dentist has reported the same difficulty during the execution of both techniques. Patients have referred more pain during the Great Palatine Canal approach versus High Tuberosity approach. Between the two groups there is no statistic differences regarding peri-operative pain or uncomfortable sensations. Complications related to the two techniques were not reported.

**CONCLUSIONS:** Our results show that in the posterior region of the maxilla, the GPC approach for the maxillary nerve block, allows to reach a better anesthesia of the dental pulp and vestibular and palatal mucosae. On the contrary, HT approach does not guarantee a full anesthesia of the pteryogopalatine branch. The loco-regional and anxietyolysis techniques applied in this study have guaranteed a low incidence of peri-operative pain, no complications and satisfaction of all the patients.

### Mesenchymal stem cells from bichat's buccal fat pad and PRP for tissue engineering: *in vitro* study

R. Gasparro <sup>1</sup>, M. Lecce <sup>2</sup>, V. D'Esposito <sup>2</sup>, S. Cabaro <sup>2</sup>, P. Formisano <sup>2</sup>, G. Sammartino <sup>1</sup>

<sup>1</sup>Department of Neuroscience, Reproductive Science and Dental Science, University of Naples, Federico II, Naples, Italy; <sup>2</sup>Department of Translational Medicine, University of Naples, Federico II, Naples, Italy

**BACKGROUND:** Mesenchymal stem/stromal cells (MSCs) represent important suitable candidates in regenerative medicine applications for the treatment of tissues damaged by trauma or pathological diseases. Even though bone marrow represents the most used source of stem cells (BMSCs) in the clinical field, adipose tissue in the last decade, gained recognition and represents a valid alternative source of MSCs. Here, we propose the buccal fat pad (BFP) as a new likely source for ASCs, which could be of great interest for dentists and maxillofacial surgeons. PRP is a platelet concentrates releasing growth factors such as PDGF (platelet derived growth factor), FGF (fibroblast growth factor), VEGF (vascular endothelial growth factor), EGF (epidermal growth factor), TGF (transforming growth factor) involved in tissue regeneration, local haemostasis and acceleration of wound healing. The purposes of our study were isolate Mesenchymal stem/stromal cells (MSCs) from Bichat's buccal fat pad, differentiate them in adipogenic and osteogenic lineage and evaluate the interaction with platelet rich plasma (PRP) at different level of glucose concentration to simulate a condition of hyperglycaemia in humans.

**METHODS:** Adipose tissues were harvested from 9 patients. Human adipose tissue biopsies were digested with collagenase and Stromal Vascular Fraction (SVF) Cells were isolated. Then the cell growth and cell viability were evaluated. Adipogenic differentiation was assessed by lipid accumulation using Oil Red O staining. Osteogenic differentiation was assessed by detection of mineralization foci using Alizarin Red (ARS) staining. The PRP was obtained by 3 healthy volunteers from the Transfusion Centre of Aversa (Italy). The PRP was activated using calcium gluconate in 2:1 ratio. The cells were seeded in 6-well culture plates in absence of



## ABSTRACT

serum. PRP was activated and the gel was placed on the cells at 10% of the volume of culture medium. Culture medium was used with two different glucose concentrations: low glucose (1 gr/l-5mmol) and high glucose (4,5 gr/l-25 mmol). Cell count has been performed with Neubauer chamber at 24, 48 and 72 hours. The study was approved by the Ethical Committee of the University Federico II, Naples (prot. N. 89/15).

**RESULTS:** At day 7 the Stromal Vascular Fraction (SVF) Cells have increased about twice compared to cells of the day 1. The cells differentiated in adipogenic and osteogenic lineage. PRP increased the cell proliferation of the both cellular groups, low and high glucose. The high concentration of glucose reduced the number of cells. PRP has significantly improved the number of cells in higher concentration of glucose, respect to the group in the same condition but without PRP. In the human physiologic glucose concentrations, PRP had a better result on the cellular proliferation compared to higher glucose concentrations. PRP may partly reverse the negative effect of high glucose on cells.

**CONCLUSIONS:** Buccal fat pad might be a novel source of MSCs. Human BFP-ASCs in association with PRP might be quite easily applied in oral tissue engineering, because this tissue is rapidly accessible by dentists and maxillofacial surgeons.

### Coronectomy in horizontally impacted third molars: treatment option or contraindication?

V. Vellani, H. Talib, T. Wiedemann

*NYU College of Dentistry- Oral & Maxillofacial Surgery Department, New York, NY, USA*

**BACKGROUND:** Although widely accepted as an alternative treatment option for mandibular 3<sup>rd</sup> molars, coronectomies in horizontally impactions are commonly considered contraindication since the surgical procedure itself poses a substantial risk of nerve damage for the IAN. The objective of this study is focused on the identification of comprehensible radiographical and clinical features, displayed on panoramic radiographs and Cone Beam CT Scans, and their relevance in the risk assessment for coronectomies in horizontally impacted mandibular third molars which require surgical treatment. A classification, based on a literature review and well defined risk assessment algorithm, has been developed to streamline the decision making process.

**METHODS:** A PubMed, OVID Medline and Google Scholar search for articles related to keywords such as "Coronectomy, Horizontal Impacted Third Molar, Coronectomy vs Extraction" has been performed. No articles about coronectomies performed on horizontal impacted third molars were found. Therefore the research was enlarged to articles related to coronectomy or to studies comparing coronectomy with extraction. References were selected based on the following criterias: Systematic Review, Reviews, Meta-Analysis and Case Report, English language.

**RESULTS:** Only horizontally impacted mandibular 3<sup>rd</sup> molars which required surgical intervention were included in the study: if specific radiological markers on the panoramic radiograph indicated a close relationship between the third molar roots and the mandibular canal, an additional CBCT was performed. The relationship of the apical portion of the roots in relationship to the IAN on the CBCT data were used to classify the tooth as low, medium or high risk for extraction. If a tooth was classified as either medium or high risk

for total removal, it was further assessed and classified for coronectomy. According to a literature review and our clinical judgement, 4 indicators can be identified as relevant in the individual risk assessment related to coronectomy: tooth angulation, bone shield, root morphology and patient related factors. Based on a cumulative point score, the indication for a coronectomy has been appraised as 'low risk', 'moderate risk' or 'high risk'.

**CONCLUSIONS:** Our results suggest that if certain radiographic and clinical characteristics can be identified, horizontal impactions of lower third molars are not necessarily to be considered a contraindication for coronectomy. Our classification offers a relatively simple guideline in the decision making process on whether a coronectomy represents a viable treatment option for mandibular horizontally impacted third molars.

### Solitary plasmacytoma of the jaw: a rare case report

A. Russo, C. Maio, P. Scalzone, R. Rullo

*Multidisciplinary Department of Medical-Surgical and Dental Specialties of the University of Studies of Campania "Luigi Vanvitelli", School of Specialization in Oral Surgery*

**BACKGROUND:** The solitary bone plasmacytoma is a tumor characterized by the abnormal proliferation of monoclonal plasma cells. It mainly affects the axial skeleton; its presence in the maxillary bones is extremely rare. Hence the desire to present the case of a solitary plasmacytoma located at the right angle of the mandible, diagnosed on the basis of clinical, radiographic, histopathological and haematological findings.

**METHODS:** The patient who came to our observation was a 70-year-old woman who presented a neof ormation for about three months at the right jaw corner which, according to her, was increasing in size over time. Intraoral examination reveal a neof ormation covered by bluish mucosa not ulcerated. On palpation, presented a soft-elastic consistency and was not displaceable with respect to the underlying layers. Moreover, it appeared painful both spontaneously and at palpation. The Cone Beam computed tomography was used as an aid to diagnosis and volumetric analysis, showing an osteolytic lesion free of sclerotic border that had invaded both the lingual and the vestibular cortical involving also perimandibular soft tissues. Occasionally, but nevertheless suggesting etiopathogenetic hipotesis, was detected the presence in the previous period of a third molar in semi-inclusion in the same site that was subsequently extracted. Considered clinical and radiological characteristics, we decided to proceed with the excision of the neof ormation and its subsequent histological examination.

**RESULTS:** The Histopathological examination's result was compatible with plasmacellular neoplasia with plasmablastic differentiation aspects (according to WHO 2016). The analyzed sample was made of fibro-osseous tissue, almost entirely occupied by a monomorphic neoplastic population with a diffuse pattern, consist of plasmacitoid cells and large plasmablastic cells, characterized by moderate amounts of slightly eosinophilic cytoplasm, atypical nucleus with open chromatin and well evident nucleolus with high mitotic index. The neoplasia infiltrated the bone and the adipose surrounding tissues. Neoplastic cells were found to be positive to immunohistochemical methods with CD138, MUM-1, EMA, CD56. The neoplastic cells had a proliferative index of 90%. The his-

tological diagnosis was further confirmed in haematological tests: protein electrophoresis of serum showed the presence of a monoclonal spike of the Kappa type IgG typical of plasmacellular disorders. After the diagnosis, the patient was referred to specialized departments to carry out further investigations and to proceed with the most appropriate therapy.

**CONCLUSIONS:** The solitary plasmacytoma of the mandible is a rare clinical condition, so in the presence of an osteolytic lesion of the jaw it is difficult to suspect plasmacytoma. But if it is diagnosed by histological examination, it is necessary to carry out further investigations to exclude the possible involvement of other body districts and the transformation into its disseminated form, the Multiple Myeloma.

### Preliminary assessment of microbiota by 16s rRNA high throughput amplicon target sequencing: clinical possibilities and application

I. Branca<sup>1</sup>, I. Ferrocino<sup>2</sup>, M. Carossa<sup>1</sup>, N. Gavrilova<sup>1</sup>, F. Musano<sup>1</sup>, S. Carossa<sup>1</sup>

<sup>1</sup>CIR Dental School, Department of Surgical Sciences, University of Turin, Turin, Italy; <sup>2</sup>DISAFA - Microbiology and Food Technology sector, University of Turin, Grugliasco (TO), Italy

**BACKGROUND:** Apical periodontitis, mainly caused by the bacterial colonization and infection of the endodontic space, occurs in the periodontal tissues in form of either a periapical granuloma (PG) or a radicular cyst (RC). These two types of lesion are histologically characterized by the absence and the presence of an epithelial lining, respectively. Bacteria could influence the evolution of apical periodontitis; despite this, valuable knowledge about the comparison of PGs and RCs as for their microbiota has not been fully addressed in the scientific literature. The aim of this research is to assess whether and how these two nosological entities are different in terms of microbiota by means of high throughput amplicon target sequencing techniques. This approach provides us with information not only about the prevailing taxa but also on the less represented community members, allowing us to acquire better knowledge of the periapical inflammation process.

**METHODS:** Five cases of periapical granulomas and five cases of radicular cysts were selected from the pool of lesions identified in 37 patients during a period of 13 months between 2015 and 2016. Medical, radiographic and histologic documentations of each patient were evaluated and only adult people in good health conditions were considered. Inclusion criteria consisted of: diameter of the lesion greater than 1 cm and proximity to teeth with unfavorable prognosis. The microbiota from chosen periapical granulomas and radicular cysts thus acquired was eventually traced by pyrosequencing of the 16S rRNA genes.

**RESULTS:** Generally speaking, facultative anaerobes taxa (like *Lactococcus lactis*, *Staphylococcus warneri*, *Propionibacterium acnes*, *Acinetobacter johnsonii*, *Gemellales*) were predominant in the microbial panorama shared between both periapical granulomas and radicular cysts. However the research shows clearly that the microbiota of PGs samples is well distinct from that of RCs. *L. Lactis*, the principle taxon in the whole dataset, was associated with periapical granuloma specimens. According to literature, the anaerobic OTUs detected prevailed in radicular cysts specimens. In addition, metabolic pathways connected with LPS biosynthesis were positively related to cyst samples. OTUs co-occurrence and co-exclusion were also investigated.

**CONCLUSIONS:** The present small-scale preliminary study

supports that microbiota of periapical granulomas and radicular cysts are qualitatively different. Moreover, it offers a new perspective about the contingent role of *L. lactis* in periapical granulomas.

### Extra-follicular adenomatoid odontogenic tumor: a case report

A. Zimbalatti<sup>1</sup>, G. La Monaca<sup>2</sup>, C. Della Rocca<sup>3</sup>, M. P. Cristalli<sup>3</sup>

<sup>1</sup>Department of Oral and Maxillofacial Sciences, Sapienza, University of Rome, Rome, Italy; <sup>2</sup>Department of Sense Organs, Sapienza, University of Rome, Rome, Italy; <sup>3</sup>Department of Biotechnologies and Medical Surgical Sciences, Sapienza, University of Rome, Rome, Italy

**BACKGROUND:** The “Adenomatoid Odontogenic Tumor (AOT)” was classified in the 1th (1971) and 2th edition (1992) of the WHO histological classification of odontogenic tumours. Later in the 3th edition (2005) AOT was defined as a tumor of odontogenic epithelium and mature fibrous stroma, in which the occurrence of a hyaline, dysplastic material or calcified osteodentin, containing occasionally dentinal tubules in some areas, was interpreted as a metaplastic process, due the absence of the odontogenic ectomesenchyme. This paper reports a case of extrafollicular type of AOT in the left maxillary region.

**CASE REPORT:** A 16-year-old female woman was referred to the Oral Surgery Unit of the Policlinico Umberto I Hospital– Sapienza University of Rome with a chief complaint of asymptomatic swelling in the left side of maxilla, gradually increasing from approximately 12 months. Intraoral examination revealed on the left maxillary posterior region a swelling extending from the mesial margin of 2.4 up to the distal margin of 2.7, which were sound and vital. Buccal cortex was expanded and the surface was covered by normal oral mucosa. On palpation, the consistency was bony, except for mild tenderness at one point above first and second molars. Radiographic exams (orthopantomogram and computer tomography) showed a well- defined unilocular radiolucency involving premolars and molars teeth, included the unerupted third molar, and resorption of the roots of the first and the mesial root of the second molar. A calcific foci was noticeable. An incisional biopsy was carried out and the specimen was compatible with the diagnosis of AOT. The treatment, performed under general anesthesia, consisted by conservative enucleation of the lesion, extraction of 2.6 with reabsorbed roots and apicectomy of the involved teeth, previously devitalized. The histologic exam of the enucleated lesion confirmed the diagnosis of AOT. The healing was uneventful. Regular follow-up was performed and 12 months postoperative radiographs revealed satisfactory bone healing with no signs recurrence.

**DISCUSSION:** The reported case was a typical AOT as far as age, sex, size, appearance and histopathology. Indeed, this type of odontogenic tumour is mostly found in young female patients and especially in the second decade of life; it presents as a low-growing, painless swelling; microscopically, “the most striking pattern is that of variably sized solid nodules of cuboidal or columnar cells of odontogenic epithelium forming nests or rosette-like structures with minimal stromal connective tissue. Between the epithelial cells and in the centre of the rosette-like configurations, eosinophilic amorphous material (“tumour droplets”) is present. Conspicuous within the cellular areas are structures of tubular or duct-like appearance.” The extrafollicular variant without relation with

## ABSTRACT

impacted tooth is quite rare, accounting of 24% of all AOT cases, while intraosseus follicular type associated with an impacted tooth represents 73%, and peripheral type attached to the gingival structure 3%.

**CONCLUSIONS:** In view of the conservative surgical treatment, accurate preventive histological diagnosis is mandatory to exclude other causes of jaw swelling in a young patient. In the differential diagnosis, it should be considered apical cyst, dentigerous cyst, calcifying odontogenic cyst, odontogenic keratocyst, central giant cell granuloma, unicystic ameloblastoma, calcifying epithelial odontogenic tumor, ameloblastic fibroma, and ameloblastic fibro-odontoma.

### Scientific evidence on the use of recombinant human bone morphogenetic protein-2 (RHBMP-2): current and potential applications in oral surgery

G. Mazzucchi, G. Serafini, L. Fortunato, M. Lollobrigida, A. De Biase

*Corso di Laurea Magistrale in Odontoiatria e Protesi Dentaria, Dipartimento di Scienze Odontostomatologiche e Maxillo Facciali, Sapienza Università di Roma, Rome, Italy*

**BACKGROUND:** BMP-2 are a group of multifunctional growth factors found in human body and are members of the transforming growth factor  $\beta$  superfamily (TGF- $\beta$ ). BMP-2 has been associated with the induction of osteoblast differentiation, and they act as potent regulators during bone and cartilage formation and repair. RhBMP-2 are manufactured using molecular biology techniques with the aid of DNA recombinant bioengineering technology.

RhBMP-2 are always associated with carriers, such as ACS (absorbable bovine collagen sponge), hydrogels, calcium phosphate ceramics, essentially hydroxyapatite (HA) and tricalcium phosphate (TCP). Their purpose is to ensure controlled release and to maximize their biological activity at the surgical site, avoiding systemic diffusion.

This research aims to identify properties, efficacy and main current and potential fields of application of rhBMP-2 in oral surgery. In 2007, the combination of rhBMP-2 and bone grafting materials and membranes was approved by the food and drug administration (FDA) as an alternative for autogenous bone graft for sinus augmentations and for localized alveolar ridge augmentations for defects associated with extraction sockets. However, the clinical use of BMPs is growing mainly in off-label applications.

**METHODS:** Literature search of the PubMed database was performed using the following MeSH index terms: “BMP-2” [MeSH] AND (“socket preservation” OR “ridge preservation” OR “ridge augmentation” OR “GBR” OR “maxillary sinus augmentation” OR “bone regeneration” OR “oral surgery” OR “periodontal regeneration”). Only studies about humans of the last ten years, published in English and related to dentistry, were included. Only observational studies such as case series, case controls and cohort studies, and experimental studies such as case reports and randomized controlled trials (clinical trials), have been considered.

**RESULTS:** According to the inclusion criteria applied, forty-one articles were considered. Eleven studies were excluded after careful evaluation of the complete texts. Therefore, thirty studies were included in this review. From these studies it was possible to highlight that BMP-2 integrated into periodontal grafting material, can regenerate successfully significant

amount of periodontal attachment apparatus including new cement, connective tissue and new bone (Bowers et al. 1991). Some studies have shown a successful application of BMP-2 in the repair of peri-implant defects and induce implant osteointegration (Sigurdsson et al. 1997). The use of rhBMP-2 in maxillary sinus floor augmentation achieved similar clinical and histometric outcomes when compared to conventional sinus grafting procedures after a healing period of 6–9 months (Lin et al. 2015). The use of rhBMP-2 for the preservation of the alveolar ridge after tooth extraction or for increasing the local defects is safe and viable. It can improve and accelerate the maturation process in case of guided bone regeneration in peri-implant defects (Ferreira et al. 2016). RhBMP-2 /ACS has been shown to be the most effective chemoattraction system for bone-forming cells, and results in favourable bone density and bone height.

**CONCLUSIONS:** the results of our research, revealed that the use of rhBMP-2 is safe. It induces bone formation and eliminates morbidity associated with autogenous grafting. Dosages and carriers are crucial issues for clinical results and for any side effects. All the investigations show an increase in bone formation if the dosage is increased, but the side effects would also increase. Further disadvantage of rhBMP-2 is the high cost. More studies are needed to determine the cost-benefit of using rhBMP-2 in oral surgery.

### Efficacy of a pool of amino acids and sodium hyaluronate (Aminogam®) in the healing of postextraction sockets in patients affected by IRC and DM-2

M. Caudera <sup>1</sup>, V. Bonino <sup>1</sup>, R. Pol <sup>2</sup>, D. Camisassa <sup>3</sup>, A. Spadafora <sup>3</sup>, M. Carossa <sup>3</sup>, T. Ruggiero <sup>2</sup>

*<sup>1</sup>Oral Surgery Unit, Dentistry Section, Department of Surgical Sciences, University of Turin, Turin, Italy; <sup>2</sup>Oral Surgery Unit, Dentistry Section, Department of Surgical Sciences, University of Turin, Turin, Italy; <sup>3</sup>Oral Surgery Unit, Dentistry Section, Department of Surgical Sciences, University of Turin, Turin, Italy*

**BACKGROUND:** To evaluate the efficacy of a medical device, in gel formulation, composed of 4 amino acids (glycine, leucine, proline, lysine) and sodium hyaluronate (AMINO GAM®) in improving socket healing after tooth extraction in patients affected by two chronic pathologies which influence negatively intraoral wounds healing: chronic renal failure (CRF) and type 2-diabetes mellitus (DM). We considered patients with high grade of severe and chronic diseases.

**METHODS:** This was a split-mouth study in which each patient also served as the control: the study socket was treated with AMINO GAM®, whereas the control socket underwent natural healing. The outcome variables were: Healing Index (HI), residual socket volume (RSV), VAS scale, post-intervention complications, individual questionnaire results. In this study we divided patients in 2 groups: the first with CRF and the second with type2-DM. To evaluate systemic risk, in first group we considered the impact of: anticoagulant/antiplatelet therapy, End-Organ Disease Score, BMI. In the second group we considered patients with HAIC level of at least 8%, insulin therapy, evidence of systemic complications from DM (heart and vascular disease, nephropathy, neuropathy, or retinopathy). In both groups we considered: pharmacologic therapy, platelet count, years from disease diagnosis, pressure, smoking habits. Patients were included in a follow-up program with 4 post-extraction check-ups over



a 21-day period. Pairs of correlated continuous variables were analyzed with the Wilcoxon test, independent continuous variables with the Mann-Whitney test, and categorical variables with the  $\chi^2$  test or Fisher test.

**RESULTS:** 30 patients affected by CRF and 30 affected by DM underwent contemporary bilateral extractions of homologous teeth. The treatment-versus-control postoperative comparison showed that AMINOGAM<sup>®</sup> resulted in significantly smaller residual socket volumes and better Healing Indices from days 3 to 14. The patients' questionnaire outcomes were in favour of AMINOGAM<sup>®</sup> treatment.

**CONCLUSIONS:** Application of AMINOGAM<sup>®</sup> after extraction improved the healing process in CRF and diabetic patients by accelerating socket closure (epithelialization) and tissue maturation, proving the association between AMINOGAM<sup>®</sup> use and improved wound healing in CRF and diabetic patients.

### Related quality of life after oral malignant lesion removal: evaluation of recent outcomes in a systematic literature review

S. Marino, L. Fiorillo, C. D'amico, G. Amoroso, G. Cervino, M. Cicciù

*Department of Biomedical and Dental Sciences and Morphological and Functional Imaging, Messina University, Messina, Italy*

**BACKGROUND:** Oral cancer (OC) is a common and rapidly aggressive tumor ranking fifth among the major causes of cancer-related deaths. Accordingly to the World Health Organization (WHO) 10.3 million people might die due to cancer by the year 2020. Therefore patients' survival remains poor and consequently the health-related quality of life (HRQoL) is fundamental in these patients. As novel treatment are developed to have quick diagnosis and management of this clinical pathological condition, a comprehensive knowledge of available tools to assess impact on QoL is needed. Health related quality of life information gives patients and carers an indication of how they will be affected following treatment.

**METHODS:** This work is going to review all the investigations in OC patients published within the last 10 years from 2008-2018, which assessed HRQoL as a primary or secondary endpoint. A total of 373 studies was recorded during a first analysis with filters. Reading and considering of suitability, only 42 articles were free full text, in english and human studies. Then 12 papers, with case report exclusion, were recorded for the revision. Commonly used tools were European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30) and the Oral Health Impact Profile OHIP or Health Related Quality of Life HRQoL and the Oral Health one OHRQoL. A comprehensive review of the current literature was conducted according to the PRISMA guidelines by accessing the NCBI PubMed database.

**RESULTS:** A total of 12 relevant studies were included in the review. The present systematic review included only papers with significant results about correlation between HRQoL and OC. The study showed that the oral cancer patients coped well and adapted to near normal oral status after prosthetic rehabilitation. After treatment, oral cancer patients had worse OHRQoL, worse physical HRQoL and similar psychological HRQoL than the general population. This contributed to the improved overall health-related quality of life. For example, patients rehabilitation program, like mandible reconstruction

with free fibula flap, influences on patients' quality of life and oral functions.

**CONCLUSIONS:** We discuss the treatments included in the tools, their evaluation, and summarize existing QoL data that will help design future OC trials in order to guarantee the maintaining of general health high standard for OC patients.

### DOACs patients do not bleed more than VKAs patients in dentoalveolar surgery!

A. Franco, J. Contarin, R. Rizzo, F. Costantinides, E. Visintini, M. Maglione, F. Berton, R. Di Lenarda

*Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy*

**BACKGROUND:** The aim of this clinical trial was to evaluate and compare the intra- and post-operative bleeding during simple dental extraction, among patients in treatment with Vitamin K Antagonists (VKAs) and patients assuming Direct Oral Anticoagulants (DOACs).

**METHODS:** Patients under oral anticoagulant therapy who needed single dental extraction were enrolled in the study and divided in VKAs and DOACs group. Every patient underwent simple and standardize single tooth extraction. All the participants were evaluated in a preoperative assessment, during surgery, thirty minutes after surgery and the day of suture removal (seven days after surgery). At the different time-points personal data, medical history, pharmacological therapy, local periodontal and dental variables were collected. The surgical protocol consisted in a simple dental extraction (no elevation of mucoperiosteal flap and/or ostectomy) lead by the same surgeon (FB), in the least invasive approach and with a maximum surgical time of 15 minutes (pain of dropout). Biological complications were registered and post-extraction bleeding was described according to Iwabuchi classification.

**RESULTS:** 37 and 53 patients were enrolled in VKAs e DOACs group respectively. No differences appeared between the two groups about age (T-test for unpaired data;  $p=0,667$ ) and gender (Fisher exact test;  $p=0,670$ ). Overall 90 teeth were extracted. The results of the present study showed statistical difference (Fisher exact test;  $p=0,032$ ) for VKAs patients regarding the post-extraction bleeding complications. On the other hand the distribution of bleeding events according to Iwabuchi classification resulted homogeneous between the two groups (Chi-quadro test;  $p=0,145$ ). In detail: no intra-operative bleeding occurred, eight patients for VKAs group and six patients for DOACs group reported a post-operative bleeding managed with a single gauze compression during the week after the extraction, six patients of VKAs group and three subjects belonging to DOACs group needed more than two compressions in the week, and finally one patient for each group referred to our dental first aid. In these two cases, the alveolar haemorrhage was managed with the local application of tranexamic acid.

**CONCLUSIONS:** Patients assuming DOACs can be treated for simple oral surgery as patients in VKAs therapy with INR index between 2 and 3. No discontinuation or changes of anticoagulation treatment with novel oral anticoagulants are possibly required. The adoption of local hemostasis techniques represents the most important precaution to prevent bleeding complications. Patient education for the post-operative care of surgical site appears also strictly necessary.



## ABSTRACT

**Dental extractions in patients affected by type I Von Willebrand disease. Efficacy of PRGF without hematological replacement therapy**D. Auteri<sup>1</sup>, N. Cocero<sup>2</sup>, C. Frascalino<sup>1</sup>, S. Carossa<sup>3</sup>

**BACKGROUND:** Von Willebrand disease (VWD) is the most common inherited bleeding disorder. It's related to a mutation in the gene encoding for the Von Willebrand factor (VWF), an important glycoprotein involved in the haemostatic process. The mutation can lead to quantitative or qualitative defects of the VWF and consequently to a phenotype characterized by an increased bleeding risk. Since surgical interventions including dental extractions may lead to excessive bleeding, common procedure is to recur to preoperative (and/or postoperative) haematological management with replacement therapy. The preoperative haematological treatment with plasma-derived products can carry risks of viral infection, is expensive and increases patient's discomfort. Plasma rich in growth factors (PRGF) is a mixture of autologous proteins and growth factors obtained from a small sample of patient's blood. Such proteins trigger angiogenesis and cellular proliferation, improving haemostasis and the healing process. While being an effective hemostatic agent, PRGF carries the advantage of being autologous and minimally invasive for the patient. Being determined by a partial quantitative deficiency of VWF, type 1 VWD is the less severe form of the disease. Episodes of massive bleeding are unfrequent in such patients and type 1 is therefore considered to be the easiest form to be managed. The aim of this study was to test the efficacy of PRGF as a local hemostatic, in absence of preoperative replacement therapy, in 30 patients affected by type I VWD.

**METHODS:** 30 patients affected by type 1 VWD were included in the study after haematological evaluation. Only patients with no need for replacement therapy were eligible. The study had no exclusion criteria for age, gender, and presence of comorbidities. Dental extractions were performed by the same surgeon in a non-traumatic way. PRGF was obtained centrifuging patient's blood samples. The PRGF component was collected and added with calcium chloride. The gel obtained was placed in post-extraction sockets. 4/0 silk thread was used for the suture. All patients underwent systemic treatment with tranexamic acid. Postoperative bleeding was evaluated after an hour, one, three and seven days after the surgery. The presence of hematoma was assessed.

**RESULTS:** 30 extractions were performed, including 7 surgical ones (23.3%). One postoperative bleeding was reported three days after the extraction and required surgical re-intervention. Nevertheless, an interruption of the tranexamic acid therapy reported by the patient may have increased the bleeding risk. No other postoperative bleeding episodes were reported. One hematoma was noted.

**CONCLUSIONS:** The results show that local therapy with PRGF seems to be effective even in absence of the systemic replacement therapy. These results encourage the use of haemostatic agents as the only treatment for patients affected by type I Von Willebrand disease in order to reduce costs for the health system, patients discomfort and risk of viral infection. Furthermore, local haemostatic agents can be a useful solution for those patients that are not responsive to desmopressin as haematological therapy. More studies should be carried out to assess if patients affected by more severe forms of Von Willebrand disease, such a type II and III, could be treated the same way.

**Prevention of oral mucositis in patients undergoing hematologous stem cell transplantation with mucosamin**

V. Bonino, M. Caudera, S. Simiele, R. Pol, D. Camisassa, M. Carossa, L. Giaccone, T. Ruggiero

*Department of Surgical Sciences, Oral Surgery Section, C.I.R. - Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** The purpose of the study is to evaluate the clinical effects of Mucosamin® (a spray preparation containing sodium hyaluronate combined with a pool of amino acids of precursors collagen, including L-Proline, L-Leucine, L-Lysine and glycine), on prevention of wound healing and pain management of oral mucositis (OM) after hematopoietic stem cell transplantation (HSCT).

**METHODS:** 101 patients undergoing Hematopoietic Stem Cell Transplantation were recruited in a randomized clinical trial and divided into 3 groups:

i) Group 1 (33 patients): patients underwent a full session of professional oral scaling and root planning by dedicated hygienist; then they were instructed to use the Mucosamin mouthwash from the first day of hospitalisation and to recognize the symptoms of oral mucositis and apply Mucosamin spray on these lesions 3-4 times a day after meals and oral hygiene, keeping it in situ for about 2 minutes avoiding drinking, eating and rinsing the mouth for at least an hour. The same doctor controlled the patients during hospitalization to recognize initial and advanced signs of OM and to remind patients how to apply the compound.

ii) Group 2 (32 patients): patients underwent a full session of professional oral scaling and root planning by dedicated hygienist, these patients did not receive Mucosamin but the usual treatment with Chlorhexidine 0.20%.

iii) Group 3 (34 patients): patients did not undergo a full session of professional oral scaling and root planning by dedicated staff and did not receive Mucosamin but the usual treatment with Chlorhexidine 0.20%. In addition, patients were asked whether they had undergone professional hygiene sessions in the 6 months before. The research systems used are: WHO mucositis scale, OMAS mucositis scale, periodontal recording, days of mucositis.

**RESULTS:** Group 1 subjects developed less cases of mucositis (61,5%) than other groups 81%. Furthermore Group 1 shows a statistically significant prevalence of lighter mucositis than other two groups. (group 1 vs group 2 p-value 0,005, group 1 vs group 3 p-value 0,003). Between those who developed mucositis, Group 1 shows a less severe grade of mucositis, WHO 1 (41,3% - 14 patients), while group 2 had a more severe grade, WHO 3 (38% - 11 patients) and group 3 shows a prevalence of more severe OM, WHO 3 (51,6% - 16 patients). Furthermore, considering OMAS scale, group 3 developed more severe lesions. (group 2 vs group 1 p-value 0,0004, group 3 vs group 1 p-value  $3,3 \times 10^{-8}$ ).

Most of the lesions disappeared in medium in 7 days, with a maximum of duration of more than 30 days; but in group 1 all lesions lasted 21 days maximum.

**CONCLUSIONS:** Mucosamin as prevention reduced incidence of mucositis cases, statistically significant. In subjects with mucositis the product reduced lesions severity; in particular Mucosamin showed efficacy in severe grade lesions in a statistically significant way

Finally, it can be stated that the use of Mucosamin also results in a reduction in the extent of chemotherapy lesions. Hyaluronic acid and amino acid-based sprays can be a valuable therapeutic aid in the treatment of OM.

## Treatment of patients who underwent kidney transplantation: analysis of logistic aspects and of systemic and oral complications

G. Rivetti, L. Savoldi, R. Pol, D. Camisassa, S. Carossa, T. Ruggero

*Department of Surgical Sciences, Oral Surgery Section, C.I.R. - Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** Analyze the possible relation between the systemic complications in the post-transplantation period and the possible presence of oral infectious foci at the moment of the transplantation. It is also given an analysis about the logistic aspects of the management of these patients in the period before and after the transplantation.

**METHODS:** It was analyzed a sample of 48 patients underwent kidney transplantation, divided into two groups:

Group A: 33 (69%) patients underwent kidney transplantation without oral infectious foci

Group B: 15 (31%) patients underwent kidney transplantation despite the presence of at least one oral infectious focus. These patients, when followed at Dental School in the pre-transplantation period, were treated following the most conservative protocol, using also elective treatments (like endodontic retreatment) when necessary, after a careful planning on the base of the clinical and radiological analysis.

Then it was analyzed the timing between the diagnosis of kidney pathology, the transplantation, the first and the last dental visit, to evaluate the timing for dental treatment.

Finally, the possible complications in the post-transplantation period were analyzed (fever, number of fever episodes, pneumonia, mucositis, urological complications, other complications, acute rejection and death) and a correlation with the infectious oral foci was done.

**RESULTS:** From the analysis of the data emerged no significant differences between the two groups about the complications, except those different from urological complications, where a decrease was seen after 6 months from transplantation in the group treated for the infectious foci. Moreover in the same group, the decrease of the fever in the first 6 months after transplantation was almost significant.

It was noticed that the complications in the first 6 months after transplantation were less in the group treated for the infectious foci, except the urological ones, which have no significant relation with the oral infectious foci.

The time for dental treatment was of about 20 months, as opposed to the time between the diagnosis and the transplantation of about 100 months.

**CONCLUSIONS:** There is no significant difference between the group in which the oral infectious foci were treated and the other about the post-transplantation complications. According to the long time for dental cares, it is suggested to treat all the infectious foci in the most conservative way, to avoid possible complications and to improve the psychological impact of the oral component on these subjects.

## Multiple manifestations of medication-related osteonecrosis in a single patient. A case report

S. Grosso, F. Eroigni, I. Bosso, E. Duni, S. Carossa

*Department of Surgical Sciences, Oral Surgery Section, C.I.R. - Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** Medication-related osteonecrosis of jaw (MRONJ) is a severe adverse drug reaction, consisting of

progressive bone destruction in the maxillofacial region. It can be caused by two pharmacological agents: antiresorptive (including bisphosphonates and osteoclasts inhibitors e.g. denosumab) and antiangiogenic. These drugs have demonstrated their efficacy in limiting the osteolysis that occurs in many disorders characterized by increased bone resorption, included bony metastases and osteoporosis. While approximately two thirds of the MRONJ lesions are in the mandible, one third is located in the maxilla. In 40-50% of them the maxillary sinus is involved, leading to sinusitis and oro-antral communications. Exposed necrotic bone is the distinctive sign of the disease, but the clinical picture can be varied and heterogeneous, including jaw pain, swelling, abscesses, and fistulas. The aim of this report is to describe a case of multiple manifestations of MRONJ involving both upper and lower jaw in a single patient.

**CASE DESCRIPTION:** A 78-year-old female patient was admitted to our department in October 2015. At the clinical and radiological examination, the presence of a bone sequestrum in the I quadrant molar region and of a fistula in the II quadrant molar region were observed. No dental events could explain the osteonecrosis. The orthopantomography also showed periradicular osteolysis of endodontic origin around the element 3.5. The patient had undergone surgery for breast cancer in March 2009 followed by adjuvant chemotherapy and hormone therapy. From September 2009 to June 2013 she has been treated with zoledronic acid (4 mg i.v. every 4 weeks) and with denosumab (120 mg i.v. every 4 weeks) from July 2013 to March 2014. She also suffered from insulin dependent diabetes and hypertension. In October 2015 the I quadrant molar region was treated through surgical resection of the bone sequestrum. In January 2016 the patient underwent surgical treatment of the II quadrant molar region. After elevating a mucoperiosteal flap using a crestal incision, all the affected bone was removed through piezosurgery. The oro-antral communication was closed through Bichat's buccal fat pad flap. The patient was prescribed 7 days preoperative and 7 days postoperative antibiotic therapy with amoxicillin and clavulanate 1000 mg x 3 die and metronidazole 500 mg x 3 die. Until removal of sutures 14 days postoperatively, the patient was asked to eat soft food, to avoid blowing her nose and to use antibacterial mouthwash with 0.12% chlorhexidine frequently. In December 2017 the patient presented with signs and symptoms of periapical periodontitis on 3.5. At the radiological examination it was observed the association of osteonecrosis foci and sequestra. The element 3.5 was extracted and the site of osteonecrosis was treated through surgical resection. The wound was closed by first intention. The same antibiotic therapy and postoperative instructions were prescribed to the patient.

**DISCUSSION:** Our patient recovered completely after surgical treatment, in combination with diabetes disease control and antibiotic therapy. Conservative treatment to reduce pain, discomfort, and infection is recommended as initial therapy, however, if there is a sequestrum, surgical treatment is of primary importance. Two key factors to ensure the success of surgical treatments in MRONJ patients are the sufficient removal of infected and necrotic tissue, and a good blood supply for the local flap in order to help the wound close completely.

**CONCLUSIONS:** This case report highlights the variety of clinical features of MRONJ which include exposition of sequestra, abscesses, fistulas, maxillary sinusitis. They can involve both the upper and the lower jaw, can be spontaneous or triggered by inflammation, infection, trauma.

## ABSTRACT

**Dental extractions in patients waiting for liver transplantation without antibiotic prophylaxis**C. Frascaolino<sup>1</sup>, N. Cocero<sup>2</sup>, D. Auteri<sup>1</sup>, M. Sacco<sup>3</sup>, S. Carossa<sup>4</sup><sup>1</sup>Dental School, University of Turin, Turin, Italy; <sup>2</sup>Oral Surgery Unit, Dental School, University of Turin, Turin, Italy; <sup>3</sup>Department of Gastrohepatology, Città della Scienza e della Salute di Torino, Turin, Italy; <sup>4</sup>Dental School, University of Turin, Turin, Italy

**BACKGROUND:** In cirrhotic patients waiting for liver transplant, eradication of infectious or potential infectious oral foci, is essential in order to prevent septic episodes after transplantation surgery. Literature seems to suggest antibiotic prophylaxis for peri-dental surgery, but there is no evidence that this practice can improve patient outcomes. Otherwise a large use of antibiotics can create resistances that lead to a more difficult management of septic episodes in these patients. We aimed to evaluate the incidence of local and/or systemic infections in cirrhotic patients listed for liver transplant, who underwent dental surgical treatments without antibiotic prophylaxis treated with our surgical protocol.

**METHODS:** The study population was derived from 1135 patients referred to the Oral Surgery Section by the liver transplant center from June 2014 to July 2017. We enrolled all adult cirrhotic patients waiting for liver transplant with non-restorable caries, abscesses and teeth with periodontal pocket depth of more than 6 mm who required dental extraction. The study had no exclusion criteria for age, gender and presence of comorbidities. Patients receiving antibiotic therapy at the time of the screening for other reasons were excluded. All patients underwent oral surgical treatments without antibiotic therapy, following our protocol. For 7 days after surgery, we monitored any signs of oral infections like edema, suppuration, and any evidence of systemic inflammatory response syndrome.

**RESULTS:** Three hundred and eighteen patients were enrolled. Average age 53±9 years; male 73.9%, average MELD 14,5±5, 46.2% affected by hepatocellular carcinoma; 40% affected by hepatitis C cirrhosis. Patients underwent 1183 extractions. During the 7-day follow-up observation period, no hospitalizations occurred and none of the 318 patients suffered from oral infections or sepsis. No post operative bleeding was reported. Local edema was observed in 12 patients (3.8%) and healing delay in 17 (5.4%); these complications could be related with a poor oral hygiene level detected in 68.2% of the patients.

**CONCLUSIONS:** Our single-centre findings seem to support the possibility of not prescribing antibiotic prophylaxis for moderately invasive procedures, as oral surgery, regardless of etiology and associated pathologies. This strategy could decrease the risk of developing resistant bacteria and reduce costs for the hospital.

**Evaluation of oral health in patients with chronic liver failure**N. Cocero<sup>1</sup>, C. Frascaolino<sup>2</sup>, C. Paparella<sup>3</sup>, S. Carossa<sup>4</sup><sup>1</sup>Oral Surgery Unit, Dental School, University of Turin, Turin, Italy; <sup>2</sup>Dental School, University of Turin, Turin, Italy; <sup>3</sup>University of Turin, Turin, Italy; <sup>4</sup>Dental School, University of Turin, Turin, Italy

**BACKGROUND:** Dental examination is an integral part of pre-transplant evaluations; the aim is to eradicate all oral

infectious foci in order to prevent septic episodes of oral origin in immunosuppressed transplantation patients. Cirrhosis is the most common reason why patients wait for a liver transplantation. It can have several etiologies, all of them leading to liver failure. The aim of the study is to evaluate the influence of different pathologies on clinical oral status of pre liver-transplant patients. We investigated which is the most common hepatic pathology and which disease has the greatest impact on general and oral health.

**METHODS:** The study population was derived from 1135 patients referred to the Oral Surgery Section by the liver transplant center from June 2014 to July 2017. All patients listed for liver transplantation. The patients were divided in 3 groups. Group 1 included postalcoholic cirrhosis (ALCI). Group 2 included viral hepatitis (HCV, HBV, HDV). Group 3 consisted of other liver disease, including primary biliary cirrhosis, sclerosing cholangitis, cryptogenic cirrhosis, metabolic syndrome and repeat liver transplantation.

**RESULTS:** Group 2 was the most represented with 668 out of 1135 patients, group 1 with 271 and 196 other pathologies, group 3. The majority were men: 79,3% in group 1, 78,4% in group 2 and 48% in group 3. Group 3 had less associated pathologies than the other groups; the most common related disease was ascites, which is one of the parameters of liver failure. Approximately half of the population had a poor oral hygiene: 58,3% in group 1, 56,4% in group 2 e 48% in group 3, with no difference for gender or age. Fifty of the 1135 patients were edentulous and 173 had no tooth loss, the average number of teeth was 24±8. The treatments more requested were extractions with an incidence of 15,1%, while fillings for decays was just 2,7%. Group 1 and 2 had the same incidence of caries and periodontitis, but group 1 had greater necessity of extractions (p=0,013).

**CONCLUSIONS:** Group 1 and 2 presented the worst general and oral health conditions, needing more attentions in the pre-transplantation evaluations. Patients with severe liver failure had worse conditions. Extractions were the most requested treatment (27,5±18,0% incidence). Poor oral hygiene in the 3 groups was linked with low compliance of these patients, probably caused by the stress for chronic pathology. A strict oral follow up is required in this patients.

**Effect of mechanical stimulation on clinical and radiographical healing in a post-extraction site: a human pilot study**

A. Gonnelli, R. Conti, M. Bianchi, N. Baldi, C. Borgioli, L. Barbatto, P. Tonelli

**BACKGROUND:** The extraction of a tooth determines the resorption of the alveolar bone. This determines challenge to place an implant and to integrate the prosthesis in soft tissue. Mechanical stimulation is fundamental for bone tropism but is not understood the effect of mechanical stimulation on post-extraction site. In a human pilot case, we used a root formed temporary prosthetic device (Intra-alveolar Device - IAD), to investigate the effect of mechanical stimulation on hard tissue clinically and radiographically.

**METHODS:** CBCT (Ortosophos XG, Sirona) was performed before the extraction (T0) and after 4 months (T1) using an individual stent. DICOM data at T0 and T1 were segmented by software thus obtaining the STL files. The alveolar bone resorption was also evaluated quantitatively using a technique described in literature. DICOM data at T0 were segmented by software thus obtaining the STL file of the tooth to be extracted. Using



a 3D printer and the STL file of the tooth, a replica of the tooth to be extracted was printed in ABS resin. The replica was then transformed in acrylic resin due to problem of biocompatibility. The Intra-Alveolar Device is a replica of the natural tooth. It has a crown and a root that was inserted in post-extractive socket and opportunely reduced. Four copy of the IAD, with different design were produced (IAD 1, IAD 2, IAD 3 IAD 4): IAD 1 was reduced circumferentially and vertically of 25% of the root dimension, IAD 2 was reduced circumferentially and vertically of 50% of the root dimension, IAD 3 was reduced circumferentially and vertically of 70% of the root dimension, IAD 4 was reduced circumferentially and vertically of the entire of root. After tooth extraction the IAD 1 was inserted into the post-extractive socket. The prosthetic device was left in occlusion.

At 1 week, clinical visit was performed, IAD 1 was removed and IAD 2 was splinted and inserted.

At 2 weeks, clinical visit was performed, IAD 2 was removed and IAD 3 was splinted and inserted.

At 4 weeks, clinical visit was performed, IAD 3 was removed and IAD 4 was splinted and inserted and left splinted for other 8 weeks.

RESULTS: Clinical healing was uneventfully. Vertical radiographical bone resorption measured on CBCT was -0,14mm (5,6%) while horizontal bone resorption was -0,21 (12,36%).

CONCLUSIONS: The IAD demonstrates clinical uneventfully healing. We need more studies to analyse the efficacy of this technique in order to reduce alveolar post extraction bone loss.

### Geometric distortion of panoramic reconstruction in third molar tilting assessments: a comprehensive evaluation

M. Cislighi, C. Todaro, M. Reza Dermenaki Farahani, S. M. Lupi

*Dipartimento di Scienze Clinico-Chirurgiche, Diagnostiche e Pediatriche, Università degli Studi di Pavia, Sezione di Odontoiatria, Poliambulatorio Monospecialistico di Odontoiatria, Pavia, Italy*

BACKGROUND: To evaluate the geometric distortion of tilting of mandibular third molars with respect to second molars on panoramic reconstruction in order to evaluate the appropriate assessment of operative risk.

METHODS: CBCT of 91 patients referred to the Dental School of the University of Pavia, over a 24-month period (from May 2015 to May 2017) were analyzed. There were 62 female and 29 male patients; 53 patients had both third mandibular molars and 34 patients had only one mandibular third molar. 140 mandibular third molars were collected. CBCT was performed only in cases where a very close relationship between the inferior alveolar nerve and the root of the mandibular third molar was suspected, as identified in panoramic radiographs. Every set of .DICOM files were loaded on a DICOM viewer installed on personal computer with Windows operating system. CBCT-reconstructed panoramic images were used as bi-dimensional images, to avoid distortions other than geometric distortions. A line passing through the upper point of the floor of the pulpar chamber and the root apex (for mono-radicular teeth) or through the middle of the line joining the two root apices (for bi-radicular teeth) was used to define the long axes of the molars. The angle between the long axes of the second and third molars was recorded from the CBCT-generated panoramic radiographs (2D angle)

and the CBCT reconstruction (3D angle). Student's *t*-test was used to assess the null-hypothesis of no difference between bi- and three-dimensional measurements.

RESULTS: A significant difference (mean:  $-2.4^\circ \pm 6.5^\circ$ ) between bi- and three-dimensional measurements was found, indicating that the geometric distortion results in underestimation of the tilting of the third molars. The absolute error between 2D and 3D evaluation was  $3.7^\circ \pm 5.1^\circ$  translated into a relative error of 10%. These findings comprehensively explain the geometric distortion on panoramic radiographs. CONCLUSIONS: Dental panoramic images are commonly used as the first level imaging for evaluation of mandibular third molars prior to their surgical removal. An important factor in the assessment of surgical difficulty is the inclination of the third molar with respect to the second molar. Although a widely used and undoubtedly useful tool for diagnosis and surgical planning of mandibular third molar extractions, panoramic reconstruction are biased from geometric distortion that may influence surgical planning. The possibility of distortion in panoramic radiographic images must always be considered.

### Efficacy of plasma rich in growth factors in patients waiting for liver transplantation

I. Bosso, S. Grosso, M. Carossa, N. Cocero

BACKGROUND: Dental extractions in patients with end-stage liver disease waiting for liver transplantation must be managed with care since they show abnormal coagulation values and platelet count, increased susceptibility to infections and altered wound healing. The aim of this study was to evaluate the efficacy of PRGF in improving socket healing. PRGF has in fact been showed to increase the amount of platelets, growth factors and cytokines at the socket level, thus promoting hemostasis and wound healing.

METHODS: A split-mouth prospective study was carried out on patients referred to the Oral Surgery Section from September 2015 to May 2017. The study population included 72 patients waiting for liver transplantation who needed bilateral extractions of homologous teeth; in each patient, a post-extractive site was treated with PRGF, whereas the contralateral one was left to natural healing. Considering the shape of the socket approximately as a parallelepiped, maximum bucco-lingual diameter (BL), maximum mesio-distal diameter (MD) and depth without forcing (PD) were measured with a periodontal probe, in order to calculate the volume (SV) of post-extraction cavities. SV data for each patient were recorded immediately after the extraction and at 7, 14 and 21 days after extraction; the residual socket volume (RSV) was computed as the fraction of post-extraction original cavity still open at each follow-up session. After the surgery, post-operative instructions and a questionnaire on pain (a 10-cm VAS scale, with 0 cm reflecting no pain and 10 cm reflecting the worst possible pain) were given to patients. VAS had to be filled up during the first week after extraction for both sites. Continuous variables were tested for normality with the Shapiro-Wilks test. Paired continuous variables were analyzed with the non-parametric Wilcoxon test, while independent variables were analyzed with non-parametric Mann-Whitney ( $n=2$  variables) or Kruskal-Wallis tests ( $n>2$ ). For categorical variables the  $\chi^2$  test was used, or when more appropriate, the Fisher test. A value of two-tail  $p<0.05$  and OR 95% CI not including 1 were considered statistically significant. StatPlus: Mac v.6 (AnalysisSoft. Walnut. CA. USA) was used.

## ABSTRACT

**RESULTS:** Initial socket volumes measured immediately after extraction in the two groups were significantly different ( $p = 0.03$ ), with the control socket volumes smaller than those treated with PRGF. Despite this initial difference in favor of control sockets, the FU showed that the PRGF treated sockets, had a Residual Socket Volume (RSV) significantly smaller than untreated sockets,  $p = 0.02$  at 7 days after extraction and ( $p < 0.0001$  at 14-days). At 21 days the RSV values were similar for control and treated sites. The VAS scales analysis indicated that in most cases the progression of postoperative pain was the same in cases and controls.

**CONCLUSIONS:** PRGF proved to be a valid tool for stimulating healing process of post-extractive socket, in patients waiting for liver transplantation. We can thus consider PRGF as a standardized, easily obtainable, effective and safe method for treatment of such patients.

### Pilot study on the correlation between the use of piezoelectric technology and the incidence of alveolites in the extraction of mandibular third molars

R. Zotti, G. Oliva, F. Marsili, E. Audino, S. Salgarello  
Dental School, University of Brescia, Brescia, Italy

**BACKGROUND:** Evaluate the possible relationship between the use of piezo-electric technology and the increase in the incidence of dry alveolitis in the extraction of third mandibular molars.

**METHODS:** Twenty-two patients between the ages of 22 and 32 were selected who needed bilateral extraction of the lower third molars. Only patients were selected whose both third molars had grade IIB inclusion level compared to the Pell & Gregory classification were selected. The patients were divided into two groups A and B with reference to the right or left side to be treated (respectively 48 or 38). Subsequently each group was then divided into two subgroups 1 and 2 randomly to distinguish between first extraction operation-with or without piezoelectric technique. Patients in group A1 (for element 48) underwent the first extraction (T0) without the use of piezo-electric technology. Patients in group A2 underwent the first extraction with the aid of piezo-electric technology. Patients in group B1 (for element 38) underwent the first extraction without the aid of piezo-electric technology. Patients in group B2 underwent the first extraction with the aid of piezo-electric technology. At the end of the surgery, the patients were given a questionnaire requesting them to indicate on the VAS scale (Visual Analogical Scale) that indicated that the pain felt every day for each of the 15 days following the operation. At a distance of three months (T1) from the first extraction the second extraction was carried out on the opposite side and with the opposite technique. Also at the end of the second operation a new questionnaire for pain assessment was delivered for each of the 15 days following the operation. The extractions were made by the same operator. At the end of each extraction, antibiotic and anti-inflammatory therapy was administered for 5 days, 2 times a day Home oral hygiene procedures were standardized among the 4 groups following both extraction procedures.

**RESULTS:** The analysis of the questionnaires did not show a statistically significant difference, according to the current literature.

**CONCLUSIONS:** We have noticed, however, that all patients

with piezoelectric technology have recorded very discordant pain values; this although the average values of pain in the VAS scale are superimposable to those recorded in the extractions carried out without the aid of piezo-electric technology.

Likewise, the lower lesion on soft tissues by the piezoelectric instruments has led to a lower incidence of edema, resulting in a better post-operative comfort of the patient; in 3 cases in groups treated with piezoelectric technique, however, episodes compatible with the framework of dry alveolate, perhaps due to the haemostatic effect of the cavitation produced by the piezoelectric instrument. Similar conditions did not occur in the remaining groups. The results obtained from this pilot study will be used in order to calculate "a priori" the correct sample size for a future RCT in this topic.

### Environmental decontamination in oral surgery

E. Audino, R. Belotti, S. Bontempi, E. Scotti, S. Salgarello

Dental Clinic, University of Brescia, Oral Surgery Dept., Brescia, Italy

**BACKGROUND:** The rotating instruments (low or high speed) or the oscillating instruments used in dentistry, as well as the piezoelectric handpieces specific for oral surgery (analogous to ultrasonic scalers in oral hygiene) generate bioaerosol. These are defined as airborne particles of liquid or volatile components. Any dental treatment involving the use of such instruments liberates a large number of microorganisms in the surrounding air. These bacteria come mainly from the oral cavity and only secondly from the water lines of the dental unit. Therefore, bioaerosol represents a potential mechanism for the spread of infections. For this reason, methods of protection against the influence of bioaerosol and splatter should be adopted, to avoid the effectiveness of surgery being reduced by environmental contamination.

**AIMS:** Assess the level of atmospheric microbial contamination before and at the end of the working day in a dental operating room dedicated to oral surgery compared to a similar one dedicated to oral hygiene or restorative dentistry. Evaluate the efficiency of a medical device designed to reduce contamination levels due to bioaerosol.

**METHODS:** Measurements of environmental contamination were carried out in various dental operating rooms for 4 weeks at a controlled environmental temperature ( $21.5^{\circ}\text{C}$ ). To quantify contamination, Columbia Agar Petri plates added with 5% sheep blood (BioMèrieux Italia s.p.a. - Grassano - Florence - Italy) were used. Baseline environmental contamination was measured by plates exposure for 24 hours of inactivity; then it was monitored through two other plates: one exposed from 8 to 20 hours of each working day, the other held open during the working week. Similar differentiation and environmental monitoring procedure was adopted during the use of a medical device, a special decontamination equipment (NIVE AIR - New Tech Solutions - Brescia - Italy) based on the principle of catalytic photo oxidation through titanium ions. These purify the air present in the environment through the introduction of a dense blanket of R.O.S. (Reactive Oxygen Species) molecules or hydroxide ions, radical peroxides and hydroperoxides which, through the action of light and air humidity, activate a decomposition reaction of harmful organic and inorganic substances leaving

only oxygen and hydrogen molecules in the air. The plates under observation were then placed in a 37°C cell incubator for 24 hours and then placed in the refrigerator at 4°C. Subsequently the bacterial count was performed with the use of the colonies count and the microscopic analysis with the stereo-microscope.

**RESULTS:** The results showed that atmospheric microbial contamination (CFU/m<sup>3</sup>) after dental treatment of any kind is superior to baseline. Different treatments (surgical, restorative, hygienic) determine different qualitative and quantitative contaminations: professional oral hygiene is characterized by a lower bacterial count compared to other treatments and by three types of bacterial colonies us bacilli, streptococci and staphylococci, all GRAM+. The bacteria count is lower when control measures are taken such as, for example, the initial flushing with 0.2% chlorhexidine for one minute, registered always for professional oral hygiene or for oral surgery but not for procedures restorative. The use of the decontaminating medical device (active 24 hours a day) showed a very significant reduction in air contamination.

**CONCLUSIONS:** The results of this pilot study will be used to plan further research aimed at reducing microbial contamination in the air during oral surgery; certainly poor attention has been paid to this particular aspect, solvable with devices similar to the one used.  
info@congressicduo.it

### Growth pattern of solitary osteoma of the mandible: case report

C. Maietta <sup>1</sup>, A. Guida <sup>2</sup>, F. Longo <sup>2</sup>, M.G. Maglione <sup>2</sup>, E. Pavone <sup>2</sup>, S. Villano <sup>2</sup>, C. Aversa <sup>2</sup>, R. Rullo <sup>1</sup>, F. Ionna <sup>2</sup>

<sup>1</sup>Post-Graduate School of Oral Surgery, Department of Dentistry, Orthodontics and Surgery, University of Campania: "Luigi Vanvitelli", Naples, Italy; <sup>2</sup>Maxillo-Facial and ENT Surgery Unit, INT – IRCCS "Fondazione G. Pascale", Naples, Italy

**BACKGROUND:** Osteomas are benign, rare, osteogenic tumors characterized by the production of mature bone and slow growth. Osteomas can be located centrally (intraosseous or endosteal), peripherally (periosteal) or extra-skeletally, and occur mainly in cranio-facial bones, with the most common location being paranasal sinuses. They may be commonly found in Gardner's syndrome, a particular form of familiar intestinal polyposis. Solitary peripheral osteomas of the jaws are a rare entity. They involve the mandible more frequently than the maxilla, especially the lingual margin, the angle and the inferior border. We report a case of peripheral solitary osteoma of the sigmoid notch of the mandibular ramus, describing the growth of this tumor in fourteen years. **METHODS:** In december 2017, a 53-year-old white man was referred to the Maxillofacial Surgery Unit of the INT-IRCCS- "Fondazione G. Pascale" of Naples for evaluation of a radiopaque lesion of the right mandibular ramus. The lesion was found incidentally on a panoramic radiograph during evaluation for dental therapy in 2003 but the patient decided to undergo surgery to remove the lesion in 2017 only. The patient was in good health and was completely asymptomatic, with no history of previous facial trauma or contributory medical factors. Before surgery we obtained 5 OPT scans (scale 1:1) with date 2003, 2008 2014, 2016, 2017 and 1 CBTC (2016). We required a new CBTC prior to perform surgery and a colonoscopy, which excluded Gardner's

syndrome. Three-dimensional images of the lesion were harvested from both 2016 and 2017 TCs. Measurements of the lesion were carried out on both OPT scans and CBTCs. Excision of the lesion was performed under general anesthesia. The mass was approached intraorally using an incision similar to the one used for the sagittal osteotomy of the mandible. The mass was found below the mandibular notch, and was detached from the bone with blunt instruments.

**RESULTS:** Microscopic examination of the lesion confirmed the preoperative diagnosis of osteoma. We measured the lesion from rx images to report its growth. Measurement obtained from OPT were: 2003-6x7mm, 2008- 8x12mm, 2014- 17x24mm, 2016- 19x25mm, 2017-21x28mm. TCCBs measurement were obtained from their own visualization softwares, revealing the following dimensions: 2016-19x15x21mm, 2017-21,4x19,2x22,7mm. Three-dimensional images confirmed the growth of the lesions too. The growth of the lesion on the OPT in fourteen years has been evaluated with a mean of 1.1mm per dimension per year. Differences of measures between OPTs and CBTCs may be explained as OPT is a planisphere, representing a three-dimensional mass on two dimensions, and thus showing small differences when compared to a three-dimensional image.

**CONCLUSIONS:** To our knowledge, this is one of the fewest reports showing detailed rx growth of solitary peripheral osteoma of the mandible. Measurements obtained from Rx's confirmed the unrelenting growth of the lesion during the years, highlighting the necessity of an early excision to reduce surgical access and symptoms/complications.

### Minimally invasive approach to ameloblastoma unicyclic treatment

A. Liguori, C. Moreschi, B. D'Orto, S. Abati, G. Gastaldi, R. Vinci

Department of dentistry, IRCCS San Raffaele Hospital, Milan, Italy

**BACKGROUND:** Ameloblastoma is a neoplasm of odontogenic epithelial origin. It is the second most common odontogenic neoplasm, its incidence, combined with its clinical behavior, makes ameloblastoma the most significant odontogenic neoplasm. Unicystic ameloblastoma (UA) refers to those cystic lesions that show clinical, radiographic, or features of a mandibular cyst, but on histologic examination show a typical ameloblastomatous epithelium lining part of the cyst cavity, with or without luminal and/or mural tumor growth. It accounts for 5-15% of all intraosseous ameloblastomas. We report a case of unicyclic ameloblastoma (UA) that is a rare, benign, less aggressive, and less invasive variant of ameloblastoma. The purpose of our work is to demonstrate how a minimally invasive approach of surgical removal of osteolytic lesion can be a valid alternative to major surgery. **METHODS:** A 44 year old male was referred to the Department of Dentistry, Dental Clinic, San Raffaele University Hospital, Milan (Italy) for a swelling located in right mandibular region involving inferior alveolar nerve. Clinical examination revealed a swelling, extending from the mandibular right canin to the mandibular right second molar. Panoramic radiograph disclosed a well corticated unilocular radiolucent lesion approximately 2,5 cm. Preoperative diagnosis of the lesion was made as ameloblastoma based on the age of the patient, location of the swelling, clinical and radiographic findings. A wide knowledge of the anatomy



## ABSTRACT

and an accurate surgery allowed both the complete lesion elimination and the preservation of adjacent teeth and inferior alveolar nerve. Thanks to this procedure nerve lesion was prevented and side effects were minimized. After loco-regional anesthesia a triangular flap incision was performed on the 42 mesially. The neoplasm was totally removed and placed in a 10% buffered formalin solution and sent for the istopathological examination. A 3/0 non-absorbable silk suture was positioned. Home care instructions included antibiotics therapy (amoxicillin 1gr/2 die for 6 days), antiinflammatory therapy with Ibuprofen p.r.n and clorhexidine 0.2 mouthwash twice a day for 1 week. At the follow-up after 7 days the patient was healed without any complication and the suture was removed.

**RESULTS:** The istopathological analysis revealed that the neoplasm was a Unicystic ameloblastoma, mural form.

**CONCLUSIONS:** UA, a variant of ameloblastoma, was first described by Robinson and Martinez and accounts for 10%–15% of all ameloblastomas. The term “unicystic ameloblastoma” is derived from the macro- and microscopic appearance, the lesion being a well-defined, often large monocystic cavity with a lining, focally but rarely entirely composed of odontogenic (ameloblastomatous epithelium). Preoperative diagnosis of UA can be difficult or sometimes impossible because this variant of ameloblastoma shares significant clinical and radiographic similarities with odontogenic cysts and tumors. The differential diagnosis of UA should include keratocystic odontogenic tumor, residual cyst, central fibroma, central giant cell granuloma and dysplastic fibrosis. Long-term follow-up is mandatory because of the recurrence risk of unicystic ameloblastoma, which may occur after a long time.

### Recurrence of ameloblastoma treated with *en-bloc* excision: case report

C. Capone<sup>1</sup>, P. Sammartino<sup>2</sup>, O. Trosino<sup>1</sup>, R. Gasparro<sup>1</sup>

<sup>1</sup>University of Naples Federico II, Faculty of Medicine, Department of Pathology and Maxillo-Facial Surgery, Naples, Italy;

<sup>2</sup>University of Campania Luigi Vanvitelli, Naples, Italy

**BACKGROUND:** Ameloblastoma is a benign epithelial odontogenic tumor of the jaws. Accounts for approximately 10% of all odontogenic tumors and 1% of the cysts of the jaws. A vast majority of ameloblastomas are unilateral (95%) and occur in the posterior region of the jaws (85%). Most tumors are located in the mandible (80-93%) Grow slowly, is locally invasive and often shows aggressive growth and high recurrence rate following conservative surgical treatment. There are three forms of this lesion: Solid-Multicystic; Unicystic ab-initio and Peripheral. According to the different forms there are two different treatment approaches: conservative and demolitive one. Such as: Curettage, Enucleation, En bloc excision, Segmentary resection; Radical resection; Emimandiblectomy/Emimaxillectomy. Our case refers to the most frequent and aggressive form: Solid-Multicystic. It is characterized by the radiographic appearance typical of multiloculated radiotransparent area, with rather clear polycyclic margins defined as “soap bubbles”. The aim of this case is to show how to treat a recurrence of Solid-Multicystic Ameloblastoma in a risk patient in local anesthesia with “En bloc” resection, according with our School protocol.

**METHODS:** A 48 years- old female patient affected by Myotonic Dystrophy of Steinert so contraindicate general

anesthesia. She comes to our observation with tumefaction in left mandibular molar region, covered by healthy mucosa. On palpation non-tender, hard in constancy, non fluctuant and non pulsatile. Orthopantomography disclosed a multiloculated radiotransparent lesion from the tooth 35 to 33. Can be appreciated root resorption of teeth 33 to 35. TC Cone Beam showed the expansion in the buccal and lingual cortical margin, although the continuity of the lower border of the mandible was intact. The patient was operated by her dentist in 2011 for a presumed radicular cyst of 36. In July of 2017 we did the incisional biopsy of the lesion that confirmed the diagnosis of Solid-Multicystic Ameloblastoma. For this reason we planned the surgical treatment: “En bloc” excision in local anesthesia. The patient started the antibiotic prophylaxis the day before the intervention (amoxicillin and clavulanic acid). We performed the mucoperiosteal flap, isolate the lesion in its margin and we started the osteotomy with rotary instruments. The bloc removed with the involved teeth ,and finally curettage of the residual bone cavity with rotary instruments and suture. The patient continue the antibiotic prophylaxis, avoid using toothbrush on the surgical site, started to use mouthwash with 2% chlorhexidine for the following 7 days and started liquid and semiliquid diet.

**RESULTS:** Clinically the patient has partially reestablished the sensibility and the one-mouth-radiography control showed the healthy mandibular margin. Probably the patient will extract also the teeth 32 and 31 that are not supported by bone. She hasn't important aesthetic discomfort.

**CONCLUSIONS:** This case report suggest en-bloc excision with a safe margin as first choice of treatment for recurrence of Solid- Multicystic ameloblastoma. A pre-operative biopsy is mandatory to find out the type of ameloblastoma. The results gives a good functional and esthetic outcome.

### How to manage impacted third molars: geroectomy or delayed removal? A systematic literature review

F. Cazzato, F. Guglielmi, A. Camodeca, E. Staderini, R. Patini, P. Gallenzi

Department of Surgical Sciences for Head and Neck Diseases, School of Dentistry, Catholic University of Sacred Heart, Rome, Italy

**BACKGROUND:** Tooth impaction is a pathological situation where a tooth fails to attain its normal functional position. The impaction rate is higher for third molars when compared with other teeth. It is clearly known that the mandibular third molar impaction could be due to the inadequate space between the distal of the second mandibular molar and the anterior border of the ascending ramus of the mandible. The aim of this systematic review is to assess the benefit of preventive impacted third molars removal in terms of: dental crowding resolution and correction of second molar inclination. The rate of surgical complications was also evaluated. **METHODS:** A literature search was performed in the following databases: the Cochrane Central Register of Controlled Trials (CENTRAL), PubMed, Scopus and Web of Science. Last search was done on February 2nd, 2018 including articles published from the last 18 years. The search aimed to identify all relevant studies written in english language. Grey literature was excluded. Risk of bias was evaluated with tools suitable for the type of study being assessed.

**RESULTS:** Articles published from 2000 to February 2018

were considered. A total of 1610 articles were screened. The Cochrane Central Register of Controlled Trials (CENTRAL), PubMed, Scopus and Web of Science retrieved respectively 682, 376, 46 and 502 results. Basing upon abstract screening and discarding duplicates from all searches, 86 full-text articles were obtained and subjected to additional evaluation. 5 articles were included in the review. All studies were considered as having a high risk of bias. Data provided in the published reports did not answer all the questions from this review and only some inferences could be made. Due to the disomogeneity of presenting results and a very low number of included studies, a quantitative analysis was not possible. Only qualitative analysis was made.

**CONCLUSIONS:** Considering the limited number of studies included and the considerably high level of risk of bias there is no sufficient evidence to state the benefits of preventive removal of impacted third molars. Such benefits must be verified by further studies that are encouraged to be conducted with a prospective designed following appropriate scientific guidelines.

## The marsupialization in the treatment of odontogenic keratocyst

L. Laino<sup>1</sup>, D. Menditti<sup>1</sup>, M. D'Agostino<sup>1</sup>, M.G.P. Di Mare<sup>1</sup>, A. Donzelli<sup>1</sup>, R. Vallebona<sup>1</sup>, S. Melito<sup>1</sup>, P. Sammartino<sup>1</sup>, L. Ramaglia<sup>2</sup>

<sup>1</sup>Multidisciplinary Department of Medical-Surgical and Dental Specialities, University of Campania "Luigi Vanvitelli", Naples, Italy; <sup>2</sup>Postgraduate Specialisation in Oral Surgery, University of Naples "Federico II", Naples, Italy

KCO<sup>1</sup>, found especially in the mandible, is a single or multiple intraosseous odontogenic cyst with "satellite" cysts originated from cellular residues of the dental lamina (residues of Serres). It has a thin epithelial layer (para or ortho-keratinized squamous epithelium) and high infiltrative potential (aggressiveness) and possible recurrences. Radiographically, it looks like an unilocular or multilocular radiolucent lesion, with "satellite" cysts at times. Due to its aggressive behaviour the parakeratinized form was considered as a benign tumor (keratocystic odontogenic tumor: KCO<sup>1</sup>)<sup>1,2,3</sup> while the orthokeratinized form as a cyst. Although the debate is still open, current classifications include the first one in the odontogenic cystic lesions as well. Among the reasons, we find the absence of positivity to PTCH gene, also found in dental cysts<sup>2</sup>. Despite the possibility of recurrence of the parakeratinized form, surgery involves a first conservative enucleation intervention with a surgical toilette extended to the peri-cystic bone wall and a follow-up with possible surgical re-entries (subsequent steps); bone demolition are performed with bone-box or resections (in case of large size formations or several recurrences). Currently, the intervention of marsupialization seems a valid alternative to enucleation with repeated curettage (62.5% recurrence rate)<sup>3,4</sup>. Moreover, a peripheral healing of the parakeratinized form is found, which represents an incompatible feature with a tumoral lesion.

**BACKGROUND:** We present a case report of parakeratinized mandibular keratocyst (unicystic form) twice treated with an enucleation-curettage intervention, finally with a conservative intervention through marsupialization.

**METHODS:** The patient, presenting a follicular-unilocular cystic formation on the third molar in the left side of man-

dible, was treated with enucleation and extraction of 3.8. Following the onset of recurrences, it was decided to operate with the marsupialization technique: it consists in the removal of a muco-cystic buccal flap on the damaged site and in the maintenance of the opening through an iodoformic gauze removed at steps, which has led to a complete recovery and *restitutio ad integrum* of the relative bone sector.

**RESULTS:** The histological result was keratocyst. The follow-up made one year later showed a complete recovery confirmed by Rx-3D with intact cortical bone where it previously appeared with osteolysis.

**CONCLUSIONS:** The implemented treatment aligns with the most current scientific evidences about the efficacy of surgical therapy through marsupialization<sup>4</sup> in the treatment of KCO and it promotes new considerations about KCO insertion among tumoral lesions.

### References

1. Pittl TL, Meier M, Hakl P, Sutter W, Turhani D. Long-term observation of a large keratocystic odontogenic tumour of the mandible treated by a single enucleation procedure: A case report and literature review. *Int J Surg Case Rep.* 2017;34:119-122.
2. Wright JM, Soluk Tekkesin M. Odontogenic tumors: where are we in 2017? *J Istanbul Univ Fac Dent.* 2017 Dec 2;51(3 Suppl 1):S10-S30.
3. Ecker J., Horst R.T., Koslovsky D., Current role of Carnoy's solution in treating keratocystic odontogenic tumors. *J Oral Maxillofac Surg.* 74 (2016) 278-282.
4. Speight PM, Takata T. New Tumpur Entities In The 4th Edition Of The World Health Organisation Classification Of Head And Neck Tumours: Odontogenic And Maxillofacial Bone Tumours. *Virchows Arch.* 2017 Jul 3. doi: 10.1007/

## Dermoid cysts of oral cavity

D. Menditti<sup>1</sup>, A. Donzelli<sup>1</sup>, R. Vallebona<sup>1</sup>, M.G.P. Di Mare<sup>1</sup>, S. Melito<sup>1</sup>, M. D'Agostino<sup>1</sup>, P. Sammartino<sup>1</sup>, A. E. Di Lauro<sup>2</sup>, L. Laino<sup>1</sup>

<sup>1</sup>Multidisciplinary Department of Medical-Surgical and Dental Specialities, University of Campania "Luigi Vanvitelli", Naples, Italy; <sup>2</sup>Postgraduate Specialization in Oral Surgery, University of Naples "Federico II", Naples, Italy

The dermoid cyst<sup>1</sup> contains keratin coated with squamous epithelium and cutaneous appendages differently from the epidermoid form. It represents <0.01% of the oral lesions and manifests itself especially in adulthood. It is mainly asymptomatic with slow growth especially in soft tissues compared to bone tissues. It can become symptomatic due to secondary infection or when it reaches size. Etiology<sup>2</sup> is linked to epithelial remains during embryonic fusion. The accepted etiological theory is the congenital theory: it comes from the pluripotent tissue incarcerated during the fusion of the first and second brachial arch in the third and fourth week of intrauterine life. The second involves the implantation of epithelial cells in an atypical region during intrauterine life (hypothetical trauma or abnormal migration). The sizes range from several millimeters up to 12 cm and often occur in Caucasians between 15 and 35 years. Sometimes, as in the ovaries, it can also contain micro-jaws, teeth or parts of other organs (so-called teratomas). The intraoral cyst generally develops in the floor of the mouth and can be found either laterally to the tongue or in the midline. Treatment is surgical<sup>3,4</sup>.

**BACKGROUND:** This work aims to report a case of a 34-year-

## ABSTRACT

old male patient that presented with a painless swelling in the floor of the mouth with abundance of hair which is rare to find. On palpation the lesion was doughy, soft in consistency, non-tender.

**METHODS:** The treatment is necessarily radical cystectomy (enucleation). The bone healing is good. While intraoral incisions are sufficient in accessing most cases of small dermoid cysts, extraoral incisions may be needed for cysts occurring below mylohyoid, in the submandibular regions, and for large cystic lesions that develop affecting both of these regions. The patient was planned for surgical excision under general anaesthesia and local anesthesia with mepivacaine. An intraoral incision was placed in lingual vestibule parallel to the Wharton's duct and the lesion was exposed. Blunt dissection was done to expose the lesion and to enucleate it.

**RESULTS:** The preoperative diagnosis was just provisional. The preoperative exams showed us the exact location and size of mass and relationship to adjacent structures, but did not give a definitive preoperative diagnosis. The final diagnosis was established after the histopathological study.

The postoperative recovery was uneventful. The patient was under follow up for 24 months, and showed no recurrence.

**CONCLUSIONS:** Sublingual dermoid cysts found on the floor of the mouth are rare. Wide vigilance about the slow growing painless mass is essential not only because of the symptoms it produces but also due to its malignant potential.

## References

- Menditti D, Laino L, Ferrara N, Baldi A. Dermoid cyst of the mandibula: a case report. *Cases J.* 2008 Oct 22;1(1):260. doi: 10.1186/1757-1626-1-260.
- D'Aquino R., Laino L., De Marco, Mezzogiorno, Itrò, Menditti D. Dermoid cysts of the Jaw. *Int J CI Dentistry* 10(2):25-34,2010
- Sahoo RK, Sahoo PK, Mohapatra D, Subudhi S. Two Concurrent Large Epidermoid Cysts in Sublingual and Submental Region Resembling Plunging Ranula: Report of a Rare Case. *Ann Maxillofac Surg.* 2017 Jan-Jun;7(1):155-158.
- Dym H., Ogle O.E. Atlas of minor oral surgery. W.B.Sunders, Philadelphia, 2001.

## Selective alveolar pre-orthodontic corticotomy

L. Laino <sup>1</sup>, S. Melito <sup>1</sup>, M.G.P. Di Mare <sup>1</sup>, A. Donzelli <sup>1</sup>, M. D'Agostino <sup>1</sup>, R. Vallebona <sup>1</sup>, M. Menditti <sup>2</sup>, P. Sammartino <sup>1</sup>, D. Menditti <sup>1</sup>

<sup>1</sup>Multidisciplinary Department of Medical-Surgical and Dental Specialities, University of Campania "Luigi Vanvitelli", Naples, Italy; <sup>2</sup>Postgraduate Specialization in Oral Surgery, University of Naples "Federico II", Naples, Italy

Selective alveolar corticotomy is defined as "iatrogenic weakening" of the maxillary cortical bone through a continuous surgical solution<sup>1,2</sup>. It aims to accelerate the therapeutic movement of the teeth, decreasing the resistance to orthodontic displacement forces, trying to respond to the increased demand for orthodontic treatment of adult patients who have a greater bone mineralization.

**BACKGROUND:** In this clinical study we present a case of corticotomy in a patient with the bilateral inverse bite of the upper premolars.

**METHODS:** This study has been conducted on a 40-year-old adult male patient with bilateral reverse bite: two upper premolars on the right side and a premolar on the left side (Teeth: 14; 15,25). Surgical-orthodontic treatment is performed with unilateral alveolar corticotomy at the level of the second premolar on the right side and a traction is applied through bands and

orthodontic brackets. Thus, each week, the distance between the cutting cusp of the second upper premolar and the mold cusp of the opposite arch was measured, until the correct repositioning of both sides in care. This value has been calculated in order to evaluate the effect of this technique in accelerating the movement of teeth subjected to orthodontic traction.

**RESULTS:** The traction rate of the second premolar has been significantly higher on the side of the corticotomy than the contralateral side, on which the same surgical technique of bone weakening has not been present. This procedure is performed unilaterally and compared with the opposite side in conventional orthodontic therapy in order to obtain a verifiable result. In fact, an identical study conducted on different patients, each of them with a modality of orthodontic treatment, could lead to altered results caused by a difference of bone density or a different susceptibility and response to the orthodontic treatment. For this reason, we have chosen an orthodontic treatment with monolateral selective alveolar corticotomy on the right side, compared against the same patient with conventional technique on the left side. We specify that the subject chosen for the study had no problems with the previous periodontal inflammation because we hypothesize that, regardless of corticotomy, an orthodontic treatment on an adult subject who had periodontal problems in the past may lead to faster orthodontic traction after trauma suffered from bones and tooth support tissues.

**CONCLUSIONS:** Based on the results obtained from this study, it is confirmed that the technique of pre-orthodontic corticotomy may accelerate the speed of orthodontic tooth movements by almost twice faster than conventional orthodontics but only during the first weeks of the treatment<sup>1,2</sup>. Therefore, considering in particular the increasing needs both aesthetic and functional, for which orthodontic treatment is required in adult patients, it is evident that buccal corticotomy can be a useful technique to achieve this purpose.

## References

- Jahanbakhshi MR, Motamedi AM, Feizbakhsh M, Mogharehabad A. The effect of buccal corticotomy on accelerating orthodontic tooth movement of maxillary canine. *Dent Res.* 2016 Jul-Aug;13(4):303-8.
- Medeiros RB, Pires FR, Kantarci A, Capelli J Jr. Tissue repair after selective alveolar corticotomy in orthodontic patients: A preliminary study. *Angle Orthod.* 2018 Mar;88(2):179-186.

## Odontogenic keratocyst: role of immunohistochemistry in differential diagnosis and prognostic evaluation

M. Lentini <sup>1</sup>, A. Barresi <sup>2</sup>, A. Marciano <sup>2</sup>, R. Cardia <sup>1</sup>, G. Oteri <sup>2</sup>  
<sup>1</sup>Department of Human Pathology "Gaetano Barresi", University of Messina; <sup>2</sup>Department of Biomedical Science, Dentistry and Functional Morphological Images, University of Messina, Messina, Italy

**BACKGROUND:** According to the latest WHO classification (2017), odontogenic cysts are classified into 3 groups: malformative, inflammatory and neoplastic. The odontogenic keratocyst belongs to the neoplastic cyst group and arises from epithelial residue of dental foil; characterized by strong invasiveness it can be occur as a sporadic lesion or associated to the Gorlin-Goltz syndrome. The aim of the study was to evaluate the development and invasiveness of odontogenic keratocyst with immunohistochemical analysis of antigen, such as apoptosis and local invasiveness markers for the purpose of a correct diagnosis, as a therapeutic first step.



**METHODS:** 15 cases of odontogenic keratocysts, 9 sporadic and 1 related to Gorlin-Goltz syndrome lesions, and 10 cases of inflammatory and malformative cysts divided into 5 radicular, 3 follicular and 2 gingival were selected. 11 silane sections were obtained by selected pads and subjected to immunohistochemical analysis with antibodies for Ki-67, p63, p21, p53, bcl-2,  $\beta$ -catenina, CK19, CK8-18, CK17, STAT6, and EGFR. Antigenic recovery was performed with Dako instrumentation (PT Link); tissue was treated in low or high pH buffer (depending on antigen) for 20' at 97°C. The following steps were then performed: PBS buffer for 5', endogenous peroxidase inhibition in H<sub>2</sub>O<sub>2</sub> at 3% for 10' at room temperature, washing in PBS buffer, primary antibody incubation in wet room for 30' at 5°, washing in PBS buffer for 10', dextran polymer incubation at room temperature for 20', double washing PBS buffer, development of reaction by DAB, washing in PBS buffer, washing in distilled water, nuclear contrast with Mayer stain for 1-3', washing in water for 5', washing in alcohol increasing scale, xylol and synthetic resin mounting.

**RESULTS:** All odontogenic keratocysts expressed CK19 in baseline and upper-baseline layer except in inflammatory areas with an irregular expression of CK19 and positivity to CK8 and CK18. The single case of keratocyst associated to the Gorlin-Goltz syndrome did not allow us to do diagnostic and predictive evaluations although it presented positivity to CK17 in the epithelium, not always expressed in the other cases. The Bcl-2 protein showed a peculiar distribution mainly in the baseline layer and was negative in areas affected by inflammatory processes. p53 expression was high in baseline and upper-baseline layers, in contrast with the other odontogenic cysts where it was negative, and related to the increasing growth fraction expressed by Ki-67. p63 expression demonstrated nuclear positivity in baseline and intermediate layers; the same positivity showed lower intensity in those areas affected by inflammation of the fibrous wall. The p21 protein showed low positivity without any correlation with other cellular cycle proteins (p63, p53 e Ki-67). STAT-6 was negative in every case. EGFR expression was weak and limited to those baseline layers hit by inflammation.  $\beta$ -catenin expression appeared localized in the membrane and involved the entire epithelium; it disappeared or was only localized in those areas affected by inflammation.

**CONCLUSIONS:** In view of the immunohistochemical analysis it would appear that odontogenic keratocyst presents an antigenic molecular pattern which is discernible from other odontogenic cysts, but it becomes similar to a radicular cyst when it is then affected by an inflammatory process. Among all of selected antigens, Bcl-2 turned out to be the main specific marker in the odontogenic keratocyst diagnosis.

## Eleven years follow-up implant prosthetic rehabilitation after cystic enucleation and regenerative surgery

A. Gualandris, B. D'Orto, A. Liguori, F. Amodio, R. Vinci  
*Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy*

**BACKGROUND:** A cyst is defined as a benign cavity filled with liquid and delineated by an internal wall of epithelial origins and by an outer cover of connective tissue. Osteolytic lesions of cystic origin can be managed in three possible ways: excision (Parsch II), marsupialization (Parsch I), a combined technique. In excision, the cyst is removed in a single session; instead, in the marsupialization, the epithelium is incised to determine drainage of the liquid, decrease the internal hydrostatic pressure and, consequently, reduce the size of the lesion. The combined technique

represents the union of both procedures: first the marsupialization is performed to obtain a significant reduction in size and, only afterwards, the surgical removal of the lesion is carried out. The purpose of this work is to show the aesthetic and functional integration of an implant-prosthetic rehabilitation after removal of extensive osteolytic lesion and subsequent autologous onlay graft surgery in the right parasymphysis.

**METHODS:** In 2006 came to the attention of the department of odontomatologic surgery of the Dental Clinic of Università Vita-Salute San Raffaele a patient affected by a big osteolytic lesion in the area around the right symphysis of the chin. The patient does not have symptoms and, therefore, the neoformation, is detected by means of control Orthopantomography. Furthermore, the examination of the first level identifies the lesion relationship with the dental elements 3.1, 4.1, 4.2, 4.3, 4.4 and 4.5. We proceed with endodontic therapy of the element 4.5 and subsequent avulsion of elements 3.1, 4.1, 4.2, 4.3 and 4.4. Among the possible surgical treatment related to cystic lesions, it was chosen the cystectomy (Parsch II procedure). The subsequent histological analysis gave as inflammatory cystic lesion outcome of radicular type. After 4 months, a sample of the left ascending ramus of the mandible was taken in order to make an onlay graft on the crestal symphysis. This graft is stabilized with osteosynthesis screws of polyactic / polyglycolic acid, using the method Sonic Weld KLS Martin. After seven months, in position 3.1, 4.3 and 4.4 were placed 3 implants BioSafin Win Six K 3.3x11mm. After four months from the application of the implants the fixtures were exposed and temporary prosthesis were placed. After nine months, the final prosthetic rehabilitation, screwed, was delivered. In the next five months the prosthetic rehabilitation was completed. Zirconia was chosen as the material to do the prosthesis and it was sintered at 650 MPa and subsequently ceramized.

**RESULTS:** The radiological data obtained after the enucleation evidenced a significant reduction of the residual cavity and a dimensional deficits in both horizontally or vertically. To compensate for the defect, it became necessary to increase bone volume, obtained by graft onlay next to left bundle branch upright levy. Next, for the same reason, the implants were inserted. Through a mimesis of gum portion and a correct length of the clinical crown, it was possible to compensate for the deficit almost entirely. The follow up to 11 years, showed good healing of the office affected by the lesion.

**CONCLUSIONS:** Clinical and imaging evidences suggest that even residual cavities of extended dimensions can be successfully treated if an optimal clinical, radiological and histopathological diagnosis is done. This clinical case shows that the placement of implants in areas previously interested by excision and subsequently subject to regenerative surgery, is superimposable with the placement of implants in the native bone.

## Correlation between rood and shehab's radiographic signs and the incidence of inferior alveolar nerve paresthesia following surgical extraction of lower third molar

M. Nisi, D. Bisordi, G. Giuca, M. Gabriele  
*Department of Surgical, Medical and Molecular Pathology and Critical Care Medicine, University of Pisa, Pisa, Italy*

**BACKGROUND:** The aim of the present study was to evaluate the predictive value of Rood and Shehab's radiographic signs in orthopantomography (OPG) with the risk of inferior alveolar nerve damage after surgical extraction of lower third molar.

## ABSTRACT

**METHODS:** The study included all consecutive patients referred to unit of Odontostomatology and Oral surgery of the University of Pisa for surgical extraction of lower third molars with Rood and Shehab's radiographic signs in orthopantomography (OPG). The 2D radiological signs of nerve proximity to the mandibular wisdom tooth (darkening of root, deflection of root, narrowing of root, dark an bifid apex, interruption of cortical line, diversion of canal, narrowing of canal) were noted for each case. A 3D examination was performed to evaluate in which cases Rood and Shehab's radiographic signs on orthopantomography revealed a real contact of the IAN with the lower third molar, a real interruption of the cortical of the mandibular canal and a real narrowing of the mandibular canal. All patients underwent a preoperative assessment of the neurosensory function of the chin and lip by measuring the function of the IAN with different sensitivity's tests: a light touch test, a pain perception test, a direction discrimination test and a two-point discrimination test. These exams were recurred seven (T7) an thirty (T30) days after surgery.

**RESULTS:** Darkening of the root and interruption of the cortical line, on the preoperative orthopantomography, were the most common marker of correlation between lower impacted third molar and IAN. The frequency at which impacted third molar was in direct contact with mandibular canal was significantly higher when darkening of root appeared on the orthopantomography (78,5%), than interruption of the cortical line (42,9%). When these two signs were present simultaneously, results showed a greater risk for mandibular canal involvement (83,3%). Moreover, darkening of root was proved to be more often involved to postoperative sensory disturbance of the lip and chin at T7, than interruption of the cortical line. At T30 no patient reported neurosensory disturbances.

**CONCLUSIONS:** Our data suggest that darkening of third molar roots seems to be significantly superior in predicting IAN injury and postoperative neurosensory disturbances than other Rood and Shehab's radiographic signs.

### Three-month interval after dental experimental treatment (surgical exodontia plus insufflation/injection ozone combined protocol) for prophylaxis of ONJ

**BACKGROUND:** Osteonecrosis of the jaw (ONJ) is a severe adverse event related to several drugs with anti-resorptive and/or antiangiogenic activity: dental exodontia has been indicated as one of the most important trigger. The aim of this study was to evaluate efficacy and safety of ozone insufflation/injection in dental extractions of patients exposed to ONJ-related drugs.

**METHODS:** Ten patients were referred to our Sector of Oral Medicine (UNIPA) for ONJ prevention, in order to find and eliminate local risk factors. After informed consent and when surgical procedure was necessary for teeth with negative prognosis, they were treated with an innovative protocol: one day before surgery, patients had to start antibiotic prophylaxis; surgical extractions were performed with PROMaF protocol (<http://www.policlinico.pa.it/portal/index.php?option=displaypage&Itemid=264&op=page&SubMenu=>) plus insufflation/injection of ozone:

1. One-minute mouthrinse with 0,2% Chlorhexidine (CHX)
2. Local anesthesia achieved using 3% mepivacaine hydrochloride without adrenaline

3. Elevation of a full-thickness mucoperiosteal flap to expose the surgical area

4. Tooth luxation and avulsion gently performed

5. If necessary, osteotomy and/or subsequent osteoplasty were done with ultrasonic surgical device

6. Debridement of the post-extraction socket

7. Insufflation inside alveolus (15 ml dosage) (by pink Venocat cannula 20G x1.1/4"/1.10 x 32 mm) and injection around its edges (15 ml dosage) (by 26G x 1/2" needle - 0.45x13mm) of oxygen-ozone mixture (15% concentration)

8. Suture of the flaps to achieve a tension-free soft tissue closure (Figure x) Postoperative instructions were provided to patients: drawing out of systemic antibiotics treatment for 6 days and of Chlorhexidine 0.2% mouthwashes for 1 min plus topical application of antiseptic gel and amino-acids and sodium hyaluronate gel 3x daily for 15 days. One week after, sutures were removed; follow up has been performed at 15, 30, 90 days after surgery; radiological evaluation has been carried out at 30 and 90 days. Local Ethics Committee approved the study.

**RESULTS:** Ten patients (3 male, 30%) took part in this study, the mean age at the presentation was 63.3±9.2 years. Six patients were in treatment with oral BPs for osteometabolic disease, while four oncologic patients were in treatment with e.v. BPs. The mean cumulative dose of BPs therapy was 19288,2mg (SD=±13836.7). Eight patients were no longer on BPs therapy at the time of surgery: the mean time after BPs discontinuation was 6.75 months (SD=±8.7). Thirteen teeth were extracted (9 from the maxilla and 4 from the mandible). Complete mucosal healing of eight extraction sockets was observed at the first follow up visit (7th day). A substantial reduction of post-operative pain, after the second day, was referred from all patients. No signs of soft tissue infections were observed in all surgical sites. At the most recent follow-up visit (90th day), all patients do not have clinical and radiological signs compatible with ONJ.

**CONCLUSIONS:** Although further studies on a larger scale are required to confirm these results and to better define the potential of O3 in oral surgery in patients at risk of ONJ; this modified protocol could accelerate the recovery period after surgery, and potentially reduce the risk of ONJ.

### Dental follicle stem cells osteogenic differentiation collected with piezosurgery device from early germectomies

V. Sibillotte, N. Baldi, A. Gonnelli, E. Del Bolgia, R. Conti, M. Bianchi, P. Tonelli

*Oral Surgery Unit, Department of Translational Medicine, University of Florence, Florence, Italy*

**BACKGROUND:** The aim of this study was to investigate if cells isolated from Dental Follicle (DF) show as first stem features and if they also appear capable to differentiate, under particular conditions, toward osteoblastic phenotype and express osteoblastic markers.

**METHODS:** Stem cells are defined as clonogenic cells capable of self-renewal and multi-lineage differentiation. They can be divided, depending on their origin, into embryonic stem cells, perinatal stem cells and adult stem cells. To date, in human postnatal dental tissues, five different sources of Mesenchymal Stem Cells have been identified, isolated and characterized. A population of these cells have been identified in human Dental Follicle (DFSCs), a loose connective tissue sac that surrounds the unerupted tooth and plays different roles in the tooth development. It is an ectomesenchymal tissue surrounding the enamel organ and the dental papilla of the developing tooth germ prior of

the eruption and appears to regulate the bone remodelling influencing either osteoblast and osteoclast activity during eruption. Harvesting DFSCs from teeth is mostly a noninvasive procedure but it naturally requires the extraction of a tooth before its physiological eruption. All the follicles analyzed in this study were collected from third mandibular molar buds of healthy pediatric patients (aged 7-9 years) through early germectomy performed with Piezoelectric Bone Surgery technique after obtaining informed consent from each patient parents. The use of Piezoelectric technique allowed to reduce significantly the risk of damaging DFSCs during harvesting and also to decrease the post-op morbidity to the patients; moreover in this early stage of development the spherical crypt of the bud appears to be extremely close to the lingual side of the bone's surface simplifying the surgical approach. All DFSCs were submitted to an initial phase of isolation by enzymatic digestion for 1 hour at 37°C in agitation. After filtration, single cell suspensions were cultivated in 25cm<sup>2</sup> culture flask containing  $\alpha$ -MEM supplemented with 5% bovine serum, Penicillin-G, streptomycin and fungizone. Amplification was performed by incubation at 37°C and 5%CO<sub>2</sub>. At last in order to obtain osteoblastic differentiation cells were grown in a osteogenic medium consisting of  $\alpha$ -MEM supplemented with FBS, dexamethasone and ascorbic acid. Firstly, to ensure that all the DFSCs cultured met minimal criteria to be called MSC three cultures were characterized in detail by performing Immunophenotypic analysis. The proliferation rate was studied by plating 2x10<sup>5</sup> cells, detached and counted after 3, 5 and 7 days of culture and comparing these values with those normally obtained culturing human Bone Marrow Stem Cells (hBMSCs). Also the ability of DFSCs to form mineralized nodules in vitro, a typical osteoblastic feature, was assessed by performing a Von Kossa staining on cells cultured for 30 days in osteogenic medium. Expression of ALP- Alkaline Phosphatase, a typical osteoblast marker, was valued in DFSCs, grown in osteogenic medium, with commercial Leukocyte Alkaline Phosphatase Kit.

**RESULTS:** Flow cytometric analysis confirmed that all DFSCs cultures exhibited 95% expression of CD73, CD90, CD146, CD44, CD105 and HLA-I all cell surface markers accepted for MSC, while they were negative for CD45, a common leukocyte antigen. Cell proliferation rate of DFSCs measured at day 3, 5, 7 was significantly higher in comparison to bone marrow-derived MSCs. Moreover the Von Kossa staining on long-term cultures demonstrated the capacity of three different DFSCs clones to form mineralized matrix nodules; and the histochemical assay used to evaluate the expression of ALP confirmed high expression levels.

**CONCLUSIONS:** This study suggests that DFSCs differentiate into osteoblasts representing a perfect source of cells for bone regeneration.

### An alternative treatment to impacted third molars extraction: the marsupialization of pericoronaric tissues

M. Bianchi<sup>1</sup>, R. Conti<sup>1</sup>, A. Gonnelli<sup>1</sup>, N. Baldi<sup>1</sup>, C. Borgioli<sup>2</sup>, L. Barbato<sup>1</sup>, P. Tonelli<sup>3</sup>

<sup>1</sup>Università degli Studi di Firenze, Florence, Italy; <sup>2</sup>Libero professionista in Empoli, Empoli, Italy; <sup>3</sup>Corso di Laurea in Odontoiatria e Protesi Dentale, Chirurgia Orale, Università degli Studi di Firenze, Florence, Italy

**BACKGROUND:** The aim of this article is to present an alternative treatment to the mandibular third molar extraction which

caused a pericoronaritis. The clinical basis of this proposal is that in many cases a surgical removal of those teeth may present some risks and consequences for the patient so that it is not always recommendable. Infact, before performing a surgical extraction of the lower third molar, it should be noted that the risks and difficulties increase proportionally with the patient's age (after 25 years), the depth of inclusion (class III / c according to the classification of Pell and Gregory), the relationship with the inferior alveolar nerve, the lingual version of the crown of the tooth and the ankylosis. Many of these complications could be resolved by not removing impacted teeth but by providing involution of the pericorona and molar re-ossification by marsupialization.

**METHODS:** We report the case of a 45-years- old female who came to our attention presenting an asymptomatic osteolytic area related to an impacted lower third molar. The patient was treated by only marsupialization treatment, performing washings and changing iodoform gauze, to keep the cystic cavity in communication with the oral cavity, once every four days for about a month and a half. To evaluate the prognosis, the following tests were performed: in the pre-surgical phase (T0) an orthopantomography, in the post-operative phase after a month (T1) clinical examination, after a year (T2) with new orthopantomography, after 5 years (T3) with new orthopantomography.

**RESULTS:** The patient was evaluated after one month (T1), one year (T2) and five years (T3) in which clinical and radiographic examinations were performed. In which these show a deposition of new bone around the tooth crown at radiographic examinations, instead at the clinical examination during the period in which the gauze change is carried out, a reduction of the gauze that could be introduced inside the cyst cavity is highlighted.

**CONCLUSIONS:** The marsupialisation is an alternative treatment to the extraction surgical similarly effective, but that avoids many risks present in the course of surgical extraction of an impacted lower third molar with pericoronaritis.

### Management of patients taking direct oral anti-coagulants in oral surgery: a review of the literature

C. Todaro<sup>1</sup>, M. Reza Dermenaki Farahani<sup>1</sup>, M. Cislighi<sup>1</sup>, M. Cerri<sup>2</sup>, S. M. Lupi<sup>1</sup>

<sup>1</sup>Dipartimento di Scienze Clinico-Chirurgiche, Diagnostiche e Pediatriche, Università degli Studi di Pavia, Sezione di Odontoiatria, Poliambulatorio Monospécialistico di Odontoiatria, Pavia, Italy; <sup>2</sup>Libero Professionista

**BACKGROUND:** The aim of the present review was to analyze the current literature in order to provide up-to-date guidelines for the management of patients on Direct Oral Anti-Coagulants therapy undergoing oral surgery.

**METHODS:** In this review the Databases of Cochrane, PubMed and New England Journal of Medicine were researched up to July 2017. A systematic search strategy was used. In the initial phase of the review, a computerized literature search for human studies was performed up to July 2017 (Medline and Embase databases). There was no language restriction. In addition, a hand search was carried out in oral surgery journals. Additional publications were identified from the reference lists of the retrieved articles. The main focus of our study was regarding the all of four DOAC currently approved by the European Medicines Agency (EMA): dabigatran, rivaroxaban, edoxaban and apixaban. Keywords for electronic search were: "NAO", "NOA", "DOAC", "new oral anticoagulants", "dabigatran", "Praxada", "rivaroxaban", "Xarelto", "Apixaban", "Eliquis", "edoxaban", "Lixiana",



## ABSTRACT

“clinical trial”, “oral surgery”, “dental surgery”, “dentistry”, “guide lines”, “bleeding”, “tooth extraction”, “implant insertion”, “peri-operative procedures”.

**RESULTS:** By the electronic literature search, a total of 1521 titles were identified. Twenty-one original articles fulfilled the inclusion criteria. A meta-analysis of the literature was not conducted because of the heterogeneity of the available studies. The included studies were RCT, cohort studies, guidelines issued by oral surgeon associations, expert opinion and literature reviews. From the literature analysis emerged that the anticoagulation effects due to the DOACs intake is less predictable than that of the Warfarin intake, due to the fact that there are no adequate hematologic test to verify the adequacy of coagulation pathway. Consequently, the intra- and post-operative bleeding risk is not directly evaluated by the use of hematologic test; on the contrary, this risk is indirectly evaluated by the assessment of the renal and hepatic function and by taking into consideration the surgical invasiveness.

In the vast majority of the analysed studies we noticed the tendency to leave the DOAC posology unaltered, considering the fact that the management of post- and intra-operative bleeding is easier and less dangerous compared to the thromboembolic complications. The results were encouraging with low rates of post-operative bleeding and no major thromboembolic events across all the studies. However, the lack in numbers and the structural variability of the reviewed studies demands caution; in fact, there isn't enough documentation related to oral surgery on high risk patients (HAS-BLED >3). From the analysis of the Literature we came to the conclusion that the new set of guidelines for the pre-operative management of patients undergoing DOAC therapies must consider the risk related to the patient and the risk related to the surgery. The risk related to the patient is especially relevant in case of impairment of the metabolic and/or excretion pathways, related to age and diseases. In case of decreased drugs metabolism the half-life of the molecules can be prolonged, with a consequent amplification of the anticoagulation effects, therefore requiring special care from the clinician. The bleeding risk is strictly related to the invasiveness of the oral surgery (low, moderate and high). Intra- and post-operative protocol requires a different approach compared to the guidelines used for drugs such as warfarin. If a complete anamnesis and a correct surgical planning is carried out, local hemostatic agents allow a correct hemostasis.

**CONCLUSIONS:** Patients taking DOACs require a different approach to evaluate the bleeding risk compared to traditional anti-coagulative drugs. This approach consists of an indirect evaluation of patient's coagulation by the assessment of patient and surgery related factors.

## Updating pre-emptive analgesia in oral surgery: a review

P. Lorusso<sup>1</sup>, F. Dell'Olio<sup>2</sup>, S. Grasso<sup>1</sup>, G. Favia<sup>2</sup>

<sup>1</sup>Unit of Anesthesiology, DAE, Emergency Department, Aldo Moro University of Bari, Bari, Italy; <sup>2</sup>Complex Unit of Odontostomatology, DIM, Interdisciplinary Department of Medicine, Aldo Moro University of Bari, Bari, Italy

**BACKGROUND:** Pre-emptive analgesia is a pain management strategy performed administrating analgesics before surgery (1 hour) in order to decrease the total amount of post-operative pain and the overall consumption of painkillers. We reviewed the latest literature to guide dental practitioners through new orientations in pain control.

**METHODS:** A PubMed search was performed using “preemptive” combined to “dentistry” or “third molar” as keywords, focusing on English language studies conducted in humans in the last 5 years. Only randomized clinical trials regarding lower third molar extraction, performed in adult patients, with reported methodology, length of surgery, post-operative pain using VAS (Visual Analogical Scale), mean time to rescue analgesic and total consumption of NSAID, were included. The resulting studies were classified in 3 groups: placebo-control studies, studies comparing different analgesics and studies comparing pre-emptive versus preventive (immediately post-operative) analgesia.

**RESULTS:** The search led to 219 articles; only 22 of them fulfilled the review criteria and were divided into placebo-control (10), preventive versus pre-emptive (4) and comparing different analgesics (8). We found that Ketorolac has pre-emptive effect (provides its best analgesic effect when administered before oral surgery), with a mean time to rescue analgesic of 7,5 hours. Lornoxicam has a pre-emptive effect with a mean time to rescue analgesic of 6,11 hours. Oral Ibuprophen has a pre-emptive effect that can be improved by intra-venous co-administration of Dexamethasone (mean time to rescue analgesic 5,83 hours). Pre-emptive Ketoprophen and Diclofenac provide the same analgesic effect of their preventive administration, and, accordingly, the latter two drugs did not show pre-emptive effects. COX2 selective NSAID provide superior pre-emptive effect and reduction of post-operative levels TNF $\alpha$  and IL-1 $\beta$  than traditional NSAID. Pre-emptive Etoricoxib has a mean time to rescue analgesic of 27,6 hours.

**CONCLUSIONS:** The latest literature shows that Ketorolac can be deemed as the “gold standard” for pre-emptive analgesia. Co-administration of oral Ibuprophen plus intra-venous Dexamethasone, or of Lornoxicam, are suitable pre-emptive solutions. Ketoprophen and Diclofenac are at least second choice pre-emptive analgesics. Further, we found that selective inhibitors of COX2 have the longest mean time to rescue analgesic and, as compared to NSAID, lead to both reduced post-operative pain and total consumption of analgesics. Accordingly, we speculate that COX 2 could be the future for oral surgery pre-emptive analgesia, even though further studies are needed to confirm this hypothesis.

## Oral mucous membrane pemphigoid - a retrospective single-center cohort study with emphasis on direct immunofluorescence assay

A. Teoli, G. Mergoni, P. Vescovi, M. Meleti, M. Manfredi

Unit of Oral Pathology and Laser Oral Surgery; Department of Medicine and Surgery, University of Parma, Parma, Italy

**BACKGROUND:** Mucous membrane pemphigoid (MMP) is a group of rare autoimmune disorders characterised by the generation of autoantibodies directed to some basement membrane zone (BMZ) components, leading to a disruption of cell adhesion and tissue integrity. MMP can affect any mucosal surface and oral mucosa is often involved, while skin lesions are less frequently observed. Oral manifestations are non-specific and include blisters, erosions, ulcers and desquamative gingivitis. Direct immunofluorescence (DIF) assay demonstrating a linear deposition of IgG, IgA and/or C3 at the basement membrane zone (BMZ), in addition to positive clinical findings, is generally needed to make a definitive diagnosis. However, a considerable proportion of patients with clinically and histologically diagnosed MMP

have a negative DIF result, since the reported sensitivity of this test is far less than 100%. This could lead to suboptimal patient management. The aim of this study was to determine the clinical characteristics of a cohort of patients with MMP with emphasis on the role of DIF in the diagnostic process.

**METHODS:** This was a retrospective study of patients with clinical and histological criteria of oral MMP, including those with positive and negative DIF findings, who were treated at the Unit of Oral Pathology and Laser Oral Surgery of the Parma University from 2000 to 2018. Demographic data, clinical findings, histopathological and immunofluorescence information were recorded, altogether with prescribed drugs and therapy outcome.

**RESULTS:** 39 patients (14 males, 25 females, average age: 63.6±15.2) were affected by MMP with a mean follow up of 2.5±3.3 years. Desquamative gingivitis was evident in 77% of cases. Non-gingival and extra-oral lesions were noted in 50% and 35% of cases, respectively. Management of MMP consisted of topical corticosteroids only in 33.3% of cases while 51.3% cases required concomitant systemic therapy. 17 patients have positive DIF findings (DIF sensibility = 68%).

**CONCLUSIONS:** The results of this study indicate that MMP affecting the oral tissue typically manifests as recurrent oral mucosal ulceration and/or desquamative gingivitis. The disease is chronic with recalcitrant symptoms and clinical signs, hence necessitating various treatment strategies and long-term follow up to prevent complications. Negative DIF test findings in cases clinically or histologically suggestive of MMP should prompt repeat biopsies. Our experience showed that obtaining multiple biopsies for DIF analysis supplies a way to reduce false-negative results.

### Piezoelectric devices vs. conventional rotary instruments in bone harvesting in oral surgery: histological and histomorphometrical evaluation of two clinical cases

M. Maisto, A. Piccirillo, O. Riccardo, G. De Marco, R. Rullo

*Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania "Luigi Vanvitelli", School of Specialization in Oral Surgery, Naples, Italy*

**BACKGROUND:** Traditionally, osseous surgery was performed using hand instruments and various rotary instruments with different burs, which required external copious irrigation because of the heat they produced. Over the last few decades, the rapid development of piezoelectric devices allowed to overcome the limitations of traditional instrumentation in oral bone surgery. Many authors have investigated the efficacy of piezoelectric instruments on osteotomy in terms of high precision and security of the cut, and biological respect of the tissues. The aim of the present study was to assess the efficacy of piezoelectric devices compared to traditional rotating instruments, from the histological and histomorphometrical point of view.

**METHODS:** A critical evaluation of the literature was made taking into consideration only human studies in which was compared the quality of the mandibular bone, in terms of vitality, morphology and tissue architecture, obtained by using both the considered devices. On the basis of the encouraging histological results of our randomized controlled clinical trial conducted on 52 cases (Rullo et al. 2013), we carried out two clinical cases harvesting the bone from the

mandibular body on patients requiring alveolar ridge augmentations prior to implant insertions. In the first patient, bone graft was harvested using a burr (Stryker tungsten carbide bur), in the second one, the bone graft was obtained by a Piezoelectric device (Esacrom Surgysonic). In both surgical sites, two bone samples, taken from the osteotomy line, were obtained in order to carry out histomorphological and immunohistochemical analyses and to evaluate any qualitative differences. IF analyses were performed to assess the presence of bone proteins (ON, OC and BAP), as well as BMP-2 and VEGF, which are both important molecular signals during bone regeneration.

**RESULTS:** The morphological analysis of the Piezoelectric (P) device sample was very different when compared with the one taken using the rotational technique (R). From the histological point of view, P sample was made up of well-organized and well-vascularized bone with a lamellar architecture surrounding the Haversian canals, and with a linear and well-formed osteotomy line bone. Conversely, R sample was badly cut, presenting an irregular osteotomy line, and evidence of bone heat osteonecrosis as shown by the absence of osteocytes. However, significant differences were observed for cell culture and for alkaline phosphatase (ALP) expression. While in the P sample there was always a very high number of cells with high ALP production and, after 40 days, the presence of calcified nodules too, on the other hand in R sample we were not able to produce a cell culture, unless with low ALP level, and there weren't any calcified nodules.

**CONCLUSIONS:** From the clinical cases performed and in accordance with the data provided by the scientific literature, it is clear that the main advantage of the piezoelectric device is certainly its selective action that allows to perform micrometric cuts with maximum surgical precision and intraoperative sensitivity. Indeed, thanks to the ergonomic handpieces with curved and angled inserts, the noble anatomical structures are more respected. The main disadvantage of this device is certainly the longer operating time needed. However, this problem is secondary, if considering the patient's comfort. Finally, the absence of marginal necrotic areas to the bone block removed makes the osseointegration with the recipient site faster.

### Informed consent: legal principles in pediatric dentistry

G. L. Vaccaro, G. Di Carlo, A. Bucca, C. M. De Sanctis

*"Sapienza" University of Rome, Dept. of Oral and Maxillo Facial Science, U.O.C. Pediatric Dentistry, Pediatric Dentistry Specialization School, Rome, Italy*

**BACKGROUND:** Informed consent is a concept that describes the relation the patient has with the information to him presented before starting a treatment or therapy. It is mandatory now to completely inform the patient of all risks and benefits that he may receive from a specific treatment and to be fully aware, and in power, of deciding whether or not he accepts such risks and/or benefits. Nowadays, it's necessary to obtain a valid consensus from the patient, or to whom legally represented, regarding the therapies or treatment prescribed. Deontologically speaking, the doctor must be respectful of the patients' dignity and help him in the assessment of eventual treatments and not make decisions for him. Sometimes however, in some patients it is not possible to completely be aware of intraoral problems during a nor-

## ABSTRACT

mal dental visit and have the possibility to sign a consensus for each treatment e.g. when patients show law compliance and/or syndromes/disabilities which impede normal dental check-ups and are therefore required to be visited and treated under general anaesthesia and it is preferable to proceed with necessary treatments in a single sitting.

**METHODS:** Two model forms have been developed in order to aid the patients and guarantee safety for medical staff and health care facilities. The first module (Attachment A) is mainly directed to patients with disabilities where clearly states potential necessities and/or necessary treatments and aims to integrate what has already been told during colloquy with the doctors. As stated above some situations are not properly assessed due to lack of collaboration and therefore only through a visit under general anaesthesia one can truly evaluate the proper needs of treatment. Attachment A summarizes the main dental operations – carried out in regime of general anaesthesia and in operating room – in a single document, which can be included in the medical records, thus simplifying the efficient management of patients' documentation. The same rationale underlies the new form (Attachment B) for the acquisition of consent to orthodontic therapies. However, this document is less technically detailed, since it aims at focusing patients' attention on the therapy goals and the need of cooperation with doctors. Attachment B highlights that the duration of therapies cannot be determined with absolute certainty, but, on the contrary, is strictly dependent on the tissues' natural response to dental operations. This is to avoid the formation of misled expectations by patients, for which orthodontists may be held accountable, even when their activity was properly performed.

**CONCLUSIONS:** Informed consent is premised on those values and becomes a prerequisite of therapies' legitimacy. There is no legitimacy when patients cannot make an informed decision based on what they have been told by the competent health care personnel. Consequently, managing the consent acquisition process can be a complex activity, full of implications under several aspects, professional, deontological and legal. This is especially true for those operating in the public health care system, often congested by the sheer number of patients.

### Intraoral lipoma in buccal mucosa: case report

B. Cassese, V. Carocci, A. Bucca, D. Milo, G. L. Sficiotti

*Sapienza University of Rome, Dept. of Oral and Maxillo Facial Science, U.O.C. Pediatric Dentistry*

**BACKGROUND:** Lipoma is a painless tumour derived from mesenchymal connective tissue. It manifests itself on soft tissue and is characterized by a slow and circumscribed growth. It's occurrence in the oral cavity is relatively low (between 1-4%). The buccal mucosa is the district with most abundant fatty tissue and therefore it is reported to be the most common site of intraoral lipomas. Its histological composition is largely of mature adipocytes with uniform nuclei resembling white fatty tissue. It poses very little threat as it is a benign form, as opposed to liposarcomas. Given the fact that it's a painless lesion, sometimes patients can undergo years with an intraoral lipoma without never accusing it, thus the hereby presented case report of a large intraoral lipoma.

**METHODS:** The reported case is of a 46-year-old male who presented a large, soft mass in the buccal mucosa. No pain

was referred by the patient, but only a slight impediment in chewing and talking. The patient does not suffer from any endocrinal pathology or any other systemic condition. The mass, as reported by the patient, was never noticed up until he felt the described impediment. The overlying mucosa appeared normal in colour with no visible alterations. The consistency was soft with a certain degree of mobility, no fluctuation was observed. Surgical excision was carried out as the only therapeutic option available following a histological exam.

**RESULTS:** The only viable method of diagnosis is via histological exam. Results confirmed the initial hypothesis. Histological studies show mature adipocytes with a large clear cytoplasm and eccentric nuclei. There was no evidence of cellular atypia and no epithelial coating. Based on the above findings, a final diagnosis of lipoma was made. No recurrences are reported in follow up visits and the surgical site healed with no complications.

**CONCLUSIONS:** Lipomas can be subtle lesions which can go unnoticed for several years until their size poses some sort of discomfort to the patient; however given the benignity of the mass it hardly poses a threat to the patient. The only proper way of diagnosis is through histologic examination after which the patient will be put through a follow-up for two years in order to intercept any possible, yet uncommon, recurrence of the condition.

### Is telephone follow-up effective in the prevention of bleeding complications in patients receiving antithrombotic therapy? Preliminary data of a randomized prospective study

L. Luigetti, M.G. Scorsolini, A. Cafolla, R. Pippi

*Department of Oral and Maxillo Facial Sciences, Sapienza University of Rome, Rome Italy*

Surgical procedures are burdened by the risk of bleeding complications which may depend both on patient related factors and/or to the procedures themselves. Therapeutic indications to oral surgeries, in case of drug-induced hemostasis alterations, have been limited for long time, because effective hemostatic substances were not available. Validated studies affirm that antithrombotic treatment discontinuation for dental extraction is not necessary because the risk of fatal consequences is greater than that of surgery-related bleeding. Moreover, clinical evidences show that dental extractions are associated with a moderate bleeding in patients on antithrombotic treatment. Recently, the introduction of direct oral anticoagulants opened new sceneries regarding both the intraoperative management of bleeding and the incidence of bleeding complications.

**BACKGROUND:** The aim of the present work is to report the preliminary data of a randomized prospective study which is being carried out on patients on antithrombotic treatment, undergoing dental extractions, to primarily evaluate the effectiveness of telephone follow-up in preventing post-extraction bleeding. Secondly the study is intended to analyze the results of the different local hemostasis techniques applied in relation to both the bleeding risk and the quality of surgical wound healing.

**METHODS:** Enrolled patients were preoperatively randomly divided into two groups: test and control. All patients in the test group received a telephone questionnaire after 6, 24, 36



and 48 hours aiming to identify possible post-operative bleeding complications and their causes. After  $6\pm 1$  days, all test and control patients were re-evaluated, sutures were removed, information about the post-operative course were collected and the quality of the surgical wound healing was evaluated according to a predetermined index.

**RESULTS:** To date, out of the total number of 256 patients expected, 140 patients were included in the study, 66 in the test group and 74 in the control group (87 males and 53 females), with a mean age of  $74.1\pm 10.4$ . Three hundred and thirty extractions were performed, only 2 of which were surgical, with on average 2 extractions per patient. Out of all 140 patients, 41 (29%) reported more or less significant bleeding. Twenty-six test group patients (39%) reported bleeding during at least one of the 4 phone contacts. Twenty-four patients (36%) complained the perception of bleeding at the first phone call but only 4 of them had the real need to put on a gauze to stop the bleeding and only 9 of them referred bleeding also at the second phone contact. At the 3rd phone contact, 3 patients referred the persistence or the onset of bleeding and only 1 patient reported bleeding at the 4th phone contact. No patients needed to be rechecked before the scheduled date.

Fifteen control group patients (20%) reported bleeding during the post-extraction days and 2 of them had to come to the Oral Surgery Unit or to the Dental Emergency Unit to stop bleeding.

**CONCLUSIONS:** The telephone follow-up revealed being a valid support in the first post-extraction days when a slight, although physiological, bleeding could worry the patient. Talking with the patient allows to confirm that his/her own oral behavior is correct and possibly to modify it, if incorrect.

## Bone regeneration for implant purposes in congenital malformations

I. Lupi, M. Tammaro, A. Varletta, F. Rullo, R. Rullo

*Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania "Luigi Vanvitelli", School of Specialization in Oral Surgery, Naples, Italy*

**INTRODUCTION:** The lip and palate cleft is the most common congenital malformation that affects the craniofacial structures. This malformation is caused by a developmental arrest, between the fourth and tenth weeks of gestation, which leads to a failure in sealing of the primitive facial buttons that contributes to the formation of the upper lip and the palate. The 22.5% of patients with a gnathoschisis exhibit agenesis of the lateral incisor with a greater incidence of dental anomalies than the rest of the unaffected population. Furthermore, in patients with gnathoschisis the presence of a bone bridge between the two abutments of the affected maxilla is not sufficient, after primary surgery, to perform a correct implant-prosthetic rehabilitation.

**MATERIALS AND METHODS:** This study presents the clinical case of a male patient affected by complete left-sided cheilognathoschisis with lateral incisor agenesis. The patient at the age of 9 months underwent rhino-cheilo-gnathoalveoloplasty primary surgery. When he was 6 years old we decided to plan and execute an orthodontic treatment to allow the alignment of both dental arches and the resolution of the left lateral crossbite, with residual space in the seat 2.2. At the age of 18 years old, TC analysis of the maxillary bone showed a bone bridge between the abutments of the affected maxilla,

it was evident that this bone insufficiency should require a horizontal and vertical GBR to allow the insertion of implant fixture. GBR intervention has been performed through block grafting and autologous bone particulate taken from the mandibular body. The operation has been performed simultaneously with the odontectomy of the third ipsilateral third molar included in order to reduce the patient's discomfort. After the preparation of the recipient site, through the interruption of the cortical lamina and flap passivation, the graft was fixed through a single screw of osteosynthesis.

**RESULTS:** Six months post-surgery, instrumental investigations were carried out (TC dental scan superior and RX opt), in which a bone increase was evident both in the palatal vestibular and in the coronal apical sense. Subsequently, a submerged 3Øx10mm dental implant was inserted. Six months later, exposure and insertion of healing abutments was carried out. Furthermore, having a proper tissue healing, a temporary dental element in resin was inserted to allow the conditioning of the soft tissues. After 3 months, the final prosthetic product was applied. At one year follow-up, the patient showed a satisfactory *mastication* and occlusal function and an acceptable aesthetic.

**CONCLUSIONS:** The treatment of patients with cheilognathoschisis is complex and multidisciplinary. One of the most difficult management aspects is the correct ossification of the gnathoschisis site. Currently, for these patients, the use of dental implants, after GBR, has become the necessary method capable of ensuring predictable and reliable long-term results. Due to the excellent characteristics of osteogenesis, osteoinduction and osteoconduction, autologous bone represents the best graft material. In this case, it was decided to proceed with blockage and particulate removal of autologous bone from the mandibular body, contextualizing it to the odontectomy of the lower molar included. In particular, the considerable increase in patient morbidity was avoided, improving compliance and reducing discomfort. The autologous block bone graft was able to guarantee new bone formation processes stimulation and was able even to support cells involved in tissue regeneration, ensuring, at the same time, a stability of the gingival scar tissue, and avoiding the collapse in the atrophic site.

## Conservative surgical treatment of Medical Related Osteonecrosis of the Jaw: fourteen-year experience of a single institution

M. Nisi, S. Mariotti, M. Gabriele

*Department of Surgical, Medical and Molecular Pathology and Critical Care Medicine, University of Pisa, Pisa, Italy*

**BACKGROUND:** Medication-related osteonecrosis of the jaw (MRONJ) is a side effect of antiresorptive medications (IV and oral BPs, rank ligand inhibitor like denosumab) and antiangiogenic medications. The management of medical related osteonecrosis of the jaw has not been completely elucidated, and its treatment can vary from no or limited surgery to more extensive surgery. Aim of the present study was to evaluate the efficacy of localized surgical treatment of MRONJ lesions in a cohort of patients referred to the unit of Odontostomatology and Oral surgery of the University of Pisa.

**METHODS:** The study included all consecutive subjects diagnosed with MRONJ that had undergone localized surgery in the Department of Dentistry and Oral Surgery of the

## ABSTRACT

University Hospital of Pisa from January 2004 to December 2017. Diagnosis of MRONJ was made according to the criteria of the American Association of Oral and Maxillofacial Surgeons. Data on demographic, health status, type and duration of antiresorptive medication and osteonecrosis characteristics were collected retrospectively. The primary outcome was a complete halting of MRONJ lesion.

**RESULTS:** Two hundred and forty three patients, with 256 MRONJ lesions, were identified and included in the present study (174 females; mean age 68,85 years; SD 10.7 years). 176 patients (72,4%) received intravenous bisphosphonates (zoledronic acid 4mg IV) for the treatment of oncologic pathologies: metastatic breast cancer (72 patients, 29,6%), multiple myeloma (44 patients, 18,1%), kidney cancer (5 patients, 2,1%) and metastatic lung cancer (17 patients, 7%). Sixty-four patients (26,3%) received bisphosphonates for the treatment of osteoporosis. Three patients (1,2%) received Denosumab for the treatment of metastatic breast cancer. The MRONJ lesions were mainly symptomatic (241 lesions, 94,1%) and bone exposure was detectable in the vast majority of cases (203 lesions, 79,3%); pus was detected in 93% of cases (237 lesions). 173 lesions were located in the mandible. The main event leading to MRONJ was dental extraction (142 lesions, 55,5%), periodontal/perimplant disease (24 lesions, 9,4%), prosthetic trauma (42 lesions, 16,4%), odontogenic infection (21 lesions, 8,2%) and dysodontiasis of third molar (2 lesions, 0,8%). The most frequent stage of MRONJ was stage II (137 subjects, 14,5 %), whereas stage I (37 subject, 14,5%), and stage III (82 subject, 32%) were less common. 175 patients show complete healing after surgical treatment. However, sixty-eight (22,7%) do not completely recuperate and required further surgical management to treat the relapsed lesion. Stratification indicated 94.3% total disease resolution for all stage I lesions, 78.9% of improvement for stage II and 51.7% for stage III.

**CONCLUSIONS:** Our data suggest that patients with MRONJ lesions may benefit from local surgical treatment. Patients with severe MRONJ stage seem to present an increased risk of surgical treatment failure.

### Etiological periodontal treatment with Low Level Laser Therapy (LLLT) effects during periodontal healing in chronic patients: an in vivo multicentric pilot study

F. Mastrangelo<sup>1</sup>, A. Dedola<sup>1</sup>, V. Vuolo<sup>1</sup>, F. Bova<sup>2</sup>, F. Cattoni<sup>2</sup>, F. Ferrini<sup>2</sup>, E. Gherlone<sup>2</sup>, L. Lo Muzio<sup>1</sup>

<sup>1</sup>Department of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy; <sup>2</sup>San Raffaele Dental Clinic University, Ateneo Vita e Salute, Milan, Italy

**BACKGROUND:** In the oral cavity, the bone loss and periodontal tissue pathology are related to inflammatory process activation and cytokine proteins may have important roles during periodontal disease pathogenesis. The aim of the present multicentric pilot study was to assess the healing periodontal effects of etiological therapy with Low Level Laser Therapy (LLLT) on clinical and biological periodontal parameters of chronic periodontitis (CP) patients.

**METHODS:** Thirty (30) non-smoker CP patients (21 male and 9 female) were selected in the dental unit of Clinical and Experimental Medicine, University of Foggia, and in other 2 dental clinics. All patients were treated with scaling and root

planning etiological treatment and Low Level Laser Therapy-LLLT. Clinical parameters, before treatment (baseline-T0), the periodontal pocket depth (PPD) and bleeding on probing (BOP) were detected in all sites. In the PPD sites, the gingival crevicular fluid (GCF) samples were collected from 15 deep ( $\geq 5$  mm) and shallow ( $\leq 3$  mm) sites and interleukin-1 $\beta$  (IL-1 $\beta$ ) level in GCF were evaluated at baseline, after 10 days and 1 month.

**RESULTS:** In all the samples at baseline, the IL-1 $\beta$  concentration in gingival crevicular fluid and BOP rate were significantly higher at deep periodontal pocket sites than at the shallow ones. After 10 days in all samples no PPD improvement was observed in the BOP rate but the IL-1 $\beta$  level was statistically significantly improved ( $p < 0.005$ ). At 10 days and 1 month, after Low Level Laser Therapy, in all deep periodontal pocket sites, PPD and BOP improvements were observed. At same time, IL-1 $\beta$  levels were lower and statistically significantly ( $p < 0.005$ ) improved.

**CONCLUSIONS:** The results observed in this study confirmed how the association between Low Level Laser Therapy and periodontal etiological therapy allows a drastic improvement of the clinical and biological parameters of superficial and deep periodontal defects promotes periodontal health. Moreover, the IL-1 $\beta$  concentration changes in gingival crevicular fluid suggest these cytokines as a predictable marker of gingival inflammation in chronic periodontitis patients. The results confirmed how the periodontal etiology treatment of deep periodontal pocket sites with associated LLLT promotes periodontal health.

### Evaluation of multifocal osteolytic lesions of the jaw after endodontic treatment: 24 months follow-up

F. Mastrangelo<sup>1</sup>, L. Lepidi<sup>1</sup>, C. Suriano<sup>2</sup>, V. Vuolo<sup>1</sup>, G. Wang<sup>1</sup>, G. Sammartino<sup>3</sup>, L. Calabrese<sup>4</sup>, L. Lo Muzio<sup>1</sup>

<sup>1</sup>Department of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy; <sup>2</sup>Private Practice, Foggia and Andria, Italy; <sup>3</sup>Department of Oral Science, Federico II University, Naples, Italy; <sup>4</sup>Department of Oral Science, Torvergata University, Rome, Italy

**BACKGROUND:** The aim of the present study was to evaluate the benign evolution of multicentric osteolytic lesions, adherent to 4 teeth and total resorption of the cortical mandibular bone.

**METHODS:** In 2015, a 23 years old male in urgency came to our observation for pain and swelling in the right side of the mandibular body. At the intraoral examination it was possible to observe clinical mucosae inflammation and a generalized swelling diffused near the molar and premolar zone (teeth 4.4 - 4.7) without fistula and purulent material. The first molar vitality test was negative, while those on the second molar and on the premolars were positive. Clinically appreciable mobility of the first molar and the second premolar were present. The antibiotic was administered and endodontic therapy of the 4.6 was performed. After endodontic treatment orthopantomography, Cone Beam Dentscan (CBCT) and histological analysis were performed.

**RESULTS:** The radiographic analysis revealed the presence of multifocal radiotransparency areas of right jaw with aggressive cortical bone erosion images compatible with neoplastic lesions. After incision biopsy the histological analysis showed a proliferation of medium/large size elements with large cytoplasm and irregular nucleus, with the presence of eosino-

philic granulocytes and some lymphocytes with diagnosis of Eosinophilic Granuloma (EG). Radical surgical strategy was formulated after endodontic treatment of all tooth involved in osteolytic multicentric lesions. For personal reasons of the patient the surgical treatment was three times delayed. After 7 months a new CBCT was performed and showed initial remission signs of the multifocal osteolytic sites. After 12 and 24 months the CBCT performed a total remission of the jaw osteolytic multifocal lesions.

**CONCLUSIONS:** Although limited to a single rare clinical case of an occasional finding, which requires more monitoring time to draw complete conclusions based on clinical evidence of at least 5 to 10 years, our study shows that even in the presence of a histological diagnosis of Eosinophilic granuloma (EG) bound to one or more necrotic elements, before performing a radical surgical treatment it would be useful for the clinician to perform an endodontic treatment of the dental elements involved in the osteolytic lesions together with a follow-up of at least 6 months before proceeding to more radical treatments.

### Retrospective study of oro-antral communication surgical management with tooth auto-transplantation technique

M. Melillo<sup>1</sup>, L. Boschini<sup>2</sup>, M. Dedola<sup>1</sup>, P. Cappare<sup>3</sup>, R. Vinci<sup>3</sup>, F. Mastrangelo<sup>1</sup>

<sup>1</sup>Department of Clinical and Experimental Medicine – University of Foggia, Foggia, Italy; <sup>2</sup>Private Practice, Rimini, Italy; <sup>3</sup>San Raffaele Dental Clinic University. Ateneo Vita e Salute, Milan, Italy

**BACKGROUND:** Several surgical approaches were used to obtain Oro-Antral Communication (OAC) healing, however none provide a predictable bone reconstruction and an immediate prosthetic rehabilitation. The use of tooth transplantation could induce bone healing with the formation of new bone with an immediate occlusal re-habilitation.

The purpose of the present study was to evaluate the bone level and the clinical occlusion at 6 months after surgical treatment of Oro-Antral Communication with a tooth autotransplantation.

**METHODS:** A female 27 years old patient needed the restoration of a compromised first molar in the upper jaw. According to the scientific literature the tooth autotransplantation could be planned to restore the 1.6 with the 1.8 when a molar is lost and a donor is present. After the extraction of the first molar and the inflammation tissue removal, an OAC was occurred. The dental team decided to treat the communication and at the same time provide the restoration of the lost tooth with the auto-transplantation of the third molar according to patient's consensus. The measured the communication was 6 mm diameter. Subsequently, the third molar (1.8) was extracted and allocated in the 1.6 alveolus with roots protruding in the sinus for 3 millimeters. After 3 weeks the endodontic treatment was performed and then the patient was followed with endoral radiographies at 1, 2 and 5 months. After 6 months the CBCT analysis was detected to evaluate the bone and sinus healing. **RESULTS:** Immediately after surgery the transplanted tooth appeared clinical stable inside the new alveolus. Similar clinical evidence and no pain was evaluated during the controls at 1,2,5 months. The x-ray images revealed a progressive sealing of the communication with a continue mineralization of the apical bone. The crestal bone resorption caused by the 1.6

residual roots determined the exposition at the surgery time of the furcation, these areas were involved in bone and periodontal ligament loss of the roots furcation. After 6 months the CBCT analysis revealed a complete bone formation in the peri-apical area with roots covered and the complete oro-antral communication healing with an apical relocation of the sinus floor. At 6<sup>th</sup> months a sinus floor augmentation was radiologically detected. The bone defect was clinically confirmed in the furcation area how observed at initial healing time after surgery.

**CONCLUSIONS:** The clinical and 3D radiological analysis showed a good healing of the OAC with tooth transplantation after 6 month follow-up. The CBCT data confirmed the oro-antral communication closure, the apical bone augmentation and the elevation of the sinus floor. The immediate clinical restoration and occlusal rehabilitation with tooth auto-transplantation encourage this approach to close little sized OAC when a third molar donor is present. This approach, even in case of failure of the dental transplant, will always allow an implant rehabilitation in a site close to the maxillary sinus with better quality and quantity of bone without oro-antral communication.

### Salivary diagnostics for oral cancer and potentially malignant disorders: a systematic review

R. Antonelli, M.E. Pezzi, I. Giovannacci, P. Vescovi, M. Manfredi, M. Meleti

Unit of Oral Medicine, Oral Pathology and Oral Laser Surgery; Centro Universitario di Odontoiatria Department of Medicine and Surgery, University of Parma, Parma, Italy

**BACKGROUND:** Oral squamous cell carcinoma (OSCC) is the seventh most common human malignant tumor, with increasing incidence and significant mortality and morbidity. Advances in treatment strategies and improvement of post-treatment quality of life of patients with OSCC are not yet accompanied by a significant lengthening in the of the 5-year survival rate (50%).

Because of the frequent late diagnosis, it seems very important the identification of novel biomarkers hopefully allowing discover of the malignancy as early as possible.

The purpose of this review is to determine whether there is scientific evidence that supports the role of "salivary biomarkers" for the diagnosis of potentially malignant lesions and oral cancer.

**METHODS:** The Medline, Scopus and Web of Science database were searched using as entry terms: .

"Saliva and oral carcinoma", "Saliva and oral cancer", "Saliva and squamous cell carcinoma", "Salivary biomarkers and oral carcinoma", "Salivary biomarkers and oral cancer", "Salivary biomarkers and squamous cells carcinoma", "Salivary biomarkers and potentially malignant", "Salivary biomarkers and erythroplakia", "Salivary biomarkers and pre cancer / pre-cancer / precancer", "Salivary biomarkers and oral leukoplakia", "Salivary biomarkers and oral lichen planus".

References lists in reviews were screened in order to identify papers possibly missing from the databases search.

Information extracted included title, Authors, publication year, disease evaluated, type of biomarker, biochemical method and device used to analyse saliva.

Papers were classified into 5 groups, according to the molecule evaluated: 1) Genomics; 2) Proteomics; 3) Metabolomics; 4) Transcriptomics and 5) Combination of these.



## ABSTRACT

Quality of studies was assessed according to the guidelines of the National Institute of Health (NIH - scores ranging from "poor" to "good").

RESULTS: The research produced a list of 9472 papers. Duplicates were deleted through the Endnote® software. The elimination of duplicates led to the selection of 3957 papers.

Titles and abstracts were evaluated and 159 articles were eventually included and considered for the following phase. Among 159 papers, 26 were reviews and therefore furtherly excluded.

The remaining 133 papers were classified as follows: 1) Genomics: 11 (8,3%) papers, 2) Proteomics: 79 (59,4%) papers, 3) Metabolomics: 18 (13,5%) papers, 4) Transcriptomics: 12 (9%) papers, 5) Combination: 13 (9,8%) papers.

The quality of papers ranged from "poor" to "good", the majority (65%) being "average" quality.

CONCLUSIONS: The identification and use of one or more salivary biomarkers could represent a reliable and safe choice for the early diagnosis of oral carcinoma and potentially malignant lesions.

The salivary collection procedure is simple and non-invasive and this has the potential advantage of being less expensive than the current ones.

## The importance of prevention in the diagnosis and treatment of oral cancer

G. Giannatempo<sup>1</sup>, F. Flauret<sup>1</sup>, M. Mascitti<sup>2</sup>, A. Santarelli<sup>2</sup>, R. Mauceri<sup>3</sup>, G. Capocasale<sup>3</sup>, A. De Lillo<sup>1</sup>

<sup>1</sup>Dipartimento di Medicina Clinica e Sperimentale, Università di Foggia, Foggia, Italy; <sup>2</sup>Dipartimento di Scienze Cliniche Specialistiche ed Odontostomatologiche, Università Politecnica delle Marche, Ancona, Italy; <sup>3</sup>Dipartimento di Discipline Chirurgiche, Oncologiche e Stomatologiche, Università di Palermo, Palermo, Italy

BACKGROUND: The oral squamous cell carcinoma (OSCC) is the most frequent malignant tumor in the oral cavity. It ranks 8<sup>th</sup> among the most common malignant neoplasia and is characterized by a low survival rate, mostly due to its late stage at the moment of diagnosis and to its high relapse and/or metastatic rate. After the initial surgical and/or radiotherapeutic treatment, relapses or metastasis occur in more than 50% of patients and, at the moment, the 5-year overall survival rate is less than 50% without showing any improvement compared to last years. If diagnosed in an initial stage, its related 5-year survival rate is around 80-90%. Unfortunately, nowadays the majority of OSCC cases is diagnosed in a late stage. Specifically for Italy, the prevalence of oral cancer among men is 27/100.000 and among women is 14/100.000. Regarding the distribution of OSC in our country, there is a major prevalence in the north-east, followed by the north-west, central Italy. In all Italy (up to 2012), the overall prevalence of head and neck tumors was 84.000 men and 22.000 women. Generally, men are more affected than women, probably due to a stronger exposure to risk factors (alcohol, tobacco, HPV); however, in the last decades, men are showing a statistically significant reduction of both mortality and incidence rates, while women are showing an increase of incidence, probably due to a convergence in the exposure to risk factors in both sexes. The prevalence for head and neck tumors increases progressively with aging; however, diagnosis of <45 years-old patients is rising, this probably related to HPV infection.

METHODS: We reported a case of oral squamous carcinoma in a 78-year-old man.

RESULTS: The patient has come to our clinic in order to undergo the periodic oral hygiene treatment at the end of the common 6 months deadline. During the usual control, a painless, slightly ulcerated, yellow colored lesion located in the retromolar trigone has come to our attention. In the anamnestic phase, the patient has referred to have quit smoking almost from 10 years (smoking average 10 cigarettes/day) but, in the last period, he started to smoke again after every meal. Moreover, he declared not to have a frequent alcohol consumption. An incisional biopsy has been performed, considering both the age of the patient (78 years old patient) and the fact that he was in treatment with the 4<sup>th</sup> generation anticoagulant therapy for a prosthetic cardiac valve inserted 4 years before. The response given by the pathologist confirmed the clinical diagnosis of OSCC with a "standby" invasive pattern, interposition of muscular fiber cells (WPOI-5 sec. AJCC VIII ed 2017) of the retromolar trigone, infiltration of fibro-adipose tissue cells of the oral floor and infiltration of the striated muscular tissues reaching the submandibular salivary gland. It has been requested the p16 evaluation, resulted negative. The patient was treated with a local resection, succeeding in the preservation of the TMJ, leading to a more conservative treatment.

CONCLUSIONS: The early diagnosis of OSCC in this case outlined the importance of prevention in oral cancer and the periodic control of oral health in order to diagnose early the cancers.

## Clinical comparison between calcium sulphate and polylactic-polyglycolic acid coated with hydroxyapatite in socket preservation

C. Mangione<sup>1</sup>, G. Giannatempo<sup>1</sup>, C. Ferraro<sup>1</sup>, A. Santarelli<sup>2</sup>, M. Mascitti<sup>2</sup>, M. Dioguardi<sup>1</sup>, N.F. Testa<sup>1</sup>

<sup>1</sup>Department of Clinical and Experimental Study, University of Foggia, Foggia, Italy; <sup>2</sup>Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University, Ancona, Italy

BACKGROUND: The bone regeneration is an important goal to assure a great implant and prosthetic rehabilitation. Many guided bone regeneration procedures and materials are studied to preserve height and thickness of alveolar bone after tooth extraction.

In this study we compared Polylactic - Polyglycolic Acid Coated with Hydroxyapatite (PLGA-HA) and Calcium Sulphate (CS) in socket preservation.

PLGA is a synthetic, hydrophilic and resorbable copolymer. It can be coated with hydroxyapatite (HA) particles widely used as a bone substitute, thanks to its excellent biocompatibility and biological activities. PLGA induces mesenchymal cells differentiation into osteoblasts, providing a scaffold for their growth.

CS is a biocompatible, osteoconductive and completely resorbable biomaterial. It is very well tolerated and used for the treatment of bone defects and maxillary sinus lift. Histological studies demonstrated that CS is completely reabsorbed in 3 months in post-extraction sockets and does not interfere with bone healing.

METHODS: Nineteen patients between 35 and 60 years old were selected for this study. Every patient needed extraction of first or second mandibular molar. None of them were smoker, no one had diabetes or other systemic disease, hormonal alterations (i.e. menopause). Patients in cure with immunomodulant or corticosteroid drugs were excluded.

After extractions, the patients were divided in three groups: (A) Nine treated with CS, (B) Nine treated with PLGA-HA (ReOss™, Intra-Lock, Boca Raton, FL), (C) One treated with both materials in a split-mouth experiment.

All patients performed preoperative, postoperative, 3 and 6 month control intraoral x-rays (3x4). The root apex of the mesial tooth from extracted tooth has been used as apical reference point and alveolar bone margin as a coronal one. Were made measurements in three different points of extracted site: (A) on the mesial bone crest, (B) on the distal bone crest and (C) on the interdental bone septum. Therefore, was calculated the mean of the three values to establish the average height loss in each patient.

Histological studies were performed on the patient treated with both materials during implants insertion; were performed three bone withdraws: (1) Socket with CS, (2) socket with ReOss™ and (3) healthy edentulous bone.

RESULTS: In the CS sockets, the average loss of bone height was  $0.44 \pm 0.1$  mm at 3 months and  $0.65 \pm 0.1$  mm at 6 months, versus  $0.57 \pm 0.1$  mm at 3 months and  $0.85 \pm 0.1$  mm at 6 months of ReOss™.

From the histological studies, the section with CS showed a percentage of bone tissue almost equal to the physiological one of the control section. On the other hand, the ReOss™ showed a lower percentage of bone filling and a greater proportion of connective tissue.

CONCLUSIONS: The results obtained reveal that both biomaterials reduced the physiological reabsorption of the alveolar ridge height after dental extraction; but neither was able to zero bone loss.

The CS seems to be more efficient in socket preservation than PLGA-HA, showing a lower bone loss, an almost complete reabsorption and new bone apposition at 6 months. aumentando la casistica potremmo capire quale sia il materiale migliore tra CS e PLGA-HA.

## Vascular Endothelial Growth Factor (VEGF) evaluation during osteoblast like cells from adipose tissue proliferation and differentiation

F. Mastrangelo<sup>1</sup>, A. Dedola<sup>1</sup>, E. Liotine<sup>1</sup>, V. Vuolo<sup>1</sup>, R. Quaresima<sup>2</sup>, F. Cattoni<sup>3</sup>, L. Lo Muzio<sup>1</sup>

<sup>1</sup>Department of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy; <sup>2</sup>Department of Engineering and Materials, University of L'Aquila, L'Aquila, Italy; <sup>3</sup>Department of Dental Science, Vita e Salute University-San Raffaele, Milan, Italy

BACKGROUND: The aim of the research was the evaluation of the VEGF different behavior of mesenchymal stems cells from human adipose tissue during osteogenic proliferation and differentiation.

METHODS: Homogeneous pool of subcutaneous and visceral adipocytes was selected after surgical procedures of 3 patients with FACS analysis. Adipose subcutaneous stromal cells (S-ADSC) and adipose visceral stromal cells (V-ADSC) were cultured for 28 days with MEM-a-medium 10% FBS, 0.05 mM ascorbic acid, 10 mM  $\beta$ -glycerophosphate and 100 nM dexamethasone. Then, they were incubated at 37 °C and 5% CO<sub>2</sub>, with soil changes every 3 days, in order to induce osteogenic differentiation. Cell counting was conducted, with the collection of cells after different culture periods (from 0 to 10 days), the trypan blue incubation and the count with a hemocytometer in triplicate. Samples were observed under light microscopy to assess confluence. The stems cells pool

was cultured in the osteogenic medium and the differentiation was assessed by RT-PCR and Western-blot.

RESULTS: All samples of human adipocytes showed a homogeneous population of mesenchymal stem cells. After 7 days the proliferating cells achieved the confluence. After 21 days it was possible to observe the positivity to the Alizarin Red staining, confirming the osteogenic differentiation. RT-PCR analysis showed a higher ALP production in the subcutaneous cells compared to visceral derivation cells. The VEGF evaluation in the subcutaneous cells during the proliferation and differentiation phase showed an higher increase of the gene activity and the VEGF protein in the cells. In visceral adipose cells pool during the proliferative phase the lower VEGF increase was detected. Also during the proliferation the decrease of VEGF was greater.

CONCLUSIONS: The presence of VEGF in all the analyzed samples confirmed the crucial and very important role of this protein during all the physiological phases of cell development, proliferation and differentiation. The evidence of a greater increase in VEGF detected in the subcutaneous cells compared to the visceral adipose cells could confirm the greater capability of this pool cells to differentiate in osteogenic sense and their potential use in regenerative dentistry and tissue engineering.

## Surgical technique of adenomatoid odontogenic tumor in a young male patient: case report

G. Sammartino, A. Cascella, F. Guerra, P. Sammartino, R. Gasparro

Department of Medicine and Durgery, Desk of Pathology and Maxillo-Facial Surgery

BACKGROUND: Adenomatoid odontogenic tumor (AOT) is a non invasive and uncommon lesion of the jaws that shows varied clinical and histoarchitectural patterns. Clinical and radiographical features represent a challenge for the clinicians in the differential diagnosis of this tumor. Surgical enucleation and revision of the cavity is the standard treatment for AOT. Marsupialization could present a valid treatment alternative, preserving the functional and esthetic features. The aim was to describe a case of AOT and how complicated the choice between a Parsh 1 or 2 in the treatment of osteolytic lesions can be. The rarity of AOT and its similarities to other odontogenic tumors and cysts of the jaw bones, could make diagnostic approach and treatment complicated. The management of a dentigerous cyst includes enucleation and marsupialization, whereas an adenomatoid odontogenic tumor is treated with enucleation and curettage. However probably that an adenomatoid odontogenic tumor does not need extensive and aggressive surgery because it has a benign, nonaggressive growth pattern, and its capsule is easily separated from the surrounding bone.

METHODS: a 13 years healthy old male patient was referred to the Department of Oral Surgery of Federico II University in Naples, with the complaint of painless swelling present in the left maxillary region since eight months. Radiographs showed a well – defined radiolucent area, extending anteriorly up to 21, posteriorly up to 27 and superiorly below the lower margin of the orbit, almost occluding the left maxillary antrum. In the radiolucent area an unerupted tooth, the permanent canine, was present. An elective surgical enucleation with canine extraction procedure under general anesthesia was performed and follow up was planned.

RESULTS: Histopathological examination revealed the pres-

## ABSTRACT

ence of AOT. A complete clinical healing about 6 months later was present, with the subsequent disappearance of all signs and symptoms. At radiographical follow-up visits at 1 year, 2 years and 4 years after surgery, we did not find any sign of relapse. In addition control RX and TC images at 4 years showed an optimal bone healing; however this type of treatment led to the loss of the permanent dental element in a young patient.

**CONCLUSIONS:** Since the reported recurrence rate is low, marsupialization can be an effective option for the treatment of an adenomatoid odontogenic tumor, and it allowed for eruption of the impacted tooth. Further prospective studies with more patients are needed before recommending marsupialization as a treatment option for adenomatoid odontogenic tumor.

### Use of ultrashort implant in the failure of the reconstruction technic of the mandible: case report

C. Iasevoli, C. Barausse, G. Simeone, P. Sammartino, R. Gasparro

*Department of Medicine and Surgery, Desk of Pathology and Maxillo-Facial Surgery, University of Studies of Naples "Federico II", Naples, Italy*

**BACKGROUND:** The loss of dental elements, due to a parodontal disease or to a trauma, can cause deficiency of the osseous tissue more or less accentuated. The atrophic mandible rehabilitation represents a challenge for the clinicians. The mandible atrophy can be solved thanks to reconstructive techniques such as GBR, osseous graft and others. The osseous grafts can be collect from intra-extra oral areas and the choice depends on a number of factors such as the required quantity of the graft. The iliac crest bone represents an example of extraoral graft, it's made almost exclusively of sponginess component, and it is subject to a higher reabsorption. The aim of this study is to evaluate the efficiency of the ultrashort implants used in areas with a reduced bone high after the failure of the reconstructive techniques.

**METHODS:** The patient comes to our attention having the mobility of the prosthetic device, pain and tumefaction. The patient underwent to a reconstructive surgery by using iliac crest bone graft ten years ago in our department. Once observed a good integration status between the osseous tissue graft and the native osseous tissue, after six months standards implants were installed. After ten years they failed and radiographic images showed a great bone reabsorption. So the implants have been removed and four ultrashort implants have been inserted (TWINKONE, Global D, France) in the interforaminal region of mandible. The surgical procedure was performed under local anesthesia. Four implants were placed in the fore mandible. The implants were transmucosal, made of commercially pure titanium with a roughened surface. The flaps were carefully sutured with Vicryl 4-0(Ethicon). Radiographs and CT scans were taken after implant placement to verify the correct implant position. A 2 grs dose of amoxicillin with clavulanic acid was administered preoperatively, followed by 1 gr twice a day for 5 days. Ibuprofen (600 mg) was prescribed to be taken as needed. A cold and soft diet and appropriate oral hygiene were recommended for 2 weeks. Sutures were removed after seven days. After 48hrs from the implant positioning, an acrylic screw-retained reinforced provisional restoration was placed; this was then replaced by a definitive prosthesis after another 4

months. Radiographic check doesn't show any perimplant resorption and the patient doesn't claim pain. The, after 48hrs from the surgery, has been made an instant load with a provisional prosthesis. **RESULTS:** The patient was examined clinically each week in the first month after surgery and twice in the subsequent month. The healing process was uneventful and the patient doesn't claim pain. No neurosensory disturbance was reported. A panoramic radiograph and CT scans were made immediately after the surgical procedure demonstrating any perimplant resorption. From an aesthetic and functional point of view, the patient was satisfied and did not claimed puffiness, pains and mastication difficulties.

**CONCLUSIONS:** After the failure of the iliac crest bone graft, 4mm implants may represent a valid alternative in the rehabilitation of atrophic mandible and a simplified approach that reduces operative time and cost as well as intra- and post-operative patient discomfort.

### Functional treatment of oro-antral communication: a clinical study

A. Barcali, M. Bianchi, R. Conti, E. Del Bolgia, M. Duvina, A. Gonnelli, P. Tonelli

**BACKGROUND:** The following study represents a review of patients with OAC associated with sinusitis, undergoing a combined treatment, comprising an otolaryngologic and intraoral approach. The purpose of the study is to demonstrate how the titanium mesh promotes guided bone regeneration, and how this combined technique has excellent success rates not only in the closure of prior communication but also in restoring physiological sinus and respiratory function.

**METHODS:** 22 patients have been revalued, to whom a OAC had been diagnosed in the past. These patients underwent a functional "one stage" treatment, that consists of FESS and, in the same session, of the application of a titanium mesh at OAC's level. The purpose of this technique is to promote tissue regeneration at the bone defect level. Both surgery and review took place at Dipartimento di Chirurgia Orale e Otorinolaringoiatrica dell'Azienda Ospedaliera di Careggi (AOUC). The review phase included an otolaryngologic stage and a dentistry stage. The otolaryngologic stage comprehended a clinical visit and a fibroscopy to evaluate the maxillary sinus health, whereas the dentistry one included a clinical visit, an endoral radiography and a Cone Beam on four patients that had been chosen as statistical sampling. These four cases have been analyzed in detail and can be used to extrapolate results for the entire dataset. The review is based on a number of parameters, such as the OAC's position, the OAC's dimensions, or the amount of time the mesh was kept in place, focusing particularly on the presence of tissue regeneration with complete closure of the defect, that allows both oral and tissue healing, regardless of the initial size of the defect.

**RESULTS:** The treatment has been successful in 90,9 % of cases, whereas it failed in the remaining 9,1% of cases. Success is determined by the OAC's closure, sinusal healing and the disappearance of all signs and symptoms. The two cases of failure have been possibly due to disadvantageous starting conditions: smoke and osteoporosis. In 50% of cases the neoformation of bone tissue has been confirmed, in 31,8 % of cases there was of fibromepous tissue, with traces of bone tissue, and, lastly, in 9,1% of cases there was fibromepous tissue without traces of bone tissue. All these different tissues represent an excellent form of healing.



**CONCLUSIONS:** This study demonstrates that the “one stage” treatment, with otolaryngologic and intraoral approach is an effective and minimally invasive technique for the long-term treatment of chronic OACs. The titanium mesh represents a scaffold for guided bone regeneration and it allows both oral and sinus healing. Although further studies are needed, this work already shows the excellent efficacy of the combined technique in restoring the closure of the OAC relatively quickly and in removing all the symptoms.

### The use of zygomatic implants in the case of failure of reconstructive surgery in atrophic maxillae: case report

R. Silvestri, G. Sammartino, S. Di Simone, P. Felice, R. Pistilli  
*Department of Medicine and Surgery, Desk of Pathology and Maxillo-Facial Surgery, Head Prof. Gilberto Sammartino, University of Studies of Naples “Federico II”, Naples, Italy*

**BACKGROUND:** The use of dental implants has been widely used, over the last few years, for the treatment of maxillary atrophic edentulous patients. The limit of implant rehabilitation is represented by inadequate bone height and width for the treatment of which can be used bone augmentation procedures: guided bone regeneration (GBR), distraction osteogenesis (DO) or onlay bone grafts (OBG). This procedure often including short and long-term complications, from barrier membrane exposure and its sequelae, post-operative infections of the donor site, gait abnormalities, nerve lesions or vascular damage. Various alternatives have been proposed to maximize the residual bone avoiding the use of bone augmentation procedures: sinus lifting, tilted implants placement or use of short implants. In recent years a new treatment has been proposed in severe atrophic maxillae cases: zygomatic implants. The zygomatic bone presents regular and compact trabecular bone with 98% of bone density. This technique can be a valid therapeutic tool in several cases of maxillectomy defects, maxillary sinus aplasia, cleft deformities and could be used as an alternative for fixed rehabilitation in edentulous patients. The use of zygomatic implants has several advantages, such as a considerable shortening of treatment time, because the technique eliminates the necessity of a graft (and a graft donor site) or sinus lifts procedures; but on the other hand the technique have some disadvantages. First there is considerable risk of soft tissue complications around the abutments, sinusitis and a more complex prosthetic design. Second, an eventual failure of this technique might require a more complex and invasive treatment compared with failures of conventional implants. The aim of this case report is to show how zygomatic implants can be an alternative in the failure of reconstructive surgery in maxilla.

**METHODS:** Fifty years old female patient referred to our Department reporting mobility of her prosthetic maxillary rehabilitation and pain. The patient underwent to a reconstructive surgery by using iliac crest bone graft ten years ago in our Department. The radiographic images showed perimplant radiolucency and massive bone resorption. The implants were removed and four zygomatic implants (Southern Implants, Irene, South Africa) were placed after three months of healing. Forty eight hours after surgery an acrylic screw retained metal reinforced provisional restoration was placed. The patient was followed up to one years after loading.

**RESULTS:** The patient was examined clinically each week in the first month after surgery and twice in the subsequent months. The patient had swelling of the maxillary regions up

to one week after surgery and moderate pain. No infection signs at both implants sites were observed. The patient had burns to inferior lips because of the drills, which healed spontaneously. The postoperator OPT showed a correct position of implants and a good position of the prosthesis. The patient was satisfied from esthetic and functional point of view.

**CONCLUSIONS:** According to this case presentation, it might be concluded that the zygomatic implants represent a valid alternative after failure of the reconstructive surgery for severe atrophic maxillae.

### Surgical treatment of maxillary osteolytic lesions: complex composite odontoma (case report)

F. Raimondi Lucchetti, L. Pittari, A. Busa, S. Abati, A. Lissoni, R. Vinci

*Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy*

**BACKGROUND:** The purpose of this case was to report a complex clinical case about an osteolytic lesion in the palatal surface associated with a conspicuous bone loss.

**CASE PRESENTATION:** The patient came to our attention in 2017 for a routine dental examination. The examination showed a moderate presence of soft debris, calculus and gingival hypertrophy, thus an oral hygiene prophylaxis and an orthopantomography for diagnostic assessment had been prescribed. The OPT showed the presence of a neof ormation in correspondence of the teeth 21-24 on the palate surface. For a further evaluation a CBCT was prescribed and it revealed the presence of some supernumerary teeth in the palatal side, exactly near the 11 and 23. Once the vitality tests have been performed, these were positive for all the elements in relation to the neof ormation, then evaluated its extension, we proceeded with the surgical intervention. After loco-regional anesthesia, we opted for the use of a Columbia-type retractor to obtain a better control of the visual field. So, we continued with a palatal intrasulcular incision performed by the interproximal side between 11-12 and by the interproximal side between 24 and 25. A full thickness flap elevation was performed to avoid vascular and nervous structures damage of the periosteum to obtain a better visibility and to reduce post-operative pain and edema. To facilitate the access to the neof ormation, suspended sutures were applied with non-absorbable synthetic suture 3.0 in the interproximal location between 13-14. Using the non-cutting edge of the Molt instrument, the adherence areas of the lesion were removed to enucleate it easier. By flaking the epithelium, it was possible to see the release of a serous liquid, a hypothesis that reinforced the initial diagnostic suspect: odontoma deriving from a supernumerary element adjacent to the canine region. Once the neof ormation has been taken out, we could remove the suspended suture; in this way it has been possible to go further with the flap previously done from 11 to 13. The choice of carrying out the two-step procedure was to preserve the nasal-palatine canal, located in the inter-incisive region. The sub-luxation and avulsion of a further supernumerary element located palatal to 11 was completed, ending the surgical phase. To facilitate the healing and bone regeneration, we used a collagen-hemostatic material. Eventually we relocated the access flap back to the corresponding incision sites, and trans papillary sutures with absorbable synthetic material 3.0 were performed. The neof ormation with the supernumerary tooth, adjacent to 23, was sent for the histological examination that confirmed, after two weeks, the diagnosis of complex odontoma.

## ABSTRACT

**CONCLUSIONS:** Although the clinical and the first and second level X-ray examinations can give us a diagnostic hypothesis concerning a specific lesion, it is only possible to obtain a complete certainty through the histological examination. In case of large osteolytic lesions, it is possible to perform minimally invasive surgical procedures too and to ensure bone regeneration which, over time, will be perfectly able to fill the defect caused by the neoformation.

### Impacted third molar extractions with and without piezoelectric device: a post-operative comparative evaluation

L. Pittari, F. Raimondi Lucchetti, F. Quasso, F. Mottola, R. Vinci

*Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy*

**BACKGROUND:** The purpose of this work is to evaluate and compare the two possible tools that we can use for the extractions of impacted upper and lower third molars: the conventional mechanical rotatory instrument (as the straight handpiece-type) and the piezoelectric ultrasonic one. In order to do so many factors such as pain, number of Ibuprofen pills taken, postoperative trismus and the time of the surgical procedure were compared.

**METHODS:** This study included 20 patients with maxillary impacted third molars and 20 with mandibular impacted third molars. All of them were between 18 and 35 years old, both males and females without systemic and/or oral diseases. Furthermore, only extractions of impacted or partially impacted third molars with a similar difficulty are considered. Each surgical procedure including osteotomy and odontotomy (if necessary) may not exceed an average of 25 minutes  $\pm$  10 minutes rounded up. For the lower third molar the mesial inclination of the whole crown had to be positioned among the mandibular branch and the CEJ of the second molar. The exclusion criteria were: patients presenting systemic pathological problems such as hypertension, taking anticoagulant, antiplatelet or other anti-inflammatory drugs, transplant patients or with general contraindications to surgery for ibuprofen allergy or prior episodes of acute pericoronitis. All patients were concerned of the nature of the study through an informed consent before the surgical intervention. The same therapeutic protocol was applied in both groups. In anatomical situations in which an osteotomy should be performed starting from the cortical bone side, using rotating instruments, it is evident that the force necessary to express the "torque" in the most mineralized bone structure is suddenly excessive in the passage to the spongiosa. In this situation the considerable pressure gives a sudden loss of control of the surgical instrument; moreover, in conditions of poor visibility the rotating instrument has proved to be more dangerous than the piezoelectric one which, having a selective cut, avoids the damage of delicate anatomical structures such as vascular bundles or nervous tissue. The cutting action of the traditional rotatory instruments produce macro-vibrations which reduce the surgical safety. The action of the piezoelectric cut is instead the result of linear micro-vibrations of an ultrasonic nature (only 20-60 $\mu$ m width in a longitudinal direction) that allows a surgical field control. Twenty-four hours after the surgery, three different parameters were evaluated in both groups: subjective pain, facial swelling and clenching. Due

to the lack of precision in the measurement of swelling, the parameter has been excluded from this study. The postoperative clenching was measured by calculating the difference between the maximum opening of the mouth before and after the surgical procedure. The landmarks were the incisal edges of the upper and lower central incisors. The maximum openings were measured before the intervention and after 24 hours. The pain was assessed through the VAS scale.

**RESULTS:** The use of the piezoelectric instrument has undoubtedly reduced the collected values for trismus, post-operative pain and the number of ibuprofen pills taken. The only value in which the rotating instrument proves to be better than the piezoelectric one is the time of intervention.

**CONCLUSIONS:** The most reliable technique between the piezoelectric surgery and the high-speed rotatory system, as a result of this study, appears to be the first one because it reduces post-operative complications by improving the post-operative course of the patient in terms of pain and trismus and always giving the confidence to operate with selectivity.

### Case report: bilateral maxillary sinus lift using bio-materials mixed with autogenic bone as filling materials: 5 years follow-up

L. Redi, R. Botta, C. Manenti, G. Tetè, A. Ligabue, R. Vinci

**BACKGROUND:** Rehabilitation of partial or total edentulous patients requires dental implants to have a fixed prosthesis, especially in that patients that have lost the last tooth in the maxilla/mandible and requires a fixed prosthesis. It's not possible place dental implant when residual bone volume is insufficient. The literature confirm that tooth lost cause the contraction of soft and hard tissues. In posterior maxilla occur the hiperpneumatization of sinus cavity after tooth lost: this reduce significantly the height of alveolar bone. The surgeon, often has to restore the bone height in the area of sinus cavity. We find in literature many techniques to elevate the sinus floor to recreate the sufficient alveolar height. The most cited technique consist in the insertion of particulated grafts in the cavity after the elevation of Schneiderian membrane. We present a case report of bilateral sinus lift, using a mix of autologous and eterologous bone (50% autologous bone- 50% Bio-Oss).

**METHODS:** A 55 year female patient was referred to the department of oral surgery at S. Raffaele Vita e Salute University for maxillary rehabilitation. The patient had a good general health and has been submitted to a bilateral sinus lift. The patient was edentulous in the posterior area of the maxilla from the age of 35 (20 years). A bilateral sinus lift was necessary to recreate the sufficient height for the placement of the fixtures. We performed a lateral access to the cavity using a bone scraper to collect autologous bone chips in order to replace bone. We elevated the Schneider's membrane avoiding the membrane perforation and filled the cavity using the autogenous bone (collected with the bone scraper) mixed with Bio-Oss (Large Size), 50% in equal part. We placed the fixtures after 6 months and we realized the prosthesis after 4 months from the placement of the fixtures. At five years follow-up we can observe the height of the sinus membrane (the new sinus floor). The sinus lift maintain it's height using filling materials: on contrary it collapse without any filling.

**CONCLUSIONS:** This technique allows clinicians to restore bone height in the posterior Maxilla. The autologous bone can be collected by the nearby areas so it doesn't require a donator

site reducing significantly the patient compliance. According with the literature we can confirm that this procedure is predictable and maintainable in the years. This technique represents also a good choice for the prosthesis: in fact, the fixtures can be placed by the axis of the future emergency profile of dental crowns (wax-up).

### Successful surgical treatment of a case of bilateral impacted fourth molars

L. Romano, A. Marciàno, M. Bitto, V. Nigrone, G. Oteri

*Department of Biomedical and Dental Sciences and Morphofunctional Imaging, University of Messina, Messina, Italy*

**BACKGROUND:** Lower third molar impaction is an uncommon condition to observe in daily dental practice. It is commonly characterized by pain, swelling and functional limitation of the mouth. Aim of the study was to share the clinical experience of the Oral Surgery Unit of the Dental School, University of Messina on a case of bilateral impacted fourth molars. The report encourage discussion on an extremely rare condition to convey important best practice knowledge. **METHODS:** A 48-year-old female came to clinical observation at the Oral Surgery Unit of the Dental School, University of Messina for swelling in the left buccal region with slight tenderness, that persisted from several days before. Past clinical history of the patient was not contributory neither family history. Clinically limitation in mouth opening and swelling in the left cheek region were the main extraoral findings. At intraoral examination a slight swelling was reported extending from the left buccal mucosa to the anterior side of the mandibular branch. Overlying mucosa was normal, there was no pus discharge from this region. Regional lymphnodes were not palpable. Panoramic radiographs highlighted an impacted supernumerary tooth in the left mandibular branch with pericoronal resorption of the bone in the distal area. Furthermore the presence of a contralateral impacted supernumerary fourth molar was reported on the right side. Teeth extraction was performed in conjunction with administration of standardized perioperative antibiotic therapy with amoxicillin plus clavulanic acid 1 gr/die for 6 days, Surgery was performed with an intraoral approach. Alveolar nerve block was performed followed by the incision and reflection of a full-thickness muco-periosteal flap. The fourth and the third molar of each side were extracted. The extractions were performed with odontotomy followed by separation and removal of the teeth. Following the extraction, curettage of the post-extractive socket was performed and primary wound closure was obtained. The use of mouth rinses with an antimicrobial solution (chlorhexidine 0.20%) three times a day was recommended. Clinical outcome were evaluated at evaluated at 12 weeks follow-up together with Quality of Life (QoL) related parameters by means of a visual analogic scale on perceived patient's related outcome with numerical values ranging from 0 to 100.

**RESULTS:** The patient did not experience any postoperative discomfort as reported through patient's related QoL assessment. A weak numbness persisted for approximately two months in the left mental region and then disappeared.

**CONCLUSIONS:** The strength of the study is certainly having reported an uncommon anatomical position of impacted fourth molars treated by surgery. Surgery is the treatment of choice although the extraction of disto-angular impact-

ed mandibular molars is complex and often followed by a complicated post-operative course that has an impact on the patient related outcome and quality of life.

### Use of autologous platelet-rich fibrin (PRF) in periodontal defect treatment after extraction of impacted mandibular third molar: case report

M. Menditti, V. Moliterno, P. Sammardino, M. Cangiano, M. Masucci, R. Gasparro, A. E. di Lauro

*Department of Medicine and Surgery, Desk of Pathology and Maxillo-Faccial Surgery, Head Gilberto Sammardino, University of Naples Federico II, Naples, Italy*

**BACKGROUND:** The extraction of mesioangular impacted third molars may cause multiple periodontal defects at the distal root of the second molar. These complications are even more frequent in older patients and when there are preoperative periodontal defects on the distal surface of the second molar before extraction of the impacted third molar. Platelet-rich Fibrin (PRF) is a material containing many autologous growth factors that may be used in the repairing of the damaged tissues. The aim of this case report was to evaluate the effects of autologous PRF on periodontal tissues after extraction of the third molar.

**METHODS:** A patient, with bilateral mandibular third molar inclusion in mesio-horizontal position was recruited. She presented a pocket distal to the right mandibular second molar with a PD (probing depth)=7.5 mm and a PAL (probing attachment level)=6.2 mm. On the other hand, she presented a pocket distal to the left mandibular second molar with a PD = 7.3 mm and a PAL = 6.5 mm. Before surgery, the preoperative measurements and the preparation of PRF was performed. An orthopantomography and an endoral radiography were obtained. Measurements of PD and PAL were made using cold resin to obtain a reproducible and accurate measurements of periodontal defect. The case report was selected for a split mouth approach study: one of the alveolar cavity was filled with PRF, while the other alveolar cavity was left empty. The PRF was prepared by drawing 40 ml of blood from patient and collected in 4 tubes without anticoagulant. The tubes were placed in a centrifuge at 2700 rpm for 12 minutes. Patient outcomes were: variations in PD and variations in PAL at 12 weeks of follow up.

**RESULTS:** 12 weeks after surgery, an intraoral radiography was performed to assess the healing of treated sites. In both the treated sites, bone formation was observed. The decrease in PD corresponding to the distal surface of the mandibular second molar in the alveolar cavity treated with PRF was 4.2 mm at 12 weeks. On the other hand, in the alveolar cavity was left empty, the decrease in PD was 3.4 at 12 weeks. While, the PAL for the alveolar cavity treated with PRF was 3,10 mm at 12 weeks. In the other alveolar cavity, the PAL was 2,3 mm. At 12 weeks after surgery, the reduction in the probing depth and the improvement in the probing attachment level in the alveolar cavity treated with PRF compared with the alveolar cavity without PRF were clinically significant.

**CONCLUSIONS:** The present study shows that the use of PRF may be a valid method which is effective in inducing and accelerating tissue healing for the treatment of periodontal defects at the distal root of the mandibular second molar after surgical extraction of a mesioangular, deeply impacted mandibular third molar.



## ABSTRACT

**Impacted wisdom tooth extraction in HIV-positive patients. A prospective longitudinal study**

L. Casula, M.C. Francia, M. Piro, L. Chiodo, R. Vinci

*Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy; Specialization School in Oral Surgery, Vita Salute University, Milan, Italy*

**BACKGROUND:** The aim of this prospective longitudinal study is to evaluate the correlation between post-operative complications and CD4+ lymphocyte count in HIV- positive patients.

**METHODS:** A prospective monocentric analysis of selected patients requiring impacted third molar extraction procedure, referred to the Dentistry Unit of San Luigi Center at San Raffaele Turro (IRCCS San Raffaele Hospital in Milan, Italy), was performed.

The inclusion criteria were as follow:

1. HIV-positive patients in anti-retroviral therapy (CD4+ lymphocyte count > 200 cell/mL)
2. recurrent pericoronitis (at least 2 episodes)
3. impacted third molar causing periodontal damage to the 2nd molar
4. ASA1 or ASA2
5. good oral hygiene

After obtaining an informed consent form, local anesthesia was administered and the extraction of the impacted wisdom tooth was performed. Data were recorded immediately after the surgical procedure (t0) and at the follow up visits settled 7 days (t1), 14 days (t2) and 28 days (t3) after surgery.

The following post-operative complications were scheduled and analyzed: delayed wound healing, local wound infection, localized alveolitis (dry socket), persistent bleeding, persistent pain and alveolar nerve hypoesthesia.

**RESULTS:** A total of 50 patients enrolled in this study following the inclusion criteria were divided into two groups: HIV- positive patients with CD4 + lymphocyte count < 350 mL (immunologically non-responders to therapy for CD4+ level) (first group) and HIV- positive patients with CD4+ count > 350 mL (immunocompetent) (second group). In the first group, 25 patients presented the following complications: 2 patients complained of persistent post-operative pain (8%), 1 patient had local wound infections (4%), 0 persistent had bleeding (0%), 1 patient had localized alveolitis (4%), 0 patients had evidence of delayed wound healing (0%) and 0 patients referred alveolar nerve hypoesthesia (0%). In the second one, 25 patients presented the following complications: 1 patients complained of persistent post-operative pain (4%), 2 patients had local wound infections (8%), 0 patients had persistent bleeding (0%), 0 patients had localized alveolitis (0%), 0 patients had evidence of delayed wound, 0 patients referred alveolar nerve hypoesthesia (0%). Fisher exact test was performed for statistical analysis. The group of HIV-positive patient with CD4 + lymphocyte count > 350 mL who required surgical extraction didn't show a statistically significant increased risk (p value > 0.05) for post-operative complications compared to HIV- positive patients with CD4 + count < 350 mL. The rate of complications that occurred was similar in both groups.

**CONCLUSIONS:** The extraction of impacted wisdom tooth could a surgical procedure commonly performed among medically compromised patient infected by the human immunodeficiency virus (HIV), showing no differences in post-operative complications compared to the healthy population. This prospective study aimed to investigate the correlation between the rate of complications following impacted wisdom tooth

extraction and the CD4+ cell count in HIV positive patients and showed that there is not statistically significant increased risk for post-extraction complications in patients with a lower level of CD4+. This result is probably due to the minor role of lymphocyte CD4+ in the inflammation and wound healing process. However more studies are needed to clear the importance of other serological markers such as CD4/CD8 ratio in the infection process.

**Clinical evaluation of the possible positive effects of the association between led light and piezoelectric tool in the extraction of impacted mandibular third molars**

A. Busa, B. D'Orto, S. Ferrari Parabita, R. Vinci

**BACKGROUND:** In the following study has been clinically evaluated what are the results of the association between a piezoelectric instrument associated with a particular insert that irradiates the operative field with a LED-light (wavelength of 665 nm) during the osteotomy for the extraction of impacted third molars in comparison with a piezoelectric instrument without LED-light and a rotating tool. Phototherapy, at the wavelength in the red spectrum, has been used to stimulate cell metabolism and tissue repair in various medical areas, including dentistry. Although the specific literature is still limited, the available data suggest that the red LED-light has a positive biostimulating effect on cell viability.

**METHODS:** According to inclusion and exclusion criteria, 30 patients were included in the study and were divided as follows: 10 patients underwent extraction with a rotating instrument (control group 1), 10 with piezoelectric tool (control group 2) and 10 with piezoelectric tool added with the LED-light (experimental group). The extraction was made by the same surgeon with the same anesthesia, incision and extension of the flap. The osteotomy was performed in group 1 totally with rotating method, in group 2 totally with piezoelectric tool and in group 3 with piezoelectric and LED-light. In order to not influence the parameters, a maximum intervention time of 40 minutes was inserted and all surgeries longer were excluded from the study. According to the ministerial clinical recommendations of 2017, post-intervention precautions have been prescribed to patients, including application of ice pack immediately after surgery and then alternating the application and the removal every 20 minutes and the assumption of a soft or liquid and cold diet in the first 24-48 hours. The parameters investigated were: the pain felt by the patient in the post-operative period, evaluated through a VAS scale for a self-evaluation and through the amount of painkiller (ibuprofen 600 mg) taken during the 7 days that follow the surgery; the edema was evaluated with photographic investigations and trismus was evaluated through the difference in the opening of the mouth both before the surgery and 7 days after. Also the duration of the surgery was evaluated. **RESULTS:** The comparison between the 3 groups, in the use of painkillers, was statistically significant (P<0.05): the experimental group and the group 2 required a lower amount of painkiller: respectively an average of 1,4+/-0,69 tablets, and 1.72+/-0.74, while 2.3+/-0.7 tablets for the group 2. According to these results, also in the average of the pain felt, evaluated with the VAS scale, were found statistically significant differences between the rotating and piezoelectric method with or without LED-light, in favor of the control group 2 and of the experimental group: the group 1 reported a value of 2.9+/-1.1, the group 2 of 2.25+/-0.7, while the experimental group

2.1+/-0.5; However the evaluation of the opening of the mouth before and after the surgery didn't show statistically significant differences between the three groups: in the group 1 the difference was of 3.45+/-0.93mm, in the group 2 of 2.63+/-0.28mm, while in the experimental group was of 2.54+/-0.81mm; also the evaluation of postoperative edema and the duration of the surgery revealed no significant differences between the three methods: the average of the duration for the group 1 was of 27.2+/-5.8min, for the group 2 of 30.62+/-6.23min and for the experimental group 29.5+/-6.2min.

**CONCLUSIONS:** The results showed that the addition of LED-light to the piezoelectric instrument can reduce the pain especially when compared with a traditional rotating instrument, but no statistically differences for the edema, the trismus and for the duration of the surgery were found.

### **Coronoidectomy with intraoral approach in a patient affect by bilateral coronoid hyperplasia. A case report**

A. Fama, M. Maschio, A.M. Bellocchio, T. Bonsignore, F. Asandri

*University of Milan, Milan, Italy*

**BACKGROUND:** The purpose of this work is to present a patient affected by bilateral coronoid hyperplasia, describing treatment and outcomes after surgery.

**METHODS:** The treatment involves bilateral coronoidectomy with intraoral approach followed by post-surgical physiotherapy. Oral opening was reduced to 11 mm maximum. Before Surgery RMN and CBCT were prescribed. In addition Electromiography of masticatory muscles was performed. A maxillofacial surgery screw was placed in the top of every coronoid process before coronoidectomy in order to avoid the recapture of the coronoid process.

**RESULTS:** The maximum oral opening obtained after surgery was 25 mm. The condyles are located in the glenoid fossa. No signs of discal and muscal dysfunction was observed. Hypertrophy of temporal muscles, signs of osteoarthritis or discal dysfunction are not observed.

**CONCLUSIONS:** The coronoid process hyperplasia is treated by surgery, because the limited mandibular movements are mainly caused by a mechanical obstacle. The aim of the therapeutic plan is to restore the physiological mouth opening.

### **Treatment of traumas with inclusion of foreign bodies in peri-oral soft tissues**

E. Vaia, C. Rengo, A. Valletta, M. Simeone, V. Lodato

*Università Federico II di Napoli, Unità Operativa Complessa di Odontoiatria, Naples, Italy*

**BACKGROUND:** Traumas directed to the jaws can lead to various types of clinical conditions depending on the kind of

trauma and on the features of blunt objects and applied forces; as a result, multiple damages can be shown to dental, periodontal and/or oral/peri-oral tissues. One of the possible consequences may be the inclusion of dental or blunt object fragments into soft tissues. The impossibility of finding dental fragments, the presence of peri-oral soft tissues cuts, the permanence of edema and swelling, the eventual abscess and the sensation of a foreign body presence are signs and symptoms that can direct attention towards the suspect of the presence of dental or blunt object fragments into soft tissues. The lack of care to oral and peri-oral soft tissues may bring clinicians to not detect those fragments, causing the permanence of foreign body reactions. The aim of the study is to emphasize the importance of the inspection to all the oral and peri-oral soft tissues, as well as the monitoring of general health.

**METHODS:** A 64-years-old woman has been visited 10 days since an accidental fall in order to evaluate the outcomes. At the clinical examination the patient showed Andreasen's uncomplicated enamel-dentin fractures to the 1.1 and 1.2, and signs of a suspected inclusion of a foreign body at the lower lip, subsequently confirmed at the radiographic examination that revealed the presence of multiple fragments. Thus, treatment consisted not only of crowns restoration, but also of a surgical removal of the lip included fragments. The operation requested a previous localization of the foreign bodies by realizing a radiographic examination after placing a radiopaque handmade landmark in order to obtain a correspondence between the x-rays and the clinical position, and a subsequent blunt dissection. The surgical procedure avoided the use of blades during the approach to deeper tissues in order to obtain a cleaner operative field and to preserve the integrity of the muscular, vascular, and nervous tissues. Therefore, the dissection has been realized only by using round-edged scissors with an opening movement of the branches in contact with muscular fibers. Since the inclusion involved multiple fragments, further x-rays have been necessary to verify the occurred complete removal; the verification must never be exclusively realized by digital pressure since fragments presence can be hidden by the muscular consistency.

**RESULTS:** A complete clinical resolution has been achieved by the use of both the adhesive teeth restorations and the surgical removal of foreign bodies. After a period of 8 weeks the patient showed an occurred soft tissues healing without signs of foreign bodies reactions in absence of aesthetic and morphologic alterations. No sensorial alterations has been reported thanks to the blunt dissection technique.

**CONCLUSIONS:** A thorough analysis of oral and peri-oral soft tissues is a mandatory aspect in the daily practice, particularly in case of traumas. Signs such as the impossibility of finding dental fragments, the presence of soft tissues cuts, the permanence of edema and swelling, the eventual abscess and the sensation of a foreign body presence should make clinicians aware of teeth fragments or various materials possible inclusion into soft tissues. In case of foreign bodies inclusion, x-rays and landmarks are key factors for a complete removal, as well as blunt dissections are suggested to preserve tissues integrity in order to reduce the incidence of vascular and nervous complications.

## CONSERVATIVA

### Shear bond strength of different adhesive curing techniques: an *in vitro* study

M. Pellegrino<sup>1</sup>, S. M. Massaglia<sup>1</sup>, W. Beccasio<sup>1</sup>, A. Brenna<sup>1</sup>, A. Coma<sup>2</sup>, E. Gherlone<sup>1</sup>, G. Cantatore<sup>1</sup>, G. Paolone<sup>1</sup>

<sup>1</sup>Dental School, Restorative Dentistry, Università Vita e Salute San Raffaele, Milan, Italy; <sup>2</sup>Department of Biomedical and Neuro-motor Sciences, DIBINEM, University of Bologna - Alma Mater Studiorum, Bologna, Italy

**BACKGROUND:** Bonding agents are conventionally applied for the retention of the resin composite materials and serve as an intermediate layer between the dental substrate and the composite restoration. In some particular situations, the use of a thin layer of uncured adhesive before cementation of indirect restorations has been proposed. In literature there are no studies comparing cured bonding agent with uncured bonding agent, thus the aim of this *in vitro* study is to investigate shear bond strength of different adhesive systems cured before composite application or co-cured together with the composite material.

**METHODS:** 180 sound human molars were selected. Teeth were embedded in acrylic resin and the buccal surfaces were ground wet with 180-grit silicon carbide abrasive paper until a flat dentinal surface was created. Specimens were equally and randomly assigned to 6 groups (n=30) as follows: G1) Prime & Bond Active (Dentsply, Germany) Self-Etch mode (SE); G2) Prime & Bond Active (Dentsply, Germany) Etch-and-Rinse mode (ER); G3) Optibond FL (Kerr, USA); G4) SE Bond2 (Kuraray, Japan); G5) Peak (Ultradent, USA). Each group was then divided into two sub-groups according to the curing protocol (n=15): SG1) adhesive pre-cured before composite application; SG2) adhesive co-cured together with the composite. Each adhesive system was applied following manufacturers' instructions and a standardized composite cylinder (Ceram-X Universal A3, Dentsply) was built on the dentinal substrate with a mold (TesaFilm; Tesa SE, Hamburg, Germany) in which a 2.34 mm hole was punched to define the bonding area. The shear bond strength test was performed with the Ultradent Ultra Tester machine, which captured the peak load values (MPa) in compression tests for each resin cylinder with a range from 0 to 1,000 pounds. Obtained data were statistically analyzed with a three-way ANOVA test (variable "adhesive", "etching protocol" and "curing protocol") and Tukey's post-hoc test and statistical significance were set at  $p < 0.05$ .

**RESULTS:** Results of the three-way ANOVA test showed that significant differences were observed for the factors "adhesive" and "etching protocol", but not for the variable "curing protocol". The interactions between two factors "adhesive" and "etching protocol" or "adhesive" and "curing protocol", as well as the interaction between "etching protocol" and "curing protocol" were not significant ( $p > 0.05$ ). Furthermore, the interaction of the three factors "adhesive", "etching protocol" and "curing protocol" was not significant ( $p > 0.05$ ). Tukey post-hoc test underlined that Universal adhesives performed

better when employed in self-etch mode, while no differences were found between pre-cured and co-cured adhesives.

**CONCLUSIONS:** The performance of the universal adhesives employed in the present study depended on the application mode. Furthermore, the presence of a thin layer of uncured adhesive before the composite increment application reached bond strength values comparable to those obtained for the pre-cured groups. However, further studies are necessary to completely understand the behavior of uncured adhesive under a composite restoration.

### Influence of a different stratification order of dentin and enamel layers on color perception of brilliant everglow and estelite asteria resin composites: a CIE L\*a\*B and statistical evaluation

G.R.M. La Rosa<sup>1</sup>, E. Pedullà<sup>1</sup>, S. Pasquale<sup>2</sup>, A. M. Gueli<sup>2</sup>, E. Rapisarda<sup>1</sup>, S. Ferlito<sup>1</sup>

<sup>1</sup>Department of General Surgery and Surgical – Medical Specialties, University of Catania, Catania, Italy; <sup>2</sup>PH3DRA (Physics for Diagnostics Dosimetry Dating Research and Application) laboratories, Department of Physics and Astronomy, University of Catania, Catania, Italy

**BACKGROUND:** The aim of this study was to evaluate the influence of a different stratification order of dentin and enamel layers on colour perception of Brilliant EverGlow (EG) (Coltene/ Whaledent AG Altstätten, Switzerland) and Estelite Asteria (Tokuyama Dental Corporation, Tokyo, Japan) resin composites.

**METHODS:** A total of 96 samples made of two new different composite materials (Brilliant EverGlow and Estelite Asteria) of Dentin (D) shade (A2B2 and A2 Body, for Brilliant EG and Estelite Asteria respectively) and Enamel (E) (Trans and Natural Enamel, for Brilliant EG and Estelite Asteria respectively), each with a 1mm thickness, were divided into 12 configurations: EDDE, the gold standard configuration that reproduces the anatomy of the tooth; EDDD, reproduced the situation of the interproximal part and the incisal edge when the palatal part is replaced by a layer of dentin; all the other possible combinations: DDDD, DDDE, DDEE, EEEE, DEEE, EEED, EEDD, DEDE, EDED, and DEED. The color specification was conducted using a Konica Minolta spectrophotometer, model CM-2600d, using a customized support designed specifically for this study. The results were elaborated with the attention to the values of the color coordinates of CIE L\*a\*b\* color space. Using this color space, the color difference between two colors was calculated by the  $\Delta E$  quantity according to the following formula:  $\Delta E = \sqrt{[(L^*1 - L^*2)^2 + (a^*1 - a^*2)^2 + (b^*1 - b^*2)^2]}$ . Concerning physiological perceptibility of differences in  $\Delta E$  values ranging from 0.0 to 1.1 were considered as not perceptible, between 1.1 and 3.3 as visually perceptible but clinically acceptable while all



$\Delta E$  higher than 3.3 were considered as clearly visible and clinically disturbing. Moreover, data were analyzed by using two-way analysis of variance (ANOVA) and Tukey post-hoc test with a significance level of 0.05 (Prism 8.0; GraphPad Software, Inc, La Jolla, CA, USA).

**RESULTS:** Statistical analysis revealed a significant difference for  $\Delta E$  stratifications of a same composite and  $\Delta E$  configurations of different composites ( $P < 0.05$ ). In particular, Brilliant EG showed the highest values of  $\Delta E$  ( $P < 0.05$ ). Six configurations (DDDD, DDDE, DDEE, DEEE, DEDE, DEED) showed  $\Delta E > 3.3$  compared to gold standard EDDE for Brilliant EG, especially for  $b^*$  and  $L^*$  coordinates ( $P < 0.01$  and  $P < 0.05$ , respectively). EDED showed no visual difference ( $0 < \Delta E < 1.1$ ) respect to EDDE for Brilliant EG. Two configurations for Estelite Asteria (DDDD, EEEE) reported  $\Delta E > 3.3$  compared to gold standard EDDE especially for  $L^*$  parameter ( $P < 0.05$ ). EDDD was the best configuration for Estelite Asteria ( $0 < \Delta E < 1.1$ ).

**CONCLUSIONS:** EDED and EDDD were the configurations more similar to the gold standard for both composites. The inner layers seem to have low influence on color perception. Moreover, Estelite Asteria presented a body mass composite capable to reproduce enamel characteristics while Brilliant EG is characterized by enamel and dentin masses with more chromatic characterizations.

### Aesthetic rehabilitation of the inferior front sextant in a periodontally compromised patient

D. Scantamburlo, M. Meneghini, M. Calabrese, E. Bressan, G. Drago, E. Stellini

*Clinical Dentistry, Department of Neurosciences, University of Padua, Padua, Italy*

**BACKGROUND:** Patients with serious systemic diseases may come to the attention of the dentist, and their pathologies can influence the treatment plan. A functional and aesthetic rehabilitation must be minimally invasive in order to afford effective solutions that benefit the patient. The purpose of this case report is to demonstrate how basic restorative dentistry approaches can be applied – as part of the global treatment – in patients that cannot receive implant placement due to compromised systemic conditions. The aim of the treatment is also to restore the anterior vertical height with a reshaping of teeth and diastema closure between elements 42 and 43 with composite resin.

**METHODS:** A 67-year-old male patient came to our attention to start the rehabilitation with implant prosthesis. The patient, in treatment for oncological pathology, had rehabilitated his edentulous areas with a removable prosthesis, waiting for an improvement of his systemic conditions for the surgical phase. Patient's natural teeth showed abrasion on the incisal edges, V class decays, positivity to probes. While waiting for surgery, non-surgical periodontal therapy was made in order to achieve periodontal health that is necessary for implant placement. Professional oral hygiene was made. Decays were removed, coronoplasty with composite resin of the elements 31, 41, 42, 43, 44 under dental dam was performed: enamel was etched with 37% phosphoric acid gel followed by the application of the adhesive system. Direct additive composite resin was placed for teeth reshaping and the diastema between elements 42 and 43 was closed. The same composite resin was placed on the buccal surfaces of the patient's removable dental prosthesis to make it uniform and aligned with the restorations.

The design of the reconstructions was carried out through a study on a model with diagnostic wax-up. All materials were used in accordance with the manufacturer's instructions and light-activated using a light emitted diode unit. The microanatomical surface of teeth was reproduced using fine grain tips and final polishing was made using silicon rubber polisher bur and acetate abrasive discs in series. Occlusion was checked with articulating paper.

**RESULTS:** The direct conservative treatment was successful for the aesthetics and the restoration of the vertical dimension of the patient, as well as an economic advantage. This approach was also well tolerated by the patient, who is motivated to take care of his oral hygiene. This is essential for the maintenance of the restoration and is the basis for future implant placement and rehabilitation. The patient is fully satisfied with the results.

**CONCLUSIONS:** The minimally invasive preparation followed by aesthetic and functional improvements has proved to be an effective solution awaiting a definitive prosthetic implant rehabilitation of the edentulous regions. For the maintenance of restorations and periodontal health, the patient must diligently take care of his oral hygiene.

### Direct aesthetic rehabilitation of the upper anterior sextant in oncological patient with compromised periodontal status and serious abrasion of dental elements

M. Meneghini, D. Scantamburlo, M. Calabrese, E. Bressan, G. Drago, E. Stellini

*University of Padua, Department of Neuroscience, Dental Clinic of the University of Padua, Padua, Italy*

**BACKGROUND:** In dental clinical practice, we can interface controversial cases of patients with even serious systemic diseases that exclude certain therapeutic approaches, such as implant-prosthetics. We aimed to elucidate how to find a solution that is advantageous, functionally and aesthetically satisfactory, and economically feasible by the patient in need of rehabilitation.

The solution proposed and treated in the case, and which respects the parameters listed above, is as simple and quick as possible: direct conservative reconstruction of compromised dental elements.

**METHODS:** The case of a 67-year-old, male, oncological patient came to our attention during the implant rehabilitation treatment. The same implant solution, for reasons related to current oncological therapy, can not be temporarily performed, and is postponed. It is therefore decided to make an improvement from an aesthetic and functional point of view, restoring the vertical dimension, with a direct reconstruction of the upper front sextant. The patient's periodontal and hygienic conditions were insufficient, with dental probing of all the remaining elements, and high plaque score. The elements 2.1.1.1 and 1.3, now severely abraded due to unbalanced chewing, were not harmonious with the prosthesis, which, although incongruous, would not be replaced by the patient's will. As a top priority, non-surgical periodontal therapy is performed, with adequate instructions for the proper maintenance of hygiene at home. The patient consents to the aesthetic rehabilitation program, and is warned that the mobile prosthesis would be retouched during the same reconstruction session for a better final aesthetic result. The aesthetic analysis

## ABSTRACT

makes clear the need for a conservative design of the elements in order to obtain an acceptable final result, regularizing the incisal margins, the vertical height and the buccal palate position of the elements severely abraded. We simulated the preparation with diagnostic wax-up on a plaster model and we made a putty mask as a matrix for the reconstructions. Then we realized the direct conservative reconstruction of the entire upper anterior sextant. Once the correct vertical height and mastication have been checked, we created the transition lines of the reconstructed denture for a final result which could be as similar as possible to natural dental elements. It follows final polishing. As expected, the mobile prosthesis in the seat 2.4 has been retouched with conservative techniques, in relation to the restoration of the 2.3.

**RESULTS:** The benefit is highlighted by an improvement both aesthetically and functionally, with a restoration of the vertical dimension, in order to be able to undertake implant therapy when the general health will improve in the future. The patient manifests his full satisfaction, and shows today a significantly healthier periodontal state.

**CONCLUSIONS:** In cases like this, when it is not possible to carry out an ordinary implant-prosthetic rehabilitation protocol, whatever the motivation, the most appropriate clinical choice could be a targeted and conservative therapy, with the techniques of direct reconstruction and the most suitable materials for the single clinical case.

## Direct aesthetic rehabilitation of upper front sector in patient with fractured elements

A. Calovi, M. Calabrese, E. Bressan, G. Drago, E. Stellini

*Neuroscience Department, University of Padua, Padua, Italy*

**BACKGROUND:** Aesthetic of anterior sectors can be compromised by causes such trauma, periodontal disease, abrasion, malocclusion. So, it frequently happens that patients with this kind of problem ask for a rehabilitation. It's the dentist's job to find the most suitable solution, considering that a conservative therapeutic plan often appears to be the best for the patient in terms of biological and temporal savings, when possible. The case reported here intends to show how a direct restoration with the appropriate composite resins can be a valid therapeutic option.

**METHODS:** A sixty-year old male patient come to our attention presents crown fracture charged to elements 2.1, 2.2, 2.3 and incisal edge fracture of 1.1. He asks for an aesthetic rehabilitation. As the amount of residual dental tissue is sufficient, a composite restoration is chosen by mutual agreement. The therapeutic plan is divided into two appointments, preceded by a preoperative phase in which a plaster model of the upper arch is developed from an alginate impression. On the model, the dental technician performs a diagnostic wax-up from some information obtained thanks to the Golden Section Divider, useful for adjusting the right proportions in aesthetic projection. It consists of an instrument set on the golden proportion, defined as the relationship between two unequal lengths whose major one, called golden section, is proportional mean between the minor and the sum of the two. This proportion is generally associated with the concept of beauty and harmony. In dentistry, the golden section is found in the upper anterior teeth: in front view it's noted that the width of the central incisor is in golden ratio with the width of the lateral, the lateral with the canine and the canine with the first premolar.

A silicone impression of the wax-up is then taken, from this

impression a little mask is obtained in order to serve as a mold for the restoration of the palatal walls. In the first appointment, after having isolated all the teeth with the rubber dam, the edges of the teeth are finished with a cylindrical diamond bur and etched with Scotchbond Universal Etchant 37%. The adhesive phase is carried out with Scotchbond Universal Primer/Adhesive (**3M ESPE**). As the colour has been decided with the Toothguide **VITA 3D-MASTER**, the little mask is placed on the patient's teeth and the stratification of the composite (**Tokuyama Estelite Sigma Quick®**) begins. We choose A2 for palatal and interproximal walls, OPA2 for dentinal body, A3,5 for vestibular surfaces and ENAMEL WHITE for incisal edges. The proportions are further checked, again using the Golden Section Divider. The restorations are finished and polished; the occlusion is also adjusted. In the second appointment we work on the definition of microanatomy: based on the transition lines, with diamond burs the surface texture is created, brushed and polished with abrasive disks and rubbers. **RESULTS:** This conservative treatment has allowed to obtain an aesthetic and functional improvement. Furthermore, thanks to the Golden Section Divider, it has been possible to respect harmony and proportions between the teeth. The method described has been performed in only two appointments, allowed the saving of dental tissue and found the approval of the patient.

**CONCLUSIONS:** The minimally invasive preparation associated with a direct composite restoration has proved to be a satisfactory functional and aesthetic solution, cheap but in any case effective, thus allowing the patient to have the possibility to smile and have a normal relationship life without discomfort.

## Diastema closure with composite layering technique

E. Pastore, G. Drago, M. Calabrese, E. Bressan, E. Stellini

*University of Padua, Department of Neuroscience, Section of Dentistry, Padua, Italy*

**BACKGROUND:** The aim of this study is to report a clinical case of composite stratification in a diastema closure with the use of silicon key. Diastema closure is one of the most demanded treatments in aesthetic dentistry and it is often considered an onerous esthetic problem. Many treatment modalities are available for diastema closure, however, not all diastemas can be treated the same in terms of modality or timing. In many cases, orthodontic treatment is the best choice to give proper space relationships and good occlusion, but this is not always possible, and we need the help of the restorative treatment. In this case report, diastema closure was performed with direct composite restorations with the guide of a silicon key. The case describes the treatment plan performed on a 56 year old female concerned with space interposed between its upper central incisor tooth and lateral incisor tooth. She agreed to the following treatment after all options were investigated and presented to her.

**METHODS:** A 56 years old female patient came to our Department asking for a dental visit: she wanted to solve the presence of space between her incisors because they caused her discomfort. After proposing a series of solutions, the patient chose the quicker and less invasive one. After isolating the working area with a rubber dam, a minimally invasive preparation of distal surface of the central incisor and buccal surface of the lateral incisor was done.

Silicone key was used as a guide, made by using as a mold plaster model of the patient, on which diagnostic waxing was

carried out. Following tooth preparation, the enamel surface of both teeth was etched for at least 30 seconds, after which the adhesive bonding agent is placed and cured. A small increment of the appropriately shaded composite resin, that corresponds to the vestibular half of each diastema, was placed over the mesiofacial aspect of each tooth. These increments were placed at the same time and contoured to ensure optimal contour and identical width for both incisors. Soft-Lex discs and a coarse polishing cup were used to contour facial surface of the restorations to make surface characteristics with a diamond bur, without water irrigation. Proximal polishing was achieved by sequentially using polishing strips, while using polishing cups to create the restoration's final luster and surface anatomy. In this case, patient was examined a week later to evaluate her satisfaction, gingival healing, and marginal adaptation. Draw with a pencil transition lines on the tooth allows us to know the anatomy that we need to reproduce to obtain an excellent result, as natural as possible. In this case before returning them to the tooth, lines were first drawn on a drawing that reproduces dental arch, to understand exactly the points of reflection of the light.

**RESULTS:** Diastema closure with correct anatomic contouring was easy to perform using this technique. This procedure allowed to satisfy the patient by reducing considerably the treatment time and without causing sensitivity thanks to a minimally invasive preparation.

**CONCLUSIONS:** Direct restoration of anterior teeth for diastema closing is a widespread treatment of restorative dentistry. The technique simplifies composite stratification, reducing treatment time and reaching a natural anatomic result. Thanks to this technique, results are very good and makes the patient happy and satisfied, in fact, our patient solved her problem in just two sessions without having to resort to months of orthodontic treatment.

## Effect of modeling resins on translucency of resin based composites

A. Bandel<sup>1</sup>, G. Scavella<sup>1</sup>, G. Salvati<sup>1</sup>, A. Brenna<sup>1</sup>, A. Comba<sup>2</sup>, E. Gherlone<sup>1</sup>, G. Cantatore<sup>1</sup>, G. Paolone<sup>1</sup>

<sup>1</sup>Dental School, Restorative Dentistry, Università Vita-Salute San Raffaele, Milan, Italy; <sup>2</sup>Department of Biomedical and Neumotor Sciences, DIBINEM, University of Bologna – Alma Mater Studiorum, Bologna, Italy

**BACKGROUND:** Dental adhesives are often used as modeler liquids while placing composite layers to perform restorations in order to improve their handling by reducing surface tension. This common practice, although very often performed by clinicians, is not recommended by manufacturers, because there have always been doubts about the influence that dental adhesives can have in color change over time and on mechanical properties of these restorations. A recent study has shown that the use of dental adhesives, etch and rinse systems both in 2 or 3 steps, as modeler liquids not only has no or little influence on color and translucency, but in fact seems to improve mechanical properties. The aim of the present in vitro study is to investigate if the presence of dental adhesive between layers of composite can change translucency over time.

**METHODS:** A total of 70 disk-shaped specimens (6mm width and 2mm height) were made by placing 4 layers of 0,5mm of composite (Ceram X Universal A3, Dentsply-Sirona) placing dental adhesive between each layer to simulate the wetting of instruments during modeling of composites. The disks were

light cured only once the last layer, which was adhesive free, was placed. The disks were then polished with medium, fine, and extra-fine abrasive disks. A total of 5 groups (14 specimens each) were made. Group1: Clearfil SE Bond 2 (Kuraray Noritake Dental Inc.), Group2: Clearfil Universal Bond Quick (Kuraray Noritake Dental Inc.), Group3: Estenia C & B Modeling Resin (Kuraray Noritake Dental Inc.), Group4: Prime and Bond Active (Dentsply-Sirona) Group5: control group, no adhesive. The specimens were randomly allocated in distilled water or wine for storage: 7 of each group in wine and 7 in distilled water. Wine was changed weekly and all specimens were kept at 37°C. Measurements were performed using a digital spectrophotometer (VITA Easyshade, VITA) at baseline and 1d, 7d and 30 days after storage in wine and distilled water. Regarding the measurements, white and black backgrounds were used to assure an accurate evaluation of translucency of the specimens.

**RESULTS:** All the measurements taken at the different timings were analyzed to obtain translucency values. By the analysis of measurements, with the limitation of this study, at t=0 the use of any of the modeling resins seems to increase the translucency of the specimens. Along time translucency decreases in all groups stored in wine, whereas specimens stored in distilled water showed variable outcomes. Groups 1 and 2 seem to have a higher difference in translucency compared to the control group in all the measurements.

**CONCLUSIONS:** Within the limits of this in vitro study, the results of the present study support the hypothesis that adhesive systems can minimally influence the translucency of resin composite. Some adhesives seem to modify translucency since t=0. Further studies are ongoing to evaluate also the color change of specimens.

## Dentists' attitudes toward restorative procedures and their change over time

A. Canestri, A. Martintoni, L. Abbruzzese, E. Gherlone, G. Cantatore, P. Gaetano

Dental School, Restorative Dentistry, Università Vita-Salute San Raffaele, Milan, Italy

**BACKGROUND:** Analyze and highlight current trends and protocols pertaining the use of direct restorative procedures used on a daily basis by clinicians in various European and non-European countries. Eventually, comparing them with the methods that the same group of clinicians used along time.

**METHODS:** 505 dentists from different parts of the world, who in 2015 answered a survey on Dentalsurvey.org website, were selected and were referred to a new and more specific questionnaire composed by 19 questions chosen from the first survey, regarding adhesive systems, types of composites and techniques most used nowadays. The survey was re-translated into 3 languages (English, Italian and Russian) in order to be more easily completed by people from different countries. Among the 505 dentists who were referred to the second survey, 111 answered and their responses were subject of comparisons between the first survey (2015) and the second (2018). Subsequently, a statistical analysis from the results gathered from the survey was done using Microsoft Excel and the latter highlighted the most significant changes in clinical habits over the last three years.

**RESULTS:** Among the most interesting results we outline:

1) A significant increase in the use of Universal Adhesives, which have replaced the classic multi-step adhesives (Total



## ABSTRACT

Etch 2/3 steps and Self Etch 2 steps) in the restoration of the anterior sectors (06 --> 17%), posterior sectors (09 --> 23%) and in those on deciduous teeth (18 --> 26%).

2) A reduction in the use of multiple enamels and multiple dentins: only one enamel (60 --> 68%) and only one dentin (42 --> 51%) in restorations of IV Class of medium size.

3) An increase in the use of sectional matrices with a separating ring (56 --> 64%); consequently, there has been a reduction in the use of circumferential matrices.

4) A significant reduction in the use of the commercial shade guides (18 --> 6%) with a consequent preference in the use of a custom shade guide made directly by clinician himself (46 --> 56%) in aesthetic restorations of the anterior sectors.

5) An increase in the number of clinicians who wet the instruments with modeling resin during the stratification and modeling phases of composite materials (26 --> 35%).

6) Continuous reduction in the use of Amalgama in posterior restorations (17 --> 13%).

**CONCLUSIONS:** In clinical practice, the dentist is changing his techniques and operative procedures in relation to new materials offered by the market and related new protocols that, if used correctly, can lead to an improvement in quality and result.

### Interfacial evaluation of dentin-cement interface in fiber-post supported restoration

A. Querro<sup>1</sup>, E. Manzon<sup>1</sup>, A. Comba<sup>2</sup>, G. Serino<sup>3</sup>, A. Audenino<sup>3</sup>, M. Alovisi<sup>1</sup>, E. Berutti<sup>1</sup>, N. Scotti<sup>1</sup>

<sup>1</sup>University of Turin, Department of Surgical Sciences, Dental School, Turin, Italy; <sup>2</sup>DIBINEM, University of Bologna, Bologna, Italy; <sup>3</sup>Politecnico di Torino, Department of Mechanical and Aerospace Engineering, Turin, Italy

**BACKGROUND:** The aim of this in vitro study was to evaluate the effect of luting cement light-curing time on mechanical properties of fiber-post supported restorations. The null hypothesis was that the curing time do not affect hardness and young modulus of luting cement.

**MATERIALS AND METHODS:** 24 lower premolars, extracted for periodontal reasons, were selected. The inclusion criteria were: sound teeth, with nearly similar root size (length > 12mm) and no cracks under trans-illumination and magnification, extracted within one month. A hand scaling instrument was used for surface debridement, followed by cleaning with a rubber cup and slurry of pumice. The specimens were disinfected in 0.5% chloramine for 48 h and then stored in 4% thymol solution at room temperature until use. Samples were endodontically instrumented using Pathfiles and ProTaper Next to the working length. The root canals were filled with gutta-percha cones through a warm vertical condensation technique. After 7 days, a second class cavity with 1,5 mm residual wall thickness and a 8 mm post space was prepared. Fiber posts (DT light post, RTD, France) were individually adapted to the post space and then luted through a standardized procedure: etching with phosphoric acid (Ultraetch, Ultradent) for 20 second, rinse for 20 second and gentle air blow; rinse with ethanol for 30 second, and air blow; dry with paper cones; universal adhesive system application (Clearfil Universal Bond Quick, Kuraray, Japan); luting cement extrusion (DC Core, Kuraray) in the post space; fiber post insertion; cement excess remove. Samples were then divided in 3 groups according to the light curing time (n=8 each): Group A) no light; Group B) 20 seconds of curing

with LED lamp at 1000 mW/s (Celalux, Voco); group C) 120 seconds. The occlusal cavity was then restored with a nano hybrid resin composite (Filtek Supreme XTE, 3M, USA). After 7 days, half of each group samples were submitted to fatigue test with a chewing simulator (CS4.4, Mechatronik, Germany) for 250.000 cycles at 50N load, 2mm excursion. After 24 hours, samples were embedded in resin and then sectioned with diamond saw in 1mm thick slices perpendicularly to the long axis, from the occlusal surface until the post end. Each slice was flattened with ascending grit papers till 2400. Then, samples were tested with a Nanoindenter XP (MTS/Agilent, USA), equipped with a diamond Berkovich indenter and characterized by a theoretical force resolution of 50 nN and a theoretical displacement resolution lower than 0.01 nm. The loading-displacement (*P-h*) curves have been analyzed by using the Oliver-Pharr method in way to obtain the Elastic Modulus and the Hardness. Obtained datas were analyzed with Anova test (p<0.05).

**RESULTS:** Hardness and young modulus were significantly correlated with curing time (p=0.0001), while fatigue test affected the luting cement hardness only when no curing was performed.

**CONCLUSIONS:** The curing time is fundamental in fiber post luting procedures. Extended curing time (120 seconds) led to a more uniform hardness, even in apical portions of the post space. Further studies are necessary to confirm the obtain results.

### Effect of collagen cross-linker on the mechanical properties of radicular hybrid layer

C. Gisolo<sup>1</sup>, A. Comba<sup>2</sup>, G. Serino<sup>3</sup>, A. Arduino<sup>3</sup>, L. Breschi<sup>2</sup>, E. Berutti<sup>1</sup>, M. Alovisi<sup>1</sup>, N. Scotti<sup>1</sup>

<sup>1</sup>University of Turin, Department of Surgical Sciences, Dental School, Turin, Italy; <sup>2</sup>DIBINEM, University of Bologna, Bologna, Italy; <sup>3</sup>Politecnico di Torino, Department of Mechanical and Aerospace Engineering, Turin, Italy

**BACKGROUND:** The aim of this in vitro study was to evaluate the effect of a collagen cross linker agent (EDC) on the mechanical properties of the adhesive interface in endodontically treated teeth.

**METHODS:** 20 upper premolars teeth, extracted for periodontal reasons, were selected. The inclusion criteria were: sound teeth, with nearly similar root size (length > 12mm) and no cracks under trans-illumination and magnification, extracted within one month. A hand scaling instrument was used for surface debridement, followed by cleaning with a rubber cup and slurry of pumice. The specimens were disinfected in 0.5% chloramine for 48 h and then stored in 4% thymol solution at room temperature until use.

Samples were endodontically instrumented using Pathfiles and ProTaper Next to the working length. The root canals were filled with gutta-percha cones through a warm vertical condensation technique. After 24 hours in water storage at 37°C, a 8mm standardized post-space was prepared in each sample, etched for 15 seconds (Ultraetch, Ultradent), rinse for 30 sec and dry with air and paper point. Then, samples were divided in 2 groups (n=10 each) according to the dentin pretreatment procedure: no EDC application (Group A); EDC application (Group B) for 30 sec and dry with air. In all samples, a universal adhesive system (Scotchbond Universal, 3M, USA) was employed in multiple application. Then, fiber posts (Rebilda Post 1,2mm, Voco) were luted with a dual-curing

luting cement (Rely-x Universal, 3M) and cured for 180 sec (Celalux LED lamp, Voco, Germany). The coronal cavity was restored with a nanohybrid composite (Filtek Supreme XTE, 3M). After 24 hours, samples were embedded in resin and then sectioned with diamond saw in 1mm thick slices perpendicularly to the long axis, from the occlusal surface until the post end. Each slice was flattened with ascending grit papers till 2400. Then, samples were tested with a Nanoindenter XP (MTS/Agilent, USA), equipped with a diamond Berkovich indenter and characterized by a theoretical force resolution of 50 nN and a theoretical displacement resolution lower than 0.01 nm. The loading-displacement (P-h) curves have been analyzed by using the Oliver-Pharr method in way to obtain the Elastic Modulus and the Hardness. Obtained datas were analyzed with Anova test ( $p < 0.05$ ).

**RESULTS:** Collected datas showed a slight but not significant increase ( $p = 0.0674$ ) in radicular hybrid layer hardness when EDC was employed before adhesive system application, while young modulus was unchanged. Mechanical properties were significantly reduced from coronal to apical portions of the post space

**CONCLUSIONS:** Hybrid layer mechanical properties could be related to the efficient infiltration of adhesive systems and collagen cross linkers trough dentin. However, sample aging is fundamental to understand the hybrid layer stability on radicular dentin

### Coronal hybrid layer mechanical properties

M. Reda<sup>1</sup>, A. Comba<sup>2</sup>, R. Michelotto Tempesta<sup>1</sup>, G. Serino<sup>3</sup>, A. Audenino<sup>3</sup>, M. Alovisi<sup>1</sup>, D. Pasqualini<sup>1</sup>, E. Berutti<sup>1</sup>, N. Scotti<sup>1</sup>

<sup>1</sup>University of Turin, Department of Surgical Sciences, Dental School, Turin, Italy; <sup>2</sup>DIBINEM, University of Bologna, Bologna, Italy; <sup>3</sup>Politecnico di Torino, Department of Mechanical and Aerospace Engineering, Turin, Italy

**BACKGROUND:** Hybrid layer mechanical properties could predict clinical performance of composite resin restorations overtime. The aim of the study was to evaluate the mechanical properties of coronal hybrid layer, obtained with several adhesive systems, before and after artificial aging.

**METHODS:** 32 molars, extracted for periodontal reasons, were selected for this in vitro study. Enamel surface was removed in order to expose flat sound coronal dentin. A standardized smear layer was created with a 600 grit paper. Then, samples were divided in four groups according to the adhesive system employed: Optibond FL (Kerr, USA, Group 1); SE Bond 2 (Kuraray, Japan, Group 2); Adhese Universal in etch&rinse mode (Ivoclar, Luxembourg), Group 3); Adhese Universal in self-etch mode (Ivoclar, Luxembourg, Group 4). Each group was subsequently divided in two subgroups according to the dentin pretreatment employed: subgroup A: 0,12% chlorhexidine digluconate application for 30 seconds; subgroup B: no pretreatment. Each adhesive was applied on dentin according to manufacturer's instructions. After light curing, which was performed with a LED lamp for 20 seconds, the restoration was completed with nanohybrid resin composite (Clearfil ES-2; Kuraray), which was placed in 2mm horizontal layers and light-cured individually for 20 s. After 24h, samples were cutted in 1mm thick slices perpendicular to the hybrid layer with a diamond saw under water cooling. Each slices was flattened up to 2400 grit paper. Then, samples were tested with a Nanoindenter XP (MTS/Agilent, USA), equipped with a diamond Berkovich

indenter and characterized by a theoretical force resolution of 50 nN and a theoretical displacement resolution lower than 0.01 nm. The loading-displacement (P-h) curves have been analyzed by using the Oliver-Pharr method in way to obtain the Elastic Modulus and the Hardness. Samples were finally stored in artificial saliva and the above mentioned evaluations were repeated after 24h, 7 and 15 days of storage. Statistical analyses was performed with ANOVA test and significance was set for  $p < 0.05$ .

**RESULTS:** Hybrid layer hardness and young modulus were significantly correlated to the adhesive system employed ( $p = 0.0001$ ), but not to the dentin pretreatment (0.0765). Indentation map showed the mechanical properties progression along the coronal hybrid layer.

**CONCLUSIONS:** The above mentioned results should be reconsidered after samples artificial aging to understand a correlation between hybrid layer mechanical properties and its degradation overtime. However, the etch-and-rinse protocol showed a higher hardness and more homogenous young modulus due to a uniform and deeper dentin demineralization and infiltration.

### Wear of composite direct restorations on endo-treated anterior elements

C. Foglia, A. Baldi, E.A. Vergano, R. Michelotto Tempesta, M. Alovisi, D. Pasqualini, E. Berutti, N. Scotti

**BACKGROUND:** The purpose of this in vitro study is evaluate the effect of different direct restoration techniques on endodontically treated anterior teeth, with or without fiber posts, analyzing interfacial adaptation, wear and fracture resistance.

**METHODS:** 36 extracted single-rooted anterior teeth were selected. The inclusion criteria were: sound teeth, with nearly similar root size (length > 12mm) and no cracks under transillumination and magnification, extracted within one month. Endodontic treatment was carried out in all samples. After 24 hours in water storage at 37°C, samples were divided in 3 groups according to the cavity design:

Group A : endodontic access

Group B : endodontic access + 1 third class cavity Group C : endodontic access + 2 third class cavities

Samples were then divided in 3 subgroups according to the restoration technique: Subgroup A : direct restoration

Subgroup B : direct restoration supported by a fiber post (Rebilda Post, Voco). Subgroup C : direct restoration supported by vertical fibers (Rebilda Post GT, Voco). Samples were then stored in water for 24 hours. Then, all specimens were scanned with X-ray computed micro-tomography (micro-CT SKYSCAN, BRUKER). Setting parameters for the high-resolution scans: voltage = 100 kV, current = 80 mA, source-to-object distance = 80 mm, source-to-detector distance = 220 mm, pixel binning = 2 9 2, exposure time/projection = 3 s (total scan duration = 2 h). COBRA 7.2 (Exxim) software was used to reconstruct the axial slices with an isotropic voxel size of 9.1 μm. Ring artefacts reduction was performed by the Pore3D software library developed at Elettra (Brun et al. 2010). Reconstructed axial slices in raw 16 bit format were equalized and converted to 8 bit TIFF file format with ImageJ 1.43u 64 bit software (National Institute of Health) with a whole stack volume of approximately 1200 9 1200 9 1200 voxels. Then, specimens of each group were subjected to mechanical fatigue test in a dual-axis masticatory

## ABSTRACT

simulator (CS4.4, Mechatronik, Germany). A force of 5 kg was applied using a ceramic steatite ball with a diameter of 6 mm as an antagonist for 100000 cycles. After fatigue, micro-CT scanning was performed to evaluate the interface behavior and external wear resistance. MicroCT images, before and after cycling load, were analyzed with Geomagic Software and Mimics to evaluate composite wear and interfaces gap progression before and after mechanical load. Finally, a static fracture test with universal machine was performed to measure the fracture resistance of the samples after fatigue tests. Statistical analysis were performed with two-way ANOVA test to evaluate the effect of cavity configuration and restoration of wear, interfacial gap and fracture resistance.

**RESULTS:** Interfacial gap progression was significantly related to the build-up technique ( $p=0.001$ ) as well as to the cavity configuration (0.032). Any specimens showed crack formation during fatigue test.

**CONCLUSIONS:** Based on the present results, endodontically treated anterior teeth should be restored with fiber supported composite restoration, above all with interfacial cavities. Increased sample size and fatigue test should be performed to confirm these results.

### Clinical evaluation of the interactions of three biomaterials used as desensitizer agents

F. Donaera, P. Usai, R. Pinna, G. Derchi, E.P. Milia

**BACKGROUND:** Dentin hypersensitivity (DH) is a painful clinical condition that has a negative effect on quality of life and often affects adults worldwide. The condition results from dentin exposure mainly resulting from gingival recession or continuous loss of dental structure promoted by erosion, abrasion, and/or abfraction. Pain caused by hypersensitivity is very common and a variety of agents have been tried and tested to put an end to this ailment, but with limited or short-term success. The search for an agent that would predictably and permanently occlude the tubules and blend with them has prompted the use of durapatite/hydroxyapatite (HAP), which is the principal inorganic constituent of the tooth. The aim of this thesis was to investigate the clinical effectiveness of three desensitizer agents in dentine hypersensitivity (DH). A patient's own perception of overall hypersensitivity as experienced by following application of various stimuli can be reported using either a visual analog scale (VAS). Because few clinical trials are currently available evaluating the efficacy of HAP as an in-office desensitizing agent, the goal of the present study is to clinically assess the effectiveness of HAP in treating hypersensitivity. Its effects were evaluated at 0, 1 week, and 4, 12 and 24 weeks after application. The results showed that all the materials tested reduced DH. After 24-week controls, there was a significant statistical difference in VAS decrease irrespective by the desensitizing agents. There are still differences in the behavior of the 3 materials.

#### MATERIALS AND METHODS:

##### Materials

1. Ghimas Dentin Desensitizer: a fluid desensitizing gel with 30% of nano-hydroxyapatite, added to 70:100 thousandths of micron-sized crystals of nano-hydroxyapatite.
2. Cavex Bite&White ExSense: a water-based mint aroma gel containing hydroxyapatite and potassium nitrate.
3. Teethmate™ Desensitizer: Calcium-Phosphate-based powder and a liquid mainly water-based, which are mixed to obtain a slurry.

**METHODS:** The study was designed as an interventional, randomized, prospective, single-center clinical trial. The research was ethically conducted in accordance with the Declaration of Helsinki. The protocol and informed consent forms were approved by the ethics committee of the University of Sassari [n° DH 2304/CE]. The study followed CONSORT guidelines and was registered at the US National Institutes of Health [ClinicalTrials.gov] # NCT02770573. The participants will be selected from among the regular attenders at Dental Clinic of the University of Sassari, Italy. Inclusion criteria: patients will be considered suitable for the study if they had sensitive teeth showing abrasion, erosion, or recession with the exposure of the cervical dentine; A week before the experiment, patients received oral prophylaxis. Non-fluoride toothpaste, soft tooth-brush and oral hygiene instructions will be also provided in order to have standardized habits during the period of the study.

Teeth will be randomly assigned to three groups ( $n = 70$  per group) for the treatment with the three desensitizing agents. At the baseline visit, they will be reassessed for dentine hypersensitivity using the Visual Analogue Scores (VAS) of pain. Each patient will be asked to rate the perception of discomfort after the application of air via a dental syringe at 45–60 psi, 1 cm at the cervical third of the tooth. The adjacent teeth will be covered by cotton rolls. The stimulus will be delivered until reaction or up to a maximum duration of 10 s. The primary success outcome is reduction of dentine hypersensitivity, evaluated by: a negative response to cold test. The null hypothesis is that there will be no statistical differences in dentin hypersensitivity between the three different desensitizing agents at the 24-week control.

### Influence of a chlorhexidine-based adhesive on dentin bond strength and MMPs activity

E. Mancuso<sup>1</sup>, A. Comba<sup>1</sup>, S. Ribeiro Cunha<sup>1,2</sup>, T. Maravie<sup>1</sup>, A. Mazzoni<sup>1</sup>, L. Breschi<sup>1</sup>

<sup>1</sup>University of Bologna, Bologna, Italy; <sup>2</sup>University of Sao Paulo, Sao Paulo, Brazil

**BACKGROUND:** In adhesive dentistry, the stability and integrity of collagen fibrils within the hybrid layer is crucial for the maintenance of bond effectiveness over time. It has been shown that dentinal endogenous enzymes, such as MMPs and cysteine cathepsins could accelerate the aging process of the hybrid layer by degrading the collagen fibrils exposed after bonding to dentin. CHX, a widely used antimicrobial agent in dentistry due to its ability to inhibit MMP-2, -8 and -9 in very low concentrations. The aim of this study was to investigate, by the means of micro tensile strength test, nanoleakage and *in situ* zymographic assays, the influence of 0.2% CHX incorporated within a commercially available adhesive on long-term bond strength.

**METHODS:** Non-carious teeth ( $N = 15$  for each group) were assigned to 4 groups and treated according to the manufacturers' instructions: G1: dentin bonded with Scotchbond Universal (SBU) in the etch-and-rinse (E&R) mode (control group); G2: dentin bonded with Peak Universal (PU, 0.2% CHX) in the etch-and-rinse (E&R) mode; G3: dentin bonded with SBU in the self-etch (SE) mode (control group); G4: PU (0.2% CHX) in the SE mode. Composite build-ups were made using Filtek Z250. Specimens were further subjected to micro-tensile bond test ( $\mu$ TBS) and stressed until failure. Another 12 teeth ( $N = 3$  for each group) were obtained for nanoleakage analysis. The interfacial nanoleakage was examined



under a light microscope and scored based on the percentage of adhesive surface showing AgNO<sub>3</sub> deposition.  $\mu$ TBS test and nanoleakage were evaluated immediately as well as after 12-month storage in artificial saliva at 37 °C. Moreover, *in situ* zymographic assay was performed on sections of dentin of the same groups in accordance with Mazzoni et al., 2014. Results were statistically analyzed using ANOVA ( $p < 0.05$ ). RESULTS: The bond strength was significantly higher in the experimental compared to the control groups, immediately, as well as after aging. The bond strength after 12-month aging was significantly lower in all tested groups compared to immediate bond strength. The predominant failure mode was mixed, followed by adhesive failure mode in all the tested groups. No differences were found in the immediate nanoleakage expression between the tested groups. Similar to the  $\mu$ TBS results, the nanoleakage expression was higher in the aged samples, without significant differences between the control and experimental groups. The results of the *in situ* zymography showed that activation of endogenous MMPs was related to the presence of CHX within the adhesive system and the bonding strategy employed. Enzymatic activity was less pronounced in both CHX-containing adhesive groups with a further reduction of the enzymatic activity on the PU E&R group. Conclusions. CHX blended within the Peak Universal adhesive monomer does not influence negatively immediate bond strength, but seems to preserve bond strength over time. Further, it seems to efficiently inhibit endogenous enzymatic activity in dentin. Hence, blending the CHX in low concentrations within the adhesive could be recommended as a feasible technique in every-day clinical practice.

### Wear and interfacial gaps of indirect cad cam restorations of endodontically treated teeth

G. Zopetto, A. Baldi, E.A. Vergano, R. Michelotto Tempesta, M. Alovisi, D. Pasqualini, E. Berutti, N. Scotti

BACKGROUND: The aim of this *in vitro* study was to evaluate the effect of three different CAD CAM processed materials on the interfacial adaptation, wear and fracture resistance of endodontically treated upper molars.

METHODS: 24 upper molar, extracted for periodontal reasons, were selected. On each specimen, Endodontic treatment was carried out in all samples. Samples were endodontically instrumented using Pathfiles (1-2-3) and ProTaper Next (Dentsply Maillefer, Ballaigues, Switzerland) to the working length, which was set at 1 mm short of the visible apical foramen. Irrigation was with 5% NaOCl (NiClor 5, Ogna, Muggiò, Italy) alternated with 10% EDTA (Tubuliclean, Ogna, Muggiò, Italy), using a 2 ml syringe and 25 gauge needle. The root canals were filled with gutta-percha cones through a warm vertical condensation technique and backfilled with Obtura 3. After 7 days, on each specimen a standardized MOD cavity, with interproximal cervical margins 1mm above the CEJ and residual wall thickness of 1.5mm, was prepared. Specimens were divided in two groups ( $n=12$  each) according to the build-up technique employed.

Group A: build-up with a bulk fill composite material (Admira Fusion X-Tra, Voco) was performed after adhesive application (Futurabond U in self-etch mode).

Group B: fiber post supported build-up. Rebuilda Post GT is employed within the build-up, which was performed with the same technique described for group A. Fiber post are luted inside a 8mm depth post-space following the same adhesive procedures.

Then, a standardized overlay preparation, 2mm thick, exposing enamel margins was performed. Preparations were then scanned with Cerec Omnicam (Dentply Sirona, USA) and the indirect restoration is milled with Cerec MXCL. Each group was then divided in 3 subgroups ( $n=4$  each) according to the CAD CAM material employed: Subgroup 1: Grandioso Bloks (Voco), color A3; Subgroup 2: Cerasmart (GC), color A3; Subgroup 3: Celtra Duo (Dentsply), color A3. Each overlay, once completed, was luted on the corresponding preparation following a standardized procedure. On overlays, manufacturer instructions were strictly followed. Then, all specimens were scanned with X-ray computed micro-tomography (micro-CT SKYSCAN, BRUKER). Setting parameters for the high-resolution scans: voltage = 100 kV, current = 80 mA, source-to-object distance = 80 mm, source-to-detector distance = 220 mm, pixel binning = 2 9 2, exposure time/projection = 3 s (total scan duration = 2 h). COBRA 7.2 (Exxim) software was used to reconstruct the axial slices with an isotropic voxel size of 9.1  $\mu$ m. Then, specimens of each group were subjected to mechanical fatigue test in a dual-axis masticatory simulator (CS4.4, Mechatronik, Germany). A force of 5 kg was applied using a ceramic steatite ball with a diameter of 6 mm as an antagonist for 250000 cycles. After fatigue, micro-CT scanning was performed to evaluate the interface behavior of the post-and-core restoration and the overlay indirect restoration. MicroCT images, before and after cycling load, were analyzed with Geomagic Software and Mimics to evaluate composite wear and interfaces gap progression before and after mechanical load. Statistical analysis were performed with two-way ANOVA test to evaluate the effect of cavity configuration and restoration of wear, interfacial gap and fracture resistance.

RESULTS: Mean interfacial gap progression was not significantly influenced by the build-up technique ( $p=0.263$ ). The Celtra Duo showed a wear rate significantly lower than other CAD CAM materials tested ( $p=0.0001$ ).

CONCLUSIONS: Based on the present study, silicate ceramic showed the best clinical stability in term of interfacial gap and superficial wear. Increased sample number and fatigue test are fundamental to validate these results.

### Effect of etching time on universal adhesives radicular bond strength (Influenza del tempo di mordenzatura sulla forza di adesione alla dentina radicolare)

G.M.G. Brunatto <sup>1</sup>, A. Comba <sup>2</sup>, R. Michelotto Tempesta <sup>1</sup>, M. Alovisi <sup>1</sup>, M. Carossa <sup>1</sup>, D. Pasqualini <sup>1</sup>, E. Berutti <sup>1</sup>, N. Scotti <sup>1</sup>

<sup>1</sup>University of Turin, Department of Surgical Sciences, Dental School, Turin, Italy; <sup>2</sup>DIBINEM, University of Bologna, Bologna, Italy

BACKGROUND: Universal adhesives were recently introduced and could be employed either in etch- and-rinse either in self-etch mode. However, any study tested the ideal phosphoric acid approach when adhesives with different acidities were employed. Thus, the aim of this *in vitro* study was to compare the effect of different etching time on push-out bond strength of universal adhesives with different pH. The null hypothesis tested was that etching time do not influence radicular bond strength.

METHODS: 24 single root teeth, extracted for periodontal reasons, were selected. The inclusion criteria were: sound

## ABSTRACT

teeth, with nearly similar root size (length > 12mm) and no cracks under trans-illumination and magnification, extracted within one month. A hand scaling instrument was used for surface debridement, followed by cleaning with a rubber cup and slurry of pumice. The specimens were disinfected in 0.5% chloramine for 48 h and then stored in 4% thymol solution at room temperature until use. Specimens were endodontically treated and obturated. After 7 days, an 8 mm post space was prepared with dedicated drills. Samples were randomly divided into 4 groups according to the adhesive protocol applied: G1) 5'' H<sub>3</sub>PO<sub>4</sub> application + All Bond Universal (Bisco, USA); G2) 20'' H<sub>3</sub>PO<sub>4</sub> application + All Bond Universal (Bisco); G3) 5'' H<sub>3</sub>PO<sub>4</sub> application + Futurabond U (Voco, Germany); G4) 20'' H<sub>3</sub>PO<sub>4</sub> application + Futurabond U (Voco). All adhesives were applied following manufacturer's instructions, and fiber posts were luted into the post space with the same cement (DC Core, Kuraray). Specimens of each group were further cured for 40s with LED lamp at 1400 mW/s. After 24h, 1mm slices were prepared with a diamond saw to perform push-out test. Results were statistically analyzed with two-way ANOVA test and Tukey post-hoc tests. Statistical significance was set for  $p < 0.05$ .

**RESULTS:** Mean bond strength (expressed in MPa) in different group was: G1) 13.56 ( $\pm 6.82$ ); G2) 13.69 ( $\pm 6.07$ ); G3) 11.78 ( $\pm 5.47$ ); G4) 17.41 ( $\pm 6.72$ ). Two-way Anova showed that the etching time ( $p=0.0226$ ) and the interaction between etching time and adhesive system ( $p=0.0293$ ) significantly influenced the bond strength.

**CONCLUSIONS:** Based on the obtained results, the null hypothesis was partially accepted since etching time significantly influenced the fiber post bond strength when more acidic adhesive systems are employed. The radicular dentin demineralization when Futurabond U is employed was stronger than All Bond Universal, due to a more acidic pH (2.3) that led to a better adhesive infiltration. Further studies are then necessary to understand the degradation of radicular hybrid layer overtime.

### Fracture strength of fiber reinforced composite direct restoration in extended mod cavity

F. Olivero, R. Michelotto Tempesta, M. Alovise, A. Comba, E. Manzon, D. Pasqualini, E. Berutti, N. Scotti

**BACKGROUND:** Endodontically treated posterior teeth should be restored with techniques that could reinforce the remaining structure and avoid catastrophic fractures. The aim of the present in vitro study was to evaluate the fracture strength of MOD cavity in endodontically treated molars filled with different composite resins, with or without fiber reinforcement. The null hypothesis tested was that restoration technique do not influence the fracture resistance of endodontically treated molars.

**METHODS:** 24 lower intact molars, extracted for periodontal reasons, were selected. The inclusion criteria were: nearly similar crown and root sizes, and no cracks under trans-illumination. A hand scaling instrument was used for surface debridement of the teeth, followed by cleaning with a rubber cup and slurry of pumice. Endodontic treatment was carried out in all samples. A standardized MOD cavity was prepared with cervical margins 1mm above the CEJ and oral and buccal walls with 1.5mm remaining thickness. Universal adhesive (G-Premio Bond, GC, Japan) was used in all specimens

in etch and rinse mode. Specimens were then divided in 4 groups according to the restoration technique (n=8 each): direct composite restoration with GC Essentia U (G1); direct composite restoration with GC Essentia U for enamel layers and Ever-X Posterior for dentin layers (G2); direct composite restoration (Essentia U) reinforced with horizontal glass fibers (Ever-Stick, GC) (G3), build-up with Essentia, overlay preparation with 2mm uniform reduction and CAD CAM fabrication using Cerasmart Block, shade A2 (GC) (G4). After 7 days of storage in water, specimens were then loaded until fracture using a universal testing machine (Instron, Canton, MA, USA). The maximum breaking loads were recorded in Newton (N) and data were analysed with two-way ANOVA and *post-hoc* Bonferroni test ( $p < 0.05$ ). Fractured specimens were also analysed in order to classify fracture pattern as restorable and non-restorable.

**RESULTS:** Mean fracture load, expressed in N, were: Group 1) 1262.19 ( $\pm 401.7$ ); Group 2) 1726.26 ( $\pm 547.4$ ); Group 3) 1530.05 ( $\pm 297.65$ ); Group 4) 1761.30 ( $\pm 208.63$ ). Statistical analysis showed that group 2 and group 4 had significantly greater fracture resistance than other groups. Fracture pattern showed restorable fractures mainly in group 3 and 4.

**CONCLUSIONS:** Based on the obtained results, the null hypothesis was rejected since different restorations showed difference fracture resistances. Above all, the use of composites loaded with glass fibers, as Ever-X Posterior, showed great improvement of fracture resistance, which were similar to cuspal coverage restoration. Increased specimen numbers are necessary to validate the obtained results

### Direct anterior restorations: effects on clinical longevity of different composites

E. Garombo, G. Massano, A. Gerbi, E. Manzon, A. Comba, E. Berutti, N. Scotti

*Department of Surgical Sciences, Dental School Lingotto, University of Turin, Turin, Italy*

**BACKGROUND:** Anterior teeth caries and fractures would be mainly restored with direct adhesive restorations. However, few clinical data are available in literature to understand composite longevity in anterior region. Thus, the aim of this in vivo study is to evaluate the longevity of III/IV class restorations performed with nanohybrid resin composites. The null hypothesis tested was that there is any differences in clinical longevity of direct restorations on anterior teeth performed with different composites.

**METHODS:** 40 adult patients, who came to the Department of Cariology and Operative Dentistry of the University of Turin to treat caries and fractures on anterior teeth were enrolled for this study. The inclusion criteria were loss of tooth substance in anterior teeth to be treated with direct restorative techniques, age between 15-65, no health problems, FMPS <20%. Patients were randomly divided in two groups according to the composite selected (Clearfil ES2, Kuraray, Japan; Filtek Supreme, 3M, USA; Asteria, Tokuyama, Japan; Inspiro, Edelweiss, Switzerland), and they were treated by the same experienced operator following a standardized clinical procedure: rubber dam positioning after shade selection, cavity detersion and finishing, application of a 3-step etch-and-rinse adhesive system (Optibond FL, Kerr, USA), composite layering following natural layering technique, composite finishing and polishing. Each composite layer was light-cured for 20 seconds with a multywave curing light (Valo, Ultradent, USA)

at 1400 mW/s. After 7 days each patient was recalled for an eventual shade correction and final radiograph evaluation. Patients were then scheduled for follow-up visits after 6 - 12 - 24 - 36 - 48 months per each group. During follow-up, the clinical examination on of performed restorations was evaluated by 2 blind calibrated operators, following USPHS modified criteria. Obtained datas were analysed with Chi Square test ( $p < 0.05$ ) and Kaplan Meyer regression analysis. Significance was set at  $p < 0.05$ .

**RESULTS:** 79 restorations were evaluated at follow-up visits (mean follow-up: 25,3 months). The statistical analysis showed that there was not a significant difference between the composites ( $p = 0.784$ ) tested. Among all the parameters, only the surface texture showed a significant reduction overtime. **CONCLUSIONS:** Based on the present study results, the null hypothesis tested was accepted since, after 2 years follow up, different composites tested showed comparable clinical performance in anterior teeth direct restoration. The surface degradation, which was the worst parameter at follow-up, do not represent a dramatic failure. However, long term evaluation is necessary to control direct composite restorations longevity in anterior teeth rehabilitation.

### Bond strength to root canal dentin with universal adhesive systems

E. Sommadossi, E. Rivarossa, A. Comba, M. Alovisi, D. Pasqualini, E. Berutti, N. Scotti

*Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** The aim of this in-vitro study was to compare the effect on push-out tensile bond strength to intraradicular dentin with two different universal adhesive systems and cements, employed with etch-and-rinse and self-etch techniques. The null hypothesis tested are that the application mode and the adhesive system do not significantly influence the radicular bond strength.

**METHODS:** 24 single rooted extracted human teeth were selected and decoronated. The inclusion criteria were: sound teeth, with nearly similar root size (length > 12mm) and no cracks under trans-illumination and magnification, extracted within one month. A hand scaling instrument was used for surface debridement, followed by cleaning with a rubber cup and slurry of pumice. The specimens were disinfected in 0.5% chloramine for 48 h and then stored in 4% thymol solution at room temperature until use. Specimens were endodontically treated with Protaper Next X2 (Dentsply Maillefer, Usa) and filled with gutta percha cones and vertical condensation technique (System B+Obtura Gun). After 24 hours, a 8-mm-deep post-space was prepared in each specimen with the same drill; specimens were randomly divided in 4 groups ( $n=6$ ) according to the materials used for fiber posts cementation:

-G1= Clearfil Universal Quick (Kuraray, Japan) + DC Core (Kuraray) in etch-and-rinse mode  
 -G2= Clearfil Universal Quick + DC Core in self-etch mode  
 -G3= Panavia V5 (Kuraray) in etch-and-rinse mode  
 -G4= Panavia V5 in self-etch mode

Etching was performed with K-Etchant (Kuraray) for 15 seconds. Each specimens were light-cured after fiber post insertion (Panavia #4, Kuraray) for 40 seconds with a LED lamp (Celalux, Voco, Germany). After 24 hours, 1-mm-thick root slices were obtained from each root. Each slice was subjected to the push-out test at a crosshead speed of 0.5 mm/min, and bond strength was calculated according to the surface of

adhesion. Results were statistically analyzed with two-way ANOVA test (variables: adhesive, etching) and Tukey post-hoc tests. Statistical significance was set for  $p < 0.05$ .

**RESULTS:** Mean bond strength, expressed in MPa, obtained in different group was:  
 G1: 11.12 ( $\pm 5.79$ ); G2: 8.94 ( $\pm 4.43$ ); G3: 12.40 ( $\pm 7.13$ ); G4: 9.71 ( $\pm 4.63$ ).

Statistical analysis showed a significant effect of the variable etching ( $p = 0.0497$ ), while the adhesive systems showed similar bond strength. A significant correlation was found between etching and adhesive system.

**CONCLUSIONS:** Based on the obtained results, the first null hypothesis was rejected while the second was accepted. Above all with UBQ, the etch-and-rinse mode showed improved radicular bond strength, thus suggesting this technique for fiber post luting. Further studies on the hybrid layer stability are necessary.

### Ex-vivo comparison between different flowcharts used for single-tooth adhesive restorations: digital versus traditional techniques

A. Baldi, E.A. Vergano, R. Michelotto Tempesta, D. Pasqualini, M. Alovisi, E. Berutti, N. Scotti

*Department of Surgical Sciences, University of Turin, Dental School, Turin, Italy*

**BACKGROUND:** The aim of this *ex-vivo* study was to evaluate accuracy and precision of different impression techniques (traditional VS optical) and consequential different cast models (die cast VS 3D printed cast), aimed to create adhesive indirect restorations.

**METHODS:** For this clinical study 20 patients, who came to the Department of Cariology and Conservative Dentistry (Dental School Lingotto, University of Turin) were recruited for presence of carious lesions, coronal fractures or inadequate restorations, diagnosed by intra-oral clinical examination and bitewings which should be treated with indirect adhesive restoration in occluding posterior teeth. Test patients agreed to restorative treatment following the study criteria (informed consent) and needed up to a maximum of 4 restorations both on vital and devitalized tooth. Expert clinicians carried out a standardized clinical procedure to clean and finish tooth hard tissues, perform an adhesive build up and a preparation for an indirect onlay or overlay. Then, on each patient 2 impressions were taken: (Group 1) a single, clinically acceptable, digital impression in order to obtain an STL file of the prepared teeth; (Group 2) a conventional impression with a vinyl polysiloxane material (heavy+light, Empress, 3M), following the manufacturer's instruction. A dual arch technique with flexible tray was used (Triple Tray, Premier Dental), after a clinical try-in of the tray itself. The impression was confirmed to be clinically acceptable by an expert operator. Traditional impressions were then scanned with lab scanner to obtain an STL file; then, conventional impressions were poured with scannable type IV gypsum (uni-base 300, Dentona, Germany). The so obtained casts were scanned with lab scanner after 96 hours, to wait until the expansion of gypsum was complete (Group 3)

In total, 3 STL files were obtained for each patient (optical impression, analogical impression, gypsum cast). All STL datasets were imported into a software for trimming the borders (Geomagic Studio 12, Geomagic), to make the superimposition more precise. Only the prepared tooth and a 1mm area surrounding the preparation was considered. STL files were



## ABSTRACT

then meshed with an STL software manager using the “best fit algorithm” (Geomagic Control X 2017, 3D Systems) in order to evaluate accuracy and precision of digital techniques (direct and indirect) compared to traditional flow-chart. A color-coded deviation map is then generated to show the differences between the aligned models. Measurements of deviation, average positive deviation, average negative deviation, standard deviation were collected and analyzed with ANOVA test.

**RESULTS:** Based on the obtained results, mean discordance between optical impressions (Group 1) and gypsum cast (Group 3) was  $0.0273 \text{ mm}^3 (\pm 0.0634)$ . Impression scans (Group 2) were as well comparable to gypsum models ( $0.064 \text{ mm}^3 \pm 0.0543$ ). Any significant difference was observed between the different workflows.

**CONCLUSIONS:** The present results showed that the digital workflow is nowadays as precise as the traditional one when used to obtain impressions for indirect adhesive restorations. Further studies are necessary to confirm these results.

### Microtensile bond strength between Cerasmart CAD CAM blocks and coronal dentin with three different adhesive cements: an *in vitro* study

E.A. Vergano, A. Baldi, A. Comba, M. Alovisi, D. Pasqualini, E. Berutti, N. Scotti

University of Turin, Department of Surgical Sciences, Dental School, Turin, Italy

**BACKGROUND:** CAD-CAM blocks are today widely used for indirect adhesive restorations, and the bond strength to coronal dentin is consequently crucial to obtain long lasting restorations. The aim of this *in-vitro* study was to evaluate different adhesive luting procedures on coronal dentin bond-strength of Cerasmart CAD-CAM blocks with  $\mu$ TBS test. The null hypothesis tested were that (1) different luting cement do not influence coronal bond strength and (2) collagen cross-linker do not preserve bond strength overtime.

**METHODS:** 36 molars crowns, extracted for periodontal reasons, were selected and stored. Occlusal surface was flattened in order to expose sound dentin and a standardized smear layer was created with 600grit paper. Specimens were then divided into six groups according to the luting cement employed (n=12 each): SG1: Panavia V5 (Kuraray, Japan); SG2: Bifix QM (Voco, Germany); SG3: Estecem (Tokuyama, Japan). Within each group, specimens were divided in 2 sub-groups according to the application of a collagen crosslinker (DCC) over dentin before cement application. CAD-CAM blocks (Cerasmart, GC), shade A2LT, size 14, were cut with a diamond saw to obtain 4mm height specimens, which were then luted on the coronal dentin, following the manufacturer instructions. After 1 minute of pression, each specimen was light cured for 180 seconds with a multi LED lamp (Valo, USA) at 1400 mW/s. After 24h, specimens were serially sectioned to obtain 1mm thick beams in accordance with the  $\mu$ TBS test technique. Half of the beams were stressed to failure after 24h (t=0), while the other half was stored in artificial saliva for 12 months, at 37°C, for ageing before stressing to failure (t=12). 12 molars crowns were similarly prepared to obtain specimens for nanoleakage evaluation. Two-way ANOVA was performed to evaluate the effects of luting cement and collagen cross-linker on coronal bond strength. Significance was set when  $p < 0.05$ .

**RESULTS:** Results showed no statistical difference between

different adhesive cements tested, either immediately (t=0) either after one year of storage (t=12). The use of a collagen crosslinker led to a reduced bond strength reduction overtime, even if its effect was not statistically significant.

**CONCLUSIONS:** Based on the obtained results, the first null hypothesis was accepted since any differences in bond strength were found between the luting cement tested. The second null hypothesis was rejected since collagen cross linker was able to better preserve bond strength overtime. Further studies are necessary to understand the MMPs activity within the hybrid layer after luting cement application.

### Degree of conversion and microhardness evaluation of bulk composites after using two different polishing systems

V. Tosco<sup>1</sup>, R. Monterubbiansi<sup>1</sup>, A. Catellani<sup>1</sup>, G. Orilisi<sup>1</sup>, G. Mengoni<sup>1</sup>, C. Conti<sup>2</sup>, M. Procaccini<sup>1</sup>, G. Tosi<sup>2</sup>, G. Orsini<sup>1</sup>, A. Putignano<sup>1</sup>

<sup>1</sup>Department of Clinical Sciences and Stomatology, Polytechnic University of Marche, Ancona, Italy; <sup>2</sup>Department of Materials, Environmental Sciences and Urban Planning, Polytechnic University of the Marche, Ancona, Italy

**BACKGROUND:** The aim of this study was to analyse the effect of new polishing systems applied on two bulk composites at different times.

**METHODS:** Estelite Bulk-Fill Flow (Tokuyama) and One Bulk Fill Restorative (3M, ESPE) were used for this study. Homemade Teflon cylinders (4 mm in height and 6 mm in internal diameter) were used to make ten samples for each resin composite. All sample were photo-polymerized in bulk using Elipar DeepCure S (3M, ESPE) for 20 seconds, with an energy output around  $1470 \text{ mW/cm}^2$  and spectrum between 430-480 nm. During the photo-polymerization, samples were covered with a Mylar strip to exclude oxygen inhibition. After curing, the samples were divided in two groups: five samples were polished immediately after curing and five were polished after 24 hours. For each sample, degree of conversion (DC) and Vickers micro hardness (VMH) were evaluated both before and after polishing. A Perkin Elmer Spectrum One NTS FT-NIR spectrometer, equipped with Perkin Elmer NIRA (Near Infrared Reflectance Accessory), was used for DC evaluations, while the VMH was determined by means of Leitz Micro-Hardness tester. One way ANOVA test and post doc t-test were used for statistical evaluations ( $p < .05$ ).

**RESULTS:** The tested materials showed statistically different ( $p < .05$ ) values for DC and VHM. Immediately after curing (t0) and after 24 hours (t24), the DC values of both groups were statistically different ( $p < .05$ ). At t0, One Bulk Fill DC of polished samples resulted higher than the DC of the unpolished ones; at t24, all DC values were not statistically different. At t0, Estelite DC of polished samples was higher than the one of unpolished samples. At t24, all DC and VMH values of both groups after polishing, were not statistically different. On the other hand, all the VHM values of Estelite were not statistically different.

**CONCLUSIONS:** DC and VHM values of tested materials increased after polishing. The two materials behave differently: One Bulk Fill, after polishing and finishing procedures, improves DC and VHM values; in the case of Estelite samples, DC values seem to depend more on the time than on polishing and finishing, while VHM values appear unconnected from both procedures.

## Features and benefits of glass ionomer materials in restorative dentistry: operational possibilities in patients with autism spectrum disorder

P. Patti, D. Corridore, M. Mazur, A. Ndokaj, F. Rinaldo, D. Salvi, D. Pasqualotto, F. Ripari, G.M. Nardi, L. Ottolenghi, F. Guerra

*Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy; School of Dentistry, "Sapienza" University, Rome, Italy; Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome; Dental Hygiene School, Sapienza University of Rome, Latina, Italy*

**BACKGROUND:** Glass ionomers are materials formed by a polymer matrix cross-linked with ionic bonds to which glass reinforcing particles are incorporated. Currently they are widely used in dentistry, available with different consistencies and viscosities that differ depending on the use, ranging from conservative, prosthetic and orthodontics. They have good adhesion to dental structures and a compression resistance very similar to dentin. They constitute a layer of elastic material able to dissipate the mechanical and thermal stresses to which they are subjected. The aim of the present study was to evaluate the operational possibilities of these materials and specifically the importance that these materials play in the treatment of caries pathology in patients with autism spectrum disorder syndrome

**METHODS:** The methods used for this work were a search for articles in English and Italian, published on PubMed from 1990 to 2016, using the following keywords: "Glass Ionomer Cements", "Dental Restoration Repair", "Dental Restoration Failure", "Dental Restoration, Temporary", "Dental Restoration, Permanent". In addition to literature we also relied on the clinic, evaluating qualitatively and quantitatively restorations of carious cavities with glass ionomer material carried out in the La Sapienza dental clinic in Rome. In 2013, a pilot study was developed at the Unit Operative Complex (UOC) of Pedodontics of the Policlinico Umberto I of Rome with the aim of creating an innovative model of approach to improve the oral conditions of patients Special needs. For the study, 151 subjects with special needs between the ages of 4 and 40 were enrolled. The subjects examined already had at the age of 2/3 years "serious" cognitive-behavioral deficits, with problematic relational modalities and verbal difficulties. Of the 151 patients included in the study, 31% needed conservative treatments, for a total of 141 restorative dentistry services, performed in the lateral sectors and therefore divided mainly into first and second class reconstructions, according to the principles of Minimal invasion. 20% of the sample was instead subjected to groove sealing, for a total of 120 seals. The success criteria adopted for the evaluation of the study were: a success code (1) when the restoration is entirely present in the prepared cavity and three failure codes: (2) when the reconstruction is partially present, (3) when the reconstruction is absent and (4) when the reconstruction is absent and a carious lesion has developed again in the bottom of the cavity that we had previously cleaned and prepared.

**RESULTS:** Of the 141 restorations and 120 sealings performed, after a follow-up at 6, 12 and 24 months the results obtained were different. With regard to the 141 first and second class restorations, these have provided the following results: 88% Code 1 (125), 9% Code 2 (13), 1.3% Code 3 (2), 0.7% Code 4 (1). Of the 120 sealings performed were: 72.5% Code 1 (87), 19% Code 2 (23), 8.5% Code 3 (10), 0% Code 4 (0).

**CONCLUSIONS:** The conclusions drawn from this work lead us to consider glass ionomers as materials of choice in the treatment and prevention of caries in subjects with special and non-collaborative needs, in which the use of composite resins is hindered by the impossibility of isolating the field operation with the rubber dam for obvious compliance problems, a factor that limits the use of the composite and does not guarantee optimal adhesion to dental tissues, favoring detachment and possible recurrence of caries.

## Case report: 36 months spectrophotometric evaluation of color stability after resin infiltration in two young patients with enamel defects

M. Mazur, D. Corridore, M. Capocci, A. Ndokaj, F. Rinaldo, D. Salvi, P. Patti, D. Pasqualotto, F. Ripari, G.M. Nardi, L. Ottolenghi, F. Guerra

*Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy; School of Dentistry, "Sapienza" University, Rome, Italy; Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome*

**BACKGROUND:** Icon<sup>®</sup> proved to be effective on enamel hypomineralized lesions such as White Spot Lesion (WSL), Developmental Defects of Enamel (DDE) and mild cases of Fluorosis.<sup>1,2,3</sup> Colour stability over time is the main criticism of the treatment and a recent systematic review<sup>4</sup> showed that the clinical efficacy grade of resin infiltration to manage enamel hypomineralization is low, mainly because the follow-up period is limited to 12 months (5) and the long-term success rate is yet unknown. Moreover, most of the published data assessing the validity of the method are done on in vitro artificial lesions (4). The aim of the present case report was to evaluate the objective effectiveness on colour stability at 36 months of follow-up by resin infiltration in two siblings affected by celiac disease and presenting developmental defects of enamel (DDE) on the esthetically relevant teeth of the upper arch.

**METHODS:** The study was performed at Sapienza University, Rome, Italy. Eight permanent upper incisors with DDE were used in this clinical report at 1<sup>st</sup> Observation Unit of Department of Oral and Maxillofacial Sciences, "Sapienza" University of Rome. One trained operator executed Icon<sup>®</sup> infiltration; colour evaluation was performed using a calibrated reflectance spectrophotometer (SpectroShade, MICRO, Serial N HDL1407, MHT, Arbizzano di Negrar, Verona, Italy) at T<sub>0</sub> (before treatment), at T<sub>1</sub> (12 months), T<sub>2</sub> (36 months) follow-up. To evaluate colour stability, the colour difference (DE) was calculated: I)DE<sub>1</sub> between T<sub>0</sub>-T<sub>1</sub>; II)DE<sub>2</sub> between T<sub>1</sub>-T<sub>2</sub> and III)DE<sub>3</sub> between T<sub>0</sub>-T<sub>2</sub>. Comparison of the DE with the acceptability threshold (AT) was made.

**RESULTS:** Overall, the average DE values in the incisal-central and gingival sections indicating the amount of colour change after resin infiltration between T<sub>1</sub> and T<sub>0</sub> were 4.46, 3.54, 4.76; between T<sub>2</sub> and T<sub>1</sub> were 1.71, 2.35, 2.28 while between T<sub>2</sub> and T<sub>0</sub> were 3.83, 3.74, 5.34. DE values at 36 months are lower than acceptability threshold (3.3).

**CONCLUSIONS:** The 36 months of follow-up showed a mean DE of 2.1, on the other hand the colour change after treatment at 12 months of follow-up was 4.3. Colour variation at 3 years of follow up was lower than acceptability threshold indicating an overall good colour stability.

### References

- Guerra F, Mazur M, Rinaldo F, Ottolenghi L. Spectrophotometric analysis of Icon<sup>®</sup> treatment outcome in two celiac

## ABSTRACT

- siblings with developmental defects of enamel, a case report. *Journal of Restorative Dentistry*. 2015; 3: p. 88-91.
- Guerra F, Mazur M, Nardi GM, Corridore D, Pasqualotto D, Rinaldo FD, Ottolenghi L. Dental hypomineralized enamel resin infiltration. Clinical indications and limits. *Senses Sci.* 2015; 2(4): p. 20-23.
  - Mazur M, Westland S, Guerra F, Corridore D, Vichi M, Maruotti A, et al. Objective and subjective aesthetic performance of icon® treatment for enamel hypomineralization lesions in young adolescents: A retrospective single center study. *J Dent.* 2018 Jan;68:104-108.
  - Sonesson M, Bergstrand F, Gizani S, Twetman S. Management of post-orthodontic white spot lesions: an updated systematic review. *European Journal of Orthodontics*. 2016: p. 1-6.
  - Eckstein A, Helms HJ, Knösel M. Camouflage effects following resin infiltration of postorthodontic white-spot lesions in vivo: one-year follow-up. *The Angle Orthodontist*. 2015;(85): p. 374-380.

### Resin infiltration and direct resin reconstruction in a post-traumatic enamel defect: a case report

F. Rinaldo, N. Ndokaj, M. Mazur, D. Corridore, M. Capocci, D. Salvi, P. Patti, D. Pasqualotto, F. Ripari, A. Spota, L. Ottolenghi, F. Guerra, G.M. Nardi

*Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy; School of Dentistry, "Sapienza" University, Rome, Italy; Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome*

**BACKGROUND:** Resin infiltration proved to be effective on enamel hypomineralized lesion of various etiologies, as described by Paris *et al.* White spot post orthodontic lesions, early enamel carious lesion, developmental defects of enamel and mild fluorosis can be treated with good prognosis by Icon®. On the other hand, when a deeper configuration of the lesion is found, as in severe fluorosis and post-traumatic lesions, an experimental approach has been described by Attal *et al.* The aim of this study was to present the clinical report of deep infiltrative technique with a mixed approach of liquid and solid resin in a patient presenting with a post traumatic lesion.

**METHODS:** The study was performed at Sapienza University, Rome, Italy. The patient, a 12 years old female, who was found with a hypomineralized lesion of traumatic origin on the upper right central incisor. Photographic images (Nikon D7100, 105 mm Macro lens, RIC1 Macro flash) were taken before and after treatment, in order to document the colourimetric outcome after treatment. Icon Etch (15% HCl) is applied up to three times (2 minutes X 3) and after each rinsing and drying the lesion is still visible. Also, the final drying with Icon Dry (Ethanol) does not reveal masking of the spot. The application of Icon Etch is not recommended moreover, after three repetitions. After the three cycles of erosion-rising-drying, milling is performed. Application of Icon Etch is repeated up to three times again. When the enamel translucency is reached, the infiltration can be performed. Icon Infiltrant is applied on the pre-treated surface and left in place for 3 minutes. The excess is removed then from the interproximal areas by dental floss and with air spray and light cured for 40 seconds. The infiltration is repeated another time with a penetration time of 60 seconds and the light curing for additional 40 seconds. After the first step of the procedure the result is of an optimal enamel translucency recovery and of a substance loss visible in the lateral view intra-oral

photographs. The subsequent step of the procedure is direct restoration of the volume lost by the erosion and milling, with bonding of a small and sufficient resin quantity. In this case, we have used the Admira Fusion (Voco) A2 shade.

**RESULTS:** The photographic images show the pleasant aesthetic outcome of the treated lesion, observed on the central and incisal tooth section of the right upper incisor. 15% HCl eliminates 0.2 to 0.3 mm of the outer enamel layer and when the lesion has a deeper configuration, clinically appears to be markedly opaque. In traditional dentistry, it would be impossible to hide the opacity at this stage using composite in such a thin layer. Milling is necessary to reach the ceiling of the lesion and to recover the enamel translucency by subsequent repeated infiltration.

**CONCLUSIONS:** Icon procedure combined with direct resin restoration and milling can be performed when clinical indication for lesions presenting a deeper configuration are ceramic veneers. This clinical case reports on the efficacy of deep resin infiltration performed on enamel hypomineralized lesion of traumatic origin.

### Periodontal-conservative combined treatment of cervical and subgingival caries

E. Vaia, C. Rengo, A. Valletta, M. Simeone, V. Lodato

*Università Federico II di Napoli, Unità Operativa Complessa di Odontoiatria, Naples, Italy*

**BACKGROUND:** Cervical or root caries are some of the most dangerous forms of caries in which the carious process is manifested on the root surface or in the cervical zone of the crowns; their margins localization often is subgingival in contact with the periodontal tissues. In case of subgingival cavities, the correct execution of the conservative treatment requires previous indispensable periodontal treatments. The periodontal surgery aim is to re-position gingival margins in order to completely expose cavities boundaries not only to let conservative procedures be properly realized, but also to prevent future periodontal damages by respecting both the superficial and the deep periodontium. Various periodontal techniques can be executed depending on the cavities boundaries localization and the quantity of the keratinized gingiva. The aim of the study is to stress on the importance of periodontology in the interdisciplinary treatment of complex conservative cases.

**METHODS:** A 60 years old woman in good general health conditions has been visited in order to evaluate her state of oral health. At the clinical examination the patient showed root and cervical cavities to the 4.6, 4.5, 4.4, 4.3, 3.2, 3.3, 3.4, 3.5, 3.6 and 3.7. mainly in contact with the periodontal tissues, multiple gingival recessions, a moderate amount of keratinized gingiva and a thin gingival biotype. Caries treatment requested a multi-disciplinary approach of both conservative and periodontal techniques. The features of the case, the amount of keratinized gingiva in particular, required cavities boundaries exposure by the execution of an apically positioned flap sutured to the periosteum in order to preserve the amount of gingiva by moving instead of removing it. The mucogingival split thickness flap must permit a proper use of the dental dam, the complete decayed tissue removal, the respect of the periodontium and the biologic width, in addition to a total exposure of the restorations perimeters 0,5 mm far from the future gingival margins in order to make their boundaries easily cleanable by the patient. After 14 days sutures were removed, and 14 further days have



been waited for a better soft tissues healing. After the period of 4 weeks, the ideal biological and clinical conditions for a proper conservative treatment have been achieved; dental dam has been correctly mounted and adhesive restorations have been realized.

**RESULTS:** A correct clinical resolution has been achieved thanks to the periodontal surgery. The control 14 days since the surgery showed a wound re-epithelialization, and after 14 other days the patient showed properly healed periodontal tissues and completely exposed caries margins. The clinical control 8 weeks since the conservative treatment showed a

successful aesthetic and morphologic teeth restoration and an ideal periodontal health.

**CONCLUSIONS:** A multi-disciplinary approach is essential in the treatment of cavities in contact with the periodontal tissues. In many of the cases periodontal surgery to apically position gingival margins is indispensable in order to correctly realize a conservative treatment of the caries and to preserve the periodontal health. Periodontology represents the key factor for an optimal, maintainable and long-lasting clinical result in restorative dentistry and, in general, in the daily practice.

# ENDODONZIA

## Evaluation of the degree of pulp tissue dissolution through different root canal irrigation protocols

G. Pantaleo<sup>1</sup>, R. D'Ambrosio<sup>1</sup>, M. Simeone<sup>1</sup>, F. Riccitiello<sup>1</sup>, R. Lo Giudice<sup>2</sup>, S. Rengo<sup>1</sup>, A. Iandolo<sup>1</sup>

<sup>1</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University of Naples Federico II, Naples, Italy; <sup>2</sup>Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Messina University, AOU Policlinico, Messina, Italy

**BACKGROUND:** The aim of this study is to evaluate in vitro, using artificial lateral canals, the rate of dissolution of the pulp tissue through different protocols of canal irrigation. **METHODS:** 100 artificial canals provided with lateral canals have been used (Thermafil blocks). Each main canal was equipped with two lateral canals (coronal third and middle third). For the test, the lateral canal located in the middle third of the main canal to 13 mm from the surface of the resin block has been used. The main canal length was 18 mm from the surface of the resin block. The diameter of the end point of the main canal was 0.3 mm with a taper of 4%. The curvature of the main canal was 25° following Schneider method. Each lateral canal was filled with pulp tissue and calibrated to 0002 mg. All canals were irrigated using 5 different protocols. 5 groups have been used for the experiment: Group A, distilled water (control); Group B, preheated NaOCl; Group C, NaOCl heated inside the canal; Group D, NaOCl ultrasonically activated; Group E, NaOCl heated inside the canal with ultrasonic activation. All samples were weighed through professional microbalance in three different phases: before insertion of the pulp tissue into the lateral canal, after insertion of the pulp tissue and, finally, after different protocols of irrigation. A statistical analysis with Kruskal-Wallis test and Mann-Whitney test was performed. **RESULTS:** The blocks were weighed into 3 different phases: empty block (T1), block with 0,002 mg of pulp tissue (T2), block after irrigation protocol and drying (T3). Mean and standard deviation showed how only group E with 6% sodium hypochlorite heated at a controlled temperature and ultrasonically activated was able to dissolve a moderate amount of pulp tissue. Other irrigation protocols are not able to dissolve the pulp tissue. Kruskal-Wallis test with  $P < 0,001$  indicated no significant differences among the tested protocols. Mann-Whitney significance test was set at  $p < 0,05$ , also in this case there were no statistically significant differences between the tested groups. **CONCLUSIONS:** The main objective of endodontic therapy is the removal of damaged tissues and bacteria. Modern literature highlights that is impossible to remove all the pulp tissue and bacteria from the whole endodontic space. So, to achieve excellence and get positive results in the short and long term, it is necessary to use techniques and technologies that may increase the degree of root canal detersion.

## Influence of crown height, root length and crown-to root ratio on the survival of healed teeth after surgical retreatment

D. Angerame<sup>1</sup>, M. De Biasi<sup>1</sup>, M. Lenhardt<sup>1</sup>, V. Franco<sup>2</sup>, L. Bevilacqua<sup>1</sup>

<sup>1</sup>Clinical Department of Medical Science, Surgery and Health, University of Trieste, Trieste, Italy; <sup>2</sup>Private Practice, Rome, Italy

**BACKGROUND:** To evaluate how the crown height, the root length, and of the crown-to-root ratio affect the survival of teeth subjected to apicectomy and classified as periapically healed.

**METHODS:** A single operator performed microsurgical endodontic interventions at the Dental Clinic of the University of Trieste from 2008 to 2017 on teeth with refractory periapical pathosis. Some of these patients were designated to be included in the present analysis by selecting teeth classified as "complete periapical healing" according to the scale proposed by Molven. Teeth used as abutment for prosthetic bridges were excluded. The periapical radiographs taken at the recall visits were subjected to image analysis with dedicated software (DBSWIN, Dürr Dental). Two independent, trained, and calibrated operators measured in a blind manner the distance between the alveolar ridge and the top of the cusp (crown height) and between the alveolar ridge and the resected apex (root length). The crown-to-root ratio was eventually calculated. The level of intra- and interobserver agreement was statistically tested with the Bland Altman plots with 95% limits of agreement (GraphPad Prism 7, GraphPad Software). An independent statistician performed a survival analysis by using Kaplan-Meier plots and a Log Rank test to assess the significance of the differences among the subgroups defined by the following criteria: a) crown height lower or greater than the median value; b) root length lower or greater than the median value; c) crown-to-root ratio lower or greater than 1; d) crown-to-root ratio lower or greater than the median value; e) single-rooted teeth Vs. multi-rooted teeth (Statistical Package for Social Sciences v.15, SPSS Inc.). The level of significance was set at 0.05. **RESULTS:** At the end of the analysis, the sample was constituted by 42 patients, who were followed-up on average for  $4,2 \pm 2,4$  years, each one contributing to the study with a single tooth. Three teeth were not available for the evaluation, as they had been previously extracted by other dentists for prosthetic purposes. In the comparison between the teeth with the longest roots ( $> 8$  mm) Vs. those with the shortest roots, the former subgroup showed improved survival ( $p < 0,05$ ). No statistically significant difference emerged among the remaining considered subgroups. **CONCLUSIONS:** Under the conditions of the present study, teeth with longer residual roots after apical surgery exhibited better chances of survival when compared to elements

with roots shorter than 8 mm. The other considered variables did not seem to affect the survival of apically resected teeth. Further studies are needed to confirm these findings on a larger sample of patients.

### Optimization of modern protocols to improve canal cleanliness: a scanning electron microscopy analysis

D. Angerame <sup>1</sup>, M. De Biasi <sup>1</sup>, L. Morelli <sup>1</sup>, M. Crevatin <sup>2</sup>, V. Franco <sup>3</sup>, A. Castaldo <sup>1</sup>

<sup>1</sup>Clinical Department of Medical Science, Surgery and Health, University of Trieste, Trieste, Italy; <sup>2</sup>Private Practice, Trieste, Italy; <sup>3</sup>Private Practice, Rome, Italy

**BACKGROUND:** To assess the influence of different endodontic protocols involving two irrigant solutions, two irrigant activation instruments, and a combination of them on the formation of smear layer and debris.

**METHODS:** The sample size was determined using G\*Power software (Kiel University) set with the following parameters:  $\alpha = 0.05$ ,  $\beta = 0.20$ , effect size = 0.686,  $\sigma = 0.9$  for smear layer scores. The crowns of 40 single-rooted extracted teeth of comparable size were removed with a cutting disc. Roots with multiple canals or aberrant anatomy were discarded. A single operator scouted the root canal and determined the working length with a stainless-steel size-10 manual file; afterwards, root canals were instrumented with BT Race files (FKG) up to size 40/.04. Between each instrument of the shaping sequence, the canal was rinsed with 2 ml of 5% sodium hypochlorite (Nicolor 5, Ogna). At the end of the shaping phase, canals were rinsed with 3 ml of distilled water. The roots were randomly divided into a control and four experimental groups of 8 elements each. In the control group, canals were rinsed with 17% ethylenediaminetetraacetic acid (EDTA, Ogna) for 3 minutes and 5% sodium hypochlorite for 3 minutes. The same irrigation protocol was adopted in the experimental groups, activating for one minute either the EDTA or sodium hypochlorite solution, either with the XP-endo Finisher (FKG) or an ultrasonic tip (Irrisafe, Satelec Acteon). Finally, canals were irrigated with distilled water and dried with paper points. The roots were split into two halves, sputter coated with gold and subjected to scanning electron microscope analysis. Five microphotographs (2000 $\times$ ) per canal third were acquired (for a total of 120 images) and scored according to the Hülsmann scale for smear layer and debris formation. For each third, the median value of the scores was considered as statistical unit. Non-parametric statistical analysis was carried out to compare groups and canal thirds ( $p < 0.05$ ).

**RESULTS:** None of the considered irrigation protocols could completely remove smear layer and debris from canal walls. Smear layer was mainly located in the apical third regardless of the group, while debris was found in the canal irregularities in the coronal and middle thirds. As a general trend, canal cleanliness worsened from the coronal to the apical portion of the root canal. In the comparison between irrigant solution activation technique, a lower amount of debris was detected in the coronal and middle thirds of the XP-endo Finisher groups, while improved smear layer removal was observed at the apical level in the ultrasonic activation groups. The groups involving sodium hypochlorite activation tended to obtain significantly worse smear layer and debris scores in comparison to the EDTA and control groups.

**CONCLUSIONS:** The use of the XP-endo Finisher did not appear to contribute effectively to the cleaning of the root

canal. Ultrasonic irrigation improved canal cleaning in the apical third, but was unable to remove the larger debris accumulated in the canal irregular portions. EDTA activation appears to lead to better smear layer removal than sodium hypochlorite in the most accessible canal portions. The possibility to use the two techniques jointly should be matter of future studies.

### Effects of sodium hypochlorite and/or autoclave sterilization on surface characteristics and cyclic fatigue resistance of hyflex cm and twisted files rotary instruments

G.R.M. La Rosa <sup>1</sup>, E. Pedullà <sup>1</sup>, G. Plotino <sup>2</sup>, N.M. Grande <sup>3</sup>, S. Rapisarda <sup>1</sup>, S. Ferlito <sup>1</sup>, L. Generali <sup>4</sup>

<sup>1</sup>Department of General Surgery and Surgical-Medical Specialties, University of Catania, Catania, Italy; <sup>2</sup>Department of Endodontics, La Sapienza University of Rome, Rome, Italy; <sup>3</sup>Catholic University of Sacred Heart, Rome, Italy; <sup>4</sup>Department of Surgery, Medicine, Dentistry and Morphological Sciences with Transplant Surgery, Oncology and Regenerative Medicine Relevance, University of Modena and Reggio Emilia, Modena, Italy

**BACKGROUND:** Aim of this study was to evaluate the effects of sodium hypochlorite (NaOCl) immersion and/or autoclave sterilization on the surface characteristics and cyclic fatigue resistance of HyFlex CM (Coltene Whaledent, Cuyahoga Falls, OH, USA) and Twisted Files (TF, Sybron Endo, Orange, CA, USA).

**METHODS:** 140 new 25/.06 Hyflex CM and Twisted Files were divided into 7 groups ( $n = 10$ ) for each brand. Group 1 (control group) included new instruments that were not immersed in NaOCl neither subjected to autoclave sterilization. Groups 2 and 3 were composed of instruments immersed dynamically for 3 minutes in 5% NaOCl solution (Nicolor; OGNA Laboratory, Milan, Italy) at 37°C for 1 and 3 times respectively. Groups 4 and 5 consisted of instruments only autoclaved 1 and 3 times respectively. Groups 6 and 7 included instruments that received a cycle of both immersion in NaOCl and sterilization, 1 and 3 times respectively. The sterilized instruments were subjected to 1 or 3 cycles of autoclave sterilization (Sterilix Vacuum Plus; Reverberi, Barco, Italy), and each cycle was performed at a temperature of 134°C for 17 minutes. Instruments were subsequently subjected to fatigue test, using an artificial canal with 60° angle of curvature and 5-mm radius. The number of cycles to failure (NCF) for each instrument was calculated by multiplying the number of rotations per the effective seconds of continuous rotation required for fracture. Moreover, the surface morphology of fractured instruments was studied by field-emission scanning electron microscopy (SEM) (Nova NanoSEM 450; FEI, Eindhoven, the Netherlands) and x-ray energy-dispersive spectrometric (EDS) (Quantax-200; Bruker, Berlin, Germany) analyses. Data were subjected to the Shapiro-Wilk test to characterize their normality and statistically analyzed using 2-way analyses of variance and the Tukey multiple comparison post hoc test to assess significant differences among groups ( $P < 0.05$ ).

**RESULTS:** Comparison among groups indicated no significant difference of NCF ( $P > 0.05$ ) except for groups of Twisted Files sterilized 3 times without o with immersion in NaOCl ( $P < 0.05$ ). HyFlex CM exhibited higher cyclic fatigue resistance than TF in files groups sterilized 3 times, independently from the immersion in NaOCl ( $P < 0.05$ ). EDS analysis showed the presence of an oxide-rich layer on the Hyflex CM files'



## ABSTRACT

external surface. No morphologic or chemical differences were found between files of the same brand subjected to different treatments.

**CONCLUSIONS:** Repeated cycles of sterilization did not seem to influence cyclic fatigue of NiTi files except for TF that demonstrated a significant decrease of flexural resistance after 3 cycles sterilization. Immersion in NaOCl did not reduce significantly the cyclic fatigue resistance of all nickel titanium files examined. The presence of an oxide-rich layer on the Hyflex CM files' external surface reduces amount of nickel exposed to the corrosion.

### Software-assisted endodontic micro-surgery: evaluation *in vitro* and *in vivo* of a new method for hostectomy and apical resection software-assisted endodontic micro-surgery: evaluation *in vitro* and *in vivo* of a new method for hostectomy and apical resection

S. Gaffuri, R. D'Ambrogio, F. Mazzoleni, F. Pasquariello, R. Tonini, S. Salgarello

Dental School-University of Brescia, Brescia, Italy

**BACKGROUND:** The objective of this work is to evaluate the operative applicability offered by the guided surgery (assisted software), in the therapeutic field of Endodontic surgery, verifying the linear and angular precision of software-guided virtual designs of osteotomies and apical resections, before and after their execution.

**METHODS:** A human hemimandible has been selected, presenting teeth from 42 to 47 intact and housed in their respective alveoli. This anatomical structure was subjected to preoperative CBCT. Subsequently, a silicone impression was taken to obtain the plaster model that was scanned in the laboratory with a scanner to generate an STL file. This file was coupled through software dedicated to guided surgery, to the DICOM files obtained by CBCT, obtaining the matching. Through the same software, 6 apical resections of the elements 43, 44, 45, 46, 47 were designed, using virtual cylinder guides, to represent the future metal guide for the path of the drill dedicated to root resection. From this design, a dental and bone support surgical model was constructed, characterized by the presence of 6 steel bushes able to guide a coring cutter inside the mandibular bone, first passing through the cortical and medullary portion (where present) and then the dental tissue, until reaching the pre-defined horizontal depth as the limit of the apical resection. In this way, 6 bone blocks obtained by the cutting action of the core drill, containing 6 root apices as per the preoperative project, were cored and removed. A post-operative CBCT was performed at the end of the 6 apical resections. Through its superposition with the preoperative one, by subtraction of the soft and skeletal structures, the dental elements analyzed before and after being apicectomized were analyzed to analyze their linear and angular position before and after. The resected teeth were then extracted and analyzed, as well as the carotated bone plugs and the apices contained therein, to visually verify the validity of apical resections.

**RESULTS:** The computer surgery procedures guided in implant surgery allow to obtain an implant placement with a linear discrepancy coefficient not higher than one millimeter and a three-dimensional discrepancy not higher than 4-6 °. All the resections were performed in the range of both linear

and angular acceptability with the exception of element 44 for which an angular deviation of about 7 ° was found and 45 for which the linear coefficient of 1 mm and angular of 6th. The clinical observation of the apical resections showed a correct centering of all the root canals, positioned equidistantly with respect to the circumference of the neo-apices.

**CONCLUSIONS:** The tests conducted can be considered very encouraging about the reliability of this system.

The clinical advantages are evident in the phases of osteotomy and apex resection that can be carried out with great precision and at the same time and performed by experienced operators, for complex clinical cases, and by less.

### Influence of different angles of file access on cyclic fatigue resistance of reciproc and reciproc blue instruments

O.G. Rinaldi <sup>1</sup>, S. Boninelli <sup>2</sup>, G.R.M. La Rosa <sup>1</sup>, S. Rapisarda <sup>1</sup>, E. Pedullà <sup>1</sup>, P. Verzi <sup>1</sup>

<sup>1</sup>Department of General Surgery and Surgical-Medical Specialties, University of Catania, Catania, Italy; <sup>2</sup>MATIS, Institute of Microelectronics and Microsystems, National Research Council, Catania, Italy

**BACKGROUND:** The purpose of this study was to compare the cyclic fatigue resistance of two single file systems, Reciproc (Rec, VDW, Munich, Germany) and Reciproc Blue (Rec Blue, VDW, Munich, Germany) with different angles of file access.

**METHODS:** Ninety new Reciproc R25 and Reciproc Blue R25 were tested and divided into 6 groups on the basis of the angle of insertion tested (n=15): 0° (Groups 1 and 2, included Rec and Rec Blue, respectively), 10° (Groups 3 and 4, included Rec and Rec Blue, respectively) or 20° (Groups 5 and 6, included Rec and Rec Blue, respectively). Resistance to cyclic fatigue was determined by recording time to fracture (TtF) in a stainless steel artificial canal with a 60° angle of curvature and 5 mm radius of curvature, using a new testing device machine. This device consisted of a platform composed of a block containing the electric handpiece and a mobile support on rails for insertion/disconnection of the file. The block ensured that electric handpiece is maintained in a fixed three-dimensional position allowing precise and reproducible placement of each instrument inside the artificial canal. In addition, the mobile support, when is fixed, is blocked always in the same point thanks to a locking mechanism. Moreover, a metal mobile platform is connected to the mobile support. This second platform with the artificial canal produced the different inclination of insertion of tested file maintaining the entrance of instrument perpendicular to the canal. Consequently, it was possible valuating cyclic fatigue of tested instruments with different inclinations of insertion of files respect to the standard position (0°) corresponding to 90°. Fifteen instruments of each system were activated by using a 6:1 reduction handpiece (Sirona Dental Systems GmbH, Bensheim, Germany) powered by a torque-controlled motor (Silver Reciproc; VDW) using the presetting programs for the Reciproc system ("RECIPROC ALL") as recommended by the manufacturer. The fracture surface of each fragment was examined with a scanning electron microscope (SEM) (ZEISS Supra 35VP; Oberkochen, GmbH, Germany). Data were analyzed using the two-way analysis of variance (ANOVA) and Tukey post-hoc

test with a significance level of 0.05 (Prism 8.0; GraphPad Software, Inc, La Jolla, CA).

**RESULTS:** Rec Blue exhibited significantly higher cyclic fatigue resistance than Rec when the angle of file access was 0° ( $P < 0.001$ ) and 10° ( $P < 0.05$ ) while there was no difference between the tested instrument for angle of 20° ( $P > 0.05$ ). Moreover, a significant difference was observed between 0° and 20° ( $P < 0.05$ ) for Rec instruments. Regarding Rec Blue, there was a significant difference between 10° and 20° as well as between 0° and 20° ( $P < 0.05$ ).

**CONCLUSIONS:** Rec Blue files exhibited higher cyclic fatigue resistance than Rec when the access to the canal is straight. However, inclined insertion of Rec Blue files into the canal seems to reduce their cyclic fatigue resistance.

### Mechanical properties and metallurgical characteristics of M3 rotary and M3 pro gold niti files

C. Virgillito<sup>1</sup>, E. Pedullà<sup>1</sup>, F. Lo Savio<sup>2</sup>, G.R.M. La Rosa<sup>1</sup>, S. Rapisarda<sup>1</sup>, G. La Rosa<sup>2</sup>, P. Verzi<sup>1</sup>, G. Gambarini<sup>3</sup>

<sup>1</sup>Department of General Surgery and Surgical – Medical Specialties, University of Catania, Catania, Italy; <sup>2</sup>Industrial Engineering, University of Catania, Catania, Italy; <sup>3</sup>Department of Endodontics, La Sapienza University, Rome, Italy

**BACKGROUND:** The purpose of this study was to evaluate mechanical properties and metallurgical characteristics of two new files: M3 Rotary and M3 Pro Gold files (United Dental, Shanghai, China).

**METHODS:** One hundred-sixty new M3 Rotary and M3 Pro Gold files (#20/0.04 and #25/0.04) were used. Torque and angle of rotation at failure of new instruments ( $n = 20$ ) were measured according to ISO 3630-1. Each file was clamped at 3 mm from the tip using a chuck connected to a torque-sensing load cell; after which, the shaft of the file was fastened into an opposing chuck able to be rotated with a stepper motor. All tested files were rotated in the clockwise direction at a speed of 2 revolutions per minute until file separation. The torque load (Ncm) and angular rotation (°) were monitored continuously using a torsionmeter (Sabri Dental Enterprises, Downers Grove, IL) at room temperature ( $21^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ), and the ultimate torsional strength and angle of rotation at failure were recorded. The cyclic fatigue tests were performed using a custom-made device that allowed a reproducible simulation of an instrument confined in an artificial curved canal as described previously. The artificial canal was manufactured by reproducing the instrument size and taper, thus providing the instrument with a suitable trajectory with a 60° angle of curvature and a 5-mm radius of curvature. The instruments were rotated at a constant speed of 300 rpm by using a 6:1 reduction handpiece (Sirona, Bensheim, Germany) powered by a torque-controlled endodontic motor (Silver; VDW, Munich, Germany). All instruments were rotated until fracture occurred. For each instrument, the time to fracture in seconds was recorded by the same operator with a chronometer. The metallurgical characteristics were investigated by differential scanning calorimetry (DSC) (TA Instruments, New Castle, DE). Moreover, the fracture surface of each fragment was examined with a scanning electron microscope (SEM) (ZEISS Supra 35VP; Oberkochen,

GmbH, Germany). Data were analyzed using the analysis of variance and the Student-Newman-Keuls test ( $P < 0.05$ ).

**RESULTS:** Comparing the same size of the two different instruments, cyclic fatigue of M3 Pro Gold files was significantly higher than the M3 Rotary ones ( $P < 0.001$ ). No difference was observed between M3 Rotary and Pro Gold files in terms of maximum torque load ( $P > 0.05$ ) while a significantly higher angular rotation to fracture was observed for M3 Pro Gold ( $P < 0.05$ ). In DSC analysis, M3 Pro Gold showed one prominent peak in heating curve and two prominent peaks in cooling curve. On the contrast, M3 Rotary files showed one small peak on heating curve and one small peak on cooling curve.

**CONCLUSIONS:** M3 Pro Gold files showed greater flexibility and angular rotation in comparison with the M3 Rotary ones without decrement of their torque resistance. The superior flexibility of M3 Pro Gold could be attributed to the martensite phase.

### Effects of continuous or reciprocating optimum torque reverse motions on cyclic fatigue resistance of two single-file nickel-titanium rotary instruments

G. Sigari<sup>1</sup>, E. Pedullà<sup>1</sup>, E. Ambu<sup>2</sup>, F. Rovai<sup>3</sup>, G. Corsentino<sup>2</sup>, G.R.M. La Rosa<sup>1</sup>, S. Ferlito<sup>1</sup>, S. Grandini<sup>2</sup>

<sup>1</sup>Department of General Surgery and Surgical – Medical Specialties, University of Catania, Catania, Italy; <sup>2</sup>Department of Endodontics and Restorative Dentistry, University of Siena, Siena, Italy; <sup>3</sup>Practitioner, Perugia, Italy

**BACKGROUND:** The aim of this study was to evaluate the resistance to cyclic fatigue of F6 SkyTaper (Komet Brasseler, Lemgo, Germany) and OneShape (Micro Mega, Besançon, France) used in continuous rotation or in reciprocating Optimum Torque Reverse (OTR) motion.

**METHODS:** A total of forty-eight nickel-titanium files were tested. Twenty-four instruments for each brand were divided into two groups ( $n = 12$ ) on the basis of the motion tested: continuous rotation (group 1) or reciprocation of OTR motion (group 2). In both groups, instruments were activated by the torque-controlled motor DentaPort ZX with its specific 1:1 contra-angle handpiece (J. Morita, Kyoto, Japan). In group 1, files were activated in continuous rotation at a constant speed of 300 rpm setting the minimum torque value and by disabling the auto-reverse and auto-stop functions. In group 2 OTR motion was performed setting the OTR function at 300 rpm and adjusting the torque limit at minimum level in order to generate a reciprocation of OTR motion without any phase of continuous rotation. The contact, between the artificial canal and the instrument tested, produces a constant torque value that exceed the one set on the endodontic motor so that the instrument rotates only in OTR reciprocating motion from the beginning of the test until final fracture of the instrument. Resistance to cyclic fatigue was tested in a stainless steel artificial canal with a 60° angle of curvature and 5 mm radius of curvature. For each instrument, the time to fracture (Tf) in seconds from the start of the test until the moment of breakage detected visually and/or audibly, was recorded. To obviate human error, video recording was carried out simultaneously, and the recordings were observed to cross-check the time of file separation. The broken fragments were evaluated under the scanning electron microscope (SEM) (S-4800 II; Hitachi High Technologies, Pleasanton, CA) for topographic features of the fracture surfaces. The Tf data were

## ABSTRACT

analyzed by using the two-way analysis of variance (ANOVA) and Bonferroni post-hoc tests at 0.05 (Prism 5.0; GraphPad Software, Inc, La Jolla, CA).

**RESULTS:** F6 SkyTaper showed higher Ttf compared with OneShape, both in continuous and in OTR motion ( $P < 0.0001$ ). The two tested instruments showed higher cyclic fatigue resistance in reciprocating OTR motion than continuous rotation ( $P < 0.0001$ ).

**CONCLUSIONS:** F6 SkyTaper showed higher cyclic fatigue resistance than OneShape, in both motions. In addition, OTR motion improves significantly cyclic fatigue resistance of tested instruments both.

### Influence of interrupted rotation on cyclic fatigue resistance of ProTaper Next and Mtwo rotary instruments

S. Bocchieri <sup>1</sup>, E. Pedulla <sup>1</sup>, A. Lizio <sup>2</sup>, N.M. Grande <sup>3</sup>, G. Plotino <sup>4</sup>, S. Boninelli <sup>5</sup>, G. Lo Giudice <sup>2</sup>

<sup>1</sup>Department of General Surgery and Surgical-Medical Specialties, University of Catania, Catania; <sup>2</sup>Department of Conservative Dentistry, Dental School, Messina University, Messina, Italy; <sup>3</sup>Catholic University of Sacred Heart, Rome, Italy; <sup>4</sup>C.L.I.D., "La Sapienza", University of Rome, Isernia, Italy; <sup>5</sup>MATIS Institute of Microelectronics and Microsystems National Research Council, Catania, Italy

**BACKGROUND:** To evaluate the influence of interrupted rotation on cyclic fatigue of ProTaper Net (Dentsply Maillefer, Ballaigues, Switzerland) and Mtwo (Sweden & Martina, Padova, Italy) rotary instruments.

**METHODS:** Cyclic fatigue of 300 new ProTaper Next size X1; X2 and Mtwo size 10, .04 taper; size 15, .05 taper; size 20, .06 taper and size 25, .06 taper instruments was tested in continuous or interrupted rotation. Fifty files of the same brand and size were randomly assigned to five groups ( $n = 10$ ). Group 1 instruments were tested in continuous rotation; groups 2 and 3 in paused rotation for 1 s every 10 or 20 s, respectively; groups 4 and 5 in interrupted rotation for 5 s every 10 or 20 s, respectively. Cyclic fatigue was expressed in time to fracture (TtF) in an artificial canal with 60° angle and 5 mm radius of curvature. The interruption of the rotation for 1 or 5 s was performed via a computing platform (Arduino; Smart Project Srl, Strambino, Italy) connected to the torque-controlled motor. It worked as a Start/Stop Timer Module set to activate the interruption for 1 or 5 s every 10 or 20 s of continuous rotation. The time to fracture for each instrument was recorded considering the effective seconds of continuous rotation (without the seconds of interruptions) required to fracture. The fracture surface was examined with a scanning electron microscope (SEM) ZEISS Supra 35VP, GmbH, Oberkochen, Germany). Data were evaluated by two-way analysis of variance.

**RESULTS:** Cyclic fatigue of groups 2 (paused rotation for 1 s every 10 s) and 4 (interrupted rotation for 5 s every 10 s) of ProTaper Next X2 and Mtwo size 25, .06 taper was significantly lower than that of group 1 (files tested in continuous rotation) of the same instruments ( $P < 0.01$ ). ProTaper Next X2 had significantly reduced cyclic fatigue in groups 3 (in paused rotation for 1 s every 20 s) and 5 (interrupted rotation for 5 s every 20 s) ( $P < 0.05$ ). No differences were found by interrupting the rotation for 1 or 5 s in all instruments ( $P > 0.05$ ). Fatigue of other instruments was not affected by interrupted rotation ( $P > 0.05$ ).

**CONCLUSIONS:** Interrupted rotation reduced cyclic fatigue resistance of ProTaper Next X2 and Mtwo size 25, .06 taper, especially when a higher number of interruptions was performed.

### Influence of photon-induced photoacoustic streaming (PIPS) on root canal disinfection and post-operative pain: a randomized clinical trial

E. Gianello, M. Alovise, D. Pasqualini, N. Scotti, E. Berutti

University of Turin, Department of Surgical Sciences, Dental School, Endodontics, Turin, Italy

**BACKGROUND:** Quality of endodontic treatment is considered the most important factor to achieve high success rate. Stage of cleaning is critical to obtain success and several methods of irrigation and activation of irrigating solutions were proposed. PIPS (Photon-Induced Photoacoustic Streaming) method was recently introduced as an additional technique to improve efficiency and speed of cleaning. It implies the use of Er: YAG laser (LightWalker Fotona) and irrigating solutions (NaOCl, EDTA). Potential risk of apical extrusion of infected debris during instrumentation and cleaning, correlated with use of laser, can produce an acute inflammatory response, with possible flare-up and worst post-operative pain perception. This clinical study evaluates ability of PIPS device to reduce the bacterial count in root canals in vivo compared to traditional irrigation, by collecting intracanal bacterial samples before and after endodontic treatment. In addition, the study aims to evaluate extent and duration of post-operative pain during the first seven days after treatment, through a specific questionnaire filled in by patient.

**METHODS:** Twenty-eight patients with apical periodontitis diagnosis, associated with dental pulp necrosis, of multiple or single root canal teeth were selected for endodontic treatment and assigned by randomization to a group: group A ( $n = 14$ ) with traditional irrigation with side-vented endodontic needles and group B ( $n = 14$ ) with PIPS method applied according to protocol. In both groups, isolation with rubber dam, dental surface disinfection with peroxyde and access cavity were performed. Mechanical glide-path with ProGlider (PG) (Dentsply Maillefer) was executed, followed by shaping with ProTaper Next (PTN) X1, X2 or X3 (Dentsply Maillefer). Irrigation was carried out with NaClO 5% and EDTA 10% solutions, used alternatively. In both groups intracanal samples were taken before and after endodontic treatment with sterile paper points and were subjected to culture test. Data distribution of microbial analysis was evaluated with Kolmogorov-Smirnov normality test. Differences between the two groups were analysed with Mann-Whitney test ( $p < 0.05$ ). Self-assessment questionnaire was given to patients to evaluate post-operative pain, possibly occurring in the first seven days after therapy. Variation of quality of life's indicators was assessed with a special form of analysis of variance for repeated measurements. The Student's T-test was used for amount of painkillers recruited. Statistical software SPSS version 17.0 was used. Endoral periapical radiographies were performed after 6 and 12 months from the therapy to evaluate the healing.

**RESULTS:** Irrigation with PIPS device is more effective than conventional irrigation in reducing intracanal bacterial count in vivo. This reduction is statistically significant in the



non-selective, highly nutritious medium, suitable for isolation and culture of obligate anaerobes from clinical specimens. Within necrotic teeth's root canals, a bacterial count consisting specially in anaerobic bacteria, the main responsables of endodontic infection, is expected. PIPS method does not adversely affect postoperative pain perceived by the patient. There are not statistically significant differences between the two groups for quality of life's indicators, except the amount of painkillers recruited, which results to be lower for the traditional method.

**CONCLUSIONS:** Antimicrobial ability of PIPS method allows to achieve optimum results of disinfection of endodontic system *in vivo*. Postoperative pain, correlated with potential risk of apical extrusion of debris, results to be comparable between traditional irrigation method and PIPS method. Therefore PIPS device could represent a promising aid to root canals disinfection, specially in case of simplified operative protocols and reduced times of instrumentation.

### **Biocompatibility of bioceramic materials in endodontics: a comparative study**

V. Mola, M. Alovisi, D. Pasqualini, N. Scotti, E. Berutti

*University of Turin, Department of Surgical Sciences, Dental School, Endodontics, Turin, Italy*

**BACKGROUND:** Bioceramic materials are typically used in dentistry to repair root defects, perforations or apifications. This study aims to compare the biocompatibility and the osteogenic potential of different bioceramic materials *in vitro* using the same human cell line model and to investigate their effect on the cells differentiation. The materials analyzed were: (i) Mineral Trioxide Aggregate (MTA), the current gold standard in clinical practice that harden also in the presence of dampness; (ii) Biodentine™, with a reduced hardening time and (iii) three new bioceramic calcium phosphate silicate cements with a different composition but the same clinical indications. In particular, we tested: Root Repairing Material Putty (RRMPU), Root Repairing Material Paste (RRMPA) and Root Repairing Material Putty Fast Set (FSP). This new bioceramic materials have been recently introduced in the endodontic proposal, they are offered in a premixed formula, in a jar or a syringe, and promise to be biocompatible as well as MTA or Biodentine. Moreover the FSP formula has a quicker hardening time: 20 minutes. In literature there are no many studies investigating biocompatibility and mineralization of this new materials.

**METHODS:** 1 mm thick and 5 mm in diameter discs were made for each material, sterilized through 2 hours of UV exposure. MG-63 human osteoblastic-like cells were cultured with the specimen (15 days) and tested for: (i) biocompatibility (evaluation of any morphology changing and cells survival), (ii) ALP activity assay and (iii) Alizarin Red Staining (ARS) to detect mineralization nodule deposition both to evaluate the osteogenic differentiation. Unexposed cells acted as the control group. The cells were monitored and photographed with a microscope Evos fl at different times: the biocompatibility at T0, 24 and 48 hours, and the osteogenic differentiation every 24 hours for 15 days. Statistical analysis was carried out using the ordinary one-way ANOVA test (Tukey's multiple comparisons test). Significance has been defined as NEJM: 0.12 ns (not significant), 0.033 (\*), 0.002 (\*\*),  $e < 0.001$  (\*\*\*)).

**RESULTS:** All materials tested had suitable biocompatibility

and bioactivity, without inducing cells morphology changing. The ALP activity level increased in all cements inducing mineralization nodule deposition, especially in RRMPU ( $p < 0.001$ ) and FST ( $p < 0.001$ ) compared to MTA considered the gold standard. ARS revealed a significant potential to induce mineralization *in vitro* for RRMPU ( $p < 0.0001$ ), FSP ( $p = 0.0003$ ) and Biodentine™ ( $p < 0.0001$ ).

**CONCLUSIONS:** The data obtained in this *in vitro* study are in agreement with those described in the literature both for mineralization nodule deposition and for osteogenic differentiation. Further analysis will be needed to confirm and validate the results. However, we can conclude that the bioceramics here tested showed good level of biocompatibility and bioactivity, even higher than the materials currently used in everyday clinical practice. Furthermore, these new ceramic cements show considerable price differences, resulting cheaper than MTA.

### **Influence of photon-induced photoacoustic streaming (PIPS) on root canal disinfection: an *in vitro* study**

M. Bertaina, M. Alovisi, D. Pasqualini, N. Scotti, E. Berutti

*University of Turin, Department of Surgical Sciences, Dental School, Endodontics, Turin, Italy*

**BACKGROUND:** The aim of this study was to compare the efficiency of the root canal cleaning with two irrigation systems: the traditional one, with syringe and endodontic needle, and the activation of hypochlorite mediated by the Photon- Induced Photoacoustic Streaming (PIPS) technique. This technique assumes the use of an Er:YAG laser which is based on photo-acoustic and photomechanical phenomena rather than photo-thermal to activate the irrigant.

**METHODS:** 22 human single-root teeth were selected. They were instrumented with ProGlider and ProTaper Next X1, X2 (Dentsply Maillefer, Ballaigues, Switzerland) at working length (WL) used at 300 rpm and torque 4.0 Ncm. During the instrumentation teeth were irrigated with 10 ml NaOCl 5% and 10 ml EDTA 10%. The root canals were sterilized in autoclave and then were infected with a culture of *Enterococcus Faecalis* ATCC 29212 ( $3 \times 10^7$  CFU/ml) in Brain Heart Infusion (BHI; Oxoid, Milan, Italy); they were incubated for 2 weeks. At the end of the incubation, teeth were rinsed with 5 ml of physiological solution and divided in different groups. Nine teeth were treated with traditional irrigation: the canal was irrigated with NaOCl 1.5% for 30", and then rinsed with 5 ml of physiological solution. The drawing was carried out with a paper point carried at the working length and placed in a test tube with 2 ml of sodium thioglycolate (TG) (Bioline, Milan). Nine teeth consisted of the PIPS group: the canal was irrigated for 30" with NaOCl 1.5% and treated with PIPS laser (LightWalker AT, Fotona, Ljubljana, Slovenia) set at energy levels between 20 and 50 mJ, frequencies between 10 and 15 Hz, with very short pulses of 50 microseconds. Then teeth was washed with 5 ml of physiological solution; the drawing was carried out with a paper point and placed in a test tube with 2 ml of TG. The tip of the PIPS instrument has been placed in the pulp chamber ensuring a continuous replacement of the solution. Two teeth were used as positive controls to evaluate the infection: they were irrigated with 5 ml of physiological solution, the drawing was carried out with a paper point and placed in a test tube with 2 ml of TG. The

## ABSTRACT

last two teeth were not infected and were evaluated as negative controls. Then the bacterial charge in the dental canals was evaluated: for each tooth 1:10 scalar dilutions were made in sterile distilled water. 100 µl aliquots from each tooth were sown on Brain Heart Infusion Agar (BHA, Biolife, Milan) site. Plates were incubated at 37°C to 5% CO<sub>2</sub> for 48 hours, and the results expressed as ufc / ml.

**RESULTS:** The results identify a greater reduction in bacterial charge in teeth where hypochlorite was activated by the PIPS laser compared to the conventional irrigation teeth. The results were statistically significant ( $p = 0.0335$ ).

**CONCLUSIONS:** The application of the PIPS method can be considered a valid irrigation activation system that can reduce working times and ensure a mini-invasive approach.

### Electronic working length variation during the endodontic treatment: a randomized clinical trial

D. Mirra, M. Alovisi, D. Pasqualini, N. Scotti, E. Berutti

*University of Turin, Department of Surgical Sciences, Dental School, Endodontics, Turin, Italy*

**BACKGROUND:** There are many studies concerning the accuracy and repeatability of the electronic working length. However, there are no studies about the motivations of a possible non-constant working length between the first and the second appointment. A randomized clinical trial was designed to evaluate the changes of working length between the end of the shaping and the canal filling performed in the second appointment (after seven days). These variations were evaluated through a questionnaire compiled by the operator during the clinical phase. The type of tooth (single or multiple canal teeth), the preoperative pulp status (vital or necrotic teeth) and the presence of acute apical periodontitis (PAA) or endodontic lesion (LEO) were considered.

**METHODS:** The first canal scouting phase was performed with a manual stainless steel k-file #10 (Dentsply Sirona), the glide path was created manually or mechanically with Proglider (Dentsply Sirona) up to working length (WL). Root canal shaping was performed with one of the following systems: ProTaper Universal (PTU), ProTaper Next (PTN) or MTwo (M2) up to the diameter required by the apical foramen. The electronic working length (EWL) was detected four times: the first during the canal scouting, the second at the end of the glide path with k-file # 20 Nitiflex (also with a radiographic check), the third after the shaping completion with K-file # 20 Nitiflex. The last detection was performed 7 days after with a K-file # 20 Nitiflex before filling. The electronic working length was detected after the creation of a horizontal plane on the reference cusp. The apex locator used was Morita Root ZX (J Morita Corp. Kyoto, Japan). The length was measured on the millimeter endodontic gauge and immediately reported on the module using a discrete scale of 0.5 mm. The procedure was repeated for all four measurements of the EWL.

**RESULTS:** 106 teeth were included in the study and subjected to the statistical analysis. The EWL variation observed between the end of the shaping and the filling session performed after 7 days was 34% of the cases. This variation displayed a value of 0.5 mm in more than 90% of the cases. The EWL variation in multi rooted teeth was 41%; while in single rooted teeth was 17%. EWL variation for necrotic

elements was 25% and 45.5% for vital ones. The variables that showed a statistically significant impact on EWL variation were acute apical periodontitis ( $P=0.0110$ ) and the type of canal instrumentation ( $P=0.0006$ ). The presence of LEO showed a weak impact ( $P=0.0708$ ).

**CONCLUSIONS:** The hypotheses to justify the EWL variations most likely involve inflammatory status induced by chemo-mechanical disinfection maneuvers that can induce an acute inflammatory process resulting in a variation in the environmental conditions in which the apex locator works. Another hypothesis is a variation of the architectural pattern of the root apex and periapical tissues, due to the inflammatory process, which is capable of providing about 0.5 mm of variation. This implies that the operator has to re-check the working length during the second appointment before proceeding with canal filling.

### Micro-CT study on cadaver of micro-cracks formation after rotary and reciprocating instrumentation

R. Tassone, M. Alovisi, D. Pasqualini, N. Scotti, E. Berutti

*University of Turin, Department of Surgical Sciences, Dental School, Endodontics, Turin, Italy*

**BACKGROUND:** The aim of this micro-CT study is to describe the micro-cracks formation in cadaver lower incisors during glide path and shaping phases with rotary and reciprocating instruments.

**METHODS:** Twenty-one cadaver lower incisors surrounded by alveolar bone were collected. After a periapical radiography, every tooth was opened with a diamond bur. Then, the canal scouting with a 10 K-file and a second control radiography was done. Seven elements were discarded: 3 damaged during the section phase and 4 for the impossibility to find the root canal. Fourteen elements were divided in two groups (7 elements each group): group REC and group CONT. A first scan with the micro-CT was made before the canal instrumentation (100 kW, 100 µA, 16,8 micron). In the REC group, the glide path was performed with reciprocating instruments Wave One Gold Glider (Dentsply Sirona) up to working length (WL), while in the CONT group with continuous rotary instruments Proglider (Dentsply Sirona). The second micro-CT acquisition was done at the end of glide path. For the shaping phase, reciprocating instruments Wave One Gold Primary (Dentsply Sirona) were used in the REC group, while in CONT group were used rotary ProTaper Next X1 and X2 (Dentsply Sirona). EDTA 10% and Sodium hypochlorite 5% were used for irrigation. The third micro-CT acquisition was done after the shaping phase. Four specialists have observed the 10908 slices obtained during the post shaping acquisition and they noted the position of the micro-cracks, the number of slices with the cracks and their localization (coronal, medium or apical third of the root). A descriptive analysis for all the variables was done. The Chi-square test was used to valutate the difference between the two groups (REC and CONT)  $P<0.05$ .

**RESULTS:** Twelve of fourteen dental elements presented cracks, the 85,71% of the samples. Five elements (35,71%) showed cracks before treatment, 1 element (8,33%) developed a micro-crack during the glide path phase and 6 elements (50%) after shaping. Twenty seven cracks were found: 8 before treatment, 3 after glide path and 19 post shaping. Our

study analyzed 10908 slices for every phase of instrumentation (initial, post glide path and post shaping). Were observed on average 780 slices for every sample, from the cemento-enamel junction to the apex. In the pre-treatment acquisition 36 (0.33%) teeth showed cracks, 29 in the REC group and 7 in the CONT group. At the end of shaping phase 114 slices reported micro-cracks (1,05 %): 37 slices after glide path phase, 11 in the REC group and 26 in the CONT group. After shaping phase, 77 slices showed dentinal defects, 39 in the REC group and 38 in the CONT one. The result of Chi square test was 3,44 ( $p=0,06$ ). There isn't a statistically significant difference between the two groups.

**CONCLUSIONS:** The method used in this study, based on the analysis of cadaver teeth and the micro-CT acquisition, is considered the most accurate to avoid bias caused by the element extraction and section. The endodontic instruments rotary or reciprocating motion didn't influence the micro-cracks formation.

### Micro-CT evaluation of ProTaper Next and WaveOne Gold Glide path and shaping outcomes in maxillary first molars curved canals

M. Bernardi, F. Tutino, M. Alovisi, D. Pasqualini, N. Scotti, E. Berutti

University of Turin, Department of Surgical Sciences, Dental School, Endodontics, Turin, Italy

**BACKGROUND:** The aim of this micro-CT study was to compare the geometrical shaping outcomes of WaveOne Gold Glider and WaveOne Gold Primary reciprocating files with ProGlider and ProTaper Next.

**METHODS:** fifteen extracted maxillary first permanent molars were selected and the mesiobuccal canals were considered. Specimens were micro-CT scanned before instrumentation and were divided in two different groups: in the group WOG glide path was performed with WaveOne Gold Glider (Dentsply Sirona) and shaping with WaveOne Gold Primary (size 025, taper .07) up to working length (WL). In the group PTN glide path was performed with ProGlider (Dentsply Sirona) and shaping with ProTaper Next X2 (size 025, taper .07) up to WL. Irrigation was achieved with 5% NaOCl and 10% EDTA. Specimens were scanned post instrumentation for the matching of the pre and post-operative volumes. Surface area, canal volume, root canal centering ability (centroid shift), canal symmetrical enlargement (meant by RDR and RA ratios) and thickness of dentinal wall at inner curvature were assessed in the apical and coronal levels and at the point of maximum canal curvature.

**RESULTS:** Post glide path analysis showed that the increase of root canal volume is not different ( $P > 0.05$ ) between groups; while the root canal surface variation is at the limits of significance ( $P = 0.051$ ) and it is greater for the WaveOne Gold Glider. In the coronal third the canal geometry enlargement is lower after the use of ProGlider and the difference between centroid displacement is not statistically significant ( $P > 0.05$ ) even if the trend seems more favorable for the Proglider. At the point of maximum curvature, the centroid shift had no statistical significance ( $P > 0.05$ ) while in the apical third the centroid shift difference between the two groups is statistically significant ( $P = 0.020$ ) with reduced values for the WaveOne Gold Glider. Post shaping analysis revealed that volume and canal surface area increases are significantly different and show a reduced removal of dental

tissue for the PTN group compared to the WOG group ( $P = 0.003$ ). The percentage of dentin removed on the furcation side at the point of maximum curvature had an average of 19.6% for the WOG group and 11.2% for the PTN group ( $P = 0.016$ ). Between the two groups there were no significant differences about the displacement of the centroid in any of the three levels of analysis ( $P > 0.05$ ). In the coronal third RDR is more favorable for the PTN group ( $P = 0.087$ ) while RA is close to 1 for the WOG group. At the point of maximum curvature RDR is at the limit of significance ( $P = 0.056$ ) while RA is significant and demonstrates a reduced root canal widening for the PTN group ( $P = 0.019$ ). Apically RDR is not significant, while RA displayed more favorable values for the WOG group ( $P = 0.040$ ).

**CONCLUSIONS:** Both instrumentation systems maintained the original canal anatomy without aberrations. WOG system showed slight less favorable results mainly at the coronal and middle level of analysis.

### Prevalence of candida spp. In endodontic infections: systematic review and meta-analysis

G. Mergoni<sup>1</sup>, D. Percudani<sup>2</sup>, D. Catalano<sup>1</sup>, P. Bertani<sup>1</sup>, M. Manfredi<sup>1</sup>

<sup>1</sup>Centro Universitario di Odontoiatria, Dipartimento di Medicina e Chirurgia, Università di Parma, Parma, Italy; <sup>2</sup>Biblioteca Centrale di Medicina, Università di Parma, Parma, Italy

**BACKGROUND:** *Candida* species (*Candida* spp.) are eukaryotic diploid sexual yeasts of the fungi kingdom and are present in the oral microbiota in humans as normal commensals. Many studies have investigated *Candida* in endodontic infections but its contribution in apical periodontitis is still debatable. In order to shed some light on the role of *Candida* spp. as endodontic pathogens, we did a systematic review of the literature to answer the following focused questions:

1. What is the prevalence of *Candida* spp. in endodontic infections?
2. Which *Candida* species are isolated in endodontic infections?
3. In the presence of a significant heterogeneity of the results, can this be explained by some of the clinical or methodological characteristics of the studies?

**METHODS:** Extensive literature search has been carried out in the most important electronic biomedical databases and additional studies were identified from references of relevant papers. For each study title, authors, year of publication, patients' nationality, method of *Candida* spp. detection, sampling modality, species of *Candida* detected and their prevalence, type of endodontic infection (primary or secondary/persistent), presence or absence of symptoms, presence or absence of direct communication between oral cavity and root canal system were recorded. Studies were critically appraised using a modified version of Joanna Briggs Institute Critical Appraisal Checklist.

**RESULTS:** From 2,225 unique records, 1,959 were excluded on the basis of title and abstract. Of the remaining 109 studies, 52 were excluded after full-text review and 57 were included for qualitative and quantitative analysis. The overall prevalence of *Candida* spp. in root canal infections was 8.20% (95% confidence interval: 5.56-11.21%). *Candida albicans* was the most frequently isolated species. Significant heterogeneity among studies was observed ( $P < 0.001$ ,  $I^2 = 86.07\%$ ). Subgroup analyses revealed a higher prevalence of



## ABSTRACT

*Candida* spp. from African samples. All studies considered, a high or unclear risk of bias was prevalent regarding six out of the eight items considered in the critical appraisal.

**CONCLUSIONS:** *Candida* spp. occurred in a small proportion of root canal infections. To reveal the possibilities and necessity to develop treatment strategies targeted at *Candida* spp., further research which clarifies the contribution of fungi to the microbial ecology in infected root canals and the challenge to the host in the periapical tissues is needed.

### Comparison of sterilization methods for gutta-percha filled teeth

A. Pascarella<sup>1</sup>, N.M. Grande<sup>1</sup>, R. Castagnola<sup>1</sup>, S. Antetomaso<sup>1</sup>, F. Bugli<sup>2</sup>, C. Martini<sup>2</sup>, M. Sanguineti<sup>2</sup>, L. Marigo<sup>1</sup>

<sup>1</sup>Department of Operative Dentistry and Endodontics, Università Cattolica del Sacro Cuore, Fondazione Policlinico Agostino Gemelli, Rome, Italy; <sup>2</sup>Institute of Microbiology, Università Cattolica del Sacro Cuore, Fondazione Policlinico Agostino Gemelli, Rome, Italy

**BACKGROUND:** The aim of this study is to compare the efficacy of three different sterilization techniques to sterilize gutta-percha filled teeth and the ability of these methods to preserve the quality of the filling materials and the sealing of root canal.

**METHODS:** The study consists of two phases, the first related to the evaluation of the sterilization efficacy and the second related to the evaluation of the sterilization effects on the gutta-percha. For the first part of the study 34 single root extracted teeth were selected and divided in three experimental groups (n=10) and one control group (n=4). All the samples have been prepared with Mtwo files to a size able to prepare circumferentially the apical third, this size was chosen based on the file gauging. The smaller preparation size was 25 .06 while the wider diameter used was 40 .04 with an average size of preparation of 30 .05. After the phase of chemo-mechanical preparation was completed the specimens were filled with gutta-percha and AH plus sealer using a single cone technique. The specimens (n=30) were then divided in 3 groups: Group A was sterilized with plasma sterilization, Group B with beta ray sterilization and Group C with an autoclave. After the sterilization procedures six samples of each experimental group and two samples of the control group were subjected to viable counts (in both agar cultures and liquid growth media) to evaluate the presence of microorganisms. Four samples of the experimental groups and two samples of the control group were sectioned on the transverse and longitudinal plane and analyzed with a light microscope (40x and 20x). For the second part of the experiment were used 14 gutta-percha pellets and 8 guttatore obturators divided into three experimental groups (n=4 pellets, n=2 guttatore) and one control group (n=2 pellets, n=2 guttatore). Each sample was marked with a longitudinal pen line and its length and diameter measured with a digital gauge. Group A was sterilized with plasma sterilization, Group B with beta ray sterilization and Group C with autoclave. After the sterilization procedures the samples were analyzed to evaluate macroscopic changes of the gutta-percha (distortions of the pen line) and their length and diameter were measured. The data were analyzed using a non parametric Kruskal Wallis test (p<0.05). **RESULTS:** Microbiological analysis results were evaluated as positive or negative depending on the presence

or absence of any bacteria. All the experimental samples were negative while the samples of the control group were positive. With the light microscope was made an assessment of the quality of the sealing with a positive or negative result. Only the Group C had negative results. In the second part of the study Group C showed a statistically significant difference with both Group A and Group B (p<0.05), while no statistically significant difference has been found between Group A and Group B (p>0.05)

**CONCLUSIONS:** Beta ray sterilization and plasma sterilization can both be viable sterilization methods for teeth that have been endodontically treated and sealed. According to our study this low temperatures sterilization techniques do not damage the gutta-percha and the quality of the sealing remains unchanged.

### Positive pressure irrigation (PPI) vs. passive ultrasonic irrigation (PUI), analysis to reduce vapour lock effect. Sistematic review and meta-analysis

M. Dioguardi<sup>1</sup>, G. Di Gioia<sup>1</sup>, A. De Lillo<sup>1</sup>, A. Cocco<sup>1</sup>, O. Di Fede<sup>2</sup>, R. Mauceri<sup>2</sup>, G. Illuzzi<sup>1</sup>

<sup>1</sup>Dipartimento di Medicina Clinica e Sperimentale, Università di Foggia, Foggia, Italia; <sup>2</sup>Dipartimento di Discipline Chirurgiche, Oncologiche e Stomatologiche, Università di Palermo, Palermo, Italy

**BACKGROUND:** The vapor lock effect, consists in the production of air or gas bubbles inside a close-ended system; the formation of bubbles in the apical third of the canal leads to the impossibility for irrigant solutions to chemically cleanse those endodontic sections more susceptible to failures and relapses. Vapor lock is produced by both physical and chemical phenomena, like the release of CO<sub>2</sub> by necrotic pulp tissues, being dissolved by sodium hypochlorite. Irrigating the root-canal system is provided by the injection of the disinfecting solution with the use of a syringe, that must not be engaged to the canal walls: this technique is called Positive Pressure Irrigation; whilst, the so called Passive Ultrasonic Irrigation, is a technique where the ultrasonic tip of the instrument is introduced inside the canal, fulfilled with irrigant solution, and being activated in order to increase the cleansing and disinfecting action of sodium hypochlorite. In this study we revised the literature including studies that were made using artificial canals and extracted teeth, preventively shaped, and we will extract data related to vapor lock formation and its eventual elimination after the adoption of sodium hypochlorite upgrading action techniques, focusing more on the Passive Ultrasonic Irrigation method. We will establish if, using modern shaping techniques, there's a major incidence in vapor lock formation and if it is reduced using the techniques to upgrade irrigant solutions activity.

**METHODS:** Search strategy being applied on PUBMED was made using the following keyword: vapor lock (66records); vapour lock (1record). On EBSCO database the same search has produced the following results: vapor lock (10 records); vapour lock (7records). Scholar Google was also consulted typing in search bar "vapor lock endodontic" producing around 844 records, of which only one was taken in exam, after consultation between reviewers.

Later on, overlaps have been eliminated and articles not containing P.U.I. have been exclude. Of these 5 articles, only 3 have been taken in consideration after the inclusion criteria

application, in order to be used for quantitative analysis.

**RESULTS:** From each study we extracted data related to vapor lock presence (outcome) in every single sample, both for P.U.I. and P.P.I. methods. Results are shown in the forest plot and all of the three studies are in favor of the P.U.I. method. Study by (Castelo-Baz Martin-Biedma et al. 2012) reports the presence of vapor lock in 6 case samples; study by (Sainz-Pardo Estevez et al. 2014) reports the presence of vapor lock in 3 samples: it must be considered that this study makes an initial distinguish of samples between close-ended and open-ended systems and the vapor lock presence in P.U.I. treated samples of open-ended systems results negative. Study by (Castelo-Baz Varela-Patino et al. 2016) shows the presence of vapor lock in 12 samples treated with P.U.I. Overall, in 20 samples treated with P.P.I. there is the presence of vapor lock. **CONCLUSIONS:** From the quantitative and qualitative analysis, it is clear and evident how is possible to reduce vapor lock formation with the use of P.U.I. and how this can be almost inevitable with the use of P.P.I.. The reviewers strongly recommend the use of P.U.I. to remove vapor lock, especially at the end of the shaping phase in an endodontic treatment.

### Dental structures by nuclear magnetic resonance micro-imaging: an *in vitro* study

D. Di Nardo, V. Ferri, A. Morese, A. Mazzoni, A. Del Giudice, M. Seracchiani

*Sapienza University of Rome, Department of Oral and Maxillo Facial Sciences, School of Endodontics, Rome, Italy*

**BACKGROUND:** In the last five years, the dental usage of MRI has grown in popularity for its potential in diagnosis, treatment planning and evaluation of the outcome in endodontics. Aim of this work is to evaluate the various field of application of Magnetic Resonance Imaging in the endodontics therapy and highlight its current advantages and limitations in order to understand its future application in clinical common practice. The effectiveness in revealing the presence or absence of a pathological condition affecting dental hard structures, such as enamel, dentin and eventually calcified masses was investigated. Furthermore endodontic space and the quality of the apical seal of an endodontic sealing technique were taken into account.

**METHODS:** Three extracted monoradicular teeth were analyzed using a Bruker Avance-400 high resolution spectrometer operating at 9.4 T with a microimaging probe (10 mm internal diameter), equipped with a gradient unit characterized by a maximum gradient strength of 1200 mT/m and a rise time of 100  $\mu$ s. XWINNMR. and ParaVision. 3.0 software were employed for data acquisition and analysis. The first specimen was an extracted upper canine. In order to access the endodontic space, a spherical diamond bur has been used. The apical patency was checked using an endodontic k-file #10. Second specimen was a not treated inferior supernumerary central incisor. It was extracted due to mobility and pain when it was still positive to cold pulp test. The third specimen was a previously endodontic treated radicular remnant. The teeth were later immersed in distilled water. Images of teeth were weighted in T2 at different TE to measure T2 relaxation times and in Apparent Diffusion Coefficient (ADC) in different regions of interest (ROI).

**RESULTS:** T2 and ADC values were obtained at different ROI. Clear images of carious lesions, periodontal tissues,

pulpal remnants and endodontic materials such as guttapercha cones were acquired. In the present study, in order to detect caries, microcracks, quality of canal obturation and the presence of pulpal remnants into the endodontic space, MRI was pursued. In detail, for the first specimen, the ability of water to fill all tooth spaces has been exploited by MRI to highlight endodontic canals, decays, periodontal remains, lateral canals, microcracks and to evaluate the effectiveness of an endodontic treatment.

**CONCLUSIONS:** Micro MRI is a non-invasive, non-destructive device for the assessment of pathological conditions affecting dental hard and soft tissues. Besides it may help in finding inadequate endodontic treatments, such as incomplete detersion or inadequate tridimensional filling *in vitro*. MR imaging may also take its place in future as an adjunct diagnostic tool, due to its several advantages, even if the radiographic examination will still be the diagnostic method of choice in endodontics, MRI can visualize soft dental tissues, can differentiate tissues, vessels and nerves in regenerative techniques, and is harmless as it does not involve any ionizing radiation.

### Wear analysis of wave one gold after clinical use

C. Pirani, R. Michelle Fitzgibbon, F. Iacono, F. Michelini, C. Nucci, M.G. Gandolfi, C. Prati

*School of Dentistry, Endodontic Clinical Section, Master in Clinical Endodontology, Department of Biomedical and Neuro-motor Sciences, University of Bologna, Bologna, Italy*

**BACKGROUND:** Aim of this study was to evaluate the impact of the clinical use on the superficial characteristics of the Wave One Gold Nickel-Titanium (NiTi) reciprocating instruments.

**METHODS:** Ten Wave One Gold Primary files (Dentply Maillefer, Baillagues, Switzerland) were inspected by Scanning Electron Microscope (SEM) (JSM-5200, JEOL, Japan) in as-received condition and after clinical uses with same angulations to identify the wear features. Each file was used in multi-rooted teeth to instrument 3-4 canals each. Working length was electronically established (Root ZX, Morita, Japan) and confirmed by an intra-operative radiograph. After an adequate glide path, preliminarily created with a 10 K-file (Dentply Maillefer) and ProGlider instrument (Dentply Maillefer), Wave One Gold Primary files were used following the manufacturer's recommendation on a X-Smart Plus motor (Maillefer) in "WaveOne All" reciprocating setting. During treatment the canal patency was frequently verified with a manual K-file #10 and irrigation was continuously ensured with 3ml of 5% NaOCl (Ogna, Muggiò, Italy) and with 3ml of 10% EDTA (Ogna). A single trained operator performed all treatments and the endodontic procedures were verified with intra and post-operative radiographs. After use Wave One Gold were autoclaved, discarded and inspected by SEM in the same points and with the same angulation of previous investigation. Micrographs were taken at increasing magnification from 35X to 3500X, on the tip and on cutting edges at 5 mm from the tip, to compare surface characteristics and to identify the wear induced by the clinical use. Number of fractures, microcracks, blunt/disruption of cutting edge and tip deformations were reported.

**RESULTS:** No instrument fractured during clinical procedures. Metal strips were noticed on the cutting edge of

## ABSTRACT

new instruments and partially maintained after clinical use. Tip profile and milling grooves of the machining process remained well-defined and only limited area of blades flattening were observed at high magnification. Only one instrument presented an isolated microcrack on the surface of a cutting edge.

**CONCLUSIONS:** In most cases the instruments presented an intact surface and absence of superficial cracks, maintaining their structural properties also after clinical stress. WaveOne Gold instruments demonstrated a safe clinical use in multi-rooted teeth showing only a limited degree of usage-induced degradation.

### Impact of a new kinematics on the fatigue resistance of reciprocating instruments

F. Iacono<sup>1</sup>, C. Pirani<sup>1</sup>, A. Arias<sup>2</sup>, C. Bianchini<sup>1</sup>, J. C. de La Macorra<sup>2</sup>, L. Generali<sup>3</sup>, M. R. Gatto<sup>1</sup>, M. G. Gandolfi<sup>1</sup>, C. Prati<sup>1</sup>

<sup>1</sup>School of Dentistry, Endodontic Clinical Section, Master in Clinical Endodontology, Department of Biomedical and Neuro-motor Sciences, University of Bologna, Bologna, Italy; <sup>2</sup>Department of Conservative Dentistry, School of Dentistry, Complutense University, Madrid, Spain; <sup>3</sup>Department of Surgery, Medicine, Dentistry and Morphological Sciences with Transplant Surgery, Oncology and Regenerative Medicine Relevance (CHIMOMO), School of Dentistry, Endodontic Section, University of Modena and Reggio Emilia, Modena, Italy

**BACKGROUND:** Evaluate the impact of a modified kinematics on the fatigue life of four commercially available reciprocating instruments.

**METHODS:** Cyclic fatigue of nickel-titanium reciprocating instruments was evaluated by measuring the time to fracture in an artificial stainless-steel canal with a curvature of 90° and 5mm radius. One-hundred-sixty instruments of four different brands were tested: WaveOne Gold and WaveOne (Dentply Maillefer, Baillagues, Switzerland), Reciproc Blue and Reciproc (VDW, Munich, Germany). The cyclic fatigue was determined with two different motors and kinematics settings: 1) X-Smart Plus (Dentply Maillefer) used in "WaveOne All" or "Reciproc All" setting, according to manufacturer's instruction; 2) a 4:1 contra-angle (Cefla, Imola, Italy) with an experimental kinematics (Goldspeed EVOE4 - Cefla, Italy) (EVO) with different rotation angles and based on a sinusoidal acceleration. All the files were reciprocated until the occurrence of the fracture and the time to fracture was visually recorded with a digital stopwatch (3M ESPE, St. Paul, MN, USA). The mean life, beta and eta were calculated for each group and compared with Weibull analysis. Clockwise (CW) and counter-clockwise (CCW) angles, as well as their interpolation with seconds to fractures (CW+CCW angles X seconds to failure/60) were also calculated and reported as number of cycles to failure (NCF). **RESULTS:** Reciproc Blue were significantly the most resistant instruments either when used with EVO or X-Smart motor. WaveOne Gold lasted significantly longer than WaveOne with EVO motor (probability of 91%) while no significant differences were found when tested with X-Smart motor. Reciproc, WaveOne Gold and Reciproc Blue lasted significantly longer when actioned with EVO than with X-Smart, with probabilities of 66%, 80% and 89% respectively, when data were considered in NCF. WaveOne Gold instruments showed the highest beta parameter.

**CONCLUSIONS:** The experimental kinematics was found

to have a positive impact on fatigue lifetime of reciprocating instruments. The present findings suggest the possibility of future improvements in the clinical use of reciprocating files. The current study also confirmed that new heat-treatment processes of the alloys (i.e. Gold and Blue) provided a substantial benefit when compared to the previous generation of reciprocating instruments.

### Microcracks formation in microsurgical endodontics on cadaver teeth: a micro CT study

M. Solavagione

Università degli Studi di Torino, Turin, Italy

**BACKGROUND:** The target of Endodontics is the long-term preservation of teeth and modern techniques are based on a mini-invasive approach towards remaining dental structures. New ultrasonic root-end preparation devices allows to remove selectively radicular tissue in the third apical region permitting the preparation of conservative and straight cavities. However, microcracks can occur due to retrocavity preparation with surgical burs and vibratory action of such instruments.

The purpose of this study was to evaluate the relationship between retrograde preparation and microcracks appearance and propagation on root-end surfaces scanned by microCT. **METHODS:** 7 human cadaver heads were dissected and mandibles were taken, subsequently 14 specimens were obtained, which consisted in 14 anterior teeth, due to avoid bias caused by extraction alveolar bone was preserved around the teeth. Therefore specimens were subjected to endodontic treatment using rotating or reciprocating instruments and then sealed by system B technique with guttapercha cones. Retrograde preparations were then practiced. Treatment consisted in: 1) Root-end resection making a bevel with a Lindemann surgery FG 26mm bur and subsequent microCT evaluation; 2) Ultrasonic preparation with Pro-Ultra retrotip and again following microCT scans. 2 different tips were used in order to avoid excessive usury which can cause itself micro-cracks creation and propagation, furthermore the order of instrumentation was randomly determined and registered due to evaluate the relationship between tip consumption and micro-cracks appearance.

**RESULTS:** 2158 slices in total were analyzed in order to evaluate formation and propagation of microcracks: new micro cracks were found in 62 slices (2.87%) caused by bevel creation, increased to 94 (4.35%) after ultrasonic preparation with a 51.6% incidence increase due to microcrack propagation. However only 2 specimens out of 14 revealed new microcracks caused by the only ultrasonic preparation. Contrariwise no statistically significant differences were observed between usury and cracks appearance.

**CONCLUSIONS:** The analysis based on anatomic specimen from cadavers and the observation of microCT scans is considered the most reliable method because of the avoiding of possible bias caused by tooth extraction and section. Since as ultrasonic tips seem to create multi axial stresses on root-end surfaces, evaluating their influence on microcracks creation due to optimize surgical instrument design results fundamental. Bevel preparation with surgical bur seems to be the main cause of micro cracks formation, which tend to propagate after ultrasonic instrumentation. Although enlargement of this study with a bigger amount of specimens results necessary.



## Naïve commitment towards pulp repairing/regeneration of dental pulp stem cells CD34+ subpopulation

G. Spagnuolo<sup>1</sup>, M. Marrelli<sup>2</sup>, F. Paduano<sup>3</sup>, C. Rengo<sup>1</sup>, S. Rengo<sup>1</sup>, M. Tatullo<sup>3</sup>

<sup>1</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University of Naples "Federico II", Naples, Italy; <sup>2</sup>Unit of Experimental Medicine, Marrelli Health, Crotone, Italy; <sup>3</sup>Tecnologica Research Institute, Stem Cells Unit, Crotone, Italy

**BACKGROUND:** Tissue engineering is a growing part of biomedicine even more interested towards dental sciences. Dental tissues are widely reported in the scientific literature to be reliable and useful source of Mesenchymal Stem Cells: dental pulp is among the most investigated stem cells niche, moreover, Dental Pulp Stem Cells (DPSCs) are the most promising to achieve dental pulp regeneration, by means of engineered scaffolds. DPSCs have been widely described as heterogeneous and characterized in different subpopulations capable of expressing different markers and having different characteristics. Specifically, despite the literature reports that MSCs deriving from dental tissues doesn't express the marker CD34, subpopulation of DPSCs-CD34+ have been isolated and investigated as well. Our aim is to better understand the biology of DPSCs-CD34+ and such cells could have a specific role in the regeneration/repairing of dental pulp.

**METHODS:** DPSCs were obtained from dental pulp, as previously described. In order to investigate if CD34+ phenotype was expressed in our samples, flow-cytofluorimetric assay was performed on 3 samples. To monitoring the phenotype over time, the CD34 expression was assessed at 5 different culture passages (P1-P5) in vitro. The same protocol was performed also for other 3 different oral-derived MSCs (Dental Follicular Stem Cells, Periodontal Ligament Stem Cells and human-Periapical Cysts-MSCs).

**RESULTS:** Cytofluorimetric analyses showed that marker CD34 was initially expressed (P1) in DPSCs. Interestingly, this marker tends progressively to become less expressed, probably as effect of the in vitro manipulations and for the absence of the native cell niche: CD34 is expressed at 3.51% in DPSCs after P4, while it is almost absent after P5 (0.29%). The absence of this marker, on the other hand, is documented by our experiments in the other cell lines analysed at each passage in vitro. Our data argued the loss of CD34 expression during the in vitro culturing of DPSCs: previous studies have reported that DPSCs-CD34+ showed lower stemness, early cell senescence and a better commitment towards neurogenic phenotype. These results support the hypothesis that CD34 is expressed in the DPSCs early generated in the pulp tissue; afterward, such cells gradually lose the ability to express CD34 over time, as reported after few in vitro manipulations.

**CONCLUSIONS:** Dental pulp is a specialized connective tissue, highly innervated and vascularized and, therefore, with the presence of embryologically heterogeneous tissues. Dental pulp repair / regeneration is a process that requires the ability of resident stem cells to differentiate both to mesodermal and ectodermal lineages. The DPSCs-CD34+ subpopulation has been shown to be natively led to differentiate versus phenotypes of both lineages. Therefore, these results lead to prefer this sub-population in future tissue-engineered pulp therapies.

## Micro-CT evaluation of three different shaping systems

F. Motta<sup>1</sup>, N. M. Grande<sup>1</sup>, R. Castagnola<sup>1</sup>, L. Marigo<sup>2</sup>, R. Pecci<sup>3</sup>, R. Bedini<sup>3</sup>

<sup>1</sup>Department of Endodontics, School of Dentistry, Catholic University of Sacred Heart, Rome, Italy; <sup>2</sup>Operative Dentistry, School of Dentistry, Catholic University of Sacred Heart, Rome, Italy; <sup>3</sup>Health Department, Istituto Superiore di Sanità (Italian National Institute of Health), Rome, Italy

**BACKGROUND:** The aim of this study was to compare the root canal shaping efficacy of three different NiTi systems: ProTaper Next, WaveOne Gold, HyFlex EDM; using Micro-CT analysis.

**METHODS:** Twenty-one teeth (nine incisors, nine premolars, three lower first molars) were selected after scanning using Micro-CT (SkyScan 1072; SkyScan, Kartuizersweg, Belgium) and assigned to three experimental groups (n = 7) according to the canal preparation technique: ProTaper Next (Dentsply Sirona, Ballaigues, Switzerland), WaveOne Gold (Dentsply Sirona, Ballaigues, Switzerland), HyFlex EDM (Coltene/Whaledent AG, Altstätten, Switzerland). A second scan was performed after shaping. The data obtained, were analyzed and compared with Resolve RT Amira (Visage imaging; Mercury computer system, Berlin, Germany) to evaluate the percentage of touched canal surface (PTCS), the volume of removed dentin (VRD) and the canal transportation (CT) at coronal, medium and apical levels.

Statistical data were compared using one-way ANOVA test. The significance level was set at p<0.05.

**RESULTS:** Statistically significant differences were not found concerning the VRD, PTCS and CT with the exception of the resulting VRD and PTCS on the coronal third, where the ProTaper Next removed more dentin (P < 0.05).

**CONCLUSIONS:** The results can be explained with the different movement, that in the reciprocating group can be assimilated to the Roane's Balanced Forces Technique. All three systems showed root canal shaping efficacy in terms of maintaining root canal axis geometry, of dentinal area contacted by the instrument and in roundness of the preparation. ProTaper Next showed an higher amount of dentine removed in the coronal third, this can be due with the geometry of the files. Generally, during the shaping of the root canal was achieved an enlarging of the canal shape without preparation errors. However, no one of the analysed systems was capable to contact the entire dentinal surface of the root canal, especially in presence of medium/severe curves. This remarks the great influence, beyond the shaping system geometry and metallurgy, of the original anatomy of the root canals over the quality and success of the canal shaping.

## Reliability of cone beam computed tomography in endodontics. A statistical evaluation

F. Nicità<sup>1</sup>, F. Puleio<sup>1</sup>, M. Calapaj<sup>1</sup>, A. Leo<sup>1</sup>, G. Lo Giudice<sup>1</sup>, G. Pantaleo<sup>2</sup>

<sup>1</sup>Dipartimento BIOMORF Università degli Studi di Messina, Messina, Italy; <sup>2</sup>Dipartimento di Neuroscienze e Scienze Riproduttive ed Odontostomatologiche Università degli Studi di Napoli Federico II, Naples, Italy

**BACKGROUND:** The aim of this study was to evaluate the accuracy of cone beam computed tomography (CBCT) in comparison with conventional intraoral radiographs, commonly used in different clinical situations, regarding endo-

## ABSTRACT

dontic pathology. CBCT in endodontics should provide not only a 3D evaluation of the region of interest but also produce images with adequate spatial resolution to allow a detailed assessment of the dental element and surrounding alveolar anatomy. Therefore, CBCT can be a powerful mean in endodontic diagnosis, treatment planning and follow-up.

**METHODS:** Statistical analysis was performed on 118 patients, some with previous endodontic treatments and others who needed to undergo a new radiographic screening necessary for endodontic therapy. All patients underwent CBCT screening for surgical reasons. The CBCT scans obtained were compared with the corresponding periapical images to evaluate the presence and extent of endodontic pathologies.

Two groups of patient were formed:

A. Patients who don't present any endodontic pathology to the intraoral radiography and the CBCT;

B. Patients who present endodontic pathology.

CBCT images have been taken using a HYPERION X9, a hybrid platform that offers a wide range of 2D analyses, cephalometric projections and 3D technology. iRYS software was used to elaborate acquired data. All images were evaluated independently by two operators. Any disagreement was resolved after accurate interpretation of results. Data were analysed for statistical differences.

**RESULTS:** Among 118 patients, 37 (31%) did not present any endodontic pathology (group A), 81 (69%) patients (group B) showed the presence of endodontic pathology in diagnostic investigations. Within group B, signs of endodontic pathology were detectable in CBCT scans in 100% of cases. 18.5% of patients showed signs of endodontic pathology both in intraoral radiography and CBCT. From the exclusive analysis of the intraoral investigation any presence of endodontic pathology was evident (0%). The endodontic lesions found were represented by internal and external resorptions (3.7%), root fractures (2.5%), perforations (1.2%), incongruous endodontic treatments (11.1%), pulp chamber floor fractures (1.2%), periapical lesions (39.5%) and untreated root canals (40.7%).

**CONCLUSIONS:** Radiograph exams allow to obtain diagnostic data for a more accurate diagnosis and correct treatment plan. An intraoral rx investigation is useful to detect signs of endodontic pathologies and make a correct diagnosis, however, it presents some limitations, that nowadays could be overcome by computed tomography. Our study shows that some important radiological signs acquired using CBCT, such as periapical lesions, incongruous endodontic treatments, root fractures, internal and external absorption, perforations, not result to be evident in images obtained by using conventional intraoral radiographs. Despite of numerous advantages over conventional intraoral radiographs, CBCT is considered as a II level exam and could not be used for a common screening, while carried out for others outcomes can give important information required in endodontics. Furthermore, it must be considered only whereas it could be useful for a more accurate diagnosis and a better management of endodontic problems.

### Clinical-grade stem cell model with antioxidant and osteoinductive properties applicable in osteolytic periapical lesions

M. Tatullo<sup>1</sup>, M. Marrelli<sup>2</sup>, F. Paduano<sup>1</sup>, G. Spagnuolo<sup>3</sup>, S. Rengo<sup>3</sup>, C. Rengo<sup>3</sup>

<sup>1</sup>Tecnologica Research Institute, Stem Cells Unit, Crotona, Italy; <sup>2</sup>Unit of Experimental Medicine, Marrelli Health, Crotona, Italy; <sup>3</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University of Naples "Federico II", Naples, Italy

**BACKGROUND:** MSCs have the ability to activate in-situ healing processes by means of paracrine effects and by stimulating cell **homing** to the damaged tissues. Tissue repairing involves multiple biologically active factors, often largely present in the human blood. Platelet lysate (PL) has shown to be an efficient promoter of wound healing in several in vitro cell models; however, in vitro expanded cells can normally accumulate oxidative stress damage, that is quite similar to the oxidative damage suffered in vivo, during inflammatory processes. Therefore, creating a clinical-grade model with antioxidant properties is particularly important to make that model usable in inflammatory periapical lesions. Ginseng contains many bioactive compounds, called ginsenosides, which have antioxidant properties. Among the ginsenosides abundantly present in the ginseng plant there is the Rg1, belonging to the group-PPT, with interesting antioxidant and osteoinductive functions. The aim is to verify the reparative and osteoinductive characteristics of a model based on stem cells from periapical cysts (hPCy-MSCs) grown in culture medium enriched with Rg1 and PL. This model could represent a strategic and clinical-grade approach to the regeneration of periapical osteolytic lesions.

**METHODS:**

*Wound-scratch assay on hPCy-MSCs*

Subconfluent hPCy-MSCs were plated in 33mm petri dishes, up to the confluence of 95-100% in  $\alpha$ -MEM with 10% FBS, and with PL 1%; with a sterile tip, damage was created on the cellular layer, in order to simulate an "injury" in vitro; finally, reparative behavior is analyzed.

*hPCy-MSCs CFU assays*

hPCy-MSCs were plated with the addition of different concentration of Rg1 (1, 5 and 10  $\mu$ mol/L) and colony-forming units in vitro assay was performed. hPCy-MSCs were seeded with basal medium for 24 hours. In the second step,  $\alpha$ -MEM medium supplemented with 10% of PL was enriched with 3 different amounts of Rg1 (1, 5 and 10  $\mu$ mol/L). After 15 days, hPCy-MSCs were washed twice with phosphate buffered saline (PBS), fixed and stained with Giemsa for 20 minutes.

*von Kossa staining of hPCy-MSCs* von Kossa staining has been performed to check if dentinogenesis or osteogenesis were achieved. hPCy-MSCs were induced in  $\alpha$ -MEM with 10% PL. Rg1 (10  $\mu$ mol/L) was added as test.

**RESULTS:** PL enhanced hPCy-MSCs migration in vitro, from the wound edges. One week after scratch, hPCy-MSCs in 1% PL were able to fully close the open wound area. Colonies were counted after 15 days. The CFU number of hPCy-MSCs in Rg1 group (1, 5 and 10  $\mu$ mol/L) was significantly higher than control group, confirming the inductive ability of Rg1.

Rg1-treated hPCy-MSCs showed a visible improved formation of calcium nodules, with respect to the control.

**CONCLUSIONS:** hPCy-MSCs are stem cells isolated from cystic periapical lesions. The use of these cells, together with PL that improves tissue healing without using bovine serum, and together with Rg1 that showed osteoinductive effects without slowing tissue repair, represents an innovative in vitro model with strategic potential in endodontic applications.

## Cyclic fatigue resistance of two different instruments used in reciprocating motion

G. Miccoli, V. Ferri, M. Seracchiani, V. Di Giacinto, S. Coppola, A. Morese

*Sapienza University of Rome, Department of Oral and Maxillo Facial Sciences, School of Endodontics, Rome, Italy*

**BACKGROUND:** The aim was to evaluate the resistance to the cyclic fatigue of two different Nickel-Titanium instruments, Rezipflow (Komet, Brasseler GmbH & Co., Lemgo, Germany) and WaveOne (Dentsply Maillefer, Ballaigues, Switzerland).

**METHODS:** 40 different NiTi endodontic instruments of length of 25 mm and tip size of 0.25 underwent to a cyclic fatigue test. 20 Wave One Primary, tip size 25 and variable taper (Dentsply Maillefer, Ballaigues, Switzerland) and 20 Rezipflow (Komet, Brasseler GmbH & Co., Lemgo, Germany) tip size 25 and taper 06. All instruments were same size and used in the same reciprocating motion. Cyclic fatigue testing was performed in a stainless steel (SS) root canal made for the aim. This artificial root canal was made with a 5 mm radius of curvature and an angle of curvature of 90 degrees. This device was already used in previous studies. The instruments were both used in the same preset program, because no proprietary reciprocating motion was realized by Komet for Rezipflow, the proprietary motion for Wave One was used. Each instru-

ment was rotated until separation happened and the time to fracture (TtF) was recorded. Data were statistically analyzed using the SPSS 17.0 software (SPSS Incorporated, Chicago, IL, USA). As the fracture occurred, the time was recorded, the fractured fragment was analyzed, and the fracture length was registered (FL). Means and standard deviations of TtF and FL were calculated and data were subjected to the Student's T-Test ( $P < 0.05$ ).

**RESULTS:** No statistically significant differences ( $P > 0.05$ ) were noted between Rezipflow and WaveOne instruments. Mean values for time to fracture for Rezipflow instruments were 50,75 seconds (SD +/- 20,06) and for WO instruments were 30,13 seconds (SD +/- 9,40). Statistical analysis did not found significant differences between the two instruments ( $p > 0,05$ ). There were no significant differences ( $P > 0.05$ ) in the average length of the separated fragments between the two instruments.

**CONCLUSIONS:** This study did not found any significant differences in cyclic fatigue resistance between Rezipflow and WaveOne instruments. Since motion was the same, this lack of difference can be related to two factors: the different cross sectional shape or the different thermal treatment of the two instruments. However, further studies are needed to better evaluate the specific role of these two different characteristics, cross-sectional design and the thermal treatment of the alloy, in improving fatigue resistance.



# GNATOLOGIA

## TMD: condylar dysfunctional remodeling and recorticalization

F. Forin Valvecchi, R. Conte, A. De Stefani, G. Bruno, A. Gracco, E. Stellini

*University of Padua, Department of Neuroscience, Dental School, Padua, Italy*

**BACKGROUND:** Temporomandibular disorder (TMD) is a collective term comprehending different clinical issues involving masticatory muscles, temporomandibular joint (TMJ) and other associated structures. TMD diagnosis is not made for its pathogenesis or aetiology, but mainly on the clinical symptoms. Primary dysfunction develops mostly on four factors: individual predisposition, high psychomotor activity (due to stress or parafunction), occlusal instability and low or absent tissue adaptation capability. On the other hand, secondary disorders can be caused by hereditary or congenital diseases, rheumatic inflammatory diseases, autoimmune and tumoral diseases. Secondary factors may worsen a primary dysfunction, determining a multifactorial aetiology mediated by triggering and perpetuating predisposing factors. During their function, the condyles undergo a structural adaptive and physiological remodelling, but when mechanical stress exceeds adaptive capability, dysfunctional remodelling phenomena may occur. It is characterized by significant condylar morphological modifications at the level of the head of the condyle (smaller condyle), break of cortical integrity and reduced mandibular ramus height with subsequent mandibular retrusion and articular function alteration. The aim of this study is to compare the condylar recorticalization amount after two different therapeutic protocols.

**METHODS:** This is a case-control study. 20 TMD patients were chosen and each of them underwent a documentation protocol including extraoral and intraoral photographs, dental casts, casts mounting on the articulator to evaluate CPI (CO-CR discrepancy index) and cone beam computed tomography (CBCT) of the mandibular condyles taken in closed mouth position. For the radiographic evaluation, a Planmeca ProMax 3D Mid system was utilized with an acquiring volume of 80x80 mm dimension, exposition 90 kV, 10.0 mA, 12 seconds with a DAP (Dose Area Product) of 1094 mGy<sup>2</sup> x cm<sup>2</sup> for each condyle. The acquired volume was elaborated by the Planmeca Romexis (version 3.2.0.R) software and TMJ module. 7 coronal cuts and 10 sagittal cuts were performed on the head of the condyle to highlight the amount of corticalization, before and after the application of two different therapeutic protocols. Protocol number 1 (10 patients) included the exclusive use of a splint, while protocol number 2 (10 patients) included the use of a splint associated with pharmacological therapy (FANS, antioxidant, Omega3). The reevaluation was performed on asymptomatic patient after a period of 6-8 months.

**RESULTS:** No significant differences in the amount of corticalization were found in the radiographic reevaluation between

the two different therapeutic protocols, even though it was noticed that the use of drugs brought to a symptoms resolution in a shorter period of time.

**CONCLUSIONS:** According to this study, pharmacological protocol in the therapy of TMD does not seem to affect condylar corticalization. Drugs although seems to accelerate the disappearance of clinic symptomatology, but more researches are needed to valid these findings.

## 3D evaluation of gnathological therapy by passive aligners: case report

G. Roselli<sup>1</sup>, M. Masi<sup>1</sup>, M. Macri<sup>2</sup>, A. Agea<sup>3</sup>, F. Festa<sup>2</sup>

*<sup>1</sup>School of Orthodontics, Department of Medical, Oral and Biotechnological Sciences, University G. D'Annunzio, Via dei Vestini, Chieti, Italy; <sup>2</sup>Department of Medical, Oral and Biotechnological Sciences, University G. D'Annunzio, Via dei Vestini, Chieti, Italy; <sup>3</sup>Ecclesiastical institution- regional general hospital "F. Miulli" Km. 4,100, strada prov.le 127 Acquaviva delle Fonti-Santeramo in Colle, 70021 Acquaviva delle Fonti, Italy*

**BACKGROUND:** Digitization represented a radical change in diagnosis and gnathological therapy. This allowed the operator to obtain advantages in terms of efficacy, quality and personalization of care, as well as having an objective and realistic result of the proposed treatments. A case report is presented below by three-dimensional reconstruction using the tc cone beam and the Dolphin software the action of gnathological therapy according to the proposed protocol of the "Gabriele d'Annunzio" University of Chieti-Pescara on chewing muscles.

**METHODS:** Man, aged 44, mesofacial, convex profile, second molar class on the right and left, deep bite and second incisal division. The patient claims to have frequent headaches and a pulsating headache that deals with anti-inflammatory drugs, to keep the teeth tight more than 15 hours a day, resulting in pains in the dental elements especially in the morning. The clinical situation shows the patient's clinical situation: the lateral, opening and protrusive movements are normal, hyper-keratotic line on the buccal mucosa and irregularity of the lingual edges, index of a patient ligator. At muscular palpation there is a diffuse tenderness of all the jaw muscles in a symmetrical manner, pain in trapezius and temporal. The patient declares to have a symptomatology that is localized in the right and left area at the temporal, occipital and cervical level. The patient quantifies pain on the VAS scale with the value of 9. The tc cone beam t0 shows hypertrophy of chewing muscles and a backward position of the condyles inside the glenoid cavities. The patient was submitted to the proposed therapeutic protocol of the "Gabriele d'Annunzio" University of Chieti-Pescara with the use of passive aligners, with a thickness of less than one millimeter in the upper and lower alternate arches: the upper one is carried during the night hours, the lower one during the day; a neuromuscular programming with a proprioception of the tongue and the entire group of

chewing muscles; a rehabilitative therapy program related to postural muscles with strengthening and stretching of the paravertebral muscles.

**RESULTS:** The patient after two months the patient declares to have had a reduction of the events (headache and headache) with the disappearance of the symptomatology at the temporal level, Vas at 6; After 6 months it is possible to observe how the patient no longer shows an important muscular symptomatology and declares to have reduced the events but not completely and the episodes of headache that are rare. At 2 years the patient appears asymptomatic. A new cone beam tc is requested during the control visit. From the comparison between the tc cone beam t0 and the tc cone beam t1 it can be stated that the patient presents after two years with a structural change of the masticatory muscles, in particular the masseter which is elongated and reduced in thickness.

**CONCLUSIONS:** This result allows us to state that the therapeutic protocol used is valid and effective not only for the reduction of pain symptoms associated with temporomandibular disorders.

## Functional evaluation of awake (AB) and sleep bruxism (SB) activity in a symptomatic subject

G. Cavinato, F. Cocilovo, A. Bracci, D. Manfredini, E. Stellini, L. Favero

**BACKGROUND:** Evaluation of the awake and sleep bruxism activity in a young woman that came to our attention for an intense, acute pain in the masticatory muscles and frequent episodes of headache in the temple area.

**METHODS:** The patient had a right temporomandibular joint (TMJ) click for years, which became more intense in the months before she asked for advice to the School of Dentistry, University of Padova. Clinical examination showed tenderness of the right (dx) masseter muscle and left (sx) masseter muscle, bilateral temporal muscle, inferior head of lateral pterygoid muscle, upper and lateral area of the dx and sx temporomandibular joint, limited mouth opening with "s" opening pattern. The evaluation of AB was made with the smartphone application "BruxApp", which monitors the jaw muscles activity, also with respect to teeth contact, by sending 20 alarms between 8 am and 10 pm. When the patient hears the alarm, he/she must choose between 5 different conditions that appears on the smartphone's display: relaxed (relaxed muscles and space between upper and lower dental arch), jaw clenching (the masticatory muscles are contracted without teeth contact), dental contact (light contact between upper and lower dental arch with relaxed muscles), tooth clenching (contracted muscles and upper and lower teeth in strong contact) and grinding (teeth scratch between them). The evaluation of SB was made with the portable bruxism holter "BruxOff", a device which is able to simultaneously record masseter muscles activity and heart activity. When the device is turned on it has to be set up to the maximum strength of contraction by tooth clenching with maximum force, so that the threshold to discriminate from swallowing can be set.

**RESULTS:** Over a total of 16 alarms that have been answered by the patient, 0 revealed a relaxed condition, 7 jaw clenching, and 9 revealed dental contact; the patient reported dental ache and pain associated with mouth opening and closing. The night registration lasted 7 hours and 54 minutes, for a total bruxism episodes of 41 with a bruxism index of 6.

**CONCLUSIONS:** Modern devices allow the clinicians to

evaluate precisely and on time the frequency of bruxism activity during the wakefulness and sleep. To enhance the accuracy of the survey, more nights of registration of the bruxism activity should be required, as well as a longer period of use with BruxApp. Such an approach with app-based ecological momentary assessment has 2 huge advantages: first, it allows the clinician to control the patient bruxism activity during the day, and second, it allows the patient to focus more attention on his/her jaw muscles activity and possibly correct any wrong habits that can be responsible for pain symptoms.

## A retrospective observational study on the effectiveness of direct bite raiser onlays in patients affected by myofascial pain disorders

F. Agostini, C. Romeo, R. Ursini, L. Giuliani, C. Grippaudo

*Postgraduate School in Orthodontics, Catholic University of the Sacred Heart, Rome, Italy*

**BACKGROUND:** Direct bite raiser onlays (DBRO) can be used as a therapeutic option for myofascial pain disorders, in alternative to stabilization splint treatment. They stimulate the reprogramming of the neuromuscular engram, reduce abnormal muscular activity and produce neuromuscular balance. A component of uncontrolled extrusion of the anterior teeth is present and useful to stabilize therapeutic results. The aim of this retrospective observational study is to assess the effectiveness of direct bite raiser onlays in patients affected by myofascial pain disorders.

**METHODS:** We screened the electronic records of male and female patients with a diagnosis of temporomandibular disorders, aged 0-65 years, who had been treated with DBRO. All patients with myofascial pain of all degrees of severity were included in the analysis. Patients who had unsuccessfully undergone splint therapy or other TMD treatments in the past were not excluded. Patients with systemic disease and comorbidities were excluded. A data collection was performed from patients' records pain at the beginning and at the end of treatment limitation in mandibular range of motion at the beginning and at the end of treatment number of repetitive occlusal adjustment and/or resurfacing in course of treatment discomfort at the beginning of treatment, related to the presence of the direct bite raiser onlays in the oral cavity time frame necessary for treatment and number of checks carried out. We also gathered a range of other clinical and demographic data that were recorded in the patients' electronic notes, including sex, age at the initiation of treatment, previous gnathological treatments, diagnosis of muscular and/or intracapsular disorders.

**RESULTS:** After applying our inclusion criteria, a final sample of 31 patients, 6 male and 25 female aged 13-65 years, was selected. The mean age of the participants was 35,26 years, SD=16,7. 14 patients (45,2%) had undergone previously a gnathological therapy. All patients had received a diagnosis of muscular disorder, and 13 of them (41,9%) had a concomitant intracapsular disorder. At the beginning of treatment, 19 patients (61,3%) referred having only pain, 1 patient (3,2%) only functional limitations and 11 patients (35,5%) complained about both, pain and functional limitation. At the end of the treatment, 18 patients (58,1%) were symptom-free. In 9 subjects (29,0%), pain was still present but reduced in intensity. In 4 subjects (12,9%) functional limitations were improved but not completely resolved. During the treatment, that lasted on aver-

## ABSTRACT

age 8,83 months (SD=5,72), a mean of 7,61 checks (SD=3,67) have been carried out; the occlusal changes made on the DBRO had been on average 3,29 (SD=2,46). In 9 patients (29%) initial discomfort occurred after the beginning of treatment.

**CONCLUSIONS:** Because of the limitations of the retrospective observational study design and the relatively small sample size, our results should be treated with caution. As we did not include a comparison group in our study, the changes in the complaint of symptoms as pain and limitation in mandibular range of motion may be a reflection of background variations occurring irrespective of treatment. Despite these limitations, this observational study suggests that direct bite raiser onlays therapy in patients with a diagnosis of myofascial pain disorders is likely to be associated with a significant reduction of pain and limitation in mandibular range of motion when compared with the initial symptomatology.

### Association between anxiety and waking-state oral behaviors in TMD diagnostic subgroups

V. Donnarumma, N. Piscicelli, A. Pango, S. Perrotta, R. Valentino, A. Michelotti

*Department of Neuroscience, Reproductive and Oral Sciences, Section of Orthodontics and Temporomandibular Disorders, University of "Naples Federico II", Naples, Italy*

**BACKGROUND:** Waking-state oral parafunctional behaviors (WOBs) are contributing factors to the development of temporomandibular disorders (TMDs) and include activities like gum chewing, teeth clenching, nail/lip/objects biting, which go beyond physiological functioning of chewing, swallowing, and talking. They can be detected through objective methods or self-reported questionnaires. WOBs are also known to be associated with mood disorders, such as anxiety, in individuals with orofacial pain due to TMDs. However, information about this relationship in specific diagnostic TMD-subgroups are still limited and controversial. The aim of the present study is to assess the association between WOBs and anxiety in subgroups of TMD-patients and to compare them with a control group of subjects free from TMDs.

**METHODS:** Subjects  $\geq 18$  years old, with a unique DC/TMD diagnosis, were included in the study. Patients with trigeminal neuralgia, fibromyalgia, burning mouth syndrome, atypical facial pain, atypical odontalgia, migraine, cervical pain and neuropathic pain were excluded. 369 subjects (267 females, 102 males; mean $\pm$ SD age 37.95 $\pm$ 16.39 years) were recruited from a pool of 785 screened patients and divided into two subgroups: pain-free TMD-Dysfunction (n=70) and Painful-TMD (based on a pain diagnosis and Characteristic Pain Intensity  $>0$ , n=299). The control group included TMD-Free participants (270 females, 104 males; mean $\pm$ SD age 37.1 $\pm$ 15.9 years). All participants completed the Oral Behavior Checklist (OBC) and the Generalized Anxiety Disorder Scale (GAD-7), two validated and standardized self-report questionnaires assessing, respectively, the frequency of WOBs (clenching, grinding, chewing gum, holding objects etc) and the severity of anxiety of a subject. Spearman correlation analysis was used to assess the relationship between the total score of OBC (OBC\_TS) and the total score of GAD-7 (GAD-7\_TS); differences as concerns GAD-7\_TS between groups (CTR, TMD-Dysfunction and Painful-TMD) ( $p < 0.05$ ) were estimated through the nonparametric Kruskal-Wallis test, followed by Dunn's post-test for multiple comparisons.

**RESULTS:** Differences in GAD-7\_TS, determined using

Kruskal-Wallis test, were significant when comparing CTR, Dysfunction and Pain groups [ $H(2) = 10.5, p < 0.01$ ]. In particular, post hoc pair-wise comparisons showed that the median GAD-7\_TS in TMD-Pain subjects (7, IQR 4 - 12) was significantly higher with respect to TMD-Dysfunction subjects (5, IQR 2-8). A moderate correlation was found between GAD-7\_TS and OBC\_TS in all population ( $\rho=0.37, p<0.001$ ) and was confirmed when considering single groups: CTR ( $\rho=0.33, p<0.001$ ), TMD-Dysfunction ( $\rho=0.26, p<0.05$ ) and TMD-Pain ( $\rho=0.43, p<0.001$ ).

**CONCLUSIONS:** Anxiety is more present in subjects affected from pain due to TMDs and it is correlated to the frequency of waking-state self-reported oral behaviors. Hence, clinicians should focus not only on oral habits but also on psychological characteristics, such as anxiety, in the multifactorial treatment of TMDs.

### Evaluation of pressure pain threshold in children with juvenile idiopathic arthritis

R. Valentino, D. Di Rosa, R. Rongo, S. Perrotta, A. Sagliocca, V. D'antò, R. Valletta

*University of Naples Federico II, Department of Neuroscience, Reproductive Sciences and Oral Sciences, Section of Orthodontic and Temporomandibular Disorders, Naples, Italy*

**BACKGROUND:** According to previous studies, patients affected by Juvenile Idiopathic Arthritis (JIA) show a significantly lower pain threshold compared to healthy controls. The pain threshold was reduced in all analyzed areas including areas unaffected by JIA. The aim of this study was to evaluate the pressure pain threshold in JIA patients and to explore factors influencing pain perception by using a digital pressure algometer.

**METHODS:** The sample included 46 children (38 girls and 8 boys) diagnosed with JIA according to International League of Association for Rheumatology criteria at least 6 month before. We excluded children affected by comorbidities potentially associated with pain (i.e. fibromyalgia). Recruited children aged between 7 and 16 years (mean age 11,2 $\pm$ 2,84 years). A specialist in temporomandibular disorders and orofacial pain visited all JIA patients according to Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). To measure the pressure pain threshold a digital pressure algometer was used testing the following muscular and articular areas: thenar, masseter and anterior temporalis muscles and temporomandibular joint. All areas were tested on both sides. Pressure was applied manually to the area of interest by using a tip fixed on the gauge. The algometer was always held perpendicular to the body area analyzed. Pressure was gradually applied at an even rate, about 0,1 kg/s, onto the area of interest: as soon as the child expressed the onset of pain, the test was stopped. Afterward all children and parents were asked to fill in a questionnaire on main demographic and clinical disease related variables.

**RESULTS:** In a univariate analysis, we evaluate the association between PPT and following factors: age class, gender, arthritis subtype, pain from palpation of masseter and temporalis muscles and TMJ, presence of clicking, popping or grating sound, and onset disease. The pressure pain threshold was significantly lower among patients with polyarticular or systemic JIA ( mean value 305 g/mm<sup>2</sup>) compared to patients affected by oligoarticular subtype ( mean value 271 g/mm<sup>2</sup>) with a p value= 0,008. A lower PPT was found also in patients report-



ing a positive pain palpation and TMJ pain ( mean value 243 g/mm<sup>2</sup>) compared to patients without pain ( mean value 301 g/mm<sup>2</sup>) with a p value=0,00002. Concerning TMJ sounds, the PPT was significantly lower in patients without TMJ sounds (mean value 278 g/mm<sup>2</sup>) compared to patients reporting articular sounds ( mean value 304 g/mm<sup>2</sup>) with a p value=,0,03. Age, gender and disease duration were not associated with a reduced pressure pain threshold (p value > 0,005).

**CONCLUSIONS:** Pain is an important symptom in children with JIA; it is a multifaceted condition only partly explained by clinical features. This study confirms the potential role of the activity of illness and other clinical factors as predictors of a reduced pressure pain tolerance. Multivariate analysis is need to determine the weight of independent predictors.

### Evaluation of temporomandibular disorders and comorbidities in patients with EHLER-DANLOS: clinical and digital findings

P. Di Giacomo, G. Ferrato, E. Serritella, C. Vompì, C. Di Paolo  
Department of Oral and Maxillo-facial Sciences, Sapienza University of Rome, Rome, Italy

**BACKGROUND:** To recognize representative cranio-cervico-mandibular features of patients with Ehler-Danlos syndrome and associated temporomandibular disorders, in order to assess a targeted and integrated treatment plan. Ehlers-Danlos syndromes are characterized by underdiagnosed heritable connective tissue disorders such as synovial joints hypermobility, hyperextensible skin and associated musculoskeletal, visceral, pelvic and neurologic dysfunctions. Temporomandibular joints and related structures are also involved with pain, dysfunctions and presence of associated comorbidities.

**METHODS:** Subjects with Ehler-Danlos syndrome were recruited at the Department of Rare Diseases of Policlinico Umberto I, "Sapienza" University of Rome. Among these, patients with referred temporomandibular symptomatology were sent to the Department of Oral and Maxillo-facial Sciences of Policlinico Umberto I, "Sapienza" University of Rome. Thirty-eight patients ( 30 females and 8 males) with an average age of 34 years were selected, between January 2017 and February 2018. Subjects eligible for study had provided signed informed consent, according to the World Medical Association's Declaration of Helsinki. *Gnathological evaluation*, according to Diagnostic Criteria for temporomandibular disorders and radiographic imaging was performed. *Psychological questionnaire* - Symptom Check list revised 90- was submitted to each patient. In addition, digital evaluation of occlusal and muscular balance, using *surface Electromyography* of jaw muscles, was conducted.

**RESULTS.** *Gnathologic evaluation.* Most common joint disorders in patients with Ehler-Danlos syndrome are mono or bilateral disc displacements and mono or bilateral subluxation. Patients referred pain in correspondence of temporomandibular joints and masticatory muscles with high frequency and severe intensity, according to Verbal Numeric Scale. Headache and neck pain- with high intensity of perceived pain, according to Verbal Numeric Scale -were the most frequent comorbidities. *Psychological Evaluation.* The Symptom Check list revised 90, for the analysis of the most recurrent psychological disorders, reported high percentage of somatization, depression, anxiety and obsessive-compulsive behavior. *Electromyographic analysis.* Significant data emerged. In

the sample, 95 % (36 patients) had BAR (occlusal-muscular centre of gravity) in an anterior position. IMP ( index of parafunction and muscular fatigue) value was increased in the 95% of patients and indicated the presence of parafunctions. Symmetry indexes were also altered except for POC MM (index of standardized contraction symmetry within the couple of masseters). Descriptive statistics were executed.

**CONCLUSIONS:** Early diagnosis and interception are requested in order to avoid injuries and repeated traumatism. Multidisciplinary treatments are available to approach all the aspects of the syndrome.

### Evaluation of psychological well-being in patients affected by juvenile idiopathic arthritis

R. Valentino, R. Rongo, D. Di Rosa, S. Perrotta, C. Sangiuolo, V. D'Antò, A. Michelotti

University of Naples Federico II, Department of Neuroscience, Reproductive Sciences and Oral Sciences, Section of Orthodontic and Temporomandibular Disorders, Naples, Italy

**BACKGROUND:** Juvenile idiopathic arthritis (JIA) is a form of arthritis of unknown etiology that represents the most common rheumatic disease among patients under 16 years old. It consists in an inflammatory joint process that in its initial phase can involve one or both temporomandibular joints (TMJ) with a prevalence of 75-85%. Previous studies evaluated the correlation between JIA and a state of anxiety: according to some Authors, the impact of negative emotions, above all anxiety, in these subjects could amplify the somatic sensitivity in children already affected by this rheumatic disease. The purpose of our study was to evaluate the relationship between signs and symptoms of temporomandibular disorders in children and adolescents suffering from JIA with the psychological well-being score.

**METHODS:** This study recruited 46 patients (8 boys and 38 girls), aged between 7 and 16 years with a mean age of 11,2±2,84 years which received a Juvenile Idiopathic Arthritis diagnosis according to International League of Association for Rheumatology criteria. We excluded children affected by comorbidities potentially associated with pain (i.e. fibromyalgia). A specialist in temporomandibular disorders and orofacial pain visited all JIA patients according to Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) in order to assess masticatory muscles pain, temporomandibular joint pain, and the presence of articular sounds. All patients fill in the Psychological Well Being Scales (PWBS) questionnaire. It consists in 22 items and 5 subscales; each item is scored on a scale from 0 to 5. In this study only the anxiety score was calculated. A total score of < 25 may indicate the presence of an anxiety disorder. A Student's T test was performed to evaluate differences of the anxiety PWBS score between subjects with and without muscular pain and with and without TMJ pain.

**RESULTS:** We didn't find any significant difference for the anxiety PWBS score between patients with and without muscular pain (p > 0,005): the mean anxiety PWBS score calculated in patients reporting muscular pain was 21,3±4,8 compared to patients without pain which reported a mean anxiety PWBS score of 18,3±4,8. We also didn't find a statistical significant difference between subjects with and without TMJ pain (p > 0,05) with a mean score of 20,7±4,7 reported in patients with TMJ pain compared to a score of 19,8±5,7 calculated in patients without articular pain.

## ABSTRACT

Conversely, a significant difference was found for the anxiety PWBS score between patients reporting articular crepitus (mean value  $22 \pm 3,7$ ) compared to patients without TMJ crepitus (mean value  $18,1 \pm 5,9$ ) with a p value= 0,01.

**CONCLUSIONS:** There is no difference in the anxiety score between JIA patients suffering from muscular and articular pain compared to pain free JIA subjects. We found a significant difference concerning TMJ crepitus: subjects reporting articular crepitus showed lower anxiety PWBS scores compared to patients without this clinical sign.

## Evaluation of frequency of oral parafunctions in patients affected by Juvenile Idiopathic Arthritis

R. Valentino, R. Rongo, M. Della Corte, R. Bucci, V. Donnarumma, D. Di Rosa, V. D'Antò

*University of Naples Federico II, Department of Neuroscience, Reproductive Sciences and Oral Sciences, Section of Orthodontic and Temporomandibular Disorders, Naples, Italy*

**BACKGROUND:** Juvenile Idiopathic Arthritis is a wide term that describes a clinically heterogeneous group of arthritis of unknown cause, which begins before 16 years of age. It is a chronic autoimmune disease characterized by persistent inflammation of the synovial tissue in at least one joint. Its annual incidence ranging from 8 to 22.6 per 100000 children and affecting 1 in 1000 children worldwide. The temporomandibular joint (TMJ) is frequently involved and inflammation can be revealed by magnetic resonance imaging (MRI); the prevalence of this condition is 75-87%. According to literature the presence of risk factors such as oral parafunctional habits, can lead to an early onset or even a faster development of temporomandibular disorders. The aim of this study was to assess if there is a relationship between oral parafunctional habits and signs and symptoms of temporomandibular disorders in children and adolescent suffering from JIA.

**METHODS:** The study consecutively recruited 46 children, 38 girls and 8 boys, aged between 7 to 16 years (mean age  $11,2 \pm 2,84$  years) affected by different JIA sub-types such as oligoarticular JIA, polyarticular JIA and systemic JIA. All patients received a JIA diagnosis according to International League of Association for Rheumatology criteria. We excluded children affected by comorbidities potentially associated with pain (i.e. fibromyalgia). A specialist in temporomandibular disorders and orofacial pain visited all JIA patients according to Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) in order to assess masticatory muscles pain, temporomandibular joint pain, and the presence of articular sounds. All patients, supported by their parents, fill in the Oral Behaviour Checklist (OBC) questionnaire: it consists in 21 items used to identify and quantify the frequency of jaw overuse behaviour. A Student's T test was performed to evaluate differences for the OBC score between subjects with and without muscular pain, with and without TMJ pain and with and without TMJ sounds.

**RESULTS:** A significant difference was found for the OBC score between patients with and without muscular pain (p= 0.03): the mean OBC score calculated in patients reporting muscular pain was  $25,6 \pm 10,6$  compared to patients without muscular pain which reported a mean OBC score of  $18,4 \pm 9,7$ . We also found a significant difference between subjects with and without TMJ pain (p= 0,03) with a mean OBC score of  $25,9 \pm 11,1$  founded in patients with TMJ pain compared to an OBC score of  $18,3 \pm 9,6$  calculated in patients without articular pain. Concerning articular sounds, data reported a significant differ-

ence in OBC scores between patients with and without crepitus (p= 0,05) with a mean OBC score of  $24,8 \pm 12,6$  founded in patients with TMJ crepitus compared to an OBC score of  $18,5 \pm 8,2$  calculated in patients without articular crepitus.

**CONCLUSIONS:** JIA patients reporting pain at the palpation of TMJ and masticatory muscles and reporting joint crepitus showed a greater frequency of oral parafunction than patients without signs and symptoms of temporomandibular disorders. Hence, JIA patients presenting temporomandibular signs and symptoms of joint and muscular involvement seem to have a higher frequency of oral parafunctions.

## Evaluation of the effects of two different oral splints in treating patients with myofascial pain: a pilot study

G. Bellagarda, E. Grifalconi, A. Daino, P. A. Deregibus, T. Castorlorio, M.G. Piancino

*Orthodontics Division, Department of Surgical Sciences, C.I.R. Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** Myofascial Pain is one of the most common temporomandibular disorders (TMD), as it generally affects more than fifty percent of patients all around the world. Patients are often referred by hospitals to treat TMD. It's a pain that affects muscles, presenting a series of trigger points. This pain is one of the leading causes of self-medication due to its significant negative impact on people's daily life. Different oral splints are commonly used to treat TMD patients. The aim of this study is to evaluate which splint is more effective: an upper arch oral splint or a lower arch one in treating patients with myofascial pain over time.

**METHODS:** 18 subjects (between the ages of 16 and 55) have been selected from patients referred by the Gnathology Unit of the Dental School of the University of Turin. All subjects have been diagnosed accordingly to diagnostic criteria for TMDs (DC/TMD) by an expert clinician and evaluated by sEMG of masseter and temporalis anterior muscles during isometric contractions at various time points. Once the initial diagnosis of myofascial pain was confirmed, each subject was enrolled in a randomized two arms controlled trial: 8 subjects were treated with an upper arch splint and 10 subjects with a lower arch one. **RESULTS:** Results from this pilot study demonstrated that after a period four weeks no statistically significant differences were found in treating patients with myofascial pain with an upper arch oral splint or a lower arch splint.

**CONCLUSIONS:** No significant differences were found in treating patients with myofascial pain with an upper arch splint or a lower oral one. Generally, improvements can be seen after at least 3 months of treatment. For this reason 4 weeks may not be sufficient to evaluate any improvements in patients with myofascial pain.

## Occlusal sensitivity in subjects with different frequency of oral parafunctions

A. Cecere, R. Bucci, R. Valletta, V. D'Antò, A. Michelotti

*Department of Neuroscience, Reproductive Sciences and Oral Sciences, Section of Orthodontics and Temporomandibular Disorders, University of Naples Federico II, Naples, Italy*

**BACKGROUND:** The occlusal sensitivity (OS) is the capacity to detect small thicknesses between teeth during intercuspatation. In natural dentition, the minimum thickness that can be

perceived ranges between 8 and 60 microns, and periodontal receptors have been reported as one of the structure responsible for this ability. Oral parafunctional activities, such as clenching or grinding, apply prolonged aberrant occlusal force to the teeth, thus stimulating the periodontal receptors. Hence, the increased periodontal activity in subjects presenting oral parafunctions might lead to an alteration of the OS. The aim of this study was to evaluate the OS of participants reporting high or low frequency of diurnal oral parafunctional behaviours.

**METHODS:** The Italian translation of the short version of the "Oral behaviour checklist" (OBC-It 6) was used to assess the parafunctional activities. The item included in the OBC-It 6 are meant to assess the jaw behaviours that might have an influence on the periodontal sensation. 208 questionnaires were distributed among dental and medical students of the University of Naples Federico II (Italy). Subjects with an OBC-It 6 score higher than or equal to 16 were included in the "high frequency parafunction" (HFP) group (>80th percentile). Subjects with OBC-6 score lower than or equal to 11 were included in the "low frequency parafunction" (LFP) group. A final sample of 56 subjects, equally divided into the two groups was included for the assessment of the OS (HFP group: 11 males and 17 females; LFP group: group 13 males and 15 females). The OS was assessed with ten different testing thicknesses: 9 aluminium foils ranging from 8  $\mu$  (0.008 mm) to 72  $\mu$  (0.072 mm) with constant increment of 8  $\mu$ , and one sham test without any foil. The testing thicknesses and the sham test were placed in the area of the first permanent molars, in correspondence of the mesio-labial cusp, and they were presented 10 times in random order (100 total tests). The participants were instructed to close their mouth only once and to report whether they felt the aluminium foil between their teeth or not (YES or NO). The subjects were not aware of the existence of a sham test. To avoid any additional information, the cheek mucosa was distanced with a mouth mirror and headphones with white noise were used to hide the noises of the foils. During the test the participants were asked to keep their eyes closed. Mean percentage of correct answers for each thickness was used for the statistical analysis. The between-group comparison (HFP vs. LFP) was performed for each thickness with a Student t-test for unpaired data with Bonferroni correction, using IBM® SPSS Statistics®, version 21.0.

**RESULTS:** For the sham test and for the testing thicknesses between 0.008 mm and 0.048 mm no statistically significant differences were found between the two groups, while the thicknesses 0.56 mm, 0.64 mm and 0.72mm were significantly better perceived in the HFP group than in the LFP group ( $P < 0.005$ ,  $P < 0.001$  and  $P < 0.001$ , respectively).

**CONCLUSIONS:** The results of the study demonstrated that subjects with high frequency of oral parafunction show better performance in the occlusal sensitivity than subjects with low frequency of parafunctional behaviour.

### Effectiveness of a lower occlusal splint in the treatment of patients with intra-articular temporomandibular disorders

C. Lavazza<sup>1</sup>, A. de Palma<sup>2</sup>, F. Barra<sup>2</sup>, M. Bertola<sup>1</sup>, M. Saetone<sup>1</sup>, M. G. Piancino<sup>3</sup>, T. Castroflorio<sup>3</sup>, A. Deregiibus<sup>3</sup>

<sup>1</sup>Dentistry student; <sup>2</sup>D.D.S. Resident; <sup>3</sup>M.D. D.D.S. PhD Aggregate Professor

**BACKGROUND:** TMJ disc displacement is a disorder characterized by the abnormal position of the articular disc in relation to the mandibular condyle and the mandibular fossa. Disc

displacements may be classified as follows: disc displacement with reduction (DDWR) and disc displacement without reduction (DDWoR). The prevalence of disc displacement is about 41% in TMD patients. The presence of any occlusal appliance leads to stress reduction in the temporomandibular joint secondary to change in the position of the mandible and decreased muscle activity. Stabilization splint slightly increases the vertical occlusal dimension. According to many authors, stabilization splint leads to a significant reduction of symptoms of closed lock.

**METHODS:** 45 patients afferent to the Department of Gnathology of the University of Turin - Dental School with DD diagnosis were recruited for the study.

Inclusion criteria were: Minimum age 25 years; Maximum age of 60 years; Female gender; TMD patient with diagnosis of DDWR and/or DDWoR. Diagnosis of TMD was formulated on the basis of clinical examination and instrumental examinations (RMN), when necessary.

Exclusion criteria were: Craniofacial Syndrome; A history of neurological and/or motor problems; History of trauma; Systemic pathologies; Current orthodontic treatments; Patients with muscular pathologies; Migraine; Osteoarthritis; Previous treatments with occlusal splints. The sample was divided in two groups: the first consisting of 24 (age 42,41667 $\pm$ 12,90742) subjects treated with a mandibular splint and the second consisting of 21 (age 40,95238 $\pm$ 14,97156) untreated subjects used as a control group. VAS have been evaluated at T0, T1 and T2 with maximum pain, medium pain and pain at the time of the visit.

Clinical data at T0, T1, T2 were:

VAS MEAN: medium VAS;

VAS MAX: max VAS;

VAS NOW: VAS at the moment of the visit;

MUO: max unassisted opening;

MAO: max assisted opening;

PM: protrusion movement;

RLE: right lateral excursion;

LLE: left lateral excursion;

PTS: pericranial tenderness score (from 0 to 3) obtained by the palpation of masseter, pterygoid internal and external and temporalis muscles;

CTS: cranial tenderness score (from 0 to 3) obtained by palpation of trapezius, nuchal and sternocleidomastoid muscles.

Cephalometric analysis of Ricketts were used to evaluate the homogeneity of the sample, for a morphological point of view.

**RESULTS:** Statistical analyses were conducted using R statistical package (version 3.0.3, R Core Team, Foundation for Statistical Computing, Vienna). For multiple comparisons, the Tukey test was used. The level of significance was set at  $p < 0.05$ . All parameters are compared at T0 for case and control group. The case group shows significant differences between values of 1 month and 3 months compared to T0 for VAS.MEAN, VAS.MAX and VAS.NOW variables. In the analysis between groups the variations are significant for VAS.MEAN at T1 and T2, VAS.MAX at T2, VAS.NOW at T1. MUO and MAO variables show significant differences at T1 and T2 and PM at T1, in favour of treated group.

**CONCLUSIONS:** Decreasing in pain shown by VAS in treated patients, proves that bite is effective in the treatment of intra-articular joint disorders. An increase in MAO, MUO and PM values shows an improvement in mandibular movements following bite treatment. Therefore it can be concluded that occlusal splint analyzed in this study seems to be effective in treating DD patients at least in a short-term period of observation.



## ABSTRACT

**Can Celecoxib enhance palmitoylethanolamide's effect in the treatment of temporo-mandibular arthralgia in osteoarthritis patients?**A. Alessandri Bonetti<sup>1</sup>, I. Marini<sup>2</sup>, M. L. Bartolucci<sup>2</sup>, A. C. D'Alessandro<sup>2</sup>, E. Staderini<sup>1</sup>, P. Gallenzi<sup>1</sup><sup>1</sup>Department of Surgical Sciences for Head and Neck Diseases, School of Dentistry, Catholic University of Sacred Heart, Milan, Italy; <sup>2</sup>Department of Orthodontics, "Alma Mater Studiorum" University of Bologna, Bologna, Italy

**BACKGROUND:** Osteoarthritis (OA) is the most common degenerative disease of joints, commonly associated with arthralgia when affecting Temporomandibular Joints (TMJ). Since there are currently no disease-modifying agents to treat it, pain management generally consists of chronic nonsteroidal anti-inflammatory drug (NSAIDs) administration; due to the important side effects related to its use, Palmitoylethanolamide (PEA) has been taken into consideration. PEA acts as an endogenous agent with anti-inflammatory effects; moreover, it has proven to exert analgesic effects starting from the fourth day of treatment. A retrospective analysis was conducted in order to assess if the short term combined therapy of PEA and Celecoxib, a cyclooxygenase-2 inhibitor, provides an early-onset reduction of pain in patients affected by OA and arthralgia of TMJ.

**METHODS:** 12 patients were diagnosed with TMJ OA and arthralgia, using the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) and magnetic resonance imaging (MRI). They underwent drug treatment with the association of PEA 600 mg (Normast 600) once a day, plus Celecoxib 200 mg (Celebrex 200) twice a day for the first 4 days; then they were instructed to continue treatment with PEA alone for the following 10 days. Patients were requested to report any adverse effect during treatment. They were also given a 14-day diary and were instructed to report their pain level every evening, using a Visual Analog Scale (VAS). Maximum mouth opening was recorded at baseline and at the seventh and fourteenth day of treatment. Data were analyzed using the Generalized Linear Mixed Model (GLMM) in order to evaluate mean changes in the treatment.

**RESULTS:** A progressive decrease in pain intensity was clearly noticeable over time. After the first 4 days of treatment, a significant reduction of mean VAS values was observed, allowing to reach, at the end of the two-weeks, not clinically importance level of pain. Maximum mouth opening also had a significant improvement; none of the participants reported any side effect related to the treatment.

**CONCLUSIONS:** This data suggest that the association of PEA and Celecoxib is effective in TMJ-OA treatment allowing an immediate reduction of pain, a significant improvement in maximum mouth opening without noticeable side effects. It should therefore be considered an effective and safe alternative to NSAIDs treatment.

**Dental support in the treatment of adult obstructive sleep apnea (OSA)**

A. Sedran, G. Borio, A. Sedran, G. Gassino

*University of Turin, Department of Surgical Sciences, Dental School, Prosthodontic Section, Turin, Italy*

**BACKGROUND:** The OSA is linked to a partial or total collapse of the upper airway, caused by the relaxation of

the muscles that control the soft palate and the tongue, with the appearance of apneas, hypopneas and flow limitation, with consequent hypoxemias. 1 adult out of 5 suffers from mild, average or severe OSA, and the prevalence increases with increasing age. 75% of severe cases of OSA are not diagnosed. Clinical signs and symptoms are both diurnal (such as tiredness on waking, or difficulty in concentration) and nocturnal (such as chronic snoring, feeling of choking and interruption of breathing). An initial diagnosis can be made using a Berlin questionnaire or the Epworth Sleepiness Scale (ESS). With the polysomnography we find the AHI apnea-hypopnea index, which allows us to classify patients by disease severity. AHI<5 physiological, AHI between 5 and 14 mild, AHI between 15 and 30 averages, finally AHI>30 serious. With a failed diagnosis, the consequences are daytime sleepiness, loss of productivity at work, increased risk of driving accidents, hypertension, arrhythmias, senile dementia, and finally metabolic dysregulation with worsening of diabetes and obesity. Treatment of patients with severe OSA provides a gold standard therapy represented by CPAP, but in literature there are several studies on the possibility of using other systems such as mandibular advancement devices (MAD), which may have the same result but with less discomfort for the patient. The objective of this study was to observe how this device can make improvements to the patient with OSA of mild to medium degree, but also of high grade, for those patients who do not tolerate CPAP, obtaining confirmation of these progresses with polysomnography exam.

**METHODS:** The Narval CC<sup>TM</sup> is a custom-made device sold on prescription. It brings the jaw into an advanced position to keep the airway open during sleep. In cases of severe OSA, it is recommended as a second-line treatment for patients who refuse CPAP. The study was set up to evaluate 20 adult patients. The inclusion criteria include the medical history of the typical clinic for OSA and related documentation, with a diagnosis of polysomnography that defines the value of AHI. The consent for privacy is recorded, with relative information on the purpose of the research with NARVAL. The impressions and the registration of the desired mandibular advancement are detected. After sending the material to the manufacturer of the Narval CC<sup>TM</sup>, you receive the device that is explained and delivered to the patient. After the adaptation of at least 4 weeks, a new polysomnography is recorded confirming the successful correction of obstructive apneas. Patients are monitored every six months for two years. The main exclusion criteria are patients suffering from central sleep apnea, patients with unstable or early teeth or suffering from advanced periodontitis, patients with removable complete dentures and patients with acute temporomandibular disorders.

**RESULTS:** Wearing Narval CC<sup>TM</sup> all patients managed to reach an AHI<6 and no drop-outs. The first 6 selected patients already wore a night bite for the bruxism. Collaterally evaluating polysomnography without and with the use of bite for bruxism, it was possible to observe a slight but not sufficient improvement, except in a patient who had worsened.

**CONCLUSIONS:** According to the data currently in possession, we can state that the Narval CC<sup>TM</sup> allows to reach the target of improvement expected in all patients, also obtaining a good compliance by the patient and a high therapeutic adhesion.

## Management of mouth opening and tenderness in patients with temporomandibular disorders (TMD) through low-level laser therapy (LLLT)

A. Sedran, A. Sedran

University of Turin, Department of Surgical Sciences, Dental School, Prosthodontic Section, Turin, Italy

**BACKGROUND:** TMD are one of the most common chronic problem of orofacial invalidity. TMD in the high number of pathology, is reveal in pain in the chewing muscles and temporo-mandibular joints, headache, disorders in the jaw movements and sounds during the opening and closing of the mouth. Pain could radiate throughout the cervical skull region. Patients could have intraoral signs of masticatory dysfunction, as a high sensibility of teeth cause teeth grinding and strain, gingival recessions, teeth hypermobility and loss of bone support. Teeth marks on the soft tissues, including tongue and cheeks. Insofar, compensatory capacity of the masticatory system come to an excessive dysfunction clinical symptom occur forcing the patient to seek help. Although just few patients request a specific treatment, there is a high prevalence of TMD in developed society. Signs of TMD are relevant in about 60-70% of population, but only 1 in 4 people are aware of the issue. The causes of TMD are: traumas, systemic upset, iatrogenic, occlusal and mental health disorders. Mental health plays a dominant role in the pathogenesis of TMD. For a multi-etiological disease, a simple therapy from a dental point of view alone could fail. Several treatments were suggested in order to keep under control pain and symptoms like: counselling, bite occlusal, medications (analgesics, muscle relaxants, antidepressants), psychotherapy, physical therapy and surgery. In the physical therapy sphere the LLLT it is often used to treat the pain of the TMJ. The purpose of physical therapy is the muscle relaxation, reduce pain, spasms, to decrease swelling, inflammation and a more joint stability.

**METHODS:** It is given a LLLT with Garda Laser 810 nm to 23 patients that had been diagnosed a TMD with physical exam. 10 men and 13 women have been examined. 5 of these men and 8 women wore occlusive bite. Output power of LLLT lower than 500 mW and therapeutic doses less than 35 J/cm<sup>2</sup>: a) use 810nm 5 x 200mW laser cluster over TMJ, muscles and nerves for 30 seconds on continuous for analgesia; b) use 810nm single 200mW laser over trigger points for 30 seconds on continuous to deactivate trigger points. It is evaluated the maximum opening of the mouth (MMO) for patients with MMO < 45 mm and comfort test (COMF-T) in order to evaluate the level of compliance to dental treatment and the visual analogue scale (VAS) to measure the degree of analgesia before and after the LLLT, observing the mobility of the TMJ and the tenderness with palpation. Exposure sites include the area of TMJ and points of muscle tension and nerves.

**RESULTS:** The analyzed patients felt less tension and pain in TMJ and muscles, more resistance to keep mouth open after treatment with LLLT compared to the same dental treatment performed without application of the LLLT. Researches shows that the applicable laser dosage would follow the rule of Arndt-Schultz, which means that photo-biomodulation occurs only when the dosage reaches threshold level. The intensity of the cold laser does not damage tissues and create biochemical effects on endothelial tissues cells and in smooth muscle, allowing them to generate vasodilation and anti-inflammation.

**CONCLUSIONS:** LLLT as adjuvant therapy can immediately improve the functional results in patients with TMD.

Through the positive interaction of the cold laser with the biological systems were obtained clinical indications for a short and medium-term dental treatment, faster for the patient and operator, with better management of the clinical procedure and compliance.

## Postural analysis using rasterstereography in patients with intra-articular TMD treated with a lower occlusal splint

A. de Palma <sup>1</sup>, C. Lavazza <sup>2</sup>, F. Barra <sup>1</sup>, M. Bertola <sup>2</sup>, M. Saetone <sup>2</sup>, M. G. Piacino <sup>3</sup>, T. Castroflorio <sup>3</sup>, A. Deregiibus <sup>3</sup>

<sup>1</sup>D.D.S. Resident; <sup>2</sup>Dentistry student; <sup>3</sup>M.D. D.D.S. PhD Aggregating Professor

**BACKGROUND:** Temporomandibular disorders (TMDs) is a collective term embracing a number of clinical problems that involve the masticatory musculature, the temporomandibular joint and associated structures, or both. The relationship between dental occlusion and body posture and between TMDs and body posture is a controversial topic in literature. Evidences of anatomic and functional connection between masticatory system and postural body regulation system led the authors to postulate several hypotheses of correlation between TMDs and postural problems. A reliable, non-invasive method to analyze three-dimensional (3D) spine morphology is rasterstereography. A recent review by Mohokum concluded that rasterstereography is a radiation-free method useful for screening examinations as well as for follow-ups. Furthermore the Authors claimed rasterstereography as a good diagnostic method for spinal scoliosis. Since no data regarding the use of this method in evaluating posture parameters in TMD patients are available in the existing literature, we decided to use rasterstereography to investigate the effect of an occlusal splint on body posture parameters in a sample of women affected by intra-articular TMD in different occlusal relationships. The treated group was compared to a matched sample of not-treated TMD patients. The null hypothesis is that postural parameters are not affected by occlusal splint therapy in TMD patients.

**METHODS:** 45 patients afferent to the Department of Gnathology of the University of Turin - Dental School with DD diagnosis were selected. Diagnosis was formulated on the basis of clinical and instrumental examinations (RMN), when necessary. The sample was divided in two groups: the first consisting of 24 subjects treated with mandibular bite and the second consisting of 21 untreated subjects used as a control group. Rasterstereographic acquisitions were performed on patients at:

- T0 (first visit)
- T1 (1 month control)
- T2 (3 months control).

To test the possible effects of the mandibular and dental occlusion position on body posture, were performed three scans with RS:

- 1) Mandible at rest (RP)
- 2) Maximum voluntary clenching in intercuspitation (MVC)
- 3) Maximum voluntary clenching on cotton rolls placed between the arches (CCR).

Cephalometric analysis of Ricketts were used to evaluate the homogeneity of the sample.

**RESULTS:** The control group does not show significant differences at 1 month or 3 months. At rest position, the variables FLECHE CERVICALE at T1, KYPHOTIC ANGLE at T1 and T2, KYPHOTIC ANGLE at T1 and LORDOTIC

## ABSTRACT

ANGLE at T2 have significant differences. At CCR, PELVIC TORSION at T1 and FLECHE CERVICALE at T1 and T2 have a p-value <0.05. All parameters were compared to T0 for case and control groups and the two groups are homogeneous and comparable.

Fleche cervicale parameters show significant differences at 1 month at RP and CCR between case and control and at 3 months at CCR between case and control. Kyphotic Angle have significant differences between case and control group at T1 and T2 at RP. From the results obtained, it is assumed that bite has effect in cervical and thoracic column. In particular, with regard to the kyphotic angle, it seems to create an improvement in kyphotic curvature.

**CONCLUSIONS:** The results of this study seem to show an improvement in the cervical and thoracic parts of vertebral column. The study, though deserving of further insight, do not allow to confirm with certainty the presence of a direct correlation between intra-articular TMD or their treatment and posture, therefore further studies are needed.

### Sensitivity and specificity of the digital analysis of occlusal forces T-scan III applied to the patient with temporomandibular dysfunction

G. Ferrato, P. Di Giacomo, C. Di Paolo

*Department of Oral and Maxillo-Facial Sciences, Sapienza University of Rome, Rome, Italy*

**BACKGROUND:** The continuous technological innovation puts at the disposal of the Dentist a digital instrument able to analyze the occlusal forces about their distribution and their behavior. Recently, at the DAI Testa-Collo, Department of Oral and Maxillo-Facial Sciences, Teaching and Service of Clinical Gnathology, Sapienza University of Rome, this tool is used to assess the degree of balance of occlusal forces in the TMD patient both in the diagnosis phase that in course of therapy. Current scientific research conducted also by the authors of this study, shown that the tool is able to detect a different behavior of the occlusal forces, statistically significant, between healthy subjects and dysfunctional patients. The aim of this paper is to test the sensitivity and specificity of the digital analysis of the occlusal forces T-Scan III on patients with temporomandibular dysfunction.

**METHODS:** The study was conducted on a control group (CG) of 30 healthy subjects and on a dysfunctional group (DG) of 160 patients with a diagnosis of Temporomandibular Dysfunction according to the diagnostic criteria DC / TMD. Both CG subjects and DG patients were inserted according to specific inclusion and exclusion criteria. The sensitivity of the instrument was tested in the globally considered TMD group and in four subgroups corresponding to four distinct DC / TMD clinical pictures. Specificity has been tested on the subjects of the control group. The examination was carried out according to a strict protocol and performed by a specialist in the use of the tool. The parameter considered was the COF (Center of Occlusal Forces) evaluated from a positional graphic point of view according to a method proposed by the authors of this work. Other parameters that the system is able to detect have not been taken into account in this research.

**RESULTS:** The emerging data concerning the location of the COF in the two groups, are graphically represented by means of two trend curves obtained from a graphic-positional evaluation that analyzes the behavior both in the postero-anterior and

lateral-lateral directions. From the analysis of the two curves, it appears that the subjects of the GC in the postero-anterior direction have a COF positioned on average in a range that goes from P (for P <56%) to A2 and in a latero-lateral direction from S2 to D2 ( for a force <60%). Patients of GD have a COF that averages in A2, A3, A4, and P (for P > 56%). The cut-off value between the curves of the two groups is located between A1 and A2 and has a value of 60%. In consideration of these ranges, it was possible to differentiate between test-positives and test-negatives. Analysis of the data showed a sensitivity of 77% in the group of patients and a specificity of 73% in the group of healthy people. The evaluation of the sensitivity referred to the four clinical pictures considered gave the following results: Myalgia: 80%; Arthralgia 76%; Reducible displacement of the disc: 72%; Non-reducible displacement of the disc: 91%.

**CONCLUSIONS:** The digital analysis of occlusal forces seems to be a sufficiently sensitive and specific test for its use in support of the clinician in assessing the degree of balance of the occlusal forces on the TMD patients both in the diagnostic phase and during the control phase. Further studies needed specially with regard to the specificity that should be calculated on a larger sample.

### Abdominal acupuncture treatment for temporomandibular disorders: a case report

E. Serritella <sup>1</sup>, S. Liguori <sup>2</sup>, P. Di Giacomo <sup>1</sup>, C. Vompi <sup>1</sup>, G. Scialanca <sup>1</sup>, C. Di Paolo <sup>1</sup>

*<sup>1</sup>Unit of Clinical Gnathology, Department of Oral and Maxillo-facial Sciences, Sapienza University of Rome, Rome, Italy; <sup>2</sup>"Paracelso" Institute, Italian Centre of Non Conventional Medicine, Rome, Italy*

**BACKGROUND:** Temporomandibular Disorders (TMD) are comprised of a group of varied conditions that result in temporomandibular joint (TMJ) pain, masticatory muscle pain or both. Chronic TMD-related pain is often poorly localized to the TMJ and masticatory muscles and may radiate or be referred to adjacent oral, cranial, facial and cervical regions. The treatments used mainly include occlusal splints, pharmacological therapies and physiotherapy, but often these patients do not have an effective resolution of pain, especially if they present alterations at different levels. The purpose of this study is to evaluate the effectiveness of abdominal acupuncture in treating symptoms associated with TMD.

**METHODS:** A 42 year-old man with a 4-year history of TMD: bilateral TMJ noises, severe limitation of the maximum mouth opening (MMO)(32mm), pain localized to the TMJ (VAS:60) and referred to facial and cervical regions (VAS: 50), chronic daily headache in frontal and temporal region (VAS: 60). He received standard treatment, which included pharmacological agents, occlusal splint therapy, massage and physical therapy. However, MMO and pain did not improve, if not for short periods during active therapy. Consequently, he received an abdominal acupuncture treatment (AAT) consisting of two cycles of acupuncture sessions: twice a week for 5 weeks, with an interval of one month between the two cycles. **RESULTS:** After the first cycle of AAT, the results were: improvement of the MMO (39mm); improvement of TMJ pain (VAS: 30), not much pain at facial and cervical level (VAS:20); improvement of headache (VAS:30). After the month of suspension the pain had increased again, although with slightly lower values. After the second cycle headache



of AAT the results were: improvement of the MMO (41 mm), improvement of TMJ pain (VAS: 20), no pain at facial and cervical level (VAS:0); headache was present only once a week and with a very low intensity (VAS: 20). One month after the end of the AAT the patient continued to have low values of painful symptoms.

**CONCLUSIONS:** The use of abdominal acupuncture might be an effective adjunct therapy in relieving symptoms associated with TMD. A large, well-designed cohort study that includes patients with TMD treated with acupuncture should be conducted.

## Mandibular deviation and opening: a comparative study

M. Basili<sup>1</sup>, A. Venditti<sup>1</sup>, G. Sottile<sup>1</sup>, G. Di Trani<sup>1</sup>, M. Asaro<sup>1</sup>, R. Rossi<sup>2</sup>, A. Barlattani jr<sup>3</sup>

<sup>1</sup>UOSD Diagnosis, Hygiene and Oral Prevention with Dental Day-Hospital, Polyclinic of Rome "Tor Vergata", Rome, Italy;

<sup>2</sup>Department of Industrial Engineering, University of Rome "Tor Vergata", Rome, Italy; <sup>3</sup>Department of Clinical Sciences and Translational Medicine, University of Rome "Tor Vergata", Rome, Italy

**BACKGROUND:** The purpose of this study is to evaluate if the mandibular deviation influences the patient's opening to a millimetre extent.

**METHODS:** The study takes into consideration patients treated at the UOSD Diagnosis, Hygiene and Oral Prevention, with D.H. special general medical-surgical treatment for vulnerable health and disabled people. The sample of patients selected has the following inclusion criteria: joint pain and facial pain. The following exclusion criteria were also applied in excluding patients from the sample: patients who have never received gnathological treatment and have never taken any muscle relaxant medications in the last month. The feasible sample consisted of 73 patients, 55 females and 18 males. For each patient, an electrognathographic examination (EGN) was performed with the Jaw Tracker 3D machine equipped with FGM sensor technology. This recorded the movements of the anterior mandibular sector in the three dimensions through a small magnet attached to the buccal surface of the lower incisors. The movement of the magnet is detected through sensors, and it records the mandibular movements in the three spatial dimensions, to then schematically report the findings on a screen connected to the machine itself. The EGN recorded the maximum aperture described in millimetres, and the possible lateral-deviation (also expressed in millimeters), which is evaluated for this study only in the frontal projection. Consequently, the data recorded per millimeters of opening and lateral deviation were cataloged in an excel worksheet and statistically analyzed by carrying out a comparative study of the two values taken into analysis. Patients were divided into six classes determined by the discriminating variable of the mandibular deviation. To each class of patients different variations were applied: average, median, minimum, maximum and standard. A correlation analysis was then performed. From the evaluation of the covariance, a variance and correlation index of Bravais-Pearson was identified. Consequently a linear regression was applied to the averages found.

**RESULTS:** From the data analysed in regards to median data a statistical correlation was identified between the value of deviation and the mandibular opening. The linear regression leads to a positive correlation ( $y = 0.5485x + 29.738$ ), specifi-

cally the increasing deviation tends to increase the mandibular opening. The coefficient of determination (R<sup>2</sup>) reaches very high values (0.98), tending to the higher limit (1). This result shows that the correlation found is statistically significant. However, these results refer to the average values of the patients in each class.

**CONCLUSIONS:** It has been determined that the mandibular deviation directly influences the average value of the mandibular opening to a millimetre level. However, the punctual and non-average data are rather dispersed because the increase value does not necessarily influences the increase of the deviation value.

## Achiness during palpation and hypertonicity of masticatory muscles: a correlation analysis

M. Basili<sup>1</sup>, A. Venditti<sup>1</sup>, R. Ferro<sup>1</sup>, T. D'Eliseo<sup>1</sup>, O. Viscogliosi<sup>1</sup>, G. Funaro<sup>1</sup>, R. Rossi<sup>2</sup>, A. Barlattani jr<sup>3</sup>

<sup>1</sup>UOSD Diagnosis, Hygiene and Oral Prevention with Dental Day-Hospital, Polyclinic of Rome "Tor Vergata", Rome, Italy;

<sup>2</sup>Department of Industrial Engineering, University of Rome "Tor Vergata", Rome, Italy; <sup>3</sup>Department of Clinical Sciences and Translational Medicine, University of Rome "Tor Vergata", Rome, Italy

**BACKGROUND:** The purpose of this study is to analyze whether there is a correlation between muscle contraction and pain at palpation.

**METHODS:** The study refers to patients treated at the UOSD Diagnosis, Hygiene and oral prevention with D.H. special general medical-surgical treatment for vulnerable health and disabled persons. The sample selected matches with the following inclusion criteria: patients reporting TMJ pain and patients who report facial pain. The following exclusion criteria were applied: patients who have never undergone gnathological treatment and have not taken muscle relaxant drugs in the last month. The sample consists of 73 patients, including 55 females and 18 males. Each patient was examined by surface electromyography (EMG) with the BioEMG II machine, which records the muscle activity measured in  $\mu V$  of six muscles simultaneously. These muscles are: right and left masseter, right and left anterior temporal, right and left digastric anterior. The electrical signals are acquired through superficial electrodes positioned on each muscle. EMG was performed at serration of the aforementioned masticating muscles. For each patient, the palpation of the following masticatory muscles was also performed: the right and left masseter, anterior right and left temporal, right and left anterior digastric. Consequently a scale of values from 0 to 3 was recorded according to the pain reported by patients. All exams have been consistently performed by the same operator and then the data recorded for each exam and patient were logged in an excel worksheet and analyzed statistically.

Patients were divided into 4 classes, in accordance with the degree of pain (0, 1, 2, 3). Average, median, maximum, minimum and standard deviation of muscle contraction values were calculated for each class. A correlation analysis (Bravais-Pearson correlation index) was applied to these values.

**RESULTS:** Considering the maximum and average contraction values, increasing values of pain are not recorded. These values, in a scale from 0 to 3, do not exceed the threshold value of 1.5. On the other hand, patients with measured minimum contraction values report greater achiness to palpation. This correlation has been identified for the right and left mas-

## ABSTRACT

seter, anterior temporal muscle right and left, left and right anterior digastric muscles. In the case of masseter muscle a generally increasing trend of the minimum value of overtone is observed as a function of the degree of palpation, that is that is, as the degree of pain referred increases, there is an increase in muscle contraction. Similarly for the anterior digastric muscles, as well as for the anterior temporal muscles, there is a growing trend of contraction with the increase in the degree of palpation.

**CONCLUSIONS:** An increase in pain corresponds, in general, to an increase in contraction, but not the other way round. The analysis showed a correlation between minimal contraction and reported pain, so patients with minimal hypertonicity values are the ones that report greater achiness to palpation. The fact that this correlation is not present, in a significant and repeated way, even for average values, indicates that a high pain generally corresponds to a greater contraction but not the other way round.

### Masticatory muscle overtone and mandibular laterodeviation: a comparative statistical analysis

A. Venditti <sup>1</sup>, M. Basili <sup>1</sup>, S. De Pasquale <sup>1</sup>, F. Ragazzoni <sup>1</sup>, G. Marsella <sup>1</sup>, R. Rossi <sup>2</sup>, A. Barlattani jr <sup>3</sup>

<sup>1</sup>UOSD Diagnosis, Hygiene and Oral Prevention with Dental Day-Hospital, Polyclinic of Rome "Tor Vergata", Rome, Italy;

<sup>2</sup>Department of Industrial Engineering, University of Rome "Tor Vergata", Rome, Italy; <sup>3</sup>Department of Clinical Sciences and Translational Medicine, University of Rome "Tor Vergata", Rome, Italy

**BACKGROUND:** The aim of this study is to evaluate whether there is a correlation between mandibular deviation and the asymmetric contraction of masticatory muscles.

**METHODS:** The study refers to patients treated at the UOSD Diagnosis, Hygiene and oral prevention with D.H. special general medical-surgical treatment for vulnerable health and disabled persons. We have selected a sample that matches with the following inclusion criteria: patients reporting TMJ pain and patients who report facial pain. The following exclusion criteria were also applied: patients who have never undergone gnathological treatment and have not taken muscle relaxant drugs in the last month. The sample consists of 73 patients, including 55 females and 18 males. Each patient was examined with an electrognathography (EGN) and surface electromyography (EMG), employing the following machines: Jaw Tracker 3D with FGM sensor technology, which records the movements of the mandibular anterior sector in the three spatial dimensions, through a small magnet attached to the buccal surface of the lower incisors and, the BioEMG II, which registers muscle activity measured in  $\mu V$ . The electrical signals, acquired through superficial adhesive electrodes positioned on each muscle, are transferred onto a screen as waves that detect contraction patterns and the relative intensities of contraction. The EMG was performed at rest and while swallowing (measured in  $\mu V$ ), concurrently with EGN it was recorded the maximum opening and the eventual lateral deviation in frontal projection (measured in mm). The data recorded following each exam, for each patient, were logged in an excel worksheet and analysed statistically. For each patient's muscle, the percentage of asymmetry was calculated, quantified as the ratio between the most contracted muscle (between right and left) divided by the least contracted muscle. The patients were divided into

7 classes, using as the discriminating variable the mandibular deviation. Consequently, mean, median, maximum, minimum and standard deviation of the asymmetries were calculated for each class.

**RESULTS:** Taking in considering the complete sample, a significant association between mandibular deviation and hypertonus of the chewing muscles does not emerge. Considering only the minimum contraction values, there is an increasing trend with mandibular deviation, reaching minimum values for asymmetrical correlation higher than 20% in the case of masseter muscles. However, there are no significant correspondences between homo / contralaterality, mandibular deviation and masseter muscles. This trend was observed in all three muscles analysed, confirming that mandibular deviation leads to a minimal asymmetric contraction.

**CONCLUSIONS:** A correlation between the mandibular lateral deviation and the asymmetry of contraction of the masticatory muscles has been found only in patients who have a minimum value of hypertonus. Looking at how this trend concerns only the minimum values, but not the mids and the maximums, highlights that it is a symptom that shows mandibular deviation as a factor, not the only one, that leads to an asymmetric contraction of the muscles. Therefore, muscles analyzed contract asymmetrically but not necessarily homolaterally to the laterodeviation.

### Clinical correlation between dental wear and sleeping bruxism

E. Rivarossa, E. Sommadossi, A. Baldi, E. A. Vergano, M. Alovisi, D. Pasqualini, E. Berutti, N. Scotti

**BACKGROUND:** Teeth wear is a major problem in today patients, above all with bruxist. The prevention of tooth wear is fundamental in order to avoid problems due to sensitivity and structural resistance. The aim of the present in vitro study was to evaluate a possible connection between dental abrasion and sleeping bruxism, showing surface changes over time in people with healthy teeth. The null hypothesis is that there is any correlation between bruxism and enamel wear of healthy teeth in vivo.

**METHODS:** A group of ten male and female young adults was selected. Inclusion criteria were: normal occlusion, healthy teeth, any general health disorders, no orthodontic treatment in progress. Each participant, once informed on the content and the nature of the study, was enrolled. An intraoral scan of the upper arch was performed with Cerec Omnicam (Dentsply Sirona, USA) in order to register an individual initial condition (T=0). Patients were then further submitted to a sleeping exam using Bruxoff Technology for the duration of three nights. At the beginning the machine need to be adjusted and adapted to the single patient recording three maximum contractions and taking them as referent point. The system was based on the joint analysis of EMG of masseter muscles and ECG for heart rate and allowed us to individuate bruxist patients calculating the bruxism index, which showed the average number of episodes per hour, with Bruxmeter system. Patients were then recalled after two years to perform a new intraoral scan (T=2). The so obtained STL files were uploaded and superimposed with Geomagic Control X to analyze the volumetric difference between the reference scan (T=0) and the control scan (T=2). Datas were statistically analyzed with one way ANOVA test, with significance set when  $p < 0.05$

**RESULTS:** Mean wear, expressed in  $mm^3$ , was 0.36 in

non-bruxist and 0.89 in bruxist patients. Thus, volumetric variation between scans was recorded in all patients enrolled. Based on bruxoff results, bruxist patients showed a significant increased occlusal wear than non-bruxist patients ( $p=0.001$ ), with a major wear identified in anterior region. 3D volumetric maps clearly showed the enamel areas which were most affected by wear

**CONCLUSIONS:** Based on the obtained results, the null hypothesis was rejected since a correlation between bruxism and tooth enamel was observed in young patients after 2 years of clinical follow-up. Increased patient number and longer follow-up are fundamental to validate the present in vivo study results.

### The effectiveness and characteristics of occlusal splints in the treatment of temporomandibular disorders: a systematic review

P. Cingari, F. Mincica, E. Gatto, A. Lo Giudice, L. Rustico, R. Castellana, L. Di Marco, M. Portelli, A. Miliati, R. Nucera

*Department of Biomedical and Dental Sciences and Morphological Imaging Section of Orthodontics, School of Dentistry, University of Messina, Messina, Italy*

**BACKGROUND:** Occlusal splints, also known as bite guards, bite splints, bite planes or oral appliances, are utilized frequently in dental practices for the management of Temporomandibular disorders (TMD). The aim of this paper is to review the literature on occlusal splints and on their use in the treatment of TMDs resulting in evidence-based conclusions and to describe the different materials used in the fabrication of occlusal splints, the various designs, their mechanisms of action and their effectiveness.

**METHODS:** A systematic search was carried out in different electronic databases (MEDLINE, Pubmed, the Cochrane Library, the Cochrane CENTRAL Register, Scopus) supplemented by examination of the bibliographies of the retrieved articles. The search strategy used a combination of controlled vocabulary (MESH) and free text terms (controlled vocabulary is given in upper case type and free text terms in lower case): temporomandibular joint disorders or temporomandibular disorders or craniomandibular disorders or myofascial pain or myofascial pain or orofacial pain or facial pain or headache and stabilization splint or occlusal splints or occlusal appliance or splint therapy and design and characteristics or kinds or features. Selection criteria include RCTs and CCTs assessing the characteristics that a successful splint should have.

**RESULTS:** 29 studies were selected after full text evaluation. The systematic review of these studies indicates that there is evidence that the following characteristics improve TMD treatment: (1) full-arch maxillary coverage in order to avoid the risk of irreversible dental migration (extrusion, intrusion and laterotrusion) resulting from the absence of stabilization with antagonist arch; (2) hard acrylic resin that allows an easy adjustment, reduces the muscle hyperactivity and is durable enough to serve as a protective nightguard; (3) smooth occlusal surface that allows the teeth to move on the splint unimpeded; (4) adjusted in centric relation; (5) equality intensity contacts on all antagonistic teeth favoring reduction of stress on individual teeth, a correct distribution of occlusal forces and relax the elevator and positioning muscles; (6) canine guidance and/or anterior teeth guidance providing immediate posterior disclusion in the lateral translation and protrusive

movements without generating posterior interference; (7) the average splint thickness (1,5/2 mm) appears to be the most efficient in producing a rapid improvement in the symptoms, to restore the previously lost occlusal vertical dimension and to reduce abnormal muscle activity due to abnormal vertical dimension.

**CONCLUSIONS:** In summary, the efficacy of splint therapy for treatment of signs and symptoms of TMD is well documented, particularly in myogenous pain management. The results of this systematic review indicate that the splint characteristics are important in order to achieve the best treatment TMD results. Hard stabilization splint covering the full arch, with the correct indications and adjustments, have good evidence of modest efficacy in the treatment of TMJD pain compared to other types of appliances.

### Temporomandibular disorders, malocclusions and ophthalmology: a literary review

C. Vompi, E. Serritella, P. Di Giacomo, A.M. Costantini, G. Scialanca, G. Galluccio, C. Di Paolo

*Unit of Gnatology. Unit of Orthodontics. Department of Oral and Maxillofacial sciences. Sapienza University of Rome, Rome, Italy*

**BACKGROUND:** Many studies pointed out the connection between stomatognathic system and posture but less interest has been given to the relationship between stomatognathic and visual system. Some authors described a neurological, functional and anatomical connection. In particular it has been tested how ocular receptors and stomatognathic ones are connected in an anatomical and neurological way. Visual and stomatognathic system are considered like a unique structure. Consequently, a dysfunction in one of the two components is followed by a dysfunction in the other one. No studies explained the specific role that one component performs over the other one. The aim of this study is to analyse the current literature in order to confirm and to underline the correlation between malocclusions, temporomandibular disorders (TMD) with vision defects.

**METHODS:** 20 papers from 1989 to 2017 were found by using Pubmed electronic database. Search keywords were Dental occlusion OR, TMD OR, Stomatognathic system OR, Mandibular deviation OR, Malocclusion AND, Ophthalmology OR, Vision defects OR, Optometry OR, Myopia OR. In addition, manual search was performed by consulting European Journal of Pediatric Dentistry (EJPD). Inclusion criteria concern studies about: relationship between gnatology and ophthalmology, orthodontics and vision defects, randomized controlled trials, literary reviews, historical controls for clinical trials. Exclusion criteria concern studies about relationship between other branches of dentistry and vision and studies involving patients with systemic diseases. According to inclusion and exclusion criteria 17 papers were included. The qualitative evaluation was made by using PICO format. For each article, the study population (P) was described by considering the sample size, age and gender; the intervention (I) by considering diagnostic test or treatment; the comparison (C) was evaluated by describing any comparison groups, as control group or subgroups within the patient population; the outcome (O) assessed the presence of the relationship between ophthalmology, malocclusions and temporomandibular disorders. According to the PICO format, qualitatively invalid articles were excluded.



## ABSTRACT

**RESULTS:** 5 articles related malocclusions to myopia, astigmatism, hyperopia, strabismus and convergence defects. 4 studies related electromyography (EMG) activity of stomatognathic muscles to visual inputs. 3 studies related TMD with convergence defects, binocular motility system and monocular accommodative fluctuations. A study related mandibular deviation to ocular convergence. A study related jaw movements to dynamics of spontaneous eye blink activity. 2 studies related orthodontic and gnathologic treatment to visual function. A literary review related dental occlusion to ophthalmology.

**CONCLUSIONS:** It seems to be confirmed the relationship between stomatognathic and visual systems. In particular it

was underlined the relationship between malocclusions, temporomandibular disorders, mandibular deviation, mandibular movements and vision diseases. Nervous system, anatomic structures and functional pathways connect dental occlusion and temporomandibular joint (TMJ) with visual system. An extraocular musculature examination could be included into the TMJ examination. Orthoptists, Orthodontists and Gnathologists could collaborate more, in order to improve the diagnosis and therapy of patients. It would contribute to the patients' psychophysical wellbeing. There are no studies about prevalence and distribution of vision defects with each single temporomandibular disorder or specific asymmetry. Further studies are under development in order to clarify this topic.

---

## IMPLANTOLOGIA

---

### Immediate, immediate-delayed (6 weeks) and delayed (4 months) post-extractive single implants: 1-year post-loading data from a randomized controlled trial

C. Berti, C. Barausse, T. Maranesi, M. Esposito, P. Felice

*Department of Biomedical and Neuromotor Sciences, Unit of Periodontology and Implantology, University of Bologna, Bologna, Italy; Department of Biomaterials, The Sahlgrenska Academy at Göteborg University, Göteborg, Sweden*

**BACKGROUND:** To compare the clinical outcome of single implants placed immediately after tooth extraction with implants placed 6 weeks after tooth extraction (immediate-delayed placement), and with implants placed after 4-month extraction and socket healing (delayed placement).

**METHODS:** Two-hundred and ten (210) patients requiring a single implant-supported crown to replace a tooth to be extracted were randomised to receive immediate post-extractive implants (70 patients), immediate-delayed implants at 6 weeks (70 patients), and delayed implants after 4 months of healing (70 patients) according to a parallel group design. When needed, patients of the immediate and immediate-delayed group had the socket grafted with a bone substitute and covered with a resorbable membrane at implant placement. Sockets randomised to delayed implants were grafted if poorly preserved or in the aesthetic areas. Implants inserted with at least 25 Ncm torque were left to heal unloaded for 4 months, whereas those inserted with less than 25 Ncm were left to heal unloaded for 6 months. Temporary crowns were delivered and were to be replaced by definitive ones after 4 months. Outcome measures were crown and implant failures, complications, peri-implant marginal bone level changes, aesthetically assessed using the Pink Esthetic Score (PES), and patient satisfaction recorded by blinded assessors. Patients were followed up to 1 year post-loading.

**RESULTS:** One year after loading, three patients dropped out from the immediate group, five from the immediate-delayed group, and six from the delayed group. Four implants (6%) failed in the immediate, four (6.2%) in the immediate-delayed, and one (1.6%) from the delayed group ( $P = 0.369$ ). Apart from the crowns (which failed due to implant losses), no other crown had to be remade. Six immediate, six immediate-delayed and four delayed implants were affected by one complication each ( $P = 0.792$ ). Mean peri-implant marginal bone loss after 1 year was  $-0.25 \pm 0.17$  mm at immediate,  $-0.29 \pm 0.14$  mm at immediate-delayed, and  $-0.31 \pm 0.16$  mm at delayed placed implants ( $P = 0.015$ ). One year after loading, the mean total aesthetic score was 12.52, 12.49 and 11.78 at the immediate, immediate-delayed and delayed groups, respectively ( $P < 0.001$ ). All patients were

fully satisfied both with function and aesthetics, and would undergo the same procedure again, with four exceptions (one from the immediate, one from the immediate-delayed and two from the delayed group), who were only partially satisfied with aesthetics ( $P = 0.785$ ).

**CONCLUSIONS:** No statistically significant differences for failures, complications and patient satisfaction were observed when placing single implants immediately, 6 weeks or 4 months after tooth extraction; nevertheless, failures were more frequent at immediate and immediate-delayed placed implants. Bone level changes were similar between the different procedures, but aesthetics was better at immediate and immediate-delayed implants.

### A case of an ultra-short sintered porous surfaced implant in a patient with periodontitis: 11-year follow-up

T. Moro, M. Zanini, M. Salvato, L. Malchiodi

*School of Dentistry, Department of Surgery, Dentistry, Pediatrics and Gynecology (DIPSCOMI), University of Verona, Verona, Italy*

**BACKGROUND:** The aim of this case report was to show that, when appropriate surgical, prosthetic and hygienic protocols are followed, ultra-short sintered porous-surfaced (SPS) implants can nonetheless prove an excellent solution for the rehabilitation of severely resorbed posterior alveolar ridges even in patients with a history of periodontal disease.

**METHODS:** After a complete cycle of non-surgical periodontal therapy, the upper first molar in the right posterior maxilla was extracted because of deep furcation exposure and wide mobility as a result of generalized chronic periodontitis. Periapical X-ray and cone beam computerized tomography (CBCT) in dental scan mode were used to assess bone width and height and to plan implant positioning. An ultra-short SPS implant was chosen because of the severe atrophy of the alveolar ridge and the patient's refusal of a bone graft. The implant was inserted after a manual osteotomic preparation and a series of surgical drills to achieve ridge expansion, good primary stability and sinus floor elevation without any bone grafting. The whole porous-surfaced region of the implant and the 0.5 mm smooth coronal region were fully submerged in bone. Three months later, the prosthesis was fashioned and checked in occlusion to eliminate precontacts and interferences during centric and eccentric movements, with reduced areas during lateral and protrusive excursions and several contacts in maximum intercuspation. The patient was included in a well-established oral hygiene protocol. It scheduled oral hygiene instructions, professional dental

## ABSTRACT

hygiene, probing pocket depth (PPD) measurements and check on occlusal contacts every 4 months. Radiographic assessments with periapical X-rays were scheduled every 8 months. The clinical crown-implant ratio was 3.1 at the baseline.

**RESULTS:** No pathological PPD, calculus or signs of peri-implantitis were observed during the follow-up. The clinical crown-implant ratio was 3.3 after 11 years of follow up.

**CONCLUSIONS:** This report shows that proper surgical, prosthetic and hygienic management enables the long-term survival of ultra-short SPS implants even in patients with a history of periodontal disease. Patients must be carefully selected (non-smokers with good oral hygiene and excellent compliance) and a well-established periodontal maintenance protocol must be rigorously imposed to guarantee the long-term success of this type of rehabilitation, avoiding the risk of rapid implant failure due to periimplantitis developing in association with the short implant length.

### Effect of platform switching on 259 SPS implants: a 36-month follow-up prospective study

M. Salvato<sup>1</sup>, T. Moro<sup>1</sup>, P. Ghensi<sup>2</sup>, M. Zanini<sup>1</sup>, L. Malchiodi<sup>1</sup>

<sup>1</sup>*School of Dentistry, Department of Surgery, Dentistry, Pediatrics and Gynecology (DIPSCOMI), University of Verona, Verona, Italy;* <sup>2</sup>*Center for Integrative Biology (CIBIO), University of Trento, Trento, Italy*

**BACKGROUND:** The aim of this prospective study was to evaluate the effect of platform switching (PS) in preserving peri-implant bone levels (PBL) around 259 sintered porous-surfaced (SPS) implants and to evaluate the influence of implant length (long and short) in peri-implant marginal bone loss (MBL), with a mean follow-up of 36 months.

**METHODS:** This prospective study involved 136 patients with 259 implants placed (108 standard and 151 short length implants) in both upper and lower jaws to rehabilitate partial or total edentulism. 79 implants were placed in the mandible, whereas 180 in the maxilla. Of these, 73 (27,3%) were rehabilitated with the platform switching technique. The implant system used was Endopore Dental System (Innova Corporation, Toronto, Canada). The most coronal 1mm segment of the implant's length is prepared as a machined surface, while the remaining length is coated with a 300 µm SPS layer. The implants were 5, 7, 9 or 12 mm long and 4 or 5 mm in diameter. The porous-surfaced area of the implant and at least 0.5 mm of smooth coronal region were fully submerged in bone. Definitive prostheses were placed after 4 months. The patients were included in a well-established oral hygiene protocol. Clinical and radiographic (periapical X-rays) assessments were scheduled every 6 months. Peri-implant bone levels (PBL) and marginal bone loss (MBL) was measured for each implant on intra-oral radiographs. Implant and prosthetic failures and complications were recorded.

**RESULTS:** Data analyzed concerned 259 implants. 3 implants were lost during the follow-up period (36 ± 7,6 months). The global implant success rate was 97.7%. The long and short implant success rate was 98.1% and 97.4%, respectively. The average global MBL was 0.48 ± 0.29mm. Average MBL of implants with PS (0,64 mm) was significantly different than that of implants without PS (0,75 mm,

P=0.0477). The average MBL of long implants was not significantly different than that of short and ultra-short implants (P=0,1791).

**CONCLUSIONS:** This study suggested that platform switching may significantly (P=0,0477) reduce the marginal bone loss if compared with its absence. There were no significant differences in bone resorption between short and long implants.

### Peri-implantitis or peri-implant malignancy? Differential diagnosis of mandibular metastasis from prostate adenocarcinoma: case report

M. Tomasin, E. Bardhi, L. Tomasin, E. Bressan, E. Stellini, C. Bacci

*Section of Dentistry, Department of Neurosciences, University of Padua, Padua, Italy*

**BACKGROUND:** The aim of the present study is to report a clinical case of radiolucent lesion around a dental implant in a patient with prostate acinar adenocarcinoma and the challenging of radiographic and clinical diagnosis.

**METHODS:** A 77-year-old male patient was admitted to the Dental Emergency Unit of Padova for evaluation of a persistent radiolucent lesion around the implant placed in the region of the dental element 4.3. The patient's medical history revealed prostate acinar adenocarcinoma treated in 2012 by means of radical prostatectomy. Four months before, due to an important periapical lesion of the element 4.3, the tooth was extracted and an implant treatment with the addition of bone graft was performed. His radiographic exam CT indicated a periapical radiolucent area of the implant 4.3. PET and scintigraphy total body revealed increased uptake mass observed in the left ilium, ischium, pubis that confirmed the diagnosis of metastasis. There was also a low but increased uptake of the radiocontrast agent in the mandibular region that indicated a possible metastasis in the area of the implant. We requested new radiographic exams: intraoral radiography, panoramic radiography and CBCT because of the scattering in previous multislice CT. CBCT revealed a radiolucent lesion with poor-defined margins around the apex of the implant and a cortical erosion of the osteolytic area. We decided to discuss with the oncologist and with the patient about performing a jaw biopsy with implant extraction.

**RESULTS:** The patient clinically didn't present any symptoms and the implant seemed to be well integrated. Considering patient's age and medical situation we decided to keep the patient in follow-up and not to perform biopsy which, in this case, would be the only way to make a sure diagnosis. The differential diagnosis between flogistic lesion and metastasis remained. However, due to the other metastasis located in the pelvic area, the patient started his therapy with monoclonal antibodies in order to treat mandibular one anyway.

**CONCLUSIONS:** Metastases to the oral cavity and to the jaws are rare, and represent 1% of oral cavity malignancies. Radiographic examination of a metastatic lesion to the jaws usually reveals a radiolucent area, with poor-defined margins. Rarely, primitive metastatic tumors have been described around dental implants, some of which also clinically imitate peri-implantitis. Without performing a biopsy, differential diagnosis cannot be performed.



## Immediately loaded zygomatic implants *versus* conventional dental implants in augmented atrophic maxillae: one-year post-loading results from a multicenter randomized controlled trial

S. Di Simone, C. Barausse, R. Pistilli, C. Berti, M. Esposito, P. Felice

Department of Biomedical and Neuromotor Sciences, Unit of Periodontology and Implantology, University of Bologna, Bologna, Italy; Oral and Maxillofacial Unit, San Camillo Hospital, and Private Practice, Rome, Italy; Department of Biomaterials, The Sahlgrenska Academy at Göteborg University, Göteborg, Sweden

**BACKGROUND:** To compare the clinical outcome of immediately loaded cross-arch maxillary prostheses supported by zygomatic implants *versus* conventional implants placed in augmented bone.

**METHODS:** Seventy-one edentulous patients with severely atrophic maxillae not having sufficient bone volumes for placing dental implants or when it was possible to place only two implants in the front area were randomised according to a parallel group design to receive zygomatic implants (35 patients) to be loaded immediately *versus* grafting with a xenograft, followed, after 6 months of graft consolidation, by placement of six to eight conventional dental implants submerged for 4 months (36 patients). Screw-retained metal reinforced acrylic provisional prostheses were to be replaced by definitive prostheses 4 months after initial loading. Outcome measures were: prosthesis, implant and augmentation failures, any complications, quality of life (OHIP-14), patients' number of days with total or partial impaired activity, time to function and number of dental visits, assessed by independent assessors. Patients were followed up to 1 year after loading.

**RESULTS:** Six prostheses could not be delivered or failed in the augmentation group *versus* one prosthesis in the zygomatic group, the difference being statistically significant ( $P = 0.045$ ). Eight patients lost 35 implants in the augmentation group *versus* two patients who lost four zygomatic implants, the difference being statistically significant ( $P = 0.037$ ). Thirteen augmented patients were affected by 21 complications *versus* 28 zygomatic patients (40 complications), the difference being statistically significant ( $P = 0.002$ ). The 1 year OHIP-14 score was  $3.93 \pm 5.86$  at augmented patients and  $3.97 \pm 4.32$  at zygomatic patients with no statistically significant differences between groups ( $P = 0.747$ ). Both groups had significantly improved OHIP-14 scores from before rehabilitation ( $P < 0.001$ ). Days of total infirmity were on average  $7.42 \pm 3.17$  for the augmented group and  $7.17 \pm 1.96$  for the zygomatic group, the difference not being statistically significant ( $P = 0.692$ ). Days of partial infirmity were on average  $14.24 \pm 4.64$  for the augmented group and  $12.17 \pm 3.82$  for the zygomatic group, the difference being statistically significant ( $P = 0.048$ ). The mean number of days to have a functional prosthesis were  $444.32 \pm 207.86$  for augmented patients and  $1.34 \pm 2.27$  for zygomatic patients, the difference being statistically significant ( $P < 0.001$ ). The average number of dental visits was  $19.72 \pm 12.22$  for augmented patients and  $15.12 \pm 5.76$  for zygomatic patients, the difference not being statistically significant ( $P = 0.055$ ).

**CONCLUSIONS:** Preliminary 1 year postloading data suggest that immediately loaded zygomatic implants were associated with statistically significantly less prosthetic failures, implant failures and time needed to functional loading when compared to augmentation procedures and conventionally

loaded dental implants. Even if more complications were reported for zygomatic implants, they proved to be a better rehabilitation modality for severely atrophic maxillae. Long-term data are absolutely needed to confirm or dispute these preliminary results.

## Radiographic outcomes of transcrestal sinus floor elevation with different graft materials: long-term results of a multicenter cases series

G. Franceschetti<sup>1</sup>, R. Farina<sup>1,2</sup>, A. Rigon<sup>1</sup>, L. Minenna<sup>1</sup>, O. L. Riccardi<sup>1,3</sup>, C. Stacchi<sup>4</sup>, R. Di Raimondo<sup>5</sup>, L. Trombelli<sup>1,2</sup>

<sup>1</sup>Research Center for the Study of Periodontal and Peri-Implant Diseases, University of Ferrara, Ferrara, Italy; <sup>2</sup>Operative Unit of Dentistry, University-Hospital of Ferrara, Ferrara, Italy; <sup>3</sup>Private Practice, Rimini, Italy; <sup>4</sup>Private Practice, Gorizia, Italy; <sup>5</sup>Private Practice, Palermo, Italy

**BACKGROUND:** The study was performed to radiographically evaluate the long-term linear changes in the contact between the implant surface and the radiopaque area (consisting of both native bone and newly formed bone within the sinus cavity) following transcrestal sinus floor elevation (tSFE) procedures. Changes were evaluated in relation to different grafts.

**METHODS:** The study is a multicenter, retrospective case series. Surgical procedures, consisting of tSFE according to the *Smart Lift* technique and concomitant single implant placement, were performed in one University Center and 3 private dental offices. At operator's discretion, tSFE was associated with a bone core (BC) alone or supplemented by a predetermined amount of graft material, selected among the followings: deproteinized bovine or porcine bone mineral (DBBM or DPBM, respectively); synthetic hydroxyapatite in a collagen matrix (S-HA);  $\beta$ -tricalcium phosphate ( $\beta$ -TCP). The following measurements were performed by a single trained examiner, on periapical radiographs: i) percentage of implant surface in direct contact with native bone or with the radiopaque area surrounding the implant surface (totCON%); ii) height of the graft apically (aGH), assessed as the distance (in mm) occupied by a radiopaque area between the implant apex and the sinus floor as assessed at the mid portion of the implant. To account for radiographic distortion, all linear measurements were adjusted for a coefficient derived from the ratio: true implant length/ radiographic implant length. The patient was regarded as the statistical unit. totCON% was the primary outcome variable of the study. Outcome variables were compared under two separate analyses: (i) **analysis 1:** based on the entire study population and including data from all available radiographs at each observation interval; (ii) **analysis 2:** based only on data from patients who attended at least the post-surgery, 6-, 12- and 36-month visits.

**RESULTS:** One implant failure occurred at 1 year after loading. The patient was excluded from analyses. 153 patients (mean age: 51.9 years) were included in analysis 1. In 144 patients, tSFE was associated with graft material insertion (DBBM:  $n = 72$ ; DPBM:  $n = 27$ ;  $\beta$ -TCP:  $n = 26$ ; S-HA:  $n = 19$ ), while in 9 patients it was associated with the bone core alone (BC group:  $n = 9$ ). Immediately post-surgery, aGH and totCON% were 2.0 mm and 49.2% (entirely consisting of the implant contact with native bone) and amounted to 1.5 mm and 98.0%, respectively, at 6 months. Both parameters varied overtime: aGH amounted to 0.8 mm and totCON% to 91.4% at 36 months. These findings were confirmed in analysis 2 (47

## ABSTRACT

patients; mean age: 51.3 years) where aGH varied from 1.5 mm to 0.7 mm and totCON% from 97.5 % to 91.6 % from 6 months to 36 months, respectively (no significant inter-group differences). At 36 months, mean totCON% was  $\geq 88.0\%$  for all groups

**CONCLUSIONS:** Following tSFE (*Smart Lift* technique), a significant increase of the percentage of implant surface in contact with the radiopaque area was observed from post-surgery to 6 months. A progressive reduction in the linear contact between the implant surface and the radiopaque area was observed at later time intervals, irrespective of the type of the graft inserted.

### Morbidity following transcrestal and lateral sinus floor elevation: a multicenter, parallel-arm randomized trial

R. Farina<sup>1,2</sup>, G. Franceschetti<sup>1</sup>, V. Antonellini<sup>1</sup>, D. Travaglini<sup>3,4</sup>, U. Consolo<sup>3,4</sup>, L. Minenna<sup>2</sup>, G. P. Schincaglia<sup>2,5</sup>, O. Riccardi<sup>2,6</sup>, A. Bandieri<sup>3,4</sup>, E. Maietti<sup>7</sup>, L. Trombelli<sup>1,2</sup>

<sup>1</sup>Operative Unit of Dentistry, University-Hospital of Ferrara, Ferrara, Italy; <sup>2</sup>Research Centre for the Study of Periodontal and Peri-implant Diseases, University of Ferrara, Ferrara, Italy; <sup>3</sup>Operative Unit of Dentistry and Maxillofacial Surgery, Department Integrated Activity - Specialist Surgeries, University-Hospital of Modena, Modena, Italy; <sup>4</sup>Department of Specialistic Surgeries Head-Neck, University of Modena and Reggio Emilia, Modena and Reggio Emilia, Italy; <sup>5</sup>Department of Periodontics, School of Dentistry, West Virginia University, Morgantown, WV, USA; <sup>6</sup>Private Practice Torre Pedrera, Rimini, Italy; <sup>7</sup>Center of Clinical Epidemiology, University of Ferrara, Ferrara, Italy

**BACKGROUND:** To comparatively evaluate the morbidity following maxillary sinus floor elevation according to either transcrestal (tSFE) or lateral (ISFE) approach with concomitant implant placement.

**METHODS:** The study is a multicenter, parallel-arm, single-blind, randomized controlled clinical trial. Patients with  $\geq 1$  edentulous maxillary posterior site with residual bone height (RBH) of 3-6 mm were consecutively treated at two University-Hospitals (Ferrara and Modena, Italy). tSFE was performed according to the *Smart Lift* technique in association with a xenograft and a collagen matrix. For ISFE, the sinus was grafted with the xenograft, and the lateral window was covered with a resorbable membrane. Implants were inserted concomitantly with sinus lift. The postoperative course was assessed in terms of: pain level (VAS<sub>pain</sub>), self-recorded using a 100-mm visual analogue scale; dosage of rescue anti-inflammatory drugs; level of discomfort, self-recorded on a 5-point rating scale; limitations in daily functions, incidence of postoperative signs and symptoms, and willingness to undergo the same type of surgery, self-reported on a 4-point rating scale. VAS<sub>pain</sub> was the primary outcome of the study. The patient was regarded as the statistical unit. Data were expressed as mean  $\pm$  standard deviation (SD).

**RESULTS:** The *per protocol* study population consisted of 27 patients (23 receiving 1 implant, 4 receiving 2 adjacent implants) in the tSFE group and 28 patients (23 receiving 1 implant, 5 receiving 2 adjacent implants) in the ISFE group. Residual bone height (RBH) was  $4.6 \pm 0.8$  mm and  $4.3 \pm 0.6$  mm in the tSFE and ISFE group, respectively ( $p = 0.151$ ). No significant inter-group differences were observed in the incidence of membrane perforation. No center effect on post-surgery VAS<sub>pain</sub> was found. A significant effect of time ( $p < 0.001$ ), but not of treatment, on VAS<sub>pain</sub> was observed.

VAS<sub>pain</sub> significantly decreased compared to post-surgery from the day +1 in tSFE group and from day +7 in ISFE group. The mean total number of analgesics during the first 2 postoperative weeks was  $3.0 \pm 3.1$  in the tSFE group, and  $5.0 \pm 5.9$  in the ISFE group ( $p = 0.398$ ). No significant inter-group differences in patient distribution according to the number of analgesics were observed at each observation interval. Compared to ISFE group, tSFE group was characterized by significantly shorter chair time, lower limitation in daily activities and in opening the mouth, as well as a lower incidence of swelling, bruising, and nasal discharge/bleeding.

**CONCLUSIONS:** The results of the present study indicate that at edentulous maxillary posterior sites with residual bone height of 3-6 mm tSFE (*Smart Lift* technique) should be preferred to ISFE due to significantly shorter chair time, lower limitation in continuing daily activities and opening the mouth, and lower incidence of postoperative signs such as swelling, bruising, and nasal discharge/bleeding.

### Four mm-long versus longer implants in augmented bone in posterior atrophic jaws: 1-year post-loading results from a multi-center randomized controlled trial

T. Maranesi, C. Barausse, R. Pistilli, M. Esposito, P. Felice

Department of Biomedical and Neuromotor Sciences, Unit of Periodontology and Implantology, University of Bologna, Bologna, Italy; Oral and Maxillofacial Unit, San Camillo Hospital, and Private Practice, Rome, Italy; Department of Biomaterials, The Sahlgrenska Academy at Göteborg University, Göteborg, Sweden

**BACKGROUND:** To evaluate whether 4.0 mm short dental implants could be an alternative to augmentation with xenografts and placement of at least 10.0 mm long implants in posterior atrophic jaws.

**METHODS:** A group of 40 patients with atrophic posterior mandibles with 5.0 mm to 6.0 mm bone height above the mandibular canal and 40 patients with atrophic maxillae having 4.0 mm to 5.0 mm below the maxillary sinus, were randomised according to a parallel group design to receive between one and three 4.0 mm long implants or one to three implants of at least 10.0 mm long in augmented bone. Mandibles were vertically augmented with interpositional equine bone blocks and resorbable barriers. Implants were placed 4 months after the interpositional grafting. Maxillary sinuses were augmented with particulated porcine bone via a lateral window covered with resorbable barriers and implants were placed simultaneously. Implants were loaded after 4 months with provisional screw-retained reinforced acrylic restorations replaced after another 4 months by definitive screw-retained metal-composite prostheses. Patients were followed up to 1 year post-loading. Outcome measures were: prosthesis and implant failures, any complication, and peri-implant marginal bone level changes.

**RESULTS:** In six augmented mandibles (30%) it was not possible to place implants of at least 10.0 mm, so shorter implants were placed instead. In mandibles, one implant from the augmented group failed versus two 4.0 mm implants in two patients from the short implant group. In maxillae, three short implants failed in two patients versus seven long implants in four patients. Two prostheses on short implants (one mandibular and one maxillary) were placed at a later stage because of implant failures, versus six prostheses (one mandibular and five maxillary) at augmented sites. In particular, three patients

in the augmented group (one mandible and two maxillae) were not wearing a prosthesis. There were no statistically significant differences in implant failures ( $P = 0.693$ ) or prostheses failures ( $P = 0.126$ ). At mandibular sites, nine augmented patients were affected by complications *versus* two patients treated with short implants ( $P = 0.01$ ), the difference being statistically significant. No significant differences were found for maxillae: nine sinus-lifted patients *versus* four short implant patients were affected by complications ( $P = 0.091$ ). At 1-year post-loading, average peri-implant bone loss was 0.51 mm at 4 mm long mandibular implants, 0.77 mm at 10 mm or longer mandibular implants, 0.63 mm at short maxillary implants and 0.72 mm at long maxillary implants. The difference was statistically significant in mandibles ( $P < 0.001$ ), but not in maxillae ( $P = 0.196$ ). CONCLUSIONS: One year after loading 4.0 mm long implants achieved similar results, if not better, than longer implants in augmented jaws, but were affected by fewer complications. Short implants might be a preferable choice over bone augmentation, especially in mandibles, since the treatment is less invasive, faster, cheaper, and associated with less morbidity. However, 5 to 10 years post-loading data are necessary before making reliable recommendations.

### Conventional drills *versus* piezoelectric surgery preparation for placement of four immediately loaded zygomatic oncology implants in edentulous maxillae: results from 1-year split-mouth randomized controlled trial

V. Marzano, C. Barausse, R. Pistilli, S. Di Simone, M. Esposito, P. Felice

*Department of Biomedical and Neuromotor Sciences, Unit of Periodontology and Implantology, University of Bologna, Bologna, Italy; Oral and Maxillofacial Unit, San Camillo Hospital, and Private Practice, Rome, Italy; Department of Biomaterials, The Sahlgrenska Academy at Göteborg University, Göteborg, Sweden*

**BACKGROUND:** To compare the outcome of site preparation for zygomatic oncology implants using conventional preparation with rotary drills or piezoelectric surgery with dedicated inserts for placing two zygomatic implants per zygoma according to a split-mouth design.

**METHODS:** Twenty edentulous patients with severely atrophic maxillae not having sufficient bone volume for placing dental implants and less than 4 mm of bone height subantrally had their hemi-maxillas randomised according to a split-mouth design into implant site preparation with conventional rotational drills or piezoelectric surgery. Two zygomatic oncology implants (unthreaded coronal portion) were placed in each hemi-maxilla. Implants that achieved an insertion torque superior to 40 Ncm were immediately loaded with screw-retained metal reinforced acrylic provisional prostheses. Outcome measures were: prosthesis and implant failures, any complications, time to place the implants, presence of post-operative haematoma, and patient's preference assessed by independent assessors. All patients were followed up to 1 year after loading.

**RESULTS:** In two patients drills had also to be used at the piezoelectric surgery side to enable implant sites to be prepared. One implant for the conventional drill group did not achieve an insertion torque superior to 40 Ncm since it fractured the zygoma. No patients dropped out and two distal oncology implants failed in the same patient (one per group), who was not prosthetically rehabilitated. Six complications occurred

at drilled sites and three at piezoelectric surgery sites (two patients had bilateral complications), the difference being not statistically significant ( $P = 0.375$ ). Implant placement with conventional drills took on average  $14.35 \pm 1.76$  minutes and with piezoelectric surgery  $23.50 \pm 2.26$  minutes, implant placement time being significantly shorter with conventional drilling ( $P < 0.001$ ). Post-operative haematomas were more frequent at drilled sites ( $P = 0.001$ ), and 16 patients found both techniques equally acceptable, while four preferred piezoelectric surgery ( $P = 0.125$ ).

**CONCLUSIONS:** Both techniques achieved similar clinical results, but conventional drilling required 9 minutes less and could be used in all instances, although it was more aggressive. These results may be system-dependent, therefore they cannot be generalised to other zygomatic systems with confidence.

### Correlation between insertion torque and implant stability quotient in tapered implants with knife-edge thread design

V. Del Lupo<sup>1</sup>, T. Lombardi<sup>2</sup>, F. Berton<sup>1</sup>, A. Zilli<sup>1</sup>, G. Perinetti<sup>1</sup>, R. Di Lenarda<sup>1</sup>, C. Stacchi<sup>1</sup>

*<sup>1</sup>Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy; <sup>2</sup>Private Practice, Cassano allo Jonio, Italy*

**BACKGROUND:** In recent years immediate and early loading protocols have been introduced into clinical practice to shorten treatment time and minimize patient discomfort. In this view, the role of implant primary stability has become extremely important and many non-invasive methods have been proposed for its assessment: among them, insertion torque measurement (IT) and resonance frequency analysis by means of implant stability quotient (ISQ) are the most widespread. Correlations between IT and ISQ have been investigated in numerous studies but it is still unclear if the two parameters are in a direct relationship. The aim of this multicenter prospective study is to evaluate the correlation between insertion torque (IT) and implant stability quotient (ISQ) in tapered implants with knife-edge threads, testing the null hypothesis of no difference in ISQ values among implants placed with different insertion torque values *versus* the alternative hypothesis of a difference.

**METHODS:** Tapered implants of the same dimensions (4mm x 10mm; Anyridge, Megagen) were inserted by using a surgical drilling unit with torque control and an integrated resonance frequency analysis module (Implantmed, W&H). IT (N/cm) and ISQ were recorded and implants were divided into three groups according to the IT: low (<30), medium (30<IT<50) and high torque (>50).

Equality of the groups by age and sex were evaluated by a one-way analysis of variance and a chi-squared test, respectively. For all the following analyses, patient was considered as the statistical unit. ISQ difference among groups was assessed by Kruskal-Wallis test, followed by Bonferroni-corrected Mann-Whitney U-test for pairwise comparisons. The strength of the association between IT and ISQ was assessed by Spearman Rho correlation coefficient ( $\alpha = 0.05$ ).

**RESULTS:** Seventy-five patients were enrolled and treated between June and September 2016 with the insertion of seventy-five implants. Mean IT and ISQ values were  $18.8 \pm 6.0$  N/cm and  $71.8 \pm 6.6$  in low torque group,  $41.2 \pm 7.2$  N/cm and  $75.6 \pm 9.2$  in medium torque group,  $68.2 \pm 12.1$  N/cm and  $78 \pm 6.4$  in high torque group, respectively.



## ABSTRACT

At the pairwise comparisons, a significant difference in ISQ values was demonstrated only between low torque and high torque groups. The strength of the association between IT and ISQ value resulted significant both for the entire sample and the medium torque group, while it resulted not significant in low and high torque groups.

**CONCLUSIONS:** The possibility to achieve a predictable primary stability is an important factor for implant osseointegration, especially when applying immediate and early loading protocols. With the limitations of this study, it can be concluded that, for the specific type of implant here tested, ISQ and IT showed a positive correlation up to values around 50 N/cm: higher insertion torques subject the bone-implant system to unnecessary biological and mechanical stress without obtaining additional benefits in terms of implant stability.

### Immediate full-arch rehabilitation of an atrophic maxilla supported by two anterior axial implants and two posterior fixtures with intrasinus insertion: a case report

M. Zanini, T. Moro, M. Salvato, L. Malchiodi

*School of Dentistry, Department of Surgery, Dentistry, Pediatrics and Gynecology (DIPSCOMI), University of Verona, Verona, Italy*

**BACKGROUND:** The aim of this report is to describe a treatment modality for the immediate fixed rehabilitation of a full maxillary arch in patients with reduced bone height and sinuses pneumatization. The innovation of this approach is the placement of two posterior tilted implants with intrasinus mesial insertion (trans-sinus implants).

**METHODS:** A 68-year-old male was referred to the authors in order to rehabilitate the entire maxilla with a fixed full-arch prosthesis. After clinical and radiographic examination the authors decided for an immediately loaded fixed prosthesis supported by 2 anterior axial implants and 2 posterior fixtures with intrasinus insertion. The old prosthesis was removed, remaining teeth were extracted and alveolar sockets were carefully and thoroughly debrided. A full-thickness flap was elevated beginning at the ridge crest with buccal relieving incisions in the first molar areas. Distal trans-sinus implants were placed preparing the site with Alternating Osteotome Technique (AOT) to achieve ridge expansion, good primary implant stability and sinus membrane elevation without laceration. Both implants achieved a good primary stability (insertion torque > 35 Ncm). Then the two axial implants were inserted. Conical abutments were placed prior to suturing the mucoperiosteal flaps to ensure that they were completely seated onto the implants. Wax maxillomandibular jaw relation records were made at the predetermined occlusal vertical dimension. Impression copings were placed onto the implants and the definitive impressions were made using a pick-up technique with plaster of Paris. Conical abutments were again placed in position and a silicon wrap was applied before discharging the patient. The following day the screw retained provisional prosthesis was placed. It was fashioned with acrylic resin masticatory surfaces, a cast metal framework and without any distal cantilevers. After 5 months the definitive prosthesis was fixed. It was made exactly as the provisional prosthesis, with a cast metal framework and acrylic resin artificial teeth. It was designed without distal cantilever on the left side, whereas a cantilever of one tooth was needed on the right side.

**RESULTS:** Patient didn't develop any sinus infection.

Implants fulfilled their supporting function and no pain or signs of infection were detected during clinical examinations. From the day after surgery the temporary implant-supported prosthesis was in function. After 5 months the definitive prosthesis was positioned and provided adequate masticatory, esthetic, and phonetic function.

**CONCLUSIONS:** Trans-sinus implants appear to be a viable minimally invasive alternative in patients presenting maxillary bone atrophy with advanced sinuses pneumatization. This technique could be considered as an effective solution for the immediate rehabilitation of the maxilla with reduced treatment time, morbidity and financial costs if compared with sinus lift augmentation procedures before implant placement. Trans-sinus implants placement allows the use of longer fixtures consequently achieving high levels of primary stability, thanks to the engagement of 3 cortical layers: alveolar crestal bone, floor of the sinus cavity and medial sinus wall. Furthermore tilting the implants results in reduction of posterior cantilever length, consequently decreasing prosthetic and periimplant bone stresses. The use of a metal framework provides increased strength and rigidity to both the immediate provisional and the definitive prosthesis. The use of a shock adsorbing occlusal surface (such an acrylic resin) allows to absorb masticatory stresses thus reducing the risk of overload.

### Technical complications with three different multi-unit abutments

A. Bianchi, S. Bortolini, A. Natali, M. Giavatto, U. Consolo

*University of Modena and Reggio Emilia, Modena and Reggio Emilia, Italy*

**BACKGROUND:** The aim of this observational study is to obtain data on the clinical behavior of three implant abutments. Technical complications were registered during an average 27-month follow-up for a total of 474 abutments.

**METHODS:** Three different Multi-Unit abutments (n. 323 OT Equator Abutments "EA", Rhein'83, Bologna, Italy; n. 65 Star Biological Abutments "SBA-1", and n. 86 Star Biological Abutments "SBA-2", PhD Course in Industrial and Environmental Engineering, Modena, Italy) have been observed during clinical function through time. Twenty-three patients were randomly selected to receive either SBA-1 or SBA-2 (test groups), and during recall appointments the authors noted down the occurrence of the following technical complications: abutment/screw loosening or fracture, fracture of the framework, and loss of prosthetic retention. Eighty-three patients with EA were used as control group.

**RESULTS:** We recorded the following complication rates: 1) abutment loosening EA 19/323 (5.88%), SBA-1 2/65 (3.08%), SBA-2 1/86 (1.16%); 2) screw loosening EA 34/323 (10.53%), SBA-1 2/65 (3.08%), SBA-2 2/86 (2.33%); 3) abutment fracture EA 1/323 (0.31%), SBA-1 1/65 (1.54%), SBA-2 2/86 (2.33%); 4) screw fracture EA 1/323 (0.31%), SBA-1 0/65 (0%), SBA-2 0/86 (0%); 5) fracture of the framework EA 1/83 (1.20%), SBA-1 0/10 (0%), SBA-2 0/13 (0%); 6) loss of prosthetic retention EA 0/83 (0%), SBA-1 0/10 (0%), SBA-2 0/13 (0%).

**CONCLUSIONS:** None of the prostheses supported by SBA (test groups) experienced loss of retention, connecting screw fracture, nor fracture of the framework; compared with the control group, SBA-2 showed lower complication rates for abutment/screw loosening but higher occurrence of minor fractures at the retentive head level. The coronal design shall be modified to further improve SBA reliability.

## A novel technique for horizontal ridge augmentation in posterior mandible

A. Grisa, A.C. Lim, A. Valladares, S. Froum, S.C. Cho

*Ashman Department of Periodontology and Implant Dentistry, New York University College of Dentistry, New York, NY, USA*

**BACKGROUND:** Nowadays, implant therapy has become an important part of dentistry. When there is not an adequate amount of bone, the bone volume can be increased by bone augmentation. A variety of techniques for ridge augmentation have been developed to overcome the challenging of atrophic ridges. These include inlay and onlay graft, titanium mesh, and titanium reinforced Guided Bone Regeneration approaches. For decades these techniques have been evolving but have yet to achieve a highly predictable outcome. The morphology of defect at the implant site has been reported as a critical factor for the success of bone augmentation. Similar to the extraction socket or maxillary sinus cavity, defect surrounded by bone is called an intra-osseous defect, and this type of defect is known to yield a highly successful regeneration due to the good blood supply and well protected from the outside trauma. In contrast, an extra-osseous defect in which the bone is exposed due to the lack of surrounding bone is known to be less predictable in its bone augmentation procedure. This protocol allows the clinician to maximize the available bone, transform an extra-osseous defect into an intra-osseous defect, avoid short or narrow implants, minimize complications, decrease morbidity, provide cost efficiency and achieve predictable horizontal ridge augmentation. This presentation introduces a customized split crest (CSC) technique for horizontal ridge augmentation in the atrophic posterior mandible. **METHODS:** The system for the CSC technique presented is composed of three components: different diameters trephine burs (4 and 5mm), corresponding trephine guide used to obtain a clean circular cut in the bone expansion device to maximize control in obtaining a green stick fracture as well as facilitating bone graft placement in the critical size defect. The inclusion criteria were the absence of general surgical contraindications, a residual crestal bone length of more than 6 mm, a buccal contour with the absence of undercut and not self-contained defects. After 3 weeks healing period, the implant is placed using implant's manufacturer placement guidelines and once osseointegration is achieved (2-3 months) screw retained restoration is completed.

**RESULTS:** Implant osseointegration was achieved successfully and screw retained restoration was completed.

**CONCLUSIONS:** This technique maximizes critical biologic concepts that improve bone regeneration such as blood supply, creating a more appropriate implant site, green stick fracture, bi-cortical implant stability and RAP (Regional Acceleratory Phenomenon).

## The ailing implant: non surgical vs. surgical approaches

V. Vellani, H. Talib, T. Wiedemann

*NYU College of Dentistry, Oral & Maxillofacial Surgery Department, New York, NY, USA*

**BACKGROUND:** While increasing numbers of implants are being inserted every year, a notable amount of ailing and failing implants are being observed in clinical practice and reported in the scientific literature. Numerous surgical and non surgical treatment protocols and modi-

fications have been published and demonstrate that the overall therapeutic goal encompasses the elimination of an ongoing infection and the preservation - or even restoration - of the surrounding hard and soft peri-implant tissue in order to maintain the function of the affected implant. Our literature review focuses on a feasible guideline of whether a non surgical approach might be sufficient or a step-wise approach with a non surgical pre-treatment and a subsequent surgical approach is indicated to preserve an ailing implant.

**METHODS:** A PubMed, OVID Medline and Google Scholar search for articles related to keywords such as "Management of Peri-Implantitis, Surgical Therapy, Non Surgical Therapy, Resective Therapy and Regenerative Therapy" has been performed. References were selected based on the following criterias: Systematic Review, Reviews, Meta-Analysis and Case Report, English language.

**RESULTS:** The diagnostic parameters used for assessing an ailing implant include clinical indices, peri-implant probing, bleeding on probing (BOP), suppuration, mobility, peri-implant radiography, and microbiology. The therapy of an ailing implant may only comprise a nonsurgical approach, which includes debridement, either alone or combined with antiseptic and/or antibiotic agents. If an ailing implant is diagnosed with bone loss, treatment will depend on the amount of bone loss and the esthetic impact of the implant in question. If bone loss is at an incipient stage, suggested treatment is non surgical similar to that prescribed for peri-implant mucositis. If bone loss is advanced or persists despite initial treatment, it will be necessary to surgically debride the soft, peri-implant tissues affected by the chronic infection and decontaminate the implant surface. Surgical resection is generally confined to implants placed in non-aesthetic sites. There is currently no consensus on a particular protocol or selection of biomaterials in surgical regenerative treatment of an ailing implant due to high heterogeneity and bias among investigated studies. Various bioactive materials including stem cells, growth factors and other bioactive modifiers are in the line for investigation to improve clinical outcomes of surgical regenerative treatment. However, a predictable improvement of clinical parameters applying surgical regenerative treatment cannot be guaranteed.

**CONCLUSIONS:** Until now, no methodology has been established as a gold standard approach for the treatment of an ailing implant. Current evidence shows that peri-implant mucositis can be successfully treated by non surgical therapy. If additional bone loss is diagnosed, a resective or regenerative surgical procedure might be considered. Due to inconsistent findings between studies, additional evidence is needed to assess the benefit of different methods of surgical resective and regenerative therapy on clinical parameters and peri- implant bone level.

## Cumulative survival rate and peri-implant bone loss of short and ultrashort single-crown locking-taper implants in the posterior mandible: a 3-year clinical and radiographic retrospective study

A. Signoriello <sup>1</sup>, M. Simancas Pallares <sup>2</sup>, E. Simeoni <sup>1</sup>, M. Marincola <sup>2</sup>, G. Lombardo <sup>1</sup>, P. F. Nocini <sup>1</sup>

<sup>1</sup>Università di Verona, Verona, Italy; <sup>2</sup>Università di Cartagena, Cartagena, Colombia

## ABSTRACT

**BACKGROUND:** Short ( $6\text{ mm} \leq \text{length} \leq 8\text{ mm}$ ) implants, in comparison with more invasive treatment options, represent a clinical solution for the rehabilitation of extremely atrophic mandible, even though there is still inadequate evidence on ultrashort implants (length  $\leq 5\text{ mm}$ ) clinical reliability. The aim of the study was to compare cumulative survival rates and peri-implant marginal bone loss between 5, 6 and 8 mm-length implants placed in the edentulous posterior mandibular region and restored with splinted and single crowns.

**METHODS:** Ninety-eight patients presenting partial edentulism, associated with vertical defects of the posterior mandible, and with sufficient bone volume to place at least a 5 mm-length implant, were included in the study. The prosthetic restorations were single crowns (S.Cr) or splinted crowns (Spl.Cr). Clinical and radiographic examinations were performed at 3-years recall appointment. Crown-to-implant ratio (C/I) and peri-implant bone loss (PBL) were determined according to well-established and standardized radiographical methods of evaluation. Statistical analysis was performed setting significance level at 0.05.

**RESULTS:** Ninety-eight patients (aged between 31 and 78 years) received 201 implants between February 2008 and June 2015: seventy-one 8 mm-length, eighty-two 6 mm-length and forty-eight 5 mm-length. One hundred-sixty-five implants were restored by single crowns: sixty 8 mm-length, sixty-four 6 mm-length and forty-one 5 mm-length implants. Most of the patients were females (56.12%), non-smokers (79.6%), ASA status I (50%), non- NSAIDs consumers (95.9%), with history of periodontal disease (65.28%). Most of the implants were placed in the molar area (61.7%), restored using porcelain (89.55%), coated by Integra-CP surface (90.5%), with a crown-to-implant ratio (C/I)  $< 2$  (57.21%). Mean C/I was  $1.96 \pm 0.63$  (range 0.92-3.81):  $1.42 \pm 0.32$  (range 0.92-3.07),  $1.99 \pm 0.4$  (range 1.09-2.8) and  $2.71 \pm 0.47$  (range 1.81-3.81) for 8, 6 and 5 mm-length implants respectively. The prevalence of  $C/I > 2$  or  $< 2$  was statistically significant among length-groups ( $p < 0.05$ ). Five late failures were registered. The overall cumulative survival rate (CSR) at 36-months follow-up was 97.51%, with significant differences ( $p < 0.05$ ) between splinted and single crowns (CSR=98.79% for S.Cr and CSR=91.18% for Spl.Cr). No statistically significant differences ( $p > 0.05$ ) among length-groups were found (CSR=98.59% for 8 mm-length implants; CSR=97.56% for 6 mm-length implants; CSR=95.83% for 5 mm-length implants). Crestal bone level (CBL) and "first-bone-to-implant-contact point" position (FBIC) were estimated, along with their variations,  $\Delta\text{CBL}$  (mean crestal bone loss) and  $\Delta\text{FBIC}$  (mean apical shift of the "first-bone-to-implant-contact point" position). Mean  $\Delta\text{CBL}$  and  $\Delta\text{FBIC}$  were respectively  $-0.4 \pm 0.95$  mm and  $0.1 \pm 0.62$  mm;  $-0.55 \pm 1.11$  mm and  $0.1 \pm 0.47$  mm for 8 mm-length implants,  $-0.34 \pm 0.97$  mm and  $0.06 \pm 0.58$  mm for 6 mm-length implants,  $-0.38 \pm 0.92$  mm and  $0.19 \pm 0.66$  mm for 5 mm-length implants;  $-0.39 \pm 1.01$  mm and  $0.07 \pm 0.57$  mm for C/I  $< 2$  group;  $-0.42 \pm 0.97$  mm and  $0.17 \pm 0.64$  mm for C/I  $> 2$  group. The linear regression model did not found any correlations between length-groups or C/I-groups and marginal bone loss ( $p > 0.05$ ) at 36-months follow-up, compared to baseline.

**CONCLUSIONS:** Short and ultrashort single-crown implants ensure stable 3-years clinical outcomes in the atrophic posterior mandible. Mean crown-to-implant ratio of 2.7 seems not to affect survival rate of 5-mm ultrashort locking-taper implants.

### Aesthetic outcomes of single-crown locking-taper implants in the anterior maxilla: a comparison between clinician's evaluation and patient's satisfaction

N. Ambrosi, G. Corrocher, J. Pighi, P. Liboni, A. Signoriello, G. Lombardo, P.F. Nocini

*Università di Verona, Verona, Italy*

**BACKGROUND:** Implant success in the anterior maxilla represents a critical issue, focused on unpredictable outcomes and patient-related aesthetic satisfaction.

The aim of the study was to assess aesthetic clinician's and patient's perspectives, among 11, 8, 6 and 5 mm-length implants placed in the atrophic anterior maxilla, only performing connective tissue or biomaterial augmentation grafts, without extended bony procedures.

**METHODS:** Thirty-two patients presenting partial edentulism, with sufficient bone volume to place at least a 5 mm-length implant, were included in the study. Clinical, radiographic and photographic examinations were performed at recall appointment. Aesthetic evaluations were obtained through a subjective patient's questionnaire (SQ, five questions with check-boxes from 1 to 10) and objective indexes, Pink Esthetic Score (PES) and White Esthetic Score (WES). PES and WES were measured by clinicians considering respectively seven and five soft tissues and tooth crown characteristics; score range was 0-2, with threshold acceptances and maximum values of 8 and 14 for PES and 6 and 10 for WES.

**RESULTS:** 32 patients (13 males and 19 females, mean age 58), mostly following regular oral professional hygiene sessions and interproximal oral hygiene habits, received 50 implants between January 2008 and July 2015. 19 implants replaced central incisors, 18 lateral incisors and 13 canine, lost for periodontal diseases (62%), cavities and endodontic complications (22%), dental traumas (10%), or endodontic-periodontal lesions (6%). Average functional time was  $55.28 \pm 25.28$  months, with a cumulative success rate of 100%. Loading protocol was immediate (18%) or conventional (82%). The prosthetic restorations were single (90%) or splinted crowns (10%), made of porcelain (92%) or resin (8%). Connective tissue graft (CTG) was employed in 21 implants (9 central incisors, 9 lateral incisors and 3 canine), at implant placement (76.2%) or after loading (23.8%). Biomaterial grafts (BG) were executed in 31 implants, at extraction time (12.9%) or at implant placement (87.1%). Median PES was  $9.68 \pm 2.41$  (range 2.25-14), with 58% of rehabilitations considered aesthetically acceptable and 28% aesthetically optimal. Median WES was  $9.01 \pm 1.12$  (range 4.75-10), with 6% of rehabilitations deemed aesthetically acceptable and 92% aesthetically optimal. Average PES+WES was  $18.68 \pm 3.03$  (range 7.75-23.5), with 38% of rehabilitations aesthetically acceptable and 58% aesthetically optimal. Furthermore, PES was greater for periodontal patient ( $9.74 \pm 2.5$ ) compared to non-periodontal ones ( $9.50 \pm 2.23$ ); on the contrary, WES was higher for non-periodontal patients ( $9.29 \pm 1.06$  vs  $8.91 \pm 1.14$ ). Correlations between aesthetic indexes and different variables were estimated, finding a positive statistical influence ( $p < 0.05$ ) of immediate loading protocol and use of CTG on PES, of non-severe bone atrophies and non-use of biomaterial graft on WES, of porcelain crowns on PES+WES. No statistical significances for type of tooth and tooth loss etiology were found. Overall patients' satisfaction was determined by the SQ as  $9.30 \pm 0.97$  (range 6-10), with greater satisfactory



outcomes in tooth crown compared to soft tissues ( $9.32 \pm 1.08$  and  $9.42 \pm 0.99$  for tooth shape and colour vs  $8.42 \pm 1.70$  and  $8.98 \pm 1.41$  for mucosal shape and colour). Patients also expressed more acceptance in cases of tooth loss for periodontal diseases.

**CONCLUSIONS:** Objective and subjective aesthetic satisfaction with locking-taper implants in the anterior maxilla was assessed, revealing similar outcomes among clinicians and patients, despite of more evident patients' criticism, especially regarding mucosal variables and tooth loss for non-periodontal causes.

### Peri-implant conditions around short and ultrashort plateau-design locking-taper implants placed in the atrophic maxilla and mandible: a 4-years retrospective study

M. Pettinà, A. Signoriello, G. Urbani, P. F. Sabbioni, A. Mascellaro, G. Lombardo, P. F. Nocini

*Università di Verona, Verona, Italy*

**BACKGROUND:** Short ( $6\text{mm} \leq \text{length} \leq 8\text{mm}$ ) and ultrashort ( $\text{length} \leq 5\text{mm}$ ) implants constitute a minimally invasive treatment option in the rehabilitation of maxillary and mandibular extreme atrophies, decreasing the necessity of major surgical procedures and the occurrence of post-operative complications. The aim of the study was to assess soft tissues conditions in 8, 6 and 5 mm-length implants placed in the edentulous maxillary and mandibular region.

**METHODS:** One hundred-seventy-two patients presenting partial edentulism, with sufficient bone volume to place at least a 5 mm-length implant and requiring single crowns or partial fixed dentures restorations, were eligible for the study. Follow-up examinations were performed at 4-years recall appointment. Soft tissues, crown-to-implant ratio (C/I) and peri-implant bone loss (PBL) were determined according to well-established and standardized clinical and radiographical methods of evaluation. Statistical analysis was performed setting significance level at 0.05.

**RESULTS:** 400 plateau-design locking-taper implants were placed in 181 males and 219 females (mean age  $53.58 \pm 10.10$ ) between February 2007 and June 2015: 175 were 8 mm-length, 129 were 6 mm-length and 96 were 5 mm-length. 208 implants were positioned in the posterior mandible (71, 81 and 56 respectively 8, 6 and 5-mm length), 140 in the posterior maxilla (59, 42 and 39), 52 in the anterior maxilla (45, 6 and 1). As two implants in the posterior maxilla failed before loading, 398 implants were restored with 343 single crowns and 55 splinted crown. Average functional loading was 48 months. Nine late failures were registered. The overall cumulative survival rate (CSR) at 48-months follow-up was 97.75%. According to success criteria, the overall success rate was 94.25% and the mean PBL was  $0.5 \pm 1.05$  mm. Mean crown-to-implant ratio (C/I) was  $1.97 \pm 0.56$  (range 0.86-3.81) and 41.75% of the implants presented a  $C/I > 2$ . The following parameters were clinically assessed: keratinized tissue (KT), modified plaque index (mPLI), modified bleeding index (mBI), peri-implant probing depths (PPD) and recession (REC). Mean KT was  $2.55 \pm 1.75$  mm; mean mPLI was  $0.91 \pm 0.76$ ; mean mBI was  $0.52 \pm 0.74$ ; mean PPD was  $3.34 \pm 1.28$  mm; mean REC was  $0.2 \pm 0.6$  mm. Only KT and mPLI showed a statistically significant ( $p < 0.05$ ) distribution among length-groups and arch-groups (together with REC).

49 mucositis were observed: 10, 20 and 19 in 8, 6 and 5-mm length implants; 37, 10 and 2 in the posterior maxilla, posterior mandible and anterior maxilla. 23 peri-implantitis were detected: 11, 7 and 5 in 8, 6 and 5-mm length implants; 12, 8 and 3 in the posterior maxilla, posterior mandible and anterior maxilla. Implant placement in the posterior mandible, 6 and 5 mm-length implants,  $KT < 2$ ,  $C/I > 2$  and resin crown-material demonstrated to statistically increase mucositis risk, while single crowns showed to decrease peri-implantitis risk.

**CONCLUSIONS:** Short and ultra-short locking-taper implants ensure stable 4-years clinical outcomes in the atrophic maxilla and mandible.  $C/I > 2$  and  $KT < 2$  seem to influence the risk of biological complications.

### Non-surgical treatment of peri-implant mucositis by manual debridement in association with two different topical antiseptic agents: a clinical and microbiological prospective study

S. Spadafora, C. Signoreto, A. Pardo, F. Baccini, A. Signoriello, G. Lombardo, P. F. Nocini

*Università di Verona, Verona, Italy*

**BACKGROUND:** Accurate prevalence and progress of peri-implant diseases are not currently defined, thus limiting the knowledge about consistent and predictable recent protocols concerning their treatment. It has been demonstrated that traditional non-surgical approaches can be properly supported by experimental means of disinfection. The aim of the study was to compare clinical and microbiological efficacy of two different antiseptic agents locally delivered in peri-implant sites affected by mucositis, in association with manual scaling and root planning (SRP) instrumentation using teflon-coated curettes. Agents used were a desiccant liquid with molecular hygroscopic properties, *HYBENX® Oral Tissue decontaminant™* (HBX), and a disinfectant gel *Chlorhexidine Digluconate Corsodyl™ Dental Gel 1%* (CHX).

**METHODS:** 30 implants in 12 patients, characterized by peri-implant probing depths (PPD)  $\geq 4$  mm and bleeding on probing, were included in the study. Two groups were randomly established at baseline (T0): the test group (T-HBX, 6 patients and 15 implants) received local administration of HBX before SRP, while chlorhexidine gel was administered to the control group (T-CHX, 6 patients and 15 implants) after SRP. Treatments were repeated after 2 and 4 weeks (T1 and T2). Clinical and microbiological evaluations were assessed at T0 and at 3 months (T3). The following clinical parameters were detected to estimate soft tissues conditions: visible plaque index (VPI), modified plaque index (mPLI), bleeding on probing (BOP), modified bleeding index (mBI), peri-implant probing depths (PPD).

**RESULTS:** Comparison between T0 and T3 revealed a greater reduction of inflammation in T-HBX group, even if no statistically significant differences among groups were found in 180 mucosal sites for VPI, mPLI, BOP, mBI.  $\Delta mBI$  was  $0.824 \pm 0.668$  in T-HBX group and  $0.93 \pm 0.781$  in T-CHX group;  $\Delta mPLI$  was  $0.458 \pm 0.525$  in T-HBX group and  $0.357 \pm 0.546$  in T-CHX group;  $\Delta PPD$  was  $0.557 \pm 0.448$  mm in T-HBX group and  $0.137 \pm 0.823$  mm in T-CHX group;  $\Delta BOP$  was 56% in T-HBX group and 44% in T-CHX group;  $\Delta VPI$  was 0% in T-HBX group and 8% in T-CHX group. Concerning the deepest PPD site, at T3  $\Delta PPD$  was statisti-

## ABSTRACT

cally different ( $p < 0.05$ ) between T-HBX group (1.125 mm) and T-CHX group (0.714 mm). T-CHX group revealed greater performances in microbiological analysis compared to T-HBX group, exhibiting a validated and targeted effect on anaerobic bacteria.

**CONCLUSIONS:** Both agents demonstrated to be effective in the reduction of peri-implant inflammatory signs, with greater results in T-HBX group, which showed a statistically significant difference in PPD compared to T-CHX group. On the other side, T-CHX group revealed superior microbiological outcomes, especially among anaerobic bacteria.

### Non-surgical supportive therapy following regenerative surgical treatment of peri-implantitis on short and ultrashort locking-taper implants: a 36-month retrospective study

S. Varalta, C. Signoretto, J. Pighi, F. Ravanello, A. Signoriello, G. Lombardo, P. F. Nocini

*Università di Verona, Verona, Italy*

**BACKGROUND:** Peri-implantitis is an irreversible inflammation of hard and soft tissues which leads to several bone defects. The presence of complex lesions, for which a deep decontamination of implant's surface is required, can be treated with surgical therapy, in order to obtain functional reosteointegration and aesthetic targets. Current techniques are still long-term unpredictable: inflammatory signs permanent in the healed sites, thus demanding the necessity of non-surgical maintenance supportive therapy (TPS) to prevent relapses after treatment. It has been proved that these complications occur more frequently in periodontal patients. The aim of the study was to clinically and microbiologically evaluate the long-term efficacy of TPS after surgical treatment of peri-implantitis on short and ultrashort (8, 6 and 5 mm-length) locking-taper implants in perio and non-perio patients.

**METHODS:** 17 implants in 15 patients, subjected to peri-implantitis, were included in the study. Peri-implantitis was characterized by peri-implant probing depths (PPD)  $\geq 5$  mm and radiographically detectable bone loss (BL)  $\geq 2$  mm. Surgical procedures were executed between December 2012 and December 2016, using a dessicant antiseptic agent containing polysulfones and sodium bicarbonate abrasive powder; defect's bony walls were filled with biphasic calcium phosphate and anorganic bovine bone-derived biomaterials mixture (without any membrane's use). An individual TPS therapy, comprehending specific oral professional hygiene sessions every 3 months and with potentially mucositis treatment through polysulfones gel and teflon-coated curettes, was established for the next 3 years, taking into account history of periodontal disease of the patients. A 36-months recall appointment was fixed to verify soft tissues and microbiological conditions in the healed sites. The following clinical parameters were detected to estimate soft tissues stability (on six sites for each implant): keratinized tissue (KT), modified plaque index (mPLI), modified bleeding index (mBI), peri-implant probing depths (PPD) and recession (REC). Full-mouth Visible Plaque Index (FM-VPI) and Full-mouth Bleeding on probing Index (FM-BOP) were also measured. Evaluation was assessed at baseline (T0), before peri-implant surgery procedure) and follow-up (T1, time of recall appointment).

**RESULTS:** Eight implants were placed in periodontal patients, while seven implants in non-periodontal patients. Cumulative

survival rate at 3-years was 100%. A statistically significant reduction of PPD and mBI was found both in periodontal and non-periodontal patients at 36-months follow-up:  $\Delta$ PPD was 3 mm (8 mm at T0, 5 mm at T1) and absence of deep pockets (PPD  $\geq 6$  mm), which were present at baseline in 16 implants, was found;  $\Delta$ mBI was 2 (2.9 at T0, 0.9 at T1). The other parameters did not show any statistical differences between T0 and T1. Comparing periodontal and non-periodontal patients, the only parameter revealing a statistical significance ( $p < 0.05$ ) among groups was FM-BOP, thus showing an overall improvement in periodontal patients, despite a slightly greater bleeding on probing permanence. Microbiological analysis demonstrated comparable bacteria cultures and common improvement for periodontal and non-periodontal patients, with prevalence of anaerobic species.

**CONCLUSIONS:** Consistency of TPS in supporting specific surgical protocols for peri-implantitis was assessed. Long-term soft tissues stability can be maintained in both periodontal and non-periodontal patients through recurring oral hygiene sessions, indispensable for intercepting inflammatory signs and bone loss.

### What do we know about implantology in patients treated with zoledronic acid? A case report

D. Parise, M. Nocent, E. Bardhi, G. Zanette, C. Bacci

*Oral Medicine, Pathology and Surgery (dott C. Bacci) Clinical Dentistry (head Prof. E. Stellini) Department of Neurosciences (head Prof. A. Martini)*

**BACKGROUND:** The aim of this study is to report a case of osteonecrosis after implant placement in a patient under zoledronic acid (ZOL) for spinal bone metastases.

**METHODS:** The patient is a 65-year-old man affected by hypertension, benign prostatic hyperplasia and with an history of a papillary thyroid cancer, which caused spinal metastases (L3). The patient was scheduled for a visit before starting the therapy with ZOL. Due to an endodontic lesion, the extraction of the element 4.6 was recommended. The extraction was performed by his practitioner and a fresh socket implant was placed. The patient started ZOL therapy 3 weeks after surgery. After 8 months the patient returned, referring pain in right jaw. Clinically there was evidence of bone exposure mesial and lingual the implant persistent for more than 8 weeks, according to international literature, diagnosis of osteonecrosis was made. Pain under morphine analgesia was 4-5 points on the VAS (visual analogic scale). The patient had already accomplished a therapy with amoxicillin but a second one was needed and prescribed together with clorexidine 0.2% mouthwashings. Panoramic x-ray and a CBCT was performed and the exams showed radiographic features of osteonecrosis involving the implant and even the element 4.5. The removal of the osteonecrotic lesion was scheduled under local anesthesia and conscious sedation. Bone block osteotomy with piezoelectric device was performed including alveolar bone, the element 4.5 and the implant.

**RESULTS:** The specimen was diagnosed as bone fragments with osteonecrosis, inflammatory infiltrate of granulocytes and colonies of actinomycetes, conformed to the so called bisphosphonate related osteonecrosis. No other lesions appeared in 6 months follow up.

**CONCLUSIONS:** Among cancer patients receiving high-dose intravenous bisphosphonates, osteonecrosis of the jaw

is dependent on dose and duration of the therapy, and has an estimated incidence of 1% to 12%. The role of bisphosphonates in the development of osteonecrosis of the jaw has not yet been completely understood. ZOL inhibits osteoclastic activity to prevent bone resorption and have anti-angiogenic properties. Dental surgery and infections are predisposing factors for development of osteonecrosis in patient using bisphosphonates. Every treatment concerning manipulation of the jaw bone is recommended to be performed before the patient starts the therapy with a bisphosphonates medication and dental implant are always contraindicated.

### The influence of irrigation system on heat generation during implant site preparation. A review of the literature

A. Zoppello <sup>1\*</sup>, M. Stocchero <sup>1</sup>, G. Brunello <sup>1,2</sup>, E. Stellini <sup>1</sup>, S. Sivolella <sup>1</sup>

<sup>1</sup>University of Padua, Department of Neurosciences, Section of Dentistry, Padua, Italy; <sup>2</sup>University of Padua, Department of Management and Engineering, Vicenza, Italy

**BACKGROUND:** The purpose of this narrative review is to examine the current evidence on the influence of cooling on bone heat generation during implant site preparation.

**METHODS:** A broad search of the literature in the PubMed database was performed. The articles were searched using the following search criteria: (“hot temperature”[MeSH Terms] OR (“hot”[All Fields] AND “temperature”[All Fields]) OR “hot temperature”[All Fields] OR “heat”[All Fields]) AND (“family characteristics”[MeSH Terms] OR (“family”[All Fields] AND “characteristics”[All Fields]) OR “family characteristics”[All Fields] OR “generation”[All Fields]) AND (“therapeutic irrigation”[MeSH Terms] OR (“therapeutic”[All Fields] AND “irrigation”[All Fields]) OR “therapeutic irrigation”[All Fields] OR “irrigation”[All Fields]) AND implant[All Fields] AND site[All Fields] AND preparation[All Fields]. *In vitro*, *in vivo* and clinical studies published in English between 2002 and January 2018, including case series, clinical trials, case-control studies and systematic reviews were selected. Studies in which the implant site was prepared with laser, piezosurgery or a single-step technique and studies with incomplete data were excluded.

Articles which fulfilled the inclusion/exclusion criteria were identified for a full-text reading. From each study, the following data were extracted: type of substrate, type of cooling, use/not use of surgical guide and temperature measurements. **RESULTS:** A total of twenty six potentially relevant studies were found. Eight articles were excluded because they did not investigate irrigation method; eighteen articles were included in this review. Fifteen of the studies were *in vitro* and the osteotomies were performed in the following substrates: bovine fresh bone (eleven studies), porcine fresh bone (two studies) and resin models (one study); three of the studies were *in vivo* and the osteotomies were made in rabbit (two studies) and sheep (one study). The irrigation system was external in ten studies and external *versus* internal or external *versus* double irrigation in the remaining eight studies. Seven of the studies compared the same irrigation method with and without surgical guide. In fifteen studies the temperature was recorded in order to determine the amount of heat generated during implant site preparation (using thermocouples, infrared thermometers, digital thermometers, thermoresistors, thermoprobes); in one study immediate cell viability was investigated by

means of immunohistochemical analysis; in another study the impact of bone overheating was assessed using histomorphometric analysis. Irrigation was found to be the most influential factor on heat generation. However, there is no shared opinion on which is the most useful type of irrigation. All studies concluded that internal or double irrigation are effective in the generation of a lower amount of temperature. Preparing an implant site with surgical guides generates higher amount of heat compared with conventional technique. The explanation which were usually drawn are the following:

- drill guide itself prevents the contact between coolant and preparation site;
- friction between drill and metal sleeves of the guide elevates temperature.

Coolant solutions at lower temperatures are more effective.

**CONCLUSIONS:** Techniques to reduce bone heating should be used during surgical drilling. Double irrigation showed better results in terms of reducing heat generation as compared to single irrigation.

### EDX analysis on failed implants: a preliminary survey

F. Amoroso, F.G. Serra, M.G. Faga, F. Mussano

**BACKGROUND:** Peri-implantitis or implant infection is a biologic complication involving soft and hard tissues around implants. The prevalence of this disease was recently estimated <sup>1</sup> between 12% and 14% in the private practice. Similar prevalence rate were also reported in the University environment.<sup>2</sup> Different methods were presented to minimize or even completely remove biofilm from contaminated surfaces.<sup>3</sup> Chemical and air-abrasive treatments have been shown to be able to disrupt biofilm.<sup>4</sup> Chemical cleaning solution in combination with mechanical debridement is ineffective to remove bacterial biofilm.<sup>5</sup> Inconsistent results were presented by lasers <sup>6</sup> or photodynamic therapy.<sup>7</sup> Interestingly, implantoplasty remains a preferred way <sup>8</sup> to remove infected contaminants. When re-osseointegration of these treated contaminated implant surfaces was assessed, the quality of the implant surface after decontamination dictates the outcome.<sup>10</sup> No matter the type of intervention implemented to counteract peri-implantitis, implant failure remains sometimes an unavoidable outcome. In this *in vitro* report the authors propose an automated EDX analysis of the whole dental implant surface so as to determine the percentage directly involved by the bacterial biofilm on failed fixtures.

**METHODS:** Microstructure was studied by means of a Scanning Electron Microscope (Zeiss SUPRA 40, Carl Zeiss AG, Oberkochen, Germany) with Energy Dispersion Spectroscopy analyzer for elemental composition detection. The energy dispersive X-ray spectroscopy (EDX) analysis was performed by means of a EDAX detector mounted on a JEOL JSM 5200 scanning electron microscope (SEM), at an energy of the primary electron beam of 25 keV. Samples, soon after being collected and fixed in 4% paraformaldehyde, were metalized in order to avoid charge accumulation during EDX analysis. The metallization process was performed by a DC magnetron sputtering, growing an AuPd thin film alloy of a few nanometers. Automated mapping was obtained on the entire surface.

**RESULTS:** On the samples analyzed (n=10), the mean sur-



## ABSTRACT

face covered by bacterial biofilm was  $79.3\% \pm 7.6$  (Mean  $\pm$  95%CI) based on the percentage of Titanium, Oxygen and Phosphorous. As a control, direct observation of the samples was also performed owing to SEM images finding optimal correlation between the automated EDX mapping and human driven quantification of the bacterial biofilm.

**CONCLUSIONS:** Based on these preliminary data, EDX automated mapping may be considered an interesting method to analyze failed implants.

## References

1. Mir-Mari J, Mir-Orfila P, Figueiredo R, Valmaseda-Castellon E, Gay-Escoda C. Prevalence of peri-implant diseases. A cross-sectional study based on a private practice environment. *J Clin Periodontol* 2012;39:490-4.
2. Atieh MA, Alsabeeha NH, Faggion CM, Jr., Duncan WJ. The frequency of peri-implant diseases: a systematic review and meta-analysis. *J Periodontol* 2013;84:1586-98.
3. Subramani K, Wismeijer D. Decontamination of titanium implant surface and re-osseointegration to treat peri-implantitis: a literature review. *Int J Oral Maxillofac Implants* 2012; 27:1043-54.
4. Mussano F, Rovasio S, Schierano G, Baldi I, Carossa S. The effect of glycine-powder airflow and hand instrumentation on peri-implant soft tissues: a split-mouth pilot study. *Int J Prosthodont* 2013;26:42-4.
5. Charalampakis G, Ramberg P, Dahlen G, Berglundh T, Abrahamsson I. Effect of cleansing of biofilm formed on titanium discs. *Clin Oral Implants Res* 2015;26:931-6.
6. Romanos GE, Gupta B, Yunker M, Romanos EB, Malmstrom H. Lasers use in dental implantology. *Implant Dent* 2013;22:282-8.
7. Mellado-Valero A, Buitrago-Vera P, Sola-Ruiz MF, Ferrer-Garcia JC. Decontamination of dental implant surface in peri-implantitis treatment: a literature review. *Med Oral Patol Oral Cir Bucal* 2013;18:e869-76.
8. Charalampakis G, Rabe P, Leonhardt A, Dahlen G. A follow-up study of peri-implantitis cases after treatment. *J Clin Periodontol* 2011;38:864-71.

### **In-vitro response of fibroblasts to different dental implant abutment surfaces treated with plasma of argon for antibacterial purposes**

F.G. Serra <sup>1,2</sup>, T. Genova <sup>1,3</sup>, L. Laurenti <sup>4</sup>, P. Mandracci <sup>4</sup>, F. Mussano <sup>1</sup>, S. Carossa <sup>1</sup>

<sup>1</sup>CIR Dental School, Department of Surgical Sciences, University of Turin, Turin, Italy; <sup>2</sup>DIMEAS, Politecnico of Turin, Turin, Italy; <sup>3</sup>DBIOS, University of Turin, Turin, Italy; <sup>4</sup>DISAT, Politecnico of Turin, Turin, Italy

**BACKGROUND:** Dental implants represent a fundamental option to treat edentulism. However, implants entail the presence of a transmucosal component interfacing also with fibroblasts and epithelial cells. Unwanted yet frequent clinical responses such as gingival recession and the so-called peri-implantitis have recently highlighted the importance of the soft tissue sealing around the implant as a possible barrier to bacterial penetration along the fixture. Several limitations remain as for the height and quality of the soft tissue surrounding the implant. To this end, numerous surface modifications have been recently proposed, among which anodization and thin film coatings have gained interest as possible means to drive selective adhesion of fibroblasts. Anodization is a widely used electrochemical process generating a titanium oxide layer on the implant surface. Titanium silicon-oxygen amorphous thin film alloys (a-SiO<sub>x</sub>) display antibacterial

properties and peculiar features as cell interface. Whatever the surface feature, plasma of Argon proved to be successful in increasing their hydrophilic behaviour. Plasma is an electrically neutral, ionized gas composed of ions, electrons, neutral particles, vacuum ultraviolet and ultraviolet irradiation, free radicals and chemically reactive neutral particles. High-energy vacuum plasma allow a relatively long free path of accelerated electrons and ions, preserving the integrity of materials, removing all chemical traces left from former treatments, and effectively producing cleaner and better controlled surfaces than with other preparation methods. In summary, plasma treatment increases the surface energy and promotes cells spreading, through augmented wettability.

**AIM:** The aim of this *in vitro* study was to evaluate the early response of fibroblasts on different titanium abutment surfaces after treatment with Argon plasma, using a chair-side device. **METHODS:** Sixty sterile 4 mm diameter disks, made of grade 4 titanium, with three different surface topographies (machined Ti, Anodized Ti, a-SiO<sub>x</sub> coated Ti) were randomly allocated to either receive (10 W, 1 bar for 12 minutes) or not plasma treatment before cell seeding.

**RESULTS:** The use of plasma of Argon was capable of significantly increasing the number of adherent fibroblasts at 10 minutes in all tested surfaces. Anodized Ti and a-SiO<sub>x</sub> coated Ti enhanced fibroblast adhesion even before plasma treatment.

**CONCLUSIONS:** This preliminary *in vitro* study highlights the potential benefits of both selecting proper surface modification designed for soft tissue healing and treating dental implant abutments with plasma of Argon

### **Conventional sandblasted and acid-etched implant (SLA) vs. covalently-linked hyaluronic acid implants: a split-mouth RCT**

M. Reza Dermenaki Farahani, M. Cislighi, C. Todaro, S. M. Lupi

Dipartimento di Scienze Clinico-Chirurgiche, Diagnostiche e Pediatriche, Università degli Studi di Pavia, Sezione di Odontoiatria, Poliambulatorio Monospecialistico di Odontoiatria, Pavia, Italy

**BACKGROUND:** This study was conducted to compare the modified dental implant surface by covalently-linked hyaluronic acid versus conventional sandblasted and acid-etched implant (SLA) in human. The null-hypothesis was that there is no difference between the two groups in terms of peri-implant bone loss.

**METHODS:** In a 4-years study, a total of 100 dental implants (52 Hyaluronic acid-coated and 48 SLA surface) were positioned on 30 patients of different gender and age groups with optimal health conditions, through a double-blind RCT study. The control group implants with the conventional uncoated SLA surface were compared to the test group being the grade 4 titanium surface modified bearing a molecular layer of covalently-linked Hyaluronic acid. The sample patients were selected being matched for the criteria of having lost at least two or more posterior and/or anterior teeth bilaterally, and having the necessity to restore the edentulous spaces with more than one implant in the same rehabilitation program. After the surgical positioning of the implants and waiting the proper period of time (two months both in the mandibular and in the maxillary arch) for the osseointegration to occur, a second surgery took place to uncover the implant site and

replace the cover screw with a healing cap. Subsequently after about two weeks, the operator proceeded with the prosthetic implant restoration. Eventually the implants were evaluated by periapical radiographs and crestal bone level were recorded at both mesial and distal sites, at baseline (day 0) and then henceforward after 12, 24, 36 and 48 months.

**RESULTS:** According to the clinician's evaluations, both in the implant placement surgical stage and later in the second surgical procedure to replace the implant cover screw, no differences were observed regarding the post-insertion conditions and stability between the two types of implants. All 100 implant operation sites healed properly without any pathological signs or symptoms. The same results were obtained afterwards in the post-operative visits for what concerns the inflammation index and the signs of the wound healing process. At last, up to our last follow-up date (up to 48 months) crestal bone level showed no difference between and within the test and control groups and all the 100 implants were maintained and being functional.

**CONCLUSIONS:** The conducted RCT demonstrates for the first time *in vivo*, that biomolecular modification of dental implant surface, by means of substituting the titanium surface chemistry with the covalently-linked hyaluronic acid, provides satisfactory outcomes. The importance of these results is highlighted by the fact that they were obtained in the routine clinical practice and in ordinary healthy patients. Last but not least, it is important to be aware of the disadvantages of the rough titanium surface chemistry in progressing the peri-implant disease and therefore taking into consideration the hyaluronic acid-coated implants as a valid alternative to the conventional SLA implants due the signaling and regenerative properties encoded within the hyaluronic acid molecular structure which might facilitate the healing process. Expectantly this clinical trial might be a pioneer for further studies to improve the outcome of dental implant surgery on a long term basis.

### The significance of maintenance for long-term success of dental implant treatments - an epidemiological survey on the quality of information received by patients

M. Gervasi<sup>1</sup>\*, G. Brunello<sup>1,2</sup>, S. Ricci<sup>1</sup>, C. Tomasi<sup>3</sup>, E. Stellini<sup>1</sup>, E. Bressan<sup>1</sup>

<sup>1</sup>University of Padua, Department of Neurosciences, School of Dentistry, Padua, Italy; <sup>2</sup>University of Padua, Department of Management and Engineering, Padua, Italy; <sup>3</sup>Department of Periodontology, Institute of Odontology, Sahlgrenska Academy at University of Gothenburg, Gothenburg, Sweden

**BACKGROUND:** Over the last few decades, the number of dental implants placed every year has been constantly increasing in Europe. As a consequence, the incidence of implant complications and failures has increased as well. Even though plaque control and maintenance are key factors for the long-term success of implant therapy, only a few studies have investigated their role in the primary prevention of complications. The analysis of the current literature reveals that most of the patients do not receive adequate information regarding the maintenance, prior to the implant treatment. Patients should be instructed and motivated to perform a satisfactory level of oral hygiene on a regular basis. Personalized recall programs should also be considered. Patient health outcomes and compliance both to the treatment and to the maintenance

could benefit from an effective patient-dentist communication. The aim of the present study was to investigate, through a questionnaire, the patients' awareness regarding implant maintenance and the quality of information provided by dentists about the role of maintenance protocols in primary prevention of complications in implant dentistry.

**METHODS:** 522 patients over 18 years of age, able to provide informed consent and restored with at least 1 implant-supported prosthesis over a minimum period of 6 months, were submitted to a 2 part questionnaire. The first part included items on demographics, general health and oral cavity status. The second part dealt with 20 items on the level and source of information received about implant therapy, with special emphasis on daily and professional implant-related hygiene measures. In the last question, the patients were asked to indicate their level of satisfaction, with a VAS scale, regarding the information received about frequency and type of procedures for dental implant hygiene. The study was conducted in seven locations (one public structure and six private clinics) during 2016-2017.

**RESULTS:** The sample consisted of 300 female (57,5%) and 221 male (42,3%) patients. Those aged between 46 and 70 represented 67,2% of the sample and the middle age of all patients was 61 years. The main source of information for both implant therapy and oral hygiene was the dentist for more than half of the patients (75,3% and 69,7%, respectively). Prior to implant treatment, 41% of patients did not receive any information about possible complications and failures of implant therapy. After implant treatment, about 68% of patients had no knowledge of measures to be taken in case of bleeding in proximity to the implants and 42% did not modify their oral hygiene habits. Concerning the maintenance, 59.4% did not practice the daily implant hygiene measures at the dental office. Regarding implant longevity, 58.2% of patients were ignorant about the life expectancy of an implant.

**CONCLUSIONS:** Patients' unsatisfactory level of knowledge related to implant therapy and implant-focused oral hygiene measures was evidenced. Patients should be aware of possible short- and long-term complications and failures that may occur. They should be instructed and motivated to perform an adequate level of oral hygiene on a regular basis. It is also essential to follow up patients with an individualized recall program. An effective patient-dentist communication might improve health outcomes and compliance both to the treatment and to the maintenance.

### Metal free implant-prosthetic rehabilitation in the anterior mandible region: a case report

A. Al Habash, A. Solimena, D. Rosella, P. Papi, M. Laureti, N. Ferrigno, G. Pompa

Implant Prosthetic Unit, Department of Oral and Maxillo-Facial Sciences, "Sapienza University of Rome", Rome, Italy

**BACKGROUND:** Nowadays yttria-stabilized zirconia implants (Y-TZP) are an attractive alternative to titanium and titanium alloys fixtures, due to their biocompatibility and high aesthetic value. It is very important in the anterior region, especially when gingival tissue is considerably thin. The aim of this case report was to evaluate the clinical and radiological performance of a full ceramic one-piece implant, immediately loaded and rehabilitated with a cement-retained metal-free crown at 1-year follow-up.

**METHODS:** A 43-years-old man, non-smoker and being with-

## ABSTRACT

out any uncontrolled systemic and local disease, came to our observation on January 2016 presenting a non-restorable mandibular right central incisor (#4.1). After the tooth extraction, a temporary flexible removable partial denture was delivered. After a healing period of 4 months, a Pure Ceramic Implant (Straumann®, Institut Straumann AG, Basel, Switzerland) with a diameter of 3.3 mm and a length of 14mm was inserted, combined with a buccal bone regeneration procedure with 50% of autologous bone and 50% of bovine bone (Bio-Oss®, Geistlich-Pharma, Wolhusen-Switzerland), covered by a porcine absorbable collagen membrane (Bio-Gide®, Geistlich-Pharma, Wolhusen-Switzerland). An insertion torque >35 Ncm allowed for an immediate-loading protocol using a polymethyl methacrylate temporary crown, cemented the following day. After 3 months of healing without any complications, the final cement-retained ceramic restoration was placed.

**RESULTS:** At a 12-months follow-up, no biological and mechanical complications were detected. The marginal bone level and peri-implant soft tissue demonstrated excellent outcomes both functionally and aesthetically.

**CONCLUSIONS:** The recent challenges in aesthetic dentistry combined to the increase of “metal-free” rehabilitation request, has brought to the spread of zirconia implants (Y-TZP). In patients with thin gingival phenotype, where gingival translucency may lead to discoloration of gingival margins due to the grey color of titanium, the use of zirconia is becoming increasingly popular. Ceramic implants show a reduced bacterial adhesion to their surface, which may result in a minor risk of peri-implantitis. Moreover, zirconia dental implants can be considered the treatment of choice in patients with allergy or hypersensitivity to titanium and where conventional metal implants are contraindicated. The present study demonstrated that monotype yttria-stabilized zirconia implants for single-tooth restoration can obtain good clinical and radiological outcomes, even in case of immediate loading procedures.

### Mandibular overdenture retained by two immediately loaded mini implants: a proposal for computer-guided surgery and prosthesis

L. Cereser\*, M.C. Domini, A. Sannicò, L. Boggione, E. Bellia, F.G. Serra, M. Terzini, C. Bignardi, S. Carossa

*Dept. of Surgical Sciences, C.I.R. Dental School, Oral and Maxillofacial Rehabilitation, University of Torino, Italy; Research Assistant, Department of Mechanical and Aerospace Engineering of Politecnico di Torino; Associate Professor, Department of Mechanical and Aerospace Engineering of Politecnico di Torino; Full Professor, Dept. of Surgical Sciences, C.I.R. Dental School, Oral and Maxillofacial Rehabilitation, University of Torino, Italy*

**BACKGROUND:** The purpose of this study is to describe computer-guided surgery and prosthesis procedures of a mandibular overdenture retained by two immediately loaded mini implants. The increasing trend of stability, masticatory efficiency and cycle patterns were evaluated.

**METHODS:** Patients were requested to undergo CB-CT examination which was subsequently loaded on BioNova (MediaLabTM) software. The computer-guided surgery and prosthesis guides were packaged and all steps of the implant positioning and prosthetic rehabilitation were described. Subjective prosthetic evaluation, masticatory cycles and masticatory efficiency tests were performed in order to evaluate the prosthetic functional improvement and patients' satisfac-

tion before and after implant anchorage. These tests were performed at four different times: T0: before implant surgery T1: after anaesthesia and before the beginning of implant surgery T2: after implant insertion under anaesthesia T3: after three months. Two groups of patients were compared: Group 1 underwent traditional surgery whereas Group 2 computer-guided surgery.

**RESULTS:** No surgical and post surgical complications. Significant increasing of comfort, denture stability and phonetic trend starting immediately after the surgery. Significant increase of masticatory efficiency and cycle patterns after implant insertion and loading. This procedure is more time saving than the traditional surgery and less expensive in comparison to traditional computer-guided surgery.

**CONCLUSIONS:** A mandibular overdenture retained by two mini implants with immediate loading protocol using computer-guided surgery and prosthesis, allows less invasive surgery, decreased post operative pain and significative cost reduction; this procedures could be a viable treatment option for the rehabilitation of mandibular edentulous patients.

### Ultrasonic instrument effects on different implant surfaces: a roughness, SEM-EDX, wettability and bacteria decontamination study

F. Faccioni, A. Frassetto, L. Bevilacqua, G. Turco, F. Rusin, A. Khoury, M. Maglione

*Clinical Department of Medical Surgical and Health Sciences, University of Trieste, Trieste, Italy*

**BACKGROUND:** To evaluate the *in vitro* effect of a Ti made ultrasonic tip on different types of implant surfaces: a machined smooth, a laser-treated regular rough and a sanded irregular surface. A roughness profilometer and an elemental trace EDX analysis were conducted. Blood/implant wettability and different bacteria decontamination methods were also evaluated.

**METHODS:** 6 titanium specimen discs were used, 2 for each group type. Each disc underwent ultrasonic debridement from the same operator with a tangential angle. 5 areas were identified in each specimen surface. A profilometer and a SEM-EDX analysis were done and SEM images were captured before and after instrumentation in each area. After instrumentation they were sterilized and a blood drop was put on the titanium surfaces to calculate the wettability angle. Specimens were then sterilized again and PRF (platelet rich fibrin) was applied before putting a blood drop and wettability angle was calculated. This procedure was repeated 3 times for each of the 6 specimens. In the second part of this study 6 more Ti discs (2 for each type) were instrumented (12 specimens in all). The instrumented specimens were contaminated with a *Streptococcus Sanguis* culture. Each specimen surface type was then treated with 4 different methods: chlorhexidine 0.20%, blu laser (Klaser®), ozone and a control group. SEM pictures were taken after bacteria contamination and after decontamination. After decontamination and sterilization specimens were also treated with 38% orthophosphoric acid for 30 seconds. After acid application they were rinsed and a blood drop was put on and wettability angle was calculated. This procedure was repeated 5 times. Specimens were sterilized again. PRF was put on the specimens and a blood drop was put on them. This procedure was achieved 5 times. Wettability angle was calculated.



**RESULTS:** Ra decreased in laser-treated and sanded groups, whereas it remained substantially unvaried in machined group. At SEM-EDX analysis C and Fe traces (steel) were found in laser-treated and sanded group at t0. Al and O traces (Alumina) were found in sanded group at t0 and t1. Microbiology results suggest that bacteria have more difficulty in adhering to sanded surfaces. Blu-laser had a major effect on the laser-treated group. Ozone therapy seemed to be the most effective in decontaminating all types of implant surfaces. PRF application increases wettability in ultrasonic-treated specimens. An additional increase in wettability is obtained in all the groups after pre-treatment with orthophosphoric acid.

**CONCLUSIONS:** To be effective implant surface ultrasonic instrumentation has to be done with Ti made tips, not whit plastic tips. Nevertheless Ti tips instrumentation causes alterations of implant surface microtopography; in addition different implant surfaces undergo different kinds of structural alteration non-clinically definable. The particulation of Ti surface needs further investigation because it is dispersed to the peri-implant niche. With ultrasonic instrumentation superficial Ti particulates are not aseptic. Whether the presence of these particles can elicit an inflammatory reaction needs further investigation. PRF application on instrumented implant surfaces *in vitro* seems to increase wettability values regardless of the implant surface roughness. Furthermore ozone therapy seems to be the most efficient therapy in implant surface decontamination. Exposed implant surface treatment with 38% orthophosphoric acid causes an increase in wettability, regardless of implant surface type. Wettability was major in specimen treated with 38% orthophosphoric acid than in specimens treated with PRF. This suggests that orthophosphoric acid could be a good solution in clinical treatment of perimplantitis.

### Clinical evaluation of dental implant placed in regenerated bone vs. dental implant placed into native bone

L. Fiorillo, S. Marino, F. Gorassini, R. Mastroianni, F. Lauritano, D. Denaro, E. Bramanti, G. Cervino, M. Cicciù

*Department of Biomedical and Dental Sciences and Morphological and Functional Imaging, Messina University, Messina, Italy*

**BACKGROUND:** Today more and more often it resorts to maneuvers of bone regeneration, also for the correction of minimal defects or to improve the aesthetic performance of an oral rehabilitation. The objective of this study is to demonstrate different survival rate in implants placed in the patient's native bone compared to implants placed in regenerated bone, so as to guide the clinician in the most predictable choice. This can be useful to understand what are the best materials, and if it is always convenient to regenerate even for minimal defects. **METHODS:** The study obtained data through the PUBMED database from 1998 to 2018. The articles taken into consideration were evaluated through the title, abstract and full text in order to be included in the review. All the articles concern human clinical studies and report the text in English. The parameters taken into consideration for evaluating implant success are different, such as BoP, radiologic marginal bone level (RBL), plaque index, gingival index, and the implant success parameters defined by Albrektsson. The search terms used to extrapolate the articles were "Native bone implant", "implant regenerated bone", "GBR implantology". It was not

possible to identify a single factor that could be compared regarding the implant health status univocal for all the articles. **RESULTS:** The research initially gave a number of 822 results, of which 792 were eliminated as not relevant to the article or duplicates. Finally, only 20 articles of the 30 remaining fulfilled the inclusion criteria, had sufficient data regarding the study and were analyzed in this review. Articles that were not in English, animal studies, and not full text were also removed.

**CONCLUSIONS:** The studies show a different degree of implant survival on implants placed in native bone compared to implants placed in regenerated bone with GBR technique, with higher values for implants placed in regenerated bone. The regenerated bone shows greater stability over time and this is due both to a slow reabsorption of the material used to perform regenerative surgery and to a probable and greater attenuation of the patient undergoing regenerative surgery by the clinician. However, from a clinical point of view, the values obtained do not prove to be significant in addressing one therapeutic route with respect to another in conditions in which implant placement is possible without regeneration.

### Implant-supported fixed rehabilitation of atrophic maxilla: the use of just-on-4® technique (a case report)

L. Abbruzzese, S. Bianchi, C. Moreschi, M. Nagni, G. Gastaldi, R. Vinci

**BACKGROUND:** This case report shows a rehabilitation of an important maxillary atrophy with the Just-on-4® technique. Using the patient's residual basal bone, we obtain a primary stability of the implants that can be loaded immediately.

**METHODS:** A 63-year-old male patient was referred to the Department of Dentistry and Dental Prosthetics of the University Vita-Salute San Raffaele, requesting a fixed maxillary prosthesis to replace his missing teeth. Through a routine RX exams a significant atrophy and a presence of two no-osseointegrated implants were showed.

A fixed implant supported rehabilitation using the Just-on-4® technique was suggested. According to this technique, four implants two of which axial mesial and two distal with an inclination between 30 and 45 degrees, were placed, toughed with the CAB bar®. The patient underwent surgery under local-anesthesia: a crestal incision was used to prepare full thickness flap in order to preserve the vascular-nervous structures, and two no-osseointegrated implants were extracted.

Two anterior axial implants were placed (WinSix TTX 3.8x13 in 13 and 23 sites), and two posterior implants were placed with a distal trajectory (WinSix TTX 3.8x15 in positions 15 and 25). These implants are characterized by an external hexagon connection. The abutments (17° for axial implants and 30° for posterior implants) and then the cannulas were screwed on the implants. The implants were solidarized by a CAB bar® (Clip Abutment Bar) which is anchored to the cannulas giving stabilization to the structure. A 3/0 non absorbable silk suture was positioned. Then the different parts of the bar on the cannulas were placed to determine the correct size of the clips. The suture was protected by an appropriate trimmed dam sheet. Once the bar was assembled, the initial mobile prosthesis was relined with Paladur resin. After finishing and polishing, the prosthesis was positioned the same day of the surgery.

**RESULTS:** A correct mechanical primary stability is

## ABSTRACT

positively associated with a successful implant integration and long-term successful clinical outcome. Healing was reached by primary intention; this reduced the risk of infection and therefore the scarring was limited. The CAB bar® strengthens the provisional prosthesis in order to elapse 5 months after surgery without occurring in fractures. It is useful to toughen the implants passively in order to guarantee the osseointegration of the implants. The Just-on-4® technique provides a flat prosthetic emergency, that creates a prosthesis tight-fitting to the tissues reducing gaps avoiding food retention and a consequent plaque formation. The Just-on-4® technique allows the implant placement without sinus lifting, reducing the treatment time, surgical procedures and biological cost in the absence of a correct bone volume of the posterior maxilla.

**CONCLUSIONS:** The insertion of fixture in the basal bone gives better outcomes and it provides better results than the insertion of bone grafts, as confirmed by the literature. The immediate implants loading guarantees a greater comfort for the patient increasing the psychological predisposition to the new rehabilitation for an immediate esthetic. The Just-on-4® technique is a valid therapeutic option in case of severe bone atrophy splitting the fixture together, and it represents a possible alternative therapy of the All-on-4® method, from which it comes from.

## Rehabilitation of severe posterior maxillary atrophy with trans-sinus tilted implants: a case report

H. Panajoti <sup>1</sup>, F. Pirani <sup>1</sup>, F. Timone <sup>1</sup>, G. Tetè <sup>1</sup>, R. Vinci <sup>1,2</sup>

<sup>1</sup>Department of Oral Surgery, Vita-Salute San Raffaele University, Milan, Italy; <sup>2</sup>Associate professor, Department of Oral Surgery, Vita-Salute San Raffaele University, Milan, Italy

**BACKGROUND:** Implant-supported rehabilitation of atrophic posterior maxilla still represents a challenge for oral and maxillofacial surgery. Even though it has achieved encouraging results in recent years, implant placement in posterior maxilla could be limited by the lack of adequate bone quantity and the presence of poor bone quality, leading to increased risk of failure, due to a combination of alveolar bone resorption and maxillary sinus pneumatization. Several techniques such as Le Fort I osteotomy, maxillary sinus floor elevation associated with bone grafts, the use of tilted or shorts implants and zygomatic implants have been studied in the past to increase volumes of maxillary alveolar ridge or to enable implant placement. Recently, new treatment approaches have been proposed by using trans-sinus tilted implants. The aim of this case report is to describe the treatment of a severe maxillary atrophy of the posterior regions with trans-sinus tilted implants and to report the outcome after a 3-year follow-up. **METHODS:** A 62-year-old patient, attended the Oral Surgery Department of Vita-Salute San Raffaele University in Milan directed by prof. Vinci, referred discomfort and pain from posterior regions of both quadrants of the maxilla, reporting the presence of wide and inadequate implant-supported prosthetic rehabilitations. On the opposing jaw there was a combination of implant-supported prostheses and natural teeth. After clinical and radiological evaluations, according to patient's wishes, a treatment plan was proposed, consisting of distal implants removal and 2 trans-sinus tilted implants placement, starting from quadrant I. In quadrant I, following the elevation of a mucoperiosteal flap, vestibular and lateral

maxillary sinus walls were exposed and a window above the residual crest was opened. Schneider's membrane was lifted from mesio-vestibular sinus wall and from sinus floor. After implant cavity preparation, a 3.8 x 22 mm fixture was inserted, emerging in molar position (no cantilever was required) and engaging the nasal cortical bone, with an angulation up to 45 degrees. In order to reduce angulation during prosthetic realization, 30° extreme abutments are required. Delayed loading was used and the prosthesis was fabricated after 4 months. After 2 years the same procedure was applied in quadrant II. Follow-up visits were performed up to 36 months.

**RESULTS:** After a 3-year follow-up the rehabilitation is well tolerated and no biological and mechanical complications occurred. No signs of peri-implant pathology or relevant marginal bone resorption were reported.

**CONCLUSIONS:** This case report indicates that trans-sinus tilted implants are a viable alternative in rehabilitation of severe posterior maxillary atrophy. Trans-sinus tilted implants may be used when the placement of conventional tilted implants is not permitted and before considering the use of bone grafting procedures or zygomatic implants.

## Use of narrow-diameter implants in totally edentulous patients: a systematic review

A. Caputo <sup>1</sup>, G. Palandrani <sup>2</sup>, M. Peditto <sup>1</sup>, A. Marcianò <sup>1</sup>, S. Storelli <sup>2</sup>, G. Oteri <sup>1</sup>

<sup>1</sup>Department of Biomedical and Dental Sciences and Morphofunctional Imaging University of Messina Policlinic "Gaetano Martino", Messina, Italy; <sup>2</sup>Department of Biomedical, Surgical and Dental Sciences, University of Milan, Milan, Italy

**BACKGROUND:** The objective of the present review was to evaluate the rehabilitation of edentulous patients through removable and fixed full arch dentures supported by narrow implants with a diameter from 2,5 mm to 3,5 mm.

**METHODS:** A systematic literature search with predetermined inclusion criteria was performed using the PubMed, Cochrane Library and Google Scholar database to find relevant articles on clinical studies published in English language up to March 2017. The preliminary assessment of patients, intervention, comparison and outcome (PICO process) was used to define the search strategy. Were included in the study randomized clinical trials, retrospective or prospective cohort studies involving implants with diameter 2.5 mm to 3.5 mm placed in edentulous patients. Follow up duration of at least 6 months following implant placement was required. Data were extracted by three review authors using data collection forms. Data collected were used to calculate the estimated survival rate at five years (%) with a standard Poisson regression analysis. For each study the estimated marginal bone loss (MBL) at 5 years was calculated by dividing the MBL reported by years of follow-up and multiplying for five.

**RESULTS:** Eight clinical studies on rehabilitations supported by narrow diameter implants were identified. All studies were referred to over-dentures, with an average survival rate of 96%. No studies with sound data on full arch rehabilitations were found. Overall, 368 patients received 825 implants. The identified narrow diameter implants were comprised between 2.5 and 3.3 mm. Follow-up ranged from 6 months to 7.6 years. Only three of the eight studies reported the implant success rate, with the following values: 100% to 12 months follow-up, 52.3% to 7.6 years follow-up and 94% to five years follow-up. Reported survival rates ranged from 84.7% to 100%. The esti-

mated survival rate after five years(%) varied between 86.19% and 98.82%, derived from Poisson regression analysis. After normalization of the results, a weighted average was obtained with a confidence interval of 95% for survival with a value of  $95.4\% \pm 4.3$ . All studies reported the bone level changes at the end of each follow-up. Mean MBL ranged from 0.48 mm to 2.45 mm with a follow-up ranged from 6 months to 7.6 years. Only two studies assessed the patient satisfaction with NDI, by questionnaires based on visual analogue scales (VAS) at 6 months and one year, respectively. In both studies the overall patient's satisfaction was high (score >60).

**CONCLUSIONS:** Clinical data, from this systematic review, suggest that NDIs (2.5mm-3.3mm) represent an alternative treatment option to bone augmentation procedures, in the rehabilitation of edentulous jaw with limited width. The weighted average of the estimated survival rate at 5 years was similar to regular diameter implants. The average MBL value after five years was 1.39 mm similar to those reported for standard implants. Patient satisfaction was generally higher when compared with studies analyzing bone grafting, but the evidence was limited. Moreover the quality and level of evidence was limited in general and with a high risk of bias, so caution is advised when interpreting these data. Further studies are required to determine predictability and possible applicability for SDIs also in supported fixed full-arch restorations.

## Bone graft with Khoury's technique for buccal defect in the aesthetic zone, prior to implant placement

A. Passaretti, G. Petroni, E. Ciarmatori, A. Cicconetti

*Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Rome, Italy*

**BACKGROUND:** The bone augmentation technique proposed by Khoury *et al.* is based on the tridimensional reconstruction of the bone defects by combining thin mandibular cortical block with particulate bone graft, recreating the original bone architecture. This surgical procedure gives better revascularization inducing to an increase of the number of vital preosteoblasts and a better rate of bone healing. The optimization of the bone volume obtained from the intraoral harvesting sites is another advantage of this technique. These factors reduce the lag time before implant insertion from 6 to 3-4 months. We present a case report.

**METHODS:** A young female patient 20 years old was referred to our department for the agenesis of 2.3. Orthodontic treatment gave the space useful for dental prosthesis. Alveolar ridge was evaluated at CT scan and less of 3 millimeter of bone thickness was available. Bone grafting with Khoury's technique was planned. Bone harvesting site was the mandibular. The technique consists of five steps: 1) harvesting of the bone graft; 2) longitudinal split of its cortical part; 3) rigid fixation at the atrophy site creating the original 3D anatomy; 4) filling of the remaining space with cancellous bone harvested with a bone scraper beneath the harvest site and particulate cortical bone; 5) hermetic soft tissue closure without tension.

After 4 months a new CT scan was performed. The volume and quality of the bone obtained at the grafted site was adequate for implant insertion. An implant fixture 4x8 was placed following a subcrestal placement protocol. After 5 months the implant was uncovered and a prosthesis was made. A crown

integrated to the abutment was made in composit material.

**RESULTS:** Six months after prosthetic restoration clinical and radiographic evaluations reveal the success of the rehabilitation. Periodontal indices are compatible with literature. The esthetic outcome satisfies the patient.

**CONCLUSIONS:** In our experience this technique seems to be predictable and reproducible. The 3D reconstruction of bone defects with bone harvested from intraoral donor sites seems to represent a better alternative than an onlay graft with thick cortical bone. Harvesting from intraoral sites exploits the better osteogenetically response than that of the extraoral bone. Moreover it is designed to obtain an "anatomo-biological" reconstruction of the alveolar ridge.

## Rehabilitation of a dental sector using GBR combined with bone graft on a previous vascularized free fibular flap: a case report

E. Brauner, S. Di Carlo, G. Pompa, M. Armida, A. Quarato, E. Grasso, S. Jamshir, A. Cioffi, V. Valentini

**BACKGROUND:** Alveolar ridge augmentation procedures, such as GBR, intend to regain hard tissues lost following teeth extractions, periodontal diseases and any pathological condition causing lack of alveolar and/or basal bone. The purpose of this case report is to illustrate how to obtain an increase of alveolar ridge using heterologous biomaterials in combination with non-resorbable membrane according to Guided Bone Regeneration technique, in a patient suffering Fibrous Dysplasia (FD), previously surgically reconstructed by fibula free flap, in order to achieve an optimal bone regeneration that allows dental implants positioning.

**METHODS:** In 2001 a 43-year-old female patient suffering Fibrous Dysplasia of the right upper maxilla came to our hospital with facial swelling. The lesion was surgically removed and the area was reconstructed with a fibula free flap. In 2003, four dental implants were placed in the fibula and loaded. In 2011, the patient came to our attention with gingival hypertrophy and periimplantitis. The infection had caused the loss of one of the four dental implants, accompanied by a substantial bone resorption. After oral hygiene sessions and removal of the 1.2 implant, we performed a guided bone regeneration in the fibula using Equimatrix® natural bone mineral matrix, Cytoplast™ Ti-150 titanium-reinforced membrane, 4 fastening screws to pin the non-resorbable membrane. After six months, the membrane was removed and 2 Zimmer® implants 3.7 x 13 mm were placed. Subsequently, a titanium milled bar with zirconia custom crowns was screwed to the implants.

**RESULTS:** Computed tomography (CT) six months after GBR showed a bone regeneration of 1 cm MesioDistal, 1 cm BuccoPalatal and 2,8 cm height. At implant insertion, the torque greater than 32 Newton and the measurement of the implant stability by Osstell with a value greater than 60 ISQ have confirmed the excellent bone quality and a good bone-implant interface.

**CONCLUSIONS:** Bone loss in fibula free flap over 1,5 cm could cause fracture requiring new surgery to replace the flap. Significant improvement of bone clinical parameters indicates success of regenerative therapy in similar cases. GBR technique is as complex as particular and needs successful management to achieve a good result in terms of bone quality allowing dental implant rehabilitation, which can improve the patient's appearance and oral function and enhance the overall quality of life.



## ABSTRACT

**Computer-aided zygomatic implants rehabilitation for oncologic patients: preliminary results at 4 years**

G. Pellegrino, D. Relics, A. Tarsitano, F. Basile, C. Marchetti  
*University of Bologna, Alma Mater Studiorum, Oral and Maxillofacial Surgery Department, Bologna, Italy*

**BACKGROUND:** The jaw's rehabilitation using grafting procedures in order to allow the standard implants insertion might be long and difficult in patients that received radical treatments for cancer, due to the lack of bone and soft tissue. In the oncological cases that underwent maxillary resection, the use of zygomatic implants, already used for atrophic jaws with a high success rate was proposed as an alternative to bone grafting techniques. Computer-aided technologies applied in virtual planning of the surgery could improve this method. The aim of this prospective study is to evaluate the use of zygomatic implants combined with a computer-aided procedure in oncologic patients whom received a screw-retained prosthesis rehabilitation and to show preliminary outcomes after 4 years follow-up. From October 2013, 9 patients (6 M, 3 F) that had several types of bone defect after maxillary-resection were treated. The mean follow-up period was 26.5 months (4m - 48m) and the patients' mean age was 66.5 years (87y - 47y). Two types of zygomatic fixture were used: standards implants which had a completely rough surface and oncologic ones that presented a machined surface in the coronal part. Twenty-seven zygomatic implants were placed, and the length of fixtures ranged from 27 mm up to 52.5 mm. In five cases a dynamic-navigation-system was used during the surgery and in seven cases an immediate prosthetic loading were performed. A planned follow-up table was set and according to this, clinical and radiographic outcomes were recorded. Also complications and correspondence between the planned implant length and the postoperative one were evaluated. All the recruited patients filled the OHIP14 questionnaire before the surgery and after the rehabilitation treatment in order to assess their quality of life before the surgery and after the prosthesis deliver.

**RESULTS:** We had a drop-out before the prosthesis loading. The implant success rate was 95.83% and 100% for the prosthesis. One patient had an implant failure that had no consequences on the prosthetic success. The planned and the real zygomatic implant length and position were the same in 75.6% of cases. The quality of life score showed a significant improvement in all patients. One of them underwent an oro-sinus communication, which had a spontaneous healing in the first three month after the surgery. Minor complications were three transient mucositis, one broken Multi-unit-abutment and one prosthesis veneer chipping.

**CONCLUSIONS:** Zygomatic implants seems to allow the fixed prosthetic rehabilitation in oncologic patients even in case of total maxillary resection, thanks to the bi-cortical stability that this kind of implants could achieve through their insertion in the malar bone. The immediate prosthesis loading seems to offers the chance to achieve better functional outcomes in the short term after the surgery and an early recover of the patients. Computer-aided surgery and navigation systems seem to be useful methods to simplify the procedure and to increase its accuracy and predictability. More clinical trials with a longer follow-up period are required to confirm the reliability of this technique.

**Combination of two new materials in alveolar socket preservation: a case report in mandibular post-extraction site**

M. Magi, A. Gumirato, S. Orlandi, M. Catania, A. Saletta, G. Iadarola, F. Zotti, D. De Santis

*<sup>1</sup>School of Dentistry, Department of Surgery, Dentistry, Pediatrics and Gynecology (DIPSCOMI), University of Verona, Verona, Italy; <sup>2</sup>Department of radiology, University and hospital trust of Verona, Verona, Italy*

**BACKGROUND:** Preservation of the alveolar crest after tooth extraction is essential to enhance the surgical site before implant placement. The aim of this work is the radiological evaluation of the effectiveness of alveolar ridge preservation after tooth extraction by using a new regenerative material.

**METHODS:** Because of carious lesion, an extraction of inferior mandibular molar has been performed with a surgical atraumatic procedure. After an accurate curettage, the socket was immediately grafted with a deproteinized bovine bone mineral matrix (Creos<sup>TM</sup> xenogain- NobelBiocare Kloten, Switzerland) and covered with a resorbable non-cross-linked collagen barrier membrane (Creos<sup>TM</sup> Xeno.protect- NobelBiocare Kloten, Switzerland). Primary soft tissue closure was achieved. Horizontal and vertical ridge dimensional variations have been radiologically assessed by cone-beam computer tomography (CBCT) at baseline (T0) and 6 months after the surgical regeneration procedure (T1). The following radiological parameters have been evaluated at each timepoint (T0 and T1): mesial, middle and distal buccal height (MMDBh) and mean value has been calculated (BH); mesial, middle and distal lingual height (MMDLh) and mean value has been calculated (LH); mesial, middle and distal working height (MMDWh) and mean value has been calculated (WH); mesial, middle and distal maximum width (MMDmw) and mean value has been calculated (MW); HU nature bone (HUB). The HU socket preservation (HUSP) and the has been further assessed at T1 in order to better highlight the regenerative potential of this new material associated with a standard GBR technique. All parameters evaluated and data collected were compared with the literature evidences.

**RESULTS:** Following results have been collected: BH(T0)=16.44 mm; BH(T1)=15.14 mm; LH(T0)=18.16 mm; LH(T1)=15.87 mm; WH(T0)=14.67 mm; WH(T1)=15.87 mm; MW(T0)=8.64 mm; MW(T1)=7.48 mm; HUB(T0)=1073.41 HU; HUB(T1)=1094.63 HU; HUSP(T1)=1098.79 HU; Considering these results the BH bone loss was 1.30 mm; the LH bone loss was 2.29 mm; the MW bone loss was 1.16 mm; Furthermore there has been a gain of the WH of 1.20 mm and the HUB difference was 21.22 HU.

**CONCLUSIONS:** Socket preservation by using a new deproteinized bovine bone mineral matrix (Creos<sup>TM</sup> xenogain- NobelBiocare Kloten, Switzerland) in combination with a resorbable non-cross-linked collagen membrane (Creos<sup>TM</sup> Xeno.protect- NobelBiocare Kloten, Switzerland) would seem to be effective in limiting horizontal and vertical ridge alterations in post-extractions sites according to literature evidences.

**Implant-prosthetic management of a severe apical root resorptions: a case report**

M. Miranda, C. Raffone, M. Benegiamo, F. Gianfreda, R. Franco, A. Barlattani

**BACKGROUND:** The aim of the present case is to outline the critical issues dealing with a severe case of apical root

resorptions due to orthodontic treatment. Failure in controlling orthodontics forces combined with an individual predisposition can lead to these undesirable complications. Moreover when the cause is the treatment of an impacted canine, is not unusual to challenge an important aesthetic issue.

**METHODS:** A 24 years old female patient came to our dental unit with chief complaint of tooth's mobility starting from the upper left later incisor to the upper right canine (2.2-1.3). In the medical history orthodontic treatment for impacted canines was present. Neither clinical nor radiological follow up were performed since the the age of 12 when the orthodontic treatment ended. Clinical and Radiological 3D examination were performed, leading to the diagnosis of severe apical root resorptions. Despite several viable options we choose the implant-prosthetic solution. Advantages of this technique are to obtain a very high compliance thanks to the rapidity and to an aesthetic outcome linked with unquestionable predictability. Nevertheless with this therapy it is possible to reduce the biological costs especially compared with a very extended FDP. The day of the surgery, dental nerve anesthesia was achieved using 4% articaine hydrochloride and epinephrine 1:100.000. Dental elements 1.3, 1.2 and 1.1 were extracted while 2.1 and 2.2, due to a good periodontal and endodontic health, weren't. Two Ø 3.8x11 mm implants were placed in the post extractive sites 1.3 and 1.1. In the 1.1 post extractive site an hemostatic sponge was placed (Spongostan™). After implant positioning, percussion test was carried out and immediate loading was performed. In order to have better adaptation of soft tissue a single simple interrupted 3.0 suture was used ( ) A provisional bridge of three elements was finally cemented.

**RESULTS:** Follow up were performed at 7, 15 and 20 days from the surgery. Good healing and aesthetic was observed waiting for final tissues maturation and definitive restoration. **CONCLUSIONS:** Clinicians must face different challenges during everyday practice trying to be more conservative as possible. In the last decade the enhancement of surgical and prosthetic technique leads to the introduction of new tools allowing clinicians a different treatment management, reducing the biological and emotional costs for patients. This report case wants to underline the importance of diagnosis and treatment planning in order to choose the best solution for patient's need.

### Implant placement accuracy using a dynamic navigation system: a prospective clinical trial

G. Pellegrino<sup>1</sup>, A. Ferri<sup>1</sup>, V. Taraschi<sup>2</sup>, A. Zaccino<sup>1</sup>, C. Prati<sup>3</sup>, C. Marchetti<sup>4</sup>

<sup>1</sup>Oral of Maxillofacial Surgery Division, DIBINEM, University of Bologna, Bologna, Italy; <sup>2</sup>University of Technology, School of Mathematical and Physical Sciences, Sydney, Australia; <sup>3</sup>Endodontic Clinical Section, University of Bologna, Bologna, Italy; <sup>4</sup>Maxillo-Facial Surgery and Oral and Maxillofacial Division, DIBINEM, University of Bologna, Bologna, Italy

**BACKGROUND:** The objective of this prospective clinical study was to evaluate the implant placement accuracy of a new dynamic navigation system, the influence on it of the surgical technique and to assess post-operative clinical outcomes and complications.

**METHODS:** Ten patients were recruited and 18 implants were placed. The implant site preparation and the placement of the fixtures were performed with the navigation system according to the pre-operative virtual planning. Ten implants were placed using a flapless technique and eight implants

with an open-flap approach; eight implant site were prepared with a combined piezo-drill method and ten with the standard technique. The accuracy of the navigation system was determined recording the deviation of the real position of each implant from the virtually planned one, matching post-operative CBCT scan to the preoperative one. Point-to-point distances were computed to calculate the average deviation. Then the deviations were measured at the implant insertion point and at the apical point based on the 3D coordinate system; the implant axis deviation and the positioning error in depth was also calculated. The influence of the surgical technique (flapless or open-flap approach), the use of piezoelectric drills and the implant length were investigated with regard to implant deviation.

**RESULTS:** The average linear deviation was  $1.19 \pm 0.54$  mm. A mean deviation of  $1.04 \pm 0.47$  mm was measured at the insertion point and  $1.35 \pm 0.56$  mm at the apical point. The depth error was  $0.43 \pm 0.34$  mm and the axis deviation was  $6.46^\circ \pm 3.95^\circ$ . No significant differences were found in implant placement accuracy between the flapless and the open-flap approach ( $p > 0.05$ ) and between the conventional and piezoelectric techniques ( $p > 0.05$ ). No significant correlation was found between implant length and the accuracy of implant position, neither for linear error ( $R^2 = 0.03$ ;  $p = 0.07$ ) nor angular deviation ( $R^2 = 0.10$ ;  $p = 0.24$ ). No intra- or post-operative complications occurred.

**CONCLUSIONS:** The accuracy values reported in this study are comparable with the literature data regarding dynamic and static computer-guided surgery. Dynamic navigation could increase the quality and safety of interventions and may reduce the morbidity. Further clinical studies should evaluate the benefits of this technique, especially in advanced implantology.

### Internal vs. external connections on immediately loaded full-arch implant rehabilitations: splith-mouth study

M. Carossa, F. Rivarossa, D. Cavagnetto, G. Ambrogio, S. Rufino, F. Pera

C.I.R Dental School, Department of Surgical Sciences, University of Turin, Turin, Italy

**BACKGROUND:** The aim of the present splith-mouth study was to evaluate the difference between peri-implant tissue behaviour using internal and external connection on immediately loaded-full-arch implant rehabilitations.

**METHODS:** 10 subjects, 7 males and 3 females, aged 46-77 years (mean 60,8) have been enrolled. They were all partially edentulous, eight in the upper jaw and two in the lower jaw, with high level of bone resorption. After extraction of the remaining hopeless teeth, patients were rehabilitated with four post extractive implants according to the All on 4 Protocol® with the variance of using two implants with external connection in one emi-jaw and two with internal connection in the other one. The mesial ones were placed up-right while the distal ones were inserted tilted ( $30-45^\circ$ ) in order to avoid the anatomical limits of the edentulous arch. Full-arch resin prosthesis supported with metal framework, connecting all the implants, according to Columbus Bridge Protocol® was screwed following immediate loading protocol (24 to 48 h from the surgery). Peri-implant bone loss was chosen as primary studied parameter. In each patient, peri-implant bone levels were evaluated on intraoral paralleling radiographs.





5 implant failures. Considering the full arch rehabilitation group, survival rate was higher, with a 98,61% with 1 implant failure over 72. Intraoral x-rays analysis revealed a mean marginal bone loss of  $1,32 \pm 0,54$  mm at 2-year follow-up. In cardiopathic patients under anticoagulation therapy the survival rate was 99% and no severe hemorrhagic events occurred. Although there is a higher risk of failure in diabetic patients, the optimization of glycaemic control improved bone healing making this group of patients to be considered at the level of normal population.

**CONCLUSIONS:** A satisfying survival rate can be obtained also in systemic patients under a specific post-operative care program. Keys for success are periodical professional oral hygiene sessions, at home oral hygiene instructions, patient management through a multidisciplinary approach and drugs side-effects supervision on implant osseointegration if present. Within the limitations of this study, dental implant rehabilitation in systemic patients did not worsen general health conditions and provided optimal clinical results, so that can be considered a safety and predictable procedure.

### Morphological alterations of the implant surface due to physical and mechanical decontamination treatments: *in vitro* study

L. Fortunato, M. Lollobrigida, G. Mazzucchi, G. Serafini, A. De Biase

Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Rome, Italy

**BACKGROUND:** The aim of this *in vitro* study is to evaluate the superficial alterations (in morphology, roughness and chemical composition) resulting from the use of 3 different physical decontamination treatments on implant surface.

**METHODS:** 15 sterile titanium discs with rough surface (SLA, Promote®, Camlog Biotechnologies, Basel, Switzerland) were used as samples, including 12 tests and 3 negative controls. The test discs were treated with three different kind of decontamination treatments: a rotating titanium brush (TiBrush™ Straumann®, Basel, Switzerland), an air-powder abrasion (EasyjetPerio, Mectron Medical Technologies, Carasco, Italy) with glycine powder (Mectron Glycine Powder, Mectron Medical Technologies, Carasco, Italy) and a diode laser  $\lambda=810$ nm (FOX Diode Laser, A.R.C. Laser GmbH, Nürnberg, Germany) at 3 and 4 W power. The control discs were not treated, and were analyzed as furnished by the manufacturer. Three different surface analyses were carried out: a morphological analysis through the use of a scanning electron microscope (SEM), a topographic analysis conducted with a white light interferometer and a chemical analysis with the X-ray photoelectron spectroscopy (XPS) technique.

**RESULTS:** The morphological analysis showed that all treatments can alter the discs surface. Minor alterations were showed when using 3 W laser, while for the other treatments several alterations resulted in rounding of the ridges, micro-fusions and cavities. Furthermore, at wide magnifications (10.000-20.000) deposits of glycine powder and titanium were visible on the discs surface in the air-powder abrasion group and titanium brush group. Surface roughness analysis had not pointed out significant alterations, but a slight decrease of roughness with the use of the air-powder abrasion and the 4 W laser, while an increase in roughness was detected with the use of the titanium brush. Moreover, a substantial uniformity of

values between the 3 W laser group and the control group was observed. All the spectra obtained through the XPS analysis appeared to be similar to each other. All the spectra showed very intense peaks of carbon, oxygen and titanium. The XPS analysis revealed small percentages of titanium (4-11%), high percentages of carbon (36-50%) and oxygen (43-50%) and minimum percentages of nitrogen (2-3 %). The above-mentioned percentages are due to the titanium chemical nature, since this element attracts and adsorbs atoms and molecules from the surrounding environment.

**CONCLUSIONS:** All the decontamination treatments analyzed in this study produced some alterations on the implant surface. Morphology was altered in particular by the titanium brush and the 4 W laser. Besides air powder abrasion involved smoothing of the peaks and glycine particles residues, whose *in vivo* effect has not yet been studied. The 3 W laser determined fewer changes than other treatment, but some concerns exist regarding the thermal effect of laser irradiation, due to the tendency of this type of laser to cause rapid temperature increases on implant surface. However, *in vivo* laser application needs to be associated with a mechanical treatment to remove killed bacteria from implant surface.

### Implant prosthetic rehabilitation in HIV-positive patients with two different surface roughness

M.C. Francia, S. Galli, F. Bova, S. Ferrari Parabita, R. Vinci, P. Capparé

Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy; Dental School, Vita Salute University, Milan, Italy

**BACKGROUND:** The present study aimed to evaluate the clinical and radiological outcomes of implant-prosthetic rehabilitations in controlled HIV-positive patients with different implant surface roughness.

**METHODS:** This mono-centric study included HIV patients with a stable disease, showing adherence to antiretroviral drug regimen and good oral hygiene that could benefit from implant prosthetic restorations. Each patient received at least one dental implant and two different types of implant surfaces were compared: one group of implants had a higher surface roughness (Microrough surface MRS) and the other one was electrochemically treated, with a lower surface roughness (Full Contact Covering Surface FCC). Depending on patient requirements, single implants or full arch rehabilitations, in some cases immediate loading (also according to the All on four protocol) was performed. Marginal bone loss (MBLC), implant and prosthetic failure, biological and mechanical complications, serological levels (CD4 cell count, CD4/CD8 ratio and HIV-RNA) were recorded at 12 (T2) and 24 (T3) months after implant insertion. Survival criteria for implant were presence of implant stability, absence of radiolucent zone around the implants, no mucosal suppuration, and no pain. Two years follow-up after implant insertion was considered.

**RESULTS:** Implants were placed in 62 patients and the overall number of fixture was 207. Twenty-six "All on four" complete-arch rehabilitations (104 fixtures) and 103 single implants were achieved. Low incidence of complications and high survival rates with good Marginal Bone Level (MBL) outcome were recorded after two years follow up. Mean marginal bone levels measured at T2 were  $0.53 \pm 0.29$  mm for FCC implant surface and  $0.48 \pm 0.24$

## ABSTRACT

mm for MRS implant surface and at T3 were  $0.90 \pm 0.33$  mm for FCC implant surface and  $0.85 \pm 0.28$  mm for MRS implant surface. Not statistically significant differences were found between the two different implant surfaces ( $P > 0.05$ ). Implant failure occurred in 6 patients (9 fixtures out of 207): four patients developed early implant failure due to primary infection and failure in the osseointegration process; the other two lost their implants due to perimplantitis. The implant survival rate was 97,8% for FCC implants and 93,7% for MRS implants. A statistically significant linear correlation ( $p < 0.001$ ) was found between early implant failure, due to primary infection and failed osseointegration, and HIV viral load. CD4/CD8 ratio, instead, resulted to be statistically correlated to late implant failure ( $p = 0.009$ ) as patients with lower CD4/CD8 ratio showed to be more likely to develop late implant failure.

**CONCLUSIONS:** Within the limitations of the present study, due to the short follow-up and the limited number of implants, low roughness surface seems to be less susceptible to implant failure compared to a higher roughness surface. Moreover, HIV-viral load and CD4/CD8 ratio showed to be important variables for patient selection as they may represent more accurate markers of patient immunological conditions.

### A systematic review on the efficacy of bone augmentation techniques performed using poly-D,L-Lactic acid (PDLA) devices

M. Annunziata, L. Natri, G. Cecoro, R. Migliaccio, L. Guida  
*Department of Dentistry, Orthopedics and Rehabilitation, University of Campania "L. Vanvitelli", Naples, Italy*

**BACKGROUND:** Poly-D, L-lactic acid (PDLA) is a resorbable material that has been proposed in dentistry for regenerative procedures in form of membranes, screws and pins. Although some preclinical studies have investigated the regenerative features, the biological properties as well as the physico-mechanical properties of the PDLA devices, only very few studies have evaluated their clinical performance for bone regeneration. The aim of this review was to evaluate the efficacy of bone augmentation techniques using PDLA devices.

**METHODS:** Medline (PubMed) and Cochrane database for systematic reviews, were searched on February 2018 using an ad hoc created search string by two independent and calibrated reviewers. All interventional and observational studies on humans assessing the efficacy of bone augmentation techniques using PDLA devices were included. No restriction on age or number of patients was considered. Studies regarding osteosynthesis techniques, mainly for fractures, and guided tissue regeneration were not considered. Follow-up duration of the studies should be at least 3 months.

**RESULTS:** 462 items were found after an initial search. By a further search on other databases other 17 studies were found. After the removal of duplicates a total of 466 studies were evaluated by title and abstract and after by the full text articles. After screening for inclusion/exclusion criteria, 6 studies published between 2001 and 2016 were finally included in the review. PDLA membranes/foils, pins and screws were used for a variety of different bone augmentation techniques. The relevant variability of design and methods of the included studies impeded any qualitative or quantitative comparison

among the results of the included studies. Ease of handling, absence of a re-entry phase, modellability of foils, and good soft-tissue response resulted appreciated characteristics of PDLA devices. Some drawbacks such as the risk of membrane exposition, a prolonged absorbability, and a tendency to a fibrous encapsulation of the PDLA devices have been described, although the clinical significance of this finding is unclear.

**CONCLUSIONS:** Clinical data about Poly-D, L-lactic Acid devices for bone regeneration in dentistry are very scarce and heterogenous. Well-designed randomized controlled trials comparing the use of PDLA foils and pins with conventional devices for bone regeneration are strongly encouraged in order to understand the real clinical benefits and drawbacks of this promising, although poorly investigated, technique.

### Prosthetic rehabilitation according to the all-on-4 protocol: prospective cohort-study with a new conical connection implant

L. Cistermino, G. Giorgio, F. Ferrini, P. Capparé, R. Vinci  
*Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy, Dental School, Vita-Salute San Raffaele University, Milan, Italy*

**BACKGROUND:** Oral rehabilitation of atrophic jaws with dental implants is limited by anatomical conditions. In atrophic patients frequently the anterior region has a sufficient alveolar crest while in the posterior area a severe bone resorption is present: this limitation is due to the reduced quantity and quality of available bone. So, the aim of this article is to test a new conical connection implant in "all-on-four" protocols with 2- year follow-up.

**METHODS:** The study was conducted at the Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy, from June 2015 to January 2016. Healthy edentulous patients requiring rehabilitation of upper maxilla and/or mandible were scheduled for the present protocol. All of them required an implant prosthetic restoration of one or both jaws. The "all-on-four" protocol was followed: 4 implants were placed, the mesial ones were axial while the distal ones tilted from 30° to 45°. Pre-operative evaluation was both clinical and radiological. The implant has a rough surface (ZirTi surface, Sweden & Martina, Due Carrare, Padova, Italy) and an internal connection with double taper. The first taper is an internal cone that supports and closes the prosthesis combined with an internal hexagon. This is used for implant screwing and prosthesis repositioning. The second taper is an interaction surface between the prosthetic abutment and the head of the tightening screw, which is conical itself. Each patient underwent implant placement and immediate loading in the same day, obtaining aesthetic and function. Follow-up were both radiographical and clinical and it included evaluation of bone marginal levels and clinical parameters at 6, 12 and 24 months from implants placement.

**RESULTS:** 24 patients, 17 females and 8 males, were enrolled in the present study. A total amount of 100 Implants were placed, 1 patient received rehabilitation of both jaws, 5 patients were rehabilitated only in the mandible and 18 patients were rehabilitated in the upper jaw. At 24 months, a survival rate of 99% was reported (one mesial implant in a maxillary rehabilitation was lost and replaced after three months). Adequate wound healing and soft tissue adaptation

were detected. At 6 months, mean bone levels were  $0.50 \pm 0.12$  mm, at 12 months a value of  $0.81 \pm 0.23$  mm was measured and at 24-month follow-up a mean marginal bone loss of  $0.83 \pm 0.33$  was reported. Not statistically significant differences were found between axial and tilted implants over time ( $P > 0.05$ ).

**CONCLUSIONS:** Within the limitations of the present study, rehabilitation according to the "all-on-four" protocol of edentulous jaws with new conical connection implants resulted in a suitable procedure.

### Implant-prosthetic rehabilitation in HIV-positive patients according to the "all-on-four" technique: a prospective longitudinal study

S. Galli, M.C. Francia, S. Bianchi, F. Bova, P. Capparè

*Department of Dentistry, I.R.C.C.S. San Raffaele Hospital, Milan, Dental School, Vita-Salute University, Milan, Italy*

**BACKGROUND:** The aim of the present study was to evaluate the survival rate of "All-on-four" rehabilitation in HIV-positive patients, treated at San Luigi Center for Infectious Diseases, I.R.C.C.S. San Raffaele Hospital, Milan, Italy.

**METHODS:** In this study 28 patients were included: they were immunocompromised but immunologically stable requiring an implant prosthetic rehabilitation of one or both jaws. They were partial or total edentulous. 4 implants were placed in maxilla and/or mandible, 2 mesial implants placed axially and 2 distal implants placed tilted (from  $30^\circ$  to  $45^\circ$ ), according to the "All-on-four" protocol. In preoperative evaluation, both clinical and radiological examinations were acquired. To obtain aesthetic and function, each patient underwent implant placement and immediate loading in the same day. Implant insertion was considered with two-year follow up; radiographic assessment of peri-implant bone level and clinical parameters were measured at 6, 12, 18 and 24 months from implant placement.

**RESULTS:** A total amount of 148 implants were placed in 28 patients. 9 patients received rehabilitation of both jaws, 3 patients were rehabilitated only in the mandible and 16 patients were rehabilitated in the upper jaw. Implant survival rate was 92.57%. Implants failure occurred in five patients, 6 months after the immediate loading. Two patients lost all four implants while the other three patients lost only one implant, with a total amount of 11 implants failed. All implants were re-placed at a later time. Mean marginal bone levels (MBL) were recorded at 6, 12, 18 and 24 months. The mean MBL in axial implants was  $1.01 \pm 0.81$  mm at 6 months,  $1.17 \pm 0.43$  at 12 months,  $1.12 \pm 0.54$  at 18 months and  $1.22 \pm 0.47$  at 24 months; the mean MBL in tilted implants was  $1.23 \pm 0.32$  at 6 months,  $1.31 \pm 0.21$  mm at 12 months,  $1.27 \pm 0.33$  mm at 18 months and  $1.35 \pm 0.25$  at 24 months. Not statistically significant differences were found between axial and tilted implants over time. A better survival rate and better marginal levels were measured in comparison with previous studies.

**CONCLUSIONS:** Within its limitations, this study shows the advantages in function and aesthetic for immediate loading, representing a predictable treatment for the rehabilitation of completely edentulous jaw in HIV-positive patients. All patients revealed a higher degree of satisfaction compared to removable prostheses. However, further studies are needed to analyze long-term follow up data.

### Immediate versus delayed loading of post-extraction implants in the aesthetic zone: a prospective longitudinal study with 2-year follow-up

L. Sacchi, G. Giorgio, R. Botta, A. Ligabue, R. Vinci

*Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy, Dental School, Vita Salute University, Milan, Italy*

**BACKGROUND:** The aim of this study was to assess implant survival in immediate loaded post extraction implants in the aesthetic zone. Each single rehabilitation was carried out through a new conical connection implant.

**METHODS:** The study was conducted at the Department of Dentistry at San Raffaele Hospital, Milan, Italy from July 2015 to January 2016. Healthy patients requiring single tooth rehabilitation in aesthetic of upper maxilla or in mandible were included in the present study. They were scheduled and randomly divided in two groups. In the first group patients underwent immediate loading procedures, in the second they underwent delayed placement (3 months after extraction) of dental implants in anterior regions. So, in this second group, implants (CSR, Sweden & Martina, Due Carrare, Padova, Italy), followed a delayed loading protocol. The implant has a rough surface (ZirTi surface, Sweden & Martina, Due Carrare, Padova, Italy) and an internal connection with double taper. The first taper is an internal cone that supports and closes the prosthesis combined with an internal hexagon. This is used for implant screwing and prosthesis repositioning. The second taper is an interaction surface between the prosthetic abutment and the head of the tightening screw, which is conical. In immediate loading implants insertion torque was at least 35 N/cm to obtain a suitable primary stability and within 24 hours the definitive abutments were screwed at 23 N/cm. In delayed implants the provisional crowns were placed after 3 months and the definitive prosthetic restoration was performed with a single unit metal-ceramic crown 3 months later. Periapical radiographic with parallel long-cone technique and clinical follow-up were performed at 3, 6, 12, 24 months. A statistical comparison between immediate loading and delayed loading groups was realised.

**RESULTS:** 50 patients, 32 female and 18 male, were enrolled in the present study. Overall at 24-month, a survival rate of 100% was reported. Adequate wound healing and soft tissue adaptation were detected. At 24-month follow-up a mean marginal bone loss was of  $0.10 \pm 0.09$  mm for immediate loading group thus a value of  $0.11 \pm 0.08$  mm was measured for delayed loading group. Not statistically significant differences were found between immediate and delayed loading implants ( $P > 0.05$ ).

**CONCLUSIONS:** When used in immediate extraction and immediate loading, the new implant showed successfully functional and aesthetics results. Nonetheless, not significant differences were detected between immediate and delayed loading groups. Further studies are needed to evaluate long term follow-up.

### Implant survival in diabetic patients: a preliminary study with 1-year follow-up

F. Pirani, P. Montemezzi, P. Capparè, R. Botta, R. Vinci

*Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy, Dental School, Vita Salute University, Milan, Italy*

**BACKGROUND:** Diabetes mellitus is a prevalent medical disorder often accompanied with wound healing alterations,



## ABSTRACT

which may affect osseointegration of dental implants. The use of dental implants in patients with type-1 diabetes mellitus (DM1) remains controversial due to the fact that impairment of bone healing around implants has been reported in literature. This study attempted to determine if DM1 does represent a significant risk factor to the clinical performance of dental implants.

**METHODS:** Adult patients affected by DM1 with a duration greater than 20 years, suffering from partial edentulism (one tooth per arch) and requesting implant treatment were enrolled in this study. Dental implants were placed into single edentulous sites according to manufacturer instructions and a delayed loading protocol was set in place. (Winsix Implant System, Biosafin, Ancona, Italy). Antibiotic prophylaxis was administered to DM1 patients 1 hour prior to the surgery and then continued for 6 days. Implant osseointegration was evaluated through digital intra-oral x-rays and clinical follow-ups at 6 and 12 months from surgery. Professional oral hygiene sessions were planned at 4, 8, and 12 months from surgery. At the same appointment, patients were motivated for at home oral hygiene habits. Single fixed implant-prosthetic rehabilitations were delivered to all patients. Data were analyzed using GraphPad Prism software version 5.00 for windows. **RESULTS:** A total of 25 DM1 patients and 25 non-diabetic patients met the inclusion criteria and were selected for the study. At 12 months, a survival rate of 100% was reported for DM1 group, and 100% for non-diabetic control group, showing no statistical differences ( $p > 0,05$ ). At 12 months follow-up, radiographic results showed a mean marginal bone loss of  $0,81 \pm 0,40$  mm for DM1 group, while  $0,75 \pm 0,30$  mm was recorded in control group, showing no statistical differences ( $p > 0,05$ ). Wound healing was reported without complications in all 25 DM1 patients. Soft tissues around the implant sites developed mild inflammation due to surgical trauma and no infections occurred over time. No prosthetic complications were reported at 12-month follow-up. **CONCLUSIONS:** The absence of statistical differences between the two groups suggested that the use of a minimally invasive implant system, the antibiotic administration before and after the surgery and a strict post-operative oral hygiene protocol are effective on controlling implant survival in DM1 patients. These findings need to be confirmed by a longer follow-up and with a larger sample size.

### Implant prosthetic rehabilitation in patients undergoing anticoagulation therapy: a prospective longitudinal study

P. Montemezzi, F. Pirani, R. Botta, P. Capparè, R. Vinci

Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy, Dental School, Vita-Salute University, Milan, Italy

**BACKGROUND:** The purpose of this study was to evaluate the frequency and threat of bleeding episodes following dental implant surgery in 40 patients where oral anticoagulant therapy was not temporary altered. The importance of not discontinuing the anticoagulation therapy is essential to minimize morbidity risk for the patient. In fact, there is scientific evidence that embolic complications may occur in case of suspension, change or reduction of the anticoagulant therapy.

**METHODS:** Patients included in this study had to be under oral anticoagulant therapy (WARFARIN) and with inter-

national normalized ratio (INR) between 2.5 and 3.5. At least one tooth had to be extracted and replaced through an implant-prosthetic rehabilitation. All patients suffered from controlled cardiovascular disease and were evaluated by the cardiac care unit of San Raffaele Hospital which gave consent to the surgery. Hemorrhagic events were reported for each patient according to a classification that ranged from mild, moderate and severe. A total of 180 teeth were extracted and 96 dental implants (CSR, Sweden & Martina, Due Carrare, Padova, Italy) were positioned in fresh sockets. Immediate prosthetic loading was applied after the surgery. Patients were enrolled in a post-operative care program which included at home instructions and professional oral hygiene sessions. Implant osseointegration was assessed through clinical examinations and bone-implant level was evaluated with digital intraoral x-rays at 6, 12 and 24 months over time. **RESULTS:** Intra-operative moderate bleeding occurred in 11 patients. Mild post-operative bleeding reported were 5: three of them within 12 hours and two within 24 hours from the intervention. Nor bleeding required patient hospitalization neither a secondary surgical intervention. Local agents use such as bone wax and collagen sponge application, sterile gauze compression, tranexamic acid mouthwash accomplished to stop all hemorrhagic complications. Follow-up at 2 years revealed a survival rate of 97,92% (two implants lost). Bone-implant level was stable over time with a mean value  $0,71 \pm 0,42$  mm crestal resorption at 2 years.

**CONCLUSIONS:** At present, there is no evidence in literature about the risk of hemorrhagic events related to dental implants surgery. According to this study, implant surgery can be performed under safety conditions in anticoagulated patients if a minimally invasive approach, specific implant design, anti-hemorrhagic agents and strict post-operative recommendations are set in place.

### Heat generation during implant site preparation through surgical guide: an *ex vivo* study

M. Parravicini, F. Amodio, B. Poletti De Chaurand, G. Sannino, R. Vinci, M. Manacorda

**BACKGROUND:** The aim of this *ex vivo* study was to evaluate the change of bone temperature during the preparation of implant site realized using a bone level surgical guide, low speed drilling and without irrigation.

**METHODS:** The protocol was evaluated *ex vivo* using 8 edentulous lower cadaver jaws, whose bodies were donated by people who had given informed consent for their use for scientific and educational purpose before death.

Inclusion criteria were mandibular areas characterized by D1 and D2 bone density, at least 15 mm residual bone height and 6mm minimum width. Volumes and bone density has been evaluated by three-dimensional radiographic analysis (CBCT) in order to select bone areas with similar properties to reduce test variability. Data of implant site projects has been realised with Real guide Software, and sent to the manufacturer to produce the surgical guides. The protocol provided the use of a standard drilling sequence consisting of five cylindrical drills (Standard twist drill, Winsix, Ancona Italy) whose cutting part is 13 mm. On the surgical guide we find stainless steel cylindrical guides for guided bone drilling and two steel tubes on the vestibular side of the stent. Generally the vestibular tubes are used to fix the template on the bone with specific "anchor pins". In our experiment the

tubes has been used to insert inside the drilled bone two. The position of the thermocouples has been planned at 3mm and 11mm depth orthogonally to the drilling axis and at 1mm far from the intended passage of the drill. For each mandible, template has been positioned after sculpting a mucoperiosteal flap to reach bone level fitting of the template. The osteotomies were performed at 80 rpm without irrigation with continuous drilling to 13 mm depth, creating a final implant site of 3.8 mm in diameter. Thermal variations induced by the last drilling procedure were taken as an experimental data and compared with the sample base temperature.

**RESULTS:** The average temperature variation was 2.6 and 2.1 centigrade degrees at 3mm and 11mm level respectively.

**CONCLUSIONS:** Dental implant success depends on several factors such as bone quality and volume and atraumatic osteotomy. Eriksson and Albrektsson showed that necrosis occurred when the temperature was 47°C or higher for 1 minute in bone. One of the aim of our drilling technique is to reduce heat generation during drilling procedure. Drilling through surgical template in fact reduce irrigation of surgical field. Several factors have been advocated in influencing heat generation during implant site preparation: drill material, drill size, drilling time, drilling speed, drilling depth, drill geometry, drill wearing, load applied, irrigation system and the presence of surgical drill guide. Today Computer Aided Surgery is frequently used to simplify planning and implant treatment. Surgical Guides allows clinically significant improvement in accuracy, time efficiency, reduction in surgical error, invasiveness as well as postoperative morbidity, leading to predictable outcomes. However, the presence of a surgical guide reduce the cooling provided by the irrigation solution. The osteotomies performed with surgical guides can generate higher temperatures than those recorded in the classical protocol with the irrigation system. Reducing drilling speed and timing of site preparation can avoid overheating. With all the limitation of the present study, the preparation of the implant site with a low rotation speed of the drill, although performed without irrigation system, could limit the bone overheating during the implant site preparation and could be more effective in the deepest sites of the osteotomy.

## Peri-implant diseases and metabolic syndrome: a cross-sectional study among an Italian population

P. Papi<sup>1</sup>, B. Di Murro<sup>1</sup>, C. Letizia<sup>2</sup>, G. Pompa<sup>1</sup>

<sup>1</sup>Oral Surgery Unit, Department of Oral and Maxillo-Facial Sciences, Rome, Italy; <sup>2</sup>Secondary Hypertension Unit, Department of Internal Medicine and Medical Specialties, "Sapienza" University of Rome, Rome, Italy

**BACKGROUND:** The association between peri-implantitis and systemic diseases is still controversial in literature. Peri-implantitis, as well as periodontitis, is considered sensitive to factors inducing tissue inflammation (smoking, poor plaque control, hyperglycemia), which can usually be found in the same population. According to current knowledge, prevalence of periodontal disease in patients affected by metabolic syndrome (MetS) is almost double, compared to those without MetS. The aim of this study is to evaluate prevalence of peri-implant diseases among an Italian population of patients affected by MetS.

**METHODS:** Consecutive patients presenting at the university's department for routine examination between September

and December 2017, were screened for presence of dental implants with  $\geq 5$  years of functional loading.

All subjects underwent screening for metabolic syndrome (MetS), in accordance with the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III [ATP III]). A diagnosis of MetS was established in presence of three or more of the following diagnostic criteria: Waist circumference  $>102$  cm (M) or  $>88$  cm (F), Triglyceridemia  $> 150$  mg/dL, HDL-cholesterol  $<40$  mg/dL (M) or  $< 50$  mg/dL (F), Blood pressure  $> 130/85$  mmHg and Fasting glucose  $> 110$  mg/dL. Patients were evaluated using the Periodontal Screening and Recording (PSR) system. If PSR codes were  $\geq 3$  only in sextants with dental implants, then complete probing pocket depths values and standardized periapical x-rays were obtained for each implant in order to evaluate the bone loss. If PSR codes were  $\geq 3$  in different sextants of the mouth, then complete periodontal charts and full-mouth periapical radiograph series were effectuated. Smoking habit, drugs and medical comorbidities were recorded for each patient. Diagnosis of peri-implant diseases was established in accordance with the EFP criteria, for peri-implantitis: probing depth  $\geq 5$ mm, bleeding and / or suppuration at probing, bone loss  $\geq 2$ mm. While, Peri-implant mucositis was defined as evidence of bleeding on probing without concomitant marginal bone loss.

**RESULTS:** A total of 41 patients, divided in two subgroups (affected by MetS or healthy) were enrolled in this case-control study for a total of 132 dental implants: 71 in MetS patients and 61 in control group. Prevalence of peri-implant diseases (peri-implantitis and mucositis) in this two groups was, respectively, 93 vs 63% with an odds ratio (OR) of 7.4462 (95% CI: 2.6092; 21.2496) for patients affected by MetS ( $p<0.001$ ).

**CONCLUSIONS:** A statistically significant association was found between peri-implant diseases and metabolic syndrome ( $p<0.05$ ), this study present just the preliminary results of a larger on-going cross-sectional evaluation. Further studies, with a different design, are needed to investigate this association.

## Salivary levels of metallic ions dissolution in patients with dental implants: a case control-study

R. Treglia, D. Penna, F. Machinè, D. Rosella, P. Papi

Oral Surgery Unit, Department of Oral and Maxillo-Facial Sciences, Sapienza University of Rome, Rome, Italy

**BACKGROUND:** Dental implants have become routine practice for prosthetic rehabilitations: the most used material is titanium or its alloys, a metal with excellent biocompatibility and good resistance to corrosion thanks to the formation of an outer layer of titanium dioxide, however corrosion of implants surface can be detected in oral cavity. Corrosion indicates a natural and irreversible process of slow and continuous deterioration of a material which results in a worsening of the physical-chemical characteristics of the material itself. It is an electrochemical phenomenon that determines a physical-chemical interaction of the material with the surrounding environment. Corrosion processes lead to alterations on the implant surface including the destruction of the TiO<sub>2</sub> layer and the dissolution of titanium. The corrosion products are not bioinert, have an immunogenic potential that can establish secondary pro-

## ABSTRACT

cesses in the inflammatory processes of peri-implantitis and therefore responsible for the increase of bone resorption. The aims of this study are to evaluate the possible correlation between dissolution of metallic particles in saliva and peri-implantitis.

**METHODS:** A saliva sample was taken for each patient, subjects were divided in 3 groups: (A) subjects with dental implants clinically healthy, (B) subjects rehabilitated with dental implants affected by peri-implantitis and (C) subjects without implants. Inclusions criteria were: a healthy implant site or implant with peri-implantitis (A-B), implants loaded for at least a year (A-B), presence of peri-apical x-ray as baseline, no pathologies of the oral mucosa, no antibiotic treatment in the previous three months, non-smoker, no uncontrolled systemic disease, not pregnant or lactating, no metal reconstruction in the mouth. The diagnosis of peri-implantitis was performed in accordance with the EFP criteria: probing depth  $\geq 5$  mm, bleeding and / or suppuration at probing, bone loss  $\geq 2$  mm. 20 ml of saliva were taken from each patient using the unstimulated drainage method and collected in sterile tubes. The inductively coupled plasma mass spectrometry (ICP-MS) was used to measure particles of Al, Mn, Cr, Fe, Co, Cu, Zn, As, Rb, Sr, Mo, Sb, Cs, Hg. Analysis of Variance (ANOVA) was performed to evaluate results, with a p value  $< 0.05$  considered as statistically significant.

**RESULTS:** A total sample of 32 patients (17 women and 15 men), with 101 implants, rehabilitated with three different types of prosthetic rehabilitation [single crown (SC), bridges (B) and overdentures (O)] were included, with a mean age of  $61 \pm 13$  years. Group A: 2 women and 5 men, 15 implants (7 in maxilla and 8 in mandible), with 11 SC, 1 B, 1 O. At ICP-MS, the following metals were detected: Aluminum:  $487,56 \pm 813,22 \mu\text{g/L}$ , Titanium:  $466 \pm 174,82 \mu\text{g/L}$ , Vanadium:  $2,81 \pm 3,22 \mu\text{g/L}$ . Group B: 10 women and 7 men, 86 implants (45 in maxilla and 41 in mandible), with 39 crowns, 6 bridges and 7 Overdenture. At ICP-MS, results were: Aluminum:  $313 \pm 557 \mu\text{g/L}$ , Titanium:  $500 \pm 248 \mu\text{g/L}$ , Vanadium:  $1,88 \pm 1,28 \mu\text{g/L}$ . Group C: 4 women and 3 men. At ICP-MS, results were: Aluminum:  $786,9 \pm 1473 \mu\text{g/L}$ , Titanium:  $488,02 \pm 288,06 \mu\text{g/L}$ , Vanadium:  $4,42 \pm 7,67 \mu\text{g/L}$ . **CONCLUSIONS:** Patients with implants affected by peri-implantitis showed statistically significant ( $p < 0.05$ ) higher levels of Titanium, Vanadium and Aluminum compared to healthy subjects. The authors speculate that metallic ions dissolution may play an important role in peri-implantitis pathogenesis, further longitudinal studies, with larger sample, are needed in order to confirm this hypothesis.

## Computer assisted implantology: static vs. dynamic surgery

F. Baldinetti, A. D'amico, M. Tromba, D. Rosella, P. Papi  
*Oral Surgery Unit, Department of Oral and Maxillo-Facial Sciences, "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** Thanks to the achievements in radiographic three-dimensional imaging technique, as introduction of cone beam computer tomography, and computer technology, as specific software programs for implant surgery planning, computer assisted implantology has become widespread among clinicians. This procedure can obviate to some constraints of the common technique such as patient movement, restricted visualization and the mental transfer of

two-dimensional radiographs to three-dimensional surgical environment, allowing the surgeon to reduce invasiveness and realize a prosthetic-guided digital planning. Computer guided surgery may be divided in two different systems: the computer-guided (static) surgery that uses virtually designed surgical templates to guide implant insertion and the computer-navigated (dynamic) surgery in which the position of the surgical instruments in the surgical area is constantly displayed on a screen with a three-dimensional image of patient. The aim of this review is to evaluate differences between static and dynamic guided implant surgery.

**METHODS:** An electronic literature search was conducted independently by two authors (AD, FB) for reports published up to 1st March 2018 in English language in several databases: Pubmed library, Web of Science (Thomson Reuters), SciVerse (Elsevier), MEDLINE (OVID) and through The Cochrane Database of Systematic Reviews (CDSR). Investigators conducted a literature review in accordance with the following focused question: there are any differences in the sources of error for static and dynamic computer assisted surgeries?

**RESULTS:** The accuracy of those systems depends on all cumulative and interactive errors involved from data set acquisition to the surgical procedure. Regarding static computer guided technique, there are several sources of error: radiographic technique, patient's movement during x-ray acquisition, position of the scan prosthesis, surgical guide production, positioning and stabilization of the surgical template, tolerance of the drills, mucosal thickness, learning curve, jaw position, computer-assisted implant system. This procedure does not allow intraoperative modifications of implant direction, furthermore, according to a systematic review of the 5<sup>th</sup> ITI Consensus Conference on accuracy, a total mean error of 1.12 mm at entry point at 1.39 mm at the apex was detected. As for dynamic surgery, several studies about computer assisted technique indicated that the overall accuracy of a computer-aided intra-operative navigation system during implant surgery depended, in addition to the acquisition of the 3D x-ray image and the intra-oral scan, also from the precision of the surgical navigation system and the skill of surgeon to interpret positional data displayed on the computer screen during implant placement.

**CONCLUSIONS:** It has been pointed out that navigation-controlled technique are less influenced by human error than computer static surgery, however there is lack of information and low quality of studies evaluated in current literature, with no direct comparison between the two methods.

## Rehabilitation of a midfacial defect using extraoral implants and computer-assisted design: therapeutic alternatives in post-oncological defects of the nasal district

L. Palumbo, B. D'Orto, M. Manacorda, R. Vinci, G. Gastaldi  
*Department of dentistry, IRCCS San Raffaele Hospital, Milan, Italy*

**BACKGROUND:** Post-oncological defects of the nasal district can be filled, either by reconstructive surgery, or by implant-supported epithesis. For minor defect, where both the nasal septum and most of the external cartilages are preserved, the surgical restoration represents the treatment of choice. In the case of larger defects, where the flaps used for recon-



structive surgery can more easily undergo necrosis, a valid therapeutic alternative, in order to obtain a good functional and esthetic result, is represented by implant-supported epitheses. The team work is essential: maxillofacial surgeon and prosthodontist, thanks to their respective experience and technical skills, they must be able to design and implement the most suitable prosthetic device for each individual case. The aim of this work is to present a complex clinical case concerning the post-oncological implant-prosthetic rehabilitation of the nasal district in a patient who had previously undergone surgical oncology exeresis.

**METHODS:** The patient came to our attention, at the Department of Dentistry and Dental Prosthetics of the University Vita e Salute San Raffaele, following a partial rhinectomy for a squamous cell carcinoma. The implant-supported maxillo-facial prosthesis requires an individual implant design based on the defect and the anatomical and clinical conditions present. From the analysis of CBCT, carried out using the Real Guide 5.0 software (3 Diemme Italia), the surgeon has defined the future implant placement. The implant planning, carried out in cross section sections and in 3D, has become indispensable for locating the fixture site and ensuring the preservation of the anatomical structures adjacent to risk loco-regional anesthesia is performed with the insertion of two implants, WinSix TTX 3.8x9 and WinSix TTX 3.3x9: implants are placed in the alveolar process of the maxillary bone between the apices of the dental elements and with the emergence in the residual nasal floor. Once the 6 months necessary for osseointegration have been completed, the monitoring checks of implants and mucous membranes are carried out, fixtures are uncovered and abutment MUA are inserted. When the healing process was complete, accurate impressions were taken. The dental technician, thanks to the obtained models, will take care of the realization of a customized metal structure and of the definitive epithesis. The metal structure is screwed into the osseointegrated implants while the epithesis is attached to the metal structure through a system consisting of 4 OT EQUATOR attachments (Rhein83, Bologna, Italy). This system favors the patient the easy removal of the prosthesis and a better cleaning of the nasal cavity and of the device itself. **RESULTS:** After one year from the surgeon / prosthetic rehabilitation, the epithesis is well tolerated and the implants are still perfectly osseointegrated. From the oncological point of view, there is no recurrence of the pathology. Rehabilitation is useful, not only to give the patient a better appearance, but also to promote social integration by ensuring greater self confidence.

**CONCLUSIONS:** The implant-prosthetic rehabilitation of post-oncological defects can be considered an effective and suitable method for the rehabilitation of patients with extensive surgical resections for head and neck cancers. Computer assisted design is essential to guarantee the precise positioning of the fixtures and the success of the implant-supported epithesis. The use of osseointegrated implants has allowed excellent stability and retention of the prosthesis, making it more acceptable and comfortable for the patient.

### **Maxillofacial implant-prosthetic rehabilitation: therapeutic alternatives in post-oncological defects of the facial district**

B. D'Orto, L. Palumbo, M. Manacorda, G. Gastaldi, R. Vinci  
*Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy*

**BACKGROUND:** Wide post-oncological defects as a result of extensive surgical resections of the facial district are rarely rehabilitated with only surgical reconstruction: usually a maxillo-facial epithesis is required to restore morphology and aesthetics. The use of osteointegrated titanium implants, to support this type of prosthesis, was introduced by Branemark as a valid solution to increase stability, retention and camouflage. The aim of this work is to describe a clinical case related to the implant-prosthetic rehabilitation of the left orbital and maxillary region in a patient who had previously undergone surgical oncology exeresis.

**METHODS:** The patient came to our attention, at the Department of Dentistry and Dental Prosthetics of the Vita San Raffaele University, following a demolition of maxillofacial surgery for excision of cutaneous malignancy of the palpebral region, identified as basal cell carcinoma. Surgery included an orbiting exenteratio including cutaneous appendages, with marginotomy of the inferior orbital commissure and partial maxillectomy, extended from the orbital floor to the ipsilateral alveolar process. Given the patient's desire to obtain a morphological restoration, in order to improve the aesthetic conditions, he opts for a maxillofacial implant-prosthetic rehabilitation. The implant-supported maxillo-facial prosthesis requires an individual implant design based on the defect and the anatomical and clinical conditions present: in addition to the objective examination, therefore, second level examinations are considered necessary. From the analysis of CBCT, carried out using the Real Guide 5.0 software (3 Diemme Italia), the surgeon has defined the future implant placement. The implant design, carried out in cross section sections and in 3D, has become indispensable for locating the fixture site and ensuring the preservation of the neighboring anatomical structures at risk: frontal sinus, anterior cranial fossa and, inferiorly, the root processes of the residual dental elements. In loco-regional anesthesia, three WinSix TTX 3.3x9 implants are placed: the first located in the frontal bone near its orbital process, the second at the level of the frontal process of the zygomatic bone maintained after surgical excision, adjacent to the zygomatic suture, and the third placed in the alveolar process of the maxillary bone between the apices of the dental elements and emerging in the residual nasal fossa. Pending the 6 months necessary for osseointegration, debts are checked for evaluation of implants, skin and mucosa.

Taking the fingerprints necessary to detect the implant emergency seats and the morphology of the skin component, the dental technician will have available the models necessary for the construction of the anchoring structure of the epithesis. This system favors the patient the easy removal of the prosthesis and a better sanitation of the post-oncological cavity.

**RESULTS:** After one year of surgical rehabilitation, the implants are still perfectly osseointegrated. From the oncological point of view, there is no recurrence of the pathology.

**CONCLUSIONS:** The implant-prosthetic rehabilitation of post-oncological defects can be considered an effective and suitable method for the rehabilitation of patients with extensive surgical resections for head and neck cancers. Computer assisted design is essential to ensure the precise positioning of the fixtures so as to achieve maximum stability and retention of the epithesis. The collaboration between maxillo-facial surgeon and prosthodontist is essential in the success of the implant-supported prosthesis.

## ABSTRACT

**Use of a porcine derived acellular dermal matrix (mucoderm) in peri-implant soft tissue augmentation procedures: a prospective cohort study**

D. Penna, F. Machinè, D. Rosella, B. Di Murro, P. Papi

*Oral Surgery Unit, Department of Oral and Maxillo-Facial Sciences "Sapienza University of Rome", Rome, Italy*

**BACKGROUND:** Local soft tissue deficits often follow tooth loss and implant therapy. Over the years, several techniques have been proposed for soft tissue augmentation around dental implants, in order to improve keratinized mucosa width (KMW). In clinical reality, higher values of KMW have been correlated with adequate plaque control through easier oral hygiene procedures, demonstrating a positive association with healthy peri-implant soft tissues. A porcine derived acellular dermal matrix mucoderm® (botiss biomaterials, Berlin, Germany) recently, has been proposed as autogenous graft substitute in order to avoid palatal harvesting and obtain comparable results to connective tissue grafts, in term of aesthetics and function. Collagen exhibits excellent biocompatibility and low antigenicity and benefits numerous cellular behaviors including cell adhesion, proliferation, migration, and differentiation. Collagen membranes have ideal biological and mechanical properties for supporting infiltration and proliferation of osteoblasts and play a vital role in guided bone regeneration (GBR). The aim of this study is to present the one year follow-up results of this matrix in peri-implant soft tissue augmentation procedures.

**METHODS:** Twelve patients were enrolled in this study: a titanium-zirconium dental implant was placed in the upper premolar area and, at implant uncovering after eight weeks, the matrix was inserted. KMW gain was considered as primary outcome variable, measured with a rotating movement of the periodontal probe by placing the tip at the mucogingival junction and continuously adapting the probe on the curved surface of the gingiva up to the zenith of the alveolar ridge. Secondary variables evaluated included: Marginal bone loss, Implant survival and success, plaque index, sulcus bleeding index and probing pocket depth. All measurements were performed after 1,3,6 and 12 months from matrix insertion.

**RESULTS:** At the pre-operative examination, mean KMW was  $1.35\pm 0.32$  mm. After one month from matrix insertion, mean KMW was  $7.86\pm 3.22$  mm and was considered as baseline (100%), with no statistically significant intragroup variations ( $p>0.05$ ). No membrane exposures or wound healing complications occurred during post-operative phase and, after 12 months, mean KMW was  $5.67\pm 2.12$  mm, with an average gain of 4 mm, in accordance with previous literature results.

**CONCLUSIONS:** Our study showed the clinical advantages of this matrix in peri-implant mucosa augmentation procedures: good esthetic outcomes and acceptable keratinized mucosa width improvement have been obtained, however, further studies are required to confirm our preliminary results. The results of the present study indicate, that by placing a mucoderm® membrane during implant surgery the keratinized tissue width can be augmented, and the width remains stable for the assessment period.

**Tilted implants: alternative to sinus lift and bone augmentation: a case report and literature review**

R. Botta, L. Redi, C. Manenti, A. Ligabue, G. Tetè, R. Vinci

*Department of Dentistry, IRCCS San Raffaele Hospital, Milan Italy Dental School, Vita-Salute San Raffaele University, Milan, Italy*

**BACKGROUND:** Rehabilitation of edentulous patients with implants becomes challenging due to reduced amount of bone available. The alveolar bone loss principally start with the tooth loss and this state may complicate the ideal placement of the implant. To successfully treat such patients, prior to implant placement, have to undergo invasive procedures like sinus lift and/or bone augmentation which is not possible many time. For this reason tilted implants are increasingly being used for rehabilitation of edentulous jaws, not only as an alternative treatment option to avoid hard tissue augmentation procedures, but also to increase primary stability for immediate loading procedures. The objective of having implants in angulated position is to utilize as much autogenous bone as possible, while still avoiding vital adjacent structures (e.g. the mental foramen in the mandible or the maxillary sinus in the maxilla). This paper focuses on an alternative treatment procedure to sinus lift and bone augmentation, solving the problem of the reduced height of the alveolar bone. The authors present a case report of rehabilitation with tilted basal implant focused on literature review.

**METHODS:** A 62 years male patient with partially edentulous maxilla was referred to the department of implant surgery at S. Raffaele Vita-Salute University. Intervention was planned by clinical intra-oral examination as well as by radiological exam of the edentulous sites. The residual teeth were to be extracted at the same stage and sockets were carefully debrided. Where necessary, a regularization of the edentulous bone ridge was performed with rotating instruments and bone forceps. The implant was placed in the basal area with a tilted position by approximately 30 degrees with respect to the occlusal plane. Motor was driven by a contra-angle at low speed (20-50rpm) and controlled torque (30-50Ncm). Implant lengths and diameters were selected according to the largest dimensions allowed by patient's anatomy, to reduce the risk of fracture for screw and implant. Between the first and second stages the patient wore temporary upper acrylic dentures. After a healing period of 6 months, the cases was finalized. Provisional upper dentures were relined with a soft temporary material. Clinical and radiographic follow-up were carried out two years after prosthetic finalization. The potential occurrence of complications was evaluated.

**RESULTS:** This technique allows for implant placement in residual basal bone in all directions and advantage can be taken of different anatomic locations (maxillary sinus anterior and posterior walls, maxillary tuberosity, pterygoid process, bone palate, nasal spine and nasal floor). No surgical complications were reported in the present study and none implant was lost during the follow-up period. Periapical implant bone resorption was not observed at the second stage surgery. At two years follow up, the clinical appearance of the soft tissues was optimal and no pathological signs were recorded. The possible presence of oral diseases such as periodontal disease, lesions of the oral mucosa may influence success rate of these procedures.

**CONCLUSIONS:** Tilted implants placed in basal bone represents an alternative solution for the best treatment response and minimally invasive surgery. The high cumulative implant survival rate indicates that this technique could be considered a viable treatment option without the use of bone grafts for jaws rehabilitation. An effective recall program is important to early intercept and correct prosthetic and biologic complications in order to avoid implant and prosthetic failures.

## Immediate versus delayed loading of post-extraction implants in molar sites: a prospective longitudinal study with 1-year follow-up

G. Gabriella, L. Cisternino, P. Capparé, R. Vinci, E. Gherlone  
*Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy, Dental School, Vita Salute University, Milan, Italy*

**BACKGROUND:** The aim of this study was to compare the survival rate of immediate loaded post extraction implants versus delayed loaded implants in first molar sites. Each single rehabilitation was carried out through a new conical connection implant.

**METHODS:** The study was conducted at the Department of Dentistry at San Raffaele Hospital, Milan, Italy from February 2016 to January 2017. The present study was based on healthy patients requiring single tooth rehabilitation in the molar region. They were enrolled and randomly divided in two groups. In the first group patients underwent immediate loading procedures, in the second they underwent delayed placement (3 months after extraction) of dental implants. While, in the second group, a delayed submerged-healing implants protocol was adopted. The implant (CSR, Sweden & Martina, Due Carrare, Padova, Italy) had an internal connection with double taper: the first taper is an internal cone that supports and closes the prosthesis combined with an internal hexagon. This is used for implant screwing and prosthesis repositioning. The second taper is an interaction surface between the prosthetic abutment and the head of the tightening screw, which is

conical itself. In immediate loading implants insertion torque was at least 35 N/cm to obtain a suitable primary stability and within 24 hours the definitive abutments were screwed at 23 N/cm. Implants were placed 0.5 mm below the crest. In delayed implants the temporary crowns were placed after 3 months and in each case the definitive prosthetic restoration was performed with a single unit metal-ceramic crown 3 months later. Periapical digital radiographs with parallel long-cone technique and clinical follow-up were performed at 3, 6, 12 months. A statistical analysis was performed to compare outcome measures between immediate and delayed loading groups.

**RESULTS:** 50 patients received 50 implants (one implant each patient). At 12 months after implants placement, a survival rate of 98.0% was reported (an implant was lost in immediate loading group one month after placement). Adequate wound healing and soft tissue adaptation were detected. At 12-month follow-up a mean marginal bone loss was of  $0.53 \pm 0.12$  mm for immediate loading group thus a value of  $0.42 \pm 0.18$  mm was measured for delayed loading group. Indeed, the bone levels remained stable; similar values were reported over time, with no significant differences ( $P > 0.05$ ).

**CONCLUSIONS:** When used in immediate extraction and immediate loading, the new conical connection implant showed successfully functional results and satisfied healing of soft and peri-implants tissues. Nonetheless similar patterns of sequential osseointegration were observed in immediate and delayed loading groups. Further studies are needed to evaluate long term follow-up.



# LASER IN ODONTOSTOMATOLOGIA

## Evaluation of two professional treatments for dentin hypersensitivity. Clinical trial

F. Bova, F. Cattoni, B. Rebba, G. Gastaldi

*Università Vita-Salute San Raffaele, Milan, Italy*

**BACKGROUND:** Dentin hypersensitivity (DH) causes a brief and intense pain in response to thermal or tactile stimuli on exposed dentin surfaces, not attributable to a carious lesion. Without a definitive explanation of HD, the current most accepted theory proposes that it is related to the exposure of light on the dentinal tubules, the most common cause of which may be the presence of toothbrush abrasions, or repeated consumption of highly acidic beverages or, again, the presence of gingival recession. In some cases HD can lead to difficulties eating or drinking cold foods and beverages, imposing such sacrifices can affect the quality of life for certain individuals. There are currently some at-home and professional treatments for HD and its associated symptoms. One of the most recent proposals for treatment of HD is the use of 980nm diode laser with the addition of a topical application of high concentration fluoride (12550ppm).

**AIM:** Compare the treatment of HD through targeted application of desensitizing varnishes with an approach based on the application of fluoride gel on areas exposed to irritation with lasers and assess the ability of the two solutions based on their power to reduce the perceived pain of HD and the duration of these effects produced by the two different treatments.

**METHODS:** 40 patients that had been diagnosed with HD were enrolled, and by randomization (iRandomizer, Shoomi LLC Developer), were divided into 2 groups of 20 individuals in which they were given one of the HD two treatments under evaluation. The patients, all over the age of 18, had at least 2 natural dental areas affected by HD but had not diagnosed with dental caries. The patients included in the first group (G1) were treated by applying desensitizing varnish (Seal & Protects, Dentsply) according to the manufacturer's instructions. The patients in the second group (G2) were treated using 980 nm diode laser (Raffaello Bio, DMT) along with a topical application of gel fluoride at a concentration of 12500 ppm (Elmex Gel, Colgate Palmolive Company). For the efficacy of the evaluation, the patients' HD was produced by a 1-second air-blast test and by a periodontal probe test (PCUNC15-HuFriedy) for 3 seconds. The pain felt by the patient was then recorded on a VAS analogue scale at baseline (before treatment, t0), right after treatment (t1), at 30 days after treatment (t2), at 90 days after treatment (t3). And at 180 days after treatment (t4). The data obtained was then analysed with an inferential statistical approach using the MANOVA test.

**RESULTS:** At the end of the statistic analysis realised on the groups object of investigation, you can confirm that in both cases, the results obtained through the distribution of both treatments, have become obvious significant ( $p<0.001$ ). The time is not strictly variable with the results obtained ( $p=0.53$ ). At the end of the period of observation, the patients treated by

laser present on average a symptomatology associated with lower dental hypersensitivity compared to the patients treated with varnish, through the statistic comparison between the two methods it couldn't get reached a significant threshold ( $p=0.491$ ).

**CONCLUSIONS:** The results obtained and their analysis below a statistic profile suggests that both the methods analysed represents a valid strategy for non-invasive treatment of dental hypersensitivity. From a clinical point of view, the treatments examined result tolerable for the patient and of a reproducible and fast execution.

## Clinical and oxidative stress parameters in periodontal pockets treated with laser therapy: a preliminary split-mouth study

M.T. Bogdan Preda, K. Rupel, G. Ottaviani, M. Gobbo, A. Poropat, V. Zoi, M. Marcat, L. Bevilacqua, R. Di Lenarda, M. Biasotto

*Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy*

**BACKGROUND:** Periodontal disease is a pathological process which involves complex interactions between microorganisms in the oral cavity and host immune system, which cause the formation of gingival pockets, and eventually loss of teeth. There is growing evidence about the efficacy of laser therapy for the treatment of periodontitis, but little is known about the possible effects on oxidative stress parameters in periodontal pockets.

**METHODS:** The study was conducted according to the declaration of Helsinki and was approved by the local ethical committee. 4 patients meeting inclusion and exclusion criteria with chronic periodontal disease assessed by periodontal chart were included in the study and treated in split-mouth, where half mouth was treated with scaling root planing (SRP), while the other half was treated with SRP + laser therapy including two protocols: an antimicrobial phase with 445nm wavelength, peak power 0.5W, frequency 20Hz and fluence 13mJ/cm<sup>2</sup>, and a biostimulating phase with 970nm wavelength, peak power 0.1W, and fluence 6J/cm<sup>2</sup>. Gingival crevicular fluid (GCF) samples from 26 pockets (13 SRP, 13 SRP+laser) with probing depth  $\geq 4$ mm were obtained using Periopaper at following time points: T0 (before treatment), T1 (24 hours after treatment), T2 (7 days after treatment), T3 (14 days after treatment) and T4 (45 days after the treatment). A blinded rater recorded clinical parameters repeating the periodontal chart 45 days after the treatment. GCF samples were processed performing tests for the determination of both oxidative stress and antioxidant capacity: TOS (Total Oxidant Status), AOPP (Advanced Oxidation Protein Products) and FRAS (Ferric Reducing Ability of Saliva). A  $p<0.05$  was assessed for the rejection of the null hypothesis.

**RESULTS:** Clinical parameters significantly improved

in both groups. Among the selected pockets, the probing depth decreased significantly in both groups. The number of SRP+laser (-56.16%) treated pockets that reduced probing depth to <4mm was higher than the SRP (-42.36%) group, but the difference wasn't statistically significant. Oxidative stress increased significantly at T1 in SRP group, while in the SRP+LT it remained at baseline. In addition, both TOS and AOPP increases at T1 were able to identify the pockets that responded less to both therapies.

**CONCLUSIONS:** The addition of laser therapy to conventional periodontal therapy reduced oxidative stress during healing time. Oxidative stress markers TOS and AOPP seem to be able to identify early the response to the treatment.

### Diode laser photocoagulation of vascular malformations: report on 1024 oral lesions

A. Tempesta, S. Capodiferro, G. Coti, A. Carrassi, P. Mezzapesa, A. De Caro, D. De Falco, R. Altieri, G. Favia

*Complex Operating Unit of Oral Pathology and Surgery, Department of Interdisciplinary Medicine, University of Bari, Bari, Italy*

**BACKGROUND:** Treatment of patients affected by vascular malformations (VM) is still matter of debate. To date, laser photocoagulation could be considered the gold standard for the management of both venous and capillary VM (CVM). The aim of this study was to describe the results of diode laser therapy on 241 patients with 1024 oral CVM.

**METHODS:** We report the cases of 241 patients (137 female, 104 male, mean age 43 years old) presenting 1024 oral CVM treated in the Complex Operating Unit of Oral Pathology and Surgery Department of Interdisciplinary Medicine University of Bari from 2005 to 2017. Considering lesions size, CVM were divided in two groups: Large Lesions (LL), comprehending lesion of more than 3x3 cm, Small Lesions (SL) with lesion  $\leq$  3x3 cm. Before treatment, all patients underwent oral clinical examination and high definition intraoral ultrasound; a contrast magnetic resonance was performed only for LL. Laser treatment was performed under local anaesthesia; no adrenalin was used to avoid vasoconstriction. Local ice application was used before and after laser photocoagulation to reduce local temperature thus avoiding any tissue damage. We chose diode laser (GaAlAs-A2Glaser "Surgery35", A2G srl) used in pulsed mode (t-on 190 ms/t-off 250ms) with a flexible optic quartz fiber of 320  $\mu$ m, a wavelength of 800  $\pm$  10nm and an energy output ranging from 9 to a maximum of 16 W, which acts specifically on the vascular target. SL were treated by transmucosal photocoagulation, with laser source kept 2-3 mm apart from the lesion, and moved slowly over the lesion, with a power of 12-14 W. LL were treated by intralésional photocoagulation, with laser fiber introduced into the lesion, staying at least 5 mm below the mucosal surface, with a power of 9W.

Postoperative protocol included local cool packing and aminoacidic and hyaluronic acid-based gel application. Gel application was continued once patient was discharged by self-application until complete healing was achieved.

**RESULTS:** Patients were successfully treated without intraoperative bleeding, local oedema and infection. No discomfort for patients was evaluated in postoperative period. All CVM healed completely without scars; LL required a mean of 4 laser sessions to achieve complete healing compared with SL group with a mean of 2 sessions.

**CONCLUSIONS:** In our experience, diode laser photoco-

agulation can be considered the gold standard for treatment of venous and capillary vascular malformations, with a better postoperative course and complete healing compared to surgical treatment who results technically difficult with increased haemorrhagic risk. These results were histologically confirmed by double laser scan confocal microscopy who evidenced selective laser coagulation on pathological tissue without damage to surrounding healthy tissue.

### Soft tissues absorption of a 645-nm diode laser: a preliminary study

G. Ghidini <sup>1\*</sup>, G. Setti <sup>2</sup>, D. Merati <sup>3</sup>, A. Sala <sup>3</sup>, R. Sala <sup>1</sup>, P. Vescovi <sup>1</sup>

*<sup>1</sup>Oral Medicine and Oral Surgery Laser Unit, University Center of Dentistry, Department of Medicine and Surgery, University of Parma, Parma, Italy; <sup>2</sup>Unit of Dentistry and Oral-Maxillofacial Surgery, University of Modena, Modena, Italy; <sup>3</sup>DMT, srl*

**BACKGROUND:** Low level laser therapy (LLLT) has been proved to stimulate cells proliferation and differentiation in *in vitro* and *in vivo* experiments. The most frequently used red-wavelengths are between 600nm and 650nm. In order to ground and design a case-control study the present preliminary study aims to assess, the possible interaction between complex systems and laser light and to measure how deep the light beam can reach cells within biologic soft tissues.

**METHODS:** A 645nm wavelength diode laser was selected to perform the study, thus allowing further comparison with published studies. On the basis of similarities with human tissues, swine tissue samples were used. Samples were collected 24 hours before the experiment. Tissue samples were stored in 500 mL of MEDIUM 199 with Earle's salts plus sodium azide 0.05% at a temperature between 2° and 8°C. A sample of periosteum of 0.45mm of thickness, two mucosae samples measuring 0.5mm and 1mm, three samples including both mucosae and periosteum of 1mm, 1,3mm and 1,65 of thickness were irradiated with a power energy of 220mW for 113 seconds. Absorption by tissues was measured by the use of a power meter positioned under each sample during irradiation.

**RESULTS:** Power meter detected a mean value of power energy of 168 mW during every single detection.

**CONCLUSIONS:** Red-light laser with 645nm wavelength has the ability to reach cells in each layer of the measured tissues, meaning a possible interaction and biostimulation of reached cells. Light was never completely absorbed by soft tissues, implying that a portion of energy has the possibility to reach bone tissue underneath. Further studies are needed to investigate possible induction of cells proliferation and cells differentiation by LLLT.

### User-friendly diode laser in oral surgery

M. Mohsen <sup>1</sup>, F. Rocchetti <sup>1</sup>, A. Mohsen <sup>1</sup>, J. Arnabat <sup>2</sup>, G. Palaia <sup>1</sup>, G. Tenore <sup>1</sup>, U. Romeo <sup>1</sup>

*<sup>1</sup>EMDOLA Master "Sapienza" University of Rome, Rome, Italy;*

*<sup>2</sup>EMDOLA Master, Barcelona University, Barcelona, Spain*

**BACKGROUND:** The presentation of laser in the dental field provides many improvements for both clinical and surgical procedures. Numerous laser devices are now available in the market and predominantly are classified according to their wavelengths, active medium and generated power. The diode laser is one of the most commonly used lasers in oral sur-

## ABSTRACT

gery. Its active medium is a semi-conductive material (Indium Gallium Arsenic) and its wavelengths vary from 810nm to 980nm. The advantages of diode laser as a surgical instrument are the haemostatic competency, decontamination of the surgical site, and decrease the postoperative bleeding and pain. The application of diode laser can be performed in contact or non-contact procedure using continuous or pulsed emission mode. In the literature, the diode laser is suggested for several surgical procedures, such as excision of soft tissue tumors and gingival hyperplasia, frenectomies, coagulation of vascular lesions, and peri-implant soft tissue surgery. The aim is to present diode laser device with new features and technologies in the daily dental practice.

**METHODS:** The new diode laser (SOLASE, LAZON® Medical Laser co., Ltd., Shenyang, China) is characterized by a wavelength of 976nm, power up to 10Watt, pulse duration range between 0.01ms and 0.9s and pulse repetition rate up to 20kHz. It is provided with three types of disposable fiber tips (200µm, 300µm, and 400µm) and is equipped with a base unit connected wirelessly to iOS device and footswitch.

**RESULTS:** Many factors are proposed for achieving the most optimal and efficient laser procedure in the field of oral and maxillofacial surgery, such as laser parameters, working time and the nature of tissue. The diode laser is an economic, portable and compact surgical device with satisfactory and consistent benefits. Recently, many technologies are introduced to this device by manufacturers, including the wireless connection between the device components, introducing smaller and more ergonomic devices, and usage of the mobile application to control the parameters. These new technologies have a positive impact on the operator and on the patient compliance. Moreover, the provided disposable fiber tips with different diameters widen the field of laser application in many interventions with an improvement of infection control.

**CONCLUSIONS:** Diode laser can be considered as a surgical tool for several interventions. The introduction of new technologies makes the device user-friendly.

### Low level laser therapy: a prophylactic approach for oral mucositis in patients undergoing hematopoietic stem cell transplantation

A. Mohsen, F. Rocchetti, G. Palaia, G. Tenore, M. Mohsen, A. Del Vecchio, U. Romeo

*EMDOLA Master, "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** Hematopoietic stem cell transplant (HSCT) is considered as a standard of care for many diseases. Mucositis is still a challenging complication of HSCT. Approximately 85% of patients receiving HSCT and high-dose of myeloablative chemotherapy are suffering from Oral Mucositis (OM). OM is defined as an inflammatory-like process of oral mucosa resulting from cytokine-mediated events, typically characterized by erythema, and ulceration. Difficulties in eating, drinking, and talking are the most prevalent and debilitating symptoms associated with OM. These symptoms can have a negative effect on patients' quality of life, nutrition, cost and duration of hospitalization, and dose of chemotherapy or radiotherapy. The development of OM is expected to begin 3 to 10 days after chemotherapy. The highest grade of OM is expected  $10 \pm 4$  days after stem cell transplantation. The severity of OM can range from mild to severe depending on many factors such as type and dose

of cytotoxic medications, dose and field of radiation, oral health, presence of mucosal trauma, genetic factors and type of transplantation. Low level laser therapy (LLLT) is one of the proposed prophylactic and therapeutic strategy for OM. The aim is to discuss the state of knowledge of LLLT as a prophylactic approach in patients undergoing hematopoietic stem cell transplantation.

**METHODS:** LLLT is a non-invasive atraumatic clinical application. The wavelength of laser is between 630 to 980 nm with a range of output power from 50 to 500 mW in pulsed or continuous mode. Analgesic and anti-inflammatory effects of LLLT have been explained to be due to the biomodulation mechanism including: ATP production in mitochondria, increased collagen production, fibroblast cells proliferation, detoxification of free radicals and neo-angiogenesis. The literature was evaluated based on current evidence and expert opinion.

**RESULTS:** Reduction of severity and duration of OM in HSCT recipients is reported in almost all the studies. The Multinational Association of Supportive Care in Cancer (MASCC) and the International Society of Oral Oncology (ISOO) recommend LLLT as a prophylactic intervention for OM in patients receiving HSCT and high-dose chemotherapy, with or without total body irradiation (level of evidence II). Reduction of pain and dysphagia with the usage of LLLT are well reported because of its anti-inflammatory, biomodulator and tissue repair properties. The absence of standardization of the technical parameters (treatment duration, dose, wavelength, and power) in the literature is the principal limit for the use of LLLT as a prophylactic approach. The most accepted parameters for this approach are as follows: *output power*, between 5 and 200 mW; *fluence*, of 2 J/cm<sup>2</sup>; *emission mode*, pulsed (<100 Hz); and *treatment schedule*, three to four times a week up to daily till the resolution of OM. The optimal duration of LLLT is 22 days starting at 1 to 3 days before the conditioning regimens. Continuing the laser application till the neutrophil recovery is also suggested because of presence of relation between the severity of OM and neutrophil count.

**CONCLUSIONS:** LLLT as a preventive strategy and a part of multidisciplinary approach could be an advancement of HSCT therapy. There is a need for new studies with identified optimal characteristics of LLLT that eventually lead to a standardized protocol for prevention of OM in HSCT recipients.

### Management of pyogenic granuloma of the maxilla with laser: a case report

F. Rocchetti, A. Montori, A. Mohsen, G. Tenore, A. Del Vecchio

*EMDOLA Master, "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** Pyogenic Granuloma (PG) is a common benign vascular oral lesion, that usually appears as a response to local irritants, traumas, hormonal changes or certain medications. The term "pyogenic granuloma" is a misnomer, because the lesion does not contain pus and does not represent, histologically, a granuloma. PG is most common in children and young adults with definite female predilection (female to male ratio of 2:1), probably due to the vascular effects of female hormones. PG preferentially affects keratinized gingiva of the maxillary region but it can occur also in lips, tongue and buccal mucosa. Clinically, PG usually is as a solitary soft mass, frequently ulcerated, that easily bleeds. When it occurs, a conservative surgical excision and the removal of causative



irritants are indicated. Diode, CO<sub>2</sub> and Nd:YAG lasers have reportedly been successful in treating PG with reduced discomfort for the patient and risk of bleeding. The recurrence of the lesion has reported to be up to 16%, however Fekrazad *et al.* report that the use of laser will reduce this recurrence rate. Free tissue transfer is an option among reconstructive surgery techniques for tissue defects following trauma or ablative oncological resections. The most common donor sites are radial fore-arm, fibula, iliac crest and scapula. Specifically, the advantages of fibula include the length of bone available that provides adequate pedicle length. The aim of this report is to discuss a case of PG developed on free flap reconstruction in an oncologic patient.

**CASE REPORTS:** A 49-years-old Caucasian man was referred to our Department in December 2017 for a swelling developed on mucosal surface of the free flap, on anterior right portion of the maxilla. Medical history was positive for upper maxilla osteosarcoma in 2015 and its recurrence at the beginning of 2017. In February 2017, the patient was treated with bilateral maxillectomy and fibula-free flap reconstruction. A palatal obturator was used to close oronasal fistula in rehabilitating *masticatory function* and facial appearance.

Intraoral examination revealed an exophytic, pedunculated, bleeding slightly sore lesion. An excisional biopsy by CO<sub>2</sub> Laser (10600nm, Smart US20D®, DEKA-Firenze, Italia), was performed with the following parameters: power of 4.2 W in pulsed mode. Chlorhexidine 0.2% oral rinse and hyaluronic acid gel were prescribed for 7 days after surgery, both 3 times a day. The histological examination was compatible with a diagnosis of PG. The recurrence of PG was observed in two months in the previous treated site. Therefore, we decide to a different surgical approach through diode laser (976nm, SOLASE, LAZON®, Medical Laser co., Ltd., Shenyang, China), because its contact mode in order to reach the deepest part of the lesion. The used parameters were a power of 2.5 W in pulsed mode. The patients received the same local therapies of the first post-surgical period. At one-month follow-up visit recurrence is not present.

**CONCLUSIONS:** Literature reports PGs lesions only associated with implant-supported prostheses in patients underwent to free flap reconstructions. This case would report the possible appearance of PG also in absence of implants; moreover, after the first surgery, the obturator had been completely discarded in the area but the lesion still recurred. Further studies are needed to evaluate, as reported to other authors, if the skin is not a suitable tissue for the reconstruction that react negatively in the oral environment.

## CO<sub>2</sub> surgical excision of fibrous idiopathic hypertrophy of the palate

D. Pergolini, G. Palaia, M. Fioravanti, G. Tenore, A. Del Vecchio

*EMDOLA Master, "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** Idiopathic Fibrous Hyperplasia (IFH) is a rare benign lesion, that involves the connective tissue and is characterized by a slow and gradual increase in gingival volume. It may be generalized or localized. In the first case, it appears during dental eruption, in the localized one, it can appear from the second decade. Generalized form of IFH has generally genetic predisposition and could recur after surgery, in contrast to the localized form. Clinically, IFH appears as a pink swelling of hard consistency while, at histological examination, it is characterized by a proliferation of fibroblasts in a myxomatous stroma.

**CLINICAL CASE:** 70-year-old female patient in pharmacological treatment for hypercholesterolemia and arterial hypertension, is sent to the U.O.C. of odontostomatological clinic due to the presence of adherent gingiva hypertrophy in the tuberositary area of the upper right maxilla. the area did not present dental elements. the lesion was broad-based implantation, of hard elastic consistency. the lesion was mobile, and its size was about one centimeter. the removal of the lesion was performed not only for diagnostic purposes, but also to allow rehabilitation with a mobile prosthesis of the upper jaw. the surgery was performed with the CO<sub>2</sub> laser at a power of 4.5 Watts. The healing was performed by second intention without putting suture with the application of compression and tranexanic acid without the presence of bleeding and pain during and after the surgery. Histological examination confirmed the clinical diagnosis of IFH.

**CONCLUSIONS:** IFH is a rare benign lesion that, when occurs, needs a surgical approach. In this regard, CO<sub>2</sub> laser could be considered an optimal device since the bloodless field, the relative speed and ease of execution, the absence of suture and the optimal healing for second intention.

### References

1. Gould Ar, Escobar Vh. Symmetrical gingival fibromatosis. *Oral Surg Oral Med Oral Pathol.* 1981 Jan;51(1):62-7. [PubMed]
2. Del Vecchio A, Palaia G, Visca P, Tenore G, Impellizzeri A, Romeo U. Valutazione istologica *in vitro* degli effetti di un laser CO<sub>2</sub> "ultra speed" nelle biopsie dei tessuti molli del cavo orale. Risultati preliminari. *Minerva Stomatologica.* 2011 Jun;60(6, Suppl 1):4.

## MATERIALI DENTALI

### ***In vitro* testing of biomechanical properties of orthodontic composite resins**

M.E. Cataldi, L. Maiolo, L. Cerroni, G. Pasquantonio, R. Condò

*Department of Clinical Sciences and Translational Medicine, University of Rome "Tor Vergata", Rome, Italy; Institute of Microelectronics and Microsystems-National Research Council (IMM-CNR), Rome, Italy*

**BACKGROUND:** The morphological and chemical characteristics of different orthodontic composite resins were analyzed: Transbond XT (3M Unitek, USA), Light-Cure Orthodontic Adhesive (Leone s.p.a., Italy) and Bisco Ortho Bracket Paste LC (Bisco, USA). They are subjected to weight loss analysis and Uv-visible spectrophotometry test.

#### **METHODS:**

**Samples preparation protocol.**—Nine samples of each material, divided into 3 randomly groups, were obtained by a polyurethane stamp (10x4 mm). Each sample was polymerized using a lamp (LED Starlight) for 40 seconds and was stored in distilled water at 37°C.

**Weight loss protocol.**—The materials have been stored for one month in saliva, collected from eight healthy male volunteers, with commercial pipettes and stored in sterile vials, and in a sugary drink. The samples were stored for 3 hours in a glow box at 30% of humidity and at a temperature of 30°C, to favor the complete removal of water on the materials and weighed with a precision balance by Mettler Toledo.

**UV-Visible Spectrophotometry.**—The optical properties of the samples were studied by measuring the angle-integrated total reflectivity in the spectral range between 200 and 1100 nm with a Lambda35 UV-Vis spectrophotometer equipped with an integrating sphere. The samples were loaded into the measuring chamber at 25°C and a fixed humidity level (30%).

**RESULTS:** No one of the samples have shown a weight loss, proving a good stability of the materials, though was registered a slight increase in weight for all the materials due to the absorption of organic residues during the samples storage in saliva. Bisco and LightCure showed a very similar change with a monotone increasing trend, while in Transbond was observed a plateau up to two weeks and a following increasing of the weight. This behavior can be related to an increase of material porosity. The ageing in sugary drink showed a similar sample trend with a general increase of the weight of the testing materials. The samples color, at a first sight, was brighter for Bisco and LightCure while Transbond exhibited a greyish color. The spectra of the samples was in general similar in shape. In all the testing disks the reflectivity dropped down at 380 nm. This result is coherent with the possibility for the materials to absorb in the ultraviolet region changing their properties, such as in the polymerization treatment.

**CONCLUSIONS:** This *in vitro* study considers the nature of three materials used as orthodontic adhesive system. All the samples do not show significant weight loss during the ageing in saliva and sugary drink up to one month, reveal-

ing a suitable stability for the patients. The analysis with the Spectrophotometer suggests a similar absorption trend in the UV region, with the Transbond exhibits a lower reflectivity as can be seen also from its greyish color. These data demonstrate that all materials are suitable for clinical application, being all dimensionally stable and biocompatible.

### **Immunomodulatory effects of titanium surface micro-topography and wettability: a systematic review**

B. Mozzoni, L. Parisi, A. Toffoli, B. Ghezzi, S. Lumetti, E. Manfredi, G.M. Macaluso

*Centro Universitario di Odontoiatria - DiMeC - Università degli Studi di Parma, Parma, Italia*

**BACKGROUND:** Macrophages have been long known to be phagocytic cells mainly involved in maintaining tissue homeostasis, but descriptions of their presence among titanium dental implant surfaces together with the discovery of two distinct macrophage phenotypes, i.e. the inflammatory M1 or the reparative M2, and their ability to secrete osteoinductive factors (i.e. BMP-2) have shed new light on the pivotal role they could play in titanium dental implant osseointegration. However, this is a quite new field of investigation still poorly understood. To this purpose, the aim of the present work was to review the current literature on *in vitro* studies investigating macrophage polarization when cultured on titanium implant surface with differences in surface micro-topography and wettability.

**METHODS:** Starting from the following review question "Do titanium implant surface characteristics influence macrophage polarization into M1 pro-inflammatory or M2 anti-inflammatory phenotype?", *in vitro* research articles focusing on the macrophages response to titanium surfaces with different surface micro-topography or wettability were included in the study. No imposition of language, publication date or publication status was applied. The primary outcome considered was the analysis of secreted cytokines, with particular regard, but not restricted, to IL-1 $\beta$ , IL-6 or TNF $\alpha$  as M1-like state markers and to IL-4 or IL-10 as M2-like state markers. Grey literature and electronic databases PubMed and LILACS were considered. Study selection was drafted by three independent reviewers and only articles meeting the inclusion criteria were included for further analysis. Information regarding M1-like or M2-like cytokines production and their statistical power were extrapolated from single studies.

**RESULTS:** 159 studies were provided from the initial search, then adjusted for replicates to 102 records. Subsequently, 87 studies were discarded for not meeting the inclusion criteria: 53 because they did not involve the use of titanium surfaces, 8 because they considered chemical modification of titanium surface composition, 9 as being *in vivo* studies, 2 because they used already differentiated macrophages, 1 because it did not

fully consider macrophage response, 1 more was eliminated as it was a narrative review and 13 records were rejected as out of topic. After the full-text analysis of the 15 records selected, 2 were excluded for focusing on chemically-modified titanium surface, 1 as being an *in vivo* study, 1 for using pre-differentiated macrophages and 1 more for inadequate topic. As a result, 10 studies were finally selected: 5 studies considered macrophages polarization on titanium implant surfaces with differences in micro-topography, 2 studied the influence of wettability on macrophage polarization and 3 studies investigated the combination of differences in surface topography and wettability. In general, studies investigating the role of surface micro-topography agreed on a whole macrophage activation on rough profiles regardless M1 or M2, showing that on rough surfaces cytokines expression is always promoted, while hydrophilicity seemed to enhance M2 reparative gene expression.

**CONCLUSIONS:** Given the results of this study, surface topography and wettability have to be considered together. In particular, surface topography seems to have a role in promoting macrophage activation, while surface wettability may play a part in molding the "plastic" nature of macrophages towards a M2 phenotype and in determining a probable sequential recruitment of macrophages during osseointegration.

## Preparation and characterization of nanostructured electrospun membranes for guided bone regeneration

G. Turco, D. Porrelli, S. Caporalini, F. Berton, C. Stacchi, R. Di Lenarda

*Department of Medical Sciences, University of Trieste, Trieste, Italy*

**BACKGROUND:** The present study is focused on the preparation and characterization of nanostructured, polymer-based membranes obtained by electrospinning of polycaprolactone (PCL) for biomedical applications. The electrospinning is a technique that allows to produce membranes and scaffolds by the generation of polymer based nanofibers. Electrospun nanofibers exhibit an extended specific surface area and can be used in several applications such as tissue engineering, wound healing, drug delivery and filtration systems, just to name some (Du *et al.* 2016 *Fibers and Polymers*). The main advantage in the biological field consists in the morphology and the organization of the electrospun nanofibers which is similar to the macromolecular network of the extracellular matrix. This feature allows native cells to recognize an optimal environment for their adhesion and growth (Han *et al.* 2006 *Nanomedicine*). Among the polymers used for electrospinning, PCL has received great attention for the preparation of biomaterials thanks to its biocompatibility, biodegradability and mechanical properties; moreover, it can be chemically modified in order to increase its biological properties (Nhi *et al.* 2016, *J Mater Sci: Mater Med*)

**METHODS:** The membranes prepared in this work were obtained by electrospinning of a polycaprolactone solution (PCL, Mw 80000) solubilized at different concentrations and in different combinations of organic solvents (Dichloromethane, DCM; Dimethylformamide, DMF; Methanol, MeOH and Tetrahydrofuran, THF). The electrospinning process is performed by means of a custom device composed by a syringe pump, a power supply and a target on which the nanofibers are collected. The parameters varied during the process were: the nozzle diameter, the flow rate,

the voltage and the distance between the nozzle and the target. In order to increase the hydrophilicity of the PCL membranes, an air plasma treatment was applied at two different power values (low and high), and the effect on the hydrophilicity was analyzed through dynamic contact angle measurements. Morphological evaluations were performed by means of Scanning Electron Microscopy (SEM).

**RESULTS:** Among the several conditions here tested, the solubilization of PCL in DCM/DMF resulted the most reliable. In the tested conditions, the use of DCM/MeOH and THF/DMF produced membranes characterized by nanofibers with high heterogeneity in the average diameter and by the presence of defects (i.e. aggregates). The air-plasma treatment of PCL in DCM/DMF membranes resulted in hydrophilic substrates (very low contact angle) whose morphology was affected by the treatment power. The low power treatment did not lead to any alteration of the nanofibers morphology; while in the case of the high power treatment, once the membranes were soaked in water, the nanofibers displayed an increased average diameter and appeared melted and cross-linked.

**CONCLUSIONS:** The results of this work showed how the electrospinning process is affected by several parameters as the preparation of the polymeric solutions (concentration and solvents), to name one. The results here presented showed that an air plasma treatment enabled to obtain membranes with high hydrophilicity. This interesting behavior is seen as promising on one hand for the encapsulation of water soluble nanoparticles or molecules for drug delivery, and on the other hand for the adhesion and proliferation of cells. These structures could offer potential applications in the field of guided tissue regeneration.

## *In vitro* penetration of bleaching agents into resin composites

D. Scaminaci Russo, U. Macis, L. Todirica, L. Giachetti

*Department of Surgery and Translational Medicine, Dentistry, University of Florence, Florence, Italy*

**BACKGROUND:** To evaluate the gradient of penetration of bleaching agents into nano-filled resin composites.

**METHODS:** Eighty disks of resin composite of about 8.4 mm in diameter and 2 mm in thickness were constructed using a nano-filled (Filtek Supreme XTE) resin composite. Nail polish was applied on both the flat surfaces of each specimen leaving uncovered the lateral surface. Seventy specimens (Group Pigmented) were subjected to a colouring treatment consisting of a storing in coffee solution for 15 days at 37°C. The remaining ten specimens (Group Control) were stored in NaCl solution for 15 days at 37°C. Thirty-five of the pigmented specimens (Group Bleached) were bleached with carbamide bleaching agent (Opalescence Ultradent PF 10%) for 10 days, 8 hours a day at 37°C humidity. During the remaining time, the specimens were stored in NaCl solution at 37°C. Successively each specimen was thinned up to half of its thickness using a lapping machine (LS2, Remet). Colour photograph of lapped surface was taken using a flat-bed scanner (Epson Perfection V850 Pro). The images were acquired by means of an image-processing software (Photoshop 11.0) and a computer (Macintosh MacBook Air, OSX 10.10.5) as JPEG images with an input resolution of 2400 pixels per inch. On each scanned surface 14 areas were selected at 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.5, 2.0, 2.5, 3.0 mm from the lateral surface. In each areas CIELAB colour variables (L, a, b) were assessed by means of the sample colour tool. The



## ABSTRACT

whiteness index (W) was calculated for each area using the following formula:  $W = 100 - [(100-L)^2 + a^2 + b^2]$ . Data were analyzed with ANOVA and Tukey-Kramer tests.

**RESULTS:** ANOVA analysis indicated significant differences between control, pigmented and bleached groups ( $p < 0.001$ ). Post-hoc comparison revealed that the pigmented specimens showed a lower W than control specimens from 0.1 to 2.5 mm depth. Bleached specimens showed a upper W than pigmented specimens from 0.1 to 1.5 mm depth and the same W of the control specimens from 0.1 to 0.5 mm depth. **CONCLUSIONS:** Discolouration of the composite resins occurs in the deep layers as well as bleaching effect. In addition bleaching agents when applied on pigmented resin composite are able to restore the colour back to the initial value at least in the superficial layers.

### Translucent cubic-phase containing zirconia for monolithic restoration: mechanical and optical evaluation, an *in vitro* study

M. Carrabba, G. Bonadeo, M. Farrari

Department of Medical Biotechnologies, University of Siena, Siena, Italy

**BACKGROUND:** The increase demand for aesthetic monolithic zirconia restorations took the attention on the performance of recently introduced Translucent cubic-phase containing Zirconia in pre-colored shade. For the present study, measurements of 3-point flexural strength, translucency and color were performed in order to analyze the main optical and mechanical proprieties of Y-TZP restorations with different compositions.

**METHODS:** Pre-sintered disks with different shade and composition of Y-TZP (Wieland Dental, Pforzheim, Germany, Zenostar MO4, T1/T2 and MT0/MT2/MT4) were milled in blocks 40 x 20 x 18 mm in a milling machine (Zenotec Select Hybrid, Wieland Dental) and then cut by a slow speed diamond saw (Isomet, Buehler, Lake Bluff, IL, USA) in order to obtain tabs shaped (for optical evaluation with final dimension 15 x 15 x 1.0 mm) and bar shaped (for flexural strength test with final dimension 15 X 4.0 x 1.2 mm). Groups were characterized by the composition and shade ( $n=15$  for flexural strength test and  $n=10$  for optical evaluation) for a total of 150 specimens. The cutting thickness was set in order to compensate the volume sintering shrinkage. Sintering were performed in a furnace (Zenotec Fire P1, Wieland Dental) following the manufacturer instructions and conventional firing time. After sintering all the specimens were wet-finished in a polishing machine with 600, 1000 and 1200 grit papers. Samples were tested in a universal testing machine (Triax 50, Controls, Milano, Italy). Values were measured in N and the flexural strength ( $\sigma$ ), Weibull characteristic strength ( $\sigma^0$ ) and the Weibull modulus ( $m$ ) were calculated. A benchtop spectrophotometer (PSD1000, OceanOptics, FL, USA), equipped with an integrating sphere (ISP-REF, OceanOptics, FL, USA) was used in PC running a color measurement software (OOILab 1.0, Ocean Optics, FL, USA). D65 illuminant and 10° standard observer were selected. Measurements for translucency were carried in CIExyz color system, and the Contrast Ratio (CR) was calculated. Color coordinates were recorded in CIELab\* color space with a neutral gray background. The  $\Delta E$  value was calculated for evaluating color differences using the uncolored MT0 as reference point. CR ad  $\sigma$  data were statistically analyzed by the One-Way ANOVA followed by the

Tukey test for post-hoc comparison. Pearson's correlation test was performed for factors CR and  $\Delta E$ . For all the evaluations, the significance was set to  $p=0.05$ .

**RESULTS:** Statistically significant difference were found for both factors CR ad  $\sigma$ . Colored Translucent Zirconia resulted in a significant lower flexural strength compared to the not colored MT0. Comparable and higher level of strength were recorded for all the other tested zirconia. A wide range of translucency were measured, Materials results in the following order (most translucent) MT0>T1>MT2>T2>MT4>MO4e (less translucent). The correlation between translucency and color resulted to be strong ( $r=0,886$ ).

**CONCLUSIONS:** Within the limitations of this *in vitro* study it is possible to affirm that the translucency of the restorations (CR) was directly correlated to the changing in shade ( $\Delta E$ ) and color negatively the translucency. The increase content of Ytria significantly influenced the strength. The pre-colored translucent zirconia MT2 and 4 resulted in a significant lower flexural strength compared to the not colored MT0. All the tested Zirconia full-fill the ISO 6872:2015 Class4 furthermore the MTO and all the 3Y-TZP tested reach the ISO Class 5. These factors should be considered for correctly evaluate the clinical performance of monolithic Y-TZP restorations.

### New perspectives in graphene-based nanomaterials and surface disinfection

E. Bruni<sup>1</sup>, M. Saccucci<sup>2</sup>, A. Salucci<sup>2</sup>, M. Guaragna<sup>2</sup>, E. Galli<sup>2</sup>, D. Uccelletti<sup>1</sup>

<sup>1</sup>Department of Biology and Biotechnology "Charles Darwin", Sapienza University of Rome, Rome, Italy; <sup>2</sup>Department of Odontostomatologic and Maxillofacial Science, Sapienza University of Rome, Rome, Italy

**BACKGROUND:** Chemical disinfection of surfaces and instruments for infection control in dental units is a relevant practice, especially at the time of antibiotic resistance microbes. Resistant bacteria are in fact, involved in the high incidence of healthcare-acquired infections, recognized as critical emergence in hospitals and clinics around the world. Infected patients disseminate and release many multidrug-resistant Gram-negative and Gram-positive species to other ones and to healthy people: such bacteria share the ability to survive on various hospital surfaces for long periods and for this reason they are difficult to eradicate by cleaning and chemical disinfection. In this regard, the use of nanomaterials as novel and non-traditional antibacterial agents offers new insight in the field of disinfection. Here we report the development of carbon based nanomaterials, such as graphene nanoplatelets (GNPs) decorated with Zinc oxide nanorods (ZNGs) to be used as disinfectant agents in dentistry units.

**METHODS:** ZNGs were produced at Sapienza NanoLab by thermal expansion of graphite; ZNGs were obtained by subsequent hydrothermal growth of zinc oxide nanorods on GNPs (graphene nanoplatelets), used as seed layers. These nanomaterials were spray coated on different surfaces with different porosity and the antimicrobial properties were evaluated by the colony forming unit method (CFU), against *Staphylococcus aureus* and *Pseudomonas aeruginosa* as main representatives of Gram positive and Gram negative bacteria, respectively.

**RESULTS:** Characterization of ZNGs sprayed on the different surfaces was performed by Field-Emission Scanning Electron Microscope and XRD analysis. Microscope images showed the nanorods of ZNGs emerging out from the surfaces

having average diameter of ~34 nm and length of 300–400 nm. The XRD pattern of ZNGs did not detect any diffraction peaks of impurity, suggesting that the synthesized nanomaterials were of high-purity. Treated surfaces with the above nanomaterial showed a strong antimicrobial power with respect to the untreated surfaces. Indeed, the survival of both types of bacteria was almost less than 10% after 30 minutes in the case of cells inoculated on treated surface.

**CONCLUSIONS:** ZNGs can be exploited as promising antimicrobial agents to be used as disinfectants in dental units.

### Effects of different protocol of surface roughening on composite surface: a S.E.M. Study

F. Puleio, F. Nicita, G. Bruno, E. Sazonova, S. Barbera, R. Lo Giudice

*Dipartimento BIOMORF, Università degli Studi di Messina, Messina, Italy*

**BACKGROUND:** The surface analysis of the composite restoration could be useful to evaluate the possibility of new filling in previously restored teeth without the necessity of a complete removal of the preexistent restoration or in all situation is planned a composite-composite interface. Many authors described surface treatments to increase roughness and improve adhesion efficiency. Aim of this study is to evaluate the different protocol effect of composite surface roughening.

**METHODS:** 42 cylinder composite blocks (4 mm high and 6 mm in diameter) were crafted using of Estelite Sigma Quick (Tokuyama Dental Co, Tokyo, Japan), A1 color, using a silicon mould. The silicon mould was filled with vertical increments of 2 mm of composite layers, light-cured for 20s at 1 mm distance (Valo, Ultradent Products, Inc. UT, USA). The last increment was covered with a glass slide in order to prevent the formation of an oxygen-inhibited layer and to create a smooth surface. For polishing and surface smoothing all samples were treated using Sof-Lex™ (3M ESPE, St Paul, MN, USA) pop on discs at coarse, medium, fine and superfine grits for 30'' each. After each step the specimens were rinsed with distilled water and air dried before the next step. Samples were randomly divided in 6 groups: control group (group 0); roughened with coarse-grit diamond bur (group 1); etched with 35% phosphoric acid for 30'' (group 2) (Ultra-Etch, Ultradent Products, Inc. UT, USA); roughened with coarse-grit diamond bur and etched with 35% phosphoric acid for 30'' (group 3); etched with 35% phosphoric acid for 60'' (group 4); roughened with coarse-grit diamond bur and etched with 35% phosphoric acid for 60'' (group 5). Observational parameters (surface pattern, presence/absence of debris) and numeric parameters (number of microcavities (NM), diameter of microcavities (DM) were observed from three random areas of 60 µm x 60 µm with a S.E.M. (600x and 4000x).

**RESULTS:** Microscopic observations and data analysis show uniformity of the observed parameters into each experimental group. Tre Groups 0 and 2 shows negativity for all the parameters. In the group 1 debris are recorded. The statistical analysis (average) show: In group 3 surface 2 NM (DM=1.20±0.42 µm); in group 4 rough surface and 46 NM (2.65 ±1.32 µm), in group 5 NM 22 (DM=2.72±0.31 µm). There numerical differences between the groups and controls are statistically significant (P<0.05).

**CONCLUSIONS:** The microscopic observations of our samples show that the surface bur roughening and etching with orthophosphoric acid 35% for 60'' is the best interface morphology treatment for increasing roughness.

### Dual composites: what polymerization protocol is the better one?

M. Petrini, M. Ferrante, V. Biferi, P. Trentini, G. Spoto

*Department of Medical, Oral and Biotechnological Sciences, University of Chieti, Chieti, Italy*

**BACKGROUND:** There is still contrast in literature about the better protocol for achieve the better polymerization of dual composites: some authors have shown that it is necessary to light cure the material in order to obtain the greater degree of polymerization, in the other hand, others have hypothesized that light activation could determine a rapid increment of the viscosity of the material, blocking the movement of free radicals and avoiding a perfect polymerization. Previous studies have shown the usefulness of thermal analysis and thermogravimetry (TG-DTA) for the study and characterization of the polymerization of dental composites. The primary outcome of this work was to compare the degree of polymerization of dual composites LuxaCore Z-Dual (DMG Chemisch-Pharmazeutische Fabrik GmbH, Hamburg, Germany), polymerized through two different protocols: automixed (group A) and light-cured for 40 seconds at a distance of 0,1 mm from the light source (MiniLed Satelec - France 1200 mW/cm<sup>2</sup>) (group B). The secondary outcome was to verify the effect of body temperature during chemical curing and for this reason before analysis, the samples of group A were left for 1 hour at 37 degrees.

**METHODS:** after preparation, all samples have been analyzed through a simultaneous thermal analyzer (TG-DTA), in order to measure the mass change and heat effects on dental composites (Model TG/DTA 6300, Seiko Instruments Inc. Torrance, CA, USA). However before proceeding with the TG/DTA analysis, a double weighing with a Gibertini electronic (mod. E42 Milano-Italy) and a TG/DTA scale was made. The samples were heated at a constant rate of 10°C min<sup>-1</sup>, from 25 to 600°C under nitrogen atmosphere (100mL/min). Results have been recorded in table and statistical analysis has been performed using SPSS software for Windows version 21 (IBM SPSS Inc., Chicago, IL, USA).

**RESULTS:** Group A and B were characterized by a very similar residual % mass after the thermal cycle that reached 600°C. The thermogravimetric curve (TGA), the differential thermal analysis (DTA) and the 1st derivative of loss of weight (DTG) have shown that both materials were characterized by similar results, without statistical significant differences.

**CONCLUSIONS:** data suggest that dual composites cured without light activation, after starvation at 37 degrees for 1 hour present the same thermal behavior of the materials photo-activates for 40 seconds. Both group of samples present a thermal behavior compatible with an adequate polymerization.

### Dental aging and dental wear behavior studied with a new technology method: (FIB) focused ion-beam milling. An alternative technique to the microindenter test?

A.F. Pavone, L. Cerroni, R. Condò, N. Bianchi, C. Gentile, G. Pasquantonio

The aging of the human body is a process that involves also the oral cavity and teeth. The dental aging occurs through the

## ABSTRACT

wear. The physiological dental aging occurs with the loss of tissue of about 0.029 mm for year; So, if the dental wear is physiological, there is a loss of tissue of 1.5 to 2 mm after about 60 years. Dental aging caused by wear is a complex multifactorial process, that actually many authors suggest to investigate as a biotribological phenomenon. Tribology is the science that studies system of work in which bodies are immersed in fluid and reciprocal motion; therefore it includes the study and application of the principles of clutch, lubrication and wear, typical of the oral cavity too. These massive and rapidly evolving wear phenomena could be considered "pathological biotribological aging" and are due to changes in the parameters of the biotribological system.

**AIM:** One of the current method to evaluate the wear coefficient and hardness of dental restorative materials is the microindenter test, based on the scale of vickers and knoop. The purpose of this study is to introduce an innovative technique focused on ionic-beam tests on enamel and dentin as an alternative method of investigation of the tooth hardness. The FIB (focused ion beam cross-sectioning and transmission electron microscopy) is able to perform an accurate ultrastructural examination of the tooth hard structures and articola restorative materials. Ion beam techniques have been used for material removal in biological materials to 'etch' away surface layers of the targeted material by bombarding it with ionized gas molecules.

**METHODS:** A focused ion beam (FIB) instrument is almost identical to a SEM, but uses a beam of ions rather than electrons. The focused ion beam can directly modify or "mill" the specimen surface, and this milling can be controlled with a nanometer precision. The scale used for the testing method is  $\mu\text{m}/\text{min}$ . The FIB technique has been carried out on composite resins and other restorative materials resulting in an innovative technique compared to the microindenter tests (Maiolo L. et Notargiacomo A CNR-IMM).

**RESULTS:** Still today there are no evaluation scales of reference regarding the assessment of the hardness and of the wear coefficient of the dentin by this new ionic indenting technique.

**CONCLUSIONS:** Wear behaviour of natural tissues and dental materials have to be further investigated to allow the choice of the appropriate restorative material in the clinical practice. The authors' aim is to determine a new scale of evaluation by this new approach in dentistry.

### Thermal treatment inducing wettability of dental implant titanium surfaces

M. Meglioli <sup>1,2</sup>, A. Toffoli <sup>1,2</sup>, L. Parisi <sup>1,2</sup>, F. Rivara <sup>1,2</sup>, R. Tatti <sup>3</sup>, S. Lumetti <sup>1,2</sup>, E. Manfredi <sup>1,2</sup>, G. M. Macaluso <sup>1,2</sup>

<sup>1</sup>Centro Universitario di Odontoiatria, Università degli Studi di Parma, Parma, Italy; <sup>2</sup>Dipartimento di Medicina e Chirurgia, Università degli Studi di Parma, Parma, Italy; <sup>3</sup>Istituto dei Materiali per l'Elettronica e il Magnetismo, Consiglio Nazionale delle Ricerche, Trento, Italy

**BACKGROUND:** Titanium dental implant surface characteristics, including micro-topography, chemical composition and wettability, are essential features to achieve osseointegration. On one hand, the choice of surface topography is still a debate topic among clinicians while it has been demonstrated that an increased level of hydrophilicity can fasten therapeutic success. Numerous efforts have been done to ameliorate surface wettability, including thermal treatments. However, no methods have been yet found to enhance hydrophilicity leav-

ing unmodified other surface properties. The aim of this work was thus to design a suitable thermal-based method to enhance titanium dental implants hydrophilicity leaving unmodified their macro and micro features.

**METHODS:** Titanium discs, with machined (M) or sand-blasted/acid-etched (SAE) surface were kindly provided by Sweden&Martina S.p.A. (Due Carrare, Padova, Italy) and used in this study. Firstly, different temperatures were tested to find the optimal one that led to an evident gain of hydrophilicity without altering other surface properties, i.e. chromatic aspect. Once ideal temperature was found, discs were physically, chemically and morphologically characterized in order to detect any change in surface micro-characteristics except for the gain in wettability. Gain in surface wettability was characterized by measuring the contact angle between the surfaces and a 5 $\mu\text{l}$  water droplet. X-Ray photoelectron spectroscopy (XPS) and scanning electron microscopy (SEM) were then use to analyze surface chemistry and microtopography respectively.

**RESULTS:** All the temperatures tested to enhance titanium surface hydrophilicity led to major and visible chromatic or morphology modifications, due to the oxide layer thickening, except for the 300°C one. As, 300°C treatment was selected as target temperature to treat samples in order to obtain hydrophilic surfaces. Contact angle analysis revealed that our treatment markedly increased titanium hydrophilicity both for M and SAE surfaces (M vs hM  $p < 0.0001$  – SAE vs hSAE  $p < 0.0001$ ). Furthermore, XPS analysis revealed that the chemical composition did not change before and after the treatment. Similarly, SEM investigation showed that the thermal treatment at 300°C did not alter the surface microtopography of titanium discs.

**CONCLUSIONS:** All considered, our results indicate that 300°C is an effective temperature to enhance surface wettability of titanium dental implant surfaces, without triggering any chromatic, chemical and morphological modification of the surface. This leads to the possibility of obtaining hydrophilic surfaces with the advantages connected to the use of micro-rough or smooth topography in implant dentistry.

### Polymerization kinetic of resin cements: comparison of two different polymerization modes

R. Monterubbiani <sup>1</sup>, V. Tosco <sup>1</sup>, C. Conti <sup>2</sup>, G. Tosi <sup>2</sup>, A. Catellani <sup>1</sup>, M. Procaccini <sup>1</sup>, A. Putignano <sup>1</sup>, G. Orsini <sup>1</sup>

<sup>1</sup>Department of Clinical Sciences and Stomatology, Polytechnic University of Marche Region, Ancona, Italy; <sup>2</sup>Department of Materials, Environmental Sciences and Urban Planning, Polytechnic University of the Marche Region, Ancona, Italy

**BACKGROUND:** The aim of this study was to evaluate the polymerization kinetics of luting cements comparing two different protocols.

**METHODS:** In this study Relyx Ultimate and Veneers (3M, ESPE), single and dual-cure Nexus™ Third Generation (Kerr Corp.), and Enamel Plus Hri flow (Micerium Group) were used. Ten samples of each materials were made using two glass slides and a ring-shaped Teflon spacer to achieve a material thickness of 0.2 mm. Then, the samples were divided in two group and cured by Elipar Deep Cure (3M ESPE) lamp following two different curing protocols: P1, five samples were cured for 40 seconds; P2, five samples were cured for 5 seconds, and, after 20 seconds, they were cured again for 40 seconds. Indeed, a 2.0 mm thickness composite disk was



interposed between the samples and the tip lamp during the polymerization, to simulate a prosthodontic work. The degrees of conversion (DC) and kinetics were evaluated using real-time near-Fourier Transform Infrared Spectroscopy. One-way ANOVA test and post hoc t-test were used for statistical evaluations ( $p < .05$ ).

**RESULTS:** The P1 and P2 were statistically different only for Relyx Veneers (P1  $53.64 \pm 1.64\%$ ; P2  $57.77 \pm 1.35\%$ ) and Dual-cure Nexus ( $23.59 \pm 0.41\%$ ;  $28.60 \pm 1.87\%$ ). P1 and P2 Enamel Plus Hri Flow values were the lowest DC, while P2 values of dual-cure Nexus 3 and the P1 and P2 values of Relyx Veneer were the highest ones. For each composite, the P1 and P2 kinetic curves slope was not statistically different. At 300 seconds no samples reached the 80% of DC.

**CONCLUSIONS:** P2 is often used to remove the excesses during the luting phase of inlays, overlays and/or veneers. The normal cured protocol, P1, and P2 were not different in many of the used samples. Although the photo cured cements had better results after 300 seconds than the dual-cured, meaning that the dual-cure cements need more time to increase their DC and 300 second seem to be not sufficient to reach a high DC. So, our advice is to use P2 to remove the material excess and to wait at least 300 seconds prior to finishing and polishing procedures.

### Morphological characterization and comparison of giomers with different dental restorative materials

R. Condo<sup>1</sup>, L. Cerroni<sup>1</sup>, M. Mancini<sup>1</sup>, C. Raffone<sup>2</sup>, L. Maiolo<sup>3</sup>, G. Pasquantonio<sup>1</sup>

<sup>1</sup>Department of Clinical Sciences and Translational Medicine, University of Rome "Tor Vergata", Rome, Italy; <sup>2</sup>Private Practice, Rome, Italy; <sup>3</sup>Institute of Microelectronics and Microsystems- National Research Council (IMM-CNR) Rome, Italy

**BACKGROUND:** Aim of this study is to performe a rigorous and specific morphological characterization of four different dental restorative materials. The research includes a Giomer (Beautifil® II by Shofu dental corporation), a Compomer (Dyract Extra by Dentsply, Caulk, Germany), Glass ionomer cement (Ketac fil plus by 3M ESPE) and a composite resin (Tetric Evoceram by Ivoclar).

**METHODS:** Sample preparation was done using a polyurethane stamp with 4 mm of diameter and height of 10 mm in order to achieve standardized specimens. A transparent matrix was used to uniform specimens surface and every specimen was light-cured using a light source (LED Starlight) at light intensity of  $400 \text{ mW/cm}^2$  for 40 sec. Four disk specimens of each of 4 materials in exam were obtained and divided randomly in 4 groups. The morphological characterization was conducted performing 5 different tests: indentation strenght test for mechanical properties, UV-Vis spectrophotometry and micro-Raman spectroscopy analysis for surface characterization, ageing test in saliva, ageing test in sugar drink and weight variation test in saliva.

**RESULTS:** After tests all data were collected. Indentation strenght tests showed identical hardness for Tetric and Dyract ( $\approx 200\text{HV}$ ) and almost double for Beautifil II. Ketac showed higher hardness, double than Beautifil II, but also fluctuations underlying lack of homogeneity of hardness. UV-Vis Spectrophotometry revealed no differences regarding the behavior of all materials and no peak of abnormal absorption were recorded. Otherwise Raman spectroscopy analysis

showed differences both in peak intensity and in the number of spectral features, especially in the range from 600 to 1800  $\text{cm}^{-1}$ , revealing the different chemical composition of the surface layers. The ageing test in saliva showed the superior behaviour of Ketac resulting in a minor contamination. During ageing test in sugary drink organic residues were observed on the surface of all materials. Furthermore signs of local heating were detected due to the effect of laser source on organic or polymeric material. Slightly different result were collected for Ketac, indicating a smaller degree of contamination. For Tetric were recorded two peak (at  $898 \text{ cm}^{-1}$  and at  $2450 \text{ cm}^{-1}$ ) suggesting a possible chemical interaction with sugary drink, causing permanent alteration of the material. About the weight variation in saliva no weight decrease has been found for all materials.

**CONCLUSIONS:** Giomers represent a new category of restoratives material with good clinical behavior and mechanical stability, very similar to the other materials investigated in this study. Advantages in using giomers are the fluoride release and recharge properties like a glass ionomer cement. They are able to decrease acid production of cariogenic bacteria, neutralize acid on contact and slow demineralitation. Further examination are required in order to assess their role in everyday clinical practice.

### At home bleaching and resin infiltration: a severe fluorosis case report

M. Mazur, A. Ndokaj, F. Rinaldo, D. Corridore, M. Capocci, D. Salvi, P. Patti, D. Pasqualotto, F. Ripari, G.M. Nardi, F. Guerra, L. Ottolenghi

Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy. (Director: prof. Ersilia Barbato), School of Dentistry, "Sapienza" University, Rome, Italy. (President prof. Livia Ottolenghi), Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome (Chief. prof. Livia Ottolenghi)

**BACKGROUND:** Iconâ proved to be effective on enamel hypomineralized lesion with white demarcated and diffuse clourimetric alteration, such as White Spot Lesion (WSL), Developmental Defects of Enamel (DDE) and mild cases of Fluorosis (1) (2) (3) (4) on the buccal side of aesthetic tooth. Resin infiltration treatment increases the Refractive Index (RI) of demineralized enamel. Paris *et al.* described the rising of RI on infiltrated lesions, that took on the appearance of the sound surrounding enamel (5). On the other hand, lesions with brown demarcated and diffuse enamel defects such as severe cases of Fluorosis did not seem to have the same response to Iconâ treatment. The aim of this study was to present the clinical procedure of pre-treatment with two weeks of home bleaching with 16% carbamide peroxide take-home whitening gel and then resin infiltration (1).

**METHODS:** The study was performed at Sapienza University, Rome, Italy. The patient, a 14 years old male, who was found with a severe fluorosis on both the upper and lower dental arches. Upper incisors presented with brown demarcated defects on central and incisal tooth sections and whitish diffuse and demarcated enamel alterations on the other teeth. Custom fitted trays were done in our Lab and a two weeks home bleaching treatment was performed (3 hours per day). Before and after two weeks' photographic images documented the beaching outcome. After a wash-out period of two weeks, Icon infiltration clinical procedure was performed according to manufacturer instructions.

## ABSTRACT

**RESULTS:** The photographic images show the aesthetic outcome of the treated lesions. The treatments proved to be effective both on brown and white lesions.

**CONCLUSIONS:** Icon clinical procedure proved to be effective on hypomineralized lesions with superficial configuration in the enamel layer. On the other hand, the clinical indication for lesions presenting a deeper configuration were ceramic veneers. This clinical case reports on the efficacy of deep resin infiltration performed on enamel hypomineralized lesion of traumatic origin.

#### References

1. Attal J, Atlan A, Denis M, Vennant E, Tirlet G. White Spots On Enamel: Treatment Protocol By Superficial Or Deep Infiltration (Part 2). *International Orthodontics*. 2014; 12: P. 1-31.
2. Guerra F, Mazur M, Rinaldo F, Ottolenghi L. Spectrophotometric Analysis Of Icon® Treatment Outcome In Two Celiac Siblings With Developmental Defects Of Enamel, A Case Report. *Journal Of Restorative Dentistry*. 2015; 3: P. 88-91.
3. Guerra F, Mazur M, Nardi Gcd, Pasqualotto D, Rinaldo Fea. Dental Hypomineralized Enamel Resin Infiltration. Clinical Indications And Limits. *Senses Sci*. 2015; 2(4): P. 20-23.
4. Mazur M, Westland S, Guerra F, Corridore D, Vichi M, Maruotti A, Et Al. Objective And Subjective Aesthetic Performance Of Icon® Treatment For Enamel Hypomineralization Lesions In Young Adolescents: A Retrospective Single Center Study. *J Dent*. 2018 Jan;68:104-108.
5. Paris S, Meyer-Lueckle H. Masking Of Labial Enamel White Spot Lesions With Resin Infiltration-A Clinical Report. *Quintessence Int*. 2009; 40: P. 713-8.

---

## ODONTOIATRIA DIGITALE

---

### Analysis of nasolabial soft tissue effects of rapid maxillary expansion detected by stereophotogrammetry: a systematic review and updated guidelines for future randomized clinical trials

M. De Luca, R. Patini, E. Staderini, L. Di Tonno, A. Camodeca, P. Gallenzi

*Department of Surgical Sciences for Head and Neck Diseases, School of Dentistry, Catholic University of the Sacred Heart, Milan, Italy*

**BACKGROUND:** The aim of the systematic review is to understand whether there are studies in the literature analyzing, through 3D stereophotogrammetry, which nasolabial soft tissue modifications may occur after RME and how many of them are scientifically valid. This systematic literature review was a-priori based on the PRISMA-P statement and was registered in the PROSPERO database with the following protocol ID: CRD42017079875.

**METHODS:** Pubmed, Cochrane, EBSCO, Scopus, Web of Science databases were searched with no restriction of year and publication status. 652 articles were retrieved in the initial search. Eligibility of the articles was biphasically determined: two of the authors (ES and MDL) independently conducted the electronic search and performed a title and abstract (TIAB) screening to pre-select articles for full-text retrieval. Any disagreement was solved in consensus with a third examiner (RP). After the review process, 11 full-text articles met the inclusion criteria. After the evaluation process, 4 publications were included for the present literature review study. Selection criteria were: randomized clinical trials, controlled clinical trials, cohort studies, cross-sectional studies, case-control studies on patients with unilateral/bilateral cross-bite, transverse maxillary deficiency and crowding, underwent RME and monitored by stereophotogrammetry.

**RESULTS:** Heterogeneous methodology made meta-analysis not possible; consequently a systematic assessment of the studies and a summary of the findings from the available evidence were performed to answer the research question. The included articles, reporting the use of the banded appliance in similar age groups, show different results in the alar cartilage width effects: the study of Baysal and Altindis found a statistically significant increase in nasal width (1.16 mm and 1.42 mm, respectively), while Altorkat et al. shows a not statistically significant change of 0.4 mm. So, the maximum widening of the alar cartilage is  $1.41 \pm 0.95$  mm, whose clinical significance is open to question. The difference between the increments is almost three times but still not clinically significant if we set a threshold value of 3 mm. The inconsistency between nasal width values may be related to the fact that post-treatment stereophotogrammetry is taken in different time periods.

**CONCLUSIONS:** The effect of RME on mouth width remains controversial. If present, the esthetic impact provided by RME appliances on nasolabial morphology can be considered not

clinically significant. According to the PICOS approach, updated guidelines for future research are outlined from the available evidence. Inconsistencies and limitations in the study population and measurement protocols were detected between studies. This data should be confirmed with a consistent protocol, avoiding selection and measurement bias.

### Comparison of skeletal changes between 2-point bone-borne and 4-point bone-borne rapid palatal expanders. A FEM study

D. Bignotti, A. Gracco, G. Bruno, A. De Stefani, E. Stellini

*University of Padua, Department of Neuroscience, Dental School, Padua, Italy*

**BACKGROUND:** Rapid Palatal Expansion has been accepted as an effective and predictable technique to correct transverse deficiency in childhood age. His primary goal is to maximize orthopedic movement and minimize the dental movement. At this purpose in the recent years this device was combined with the potential of mini-implants. The bone anchorage allows a more specific skeletal dislocation without influencing the buccal tipping of the teeth. The integration of digital technologies in the modern clinic allows to place them with 3D-sofwares permitting great precision and low risk of damaging teeth or other important areas. There are a lot of construction options to create almost individualize devices for every patience, with different forms, porpoises or number of mini-implants. The aims of this study were to analyze and compare the stress distribution and displacement on the maxillary bone and the palatal suture using a 2 mini-implants vs a 4 mini-implants anchorages during bone-borne palatal expansion using finite element analysis.

**METHODS:** An analytical maxillary model was constructed from Cone Beam computed tomography (CBCT) scan images taken from human skull of a 24 years old female. The model was processed using Mimics software and ABAQUS software was used to solve the mathematical equation. The two expander prototypes and the screw model were realized with Solidworks software. The location of the palatal insertion of the screws was located according to the directive of mini-implants positioning and their correct length was chosen from the palatal bone thickness. The total displacement was 0.5mm on each side, making it a total of 1.0mm. Stress and displacement values were obtained and interpreted.

**RESULTS:** In the two mini-implants bone borne expander the maximum displacement in the transverse direction was observed at the upper central incisor and upper canine zone. The displacement assumes the shape of a pyramid with the base on the incisors region, gradually decreasing from the anterior to the posterior part of the maxilla. The same happens considering the frontal view of the model, with the maximum displacement in the inferior part of the maxilla and the minimum in the superior. The stresses were concentrated around



## ABSTRACT

the micro-implants and the mid-palatal suture. No stress was observed around the roots region. In the four mini-implants the stresses on the screws are lower but the stress on the palatal suture are higher. The expansion of the two palatal portions is more parallel compared to the one supported by only two mini-implants.

**CONCLUSIONS:** FEM analysis is a valid method. The results of the study and the absence of stresses in the roots region confirmed that the skeletal movement obtained do not affect the teeth. The different type of displacement observed suggests that a 4 mini-implants anchorages expander is better for suture of older patients because his stress distribution is larger and more spread in the entire maxilla suture's.

### Feasibility of digitizing edentulous jaws *in vivo*: preliminary study

L.F. D'ariento, A. Borracchini, A. D'Arienzo, M. Ferrari

*Department of Medical Biotechnologies, University of Siena, Siena, Italy*

**BACKGROUND:** Studies demonstrate that the accuracy of intra-oral scanners can be compared with conventional impressions for most indications. However, little is known about their feasibility and applicability in digitizing edentulous jaws in view of mobile prosthetic rehabilitation. The aim of the study is to evaluate the feasibility of using one of the most accurate intra-oral scanners (Trios, 3Shape, Copenhagen, Denmark) to digitize maxillary edentulous jaws *in vivo* and to verify, on the obtained data sets, if it is possible to replace the traditional approach with the digital one in the perspective of mobile prosthetic rehabilitation (complete denture).

**METHODS:** Four (1 male, 3 female) subjects who had no previous experience with either conventional or digital impression participated in this study. The patients were treated by two clinicians, the first with expertise in the fields of conventional impression and the second one expert in digital impression. For each patient were taken two impressions of the upper arch, one for each clinician. Digital impressions were performed using an intra-oral scanner (Trios3®). After that, conventional impressions of maxillary edentulous jaws were taken with a irreversible hydrocolloid impression material (Hydrogum 5, Zhermack) with Schreinemakers impression tray. Impressions were taken always with this sequence in order to not conditioning tissues with the impression material before using the IOS. After conventional impression, in the laboratory, preliminary gypsum models (Type III, Elite Model, Zhermack) were obtained and all the four models were scanned with a laboratory scanner (3Shape). At this point, both for the Intra-oral scanner and for the laboratory scanner, the scanning software saved the data automatically to the STL file format (STereo Lithography interface format). Then it was used 3-D evaluation software (3DReshaper 2017, Hexagon), where by using the best-fit algorithm the software automatically performed overall 3-D comparisons (x, y, z coordinates). Finally, it was possible to inspect the data sets visually and to conduct an analysis.

**RESULTS:** Digitizing edentulous jaws was possible using the IOS of the 3Shape. The mean value of difference between the two impression technique, it ranged from 219 to 347  $\mu\text{m}$  and on average only 10% of the arch recorded differences of more than 500 microns. The comparison of models obtained with different techniques (digital and conventional) showed that the compression given by the impression material on the

peripheral areas such as oral vestibule and soft palatal determined the most important differences recorded.

**CONCLUSIONS:** Although the results of our study show that digitization of edentulous jaw models was feasible with the use of the Trios scanner, the high levels of difference in compression in the peripheral sealing zone lead us to conclude that the use of optical scanning can be considered valid only to replace the preliminary impression, so to obtain a model thanks to which it is possible to build an individual impression tray. In fact, in view of mobile prosthetic rehabilitation, it is fundamental to exert a selective pressure in peripheral areas, that today it is not possible without the functional impression. In our opinion, a good solution to overcome this limit could be the use of contact scanner, so scanner that can physically probe the surface of the jaw and exert a selective pressure on tissues, although it must be remembered that the physical contact with the probe can somehow modify tissues in a way not desirable. Furthermore contact scanners exist only for laboratory and they are slow and expensive.

### Evaluation of the accuracy of digital impression for full-arch implant supported fixed dental prosthesis with six different intra-oral scanner

A. Di Fiore<sup>1</sup>, R. Meneghello<sup>2</sup>, L. Graiff<sup>1</sup>, G. Savio<sup>3</sup>, M. Turcetto<sup>3</sup>, E. Stellini<sup>1</sup>

*<sup>1</sup>Departments of Neurosciences, University of Padua, Padua, Italy; <sup>2</sup>Departments of Management and Engineering, University of Padua, Padua, Italy; <sup>3</sup>Departments of Civil, Environmental and Architectural Engineering, University of Padua, Padua, Italy*

**BACKGROUND:** The aim of the present study was to evaluate the accuracy of digital impression for full-arch implant-supported fixed dental prosthesis with six different intra-oral scanners.

**METHODS:** A virtual model of a mandibular edentulous with six scan-abutment positioned vertically at different height was designed by software (CAD) and subsequently manufactured in zirconia by a CNC machine tool (master model). The master model was measured with a coordinate measuring machine (CMM) (SmartScope Flash). The coordinates of the probed points were transferred into a 3D CAD software (Rhinoceros 5.0 Beta) and analyzed with a task specific evaluation protocol to estimate the position and orientation of each scan-abutment. The master model was directly digitized using six different intraoral scanner (n=15 for group). The software called "Scan-abut" was realized as a plug-in for Rhinoceros 5.0. Three-dimensional distances between reference points of digital impression and reference points of master model along the x-, y-, and z- axes were calculated at each position for all impression. 3D Position and 3D Distance analysis were calculated to compare the six intra-oral scanners. The Wilcoxon matched-pairs signed-rank test (one-tailed) was used to compare groups. The level of statistical significance was set as  $\alpha = 0.05$  and with a statistical power of 80%.

**RESULTS:** 3D Position analysis showed a mean deviation value respect the master model (trueness) of 31  $\mu\text{m}$  (SD 9  $\mu\text{m}$ ) for Scan A, 31  $\mu\text{m}$  (SD 5  $\mu\text{m}$ ) for Scan B, 60  $\mu\text{m}$  (SD 31  $\mu\text{m}$ ) for Scan C, 246  $\mu\text{m}$  (SD 81  $\mu\text{m}$ ) for Scan D and 98  $\mu\text{m}$  (SD 23  $\mu\text{m}$ ) mm for Scan E and 60  $\mu\text{m}$  (SD 18  $\mu\text{m}$ ) for Scan F. 3D Distance analysis showed a good linear relation between error and distance with Scan A and Scan F. There was no statistically significant difference between Scan A

and Scan B ( $p$ -value = 0.47), but a significant difference was present between all the groups.

**CONCLUSIONS:** Based on the results of this *in vitro* study, the Scan A demonstrated the highest accuracy. Four intraoral scanner device did not achieve the necessary level of accuracy to be used for full-arch implant-supported fixed dental prosthesis.

### Methodology for digital realization of a functional orthodontic appliance for the treatment of facial asymmetries

**BACKGROUND:** The present work shows: a) an innovative device (patent 281578) for the treatment of facial asymmetries on the mandibular basis. b) This apparatus is realized by mean of a novel method (patent 102616000066033) that allow the independent operator procedure to be made on the basis of the cephalometric tracing generated by a computer without contacting the patient, than through a 3D printer it is possible to produce the device remotely.

**METHODS:** In the literature different appliances are reported but protocol and timing of procedure of this pathology are controversial. In this work we suggest a new appliance for to treat a hemifacial microsomia very easy (before age of school and made by methodology easy and without high costs). The early treatment of hemifacial microsomia (before age of school) reduce the secondary deformities and the risk of surgery treatment in the future. The posterior anterior cephalogram tracing modify (P.A.C.M.) by author to allow: quickly evaluation of severity of asymmetry and the degree of activation of functional device that are transmitted remotely by a computer which automatically transmits to a printer 3D the information for the construction of the remote functional device on model taken through an intraoral scanner.

**RESULTS:** a) the patient has a "restitutio ad integrum" of mandible and temporomandibular joint affected by a microsomia in the age before of school. b) the apparatus is easy to create and to manage. c) the patient don't have a psychosocial problem because he's treated before age of school.

**CONCLUSIONS:** This methodology allows achieving the functional appliance also remotely, simply by transmitting data relating to P.A.C.M. by a personal computer which automatically transmit to a 3D printer and remotely made this device.

### Cone beam computed tomography radiographic evaluation of severely atrophic maxillae for tilted iuxtameatal implants: a retrospective anatomical study

B. Poletti de Chaurand, A. Merlone, F. Amodio, R. Vinci, M. Manacorda

*Dental School, Vita-Salute San Raffaele University, Milan, Italy*

**BACKGROUND:** This study aims at proving the existence of a permanent and adequate bone volume in the mid-maxilla area in patients presenting a severe maxillary atrophy. Furthermore the purpose is to show, using CBCT-scans, that this bone volume could be a sufficient base for an iuxtameatal implant. **METHODS:** A sample of 50 subjects were included in this study. There were 20 male and 30 females. Each patient provided a written consent before undergoing the CBCT scan. For each patient 2 iuxtameatal implants were virtually placed in

the mid-maxilla region in tilted position, trying to maximally exploit all the bone volume offered. The implants were all inserted with the same procedure, measured geometrically, at 30° and 45° degrees of tilting, with at least 1mm of bone all around every fixtures. The length, the palatal angulation and the diameter of the placed implant were identified. **RESULTS:** A total of 100 implant insertions were simulated with the program. In the analyzed sample of 100 iuxtameatal implants an average implant measurement of 3,35 x 14,23 mm and an average anterior-posterior angulation of 6,17° were identified. These measurements imply the existence of a sufficient amount of basal bone situated in the mid-maxilla region for iuxtameatal implants placement. **CONCLUSIONS:** The psychosocial perception of tooth loss and the growing ageing population have both contributed to increase the implant-supported solutions. This is also due to the frequency of disapproving patient outcomes with the use of partial or total removable dentures. Throughout the past twenty years, the use of osseointegration methods has grown essential for patients rehabilitation, in order for them to complete form and function. Unfortunately, numerous patients show a significant degree of bone resorption and sinus pneumatization due to the tooth loss which complicate maxillary implant-supported rehabilitations. There are many examples of bone graft procedures such as the sinus floor elevation, the guided bone regeneration or the onlay bone graft. These are all characterized by high morbidity and biological costs, long duration of the therapy and low predictability. Other treatment options of atrophic maxilla include split crest, pterygo-maxillary implants and zygomatic implants but they are operator-dependent surgeries. However an accurate analysis with a three dimensional imaging of the residual bone may reveal the presence of a suitable bone volume for tilted implant. In fact, in this study it is founded that in the majority of the maxillary atrophy the volumetric evaluation of the mid-maxilla region could suggest the possibility of iuxtameatal implants placement without the need of additional bone grafting or sinus floor elevation.

### Three-dimensional versus two-dimensional digital methods for the diagnosis of facial asymmetry

D. Dalessandri, L. Pedersoli, A. Fabbri, E. Lazzaroni, G. Volpini, I. Tonni, L. Visconti, C. Paganelli

*Department of Orthodontics, School of Dentistry, University of Brescia, Brescia, Italy*

**BACKGROUND:** To assess if three-dimensional (3D) skull digital reconstructions, obtained from Cone Beam Computed Tomography (CBCT), are a more sensitive and accurate method for the diagnosis of facial asymmetry compared with postero-anterior (PA) cephalograms.

**METHODS:** PA cephalograms and CBCT exams of the maxillo-facial complex of 10 patients (aged between 20 and 37 years, exams carried out from 2008 to 2017) with clinical diagnosis of facial asymmetry were obtained from the archives of the orthodontic department of the University of Brescia. No limits regarding medical history and severity of facial asymmetry was established in the selection of patients. The NNT software (NewTom, QR, Verona, Italy) was employed to perform Ricketts frontal cephalometric analysis and to calculate four linear and one angular distances on PA cephalograms. 3D digital models of the skulls were reconstructed from CBCT exams using Materialise Mimics and 3-Matic

## ABSTRACT

Medical software (Materialise, Leuven, Belgium). By means of these software six linear and six angular distances were calculated on the digital models. 3D method, based on CBCT digital models' measurements, was compared with the 2D method, based on PA cephalograms measurements, both from a quantitative and a qualitative point of view. Regarding the quantitative approach, right/left ratios between corresponding variables, calculated in 2D and 3D, were compared and the results were analysed through Student's T test or Wilcoxon test for paired samples, depending on the normality or not of data distribution.

**RESULTS:** there was no statistically significant difference between the 3D and the 2D methods as regards the quantitative level. However, PA cephalograms provide less information about the aetiology of facial asymmetry and they are susceptible to distortion, superimposition of different anatomical structures and other limits. On the other hand, the 3D method exposed the patients to a higher dose of radiation and it is more expensive.

**CONCLUSIONS:** According to the results of the present study, even though 3D methods seems to be more sensitive and accurate than 2D ones, in the comparison between left/right variables the difference is not so significant to validate the use of 3D models as a first level exam in the diagnosis of facial asymmetry. PA cephalograms can represent a valid first step exam to approach and understand this condition. However, 3D models should be preferred when the aetiology of facial asymmetry is multiple and difficult to properly detect or when the asymmetry requires a surgical maxillofacial treatment.

### Digital impression on transmucosal vertical neck® implants: evaluation of soft tissues stability

P. Lomelo, F. De Angelis, A. Visca, M. Senatore, G. Pignatiello, S. Di Carlo

*Dipartimento di Scienze Odontostomatologiche e Maxillofaciali, Sapienza Università di Roma, Rome, Italy*

**BACKGROUND:** The literature indicates that 0.5 to 1.5 mm of gingival recession most often occurs within the first months after implant placement or abutment connection. The aim of this study is to test the validity of the new Biotype implant design (Vertical Neck®) to evaluate the effect of a concave transmucosal profile on the vertical stability of soft tissues at the facial aspect of dental implants, taking advantage of the benefits deriving from intraoral digital impression.

**METHODS:** The study was carried out at the Department of Oral and Maxillofacial Sciences, Sapienza - University of Rome. A 45-years-old patient was selected. He didn't show periodontal and systemic diseases. Mono edentulous sites were either in maxilla (1.6) and in mandible (3.6). After the sign of the informed consent form, according to the World Medical Declaration of Helsinki, the surgical phase was performed. Mini-invasive osteotome sinus floor elevation in atrophic maxilla was used to insert a transmucosal Vertical Neck® implant with 4.8 mm diameter and 8 mm length. In mandible was used a transmucosal Vertical Neck® implant with 4.1 mm diameter and 8 mm length. Six months later a digital impression was taken with an intraoral optical scanner (CS3500, Carestream Dental, Atlanta, GA, USA). A Simbiosi® Scan Body was applied on implants. Periapical radiographs were taken in order to show the right linkage between devices and implants. Straight titanium abutments

were used and periapical radiographs were made to evaluate a correct marginal fit on implants. Two monolithic zirconia crowns were realized with a CAM system.

**RESULTS:** No recession in soft tissue was observed. The gingival level remained stable at 12 months. Vertical Neck® implants have shown a good relationship with bone and soft tissues. Also the aesthetic goals have been reached.

**CONCLUSIONS:** Biotype transmucosal Vertical Neck® implants have been projected to allow the placement of prosthetic border into an area of 2 mm of eight instead of predetermined point. Because of its intrinsic feature, the biological width is respected. Thanks to the management of the impression into a digital format (intraoral scan and CAD/CAM system), the final crowns resulted to be more accurate than with a traditional system; in fact, common mistakes linked to clinical and laboratory process have been avoided.

### Evaluation of the accuracy of intraoral scanner on a totally edentulous maxilla: a comparison of two different techniques of scanning and accuracy in case of different anatomical landmarks definition. A 3d analysis

G. Ruggiero, R. Sorrentino, F. Zarone

*Department of Neurosciences, Reproductive and Odontostomatological Sciences, University "Federico II" of Naples, Naples, Italy*

**BACKGROUND:** The first aim of this study was to compare the accuracy of an intraoral scanner (TRIOS 3 Pod, 3Shape) on two similar completely edentulous typodonts of the maxilla characterized by a different definition of the anatomical landmarks. The second aim was to evaluate the accuracy of two different techniques of scan with the same intraoral scanner.

**METHODS:** Two reference identical typodonts in polyurethane resin (PRIMA-DIE, Gerhò) of an upper totally edentulous jaw were made, one ("typodont-1" - WT) with marked palatal rugae, the other (ST) without palatal rugae and with smoother ridge surfaces than WT. Both reference typodonts were scanned using an industrial 3D metrological machine (Atos Core 80, GOM), obtaining 2 digital reference scans (rWT and rST), saved in ".stl" format. All the areas needed for the construction of a complete maxillary denture were included in the scans. In the first technique of scanning (T-1), the authors proceeded longitudinally along the ridge's occlusal side of the full arch, starting from the left maxillary tuberosity and ending at the right one, then continuing on the buccal side and, eventually, on the palatal side. In the second technique (T-2) the authors scanned the casts starting from the buccal side of the left maxillary tuberosity, moving the scanner with bucco-lingual and linguo-buccal alternate movements along the ridge, from one side to the other, until the entire cast was scanned. 4 groups of scans were performed (each group including 10 scans): the first group on WT with T-1 (WT/T-1), the second on WT with T-2 (WT/T-2), the third on ST with T-1 (ST/T-1) and the fourth on ST with T-2 (ST/T-2). These 40 scans were saved in ".stl" format for the comparison. All files were imported into a dedicated software (Geomagic Control X), and the accuracy evaluated calculating trueness and precision, measured in µm (micrometres).

**RESULTS:** Trueness values (95% confidence interval) were: WT/T-1 49,1 [37,9-60,3]; WT/T-2 66,3 [54,3-78,2]; ST/T-1 48,4 [42,5-54,3]; ST/T-2 56,8 [43,9-69,8]. Differences between groups were statistically significant only between: WT/T-1 and



WT/T-2; ST/T-1 and WT/T-2. Precision values (95% c.i.) were: WT/T-1 48,7 [37,8-59,5]; WT/T-2 65,9 [54,3-77,48]; ST/T-1 48,1 [42,5-53,7]; ST/T-2 56,4 [43,9-68,9]. Differences between groups were statistically significant only between groups: WT/T-1 and WT/T-2; ST/T-1 and WT/T-2.

**CONCLUSIONS:** The presence of marked anatomical landmarks don't improves the accuracy of scans with the tested intraoral scanner. On the contrary, many superimposition detected distortions in correspondence of the palatine accentuated wrinkles, probably due to a difficult stitching in this area; the use of the technique-2 showed a statistically significant reduction of the intraoral scanner's accuracy, also in this case the stitching was difficult.

### Comparison of the accuracy of an intraoral and an extraoral laboratory scanner on the totally edentulous maxilla: a 3D analysis

G. Ruggiero, F. Zarone, R. Sorrentino

*Department of Neurosciences, Reproductive and Odontostomatological Sciences, University "Federico II" of Naples, Naples, Italy*

**BACKGROUND:** The aim of this study was to compare the accuracy between an intraoral scanner (TRIOS 3 Pod, 3Shape) and an extraoral laboratory scanner (DScan 3, EGSolutions) on the reference typodont of an upper totally edentulous jaw. The accuracy of the extraoral scanner was evaluated from the direct scans of the impressions in polysulphide (through a reverse process), then from the scans of the models obtained pouring the stone in the impressions.

**METHODS:** A reference typodont (RT) in polyurethane resin (PRIMA-DIE, Gerhò) was made; the RT was scanned using an industrial 3D metrological machine (Atos Core 80, GOM), obtaining a digital reference scan (dRT), saved in ".stl" format. All the areas needed for the construction of a complete maxillary denture were included in the scans. 10 intraoral scans (dIOM) were performed proceeding longitudinally along the ridge's occlusal side of the full arch, starting from the left maxillary tuberosity and ending at the right one, then continuing on the buccal side and, eventually, on the palatal side. The authors created a device to take impressions with a repeatable, consistent process that can guide and position an individual impression tray in resin (Vertys Surgical, Vertysystem) onto the typodont with the same standardized pressure and orientation in the space. 10 impression trays were made with a dedicated software (PreForm 2.15.0, Formlabs) and printed with a 3D printer (Form 2, Formlabs), in order to obtain 10 identical ones. With this device, 10 impressions in polysulphide (Permlastic, Kerr) were obtained; then, by the laboratory extraoral scanner (DScan 3, EGSolutions) a scan of each impression was done. With a dedicated software (DentalCad, EGSolutions) 10 digital models (dREM) were obtained processing "in reverse" the physical impressions. Eventually, a type IV stone (Elite Stone, Zhermack) was poured in the impressions to obtain 10 physical gypsum models (dEOM), then scanned as well by the laboratory scanner. In this way, 3 groups of scans were done (each group including 10 scans) and saved in ".stl" format for the comparison, performed importing them into a dedicated software (Geomagic Control X), and the accuracy evaluated calculating trueness and precision, measured in  $\mu\text{m}$  (micrometres).

**RESULTS:** Trueness values (95% confidence interval) were: dIOM 49,1 [37,9-60,3]; dREM 349,1 [290,7-407,6]; dEOM 1243 [1130,7-1355,3]. Precision values (95% c.i.) were: dIOM 48,7 [37,8-59,5]; dREM 346,8 [293,8-399,8]; dEOM

1241,8 [1129,6-1354]. Differences between groups were statistically significant.

**CONCLUSIONS:** With the materials and methods used in the present study, intraoral scanning allows better accuracy than the scanning of the model with an extraoral laboratory scanner. The reverse process performed on the direct scans of the impressions guarantees better accuracy compared to the scanning of the corresponding model but worse accuracy compared to the intraoral one. According to the authors, these results could be explained by the distortion of the materials used to take the impression and to make the model.

### 3D-printed bone models with patient-specific anatomy from a CBCT file: an evaluation of mechanical properties

M. Meglioli<sup>1,2</sup>, A. Toffoli<sup>1,2</sup>, L. Parisi<sup>1,2</sup>, F. Rivara<sup>1,2</sup>, S. Lumetti<sup>1,2</sup>, E. Manfredi<sup>1,2</sup>, G. M. Macaluso<sup>1,2</sup>

*<sup>1</sup>Centro Universitario di Odontoiatria, Università degli Studi di Parma, Parma, Italy; <sup>2</sup>Dipartimento di Medicina e Chirurgia, Università degli Studi di Parma, Parma, Italy*

**BACKGROUND:** Three dimensional (3D) printing is one of the most advanced technologies in manufacturing industries, allowing to produce complex structures using materials with different mechanical properties. Therefore, it has been implemented in dentistry to produce dental casts, temporary crowns or surgical templates. 3D printers produce items starting from a stereolithographic (STL) file that can be obtained through computer-aided-design (CAD) software. Most of the 3D printers use a photosensitive resin and a lighting system. The resin is polymerized layer by layer thanks to the light source that triggers the reaction. The aim of this study was the definition of a digital work-flow to obtain 3D printed patient-specific bone models that reproduce original anatomical characteristics starting from a 3D DICOM file and the evaluation of their mechanical properties.

**METHODS:** Firstly, a proper transformation of the Cone Beam Computerized Tomography (CBCT) dicom file into a STL file was obtained with a dedicated software (ITK-SNAP, University of Pennsylvania, Philadelphia, USA). Then an advanced 3D mesh processing software (MeshLab, CNR-ISTI, Pisa) was used to refine the mesh before printing. The support of the model was created through the use of PreForm software (Formlabs, Somerville, MA). A Form2 3D printer (Formlabs, Somerville, MA) was used to produce the model. This stereolithographic apparatus (SLA) printer, with a laser spot with a 140 $\mu\text{m}$  diameter, is able to polymerize layers up to 25 $\mu\text{m}$  thick and to create structures with a maximum volume of 13x15x17cm. The Formlabs resin with manufacturer declared mechanical properties more similar to those of human bone was chosen. Different samples printed with the same resin were light-cured for different times with a post-curing UV machine. Faithfulness of cortical bone mimesis was evaluated by different experienced clinicians who drilled the bone model, reported their perceptions on a visual-analogue scale (VAS) and answered a short survey.

**RESULTS:** Anatomical characteristic was properly reproduced.

Despite the choice of resin was fundamental, the mechanical properties of the printed objects were greatly influenced by the post-curing process. It was possible to create cortical bone models with mechanical characteristics superimposable to those of the patient. The media of VAS results, ranged from 0 to 10, was 8.78 and the median was 8.95. The results of the

## ABSTRACT

survey suggested that bone model's hardness and elasticity was similar to the cortical human bone. With this technology it was not possible to reproduce the cancellous bone, because the trabeculae were too thin compared to the laser spot.

**CONCLUSIONS:** This work-flow allowed to create printed models that reproduce the patient-specific features. These 3D-printed models can be used by surgeons and students for surgical practicing and case discussions allowing a safer and more predictable surgical outcome. Although it was not possible to reproduce a patient-specific cancellous bone because of its reduced thickness, there are manifold possibilities to recreate it using materials with different mechanical performances to fill the inner parts of the models.

### Work-flow beyond the guided implantology: 3D templates in oral surgery

A. Catania, A. Marcianò, M. Bitto, M. Pisano, L. Cavallo, G. Oteri

*Department of Biomedical and Dental Sciences and Morphofunctional Imaging, University of Messina, Messina, Italy*

**BACKGROUND:** Computer-guided technologies are adopted in various fields of surgery to limit invasiveness and obtain patient benefits in terms of surgery duration and post-operative course. Surgical templates realized through computer-aided design (CAD) and computer-aided manufacturing (CAM) technologies are widely diffused in implant dentistry. The aim of this work is to propose, beyond implantology, the feasibility of application of 3D printed surgical templates in oral surgery procedures requiring osteotomies like maxillary cyst enucleation, tooth disimpaction and tooth transplantation in order to obtain accurate surgeries, avoid anatomical damage of surrounding structures and decrease patient's morbidity.

**METHODS:** A stereolithography (STL) file of maxillary structures is obtained by the use of a 3D medical image processing software (Materialise mimics 20.0) a segmentation toolbox acquiring RX volumes by cone-beam computed

tomography (CBCT). Digital models of teeth, acquired as STL files directly by the use of an intra-oral scanner or indirectly by using the desktop scanners, are imported in the same 3D medical image processing software (Materialise mimics 20.0) and obtained STL files of maxillary structures and teeth are superimposed. Data are transported into Blue Sky Plan 4.0 (Blue Sky Bio, LLC), a software for 3D implant guides fabrication, together with the DICOM images package of maxillary volumes to carry out the pre-surgical treatment planning. Anatomical structures (nerves, dental roots, etc.) at risk are identified; a contour of ideal incision shape and bone osteotomy extent is drawn. Once the settings are confirmed, file of the three-dimensional guide is generated and the document created is used to fabricate the surgical guide either through additive methods (3D printing) or subtractive methods (milling machines). The resulting 3D template is fabricated with the following major features: teeth support, flap incision design, bone osteotomy design.

**RESULTS:** The proposed work-flow assist the surgeon in both pre-operative and intra-operative work phases through accurate virtual planning and the fabrication of precise surgical guides to be used in oral surgery practice. The use of CAD-CAM technologies in 3D oral surgery planning allows a better control of the osteotomy planes and flap management. 3D templates in oral surgery could be employed in order to safeguard adjacent healthy tissues and guarantee minimum tissue damage and good coverage.

**CONCLUSIONS:** Objective of the study was to present a specific workflow to be applied by Oral Surgery Units when planning surgical oral treatments. In oral surgery the preparation of the osteotomy window is crucial, its size, design, and position may affect the intra- and post-surgical complication rates. To apply the concept of computer guided surgery could decrease the risks of surgical complications related to incision size and extent of the osteotomy. The use of 3D system techniques in oral surgery can provide useful intra-operative guidance and may help to further increase accuracy of the surgery and patient safety. Clinical trials are needed to evaluate the efficacy of the proposed protocol.

---

## ODONTOIATRIA PEDIATRICA

---

### Primary and secondary prevention of lesions mih linked: dental hygienist's role and competence

M. Rampazzo, S. Mazzoleni, A. Zuccon, E. Gobatto, A. Salmaso, M. Caburlotto

**BACKGROUND:** Molar-Incisor Hypomineralization (MIH) is a qualitative defect of enamel with systemic origin that damage from 1 to 4 the first permanent molars, with or not the presence of hit permanent incisors.

**AIM:** The aim of this search is to verify if in literature there are some guidelines for the prevention of the teeth affected by Molar-Incisor Hypomineralization and the role of the Dental Hygienist in actuate an efficient primary and secondary prevention in order to avoid the instauration of a clinical picture more difficult to face, since the disease of Molar-Incisor Hypomineralization has an increasing prevalence in every part of the World.

**METHODS:** To get a detailed research, and in order to have the access to many odontoiatric journals, the proxy of the University of Padua was activated with a personal account and then a research of some articles started with Google Scholar® and Pubmed® search engine. The keywords that used were "MIH", "prevention", "aetiology", "causes", "prevalence", "guidelines", "caries", "dental hypersensitivity" and other more. Another support to the study was given by the books *L'igienista orale*, written by V. Cortesi Ardizzone e A. Abbinante, and *Clinical practice of dental hygienist* written by E. M. Wilkins. There wasn't any data limit to choose or discard the articles found but, since before the year 2001 Molar-Incisor Hypomineralization was identified with different names, the ones following that year have been chosen and the previous articles have been used only to clarify any doubt or to make some clarifications. The only rule followed has been that if there were any conflicting reports, the more recent was considered the best.

**CONCLUSIONS:** in this study the guidelines for the prevention of the teeth affected by the Molar-Incisor Hypomineralization and the role of the dental hygienist in actuating an efficient primary and secondary prevention were found, reaching the conclusion that the dental hygienist is the first person who could find the MIH disease and who could employ the prevention protocols. The dental hygienist may have a role of protagonist in every phase where the devices to make an efficient prevention have to be used. This is in every phase except for the part of the restorative treatment. This one is a task for the dentist who could work on teeth with the use of glass ionomer cements, when the patient presents one or more first permanent molars with MIH with post-eruptive breakdown, or when there are permanent incisors presenting brownish coloration.

### Importance of clinical and genetical evaluation for non-syndromic oligodontia in permanent dentation

S. Can Kuskonmaz, G. Bruno, A. De Stefani, A. Gracco, E. Stellini

*University of Padua, Department of Neuroscience, Dental School, Padua, Italy*

**BACKGROUND:** Hypodontia is one of the most common congenital abnormalities. It affects in 2.2-10% of the general population. It is frequently associated with other oral anomalies, such as structural variations and malformations of other teeth, late eruption, transposition and crowding. Oligodontia consists in the congenital absence of more than six permanent teeth. Prevalence of oligodontia in permanent dentition is 0.14% of general population. Oligodontia can be divided into two categories: Syndromic or non-syndromic and as familiar or sporadic. It is generally associated with a syndrome but in some cases, it can be present as an isolated oligodontia. More than 300 genes are involved in tooth development, the most common associated with the hypodontia are: WNT10A, MSX1, PAX9 and AXIN2. The objective of this case report is the evaluation of the importance of the treatment and diagnosis of this condition in a healthy patient with multiple agenesis. **METHODS:** A 14-year-old male Italian patient attended the clinic of University of Padua for an orthodontic evaluation. After intra and extra oral examination, an orthopantomographic radiograph was made and it revealed the absence of the four third molar teeth, lower central and lateral incisors, lower second premolars and lower second molars. The upper lateral incisors resulted reduced in shape and volume. No other episodes of teeth agenesis were referred in his family. A genetic evaluation was required to obtain detailed informations about his genotype.

**RESULTS:** The genetic analyses of the patient and his family revealed a mutation of WNT10A gene in the patient and in his parents. The parents were carrier of the mutation and they presented the 50% of the risk to transmit the mutation to their son. Therefore, the patient was diagnosed with compatible oligodontia. The patient holds a risk of 100% of passing this mutation to his children. This mutation can cause a syndromic situation like ectodermal dysplasia. Because of this, counsel to the patient make another genetic analyses with his future partner. The patient started the orthodontic, prosthodontic and restorative treatments in order to tackle aesthetic and functional disorders.

**CONCLUSIONS:** It is fundamental to direct patients with oligodontia to the genetic analyses as late diagnosis can be mortal. It is also important know the probability of passing onto their children. Orthodontic, prosthodontic and restorative treatments are crucial to treat oligodontia for physical and psychological wellbeing of the patient.



## ABSTRACT

**Morphological and three-dimensional analysis of ponticulus posticus on orthodontic patients: prevalence study by age**

S. Ucci, M. Macri, F. Festa

*Università degli Studi "G. D'Annunzio" di Chieti, Chieti, Italy*

**BACKGROUND:** The aim of this study was to improve the knowledge on the Ponticulus Posticus concerning prevalence and morphological characteristics, both general and related to different ages.

**METHODS:** We designed a retrospective cohort study using the CBCT (range 6-87, mean age:  $27.08 \pm 15.12$ ) who presented to the Department of Medical, Oral and Biotechnical Sciences at University of Chieti "G. D'Annunzio" for orthodontic diagnosis and treatment planning. The sample studied is composed of 202 males (40.4%) and 298 (59.6%) females. The age of male patients is between 6 and 86 (mean age:  $23.8 \pm 13.3$ ), while the age of female patients is between 7 and 87 (mean age:  $29.3 \pm 15.9$ ). The measurements were carried out from 23 November 2016 to 13 September 2017. CBCT images were obtained using Pax Zenith 3D CBCT (Vatech, Korea) with low dosage protocol based on the following parameters: FOV 240x190, normal resolution quality, 80 kVp, 5 mA, acquisition time of 15 s. Patients were positioned with the Frankfurt plan parallel to the floor with the head in the portal of the X-ray detector system. A 360-degree rotation around the patient's head was performed with a scan time of 15-20 s. Subsequently, raw data was uploaded and processed into multi-plan and three-dimensional images using the Dolphin imaging software. The general prevalence of PP, the anatomical variants and their gender and ages distribution was measured. All data was recorded on Excel version 16.0. for Windows 10. To facilitate the visualization of the results obtained, the patients were divided into 3 groups of age. All data has been subjected to statistical analysis with the IBM SPSS software version 17.0. Descriptive statistics were performed and the relationship between PP, anatomical variants, age and sex was evaluated via  $\chi^2$  test. A p-value lower than 0.05 was considered the reference to indicate a statistically significant difference.

**RESULTS:** The analysis of 500 CBCT detected the presence of Ponticulus Posticus, uni and bilateral, in 110 patients (22%). There was a slight increase in the prevalence of Ponticulus with increasing age. From the results obtained it is noted that the higher average age refers to the CS variant; while the lower average age is CSPD.

**CONCLUSIONS:** The study, therefore, wanted to underline the role and effectiveness of CBCT in the orthodontic and gnathological treatment, in order to be able to carry out a major differential diagnosis in symptomatic patients.

**METHODS:** A 6-year old child was referred to our Institute in September 2017 for multilocular, radiolucent lesions of the mandible, accidentally revealed by a panoramic x-ray performed for orthodontic reasons in July 2017. Anamnesis revealed that the patient had a negative medical history for jaw fractures or injuries and no other cherubism cases were reported in his family. The boy presented a painless symmetrical slowly increasing swelling of the mandibular angles, more extended on the right side. No other physical or growth abnormalities were present. Intraoral clinical examination disclosed an intact mucosa. Submandibular and cervical lymph nodes were palpable. No hematological anomalies were detected. To confirm the clinical suspect, different diagnostic exams were performed: computed tomography cone beam (CT), histopathological evaluation of an incisional biopsy, total-body magnetic resonance imaging (MRI), total-body scintigraphy, and molecular genetic testing.

**RESULTS:** CT scan of the mandible showed well-defined, bilateral, multilocular, expansive lesions with thinning of the cortical bone. There were no cortical breaks, fractures or extra-osseous soft tissue lesions. An incisional bilateral biopsy was carried out in general anaesthesia. Intraoperative appearance of the lesion was heterogeneous, gelatinous and disorganised. The mandibular bone was deformed and eroded both on the buccal and lingual side and the periosteum infiltrated by the lesion. The histopathological exam described the presence of fibrous fragments with thin trabeculae of woven bone and a large number of giant cells in a mesenchymal stroma; some foci of extra-vessel blood were present. These characteristics were compatible with a polyostotic fibrous dysplasia, but while MRI confirmed the presence of multilocular solid lesions of both mandibular angles (more represented on the right side with a diameter of 3,5 cm), it excluded the involvement of other skeletal segments. Similarly, bone scintigraphy showed the presence of the radiopharmaceutical marker on both the ascending mandibular rami with limited activity and no involvement of other bones. The genetic sequence analysis of exon 9 of SH3BP2 gene was negative for a mutation linked to cherubism.

**CONCLUSIONS:** The sum of clinical, radiologic and histopathological data led to the diagnosis of cherubism. Literature suggests that cherubism is a genetic heterogeneous pathology. Nevertheless, in this case the parents and other family members were not apparently affected and the identification of gene SH3BP2 was negative. Cherubism mutations are located in exon 9 in 90% of the cases but in a small percentage other exons of the same gene may be affected, so the complete sequencing of the gene need to be performed.

**A case of cherubism of unknown genetic etiology**

A. Franco, S. Lega, V. Guastalla, M. Biasotto, E. Barbi, M. Cadenaro

*Department of Medical Sciences, University of Trieste; IRCCS Burlo Garofolo, Trieste*

**BACKGROUND:** Cherubism is a rare genetic fibrous osseous dysplasia characterized by progressive, painless, bilateral enlargement of the mandible and/or maxilla. The aim of this case report is to present a case of cherubism not confirmed by genetic analysis.

**Restorative management of severe molar incisor hypomineralization (MIH). A minimally invasive technique: three years follow-up**

L. Zaffarano, A. Malerba, M.G. Cagetti

*Scuola di Specializzazione in Odontoiatria Pediatrica, Università degli Studi di Milano, Milan, Italy*

**BACKGROUND:** To present a minimally invasive approach for severe cases of MIH. In order to treat extensive lesions with post-eruptive breakdown, especially if the cusps are involved, preformed stainless steel crown (SSCs) are preferred as an effective medium-term restoration.

**METHODS:** A seven year old girl (F.F) with no significant

medical history, came to the office. She reported pain at all the four First Permanent Molars (FPMs). The previous dentist diagnosed incipient caries with pulp involvement and suggested an endodontic treatment followed by a full crown restoration for each FPM. MIH was diagnosed basing on the clinical appearance. No clinical or radiographical signs of endodontic involvement were found. In order to avoid the high risk of pulp involvement, the restorative appointments were immediately started without any previous casein phosphopeptide-amorphous calcium phosphate (CPP/ACP) treatment. A minimally invasive approach without any crown preparation was chosen. The treatment plan was set in four appointments, one for each FPM. The same week day, since the first visit, was held for subsequent appointments. Two full arch impressions were performed in order to make a wax-up of the four FPMs and to obtain the corresponding occlusal transparent silicon indexes. During the appointments, after local anesthesia and appropriate isolation, a careful removal of the caries was carried out, keeping sound tissue as much as possible. In order to avoid any pulp response, a resin-modified glass-ionomer cement liner was used. Subsequently, a mild self etch adhesive system with selective enamel etching was used. A resin composite stratification was performed. The last layer was cured with the aid of the silicon index in order to obtain a proper control of the occlusal contacts; indeed, it strongly changed due to the time passed without a proper anatomy of the FPMs.

**RESULTS:** After three years, during with a strict follow up and oral hygiene / remineralization program was done (7), no clinical or radiographic signs of restorative or endodontic failure were found.

**CONCLUSIONS:** In severe cases of MIH, a direct composite restoration could be considered a therapic option as much predictable as other more invasive approaches.

The use of a "semi direct" technique, with the aid of an occlusal silicon index, represents an important support for the operator in order to obtain a satisfying technical and behavioural management. Starting from this case report, high quality-well design studies could be elaborated.

### Italian proposal for early childhood oral health impact scale (I-ECOHIS): preliminary validation

M. Contaldo, F. Villamina Scorrano, D. De Angelis, M.C. Donnarumma, A. Di Santi, C. Gentile, A. Lucchese, R. Santoro, G. Minervini

**BACKGROUND:** The national guidelines establish child's first dental visit at 18/24 months, regardless the oral health status. Children's oral health related quality of life may be evaluated by several ways. Among them, the ECOHIS (Early Childhood Oral Health Impact Scale) has been proven to be a reliable tool in correlating the parent's perception of the quality of life of their preschool children with the oral health status. ECOHIS was first defined in 2007 and, since then, it has been validated and translated into different countries. What is missing today is its use in the Italian context. **AIM:** The aim of this work is to provide a preliminary Italian version of ECOHIS (I-ECOHIS) and to apply it to a sample of children/parents, in order to evaluate its comprehensibility and applicability in this country.

**METHODS:** This pilot study is descriptive and has been approved by the Ethics Committee. After proceeding to literal translation from English to Italian (I-ECOHIS) of the original

ECOHIS questionnaire, I-ECOHIS was administered to parents of children afferent to the Dental Clinic of the University of Campania "L. Vanvitelli", regardless of age, between May 2017 and January 2018. Children with parent's consent have been subjected to anamnestic survey and physical examination, to correlate these data with the questionnaire. According to literature, the I-ECOHIS answers were coded as follows: 0)never; 1)hardly ever; 2)occasionally; 3)often; 4)very often; 5)don't know. The total scores were calculated as a simple sum of the response codes for the child and family sections separately, ranging from 0 to 36 and 0 to 16, respectively. The total score (ranging from 0 to 52) was compared with the children's oral health conditions.

**RESULTS:** 300 children have come to our observation. I-ECOHIS was administered every parent to establish its comprehensibility, but we considered only 62 children (38 females and 24 males) under 7 years ( $5.2 \pm 1.4$  years) to determine I-ECOHIS/oral health status correlation. The parents answered the questionnaire in our presence and 101 out of 300 asked for clarifications (34%). Among the 62 children examined, the higher total score reached was 25/52, while the higher "child section" and "family section" scores reported were 20/36 and 12/16 respectively. Not all higher I-ECOHIS scores matched - as expected - to worse oral health. The I-ECOHIS score/oral health correlation was stronger and more consistent with literature in the group of children whose parents asked for clarifications (41 parents).

**CONCLUSIONS:** The present pilot study aimed to establish applicability and parental comprehensibility of an Italian version of the ECOHIS questionnaire. Its resulted incomprehensibility in 1/3 of parents tested, and the incongruity of the ECOHIS score/oral health correlations, highlight critical issues attributable to the questionnaire (questions formulation and answers misinterpretation) and to the parent (level of education, time spent, "parent-liar" or that "doesn't remember"). These evidences suggest the need to: review the translation in order to make it more understandable to the parent even without the operator; administer the same questionnaire again and at distance of time in order to verify the reliability of the answers; to collect more demographic information to better frame the parents. Once this has been done, we will expand the sample to carry out in-depth statistical surveys and we will be able to validate -or not- the I-ECOHIS scale in order to promote -or refuse- its use in Italy.

### Interceptive extraction of deciduous canine in children with palatally displaced permanent canines: case series

M. Oricchio<sup>1</sup>, M. Aprile<sup>1</sup>, C. Pala<sup>1</sup>, G. Rosati<sup>2</sup>, L. Gallottini<sup>2</sup>, V. Piras<sup>1</sup>, G. Denotti<sup>1</sup>

<sup>1</sup>Università di Cagliari, Cagliari, Italy; <sup>2</sup>Lu.de.S

**BACKGROUND:** Palatal displacement of maxillary canines is defined as the developmental dislocation to a palatal site often resulting in tooth impaction requiring surgical and orthodontic treatments (Peck *et al.* 1996). The aim of this study is to evaluate the clinical effectiveness of the interceptive treatment in children with palatally displaced canines. This interceptive treatment consists in the extraction of deciduous canine in mixed dentition in order to prevent permanent canine impaction.

**METHODS:** The sample consists in 3 children from 10 to 13 years old with diagnosis of intraosseous malposition of the

## ABSTRACT

upper permanent canine derived from the analysis of panoramic radiographs according to the method by Ericson and Kuroi (1987) that examine the alpha angle (the angle formed by the long axis of the canine and the midline), the distance in mm from the canine tip to the occlusal plan, and sector measurements (mesiodistal crown position in sector 1-5). The examined patients shows canines with an alpha angle greater than or equal to 15 degrees, within sectors 2-5. All the patients were treated with preventive deciduous canine extraction and then have been used two different orthodontic procedures to maintain space in the upper arch : transpalatal arch in the first patient and removable appliance for the other two patients.

**RESULTS:** After an average period of 18 months the radiographic exams show a decrease of the alpha angle with a significant improvement in the measures for intraosseous canine position in all the treated patients.

**CONCLUSIONS:** The extraction of the deciduous canine can be an effective procedure to increase the rate of normal eruption of maxillary palatally displaced canines.

Prevention of palatally displaced canines from becoming impacted is very important because an impaction can complicates orthodontic treatment and can increases the risk of root resorption of adjacent teeth with a potential result of tooth loss , so an early interceptive treatment is recommended. this interceptive treatment can be used in everyday practice and the success is related to early diagnosis and strategic interceptive treatment choice. We have to improve the statistical sample in order to provide statistically significant data.

### Dental anxiety in children: correlation with the parental anxiety

E. Facco, S. Brunello, R. Vianello, F. Golin, L. Favero, G. Zanette

*Clinical Dentistry, Department of Neurosciences, University of Padua, Padua, Italy*

**BACKGROUND:** Dental anxiety is a common condition, with relevant clinical implications as regards both the perioperative management and the impact on oral health. An inadequate management of anxiety and pain has even worse consequences in children. Preoperative anxiety is multifactorial and multidimensional, including a variety of both endogenous and exogenous components. The data available in the literature suggest a relationship between the anxiety of children and parents (especially mothers). However, the majority of these claims are flawed by the fact of not being based on validated anxiety tests. The aim of this study is to check dental anxiety in children using validated anxiety tests and analyze the relationship between children's and parent's anxiety.

**RESULTS:** The children showed higher VAS-A and MDAS scores than parents ( $p=0.046$  for VAS-A e  $p<0.001$  for MDAS). The anxiety evaluations obtained with the VAS-A in parents and children demonstrated a statistically significant correlation ( $p=0.021$ ).

**CONCLUSIONS:** Children have an anxiety much more elevated than their parents for dental procedures and this present study confirms the influence of parent's anxiety on children's one. This result is in line with the previous studies which demonstrate that children and adolescents suffer more dental anxiety than adults. Furthermore, children have to be subject to dental treatment, so they have to personally face up to the dental experience, while the anxiety of the parents depends on to their personal level of dental anxiety and also on the empathy with the child. There is a significant correlation between pre-

operative anxiety of the pediatric patient and the parent anxiety. The correlation though, is significant only for the VAS-A, but not for the MDAS. The reasons have to be searched in to the following facts: a) VAS-A is much more sensitive than the MDAS; b) VAS-A it is not a verbal test, allows to give a global, synthetic evaluation of the anxiety status, which extends itself way over the limits of the dentistry scenario of the MDAS. To be submitted on this test do not increase significantly the anxiety of the kid, is a procedure that consents to evaluate quickly, reliably and surely, the entity, avoiding the risk of scaring the little patient. Curiously after being subjected on those tests parents has significantly increased the anxiety.

### Quality of life after dental treatment under general anesthesia in special needs patients: a case report

M. Chermetz, M. Cadenaro

*University of Trieste, Department of Medical, Surgical and Health Sciences, IRCSS Burlo Garofolo, Pediatric Dentistry Post Graduate Program, Trieste, Italy*

**BACKGROUND:** This case report illustrates a protocol for special needs/disabled/odontophobic patients who need dental treatments. The first aim is the maintenance of deciduous teeth to prevent and limit consequences due to early extractions and to preserve esthetic and function, through the application of an educational program dedicated to these children and their caregivers, in order to prevent dental pathologies and to reduce the necessity of treatments under general anesthesia. The second aim is to investigate how dental treatments under general anesthesia can change the quality of life of these children and their care-givers in daily activities.

**METHODS:** Three questionnaires to evaluate the differences in quality of life before and after dental treatment were selected: ECOHIS (Early Childhood Oral Health Impact Scale), FIS (Family Impact Scale) and a modified 24-items-COHIP (Child Oral health Impact Profile). These questionnaires are related to specific child behaviors, such as eating, drinking, sleeping, speaking and social relations, and to their care-givers' life aspects, such as absence from work, quarrels among family members or guilt feelings. The protocol was tested with D.G., a 6-year old girl, affected by hypogammaglobulinemia, hypereosinophilia, anemia, deficit in intestinal absorption associated to hypothyroidism and a growth hormone deficit, with a dmft score of 19. D.G. was treated under general anesthesia for two primary teeth extractions, one root canal therapy, ten restorative treatments and three fissures sealings. Questionnaires were submitted to D.G.'s mother before the intervention (T0) and after two months (T1). After the intervention both the mother and child were instructed about correct diet and oral hygiene habits and a follow up was scheduled after 15 days and two months.

**RESULTS:** Scores from questionnaires at T0 were dramatically high, particularly in questions regarding pain during eating or drinking, difficulty in proper brushing, and parents' guilt feelings about their child dental situation. At T1 significantly lower results were recorded, with a complete reduction of pain, although the mother still reported difficulty in properly cleaning D.G.'s teeth.

**CONCLUSIONS:** Bad oral health conditions can have a strong impact on the quality of life, affecting daily activities as eating, speaking or smiling in social situations, in particular for patients with a complex medical history like D.G. Treatment under general anesthesia can solve in a single ses-



sion difficult cases, re-establishing a healthy oral situation, with a significant improvement in daily activities. A dedicated protocol, with a particular attention towards children and families needs and focused on the importance of prevention, can facilitate post operative recovery and prevent the relapse of oral pathologies. Further data on other patients need to be collected to quantify the impact of oral health conditions on quality of life scores on a larger scale.

### Hypnosedation in pediatric patients for dental procedures: ketamine/midazolam vs. ketamine/propofol

A. di Santi <sup>1</sup>, R. Santoro <sup>1</sup>, D. De Angelis <sup>1</sup>, C. Cecere <sup>1</sup>, F. Villamaina Scorrano <sup>1</sup>, B. Prisco <sup>1</sup>, N. Amato <sup>2</sup>, C. Greco <sup>2</sup>, O. Di Bella <sup>1,2</sup>, G. Minervini <sup>1</sup>

<sup>1</sup>Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania "Luigi Vanvitelli", Naples, Italy; <sup>2</sup>Department of Women, Child and General and Specialist Surgery, Service of Anesthesia and Reanimation, University of Campania "Luigi Vanvitelli", Naples, Italy

**BACKGROUND:** Dental procedures performed in pediatric patients often require sedation and deep analgesia. Ketamine (K) is a hallucinogen that is strictly used for sedation in pediatric patients - derived of phenylclidine, a non-competitive inhibitor of NMDA - but its use is not free from known side effects (dissociative anesthesia). Hence the choice of using ketamine in combination with a benzodiazepine: the pharmacokinetic synergism allows the use of low doses of both, a rapid cognitive and neuromuscular recovery and minor side effects.

**METHODS:** Two groups have been selected each consisting of 30 patients (24M 36F, mean age 6 years, all ASA I). In both groups a premedication was performed with ketamine i.m. (K at the dose of 1.5 mg / kg). After obtaining a peripheral venous access, at 5'-7' from the administration of ketamine, maintenance has been carried out in group A (K / M) with midazolam - M - benzodiazepine with a short half-life enhancing the inhibitory action of GABA at the dose of 0.5 - 1 mg / 10 kg in bolus i.v.; in group B (K / P) with the propofol - P - rapid onset and short duration of action hypnotic without analgesic properties at the dose of 10-15 mg / 10Kg in bolus i.v.. Whatever sedation had been, it was always necessary to practice local anesthesia with 2% mepivacaine for dental procedure: multiple extractions (deciduous and permanent), marsupialization of ranula, apicectomy, extraction of supernumeraries, frenulectomy, removal of fibroma in the oral cavity. At a distance of 15', 30' and 60' cognitive and neuromuscular status (Romberg sign) - psycho attitudinal (test of the drawing) recovery and the continuation of analgesia (Wong-Baker scale) have been evaluated.

**RESULTS:** In both groups, it has been necessary to use the bite block to allow access to the oral cavity and allow the operator to perform the surgical procedure. In group A, total cognitive and neuromuscular recovery has been achieved in 15 minutes while in group B it took about 20 minutes. No post-operative medication has been required to be added to the post-operative period, and only one postoperative vomiting occurred in group A. No respiratory assistance with O<sub>2</sub> was required in any patient.

**CONCLUSIONS:** This study suggests that the two methods of hypnosedation are superimposable because they satisfy both procedural amnesia criteria and short sedation and recovery times, excellent outcomes for the operator - in terms of the

quality of sedation - and the small patient. The combination ketamine/midazolam allows to carry out the surgery, even if it had to last beyond the established times, gives stability and psycho attitudinal sedation better than the association K / P in which the patients, to the awakening, present reactivity sometimes anomalous when they do not recognize the family atmosphere. It is, therefore, our policy to prefer the K / M association. Further studies with greater sample size are necessary to evaluate the efficacy of the K / M association compared to K / P in the hypnosedation of pediatric dental procedures.

### Proposal of a clinical informatic chart for pediatric dentistry

B. Prisco, C. Gentile, M. Contaldo, A. Romano, C. Cecere, R. De Luca, R. Femiano, R. Santoro, G. Minervini

Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania "Luigi Vanvitelli", Naples, Italy

**BACKGROUND:** Epidemiological studies are the basis for the construction and establishment of prevention protocols. The aim of epidemiology is to recognize the basics of the disease, so the collection of information is a fundamental aspect in the medical evaluation. The computerized medical record was created with the aim of collecting the anamnestic and clinical data of pediatric patients with the collaboration of the various departments, which deals with the support in the childhood. The dental aspects have been integrated into these with welfare, epidemiological and scientific purposes. In the welfare sector, we try to intercept problems that require specialized insights, while in scientific field we try to define a database to be able to undertake epidemiological studies.

**METHODS:** Epidemiological studies provide for the collection of ad hoc data and the establishment of databases to be analyzed according to the set goals. These databases and their integration are a powerful tool for guiding toward epidemiological research sides. The development of hardware technologies that allows the management of increasingly large amounts of data, in ever faster times, has produced a progressive increase in the completeness and validity of the latter. Both for public health purposes and for epidemiological research, the integration of health data with reference archives, or with certified data in their quality, can also allow the measurement of the validity of the data and produce an external remediation, enriching at the same time the base information. Let's think about the possible registry checks with the Ministry of Finance or the possibility to standardize addresses thanks to Regional Unified Roadways.

**RESULTS:** The quality of the data is, after the feasibility, a decisive prerequisite in the process of integration of electronic archives. The attributes of quality, to be considered, concern the reliability, efficiency, accuracy, completeness, timeliness, traceability, relevance, taking for granted the truthfulness. The considerations resulting from the analysis of the aforementioned attributes of quality are specifically connected to archives of significant size, for which the accidental errors of the collection, coding, recording and transmission phases have their own characteristics, depending on the heterogeneity of the sources and, often, not totally transparent.

**CONCLUSIONS:** The computerized medical record is therefore a useful tool as a protocol for standard epidemiological studies because it allows us to collect a good quantity and quality of clinical data, although this protocol is limiting for larger populations and for longer times.

## ABSTRACT

**Impact of BMI increase in child oral health**

M.C. Donnarumma, R. De Luca, R. Femiano, A. Romano, R.G. Umamo, M. Pedullà, R. Santoro, G. Minervini

*Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania "Luigi Vanvitelli", Naples, Italy*

**BACKGROUND:** The purpose of the study is to highlight the presence of a correlation between an increase BMI and oral health in pediatric subjects. The data collection necessary for the research took place using computerized record.

**METHODS:** For this study a sample of 262 children with age range from 5 to 14 years was analyzed.

**Inclusion criteria:**

Body Mass Index (BMI) > 5°percentile

**Exclusion criteria**

BMI < 5°percentile

Pazienti with systemic disease

The discriminating parameter for determining the test sample and the control group is the BMI. According to these criteria, a sample of 250 patients, divided into two groups is defined: a test sample (BMI > 85°percentile) of 114 patients and a control group (5° > BMI < 85°percentile) of 136 patients. All children's parents were informed, both verbally and by a written consensus, of the objective of the study, which would include the patient's anamnesic data and a clinical dental examination. The collected data were selected: gingival index, oral hygiene level, decay prevalence and oral breathing.

**RESULTS:**

**GINGIVAL INDEX:**

(Sample test: 7.9% absence of gingivitis, 53.5% mild degree, 32.4% moderate degree, 6.1% severe degree / control group: 3.7% absence of gingivitis, 68.1% mild degree, 20% moderate degree, 8.1% severe degree).

**ORAL HYGIENE LEVEL:**

(test sample 12.28% absence of plaque, 57.01% modic presence of plaque, 23.68% presence of plaque, 7.01% presence of plaque and tartar / control group 11.11% absence of plaque, 56, 3% modest presence of plaque, 24.44% presence of plaque, 8.15% presence of plaque and tartar).

**DECAY PREVALENCE:**

(Test sample 34.18%: deciduous dentition 40%, mixed dentition 35.44%, permanent dentition 30%; control group 35.3%: deciduous dentition 33.34%, mixed dentition 41.66%, permanent dentition 22, 23%)

**ORAL BREATHING:**

(15.8% test sample / 5.92% control group)

From the data collected through the percentage analysis of the two groups, it is clear that patients with absence of gingivitis and moderate gingivitis are more frequent in the sample than in the control group, which has a higher percentage in the mild degree, while the data are similar in the severe degree in both groups. The data regarding oral hygiene levels showed similar results. With regard to the decay prevalence, in both groups the percentages are similar, specifically the test sample shows a greater percentage in the permanent dentition and in the deciduous one compared to the control group which has a higher frequency of caries in mixed dentition. From this, it could be seen the non-correlation between the oral hygiene level and the BMI as well as the BMI and the prevalence of carious lesions. Lastly, the test sample has a higher percentage of patients with oral breathing than the control group.

**CONCLUSIONS:** Currently, the results found through the computerized record are still being updated and reviewed, in order to refine this tool to offer a contribution to the pediatric dentist who approaches the small overweight patient, framing him it entirely.

**Are cesarean section and AB0 group related to caries severity? A retrospective cross-sectional study on italian children**

F. Cocco<sup>1,2</sup>, M. Arrica<sup>1</sup>, M.G. Cagetti<sup>1,3</sup>, P. Lingström<sup>2,4</sup>, G. Lai<sup>1</sup>, G. Campus<sup>1,2</sup> and Italian study group on ECC<sup>1</sup>, M. Columbano, J. Davi, G. Frascioni, S. Nieddu, R. Pinna, L. Satta

*<sup>1</sup>Department of Surgical, Medical and Experimental, Sciences – School of Dentistry, University of Sassari, Sassari, Italy; <sup>2</sup>WHO Collaborating Centre of Milan for Epidemiology and Community Dentistry, University of Milan, Milan, Italy; <sup>3</sup>Department of Biomedical, Surgical and Dental Sciences, University of Milan, Milan, Italy; <sup>4</sup>Department of Cariology, Institute of Odontology, The Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden*

**BACKGROUND:** Mode of delivery affects child's general health, moreover a connection between several diseases and different AB0 blood group was speculated. This preliminary epidemiological retrospective cross-sectional survey was aimed to investigate the potential associations between mode of delivery AB0 blood group and early childhood caries in a group of Italian toddlers.

**METHODS:** From Medical Birth Chart (2013-14), data on the mode of delivery and AB0 blood group was collected and on Italian toddlers living in Sardinia (n=6775) aged 24–30 months were recruited. Power analysis was performed (3.1.9.2 for Apple G\*Power software) prevalence ratio added to 40% to safeguard against the risk of disease spread, an error probability of 0.05 and actual power of 0.95. The total sample size was set to 236. 2191 were invited to participate and 244 toddlers were examined. Caries lesions were recorded using the International Caries Detection and Assessment System (ICDAS) by calibrated examiners -Italian study group on ECC- (Cohen Kappa from 0.85 to 0.91). Caries severity (CS) was calculated as the summation of ICDAS multiplied by the number of lesions [ $\sum(0-6 \text{ ICDAS}(\text{score}) * n(\text{lesions}))$ ]. The non-parametric Mann-Whitney U test was used for between-group comparisons.

**RESULTS:** 47.80% (n = 117) of children was delivered via caesarean section, while 52.20% (n = 127) was vaginally delivered. Caries severity (CS=3.66±6.59) was higher in children delivered by caesarean section compared to children vaginally delivered (CS=3.03±5.52) p>0.05. Caries severity was statistically significantly lower (p<0.02) in toddlers with AB blood group (CS=1.86±2.34), followed by toddlers with A blood group (CS=2.29±4.41) and toddlers with 0 blood group (CS=2.75±5.34); and toddlers with B blood group showed the highest caries severity (CS=3.60±6.24).

**CONCLUSIONS:** The study failed to prove an association between CS and delivery modalities biased by the high frequency of CS observed. A higher caries severity level was observed in toddlers with B blood group.

**Bisphosphonates therapy in children with osteogenesis imperfecta: clinical experience in oral surgery**

G. D'Angeli, F. Calcagnile, F. Covello, A. Salucci, G. Di Giorgio, D. Milo

*"Sapienza" University of Rome, Department of Oral and Maxillo-Facial Sciences, UOC Pediatric Dentistry, Pediatric Dentistry Specialization School, Rome, Italy*

**BACKGROUND:** To define the possible oral surgery complications in growing patients affected by type I of

Osteogenesis Imperfecta (OI) and treated with bisphosphonates (BP). We focused our observation from simpler procedures such as abt of the tartar in which it is expected to have gingival bleeding, or the simple extraction, to the most complex and invasive procedures as complicated extractions such as germectomy or the application of orthodontic mini-implants. METHODS: The study was conducted among 20 patients in childhood with 8-14 years old (12 males e 8 females) affected by OI. Patients were initially evaluated at the Policlinico Umberto I, University Hospital of Rome, Rare Disease Center Skeletal Dysplasia-Bone Metabolic Pathologies and after at the Policlinico Umberto I, University Hospital of Rome, Head and Neck Department, UOC Pediatric Dentistry. Patients underwent specialist examination, were prescribed first and second radiographic investigations based on clinical need and hence dental care plans were drawn up in collaboration with the pediatric specialist. The therapeutic use of BP in compliance with a scientifically validated protocol is evaluated in relation to a clinical history that has one of the following conditions occurring in the two years prior to observation. The BP certificated in Italy is neridronate (Nerixia®), administered intravenously to quarterly cycles.

RESULTS: From this experience, we showed that a multidisciplinary approach of pediatric dentist and pediatrician can manage these patients from the risk of post-operative complications, such as onj, soft tissue infection, intraoral and extraoral fistulas, failure to heal the post-extractive sockets, delayed but complete healing of the post-extractive sockets, infections, post-operative pain and swelling, purulent discharge and pathological fractures. The follow-up, ranging from a minimum of 2 years to a maximum of 5 years, have not demonstrated the presence of particular complications or healing defects.

CONCLUSIONS: Based on the clinical experiences of the patients recruited at the Policlinico Umberto I, University Hospital of Rome, Head and Neck Department, UOC Pediatric Dentistry, and based on the literature reviews, it is not yet possible to define scientifically validated protocols or guidelines for the management of the developing age patient with OI that needs oral surgery. The clinical experiences observed in these patients are encouraging because no post-operative complications have been observed compared to patients not affected by OI. In the management of these patients, it must be important the collaboration with the pediatric specialist in order to optimize the response time according to drug therapy, monitor healing with close controls, assess the actual need for some interventions, the risks of complications and perform remote follow up.

### Anesthesia in pediatric dental surgery: effects of a computer controlled delivery system on pain and heart rate. A randomized clinical trial

A. Laureti, R. Patini, E. Staderini, F. Guglielmi, M. Cantiani, P. Gallenzi

*Department of Surgical Sciences for Head and Neck Diseases, School of Dentistry, Catholic University of Sacred Heart, Rome, Italy*

BACKGROUND: The administration of local anesthesia by conventional syringe injection is the most commonly used method in dentistry. Since that fear of injections is constantly reported by dental patients, the objective of newest technologies should always be to reduce pain and anxiety connected with dental care procedures. This randomized clinical study

aims to evaluate pain perception and heart rate changes during dental anesthesia administration in children, using a computer controlled device (Wandá) compared to the traditional syringe.

METHODS: This double-blind split-mouth study enrolled a population of seventy-six children, aged 5 to 12 years, requiring local anesthesia for dental extractions. All of them were in good general health state without contraindications to local anesthetics. Mepivacaine 2% with adrenaline (1:100.000) was given as intraligamentary injection. Each half of maxilla was anesthetized with a different technique in the same appointment and the order was randomly selected according to a sequence generated by a PC. The authors' hypothesis was that the controlled anesthetic flow rate could result in virtually imperceptible injections. The outcomes considered were the pain perception during injections and the heart rate (HR) changes before and after the procedure. These data were evaluated and a paired *t*-test was used to assess statistical significance for each outcome.

RESULTS: Dental anesthesia was administered with both devices and data from primary and secondary outcomes were collected and analyzed for all participants since there were no dropouts. The computerized delivery system registered significantly lower pain levels as compared to conventional injection technique. Moreover, a statistically significant increase in the HR (2.38 bpm/m) was registered when comparing traditional local anesthetic technique with the Wand® system. A high percentage of patients (27%) anesthetized with traditional syringe technique required a second injection.

CONCLUSIONS: The results of this study suggest that dental anesthesia administered using a computer controlled delivery system in children successfully reduced pain more than the conventional syringe. The findings of this study, even if limited to dental surgery procedures, should be strongly considered by dentists, in view of the constant effort to ensure a painless dental care, especially in paediatric dentistry. Further studies are needed to confirm these findings in order to include the Wand® system in routine dental practice.

### Successfully synergy between invisalign® technique and speech therapy in a class III malocclusion orthodontic treatment

V. Ventura, S. Meuli, E. Staderini, F. Guglielmi, A. Camodeca, P. Gallenzi

*Department of Surgical Sciences for Head and Neck Diseases, School of Dentistry, Catholic University of the Sacred Heart, Rome, Italy*

BACKGROUND: Malocclusion of the teeth and the broader spectrum of dentofacial deformities are due, of course, to an interplay between innate genetic factors and external environmental factors (i.e. resting pressures of cheek and tongue). The environment of the teeth and alveolar bone includes conflicting forces and pressures, primarily from muscular functions and oral habits, which in part determine tooth position. In growing patients, the neuromuscular environment may influence jaw posture, teeth eruption and occlusal relationships. We aim to report a class III case, where invisible aligners and myofunctional therapy were performed to re-establish a proper occlusion and function. METHODS: The patient, in the first visit, was 11 years and 8 months-old and was in late mixed dentition. She presented a not hereditary skeletal and dental class III (ANB -3° and



## ABSTRACT

Wits index of -10 mm) associated with low tongue posture, a slight hyperdivergence (ML 27), a cross-bite between 2.2-3.2 and a lateral mandibular deviation. It was decided to proceed with multi-phase Invisalign® treatment together with cycles of speech therapy. Speech therapy was started shortly before the orthodontic treatment. The first phase of the Invisalign® therapy lasted 7 months: 14 aligners were applied, with an aligner change every 14 days. Rectangular horizontal attachments were placed on the mesial portion of 1.6 and 2.6 and vertical rectangular attachments on the vestibular surfaces 3.3 and 4.3. Moreover, a precision cut was made for the class III elastics on 1.6 and 2.6, 4.3 and 3.3. Medium Force elastics of 128gr (4.5oz), 1/4 inch (6.4mm) or 3/16 inch (4.8mm) have been used and wore for 20/22h a day. During the second phase (duration: 12 months), 24 aligners were used. At the end of this phase, a second radiographic check was performed. During the third phase (duration: 12 months), 25 aligners were used for leveling and alignment purposes.

**RESULTS:** At the end of the second phase, the values resulting from the radiographic check were as follows: ANB 0°, Index of Wits of -2mm; ML 24°. Further improvements occur in the third phase. The correct initial diagnosis is essential. First of all, the class III of the case patient was characterized by a dysfunctional pattern, related to low tongue posture, occlusal interferences (cross-bite between 2.2-3.2) and latero-deviation of the mandible. For these reasons, the speech therapy treatment was considered a relevant tool for eliminating the low posture of the tongue, while the treatment with Invisalign® was helpful in eliminating dental interferences, providing a quick repositioning of the inferior arch with the maxilla.

**CONCLUSIONS:** Edward Angle believed in the equilibrium of environmental forces around the dentition. It is difficult even in today to disagree with his point of view. We consider that the muscular balance represents a primary factor in the equilibrium of the stomatognathic system and should be considered a major diagnostic issue, required in the orthodontic practice. As the great anatomist Harry Sicher said, "Whenever there is a struggle between muscle and bone, bone yields!"

## Dental injuries in young sportsmen: a preliminary study on a Sardinian population sample

A. Mameli, C. Demontis, F. Mulas, M. Deias, C. Pinna, E. Spina  
*Department of Surgical Sciences, Division of Sport Dentistry, University of Cagliari, Cagliari, Italy*

**BACKGROUND:** Dental traumas represents a considerable portion of all events that are treated every year in dental practices and its percentage among all oral pathologies lies between 18-30% and involved the 25% of all schoolchildren and the 33% of young adults. Being so extensive, the phenomenon has been widely studied having a major impact on costs and quality of life, but there are scarce information in the field of sports dental trauma in Italy and in our case, in Sardinia. So, data that are more representative are required to investigate the epidemiology of dental sports. The aim of this work is to collect data from a first cohort of young Sardinian athletes (aged 8-20 years, mean 14 years) compound by a total of 30 subjects (15 male and 15 female) which went to our Department to be treated.

**METHODS:** This study involved a group of 30 athletes (15 male and 15 female) all engaged in competitive sports and aged between 8 and 20 (average age of 14). All of these young athletes had suffered a traumatic injury in the two-year period 2010-2011 while practicing their sport. All injuries

were classified following the IADT classification. The major Epidemiological data recorded regards the number of teeth involved per subject, the frequency of trauma between male and female, severity of trauma and type and number of teeth involved.

**RESULTS:** We recorded a total of 55 traumatized teeth in 30 subjects (1,83 teeth/subjects) with a male/female ratio of 1:1. Teeth most involved in dental trauma were maxillary central incisors (60%), followed by maxillary lateral incisors (27,2%), mandibular central incisors (9,1%) and mandibular lateral incisors (3,6%). The most frequent dental trauma were uncomplicated fractures (50%), followed by complicated fractures (14,5%) sub-luxation (14,5%), extrusive luxation (12,7%), intrusive luxation (5,45%) and avulsion (3,5%). We were also recorded the number of teeth for each athlete: 26,6% of the athletes had only a tooth traumatized, 56,6% had 2 teeth traumatized and the 16,8% had 3 teeth traumatized. The frequency of teeth involved in more type of trauma was 72,7% of teeth with one type of trauma (e.g. fracture or luxation) and 27,3% of teeth with more type of trauma (e.g. fracture and luxation in the same tooth). Most of injured teeth were in basket players (17/55 teeth) followed by field hockey (13/55), handball (6/55), cycling (5/55), skating (4/55), football (4/55), rugby (2/55), martial art (2/55) and tennis (2/55).  
**CONCLUSIONS:** This preliminary study represent the first epidemiological study in Sardinia involving young athletes with dental traumas. There are some interesting data that differs from the literature as the equal ratio between male and female, the number of lateral incisive involved in sports trauma, the number of complicated fractures and teeth that sustained more the one type of injury. However, due to the limit sample size, these data will need a confirm involving more subjects in the study for a better understanding of the factors involved in sports trauma occurrences and to process new strategies in our territory for a better prevention program.

## Reciprocating single-file technique for pulpectomy in primary teeth: a case series

M. Cantiani, N.M. Grande, R. Castagnola, E. Staderini, R. Patini, P. Gallenzi

*Clinical Dentistry Institute, Università Cattolica del Sacro Cuore, Rome, Italy*

**BACKGROUND:** The aim of this study is to describe a new reciprocating single-file technique, regularly used in permanent teeth, adapted to pulpectomy of primary teeth, in order to make the therapy easier, faster and more suitable for children needs.

**METHODS:** A case series of pulpectomy procedure was performed on a lower and upper primary molars requiring endodontic treatment. After placing rubber dam, the decayed tissues were removed and an endodontic access was performed. Once the root canal orifices were located in the pulp chamber, the reciprocating single-file Reciproc R25 ( 25.08, Length 21 mm) (VDW, Munich, Germany) was used in the canals, without performing any glide path or scouting procedures using stainless steel files. The mechanical file was directly connected to the Apex Locator clip in order to measure the right working length and to avoid over-instrumentation of the root canal. No stainless steel files were used during the entire procedure. Root canal irrigation was performed using 5% sodium hypochlorite buffered at 7 pH value by a rinse of saline solution. After the preparation of all the canals, we activated irrigation sonically (Eddy® VDW) in order to improve

hypochlorite performance. The root canals were dried with paper points and were filled with a fluid ZOE material (a resorbable material which allows the physiological root reabsorption). The tooth was first restored using the same ZOE material with a greater consistence. After a 10 days follow up, the tooth was finally restored using a layer of bonded direct resin composite.

**RESULTS:** No iatrogenic damages were observed in the cases treated.

**CONCLUSIONS:** The single- file Reciproc technique allows optimum canal preparations thanks to its large taper near the tip of the file and a reverse taper in the coronal portion where it appears to be minimal invasive, this aspect is crucial in primary teeth because of the narrow diameter of the roots. The martensitic blue can be bent if pre-cooled and this feature makes this instrument usefull in treating divergent root canals (common in primary teeth) and in case of not having an adequate space to work (young patients are not always so compliant). Moreover the stiffness of the files permits to use the tip of the file as a probe to locate the root canal orifices even in difficult situation such as massive bleeding compromising visibility. The mechanical efficiency and safety of the reciprocating motion permits to ensure a sufficient preparation using a single file in a short time, giving the opportunity to make this technique suitable for low compliance cases.

### Modified rapid expander in a patient with osteogenesis imperfecta and dentinogenesis imperfecta

E. Galli, C.M. De Sanctis, N. Petrazzuoli, G. Ottaviani, F. Semprini, G. Di Giorgio, G. Nardacci

*Sapienza University of Rome, Dept. of Oral and Maxillo Facial Science, U.O.C. Pediatric Dentistry, Rome, Italy*

This case report is the multidisciplinary management of a growing patient in mixed dentition affected by Type I Osteogenesis Imperfecta and Dentinogenesis Imperfecta. Osteogenesis Imperfecta is an autosomal dominant transmission genetic disease characterized by an abnormality of type I collagen synthesis by mutation of the Col1A1 and 2 genes. It is linked with issues related to the skeleton, the ear, the joints, the eyes, the skin and teeth.

**CASE REPORT:** The patient M.C. of 9 years is being treated at the centre of rare diseases of the Policlinico Umberto I in therapy with intravenous bisphosphonates with four-monthly infusions to monitor the pathology until she was 1 year old. From the dental point of view, the patient presents itself in mixed late dentition with dentinogenesis imperfecta and agenesis of the dental elements 1.5, 3.5, 4.5. From the orthodontic point of view the patient presents right lateral-posterior crossbite; III molar class, both left and right, and decreased overjet and overbite. The cephalometric analysis confirms the III skeletal class (SNA= 71.6, SNB= 76.75, ANB= -5.3, AoBo= -3). Because of the particular bone density and the lack of solid dental anchorage, in order to solve the transversal problem, a rapid expander modified with bands on the first molars is programmed along with palatal mini-screws for skeletal anchorage. To guide the insertion of the mini-screws, the patient performed a CONE BEAM CT with a surgical guide with gutta-percha guiding. The mini-screws are a palatal anchoring devices used to unload the orthodontic forces onto the bone and not on the dental elements. In the case of this patient, par-

ticularly compromised by dentinogenesis imperfecta, the use of mini-screws proved to be essential for a correct orthodontic treatment. Generally the mini-screws are used in permanent dentition and for this reason we have used the CONE BEAM CT, not only for the evaluation of bone density, but also to evaluate the contiguity with the gems of the dental elements of the permanent series. The operation was performed, after antibiotic prophylaxis, with the insertion of mini-screws with a diameter of 1.8 mm and 8 mm of length. Afterwards the impression was taken with silicone material for the design and development of the orthodontic device. During the period of expansion, the patient suspended bisphosphonate infusions in agreement with the attending paediatrician. The expansion was performed according to literature with 2 activations per day for 15 days, at the end of which the patient was given the "Petit mask" orthopaedic device for correction of sagittal deficit through the use of 14-ounce traction elastics. To date, the patient maintains extraoral traction and has restarted infusion of intravenous bisphosphonates. The objectives attained up to date are the resolution of the transversal deficit and a partial correction of the overjet.

### Effectiveness of MTA pulpotomy in primary molars: a systematic review

C. Tselemegkou, L. Scarpatà, E. Giannotti, A. Abrignani, L. Di Marco, M.R. Giuca

**BACKGROUND:** Pulpotomy is a common procedure to treat pulp exposures due to caries in primary molars. This technique has been conducted with various medicaments over the years.

The aim of this study is to perform a literature review on clinical and radiographic outcomes of MTA as a pulpotomy medicament in primary molars.

**METHODS:** A search of literature on pulpotomies published between the years 2000-2018 was conducted in the Cochrane Oral Health Group's Trials Register, the Cochrane Central Register of Controlled Trials (CENTRAL) and MEDLINE (via PubMed).

**RESULTS:** The search generated 50 studies involving 4641 teeth. Included were randomized clinical trials (RCTs) and clinical trials (CTs) comparing the clinical and radiographic success of MTA, Formocresol (FC), Ferric Sulfate (FS), Calcium Hydroxide (CH) and Biodentine pulpotomies. 19 trials compared the effectiveness of MTA with Formocresol. MTA showed a higher clinical and radiographic success rate when compared to FC as a pulpotomy agent in vital primary molars in all the different periods of follow-up. In effect, it has a potential to become a reliable alternative of FC in pulpotomy. Moreover, MTA was more successful than CH (four trials) for pulpotomies in primary molar teeth, and may be useful as a substitute for CH in pulpotomy procedures. When comparing MTA with ferric sulphate (FS) (two trials), there were no clinical and radiographic differences between the two materials. Four studies demonstrated that Biodentine and MTA did not differ significantly in combined clinical and radiographic success after 24 months when used for pulpotomies of primary molars. Regarding other studies (14 trials) that compared MTA with more than one different medicaments (FC, FS, EMD, Biodentine, CH, Portland cement and Laser) for pulpotomy showed that there were no statistically significant differences in clinical and radiographic success rates among the different materials. MTA appears to be

## ABSTRACT

superior to formocresol, Portland cement, CH and enamel matrix derivative as a pulpotomy agent in primary teeth. FC and FS appeared to be superior to the other agents. Of the 50 articles obtained, seven evaluated the success rate of MTA pulpotomy on vital pulp of primary molars. The response of pulp in primary teeth to MTA was favorable in all cases from clinical and radiographic perspective, and histological evaluation confirmed the observation. The abundance of positive result (100%) strongly demonstrate that the MTA pulpotomy on carious temporary molars is a promising technique. CONCLUSIONS: The results demonstrate that MTA as a pulpotomy medicament resulted in significantly higher clinical and radiographic successes in all time periods. The cost of MTA may preclude its clinical use.

### Panoramic evaluation of root axes parallelism in elastodontic therapy

G. De Stefani, G. Ottaviani, M. Saccucci, G. Di Carlo, A. Perrone, V. Luzzi

*Sapienza University of Rome, Department of Oral and Maxillo Facial Science, UOC Paediatric Dentistry, Pediatric Dentistry Specialization School, Rome, Italy*

**BACKGROUND:** Parallelism of root axes is recommended to preserve the stability of the results obtained from an orthodontic therapy. The purpose of this study is to evaluate the efficacy of elastodontic device occluso-o-guide in mixed dentition patients.

**METHODS:** Measuring the longitudinal axes inclination of anterior maxillary teeth from 1.3 To 2.3, Of a experimental group of 28 patients, with age range within 8 to 12 years old, treated exclusively with elastodontic device occluso-o-guide. The mean period treatment was 2 years and panoramic radiographs were taken at the beginning and in the end of treatment. Cephalometric software orisceph rx3 was used for doing the evaluation of the mesio-distal axial inclinations of the teeth. The mean values were compared with the study of almeida-pedrin "panoramic evaluation of mesio-distal axial inclinations of maxillary anterior teeth in orthodontically treated subjects", where there is a control group with 42 white subjects ( 14 male, 28 female, age range 12-17 years old) with untreated normal (acceptable) occlusion. In these 2 groups of patients the evaluation was about the internal angle created by the interception of the long axis of the maxillary anterior teeth and a reference plane constituted by a line passing by the lowest point of both orbits.

**RESULTS:** Most of the values obtained at the end of the therapy were inside a range of  $90^{\circ} \pm 5^{\circ}$ , that it is considered a good standard for root parallelism. Comparing the data collected between the two groups, all of them are statistically significant, except for the right lateral incisor and the left canine. At the end of the therapy, the values obtained and calculated, were similar to the values of the control group.

**CONCLUSIONS:** Occluso-o-guide is a useful device for guiding the eruption of the anterior maxillary teeth in a good parallelism. To use the elastodontic device in mixed dentition it's an effective method to obtain a normal occlusion and prevent the need of a further orthodontic treatment or, at least, it's an efficient device that help to reduce the time of orthodontic therapy in permanent dentition, especially considered the short time that this device is required to be worn by the patient, few hours during the daylight and at the sleeping time during night.

### Pulpotomy in immature tooth with mineral trioxide aggregate (MTA): a case report

A. Vallone, F. Pepe, M. Fioravanti, F. Semprini, C.M. De Sanctis, G. Di Giorgio, F. Covello

**BACKGROUND:** This study evaluated the clinical and radiographic success of mineral trioxide aggregate (MTA) in immature permanent lower molar after a pulpotomy over a period of 1-3-6-12 Months.

**METHODS:** The patient, 7 years old, comes to the Pediatric Dentistry Unit, Department Head and neck, Policlinico Umberto I, Sapienza University of Rome, for a dental check-up. Evaluating the orthopantomaxillary and the intraoral rx, we highlighted the presence of carious exposure grade 5 on ICDAS detection codes of the element 3.6. The treatment started with: removal of infected tissue prior anesthesia of the inferior alveolar nerve and positioning of a rubber dam. At the end of the cavity cleansing, an extended exposition of the pulp chamber was visible. The coronal pulp was carefully amputated up to the entrance of the root canals using a sharp bur on a high velocity turbine. Post-amputation, bleeding was confirmed to be bright red and was seen to subside after applying 2-3 minutes of gentle pressure with a sterile cotton pellet with physiological solution 0,9 %; the tooth was treated with full pulpotomy according to the condition of the pulp bleeding. White ProRoot MTA powder (Tulsa Dental Products, Tulsa, OK, USA) was packed at the entrance of the root canals and a wet pellet was placed to promote the hardening of the MTA. The whole procedure was carried out in two steps: firstly with temporary materials and subsequently with definitive composite resins. In order to obtain a correct reconstruction of the tooth, we etched with orthophosphoric acid (37%) for 30 seconds on enamel and 15 seconds on dentin; then applied primer and bonding in one solution. the composite resin (A3) was stratified and finally light cured. The child was recalled for clinical and radiographic evaluation at 3 months, 6 months, and at approximately 12 months.

**RESULTS:** The periapical radiographs and clinical evaluation at 1-3-6-12 months revealed total success rates of the treatment. No clinical signs or symptoms were observed; a marked increase in the root canal wall thickness and ongoing closure of the apical opening.

**CONCLUSIONS:** MTA partial pulpotomy is an effective treatment in maintaining pulp vitality and allowing physiological root development in a faster and predictable way (apexogenesis).

### Delays of eruption induced by odontogenic neoformations in evolutive age: surgical-orthodontic approach. Case report

F. Pepe, G. Ottaviani, M. Guaragna, A. Vallone, M.P. Balocchi, E. Battaglia

*Sapienza University of Rome, Dept. of Oral and Maxillo Facial Science, U.O.C. Pediatric Dentistry, Pediatric Dentistry Specialization School, Rome, Italy*

**BACKGROUND:** Tooth impaction is a rare anomaly in the primary dentition because the distance of tooth germs from the dental arch is very short and usually there are no obstacles to eruption. Odontoma has been described like the most common aetiological factor for primary teeth impaction. Compound odontomas commonly occur in the incisor-canine region of the maxilla and complex odontomas are frequently



located in the premolar and molar region of both jaws. Early treatment allows the impacted tooth to re-start the physiological eruption. A conservative orthodontic-surgical approach is advisable in order to minimize damage to the impacted teeth and preserve their normal timing and path of eruption. Canines, after third molars, are the teeth with the highest impaction percentage. Sometimes retention or impaction of the tooth is caused by the persistence of the deciduous dental element or the presence of odontogenic neoformations. The aim of this case report is to show a multidisciplinary approach in a patient in evolutive age.

**CASE REPORT:** An healthy, 11 years old patient came to Pediatric Dentistry Unit, Department Head and neck, Policlinico Umberto I, Sapienza University of Rome, for a check of dental exchange. It was notable the persistence of the deciduous tooth 6.3 and the absence of 2.3 in the upper arch. Evaluating the orthopantomograms as I level X-ray assessment and sectorial Tc Cone Beam of the upper arch, as II level one, we highlighted the presence of a neoformation of appearance similar to a complex odontoma that determined the impaction of 2.3. After signing the informed consent and following a protocol complying with the ethical guidelines of the Helsinki declaration, in a single step the surgical excision of the neoformation and of the respective deciduous tooth were carried out in the treated area. The impacted tooth 2.3 was connected at the same time in order to perform the orthodontic traction. Subsequently a bonding of the upper arch was performed with a low friction fixed device with self-ligating brackets. In just nine months, by subjecting the patient to appropriate clinical and radiographic checks, the permanent tooth was recovered and is now present in the arch. At the moment the patient is undergoing to an orthodontic finishing phase.

### Management and prosthetic restoration in a rhabdomyosarcoma patient presenting dental disorders to antineoplastic therapy: a case report

F. Zara, D. Milo, A. Bucca, C.M. De Sanctis, G.L. Sfaciotti

*Sapienza University of Rome, Dept. of Oral and Maxillo Facial Science, U.O.C. Pediatric Dentistry, Rome, Italy*

**BACKGROUND:** Rhabdomyosarcoma (RMS) is considered the most common soft tissues malignant tumor in childhood. Presenting an aggressive behavior, RMS is localized at head and neck structures in 40% of all cases. This neoplasm needs to be treated with chemotherapy, supported by a combination of surgery and radiotherapy. Radiant therapy can be responsible of iatrogenic abnormalities on dentition like hypoplasia, interruption of root maturation and agenesis; susceptibility to carious lesions and mucositis can also be detectable. Other sequelae can affect the bone tissue, arresting permanently its own growth process. The severity of damaging effects depends on the patient's age, the treated anatomic site and the administered dose. The aim of this case report is to illustrate our experience in management of dental complications in a patient with a history of RMS.

**METHODS:** In 2012 an 8-years old girl was referred by maxillofacial surgeon to our Department. The panoramic x-ray exam unveiled the absence of root portions of all permanent elements, in addition to the agenesis of the second premolars. Severe teeth mobility, gingival reddening, necrotic primary teeth and multiple caries were observed during the intra-oral examination. The patient showed poor oral hygiene and angular cheilitis. She reported difficulty in chewing as well. The

treatment plan was based on the necessity of reducing dental mobility and maintaining the dentition for as long as possible with the aim of improving masticatory function and limiting the long-term bone resorption. Preserving an acceptable aesthetics was another goal of the plan.

**RESULTS:** During six years of treatment and periodical follow-up (from 2012 to 2018), the teeth decay and gingival inflammation have been treated through many sessions due to the patient's high susceptibility to oral disorders. In the attempt to improve mastication, an individualized thermoplastic retainer was made in 2014 and, when the patient lost both of the central upper incisors, at the age of 13, a resin temporary fixed prosthesis supported by a non-osseointegrated implant was realized. This choice was necessary due to the patient's ever-increasing psychological discomfort. After 8 months an intraoral x-ray was obtained showing the stability of the screw in the bone.

**CONCLUSIONS:** Antineoplastic therapy of the RMS had severe effects and remarkable impact on dental aesthetic and function. The management of dental complications included not only oral hygiene sessions and conservative procedures, but also surgery and prosthetics that were possible only because of a strong motivation from the patient and her parents. However, despite these considerations, a follow-up needs to be continued to verify the reliability in the medium-term of a non-osseointegrated screw for prosthetic purposes in very young patients.

### Central giant cell granuloma in pediatric patients: a case report

N. Guadagno, F. Zara, C.M. De Sanctis, A. Bucca, A. Pernazza, C. Di Gioia, G.L. Sfaciotti

*<sup>1</sup>Sapienza University of Rome, Dept. of oral and maxilla Facial Science, U.O.C. Pediatric Dentistry, <sup>2</sup>Sapienza University of Rome, Dept. of Radiological Sciences, Oncologic and Pathological Anatomy, Policlinico Umberto I*

**BACKGROUND:** Osteolytic lesions of the maxillary bones in paediatric patients may show a wide range of clinical and radiological findings. The nature of these lesions is heterogeneous: cysts; neoplasms; developmental or dysplastic conditions; inflammatory or infectious processes; furthermore, some of these may be an oral localization of a systemic pathology. The histological nature of the disease influences the treatment and the prognosis. It's mandatory to perform a biopsy in order to proceed with the therapeutic planning, with the exception of cyst-like lesions, for which there is a different decision tree (a radiographic diagnosis of cyst is enough to set up an appropriate decision-making process: that is cystotomy or cystectomy). Finally, the management of the paediatric patient poses several critical issues that must be considered in order to achieve the long-term success of the procedure.

**METHODS:** A Central Giant Cell Granuloma is a benign intraosseous lesion with osteolytic activity. We report a case of CGCG of the maxilla in a 11-year-old girl. A radiolucent area in the left canine-first premolar region was initially detected in a panoramic radiograph for routine examination. The area was unilocular and the borders were well-defined. Roots of 2.3 and 2.4 were dislocated by the lesion, but no roots resorptions were observed. Intraoral examination revealed a minor and painless swelling in the buccal region of upper left canine and first premolar. There was no history of trauma, dental problems, systemic anomalies, inherited syndromes or other disorders. An incisional biopsy was performed and

## ABSTRACT

diagnosed histologically as a CGCG. The microscopic examination shows a cellular fibrous stroma that contains multiple foci of haemorrhage and aggregations of multinucleated giant cells. Blood chemistry (serum alkaline phosphatase, calcium and phosphorus levels) and parathyroid-gland ultrasonography ruled out the brown tumour of hyperparathyroidism.

**RESULTS:** The patient underwent surgical curettage through an intraoral approach under local anaesthesia. There are no signs of clinical and radiographic recurrence after a follow-up period of 2 years, and it was avoiding damage to the erupted tooth. Curettage is a satisfactory method for the treatment of CGCG, with a low recurrence rate and favourable postoperative outcome.

**CONCLUSIONS:** Many lesions that occur in the maxillary bones have a radiolucent appearance. Maxillary bones' lesions are often difficult to differentiate on the basis of their radiographic characteristics alone. Furthermore, non-odontogenic cysts and tumours in the skeleton, exhibit the same radiologic characteristics when associated with odontogenic tissues of the maxillary bones. The most common non-odontogenic lesions were found to be benign fibro-osseous lesions, traumatic and aneurysmal bone cysts, Stafne defect, central giant cell granuloma, brown tumour of hyperparathyroidism. The clinical and radiographic examination helps differential diagnosis of the lesions, although histologic examination is necessary to know the nature of the lesions and to establish the appropriate treatment plan.

### Comparison between traditional and digital records: experience in UOC of pediatric dentistry at Sapienza University of Rome

E. Quarta, S. Vitali, G. Di Carlo, G. Ottaviavi, M. Saccucci, V. Luzzi, G. Ierardo

*Sapienza University of Rome, Department of Oral and Maxillo Facial Science, UOC Pediatric Dentistry, Pediatric Dentistry Specialization School, Rome, Italy*

**BACKGROUND:** Study models are a very important element for orthodontic documentation and for a complete study of the clinical cases. The examination of the models provides much information about the teeth and the dental arches and a detailed dental model analysis is useful to compare the initial case and the therapeutic result. Traditional dental models made with plaster can be substituted by new, digital ones that can be obtained from digital records. The aim of this study is to make a comparison between traditional records and digital records in particular investigating about compliance of growing patients.

**METHODS:** A group of 50 growing patients, 25 males and 25 females, were selected to evaluate their experiences with digital records in UOC of Pediatric Dentistry of Sapienza University of Rome. Their age was from 6 to 9. The patients were subjected to traditional records made through alginate and digital records using the intraoral scanner CS 3600. Traditional plaster models and digital ones were realised. This study aimed at investigating the preference of the patients between the two different modalities at the moment of dental records. A questionnaire with tree questions was used to evaluate experiences of the patients. The possible answers were illustrated by cartoon images in order to be more pleasant for the children examined. The questionnaires wanted to reveal the problems patients had during records (like nausea, difficulties to breathe etc ) and to highlight their preference.

**RESULTS:** The results of the questionnaires showed that 24 females and 22 males had no nausea during digital records made with scanner while 1 female and 3 males were confused. On the other hand, 6 females and 9 males had nausea during traditional records, 10 females and 11 males had an uncertain experience, 9 females and 5 males had no nausea. As it concerns the difficulties to breathe during digital records, 19 females and 23 males had no problems in breathing, 6 females and 2 males had some doubts about it. During traditional records, 10 females and 9 males declared that they had no difficulties to breathe, 8 females and 12 males had some doubts and 7 and 4 females had some problems to breathe. The third question examined if there were some other problems during the records: 18 females and 20 males answered no, 5 females and 5 males were uncertain and 2 females answered yes for digital records. On the contrary, 3 females and 5 males had some problems during alginate records, 11 females and 12 males had some doubts, 11 females and 7 males had no problems. As it concerns the preference between the two record modalities, 76% of females and 76% of males answered "Scanner", 12% of males and 20% of females preferred alginate traditional records, 12% of males and 4% of females had no preference.

**CONCLUSIONS:** Growing patients prefer digital record to traditional alginate, although traditional records need less time to be realised. Research for new technology in digital record need to have further developments in order to diminish the disadvantages, for example introducing scanners which are more comfortable, less expensive, and able to give excellent performances.

### Use of an infiltrating resin in hypoplasia and hypomineralization of permanent incisors in pediatric dentistry

N. Petrazzuoli, M. Rampino, C. Sbarbaro, M.G. Tarantino, G. Ottaviavi, F. Calcagnile

*Sapienza University of Rome, Dept. of Oral and Maxillo Facial Science, U.O.C. Pediatric Dentistry, Pediatric Dentistry Specialization School, Rome, Italy*

**BACKGROUND:** Recently a new micro invasive technique has been launched which includes the resin infiltration up to the depth of the lesion. The infiltrant (ICON, DMG) can be used for both the vestibular and interproximal non-cavitated lesions. This novel approach is meant to stop lesion progression which is not achieved by any material till date since addressing the caries challenge has always relied on prevention and restoration with no intermediary means to stop lesion progression. The aim of resin infiltration is to soak up the porous lesion body with a low viscosity resin (infiltrant) that is subsequently hardened with blue light. Thereby, diffusion pathways for cariogenic acids are blocked, and lesions are sealed and the progression is arrested. The aim of this study is to examine the effectiveness of infiltrant in caries prevention in pediatric patients. The effectiveness of infiltrant will be evaluated without other preventive treatments, oral hygiene or alimentary instructions. The treatment of noncavitated lesions should aim upon arresting the lesion progression and improving the esthetics by diminishing the opacity.

**METHODS:** At the UOC of Pediatric Dentistry of the Policlinico Umberto I, enamel lesions were identified on central incisors and permanent lateral incisors, both upper and lower, in children aged 7 to 12 years. Each dental ele-

ment, properly insulated with a rubber dam, was cleaned with a prophylaxis brush to eliminate bacterial plaque before treatment. The main steps are: etching with ICON Etch, 15% hydrochloric acid, for the duration of 2 min, for a maximum of three applications each of 2 minutes; Icon-Dry application for 30 seconds; two infiltrations with Icon-Infiltrant for 3 minutes with respective curing of 40 seconds. For the elimination of excess cotton pellets and dental floss were used and for the polishing of composite rubbers. For each lesion, a pre-treatment, post-treatment and a follow-up picture of one week was taken, time needed to restore the tooth's hydration and to heal any marginal gingival wounds.

**CONCLUSIONS:** following our experience we can consider the product a valid alternative to resolutions of aesthetic defects of incisors of low and moderate severity whose infiltration with the resin has given excellent aesthetic results since the lesions disappeared from view. In general, the ability to mask the lesion depends on the histology and severity of this, consequently, in the most severe cases, or in the deepest lesions, the result will not be optimal, requiring the removal of dental tissue to obtain better aesthetic results. Nevertheless, even in these cases the pretreatment with ICON has allowed to reduce the surfaces to be treated, limiting the interest to the only irreparably damaged.

### Experimental study on the clown therapy as a psycho-emotional approach of the hospitalized child to the promotion of oral health

E. Buonifacio, D. Corridore, F. Calcagnile, O. Brugnoletti, I. Vozza

**BACKGROUND:** The child's anxiety linked to dental treatment is still a barrier to dental care. In fact, anxious children may lose or avoid dental procedures, judging them to be erroneously painful and invasive. The studies carried out in recent years have reinforced the idea that happiness should be promoted and introduced in all environments, to improve the psychophysical well-being of individuals. Especially in these circumstances, the intervention of clowns of entertainment even during therapeutic procedures, can determine a shift of children's attention from the body to different external stimuli such as soap bubbles. The purpose of the study was to examine odontophobic pediatric patients and the different levels of difficulty that arise from the approach with them and their parents, reporting the various procedures that can be used, from a simple friendly and persuasive interview of the operator to the support of psychologists and drugs. Dental environment plays an important role in the child's behavior and his cooperation in planned dental treatment.

**METHODS:** The study was carried out in the pediatric unit of Santobono Hospital in Naples, where there are two dental units for hospitalized children. An anonymous self-assessment questionnaire was administered to 6-15 years aged patients and their parents, about the perception of oral hygiene conditions and behavior of children and parents in relation to oral health including: brushing techniques, tools for oral hygiene, use of mouthwashes, tongue brushing, sealing, exchange of tools with friends or siblings, time spent between meals and oral hygiene etc. In this first phase of the study, as clowns, we tried to explain and change the habits considered wrong by the patient. The second part of the study consisted of a clinical examination, previous informed consent, for the collection at T0 and T1 (one month from the first visit) of the

clinical indexes such as: plaque index (PI), gingival bleeding index (GBI), DMFT. In order to obtain better results, in addition to the experimental method of clown-therapy approach, the traditional tell-show- method was also used to improve patient learning.

**RESULTS:** 50 questionnaires were filled over a period of time from 30th August 2017 to 30th October 2017. Of these 50 patients, only 25 received two check-up for the collection of the clinical indices at T0 and T1. Over time the improvements obtained in relation to the compliance of small patients have been observed. The children showed a good level of learning after questionnaire and also the clinical indexes showed a marked improvement, but above all there was no more odontophobia in the small patients.

**CONCLUSIONS:** At the end of the study an optimal result was achieved by all the young patients responding positively to their oral hygiene care. Many patients appreciated the presence of clowns in the dental clinic, were able to relax during treatment and enjoyed time with the clowns and wanted to do it again. These results confirm and validate the positive effects of clown therapy in promoting oral health in pediatric dentistry and assess its potential as an alternative method to sedation.

### Clinical and epidemiologic study about tooth decay incidence in a population of 500 patients between the age of 8 and 12 years

F. Flauret<sup>1</sup>, G. Giannatempo<sup>1</sup>, E. Coccia<sup>2</sup>, G. Rappelli<sup>2</sup>, O. Di Fede<sup>3</sup>, G. Capocasale<sup>3</sup>, M. Giuliani<sup>1</sup>

<sup>1</sup>Dipartimento di Medicina Clinica e Sperimentale, Università di Foggia, Foggia, Italy; <sup>2</sup>Dipartimento di Scienze Cliniche Specialistiche ed Odontostomatologiche, Università Politecnica delle Marche, Ancona, Italy; <sup>3</sup>Dipartimento di Discipline Chirurgiche, Oncologiche e Stomatologiche, Università di Palermo, Palermo, Italy

**BACKGROUND:** The aim of this study is to evaluate the incidence of tooth decay in a population of 500 patients between the age of 8 and 12 years using a clinical and epidemiologic survey in order to understand all phenomena undermining the community oral health. Tooth decay is one of the most diffuse chronic disease worldwide. For World Health Organization (WHO) it is important the realization of national epidemiologic studies to monitor the oral health status in specific age-related population groups.

**METHODS:** The study was conducted on a sample of 500 patients of 8-12 year age in order to evaluate the clinical-epidemiological incidence of tooth decay.

**RESULTS:** The analysis of this data showed that 39.6% (198 children) were affected by an active tooth decay. 91.9% of 198 children affected by tooth decay showed tartar and plaque accumulation with an evident inadequate oral hygiene, and 100 of these patients (50.54%) showed hypertrophic and red colored gingiva, while in 18 (9.1%) the individual susceptibility and alimentation represented the main predisposing factors. 25.4% has never undergone a dental control, the 22% has been visited just once during childhood, the 21% is visited once a year, the 10% twice a year and the 21.6% three times a year. The reason for dental visit in the 14.2% was the presence of tooth decay, in the 8% the tooth extractions, in the 22.4% the orthodontic problems and in the 30% the prevention, even if only 4.4% of children showed the presence of sealants and the 2.8% of fluorosis.



## ABSTRACT

**CONCLUSIONS:** These data showed that the WHO goals predicted for 2020 in Europe, 95% of 5-6 years old children with no tooth decay, 12 years old patient with a DMFT index  $\leq 0.7$ , was not satisfied. The strong interest showed by the scientific community towards the tooth decay incidence is strictly related to its high incidence, especially among children. Its causal factors are commonly known, but every effort to reduce its mobility results unsatisfying. The main reasons would be related to the low patient ability in following the simple rules of oral hygiene and alimentation. Most children evaluated by this study showed notable plaque accumulation, even if they claimed to brush their teeth at least twice a day. Probably their mistakes are related to an inadequate brushing technique. So, the study underlines the importance of primary prevention.

### Comparative evaluation between cervical vertebral maturity, hand-wrist radiograph exam and serum levels of growth factors in young patients

L. Di Marco<sup>1</sup>, R. Fastuca<sup>1</sup>, A. Caprioglio<sup>2</sup>, T. Arrigo<sup>3</sup>, R. Nucera<sup>1</sup>, F. Forestieri<sup>1</sup>, M. Portelli<sup>1</sup>, A. Lo Giudice<sup>1</sup>, S. Costa<sup>1</sup>, A. Milioti

<sup>1</sup>Department of Biomedical and Dental Sciences and Morphofunctional Imaging, School of Orthodontics, School of Dentistry, University of Messina, Messina, Italy; <sup>2</sup>Department of Medicine and Surgery, University of Insubria, Varese, Italy; <sup>3</sup>Department of Pediatrics, University of Messina, Messina, Italy

**BACKGROUND:** This study was performed to investigate skeletal maturity, in particular to evaluate skeletal age and growth spurt, in order to obtain the prediction of facial growth (most critical aspect of the orthodontic clinic). Indeed, orthodontic appliances such as functional appliances and extra-oral devices should be used during the peak of growth. On the other side, orthognathic surgery can be performed only after the pubertal growth spurt as considerable post-surgical growth can cause relapse. Therefore, correct identification of the different phases of skeletal maturation represents a crucial issue in orthodontic diagnosis and treatment planning, as chronological age is not a valid indicator of skeletal maturity. Several methods were proposed to perform skeletal maturity evaluation in orthodontics such as the cervical vertebral method (CVM) but its reliability is still controversial. The aim of the present study was to investigate the correlation between CVM method, hand-wrist radiograph and growth mediators (IGF-1 and growth hormone, GH).

**METHODS:** A total of 25 patients (8-12 years old), who referred to Orthodontic Department of Dental School and who had never been treated before, were enrolled. After obtaining the informed consent, hand-wrist radiograph, dental panoramic and lateral cephalometric radiographs and a peripheral venous blood specimen to evaluate IGF-1 and GH were performed on all the patients, before the start of treatment. Hand-wrist radiographs were analyzed such as lateral radiographs according to CVM stage system by one trained operator and the measurements were repeated two months later to perform the method error. Then IGF-1 and GH were standardized according to the reference tables in order to assign a patient to a range of skeletal maturity. Then the variables were compared by using a Pearson correlation coefficient.

**RESULTS:** The correlation between the the hand-wrist skel-

etal maturation stages and CVM stages was low and as a matter of fact they cannot be used alternatively to estimate patients' skeletal age or to predict the peak bone growth spurt. Indeed, the comparison between hand-wrist radiographic assessment and GH, IGF-1 and then between CVM and GH, IGF-1, showed significant correlation ( $P < 0.05$ ) between the radiographical method and the serum variables, when separately tested.

**CONCLUSIONS:** Finally, to evaluate growth assessment, it seems that the concordance between vertebral maturation and hand-wrist radiographs methods were not acceptable; instead, using growth factors method, on one hand we have allowed to limit the patient's exposure to X-rays and on the other hand we have reduced the time necessary to plan the treatment, as serum levels of GH and IGF-1 are reliable growth indicators that respond positively to correlation values obtained through the other growth factors: CVM and hand-wrist radiograph.

### Oral health related quality of life: dental treatment under general anesthesia in preschool aged children and its influence on the ecchis

L. Giroto, P. Mariuzza, A. Semisa, S. Mazzoleni, E. Stellini

Padua University, Faculty of Odontology, Postgraduate School of Pediatric Dentistry, Padua, Italy

**BACKGROUND:** Most pediatric patients are able to face dental treatment in conventional setting. Notwithstanding, for a considerable minority usual management modalities are not suitable: sometimes children cannot cope with in-office conscious state, not necessarily owing to peculiar psychiatric or organic pathologies. Dental disease and treatment experience can negatively affect the "Oral Health Related Quality of Life" (OHRQL) of preschool aged children and their parents/caregivers. These negative influences are currently described (with reference both to the young patients and their families) through the "Early Childhood Oral Health Impact Scale" (ECOHIS). This prospective pair-matched design evaluates how dental treatments under general anesthesia affect the quality of life.

**METHODS:** An experimental group of 31 "under-five" pediatric patients (14 males and 17 females, none of whom affected by psychiatric or organic pathologies) was asked to fill the ECOHIS form in, both before and one month after undergoing dental treatment under general anesthesia. With the aim of toning down age-related and sex-related biases, a pair matched control group, consisting of 31 other "under-five" pediatric patients who didn't undergo general anesthesia and received dental treatment over multiple visits, was also asked to complete the ECOHIS scale both before and one month after the treatment. None of the patients (in both groups) had previously undergone any dental treatment, neither under general anesthesia nor in multiple visits, and at first diagnosis all of them showed at least 8 involved teeth.

**RESULTS:** Before treatment, both groups scored similar, without significant statistical difference ( $P > 0.05$ ); but in the after-treatment evaluation the experimental group scored much better than the control group and the difference was statistically significant ( $P < 0.001$ ). The total mean effect in the experimental group was much higher (85,5%) than that of the control group (65,7%).

**CONCLUSIONS:** According to the statistical comparison

between the experimental and the control groups, dental treatment under general anesthesia can provide better quality of life restoration when compared with treatment over multiple visits. One cannot on the other hand forget that all anesthetic agents are associated with some reports of morbidity and mortality and could represent some sort of hazard to the young patient's overall health. Therefore, general anesthesia is only to be considered in pediatric preschool-aged patients when routine office practices cannot successfully be adopted.

### Traumatic dental injuries in pediatric age: conservative and orthodontic approach. Case report

G. Ottaviani, M.G. Tarantino, E. Galli, G. D'Angeli, A. Vallone, D. Campenni, F. Pepe

*Sapienza University of Rome, Dept. of Oral and Maxillo Facial Science, U.O.C. Pediatric Dentistry, Pediatric Dentistry Specialization School, Rome, Italy*

**BACKGROUND:** Dental traumas involving the deciduous and permanent dentition acquire significant evidence, occurring in 25 – 30 % of the population with a certain degree of variability. In corono-radicular fractures, a clinical examination shows the coronal fracture line which continues below the gingival margin; these are considered complicated with the presence of pulp exposure and uncomplicated when there is no pulp exposure. Corono-radicular fractures are complex traumatic events, which require not only an evaluation of the extent of the fracture but also of the potential pulp exposure; they therefore need different rehabilitative recovery interventions.

**CASE REPORTS:** Patient C.M., aged 11, comes to Paediatric Dentistry Unit, Department Head and Neck, Policlinico Umberto I, Sapienza University of Rome for a first dental visit. The patient's mother reports that in the month prior to the visit the girl had a bicycle accident, in which she violently hit her face. The intra-oral clinical examination, supported by the intraoral radiographic examination, shows the presence of a coronoradicular fracture of the tooth 2.1 and of an uncomplicated crown fracture of the tooth 1.2. The element 2.1 had a negative response to pulp vitality test, whereas the 1.2 responded positively. The of element 1.2 needed a simple resin restoration, while 2.1 required a more complex approach.

Besides for a further diagnostic evaluation and for a more precise therapeutic program a Cone-Beam CT of the upper dental arch is required. The therapy consisted of: firstly pulpectomy of the element 2.1 with partial crown reconstruction, secondly placement of orthodontic brackets on the whole of the dental arch and specifically on the 2.1 an orthodontic button for extrusion. Later on, after about 9 months, a gingivectomy on the element 2.1 is performed in order to increase the clinical crown for further rehabilitation. After 15 months from the beginning of the orthodontic treatment, brackets are debonded and a glass fiber post is placed in the 2.1 root canal, to allow the cementing of an acrylic – resin temporary crown. A further 16 months wait is necessary before finalising the case with a zirconium crown. Certainly, a zirconium crown is preferred in anterior sectors because of the high aesthetic value compared to a classic metal ceramic crown.

### Correlation between breathing function and IGF-1 in young patients presenting maxillary transverse deficiency

F. Forestieri<sup>1</sup>, R. Fastuca<sup>1</sup>, A. Caprioglio<sup>2</sup>, T. Arrigo<sup>3</sup>, R. Nucera<sup>1</sup>, L. Di Marco<sup>1</sup>, M. Portelli<sup>1</sup>, E. Gatto<sup>1</sup>, A.M. Bellocchio<sup>1</sup>, A. Militi<sup>1</sup>

*<sup>1</sup>Department of Biomedical and Dental Sciences and Morphofunctional Imaging, School of Orthodontics, School of Dentistry, University of Messina, Messina, Italy; <sup>2</sup>Department of Medicine and Surgery, University of Insubria, Varese, Italy; <sup>3</sup>Department of Pediatrics, University of Messina, Messina, Italy*

**BACKGROUND:** The effect of type of breathing on craniofacial growth has been widely debated as a controversial issue within orthodontics for decades. It has been maintained that when significantly large adenoids are present, nasal breathing is (partially) obstructed leading to mouth breathing or in extreme cases to obstructive sleep apnoea (OSA). Along with breathing issues, body growth retardation is frequently observed in OSA patients. The complex mechanisms behind growth retardation are still unclear. OSA might interrupt slow-wave sleep, when GH is preferentially secreted. GH modifications were often related to serum levels of insulin-like growth factor-1 (IGF-1) and IGF-binding protein 3 (IGFBP-3) which are related to diurnal GH secretion. The aim of the present study was to investigate correlations among apnea/hypopnea index(AHI), oxygen saturation (SpO<sub>2</sub>), serum levels of IGF-1 and body mass index(BMI) in growing patients presenting maxillary deficiency.

**METHODS:** The present study followed the guidelines of the World Medical Organization Declaration of Helsinki. The sample was selected according the following inclusion criteria: i) good general health according to medical history and clinical examination; ii) maxillary transverse discrepancy (skeletal discrepancy) with or without unilateral posterior crossbite; iii) age between 7 and 10 years old (this age range was chosen to prevent bias in terms of pubertal peak growth since at this age it is assumed males and females have not had it yet); iv) body mass index (BMI) normal (not below the 25th percentile and not above the 75th percentile) according to age. PSG exam (Embletta - EMBLA, Thornton, CO, U.S.A.), blood samples for the evaluation of serum levels of IGF-1 and BMI were collected at T0. Shapiro-Wilk test revealed normal distribution of the variables, then parameter tests were applied for the evaluation of the correlation among the variables tested. The means and standard deviations (SD) were calculated for the variables. AHI and SPO<sub>2</sub> values indicated alterations in the breathing function. Pearson correlation coefficient was used to evaluate the correlations among the variables in a correlation matrix. Multiple linear regression analysis was then used to evaluate the association between IGF-1 and the other tested variables (age, BMI, BMI normalized, SpO<sub>2</sub>, AHI).

**RESULTS:** Pearson correlation analysis showed a medium-high significant correlation between the IGF-1 and the BMI, both the normalized value ( $r = 0.549$ ,  $p < 0.05$ ) and the non normalized value ( $r = 0.665$ ,  $p < 0.05$ ). No correlations were found between SpO<sub>2</sub> and AHI with BMI and / or IGF-1 values. Multiple regression analysis showed that the variables tested affected values of IGF-1 for 60% ( $R = 0.777$ ,  $R^2 = 0.604$ ) with a tendency to significance for the BMI variable.

**CONCLUSIONS:** Patients presenting maxillary transverse discrepancy (skeletal discrepancy) with or without unilateral posterior crossbite showed alterations in the breathing function and a medium-high significant correlation between the IGF-1 and the BMI. Moreover age, BMI, BMI normalized, SpO<sub>2</sub>, AHI affected values of IGF-1 for 60%.

## ABSTRACT

**BMI and behavioral factors on caries in Mexican urban/rural populations**C. Lara-Capi<sup>1,2</sup>, M.G. Cagetti<sup>1,2</sup>, F. Cocco<sup>2,3</sup>, P. Lingstrom<sup>2,4</sup>, I. Laudicina<sup>3</sup>

<sup>1</sup>Department of Biomedical, Surgical and Dental Sciences, School of Dentistry, University of Milan, Milan, Italy; <sup>2</sup>WHO Collaborating Center for Epidemiology and Community Dentistry, University of Milan, Milan, Italy; <sup>3</sup>Department of Surgical, Medical and Experimental Sciences, School of Dentistry, University of Sassari, Sassari, Italy; <sup>4</sup>Department of Cariology, Institute of Odontology, The Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

**BACKGROUND:** To investigate if, in Mexican adolescents, body weight and caries severity are associated, and if this association differs between rural and urban populations. **METHODS:** Adolescents from the rural area of Tepanacan and the city of Veracruz were enrolled. Caries was recorded using the International Caries Detection and Assessment System and the body mass index (BMI) was calculated. Oral habits (toothbrushing, flossing, dental check-ups) and dietary patterns (sweets intake) were assessed. A dummy variable between BMI and living area (BMI/Area) was generated. Data were analysed using STATA and a multinomial logistic regression model was run, using caries severity as the dependent variable.

**RESULTS:** Four-hundred and sixty-four subjects, 12–15 years of age, participated (rural = 240; urban = 224). The BMI and area of residence were significantly associated ( $\chi^2 = 12.59$ ,  $P < 0.01$ ). Area was also associated with caries severity ( $\chi^2 = 24.23$ ,  $P < 0.01$ ), with the highest number of caries in dentine recorded in participants from the rural area. The dummy variable BMI/Area was related to caries severity ( $\chi^2 = 27.47$ ,  $P < 0.01$ ): overweight adolescents with caries in dentine were most frequently found in the rural area. A higher prevalence of caries in enamel and a lower prevalence of caries in dentine ( $P < 0.01$ ) were recorded in adolescents from the urban area, where better oral habits, but higher sweets intake ( $P = 0.04$ ), were encountered. According to the multinomial logistic regression model, BMI/Area was significantly associated with caries severity ( $P < 0.01$ ).

**CONCLUSIONS:** Overweight was not associated with caries severity in the overall population, but it became a statistically significant risk indicator in adolescents living in the rural area.

**Oral health inequalities in Italian schoolchildren: a cross-sectional evaluation**G. Carta<sup>1</sup>, M.G. Cagetti<sup>2</sup>, S. Sale<sup>1</sup>, G. Congiu<sup>1</sup>, L. Strohmenger<sup>2</sup>, M.C. Morcaldi<sup>3</sup>, M. Bossu<sup>4</sup>, P. Lingström<sup>5</sup>, G. Campus<sup>1,2</sup> and the Italian Experimental Group on Oral Health

<sup>1</sup>Department of Surgical Medical and Experimental Sciences, University of Sassari, Sassari, Italy; <sup>2</sup>WHO Collaborating Centre for Epidemiology and Community Dentistry of Milan, University of Milan, Milan, Italy; <sup>3</sup>Istituto Superiore di Sanità, Rome, Italy; <sup>4</sup>Department of Dental Sciences, Sapienza University of Rome, Rome, Italy; <sup>5</sup>Department of Cariology, University of Gothenburg, Gothenburg, Sweden

**BACKGROUND:** To evaluate which of the following indicators of socio-economic status (SES) has the strongest association with dental caries status in a 6-years-old population: the educational level of each parent (individual-level); the mean

price of housing/m<sup>2</sup> in the area where the family resides; or the mean per capita income in the area where the family lives (area-level).

**METHODS:** Dental caries was recorded in 2,040 schoolchildren (42.5% boys, 57.5% girls) using decayed/missed/lined surface index (d3 level) in primary dentition. Parents filled in a standardised questionnaire regarding nationality, level of education, frequency of dental check-up and perception of child's oral health and child's oral hygiene habits.

**RESULTS:** At the individual-level of SES, mothers' educational level was associated with their children's caries severity ( $\chi^2 = 147.51$ ,  $p < 0.01$ ): as educational level rose the proportion of children with high numbers of carious lesions fell. The two income indicators (area-level SES) were not associated. A multinomial logistic regression model was run for caries risk factors. Caries severity was used as dependent variable and the model was stratified by mothers' educational level. Mothers' perception of child's oral health was the only covariate that was always associated in every caries severity strata and for each level of mothers' education.

**CONCLUSIONS:** The present study shows that mothers' educational level is a useful individual SES indicator for caries in Italian children living in a low-income population.

**Surface analysis on primary teeth after using of two toothpastes with different fluoride concentration: an *in vivo* study**

A. Salucci, D. Campenni, G. Ottaviani, G. D'Angeli, G. Nardacci, M. Rampino, M. Saccucci

Department of Oral and Maxillo-Facial Sciences Unit of Pediatric Dentistry; Department of Odontostomatologic and Maxillofacial Science, Sapienza University of Rome, Rome, Italy

**BACKGROUND:** The aim of the study was to observe *in vivo* the surface effect of two different toothpastes, available on the market, with different fluorine concentration. The analysis was conducted *in vivo* on deciduous teeth.

**METHODS:** A selection of 20 deciduous molars, from 20 patients, was prepared. The selected teeth showed no alteration of the enamel. The teeth were extracted as a result of orthodontic treatments or physiological replacements. The procedures were performed at the UOC of Pediatric dentistry Sapienza University of Rome department of Oral and Maxillo-Facial Science. The selected patients were successively divided in two groups of ten patients each one respectively. The daily oral hygiene procedures was carried out with 500 ppm of fluorine, for the first Group and 1400 ppm of fluorine for the second Group. After 15 days the aforementioned primary teeth were extracted and preserved in normal saline. Successively the primary teeth were sectioned at a cementum-enamel junction and were viewed with VP-SEM electronic microscope to analyze the characteristics of the enamel surface.

**RESULTS:** Micrographic analysis of the samples treated with toothpaste at 500 ppm of fluorine shows non-uniform layers, with a high surface roughness and the presence of irregularly scattered amorphous precipitates. Patient samples that instead used toothpaste with a fluoride concentration of 1400 ppm, show a less irregular surface with a present, but more attenuated, roughness. A finer granulation than the previous ones is visible in an uneven manner, which confers a non-uniform but in any case more structured stratification.



**CONCLUSIONS:** In the pediatric field the prevention of caries lesions is one of the main targets. Early remineralization of initial enamel alterations may result in a delay in the progression of the carious process and an arrest of the same. The use of toothpaste with a high content of fluorine showed a better remineralizing effect, resulting in a more uniform surface compared to teeth after toothpaste treatment with 500 ppm fluorine. These do not improve the superficial morphology of the teeth, maintaining a relevant roughness that exposes the enamel more to the bacterial insult and the onset of carious lesions.

### Comparative evaluation of the surface effect of two toothpastes with different fluorine concentration on primary teeth surface

F. Semprini, A. Salucci, G. Ottaviani, E. Battaglia, G. Nardacci, M. Saccucci

*Department of Oral and Maxillo-Facial Sciences, Unit of Pediatric Dentistry, "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** The purpose of this study is to analyze the effect of two toothpaste, with different fluorine concentrations, on the enamel surface of deciduous teeth. The study was performed *in vitro* by means of SEM microscopy.

**METHODS:** A selection of 20 deciduous molars was prepared. The teeth were extracted as a result of orthodontic treatments or physiological replacements. The procedures were performed at the UOC of Pediatric dentistry Sapienza University of Rome department of Oral and Maxillo-Facial Science. Each element, with no sign of cracks on the enamel, was preserved in normal saline and then sectioned at a cementum-enamel junction level. Successively the external and occlusal surfaces have been etched with 37% orthophosphoric acid for 1 minute in order to reproduce the demineralization that occurs in the oral environment. Each fragment of the same tooth was treated with two different toothpastes (with 500ppm and 1400ppm fluorine concentration respectively) for 15 days and manually brushed three times a day using pediatric toothbrushes for 2 min. Each section was rinsed and preserved in normal saline, renewed every brushing session. Finally a roughness analysis was carried out.

**RESULTS:** In the samples treated with 500 ppm both surfaces present a cribrous layer, uneven, with a worn out appearance and visible crater-like spaces. In the samples treated with toothpaste at 1400 ppm of fluorine, an improvement of the surface morphology of the enamel has been highlighted, which however maintains a superficial roughness not completely attenuated, due to a non-homogeneous distribution of the same material. The roughness analysis values highlight these differences between the two materials.

**CONCLUSIONS:** The use of toothpaste with a high concentration of fluorine, compared to those with low concentration, shows a greater remineralizing power on surfaces of artificially demineralized deciduous teeth, ensuring a character of caries prevention. Toothpastes with 500 ppm, despite reducing the potential risk of systemic accumulation of fluorine (due to accidental ingestion of the material during daily oral hygiene), do not demonstrate significant effectiveness in the repair and protection of the enamel surface by acidic substances attack. These findings therefore translates into an increased risk of the onset of caries.

### Lesch-Nyhan syndrome: evaluation of a modified bite device to prevent bite injuries

M. Fioravanti, G. Ottaviani, M.G. Tarantino, M.P. Balocchi, E. Battaglia, D. Campenni

*Department of Oral and Maxillo Facial Sciences, "Sapienza" University of Rome, UOC Pediatric Dentistry, Pediatric Dentistry Specialization School, Rome, Italy*

Lesch-Nyhan syndrome (LNS) is a hereditary purine metabolism disorder, characterized by hypoxanthine-guanine phosphoribosyltransferase deficiency with uric acid overproduction, neurological and behavioral disorders. The prevalence reported in the literature is 1/380,000 to 235,000 births. Males are affected and females are heterozygous carriers. LNS begin to appear at 3-6 months of age with muscle hypotonia and difficulties in maintaining the sitting position and supporting the head. Other signs include psychomotor and mental retardation of varying degrees of severity and obsessive-compulsive self-injurious behavior, usually marked by stress, with bites and injuries to lips, tongue, cheeks and fingers. A 4-year-old patient with LNS showed up at the Department of Pediatric Dentistry of "Sapienza" University of Rome. The first signs of the disease occurred at approximately 3 months of age, but only genetic test confirmed the definitive diagnosis. From three months of age the patient showed typical bite injuries to hands and lips. Initially, patient's parents controlled hand injuries with application to arms of guardians which prevented bending of the elbow. As a solution to intraoral injuries, parents used an extraoral elastic as attempt to prevent biting. This solution was a source of discomfort for the child and caused decubitus of the lips. In agreement with other studies in the literature, the following therapy has been proposed by our department: two 2mm thick silicone soft bites applied to two arches. In the following days compliance and results were monitored: the upper bite had a positive effect, with good compliance, but the patient could easily remove the lower bite for inadequate retention given reduced dental support. Because literature does not provide specific guidelines, an individual bite device with innovative features was built. New silicone putty dental casts were taken and a study model was realized and digitized. This virtual working model could then be reproduced in the lab with the great advantage of not having to take further casts from the patient, without discomfort and stress. The main goal was improving comfort and compliance of new device with a better retention and stability. The inner part, in contact with teeth, was realized in 2mm thick soft silicone. The external part has been realized with hard transparent resin, extended to the fornix, with two shields which removed muscular pressure of lower lip and cheeks. A front handle in soft resin was inserted to help the parents inserting the device in child's oral cavity and improve the device' overall stability. A review of previous case reports from literature showed usual failure of standard mouth guards and successive resort to tooth extractions. In this case report, the patient underwent regular follow up visits that highlighted device positive effect. Compliance was excellent, the child wore device regularly without discomfort, no intraoral bite injuries were found, and parents reported a normal night's rest, which also improved the quality of life by reducing stress and pain due to injuries. Bites were also worn during soft food feeding, increasing adherence with a standard denture adhesive. The current 10 months follow up confirms the results obtained in the first few days of use. This case report show a correct management to prevent bite injuries due to LNS. For future studies, it is important to improve the multidisciplinary

## ABSTRACT

of the treatment and, after completing the current treatment programs, to provide scientific value out of what is now clinical evidence.

### The management of oral health in autistic pediatric patients: an innovative approach

D. Visentini, M. Guaragna, T. Marinucci, N. Petrazzuoli, S. Vitali, C. Sbarbaro, D. Corridore

*Facoltà di Medicina e Odontoiatria, Dipartimento di Scienze Odontostomatologiche e Maxillo Facciali, "Sapienza" Università di Roma, U.O.C. di Odontoiatria Pediatrica, Rome, Italy*

**BACKGROUND:** At the UOC of Pediatric Dentistry of the Policlinico Umberto I, a project is in place that involves the use of approach techniques adapted to the needs of the various patients with autism spectrum (age 0-17 years) studied on the basis of careful observation and an anamnestic survey complete with specific information regarding the behavioral therapies performed and on the subjective perceptions of the child (positive and negative). We use the Alternative Augmentative Communication technique that facilitates the child's understanding of the type of therapy and the duration of the same. The goal is to minimize the interventions in General Anesthesia only to cases of more complicated therapies (extractions of permanent teeth and root canal therapies) managing to intercept all other at risk situations with prevention interventions (sealing and ablations) and Minimal Intervention, as well as managing patients treated under General Anesthesia with long-term follow-up to maintain long-term results.

**METHODS:** For the study, subjects with autism spectrum

disorder aged between 4 and 17 years were enrolled. The subjects examined are autistic patients who already have "serious" cognitive-behavioral deficits at the age of 2/3 years, with problematic relational modalities and verbal difficulties. Of these patients the proximate and remote medical history was collected and the DMFT data on the Silness and Loe plaque index. They were subsequently divided into groups of three phases depending on the first access to the ward and the type of therapies that were managed in these phases.

**RESULTS:** The sample of 149 subjects, 108 males and 41 females. In the First Phase the approach was carried out in 74% of the sample, in 23% tartar ablation, in 2% respectively controls and prevention techniques and in 1% of cases it was necessary to resort to General Anesthesia. In the second phase 61% of the sample performed a tartar ablation, 18% minimally invasive conservative treatments, 15% continued with the approach, 3% preventive treatments, 2% performed minor surgery and 1 % checks. In the Third and Last Phase (to date) 45% performed tartar ablation, 27% conservative treatments, 10% preventive treatments, 5% controls, 4% continue with the approach, 3% small surgery and in 6% of cases the appeal to General Anesthesia was necessary.

**CONCLUSIONS:** The multidisciplinary approach (Odontoiatra, Dental Hygienist, Pedagogist and Psychiatrist) has proved effective in order to obtain the collaboration of patients with autism. In fact, out of a total of 149 enrolled subjects, it was possible to treat more than 90% of them (mainly with preventive treatments) and only 11 of them had to schedule treatment under Day Hospital under general anesthesia. The Alternative Augmentative Communication is the technique that manages to reconcile the therapeutic needs with the most effective type of communication approach to make the treatments as comfortable as possible for patients.

## ORTOGNATODONZIA

### Prevention on impacted canine to achieve correct occlusion

**BACKGROUND:** The aim is to present the most innovative interceptive treatment option during the early mixed dentition in subjects with a early displaced maxillary permanent canine. Impacted canine prevention is an important diagnostic and therapeutic challenge to the orthodontist. Impacted canine prevention in an important diagnostic and therapeutic challenge to the orthodontist. A tooth is impacted when, after passing the physiological period of eruption and with the apex now formed, it remains inside the bone. On the other hand, a tooth is malpositioned when it is in an abnormal position inside the bone even prior to the development period. case A) a 7.10 years old female presented missing lateral incisor, suspect of displaced maxillary canine.

**METHODS:** Orthodontic finalization with asymmetric distalization, bilateral 1st class occlusion, midline coincidence, presence of permanent canine in dental arch.

**Progress:**

1st phase with:

- 1) ERP
- 2) Extraction C
- 3) Extraction D

2nd phase with:

- 4) Slicing E
- 5) Distalization with Pendulum
- 6) Extraction E
- 7) Traction 5

Case B) a A 8-year and 6-month old girl who falls within the second degree of severity because of great pericanine congestion caused by mesialization of the buds of the 1<sup>st</sup> and 2<sup>nd</sup> premolars and displacement of the lateral incisor in the vestibular area. Early orthodontic treatment is indicated due to the presence of crowding in the pericanine region and where the OPT shows an inclination of the first premolar and abnormal inclination of the canine with respect to the midline.

The protocol used for this level of severity consists of:

Orthopedic maxilla expansion phase

Extraction of element C

Extraction of element D

Slicing of element E

Recovery of Leeway space

Distalization by Pendulum

Extraction E

Application of a fixed brace on both arches

**RESULTS:** The results were impressive both in esthetic, occlusal and functional terms and there was the presence of permanent canine in the occlusal arch. **Discussion:** Displaced canine presents some peculiar difficulties related to some challenge during the diagnostic and therapeutic phase, and functional aspects. Orthopedic and orthodontic early appliance has been chosen in order to avoid more invasive treatments.

**CONCLUSIONS:** In this case, with an early treatment, there was a spontaneous recovery of a canine with an high risk of displacement avoiding extraction and other invasive therapy. Interceptive therapy procedures, using distalizing action obtained with a pendulum, are able to reduce the rate of impaction of maxillary canines: Avoiding the need for active treatment in patients with an acceptable occlusion. Reducing the need for combined orthodontic-surgical treatment for recovery and alignment of the canine in the arch. Cancelling the risk of any damages to adjacent teeth caused by the malpositioned canine.

### RME anchored on deciduous teeth: comparative study on different anchoring systems

G. Rubino, R. Favero, C. Cicognini, A. Volpato, L. Favero

*University of Padua, Faculty of Medicine and Surgery, Department of Neurosciences: Neurological, Psychiatric, Sensory, Reconstructive and Rehabilitative Sciences, Padua, Italy*

**BACKGROUND:** The aim of the current study is to verify the efficacy and effects of using baby screw expander (A0620-11 Leone of 11 mm) anchored to the second deciduous molars in early mixed dentition on the upper and lower arch in three groups of patients: expander with only front arms (Group A), expander with front and rear arms (Group B), expander with only rear arms (Group C).

**METHODS:** Inclusion criteria: early mixed dentition, presence of the second deciduous molars, the deciduous canines and the first permanent molars (in partial eruption) in both arches, and patients requiring 24 activations (4.8 mm). The number of patients for group is 30 divided into 20 males and 10 females with an average age of 7-8 years, treated by application to the removal of the RME. The statistical analysis is based on "t-test", applied at different time intervals: start of treatment (T0), after 24 activations (T1), at 6 months after T1 (T2). Another "t-test" is used to compare the different groups at T2. The following measurement were made on virtual dental casts: 1 (intercanine width), 2 (primary intermolar width), 3 (intermolar width) in the upper and lower arch.

**RESULTS:** The data obtained in the t-test gave the following indications.

Group A: in the upper arch, increases the intercanine width (from  $28.67 \pm 2.31$  mm to  $33.67 \pm 3.2$  mm), the primary intermolar width (from  $38.00 \pm 2.00$  mm to  $43.67 \pm 2.08$  mm) and the intermolar width (from  $44.00 \pm 2.83$  mm to  $46.00 \pm 4.24$  mm). In the lower arch the intercanine width is from  $25.67 \pm 4.16$  mm to  $25.67 \pm 3.06$  mm, the primary intermolar width remains at  $36.50 \pm 2.12$  mm, intermolar width is from  $39.00 \pm 4.24$  mm to  $40.50 \pm 4.95$  mm.

Group B: in the upper and lower arch, increases the intercanine width (from  $31.25 \pm 2.50$  and  $22.50 \pm 5.00$  mm to  $34.25$



## ABSTRACT

$\pm 2.22$  mm and  $23.25 \pm 4.57$  mm), the primary intermolar width (from  $37.75 \pm 0.96$  mm and  $32.00 \pm 1.63$  mm to  $43.50 \pm 1.73$  mm and  $33.00 \pm 2.58$  mm), and the intermolar width (from  $44.00 \pm 2.65$  mm and  $36.75 \pm 3.50$  mm to  $48.00 \pm 4.00$  mm and  $39.00 \pm 1.83$  mm).

Group C: in the upper arch, increases the intercanine width (from  $33.00 \pm 2.16$  mm to  $33.75 \pm 0.96$  mm), the primary intermolar width (from  $40.25 \pm 0.96$  mm to  $45.25 \pm 2.63$  mm), and the intermolar width (from  $43.75 \pm 3.10$  mm to  $49.50 \pm 1.73$  mm). In the lower arch the intercanine width is from  $27.62 \pm 1.97$  mm to  $25.75 \pm 1.50$  mm, the primary intermolar width is from  $34.751.71$  mm to  $37.00 \pm 1.41$  mm, the intermolar width is from  $40.25 \pm 4.57$  mm to  $42.50 \pm 2.08$  mm.

The increase of group C patients intermolars widths was shown to be statistically significant when compared to other groups. However, the expansion of the maxillary anterior area was statistically significant better in group B.

**CONCLUSIONS:** a) Unlike the other types of expanders examined, the expander with only the rear arms is the most effective and hygienic. b) Patients with an expander with anterior and posterior arms have a greater improvement of anterior dental crowding or anterior crossbite.

## Treatment of deep bite in patient with TMJ disorder: case report

V. Fiore, M. Macri, F. Festa

Università degli Studi "G. D'Annunzio" di Chieti, Chieti, Italy

**BACKGROUND:** Resolution of a skeletal Class II malocclusion with deep bite using invisible aligners in patient with TMJ disorders.

**METHODS:** the patient, 39 year old male, reported frequent episodes of headache, neck pain and soreness to the chewing muscles. A low dose cone beam is performed for diagnostic purposes. From this type of radiological survey we obtain the 2d plates conventional as opt, tele L / L, vertex subment and much more. We diagnose a posterior position lower jaw, maxilla contract, dental crowding in both arches, deep bite and loss of physiological cervical lordosis. At first the treatment was conducted with passive aligners to get muscle relaxation, a neuromuscular programming with a gymnastics of proprioception of the tongue and of the entire group of chewing muscles. Reached this, we decided to treat malocclusion with Invisalign aligners. The therapy was aimed at expanding the upper arch, to solve the overcrowding by stripping and for the correct management of the incisors torque. The dental aligners are an orthodontic technique now consolidated over the years. The aligners are removable and individualized invisible masks made of thermoplastic polymers so they are also ideal for patients allergic to nickel for example element present in normal metal brackets. We reiterate are individualized devices to be used approximately 22 hours a day that change every 15 days. The aligners are created from virtual dental arches models obtained by scanning the normal dental impressions, but not only thanks to the intraoral scanners we have directly the scan of the dental arches of our patient. In order to guarantee and to respond to the principles of biomechanics, the so-called attachments are usually used in the planning of the treatment, they are nothing more than beads made of composite material that are reproduced through a template on the dental surface. We recognize

retention attachments generally on molars or at most on the diatonic but still rectangular or horizontal vertical attachments up to the optimized attachments.

**RESULTS AND CONCLUSIONS:** Bite opening has been reached with 34 aligners, so let's talk about an actual time of scarcely 17 months with the possibility to make a finish with aligners certainly very small number. After the first cycle of aligners, we request a series of finishing masks, 15 aligners, that allow us an exemplary resolution of the malocclusion, restoring the patient's desired smile. Once a Cone beam control has been performed, we confirm the support with the restoration of the physiological cervical lordosis. The lower jaw has repositioned forward with remission of neck pain and headache. The stability of the treatment is performed by passive aligners and the correct application of anti-squeezing protocol.

## Three-dimensional evaluation of dental models in cleft lip and palate subjects using an automated digital tool

S. Meneghello<sup>1</sup>, D. Cassi<sup>1,2</sup>, M. Magnifico<sup>1</sup>, G. Pedrazzi<sup>3</sup>, A. Di Blasio<sup>1</sup>

<sup>1</sup>Centro Universitario di Odontoiatria, Department of Medicine and Surgery, University of Parma, Parma, Italy; <sup>2</sup>University of Modena and Reggio Emilia, Department of Medicine and Surgery, Modena-Reggio Emilia, Italy; <sup>3</sup>Unit of Euroscience, University of Parma, Parma, Italy

**BACKGROUND:** To analyze the three-dimensional digital models of patients with cleft lip and palate (CLP) with regard to maxillary arch width and dental arch relationships, employing an automated software tool which calculates dental distances and the modified Huddart and Bodenham index (MHB).

**METHODS:** Seventy-seven CLP patients (51 male, 26 female) consecutively referred to the Orthodontic Section of the Academic Hospital of Parma were included. Subjects were classified according to the cleft phenotype as follows: 48 subjects with unilateral CLP (UCLP), 14 with bilateral CLP (BCLP), 4 with cleft lip (CL), 5 with cleft palate (CP) and 6 with cleft soft palate (CSP). Alginate impressions for the construction of plaster models were taken before orthodontic treatment (mean age  $7.2 \pm 2.7$  years). Digital dental casts were obtained using a 3 Shape B500 laser scanner and exported as STL files. Digital models were landmarked for automatic scoring using a software plug-in: overjet, intercanine and intermolar widths were measured; additionally, the modified Huddart and Bodenham index (MHB) was automatically calculated. Such a numerical scoring system requires all maxillary teeth to be scored according to their buccolingual relationship to the corresponding mandibular tooth and reflects the maxillary arch constriction. After one-month interval, the same examiner repeated the landmarks identification on 30 models randomly selected. Intra-observer reproducibility was tested using Pearson's and Linn's coefficients. Analysis of variance (ANOVA) and Tukey post-hoc tests were used to calculate the statistical differences between the cleft groups. The results were considered to be significant at values  $P < 0.05$ .

**RESULTS:** Intra-observer reproducibility was substantial (Pearson's  $r$  and Linn's  $ccc = 0.96$ ). A statistically significant difference was found for MHB score between all groups and for OVJ between BCLP versus SCP and CL versus CP. No statistically significant differences were found between

the groups comparing intermolar and intercanine distances. BCLP patients had the lowest mean values both of OVJ and MHB score.

**CONCLUSIONS:** The digital automated system is a new, objective approach to analyze dental cast and assess surgical and orthodontic outcomes. In the present study, subjects with BCLP have significantly reduced MHB, while intercanine and intermolar widths are similar to those measured in other cleft groups. Thus, the automatic MHB scoring might be considered a reliable and accurate method to quantify maxillary arch constriction and interarch discrepancy among various cleft phenotypes.

### Morphological and three-dimensional analysis of ponticulus posticus on orthodontic patients: prevalence study by gender

C. Labellarte, M. Macri, F. Festa

*Università degli Studi "G. D'Annunzio" di Chieti, Chieti, Italy*

**BACKGROUND:** the aim of this study is to improve the knowledge on Ponticulus Posticus (PP) regarding prevalence and morphological characteristics, exploiting the high diagnostic power of Cone Beam Computed Tomography (CBCT) as a method of evaluation. The PP is an anatomical variation occurring on the atlas vertebra, which is the first cervical vertebra of the spine. The PP is a bony bridge between the posterior part of the superior articular process and the posterolateral part of the superior margin of the posterior arch of the atlas. The PP can be evaluated radiographically in lateral cephalography, in computed tomography and in cone beam computed tomography. The PP is formed by ossification of the atlanto-occipital membrane that offers the passage in the skull to the vertebral artery. In fact, the vertebral artery originates from the subclavian artery and ascends passing through the transverse foramina of the cervical vertebrae up to the atlas. At this point it passes between the articular process and the posterior arch of the atlas and enters the skull.

**METHODS:** A cross-sectional study was performed on CBCT images obtained from a random sample of 500 Italian patients (age range: 6-87 years; average age:  $27,08 \pm 15,12$  years) who were referred to the Department of Medical, Oral and Biotechnological Sciences of the University "G. D'Annunzio" of Chieti for the orthodontic diagnosis and treatment planning. The sample was composed of 202 males and 298 females.

CBCT images were obtained using Pax Zenith 3D CBCT (Vatech, Korea) with low radiation dosage protocol.

The study included all types of PP: complete bilateral, complete on the left, complete on the right, complete on the right and partial on the left, complete on the left and partial on the right, partial bilateral, partial on the left, partial on the right. Complete PP was considered a bone bridge that extends from the articular process to the posterior arch of the atlas, instead partial PP was defined as a bone spicule over the groove of the vertebral artery, extending from the upper articular process or from the posterior arch of the atlas.

A P-value lower than 0,05 was considered the reference to indicate a statistically significant difference.

**RESULTS:** The study results showed the presence of PP in 110 patients, suggesting a prevalence of 22 % in the Italian population. There aren't any statistically significant differences in gender distribution of PP.

**CONCLUSIONS:** The present study suggests a prevalence of

the PP of 22% on a sample belonging to the same racial group (Italians), without differences between males and females. The PP is a fairly common anatomical anomaly, occasionally found during routine exams. It therefore becomes important for the clinician to be aware of the symptomatology related to vertebral artery compression linked to the presence of PP, such as headache, vertigo, diplopia and migraine.

### Prevalence of teeth agenesis in a class II division ii group of orthodontic Italian patients: a case-control study

A. Frezza, E. Conte, G. Bruno, A. De Stefani, A. Gracco, E. Stellini

*University of Padua, Department of Neuroscience, Dental School, Padua, Italy*

**BACKGROUND:** Tooth agenesis is a frequent condition in general population. A meta-analysis of Polder B. found that the most frequent teeth affected by agenesis are the mandibular second premolars, followed by the maxillary lateral incisors and the maxillary second premolars. In literature prevalence of agenesis is reported between 2.7% and 11.3%. Percentages of frequency change because of geographic variations and gender: for example, prevalence is higher in European Caucasians (males 4.6%; females 6.3%) and in Australian Caucasians (males 5.5%; females 7.6%) rather than in North American Caucasians (males 3.2%; females 4.6%). Different frequencies of agenesis can also be found in different sample of patients classified for Angle's malocclusions or skeletal malocclusions. The purpose of this study was to evaluate the prevalence and pattern of tooth agenesis in Italian patients with a Class II division II malocclusion compared to an Italian control group of general orthodontic patients, and with previous studies performed in other countries.

**METHODS:** In this observational study, a sample of 600 patients, aged 7 or older, from University of Padua Dental Department was analyzed. The entire sample consisted in a group of 37 patients with Class II division II malocclusion and a control group of general orthodontic patients with the remaining 563 patients. For Class II division II group inclination of central incisors and the relationship of first molars (Class II end to end or worse on at least one side in maximum intercuspitation) were evaluated from dental casts, intraoral photographs and lateral cephalograms (U1-SN less than 90°, overbite >3mm). Presence of agenesis of permanent teeth, except for third molars, was judged from panoramic radiographs.

**RESULTS:** Prevalence of teeth agenesis in patients with Class II division II malocclusion (18.9%) was more than double towards that one of the control group of general orthodontic patients (8.3%). The pattern of tooth agenesis in Angle Class II division II was: 53.85% mandibular second premolar, 23.08% maxillary second premolar, 15.38% mandibular lateral incisor.

**CONCLUSIONS:** Prevalence of permanent tooth agenesis was almost 2 times higher in the Class II division II group than in the control group. No agenesis of maxillary lateral incisors was found in the Class II division II group. This result was in contrast with other studies in Japan or Germany, questioning the higher prevalence of this tooth agenesis as a characteristic of a Class II Division II malocclusion.

## ABSTRACT

**Transversal contraction of maxilla and allergic respiratory disease: an epidemiological and statistical correlation**S. Hajrulla <sup>1</sup>, R. Favero <sup>2</sup>, N. Camurri <sup>3</sup>, A. Volpato <sup>4</sup>, L. Favero <sup>5</sup><sup>1</sup>*Odontostomatology Institute, Department of Neuroscience, University of Padua, Padua, Italy;* <sup>2</sup>*Odontostomatology Institute, Department of Neuroscience, University of Padua, Padua, Italy;* <sup>3</sup>*Odontostomatology Institute, Department of Neuroscience, University of Padua, Padua, Italy;* <sup>4</sup>*Odontostomatology Institute, Department of Neuroscience, University of Padua, Padua, Italy;* <sup>5</sup>*Odontostomatology Institute, Department of Neuroscience, University of Padua, Padua, Italy*

**BACKGROUND:** According to Moss' Theory of the Functional Matrix, functional needs and soft tissues are determining factors in the growth and development of craniofacial structures. The effect of prolonged mouth breathing on craniofacial growth remains a widely debated topic in orthodontic literature. Many authors sustain the hypothesis that a prolonged habit of mouth breathing, as a consequence of nasal obstruction, interferes with the normal process of growth resulting in different types of malocclusion. Allergic rhinitis is one of the main causes of nasal obstruction in the pediatric population. The present retrospective epidemiological study aims to investigate the role of allergic rhinitis/asthma in the etiology of transverse orthodontic problems, represented by posterior crossbite and ogival palate. Furthermore, the study aims to assess the influence of allergic rhinitis/asthma on the long-term stability of the effects induced by the transverse expansive treatment in patients aged between 5-12 years.

**METHODS:** The clinical record of 319 patients who had turned to an orthodontist specialist for orthodontic evaluation and treatment were included in the study. The sample was divided into a case and a control group: the case group consisted of subjects that presented with mono- or bilateral posterior crossbite/ogival palate; the control group consisted of patients who were affected by malocclusions other than maxillary contraction. For both groups the following data was collected from the clinical records: presence or absence of perennial or seasonal allergic rhinitis, asthma, habit of mouth breathing, medical therapy for allergic rhinitis/asthma, past interventions of adenoidectomy/tonsillectomy. In patients of the case group that had completed the transverse expansive treatment, we investigated the occurrence of relapse. Clinical records were selected randomly, excluding subjects not belonging to the pre-established age range, subjects that presented genetic malformations and subjects who had undergone previous orthodontic treatments.

**RESULTS:** Case group: 174 subjects aged between 5-12 years (mean=8,8; median=9; standard deviation=1,96); prevalence of allergic rhinitis 24,13%; prevalence of asthma 5,7%. 108 subjects had completed the orthodontic therapy. In 77 subjects treatment effects were stable, among which 18 suffered from allergic rhinitis; in 31 subjects relapse had occurred, among which 10 suffered from allergic rhinitis. Control group: 145 subjects (mean=9,7; median=10; standard deviation=1,93); prevalence of allergic rhinitis 15,17%; prevalence of asthma 4,13%. The results of the statistical analysis performed showed that there was a statistically significant correlation between the presence of posterior crossbite/ogival palate and the presence of allergic rhinitis (confidence interval=95%; p-value=0,05; odds ratio=1,77). No significant correlation was found between the occurrence of relapse and the presence of

allergic rhinitis/asthma (confidence interval=95%; p-value=0,34; odds ratio=1,55).

**CONCLUSIONS:** A statistically significant correlation emerged between posterior crossbite/ogival palate and allergic rhinitis (p-value=0,05). Our findings, therefore, suggest the existence of a cause-effect relationship between the presence of respiratory allergies and transverse maxillary contraction. No correlation was found between allergic rhinitis and the occurrence of relapse after the transverse expansive treatment.

**Personality traits are associated with propensity to use mandibular advancement devices for obstructive sleep apnea syndrome**L. Mezzofranco, A. De Stefani, G. Bruno, A. Gracco, E. Stellini  
*University of Padua, Department of Neuroscience, Dental School, Padua, Italy*

**BACKGROUND:** Obstructive Sleep Apnea Syndrome (OSAS) is a respiratory syndrome that may involve the dentist within a multidisciplinary team, because of the possibility of using Mandibular Advancement Devices (MAD). Although not achieving the efficacy of CPAP (Continuous Positive Airway Pressure) in decreasing nocturnal respiratory events, MAD may provide similar short-term health (*i.e.* daytime symptomatology) and cardiovascular benefits than CPAP. These results may be related to the better compliance of MAD, thus identifying the subjects who are disposed to using MAD is important to offer adequate treatment options. The aim of this study was to evaluate the association between potentially relevant personality traits (including the desire to have firm answers, the aversion to ambiguity, the anxiety and the resistance to something new) and the propensity to be treated by a dentist for a general health problem such as OSAS and snoring.

**METHODS:** One hundred and forty-eight participants (35 males and 113 females) were enrolled in the study and were asked to fill in the questionnaires. Median age was 30 years (IQR 21-45). Sixty-six participants (45%) were University students while the remaining 82 (55%) were enrolled at local dentistry wards while waiting for a visit. Potentially relevant personality traits were evaluated using NFC (Need for Closure), PER (openness to new experiences), STAI-Trait and STAI-Stat questionnaires. The propensity to be treated with dental devices for a general health problem such as OSAS and snoring was evaluated with a specific questionnaire (Mad-related distress).

**RESULTS:** Higher NFC was associated with older age (p<0.0001) and being non-student (p<0.0001), while higher STAI-Trait was associated with younger age (p=0.0007) and being student (p=0.0003). PER, STAI-State and Mad-related distress were not associated with age or student/patient group. Males and females showed similar scores. A positive opinion on dental devices for alignment was associated with a lower Mad-related distress (p=0.02). Eight out of ten participants would accept to use dental device to be kept at night for the solution of a health problem or the treatment of a disease that does not affect the teeth, and they had lower STAI-Trait than those who would not (p=0.03). Only five participants had already been visited or treated for OSAS, while 60% of subjects already knew about such issue. A positive opinion on device used to treat OSAS was associated with higher PER (p=0.02) and lower Mad-related distress (p=0.03), while the opinion of usefulness of the device was positively associ-



ated with higher PER ( $p=0.03$ ) and STAI-Trait ( $p=0.04$ ). Underestimating the snoring when sleeping alone and underestimating the benefit of dental device on preventing a heart attack or a stroke were associated with lower PER and higher Mad-related distress (all  $p<0.05$ ). Greater distrust on dental devices was associated with higher NFC, STAI-State and Mad-related distress (all  $p<0.05$ ). A positive opinion about treatment of snoring and OSAS using dental devices was associated with higher PER, while lower STAI-Trait was associated with positive opinion on treatment of snoring using dental devices (all  $p<0.05$ ).

**CONCLUSIONS:** The results suggest that some personality traits are associated with the propensity to use MAD to treat a general pathology as OSAS. In addition, more information on MAD should be provided to OSAS patients.

## Cephalometric evaluation of saddle angle excluding nasion point

C. Benetazzo, G. Bruno, A. De Stefani, A. Gracco, E. Stellini  
University of Padua, Department of Neuroscience, Dental School, Padua, Italy

**BACKGROUND:** The lateral cephalometric radiograph represents a fundamental diagnostic tool in the description of the skeletal and dental relationships, horizontally and vertically. The cephalometric tracing highlights the linear and angular relationships between the various selected points, thus analyze the most important components of the face: skull and cranial base, maxilla and mandible, upper and inferior teeth with their concerning alveolar processes. Regardless of the tracing used, the purpose is to develop an individualized treatment plan. The starting point of the present study is the Björk-Jarabak polygon ( $396^\circ \pm 6$ ), defined by Nasion (Na), Sella (S), Articular Point (Ar), Gonion (Go) and Menton (Me). This structure is useful to determinate the direction and the potential of growth and for the determination of the facial biotype. Among the various measurements which the polygon includes, the present study focused on the Saddle Angle ( $123^\circ \pm 5$ ), formed by the anterior cranial base (line Na-S) and the posterior cranial base (line S-Ar). It describes the temporomandibular joint (TMJ) position inside the glenoid cavity and thus it influences the sagittal projection of the mandible. However, this measurement is not precise, since it is influenced by the Na-S plane orientation, which is extremely variable, so much that it can distort the value of this angle. For this reason, it could be better evaluating an angle determined by the landmarks S and Ar and the use of the True Vertical Line (TVL) or the True Horizontal Line (THL), which are more reliable than the intracranial referent lines. Therefore, the aim of this study is to evaluate how much the Nasion position affects the Saddle Angle's value and to identify a new angle (THL-S-Ar) that excludes that point. At last, this angle will be compared to the "traditional" one, in order to evaluate if they match or not.

**METHODS:** This is an observational study. 154 patients were evaluated, randomly selected among those under treatment at the Padua's Dental Clinic. Lateral cephalometric radiograph of the head and right-side photography for every patient were taken. All the radiographs have been oriented in Natural Head Orientation (NHO) by superimposing them on the photos previously taken in Natural Head Position (NHP). Roth-Jarabak cephalometric tracing was made and the THL passing for the S landmark was drawn, in order to identify a new angle determined by the following landmarks: THL-S-Ar. Therefore, a new normal range has been identified and compared to the

"traditional" one, in order to evaluate if there were any differences. All the measurements were made by the same operator. **RESULTS:** In the present study, approximately the 30% of the patients analyzed does not match. Above all, about the 60% of patients, previously categorized such as "open angle", actually had a normal angle, if we considered the new identified range of normality.

**CONCLUSIONS:** These results seem to confirm that the Nasion can affects negatively on the Saddle Angle evaluation. Therefore, this measurement should be used with caution, especially because it is a structural factor, which cannot be modified by the orthodontic treatment, influencing the treatment plan.

## A new method to evaluate compliance of patients with Down syndrome

C. Strappa<sup>1</sup>, C. Romeo<sup>2</sup>, B. Ricci<sup>3</sup>, I. D'Apolito<sup>3</sup>, C. Grippaudo<sup>4</sup>

<sup>1</sup>Dental School, Catholic University of Sacred Heart, Rome, Italy; <sup>2</sup>Postgraduate School in Orthodontics student, Catholic University of Sacred Heart, Rome, Italy; <sup>3</sup>PhD Program in Cellular and Molecular Clinical Research in Dental Diseases; <sup>4</sup>Postgraduate School in Orthodontics, Catholic University of Sacred Heart, Rome, Italy

**BACKGROUND:** Down syndrome (SD) is usually associated with a delay in cognitive ability and physical growth, as well as typical cranio-facial dysmorphic features and dental malocclusion, frequently characterized by open bite, cross bite, III skeletal class and agenesis. Although the need for orthodontic treatment is often present, it is not always feasible until the pursuit of all possible treatment goals. Often, due to the poor collaboration of patients, partial targets are established and minimally invasive orthodontic treatments are used. The aim of the work was to assess the use of a questionnaire to estimate collaboration of patients with Down syndrome who need orthodontic treatment.

**METHODS:** To evaluate the patient's collaboration, a questionnaire was subdivided into 3 levels, to be completed in the appointments that precede the beginning of the orthodontic therapies. Each level describes the procedures that are usually performed before starting an orthodontic treatment, in sequence. Each one is assigned a score from 0 to 3 based on the collaboration offered, where 0 matches a non-cooperative patient and 3 a fully cooperative patient. Level 1 assesses the possibility of performing the procedures usually performed during the first dental visit. Level 2 includes the evaluation of the procedures necessary for the acquisition of diagnostic records (photos and impressions) of orthodontic treatment. Finally, level 3 aims to evaluate the patient's short- and long-term compliance. At the end of the assessment, for each level, the totalized values are added together and the patient is assessed to have obtained a sufficient score to pass the execution of the procedures planned in the next level. If the score is insufficient, the evaluation is repeated at the next appointment, and a sustainable treatment plan will be established based on the patient's clinical needs and compliance. This method was tested on 39 patients divided into 3 age groups: 8-15 years; 15-25 years; > 25 years, by two operators, over a period of one year.

**RESULTS:** The patients observed showed a variability in obtaining the scores expected from the use of the questionnaire. Therefore, 22 had access to complex orthodontic therapies, with fixed multibrackets devices, as they achieved

## ABSTRACT

adequate scores at the end of the third-level assessment; 15 patients, who had been assessed as unable to access the third level but had passed the second level score, received orthodontic treatment with simple and minimally invasive devices, such as removable orthodontic appliances for palatal expansion. Finally, only 2 patients did not achieve sufficient scores to guarantee an adequate and continuous collaboration, necessary for orthodontic therapies, and therefore received preventive care and maintenance of oral hygiene and dental health. In this case it was not possible to start orthodontic treatment. **CONCLUSIONS:** Unlike other dental treatments, orthodontic treatments may be deferred or not performed in non-cooperative patients, because their ultimate goal is improvement of patient's quality of life. On the other hand, it is not possible to correctly perform orthodontic care without the involvement of the patient, who must follow the orthodontist's instructions, must not damage the equipment and must maintain an excellent level of oral hygiene. If these aspects of collaboration fail, the presence of an orthodontic appliance constitutes a risk, more than a benefit, for oral health. This questionnaire has been a valuable tool for the screening of patients with Down syndrome who guarantee the collaboration necessary to carry out orthodontic treatments.

### The correction of the occlusal plane: diagnosis, technique, indications and complications

E. Bica <sup>1</sup>, C. Manenti <sup>1</sup>, F. Poletti <sup>1</sup>, A. Nota <sup>1</sup>, A. Castaldo <sup>1,2</sup>, S. Tecco <sup>1</sup>

<sup>1</sup>Dental School, Vita-Salute San Raffaele University, Milan, Italy;

<sup>2</sup>Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy

**BACKGROUND:** The correction of the occlusal plane in orthodontics is an hard goal. The analysis of the occlusal plane depends on the adopted diagnostic methodology in evaluating the presence of a malocclusion, as well as other different situations (facial aesthetics, temporomandibular disorders, posture and facial asymmetry). The analysis of the occlusal plane frontal inclination (occlusal cant) is one of the parameters affecting smile esthetics. Occlusal cant can be related or not with facial asymmetry due to asymmetric development of the mandible, unilateral extruded molars, or asymmetric dentoalveolar development. Even if it can be observed also with relaxed lips it can be clearly studied during smile. Therefore, the management of the occlusal cant, is a complex variable during an orthodontic treatment. The aim of the present review is to analyse the published literature about the occlusal cant, its diagnosis, the indications to its correction and the management of the treatment techniques and possible associated complications.

**METHODS:** This literature review includes articles and books indexed in different databases: PubMed, Medline, Science Direct. Longitudinal, cohort, case-control, cross-sectional, experimental and case series studies were compared. Literature reviews were also included. We excluded articles that did not talk about the correction of the occlusal plane frontally. The investigation was restricted to articles and books published in English, Spanish and Italian languages.

**RESULTS:** The final search yielded 60 citations. After excluding repetitions, 18 were excluded, which returned 42 references. In order to complement the relevance and the validity of the review 10 books, 9 case report/series, 14 clinical studies, 4 literature reviews, 1FEM study, 4 expert opinion

articles, were analysed. Most of the references studied the generalities and implications on the canted occlusal plane. Moreover, scientific evidence about the correction of occlusal cant with different techniques as micro-screws like valid alternative to orthognathic surgery is reported and was showed by clinical studies and case reports.

**CONCLUSIONS:** The inclination of the occlusal plane on the frontal view could be a clinical manifestation of facial asymmetry. Occlusal plane canting is a characteristic that must be evaluated in any assessment of smile esthetics and before an orthodontic treatment. Changing the occlusal plane angle does affect relative smile attractiveness. The perception of occlusal cant varies between patients and dentists. Cants of 4° or greater are noticeable and may be unacceptable to a patients. The most commonly used diagnostic methods are the 3D images, the frontal photos, the frontal cephalometric tracing, and the clinical view with a tongue depressor or the fox plane. According to the indications, the correction techniques are different. If there is a small occlusal inclination or just an incisal inclination, an intrusion arch with braces could solve the problem. Some complications can be associated to this technique. Mini-screws have proven to be a useful addition to the orthodontist's arsenal for the control and correction of occlusal cant and in patients who meet less or do not meet the standards could be a valid alternative to orthognathic surgery. Complications may arise during the placement of the mini-screw and then in terms of patient stability and safety. An in-depth knowledge of proper technique placement, bone density and location, soft peri-implant tissues, regional anatomical structures, and patient's home care are essential for the optimal success of the mini-screw.

### Management of impacted maxillary canines: comparison of therapeutic methods

C. Manenti <sup>1</sup>, E. Bica <sup>2</sup>, N. Nardi <sup>2</sup>, A. Lucchese <sup>2</sup>, R. Vinci <sup>2</sup>

<sup>1</sup>Dental School, Vita-Salute San Raffaele University, Milan, Italy;

<sup>2</sup>Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy

**BACKGROUND:** The orthodontic-surgical treatment of impacted teeth represents one of the most challenging clinical situations the orthodontist would face. Second to the third molars, that are usually condemned to be extracted, the maxillary canines are the most commonly impacted permanent teeth, with prevalence of between 1% to 3%, females are more commonly affected. Moreover, canines are impacted palatally more frequently than labially. The diagnosis is based on both clinical and radiographic examination. The clinical inspection guides us with easiness to notice the absence of a permanent tooth in the dental arch and to locate it frequently as a bulge that represents the osteomucosal retention of the canine. The radiological inspection helps us with high reliability to distinguish the path of eruption of the tooth. The periapical radiographs assist in locating the position of the impacted tooth whether it's palatal or labial. Panoramic radiographs are used to determine if the tooth is totally impacted or simply retained. The clinical approach will be orthodontic-surgical with the totally impaction or ostemucosal retention. Usually it's one of two approaches to adopt, on a case by case basis: extract or not. The aim of this study is to confront and investigate the differences in the periodontal state outcome after exposing totally impacted canine, by the use of rotating instruments compared to piezoelectric terminal

**METHODS:** We have picked 12 patients, 4 males (age from 15 to 37) and 8 females (age from 16 to 32). All the patients had one or both the canines in total palatal impaction. The standard of impaction used in the study is the absence of: orofacial trauma, Systemic diseases, congenital disorders, mental retardation and prepubertal periodontal diseases. Before following the patients all of them have had finished orthodontic treatment to improve the alignment of the teeth and create adequate space in the dental arch to accommodate the impacted canine. Then the patients undergone a surgical exposure of the canines. In one group the osteotomy was performed by rotating instruments while in the other group with piezoelectric terminal. Consequently, to bring the tooth into the line of occlusion, the patients continued the orthodontic therapy. At that point, the patients returned to our observation to evaluate clinical attachment level (CAL), eventual gingival recessions (REC), plaque index (PI), bleeding on probing (BOP), bone loss, pulpar canal obliteration and/or radicular resorption.

**RESULTS:** The outcome of this study showed that the CAL was slightly higher in the test group. Only one patient had gingival recession of 2mm. Bleeding and plaque index was positive in two patients of the test group and the same for the control group. Only one patient has demonstrated alveolar bone loss which is the same tooth that suffered of gingival recession in the control group.

**CONCLUSIONS:** Mainly there are no statistically significant differences between the two techniques. The periodontal state was acceptable in both methods. The critical analysis of the results indicated that piezoelectric instruments are more efficient and widely used in oromaxillofacial surgery; due to simplicity of execution, better visibility of the operating field, respecting the sensible structures such as vessels and nerves, high cutting precision and reduction of healing time and postoperative discomfort owing to its minimum damage to soft tissues.

## Cephalometric evaluation in patients with bilateral and unilateral cleft lip and palate

V. Montanari, G. Bruno, A. De Stefani, A. Gracco, E. Stellini

<sup>1</sup>University of Padua, Department of Neuroscience, Dental School, Padua, Italy

**BACKGROUND:** Cleft lip and palate is a malformation of the lip and the palate present since the birth and it is one of the most prevalent deformities of the oral and facial region. Cleft is a missed connection of the lip and the palate. Cleft lip can have different levels of severity: it can concern only the vermilion of the upper lip, or it can be a complete split. Cleft palate, instead, can concern the hard palate only or the soft palate too. Cleft can be unilateral or bilateral; if there is an unilateral cleft, it can be both in the right side and in the left side. Often, patients with cleft lip and palate have dental and structural cranio-facial abnormalities, like a sagittal deficiency of the maxilla. The aim of this study is to examine the cephalometric analysis of both the groups of patients (with unilateral and bilateral cleft lip and palate) and to verify if there are associations or differences between the data.

**METHODS:** This is a retrospective study. Lateral radiographs were used to get the cephalometric evaluation. 40 patients between five and fifteen years old were evaluated in the study: 20 patients with bilateral cleft lip and palate, 10 patients with

unilateral cleft lip and palate in the right side, 10 patients with monolateral cleft lip and palate in the left side. All the radiographs were evaluated by the same operator. In this study both skeletal and dental measurements were considered. The cephalometric parameters analyzed were: saddle angle, articular angle, gonial angle, upper gonial angle, lower gonial angle, anterior cranial base, posterior cranial base, ramus height, corpus length, SNA, SNB, FMA, anterior face height, posterior face height, overbite, overjet, IMPA, U1-SN, U1-FH. Statistical analysis was performed on the data obtained to compare bilateral and unilateral groups.

**RESULTS:** Compared to normal values, patients with cleft lip and palate (both unilateral and bilateral) have lower values of anterior cranial base, ramus height, corpus length, SNB, posterior face height, anterior face height and a light retroinclination of the upper and lower incisor (U1-SN, IMPA). Even if they have lower values of posterior face height (HFP) and anterior face height (HFA), the measure HFP/HFA results correct. Data shows that between patients with unilateral cleft lip and palate and patients with bilateral cleft lip and palate, articular angle and lower gonial angle are bigger in patients with unilateral cleft, whereas upper gonial angle is bigger in patients with bilateral cleft; despite the last two results, gonial angle is similar between the two groups of patients.

**CONCLUSIONS:** Only some cephalometric parameters shows differences between patients with unilateral cleft lip and palate and patients with bilateral cleft lip and palate, but in general there is not an important difference between the data of the groups. Moreover, only some parameters of all patients with cleft lip and palate (both unilateral and bilateral) are very different compared to normal values.

## Eruption problems solving in patients with crowding

D. Carozza, M.C. Chiarenza, R.P. Rotolo, A. Correrà, L. Perillo  
Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania "Luigi Vanvitelli", Naples, Italy

**BACKGROUND:** The amount of crowding in cases having tooth-size/dental arch length discrepancy is an important factor when deciding between extraction and nonextraction orthodontic treatment. Because of mandibular anatomical constraints, the mandibular dental arch usually serves as a guideline to determine required changes in the maxillary dental arch. The aim of this study was to evaluate short- and long-term mandibular dental arch changes in patients treated with a lip bumper during the mixed dentition followed by fixed appliances, compared with a matched control sample. **METHODS:** Dental casts and lateral cephalograms obtained from 31 consecutively treated patients before (T0), after (T1) lip bumper, after fixed appliances (T2), and a minimum of 3 years after fixed appliances (T3) were analyzed. The control group was closely matched. Arch width, perimeter and length, and incisor proclination were evaluated. Repeated measures ANOVA were used to analyze changes in measurements over all four time points between treatment and control groups. **RESULTS:** For the dental cast measurements, interreliability was ICC = 0.99 CI 95% (0.97, 0.99). The standard error for the cephalometric analysis, based on the IMPA angle calculated by Dahlberg's formula, was not considered clinically significant. Statistical analyses for the reliability and accuracy



## ABSTRACT

assessments were repeated after removing all outlying data points. Since they were determined to have no significant effect on the results, all data points were maintained for the analyses in this study. The results of this study increased our understanding of mandibular dental arch dimensional changes and their short- and long-term stability among growing patients treated with the lip bumper followed by fixed appliances. Analysis of the lip bumper effects in the mixed dentition followed by fixed appliances showed statistically and clinically significant increases in arch widths and decreases in crowding after an average 6.3-year follow-up. Arch widths and crowding were significantly different except at T2-T1. At T1-T0, only crowding decreased 3.2 mm while intercanine, interpremolar and intermolar widths increased. Changes at T3-T2 showed a significant decrease of 2.1 mm for crowding and an increase for intercanine, interpremolar, and intermolar widths and arch perimeter, respectively. Finally, at T3-T0, the reduction in crowding of 5.03 mm was significant and clinically important in the treated group. The differences between intercanine, interpremolar, and intermolar widths were also significant in the treated group.

**CONCLUSIONS:** Mandibular dental arch dimensions were significantly changed after lip bumper treatment. At follow-up, all arch widths were slightly decreased without clinical relevance. Changes remained stable after an average 6.3-year follow-up.

### Digital dental casts: 3-dimensional evaluation of the maxillary arch and palate in cleft patients

M. Scerra, M.G. Schiavone, A. De Benedictis, M. Vitale, L. Perillo

*University of Campania "Luigi Vanvitelli", Caserta, Italy*

**BACKGROUND:** Cleft lip and palate (CLP) is the most common craniofacial malformation that orthodontists will encounter with an incidence of 1 out of 700 newborns. The morphology of the upper arch and palate has been widely investigated in cleft patients mainly using conventional two-dimensional dental cast analysis. This method, although reliable, is very time-consuming and limited to provide reliable volumetric data. More recently, several studies used different three-dimensional (3D) imaging systems to accurately record the upper arch and palate in cleft subjects. The aim of this study was therefore to evaluate and compare arch width, palatal surface area, and volume of unilateral CLP (UCLP) subjects and non-CLP subjects (NCLP) in the mixed dentition phase using 3D laser scanning.

**METHODS:** A total of 38 Caucasian subjects, aged from 5.6 to 11.9 years, were included. 19 in each group (UCLP and NCLP). All patients were treated at the Division of Maxillofacial Surgery at the University of Campania "Luigi Vanvitelli", Naples, Italy, by the same surgeon, using the same protocol and method as follows: lip surgery at 6 months according to the Delaire technique, soft palate surgery at 12 months and hard palate surgery at 18 months by pushback with two aps. Digital dental casts were obtained using a 3Shape R700 laser scanner. Intercanine and intermolar widths (cusp and gingival levels), palatal surface area and volume were measured. **RESULTS:** A post hoc analysis of the obtained power for each variable with statistical significant differences

showed a power of 99.9 per cent for both intercanine measurements, of 66.6 per cent for the area difference and of 82.9 per cent for the volumetric difference. Intercanine widths at the cusp (5.60 mm;  $P < 0.001$ ) and at the gingival level (3.11 mm;  $P = 0.014$ ), palatal area (141.5 mm<sup>2</sup>;  $P = 0.009$ ) and volume (890.7 mm<sup>3</sup>;  $P = 0.029$ ) were significantly lower in the UCLP compared to the control group. **CONCLUSIONS:** Subjects with UCLP have significantly reduced intercanine maxillary arch widths, while intermolar widths are similar to those measured in matched subjects without malocclusion. Furthermore, a significantly smaller palatal surface area and volume is seen in UCLP subjects in whom early orthodontic or orthopedic treatment was not performed. Therefore, based on the results of the present study expansion of the anterior part of the maxillary arch could be beneficial.

### The efficacy of retention protocols after orthodontic treatment: a systematic review and meta-analysis

L. Rustico, A. Mili, A. Lo Giudice, M. Portelli, A.M. Bellocchio, A. Farah, P. Leonardo, A. Costantino, F. Mincica, R. Nucera

*Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Section of Orthodontics, School of Dentistry, University of Messina, Policlinico Universitario "G. Martino," Messina, Italy*

**BACKGROUND:** The aim of this systematic review and meta-analysis was to evaluate the amount of relapse of anterior crowding and to evaluate the efficacy of retention protocols applied after orthodontic treatment by the best scientific evidence available represented by randomized prospective clinical trials.

**METHODS:** A survey of articles published up to January 2018 about stability of dental alignment and retention after orthodontic treatment was performed using 7 electronic databases (MEDLINE, EMBASE, OvidSP, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Scopus, Web of Science) with 3274 initial identified articles. Only randomized clinical trials investigating patients previously treated with multi-brackets appliances and with a follow-up period longer than 6 months were included. Two authors performed independently study selection, data extraction, and risk of bias assessment. All pooled data analyses were performed using the random-effect model. Statistical heterogeneity was evaluated.

**RESULTS:** In total, 8 RCTs were included, grouping data from 987 patients. The ages of the patients varied across the studies, ranging between 13 and 17 years. Observation period ranged between 6 and 24 months. The appliance features were heterogeneous among the selected studies: 6 trials evaluated the effects of vacuum-formed retainer, 4 trials evaluated the effects of bonded fixed retainers, 2 trials evaluated the effects of the Hawley retainer, 1 trial evaluated the effects of the Begg retainer and 1 trial evaluated the effects of the positioner. Data showed no significant intercanine width modifications during the retention period with both fixed and removable retainers. Significant modification of Little's Index were found for the mandibular removable retainers with a mean difference of 0.72mm (95% CI, 0.47 to 0.98) and for the maxillary removable retainers with a mean difference of 0.48mm (95% CI, 0.27 to 0.68). Not significant changes were found evaluating Little's Index modification for mandibular fixed retainers. 4

RCTs reported the failure rate of the fixed retainer during the observation period, the summarized failure rate was respectively the 41,3% (72/174) for the maxillary arch and 36,7% (115/313) for the mandibular arch.

**CONCLUSIONS:** The results of this meta-analysis showed that all the considered retainers are effective in maintaining dental alignment after fixed orthodontic treatment, however fixed retainers showed a greater efficacy compared to removable retainers. The most important issues for the fixed and removable retainers are respectively: the risk of failure and the patients' compliance. Further RCTs studies with a longer observation period are needed in order to assess the long-term effect of retainers in maintaining the occlusal results obtained with fixed orthodontic appliance.

### Palatal surface and volume on 3D digital casts of patients with different types of orofacial clefts

M. Cinotti<sup>1</sup>, D. Cassi<sup>1</sup>, A. Di Blasio<sup>2</sup>, P. Puddu<sup>3</sup>, P. Sassatelli<sup>3</sup>, U. Consolo<sup>1</sup>

<sup>1</sup>University of Modena and Reggio Emilia, Modena and Reggio Emilia, Italy; <sup>2</sup>Section of Orthodontics, Centro Universitario di Odontoiatria, Department of Medicine and Surgery, University of Parma, Parma, Italy; <sup>3</sup>Department of Engineering "E. Ferrarini", University of Modena and Reggio Emilia, Modena and Reggio Emilia, Italy

**BACKGROUND:** The aim of this study is to measure and compare palatal surface area and volume of patients affected by different types of cleft lip and palate (CLP), using three-dimensional digital models.

**METHODS:** The sample included 76 subjects, which were classified according to the subtype of clefting as follows: 48 patients (16 girls, 32 boys; aged 6,9±4,3 years) with unilateral CLP (UCLP); 14 patients (3 girls, 11 boys; aged 6,2±0,4 years) with bilateral CLP (BCLP); 5 patients (2 girls, 3 boys; aged 9,1±0,7 years) with cleft soft palate (CSP); 4 patients (3 girls, 1 boy; aged 7,0±0,9 years) with cleft lip (CL) and 5 patients (3 girls, 2 boys; aged 8,3±4,1 years) with isolated cleft palate (CP). All the patients were in the deciduous or early mixed dentition phase. Digital dental model were obtained from plaster study casts by using 3 Shape B500 laser scanner. 3D casts in STL file format were converted into a different format by Geomagic Studio in order to be processed by SolidWorks. From each cast the palatal area was isolated using two reference planes: the horizontal plane was identified selecting three points on the gingival border; the posterior vertical plane was tangent to the distal surfaces of the last permanent molar. On the horizontal plane a curve line crossing the lowest points of the gingival border of each tooth was drawn to define the perimeter of the palatal area. When the isolation was correctly achieved, the software measured total surfaces (mm<sup>2</sup>) and volume (mm<sup>3</sup>). After 40 days interval, measures were repeated by the same operator on 30 models randomly selected. Intra-observer reproducibility was tested using Intra-Class Correlation (ICC) coefficients. Statistical analysis was performed using the analysis of variance (ANOVA) and Tukey post-hoc test, with p<0.05 as a significant level of difference.

**RESULTS:** The statistical analysis of the repeated measurements showed high level of reproducibility. The analysis of variance revealed a statistically significant variability of measures between the groups. Particularly, palatal surface area

and volume were significantly greater in CL and SCP groups compared to UCLP, BCLP and CP groups. No statistically significant differences were found between the UCLP and BCLP for both palate parameters.

**CONCLUSIONS:** Maxillary arch constriction varies among cleft patients, being more severe when the congenital defect involves alveolar and palatal hard tissues. Compared to linear interdental measurements, three-dimensional evaluation can better describe maxillary morphological characteristics, being a reliable indicator of palatal growth and dentoalveolar development.

### Accuracy and reliability of digital measurements on dental scanned models. A preliminary study

E. Gatto, R. Castellaneta, L. Incardona, A. Costantino, P. Cingari, G. Messina, A. Lo Giudice, A. Militi, R. Nucera, M. Portelli.

Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Section of Orthodontics, University of Messina, School of Dentistry, Messina, Italy

**BACKGROUND:** The aim of this preliminary study is to evaluate and compare the measurements performed on plaster and digital models to calculate the indexes of Bolton, Peck and Little.

**METHODS:** The study was carried out on 10 patients models of the Orthodontics Department of University of Messina. Only models in permanent dentition with all the teeth perfectly erupted, without caries and dental filling were selected. The included models for the preliminary study showed a slight-moderate overcrowding index, the patients didn't have previously orthodontic treatment or dental abnormalities, genetics syndromes or systemic disease with possible dental correlation. The measurements on the plaster models (mesio-distal diameter of the teeth in the upper and lower arches, buccal-lingual dimension of the lower incisors, the distance of contact point of mandibular incisors) were performed using a sliding caliper (Dentaurum, Germany) with the Vernier scale set at 0.1 mm for accuracy according to the technique proposed by Moorees et al. [1947]. Before using the caliper was calibrated, to avoid measurement errors. For the intra-examiner calibration, an experienced operator measured 5 pairs of double arched models one week a part. Moreover a second operator carried out the same measurements for the inter-examiner calibration. The same measurements were done on the models scanned through Maestro 3D dental scanner model MDS500 (Age-Solutions srl, Pisa, Italy). Measurements were performed with the software Rhinoceros 5.0 (Robert McNeel & Associates, Seattle, Usa). Coupled T-Test analysis was performed. The level of significance was set at P< 0.05. It was calculated the methodological error of measurements with Dahlberg test. The degree of correlation between the recorded indexes in this study was calculated instead with the correlation index.

**RESULTS:** From the data processing were calculated the indexes of Bolton, Peck and Little for both considered groups. There were no statistically significant difference between the examined indexes calculated with manual and digital measurements; this indicated a certain level of agreement between the methods tested (P<0.05). The correlation index showed a high correlation between digital and manual measurements. **CONCLUSIONS:** The measurements performed on the

## ABSTRACT

scanned models result to be reliable and superimposable to those achieved in plaster models. The digital calculation of the considered orthodontic indexes can be considered as a reproducible and validated procedure.

### Evaluation of nasopharyngeal microbial flora in patients treated with rapid palatal expansion

G. Tomaboni, S. Capriglione, G. Mannelli, L. Di Vece, T. Doldo  
Department of Medical Biotechnologies

**BACKGROUND:** The purpose of our study was to evaluate through throat swab whether the palatal expansion treatment can determine a microbial flora change in the upper respiratory tract.

**METHODS:** Eighteen patients candidates for palatal expansion treatment, average age 8.5 years old, were recruited. Each patient was subjected to: an anamnestic questionnaire; rapid palatal expansion (RPE); active anterior rhinomanometry and a nasal endoscopy at time T0; three throat swabs were performed at:

T0: before the palatal expander application;

T1: 15 days after the application of the palatal expander;

T2: 15 days after the suspension of the expander screw activations.

Samples have been analysed by cultural test agar medium for the detection of pathogens.

**RESULTS:** In all patients included in this study the RPE resulted in: a resolution in the upper jaw contraction and a respiratory improvement, initially in subjective terms and subsequently - following a otorhinolaryngological ENT check-ups - in objective ones. From the microbiological point of view, the analysis of the samples on the agar plate showed that seven patients of 18 have a normal microbiotic flora, while the other 11 have a potentially pathogenic one - at least in one of the times of this study. The highest level of prevalence of samples presenting a potentially pathogenic flora has been detected at T2 (46%). Fifteen samples among the 54 tested have shown the presence of a potentially pathogenic flora which have been detected with: a MALDI technique (*matrix-assisted laser desorption/ionization*) analysis to detect *H. influenzae*, *M. catarrhalis* and *C. albicans*; agglutination test to detect *S. pyogenes* and *S. aureus*; optochine test to detect *S. pneumoniae*. The germs prevalence among the 15 positive samples is as follows: *H. influenzae* 73,3%; *S. aureus* 33,3%; *S. pyogenes* 26,6%; *S. pneumoniae* 26,6%; *M. catarrhalis* 6,6%; *C. albicans* 13,3%. The distribution of each pathogenic species, evaluated on the basis of the number of colonised samples at T0, T1 and T2, has been largely consistent regarding the following germs: *H. influenzae*, *S. aureus*, *S. pyogenes*.

There has been an increase from T0 to T2 regarding *S. pneumoniae* and *C. albicans*. Another factor which has been analysed is seasonality: the higher strength of positive samples has been detected during spring months. Comparing the degree of adenoid hypertrophy with the presence of potentially pathogenic germs reported during the ENT check-up, we have noted that 100% of the patients presenting a normal microbiological flora at each time of the study is now showing an adenoidal hypertrophy between 20-40%, while 70% of the patients with at least one swab containing a potentially pathogenic flora shows an hypertrophy between 50-80%. Student t-test has indicated a statistically significant difference ( $P < 0,005$ ) between the two groups. Making a further

distinction based on gender among the 11 patients with at least one positive throat swab, we have detected a statistically significant difference ( $P < 0,01$ ) between the two groups. **CONCLUSIONS:** Children showing an adenoidal hypertrophy require the orthodontist to treat the patient in a multi-disciplinary manner, not only in order to restore the correct respiration but also to supervise the potential risk of infection - with special attention being given to immunosuppressed patients. Our study, albeit preliminary and involving a limited sample of patients, has shown that the rapid palatal expansion may represent a significant factor in the increase -probably transitory- of potentially pathogenic species in the nasopharyngeal tract.

### Orthodontic treatment of obstructive sleep apnea syndrome: resolution and comparison of apnea cases

F. Poletti<sup>1</sup>, E. Storti<sup>1</sup>, S. Ehsani<sup>1</sup>, E. Bica<sup>1</sup>, A. Nota<sup>1</sup>, A. Castaldo<sup>1,2</sup>, S. Tecco<sup>1</sup>

<sup>1</sup>Dental School, Vita-Salute San Raffaele University, Milan, Italy; <sup>2</sup>Department of Medical,Surgical and Health Sciences, University of Trieste, Trieste, Italy

**BACKGROUND:** Over the last few years, Sleep Disorder Breathing (SDB) and especially OSAS (Obstructive Sleep Apnea Syndrome) have been the subject of increasing interest from the medical community; a search made on Pubmed with the words "sleep apnea" result as 12,610 items found only in the last 5 years, a sign of interest and more thorough research and growing implications of this type of disorder in many branches of medicine including dentistry. OSAS is a respiratory sleep disorder that may occur in both adult and pediatric age, characterized by repeated episodes of complete (apnea or suspended respiratory activity for at least 10 seconds) or partial (hypoapnea) upper airway obstruction with signs and symptoms that can determine the onset of important systemic dysfunctions that cause a reduction of the quality of life, such as phasic reductions arterial oxygen saturation values and a possible increase of carbon dioxide in the blood, heart rate variations, sleep fragmentation and increased blood pressure values, both systemic and pulmonary. The dentist has an important role as a "diagnostic sentinel" for this syndrome, also providing therapeutic resolution through the application of specific intraoral medical devices.

**METHODS:** The dentist and especially the orthodontist, play an important role in the diagnostic and therapeutic because they have the ability to intercept early signs and symptoms of OSAS, thanks to a careful clinical and instrumental examination (CBCT and teleradiography of skull in lateral-lateral projection) especially polysomnography, the gold diagnostic standard and, at the same time, can evaluate if the patient has the indications for treatment with specific oral devices (Oral Appliances,OA). Two documented clinical cases, show how whether in adulthood or pediatric age, the dentist has the ability to intervene in a therapeutic way on mild and moderate OSAS with MAD (Mandibular Advancement Device) SILENSOR and RME (Rapid Maxillary Expander) respectively. These devices have the goal to maintain the upper airway patency during sleep through protrusion and advanced positioning of the jaw in the case of SILENSOR and with the transverse maxillary expansion by opening the midpalatal suture in the case of the RME.

**RESULTS:** Documented case reports demonstrate a reduc-



tion in the number of sleep apneas in post-orthodontic polysomnography. The pediatric patient (Apnea/Hypoapnea index 0,1/h, ODI 0,4/h, SpO<sub>2</sub> 94%) treated with RME presents the complete cessation of apneas: Apnea/Hypoapnea index AHI 0/h, ODI desaturation index 0/h and an increase of SpO<sub>2</sub> from 94% to 96%. The adult patient treated with SILENSOR showed an improvement in respiratory performance: the number of apneas decreased from 16/h to 13/h (Apnea/Hypoapnea index), ODI desaturation index from 21/h to 20/h and SpO<sub>2</sub> is increased from 91,3% to 91,7%. Being SILENSOR MAD a device that allows to obtain gradually increasing mandibular advancements, after checking the efficacy, the device was then modified in order to adapt it to the patient's therapeutic needs and obtain the optimal reduction/disappearance of the apneas.

**CONCLUSIONS:** OA therapy represents a treatment for OSAS that achieved a large growth during the last years and whose clinical efficacy has been demonstrated in the scientific literature. Therefore, especially for mild and moderate cases, it can be considered a valid alternative to traditional CPAP (Continuous Positive Airway Pressure) therapy, not accepted by many OSAS patients for its noise and physical size.

## Oral hygiene and management of orthodontic appliances: a survey among orthodontic patients and their parents

C. Cinquini<sup>1</sup>, E. Carli<sup>1</sup>, L. Scarpata<sup>1</sup>, G. Ceccanti<sup>2</sup>

<sup>1</sup>University of Pisa, Department of Surgical, Medical, Molecular and Critical Area Pathology, U.O. Odontostomatology and Oral Surgery, Pisa, Italy; <sup>2</sup>Private Practice, Pisa, Italy

**BACKGROUND:** Oral hygiene is an important factor controlled by the patient during orthodontic treatment, which can affect the quality and timing of the therapy. Fixed orthodontic appliances may cause a temporary deterioration of oral hygiene with a plaque augmentation, enamel demineralization and periodontal inflammation. During orthodontic treatment some urgencies can occur to the patients (loose or broken brackets, bands or wires, misplaced or poking wire, bracket or tie), causing pain, discomfort and anxiety in patients themselves and in their parents. We asked patient's parents how they felt about the orthodontic treatment of their children, their perception of ability to handle urgencies, to maintain a good oral hygiene and an adequate dietary behavior. Plaque Index score was used to assess the quality of oral hygiene of the patients.

**METHODS:** A questionnaire was given to the mother or the father of the patient undergoing orthodontic treatment during a control visit. Inclusion criteria were a fixed orthodontic treatment (multibrackets, rapid maxillary expander, space maintainers) started from 6 to 24 months before the examination in children aged between 5-18 y.o. All information about oral hygiene, alimentation and the management of the urgencies were given to the parents at the beginning of the treatment. The dentist recorded the Plaque Index score and explained briefly the aim of the questionnaire both to the parents and the patients and an informed consent were signed.

**RESULTS:** Fifty-two patients met the inclusion criteria and their parents completed the questionnaire, thirty-two males and twenty females. The mean age of the patients was fourteen years. Ten patients underwent rapid maxillary expansion, forty had a multibrackets treatment and two of them had a space maintainer, the mean time from the beginning of the

treatment was 12,2 months. Twenty-four parents stated their children had difficulty in maintaining a good oral hygiene, two were uncertain. The 85% of the patients used a manual toothbrush while 15% used an electric toothbrush. Twenty patients used in addition a mouthwash and fourteen used an interdental brush or dental floss. The 25% of the parents thought the needed more explanations on the maintaining of oral hygiene. Twenty-six of fifty-two parents thought they were capable of handling an urgency at home, ten stated they had called the dentist in that case, fourteen felt totally inadequate and needed more explanations. Thirty-four of them never had an urgency. Thirty parents thought they had sufficient information about the dietary changes during orthodontic treatment, the remaining twenty-two parents needed more explanations. Only two parents referred difficulties in the alimentation of the patients just at the beginning of the treatment. The mean PI score was 1,3.

**CONCLUSIONS:** The level of oral hygiene of the patients was quite good. The majority of the patients used a manual toothbrush, considered to be easier to use with orthodontic appliances. Fourteen parents felt inadequate to handle orthodontic urgencies and ten always call the dentist if urgencies happen. Diet changes did not represent a problem for the majority of patients. Even though some parents were capable of managing the fixed orthodontic device, oral hygiene and alimentation related, it may be useful to give more detailed explanations, in order to prevent anxiety and discomfort especially in the case of urgencies easily resolvable by the parents themselves.

## Treatment of class II malocclusions with Herbst miniscope appliance: aesthetical and profilometrical changes

D. Aiello, C. Malara, D. Dibetta, L. Barbara, S. Paduano

Università degli Studi "Magna Graecia" di Catanzaro, Catanzaro, Italy

**BACKGROUND:** The relationship between facial profile changes and orthodontic treatment is currently object of interest of many studies. In this study we evaluated the profile changes following orthopedic/orthodontic treatment with Herbst miniscope fixed appliance in subjects affected with class II malocclusion with mandibular retrusion.

**METHODS:** A total of 44 patients were included in this study. All the patients presented a skeletal Angle Class II malocclusion due to mandibular retrusion and a cervical maturation stage included between CS2 and CS3. Of these 44 patients 22 treated by using the Herbst appliance, 22 (14 boys, 8 girls; mean age 11.9 ± 1.3, HBT group) while 22 were followed for a 12 months observational period (14 boys, 8 girls; mean age 10.6 ± 1.3, CTR group). A cephalometric tracing was performed, by one single blinded operator, at the beginning of treatment (T0) and after 12 months of observation or after appliance removal (T1). A customised Pancherz's analysis focused on soft tissues cephalometric points was used. The variables assessed were the position of: Pronasale, Subnasale, soft tissue A point, Upper lip, Lower lip, Mandibular sulcus, Pogonion. Data were analysed by means of Shapiro-Wilk test to assess their distribution and between groups and within group differences were assessed by means paired and unpaired Student's T-Test.

**RESULTS:** In both group there was a significant advancement of soft tissue pogonion (HBT = 3.49 ± 3.03 mm, P < 0.001;

## ABSTRACT

CTR =  $2.24 \pm 2.94$  mm,  $P < 0.001$ ) but the difference between groups was not significant ( $P = 0.172$ ). On the contrary, both group had a significant advancement of the mandibular sulcus (HBT =  $3.66 \pm 2.80$  mm,  $P < 0.001$ ; CTR =  $1.17 \pm 2.25$  mm,  $P < 0.001$ ) and a lower lip protrusion (HBT =  $3.45 \pm 2.51$  mm,  $P < 0.001$ ; CTR =  $1.66 \pm 2.74$  mm,  $P = 0.008$ ) but in both cases the HBT group showed a statistically significant increase in sulcus protrusion ( $P = 0.002$ ) and lower lip protrusion ( $P = 0.029$ ). Regarding the upper jaw, no one of the variable assessed, position of the Subnasale, position of the soft tissue A point and position of the upper lip presented statistically significant differences between the two groups, but all increase due to the growth.

**CONCLUSIONS:** The Herbst appliance did not reduce the soft tissue growth of the upper jaw, while advanced the position of the lower lip and of the mandibular sulcus.

### Evaluation of facial profile attractiveness of growing class II division 1 patients after orthodontic treatment with functional appliances

D. Dibetta, A. Dieni, F. Rende, L. Barbara, S. Paduano

*Università degli Studi "Magna Graecia" di Catanzaro, Catanzaro, Italy*

**BACKGROUND:** The most important goal of orthodontic treatment is to improve facial appearance. Indeed, dental and facial aesthetics have a key role for patients seeking an orthodontic consultation. 1 Sagittal skeletal malocclusions, such as Class II and Class III, are often characterized by a convex or concave facial profile, which significantly affect a patient's facial appearance. 2 In almost 80% of the cases, Class II skeletal malocclusions are due to a mandibular retrusion associated with a normal, protruded or retruded maxilla. This configuration determines a convex profile with a reduced chin projection. 3 The aim of this study is to determine if orthodontic treatment with functional appliances improves the facial profile attractiveness of subjects with Class II Division 1 malocclusion. The null hypotheses is that the orthodontic treatment with functional appliances did not achieve any significant improvement in facial profile attractiveness in Class II Division 1 patients.

**METHODS:** Twenty patients (CLII) with Angle Class II Division 1 malocclusion (mean $\pm$ SD=11.1 $\pm$ 0.6 years) treated with fixed or removable functional appliances, and 20 controls (CLI) with Angle Class I malocclusion (11.7 $\pm$ 0.8 years) were included in the study. Profile pictures taken before (CLII T1 and CLI) and after treatment (CLII T2) were transformed into black silhouettes. Three panels of observers including 30 orthodontists (39.0 $\pm$ 10.1 years), 30 dentists (40.0 $\pm$ 9.7 years) and 30 laypeople (39.0 $\pm$ 9.2 years) evaluated each patient's profile attractiveness, using a visual analog scale (VAS 100 mm). Furthermore, the positions of upper lip, lower lip and chin before and after treatment, was judged using a 3-point Likert scale. Data were analyzed by means of a two-way analysis of variance and a chisquared test ( $\alpha < .05$ ).

**RESULTS:** The CLII T2 silhouettes showed the most attractive profiles (67.8 $\pm$ 5.9 mm) as compared to CLI (59.2 $\pm$ 4.4 mm) and CLII T1 profiles (37.3 $\pm$ 4.5 mm,  $P < 0.001$ ). Laypeople rated the profiles of each group as more attractive than orthodontists and dentists ( $P < 0.001$ ). CLII T2 silhouettes showed protruded upper lips (52.7%) and retruded lower lips (71.3%) and chins (72%). CLII T2 silhouettes after treatment

were mostly judged to present with a normal position of the upper lip (69.5%), lower lip (74.9%), and chin (72.3%).

#### CONCLUSIONS:

— Children with skeletal Class II malocclusion showed a less attractive profile than children with skeletal Class I and exhibited a more retruded lower lip and chin, and a protruded upper lip.

— The functional treatment of skeletal Class II malocclusion in children improved the profile attractiveness, and they were judged, on average, as more attractive than skeletal Class I children. Hence, functional treatment is suggested in patients with a skeletal Class II malocclusion to improve the facial appearance.

— Finally, laypeople always gave the statistically significant highest scores for each group of silhouettes.

### The prevalence of oral pathologies and the association between malocclusion and TMD in Calabrian population aged 9 - 13: epidemiological study

D. Aiello, A. Dieni, C. Malara, F. Rende, S. Paduano

*Università degli Studi "Magna Graecia" di Catanzaro, Catanzaro, Italy*

**BACKGROUND:** To describe the actual oral health status of primary school children and adolescents in the province of Catanzaro (Southern Italy), in order to facilitate further preventive activities.

**METHODS:** The sample was collected from 31 primary schools, all located in the province of Catanzaro, Southern Italy. 1086 children (578 males and 508 females) enrolled in the third, fourth and fifth grade of these schools were examined, aged 9-13. Children were asked if they had periodical examinations from dentists. Dental caries status was assessed for the primary and permanent dentitions using Klein's dental caries index, which sums the number of decayed (d/D), missing (m/M), and filled (f/F) teeth (t/T). The Community Periodontal Index (CPI)<sup>6</sup> was used to assess periodontal condition. Angle dental class, overjet, overbite, crossbite were recorded for orthodontic evaluation. Opening path of the mandible, click presence and pain of the TMJ were considered for gnatologic assessment. Furthermore, presence of dental agenesis, teeth in ankylosis and supranumerary teeth was recorded. Data analysis: Descriptive statistics mean and standard deviation (SD) for continuous data, and frequencies and percentages for categorical and ordinal data were calculated. A standard statistical software package (SPSS version 22.0, SPSS IBM, New York, NY) was used for statistical analysis. **RESULTS:** Among the 1086 children (mean age 10.3 $\pm$ 0.72yrs), 84.6% had periodic check-ups from their dentists. Considering plaque-related pathologies, 41.6% had active dental caries in permanent teeth (mean DMFT=1.25 $\pm$ 1.75, DMFS=1.31 $\pm$ 1.94), 40.3% in deciduous teeth (mean dmft=1.1 $\pm$ 1.74, dmfs=1.38 $\pm$ 2.65), and 54.8% experienced periodontal problems, revealed from the CPI. Analyzing data from orthodontic examinations, a typical pattern of malocclusions was noticed: 54.3% of the patients had Angle Class I, 40.1% Class II and 5.5% Class III. 50.3% had a pathological overjet, 57.6% an overbite minor than 0mm or major than 3mm, 13.2% of them had crossbite and only 2.8% was found with agenesis. Data from TMJ evaluations showed 13.8% of children had a deviated opening pattern,

and some of them experienced TMJ clicking and pain, 5.7 and 2.2%, respectively. DMFT greater than 0 was associated with positive CPI ( $p=0.042$ ,  $\beta=0.73$ ), along with dmft ( $p<0.001$ ,  $\beta=0.222$ ) and dmfs ( $p<0.001$ ,  $\beta=0.198$ ). An interesting greater susceptibility to periodontal disease was found in males, compared to females (OR=1.30, 95% CI= 1.19-1.66). On the other hand, lack of periodic examinations was not related to higher decay prevalence.

**CONCLUSIONS:** This study found a noticeable prevalence of oral diseases among children of Southern Italy, considering the DMF and CPI indices. Besides, the association between malocclusions and TMDs, periodontal disease and dental decay was investigated, reporting a correlation between a decreased overbite and TMJ pain ( $\beta=-0.089$ ,  $p=0.004$ ). The Community Periodontal Index was related to DMFT ( $p=0.042$ ,  $\beta=0.73$ ), dmft ( $p<0.001$ ,  $\beta=0.222$ ) and dmfs ( $p<0.001$ ,  $\beta=0.198$ ); an increased susceptibility to periodontal disease was found in males, compared to females (OR=1.30, 95% CI= 1.19-1.66). Given these conclusions, a higher number of preventive interventions are recommended in the area. Specifically, there is still a certain amount of children not having periodical examinations from their dentists, thus not being counseled to meet the major preventive measures.

## Invisalign® and conventional fixed orthodontics. Comparison at the periodontal, aesthetic and comfort levels

M. Maschio, A. Fama, F. Parisi

**BACKGROUND:** The objective of this work is to perform a bibliographic review that allows comparing the fixed multibrackets orthodontic appliance with the removable Invisalign® system from the point of view of periodontal health, aesthetic perceptions of patients, pain and comfort generated by the two systems.

**METHODS:** A literature search was conducted through the following electronic databases: Pubmed and Medline, using combinations of the following keywords: "Clear aligners", "Invisalign®", "Fixed Orthodontic", "Oral Hygiene", "Plaque index", "Quality of life", "Aesthetics". The inclusion criteria were: Articles between 2007 and 2017 were selected. Using the "limits" option, only articles referring to "Humans" published in English, Spanish and Italian were considered. The following types of studies were included in this review: case-reports, case-series and reviews. The electronic search strategy produced 499 starting articles. Successively, duplicates and articles considered as non-relevant on the basis of abstract, title and study design, were eliminated. Only 28 articles met the inclusion criteria.

**RESULTS:** In all the investigations, the following periodontal indices were analyzed: plaque index (PI), gingival index (IG), periodontal probing (PS) and bleeding on probing (BOP). For each parameter, a significant improvement was obtained during the treatment with Invisalign® system in comparison with the fixed orthodontics appliance. This is mainly due to the difficulty of maintaining a correct oral hygiene in fixed orthodontic devices, producing an evident accumulation of periodontopathogenic bacteria. From an aesthetic point of view, the articles show that adult patients prefer the Invisalign® system over traditional brackets, both lingual and vestibular ceramics. Children prefer brackets with colored elastics. Teenagers well accept both of them. Demineralization and white spot lesions

have a high rate of rapid onset with multibrackets fixed orthodontic appliances. No articles have been found which relate Invisalign® system to the appearance of white spot lesions. Finally, the analyzed articles show a lower perception of pain and anguish in patients treated with Invisalign compared to those treated with braces, especially in the first three days of treatment.

**CONCLUSIONS:** Based on the results of this study, it is possible to conclude that Invisalign® devices give better index in terms of periodontal health, aesthetic and comfort. On the other hand, the planning and analysis of each case is indispensable for the choice of treatment to be performed. A determining factor in the choice of therapy is patient collaboration and disposition.

## Effects of rapid maxillary expansion on alveolar bone assessed with computed tomography: a systematic review and meta-analysis

G. Messina, P. Spinuzza, A.M. Bellocchio, E. Gatto, L. Rustico, P. Leonardo, S. Costa, M. Portelli, R. Nucera, A. Militi

*Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Section of Orthodontics, School of Dentistry, University of Messina, Messina, Italy*

**BACKGROUND:** The aim of this study is to evaluate the effects of rapid maxillary expansion on alveolar bone in growing patients assessed with Computed Tomography.

**METHODS:** This systematic review and meta-analysis was conducted according to the guidelines of the Cochrane Handbook for Systematic Reviews of Interventions (version 5.1.0) and is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis statement. Nineteen electronic databases were searched without languages restrictions up to October 2017. Clinical trials selected in this systematic review were those that include growing subjects with transversal maxillary deficiency treated with RME and evaluating the change of alveolar bone width and thickness on buccal and palatal side before and after rapid maxillary expansion by means of one of the following 3D imaging CT techniques: CBCT, spiral CT and low-dose CT. Two authors independently executed study selection, data extraction, and risk of bias assessment. To evaluate the effects on alveolar bone, were taken into account studies which consider alveolar bone width and thickness in the first molar maxillary area. According to the period of time passed between the first and second observation the included studies were divided into two groups: after expansion group (2-6 weeks, average of 3 weeks); after retention group (3-6 months, average of 5 months).

**RESULTS:** According to inclusion criteria 21 studies were selected. The considered studies presented prospective and retrospective design. The ages of the patients varied across the studies with a mean age of 12 years. The effect of rapid maxillary expansion on alveolar bone width in the first molar region was an increment of 3.89 mm (95% CI, 2.94 mm to 4.83 mm) on buccal side and 3.08 mm (95% CI, 1.95 mm to 4.20 mm) on palatal side after expansion; the same outcome was 3.15 mm (95% CI, 2.07 mm to 4.23 mm) on buccal side and 3.31 mm (95% CI, 2.69 to 3.93 mm) on palatal side after retention period. The effect on alveolar bone thickness in the first molar region was -0.54 mm (95% CI, -0.98 mm to -0.09 mm) on buccal side and 0.37 mm (95% CI, 0.04 mm to 0.69



## ABSTRACT

mm) on palatal side after expansion; the same outcome was -0.66 mm (95% CI, -0.98 mm to -0.34 mm) on buccal side and 0.68 mm (95% CI, -0.23 mm to 1.59 mm) on palatal side after retention period.

**CONCLUSIONS:** This systematic review with meta-analysis evaluates, for the first time in the orthodontic literature, the effects of rapid maxillary expansion on alveolar bone at different treatment stages by means of computed tomography. The results indicate that the alveolar bone width increment gained after expansion on buccal side shows a reduction (-19%) after 3-6 months of retention period, however the increment on palatal side shows a little increase (+7%) after 3-6 months of retention period. The results indicate also that the alveolar bone thickness shows a reduction on buccal side (-0.66 mm) and an increment on palatal side (+0.68 mm) after 3-6 months of retention period.

### Sagittal and vertical facial growth and attainment of circumpubertal middle phalanx maturation (MPM) stages: a multiple regression study

M. Mason, D. Sverko, B. Dal Borgo, G. Perinetti, L. Contardo  
*Department of Medical, Surgical and Health Sciences, School of Dentistry, University of Trieste, Trieste, Italy*

**BACKGROUND:** Orthodontic treatment for most of the skeletal malocclusions have specific optimal timing according to the skeletal maturation phases. The knowledge of whether attainment of a specific maturation phase is associated with the different sagittal and vertical craniofacial growth pattern then becomes of clinical relevance. Therefore, using multivariate models, this cross-sectional study evaluated whether sagittal and vertical craniofacial growth pattern, has an association with the age of attainment of the circumpubertal skeletal maturation phases according to the MPM method.

**METHODS:** A total of 300 subjects (170 females and 130 males) were included in the study (mean age, 12.0 ± 1.5 years; range, 8.3-15.6 years). They were equally distributed in the circumpubertal middle phalanx maturation (MPM) stages 2, 3 and 4. Subsequently, multiple regression models were run for each MPM stage group to assess the significance of the association of cephalometric parameters (SNA, SNB, ANB, PP/MP, CoGoMe, SN/MP and NSBa angles) with age of attainment of the corresponding MPM stage (in months). A dedicated X-ray machine (KODAK 8000C; Eastman Kodak Company) was employed for the recording of lateral head cephalograms. An experienced orthodontist assisted by a second operator screened the cases for inclusion. A further experienced orthodontist was involved to ensure correct enrollment and, in case of disagreement, discussion was made until satisfaction of both operators. A customized digitization regimen and analysis with the cephalometric software Viewbox was used for all cephalograms examined in this study. The SPSS software version 20 was used to perform the subsequent data analysis. After testing the normality of the data with the Shapiro-Wilk test and Q-Q normality plots of the residuals, and the equality of variance among the datasets using a Levene test, parametric methods were used for data analysis. Moreover, within each MPM stage group, the association of each of the craniofacial parameters (explanatory variables) with the chronological age in months (dependent variable) were investigated by means of multiple linear regressions

**RESULTS:** Only sex yielded significant associations, with females having an anticipated attainment of each of the circumpubertal MPM stage.

**CONCLUSIONS:** Only a previous study investigated on possible associations between vertical craniofacial growth and timing of attainment of skeletal maturation phases. Through multivariate models, the present study showed no significant correlations of the different sagittal and vertical cephalometric parameters with the age of attainment of each of the circumpubertal MPM stages 2, 3 and 4. Moreover, the MPM stages 2 and 3 have been associated with the onset and maximum mandibular growth peak, respectively, in most of the subjects. The only significant association was with sex, where females had anticipated attainment of each MPM stage as compared to males.

### Does asymmetry in the stomatognathic system correlate with body posture impairments? A systematic review

B. Dal Borgo, G. Perinetti, L. Contardo

*Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy*

**BACKGROUND:** The knowledge of any potential effect of the stomatognathic system on body posture would have major clinical implications in the management of patients with malocclusion. Therefore, the present systematic review was aimed at the evaluation of potential correlations between anatomical and functional asymmetry in the stomatognathic system (without signs and symptoms of TMDs) and body posture impairments.

**METHODS:** Articles were identified through a literature survey carried out through the Medline, SCOPUS, LILACS and SciELO databases, the Cochrane Library and a manual search. Experimental studies, in which any treatment for the asymmetry was included, and observational studies were considered, irrespective of the method used to record body posture. Type of asymmetry, treatment and/or recording conditions, follow-up, postural examinations, main results and clinical implication were extracted, and risk of bias was assessed.

**RESULTS:** Only 11 (including one randomized clinical trial) out of 1,056 screened studies were included according to the inclusion and exclusion criteria. Most of the studies were focused on the posterior monolateral crossbite or other occlusal traits such as asymmetrical dental Class. The only RCT was focused on the body posture effects of the treatment of monolateral crossbite by slow maxillary expansion. Only one study included subjects with major skeletal asymmetries irrespective of the presence of a crossbite. Regarding the posturographic recording, all the studies recorded body posture exclusively under static conditions. According to the risk of bias analysis, 6 studies (including the only RCT) were judged to have a high risk of bias. Regarding the other studies, only in 5 investigations, the risk of bias was judged to be medium.

In 8 studies no significant or very minimal correlations were seen between asymmetry in the stomatognathic system and body posture impairment. Only 3 studies, all with a high risk of bias and without follow-up, reported significant correlations between the asymmetry in the stomatognathic system and body posture impairments.

**CONCLUSIONS:** The quality of the existing study reports is low and further investigations with qualitatively better study designs are necessary. Using current methodology, asymmetry in the stomatognathic system (in the absence of TMDs) do not appear to be correlated to body posture impairments at a clinically relevant level. According to the limited available evidence, prevention or treatment of the body posture imbalance may not be included at present among the indications for the treatment of the asymmetry in the stomatognathic system.

### Treatment of post orthodontic recessions: the bilaminar technique

A. de Sanctis<sup>1</sup>, F. Giugno<sup>1</sup>, M. Martinelli<sup>1</sup>, L. Di Vece<sup>1</sup>, T. Doldo<sup>2</sup>

<sup>1</sup>University of Siena, Siena, Italy; <sup>2</sup>Department of Medical Biotechnologies, University of Siena Siena, Italy

**BACKGROUND:** The aesthetic improvement of a patient's smile is an everyday request and most of the time it is due to the evidential presence of one or more gingival recession when smiling. Many factors are related to its development including orthodontic movement beyond limits of the osseous. Today we can utilize several surgical techniques that yield very good results both in terms of root coverage and aesthetic improvement, obviously an ideal technique should possibly solve the problem of gingival lower recession. This two case report shows how is possible to develop gingival recessions especially in inferior incisors post orthodontic therapy and how to solve the problem both in terms of aesthetics and periodontal health through the bilaminar technique. The clinical re-evaluation was made 1 year after surgery.

**METHODS:** Surgical methods were proposed by recruiting two healthy adults who made a fixed orthodontic treatment for a severe dental crowding and have completed orthodontic treatment with a gingival recession defect in the lower incisors. The cause of movement of the incisors out of the osseous envelope of the alveolar process may be associated with a higher tendency for developing gingival recessions and a thin gingival tissue. In the first patient of 28 years old the gingival recession was on the 4.1-3.1, the dental elements were vital and there were no signs of mobility, but only tooth hypersensitivity. In the second patient of 24 years old the gingival recession was on the 3.1, also here the dental elements were vital with no signs of mobility, but hypersensitivity. All recessions fall into Miller class I or II. Gingival recession coverage, in both cases, was performed using mucogingival surgery with bilaminar technique. The bilaminar surgical approach shown here consisted of a connective tissue graft covered by a coronally advanced pedicle flap. The connective tissue graft was placed inside the root concavity to compensate the abrasion space and to prevent soft tissue flap collapse internally. The graft, by acting as a "biologic filler" or space maintainer inside the concave abrasion area, stabilized the covering flap and helped restore a correct tooth emergence profile.

**RESULTS:** One year after surgery, an average of 97% root coverage was achieved. The amount of recession coverage was stable as of the 3rd month. From day 1, pain and bleeding decreased over time, however, there were peaks on days 2 and 3 for swelling and bruising, respectively, followed by a subsequent decrease in both. Post-surgical complications were clinically evaluated and resulted negative. The size of

the recession was also re-evaluated after 12 months, with positive results.

**CONCLUSIONS:** The results achieved regarding the above mentioned cases demonstrated that the bilaminar technique was a highly effective procedure for the treatment of gingival recession caused by orthodontic therapy, therefore a better result in terms of an aesthetic outcome can be obtained. Recession coverage achieved at 3 months remained stable in the 1-year follow-up period.

### 3D geometric morphometric analysis of the palatal morphology in young subjects with marfan syndrome

N. Venza, D. Palmacci, E. Cretella Lombardo, V. Paoloni

Department of Orthodontics, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy

**BACKGROUND:** To evaluate the variability of palatal shape in a group of Marfan subjects (MG) compared with a control group (CG) through geometric morphometric analysis.

**METHODS:** 5 subjects with a clinical and genetic diagnosis of Marfan Syndrome, (MG, mean age  $4.8 \pm 0.4$  years) were recruited from the Centre for Rare Disease, Marfan Clinic of Tor Vergata Hospital and evaluated in the Department of Orthodontics of the same University. After the selection this MG was compared with a control group of 5 non-syndromic subjects (CG, mean age  $4.7 \pm 0.6$  years). The inclusion criteria for both MG and CG were: presence of deciduous dentition, presence of bilateral/unilateral cross-bite, Caucasian ancestry and CS1 stage of cervical vertebral maturation as assessed on lateral cephalograms, good quality of records. Exclusion criteria for both MG and CG were: presence of sucking habits, previous orthodontic treatment, cleft lip and/or palate, other genetic diseases. For each subject dental casts were taken and scanned using an extraoral scanner with a manufacturer's reported accuracy  $<20 \mu\text{m}$ . All models were exported in a Standard Tessellation Language format (.stl digital file). To study the shape of the palate at any point of the surface, 3D geometric morphometrics (GMM) analysis was used. A template for data set/collection of homologous landmarks describing a palate was created with Viewbox 4 (dHAL software, Kifissia, Greece). On each digital cast three curves were drawn and a total of 239 landmarks were digitized. Procrustes superimposition and principal components analysis were used to reveal the main pattern of the shape variation. In order to determine the reliability of the method, all the casts were re-digitized by the same operator ten days after the first digitization.

**RESULTS:** Although both groups presented bilateral or unilateral cross bite, an important difference between the palate's shape of MG and CG was found the most significant morphological variability ( $PC1 = 61.2\%$  of total shape variability), describes changes in all the three dimensions. MG mainly presents alteration of the palatal vault in the vertical plane and in the transverse dimension of the posterior region. **CONCLUSIONS:** Comparing with a control group of non-syndromic subjects with unilateral/bilateral cross-bite, the MG have a specific palatal morphology with several alterations in all dimensions of the space also in deciduous dentition. Further investigations on more numerous samples are necessary for a complete comprehension of palatal morphology in Marfan syndrome.

## ABSTRACT

## Skeletal, dento-alveolar and aesthetic effects of ba-RME and facial mask treatment on a growing III class patient with maxillary hypoplasia, following Alt-RAMEC protocol: a case report

P. Bursi<sup>1</sup>, E. Sartori<sup>1</sup>, E. Simeoni<sup>1</sup>, L. Tomasi<sup>1</sup>, A. Compri<sup>2</sup>, D. Bertossi<sup>3</sup>

<sup>1</sup>Dentistry, University of Verona, Verona, Italy; <sup>2</sup>Orthodontics and Dentistry, University of Verona, Verona, Italy; <sup>3</sup>Maxillo-Facial Surgery, University of Verona, Verona, Italy

**BACKGROUND:** The purpose of this study is to analyse the maxillo-facial effects of the facial mask therapy associated with bone-anchored miniscrews, during and after Alt-RAMEC protocol in a growing male child with maxilla hypoplasia. Skeletal, dental and soft tissue changes have been considered. **METHODS:** A 8-years-old patient came to observation at the department of Orthodontics of the University of Verona presenting a skeletal III class caused by a maxillary retrusion. Firstly, clinical examination (with Arnett's aesthetics analysis), photographs, ortopantomograph and telerradiograph in latero-lateral were required in order to elaborate a preliminary study to the end of producing an accurate treatment plan. Cephalometric analysis was conducted using QuickCeph® software. Considering the clinical and cephalometric situation, a postero-anterior traction of the facial mid third using the facial mask was suggested. In addition, an exclusive bone-anchored Rapid Maxillary Expansor (ba-RME) in accordance of Alt-RAMEC protocol (alternate rapid maxillary expansions and constrictions) was proposed, in order to open the circumaxillary sutures and enhance protraction. After collecting the consent to treatment from the patient's mother, selective slicings on 5.4 and 6.4 were performed to create the groves that hold the buccal wires. Since the miniscrews are positioned according to EasyDriver® technique, a CBCT of the palate has been required and polyvinyl siloxane impressions were recorded to verify the feasibility of the treatment planned. In May 2017 the miniscrews and ba-RME were applied and after two weeks the patient started 8 weeks of Alt-RAMEC Protocol and 9 months of maxillary protraction. 400g force per side was applied to the facemask. Total treatment time was 9 months. Photographic analysis has been taken every 2 months from the baseline.

**RESULTS:** The miniscrews withstood the orthopaedic forces exerted during treatment (both expansion-constriction forces and posterior-anterior traction). Cephalometric findings show that maxilla moved anteriorly of 2,5 mm and rotate 1,6° counter-clock wise, and maxillary incisors rotate 1° in vestibular direction. The mandible rotated 2,8° clock-wise, moved backward 1,5 mm and downward 2 mm. ANB and Wits improved of 3,4° and 4,89 mm. Aesthetics improvements following Arnett's analysis were achieved: the cheekbone contour changed from "flat" to "soft"; the upper lip prominence changed from "retruded" to "normal" and the upper lip support changed from "weak" to "normal"; the lower lip prominence and the soft tissue pogonion changed both from "retruded" to "normal". Both the patient and his parent's aesthetic expectation were fulfilled. Further clinical and radiographical recalls will objectify if long term maintainance will be attained.

**CONCLUSIONS:** Facial mask treatment combined with Alt-RAMEC protocol resulted effective in this patient in terms of skeletal, dental and soft tissues improvements. It would be significant to extent this combined approach to a wider sample in order to evaluate the reproducibility of the results obtained.

## Evaluation of new generation orthodontic devices: attractiveness and economical value

A. Sedran<sup>1</sup>, G. Rossini<sup>2</sup>, A. Cortona<sup>1</sup>, M.G. Piancino<sup>3</sup>, T. Castrolforio<sup>4</sup>, A. Deregibus<sup>3</sup>

Resident, Orthodontic specialist; Orthodontic specialist; Aggregate Professor, University of Turin, Department of Surgical sciences CIR - Dental School; Post-graduate Specialization in Orthodontic

**BACKGROUND:** The aim of this study is to identify significant differences regarding laypeople's perception of attractiveness, acceptability and economical value of orthodontic appliances.

**METHODS:** A photo master of the smile was obtained from a previously selected model. The photo was taken with a Nikon D32 camera (Macro 105mm lens, ring flash) and imported in RAW format in a photo editing program (Photoshop, Adobe Inc.). 6 different orthodontic devices were applied using a photo-editor software on the smile photograph:

- Brackets Jupiter (TNB Dental, Turin, Italy) with aesthetic Teflon-coated wire (J)
- Orthodontic aligners (ALL)
- Self-ligating brackets with metal wire (SLB)
- Self-ligating ceramic stirrups with aesthetic Teflon-coated wire (SLEB)
- Metal brackets with metal wire (B)
- Ceramic brackets with metal wire (EB)

Evaluation template with questions regarding attractiveness, acceptability and economical value of orthodontic appliances have been submitted to 30 randomly selected adults who have never received any kind of professional dental education. The assessment sheet consists of a 100mm VAS scale and 3 questions regarding the willingness to subject themselves and their children to the treatment with the equipment shown, as well as an assessment of the additional economic contribution that observers would be willing to pay for that device if they want to undergo orthodontic treatment. Each image was submitted to the observers twice in non-consecutive order, for a total of 12 evaluation sheets obtained for each observer. After verifying the normal distribution of measurements, a one-way ANOVA test was used for paired samples and inter-group comparisons were performed for all equipment.

**RESULTS:** For all analyzed features, the flowing hierarchy was obtained: ALL > J > SLEB > SLB > EB > B. Significant differences (p<0.05) were revealed regarding attractiveness and perceived economical value. Metal components influenced negatively the scoring for all variables.

**CONCLUSIONS:** Analysis of the opinions of possible patients regarding the perception of orthodontic equipment has provided statistically and clinically significant results. The lack of aesthetics of the metal parts has influenced all the remaining variables analyzed, going also to affect the evaluation of the economic value. The additional economic contribution according to adults for aesthetic equipment can be up to twice that for standard metal brackets. Limitations of this study are the non-stratification of groups based on socio-cultural conditions and income, as well as the fact that it is only a sample of adults and not teenagers / children, who have shown different opinions about orthodontic devices. Esthetics of orthodontic appliances is significantly related to attractiveness, acceptability and perceived economical value from adult laypeople's point of view.



## Early functional treatment in skeletal class II non growing patients: a comparative study of two appliances

F. Barra, A. Sedran, F. Spadaro, T. Castroflorio, M.G. Piacino, A. Deregibus

University of Turin, Department of Surgical Sciences, C.I.R - Dental School, Turin, Italy

**BACKGROUND:** The aim of this retrospective study was to compare the effectiveness of two orthodontic interceptive appliances in growing patients at CVM2 stage with Skeletal Class II malocclusion.

**METHODS:** 80 lateral cephalograms were obtained from 40 skeletal Class II malocclusion growing subjects at the beginning (T0) and at the end (T1) of their functional orthodontic treatment to assess skeletal and dental changes. 20 patients (Group 1) underwent EF class II (OrthoPlus, Igny, France) and for 20 subjects (Group 2) Functional Generating Bite (FGB) was adopted; 40 lateral cephalograms were obtained from 20 untreated subjects as control group (Group 3). The differences between groups before and after treatment were compared with the mixed 2-way analysis of variance (ANOVA) with repeated measurements. Skeletal measurements: ANB Angle, A:Po, WITS Dental measurements:  $11^\circ$ SpP,  $41^\circ$ GoGn,  $11^\circ$ 41

**RESULTS:** Statistically significant differences between the two appliances were shown both for skeletal and dental variables; Wits index values for Group 1 were significantly improved with respect to Group 2 ( $P=0,02$ ) at the end of the treatment, as well as upper incisors proclination, with an average decrease of  $11^\circ$ SpP of  $9,33^\circ \pm 5^\circ$  ( $P=0,004$ )

**CONCLUSIONS:** Skeletal class II growing patients seem to partially benefit of early functional treatment, showing a significant decrease of overjet and a Wits index improvement with EF device.

### References

1. Pavlow, S.S., McGorray, S.P., Taylor, M.G., Dolce, C., King, G.J. And Wheeler, T.T. (2008) Effect of early treatment on stability of occlusion in patients with Class II malocclusion. *American Journal of Orthodontics and Dentofacial Orthopedics*, 133, 235–244.
2. Tausche, E., Luck, O. and Harzer, W. (2004) Prevalence of malocclusions in the early mixed dentition and orthodontic treatment need. *European Journal of Orthodontics*, 26, 237–244.
3. Keski-Nisula, K., Lehto, R., Lusa, V., Keski-Nisula, L. and V arrela, J. (2003) Occurrence of malocclusion and need of orthodontic treatment in early mixed dentition. *American Journal of Orthodontics and Dentofacial Orthopedics*, 124, 631–638.

### Analysis with finite elements method of upper incisor root torque with clear aligners

A. Cortona, M. Rolfo, E. Grifalconi, P.A. Deregibus, T. Castroflorio, M.G. Piacino

Division of Orthodontics, Department of Surgical Sciences, C.I.R. Dental School, University of Turin, Turin, Italy

**BACKGROUND:** Clear aligners treatment is spreading in orthodontic world and it is cited to be safe and efficient, but only few papers investigated the predictability and the possible negative periodontal effects of orthodontic movement with clear aligners. Two reviews carried out by Univeristy of Turin in 2015, reported respectively only 11 and 5 papers

within their inclusion criteria. However, despite the low number of good studies on the topic, the overall quality of the included papers was quite good and thus based on those reviews it is possible to conclude that Invisalign aligners are quite effective in controlling root movement.

The force system and displacement created by plastic aligners on the whole upper arch, during palatal root movement of an upper central incisor, was evaluated with Finite Element Analysis (FEA), considering several configurations of aligner activation and attachments in order to find the best approach. **METHODS:** A CAD model of a complete upper arch and periodontal tissues were imported in a FEA software. Two different aligner activation were considered: at the centre of the clinical crown and at the incisal edge. Aligner activation was set at 1 degree of palatal root torque on right upper central incisor. Different configurations of attachments and pressure areas were evaluated.

**RESULTS:** Aligner activation around the centre of the clinical crown resulted more efficient than the one around incisal edge. All simulations resulted in better control of posterior and anterior teeth when posterior attachments with one or two pressure areas were adopted. Furthermore, as previously described in similar FE studies as well as in recent trials on tooth movement with aligners, auxiliaries are mandatory to improve the expression rate of prescribed tooth movement. The present study confirms this assumption, stating that the best combination is the one including posterior attachments (from second molar to canine) and single or double pressure areas on the tooth crown. The adoption of a second pressure area on the incisor incisal-lingual region together with attachments decreased the efficiency of tooth movement but showed the highest generated torquing moment.

To perform efficiently root torque movement with clear aligners, a moment-to-force ratio between 6.5 and 7.5 was indicated. Maximum values of pressure and tension areas of periodontal ligament are pointed out at the apex of the upper right central incisor.

**CONCLUSIONS:** Clear orthodontic aligners associated with auxiliaries, such as attachments and altered geometries, can produce tooth root movement. The most efficient configuration produces 0.1 mm of apex displacement for a 1° activation.

### A comparison of the effects of fan-type rapid maxillary expansion and rapid maxillary expansion on dentofacial structures in early mixed dentition. A case series

L. Di Tonno, M.G. Paolone, E. Staderini, F. Guglielmi, A. Camodeca, P. Gallenzi

Department of Surgical Sciences for Head and Neck Diseases, School of Dentistry, Catholic University of Sacred Heart, Rome, Italy

**BACKGROUND:** The aim of this study is to test the hypothesis that there is a difference between the effects of fan-type rapid (FRME) and rapid maxillary expansion (banded RME) on dentofacial structures in early mixed dentition.

**METHODS:** The FRME group had an anterior constricted maxillary width with a normal intermolar width, while the banded RME group had bilateral constricted maxillary width. The FRME group consisted of 8 patients and the banded RME group consisted of 10 patients. Lateral and frontal cephalometric radiographs and dental casts were taken before and after expansion and 3 months after completing treatment for

## ABSTRACT

each patient. The screws were activated twice a day in the first week to overcome the resistance of the sutures and then once a day after suture opening. Patients met the following inclusion criteria: no systemic diseases; no history of orthodontic treatment; no pathologic periodontal status; mixed dentition; and erupted first permanent molars.

**RESULTS:** The maxilla moved downward and forward in both groups. The nasal cavity and maxillary width were expanded more in the banded RME group and there were only a few relapses in this group during the retention period. There was significant labial tipping of the upper incisors in the FRME expansion group. The expansion of intercanine width was similar in both groups, but the expansion of intermolar width was significantly greater in the banded RME group.

**CONCLUSIONS:** The transversal deficiency problems of all subjects were corrected. There was a difference between the effects of FRME and banded RME on dentofacial structures in early mixed dentition.

## References

1. Da Silva Filho OG, Boas MC, Capelozza Filho L. Rapid maxillary expansion in the primary and mixed dentitions: a cephalometric evaluation. *Am J Orthod Dentofacial Orthop.* 1991;100:171-179.
2. Kuroi J, Berglund L. Longitudinal study and cost-benefit analysis of the effect of early treatment of posterior crossbites in the primary dentition. *Eur J Orthod.* 1992;14:173-179.
3. Sandikcioglu M, Hazar S. Skeletal and dental changes after maxillary expansion in the mixed dentition. *Am J Orthod Dentofacial Orthop.* 1997;111:321-327.
4. Sari Z, Uysal T, Usumez S, Basciftci FA. Rapid maxillary expansion. Is it better in the mixed or in the permanent dentition? *Angle Orthod.* 2003;73:654-661.
5. Doruk C, Bicakci AA, Basciftci FA, Agar U, Babacan H. A comparison of the effects of rapid maxillary expansion and fan-type rapid maxillary expansion on dentofacial structures. *Angle Orthod.* 2004;74:184-194.

### Clear aligners' effects on aesthetics: evaluation of facial wrinkles

A. Camodeca, S. Meuli, F. Guglielmi, E. Staderini, L. Di Tonno, P. Gallenzi

*Department of Surgical Sciences for Head and Neck Diseases, School of Dentistry, Catholic University of Sacred Heart, Rome, Italy*

**BACKGROUND:** The aim of this retrospective cohort study is to evaluate the facial aesthetic effects of orthodontic treatment performed with clear aligners and compare it with an untreated control group. Evaluation will be focused on lower third facial ageing in adult patients through the use of the assessment of the severity of wrinkles (WSRS) at the beginning (T0) and at the end (T1) of the study period.

**METHODS:** The examined sample consists of subjects enrolled in a retrospective observational study at the "Agostino Gemelli" dental clinic Foundation - Teaching Hospital of Rome. The study project was approved by the Ethics Committee at the Catholic University of the Sacred Heart, Rome. A sample of 101 patients with moderate crowding was enrolled for the study and informed consent was obtained for all participants. These were divided into a group of 68 patients treated with clear aligners (TG) and a control group of 33 untreated patients (UG). Each group has been divided into 2 subgroups based on age: subgroup 1 if younger

than 40 years old and subgroup 2 if older. The facial aesthetics of the lower third were evaluated at the time T0 and T1 by a group of five aesthetic experts with WSRS. In the TG a set of clear aligners (Invisalign®, Align Technology, San José, CA, USA) was used as the sole appliance. Each aligner has a thickness of approximately 0.75 mm. Patients were instructed to wear aligners for 22 hours / day, remove them only for meals and teeth cleaning and to change them regularly every 14 days. Patients belonging to the UG did not receive any form of orthodontic treatment during the study period. Extraoral front projection photographs of T0 and T1 were taken in the same room with steady light conditions with the same camera parameters (distance, focus and flash). All patients belonging to the treated groups had their clear aligner removed before taking the photographs.

**RESULTS:** No significant differences were found between the age groups of the T0 participants and the duration of the study period (Table I and II). Statistically significant changes were found in all subgroups comparing the WSRS scores at T0 and T1. Comparisons between the groups revealed that the use of clear aligners produces a statistically significant improvement in lower third facial aesthetics both in younger ( $p < 0.05$ ) and older ( $p < 0.001$ ) patients. The skeletal, molar and canine class, the overjet and the overbite did not register any significant change during the study period.

**CONCLUSIONS:** The present retrospective cohort study successfully shown that malocclusion therapy conducted through the use of clear aligners in a population of adults with dental crowding has beneficial effects on lower third facial ageing. In addition, the effect of wearing clear aligners can be interpreted as a complex and multiple phenomenon involving blood vessels, cells, growth factors, dermis and muscles. Such phenomenon has led to a positive aesthetic impact of the face even if its results should be considered partial and interpreted with caution due to the need for further research.

### Evaluation of orthodontic movement by using intraoral scanner

D. Giovannoni<sup>1</sup>, A. Putrino<sup>2</sup>, G. Galluccio<sup>1</sup>

*<sup>1</sup>Orthodontics, Department of Oral and Maxillo-Facial Sciences, "Sapienza" University of Rome, Rome, Italy; <sup>2</sup>Orthodontics, Innovative Technologies in Diseases of the Skeleton, of the Skin and of the Oro-Maxillofacial District, Department of Oral and Maxillo-Facial Sciences, "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** Intraoral-scanner is a device that creates digital models in real time by placement and shift in the oral cavity; the purpose of this study is to quantify the orthodontic movement in three space directions, mesio-distal, vestibular - oral and vertical (M-D, V-O and V), during high-tech edgewise phase of Damon System® (Ormco). This is the second archwire sequencing of Damon System® (Ormco) and defines completion of leveling and aligning, continues arch development, resolves remaining rotations, begins torque control and consolidates minor spacing. The archwires used to perform these movements are 0.014x0.025 inch Cu-Ni-Ti and 0.017x0.025 inch Cu-Ni-Ti or 0.018x 0.025 inch Cu-Ni-Ti respectively kept for ten weeks, 6-8 weeks and 8-10 weeks. The archwires considered in this study are the first two only. **METHODS:** It was realized a sample of 15 patients bonded with Damon brackets coupled with 0.014x0.025 inch Cu-Ni-Ti archwire, activated at least by ten weeks (t0). Patients

have been recruited at Orthodontic Unit of Department of Oral and Maxillo-facial Sciences of Sapienza, University of Rome. It has been used Carestream© 3500 intraoral-scanner; it is a stytching type scanner with a green light guide system and doesn't need powders or dry surfaces to acquire the images and create a digital models. A first digital impression of bonded dental arches was taken on every patient at time considered zero (t0) by using intraoral scanner; after ten days, archwire has been changed with an 0.017x0.025 inch Cu-Ni-Ti and after further 15 days (t1), a second digital impression of bonded dental arches was taken. Through digital models superimposition, movements of each tooth were measured in the 3D dimensions by using the software Meshlab2016.12 and furthermore, intermolar and intercanine distances change has been evaluated. Moreover, every measurement was performed independently by two calibrated (K=1) operators.

**RESULTS:** According to ANOVA variance analysis, overall average movements on three space plans are statistically significant in both dental arches; mesiodistal overall average movements are prevalent in the inferior dental arch and V-O overall average movements in superior dental arch; vertical overall average movements resulted smaller in both dental arches. According to linear regression index, intermolar and intercanine distances variations aren't statistically significant ( $P=0.05$  gdl=5  $F=0,000$ ). Moreover, about the average movements of each tooth in the three space plans evaluated, there are more movements in the posterior sectors of dental arches, more in the upper arch than in the lower.

**CONCLUSIONS:** Orthodontic movements in the high-tech edgewise phase of Damon System®(Ormco) are statistically significant and correspond to those expected.

## Dental arch dimensional changes in class II patients treated with clear aligners: comparison between pre-treatment and pre-refinement digital models

L. Tallone, M. Saettoni, B. Nebiolo, M. Piancino, T. Castrolforio, A. Deregibus

*Division of Orthodontics, Department of Surgical Sciences, C.I.R Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** To identify the dental arches shape changes in class II patients treated with Invisalign© (Align Technology, San José, CA, USA), comparing the arch form of pre-treatment and the pre-refinement three-dimensional digital models (STL files) by using facial axis (FA) points.

**METHODS:** 64 adult Caucasian patients were selected for the study but only 44 met the following inclusion criteria: complete permanent dentition excluding the third molars; normal tooth size and shape; absence of supernumerary teeth; no extraction. Each stl model was imported in GOM Inspect© software (GOM GmbH, Braunschweig, Germany) to identify the FA points and to create a coordinate system. In each model the origin of coordinate was locate in the contact point of central incisors and the the cartesian axes were oriented as follows: x-axis adjusted to be parallel to the mean inclination of the lines connecting the bilateral contact points of the first and second premolars and the second premolars and the first molars, y-axis perpendicular to the x-axis and passing through the contact point of the central incisors and z-axis perpendicular to the x and y axis. Besides an average arch form was obtained for both pre-treatment and pre-refinement

models. Therefore the comparison was performed between the two average arch shapes.

**RESULTS:** The pre-refinement average mandibular arch showed an average buccal movement of 0,7 mm ( $P<0,05$ ) for canines, 1,3mm( $P<0,05$ ) for first bicuspid, 1,7mm ( $P<0,05$ ) for second bicuspid, 1,5mm ( $P<0,05$ ) for first and second molars in the mandibular arch. The pre-refinement average maxillary arch showed a buccal movement of 0,8mm for canines, 1,3mm ( $P<0,05$ ) for first premolars, 1,5mm ( $P<0,05$ ) for second premolars, 1,3mm( $P<0,05$ ) for first molars and 0.8mm for second molars. Moreover was observed a sagittal mesial movement of 0,7mm for second premolars ( $P<0,05$ ), of 0,9mm ( $P<0,05$ ) for first premolars and of 0,5mm for canines ( $P<0,05$ ).

**CONCLUSIONS:** the orthodontic treatment of class II patients with invisalign© aligners results in an expansion of the dental arches, in particular in the region of premolars and molars both in the mandibular and maxillary arch. Moreover, a mesial movement of premolars and canines was observed in the maxillary arch probably due to the expansion of the arch.

## Initial force system of upper molars distal rotation with clear aligners: a finite element study

L. Tallone, F. Barra, E. Ursu, M. Piancino, T. Castrolforio, A. Deregibus

*Division of Orthodontics, Department of Surgical Sciences, C.I.R Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** To investigate, using FA models, the force system and displacement patterns produced by clear aligners on the whole upper arch during distal rotation of both upper molars and to evaluate the influence and efficiency of clear aligners in association with attachments.

**METHODS:** Three CAD models of upper arch and periodontal tissues were designed with a CAD software (SpaceClaim© Corporation; www.spaceclaim.com) and imported into FE software. CAD models included alveolar bone, periodontal ligament (PDL), teeth (complete upper arch except for third molars), plastic aligner and composite attachments. For each model, aligner activation of 2-degrees of distal rotation of upper molars was performed with different configurations of attachments: without attachments (NA), with vertical rectangular attachments on upper first molars (ATT6) and with vertical rectangular attachment on upper molars, upper premolars and upper canines (ATT3-7). Vertical rectangular attachments were designed with a 3mm height a width of 2 mm and a mean thickness of 1 mm. A 0.8 mm bevel was applied to coronal edge.

**RESULTS:** Differences were registered within all configurations analysed. Rectangular attachments are effective in transmitting enough force from aligner's activation to tooth crown to perform rotation, locating the main anchorage unit distally, and thus, preventing incisors flaring with the consequent lack of tracking between teeth and aligner. The values of anchorage loss differed significantly between the tested environments despite displacement pattern was similar for all the simulated conditions. Rotation with attachments only on upper first molars resulted to be as efficient as rotation obtained with attachments from upper canine to upper second molar but presented less collateral forces. Together with tooth rotation, a variable amount of distal tipping was observed. Regarding PDL stress, maximum pressure areas were detected in the most mesial-coronal part of second molars PDL,



## ABSTRACT

while tension areas were concentrated on first premolars PDL distal surfaces. On first molars, PDL was more compressed on the distal surface of the distal-buccal root. In simulations with attachments, aligners active stress areas were revealed on the mesial surfaces of first molars attachments. A mean lack of 0.02 mm between aligner activation and tooth displacement has been revealed in simulations with attachments, while a 0.04 mm lack resulted from NA simulation.

**CONCLUSIONS:** Clear orthodontic aligners can produce a controlled tooth movement in association with attachments during upper molars rotation. Sequencing of attachments applications may improve clinical efficiency for molar rotation moreover overcorrection aligners may be required to compensate the “elastic play” of the aligner.

### Lingual fixed retainers: clinical aspects

A. Gramuglia, M.G. Paolone, L. Di Tonno, E. Staderini, M. De Luca, P. Gallenzi

*Department of Surgical Sciences for Head and Neck Diseases, School of Dentistry, Catholic University of Sacred Heart, Rome, Italy*

**BACKGROUND:** Retention is one of the most difficult and discussed problems in orthodontics. Fixed retainers have been a retention solution during last years. Cochrane recent reviews on retention procedures concluded that there was insufficient data to draw clear conclusions about the best retention procedure. New studies have shown clinical complications such as bonding failure and unwanted tooth movements. These movements include increase of the Irregularity Index or a variation of the incisor torque and buccal canine movements. In particular bonding failure can be hidden or partial and not immediately evident to the patient. The increase of irregularity of lower incisors during retention period seems to be strongly related to the bonding failures of the retainer. 2.7% out of 221 patients who received a FSW canine-to-canine lingual retainer bonded to all 6 anterior teeth showed, according to Renkema et Al., unexpected post-treatment complications (torque differences of the incisors, increased buccal canine inclination). The aim of this study is to detect these unexpected clinical complications.

**METHODS:** 30 Patients treated by one operator have been examined two years after the end of active fixed appliance treatment and lingual inferior fixed retainer application in order to examine clinical complications. Clinical aspects of the unwanted tooth movements are described and shown.

10% of the patients showed unwanted torque incisor movement or partial bonded failures. Previous *in vitro* studies showed that the pull out detachment forces in the best conditions are 20MPa which is far below the habits such as clenching, nail biting and tongue malposition. Maximum biting force at the level of the molars is 651 N and for incisors 113 N. Some children and adults bite their nails: a finger pinch force is 80.4 N and the total hand pinch is 504.2 N. Normal functional forces created by the tongue are 63 kPa. These values are very close to the ultimate retention forces of the wires and composites that orthodontists commonly use in fixed retainers.

**CONCLUSIONS:** Fixed retainers cannot be considered a panacea for every patient and careful selection of materials and patients is essential before they are used. Further studies *in vivo* and *in vitro* are needed to obtain a guideline for fixed retainers use in daily practice for strict selection and follow up of patients during retention.

### Long-term evaluation of rapid maxillary expansion and bite-block in open-bite growing subjects: a controlled clinical study

D. Fusaroli, G. Di Fusco, A. Milazzo, M. Mucedero

*Department of Orthodontics, Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy*

**BACKGROUND:** The purpose of this study was to evaluate the long-term stability of Rapid Maxillary Expander (RME) and posterior Bite-Block (BB) treatment in growing subjects with dentoskeletal open-bite.

**METHODS:** Sixteen subjects (2 boys, 14 girls; mean age, 8.1±1.1ys) were treated consecutively with RME and BB appliances. Each patient underwent a standardized treatment protocol with RME soldered to bands on the second deciduous molars or on the first permanent molars. The expansion screw was activated once a day until the palatal cusps of the maxillary posterior teeth approximated the buccal cusps of the mandibular posterior teeth; then the appliance was left in place for at least 8 months working as a retainer. The BB appliance was constructed in the form of a Schwartz plate for the lower arch with posterior occlusal resin splints of 5 mm thickness. Removable mandibular BB was applied for 12 months to control the vertical dimension. The patients were instructed to wear the BB 24 hours a day. The patients were reevaluated at the end of active treatment with RME and BB (mean age, 9.6±1.2ys) and at least 4 years after the completion of treatment (mean age, 13.5±1.4ys). A control group of 16 untreated subjects with the same dentoskeletal disharmony was used for the statistical comparison (independent t-test). The inclusion criteria included: no sucking habits before treatment; overbite < 0 mm; transverse discrepancy ≥ 3 mm; Frankfort horizontal to mandibular plane angle greater than 26°; full eruption of first permanent molars, and maxillary and mandibular incisors (to prevent the “pseudo-open bite” due to undererupted permanent incisors), no permanent teeth extracted before or during treatment, and 3 consecutive lateral cephalograms of good quality with adequate landmark visualization, taken before treatment (T1), at the end of the active treatment with the RME and BB (T2), and at a follow-up observation at least 4 years after the completion of treatment (T3).

**RESULTS:** Active treatment with RME and BB (T1-T2 interval) was effective in correcting dental open bite with a significantly greater increase in overbite compared with the controls (+2.0 mm). The treated group showed a significantly greater decrease of facial divergence when compared with the control group (-1.9 degrees). The improvement of the dental open bite was associated with a significantly smaller increase of the sum of upper and lower molar extrusion in the treated group in comparison with the control group (-1.3 mm). No significant differences in posttreatment changes (T2-T3) were found between the treated group and the control group. In the long term (T1-T3), the treated group showed, a greater increase in overbite (1.8mm), an extrusion control of maxillary and mandibular molars (-1.9mm; -1.3mm), and a decrease in facial divergence (-2.8°) when compared with the controls. **CONCLUSIONS:** In the long term, the use of the RME and BB protocol led to successful outcomes in 100% of the growing children considered. The treated patients exhibited reduced extrusion of maxillary and mandibular molars and, consequently, a significant improvement in vertical skeletal dimension when compared with untreated open bite subjects. The effects of early treatment with RME and BB resulted stable at a long-term follow-up.

## A combined orthodontic-surgical approach for the treatment of periodontally compromised patients

B. Toni, M. Panetta, K. Gardini, D. Loli, G. Galluccio, E. Barbato

*Sapienza University of Rome, Orthodontic Department, Rome, Italy*

**BACKGROUND:** An orthodontic therapy is recommended to improve periodontal tissues health in clinical situations which favor periodontal tissues health impairment. The treatment does not only allow to resolve the original malocclusion but also to obtain a physiological and balanced distribution of occlusal forces and contacts, with great functional and aesthetic results. In periodontally compromised patients with dentofacial deformities, combined orthodontic-surgical approach is required to correctly and stably resolve the malocclusion and to improve the periodontal tissue status of the patient.

**METHODS:** Several patients with dentofacial deformities (class I, II, III) and some clinical conditions that are cofactors or have caused clinically observed periodontal tissue damage, were treated at the Unit of Orthodontics of the Rome "Sapienza" University. Patients were treated with a combined orthodontic-surgery approach in order to resolve both dental and skeletal discrepancies and to improve periodontal tissue health. We included patients that, after intraoral examination, didn't present limiting factors to orthodontics treatment and underwent to a careful protocol of oral hygiene and regular Periodontal Screening Recording (PSR) follow up.

**RESULTS:** In specific clinical situations where a periodontal tissues impairment is clinically observed, an orthodontic treatment is suggested to avoid the worsening of periodontal defects and to improve periodontal tissues health. Those clinical cases with dentofacial deformities associated with periodontal disease require a multidisciplinary approach with specialized figures as orthodontist, periodontist and surgeon. Before the orthodontic treatment, a careful case selection with adequate intraoral examination, active periodontal treatment to improve periodontal status, monitoring of the patient's oral hygiene and his motivation and collaboration and evaluation of presence of limiting factors is fundamental. In patients with active periodontitis (plaque-infected deep pockets evidenced by bleeding on probing) orthodontic tooth movement may accelerate the periodontal disease process. Once orthodontic treatment is started, periodontal follow up is recommended at shorter intervals (6 weeks) with sessions of oral hygiene and PSR protocol. The placement of orthodontic brackets, wires, bands, ligatures, auxiliaries and elastics represents a challenge for the patient to maintain an adequate oral hygiene, with plaque accumulation and consequently gingivitis and, as the subgingival bacterial pattern has an anaerobic shift once bands are placed in, thus leading to periodontal damage. Some tooth movements such as dental intrusion shift supragingival plaque to a subgingival location, favoring worsening of periodontal health. The use of steel rather than elastic ligatures has been recommended on brackets, because elastomeric ones have been shown to attract significantly more plaque than steel ligatures; the use of low force systems and delayed archwire changing sequence is recommended so that the periodontal tissues are not stressed and physiologically moved.

**CONCLUSIONS:** A multidisciplinary orthodontic-surgical approach in periodontally compromised patients is suggested in specific cases when untreated dental and /or skeletal dis-

crepancies lead to the worsening or impairment of the periodontal health status. Orthodontic treatment alone with the supervision of the periodontist, in selected cases, is useful in order to improve the periodontal tissues health. However, when the underlining malocclusion doesn't allow to achieve a stable and physiological occlusion between dental arches with orthodontics only, a combined multidisciplinary orthodontic-surgery approach is required.

## Oral microbiota and orthodontic appliances: a systematic review

N. Nardi<sup>1</sup>, F. Toma<sup>1</sup>, M. Marcolina<sup>1</sup>, A. Liguori<sup>1</sup>, G. Ghilardi<sup>1</sup>, R. Burioni<sup>2</sup>, M. Manuelli<sup>1,3</sup>, A. Lucchese<sup>1,3,4</sup>

<sup>1</sup>Department of Orthodontics, Vita-Salute San Raffaele University, Milan, Italy; <sup>2</sup>Department of Medical Microbiology, Vita Salute San Raffaele University, Milan, Italy; <sup>3</sup>Unit of Dentistry, Division of Orthodontics, Research area in Dentofacial Orthopedics and Orthodontics, IRCCS San Raffaele Scientific Institute, Milan, Italy; <sup>4</sup>Department of Orthodontics, Vita Salute San Raffaele University, Milan, Italy

**BACKGROUND:** In daily clinical practice, orthodontic appliances, both fixed and removable, may be associated with an increased cariogenic risk and a worsening of pre-existing periodontal diseases; the mechanism by which this phenomenon is realized is the increase of retentive sites where bacterial plaque and potentially pathogenic species can proliferate more easily. The purpose of this review is to investigate the association between orthodontic appliances and changes in the quality and quantity of oral microbial flora.

**METHODS:** The research included all the articles published until October 2017 with the keywords: "Orthodontic appliance\* AND (microbiological colonization OR periodontal pathogen\* OR Streptococcus OR Lactobacillus OR Candida OR Tannerella forsythia OR Treponema denticola OR Fusobacterium nucleatum OR Actinomyces actinomycetemcomitans OR Prevotella intermedia OR Prevotella nigrescens OR Porphyromonas gingivalis)" and it was conducted in the major medical databases. Inclusion criteria were: clinical studies in humans; presence of orthodontic appliance; standardization and training in oral hygiene; analysis of microbial flora from the whole mouth, not only from orthodontic appliance; microbiological analysis of collected material. The methodological quality of selected papers was scored, using the "Swedish Council on Technology Assessment in Health Care Criteria for Grading Assessed Studies" (SBU) method. **RESULTS:** With the initial research, we found 587 articles of which 58 met the inclusion criteria. Then of the 58 studies, 43 of them were classified as having a moderate methodological quality, but the biggest bias in these studies is the absence of repeatability test, and the others 15 were classified as having a low quality. The articles classified as having low quality were excluded. The results showed that orthodontic appliances influence the oral microbiota with an increase in the counts of Streptococcus Mutans and Lactobacillus and in the percentage of potentially pathogenic Gram-negative bacteria. Increase in quantity and variation in quality of microbiota was observed also in patients undergoing orthodontic treatment with removable appliances, suggesting the influence of these appliances in modifying the whole oral environment. Plaque index and the bleeding on probing index showed an increase on fixed appliances, however results were not homogeneous and the differences in the results of the stud-

## ABSTRACT

ies were related to the fact that distinct methods of analysis were applied.

**CONCLUSIONS:** There is moderate evidence regarding the association between orthodontic appliances and changes in oral microbiota.

### Maxillary orthodontic expansion assisted by unilateral alveolar corticotomy and low-level laser therapy: a new protocol for the treatment of posterior unilateral cross-bite in adults

R. Bertino <sup>1</sup>, P. Spinuzza <sup>1</sup>, A. Farah <sup>1</sup>, P. Cingari <sup>1</sup>, E. Gatto <sup>1</sup>, G. Caccianiga <sup>2</sup>, A. Militi <sup>1</sup>, M. Portelli <sup>1</sup>, R. Nucera <sup>1</sup>, A. Lo Giudice <sup>1</sup>

<sup>1</sup>Dipartimento di Scienze Biomediche Odontoiatriche e delle Immagini Morfologiche e Funzionali, Sezione di Ortognatodonzia, Università degli Studi di Messina, Messina, Italy; <sup>2</sup>Facoltà di Medicina e Chirurgia, Università di Milano-Bicocca, Milan, Italy

**BACKGROUND:** The treatment of true unilateral posterior crossbite often requires asymmetric maxillary expansion, however this is challenging to achieve with conventional expansion methods because of several biomechanical limitations. In this paper, we introduce a new protocol for the treatment of unilateral posterior crossbite in adults based on maxillary orthodontic expansion assisted by corticotomy and low-level laser therapy (LLLT) performed on the crossbite side.

**METHODS:** The study sample included 15 adults (8 females, 7 males) with a mean age of  $21.6 \pm 3.1$  years old, affected by true unilateral posterior crossbite. Exclusion criteria were: bilateral posterior crossbite or functional unilateral crossbite, dental agenesis, cranio-facial syndromes and periodontal disease. The same day of application of orthodontic appliances (palatal expander and self-ligating brackets), corticomy was performed on the buccal aspect of the crossbite side. A full thickness flap was raised in the area between the distal aspect of the upper first molar and the mesial aspect of the canine/lateral incisor. Vertical incisions in each interproximal space were performed and maintained apical to the interdental papilla. Cortical bone was cut for 3 mm of depth, assessed by a periodontal probe. Vertical corticotomies were connected by a horizontal corticotomy, at least 2 mm apical to the root apex of each tooth. Finally, the flap was sutured using a non absorbable 4/0 suture. In seven subjects corticotomy was carried out with the Piezosurgery BS1, while in eight subjects the Erbium:Yag laser was used (wavelength of 2940 nm, 180 mJ output and frequency of 20 Hz, 600 micron sapphire glass tip). Once a month, all patients underwent LLLT at the cross-bite side using a diode laser with a wavelength of 980 nm (Wiser, Doctor Smile – Lambda Spa, Brendola, VI), power of 1 Watt set on continuous wave mode. The beam was delivered by means of a plane wave optical fiber (AB 2799, Doctor Smile – Lambda Spa, Brendola, VI). Irradiation was performed for 50 seconds at each point, for three times, and repeated every 2 minutes on relaxing time. LLLT procedure was conducted up to the correction of the crossbite. The efficacy of the technique was evaluated on digital models by assessing differential expansion on both sides relative to the maxillary midline at levels of canine, first and second premolars and first molars.

**RESULTS:** All subjects reported successful correction of posterior unilateral crossbite, functional occlusion was

achieved as well. The average expansion was greater at the crossbite side compared to the unaffected side and such difference was significant at first premolars ( $p < 0.05$ ), second premolars ( $p < 0.05$ ) and first molars ( $p < 0.05$ ) levels.

**CONCLUSIONS:** Orthodontic maxillary expansion assisted by unilateral corticotomy and LLLT was effective in the treatment of true unilateral crossbite.

### Geometric morphometric analysis of maxillary morphology in children with impacted incisors: a three-dimensional evaluation

V. Di Fazio, V. Brunelli, S. Loeberto

Departments of Orthodontics, University of Rome Tor Vergata, Rome, Italy

**BACKGROUND:** To analyse variations in palatal morphology in subjects presenting with unilaterally impacted maxillary permanent central incisors (IIG) compared with a control group (CG) of subjects without eruption anomalies using three-dimensional (3D) analysis.

**METHODS:** A sample of twenty-six subjects (10 females, 16 males; mean age  $9.5 \pm 1.5$  years) with IIG were selected. The inclusion criteria for the enrollment of the subjects in IIG were the following: European ancestry (white), eruption of the contralateral incisor at least 6 months earlier or deviation from the normal sequence of eruption (lateral incisor erupted prior to the central incisor), no posterior or anterior crossbite, normal overjet and overbite values, intermediate mixed dentition, Class I or edge-to-edge molar relationship (46.2% Class I, 53.8% end-to-end molar relationship), skeletal Class I relationships, prepubertal skeletal maturation (CS1, CS2). Exclusion criteria included: previous orthodontic treatment or tooth extraction, multiple and/or advanced caries, tooth agenesis, supernumerary teeth, sucking habits, craniofacial syndromes, cleft lip and/or palate and other genetic disease. For each subject a panoramic radiograph and cephalometric radiograph were taken at the time of initial observation to confirm the diagnosis of incisors' impaction and planned a treatment. IIG was compared with a CG of 26 subjects (14 females, 12 males, mean age  $8.7 \pm 1.6$  years) presenting no eruption disorders. The CG group matched the IIG as to occlusal development, skeletal maturation, skeletal and occlusal relationship. To analyse the palate's shape, study casts of the maxillary arches of all subjects were scanned using an intraoral scanner (Carestream 3500) with a reported accuracy of 30  $\mu$ m. All models were exported in a Standard Tessellation Language format (.stl digital file). To study the entirety of the shape of the palate at any point of the surface, 3D Geometric Morphometrics Method (GMM) was applied. **RESULTS:** IIG showed skeletal adaptations of the maxilla. In the IIG, both superior palatal region and lateral palatal surface showed significantly different morphologies when compared with CG, with a narrower and higher palatal vault. **CONCLUSIONS:** GMM can be a useful tool for describing the 3D shape changes of maxillary surfaces in children with impacted incisors. The absence of maxillary central incisors over the physiological age of eruption influenced the development of palatal morphology compared to subjects without eruption anomalies. Children with unilaterally impacted maxillary permanent central incisors showed a narrower and higher palatal vault when compared with a control group of subjects without impaction.



## Orthognatodontic treatment of a diabetic patient with a caries-free functional appliance

M. Rolfo, L. di Benedetto, P.A. Deregibus, T. Castroflorio, M.G. Piancino

*Division of Orthodontics, Department of Surgical Sciences, C.I.R. Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** Diabetes mellitus (DM) is a chronic disease resulting from a relative or absolute insulin deficiency, which affects the metabolism of carbohydrates, proteins and fats. There are two main types of DM: type 1 is caused by immune-mediated destruction of pancreas' beta cells, which leads to insufficient production of insulin; type 2 occurs when the body is non-responsive to insulin. In oral care, DM causes two main effects: caries and periodontal disease. Studies indicate that DM increases the risk of periodontal disease by three times when compared to healthy patients. Risk of caries, one of the most common chronic disease with dietary-bacterial etiology, increases particularly in DM-affected children. These patients, in fact, are often asked to follow special dietary regimes, where amount, type and distribution of carbohydrate is controlled and spread during the day in numerous meals and snacks in order to promote an optimal growth and control of blood glucose. Furthermore, unbalanced diabetes is associated with significant cariogenic changes in the oral environment: reduced saliva flow, lower saliva buffering capacity in presence of acidic pH, higher salivary glucose, higher salivary albumin concentrations, high proportion of salivary mutans streptococci and yeast. Changes in the oral microflora in subjects with poor glycaemic control may significantly influence the prevalence of gingivitis and caries. Young orthodontic patients affected by DM need no-caries appliances in order to minimize the risk of dental caries during the orthodontic treatment. This case report shows why Function Generating Bite (FGB) can be considered the first choice appliance to treat this type of patient.

**METHODS:** The case of a 10 years old girl, referring to the Orthodontic Division of C.I.R. Dental School in Turin, with bilateral molar class 2, anterior open bite, hyperdivergent skeletal pattern of growth (SpP<sup>o</sup>GoGn: 27°) and a history of Diabete Mellitus type 1 is described. Function Generating Bite (FGB) was used in order to correct the dental malocclusion and to improve the hyperdivergent pattern of growth and the pathological vectors. The appliance was individually manufactured with acrylic resin and resilient stainless steel posterior bites. It's removable to allow an optimal oral hygiene. The patient was instructed to use this device always, day and night, except during meals and physical activity.

**RESULTS:** After one year of treatment, the malocclusion was corrected and the patient achieved a canine and molar class one, physiological overbite and overjet without signs of caries.

**CONCLUSIONS:** The reason for no-appliance-caries is due to the fact that Functional appliances do not have any dental anchorage, any hook, leaving teeth free to move, and avoiding constrictions that cause caries. They work with dental point contacts, intermitted and self-regulating forces. For these reasons, Functional appliances can be considered the gold standard in orthodontic patients with systemic disease that are a risk factor for caries.

## Diagnosis of condylar asymmetry in juvenile idiopathic arthritis

L. di Benedetto, C. de Biase, R. Cannavale, M.G. Piancino

*Orthodontic Division, Department of Surgical Sciences, CIR Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** Juvenile idiopathic arthritis (JIA) is characterized by chronic inflammation of one or more joints, with an onset before the age of 16 years and a minimum duration of 6 weeks. TMJ involvement in JIA was recognized by Still in 1897, both unilateral and bilateral. Being the TMJs characterized by adaptive growth during development, it is likely that TMJs are involved from the early stages of the disease. The diagnosis of condylar and ramal asymmetry is important to establish an appropriate and early treatment and it can readily be determined using ortopantomography (OPT). The latter is the only imaging showing simultaneously the two condyles, giving a clear idea of the asymmetry between sides. Of course, to detect the condylar morphology CBCT or MRI are necessary, but it is not so easy to properly obtain these images in children. OPT is a cost benefit favorable imaging tool, routinely used in the dental field, at an early stage in development also; it can be used as a first screening examination, for monitoring and follow-up of the therapy. The aim of this study was to evaluate in ortopantomography condylar and ramal asymmetry of JIA patients with respect to normal subjects.

**METHODS:** Thirty patients (23 females, 12.8 ± 4.8 years) with confirmed diagnosis of JIA (according to the ILAR 2003 criteria), free of signs and symptoms of temporomandibular joint disorders, and 30 matched healthy subjects (23 females, 13.6 ± 4.8 years) were selected for this study. All patients had a panoramic radiograph. The method of Habets et al. was used to compare the vertical heights of the condyles and rami of both sides in OPT. The ramus tangent (A) was drawn between the most lateral point of the condyle (O1) and of the ascending ramus (O2). The condylar height (CH) was measured as the distance on the ramus tangent between the B line (perpendicular to the ramus tangent from the most superior point of the condyle) and O1. The ramus height (RH) was measured as the distance between O1 and O2. To evaluate the symmetry between the condyles and the rami, the following formula was used:  $(R - L) / (R + L) \times 100\%$ . According to Habets et al., a 6% difference between the condylar vertical sizes in OPT is an acceptable limit for diagnosing a condylar asymmetry. For statistical analysis, data were expressed as mean ± SD and the significance of between-group differences were assessed using Mann-Whitney test. Statistical significance was set at  $p < 0.05$ .

**RESULTS:** Results showed a significant difference regarding the condylar asymmetry (expressed in percentage from 0 to 100%), being the asymmetry index in the JIA group 15.58% ± 10.98 and in the control group 1.72% ± 1.21 ( $p < 0.0001$ ). No differences were found in the range of asymmetry of the ramus between groups ( $p = 0.47$ ), being the asymmetry index in JIA group of 2.97% ± 2.42 and in the control group of 2.33% ± 1.7. The intra-group comparison between males and females showed a significant difference in the range of asymmetry of the condyle in the JIA group ( $p < 0.05$ ), being the females more asymmetric. No differences were found in the range of asymmetry of the ramus in both groups ( $p > 0.05$ ).

**CONCLUSIONS:** The results of this study confirm that TMJ is highly susceptible to inflammatory alterations during growth, even in absence of symptoms, and that OPT is a valuable simple tool for early diagnosis of condyles asymmetry.

## ABSTRACT

**Occurrence of sella turcica bridging in patient with palatally displaced canine impaction: a lateral cephalogram investigation**

F. Squillace, F. Germanò, G. Padalino, R. Guarnieri, E. Barbato  
*Department of Oral and Maxillo-Facial Sciences, Sapienza, University of Rome, Rome, Italy*

**BACKGROUND:** Palatally displaced canine is a common dental anomaly and several theories contributing to define its etiology. In particular, the calcification of the sella turcica bridge might be positively associated with PDC because dental epithelial progenitor cells, maxillary and sella turcica share a common embryologic origin and development by neural crest cells. Sella turcica bridging is a frequent morphologic anomaly caused by abnormal ossification of the dura mater between the anterior and posterior clinoidal process of sphenoid, or caused by an excessive embryologic development of the same bone. The purpose of this study was to investigate the incidence of the calcification of the sella turcica bridge in lateral cephalometric of a pool of 35 orthodontic patients affected by palatal displaced canine and to sensitize orthodontists and clinicians for examining the cervical area carefully.

**METHODS:** The study was carried out at the Department of Oral and Maxillo-Facial Sciences, Sapienza, University of Rome, Rome, Italy. The lateral cephalometric radiographs of 35 orthodontic patients affected by palatally displaced canine were collected and examined retrospectively to detect the presence of the calcification of the sella turcica bridge. This group was composed by 27 females and 8 males. Thirty-five patients with maxillary canines normally erupted were randomly selected and included in the control group. Chi square test was used to evaluate the presence of statistically significant differences between two groups in incidence of sella turcica bridge.

**RESULTS:** Sella turcica bridging occurrence was positively associated with impacted palatally canine. The numerosity of complete and partial calcification of the sella in the patients were of twenty and eight respectively. Statistically significant differences between the case group and control group were found (chi square,  $P = 0,003$ )

**CONCLUSIONS:** Conventional imaging is routinely used in orthodontics for various purposes, including diagnosis of impacted canines and morphologic anomalies of teeth and craniofacial skulls. Cephalometric radiographs can be used to evaluate the development and the relationships between craniofacial and dental structures. Indeed anomalies of cervical vertebrae might be associated with malformations of the jaw, maxillary and teeth and they could be useful as predictive indices. Sella turcica bridging was often associated with PDC and so, according to what has been said, the authors affirms that this spinal anomaly could be helpful for an early diagnosis of the palatally impacted canine. Finally, is fundamental to improve a correct and complete reading of cephalometric radiographs in order to locate early this anomalies.

**Agensis of the lateral incisor: close or open spaces? A systematic review**

M.M. D'Emidio, F. Squillace, F. Germanò, E. Barbato

*Department of Oral and Maxillo-Facial Sciences, Sapienza, University of Rome, Rome, Italy*

**BACKGROUND:** Dental agensis is the result of a disorder in the dental lamina formation process that can generate both

functional and aesthetic disorders. Nowadays the therapeutic alternatives are mainly based on the closure of the spaces and the replacement of the lateral incisors with the canines or opening of the spaces and insertion of implants. The purpose of this review is to explain the guidelines to be followed by evaluating advantages and disadvantages as well as the distinct indications of each of the two therapeutic options.

**METHODS:** A literature search was performed in main database like Pub Med Central, Cochrane Library, Embase and Google Scholar. In a first research, fifty-two articles were evaluated. Twenty-one articles were excluded from the fifty-two articles. In a second research, forty-nine articles were evaluated. Of the forty-nine articles, sixteen were excluded. In total the articles used were sixty-four.

**RESULTS:** The research carried out in the literature has allowed to delineate a series of elements that identify the situations in which it is better to open the space compared to situations in which the best indication would seem instead to close the space. Specifically, it opens the space is preferred in case of: adult patient, generalized space in the upper arch, absence of gingival smile, third skeletal class, first skeletal class with absence of crowding in the inferior arch, verticalization of the lower incisors, little alveolar ridge developed, shape, size or color inadequate about canine or premolar, biological or economics costs major. Instead, a closure of the space is preferred in case of: young patients, lack of space in the upper arch, presence of gingival smile, first skeletal class with presence of crowding in the inferior arch that needs extraction, protrusion of the dento-alveolar arch, absence of overbite, color, shape and size appropriate about canine and premolar, biological/economic costs minor.

**CONCLUSIONS:** Each therapeutic alternative has its advantages and disadvantages and will be recommended one or the other after careful analysis of different parameters. In any case, there may be equally valid therapeutic alternatives. Each therapeutic choice can achieve excellent results if based on a correct initial diagnosis and a multidisciplinary therapeutic approach. The excellence of a good treatment result, for both techniques, is based on an accurate diagnosis, a correct initial analysis of the situation, the individualization of each patient and the choice of the most suitable treatment plan for the patient from the beginning. In addition to orthodontics, a multidisciplinary approach is essential among the different branches of dentistry such as aesthetics, periodontology, prosthetics and implantology in the treatment of these patients to achieve optimal aesthetic and functional results.

**Dental effects after rapid maxillary expansion assessed with CT: tooth-borne vs. bone-borne appliance**

L.M. Valentini, E. Fantasia, A. Gavillucci, E.M. Pompeo, G. Galluccio

*<sup>1</sup>Department of Oral and Maxillofacial Sciences, "Sapienza" University of Rome, School of Dentistry, Rome, Italy*

**BACKGROUND:** Our objective was to investigate the changes in maxillary posterior teeth caused by the Rapid Maxillary Expansion with the tooth tissue-borne and tooth-borne expanders assessed using computed tomography (CT). **METHODS:** To analyze this aspect a Review of English-language literature from 1990 to March 2017 was conducted on Pubmed (Medline), Lilacs and Scopus with the words Rapid maxillary expansion; Hyrax expander; Bone-borne expander; Cone-beam computed tomogram; Alveolar bone to

identify all articles reporting on the effects of Rapid Maxillary Expansion with both tooth-borne and Bone-Borne Appliances. We finally selected 12 articles. The inclusion criteria were: young subjects with Class I or II division 1 malocclusion, with unilateral or bilateral posterior crossbites; age above 12 years, with the presence of only secondary tooth dentition; necessity of only orthodontic treatment, without extractive or orthognathic approaches. The exclusion criteria were: absence of maxillary posterior permanent teeth, metallic restorations on the maxillary posterior teeth, previous periodontal disease, previous orthodontic treatment. The sample was divided into two groups: patients treated with tooth tissue-borne expanders vs patients approached with bone-borne appliances. All patients were subjected to CT imaging before expansion and after when the expander was removed to compare the dentoalveolar effects of the two treatments. The evaluated parameters were: the distance of the center of the palatal root of the first premolars and molars and center of the root of the second premolars, as the distances of dental crowns for the same teeth on both sides.

**RESULTS:** RME led to a buccal tipping of the posterior teeth, especially of the second premolars when compared with the banded teeth, namely the first premolar and the first molar. In group I, the tooth tissue-borne expander, showed significant buccal tipping of all posterior teeth. On the other hand, group II did not demonstrate any significant change in the inclination of the anchorage teeth but only in the inclination of the second premolars. Intergroup comparison revealed a statistically significant difference only for the first premolars, which presented more buccal tipping in the tooth tissue-borne expander group.

**CONCLUSIONS:** Overall, the analysis provided evidence that dental inclination occurs in molars for both RME treatments but the second premolars displayed more buccal tipping with tooth borne type rather than the bone-borne type.

### Evaluation of spontaneous decompensation of the jaw after rapid maxillary expansion

G. Rodi, F. Germanò, F. Squillace, C. Vompi, A. Costantini, G. Galluccio, E. Barbato

*Department of Oral and Maxillo-Facial Sciences, Sapienza, University of Rome, Rome, Italy*

**BACKGROUND:** The purpose of this study was to measure and evaluate the decompensation and the increase of Wilson curve of lower jaw after rapid palatal expander therapy.

**METHODS:** 10 patients were recruited. Subjects in growing skeletal age (stage CS2-CS3), with mild to moderate malocclusion, presenting a transverse skeletal deficit of the upper arch or non-syndromic and patients in good general, oral and periodontal health, with increased Wilson curve were included. Adult subjects, patients with previous orthodontic treatment, with acute and / or chronic diseases affecting the musculoskeletal system and who had not given consensus to the diagnostic investigation and all the total or partial lack of the requested radiographic evaluations and/ or radiograms that do not comply with the required standards were excluded. First of all, each patient has been taken an alginate imprints to realize the initial plaster model. Each patient has been mounted a rapid expander of the palate anchored to the two first upper permanent molars and it included two lateral arms. The screw that has been chosen is 10mm so it was possible to position it as high as possible and it could be as close as possible to the center of jaw strength and maximize the skeletal effects

of the expansion. No other devices were applied on patient lower arch. The active expansion phase lasted 9 months until it was possible to appreciate contacts between the palatal sides of the cusps of the first upper molars and the vestibular side of the cusps of the first lower molars. The maintenance phase lasted 9 months. At the end of this phase the palate expander was removed and alginate imprints were taken for the final study models. It was possible to compare and measure with a precision caliper, on initial and final plaster models of lower jaw, the distance from the cusp-distal-palate of 36 to the cusp-distal-palatine of the 46. Then it has been calculated the inter-mediate distance before the expansion, after the expansion and the difference between the two measures.

**RESULTS:** In all patients an increase of intermolar diameter was found. A statistics average difference of 3 millimeters was calculated between the pre-expansion and post-expansion inter-molars diameter.

**CONCLUSIONS:** The expansion of the upper arch with palate expander causes an almost complete spontaneous correction of the lower Wilson curve. The entity of the decompensation demonstrate that it is not necessary to decompensate the lower arch simultaneously with a device.

### A lateral cephalogram investigation of ponticulus posticus in patients with palatal canine impaction

F. Germanò, F. Squillace, M. Mezio, R. Guarnieri, E. Ersilia

*Department of Oral and Maxillo-Facial Sciences, Sapienza, University of Rome, Rome, Italy*

**BACKGROUND:** Ponticulus posticus is an anomaly of first cervical vertebra due to ossification of the posterior atlanto-occipital ligament of atlas identified as a bony bridge between the lateral mass and the posterior arc. This calcification of the bony bridge could be completed or partially and it is visible in lateral cephalogram. Some authors have also noticed that the occurrence of complete and incomplete ponticulus posticus was correlated positively to the incidence of palatally displaced canine; this could be attributed to the activity of the neural crest as the common embryonic origin of the neck and shoulder skeletal development as well as the origin for dental development and eruption. Unfortunately, it is often undetected by orthodontists and other specialists. The purpose of this study was to investigate the incidence of Ponticulus Posticus in lateral cephalometric of a pool of 35 orthodontic patients affected by palatal displaced canine and to sensitize orthodontists and clinicians for examining the cervical area carefully.

**METHODS:** The study was carried out at the Department of Oral and Maxillo-Facial Sciences, Sapienza, University of Rome, Rome, Italy. The lateral cephalometric radiographs of 35 orthodontic patients affected by palatally displaced canine were collected and examined retrospectively to detect the presence of partial or complete ponticulus posticus. This group was composed by 27 females and 8 males. Thirty-five patients with maxillary canines normally erupted were randomly selected and included in the control group. Chi square test was used to evaluate the presence of statistically significant differences between two groups in incidence of ponticulus posticus.

**RESULTS:** Ponticulus posticus was observed in twenty patients with palatal canine impaction and eight patients without anomaly. About the twenty cases of inclusion with



## ABSTRACT

ponticulus, eleven had partial ponticulus posticus and nine had complete ponticulus posticus. Statistically significant differences between the case group and control group were found (chi square,  $P = 0,007$ ).

**CONCLUSIONS:** As reported in literature, the prevalence of skeletal anomalies was increased in patients with PDC. In this study the relationship between ponticulus posticus and PDC was confirmed although the restricted group of patients suggest a largest investigation. The authors affirm that this spinal anomaly could be helpful for an early diagnosis of the palatally impacted canine; especially if it is associated with others skeletal or dental anomalies. It's important to let know the existence of the ponticulus posticus and how easy is to detect it on the lateral chefalogram not just for dentistry but also for the possible future implications that this anomaly lead to (headaches, dizziness..)

### A retrospective study in pre-surgical patients treated with self-ligating techniques: variability in timing of arches alignment

K. Gardini, M. Panetta, B. Toni, D. Loli, G. Galluccio, E. Barbato

*Sapienza University of Rome, Orthodontic Department, Rome, Italy*

**BACKGROUND:** Self-ligating techniques have been emphasized in the scientific literature because of the ability to reduce treatment times of the first orthodontic phase, which consists in the alignment and leveling of the dental arches, caused by a decrease in friction between arch and bracket. The variables related to the reduction of friction is related to bracket, wire and crowding. Aim of the study is to verify the time necessary to completely align the arches measuring the time elapsed between application of the first arch and the second one, based on clinical observation of effective wire passivation.

**METHODS:** The population consisted of 16 patients subjected to pre-surgical orthodontic treatment for skeletal Class III malocclusion at Unit Orthodontics, "Sapienza" University of Rome. Out of the sixteen patients, ten were treated with passive self-ligating Damon Q (Ormco) technique, 6 with interactive self-ligating Empower (Micerium) technique. A retrospective analysis was made on these patients by measuring the time elapsed between the banding and the positioning of the second archwire based on clinical observation of effective first arch passiveness. The first archwire was chosen on the basis of the severity of clinically observed crowding. The measurements were performed both on the upper and lower arch. Both the upper and lower arches have been analyzed separating clinical data from the specific technique used.

**RESULTS:** The time necessary to have passiveness of a 0.013 arch was about 6 months, justified by the complexity of dental arch crowding and misalignment. Similar results were obtained for the lower arch. The 0.016 arch was used for minor degree of crowding that allowed a full wire engagement without creating sharp angles and the notching phenomenon was missing. The time of application was 7 months for upper arch, probably due to increased frictional resistance related to the increased contact area between wire and bracket, and 4,4 months for lower arch. The 0.014 arch was the most widely used by us in both techniques, with less time spent between the application of the first and the second arch (4,1 months for upper arch and 4,3 months for lower arch). In the lower arch, the time of the first arch was low despite the fact the shortest interbracket distance is a factor of sliding resistance.

The clinical data of our study are compatible with the work of Pandis et al. reporting an average time of about 90 days for moderate crowding degree and 120 for severe ones. The increased length of the timing recorded in our study cases is probably due to the fact that all patients have also an altered muscle component subsequent to the dento-facial deformity with negatively effects on wire performance.

**CONCLUSIONS:** Our study outlines that the timing of arch replacement, as determined from clinical observation of its passiveness, is not standardized neither based on active or passive technique, nor on the diameter of the arch or to the upper and lower arch position. The variability of timing is caused by the choice of the arch diameter determined by the severity of crowding and then by the clinical observation of wire passivation.

### Tandem skeletal appliance to orthopedically correct transverse maxillary deficiency in an adult. Case report

E. Paoletto <sup>1</sup>, G. Seccia <sup>2</sup>, M. Seccia <sup>2</sup>, L. Lombardo <sup>3</sup>, G. Sciliani <sup>3</sup>, G. Maino <sup>2</sup>, B.G. Maino <sup>3</sup>

*<sup>1</sup>Orthodontic Technician, Thiene (VI), Italy; <sup>2</sup>Private Practice of Orthodontics, Bari, Italy; <sup>3</sup>Department of Orthodontics, University of Ferrara, Ferrara, Italy*

**BACKGROUND:** This case report describes the use of Tandem Skeletal Appliance (TSA) in order to orthopedically correct a transverse maxillary deficiency in an adult patient. The TSA is a rapid palatal expansion appliance that involves the use of four microimplants and two expansion screws, one front and one rear. The expansion forces transmitted through the teeth in traditional rapid palatal expansion appliances create unwanted dental effects rather than true skeletal expansion, particularly in older patients with more rigid interdigitation of the midpalatal suture. The TSA appliance provides a purely skeletal anchorage with the bicortical engagement of the microimplants into the palate, this should minimize these side effects.

**METHODS:** This 23-year-old patient had maxillary constriction with a unilateral posterior crossbite. Before the TSA was installed, we designed the sites and the guided insertion of the miniscrew through the MAPA method (Patent). This type of method guarantees a safe insertion of miniscrews for both the patient and the orthodontist. The activation of the front screw started with 1 turn per day during the first 30 days. The rear screw has been activated 2 times a day for the first 20 days, once a day for the remaining 10 days. The active phase of the expansion lasted in total 50 days. The opening of the diastema occurred on the twentieth day. Activation was stopped when the patient reported some discomfort in the palate and nasal cavity areas and headache. The pain was resolved after a short interruption of the activation.

**RESULTS:** At the end of the expansion the maxillofacial structures are significantly expanded and this determined the complete resolution of the crossbite on the right. Comparing the pre and post-TSA images, both in 2D and in 3D, it is possible to observe the skeletal changes obtained.

**CONCLUSIONS:** As a result of this study and as a conclusion of this report it is possible to show how to achieve a successfully transverse expansion of the maxilla in an adult patient without using surgery and without affecting any tooth. This achievement was made possible through the use of a skeletal anchorage specially developed, 3D technologies and the MAPA system.

## A systematic review of the literature about two-dimensional and three-dimensional methods for the diagnosis of facial asymmetry

L. Pedersoli, D. Dalessandri, A. Fabbri, L. Sangalli, A. Rolfi, F. Nervi, S. Bonetti, C. Paganelli

*Department of Orthodontics, School of Dentistry, University of Brescia, Brescia, Italy*

**BACKGROUND:** The primary goal of this systematic review was to review the literature about the methods available for the clinicians to diagnose facial asymmetry. All methods reported from different Authors in the selected papers, both in two-dimensions (2D) and in three-dimensions (3D), were presented and critically analysed in this review. A secondary aim was to try to compare mostly used methods in terms of accuracy, precision and sensitivity.

**METHODS:** The online databases selected for the literature search were PUBMED (National Library of Medicine, NCBI), Scopus, LILACS and Google Scholar. The search was conducted on papers dated from 1982 to 2018; the last access on these databases was on 1st February 2018. 781 papers remained after duplicates elimination. Reading their abstracts, the majority of them were eliminated because they distanced themselves from the topic of this study. 58 papers, available in full text, were considered relevant and analysed in details. **RESULTS:** 2D and 3D methods are used to diagnose facial asymmetry. The complete list of these methods includes both x-ray based and not based techniques. Regarding 2D methods, panoramic radiography (OPG), postero-anterior cephalograms (PA), submentovertex projection and digital photography are available for the clinicians. Submentovertex projection is no longer used in the daily routine because during its execution an important dose of radiation strikes patients' thyroid. It represents an uncomfortable exam and it is characterised by the superimposition of different anatomical structures. Also the panoramic radiography is not frequently used in the diagnosis of facial asymmetry because it is affected by a lot of limitations such as distortion and magnification of the structures. Regarding 3D methods, different methods are available for the orthodontists: Cone Beam Computed Tomography (CBCT), stereophotogrammetry, laser scanning, contact digitalization and, less used, morphoanalysis, stereolithography, 3D ultrasonography, facial morphometry, digigraph imagines, moiré topography and contour photography. Some of these latter methods seems to be extremely rare in orthodontic routine especially because their use requires certain instruments and specific knowledge.

**CONCLUSIONS:** Several methods are potentially available for the clinicians to diagnose facial asymmetry. Three-dimensional ones seems to be more accurate, precise and sensitive than two-dimensional methods. However there is a literature agreement that, regardless of the method used, the first fundamental step in the diagnostic process of a patient with facial asymmetry must be the clinical exam.

## Efficacy of class II malocclusion treatment using sander bite jumping appliance

S. Bazzanella<sup>1</sup>, E. Gumirato<sup>1</sup>, F. Faccioni<sup>2</sup>

<sup>1</sup>University of Verona, Verona, Italy; <sup>2</sup>Department of Orthodontics, Dentistry, Department of Maternal-Infant and Surgical Odontostomatologic Sciences, University of Verona, Verona, Italy

**BACKGROUND:** The aim of this poster is to show the efficacy of class II malocclusion treatment in growing patients using Sander Bite Jumping Appliance. In the case discussed in this article, the patient presented a class II-division 2 malocclusion with a deep bite. The overbite was 6 mm, while the 1 mm overjet was caused by the retroversion of the upper central incisors. The initial radiographs of the patient were evaluated and a cephalometric diagnosis was performed. SNA value was 81, that indicated a normally-developed upper jaw, and SNB value was 77, that was an indication of mandible underdevelopment. The patient had a concave profile and an open nasolabial angle. The treatment plan foresaw an initial upper arch alignment to reduce the deep bite and increase the overjet in order to create space for mandibular protrusion. After this first phase of treatment the malocclusion became class II - division 1. Subsequently, an orthopedic-functional treatment was undertaken to correct the sagittal basal defect. **METHODS:** The orthopedic-functional treatment was performed using Sander Bite Jumping Appliance. It is a mobile device that consists of two resin plates. The upper plate has a median expansion screw and it is joined to two robust steel extensions (clamps). The clamps form an angle of 60° with the occlusal plane. Associated with the upper plate, there is a vestibular arch, that covers the front group up to the canines and two Adams hooks resting on the sixths. The lower plate, on the other hand, has an inclined plane constructed to be parallel to the clamps. The lower plate provides a vestibular arch for the anterior elements and a resin overlay on the incisal portion of the latter to prevent their proclination. Mandibular propulsion is determined by the advancing construction bite and the upper plate clamps resting on the inclined plane of the lower plate. In the case presented in this work, the resolution of the second class was evaluated through an intensive use of this mobile device by the patient, higher than the 14 hours a day usually indicated.

**RESULTS:** Six months after the SBJA delivery, a hyper-correction was obtained: the initial class II malocclusion became class III. Overbites and overjets were reduced. Posterior disclusion at rest is a sign of future relapse of the hyper-correction, which will lead the patient from a class III occlusion to a class I occlusion and to a restoration of correct overbite and overjet values.

**CONCLUSIONS:** The device, if worn more than 14 hours a day, is effective in correcting class II malocclusion. However, this orthopedic-functional treatment must be prescribed only after an assessment of the overjet, to allow the jaw to grow in a sagittal sense. The presented case demonstrates how patient compliance in treatment with SBJA is essential for the achievement of short-term results.

## The orthopassion approach to mini-implants: case report

M. Pellegrino<sup>1,2</sup>, G. Ghilardi<sup>1,2</sup>, C. Manenti<sup>1,2</sup>, G. Caldara<sup>1,2</sup>, T. Saladino<sup>1,2</sup>, R. Vinci<sup>1</sup>, A. Lucchese<sup>1</sup>, M. Manuelli<sup>1</sup>

<sup>1</sup>Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy; <sup>2</sup>Dental School, Vita-Salute San Raffaele University, Milan, Italy

**BACKGROUND:** A different and always more frequent therapeutic choice in orthodontics is the use of Mini-implants. They can represent a helpful anchorage device as a substitute for more traditional techniques requiring patient collaboration. Titanium mini-implants are frequently used for their advantages like versatility, small size, low cost and the easiness

## ABSTRACT

in positioning and removal. With this system osseointegration is not necessary and it can be used for a large range of orthodontic procedures. The use of mini-implants is indicated for both sagittal movements, as retrusion and protraction and vertical movements, as intrusion and extrusion. This study has the purpose to demonstrate the clinical employment of mini-implants in a female patient with severely compromised teeth and to show their benefits.

**METHODS:** The patient was a 47 years woman, after an appropriate case study through dental impressions and X-rays (T0), a titanium mini-implant was considered the best treatment solution. The mini-implant was placed in her mouth between the maxillary second premolar and first molar of right on the vestibular side (T1). The mini-implant had the following dimensions: 1.8 mm of diameter and 7 mm of length. The loss of premolars and molars in one dental arch often brings to super-eruption of the antagonist teeth, causing insufficient space for the prosthetic rehabilitation. In this situation the possible treatments are odontoplasty of the extruded teeth with the necessity of endodontic treatment, or maxillary impaction surgery or orthodontic treatment. This case report shows the situation of an adult patient requiring the intrusion of the first maxillary molar of right to obtain enough space for a removable prosthesis to replace the lower lost teeth. Furthermore, this clinical case demonstrate the utility of mini-implants to obtain a reduction of the upper incisor protrusion. Optimal results were reached in only 6 months (T2) from the first orthodontic visit (T0).

**RESULTS:** The mini-implant allowed the intrusion and the backward movement of the maxillary anterior teeth. This kind of treatment allowed a high preservation of dental structures and a good restoration of the mandibular dentition. Through this technique the patient obtained a safety and proper solution to her dental serious problems.

**CONCLUSIONS:** The use of mini-implants during orthodontic therapy as a temporary devices is the most appropriated solution in many different clinical situations. If slight forces are involved, the immediate-loading of these devices is not a cause of failure. For an appropriate mini-implants stability good bone quality (adequate cortical bone thickness and high trabecular bone density), no inflammation of peri-implant soft tissues and a correct placement procedure are necessary. Furthermore, also a limited distance between the mini-implant center of resistance and application point of the force is required.

### Laypeople's preferences of facial profile aesthetics by analyzing different silhouettes with specific cephalometric values: preliminary study

F. Spadaro, G. Bellagarda, M. Saettone, P.A. Deregibus, T. Castroflorio, M.G. Piangino

*Division of Orthodontics, Department of Surgical Sciences, C.I.R. Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** The aim of this study is to identify the facial profile aesthetics preferred by laypeople who do not have specific knowledge in dental field. This study was carried out to compare it with dentists' perception of facial profile aesthetics.

**METHODS:** 30 different silhouettes of facial profiles were produced and they were grouped in 6 different groups. Each group contained 5 silhouettes (1 of this silhouettes have meso-

type values) in which a specific cephalometric value varied. The analyzed values were: SN<sup>o</sup>GoGn, S<sup>o</sup>NA, S<sup>o</sup>NB, Ls:E, Li:E, SnPg<sup>o</sup>Gsn. In each group there were the mesotype values with its standard deviation. To get the other four silhouettes at first we added and subtracted one and half standard deviation and in a second moment two times standard deviation. A questionnaire was submitted to 108 laypeople; the questionnaire asked for age, sex, education level and contained 30 VAS scales, each corresponding to a different silhouette. The age, sex and education level have been requested because in literature it was showed that by changing this characteristics also the laypeople's preferences change. When the questionnaire as proposed to laypeople, they analysed a group of images at a time and they were not made aware of what value changed and if there were repeated silhouettes.

**RESULTS:** Laypeople preferred a mesodivergent or slightly hypodivergent facial profile compared to a hyperdivergent one. They also preferred a maxilla anteriorly positioned to the mesotype rather than a posteriorly one; on the other hand the mesotype is highly preferred for the mandible. Both the upper lip and the lower lip are preferable not excessively protruded. The facial convexity highly preferred by laypeople was mean value. In particular the laypeople's preference about divergent facial profile was with Sn<sup>o</sup>GoGn. For that concern the position of maxilla and mandibular considering the angles S<sup>o</sup>NA and S<sup>o</sup>NB, they preferred S<sup>o</sup>NA=85° and S<sup>o</sup>NB=80° The distance between the upper and lower lips and E was respectively -7mm and -2mm. At the end the facial convexity value preferred was angle Sn-Pg<sup>o</sup>G-Sn = 12°

**CONCLUSIONS:** Analyzing the averages obtained from the scores attributed to the silhouettes with the VAS scales by the 108 subjects interviewed, it is possible to identify a facial profile aesthetics with precise cephalometric values preferred by laypeople, in particular the facial profile preferred was mesotype one.

### Three dimensional analysis of facial morphology in children with non-syndromic cleft lip and palate

R. Tafa<sup>1</sup>, D. Cassi<sup>1,2</sup>, M. Magnifico<sup>1</sup>, A. Di Blasio<sup>1</sup>

*<sup>1</sup>Section of Orthodontics, Centro Universitario di Odontoiatria - Department of Medicine and Surgery, University of Parma, Parma, Italy; <sup>2</sup>Doctoral School in Life and Health Science, PhD Program in Experimental Medicine and Therapy, 29th cycle, CIR Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** Orofacial clefts are a heterogeneous group of disorder and can occur as isolated, nonsyndromic events, or as part of Mendelian syndromes. Expressivity, which describes the severity of the disease, may vary considerably among affected individuals, ranging from cleft lip alone, to cleft lip plus cleft palate, to cleft palate alone. In addition to this substantial phenotypic diversity, recent evidence suggests that minor defects, including microforms or sub-clinical physical features, are also part of the clinical presentation. The aim of this study is analyse three dimensional (3D) facial morphology of patients with non-syndromic cleft lip and palate (NSCLP) compared to unaffected controls, using digital surface stereophotogrammetry.

**METHODS:** This prospective cross-sectional, case-controlled morphometric study was performed on 15 children with NSCLP (11 male, 4 female) aged 5-14 years and 20 controls (10 males, 10 females). 3D stereophotogrammetric facial scans



were recorded for all participants in a natural head position. Ten anthropometric soft tissue landmarks were digitized on each image and x-, y-, z-coordinates for each landmark were extracted. From these different landmarks were obtained three vertical and six horizontal linear measurements. Based on soft tissue points, 9 linear facial distances (3 vertical and 6 horizontal) were measured. After one-month interval, the same operator repeated landmark identification and linear measurements on 25 images randomly selected. Intra-operator's repeatability was tested using Intra-Class Correlation (ICC) coefficient. A statistical analysis was performed with unpaired Student's t-test to investigate differences in anthropometric measurements between patients and case controls. The significance level was set as  $P < 0.05$ .

**RESULTS:** Based on ICC results, intraobserver agreement was above 0.85 for all measurements. Significant differences were observed between the groups with regard to some horizontal and vertical distances. Particularly, cleft children had increased intercanthal width and upper facial width as well as midface reduction.

**CONCLUSIONS:** The results revealed that 3D shape analysis provides a quantitative assessment of the craniofacial phenotype, allowing morphometric discrimination between subjects with congenital malformation and the control group. Stereophotogrammetry has proven to perform an accurate, non-invasive analysis of the face, being a useful tool for diagnoses and management of craniofacial anomalies such as cleft lip and palate.

### Clear aligners therapy and periodontal health: a systematic review and meta-analysis

P. Leonardo, A. Costantino, P. Spinuzza, G. Messina, R. Bertino, L. Rustico, E. Gatto, M. Portelli, A. Miliati, R. Nucera

*Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Section of Orthodontics School of Dentistry, University of Messina, Messina, Italy*

**BACKGROUND:** Perio-orthodontic relationship has been subject to a lot of investigations so far, and it is still a controversial issue. Orthodontic therapy with fixed appliance is often associated with alterations in the oral hygiene habits and periodontal health. Clear aligners are considered to facilitate better oral hygiene when compared with conventional brackets. The aim of this systematic review and meta-analysis was to evaluate the periodontal health of patients treated with clear aligners.

**METHODS:** A survey of articles published up to March 2018 about clear aligner therapy and periodontal health was performed using 7 electronic databases (MEDLINE, EMBASE, OvidSP, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Scopus, Web of Science) with 690 initial identified articles. Only clinical trials investigating patients treated with clear aligners and with a comparable control group were included. Two authors independently performed the study selection, data extraction, and risk of bias assessment. All pooled data analyses were performed using the random-effect model. Statistical heterogeneity was evaluated. To evaluate the periodontal health of the treated sample two outcomes were considered: Plaque Index (PI) and Gingival Index (GI).

**RESULTS:** Four relevant articles were selected. In total, data from 277 patients (117 treated with clear aligner and 160 with fixed appliances) were collected. Mean age at the start of the treatment in the evaluated samples ranged from

11 to 62 years. The group treated with clear aligners showed a significant improvement for the Plaque Index [-0.28 (95%; -0.56 to -0.00)] and for the Gingival Index [-0.30 (95%; -0.43 to -0.16)] compared to the group treated with fixed orthodontic appliances.

**CONCLUSIONS:** To the best of our knowledge, this is the first meta-analysis that specifically investigated the current literature about periodontal health during clear aligner therapy. The results of this meta-analysis showed that clear aligner therapy produce a significant improvement of periodontal health, evaluated by means of Plaque Index and Gingival Index, compared to fixed orthodontic appliances therapy. The conclusions of this systematic review and meta-analysis should be considered with some caution because of the low quality of evidence found among the original studies. Thus, further high-quality studies, such as RCTs, are needed to elucidate the effects clear aligner therapy on the periodontal health.

### Comparison of the accuracy of intraoral and extraoral scanners: a review

S. Costa, A. Miliati, M. Portelli, L. Rustico, A. Lo Giudice, A. Farah, E. Gatto, L. Incardona, R. Castellaneta, R. Nucera

*Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Section of Orthodontics, School of Dentistry, University of Messina, Policlinico Universitario "G. Martino", Messina, Italy*

**BACKGROUND:** Digital models represent an alternative to the conventional plaster models. They can be produced directly, via intraoral scanning, or indirectly, using extraoral scanners. Digital models allow electronic storage, digital measurements, and faster reliable manufacturing processes. However, it is not yet clearly established how accurate both scanning methods are. Similarly, there are no clear indications regarding which type, intra- or extraoral, should be preferred in a treatment work-flow. Aims of this review are to determine whether or not intraoral and extraoral scanners can produce clinically acceptable digital impressions, and which method achieves better results in terms of accuracy and reliability.

**METHODS:** An electronic search of the literature was conducted through Pubmed, Google Scholar and Cochrane Library, using the query terms "accuracy", "trueness", "precision", "intraoral scanner" and "extraoral scanner", combined by the Boolean operators "OR" and "AND". No time or language limitation was applied. The search strategy led to 127 articles. If the title and/or abstract seemed to be relevant to the topics of the study, full texts were retrieved. Once the full text were obtained, they had to satisfy the following inclusion criteria to be finally included: studies focused on the accuracy, precision, trueness of intraoral and extraoral scanners; human-based studies and in vitro studies; studies considering full-arch impressions; studies published in english. Additionally, these exclusion criteria were applied: lack of clear description about criteria for full-arch measurements; studies dealing with implant impressions, prosthetic unit preparations or single crowns; studies not including full-arch impressions; impressions taken on fully or partial edentulous arches; pilot studies; studies published in languages other than english. Finally, four articles were selected.

**RESULTS:** The articles investigate the accuracy of several scanners with different technologies. Nine intraoral (Cerec Omnicam, Cerec Bluecam, Planmeca Planscan, Carestream 3500, Cadent iTero, 3Shape Trios, Lythos, Lava COS, E4D)

## ABSTRACT

and four extraoral scanners (3Shape D800, Ortho Insight 3D, D250, D700) are described. Each study successfully makes a comparison between intraoral and extraoral scanners, focusing on accuracy, reliability and validity of full-arch digital impressions through different means.

**CONCLUSIONS:** Within its limits, this review suggests that both intraoral and extraoral scanners represent a valid tool to obtain dental impressions. Overall, digital models and plaster models are alike in terms of reproducibility and measurement accuracy. Regarding intraoral scanners, patient-related factors may impair the scanning accuracy. When used in an extraoral environment, intraoral scanners underperform when compared to the extraoral scanners. In orthodontics, intraoral scanning could be used reliably for diagnostics and treatment planning, while extraoral scanners, showing higher accuracy, allow higher precision of appliances built with computer-aided design and computer-aided manufacturing.

### Swallowing activity and temporomandibular disorders in adults

M. Laurenziello <sup>1</sup>, G. Montaruli <sup>1</sup>, G. Illuzzi <sup>1</sup>, M. Tepedino <sup>2</sup>, C. Cianci <sup>3</sup>, D. Ciavarella <sup>1</sup>

<sup>1</sup>Dipartimento di Medicina Clinica e Sperimentale, Università di Foggia, Foggia, Italy; <sup>2</sup>Dipartimento di Medicina Clinica, Sanità Pubblica, Scienze della Vita e dell'Ambiente, Università degli Studi dell'Aquila, L'Aquila, Italy; <sup>3</sup>Dipartimento di Meccanica, Matematica e Management, Politecnico di Bari, Bari, Italy

**BACKGROUND:** Temporomandibular disorders (TMDs) are a heterogeneous group of disorders affecting the masticatory system with pain as the dominating characteristic. The aetiology is multifactorial and is related to many perpetuating, predisposing and initiating factors. The daytime parafunctions may have an important role in TMD pathogenesis, and also may be consequences of TMD due to muscles compensatory responses. In literature the most frequent parafunction evaluated are: the static parafunction (i.e. clenching) and the dynamic parafunction (i.e. grinding) but there are poor data about the role of the tongue. In the present paper the authors evaluated the swallowing activity (an oral function/parafunction) with the surface electromyography (sEMG) in patients with TMD. **METHODS:** Twenty patients with TMD problems (NHP) (mean age: 32,5 ± 1.997; 7 men and 11 women) and 20 healthy matched subjects (HP) (34.4 ± 2.782; 6 men and 14 women) were selected and examined. On each patients an 8 channels surface electromyography was performed during saliva swallowing activity. The parameters evaluated in both HP and NHP patients were: 1. Muscles tension (uV), 2. Muscles right and left percentage of balancing (%), 3. Time of swallow (t), 4. Muscles Frequency (Hz). Data were evaluated on statistical "GraphPad" software. Statistical significance was set at 0.05. **RESULTS:** NHP patients presented higher masseter and temporalis activation than HP (P<0,05) but no difference has been found during sub mental muscles activation. The NHP patients showed an unbalancing of temporalis and sub mental muscles activation (P<0,05) and an higher swallow time than HP (P<0.001).

**CONCLUSIONS:** The oral parafunctions may have an influence in Temporomandibular disorder (TMD) pathogenesis. The most important parafunctions correlated were: clenching and grinding. Swallowing is one of the most important oral function and this act involves cortical

and subcortical structures and many head/neck muscles. In the present paper authors evaluated the swallowing using the sEMG in patients with TMD (NHP) paired to an healthy group patients (HP). Our data showed that patients with TMD has an alteration in the swallowing pattern, and this suggest a possible key role of the swallowing phase in the pathogenesis of TMD and so the importance of the evaluation of the swallowing function/parafunction during diagnosis phase of patients with TMD.

### Orthodontic-surgical management of skeletal class III malocclusion in adult patient

**BACKGROUND:** Class III malocclusions are considered one of the most difficult problems in the orthodontic treatment. Their causes are multifactorial and include genetic and/or environmental factors. Class III malocclusions are generally classified into skeletal and/or dental. The diagnosis is important due to the different treatment approaches. Generally a dental class III can be treated with orthodontics alone, while a true skeletal class III requires a combination of orthodontics and surgery. The aim of this case report is to describe the orthodontic-surgical management of skeletal Class III malocclusion due to maxillary deficiency in adult patient.

**METHODS:** A 50 years old male patient came to our observation seeking orthognathic correction of Class III malocclusion. He had a concave and retrusive profile, a dento-skeletal Class III malocclusion due to maxillary deficiency, reduced overjet and overbite and decreased teeth exposure during smiling. The alternative treatments were surgical treatment or dental compensation (camouflage). The treatment objectives were to achieve a good functional occlusion, improve the skeletal and soft tissue profile, to correct the dento-skeletal Class III, and to normalize OVJ and OVB values. Camouflage would correct the dental class III without improvement of profile and facial aesthetic. For this reason the surgical treatment with orthodontic presurgical dental-decompensation was chosen.

**RESULTS:** The treatment plan consisted in bonding of the upper and lower dental arches in order to obtain the dental decompensation and passive stainless steel archwires were placed; maxillary osteotomy Le Fort I with advancement and post surgical orthodontic treatment was performed. Six months after surgery, orthodontic treatment went on to achieve arch form coordination and the fixed appliance was removed. Retention was provided by upper Hawley biteplate and lower 3-3 bonded lingual retainer. Total treatment duration was 24 months. There was a good improvement in facial harmony and in the profile of the patient. Ideal overjet and overbite, Class I molar and canine and coincidence of upper and lower midline were achieved. Moreover has been obtained a good exposure when smiling.

**CONCLUSIONS:** In the present case report only maxillary surgery was performed in order to achieve a normal facial appearance. When reviewing the patient's final records, the major goals set at the beginning of treatment were successfully achieved, providing the patient with adequate masticatory function and pleasant facial aesthetics. After a 1-year clinical follow-up, the maxillary and mandibular stability was preserved. In conclusion surgical treatment with only maxillary advancement is a short-term effective therapy for mild/moderate Class III malocclusion. However the long-term stability of these approach needs further evaluation.

## Treatment of pseudo-class III malocclusion in children with SOCIA III

G. Illuzzi<sup>1</sup>, G. Montaruli<sup>1</sup>, A. Landolfi<sup>1</sup>, M. Laurenziello<sup>1</sup>, C. Pappalettere<sup>2</sup>, D. Ciavarella<sup>1</sup>

<sup>1</sup>Dipartimento di Medicina Clinica e Sperimentale, Università di Foggia, Foggia, Italy; <sup>2</sup>Dipartimento di Meccanica, Matematica e Management, Politecnico di Bari, Bari, Italy

**BACKGROUND:** Class III malocclusion is a condition characterized by an inverse relationship between maxilla and jaw with a prevalence that varies among populations from 0% to 26%. In the specific field, Pseudo class III malocclusion the anterior cross bite is due to a forward functional displacement of the mandible. Many type of treatment are suggested in dental literature for treatment of Class III malocclusion and Pseudo Class III malocclusion. The aim of the present paper was to evaluate the dentoskeletal effects of Swallowing Occlusal Contact Intercept Appliance (SOCIA) III in pseudo Class III malocclusion treatment.

**METHODS:** Thirty patients (mean age: 9.58 years old) with pseudo Class III malocclusion and nine-teen controls (mean age 8.4 years old) were selected and treated for 20 months with "Modified Swallowing Occlusal Contact Intercept Appliance" appliance. It is composed by several acrylic components consisted of a palatal body with a sixty degrees tilted lingual flight with respect to an occlusal plane ending with a hole near palatal wrinkle, and a vestibular pad set 4mm buccal to the deciduous molars with metallic posterior bite blocks embedded in them. An Eschler arch built to touch the lower incisor labial surface was used to control the mandibular growth. All patients presented with a stage CS2, CS3 or CS4. Patients with CS5 were not enrolled in the study. Cephalometric analysis was performed before phase 1 treatment (T1), and immediately following phase 2 treatment (T2). A statistical analysis of cephalometric values before and after treatment was done.

**RESULTS:** The effect of the SOCIA III was evaluated after 20 months of treatment and paired with case control group. SOCIA III had skeletal and dental effects. Authors evaluated 12 dento-skeletal parameters: 2 about the vertical growth, 5 about the sagittal growth; 5 of dental position; among them 8 were statistically significant. On vertical plane the modification was about the facial height (+ 4,185 mm;  $P < 0,0001$ ). On sagittal plane ANB correction (+ 1,33°;  $P < 0,001$ ), CB growth (+4,14 mm;  $P < 0,0001$ ), ACB growth (+2,468  $P < 0,0001$ ) Co-A modification (+ 5,6 mm;  $P < 0,001$ ), Co-Gn (+7,09 mm;  $P < 0,0007$ ) were evaluated. The most important modifications of dental parameters were: the upper and lower incisors inclination (U1-SN +4,17°;  $P < 0,01$  and L1-MP -5,64°;  $P < 0,0007$ ) and overjet (+2,58 mm;  $P < 0,0001$ )

**CONCLUSIONS:** Authors evaluated that SOCIA III had skeletal and dental effects in treatment of pseudo III Class. They are resumed as follow: a) an effective maxillary sagittal increase on sagittal plane; b) a vertical jaw control; c) a resolution of overjet; d) no changes in overbite; e) a stimulation of ACB growth

## Analysis of the variability of the condilion-gonion-menton angle in a population of orthodontic patients

R. Baiano, S. Perrotta, R. Rongo, G. Monti, S. Gagliardi, R. Valletta, V. D'Antò

Department of Neuroscience, Reproductive Sciences and Oral Sciences, Section of Orthodontic and Temporomandibular Disorders, University of Naples Federico II, Naples, Italy

**BACKGROUND:** To evaluate the distribution and to determine a mean value of the Condilion-Gonion-Menton

(CoGoMe) angle in a population of patients from south of Italy.

**METHODS:** The cephalometric analysis was performed on a sample of 290 subjects (168 females, 122 males; mean age of 15.58 ± 6) recruited among orthodontic patients of the University of Naples "Federico II". The inclusion criteria were: age ≥ 8 and a good quality of x-ray; the exclusion criteria were: presence of systemic diseases and genetic syndromes, previous orthodontic treatment, history of obstructed nose breathing. All cephalograms were traced by using the software Dolphin (Chatsworth, CA, U.S.A.). One operator (G.M.) localized the cephalometric landmarks and measured the angles. The method error for the CoGoMe<sup>^</sup> was 0.87°, there was no systematic error for any measurements (Student's t-test:  $P = 0.539$ ). Continuous variables were reported as means, standard deviations, medians, and range. Regression analysis were performed to evaluate CoGoMe<sup>^</sup> changes according to the age. Differences in CoGoMe<sup>^</sup> among individuals with different A-N Pogonion angle (ANPg<sup>^</sup>) and Sella/Nasion-Gonion-Gnation angle (SnGoGn<sup>^</sup>) were estimated as appropriate using ANOVA followed by Bonferroni's post hoc test.

**RESULTS:** the CoGoMe<sup>^</sup> resulted normally distributed ( $P = 0.289$ ) and the mean was 127.2° ± 7.7° [IC 95% 112.1° - 142.3°] (range min 102.5° max 156.5°). The regression analysis showed a decrease of the CoGoMe<sup>^</sup> during the growth ( $B = -0.58$ ;  $P = 0.014$ ;  $CONST = 135.54$ °). The total sample was divided in three groups according to ANPg<sup>^</sup> (Group 1 including 32 patients with ANPg<sup>^</sup> ≤ -1°; Group 2 including 196 patients, with 1 ≤ ANPg<sup>^</sup> ≤ 5 and Group 3 including 62 patients with ANPg<sup>^</sup> ≥ 5°). No significant differences of the CoGoMe<sup>^</sup> values were found among these three groups ( $P = 0.559$ ). Furthermore, the total sample was divided in three groups according to SnGoGn<sup>^</sup> (Group 1 including 60 patients with SnGoGn<sup>^</sup> < 27; Group 2 including 166 patients with 27 ≤ SnGoGn<sup>^</sup> ≤ 37 and Group 3 including 64 patients with SnGoGn<sup>^</sup> > 37). Significant differences of the CoGoMe<sup>^</sup> values were found among these three groups ( $P < 0.001$ ).

**Conclusions:** In this study, the mean and standard deviation of CoGoMe<sup>^</sup> were of 127.2° ± 7.7°. Results demonstrated that sagittal occlusion does not influence the CoGoMe<sup>^</sup>. From the age of 8 to 16 year old the CoGoMe<sup>^</sup> decreases 0.58° per year starting from the initial value of 135°.

**CONCLUSIONS:** The CoGoMe<sup>^</sup> may be considered a useful cephalometric parameter for the diagnosis of the facial growth pattern.

## Analysis of dental parameters in subjects with agenesis of maxillary lateral incisors: a retrospective study

L. Caterini, R. Di Giorgio, R. Guarnieri, E. Barbato

Department of Oral and Maxillo-Facial Sciences, Sapienza, University of Rome, Rome, Italy

**BACKGROUND:** Agenesis of maxillary lateral incisor, unilateral and bilateral, is one of the most common dental anomalies. This often presents a significant clinical challenge for orthodontists who are faced with the decision to open or close spaces. The type of treatment is conditioned in particular by: profile- malocclusion- available space in the arch and tooth size. The aim of this retrospective study was to investigate the association between upper lateral incisors agenesis and the differences in the dental structures compared with patients



## ABSTRACT

without congenitally missing lateral incisors. Different dental parameters will be analyzed to guide the clinician to design a proper therapeutic plan.

**METHODS:** A sample of 120 patients was selected. A total of 60 patients with one or two congenitally missing lateral incisors were retrieved; 25 (41,7 per cent) patients presented unilateral agenesis, whereas 35 (58,3 per cent) had bilateral agenesis. The control group consisted of 60 orthodontic patients. Panorographic radiographs and dental casts were analyzed for each patient. The following Inclusion criteria were selected: absence of previous orthodontic treatment; absence of sequelae of traumatic injuries; cleft lip and palatal or other craniofacial syndromes; availability of pre-treatment panoramic radiographs performed in mixed or permanent dentition and lateral telerradiography of the head as a diagnostic tool used to evaluate the skeletal class and the facial divergence of each subject; good quality radiograph views. The largest mesiodistal crown dimension for all teeth, except for the third molars, was measured on plaster casts using an electronic digital caliper to the nearest 10th of a millimetre. T-test was used to evaluate the presence of statistically significant differences between two groups. Statistical testing was performed using the analysis of variance model ( $P < 0.05$ ) to test for differences in the mesiodistal dimension between the sample and the control group. Significance has been assessed using a P-value threshold level of 5 per cent.

**RESULTS:** Patients who were missing maxillary lateral incisors had smaller teeth compared to control subjects, except for the lower right central incisor, second lower premolars and second lower molars. The reduction of the mesio-distal diameter of patients in the unilateral agenesis group is greater than those in the bilateral agenesis group. A higher prevalence of micro-dontic contralateral incisors was found in patients with unilateral agenesis with respect to the control group. (Upper left lateral incisor: average difference of 1.69 mm). Patients with agenesis of the upper lateral incisors are more likely to have other agenesis involving different dental elements. (Frequency of 23.3 per cent). These patients are more likely to have class II malocclusion, reduced overjet and absence of overcrowding in the upper arch, which is generally square-shaped.

**CONCLUSIONS:** Agenesis of maxillary lateral incisors was found to be a significant predictor of tooth size. The element whose mesio-distal diameter has the greatest reduction is the upper lateral incisor which in most cases is microdontic or conoid. Moreover, further studies are needed to establish with greater certainty the dental parameters, along with the skeletal parameters of patients with unilateral and bilateral agenesis maxillary lateral incisors. It is important to start from a careful early diagnosis that takes into account the need for aesthetics and function in order to direct the patient towards the most suitable therapeutic choice.

### Bone and cortical bone characteristics of mandibular retromolar trigone and anterior ramus region for miniscrew insertion in adults

A.J. Farah, A.M. Bellocchio, M. Portelli, G. Oteri, R. Leonardi, G. Cordasco, R. Nucera

<sup>1</sup>Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Section of Orthodontics, School of Dentistry, University of Messina, Messina, Italy; <sup>2</sup>Department of Medical-Surgical Specialties, Section of Orthodontics, School of Dentistry, University of Catania, Italy

**BACKGROUND:** To date, no quantitative and qualitative assessment of the skeletal characteristics of MRTARR has

been performed for miniscrew insertion. The aim of this study was to evaluate bone depth, cortical bone thickness and vestibulo-lingual bone dimension of mandibular retromolar trigone, an anatomical area positioned distally to the second mandibular molar, recently documented in literature as a strategic insertion site for orthodontic miniscrews.

**METHODS:** The sample included CBCT records of 60 adult subjects (mean age  $32.8 \pm 8.2$ ) retrospectively evaluated, including 30 males (mean age  $33.4 \pm 8.6$ ) and 30 females ( $31.7 \pm 9.1$ ) selected from the digital archive of a private practice. The CBCT exams were preselected if the examined subjects fulfilled the following selection criteria: Caucasian subjects, age between 20 and 45y.o., absence of: periodontal disease, metallic restorations in the first and second permanent mandibular premolars and molars, missing teeth except for third molar, genetic syndromes, craniofacial dysmorphisms, facial trauma, and previous orthognathic surgery treatment.

All CBCT examinations were performed with i-CAT CBCT scanner (Imaging Sciences International, Hatfield, Pa). Each exam was converted into DICOM format and processed with OsiriX Medical Imaging software. The following procedure was used in order to obtain proper view sections of MRTARR for quantitative and qualitative bone characteristics evaluation. On reproducible sagittal scan views, bone depth and cortical bone thickness were evaluated on specific lines parallel and  $45^\circ$  angulated to the occlusal plane and at 3 and at 6mm dislocated from it. Vestibulo-lingual bone dimension was computed in 4 different cross section scans and at 3 different level of depth (0, 6 and 11mm).

**RESULTS:** All the considered insertion sites showed on average more than 10mm of bone depth. Significant differences ( $p < .05$ ) were found comparing bone depth in cross-sectional scans at different inclinations (parallel vs  $45^\circ$  oriented compared to the occlusal plane). This finding suggests that the insertion with a parallel disposition to the occlusal plane is potentially safer compared with a  $45^\circ$  insertion inclination modality. No significant difference of bone depth was found comparing cross sectional scans with the same orientation (parallel or  $45^\circ$  inclined) but at a different dislocation (3 vs 6mm) from the occlusal plane. Vestibulo-lingual bone dimension evaluation showed adequate values for miniscrew insertion.

**CONCLUSIONS:** MRTARR can be successfully used as a miniscrew insertion site for different clinical applications. Retromolar trigone and anterior ramus region showed enough bone quantity and adequate bone quality for safe mini-screw insertion in adults. Miniscrew insertion with a parallel orientation to the occlusal plane offers increased bone depth compared to the  $45^\circ$  insertion orientation. Vestibulo-lingual bone dimension showed a significant reduction in the posterior regions. Considering the average cortical bone thickness, pre-drilling is always recommended before screw insertion.

### A finite element analysis of the distalization movement of an upper molar: a clinical case

R. Valentino <sup>1</sup>, A. Pango <sup>1</sup>, C. Klain <sup>1</sup>, M. Piergentili <sup>1</sup>, R. Valletta <sup>1</sup>, R. Savignano <sup>2</sup>, V. D'Antò <sup>1</sup>

<sup>1</sup>University of Naples Federico II, Department of Neuroscience, Reproductive Sciences and Oral Sciences, Section of Orthodontic and Temporomandibular Disorders, Naples, Italy; <sup>2</sup>Nivol s.r.l., Cascina (PI), Italy

**BACKGROUND:** Finite Element Analysis (FEA) represents a numerical simulation method used to evaluate the effective-

ness of orthodontic appliances without the need of physical prototyping. AirNivol® developed a specific tool to predict the outcome of the orthodontic treatment by thermoplastic appliances. The aim of this research is to evaluate the predictability of the distalization movement for a maxillary second molar.

**METHODS:** The patient was a 25 years-old female showing a dento-skeletal class II with a convex profile and lower incisors severely buccally inclined. A full maxillary patient's arch (14 teeth) was modelled by combining two different imaging techniques: Cone Beam Computed Tomography to reconstruct tooth roots and bone tissues, and Surface Structured Light Scanning to create digital tooth crown models from patient's impressions. The reconstructed surface digital models were imported within the Finite Element Model (FEM) software (Ansys® 17) to simulate all planned orthodontic movements.

The treatment simulation included 4 mm of sequential distalization of upper teeth and 1.5 mm of anchorage loss at the lower arch with a set of 32 upper and 15 lower aligners. **RESULTS:** The FEA results show the second molar distalization determined mesial displacement of the first molar and buccal tipping of the incisors. Therefore, the attachment did not bring to a bodily movement as expected, at least in the initial tooth displacement. However, it enhanced the target tooth displacement. The Force system of second molar measured at the CRES was ( $F_x = 0,18$  N;  $F_y = 7,9$  N;  $f_z = -1,36$  N) and ( $M_x = -72,8$  Nmm;  $M_y = -0,7$  Nmm;  $M_z = -16,6$  Nmm).

**CONCLUSIONS:** Computer Aided Engineering (CAE) can be usefully applied to the study of orthodontic thermoplastic appliances. AirNivol® treatment protocol is based on the latest development of the research in the field of digital design and manufacturing. It is possible to analyze the effects of different attachment options and to highlight the difference between the designed orthodontic movement and the expected result calculated by the FEA. Further efforts will be concentrated on the analysis of multiple movements for different teeth aiming the selection of the appropriate auxiliary element for each treatment stage. This will allow an accurate and predictable orthodontic treatment.

### Maxillary sinusitis prevalence in juvenile idiopathic arthritis: cone beam CT study

U. Garagiola, P. Cressoni, L. Cigni, C. Occhipinti, B. Colangelo, P. Campagna, E. del Rosso

*University of Milan, Biomedical Surgical and Dental Sciences Department, Maxillo-Facial and Odontostomatology Unit, Orthodontics and Gnathology Department, Fondazione Cà Granda IRCCS Ospedale Maggiore Policlinico, Milan, Italy*

**BACKGROUND:** To evaluate a possible correlation between Juvenile Idiopathic Arthritis (JIA) and sinusitis of the maxillary sinuses and determine their prevalence.

**METHODS:** The Juvenile Idiopathic Arthritis is a chronic inflammatory disorder of probable autoimmune origin. The most important manifestation of this disease is chronic synovitis, synovial fluid pressure is produced in it often causes pain. The JIA begins before the age of 16 years of age. Sinusitis of the maxillary sinus is an inflammatory process, acute or chronic, causing a marked thickening of the mucosa, with or without local pain. This study analyzed 200 Cone Beam Computed Tomography (CBCT). Of

these 100 patients suffering from JIA, 100 were healthy. All patients who fall in this study were aged between 8 and 16 years. CBCT data were captured using an I-CAT™ Cone Beam 3-D imaging system (Imaging Sciences International, Hatfield, PA, USA) and processed using the I-CAT Vision viewing software (Croall Radiography, San Jose, CA, USA), which allows 3D image visualization and measurement: images are shown as a three-dimensional rendering and in their three spatial projections (frontal, lateral and axial). All CBCT were observed in the three planes of space, bringing attention to the coronal and transverse sections. Were not considered pathological maxillary sinuses presenting with mucous cysts and those with mild thickening of the membrane of the maxillary sinus (within 2-3 mm). Were considered acute sinusitis showed that, in the above sections, air-fluid level visible and those that showed complete obstruction (empyema) of the maxillary sinus and the complex osteomeatale.

**RESULTS:** The analysis of CT slices showed involvement of the maxillary sinuses in greater proportion in patients with JIA (24%), whereas in healthy subjects are involved in only 11% of cases. The difference between the two study groups was statistically significant ( $p = 0.0156$ ) ( $\chi^2 = 5.85$ ). Of the 24 patients with JIA, 50% showed bilateral sinusitis, 50% unilateral sinusitis. In healthy patients with sinusitis, however, the percentages vary: 36.4% 63.6% unilateral and bilateral sinusitis.

**CONCLUSIONS:** Only 1 from 11 healthy patients showing acute sinusitis, the remaining 10 cases had chronic sinusitis. Of the 24 patients with JIA, only 2 have acute sinusitis. In most cases analyzed, therefore, the sinusitis is chronic, especially in patients with JIA. In light of what, it is possible to assume a correlation between Juvenile Rheumatoid Arthritis (JRA) and sinusitis.

### Ossification timing of the spheno-occipital suture of skull: juvenile idiopathic arthritis vs. healthy patients

U. Garagiola, L. Cigni, C. Mauro, C. Occhipinti, P. Campagna, E. del Rosso, P. Cressoni

*University of Milan, Biomedical Surgical and Dental Sciences Department, Maxillo-Facial and Odontostomatology Unit, Orthodontics and Gnathology Department, Fondazione Cà Granda IRCCS Ospedale Maggiore Policlinico, Milan, Italy*

**BACKGROUND:** The aim of this to evaluate, by TC Cone Beam (CBCT), any discrepancy about the age range of the complete ossification of the spheno-occipital suture, comparing a sample of patients with Juvenile Idiopathic Arthritis (JIA+) with a sample of healthy patients (JIA-).

**METHODS:** We analyzed 210 CBCT of Juvenile Idiopathic Arthritis patients (JIA+) between the ages of 4 and 26 years treated at the Department of Orthodontics, University of Milan, and compared with the results of a sample of 230 healthy patients (JIA-) aged between 5 and 25 years being treated in the same department. CBCT data were captured using an I-CAT™ Cone Beam 3-D imaging system (Imaging Sciences International, Hatfield, PA, USA) and processed using the I-CAT Vision viewing software (Croall Radiography, San Jose, CA, USA), which allows 3D image visualization and measurement: images are shown as a three-dimensional rendering and in their three spatial projections

## ABSTRACT

(frontal, lateral and axial). All the patients have already had the CT we evaluated in this study because of the diagnosis of condylar disease (JIA+) or for the cephalometric evaluation. Sections obtained were studied in three planes of space through the use of dedicated software for the three-dimensional volumetric reconstruction. According to the radiographic images observed, were divided into two groups: the first one in which there is a complete speno-occipital ossification, characterized by the absence of radiolucent band separating the two bones considered; a second one in which is not observed bone fusion.

**RESULTS:** Direct observation of three-dimensional images available to us shows that: in subjects JIA + no female patient presents complete speno-occipital ossification before 10 years and no male patient has the same ossification before the 11 years. Also is noted that no female subject has incomplete ossification after 15 years or any male subject after the age of 13 years.

**CONCLUSIONS:** The results we obtained from this study allow us to say that considering female groups we observed comparable data in the two samples analyzed; instead in male groups there are slight differences. We can affirm that both juvenile idiopathic arthritis and its therapy does not significantly change the growth of the cranial base or the mean age ossification of speno-occipital suture.

### Torque control efficacy of elastomeric ligatures for lingual appliances over time: an experimental study

C. Calzolari, M. Migliorati, D. Poggio, S. Drago, A. Silvestrini-Biavati

*Orthodontic Department, DISC, University of Genoa, Genoa, Italy*

**BACKGROUND:** The aim of this in-vitro study was to evaluate the torque control efficacy of elastomeric ligatures in a customized lingual appliance over time.

**METHODS:** A home-made typodont was built with extracted human teeth and bonded with Incognito® customized lingual brackets (3M Unitek). Two different ligatures were evaluated: Alastik™ O-ring ligatures (3M Unitek) and Alastik™ Lingual ligatures (3M Unitek). The tested wire was a 0.016x0.022-in. Nickel-Titanium. An extension was laser-welded to the missing tooth's bracket in order to apply the forces with Zwick/Roell Z0.5 machine (sensitivity <1%, displacement sensibility 1µm, full scale range 500N). The machine generated forces from 0 N to 1N. TestXpert® II software was used for data collection. Torque moment (Nmm) was calculated by multiplying the force applied through the arm at T0. Torque angle was algebraically calculated: the ZwickLine® machine measured also the displacement performed by the extension, knowing the displacement and the arm we could derive the sine of the torque angle. The same tests were repeated after one month (T1), without changing the ligatures. During this period specimens were kept in saline solution.

**RESULTS:** After one month (T1) for each ligature the torque control was similar to the one recorded at T0. This finding was evident for both ligatures, (O-ring ligature and Alastik lingual ligature).

**CONCLUSIONS:** After one month both elastomeric ligatures (Alastik™ O-ring ligatures and Alastik™ Lingual ligatures) showed a good efficacy of torque control.

### Temporomandibular disorders before and after use of low energy polarized light

U. Garagiola, P. Cressoni, R. Soldo, L. Cigni, C. Occhipinti, E. del Rosso

*University of Milan, Biomedical Surgical and Dental Sciences Department, Maxillo-Facial and Odontostomatology Unit, Orthodontics and Gnathology Department, Fondazione Cà Granda IRCCS Ospedale Maggiore Policlinico, Milan, Italy*

**BACKGROUND:** The objective was to assess the effectiveness of a therapy using low energy polarized light (PL) devices, in reducing pain, promoting healing of soft tissue injuries and reducing inflammation, improving function and quality of life of the temporomandibular disorders (TMD) patients.

**METHODS:** 48 patients (21 males and 27 female), with TMD diagnosed using standard criteria, were assessed using electromyography (EMG) and computerized mandibular scan (K6). 8 minute PL therapy has been applied, 3 times per week for 4 weeks. No other treatment was given and patients were asked to refrain from taking analgesics during the course of the study. Polarized light therapy used a non-invasive optical device to project a beam of light on to the skin and mucosa. This light has four characteristics: polarization – the light waves move in parallel planes, producing a narrow, concentrated beam, unlike ordinary light, where waves oscillate in all directions; polychromy – it contains a broad spectrum of wavelengths or colours, including visible light & part of the infrared range, enabling it to stimulate a range of light receptors on the skin (cf. lasers, which are monochromatic, i.e. they contain only one wavelength); incoherency – the light waves are out of phase or unsynchronized, unlike laser light, which is coherent; it has low energy density, unlike laser light, which may have high or low energy density. Patient-reported questionnaires (PORs) and performance measures are used to assess TMD pain and function in clinical practice. PORs assess the patient's perspective, while performance measures assess functions such as mandibular kinesiology (mouth opening and closing or other standardized maneuvers) in a controlled setting. Standardized assessment of patient outcomes allows physicians to measure the success or failure of diagnostics and treatments that TMD patients receive.

**RESULTS:** Electromyographical, kinesiological and clinical data showed statistically significant reductions in pain and muscular spasms, improvements in function and increases in muscular strength were reported (compared to baseline measures). (P<0.01).

**CONCLUSIONS:** Joint pain typically involving the TMJ is the predominant complaint of people living with temporomandibular disorders. Pain is what drives patients to seek medical care. People with TMD are most distressed by the intensity, quality, and predictability of their joint pain, as well as its impact on physical function, sleep, fatigue, and mood. Valid and reliable PORs and performance measures are available to assess these aspects of the pain experience. The polarized light characteristics enable to penetrate the skin and underlying tissues in order to stimulate various biological processes. PL improves microcirculation, stimulates regeneration and repair, promotes wound healing and relieves pain, with no adverse effects. Low energy polarized light could be a valid alternative or concomitant treatment of temporomandibular disorders.



## Comparative analysis of torque control efficacy using different archwires in fixed vestibular bracket-wire system: an *in vitro* study

M. Migliorati, C. Calzolari, D. Poggio, S. Drago, A. Silvestrini-Biavati

*Orthodontic Department, DISC, University of Genoa, Genoa, Italy*

**BACKGROUND:** The aim of this study was to compare the torque control efficacy obtained in a fixed vestibular bracket-wire system using: (1) archwire of different size, (2) archwire of different material.

**METHODS:** A home-made typodont was built with eight extracted human teeth and bonded vestibular .022 x .028-in. brackets without torque pre-information. Teeth were positioned in a straight line to study the mechanical properties of the system, without following the natural shape of the arch. Teeth's roots were incorporate in transparent orthodontic resin (methyl-methacrylate). The teeth were in contact with one another, leaving space for one missing tooth. The tested wires were: Tru-Chrome .018x.025-in., .017x.025-in.  $\beta$ -Titanium, .016x.022-in. stainless steel. Ligatures used were standard elastic ligatures. An extension was laser-welded to the missing tooth's bracket in order to apply the forces with Zwick/Roell Z0.5 machine (sensitivity <1%, displacement sensitivity 1 $\mu$ m, full scale range 500N). The machine generated forces from 0 N to 1N. TestXpert® II software was used for data collection. Torque moment [Nmm] was calculated by multiplying the force applied through the arm; the arm was obtained, measuring the distance between the axis of rotation and the point of force application. The torque angle was algebraically calculated: the ZwickLine® machine measured also the displacement performed by the extension, knowing the displacement and the arm we could derive the sine of the torque angle. Torque angle changes corresponded to arm force changes, so the error was corrected after data collection.

**RESULTS:** Torque moment was increased with larger SS wire sizes.

There was a significant difference in torque moment using stainless steel wires of different size (.016x.022-in., .017x.025-in., .019x.025-in. wires). There was a significant difference in torque moment between the SS and beta-titanium wire, using the same wire section.

**CONCLUSIONS:** Increasing SS wire section, we needed higher torque moment to obtain equal degrees of torque (stainless steel .016x.022-in., .017x.025-in., .019x.025-in.). Using wires with the same section but different materials (beta-titanium .017x.025-in and stainless steel .017x.025-in) and applying an equal torque moment, beta-titanium wire produced a greater torque angle. To obtain the same torque angle value we had to apply a greater torque moment using stainless steel wire than beta-titanium wire.

## Dento-skeletal effects of maxillary expansion: a systematic review and meta-analysis

P. Spinuzza, G. Messina, L. Rustico, A.M. Bellocchio, A. Farah, F. Forestieri, F. Mincica, A. Lo Giudice, M. Portelli, A. Militi, R. Nucera

*Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Section of Orthodontics, School of Dentistry, University of Messina, Messina, Italy*

**BACKGROUND:** The aim of this systematic review and meta-analysis is to evaluate the dento - skeletal effects of rapid maxillary expansion in growing patients assessed by computed tomography.

**METHODS:** This systematic review and meta-analysis was conducted according to the guidelines of the Cochrane Handbook for Systematic Reviews of Interventions (version 5.1.0) and is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement. No language or age restrictions were applied in the nineteen electronic databases searched up to October 2017. Clinical trials were included in this systematic review if they were conducted including growing subjects with transversal maxillary deficiency treated with RME and evaluating skeletal and dental effects before and after rapid palatal expansion by means of one of the following 3D imaging CT techniques: CBCT, spiral CT and low-dose CT. Two authors executed study selection, data extraction, and risk of bias assessment independently. To evaluate the efficacy of the treatment, studies considering transverse skeletal increase assessed in the anterior, middle and posterior area of nasal cavity width, palatal basal bone and total alveolar bone; and considering additionally interdental width and dental tipping were taken into account. Then the studies included here were divided into different groups, according to the time frame between the first and second observation: 0-1 month, and 6-8 months, respectively.

**RESULTS:** 22 studies were included, according to our selection criteria. The studies considered here present a prospective and retrospective design. The patients' age varied across the studies, with the majority of them aged between 8 and 12 year old. The small number of studies for the anterior and middle area did not allow to carry out a metanalytic analysis. The mean treatment effect of rapid maxillary expansion was measured in the first molar region. They showed an increase on nasal cavity width of 1.94mm(81% CI, 1.29mm to 2.58mm) after 1 month, reduced to 1.77mm(84% CI, 0.71mm to 2.83mm) after 6-8 months; on basal bone dimension an increase of 2.71mm(93% CI, 2.14mm to 3.28mm) after 1 month; and the same outcome was 2.40mm(89% CI, 1.71mm to 3.10mm) after 6-8 months; while on total alveolar buccal bone the studies showed an increase on the crest of 3.89(96% CI, 2.94mm to 4.83mm) after 1 month; reduced to 3.15mm(93% CI, 2.07mm to 4.23mm) after 6-8 months; the same outcome on the palatal level was 3.08mm(85% CI, 1.95mm to 4.20mm) after 1 months; reduced to 3.31mm(94% CI, 2.69mm to 3.93mm) after 6-8 months. Dental effects measured in the posterior area were for intermolar width of 5.24mm (100% CI, 2.37mm to 8.11mm) after 1 month and 5.23mm(95% CI, 4.36mm to 6.10mm) after 6-8 months. Finally the dental tipping was 3.77°(95% CI, 2.64° to 4.91°) after 1 month and 2.50°(64% CI, 1.28° to 3.72°) after 6-8 months.

**CONCLUSIONS:** This systematic review with meta-analysis evaluates, for the first time in the orthodontic literature, the skeletal effects of rapid maxillary expansion at different treatment stages by means of computer tomography. The results indicate that rapid maxillary expansion show a transverse increase of the maxillary bone during activation period and even if during the retention period the skeletal basal bone seems to decrease the relapse is about 11.64%. On the dental effects the relapse is about 36.75%, reflecting a root uprighting evidenced by the decrease in the level of the buccal alveolar bone, and his increase to the level palatal.

## ABSTRACT

**Orthopassion on the treatment for class II malocclusion: the influence of twin block appliance on mandibular growth**A. Martintoni<sup>1</sup>, S. Croce<sup>1</sup>, S. Korolija<sup>1</sup>, A. Liguori<sup>1</sup>, G. Ghilardi<sup>1</sup>, M. Manuelli<sup>1,2</sup>, R. P. Mc Laughlin<sup>1,2</sup>, A. Lucchese<sup>1,2</sup><sup>1</sup>Department of Orthodontics, Vita Salute San Raffaele University, Milan, Italy; <sup>2</sup>Unit of Dentistry, Division of Orthodontics, Research Area in Dentofacial Orthopedics and Orthodontics, IRCCS San Raffaele Scientific Institute, Milan, Italy**BACKGROUND:** The aim of this clinical study was to evaluate the skeletal effects induced by Twin Block in the therapy of Class II malocclusion during, or slightly after, the onset of pubertal bone growth peak.**METHODS:** The study sample, obtained from the records of the author's private practice, consisted of a primary sample of 70 Class II division 1 subjects, of whom good quality lateral cephalogram were available, and they were treated with the Twin-block appliance. From this sample, 30 subjects (Study Sample, 15 males and 15 females) were selected according to the following inclusion criteria: ANB greater than or equal to 4°, full Class II or end-to-end molar relationships, no history of previous orthodontic treatment or surgery treatment, absence of congenital anomalies, caucasian race. All patients received active treatment with Twin-block before or during their pubertal growth peak, as assessed by the cervical vertebral maturation (CVM) method. Lateral cephalogram were digitized for each subject by a single author (AL), respectively at time 1 (T1) immediately before treatment (mean age 10.0±1.1 years) and at time 2 (T2) immediately after treatment (mean age 12.0±1.1 years). The error of the method was calculated with the formula described by Dahlberg (1940). In addition systematic error and the reliability coefficient were determined as suggested by Houston. The Control Group consisted of untreated Class II subjects, with the same inclusion criteria. A modification of the Twin-block appliance, originally developed by Clark, was used in this study. In the present study the mean duration of the Twin-block treatment was 1.2±0.5 years.**RESULTS:** The statistical comparisons between Study Sample (treated subjects) and Control Group (untreated subject), during the T1–T2 observation, showed significantly changes in favour of the treatment: the mandibular length (Co-Me), the ramus height (Co-Go) and the corpus length (Go-Me) increased more in cases than in controls. Our results show a significantly higher average answer in the Study Sample, both in the paired t-test, comparing pre and post treatment, and in the unpaired t-test, comparing the Study Sample and the Control Group. Paired T-test data for the variables Co-Me, Co-Go, Go-Me, with a P = 0.05 significance level, lead us to reject the null hypothesis (differences average = 0) in favour of the alternative of a positive differences average, meaning that the average of the values is higher after the treatment.**CONCLUSIONS:** An important mandibular growth was showed using the Twin-block appliance in the Study Sample, higher than the Control Group; moreover this appliance is more effective during the pubertal peak.**Soft tissue effects of twin block functional appliance in patients with class II division 1 malocclusion: a review of literature**

D. Jamshir, A. Chudan, A. Boboc, G. Galluccio

*Dipartimento di Scienze Odontostomatologiche, Università di Roma La Sapienza, Rome, Italy***BACKGROUND:** The aim of the present review was to evaluate changes in the facial profile resulting from the use of Twin Block functional appliance in the treatment of Class II division 1 Malocclusions. The Twin Block appliance is one of the widely used removable functional appliances to correct class II dentoskeletal disharmony. The Twin Block appliance consists of two separate, unattached upper and lower bite block components which work together as one. Subjects presenting with a Class II division 1 malocclusion have specific clinical characteristics such as an unfavourable profile which may produce negative feelings of self-image and self-esteem.**METHODS:** We reviewed the literature recording the number of publications in relation to specific keywords using Pubmed database. Only articles written in English was included in the study. The period considered was from 2005 to 2016. Key words: Twin Block appliance; soft tissue changes; Angle class II malocclusion.**RESULTS:** A systematic review of soft tissue changes after TB therapy have found some statistically significant changes, but the magnitude of the changes may not be considered as clinically significant. Changes produced in the upper lip seem to be controversial. No change in the anteroposterior position of the lower lip and the soft tissue menton or improvement of the facial convexity was observed. Many authors on the contrary have found statistically significant soft tissue changes using Twin-block therapy. Some studies showed important increase in the LAFH in patients treated with Twin Block appliance. An advancement of the soft tissue pogonion and mandibular soft tissues in general was observed by some authors after Twin-block therapy. Other significant effects that many studies evidenced using Twin-block appliance were the decrease of H angle and mentolabial angle. Many authors have found a reduction of soft tissue profile convexity when the nose is no taken into consideration in Class II patients treated with Twin Block appliance therapy. The most significant effects were a retraction and flattening of the upper lip, anterior movement of soft tissue pogonion and a significant improvement in the facial profile, which closely followed the underlying dentoskeletal changes.**CONCLUSIONS:** Improving facial aesthetics is one of the aims of orthodontic treatment. However, changes in the facial profile may occur due to many factors, such as dental movement or growth. All studies showed that Twin Block appliance lead to changes in soft tissue profile in terms of improving facial balance and aesthetics. However often controversial studies are still available today about the soft tissue effects produced by functional appliance therapy of the treatment of class II malocclusions.**Potential risks and complications of orthodontic treatment: a review of literature**

A. Chudan Poma, D. Jamshir, A. Boboc, E. Lombardelli, G. Galluccio

*Dipartimento di Scienze Odontostomatologiche, Università di Roma La Sapienza, Rome, Italy***BACKGROUND:** This review provides an overview of the main risks linked to orthodontic interventions in clinical practice and analyze how different treatment factors and patient factors interact to modify the risk. Although orthodontic treatment has many recognized benefits, including improvement in dental health, function, appearance, and self-esteem, however

orthodontic appliances can cause unwanted complications if adequate care is not taken during the treatment. A good understanding of these risks is required for clinicians to obtain informed consent before starting treatment as well as to prevent associated complications.

**METHODS:** A review of the literature was carried out using the scientific database PubMed with precise inclusion criteria. Only articles written in English was included in the study. The period considered was from 2004 to 2016. Search keywords were combinations of words: complication, orthodontic treatment, risks, side effects, iatrogenic factors, systemic risks, white spot lesions, root resorption, temporomandibular disorder.

**RESULTS:** According to numerous authors, there are a lot of conditions to which orthodontic treatment can be linked. Even if there are no proofs of direct cause/effect relationships for most of them, we must still consider them seriously and inform our patients about them. The possible risks and complications associated with orthodontic treatment, according to their effects, can be divided into three main groups: intra-oral risks; extra-oral risks and systemic risks.

— Intra-oral risks includes: Enamel demineralization (white spot lesions) ; fracture during debond; root resorption; pulpal reaction (ischemia, pulpitis, or even necrosis); periodontal complications (gingivitis, periodontitis, gingival recession or hypertrophy, alveolar bone loss, dehiscence, fenestrations, dark triangles).

— Extra-oral risks: Temporomandibular dysfunction (TMD), profile damage, trauma.

— Systemic risks: Cross infection, Infective endocarditis. The occurrence of these complications depends on a synergy between treatment factors and patient factors. Treatment factors that can influence risk include the orthodontic technique, appliance type, force vectors, duration of treatment and medical knowledge in this field; patient factors include patient's general and oral health. These must be considered even from the start because it might influence the treatment objectives, phases, and goals.

**CONCLUSIONS:** This review has considered some of the main risks of orthodontic treatment by way of an overview of the literature. It has been shown that the risks of orthodontic treatment vary between individuals and treatment plans. Before proceeding with orthodontic treatment, both the patient and the orthodontist should reflect on the risks and the benefits of the proposed treatment. Clinicians should develop treatment plans based on their patients' susceptibility to these risks and patients should be duly informed of these risks as part of informed consent. With vigilant selection, diagnosis, treatment planning, monitoring, timely intervention, and good cooperation between patient and orthodontist, we can minimize most of the adverse effects of orthodontic treatment.

## Evaluation of cranio-facial asymmetries using cone-beam computed tomography (CBCT): a review of literature

A. Chudan Poma, D. Jamshir, A. Boboc, G. Galluccio

*Dipartimento di Scienze Odontostomatologiche, Università di Roma La Sapienza, Rome, Italy*

**BACKGROUND:** Cranio-facial asymmetry is common in humans, however significant asymmetries causes functional and esthetic problems and needs combined orthodontic and

surgical treatment. Medical imaging is helpful for objective diagnosis and measurement of the asymmetry, as well as for treatment planning. The purpose of this article is to evaluate the use of cone-beam computed tomography (CBCT) images for the detection and the treatment of asymmetry.

**METHODS:** A review of the literature is carried out using the scientific database PubMed with precise inclusion criteria. The period considered was from 2010 to 2017. Only articles written in English was included in the study. Keywords: asymmetries diagnosis; asymmetries CBCT; three-dimensional cephalometric.

**RESULTS:** Cone-beam CT (CBCT) was developed for the three-dimensional (3D) imaging of the maxillofacial area and has become popular in dentistry, orthodontics, and maxillofacial surgery. Recent studies have shown that computed tomography (CT) scans with 3D reconstruction and cone-beam CT (CBCT) images are useful to identify skeletal and dental landmarks for orthodontic and craniofacial analyses and to evaluate asymmetry in the facial skeleton. Studies showed that CBCT technique have many advantages: 3D images can allow for analysis of the size, shape and volumetric differences in bilateral structures as well as growth changes in 3D; measurement error from CBCT are lower than those from cephalograms and uses a low dose of radiation; it eliminates the problems of deformation, magnification, superimposition, and artifacts. CBCT imaging offer the ability to capture images and to analyze the craniofacial hard and soft tissues and their spatial relationship using virtual models and specific software; also, the virtual models can be used to simulated or test treatment options; 3D measurements from CBCTs can be made in several visualization modes, including multiplanar(MPR), volume rendered (VR) and shaded surfaced display (SDD).

**CONCLUSIONS:** CBCT has been shown to produce accurate 3D images of the craniofacial region and a 1-to-1 image-to-reality ratio, which has greatly reduced errors of frontal cephalometry and improved our ability to diagnose asymmetry. The advent of CBCT has also greatly reduced magnification errors from geometric distortions that are common in conventional radiographs, furthermore recently were introduced 3-dimensional software enables 3D reconstruction and quantitative measurement of the maxillofacial complex. Therefore, a CBCT scan should be considered when a visible deviation is present which requires surgical correction. The innumerable advantages offered by this technique allow us to state that it is the best technique available today for the evaluation and treatment of cranio-facial asymmetries.

## Early treatment of deep bite with the infant trainer

S. Cammarata <sup>1</sup>, A. Volpe <sup>2</sup>, I. Giorgini <sup>2</sup>, T. Doldo <sup>3</sup>

*<sup>1</sup>University of Siena, Siena, Italy; <sup>2</sup>Department of Medical Biotechnologies, University of Siena, Siena, Italy*

**BACKGROUND:** Current trends in pediatric orthodontics aim at identifying incorrect development of mouth and medium/lower facial third as early as possible. Early preventive treatment with infant-trainer device resulted in avoiding dysfunctional forces from acting on the skeletal pattern, so reaching a balance between bone basis and muscular components. The infant trainer can be used easily in an early phase of development at 4-5 years of age for the deep bite correction. The infant trainer, a polyurethane prefabricated functional



## ABSTRACT

appliance, is proposed as a substitute of the dummy without its negative consequences. The device is indicated for the resolution of deep bites because it is made in such a way as to provide the front teeth depressive forces and, simultaneously, to encourage the posterior teeth to erupt and fit in their optimal vertical position, so that stabilizes an overbite vertical front minimum. In relation to timing of treatment and to the parameters cost-benefits-precocity of intervention, the infant-trainer use is predictable and repeatable in anterior deep-bite management.

**METHODS:** The clinical cases considered are children aged 4 and 5 years referred to the Department of orthodontics, University of Siena. They all presented early mixed dentition, absence of caries in act and a anterior deep bite. Intra and extraoral photos were made and the infant-trainer device was given to the young patient and was easily accepted. Patients had to wear it 2-4 hours during the day and throughout the night. After 1 month usually a good compliance was achieved and the children were checked every 2 months. After 4 months it was observed correction of the anterior deepbite and an improvement of the jaw relationship. Total treatment time was about 12 months in average. 2 years after treatment the correction achieved was stable.

**RESULTS:** Pictures of patients pre, during and at the end of the early interceptive phase of functional treatment demonstrates the effectiveness of the use of the infant-trainer in the resolution of deep bite in the short and long term. The infant trainer is proposed as a substitute of the dummy but it hasn't negative consequences. The treated show that the infant-trainers are an indication predictable and repeatable if handled properly and at a correct time.

**CONCLUSIONS:** Early treatment of the vertical anomalies of growth or any other alterations to the aesthetic of the profile of the pediatric patient is extremely important to avoid their aggravation and/or consolidation and orthodontic treatment that might be required later will be of a shorter duration. In this way the young patient is allowed to grow at the level panel inside-skeletal-facial in the ideal condition. The infant-trainer makes the child approaching to the orthodontic world already at the age of 4 years and requires only the intra and extraoral examination, by delaying around 6 years of age more invasive diagnostic investigation such radiographs. The treatment, carried out in a very early phase of the patient life, lead to a stable and balanced relationship between basal bones and muscle components over time. The present cases highlight how a deep bite can be managed with a simple, low-cost and user friendly appliance.

## 2 different options for the agenesis of mandibular second premolar: case reports

M. Chazine<sup>1</sup>, L. Parrini<sup>1</sup>, S. Grandini<sup>2</sup>, P. Lucchi<sup>3</sup>, M. Rosa<sup>4</sup>, T. Doldo<sup>1</sup>

<sup>1</sup>Department of Medical Biotechnology, University of Siena, Siena, Italy; <sup>2</sup>Department of Medical Biotechnology, University of Siena, Siena, Italy; <sup>3</sup>University of Cagliari, Cagliari, Italy; <sup>4</sup>University of Insubria, Varese, Italy

**BACKGROUND:** Agenesis of the mandibular second premolar is very common. The treatment plan consists of maintaining the space either by leaving the deciduous molar in situ or making a fixed space maintainer, or in alternative closing the space using fixed appliances. However, whichever treatment plan is chosen, the most important aspect is timing. The aim

of these case reports was to demonstrate how two different methods of treatment can give predictable results. In the first case, the emisection of the deciduous second molar allowed the first permanent molar to spontaneously close the space. In the second case, maintaining the deciduous teeth allowed the patient to not overcome major treatments (implants or bridges) when she was older.

**CASE REPORTS:** C,T, female 9 years old with multiple agenesis of 12, 22, 35, 45. The orthodontic treatment plan consisted of closing the inferior agenetic space. This was obtained by the emisection of the second deciduous inferior molar, allowing the permanent first molars to drift mesially. The superior spaces and the remaining inferior spaces were then closed using fixed appliances. A.A, female 12 years old, with multiple agenesis of 3.5 and 4.5. The orthodontic treatment plan consisted of mantaining 7.5 and 8.5. The space was reopened and maintained after the treatment to allow the patient to have an implant placed later in life.

**RESULTS AND CONCLUSIONS:** In both cases, a good occlusion stability was obtained. The timing and an accurate diagnosis are the most important aspects for good results. In the first case the slicing of the deciduous second molar can be a valid alternative to conventional treatments. Controlled slicing of the deciduous second molar, between the ages of 8 and 9 years produced a bodily controlled mesial movement of the permanent first molar in less than 1 year with no or minor rotations or inclination. The emisection can reduce the time of treatment or sometimes make the orthodontic treatment not necessary at all.

### References

1. Valencia R, Saadia M, Grinberg G. Controlled slicing in the management of congenitally missing second premolars. *Am J Orthod Dentofacial Orthop.* 2004 May;125(5):537-43.
2. Ith-Hanses K1, Kjaer I. Persistence of deciduous molars in subjects with genesis of the second premolars. *Eur J Orthod.* 2000 Jun;22(3):239-43.
3. Bjerklind K, Bennett J. The long-term survival of lower second primary molars in subjects with genesis of the premolars. *Eur J Orthod.* 2000 Jun;22(3):245-55.
4. Bjerklind K, Al-Najjar M, Karestedt H, Andren A. Agenesis of mandibular second premolars with retained primary molars: a longitudinal radiographic study of 99 subjects from 12 years of age to adulthood. *Eur J Orthod.* 2008 Jun;30(3):254-61. doi: 10.1093/ejo/cjn027.
5. Kenrad JB, Christensen IJ, Kjaer I. Gender differences in patterns of second premolar genesis observed in 4,756 individuals. *Eur Arch Paediatr Dent.* 2013 Dec;14(6):397-403. doi: 10.1007/s40368-013-0041-8. Epub 2013 May 1.
6. Cozzani G. *Il giardino dell'ortodonzia.* Ed. Martina 1999

## Auriculotherapy for the management of orthodontic pain

E. Serritella<sup>1</sup>, C. Vompi<sup>1</sup>, A. M. Boboc<sup>1</sup>, A. Liguori<sup>2</sup>, G. Galluccio<sup>1</sup>

<sup>1</sup>Unit of Orthodontics, Department of Oral and Maxillofacial Sciences, "Sapienza" University of Rome, Rome, Italy; <sup>2</sup>"Paracelso" Institute, Italian Centre of Non Conventional Medicine, Rome, Italy

**BACKGROUND:** Orthodontic therapies can cause emotional stress to the patient, and are often associated with pain perception, even very intense. Different methods are studied for the orthodontic pain management, including the use of pharma-

cological and mechanical therapies, laser therapies and behavioral strategies. Even today, however, there are no versatile tools and standardized protocols. Consequently, alternatives to conventional analgesic methods are needed. This study aims to verify the analgesic effects of Auriculotherapy (AT) during the first 3 months of fixed orthodontics treatment.

**METHODS:** A population of 36 subject, 14 males and 22 females (mean age of 19.5 years), was studied and divided in two homogeneous groups: Study Group (SG) and Control Group (CG), depending on the application / non-application of AT. Patients rated pain scores monthly on 0 to 10 visual analogue scales (VAS) at the time of bonding (t0) and subsequent two appliance adjustment (t1 and t2), relative to 6 different time moments (TM): immediately before, immediately after, after 4, 8, 24 and 72h. Descriptive statistical analysis and Student's t-test has been applied (statistical significance for  $p < 0.05$ ).

**RESULTS:** Patients treated with Auriculotherapy (SG) report on average a lower pain intensity compared to no-treated patients (CG), both at t0, t1 and t2, and this difference is statistically significant ( $p = 0.0497$ ). On average, male seem to experience more pain than female but, despite this, belonging to a specific gender is not such a significant factor in determining the onset and the intensity of pain sensation ( $p = 0.359 / p = 0.418$ ). It was instead significant if they received or not the auricular treatment, regardless of the belonging gender ( $p = 0.0315 / p = 0.0246$ ). The average pain intensity values, moreover, are lower in SG for all TM analyzed, for each of which the t-test was significant. ( $p < 0.05$ ).

**CONCLUSIONS:** This research has for the first time verified that the application of AT is effective in the pain management of patients undergoing fixed orthodontic treatment. Furthermore, it has allowed the development of a standardized therapeutic protocol that is versatile, easy to apply and minimally invasive, and therefore can also be used in pediatric subjects. We can therefore consider Auriculotherapy as a valid analgesic alternative in patients with fixed orthodontic appliances.

## Orthopassion for OSAS: the importance of interdisciplinarity

G. Rubini<sup>1</sup>, A. Martintoni<sup>1</sup>, M. Pellegrino<sup>1</sup>, F. Toma<sup>1</sup>, N. Nardi<sup>1</sup>, M. Manuelli<sup>1,2</sup>, A. Lucchese<sup>1,2</sup>, E.F. Gherlone<sup>3</sup>

<sup>1</sup>Department of Orthodontics, Vita-Salute San Raffaele University, Milan, Italy; <sup>2</sup>Unit of Dentistry, Division of Orthodontics, Research area in Dentofacial Orthopedics and Orthodontics, IRCCS San Raffaele Scientific Institute, Milan, Italy; <sup>3</sup>Dental School, Vita-Salute San Raffaele University, Milan, Italy and Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy

**BACKGROUND:** Too often the obstructive sleep apnea syndrome (OSAS) is not taken sufficiently into account, although it's a disease which affects about 6% of the population. The aim of this study is to highlight the importance of having a team of specialists, which includes a dentist, an otorhinolaryngologist, a nephrologist, a neurologist, a pulmonologist and a nutritionist, working synergistically to treat this disease. Furthermore this study aims to demonstrate how this condition should not be underestimated and indeed requires early intervention, since its effects are reflected on everyday life: going from the risk of accidents caused by somnolence to clinical consequences which can bring to cardiovascular, cerebrovascular and nephrological problems.

**METHODS:** Why involve nephrologist? Apneas in obese, or even just overweight patients, don't allow an adequate oxygenation of their entire organism. The first organs to be affected are the ones which are usually the most perfused such as kidneys, and in the long term episodes of renal ischemia may occur. It has been shown that after such ischemic injuries these patients may become affected by hypertension, resulting in a concrete risk of stroke. Why involve nutritionist? The role of the nutritionist is to keep under control hypertension and proteinuria (resulting from kidney damage) by educating them about correct dietary habits. Why involve pulmonologist? The pulmonologist is often the first specialist to be interviewed by the patient suffering from sleep apnea. He prescribes to the patient the polysomnography, a diagnostic test that records the progress and changes of some physiological parameters during REM and NON-REM sleep in individuals with suspected sleep disorders. CPAP (Continuous Positive Airway Pressure) are given to people who have major problems that don't allowed them to breath spontaneously. Why involve otorhinolaryngologist? This figure can improve the quality of these patients' sleep through interventions of functional nasal surgery such as septoplasty and the reduction of the inferior turbinate. In addition, after performing a polysomnography and having received the data, he can re-quest a Sleep Endoscopy that can be used to identify the type of intervention which could be more effective against the specific cause each patient's sleep apnea. Why involve dentist? During the session of Sleep Endoscopy MADs (Mandibular Advancement Devices), made by the dentist after a careful examination, are applied to see if they can work for that specific patient. In case of a positive effect these devices could be a valid alternative to CPAP (which is more bulky and presents more side effects such as claustrophobia, aerophagy and earache). Furthermore, the compliance of patients using MADs turns out to be higher than that of patients using CPAP (65%).

**RESULTS:** The main result that this study aims to achieve is an interdisciplinary approach to this disease. This is essential, not only for systemic health correlations, but also to prevent the patient from feeling abandoned by making him able to rely on the most experienced specialists in the field which can help him solve this problem.

**CONCLUSIONS:** After explaining what risks and complications a patient suffering from sleep apnea can undergo to, the aim is that of taking care of the patient in Day Hospital so to perform in a single day: Holter monitoring, sleep endoscopy, dental exam, neurological exam, pneumological exam and visit by the nutritionist.

## Orthopassion for OSAS: the importance of interdisciplinarity

G. Rubini<sup>1</sup>, A. Martintoni<sup>1</sup>, M. Pellegrino<sup>1</sup>, F. Toma<sup>1</sup>, N. Nardi<sup>1</sup>, M. Manuelli<sup>1,2</sup>, A. Lucchese<sup>1,2</sup>, E.F. Gherlone<sup>3</sup>

<sup>1</sup>Department of Orthodontics, Vita-Salute San Raffaele University, Milan, Italy; <sup>2</sup>Unit of Dentistry, Division of Orthodontics, Research area in Dentofacial Orthopedics and Orthodontics, IRCCS San Raffaele Scientific Institute, Milan, Italy; <sup>3</sup>Dental School, Vita-Salute San Raffaele University, Milan, Italy and Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy

**BACKGROUND:** Too often the obstructive sleep apnea syndrome (OSAS) is not taken sufficiently into account, although

## ABSTRACT

it's a disease which affects about 6% of the population. The aim of this study is to highlight the importance of having a team of specialists, which includes a dentist, an otorhinolaryngologist, a nephrologist, a neurologist, a pulmonologist and a nutritionist, working synergistically to treat this disease. Furthermore this study aims to demonstrate how this condition should not be underestimated and indeed requires early intervention, since its effects are reflected on everyday life: going from the risk of accidents caused by somnolence to clinical consequences which can bring to cardiovascular, cerebrovascular and nephrological problems.

**METHODS:** Why involve nephrologist? Apneas in obese, or even just overweight patients, don't allow an adequate oxygenation of their entire organism. The first organs to be affected are the ones which are usually the most perfused such as kidneys, and in the long term episodes of renal ischemia may occur. It has been shown that after such ischemic injuries these patients may become affected by hypertension, resulting in a concrete risk of stroke. Why involve nutritionist? The role of the nutritionist is to keep under control hypertension and proteinuria (resulting from kidney damage) by educating them about correct dietary habits. Why involve pulmonologist? The pulmonologist is often the first specialist to be interviewed by the patient suffering from sleep apnea. He prescribes to the patient the polysomnography, a diagnostic test that records the progress and changes of some physiological parameters during REM and NON-REM sleep in individuals with suspected sleep disorders. CPAP (Continuous Positive Airway Pressure) are given to people who have major problems that don't allowed them to breath spontaneously. Why involve otorhinolaryngologist? This figure can improve the quality of these patients' sleep through interventions of functional nasal surgery such as septoplasty and the reduction of the inferior turbinate. In addition, after performing a polysomnography and having received the data, he can request a Sleep Endoscopy that can be used to identify the type of intervention which could be more effective against the specific cause each patient's sleep apnea. Why involve dentist? During the session of Sleep Endoscopy MADs (Mandibular Advancement Devices), made by the dentist after a careful examination, are applied to see if they can work for that specific patient. In case of a positive effect these devices could be a valid alternative to CPAP (which is more bulky and presents more side effects such as claustrophobia, aerophagy and earache). Furthermore, the compliance of patients using MADs turns out to be higher than that of patients using CPAP (65%).

**RESULTS:** The main result that this study aims to achieve is an interdisciplinary approach to this disease. This is essential, not only for systemic health correlations, but also to prevent the patient from feeling abandoned by making him able to rely on the most experienced specialists in the field which can help him solve this problem.

**CONCLUSIONS:** After explaining what risks and complications a patient suffering from sleep apnea can undergo to, the aim is that of taking care of the patient in Day Hospital so to perform in a single day: Holter monitoring, sleep endoscopy, dental exam, neurological exam, pneumological exam and visit by the nutritionist.

### Methods of approach for maxillary, impacted, labially or in crest, canines: a review

M. Dari, C. Carreri, S. Del Prete, M.L. Favale, G. Galluccio

*Unit of Orthodontics, Department of Oral and Maxillo Facial sciences, Sapienza University, Rome, Italy*

**BACKGROUND:** The aim of this work is to describe the advantages and disadvantages to help the clinician in making her choice, among the various surgical techniques of access to the canines labial impacted into maxilla.

**METHODS:** An initial research of the abstracts has been performed using the scientific archives "PubMed" and Google Scholar, using the keywords "labial maxilla impactect canine" "labially maxillary impactect canine" "buccal maxilla impactect canine". The research was limited to the international literature in the English language. The abstracts of 22 articles were read, case reports and studies that were not meaningful for research were excluded. The articles with scientific accuracy in explaining the problem were selected for a total of 12 articles.

**RESULTS:** After third molars the most common included dental elements are canines. Of those the 17% is represented by canines impacted labially or in crest. Buccal Canine's impaction in most cases results from a lack of space for the eruption of the element. The absence of the element leads to aesthetic and functional problems. Treatment often requires a surgical-orthodontic approach: characterized by a first phase of space creating, followed by a surgical intervention to expose the impacted tooth and to place an element of traction with the aim of carrying the canine into the arch. The orthodontist plays a fundamental role in all the steps, even in the choice of the surgical technique since it is fundamental to avoid subsequent aesthetic and periodontal problems, particularly relevant in the anterior area. The methods described in the literature for the surgical exposure of the maxillary impacted canines are four: apically positioned flap, excisional uncovering, the closed eruption techniques and "VISTA technique" (vestibular-incision-subperiosteal-tunnel acces). The latter was used classically in periodontal recession surgery and was modified by dr. Chris Chang to be applied to treat this type of malocclusions. With this technique a periosteal tunnel is created surgically, this tunnel acts as a traction corridor for the included element. The data obtained from the review were analyzed and represented in graphical form by tables. The first table summarize the criteria to choose the various techniques, the choice of which is taken considering the spatial position of the included element and its relations with the adjacent structures. In the second table, the aesthetic and periodontal results of the four techniques were analyzed highlighting the specific disadvantages of each. **CONCLUSIONS:** From the literature review emerged that the current data are insufficient to establish which of the techniques is the better for periodontal's health. The data suggest that apically positioned flap presents more periodontal consequences than closed eruption. The VISTA technique seems to be a valid alternative which minimally invasive to prevent recessions and scars in the esthetic zone.

### Clinical assessment methods for generalized joint hypermobility and correlation with prevalence: a review of the literature

A. Boboc, A. Chudan, D. Jamshir, G. Galluccio

*Dipartimento di Scienze Odontostomatologiche, Università "Sapienza" di Roma, Rome, Italy*

**BACKGROUND:** Joint Hypermobility (JH) is an increase of joints mobility over physiological limits and has



been reported as a predisposing factor to the development of Temporomandibular disorders (TMD). The term Generalized joint hypermobility (GJH) is used when multiple joints are affected and its prevalence varies widely in literature, ranging from 10% to 30% in the adult population, and from 2% to 65% in children and adolescents. In addition to the necessity of taking into consideration important influencing factors like age, gender, and ethnicity, one reason for the wide range of prevalence may be the use of different clinical assessment methods and that the cutoff level used to identify GJH often vary in different studies. Therefore, the aim of the present study is to evaluate the clinical assessment methods for GJH and the cutoff point for diagnosing GJH.

**METHODS:** Literature was searched using Pubmed and Cochrane Library from 2004 to 2018. Only articles written in English were included in the study. The following key words were used: joint hypermobility, generalized joint hypermobility, joint laxity, evaluation, tests, assessment methods, Beighton tests, Carter and Wilkinson, five-part questionnaire, prevalence, reproducibility, diagnostic criteria.

**RESULTS:** The main clinical assessment methods for GJH were: Beighton scoring system (BS), Carter and Wilkinson, Rotès-Quérol and two questionnaires (Five-part questionnaire and Beighton score self-reported). Most of the studies used the BS for assessment of GJH with 9 tests and scores ranging from 0 to 9. Regarding questionnaire assessment methods the Five-part questionnaire (5PQ) by Hakim and Grahame is the most frequently used method, so far used only for adults, and include additional historical information because joint mobility, and therefore BS, is known to decrease by age. Among different authors which use the BS there is a lack of consensus for a GJH diagnostic cutoff level: most consider GJH present when  $\geq 4$  of 9 tests are positive, whereas others use  $\geq 5/9$  or  $\geq 6/9$ . Generally, in the different studies was used a cutoff point of  $\geq 4$  or  $\geq 5$  positive joints of 9 tests and  $\geq 2/5$  in 5PQ to determine GJH for adults. A cutoff level of 4/9 for GJH is included in the Brighton Criteria (Major and Minor criteria) for JHS. While for children to date there are no consensus criteria for GJH and the cutoff level in the different studies varies from 5/9 to 7/9. Since joint mobility decreases with age, a higher BS has been suggested as a diagnostic criterion for children ( $\geq 6/9$ ). When a most rigorous cutoff was used the prevalence decrease. Prevalence of GJH varies according to age, gender, ethnicity and also to diagnostic criteria used and the reliability of the diagnostic procedures for joint mobility.

Also, many individuals with GJH are asymptomatic, that makes difficult to estimate an accurate prevalence.

**CONCLUSIONS:** Beighton tests seem to be reproducible by experienced examiners but a methodological shortcoming is that there haven't been yet reported detailed descriptions of test procedures so there can be discrepancies (e.g., the starting position with thumbs apposition with flexed or straight elbow, knee extension in standing or supine lying) in the test's performance of different researchers and clinicians that can influence the prevalence of GJH and limit the ability to make cross-study comparisons. More studies are required to establish a clear standard protocol for test performance and to identify a consensus-based cut-off level for GJH. In conclusion, applying uniformity in performing the test-

ing procedures, the recommendation for clinical practice is Beighton score, in addition to historical information, especially in adults.

### Unilateral condylar hyperplasia: the comparison of the condyle volumes

A.M. Costantini, C. Vompi, F. Germanò, N. Gjoka, G. Galluccio, P. Cascone

*Department of Oral and Maxillo-Facial Sciences, Sapienza, University of Rome, Rome, Italy*

**BACKGROUND:** Unilateral Condylar Hyperplasia (UCH) is a pathologic condition characterized by an increased condylar growth due to osteoblastic hyperactivity, resulting in a facial asymmetry, malocclusion and articular dysfunction. Nitzan et al. classified UCH as transverse, vertical or combined. The diagnosis between the different forms can be due with clinical parameters. The vertical growth is clinically characterized by three-dimensional volume increase of the affected side, ipsilateral deviation or no deviation and tilting of the occlusal plane and absence of cross-bite. The transverse growth clinically results in contralateral chin deviation, contralateral cross-bite, preserved occlusal plane, extending of the affected side. The purpose of the study is to quantify condylar volumes using Dolphin Imaging Software, make a comparison between the affected and unaffected sides and between transverse and vertical form.

**METHODS:** For this study, the Authors selected four patients. They all presents an active UCH, diagnosed according to clinical and radiological exams (SPECT), two affected by the vertical form and the other two affected by the transverse form. The volume quantification has been done using the 3D module of Dolphin Imaging Software. Condylar volume was considered from the perpendicular line to the posterior mandibular margin, passing for the sigmoid notch. It allows to isolate only the condylar volume, to do a precise rating method in preparation for condylectomy.

**RESULTS:** In the transverse form, a 16 years old male: the affected condyle measured 3039,80 mm<sup>3</sup> and the unaffected was 2167,66 mm<sup>3</sup>. In the transverse form, a 12 years old female: the affected condyle measured 2410,03 mm<sup>3</sup> and the other one was 1087,66 mm<sup>3</sup>. In the in the vertical form, a 17 years old male: the affected measured 3001,79 mm<sup>3</sup> while the unaffected was 1301,37 mm<sup>3</sup>. In the in the vertical form, a 12 years old female: the affected measured 2534,58 mm<sup>3</sup> and the other one was 1020,60 mm<sup>3</sup>.

**CONCLUSIONS:** The affected condyle volume is much higher than the other one in both patients and, as clinical and radiological experience hypothesizes, the vertical affected condyle volume results bigger than the transverse one. The volumetric rating method is important to do a precise diagnosis and to decide the better way to do the condylectomy: it can be useful in surgical condylectomy preparation to establish the condyle amount to remove. It's needful also in the post-surgical evaluation, to estimate the morphological TMJ remodeling and to do an accurate follow-up. Considered this preliminary study feed-back, the authors are working to extend the volume evaluation to a bigger number of patients.

## ABSTRACT

**Correlation between alveolar bone loss and torque variation after fixed orthodontic treatment: three-dimensional analysis**

F. Gaffuri, S. Bertini, A. Abate

*Università degli Studi di Milano, Scuola di Specializzazione in Ortognatodonzia, Dipartimento di Scienze Biomediche, Chirurgiche ed Odontoiatriche. Fondazione IRCCS Cà Granda, Ospedale Maggiore Policlinico, Milan, Italy*

**BACKGROUND:** The aim of this study was to evaluate the correlation between dental torque changes and the amount of cortical bone thickness and height loss after fixed orthodontic treatment using Cone Beam Computed Tomography (CBCT) and three-dimensional (3D) models.

**METHODS:** The sample included 22 individuals (9 males and 13 females) with a mean age of 13 years at the baseline, selected if the following eligible criteria were met: patients presenting with Angle Class I malocclusion and mild or moderate dental crowding, during the stage of permanent dentition and with no previous orthodontic treatment. The database contained dental CBCT scans obtained before and after orthodontic therapy (Roth prescription). Vertical alveolar bone distances and horizontal thicknesses were measured by the same examiner, around the maxillary and mandibular central/lateral incisors, canines, first/second premolars, first molars. The images were analyzed using a specific software Horos™, a free 64-bit medical image viewer, Version 3 (LGPL-3.0). Axial-guided navigation (AGN) was used to locate all landmarks and reference points moving the axial cursor on the sagittal or coronal multiplanar reconstructions guided by the plane along the dental root axis to achieve an optimal visualization of the marginal bone in the chosen view. Vestibular (BHv) and palatal/lingual bone height (BHp) indicated the distance between cement-enamel junction (CEJ) and alveolar bone crest (AC), measured parallel to the long axis of the tooth. To determine which slice should be used to evaluate these lengths we selected, for anterior teeth, the sagittal section following the vertical dental axis, whereas for posterior teeth, we selected the coronal one. The vestibular (aBTv, mBTv) and palatal/lingual (aBTp, mBTp) bone thicknesses were measured at mid-root and root apex level, perpendicularly to the long axis of the tooth. Dental models were processed by means of a 3D scanner (3Shape R700) and all dental torque, before and after orthodontic therapy, were measured using 3D VistaDent software (Dentsply, New York, USA). Of the 22 CBCT scans, a total of 7392 measurements were defined; 528 vestibular and 528 palatal surfaces for each maxillary and mandibular tooth were evaluated.

**RESULTS:** Measurements of 200 teeth, randomly selected from the total sample, were repeated after two weeks by the same investigator (F.G) to evaluate method reproducibility. Reliability was evaluated using the Intra-class Correlation test (ICC), which gave a strong intra-examiner reliability (ICC 0.8897). To standardize measurements, data were checked by another senior clinician (G.C.) one month after initial examination and the Dahlberg's formula showed minimal error. The Pearson-Correlation Test showed a high association between torque increasing of anterior teeth and alveolar bone thickness loss ( $R > 0.7$ ). The most statistically significant correlation ( $P < 0.02$ ) was found for lower canines, considering the mid-root level. The CEJ-AC distance was greater than or equal to 2 mm, classified as bone dehiscence, in 97 (18.37%) vestibular and 60 (11.36%) palatal sides of the total 528 surfaces at baseline. After orthodontic treatment,

the increasing of surfaces with a CEJ-AC width  $\geq 2$ mm was 17.61% vestibular and 8.53% palatal.

**CONCLUSIONS:** Torque variation was shown to be strongly associated with the amount of alveolar bone thickness and height loss for anterior teeth. The alveolar bone remodeling due to tooth movement should be considered during orthodontic treatment planning to prevent or make more predictable clinically relevant findings as gingival recessions.

**Dimensional variations of the mandibular triangle in orthodontic patients affected by juvenile idiopathic arthritis**

U. Garagiola, P. Cressoni, F. Bellomia, W. Brounsouzoghly, A. Fama, C. Occhipinti

**BACKGROUND:** To highlight the dimensional variations of the mandibular triangle of the healthy patients versus patients with Juvenile Idiopathic Arthritis (JIA) by means of Cone Beam CT (CBCT).

**METHODS:** 75 CBCTs, 36 of healthy patients and 39 of patients with JIA, aged between 6 and 15 years, were analyzed. The study was based on the identification of the right Gonion cephalometric point (Go dx), left Gonion (Go sx) and Menton (Me) through a 3D Medical Image Processing Software, thus obtaining the mandibular triangle.

**RESULTS:** From the observation of the collected values, it is showed that the Gonial angle corresponding to the healthy side undergoes a reduction of the amplitude. Contrariwise, the Gonial angle corresponding to the side affected by the disease, undergoes an increase of its amplitude. The proportionality of these values is strongly influenced by the age in which the patient has been evaluated, considering that the sample is composed of patients ranging from 6 to 15 years, younger the patient is, less would be the difference evident and significant between the lengths of the sides and relative angles, at time 0 and at time 1.

**CONCLUSIONS:** The results show that patients suffering from JIA have a reduction in the sagittal growth of the jaw, corresponding to the side affected by the disease; this implies a proportional increase of the angle associated with it. On the other hand, the growth of the healthy side appears to be normal and physiologically active as it is not affected by the disease. The final result is the presence of a pronounced asymmetry of the mandibular bone of the patients with Juvenile Idiopathic Arthritis (JIA).

**Magnetic resonance 3 TESLA, 3D cephalometric analysis**

A. Abate, F. Gaffuri, S. Bertini

*Università degli Studi di Milano, Scuola di Specializzazione in Ortognatodonzia, Dipartimento di Scienze Biomediche, Chirurgiche ed Odontoiatriche. Fondazione IRCCS Cà Granda - Ospedale Maggiore Policlinico, Milan, Italy*

**BACKGROUND:** Determine the reproducibility of the 3D cephalometric analysis of the University of Milan on MRI 3 Tesla compared to CBCT. Evaluate the MRI diagnostic accuracy in the bone measurements having the CBCT as point of reference.

**MATERIALS:** A sample of 9 female subjects with TMD (temporo-mandibolar-disorder) and age between 18 and 53 (average age 38,5) has been selected from a sample of 800

CBCT. During the study, patients have not been subjected to any odontoiatric and ortodontic therapy. The operative procedure consisted in a CBCT (I-cat®) and a MRI (3 T-philips achieve®), with a maximum distance between the two exams of 1 month (the same equipment has been adopted for all the sample). Files have been exported as file dicom and evaluated through Materialise Mimics software 18®. 3D Cephalometric analysis of University of Milan has been performed on CBCT and on MRI. The real three-dimensional cephalometry is created, providing 18 points, including 10 middle and 8 side counterparts, identified on a CT slide hard tissue and subsequently verified on the two remaining and the rendering of the volume generated by the software Mimics. From these 18 points arise 36 measurements, which provide sagittal, vertical and transverse information. All the measurements have been analyzed and compared. Statistical analysis has been performed: T Student with  $P < 0.05$  has been calculated for intra and inter operator comparisons and Pearson ICC to evaluate reproducibility of the method. Finally, MRI and CBCT values have been compared through ANOVA test and Tukey's HSD (SPSS 17.00®), to evaluate the methodology validity.

**RESULTS:** Results are showed in the table 1: not exists any statistically relevant difference between 3D cephalometric analysis on MRI 3 Tesla and CBCT for all the measurements analyzed. Values which consider intracranic cephalometric points show much better superimposition than the extracranial cephalometric points.

**CONCLUSIONS:** 3D cephalometry on Magnetic Resonance is a repeatible and accurate method for the cranial valuation of skeletal structures. It resulted to be a reliable support for 3D cephalometric analysis in orthodontic diagnosis. Moreover, MR exam does not expose patients to ionizing radiations and gives the possibility to evaluate soft, muscular and articular tissues with just one exam.

## Use of occluso-guide and position trainer in patient in growth

S. Bertini, F. Gaffuri, A. Abate

*Scuola di Specializzazione in Ortognatodonzia, Università degli Studi di Milano, Dipartimento di Scienze Biomediche, Chirurgiche e Odontoiatriche, Fondazione IRCCS Cà Granda - Ospedale Maggiore Policlinico, Milan, Italy*

**BACKGROUND:** According to the Orthodontic School of the University of Milan, the phases of orthodontic treatment must find a correspondence to the different growing periods of the patients. According to this point, we can distinguish four stages of growth (before the pubertal peak, at the pubertal peak, at the end of the peak, at the end of growth) to which correspond four phases of the orthodontic treatment: preventive, interceptive, corrective and retention phase.

In the dynamic phase of growth, therefore, the purpose of our equipment will be twofold: to limit damage from extrinsic factors (bad habits) and to counteract the inherent negative genetic factors that will manifest throughout the dynamic growth span.

**METHODS:** Technological progress and evolution in the field of materials have made available equipment made of resilient material, which respond well to the therapeutic needs of contrasting bad habits and functional guidance in improving the patient's growth potential. In our study we treated 30 patients (18 females and 12 males) belonging to the Orthodontics

department of the Dental Clinic pavilion of the University of Milan, via della Commenda. All the patients were in pre-pubertal peak stage. The patients were treated with two elastodontic devices: Position Trainer and Occluso-Guide. The Position Trainer was used in patients with deciduous teeth, while the Occluso-Guide was preferred for patients with mixed dentition. Upon delivery, the patients were informed about the way to use appliances, specially about the request to wear it during evening and night time, and in every moment patients usually shows the bad habit.

**RESULTS:** The recovery of the correct spatial relationships between the upper and lower incisors was obtained quite early. In control after 3 months, in many cases we have verified a significant reduction in overjet and the complete disappearance of bad habits.

**CONCLUSIONS:** The preliminary clinical results obtained in this research have demonstrated the efficacy of elastodontic devices in early orthodontic therapy, the efficacy in the resolution of bad habits and in the consequent restoration of the correct dento-alveolar relationships. Therapeutic success is, however, conditioned by the correct indications that must support the prescription of the equipment and the achievement of sufficient patient compliance.

## Transverse and torque dental changes after passive self-ligating fixed therapy: a two-year follow-up study

A. Lucchese<sup>1,2</sup>, A. Martintoni<sup>1,2</sup>, P. Albertini<sup>1,2</sup>, L.H. Ghislanzoni<sup>1,2</sup>, M. Manuelli<sup>1,2</sup>, E. Gherlone<sup>1,2,3</sup>

*<sup>1</sup>Department of Orthodontics, Vita-Salute San Raffaele University, Milan, Italy; <sup>2</sup>Unit of Dentistry, Division of Orthodontics, Research area in Dentofacial Orthopedics and Orthodontics, IRCCS San Raffaele Scientific Institute, Milan, Italy; <sup>3</sup>Dental School, Vita-Salute San Raffaele University, Milan, Italy*

**BACKGROUND:** Self-legating passive appliances are claimed to expand the arches but evidence is missing about stability of results. Our aim was to measure the width of the maxillary and mandibular dental arches and torque changes after treatment with a passive self-ligating appliance, and stability at a 2-year follow-up.

**METHODS:** Maxillary and mandibular 3D models from a sample group of 32 subjects (mean initial age  $14.9 \pm 0.9$  yrs), consecutively treated with a self-ligating appliance, were obtained before, immediately after treatment and 2yrs after the end of treatment. The dental arches were examined by a 3D software to evaluate the differences in transverse arch dimensions and torque values.

**RESULTS:** An increment of the arch widths was recorded, especially for the upper and lower premolars. The increase in the transverse diameters was associated to a significant positive torque gain. No significant changes in arch perimeter and arch depth were recorded. In the retention period a slight significant changes in transverse diameters were recorded, and a transverse diameters constriction was detected. Torque values remained almost unchanged in the follow up period.

**CONCLUSIONS:** Transverse arch dimensions, along with the torque values, increased significantly after the treatment with passive self-ligating appliance. In the two years after the end of the treatment, a slight tendency to transverse diameter restriction, especially for the upper and the lower premolars, was observed even though not statistically significant.



# PARODONTOLOGIA

## Regenerative periodontal treatment with the single flap approach in smokers and non-smokers

L. Toselli<sup>1</sup> A. Simonelli<sup>1</sup> R. Farina<sup>1,2</sup> L. Minenna<sup>1</sup>, L. Trombelli<sup>1,2</sup>

<sup>1</sup>Research Center for the Study of Periodontal and Peri-Implant Diseases, University of Ferrara, Ferrara, Italy; <sup>2</sup>Operative Unit of Dentistry, University-Hospital of Ferrara, Ferrara, Italy

**BACKGROUND:** In 2007, a simplified surgical technique (Single Flap Approach, SFA) was introduced for the regenerative treatment of periodontal intraosseous defects. The basic underlying principle of the SFA consists of the elevation of a limited mucoperiosteal flap to allow access to the defect from either the buccal or oral aspect only, depending on the main buccal/oral extension of the lesion, preserving the integrity of the interproximal supracrestal gingival tissues. The combination of enamel matrix derivative (EMD) with deproteinized bovine bone mineral (DBBM) in periodontal regenerative surgery, in general, and SFA, in particular, was shown to ensure a substantial attachment gain while limiting the post-surgery recession. Smoking has been recognized as a factor affecting the outcomes of periodontal treatment. The present study was performed to evaluate the impact of smoking status on 6-month clinical outcomes of the buccal SFA with EMD and DBBM.

**METHODS:** The present study is a retrospective analysis of a patient cohort. De-identified data were retrospectively derived from periodontal patients seeking care at the Research Centre for the Study of Periodontal and Peri-Implant Diseases, University of Ferrara, Italy, and one private dental office in Ferrara, Italy. Twenty-two defects were selected in smoker (n= 11) and non-smoker (n= 11) patients. Each defect had been treated with buccal SFA. A sandwich technique had been applied to stratify EMD and DBBM: first, a layer of EMD had been injected to condition the bone defect; then, DBBM had been mixed with EMD and positioned to fill the intrabony component of the defect; finally, a second layer of EMD had been injected over the grafted DBBM particles to condition the portion of the root surface coronal to the bone crest. Immediately before surgery and 6 months after surgery, the following measurements had been collected: probing depth (PD); clinical attachment level (CAL); interdental REC (iREC). At suture removal, performed 2 weeks after surgery, the Early Healing Index (EHI) had been evaluated.

**RESULTS:** Twenty-two patients (14 males and 8 females; mean age:  $50.2 \pm 11.4$  years, range: 29 - 68 years; 11 smokers, 11 non-smokers) were included for the analysis. The procedure resulted in significant change in CAL from  $10.0 \pm 1.9$  mm to  $5.5 \pm 1.9$  mm in smokers ( $p=0.003$ ) and from  $10.1 \pm 2.5$  mm to  $6.5 \pm 2.0$  mm in non-smokers ( $p=0.003$ ), the 6-month CAL gain being not significantly different between groups. Also, PD was significantly reduced from  $8.4 \pm 1.6$  mm to  $3.1 \pm 0.5$  mm in smokers ( $p=0.003$ ) and from  $7.7 \pm$

$1.2$  mm to  $3.6 \pm 0.9$  mm in non-smokers ( $p=0.003$ ), with a significant difference between groups ( $p=0.028$ ). At 6 month, PD was similar ( $p=0.151$ ) in smokers and non-smokers. At 2 weeks, smokers and non-smokers showed a significantly different patient distribution according to EHI ( $p=0.009$ ). In particular, the number of sites showing optimal wound healing (i.e., EHI= 1) was 5 (45.5%) in non-smokers while was 0 for smokers.

**CONCLUSIONS:** Treatment of intraosseous defects with buccal SFA in association with EMD and DBBM may similarly lead to substantial CAL gain and limited residual PD in smokers and non-smokers.

## Subgingival microbiota of diabetics and non-diabetics with different periodontal condition: a metagenomic analysis

M. Severi<sup>1</sup>, R. Farina<sup>1,2</sup>, C. Scapoli<sup>1,3</sup>, A. Carrieri<sup>3</sup>, A. Benazzo<sup>3</sup>, E. Mamolini<sup>3</sup>, C. Bassi<sup>4</sup>, E. Callegari<sup>4</sup>, E. Miotto<sup>4</sup>, S. Sabbioni<sup>4</sup>, L. Trombelli<sup>1,2</sup>

<sup>1</sup>Research Centre for the Study of Periodontal and Peri-implant Diseases, University of Ferrara, Ferrara, Italy; <sup>2</sup>Operative Unit of Dentistry, University-Hospital of Ferrara, Ferrara, Italy; <sup>3</sup>Department of Life Sciences and Biotechnology -Section of Biology and Evolution, University of Ferrara, Ferrara, Italy; <sup>4</sup>Department of Life Sciences and Biotechnology - Section of Pathology and Applied Microbiology

**BACKGROUND:** The study was performed to characterize the subgingival microbiota of patients with and without type 2 diabetes (T2D) with different periodontal status.

**METHODS:** Twelve caucasian non-smoker subjects participated in a cross-sectional study. Subjects were considered diabetics if having a history of T2D for at least 2 years and showing insufficient metabolic control (i.e., Hb1Ac >7%). Subjects were classified into one the following 4 groups (of 3 subjects each): diabetics with or without periodontitis (T2D+P+ and T2D+P-, respectively) and non-diabetics with or without periodontitis (T2D-P+ and T2D-P-, respectively). Each subject underwent subgingival plaque sampling at 4 sites with probing depth (PD)  $\leq 3$  mm and negative to bleeding on probing (BoP) (in patients without periodontitis) or 4 sites with PD  $\geq 4$  mm and BoP+ (in patients with periodontitis). For each patient, DNA was then obtained and subjected to enzymatic fragmentation to obtain 400bp fragments. Fragments were used to create library by mean of a specific kit and then sequenced using an High-Output sequencer (Illumina NexSeq 500).

**RESULTS:** Diabetic subjects had received the diagnosis of T2D at least 3 year before participation in the study, and their HbA1c levels were comprised between 7.1% and 8.0%. Subjects with P had a number of sites with PD  $\geq 5$  mm varying between 19 and 39 in T2D-P+ group, and between 18 and 29 in T2D+P+ group. The number of known species detected in the subgingival microbiome varied between 101 (T2D+P+

group) and 150 (T2D-P- group). In T2D+P- group, DNA copies for *Wolinella succinogenes* was significantly higher, at nominal level, compared to T2D-P- group. DNA copies of 9 species differed significantly between T2D+P+ and T2D-P+ groups, with those of some periopathogens being significantly lower in T2D+P+ group.

**CONCLUSIONS:** The composition of the subgingival microbiota differs between subjects with and without poorly controlled T2D. These differences are related to a limited number of species under conditions of periodontal health, while are more marked (9 species) under conditions of periodontitis.

### Post-surgery healing with a chlorhexidine-based mouthrinse containing hyaluronic acid and an anti-discoloration: a randomized controlled trial

A. Simonelli<sup>1</sup>, R. Farina<sup>1,2</sup>, M. Pramstraller<sup>1,2</sup>, M.E. Guarnelli<sup>1,2</sup>, E. Maietti<sup>3</sup>, L. Trombelli<sup>1,2</sup>

<sup>1</sup>Research Center for the Study of Periodontal and Peri-Implant Diseases, University of Ferrara, Ferrara, Italy; <sup>2</sup>Operative Unit of Dentistry, University-Hospital, Ferrara, Italy; <sup>3</sup>Center of Clinical Epidemiology, University of Ferrara, Ferrara, Italy

**BACKGROUND:** The primary aim of the study was to evaluate the healing of gingival tissues following post-surgical chemical plaque control with two different chlorhexidine (CHX) mouthrinse formulations: (i) 0.2% CHX, and (ii) 0.2% CHX + anti-discoloration system (ADS) + 0.2% hyaluronic acid (HA). The secondary aim was to compare the anti-plaque, anti-gingivitis and staining effects of the two mouthrinse formulations.

**METHODS:** Thirty-five patients were selected for participation in a single center, parallel-arm, triple blind, RCT. Patients were included only if the surgical flap involved the interdental papilla between the canine or the first premolar or between the first and second premolar due to enhanced surgical visibility. Teeth in this area had to present an intact or reduced but healthy periodontium and were identified as the *experimental teeth*. After surgery, patients used the assigned mouthrinse (CHX or CHX+ADS+HA) three times a day for 21 days. At day 7, patients were asked to re-establish their self-performed oral hygiene regimen at experimental teeth using a specific post-surgical toothbrush, to be used up to day 21. At day 7 and 21 one calibrated examiner assessed all experimental parameters at experimental teeth. Gingival Healing Index (GHI), a composite index specifically created to assess the post-surgery conditions of the interdental papilla, was obtained by the combined evaluation of the severity of wound dehiscence and the profile of the buccal and oral aspects of the interdental papilla. Also, Plaque index (PII), Gingival Index (GI), Angulated bleeding score (AngBS) as well as tooth discoloration and tongue staining were assessed.

**RESULTS:** At either 7 or 21 days after flap surgery, CHX and CHX+ADS+HA mouthrinse formulations were associated with optimal GHI in  $\geq 50\%$  of patients, along with a limited number of cases of major wound dehiscence and/or necrosis of the marginal portion of the papilla. Both treatment modalities showed a substantial antiplaque and antigingivitis effect with low median values of PII, GI and AngBS during the entire experimental period. Except for a lower GI in CHX group at day 7, no other significant inter-group differences were found. In both groups, tooth discoloration showed a modest but significant increase (CHX+HA+ADS:  $p=0.001$ ; CHX:  $p=0.004$ ), with no inter-group differences. Moreover, in both groups a

reduction in the proportion of patients with non-pigmented tongue was observed with time. At day 7, the proportion of patients with  $\leq 25\%$  stained area was significantly higher in CHX+HA+ADS group than in the CHX group ( $p=0.047$ ), but the difference was not detected at day 21. At day 21, the majority (about 50-60%) of patients in both groups showed 50% or lower of pigmented tongue area and mild intensity of tongue staining.

**CONCLUSIONS:** The results of the present study showed that post-surgery use of CHX and CHX+ADS+HA mouthrinses results in similar optimal plaque control and quality of gingival healing along with limited staining.

### Clinical and histological evaluation of patients with altered passive eruption (APE): a case-control study

R. Aghazada, F. Nardo, C. De Gennaro, A. Pilloni

Sapienza Università di Roma, Dipartimento di Scienze Odontostomatologiche e Maxillo Facciali, Cattedra di Parodontologia, Rome, Italy

**BACKGROUND:** Despite literature suggests that patients with APE are more susceptible to gingivitis and periodontitis, due to the excess of gingiva which impedes the correct oral hygiene procedures, there is no clinical study confirming this assumption. This study wants to examine an experimental gingivitis (EG) in patients with APE compared to healthy patients and analyse the histological aspect of soft tissues in APE.

**METHODS:** 9 patients with APE for test group (TG) and 9 patients with normal anatomy of gingival tissues, as control group (CG) were selected for the study. Clinical parameters have been compared intrapatiently: an EG in one selected side (test) of maxillary arch, another side as control. The following clinical parameters were obtained from selected test and control sites:

Angulated bleeding score (AngBS)

Gingival index (MGI)

Plaque index (PLI)

Quigley Hein Plaque Index - QH

Gingival crevicular fluid volume (GCF)

Individual cast models were prepared and customized stents were obtained from the model. The stent was adapted to fit teeth (from central incisor to canine) only in test quadrant. The stents were delivered on day 0. Subjects were asked to wear the stent during oral hygiene sessions throughout the EG period, to prevent plaque removal. After EG period, patients with APE underwent a surgical correction of gingival smile. Secondary flap was removed during surgery and analyzed histologically.

**RESULTS:**

PI: On day 42 (T6) QH was  $1.22 \pm 1.64$  in TG and  $0.56 \pm 1.33$  in CG ( $p=0.258$ )

GI: At the end (T6) of EG, the difference in the inflammatory indices was not significant. On day 42 (T6) AngBS was  $0.33 \pm 0.50$  in TG and 0 in CG ( $p=0.206$ ) and MGI was  $0.67 \pm 0.71$  in TG and 0 in CG ( $p=0.029$ ).

Gingival crevicular fluid ( $\mu$ l): On day 42 (T6) GCF was  $0.1 \pm 0.07$  in TG and  $0.08 \pm 0.04$  in CG, which was similar to day 0 (T0)  $0.10 \pm 0.06$  and  $0.11 \pm 0.03$  in TG and CG respectively ( $p=1.0$ ).

The histologic aspects were compatible with chronic gingivitis with different degrees of severity. By dividing the sub-epithelial connective tissue into two portions, collagen fibers were

## ABSTRACT

more dense in the deeper areas, parallel to gingival epithelium where the less dense surface fibers came off, with a “sunburst” pattern with respect to the alveolar bone and root surface but perpendicular to the gingival lining epithelium. In patients with APE there was an increase in size and number of fibers, corresponding to a significant sclerotization of the deep part and a loss of “laxity” of the superficial part. Microscopic characteristics confirm the hypothesis of chronic traumatism in subjects with APE associated with histologic signs of chronic plasmacellular gingivitis.

**CONCLUSIONS:** EG clinical trial revealed that among TG and CG there were no significant differences in plaque accumulation time and its amount. However, in case of plaque accumulation, APE is factor which facilitate the rapid development and progression of gingivitis with higher inflammation indexes (AngBs and MGI). The causes of this phenomenon could be found in anatomical differences of periodontal tissues between TG and CG; excess of gingiva, making oral hygiene difficult; a deeper gingival sulcus, facilitating bacterial growth. Our findings are compatible with studies in literature, showing that a gingival margin more coronally located reduces the protective capacity of periodontal tissues against chewing traumas, contributing to the development of chronic inflammation and predisposition to gingivitis.

### **Influence of flap position in fiber retention osseous resective surgery on keratinized tissue increase and patient's postoperative discomfort: a 6-month randomized, split-mouth study**

G.M. Piccoli, N. La Bruna, M. Giraudi, F. Ferrarotti, F. Romano, M. Aimetti

*Department of Surgical Sciences, C.I.R. Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** To the current state of our knowledge, limited information is available on soft tissue regrowth following osseous resective surgery with fiber retention technique (FibReORS) in chronic periodontitis patients. In particular, no study examined the changes over time of keratinized tissue (KT) width in relation to flap placement with respect to the bone crest after surgery. Therefore, the present randomized split-mouth study primarily aimed to assess the influence of primary flap position, apically or at the level of the bone crest, on the amount of KT at 6 months after FibReORS and secondly to compare patient-related outcomes.

**METHODS:** A total of 16 patients with advanced chronic periodontitis showing persistent periodontal pockets in at least two posterior sextants after cause-related therapy were consecutively enrolled. Each sextant, treated with FibReORS, was randomly assigned either to primary flap positioned 2 mm below the bone crest (Test group) or at the level of bone crest (Control group). Measurements were performed by a blind and calibrated examiner using a customized acrylic stent. KT increase and soft tissue rebound in terms of relative recession reduction after flap suture were monitored at 1-, 3- and 6-month follow-up. Patient-related outcomes were recorded during the first three weeks after surgery.

**RESULTS:** An overall mean KT gain was observed during the 6-month follow-up period ( $2.15 \pm 0.92$  mm in the test group versus  $1.80 \pm 0.87$  mm for control group,  $p = 0.11$ ). The mean amount of soft tissue rebound following surgery was  $2.23 \pm 1.29$  mm for the test group and  $1.56 \pm 0.76$  mm for the control group ( $p = 0.05$ ). Interestingly, in the apically

positioned flap group about 87.6% of the coronal re-growth occurred during the first 3 months after surgery, while in the crestal group approximately 78% of the coronal re-growth occurred in the last 3 months. Both groups referred the same discomfort during the healing phase ( $p = 0.51$ ).

**CONCLUSIONS:** The results of this study confirm the benefits of FibReORS in the treatment of intraosseous defects  $\leq 3$  mm. The positioning of the primary flap apical to the bone crest results is related to a general trend of greater coronal soft tissue regrowth and formation of wider band of KT without lowering the healing process and worsening patient discomfort.

### **Impact of professional hygiene and motivational strategies on the gingival health of patients with orthodontic treatment: a pilot study**

A. Pango, R. Piccialli, R. Bucci, V. Donnarumma, R. Valletta, V. D'Antò

*Department of Neuroscience and Reproductive Sciences and Oral Sciences, School of Orthodontics and Temporomandibular Disorders, University of Naples Federico II, Naples, Italy*

**BACKGROUND:** The most significant etiological factors in the development of periodontal disease is the dental plaque (biofilm). Orthodontic treatment might influence the accumulation and composition of the supragingival and subgingival microflora, giving rise to inflammation, gingivitis, gingival bleeding, gingival enlargement and increased gingival pocket depth. Therefore, the association of orthodontic treatment and poor oral hygiene can cause serious damage to the periodontium. The aim of this study was to evaluate the effects of clinical and motivational strategies of the dental hygienist on the gingival health of patients undergoing fixed orthodontic treatment and clear aligners therapy after a 3-months follow-up.

**METHODS:** The sample comprised 40 orthodontic patients (26 females; 14 males, mean age  $27.63 \pm 12.62$ ) recruited at the Section of Orthodontics and Temporomandibular Disorders of the University of Naples Federico II (Italy) with full permanent dentition. Twenty subjects (mean age  $20.55 \pm 8.09$  years) were undergoing multibracket fixed therapy (Fixed Group – FG), while 20 subjects (mean age  $34.7 \pm 12.5$  years) were in treatment with clear aligners (Clear Aligners Group – CAG). At the baseline (T0) the patients were submitted to an evaluation of the periodontal health status through a periodontal charting. The following clinical parameters were measured: probing deep (PD), plaque index (PI), bleeding on probing (BOP) and gingival recession (REC). Subsequently, the patients underwent a professional oral hygiene, supra- and subgingival scaling for removing bacterial plaque and calculus. Finally, all the patients were instructed for individualized toothbrushing technique. Every two weeks, the subjects were re-called for reinforcement of the instructions of the daily oral hygiene. After 3 months (T1), all patients were re-evaluated through periodontal charting. The intra-group comparisons (T1 vs. T0) were calculated with a paired sample t-test, while two-way ANOVA was used for the inter-group comparisons. The statistical significance level was set at  $P$  value  $< 0.05$ .

**RESULTS:** In both groups, a significant improvement of PD (FG:  $p$  value  $< 0.001$ ; CAG:  $p$  value  $< 0.0001$ ), BOP ( $p$  value  $< 0.0001$  in both groups) and PI ( $p$  value  $< 0.05$  in both groups) was observed at T1. Instead,



REC was unchanged over time (FG: p value 0.1; CAG: p value 0.7). For all the variables, no effect of the appliance was shown in the inter-group comparisons. CONCLUSIONS: The role of hygienist is important in setting up oral hygiene prevention and education programs, by choosing appropriate methods and personalized tools during orthodontic therapy. An adequate control of bacterial plaque and professional dental hygiene every 3 months allows to maintain optimal gingival health, independently of the type of orthodontic therapy applied.

### Effects of partial recording protocols on estimates of prevalence of periodontitis using the CDC/AAP case definition: a cross-sectional study in an adult population from North Italy

F. Romano<sup>1</sup>, F. Deli<sup>1</sup>, S. Perotto<sup>2</sup>, A. Castiglione<sup>3</sup>, M. Aimetti<sup>1</sup>

<sup>1</sup>Department of Surgical Sciences, C.I.R. Dental School, University of Turin, Turin, Italy; <sup>2</sup>Private Practice, Turin, Italy;

<sup>3</sup>Unit of Clinical Epidemiology, Città della Salute e della Scienza and CPO Piedmont, Turin, Italy

**BACKGROUND:** Underestimation of periodontitis prevalence for different severity thresholds of probing depth (PD) and clinical attachment loss is well documented in partial-mouth recording (PMR) protocols. Limited data is available on their accuracy when applying the periodontitis case definition introduced in 2007 by the Centers of Disease Control and Prevention and American Academy of Periodontology (CDC/AAP) for population-based surveillance. Therefore, the aim of the present study was two fold: 1) to evaluate the bias for PMR protocols in estimating prevalence of periodontitis and 2) to assess the impact of disease level and extension on periodontitis misclassification according to CDC/AAP case definition.

**METHODS:** This cross-sectional study enrolled a representative sample of 721 dentate individuals, 20-75 years old, living in a city in North Italy. Full-mouth examination (FME), excluding third molars, was performed to determine the true prevalence of severe and moderate periodontitis according to the CDC/AAP definition. Two PMR systems, both producing 56 sites per individual, were compared to the FME results (gold standard). They were the full-mouth mesio-buccal-distal-lingual protocol (fMB-DL) and the diagonal half-mouth four sites protocol using the mesio-buccal, disto-buccal, mesio-lingual and disto-lingual sites (pMDB-MDL) of teeth in two randomly selected diagonal maxillary and mandibular quadrants. Prevalence, absolute bias, relative bias, and sensitivity were derived for these protocols according to the CDC/AAP definition.

**RESULTS:** Under FME, the prevalence estimates of moderate and severe periodontitis were 39.81% (95% CI: 36.23; 43.38) and 38.14% (95% CI: 34.60; 41.69), respectively. A relative bias of approximately -3% in moderate periodontitis prevalence was provided by both PMR systems, whereas the underestimation level for severe periodontitis prevalence ranged from -28.74% (pMDB-MDL) to -14.55% (fMB-DL). The percentage of false negatives was 9% for the fMB-DL protocol and increased to 27% for the pMDB-MDL system. When CDC/AAP algorithm was applied to PMR methods, it required a threshold of  $\geq 5\%$  of sites with PD  $\geq 4$  mm to properly identify cases of moderate periodontitis and of  $\geq 25\%$  for cases of severe periodontitis. If the percentage of

pockets  $\geq 6$  mm deep was less than 5%, subjects with localized severe periodontitis were misclassified as healthy. This implies that PMR systems are not suitable for their early detection in population-based screening programs.

**CONCLUSIONS:** Both PMR protocols provided large underestimation of the prevalence of periodontitis with the pMDB-MDL protocol performing the worst under the study conditions. In spite of the advantage of requiring less resource, this limits their applicability in periodontitis surveillance. On this basis, an improvement of CDC/AAP algorithm would need to be introduced to enhance adherence to the clinical requirements.

### Generalized aggressive periodontitis in 5-year-old patient: a case report with 17 years follow-up

E. Simeoni, A. Pardo, A. Signoriello, G. P. Bertelè, L. Malchiodi, G. Lombardo, P.F. Nocini

Department of Surgery, Dentistry, Pediatrics and Gynecology, Università degli Studi di Verona, Verona, Italy

**BACKGROUND:** Although aggressive periodontitis is a rare condition in young patients, this disease still may affect children. Several authors suggest that this form of periodontitis may be followed by severe periodontitis of permanent teeth or by healthy permanent dentition, and that the affected patients may have some underlying systemic disorder. The purpose of this study was to report about a non-surgical/ surgical periodontal and orthodontical combined approach to diagnose and effectively treat a GAgP/ LAgP diagnosed 5- years old child. The clinical and radiographic findings as well as the patient's clinical response to treatment after a 17-years follow up period are discussed.

**METHODS:** This study presents a case of generalized aggressive periodontitis in a 5-year-old girl. In January 2001, the patient received a diagnosis of aggressive periodontitis affecting her deciduous teeth with abundant clinical loss of attachment that started to involve also the definitive first molars. With the purpose of reduce pain and improve her oral condition, the teeth with highest mobility were extracted, and the patient was referred to a pediatrician in order to exclude the possibility of other syndromes that can include periodontitis as a clinical presentation. In March 2002 to reduce patient's discomfort, the remaining hopeless deciduous teeth were extracted and the girl was referred to the personal dentist. In November 2005, the 9-years-old girl presented deep intraosseous defects, spontaneous bleeding and mobility of the erupted teeth, receiving a diagnosis of aggressive periodontitis. The treatment consisted of Full-mouth Ultrasonic and manual subgingival debridement sessions (US-RP Full mouth) every 3-4 months, the first of which associated with antibiotic local therapy using metronidazole gel (Elyzol25% gel Colgate). In February 2007 the first permanent molars in mandible were treated with a periodontal regenerative approach using enamel matrix derivative. In May 2008, the patient started an orthodontical treatment in order to correct her III class malocclusion associated with maxillary hypoplasia. After collecting radiographical and photographic findings, the orthodontist chose to start the treatment in May 2009 with the purpose of realizing an orthodontical presurgical therapy since the skeletal discrepancies between the maxilla and the mandible did not allow a complete correction if treated only orthodontically. In 2010, the patient

## ABSTRACT

was diagnosed with polycystic ovary syndrome and profound insulin-resistance by the endocrinologist. In September 2014 the orthodontical treatment stopped waiting for the surgery to be performed. The patient decided to proceed with the usual 3-months recalls in order to maintain stable her periodontal health and to postpone the surgery in 2019. In February 2018, a complete radiographical and clinical examination was performed in order to assess the patient's general oral and periodontal condition.

**RESULTS:** After therapy, clinical measurements demonstrated decreasing to a maximum of 4 mm in PD (Probing Depth) of the affected sites with no suppuration and full-mouth Bleeding Score (FMBOP) lower than 5%. In 2018 periodontal and radiographic examination revealed stable clinical improvements with FMBOP of 1% and a FM-vPI score of 1%. The periodontal novel condition obtained was maintained also through the orthodontical treatment by an accurate plaque control achieved both at home and professionally with 3-months recalls followed thoroughly for 10 years.

**CONCLUSIONS:** Successful treatment of GAgP is considered to be dependent on early diagnosis, a suitable therapy aiming to eliminate or suppress the periodontal pathogenic microorganisms. A multi-disciplinary approach involving periodontal, surgical and orthodontical therapies led to an oral healthy environment promoting long-term maintenance for more than 15 years.

### Evaluation of the knowledge of oral pathologies and oral hygiene techniques by means of who questionnaire. Multicentric epidemiologic study

E. Volpe, P. de Paola, M. Nicolò, A. Blasi, V. Iorio Siciliano, L. Fortunato

**BACKGROUND:** An appropriate knowledge of oral pathologies and oral hygiene methods is basic to prevent periodontal and dental pathologies. Oral disease is associated with an array of structural determinants. It is also associated with daily living conditions, and social gradients have been reported for dental caries, periodontal disease, and tooth loss. Several studies have reported a mediocre knowledge of oral hygiene pathologies, techniques and devices by the population. The aim of this study was to evaluate the knowledge level of oral pathologies and home oral hygiene techniques of population, by means of questionnaire.

**METHODS:** Two examiners from two different University Center (University of Naples "Federico II", University "Magna Graecia" of Catanzaro) have recruited a sample of 836 subjects, aged 18 and 65 years old. An examiner for each centre has submitted to the participants the questionnaire illustrating the contents. The questionnaire was completed anonymously, in the absence of the examiner, who recovered it after about 30 minutes.

**RESULTS:** The statistical analysis of the results has shown a homogeneity in terms of the mean age, gender distribution, degree of education and smoking among the subjects recruited in the two university centres. The most part of the subjects included in the study have knowledge of gingivitis, especially those that have a medium-to-high level of education. About the other two most common oral pathologies, periodontitis and caries, it has been demonstrated that the knowledge of these diseases is only the prerogative of subjects with a higher level of education. The most part of the

subjects with a medium-high level of education recognize the importance of the biannual frequency of dental check-ups. As to the oral hygiene habits of the subjects included in the study, it appears that everyone is using the toothbrush. The less common devices (interdental brush and dental floss) are used by subjects presenting medium-high education. The knowledge of these devices is less broad and transversal.

**CONCLUSIONS:** Within the limits of present study, the degree of education would seem to be a determining factor in the knowledge of oral and periodontal pathologies, as well as the homemade oral hygiene procedures.

### Subepithelial connective tissue graft maturation over 5 years: a clinical observation

M. Corana, D. Collivasone, L. Zacconi, F. Vezzoni

*Periodontal Unit, School of Dentistry, Department of Clinical-Surgical Diagnostic and Pediatric Sciences, University of Pavia, Pavia, Italy*

**BACKGROUND:** The aim of this case report is to describe the so-called "creeping attachment" of a subepithelial connective tissue graft over 5 years considering the potential factors involved.

**METHODS:** A 47-year-old male patient presented with a Miller Class I recession on the buccal aspect of the mandibular right first molar, associated with a cervical abrasion. Less than 1 mm of keratinized tissue remained. The recession was treated with a subepithelial connective tissue graft partially covered with an envelope flap. Before treatment and during the supportive periodontal therapy the patient was instructed to brush the teeth properly according to the modified Bass technique. The results of the surgical procedure were evaluated after 3, 12, 24, 36 and 60 months. The abrasion was not restored because it was not symptomatic and the cervical discoloration was considered as a stable reference point to observe the maturation of the graft.

**RESULTS:** The initial recession measured 3.5 mm. Three months after surgery less than 50% of the defect was covered (2 mm of residual recession). The amount of residual recession decreased to 1.5 mm 12 months after treatment and to 1 mm at 24 months. The next re-evaluation of the site was made 3 years after surgery and an additional maturation was observed (0.5 mm of residual defect). Another slight improvement was noted during the 5-year recall. As a result, an almost complete root coverage was obtained.

**CONCLUSIONS:** This case report shows that the maturation process of a connective tissue graft could last several years; this process could significantly improve the results of the surgical correction of a gingival recession. Some studies evaluated long term results achieved using various root coverage procedures. In particular it was shown that a progressive coronal improvement of the gingival margin level could be expected using a subepithelial connective tissue graft in comparison with sites treated only with a coronally advanced flap; in the second case an apical shift of the gingival margin was observed during a five-year follow-up. Moreover, the "creeping attachment" seems to be influenced by: the convexity/concavity of the tooth surface, the thickness of the connective tissue graft and the tooth brushing method. However, the role of the factors involved

with the long term coronal maturation of a subepithelial connective tissue graft has never been deeply analyzed in the literature.

### Complications of peri-implant mucogingival surgery: a challenging case-report

G.P. Patianna, L. Pittari, F. Raimondi Lucchetti, B. Poletti de Chaurand, R. Vinci

*<sup>1</sup>Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy; Specialization School in Oral Surgery, Faculty of Medicine and Surgery, Vita-Salute San Raffaele University, Milan, Italy*

**BACKGROUND:** The main goal of the implant rehabilitation in the aesthetic area is patient satisfaction and function. A major concern is the appearance of soft tissue dehiscence in the facial aspect, common finding following implant restorations. To date, international literature shows that periodontal plastic procedures like Coronal Advanced Flap (CAF) with Connective Tissue Grafts (CTG) technique present high predictability in terms of exposed implant surface coverage.

Periodontal plastic procedures are complex, technique-sensitive interventions that require advanced skills and expertise. The aim of the following case is to report a complication after a bilaminar technique in the aesthetic buccal area of an upper central implant.

**METHODS:** A female patient (42 yo) in general health condition came to our attention with a complex history on an implant placed in position #11. After a trauma, she lost her central incisor and received a bone block graft harvested from the mandibular branch. After 6 months, an implant was placed and the prosthetic treatment was completed after 6 months more, without any complication or suppuration. Due to a gingival recession on the facial aspect of the implant, a Coronally Advanced Flap (CAF) with a connective tissue graft (CTG) was executed by another operator. After 12 weeks, the patient finally came to our attention with suppuration on the buccal aspect of the implant. The fistulography and CTscan showed two threads of the implant exposed. The implant was removed and a post-extractive immediate-loading implant was then placed. After an observational period of 1 month, the buccal suppuration continued. An explorative access flap was then elevated to observe the peri-implant submucosal environment and find the cause of the suppuration. Primary horizontal crestal incision was performed after removing the provisional crown from the implant, extended mesially and distally with a papilla preservation flap technique. A vertical incision was then carried out distally to increase the visibility of the operatory field, keeping the incision area away from the highly aesthetic area. A total thickness flap was elevated in order to manage properly the periostium and access directly to the fistulae. The presence of sub-connective epithelial tissue was noticed within the raised flap. The presence of this tissue highlights the importance of the management of the grafted tissue and the receiving vascular bed. In particular, the grafted connective tissue was not carefully de-epithelialized: so the epithelium proliferated below the submucosal layer. The epithelial pearls were then surgically removed with 15C blade and the flap was repositioned and sutured with 5/0 polypropylene sutures.

**RESULTS:** After 8 weeks of follow-up and soft tissue maturation and adaptation to the implant provisional crown, com-

plete absence of suppuration was noticed. Due to the previous surgeries, a soft tissue deficiency was observed.

**CONCLUSIONS:** Periodontal plastic procedure are great solutions to enhance aesthetic outcome and increase ketaritized tissue improving the peri-implant emergency profile. By the way they must be performed in the best way: in order to avoid complications, the management of the connective tissue graft and the preparation of the vascular bed with the de-epithelialization are extremely crucial.

### The effects of periodontitis on adverse pregnancy outcomes

F. Graziani, S. Gennai, M. Tonelli, M. Nisi, M. Gabriele, M. Petrini

*Department of Surgical, Medical and Molecular Pathology and Critical Care Medicine, University of Pisa, Pisa, Italy; Sub-Unit of Periodontology, Halitosis and Periodontal Medicine, University Hospital of Pisa, Pisa, Italy*

**BACKGROUND:** Adverse pregnancy outcomes (APOs) cause every year the death and disability of many newborns and women all over the world. The most common APOs are low birth weight (LBW, that is defined as weight <2.5 kg at birth), preterm birth (PTB, birth at <37 weeks of gestation) and pre-eclampsia (PE, maternal hypertension, and proteinuria after the 20th gestational week). Periodontitis and APOs have been frequently associated because they are both correlated with bacterial infections and increased local and systemic inflammation. However, a not clear evidence in literature exists.

**METHODS:** A systematic literature review has been performed through hand and electronic search; in particular, Medline, Embase, Web of Science and Cochrane Central databases have been used to find articles published until April 2017. Studies to be included had to be non-intervention, observational studies such as cohort, case-control (cases represented by periodontally-affected pregnant women and controls by periodontally healthies pregnant) or cross-sectional in design. In the selected studies, exposure had to be the periodontal status of pregnant women (measures of inflammation, signs of disease such as pocketing and attachment level excluding tooth loss/edentulism) and outcome one parameter related to pregnancy-related complications. Only studies in the English language were selected. Once completed the electronic and hand searching and after the elimination of papers present in duplicates, a total of 1182 studies were identified for inclusion in this review. After the title, abstract and full-text analysis, a total of 109 studies were included and categorized for the following adverse pregnancy outcome: 31 LBW, 43 PTB, 17 PTLBW and 18 PE.

**RESULTS:** A significant association between maternal periodontitis and APOs have been found in 57 of the included studies: 19 for LBW, 20 PTB, 7 PTLBW and 13 PE. Despite the studies included in this review have been conducted in different parts of the world and results are generalizable, they are characterized by a great heterogeneity. In particular important differences have been found for the modalities of periodontal examination adopted by the studies: partial or total examination, single or multiple examiners, different calibration and training of the examiners, the different definition of periodontitis adopted as cut off of disease. Other factors that could influence results were connected with sample population enrolled in the studies: different numbers of the



## ABSTRACT

probands, different ethnicity and timing of gestation at the moment of the enrolment and examination.

**CONCLUSIONS:** Solid and definitive conclusions cannot be drawn, while further research is strongly encouraged. A consistent association between maternal periodontitis and PE has been found; on the contrary, the evidence about LBW, PTB, and PTLBW suggest that there might be an association with periodontitis but reported data are of high heterogeneity.

### Antimicrobial photodynamic therapy as an adjunct to non-surgical periodontal treatment: a randomized, controlled clinical trial

M. Annunziata, L. Natri, G. Persico, R. Migliaccio, G. Cecoro, L. Guida

*Department of Dentistry, Orthopedics and Rehabilitation, University of Campania "L. Vanvitelli", Naples, Italy*

**BACKGROUND:** Antimicrobial photodynamic therapy (aPDT) has been suggested in adjunct to subgingival debridement for the treatment of chronic periodontitis, with the aim to benefit periodontal treatment, especially in areas of difficult access. However, its efficacy is controversial, and only limited data from controlled clinical trials are available to date. The aim of the present study was to clinically and microbiologically assess the efficacy of aPDT in adjunct to full-mouth subgingival debridement in the treatment of chronic periodontitis.

**METHODS:** In this 6-month single-masked, parallel group clinical trial, 24 chronic periodontitis patients were selected to receive one session of full-mouth ultrasonic subgingival debridement (FMUD). Afterwards, patients were randomly assigned to a test treatment, consisting of two adjunctive sessions of aPDT performed, one and three weeks apart, by an indocyanine green solution (Emundo, Sweden & Martina, Padua, Italy) activated by a 810nm diode-laser (Fox ARC Laser, Sweden & Martina, Padua, Italy) in sites with initial probing pocket depths (PD) >4 mm, and to a control treatment, consisting of two adjunctive sessions of sham aPDT treatment. The main outcome variable was the change in PD and, as secondary outcomes, changes in clinical attachment levels (CAL) and proportions of bleeding on probing (BOP) sites, which were assessed at baseline, 3 and 6 months. At the same time points microbiological evaluation of *Aggregatibacter actinomycetemcomitans* (A.a), *Porphyromonas gingivalis* (P.g.), *Prevotella intermedia* (P.i.), *Prevotella nigrescens* (P.n.), *Parvimonas micra* (P.m.), *Campylobacter rectus* (C.r.) was performed by real time polymerase chain reaction. Data were analysed with an intention to treat analysis, using t-test or the Mann-Witney U-test to assess for inter-group differences.

**RESULTS:** Both treatments resulted in significant clinical improvement at both 3 and 6 months. A higher PD reduction values in the deepest pockets ( $\geq 7$ mm vs  $< 7$ mm) in the test group compared to the control group was registered ( $P < 0.0002$  at 3 months), whereas none other inter-group difference could be evidenced. No difference in terms of microbiological changes was found between test and control group, excepting for a more pronounced reduction in A.a. and P.m. levels in the test group.

**CONCLUSIONS:** The additional use of aPDT to FMUD in the treatment of chronic periodontitis provided limited benefit in terms of additional clinical and microbiological improvement,

although some encouraging results in favour of the combined approach were found, e.g. for the treatment of hardly accessible sites. Further RCT performed on larger patient populations are required to confirm these results, and to see whether there is a rationale for the application of aPDT in conjunction with FMUD for the treatment of chronic periodontitis patients.

### Improved technique to augment the soft tissue in atrophic ridge: case series

C. Franceschini, R. Lombardi, S. Bonomo, M. Galli

*Department of Oral and Maxillo-Facial Sciences, Sapienza, University of Rome, Rome, Italy*

**BACKGROUND:** The aim of this work was to treat and to solve horizontal localized defects of alveolar crest (1 class of Saibert) by soft tissue's augmentation in a fixed partial prosthetic. The surgical techniques consist in using connective subepithelial palatal free grafts.

**METHODS:** 6 patients (3 male and 3 female) aged from 25 to 55 years old were included. All patients were chosen through these criteria: intercalated missing teeth in the aesthetic zone, presence of moderate Saibert's 1 class defects, impossibility to realize implantprosthetic rehabilitation and negative medical history to systemic diseases. All surgical procedures were performed by a single operator. The used technique is the one proposed by Garber and Rosemberg. First of all, defect's size is measured by using a periodontal probe. Then we realized vestibular pouch by a single split flap on the crest; after that a dissection extended over the defect's entire surface and in proximity to the periosteum is performed, that for maximize the increase of tissue thickness. Lorenzana and Allen technique is used to taking a tissue graft from palate by a single access incision and the residue epithelial peduncle has healed by first intention. The graft is placed on the receiving site and that stabilized by suture: the first patch connects the graft to the vestibular flap by controlling the right apical-coronal position, than other stitches were positioned for restricting flap movement, at the end the vestibular flap's free margin is sutured at the palatal margin.

**RESULTS:** In all cases GAL (gingival aesthetic line) was respected and also patients were satisfied about the obtained result. After 6 and 12 month, tissue stability turns out to be optimal. In the final analysis we can assert that this kind of surgery is not painful for patients and don't cause distress in post-operative period. Just in two cases FANS were taken due to patients reported pain in the donor site.

**CONCLUSIONS:** According to the last forty years literature, the alveolar crest's augmentation by periodontal plastic surgery represents a good solution for bone defects treatment. Many techniques have been proposed during the years but everyone has specific indication according to the adopted procedure and defect's characteristics. Thanks to soft tissue increase it's possible to obtain an excellent aesthetic result because: there are no worse concavities in the crestal surface, the ridge acquires her natural form smooth and blunt, mucosa and pontic elements takes a shape than mimic a natural profile of teeth. A limit of this technique is that his effectiveness and predictability are correlated to operator skill an expert one is more capable in preparing donor and receiving sites and in the tissue management. These factors reduced accidents and complications in this surgery procedure.

## PPAR15 - Adjunctive hyaluronic acid application in coronally advanced flap in miller class I single gingival recession sites: a randomized controlled clinical trial

P. Russo<sup>1</sup>, P. Sahrman<sup>2</sup>, M. Rojas<sup>3</sup>, L. Ottolenghi<sup>1</sup>, A. Pilloni<sup>1</sup>

<sup>1</sup>Sapienza, University of Rome, Department of Dental and Maxillofacial Sciences, Sections of Periodontology and Preventive Dentistry, Rome, Italy; <sup>2</sup>University of Zurich, Center of Dental Medicine, Clinic of Preventive Dentistry, Periodontology and Cariology, Zurich, Switzerland; <sup>3</sup>University of Buenos Aires, School of Dentistry, Section of Periodontology, Buenos Aires, Argentina

**BACKGROUND:** Animal and in-vitro studies have demonstrated that hyaluronic acid (HA) increases the tensile strength of granulation tissue, stimulates clot formation, induces angiogenesis, increases the osteogenic potential during healing and does not interfere in the calcification nodules during bone formation. Furthermore, HA facilitates cell migration and differentiation during tissue formation and repair of both soft and hard tissues. Recently, it has been shown to improve ligament cell viability and even early osteogenic differentiation in vitro. All these aforementioned properties are essential for tissue regeneration and wound healing that take place after interventions for root coverage. Accordingly, the aim of this randomized controlled clinical trial (RCT) was to evaluate the possible advantages of adjunctive HA application in coronally advanced flaps (CAF) in the treatment of single Miller Class I gingival recessions.

**METHODS:** Thirty patients with one recession each were enrolled. Fifteen were randomly assigned to CAF + HA and fifteen to CAF alone. Clinical parameters like recession reduction (RecRed), clinical attachment level gain (CAL-Gain), changes in probing pocket depths (PPD) and the change in the width of keratinized tissue (KT), the number of complete root coverage (CRC) and the mean root coverage (MRC) were assessed and calculated after a healing time of 18 months. Post-operative morbidity like pain intensity, discomfort and swelling was recorded seven days after treatment using a visual analogue scale (VAS). Non-parametric distributed continuous data was tested for possible intergroup differences using the Mann-Whitney U test. Ordinal data were tested by Pearson's chi-square test. For all tests, the level of significance was 5%.

**RESULTS:** After 18 months, recession reduction was significantly enhanced in the test group ( $p < 0.007$ ) as compared to controls, displaying medians and [interquartile ranges] of 2.7 [1] mm vs. 1.9 [1] mm, respectively. PPD were found to be slightly but not significantly increased in both groups without significant intergroup differences. No statistically significant difference was found for KT gain between treatment groups.

CRC turned out to be 80% for the test sites and 33.3% for control sites, resulting in a statistically significant intergroup difference of  $p = 0.025$ . MRC of  $93.8 \pm 13.0\%$  for test and  $73.1 \pm 20.8\%$  for control sites was calculated and a statistically significant difference between the groups was found ( $p = 0.003$ ).

The test group reported lower swelling values 7 days post-surgery with VAS scores of 1 [1] for the test group and 2 [1] for the controls ( $p = 0.01$ ). Likewise, discomfort was reported to be different with VAS score of 1 [1] for the test and 2 [2] for the control group ( $p = 0.029$ ). However, no statistically significant difference was found for pain intensity.

**CONCLUSIONS:** A coronally advanced flap with adjunctive hyaluronic acid application is a predictable and safe method for single Miller class I gingival recession site treatment. The present findings indicate that the use of HA may not only improve the clinical results but also represent an option to reduce patient morbidity.

## The use of a new xenogeneic 3D collagen matrix for root coverage of miller class i localized recession type defects: a 1-year follow-up case report

C. Cavalcanti<sup>1</sup>, V. Blandi<sup>1</sup>, M. Carere<sup>2</sup>, A. Pilloni<sup>2</sup>, R. Cavalcanti<sup>2</sup>

<sup>1</sup>Sapienza, Università di Roma, Corso di Laurea Magistrale in Odontoiatria e Protesi Dentaria, Rome, Italy; <sup>2</sup>Cattedra di Parodontologia Percorso Diagnostico Odontoiatrico Completo, Rome, Italy

**BACKGROUND:** In the modern surgical periodontal therapy, reconstruction of periodontal soft tissues is a key aspect of the treatment for aesthetic and functional purposes. Over the years, different surgical methods have been proposed for the treatment of keratinized tissue deficiencies, and for single and multiple recession defects, with different techniques and approaches, with different flap designs and with or without the use of connective tissue grafts, reaching a high level of scientific evidence. More recently, research has focused on collagen matrices as substitutes for connective tissue grafts, in order to reduce post-operative discomfort and morbidity for patients, allowing to avoid a second wound at donor site. Our aim was to clinically evaluate the performance and efficacy of the use of a new collagen matrix, with a three-dimensional structure, in association with a coronally advanced flap, to achieve root coverage in Miller class I localized gingival recession type defects.

**METHODS:** A Miller Class I and Cairo RT 1 single gingival recession type defect was treated in order to possibly achieve complete root coverage. The gingival recession was localized on the buccal aspect of the upper right canine in a 40 years old patient. The contralateral canine was already successfully treated by mean of a coronally advanced flap and connective tissue graft (bilaminar technique) one year before, and was used for a clinical comparison between the two different techniques and approaches utilized. After periodontal causal therapy, finalized to control tissue inflammation and to give the patient proper oral hygiene instructions, in order to prevent possible pathology recurrence, surgical approach to the recession defect was performed. During surgery a trapezoid flap was designed, with two vertical release incisions on the distal and mesial aspect, with a sulcular incision at the coronal aspect and with two horizontal anticipated incisions at papilla level. The flap was elevated in a split-full-split manner, in order to get an easy advancement of the flap itself. A collagen matrix (Geistlich Fibro-Gide) was trimmed to fit to the recipient bed and, after placement, was sutured to the periosteum by mean of a 7-0 PGA resorbable suture. The flap was then sutured (6-0 PGA resorbable) above the matrix in a more coronal position. Suture removal occurred 14 days later and patient received new customized oral hygiene instructions. Patient underwent a series of control visits at 3 days, 1 week, 2 weeks, 4 weeks, 2 months, 3 months, 4 months, 5 months, 6 months, 9 months and 1 year.

**RESULTS:** Complete root coverage of the gingival recession was achieved and was stable at 1 year follow-up. The amount

## ABSTRACT

of keratinized tissue present at baseline was maintained after surgery and its dimension was stable after 1 year. There was no difference in terms of root coverage and surgery outcomes compared to the contralateral canine treated by mean of bilaminar technique. The contralateral site showed an excess of soft tissue volume that was judged as less aesthetic.

**CONCLUSIONS:** The use of a new 3D collagen matrix in a localized gingival recession surgical treatment, in association with a coronally advanced flap, gave satisfying aesthetic outcomes and seems to be a reliable procedure in terms of root coverage.

### The use of a new xenogeneic 3d collagen matrix for root coverage of miller class I multiple recession type defects: a 1-year follow-up case report

R. Cavalcanti, C. Cavalcanti, E. Pacifici, M. Carere, A. Pilloni  
*Sapienza Università di Roma Cattedra di Parodontologia, Rome, Italy*

**BACKGROUND:** In the modern surgical periodontal therapy, reconstruction of periodontal soft tissues is a key aspect and a goal of the treatment for aesthetic and functional purposes. Over the years, different surgical methods have been proposed for the treatment of keratinized tissue deficiencies, both for single and for multiple recession defects, with different techniques and approaches, with different flap designs and with or without the use of connective tissue grafts, reaching a high level of scientific evidence. More recently, research has focused on collagen matrices as substitutes for connective tissue grafts, in order to reduce post-operative discomfort and morbidity for patients, allowing to avoid a second wound at donor site. Our aim was to clinically evaluate the performance and efficacy of the use of a new collagen matrix, with a three-dimensional structure, in association with a coronally advanced flap, to achieve root coverage in Miller class I multiple gingival recession type defects.

**METHODS:** A Miller Class I and Cairo RT 1 multiple gingival recession type defect was selected to be treated in order to possibly achieve complete root coverage. The gingival recessions were localized on the buccal aspect of the upper right canine and first premolar in a 22 years old patient. The contralateral side was already successfully treated by mean of a coronally advanced flap with selective placement of connective tissue graft (bilaminar technique) one year before, and was used for a clinical comparison between the two different techniques and approaches utilized. After periodontal causal therapy, finalized to control tissue inflammation and to give the patient proper oral hygiene instructions, in order to prevent possible pathology recurrence, surgical treatment of the recession defects was performed. During surgery an envelop coronally advanced flap for multiple recessions (Zucchelli & De Sanctis) was designed, with an intrasulcular incision at the coronal aspect of each tooth and with angulated horizontal anticipated incisions at papilla level. The flap was elevated in a split-full-split manner, in order to get an easy advancement of the flap itself. A collagen matrix (Geistlich Fibro-Gide) was trimmed to fit to the recipient bed and, after placement, was sutured to the periosteum by mean of a 7-0 PGA resorbable suture. The flap was then sutured (6-0 PGA resorbable) above the matrix in a more coronal position. Suture removal occurred 10 days later and patient received new customized oral hygiene instructions. Patient underwent a series of control

visits at 1 day, 4 days, 10 days, 3 weeks, 1 month, 2 months, 3 months, 4 months, 5 months, 6 months, 9 months and 1 year. **RESULTS:** Almost complete root coverage of the two gingival recessions was achieved and was stable at 1 year follow-up. The amount of keratinized tissue present at baseline was maintained after surgery and its dimension was stable after 1 year. There was no difference in terms of root coverage and surgery outcomes compared to the contralateral canine and first premolar treated by mean of bilaminar technique. The contralateral site showed a prominence in the soft tissue contour that was considered less aesthetic by the patient perception.

**CONCLUSIONS:** The use of a new 3D collagen matrix in surgical treatment of multiple gingival recessions defect, in association with a coronally advanced flap, gave good aesthetic outcomes and seems to be a reliable procedure in terms of root coverage.

### Surgical treatment of a periodontal infra-bony defect associated with a cemental tear using hyaluronic acid. A case report with two-year follow-up

F. Nardo, M.A. Rojas, N. Cvetkova, A. Pilloni

*Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Rome, Italy*

**BACKGROUND:** Cemental tears are an unusual type of dental root fracture which consists in the detachment of a cemental fragment from the underlying root surface. These lesions can cause a rapid localized attachment and bone loss and even a periapical tissue destruction. The aim of this report is to present a case of periodontal involvement associated with a cemental tear and to describe its surgical treatment using a regenerative approach with hyaluronic acid and a collagen membrane.

**METHODS:** A 61 year-old man presented with spontaneous pain on the maxillary right central incisor which displayed an erythematous area and swelling at the level of the attached gingiva. Clinically, probing pocket depth was less than 4 mm at all sites of the element, tooth mobility was absent and the tooth was vital. Radiographic and CT scans examination revealed a moderate loss at periapical and buccal wall bone. An exploratory surgery was performed: a mucoperiosteal flap was elevated (according to Modified Papilla Preservation Technique) and the granulation tissue was removed. A three-walls infra-bony defect was then observed in correspondence of the aforementioned tooth: the buccal wall bone was absent. A small partially detached cemental fragment of the root structure was found on the mesial side of the tooth and it was removed. A root planing was performed and the root surface was carefully observed in order to prevent the presence of a root fracture. The infra-bony defect was treated with hyaluronic acid and covered with a reabsorbable collagen membrane. The flap was coronally displaced and sutured covering the cementum-enamel junction. Sling and interrupted sutures were used and a frenulotomy was made at the end of the surgical procedure. Post-operative pain and edema were controlled with anti-inflammatory drugs. The patient was instructed to avoid any trauma at the surgical site. A 60 second rinse with 0.12% chlorhexidine digluconate was prescribed twice a day for two weeks. The sutures were removed two weeks later.

**RESULTS:** Four weeks after the surgical procedure, a control visit was made: the patient was asymptomatic and soft tissues



revealed good healing. No clinical signs and symptoms were noticed during the periodontal maintenance. Two-year follow-up was successful: CBCT scans showed bone filling of the periapical defect, the reconstruction of the buccal wall bone and there was no evidence of any cemental root fragments. Besides, soft tissues were clinically healthy.

**CONCLUSIONS:** Moderate to severe periodontal attachment and bone loss associated with cemental tears can be successfully treated with the removal of the detached cemental fragments and a regenerative surgical approach. This is the first case reported in literature concerning an infra-bony defect associated with cemental tear treated with hyaluronic acid and a reabsorbable membrane by which clinical and tomographic success and stability were achieved at two-year follow-up.

### Early periodontal wound healing assessment methods: a literature review

L. Marini, W. Floris, R. Aghazada, M. Rojas, P. Russo, M.A. Cassini, A. Pilloni

*Sapienza, Università di Roma, Corso di Laurea Magistrale in Odontoiatria e Protesi Dentaria, Cattedra di Parodontologia, Percorso Diagnostico Odontoiatrico Complesso, Rome, Italy*

The early phase of wound healing seems to be decisive to reach the periodontal surgical final outcome. In particular, the first postoperative weeks appear to be critical for the maintenance of wound stability and have been universally recognized to be determinant for periodontal wound healing following regenerative procedures. Therefore, early wound healing assessments methods, that allows clinicians to follow and over time manage its evolution, could be important. Up to date, numerous methods have been proposed for the determination of oral soft tissues wound healing. The first index, the Healing Index (HI), was introduced by Landry et al. (1988) and evaluated tissue color, bleeding response to palpation, presence of granulation tissue, characteristics of incision margin, and the presence of suppuration. This index permits the clinician to assess the wound healing through a classification from grade 1 to grade 5. The very poor healing wound is classified as grade 1, whereas the excellent as grade 5. The second one, the Early Healing Index (EHI), was developed by Watchel et al. (2003), classifying the healing wounds in 5 degrees, following surgical treatment of intrabony defects. It differentiates not only between complete and incomplete closure of flaps but also it registers both the amount of fibrin or necrosis in case of complete or incomplete closure, respectively. The third index, the Wound Healing Index (WHI), was introduced by Huang et al. (2005), which evaluated the periodontal soft tissue wound healing, subsequently a root coverage procedure, with a differentiation from score 1 to score 3.<sup>10</sup> Wounds were scored 1 in case of absence of gingival edema, erythema, suppuration, patient discomfort and flap dehiscence; 2 uneventful healing with slight gingival edema, erythema, suppuration, patient discomfort and flap dehiscence, but no suppuration; 3 poor wound healing with significant gingival edema, erythema, suppuration, patient discomfort and flap dehiscence, or any suppuration. Furthermore, other authors choose to evaluate periodontal soft tissues healing after surgery through different approaches: Cortellini et al. (2001), Tonetti et al. (2004), and Sanz et al. (2004) recorded independently and dichotomously parameters such edema, hematoma, suppuration, flap dehiscence; Hagenaaers et al. (2004) developed a two-level score (both from 0 to 2) regarding swelling and color of gingival tissues. Even though numerous methods have been developed,

an assessment system ready to use during the early wound healing of the whole spectrum of periodontal surgical procedures seems to be still complex to achieve. Among the limitations of the previously described methods can be listed: (1) not all the parameters, referred to the wound healing clinical features, are included in each assessment method; (2) most of them are designed to follow the wound healing starting the evaluation at 1 or 2 weeks after surgery and not since the very beginning (e.g. 24h after surgery); (3) some of them comprehend excessive parameters in the same score of the index, assembled in an inflexible arrangement, avoiding a proper classification of the wound and generating confusion when the evaluation is performed; (4) some methods evaluated the healing features dichotomously without an integration of the information obtained by each parameter, leading to a less organic assessment of wound healing; (5) some parameters could not be objectively evaluated because lacking of an adequate definition of their different clinical presentation; (6) do not allow their use in the evaluation of every kind of surgical procedure.

### Analysis on the impact of patients' age and sex on the length of first upper premolars

A. Punzo<sup>1</sup>, L. Montanaro<sup>1</sup>, M. Rojas<sup>2</sup>, C. Trezza<sup>1</sup>, A. Pilloni<sup>1</sup>

*<sup>1</sup>Sapienza, Università di Roma, Corso di Laurea Magistrale in Odontoiatria e Protesi Dentaria, Cattedra di Parodontologia, Percorso Diagnostico Odontoiatrico Complesso, Rome, Italy; <sup>2</sup>Universidad de Buenos Aires, Catedra de Periodoncia, Buenos Aires, Argentina*

**BACKGROUND:** Root trunk is the multi-rooted tooth's portion that is located between the cementum enamel junction (CEJ) and furcation. Root trunk dimensions (RTD) play an important role in the diagnosis, prognosis and treatment of periodontitis. In general, periodontal therapy (especially non-surgical therapy) is less effective in multi-rooted than in single-rooted teeth and the progression of the disease is quicker in the multi-rooted. The aim of this study is to evaluate the RTD of first maxillary premolars and its association with age and sex in this context.

**METHODS:** The sample included 110 cone beam computed tomographies (CBCT). Images comprised 220 maxillary first premolars (of both sides, each) from Italian systemically healthy patients aged between 18 and 70 years presenting for dental treatment in the periodontal section of "Università La Sapienza". None of these teeth had previously undergone periodontal treatment. The tooth length (TL) and the root trunk length (RTL) were measured. These two parameters were considered dependent variables, while sex and age were considered as independent variables.

**RESULTS:** Dependent variables were found to have a normal distribution. No statistically significant correlation was found between RTL and TL. Within the assessed cohort, longer RL (Root length) and longer RTL were observed in younger patients than in older subjects. Single rooted first left premolars were more frequent in older patients while right ones did not show a significant difference regarding the root number. Females had statistically significant more first premolars with only one root than male patients ( $p = 0.05$ ).

**CONCLUSIONS:** Patients' age was found to be associated with RTL and RL but only in left premolars. Moreover, first premolars with one root only were found more frequently in older patients, where the distribution was symmetrical in the left and right maxilla. Sex seemed to have only a minor

## ABSTRACT

influence on the frequency of single rooted teeth of the right side of the mouth. Further studies should evaluate a possible asymmetry as observed between the two sides of the maxilla in the present study in order to strengthen evidence and understanding of different variables that could influence the root trunk dimensions. These future studies should not only rely on maxillary first premolars, but on all multi-rooted teeth in both jaws.

**Influence of local risk indicators upon relative site-specific bacterial charges in chronic periodontitis patients: multilevel and cluster analysis on 6 periodontal pathogens identified by mean of quantitative real-time pcr microbiological test**

L. Lo Bianco <sup>1</sup>, M. Montevecchi <sup>1</sup>, A. Spighi <sup>1</sup>, G. Piana <sup>2</sup>, L. Checchi <sup>1</sup>

<sup>1</sup>*Alma Mater Studiorum, Università di Bologna, Unit of Odontostomatological Sciences, Division of Periodontology and Implantology, Department of Biomedical and Neuromotor Sciences, Bologna, Italy;* <sup>2</sup>*Alma Mater Studiorum - Università di Bologna, Unit of Odontostomatological Sciences, Dental service for patients with special needs - Department of Biomedical and Neuromotor Sciences, Bologna, Italy*

**BACKGROUND:** The aim of the present study was to analyze the correlation among the site-specific relative bacterial charges and the local risk indicators.

**METHODS:** The data have been collected from the clinical and radiographic records of 40 consecutive chronic periodon-

titis patients. The examined indicators analyzed were presence or absence of: furcations, open contacts, enamel pearls, malposition, root proximity, root fracture, endodontic problem, over hanging restoration and resorption. Furcation involvement and open contacts were previously identified by a pilot study as guidance indicators. The sample was divided into two groups: 20 subjects with at least one guidance indicator and 20 subjects with out. The studied bacteria were: *Aggregatibacter actinomycetemcomitans* (Aa), *Porphyromonas gingivalis* (Pg), *Tannerella forsythia* (Tf), *Treponema denticola* (Td), *Fusobacterium nucleatum* (Fn) e *Campylobacter rectus* (Cr). The relative charges of the above mentioned bacteria were analyzed by mean of a site-specific quantitative Real-Time PCR microbiological test. With the Cluster analysis ecological niches presence was searched and the Multilevel analysis was used to quantify local risk indicators influence upon bacterial relative charges.

**RESULTS:** The Cluster analysis shows that all sites with the presence of at least one guidance indicator fall in the cluster where the relative bacterial charges are the highest. The Multilevel analysis indicates that the relative charges of *Tannerella forsythia* (Tf) and *Porphyromonas gingivalis* (Pg) are significantly more elevated in sites with presence of furcation and open contacts compared to the ones without ( $p=0,004$ ;  $p=0,021$ ).

**CONCLUSIONS:** The results show the prognostic importance of the individuated guidance local risk indicators and their influence on the examined site-specific relative bacterial charges. From this study emerges that such local risk indicators can be considered as real ecological niches. In a comprehensive periodontal treatment a special effort should be made to eradicate these ecological niches.

## PATOLOGIA E MEDICINA ORALE

### Application of a non-invasive sampling procedure based on oral brushing and DNA methylation analysis of a 13-gene panel to study high risk patients to develop oral cancer

R. Rossi<sup>1</sup>, L. Morandi<sup>2</sup>, A. Gabusi<sup>1</sup>, A. Tarsitano<sup>3</sup>, L. Sozzi<sup>1</sup>, S. Kavaja<sup>1</sup>, C. Amadasi<sup>1</sup>, A. Spinelli<sup>1</sup>, D. B. Gissi<sup>1</sup>

<sup>1</sup>Department of Biomedical and Neuromotor Sciences, Section of Oral Sciences, University of Bologna, Bologna, Italy; <sup>2</sup>Department of Biomedical and Neuromotor Sciences, Section of Anatomic Pathology "M. Malpighi" at Bellaria Hospital, University of Bologna, Bologna, Italy; <sup>3</sup>Department of Biomedical and Neuromotor Sciences, University of Bologna, Section of Maxillo-facial Surgery at Policlinico S. Orsola-Malpighi, Bologna, Italy

**BACKGROUND:** Screening populations for the early detection of patients at risk to develop an oral neoplasia is an attractive strategy to reduce the burden of Oral Squamous Cell Carcinoma (OSCC). Recently our research group developed a non-invasive procedure based on oral brushing as method for collecting samples followed by DNA methylation analysis of 13 pre-selected genes. In a recent paper, using this non-invasive method, we correctly stratified OSCC from healthy donors (sensitivity 97,1%, specificity 100%, AUC 0.981). The purpose of the present study is to apply this non-invasive procedure in four different risk groups of patients: a group of healthy donors, two different groups of patients with Oral Potentially Malignant Lesions (Oral Leukoplakia and Oral Lichen Planus) and a group of patients surgically treated for oral cancer. **BACKGROUND:** of the study is to evaluate the between-group differences and the epidemiologic, clinical and histological variables that may influence the methylation profile in each group.

**METHODS:** Oral brushing samples were collected from 54 healthy donors, 44 patients with OPML (28 Oral leukoplakia "OL" and 16 Lichen Planus "LP") and 26 patients surgically treated for OSCC (ex-OSCC). In all cases DNA methylation analysis was applied as previously described by a precedent paper of our research group. Each sample was defined as positive or negative in relationship to a calculated cut off value. One-way ANOVA analysis with multiple range test and Chi square analysis were used to evaluate the presence of any between-group significant difference and the variables that may influence the methylation profile in each group.

**RESULTS:** None of healthy donors was detected as positive, whereas 20/28 (71,4%) of patients with OL, 3/16 (18,8%) with LP and 8/26 (30,7%) ex-OSCC showed higher values with respect to cut off. OLs showed significant ( $p<.01$ ) higher values with respect to all other groups while healthy donors showed significant ( $p<.01$ ) lower values with respect to all other groups. In patients with OLs, presence of high grade dysplasia was the only variable significantly related to posi-

tive results: indeed 8/8 OLs with high grade dysplasia resulted positive with respect to 12/20 OLs with no or mild dysplasia (Chi 4,480  $p<.05$ ).

**CONCLUSIONS:** Larger population studies and an adequate follow-up period are necessary to confirm these preliminary data, but DNA methylation analysis in epithelial cells collected by oral brushing seems to be a promising genetic method to discern lesions at high risk of developing OSCC.

### Outcome of gingival epithelial dysplasia: a retrospective study in 17 years

A. Gambino, M. Brega, E. Bressan, G. Antonucci, R. Broccoletti  
Department of Surgical Sciences, Oral Medicine Section, CIR Dental School, University of Turin, Turin, Italy

**BACKGROUND:** Gingival epithelial dysplasia (GED), frequently the precursor of squamous cell carcinoma (SCC), characteristically presents itself as a predominantly white, red, or a mixed of white and red mucosal lesion also in the gingiva. The management of OED is far from satisfactory and there are no large trials that propose guidance as to the most reliable form of treatment, with regard to the prevention of future development of oral cancer. It is not possible to offer evidence-based recommendations for specific surgical, medical or other interventions. The aim of this study to analyze the management and prognostic factors of GED in a population of North-Western of Italy.

**METHODS:** It have been analyzed data collected of gingival precancerous lesions of patients afftered to Oral Medicine Section- CIR Dental School , University of Turin, from January 2000 to December 2017. Demographic information of age at the time of diagnosis, gender, smoking, site of lesion, grade of GED (mild, moderate, severe) SCC evolution, treatment and recurrence were examined.

**RESULTS:** A total of 219 patients with diagnostic hypothesis of GED were initially selected. After the data trimming process, 18 cases of GED were studied, 6 men and 12 women (mean age: 63.80) was observed. The average age at diagnosis was 63.58 years for females and 64.17 years for males. Two patients were smokers. Maxillary gingiva was the side mainly involved and with lesions are mainly described as elementary clinical feature. 61% patients had lesions with histopathological features of mild GED, 28% had moderate GED and 11% had severe GED. During the follow-up period, 5 patients developed an oral SCC at the site of the OED; the diagnosis was based on histopathological examination of a representative incisional specimen. All patients underwent active treatment after the initial histopathological diagnosis and the recurrences we have found in... patients.



## ABSTRACT

**CONCLUSIONS:** The risk of malignant development does not seem to be predictable. Surrounded by the limitations of the retrospective designs, we have showed the principal features of GED: it is frequently in maxillary gingiva of a female population, mild GED developed SCC and smoke wasn't real risk factor in these patients. Some articles reported that patients with periodontitis were more likely to have poorly differentiated oral cavity SCC than those without periodontitis: this is another aspects for further prospective studies.

### The role of microRNA in the early diagnosis of oral cancer: validation of a new procedure based on non-invasive sampling method

A. Spinelli <sup>1</sup>, L. Scapoli <sup>2</sup>, L. Morandi <sup>3</sup>, A. Gabusi <sup>1</sup>, A. Tarsitano <sup>4</sup>, L. Felicetti <sup>1</sup>, R. Rossi <sup>1</sup>, L. Luccarini <sup>1</sup>, D. Servidio <sup>1</sup>, D. B. Gissi <sup>1</sup>

<sup>1</sup>Department of Biomedical and Neuromotor Sciences, Section of Oral Sciences, University of Bologna, Bologna, Italy; <sup>2</sup>Department of Experimental, Diagnostic and Specialty Medicine, University of Bologna, Bologna, Italy; <sup>3</sup>Department of Biomedical and Neuromotor Sciences, "M. Malpighi" Section of Anatomic Pathology at Bellaria Hospital, University of Bologna, Bologna, Italy; <sup>4</sup>Department of Biomedical and Neuromotor Sciences, University of Bologna, Section of Maxillo-Facial Surgery at Policlinico S. Orsola-Malpighi, Bologna, Italy

**BACKGROUND:** MicroRNAs are short non-coding RNAs that regulate gene expression and are crucial to tumorigenesis. miRNAs possess unique properties that make them promising markers to be used in screening tests associated with non invasive collecting procedures: they are abundantly expressed in lesions and in control tissues and their isolation and quantification seems to be easy, convenient and reproducible also in body fluids or in exfoliated cells. The aim of the present study was to analyze the expression of a panel of miRNAs in epithelial cells collected by oral brushing from Oral Squamous Cell Carcinomas (OSCC), from regenerative areas after OSCC surgical resection and from their respective normal distant mucosa.

**METHODS:** Oral brushing specimens were collected from: 14 OSCC and their respective normal mucosa in distant areas, 13 samples from regenerative areas after OSCC surgical resection. Finally oral brushing specimens from 24 healthy donors were collected as control. In all different groups the expression levels of miRNAs were evaluated by real time PCR. Eight target were evaluated (mir-21, miR191, miR-375, miR-345, miR-181b, miR146a, miR-649 and miR-518b). RNU44 was used as endogenous reference for data normalization. The miRNA expression levels across groups were assessed by ANOVA statistics, Tahmane post-hoc test and t-student for paired samples.

**RESULTS:** A highly significant between-group difference in expression was found for miR21 (F=6.576 p<.000), miR191 (F=17.707, p<.000) and miR146a (F=6.974 p<.000). The major difference was observed between samples from healthy donors and from OSCC brushing, whereas no significant differences were observed between areas infiltrated by OSCC and their respective normal distant mucosa. Furthermore, altered expression of miR-146a and miR-191 was also observed in regenerative areas after OSCC resection.

**CONCLUSIONS:** Altered miRNA profiles can be expressed both in OSCC and in distant areas from OSCC, but even in regenerative areas following OSCC resection. These

preliminary results suggest that microRNAs sampled with a non invasive method can be reliable biomarkers in oral tumorigenesis.

### The role of fascin in oral squamous cell carcinoma

S. Rizzato <sup>1</sup>, C. P. Rodrigues <sup>2</sup>, T.A. Salo <sup>2</sup>, A. Angelini <sup>3</sup>, M. Fedrigo <sup>3</sup>, S. Sivolella <sup>1</sup>

<sup>1</sup>Department of Neurosciences, Section of Dentistry, University of Padua, Padua, Italy; <sup>2</sup>Unit of Cancer Research and Translational Medicine, Faculty of Medicine and Medical Research Center Oulu, Oulu University Hospital, University of Oulu, Oulu, Finland; <sup>3</sup>Department of Cardiac, Thoracic and Vascular Sciences, University of Padua, Padua, Italy

**BACKGROUND:** Fascin is a highly conserved actin-binding and bundling protein that plays a key role in the assembly and stability of cell protrusions and other actin-based structures underneath the plasma membrane that aid in cell mobility, migration and invasion. Over the last decade, multiple studies have reported that fascin is upregulated in more aggressive and metastatic epithelial cancers and that its overexpression is a relevant independent prognostic index of poor outcome. An overview of the potential value of fascin in oral squamous cell carcinoma (OSCC) is presented.

**METHODS:** A systematic search of the literature was performed through PubMed database by using the following key words strategy: ("fascin"[Supplementary Concept] OR "fascin"[All Fields]) AND (("mouth"[MeSH Terms] OR "mouth"[All Fields] OR "oral"[All Fields]) AND ("carcinoma, squamous cell"[MeSH Terms] OR ("carcinoma"[All Fields] AND "squamous"[All Fields] AND "cell"[All Fields]) OR "squamous cell carcinoma"[All Fields] OR ("squamous"[All Fields] AND "cell"[All Fields] AND "carcinoma"[All Fields])). The search identified 8 relevant articles and after abstract review, 7 studies were classified appropriate.

**RESULTS:** The expression levels of fascin protein in OSCC tissues and cell lines were evaluated by most of the studies. Fascin is upregulated in tumoral cells and tissues and may functionally contribute to disease progression. The levels of fascin expression and frequency of overexpression show a gradual increase in the progression from normal epithelium, to dysplasia, and finally OSCC. The fascin-overexpressed OSCC cells form longer and thicker microspikes, develop more filopodia, show significant increase in cell motility, disorganization of cell-cell contacts and decrease in E-cadherin levels (events that are often observed during epithelial mesenchymal transition). Both the intensity and distribution of fascin immunoreactivity are correlated with size of the tumor, lymph node metastasis, clinical staging, histological grading and poor patient survival. Fascin knockdown, obtained by silencing its gene, has no significant effects on viability and proliferative potential of OSCC cells but it results in significant suppression of migration and invasion as well as decreased adhesion of OSCC cells.

**CONCLUSIONS:** The identification of protein expression profiles is important to understand oral tumorigenesis, as well as to undercover new biomarkers for early detection, prognosis and development of new therapeutic targets. Fascin is one of the most significant protein upregulated in OSCC and its expression is related with increased cytoskeletal protrusions, invasive and metastatic ability of

OSCC cells. Fascin may have an important role on OSCC development and progression. However, the role of fascin protein has not been yet well clarified. Thus, further studies are needed to understand its mechanisms of action and to establish fascin as a routine therapeutic target for patients with OSCC.

### Narrow band imaging in the follow-up of high-risk patients for early diagnose of OSCC: preliminary results

A. Guida<sup>1</sup>, A. Crispo<sup>2</sup>, M.G. Maglione<sup>1</sup>, F. Longo<sup>1</sup>, S. Villano<sup>1</sup>, E. Pavone<sup>1</sup>, C. Aversa<sup>1</sup>, F. Ionna<sup>1</sup>

<sup>1</sup>S.C. Chirurgia Maxillo-Facciale-ORL, "INT, IRCCS Fondazione G. Pascale", Naples, Italy; <sup>2</sup>S.C. Epidemiologia e Biostatistica, "INT - IRCCS Fondazione G. Pascale", Naples, Italy

**BACKGROUND:** Oral Squamous Cell Carcinoma (OSCC) is the sixth cause of cancer death throughout the world. Early diagnosis may dramatically influence survival. OSCC has high recurrence rate and it is strongly related to smoking. It may also arise from dysplastic lesions or chronic inflammatory disease (oral lichen planus, chronic hyperplastic candidiasis). Narrow band imaging (NBI) is a novel optical digital method of image-enhanced endoscopy, revealing the thin capillary network on the mucosal surface (intrapapillary capillary loops, IPCL); four different IPCL patterns are usually identified, from I-IV, increasingly associated with malignant lesions. We investigated if NBI could be a useful tool in high-risk patients' follow-up in order to perform early diagnosis of neoplastic lesions.

**METHODS:** High risk patients (history of OSCC, oral dysplasia, chronic inflammatory disease, voluptuous risk factors) were prospectively enrolled in this non-randomized study from 2014 to December 2017. Patients underwent NBI visits every 3, 4 or 6 months, according to their anamnesis. Lesions showing NBI pattern IV were considered as "positive"; if a pattern IV lesion turned out as a OSCC/Cis or High Grade Dysplasia at histopathological evaluation, it was considered a true positive. Lesions showing IPCL I-II-III were considered as "negative"; they were considered true negative if histopathological diagnosis excluded OSCC/Cis or High Grade Dysplasia. White lesions with nbi pattern I and II, which did not showed clinical compatibilities to Oral Lichen Planus, were not biopsied and classified as "frictional hyperkeratosis" (at least 24 months follow-up). Positive Predictive Value (PPV), Negative Predictive Value (NPV), Sensitivity, Specificity, Positive Likelihood Ratio (PLR), Negative Likelihood Ratio (NLR) and accuracy were calculated; sex, age and voluptuous factors (smoking) were statistically evaluated as independent factors, to avoid biases.

**RESULTS:** 47 lesions from 45 patients (age median 60 – range 19-90; mean 59 ± 14) were examined. Mean follow-up was 21 ± 13 months. Histopathological diagnoses were 11 OSCC/Cis, 1 High Grade Dysplasia, 2 Medium Grade Dysplasia, 3 Low Grade Dysplasia, 1 Proliferative Verrucous Leukoplakia (PVL), 12 Lichen Planus, 1 Chronic Hyperplastic Candidiasis, 11 frictional hyperkeratosis, 2 Actinic Keratosis, 3 Papilloma. Sex (p=0.9), age (p=0.1), and smoking (p=0.5) were not found significantly associated with NBI pattern. NPV and PPV were 100% and 70.6% respectively; sensitivity was 100%, specificity was 85.7%; PLR and NLR were 7 and 0 respectively; accuracy was 89.4%. All these statistical evaluations were found statistically significant (p≤0.5). In two cases, patients being followed-up for previous OSCC,

had a negative white-light surgical scar, but thanks to a pattern IV NBI examination a recurrence was early diagnosed. In another patient, in follow-up for an erosive lichen planus, which had steadily shown NBI patterns II – III for more than a year, OSCC was early diagnosed thanks to a NBI pattern switch to IV.

**CONCLUSIONS:** NPV, PPV, sensitivity, specificity, PLR, NLR and accuracy of the present study were coherent with literature. Three OSCC early diagnoses in clinically white-light negative patients were performed; as showed by literature, this will have a strong impact on these patients' survival and quality of life. In the definitive study, further statistical evaluation will be performed, to understand implications between histopathological diagnosis and NBI pattern. Our study showed positive preliminary results, coherent with abundant scientific literature; NBI may be thus considered a reliable diagnostic tool for expert clinicians in the follow-up of high-risk patients.

### Uncommon presentation of actinomycosis in a young healthy woman

D. Karimi, M. Cabras, A. Gambino, R. Broccoletti, P.G. Arduino

Department of Surgical Sciences, Oral Medicine Section, CIR-Dental School, University of Turin, Turin, Italy

**BACKGROUND:** Actinomycosis is an infrequent chronic infection considered one of the most misdiagnosed oral diseases. Tongue involvement is rare and, if undetected, can lead to extensive tissue destruction. The aim of this work is to present a case report of such unusual manifestation.

**METHODS:** A 35-year-old woman with unremarkable medical history was referred to the Oral Medicine Section of the CIR Dental School of Turin, complaining about a lesion arisen on the upper surface of the tongue three days before. When thoroughly questioned, she recollected of a similar lesion, which had appeared two months before in the same area but successfully treated with systemic antibiotic and corticosteroid therapy. At conventional oral examination, a solitary submucosal nodule on the right paramedian surface of the tongue dorsum was detected, presenting with a pinkish-yellowish color and stretched-elastic consistency, causing mild tenderness to palpation; however, neither restriction of the tongue movement nor cervical lymphadenopathy were noticed. Due to these non-specific clinical features, an incisional biopsy was performed on the same day: a purulent leakage enriched with yellowish granules, suggestive for bacterial aetiology, occurred right after the first scalpel incision. Therefore, a subsequent antibiotic treatment, in the form 1 gram of amoxicillin, 3 times daily for seven days, was administered; local antiseptics was also provided through chlorhexidine mouth rinse tid for the next seven days. At the same time, a series of blood tests were carried out in the form of a complete blood count with leukocytes differential count, as well as a lymphocyte typing. On the other hand, serum ACE and Quantiferon TB were required to evaluate the presence of underlying granulomatous diseases. Finally, the pathologist's examination revealed the presence of inflammatory infiltrate of granulocytes within the oral mucosa, in relation with colonies of Actinomyces organized in fungus-like branched networks. One month after the first visit, a complete healing of the tongue was obtained, with no traces of the pre-existing nodule; at the same time, all the blood tests were within range:

## ABSTRACT

hence, a final diagnosis of oral actinomycosis was formulated. RESULTS: Actinomycosis is a chronic suppurative infection mainly caused by *Actinomyces israelii*, although other types such as *A. naeslundii*, *odontolyticus*, *mayeri*, *viscosus* are found. A presumptive diagnosis can be made based on the identification of the so-called "sulfur granules" which represent colonies of bacteria. Clinical manifestations of oral actinomycosis can be often confused with other type of infections, such as granulomatous diseases and also different types of neoplasms.

CONCLUSIONS: Lingual actinomycosis is rare, representing less than 3% of all reported cases. This rarity can be explained by the fact that the histophysiological characteristics of the tongue make it resistant to infection. For these reasons, differential diagnosis of a yellowish submucosal nodule of the tongue should also contemplate lingual abscess, lipoma, and granular cell tumour.

### Recurrent aphthous ulcerations in the patient affected by gastrointestinal disorders: a questionnaire as a complementary diagnostic tool

A. Melis, M. Cabras, A. Gambino, P.G. Arduino, R. Broccoletti  
*Department of Surgical Sciences, Oral Medicine Section, CIR Dental School, University of Turin, Turin, Italy*

BACKGROUND: Recurrent aphthous ulcers are the most common lesions of the oral mucosa in the general population. Local trauma, genetic factors, nutritional deficiencies, viral and bacterial infections, immune or endocrine disturbances have all been implicated as etiologic factors. Although a subset of patients may have a diagnosis of idiopathic recurrent aphthous stomatitis (RAS), sometimes oral aphthous-like ulcers (ALU) can be the earliest manifestation of an unacknowledged systemic disease. BACKGROUND: of the work was to focus on the association between oral ALU and four diseases with gastrointestinal involvement - Behçet disease (BD), Crohn disease (CD), Coeliac disease (CoD) and Reactive Arthritis (ReA) - and to propose a questionnaire as a further diagnostic tool for everyday clinical practice.

METHODS: At first was conducted a literature research in PubMed in order to acquire the most thorough and recent reviews, published between 2010 and 2017, concerning BD, CD, CoD and ReA. Therefore, a second PubMed research was outlined, investigating the muco-cutaneous, gastrointestinal, genital, articular and ocular manifestations of the above mentioned disease.

RESULTS: Oral ALU can be recognized in 20-30% of CD, in 3-61% of CoD, in 92-100% of BD and 9-40% of ReA. Gastrointestinal system can be associated in CD with alternating constipation and diarrhea, in ReA as a prodromal acute diarrheic episode, whereas CoD and BD may have overlapping symptoms, such as abdominal pain, recurring diarrhea with blood and/or mucus in stools. Urogenital manifestations include typical ulcers in BD, urethritis in ReA, cystitis and higher risk of urolithiasis in CD and higher risk of spontaneous miscarriage or premature childbirth in CoD. Skin may be affected by blisters, such as those of dermatitis herpetiformis in CoD, by nodules, in the form of a proper erythema nodosum in CD or with erythema nodosum-like lesions in BS and by ulcers, such as pyoderma gangrenosum, again in CD. Eyes can be one of the most affected sites in ReA and BD, respectively with conjunctivitis or uveitis, an important

deficiency of vitamin A may cause ocular affection in CoD, furthermore episcleritis and uveitis can arise in CD. Peripheral arthritis and enthesitis can occur in BS, CD and CoD, whereas an asymmetric oligoarthritis of the lower limbs is one of the three major criteria required in ReA. The whole group of these clinical information was processed into a questionnaire characterized by simple questions concerning the features of the aphthous stomatitis and the signs and symptoms of gastro-intestinal, ocular, articular, cutaneous and uro-genital involvement.

CONCLUSIONS: The clinical validity of this questionnaire must be tested more extensively on a large number of patients. Further proposals may consider integration with specific hemato-chemical tests usually required in an Oral Medicine Unit for patients with a clinical history of recurrent aphthous ulcerations.

### Exclusively oropharyngeal histoplasmosis leading to diagnosis of AIDS: a singular case report and review of literature

M. Cabras<sup>1</sup>, A. Gambino<sup>1</sup>, L. Chiusa<sup>2</sup>, P. G. Arduino<sup>1</sup>, R. Broccoletti<sup>1</sup>

<sup>1</sup>Department of Surgical Sciences, Oral Medicine Section, CIR Dental School, University of Turin, Turin, Italy; <sup>2</sup>Pathologist Unit, Città della Salute e della Scienza di Torino, University of Turin, Turin, Italy

BACKGROUND: To describe a case of exclusively oropharyngeal histoplasmosis leading to diagnosis of AIDS and review the current literature.

METHODS: In September 2017, a 60-year-old male patient was referred to our Oral Medicine Section, complaining of severe pain, arisen a few months before, which had reached such an intensity that was preventing him from feeding or properly speaking; he reported to be otherwise well. At the conventional oral exam the patient presented a wide, infiltrative ulcer involving the left cheek and the retromolar trigone, as well as the left anterior and posterior palatine pillars. Due to the worrying extension and clinical features, suspecting an oral squamous cell carcinoma (OSCC), an incisional biopsy of both left cheek and of palatal mucosa was performed. Opioids were prescribed to reduce pain, facilitating food and water ingestion. The pathologist's examination of the samples did not confirm the hypothesis of an OSCC, reporting an inflammatory, granulomatous process, rich with histiocytic nests, lymphocytes and intra-histiocytic yeasts of *Histoplasma capsulatum*. Due to these unexpected results, a complete blood cell count and a lymphocyte typing were urgently required, showing leucopenia (WBC 3.41 x10<sup>3</sup>/μl), hypochromic microcytic anemia (HGB <11.8 g/dl, HCT <36.5%, MCV <68.4 fl, MCH < 22.1 pg), and a T-helper count under 200/μl (TCD3+/CD4+ <68/μl; < 8.6%) with elevation of TCD8+ (TCD3+/CD8+ > 64.4 %). A thorough recollection of anamnestic data was acquired, revealing the exposure of the patient to risky sexual behavior and exposure to birds. An HIV test was finally required, resulting positive (HIV-1 RNA 13326 cp/ml). A conclusive diagnosis of acquired immunodeficiency syndrome (AIDS) was at last formulated. The patient was referred to the Infectious Diseases Unit of the "Ospedale Amedeo di Savoia" in Turin, for an appropriate treatment of AIDS and to assess if histoplasmosis was indeed limited to the oropharynx or already disseminated. A follow-up visit three months later revealed no systemic involvement, with a



mild improvement of the oral lesion, thanks to the itraconazole therapy (200 mg bid for six weeks). Unfortunately, the patient admitted to having dismissed HAART at his own will, only a month after its first administration: therefore, the latest exams have showed only a mild increase in T-helper count (<11.3%; <129/ $\mu$ l), with HIV RNA being four times higher than three months before (53546 cp/ml).

**RESULTS:** A PubMed search was conducted with search-terms "oral histoplasmosis AND AIDS" "oral histoplasmosis AND HIV" "oral Histoplasma capsulatum AND HIV" "oral Histoplasma capsulatum AND AIDS". Three hundred eighty-seven (387) results were obtained: 196 doubles and 25 not-in-English articles were removed; 101 studies were not inherent to the purposes of the present review. Of the remaining 65 studies, 15 described histoplasmosis in immunocompetent patients; 34 presented oral manifestation of disseminated histoplasmosis in HIV patients, with two of these in which disseminated histoplasmosis lead to detection of HIV; nine studies illustrated cases of exclusively oral histoplasmosis in HIV patients. Only seven reports were similar to the presented case.

**CONCLUSIONS:** To date, only seven patients in which exclusively oral histoplasmosis lead to HIV detection and diagnosis of AIDS have been reported in literature.

## Unilateral parotid gland swelling related to chlorhexidine 0.2% mouthwash: a case report

G. Pipinato, F. Berton, M. Maglione, R. Di Lenarda

*Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy*

**BACKGROUND:** Many pathologic conditions may cause parotid gland swelling such as dehydration, bacterial or viral infections, traumas, tumors, Sjögren's Syndrome, sialolithiasis, etc. Unilateral or bilateral parotid gland swelling is also a reported side effect of chlorhexidine mouthwashes. This adverse reaction is extremely rare and the clear mechanism has to be determined yet; however, only three reports of parotid gland swelling caused by the use of other mouthwashes are reported (containing hexetidine, a saturated pyrimidine derivative cationic antiseptic). Here we report the clinical management of unilateral parotid swelling caused by chlorhexidine mouthwash.

**METHODS:** The patient, a healthy 66 years old man, underwent a sinus augmentation with lateral approach on the right side of his maxilla. The patient was prescribed to take amoxicillin clavulanate 875mg+125mg twice a day for five days together with metronidazole 250mg three times a day for five days. As part of his postoperative care, he was prescribed to rinse with a 0.2% chlorhexidine mouthwash three times a day for one week, until the appointment for suture removal. After three days, the patient reported a sudden swelling of his left cheek, therefore he was examined at our department. The patient, asymptomatic, presented a swelling in the parotid region without any sign of local inflammation (no redness, no fever, no pain). All the teeth on the left side were asymptomatic, without any sign of acute inflammation or infection, clear saliva was flowing from the Stenone's duct at the manouvre of squeezing of the left parotid gland. An orthopantomography and ultrasound of the gland, executed to exclude other pathologic conditions, confirmed the presence of edema and hyperemia of the gland (characterized by an augmented vascularization at the color-

doppler), without any other organic alteration. Therefore, a diagnosis of parotid gland swelling due to rinsing with chlorhexidine was formulated. This patient has not previously experienced this type of adverse event. Subsequently he was advised to stop rinsing and it was decided to simply monitor the condition for the following days. On the evening of the same day the swelling increased and the patient went to emergency department in which methylprednisolone 40mg was administered IM.

**RESULTS:** After seven days, the parotid swelling decreased significantly. The patient did not report any other sign or symptoms and the healing of the surgical wound (contralateral side) was uneventful. Three weeks after the sinus surgery, at follow-up appointment, the patient came without any sign of swelling and a complete restitution was gained.

**CONCLUSIONS:** Even if unilateral or bilateral parotid gland swelling after using chlorhexidine mouthwashes represents a rare adverse event, it has to be taken into account whether other organic or infective conditions can be excluded. A correct clinical and instrumental examination should be provided in order to evaluate every possible pathologic condition related to parotid swelling. Even if the clear mechanism has not been determined yet, the patient showed a good response to corticosteroid administration. More case-control studies should be carried out to better understand the underlying pathophysiology of this phenomenon.

## How nutrition can affect the occurrence and prevention of autoimmune diseases

I. De Pasquale, A. Gambino, A. Cafaro, P. G. Arduino, R. Broccoletti

*Department of Surgical Sciences, Oral Medicine Section, CIR Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** The occurrence of autoimmune diseases involving the oral cavity and of nutrition issues has increased exponentially over the past 20 years. It is not a sufficiently long period of time to justify genetic changes, environmental factors therefore being a potential cause. This paper aims to search the medical literature in order to find potential connections between autoimmune diseases and nutrition.

**METHODS:** We used Pubmed as a search engine in order to find the scientific work needed for our project, using the following keywords: "autoimmune disease", "gut", "molecular mimicry", "food", "diet" and "microbiota".

**RESULTS:** Recent publications by different universities suggest that alterations of the following 3 levels of defence within the intestine, where 65% of the immune system is located, can cause: 1) alteration of gut microbiota, resulting in microbial dysbiosis; 2) alteration in the intestinal membranes, triggering zonulin release and disruption of intercellular junctions resulting in intestinal permeability (leaky gut syndrome), which allows metabolism residues and small intestine microbial toxins to invade the blood flow where the immune system related to the gastrointestinal tract is located; 3) alterations in the immunosensitivity of the immune system in some genetically predisposed patients could potentially memorize the amino acid chain of the metabolic residues and of the microbial toxins penetrated, and due to the similarities to some body parts with a similar chain, it could be recognized as potentially harmful and be attacked by lymphocytes.

**CONCLUSIONS:** As stated by Fasano, a useful method of prevention consists in maintaining intestinal eubiosis, by

## ABSTRACT

avoiding abuse of some prescription drugs and adopting an anti-inflammatory diet. According to Longo, periodic therapeutic fasting might reduce immunosenescence, increase immunosensitivity, reduce RCP levels, promote the proliferation of anti-inflammatory bacteria, reduce oxidative stress and enhance stem cell function.

### Clinical and histological features of gingival squamous cell carcinoma (GSCC) vs. tongue squamous cell carcinoma (TSCC): a descriptive analysis of a population of Northwest Italy

L. Cecchinato, A. Gambino, M. Carbone, P.G. Arduino, R. Broccoletti

*Department of Surgical Sciences, Oral Medicine Section, CIR Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** The onset of oral carcinoma is a source of serious global concern as its incidence is constantly growing, and the difficulty in the differential diagnosis often determines a diagnostic delay such that 5 years after diagnosis the survival rate is attests below 50%. The aim of this study was to analyze and compare the clinical appearance and histopathological features of a population affected by gingival squamous cell carcinoma (GSCC) and a population affected by tongue squamous cell carcinoma (TSCC).

**METHODS:** The medical case records of 219 patient with diagnosis of GSCC and TSCC, followed from 2000 to 2017 at the Unit of Oral Medicine, CIR – Dental School- University of Turin, were reviewed. We obtained personal data and clinical and histopathological features from ward's database and medical records.

**RESULTS:** We obtained TSCC in 135 patients, and GSCC in 84 patients was diagnosed. In particular, there were 127 cases of TSCC and 8 of Tongue Verrucous Carcinoma (TVC), and 77 cases of GSCC and 7 of Gingival Verrucous (GVC). In both groups, the squamous variant is present in > 90% of the patients, while almost half of the verrucous form has been presented at the gingival level. Almost all the Squamous cell carcinoma (SCC) we have documented in this regard are infiltrating, and in both groups the prevalent degree of differentiation is G2 followed by G1. The distribution by gender was rather balanced with a 1:1 ratio in the gingival population and a slight male prevalence in the lingual population, in both samples there was also a medium age of insurgence slightly higher in females. The most affected sites were border tongue, followed by the pelvis, and lower adherent gingiva, followed by lower edentulous ridge. Specifically, were significantly positive for SCC the border tongue ( $p < 0,035$ ) and lower adherent gingiva ( $p < 0,018$ ), while for Verrucous Carcinoma (VC) back tongue ( $p < 0,007$ ) and upper adherent gingiva ( $p < 0,049$ ). The ulcerative appearance is the most represented in both groups, followed by white lesions in the tongue group and exophytic lesions in the gingiva group. Statistical analysis highlighted for both lingual SCC and VC positive significance for ulcerative appearance, for gingival SCC the significativity results positive for ulcer and for gingival VC for esophytic appearance. If we analyze the same data statistically, however, by comparing the manifestations of the SCC in the different districts (tongue and gingiva) then gingival SCCs show statistical significance for the esophytic and not ulcerative appearance.

**CONCLUSIONS:** In conclusion, the uniqueness of this study is given by the statistical analysis of clinical manifestations and how much is connected to it in two different structures of

the oral cavity. The result obtained from the analysis of the elementary lesions of GSCC is peculiar, since apparently in contrast with what has been ascertained up to now. Therefore, must be given great importance at the analysis and description of the clinical aspect of the lesions, which must be carried out systematically, and in the presence of ulcerated lesions with an increase in gingival volume the hypothesis of being in front of a carcinoma should be considered.

### Erosive-atrophic OLP and oral candidiasis: diagnostic workup and review of literature

S. Giacometti, A. Gambino, C. Gioppo Boggio, M. Cabras, P. G. Arduino

*Department of Surgical Sciences, Oral Medicine Section, CIR Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** In this work are evaluated two different clinical pictures. Oral Lichen Planus, a chronic inflammatory disease, whose erosive appearance is symptomatic and it manifests, especially, on mucosal tissues; oral sites are geniene mucous (85%), tongue (28-4%) and gum (10-38%). Oral Candidiasis is an acute infectious disease, whose clinical aspect consists of a reddened and atrophic mucous; oral sites are geniene mucous, tongue and palate. The aim of this study is to research the exactly relationship between erosive-atrophic OLP and oral candidiasis, analysing previous literary sources.

**METHODS:** Candida is present in a common oral microbial flora. The considered studies have analysed microbial culture in agar, cytological examination, istopathological and clinical examination (with fungal hyphae feedback), PCR exam (that indicates candida species). In a range of 67 articles on the topic, only 13 of these have been in accordance with the purpose.

**RESULTS:** Some studies compared healthy and erosive-atrophic OLP patients (no use of cortisone and antimicrobial previous therapy) coming to contrasting results probably because the number of OLP patients is too low. However, Candida Albicans is the most widespread species in patients with lichen planus. Other studies payed attention about erosive-atrophic lichen patients and micetica flora changes during a topical corticosteroid therapy: after steroid administration, all patients presented, in addition to C. Albicans, also C. Glabrata and Parapsilosis. It could lean towards the fact that a immuno-suppression state leads to the development of less common forms of candida. There was a relationship between the genotypes A and C of Candida albicans and pathogenesis and progression of OLP erosions (Zeng 2008). Further literature studies showed that administration of miconazole and chlorhexidine may prevent the onset of oral candidiasis. The antifungal treatment of erosive lesions with-infection by candida may change in reticular lesions; on the other hand, there were no statistically significant differences in resolution of erosive lesions in patients taking an antifungal as a precautionary measure.

**CONCLUSIONS:** The reported articles evidence that it's not totally clear relationship between erosive-atrophic OLP and Candida. Biopsy and fungal hyphae controls are very important to diagnose a over candidosic infection, while cytological examination and swabs can give false positives results (Candida is, often, present in a healthy oral cavity). This analysed literature studies are important but it would be interesting evaluate further studies to deepen this topic.

## Oral manifestation of iron deficiency anemia: a case report

M. Garrone, A. Gambino, C. Gioppo Boggio, M. Cabras, R. Broccoletti

*Department of Surgical Sciences, Oral Medicine Section, CIR Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** Iron deficiency anemia (IDA) is a common type of anemia, with women being more frequently affected than men. Women of childbearing age may be iron-deficient due to the chronic blood loss associated with excessive menstrual flow. Moreover, adult men can be iron-deficient because of chronic blood loss related to gastrointestinal diseases, such as peptic ulcer, diverticulosis, or malignancies. In addition to chronic blood loss, an increased demand for red blood cell production during childhood growth spurts and during pregnancy, a decreased intake of iron during infancy and old-age stage, and a reduced absorption of iron in patients with total gastrectomy or celiac sprue are also possible causes of IDA. Patients with IDA may have characteristic systemic symptoms such as fatigue, weakness, lightheadedness, shortness of breath, and palpitations. Oral symptoms and signs may include atrophic glossitis, angular cheilitis, generalized oral mucosal atrophy and tenderness or burning sensation of oral mucosa.

**METHODS:** We report the case of a 75-year-old female patient suffering from diverticulitis, genital ulcers, non-specific inflammation of the auricle, general fatigue, which attended our Department complaining about the onset from about three months of oral lesions lasting 15-20 days, with monthly recurrence, burning of the tongue and difficulty in feeding. During the intraoral examination, we were highlighted a ulcer on the hard palate, angular cheilitis, reddening of the tip of the tongue. Given the clinical picture, the diagnostic hypotheses formulated foresaw Behcet syndrome, the MAGIC syndrome. Hematochemical examinations are therefore prescribed for in-depth diagnosis and a therapy with topical clobetasol and chlorhexidine mouthwash to manage pain and to allow the patient to resume proper feeding and diflucortolone valerate and isoconazole nitrate to treat the cheilitis.

**RESULTS:** After 3 weeks the patient takes us to the required examinations, which show iron deficiency and reduction of the average hemoglobin content. When new lesions appear, the pain is controlled well with the prescribed therapy, the burning of the tongue persists, but the patient manages to feed. She also brings a vision of a gynecological examination with a diagnosis of genital lichen sclerosis and reports that the episode of auricular inflammation was treated with anti-biotic therapy, thus suggesting a possible otitis, rather than a cartilage disorder. At this point the diagnostic hypotheses change, including the atrophic-erosive lichen considering the patient's age, erosions and atrophy of the dorsal tongue. Hypochromic iron deficiency anemia also possible due to iron deficiency, fatigue reported by the patient and the compatible intraoral frame work. Then an integrative iron therapy is prescribed and the patient is reviewed after 1 month. At the follow-up visit, the patient has no oral lesions and reports that she has had no new episode of oral ulceration.

**CONCLUSIONS:** IDA may cause oral manifestations as ulcers, atrophic glossitis, angular cheilitis, generalized oral mucosal atrophy and tenderness or burning sensation of oral mucosa. Moreover, routine haematological screening and tests for serum iron, folic acid and vitamin B12 deficiency should be assessed in patients with recurrent ulcers and other oral manifestation to treat any known nutritional deficiency and to prevent more important related systemic manifestations.

## Efficacy of ultramicronized palmitoylethanolamide in burning mouth syndrome-affected patients: a randomized double-blind controlled trial

M.T. Bogdan Preda, G. Ottaviani, K. Rupel, M. Gobbo, A. Poropat, V. Zoi, R. Di Lenarda, M. Biasotto

*Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy*

**BACKGROUND:** Burning mouth syndrome (BMS) is an intraoral burning or dysaesthetic sensation of the mucosa of the mouth, recurring daily for more than two hours per day over more than three months. It typically involves the tongue, with or without extension to the lips and oral mucosa and without clinically evident causative lesions. Classically, BMS is accompanied by gustatory disturbances dysgeusia and subjective xerostomia, while no objective alterations in oral mucosa are detectable. Among treatments, palmitoylethanolamide belongs to a class of naturally-occurring molecules, namely, the N-acyl ethanolamines. These are produced on-demand within the lipid bilayer in conditions of cell/tissue stress or injury. Palmitoylethanolamide (PEA) has been proposed to act as a protective endogenous mediator produced on-demand during inflammatory and neurodegenerative conditions to counteract inflammation pain, and neuronal cell damage. The aim of this randomized double-blind controlled trial was to verify the efficacy of ultramicronized PEA treatment in patients affected by burning mouth syndrome.

**METHODS:** Patients with burning intensity greater than 4, according to a 0-10 numeric rating scale, were included in the trial according to established inclusion and exclusion criteria. Patients were randomized into two groups: one group received um-PEA 600 mg micro-granules twice daily for 60 days (Normast®, Epitech Group SpA), while the other group placebo (inactive product) with the same time schedule. Patients were assessed at baseline (T0), 30 (T1) and 60 days (T2) after treatment start and 4 months after treatment discontinuation (T3). The evaluation was carried out on the basis of: a) the type of manifestation of burning symptoms during the assessments (T0, T1, T2, T3) following the Lamey and Lewis classification; b) the referred location of symptoms in the oral cavity: tongue, upper and lower lip, palate, gums, buccal mucosa, floor of the mouth, oral cavity; c) the simultaneous presence of symptoms such as xerostomia and dysgeusia, gastritis and anxiety. The intensity of burning/pain and the mode in which it was perceived were assessed by the Neuropathic Symptoms Pain Inventory. All recorded data were analyzed using the Generalized Linear Mixed Model in order to evaluate changes across time between treatment and control groups. Age, sex, Lamey and Lewis classification, xerostomia, dysgeusia, gastritis and anxiety were used as covariates. Data are expressed as mean +/- standard error; a 'p' value lower than 0.05 was used for rejection of the null hypothesis.

**RESULTS:** A total of 35 patients were enrolled in the study according to the inclusion and exclusion criteria. It has been registered 6 withdrew prior to the end of treatment. A statistically significant reduction in patients' burning sensation ( $p=0.0132$ ) was registered at the end of the active treatment in the ultramicronized palmitoylethanolamide group compared to the placebo one. Any side effect related to the active treatment was neither observed nor reported both by patients and by the physician.

**CONCLUSIONS:** The significant decrease of burning sensation in the ultramicronized PEA group compared to the placebo group suggests that this natural-occurring molecule, as a food for special medical purposes, may represent a viable therapy in the management of burning mouth syndrome.



## ABSTRACT

**Enzyme linked immunosorbent assay diagnostic performance in oral pemphigus and oral pemphigoid**

A. Patano, F. Della Vella, V. Ivone, G. Maiorano, D. Conte, C. Laudadio, G. Benizio, P. Callea, G. D'Ostuni, A. Ferraro, M. Petruzzi

*Sezione di Odontostomatologia- Dipartimento Interdisciplinare di Medicina, Università degli Studi di Bari "Aldo Moro", Bari, Italy*

**BACKGROUND:** Enzyme Linked Immunosorbent Assay (ELISA) is considered a practical, highly standardized and widely available diagnostic tool in the diagnosis of Pemphigus vulgaris and Pemphigoid. High sensitivity and specificity have been reported in patients with cutaneous pemphigus and pemphigoid. Few data exists in exclusively oral localized pemphigus vulgaris (OPV) and oral mucous membranous pemphigoid (OMMP). **BACKGROUND:** of this study was to evaluate the ELISA performance in OPV and OMMP.

**METHODS:** Consecutive patients with a provisional diagnosis of OPV and OMMP referred to the Oral Medicine Section of University Hospital Policlinico of Bari were enrolled. Each patient was tested with direct immunofluorescence and ELISA (detection of IgG against desmoglein 1 and 3, BP180, BP230). Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy and Kohen's K value of ELISA were calculated in comparison to direct immunofluorescence, considered as the gold standard.

**RESULTS:** Fifty-four patients (41 women and 13 men, mean age  $61 \pm 12$  yrs.) were enrolled. Eleven patients were diagnosed as OPV, the remaining 43 were affected by OMMP. Considering OPV and OMMP patients as an unique group, we recorded an ELISA sensitivity of 71% and 54% of specificity, 63% of PPV, 64% of NPV, 63% accuracy, 0.254 K value (moderate agreement). In OPV group, ELISA showed a sensitivity of 88% and a specificity of 65% with an accuracy of 73% and 0.233 Kohen's K value (moderate agreement). PPV and NPV was 78% and 50% respectively. In OMMP group ELISA showed a sensitivity of 65% and a specificity of 56% with an accuracy of 60% and 0.213 Kohen's K value (moderate agreement). PPV and NPV was 57% and 65% respectively. **CONCLUSIONS:** ELISA in OPV and OMMP is less specific and sensitive than in cutaneous counterpart. In particular, we evidenced low specificity and agreement with Direct Immunofluorescence that remains the milestone in the diagnostic pathway. Lack of diagnostic efficacy of ELISA is probably due to polymorphic antigenicity of different epitopes of desmogleins and BP-Antigens, circulating IgA autoantibodies, antigens different from desmogleins and BP-Antigens (e.g. alpha1, beta4, laminin). On the other hand, ELISA can be considered as an adjunctive prognostic test for initially positive ELISA patients affected by oral vesiculobullous diseases. Further studies are necessary to better investigate the role of ELISA in OPV and OMMP and it is important to develop more specific commercially available ELISA kit for OPV and OMMP.

**Dorsal tongue red and orange autofluorescence: is candida implicated?**

C. Laudadio, P. Callea, A. Ferraro, G. D'Ostuni, G. A. Benizio, A. Cassandro, A. Patano, D. Conte, F. Della Vella, V. Ivone, G. Maiorano, M. Petruzzi

*Sezione di Odontostomatologia, Dipartimento Interdisciplinare di Medicina, Università degli Studi di Bari, Bari, Italy*

**INTRODUCTION:** Candida species commonly colonize the oral cavity; in particular *Candida albicans* is a major human fungal pathogen, isolated in the 40-60% of healthy patients. Saprophytic Candida is able to induce opportunistic infections if predisposing conditions and factors permit its overgrowth. Autofluorescence of the oral tissues is employed in the detection of microstructural and biochemical changes of the oral mucosa, which are directly related to neoplastic derailment. The VELscope is an optical device that allows proper autofluorescence examination of the oral tissues. Loss of fluorescence, enhancement in fluorescence or maintained fluorescence are common outcomes recorded during the VELscope inspection. Red/orange fluorescence is usually described on the dorsal tongue but its significance is still unexplored. **BACKGROUND:** Background of this study was to evaluate the effectiveness of autofluorescence test by the VELscope device in the detection of Candida colonization of on the dorsal tongue surface and to compare it with a lingual swab test.

**METHODS:** Fifty-six consecutive patients were subjected to conventional lingual swab test followed by the VELscope examination. The analysed sites were photographed by Nikon 3100 digital equipment, with a dedicated adapter provided by the manufacturer; then the same sites were examined in autofluorescence with the parameters ISO 1600-F 8t 1/60. Red and/or orange fluorescence was reported and photographed (if present) for each patient. Patients who did not show protoporphyrin fluorescence were indicated as positive for Candida colonization while patients with protoporphyrin fluorescence were considered as negative for Candida colonization. Sensitivity, Specificity, Positive Predictive value and Negative Predictive value of the red/orange autofluorescence test were calculated analytically. Accuracy and K Cohen's test were also evaluated.

**RESULTS:** Twenty-seven patients (48,2%) were positive and 29 patients (51,9%) were negative for red/orange autofluorescence evaluation. Twelve patients were positive to the Candida swab test. The autofluorescence evaluation by the VELscope device showed sensitivity and specificity values of 83% and 57%. Positive and negative predictive values were 34,5% and 93% respectively. Accuracy was of 62,5% and K Cohen value of 0,6%, indicating a good agreement between the tests.

**CONCLUSIONS:** The absence of red/orange autofluorescence indicates with a sufficient validity and reliability the presence of Candida. Sensitivity was high while Specificity was not so efficiently high and was negatively influenced by False Negative. The main strength of the present study is the off-label use of oral tissue autofluorescence as an adjunctive device for diagnostic-microbiological purposes. These results suggest that the use of Autofluorescence could represent an alternative, quick and cheap method in Candida detection in the oral cavity.

**Helicobacter pylori and oral cavity: descriptive analysis of the literature**

G. El Haddad, M. Cabras, A. Gambino, P. G. Arduino, R. Broccoletti

*Department of Surgical Sciences, Oral medicine Section, C.I.R. - Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** In 1982, Marshall and Warren identified the *Helicobacter pylori* (Hp). It was cultured from gastric

biopsy specimens from patients with gastric inflammation and peptic ulcer. Based on these results, they proposed that Hp could be the etiologic agent of these conditions. In 1994, this microorganism was recognized as a type I carcinogen, and it is now considered the most common etiologic agent of infection-related cancers. To this date, the transmission routes of Hp infection within and between humans are not clear. Transmission of Hp could occur through iatrogenic, fecal-oral, and oral-oral routes, or through contaminated food and water. The microorganism may be transmitted orally and has been detected in dental plaque and saliva. **BACKGROUND:** of the present study is to review the scientific literature concerning the intriguing relationship between Hp and oral cavity, in order to assess the role of saliva, plaque and periodontal pockets as a niche for Hp and, more importantly, if there is a correlation between oral colonization and gastrointestinal recurrence.

**METHODS:** A bibliographical research on Pubmed was carried out, revising the literature from 1989 to the present date. The strings used were: "Helicobacter pylori infection" "Helicobacter pylori diagnosis" "Helicobacter pylori epidemiology" "Helicobacter pylori Treatment" "Helicobacter pylori dental plaque" "Helicobacter pylori oral cavity" "Helicobacter pylori mouth" "oral Helicobacter pylori recurrence" "Helicobacter pylori gastric recurrence" "Helicobacter pylori saliva" "Helicobacter pylori salivary tests" "Helicobacter pylori oral diagnostic tests".

**RESULTS:** Prevalence of Hp in the oral cavity varies from 0% to 100%. The inconsistency of these results may be due to undeniable differences concerning study design, heterogeneity in subgroup analyses, different Hp testing methods, with some Authors using several methods for Hp identification. Detection through culture may just indicate a transient colonization of the mouth, while isolation of fragments of Hp DNA through PCR can be still considered insufficient evidence to prove effectively an ongoing replication of Hp in the mouth. Some salivary tests have been tested through the years, but their low specificity and sensibility discouraged further research; the most recent salivary antigen test HPS / HPF from Asia has given promising results, although its reliability is still under investigation in Western countries. In any case, polymerase chain reaction (PCR) seems to be the most promising and reliable approach for detection of Hp in the oral cavity, thanks to its high sensitivity and specificity (> 90%). Some Authors speculate that the oral cavity is not only an extra gastric reservoir of the Hp but can also be a source of gastric re-infection, suggesting therefore the possibility to combine the usual eradication via systemic therapy with plaque removal by causal therapy, in order to reduce the chances of gastric recurrences. However, the most recent and thorough systematic reviews, including a Cochrane review published in 2016, have attributed a mere low-level of evidence to this captivating association, with too many biases and very few randomized-controlled trials (RCT) to reflect upon. **CONCLUSIONS:** Further studies must be conducted to understand if oral cavity is indeed compatible with survival and replication of Hp. A non-invasive, cost-effective method for detection of Hp within saliva or plaque is needed. Moreover, multicentric RCTs are imperative to determine if periodontal treatment can actually decrease the percentage of gastric relapses, thus becoming a precious ally in sheltering patients from the most notorious long-term consequences related to Hp reappearances, such as development of peptic ulcer or cancerization.

## The morphogenesis of molar tooth in the mouse: post-natal evaluation of polarization of odontoblast and expression of KI-67 in dental mesenchymal tissue

R. Balzano <sup>1</sup>, C. Mucignat-Caretta <sup>2</sup>, E. Stellini <sup>1</sup>

<sup>1</sup>University of Padua, Department of Neuroscience, Padua, Italy; <sup>2</sup>University of Padua, Department of Molecular Medicine, Padua, Italy

**BACKGROUND:** Cytological differentiation of odontoblasts with exit from the cell cycle, cytological polarization and secretion of predentin/dentin is controlled by the inner dental epithelium. The basement membrane plays a major role both as a substrate and as a reservoir of paracrine molecules. Cytological differentiation implies changes in the organization of the cytoskeleton and is controlled by cytoskeleton-plasma membrane-extracellular matrix interactions. The induction of differentiation starts from the expression of soluble growth factors from BMP/TGFβ family. Cytological polarization occurs during the elongation of the cell body and is characterized by changes in the distribution of organelles, the appearance of a terminal web, and the formation of a cell process. Odontoblasts express vimentin and nestin, two intermediate filament proteins that guide polarization. To erupt, the mesenchymal tissue surrounding the tooth gives rise to a cell lineage, that control the formation of the eruption pathway. Demonstrating the presence of Ki-67, a nuclear antigen, could give a clue about the proliferating cells in adjacent mesenchymal tissue. In the present study we wanted to identify the expression of intermediate filaments and Ki-67 in the post-natal stages of mouse first molar.

**METHODS:** Experiments were conducted according to directive 86/609/EEC in the Department of Molecular Medicine, University of Padova. Mouse CD-1 specimen from post-natal day 1, 5, 8, 11, 15 and 19 were sacrificed, fixed in formalin and decalcified in EDTA for 3 weeks. Once decalcified the mandibles were cut off and embedded in paraffin. A series of 6µm slices were placed on polylysine slides. After deparaffinizing the slides in xylene and rehydrating in water, the samples were submitted to classic histological staining (Hematoxylin & Eosin staining and Gomori trichromic staining) and immunohistochemistry (IHC) procedures. For IHC the primary antibody anti-nestin (Santa Cruz Biotechnology SC 21247), anti-vimentin (Sigma V2258) and anti-Ki-67 (Sigma P6834) were used. The secondary peroxidase-labelled antibody was visualized with diaminobenzidine. Samples were then observed on light microscope.

**RESULTS:** A morphological study in developmental first mouse molar, from enamel formation to eruption, was obtained thanks to classic histological staining. IHC protocols revealed the localization of intermediate filaments in differentiating odontoblasts, and the presence of proliferating cells in developing tooth and its surroundings tissues.

**CONCLUSIONS:** The present study allowed us to localize intermediate filament nestin and vimentin in differentiating odontoblast until 19 days post-natally prior to tooth eruption. Proliferating cells, expressing Ki-67 antigen, were shown to be present even in surrounding mesenchymal tissues. Mesenchymal tissues, particularly the dental follicle, seems to be involved in tooth eruption. Further analyses are necessary to investigate whether dental follicle contains pluripotent stem cells able to give rise to a cell line guiding tooth eruption.

## ABSTRACT

**Myxoma of the maxillary gingiva: report of a rare case**

M. Carbone, A. Gambino, M. Cabras, R. Broccoletti, P.G. Arduino  
*Department of Surgical Science, Oral Medicine Section, CIR Dental School, University of Turin, Turin, Italy*

**BACKGROUND:** To describe a case of gingival myxoma. Soft tissue myxomas of the oral cavity are rare and considerably less common than odontogenic myxoma of the jaws. These neoplasms are benign tumors, slowly growing, insidious and potentially infiltrative. Differently from osseous myxomas, they show a less-aggressive behavior, and rarely recur after excision. We present a case of gingival myxoma arising from the left maxillary adherent gingiva in a 45-year-old female patient.

**METHODS:** Intraoral examination revealed a painless and well-defined nodule in the vestibular gingiva of the left maxillary central incisor, which measured 1.2 x 0.8 cm in diameter, with a tense elastic consistency on palpation. Radiologically, neither the erosion of the underlying bone nor other signs of radiolucency were present. The lesion was fully excised under local anesthesia, using a diode laser DMT Raffaello®, 645-980nm with power setting of 3.5w. Histological examination with Masson's trichrome stain, Alcian-Blue and Reticulin, and immunohistochemical reactions with anti-Actin antibodies, CD117, S-100 and Ki67 were also performed.

**RESULTS:** The patient's medical history and an extra-oral examination did not reveal other abnormalities. The lesion has been previously removed 5 years earlier, with only clinical diagnosis of pregnancy epulis, and 3 years earlier at the same site, with subsequent histological diagnosis of gingival fibroma. Microscopic analysis of the lesion showed spindle-shaped and stellate cells arranged in a myxoid fibrous stroma, with collagen fibers distributed uniformly. Immunohistochemical reactions yielded negative results. The differential diagnosis arises with nerve sheath myxoma, benign tumor of perineural or Schwann cell origin; in this case, the spindle-shaped and stellate cells in the lobulated areas show strong positivity for S-100. Instead, the immunohistochemical reaction of our patient was negative for S-100. On the basis of histological and immunohistochemical findings, the final diagnosis was soft tissue myxoma. Six months after surgery, no signs or symptoms of recurrences were observed. Only four cases of myxoma of gingiva have been reported in the literature to date: three cases were located in the mandibular gingiva, and only one was located in the maxillary area. To the best of our knowledge, our clinical case is the second soft tissue myxoma located in the maxillary gingiva.

**CONCLUSIONS:** Because soft tissue myxoma is a benign tumor, conservative surgical resection is the treatment of choice. The recurrence rate is 3-8%, and the neoplasm is most likely to recur within 2 years; hence, close follow-up is required. Further studies are necessary to clarify the origin and histogenesis of this lesion.

**New cancer therapies and jaws necrosis**

L. Brizzi, E. Giofrè, W. Colangeli, C. Tortosa, R. Cordaro, C. Boschetti, D. Caruso

*Department of Experimental and Clinical Medicine, Unit of Oral and Maxillofacial Surgery, University "Magna Graecia" of Catanzaro, Catanzaro, Italy*

**BACKGROUND:** The jaws have a predisposition to developing osteonecrosis. The mandible is more predisposed

to necrosis, when compared to the remaining skeleton, because of its high bone metabolism and ready exposure to bacteria through breaches in the thin oral mucosa or the dentition. The two well-known predisposing risk factors are radiation and bisphosphonate medication. A number of new cancer drugs are reported to induce osteonecrosis. As treatment outcomes improve the pool of 'at risk' patients in the population will increase and with it the prospect of developing necrosis of the jaw. The aim of this study is to present a case of osteonecrosis of the jaw in a patient treated with Radium-223 dichloride (Xofigo®) and Zoledronic acid (Zometa®).

**METHODS:** In December 2017, a 69-years-old man, affected by prostate cancer with symptomatic bone metastases, presented to the Unit of Oral and Maxillofacial Surgery at University "Magna Graecia" of Catanzaro, complaining severe pain on right lower jaw. Patient told us that, from 2010 to September 2017, he started an experimental therapy with Xofigo and Zometa. At clinical examination, the patient had swelling in submental region, paresthesia of right lower lip and intraoral pus excretion; furthermore, OPT and CT stated a relevant loss of alveolar crest in mandible and a diffuse inflammatory reaction of the soft tissues of the submental region. Diagnosis of Medication related osteonecrosis of the jaw (MRONJ) was made.

**RESULTS:** In January, patient has been undergone to surgical debridement of necrotic bone, remodeling of alveolar crest, hemostasis and cleaning of the surgical site. Antibiotic protocol (Amoxicilline 1gr/2 times a day starting 5 days before the surgery; Metronidazole 500 mg/3 times a day starting 1 day before surgery) and antibacterial rinses, for a total duration of 10 days, were prescribed. Surgery was conducted opening a full thickness flap; then, with piezoelectric shovel, necrotic bone was removed until bleeding of the bone could be clinically appreciated. A week after surgery, there was a wound dehiscence and so we carried out a new remodeling operation of alveolar process and advancement flaps for wound closure; also we have applied resorbable hemostatic material (Tabotamp®). At subsequent clinical check, surgical dehiscence remains but no signs of infection are present.

**CONCLUSIONS:** Radium-223 dichloride (Xofigo®) is given as an intravenous infusion as an internal form of radiotherapy. Radium is a calciummimetic and is therefore taken up by the active tumour and normal bone cells. The high bone turnover in the jaws will attract the drug. From this paper we can conclude that presence of radiopharmaceutical can increase the risk of ONJ and of surgical failure. There is emerging evidence that Radium-223 dichloride is related to osteonecrosis of the jaw, but randomized controlled clinical trials are indicated.

**Ossifying epulis in pseudohypoparathyroidism: a case-based therapeutic approach and review of the literature**

F. Guglielmi, E. Staderini, A. Camodeca, M. Cantiani, P. Galenzi

*Department of Surgical Sciences for Head and Neck Diseases, School of Dentistry, Catholic University of Sacred Heart, Rome, Italy*

**BACKGROUND:** The term Pseudohypoparathyroidism indicates a group of rare conditions characterized by an end-organ resistance to the parathyroid hormone (PTH) action.



Ossifying epulis (OE) is an exophytic gingival lesion characterized by spontaneous bone formation beneath the mucosa. We report a representative case of a peripheral ossifying epulis in a patient performing a drug treatment protocol for pseudohypoparathyroidism with optimal serum markers. A literature review is performed to review and update the knowledge about the remarkable occurrence of drug-resistant GNAS mutations.

**METHODS:** An Italian 11-year-old girl was referred to the Operative and Paediatric Dentistry Unit of the Department of Surgical Sciences for Head and Neck Diseases – in “Agostino Gemelli Hospital - Università Cattolica del Sacro Cuore” of Rome. The medical history of the patient revealed a diagnosis of pseudohypoparathyroidism and of Albright’s hereditary osteodystrophy at the age of 5 years, caused by a frameshift GNAS mutation. She complained a single subgingival bulky neof ormation - 0,6 cm in diameter - of hard-wooden consistency, with well-defined margins and sessile-based attachment to the underlying bone. It was covered by a non-keratinized ulcerated epithelium, in correspondence of the dental element 2.1. A moderate gingival inflammation was noticed, with no bleeding, pain or tenderness. The extraoral examination no evidence of facial or skeletal abnormalities. Medical records were matched with clinical features, radiological and pathological findings for a definitive diagnosis. After her mother’s consent, it was decided to keep the lesion under control and to re-evaluate monthly. During the first observation, intraoral photographs were carried out and an ortopantomotography was prescribed to evaluate the general oral status. After four months, the lesion did not show any signs of spontaneous regression; therefore, clinicians decided to perform a surgical enucleation and a biopsy. The informed consent was obtained, even if the surgical procedure had a minimal risk for the patient. Histological analysis revealed some typical features of a chronic and acute inflammatory microenvironment with plasma cells and bone tissue fragments with rehashing aspects referable to flogistic osteolysis.

**RESULTS:** Clinical and radiological follow-up appointments were scheduled every 6- and 12 months, respectively. Two years after excision, no signs of scar or recurrence were noticed. Histological analysis revealed typical features of a chronic and acute inflammatory microenvironment with plasma cells (positivity for CD38, MUM1, Lambda and Kappa chains) and bone tissue fragments with rehashing aspects, referable to flogistic osteolysis. The biopsy result leads to hypothesise a change in the patient’s drug therapy.

**CONCLUSIONS:** We have reported a patient with OE associated with POH, in whom an autoimmune thyroiditis has furthermore developed. According to the available literature the evidence-based gold standard approach for this multisystemic disorder is still controversial. There is a strong evidence supporting the link between thyroid hypofunction and the development of benign calcified lesions. The aim of this study is to review and update the knowledge regarding the remarkable occurrence of drug-resistant GNAS mutations. This case represents a clinical practice guideline, worthy of further studies to explore whether there are successful customized treatment modalities for this systemic condition. Considering the localization of peripheral ossifying epulis all over the body, all clinicians should focus their efforts to an early diagnostic assessment and, when possible, a multidisciplinary referral of the patients for a specialist examination.

## Risk factors for a bad wound healing due to oral biopsies: a preliminary report

C. Lajolo, I. Rizzo, I. Vanella, G. Vittorini, M. Cordaro

*Oral Medicine Department, Catholic University of Rome, Rome, Italy*

**BACKGROUND:** Oral biopsy is a common and fundamental surgical procedure: literature reports focused mainly on the reliability of surgical sample, but few studies evaluated wound healing after biopsy procedures. The aim of this observational study was to evaluate subjective and objective aspects related to wound healing, either in incisional or excisional biopsies, and determine risk factors for bad healing.

**METHODS:** Sixty seven patients underwent oral biopsies for diagnostic or therapeutic purpose (Oral Medicine Department, Fondazione Policlinico Universitario A. Gemelli), between January 2017 and February 2018. Mean age of patients was 58.9 (range: 23-88), 42 were female and 25 male. Type of biopsy, location, instruments, biopsy time, postoperative bleeding, other intra-surgical complications were recorded. Photos were taken at time 0 (before the surgery), after the biopsy and after one week (at suture removal); furthermore a photo of the sample was done in a standard photographic setting, in order to calculate the harvested volume through an image software (ImageJ, NIH, Betesda, USA). Visual number scale of pain (VNS) was recorded at 6h, 7 days and 21 days after biopsy. A post operative VNS 4/10 was considered representative of painful healing.

**RESULTS:** Forty biopsies were incisional and 27 were excisional, 24 were in OLP patients, 12 for fibromas, 10 for leukoplakia and 21 for other lesions. Twenty-three were made in cheeks, eight in the dorsal tongue and thirty six in other sites. Eight patients had during the following 6 hours post operative bleeding easily kept under control, and 7 needed pain killer therapy; no patients presented severe intra-operative or post-operative complications. The mean sample volume was 231.24 mm<sup>3</sup> (15-1250 mm<sup>3</sup>). The VNS one week after the biopsy was <4 in 94% of cases: diameter of suture (p 0.023) and number of stitches applied (p 0.016) were correlated with an higher VNS. One week after the biopsy, only 10.4% of the sample presented a wound dehiscence and silk suture was a risk factor for a bad wound healing (6 on 24 biopsies), whereas resorbable suture was associated with a better healing (0 on 31 biopsies – p=0.049).

**CONCLUSIONS:** Although biopsy is a safe surgical procedure, with a low risk of complications, some clinical precautions, such as resorbable or small diameters suture, can be used to decrease the post-operative discomfort; with all the limitation of this study, the sample volume seems not to influence a lot post-operative discomfort. It is suggested to increase the population to improve the statistical significance.

## Oral painful ulcers due to TNF-alpha inhibitors drug: a case report and literature review

C. Lajolo, I. Vanella, G. Gioco, M. Cordaro

*School of Dentistry, Catholic University of Rome, Rome, Italy*

**BACKGROUND:** We present a case of oral painful ulcers arisen in a woman suffering from psoriatic arthritis (PsA) treated with a TNF-alpha inhibitors (Adalimumab).

**METHODS:** A 70 years old Slavic women suffering from psoriatic arthritis since 2000, was referred to our Department for evaluation of oral mucous membrane ulcerative lesions

## ABSTRACT

developed during treatment of PsA. The patient, affected by type 2 diabetes, hypertension, fibromyalgia and COPD (chronic obstructive pulmonary disease), was under therapy for PsA since 2001 with different therapeutic protocols: due to low efficacy on arthritis activity of all the different drugs, she underwent to a new drug protocol (Methotrexate - 20 mg/week and Adalimumab - 40 mg/2 weeks) from 2006 up to our examination. Oral exam showed multifocal ulcers with keratotic margins, mainly affecting right buccal mucosa and ventral tongue: ulcers arose 4 months earlier with a tendency to recur without a complete healing. Ulcers were very painful and presented an increased consistency; Nikolsky's sign and auto-antibody for blistering diseases were negative. A biopsy was taken and pathology examination revealed an ulcer with an unspecific inflammatory reaction; acantosis and hyperparakeratosis were also present at ulcer borders. Since pathology was non-contributing, we hypothesized a drug reaction due to biologic therapy and, in accordance with her rheumatologist, a 30 days of drug holiday and a further re-examination was proposed. After 30 days, oral clinical conditions were considerably improved and, due to poor general health (i.e., lymphocytosis, thrombocytopenia and vitamin B12 deficiency anemia), the patient underwent systemic and local corticosteroid therapy with a further clinical improvement.

**RESULTS:** Ulcerative conditions of oral mucous membranes can be due to several local and/or systemic factors, being a diagnostic and therapeutic challenge for clinicians, and can be clinically classified into acute or chronic: malignant nature of persistent, non-healing ulcers must be always excluded through biopsy. The present case showed uncommon features, being acute in the onset, highly painful, but chronic in their natural history: oral manifestations of systemic or infectious diseases were excluded since no systemic signs and/or symptoms (e.g. fever, weakness, gastrointestinal disorders, auto-immunity) were present; local trauma and blistering diseases were also excluded, thus a drug related adverse reaction was suspected. Among the different drugs taken by the patient, Adalimumab was the most suspected: even if the most common side effects of Adalimumab are injection site reaction and upper respiratory infections, other serious side effects, (i.e., TB, deep fungal infections and other atypical pathogens) must be kept in mind when treating patients. Muco-cutaneous drug eruptions (erythema multiforme, Stevens-Johnson syndrome, bullous pemphigoid and pemphigus), anti-TNF- $\alpha$ -induced lupus, liver and hematological abnormalities (especially thrombocytopenia) are rare side effects of TNF- $\alpha$  antagonists, but must be always considered. **CONCLUSIONS:** The relatively recent introduction of TNF- $\alpha$  antagonists in the treatment protocols and the possibility to use new biological drugs warrants complete awareness of the incidence and management of common and rare side effects associated with their use.

### Neuroendocrine tumor of the submandibular gland: a case report

E. Luconi<sup>1</sup>, M. Mascitti<sup>1</sup>, L. Lo Muzio<sup>2</sup>, L. Lo Russo<sup>2</sup>, V. Panzarella<sup>3</sup>, A. Santarelli<sup>1</sup>, M. Procaccini<sup>1</sup>

<sup>1</sup>Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University, Ancona, Italy; <sup>2</sup>Department of Clinic and Experimental Medicine, University of Foggia, Foggia, Italy; <sup>3</sup>Department of Surgical, Oncological and Stomatological Disciplines, University of Palermo, Palermo, Italy

**BACKGROUND:** Neuroendocrine tumors (NETs) are a heterogeneous group of malignancies with a broad spectrum of

histomorphologies, tissue origins, and clinical outcomes, that arise from neural crest cells with neuroendocrine differentiation. Salivary gland tumors account for 3 to 6% of all head and neck neoplasms in adults, while salivary gland NETs are extremely rare tumors, with few cases reported in literature, on which only 5 cases involving submandibular gland. The rarity of NETs in salivary glands is probably related to the scarcity of neuroendocrine cells in this tissue. In fact, the presence and distribution of neuroendocrine cells in human salivary glands is still a matter of debate. In this work we present a case of NET involving a submandibular gland.

**METHODS:** On February 2016, a 21-year-old Caucasian man was referred to Department of Maxillofacial Surgery, Ospedali Riuniti General Hospital, Ancona by his general practitioner for a painful swelling in left submandibular region. Past medical history was unremarkable. On palpation, a firm and painful small nodule was detected in this region. The radiologic exams showed a nodular, well-enhanced tumor, about 2.5 cm in maximum diameter, in the left submandibular gland, with a moderate swelling of some locoregional lymph nodes of the homolateral neck region. The fine-needle aspiration cytology of the nodule was non-diagnostic. The patient underwent total left submandibular gland and lymph node removal and the material was sent to the Institute of Pathology, Marche Polytechnic University, Ancona, for histological examination. **RESULTS:** On gross examination, the submandibular gland showed a grayish-white, firm and solid nodule, measuring 2.5 x 1.8 cm. This lesion had well-defined margins, with a margin distance of 0,1 cm. On microscopic examination, this lesion was composed of small necrotic areas and poorly differentiated neoplastic cells, scarce cytoplasm, polymorphic nuclei, thickened chromatin, and small nucleoli, organized in solid nests. The proliferative index, evaluated with Mib1/Ki67, was about 30-35%. The neoplastic cells were stained positively with AE1/AE3, CAM 5.2, p63, and Synaptophysin. No immunostaining was observed for CK7, CK20, Chromogranin A, S100, and HMB45. Based on the cell morphology, growth pattern, proliferative index and immunophenotype, this lesion was classified as poorly differentiated neuroendocrine carcinoma. During 2-year follow-up, clinical and radiological follow-up showed no evidence of recurrence.

**CONCLUSIONS:** As an exceedingly rare entity, NETs of the salivary glands represent a diagnostic and therapeutic challenge in the routine practice, and an appropriate registry of the cases could be useful to gather experience in its management.

### Immunohistochemical evaluation of pon-2 expression in OSCC

S. Ripanti<sup>1</sup>, M. Mascitti<sup>1</sup>, L. lo Muzio<sup>2</sup>, K. Zhurakivska<sup>2</sup>, O. di Fede<sup>3</sup>, M. Procaccini<sup>1</sup>, A. Santarelli<sup>1</sup>

<sup>1</sup>Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University, Ancona, Italy; <sup>2</sup>Department of Clinic and Experimental Medicine, University of Foggia, Foggia, Italy; <sup>3</sup>Department of Surgical, Oncological and Stomatological Disciplines, University of Palermo, Palermo, Italy

**BACKGROUND:** Reactive oxygen species (ROS) are generated in cellular response to several processes and their adverse effects are opposed by antioxidant defense systems. This balance is critical for preventing cell damage; in fact, the imbalance between ROS generation and removal results in damage to cellular macromolecules. ROS are responsible for pathogenesis of different diseases including cancer and the process of carcinogenesis can be induced by redox imbalance.

Oral squamous cell carcinoma (OSCC) is the most common phenotype of oral cancer, and chronic irritating factors, such as tobacco and alcohol, play a critical role in its development. The paraoxonase (PON) gene family includes three members (PON1, PON2, and PON3), that share structural homology and antioxidant activity. Paraoxonase 2 (PON2) is involved in the antioxidative and anti-inflammatory response and, in contrast to PON1 and PON3, is not found in plasma, being instead expressed in several tissues. Several studies suggest that PON2 significantly enhances cellular stress resistance by attenuating ROS-mediated apoptosis in cancer cells. The aim of this study is to investigate the role of PON2 in OSCC. METHODS: This study included 15 specimens of primary OSCC (7 graded as G1 and 8 graded as G3). Data were retrieved and cataloged from clinical records and from the archive of the Institute of Pathology of Marche Polytechnic University. For each case, 4- $\mu$ m sections were cut from formalin-fixed paraffin-embedded tissue blocks. Immunohistochemistry was performed on 4- $\mu$ m histological sections mounted on poly-L-lysine coated glass slides. After deparaffinization in xylene and rehydration in a graded series of alcohol, slides were treated with microwave for heat-induced epitope retrieval in EDTA Buffer (1 mM EDTA, 0.05% Tween 20, pH 9.0) for antigen retrieval. Endogenous peroxidase was quenched by incubation with 0.3% hydrogen peroxide in methanol for 20 minutes. Then, the sections were incubated with the monoclonal antibody anti-PON2 (1:200 dilution; Sigma-Aldrich, St. Louis, MO, USA) in humidified atmosphere at room temperature for 1 h. After incubation with 0.05% 3,3'-diaminobenzidine (Sigma-Aldrich) in 0.05 M Tris buffer, pH 7.6 with 0.01% hydrogen peroxide, sections were counterstained with Mayer's hematoxylin (BioOptica, Milan, Italy), permanently mounted on slides and examined by light microscopy. To evaluate PON2 expression, the percentage of positive cells was determined from the analysis of 1000 cells at x40 magnification. RESULTS: PON2 expression in apparently normal mucosa was almost undetectable, while there was a significant correlation between PON2 overexpression at the invasive zone and grading. In fact, well differentiated OSCC group showed an expression pattern similar to normal mucosa, while in G3 cases the number of PON2+ cells were significantly increased (> 50%). CONCLUSIONS: According to these data, PON2 was overexpressed in less differentiated OSCC, suggesting a possible role of this marker in aggressive clinical behavior.

### NNMT: potential involvement in oral malignant melanoma

L. Togni <sup>1</sup>, D. Sartini <sup>1</sup>, G. Troiano <sup>2</sup>, L. Lo Muzio <sup>2</sup>, M. Procacini <sup>1</sup>, M. Emanuelli <sup>1</sup>, A. Santarelli <sup>1</sup>

<sup>1</sup>Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University, Ancona, Italy; <sup>2</sup>Department of Clinic and Experimental Medicine, University of Foggia, Foggia, Italy

BACKGROUND: The oral malignant melanoma (OMM) is extremely rare, accounting for about 0.5% of all oral malignancies and 0.2-8.0% of all melanomas. Unlike its cutaneous counterpart, the aetiology of OMM is not known: most OMM seem to arise from apparently normal oral mucosa, while one-third of these tumours develop from pre-existing oral pigmentations. OMM are aggressive tumours, and unfortunately most of them showed deep tissue invasion at initial

presentation. The prognosis for patients with OMM is worse than for those with cutaneous melanomas, and the overall 5-year survival rate is 10-25%. The study of the molecular mechanisms that are involved in the development of OMM is necessary to identify new prognostic markers, as well as to identify new targets for molecular-based treatments. The aim of the present retrospective study was to correlate the expression of Nicotinamide N-Methyltransferase (NNMT), a Phase II drug-metabolizing enzyme overexpressed in many tumours, to clinicopathologic data and with the prognosis in patients affected by OMM.

METHODS: This study included surgical resection specimens obtained from 15 OMM and 15 cutaneous melanoma (CM). Data were retrieved and cataloged from clinical records and from the archive of the Institute of Pathology of Marche Polytechnic University by a single operator, in order to ensure the uniformity of the collected data. Serial sections (5  $\mu$ m) from formalin-fixed, paraffin embedded blocks were cut for each case and mounted on poly-L-lysine-coated glass slides. The sections were incubated for one hour at room temperature, with the rabbit polyclonal anti-NNMT antibody (Sigma-Aldrich, St. Louis, MO, USA) diluted 1:1500 in a humidified chamber at room temperature for 1 h. To evaluate extension of NNMT expression, the percentage of positive cells was determined from the analysis of 1000 cells at x40 magnification. The intensity values of NNMT staining was scored and reported into a dichotomous scale: “-” (negative-weak expression); “+” (moderate-intense expression).

RESULTS: The extension of the NNMT expression in tumor cells showed a statistically significant difference between the two groups (P = 0.0008), showing higher values in CM group (41.7% vs 14.6%). A significant correlation was observed in NNMT staining intensity, showing more highly stained cases in OMM group. The expression of NNMT was significantly lower in the cases of CM that showed recurrences (P = 0.0037), while no statistically significant correlation was found between NNMT expression in OMM and the risk of recurrence. Regarding the relationship between ulcerated lesions in the melanoma samples and NNMT expression, OMM showed no significant differences between the extension of the NNMT expression and the presence of ulcers, while the NNMT staining intensity was significantly higher in OMM cases with ulceration (P = 0.0440). Regarding the prognostic significance of this enzyme, the univariate analysis showed a negative effect of NNMT expression on the disease-free survival rate (log-rank test, P = 0.0452).

CONCLUSIONS: This study is the first report to evaluate NNMT overexpression in OMM, showing a different expression pattern from that of CM, suggesting the presence of molecular and metabolic differences between these two types of melanocytic neoplasms.

### Interventions for treating osteonecrosis of the jaw stage III: may conservative surgical management be a viable option?

R. Mauceri <sup>1</sup>, O. Di Fede <sup>1</sup>, M. Dioguardi <sup>2</sup>, L. Lo Russo <sup>2</sup>, N.F. Testa <sup>2</sup>, G. Capocasale <sup>1</sup>, G. Campisi <sup>1</sup>

<sup>1</sup>Dept. of Surgical, Oncological and Oral Sciences, University of Palermo, Palermo, Italy; <sup>2</sup>Dept. of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy

BACKGROUND: Osteonecrosis of the jaw (ONJ) is a serious adverse reaction of anti-resorptive and anti-angiogenic



## ABSTRACT

agents, potentially painful and debilitating condition that can considerably affect the quality of life of patients.

The goals of the ONJ therapy are to reduce pain, to control infection and to stop the progression of the disease or, when it is reachable, to eradicate completely the necrotic bone in order to have a complete healing.

However, the ONJ management is still controversial and there are no evidence-based guidelines on the management of this disorder. Surgical approach should be defined due to the stage of the disease; symptomatic patients with stage III disease may require segmental resection and bone reconstruction if indicated.

Nevertheless, lately, conservative treatments are increasingly performed at all stages of the disease. The aim of this study is to describe a case report regarding a conservative surgical approach of an ONJ stage III.

**METHODS:** A man was referred to our Sector of Oral Medicine (UNIPA) for the presence of bone exposure, on February 2017.

**RESULTS:** A 60-year-old partially edentulous male presented to our attention with a necrotic bone exposure of the mandible.

Anamnestically, the patient was affected by a prostatic cancer with bone metastases and reported 2 cycles of anti-resorptive therapy (i.e. zoledronic acid ev); no consumption of tobacco or high consumption of alcohol was reported.

Extraoral examination revealed the presence of a painful swelling in the left mandibular body, with a beginning of a fistula. Intraoral examination showed a bone exposure on the left side of the mandible, with presence of suppuration.

A CT scan was requested and medical therapy was prescribed according to PROMaF protocol for acute infection control ([http://www.policlinico.pa.it/portal/index.php?option=com\\_content&Itemid=264&op=page&SubMenu](http://www.policlinico.pa.it/portal/index.php?option=com_content&Itemid=264&op=page&SubMenu)).

The ONJ process involved the entire mandibular body and the ONJ was classified as stage III (AAOMS staging system).

Applying the PROMaF protocol, pre- and post-operative antibiotic systemic treatment was given (ampicillin/sulbactam im and metronidazole per os) as well as the use of chlorhexidine mouthwashes and sodium-hyaluronate gel topically. The surgical protocol expected:

- 1) anesthesia without adrenaline;
- 2) full-thickness mucoperiosteal flap;
- 3) curettage of the necrotic bone, by mean of a piezo-surgery device;
- 4) irrigation with rifamycin sodium;
- 5) tension-free suture.

Post-operative instructions were given. Follow-up visits were scheduled to remove the suture (10 days), then at 1,3,6 and 12 months.

Ten days after, the healing process was incomplete, indeed the wound presented a central depression covered by granulation tissues. At one month, the complete mucosal healing was achieved. After 12 months of follow-up, the patient was free of symptoms or clinical signs related to ONJ.

**CONCLUSIONS:** Preserving the quality of life of cancer patients should be a key point in choosing the surgical approach; therefore, when reasonable, ONJ stage III may be treated initially with conservative treatment, avoiding more complex procedures for the clinicians and demanding surgery for the patients (e.g. segmental resection). Further studies, particularly controlled clinical trials, are necessary in order to validate and standardize the surgical technique reported here.

## Proposal of a diagnostic and therapeutic pathway for oral health complications related to sjogren syndrome in autoimmune diseases

G. Setti <sup>1</sup>, G. Sandri <sup>2</sup>, S. Pozzi <sup>3</sup>, L. Panari <sup>1</sup>, P. Bellini <sup>1</sup>, U. Consolo <sup>1</sup>

<sup>1</sup>Unit of Dentistry and Oral-Maxillofacial Surgery, Surgical, Medical and Dental Department of Morphological Sciences related to Transplant, Oncology and Regenerative Medicine, University of Modena and Reggio Emilia, Modena and Reggio Emilia, Italy; <sup>2</sup>Unit of Rheumatology, Department of Diagnostics, Clinical and Public Health Medicine, University of Modena and Reggio Emilia, Modena and Reggio Emilia, Italy; <sup>3</sup>Unit of Hematology, Department of Diagnostics, Clinical and Public Health Medicine, University of Modena and Reggio Emilia, Modena and Reggio Emilia, Italy

**BACKGROUND:** According to Dentistry and Rheumatology Units of Azienda Ospedaliera Universitaria Policlinico di Modena, the lack of a diagnostic and therapeutic pathway for oral health problems related to primary and secondary Sjogren Syndrome, makes necessary to develop a database for rheumatology autoimmune disease affected patients. Usually, after the oral cavity comprehensive clinical examination and patient history interview, dental and oral health condition are not registered by the operator who perform labial glands biopsy. Moreover, general oral conditions are not actually followed-up after pathologic glands evaluation, requested as a criterion for syndrome diagnosis; also, clinical and serological patient course are not shared between dental and medical specialists. Thus, is not actually possible to evaluate onset, progression or remission of oral diseases and to follow-up patient for effects of xerostomia such as decays, periodontal diseases and mucositis. Setting-up a data base will provide us the possibility to follow-up patients over years and register oral health conditions in relationship to the progression of main diseases and drug therapy.

**METHODS:** A literature review to identify the diagnostic parameters for primary and secondary Sjogren syndrome was performed. Histological results of all labial salivary glands examination, performed at Azienda Ospedaliera Universitaria Policlinico di Modena from 2011 to 2018, were collected. Then exclusion criteria were defined: patients with pulmonary and rare respiratory diseases, nephropathic disease and glands biopsy for oncological suspect or traumatic lesions (such as mucocele). By the gathering of medical reports, pharmacological history, serological exams, functional salivary glands test, imaging (e.g. sialography), we could appreciate basal conditions at time of suspected diagnosis, and fill the database comprehensively. Moreover, a pathological re-evaluation of biopsies performed by the same pathology specialist would let us retrospectively compare diagnostic scores with clinical course of disease.

**RESULTS:** We have currently collected 134 cases of patients who undergo to labial salivary glands biopsy in our department between January 2011 to December 2017, respecting exclusion criteria. We made a database recording age, sex, and the histological reports. Evaluation of histological reports showed non homogeneous diagnostic criterion (focus score Greenspan; grading by Chisholm&Mason; Tarple&Cipolletti; Baldini); in addition, scores overlapping not always couple with positive diagnosis or disease severity.

**CONCLUSIONS:** Histological specimen revision could give us a homogeneous diagnostic score for the inflammatory infiltrate. Medical and pathological data crossing

could let us retrospectively understand the natural history of autoimmune disease and the influence on oral health. Additionally, reviewing data collection will indicate us which criterion to select in future prospective quality evaluation.

## Epithelial-myoepithelial carcinoma of the minor salivary glands: a case report

V. Panzarella<sup>1</sup>, R. Mauceri<sup>1</sup>, G. Di Gioia<sup>2</sup>, C. Mangione<sup>2</sup>, A. Cocco<sup>2</sup>, O. Di Fede<sup>1</sup>, G. Campisi<sup>1</sup>

<sup>1</sup>Dept. of Surgical, Oncological and Oral Sciences, University of Palermo, Palermo, Italy; <sup>2</sup>Dept. of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy

**BACKGROUND:** Epithelial-myoepithelial carcinoma (EMC) derives from the intercalated ducts of salivary glands. The EMC is a rare malignancy, showing an incidence of 0.48% – 1% of all salivary glands tumour and it usually affects the parotid glands (73.5% - 80%). EMC lesions arising in minor salivary glands are rare, only 5% - 6.2% of reported EMCs. The aim of this paper is to report the rapid onset of a EMC of the minor salivary glands.

**METHODS:** We report the case of a woman, who was referred by his dentist to our Sector of Oral Medicine (UNIPA) for a swelling of the palate, on January 2018.

**RESULTS:** A 56-year-old female presented to our attention with an asymptomatic lesion of the hard palate. Anamnestically, the patient reported no health concern and no consumption of tobacco or high consumption of alcohol. Clinical examination revealed a firm swelling area on the right side of the hard palate, the overlying mucosa presented an ulcerated red-purple surface. The lesion was asymptomatic. Radiographically, the patient was already in possession of a magnetic resonance and CT scan of the head and neck. Both radiographic examinations exhibited a solid tissue formation, with oval shape, irregular margins and intense post-contrastographic enhancement. The lesion involved the hard and soft palate, slight commitment of the maxillary bone and approximately a size of 13 x 16 mm. Based on clinical features and radiology evidences (CT, MRI), the clinical diagnosis was salivary gland tumour (pleomorphic adenoma), and different diagnosis included low-grade adenocarcinoma, low-grade muco-epidermoid carcinoma, mantle cell lymphoma. After obtaining the consensus of the patient, an incisional biopsy was performed and the histopathologic examination revealed a newly formed epithelial atypical tissue, predominantly solid architecture, rare ductal structures, elevated proliferative activity (Ki67=about 30%) and with morphological and immunophenotypic characters consistent with an epithelial-myoepithelial origin. The histopathological analysis associated with macroscopic and radiographic examinations permitted the definitive diagnosis of epithelial-myoepithelial carcinoma. Patient was subsequently referred to the Department of Oncology for the management.

**CONCLUSIONS:** Epithelial-myoepithelial carcinoma is very rare, especially in minor salivary glands. Occasional indolent multifocal lesions of the oral cavity should be carefully investigated; during the differential diagnosis is fundamental to remember that unusual lesions like EMC with a low-grade malignancy can occur. Indeed, early diagnosis may contribute to a better prognosis.

## Exfoliative cheilitis in a young adult patient: a case report

B. Mainardi, F. Toma, A. Peri, C.M. Morini, P. Capparè, A. Lissoni, S. Abati

Oral Pathology, Dept. of Dentistry - IRCCS San Raffaele University Hospital, University Vita-Salute San Raffaele, Milan, Italy

**BACKGROUND:** Exfoliative cheilitis is a condition that affects the upper and lower lip with the consequent dehydration and flaking off of the lip mucosa. The lips appear chopped and cracked, bleeding may occur spontaneously and the patient experiences sensitivity and pain especially in unfavorable weather conditions such as excessive sun exposure or chilling days. Therefore, they look unattractive, itchy and this condition results as extremely challenging for the quality of life of the affected patient.

**METHODS:** A young male patient of 21 years old came for a consult with the oral medicine expert referred by his physician. He was previously visited by several dermatologists that hypothesized different diagnosis and treated the condition with therapeutical approaches that did not give any consistent results. His medical history was clear, the patient never smoked and reported that this condition appeared after an excessive sun exposure in 2015. As the first manifestations he had erosive and crusted labial lesions cured initially as a herpetic form or an alleged propolis allergy. Dermatologists performed also some patch testing that gave negative results. In 2016 a biopsy was performed and the consequent diagnosis was a psoriasiform hyperplasia of the epithelium with diffused spongiosis and intradermal granulocytes. Other exams were carried out without any relevant positivity (fecal exams, lactose allergies ...) The patient reported that the evolution of the condition followed a 2-week cycle and that there were not any correlation with other symptoms. The clinical extraoral and oral examination showed a poor oral hygiene condition, tonsillar hypertrophy and painful erosive chopped lips that easily peeled off. The previous therapeutical approaches prescribed by the dermatologists with acyclovir, tacrolimus, prednisone and doxycycline were ineffective. The oral medicine expert decided for a topic treatment with professional oral hygiene prophylaxis to reduce the bacterial load, dedicated oral hygiene home instructions with a mild fluoridated toothpaste without Sodium Lauryl Sulfate, Chlorhexidine mouthwash in a low concentration (CHX 0.06% 2 times a day), an oral lubricant gel and an hypoallergenic lip balm. Furthermore, nasal irrigations with an isotonic solution to improve the air flow through the turbinates and prevent mouth breathing that enhanced the lip and mucosal dryness. Hematologic exams to check the antibodies anti-transglutaminase, anti-endomysium and anti-gliadin were requested. After 3 weeks the lip condition was greatly improved and the lips were further treated with borax glycerin to improve the hydration and the patient was relieved of the burning and itchiness.

**CONCLUSIONS:** Exfoliative cheilitis may be exacerbated by weather conditions, chemical agents such as SLS, and its treatment should be just topical. The improvement of oral hygiene and the rehydration of the lips with specific ointments was indeed successful. In absence of any other systemic condition that could be responsible of this clinical manifestation and the treatment with topical agents resulted effective for the patient that is still improving noticeably.

## ABSTRACT

**Non-drug induced gingival hyperplasia: a case report in a young woman**

B. Mainardi, F. Toma, A. Lissoni, A. Peri, C.M. Morini, R. Vinci, M. Clementini, S. Abati

*Oral Pathology, Dept. of Dentistry IRCCS San Raffaele University Hospital, University Vita Salute San Raffaele, Milan, Italy*

**BACKGROUND:** The purpose of this report is to describe a clinical case with a massive bilateral gingival hyperplasia that is not related to drug treatment, in a young woman from Philippines. Gingival enlargements such as diffuse or multifocal gingival hyperplasias are usually related to the chronic assumption of medications such as immunosuppressants, antiepileptic and calcium channel blockers. Therefore, it is essential to investigate thoroughly the medical history and drugs assumption of affected patients to exclude any possible correlation with the clinical aspect of hyperplasia.

**METHODS:** In December 2017 a 39 years old Asiatic female patient came for a first visit in our Clinical Unit of Oral Pathology complaining about an unusual enlargement of the maxillary gingiva in the area of the palate that slowly began one year earlier. The mass was indolent but worrisome. Her general practitioner prescribed her the blood tests that did not reveal any particular condition. The oral medicine expert reviewed the medical history of the patient that was completely cleared. The woman did not report any habit such as smoking, alcohol, drugs or a particular diet. She just had two pregnancies in 2008 and 2010. She did not refer any familiarities with her clinical manifestation. The medical investigation was further complicated by a linguistic barrier since the patient spoke just her native language and a little of English, with the help of her husband. The radiographic exam (OPT) showed a severe grade of periodontal disease with a generalized horizontal bone loss and molar furcation involvement both in the maxilla and mandible. Her oral hygiene status was poor. The massive gingival growth was not edematous and firm, with irregular but demarcated borders. A diagnostic incisional biopsy was performed to exclude any metaplasia or malignancy, such as a lymphoma. The teeth 1.6 and 1.7 were extracted and the dental hygienist performed a professional oral hygiene at the following appointment. The histopathology reported gingival hyperplasia with a moderate lymphoplasmacytic infiltrate. The lesion is slowly reducing after the extractions and the clinical and final diagnosis, excluded a congenital gingival fibromatosis or any other genetic condition that could exacerbate the gingival status.

**CONCLUSIONS:** In this unusual case of massive gingival enlargement, the clinical and final diagnosis excluded a congenital gingival fibromatosis or any other genetic condition that could affect the gingival tissues. The disruption of periodontal attachment caused by the accumulation of bacteria due to pseudopocketing in the areas of hyperplasia led to the loss of the involved teeth.

**Diseases and conditions of the oral mucosa in a cohort of consecutive patients at the oral medicine and pathology unit and relation with oral symptoms**

F. Toma, B. Mainardi, A. Peri, M. Moretti, C. M. Morini, G. Gastaldi, A. Lissoni, S. Abati

*Oral Pathology - Dept. of Dentistry - IRCCS San Raffaele University Hospital - University Vita Salute San Raffaele, Milan, Italy*

**BACKGROUND:** The aim of this retrospective study has been to highlight the prevalence of oral mucosal inflammatory

diseases and conditions in a 12-months time period at the Oral Medicine and Pathology Unit of the Dental Clinic in Hospital San Raffaele, Milano. The relations between the oral inflammatory disorders and subjective symptoms like burning, pain and xerostomia have been evaluated.

**METHODS:** Medical histories, clinical charts and records of the patients visited at the oral medicine and pathology unit in Hospital San Raffaele, Milano, were collected and filed in a customized secured digital database. Data collection included demographic informations such as sex and age, education and profession, systemic diseases, drug therapies, biopsies, oral clinical and histopathological diagnosis. The sample included 228 patients firstly accessed to the unit and followed during 2017. The patients' files were statistically analyzed with JMP 9.0 software in a Macbook pc, showing descriptions and correlations between demographic and clinical data.

**RESULTS:** Among the 228 patients, 148 were females and 80 males; the mean age was 54.5 yrs  $\pm$  17.96 sd (age range 1 - 93, females mean 56.1 males 51.5). 47.7% of the patients were systemically healthy while 52.3% were affected by different general conditions: 36 pts with cardiovascular diseases, 23 with neurological disorders, 21 pts with metabolic and/or endocrine diseases, 16 pts with immunopathological diseases and/or allergies, 10 pts with gastroenteric diseases and 10 pts with cancer. Eighty-seven (38%) of the studied subjects were chronically treated with xerogenic drugs. The most frequent oral conditions evidenced were benign growths like traumatic fibromas and salivary cysts (43 pts, 18.8%); oral lichen planus was present in 42 pts (18.4%), aphthous ulcers were seen in 15 pts (6.6%), migratory glossitis in 9 pts (3.9%), mucosal keratosis in 14 pts (6.1%) and oral squamous carcinomas in 5 patients. Burning and/or mucosal pain were the chief complaint in 52 subjects (22.8%), significantly prevalent in inflammatory oral conditions ( $p < 0.0001$ ); subjective symptoms of dry mouth were reported by 59 pts (25.9%), more common in women (n.s.) and in patients with inflammatory oral conditions ( $p < 0.011$ ) and obviously prevalent in patients taking xerogenic drugs.

**CONCLUSIONS:** Oral inflammatory mucosal diseases and conditions can affect the patients' quality of life and are able to induce symptoms of burning, pain and xerostomia that should be taken care of with appropriate relieving treatments.

**Diagnostic pathway for a blue-grayish pigmentation of the hard palate: a case report**

F. Toma, A. Peri, A. Lissoni, B. Mainardi, C.M. Morini, G. Arigoni, S. Abati

*Oral Pathology, Dept. of Dentistry IRCCS San Raffaele University hospital, University Vita Salute San Raffaele, Milan, Italy*

**BACKGROUND:** Dark pigmentations of the oral mucosa can be caused by many different factors, the most common are ethnic pigmentations with a brownish variation of the mucosal appearance. Other pigmentations may be caused by amalgam particles that enters through micro lesions of the mucosa during the tooth prosthetic preparation. Some others are a secondary effect induced by the chronic assumption of certain drugs, such as minocycline, tetracycline, antimalarial agents (in particular with chloroquine and hydroxychloroquine), birth control pills or hormonal replacement therapies and ketoconazole. Ultimately the differential diagnosis must be carried out also with the melanoma, a malignant tumor with a very poor prognosis for the patient.

**METHODS:** A female patient of 69 years old came for



the clinical assessment and diagnosis of a blue pigmentation area in the hard and soft palate below the upper complete denture, noticed by her GDP. Her medical history reported hypertension, a smoking habit and rheumatoid arthritis treated with chloroquine and prednisone; moreover, her elevated blood pressure was compensated with ace-inhibitors, diuretics, beta blocker agents and she mentioned allergies to nickel and contrast media agents. At the clinical observation the palate had a bluish pigmentation area with a 3 cm diameter, the lesion was slightly tingling because of the direct contact with posterior ridge of the denture. The biopsy for the suspicious lesion was performed within a week after the first observation. The differential hypothetical diagnosis was carried out with an extended tattoo, melanoma, melanocytic deposits and drug induced pigmentation. The incisional punch biopsy of 5 mm was immediately sent for the histopathology evaluation. The diagnostic assessment initially suggested a tattoo-like lesion, but this was not convincing both the pathologist and the oral medicine expert according to the histopathology and the clinical pictures of the oral lesion. The specimen was then processed one more time and revealed many deposits of hemosiderin (Perls +) with a mild fibrosis and keratosis with lymphohistiocytic infiltrate and a moderate microvascular proliferation and endothelium thickening with lymphocytic infiltrate that lead to vasculitis. **CONCLUSIONS:** This case report shows how an oral pigmentation should not be underrated and misdiagnosed with a simple amalgam tattoo. Although the patient cannot modify her systemic therapies for rheumatoid arthritis, the pigmentation has been classified as a drug induced one, excluding also malignancies such as melanoma. The oral medicine expert set up a 6 month follow-up.

### Oral squamous cell carcinoma on immune-mediated diseases: study of a sample of 31 patients

L. Limongelli, S. Capodiferro, F. Dell'Olio, G. Barile, D. De Falco, S. Di Nanna, G. Favia.

*Complex Operating Unit of Oral Pathology and Surgery, Department of Interdisciplinary Medicine, University of Bari, Bari, Italy*

**BACKGROUND:** The recent literature shows a statistically significant relationship between oral carcinoma and immune-mediated diseases, probably due to the established correlation between chronic inflammation and carcinogenesis. The rate of malignant transformation in Oral Squamous Cell Carcinoma (OSCC) is in a range of 0.4-5.3% in the Oral Lichen Planus (OLP) and 15% in Graft Versus Host Disease (GVHD). The aim of this study is to report the clinical records of OSCC on patients affected by immune-mediated diseases referred to "Complex Operating Unit of Oral Pathology and Surgery (University of Bari)".

**METHODS:** To carry out this study, the authors analyzed the database of OSCC comprehending 722 patients (950 OSCC) referred to "Complex Operating Unit of Oral Pathology and Surgery (University of Bari)" from 1977 to 2017. The authors used as inclusion criteria: patients affected by immune-mediated diseases referred from 2000 to 2015 with a OSCC. Of these patients, the following variables were assessed specifically: sex, age, multiple carcinomas, site, clinical presentation, TNM classifications, staging and grading, kind of therapy, histological features (tumor thickness - TT, tumor depth - TD, muscular and vassal infiltration) and status of the patients.

**RESULTS:** The authors found 31 patients affected by immune mediated diseases: 21 with diagnosis of OLP (60.34% of OSCC), 7 with GVHD (29.31% of OSCC), 2 with Pemphigus (P - 5.17% of OSCC) and 1 with Mucous Membrane Pemphigoid (MMP - 5.17% of OSCC). To these 31 patients corresponded 58 OSCC: 35 in the OLP group, 17 in the GVHD group, 3 in P group and 3 in MMP group. There is no preference for sex (M: 51.7%, F: 49.3%), average is 63 years old; the most frequent sites are: tongue (44,83%), followed by cheek (20,3%) and gingiva (18,2%). The lesions present as ulcer (42%), leukoplakia (21%), nodule (14%), eritroplakia (5%), mixed (18%). The OSSC considered are in 85% of cases at stages I-II. All the OSCC underwent to the same diagnostic-therapeutical protocol consisting in HD intraoral ultrasonography and RMN for lesions occurred on soft tissues and OPT and TC for lesions occurred on gums and alveolar ridges for the diagnosis, and wide laser excision with piezoelectrical tools for lesions of hard tissues as surgical treatment. Three patients underwent lymphadenectomy because of the presence of clinical lymph nodes and one patient (GVHD) underwent chemotherapy for a T4N2aM0 OSCC. At histological analysis, the OSCCs presents more frequently as well-differentiated carcinoma (54%). TT ranged from 2 to 7 mm and TD from 1.5 to 6. Lymph nodes metastasis were detected only in two patients presenting OSCC with grading 3, TD>5mm and infiltration of vessels. All the patients healed except the patient with stage IV that died for OSCC.

**CONCLUSIONS:** The obviousness of the higher risk of development of OSCC in patients affected by immune-mediated diseases allows to establish programs of primary and secondary prevention with customized follow-up. Indeed, based on this experience, surely it is possible to set up a rescue level considering GVHD at most risk compared to the other immune-mediated disease and so in need of more frequent follow up.

### Early tongue squamous cell carcinoma: tri-dimensional diagnosis, therapy and clinical-pathological correlations in 85 patients

F. Dell'Olio, L. Limongelli, A. Tempesta, S. Capodiferro, G. Coti, A. Carrasi, R. Altieri, G. Favia

*Complex Unit of Odontostomatology, DIM, Interdisciplinary Department of Medicine, Aldo Moro University of Bari, Bari, Italy*

**BACKGROUND:** Early oral cancer is a malignancy characterized by a maximum diameter of 4 cm, occurring after the fourth decade, with few or no symptoms, rare metastasis and high rate of healing after surgery. The aim of this study is to report the clinical records regarding the early tongue squamous cell carcinomas (stage 0, I, and II) referred to the Oral Pathology and Surgery Unit of University of Bari from 2005 to 2015 focusing on the diagnostical and therapeutical management and Histological Prognostic Parameters (HPP) in order to establish the more predictive ones for the occurrence of metastasis in lymph-nodes.

**METHODS:** All the patients underwent the same protocol of diagnosis and therapy: W.H.O.'s 8-steps examination, application of T-blue and Lugol, HD intra-oral ultrasonography in order to assess Tumor Thickness (TT) as the total thickness of the tumor and Tumor Depth (TD) as the thickness of the invasion beyond basal membrane, TC or RMN to complete pre-surgical cTNM staging. Micro-invasive laser excision of

## ABSTRACT

cancers was performed with intra-operative exam of resection margins; definitive histological exam to assess HPP. Follow-up performed with clinical exam and ultrasonographical evaluation of neck's nodes, in order to perform lymphadenectomy only on pathological ones. Medical records were collected for each patient, focusing on risk factor, clinical presentation, site and W.H.O.'s sub-site classifications, and HPP used (grading, TT, TD, histological structures invaded by cancer, like muscles, vessels, nerves, salivary ducts). HPP's correlation with occurrence of nodal metastasis was assessed with  $\chi^2$ -test (1 g.l. and  $\alpha < 0,05$ ), then compared to select the more reliable ones.

**RESULTS:** The database gathered 85 cases of oral tongue cancer occurred from 2005 to 2015. The early tongue cancer affects more males (58,82%), during the seventh decade of life (31,74%), occurring on tongue's lateral margins more frequently (77,64%) than other tongue's sub-sites, in form of ulcer (54,11%) or of exophytic mass (31,76%). The early tongue cancers are often of stage one (56,47%) and rarely of stage zero (2,35%), according to cTNM stadiation. The most frequent histological form is invasive (98,83%) well-differentiated (52,94%) carcinoma, with a large nest invasion pattern (75,29%) extended to the extrinsic muscles of tongue (72,94%) and rarely extended to vessels (7,06%), nerves (17,65%) or salivary ducts (15,29%). Few lymphadenectomies were performed (10,58%), with only two cases of occult metastasis in nodes that needed a pTNM re-stadiation to third stage (2%). The 98,73% of patients involved in this study is still alive, documented by a follow up period lasting from 2 to 12 years. Only one died because of multiple carcinomas and 6 because of other reasons. Our statistical analysis allowed to correlate all HPP to occurrence of nodal metastasis (except TT) with statistical significance. The HPP more predictable are: grading, TD, invasion of intrinsic muscles of tongue, invasion pattern, vascular invasion.

**CONCLUSIONS:** This study about the early tongue cancer proves the efficacy of the management used in Odontostomatology's Unit of University of Bari revealing a 98,73% of patients without carcinomas in a period from 2 to 12 years. The main Histological Prognostic Parameters useful to evaluate the risk of nodal metastasis are: grading, TD, invasion pattern (proper of OSCC), vascular invasion and invasion of the intrinsic muscles of tongue (exclusive of early tongue cancers). TT can't be considered as a HPP useful for early tongue cancer.

### Cost of illness of oral lichen planus: preliminary report of a multicentric study

C. Lajolo<sup>1</sup>, G. Gioco<sup>1</sup>, T. Salo<sup>2</sup>, M. L. Specchia<sup>3</sup>, P. Cacciatore<sup>3</sup>, M. Giuliani<sup>4</sup>, M.K. Siponen<sup>5</sup>

<sup>1</sup>School of Dentistry, Oral Medicine Department, Catholic University of Rome, Rome, Italy; <sup>2</sup>Cancer and Translational Medicine Research Unit, Faculty of Medicine, University of Oulu and Oulu University Hospital, Oulu, Finland; <sup>3</sup>Public Health Department, Catholic University of Rome, Rome, Italy; <sup>4</sup>Department of Clinical and Experimental Medicine, University of Foggia, Foggia, Rome; <sup>5</sup>Department of Oral and Maxillofacial Diseases, Kuopio University Hospital, Kuopio, Finland

**BACKGROUND:** To estimate the economic costs of oral lichen planus (OLP) through an out-patient multicentric study conducted in Finland and in Italy.

**METHODS:** A multicentric retrospective study was conducted, retrieving clinical records of patients affected by OLP and

followed at Kuopio University Hospital (Kuopio, Finland) and at Oral Pathology Departments of Catholic University (Rome, Italy), to evaluate the economic burden of OLP. Direct costs concerning diagnostic procedures (i.e., biopsies, swabs, blood exams), therapeutic management (either local and/or systemic) and follow-up visits were obtained from clinical records.

**RESULTS:** One hundred and eight patients with confirmed diagnosis of OLP (81 females and 27 male), 50 Finnish and 58 Italians, with a mean age of 60.8, were enrolled in this study. Buccal mucosa (81%) and gingiva (48%) were the most involved sites, followed by the tongue (37%). Considering clinical presentation, 59 patients (54.6%) had mixed form, 32 the red (29.6%) and 17 white form (15.7%). The mean follow-up was 24.58 months with a mean of 8.6 visits per patient (4.2 times per year). The study population was divided into two subgroups according to need of therapy: 73 subjects received therapy (Group 1) and 35 did not (Group 2). Group 1 had a mean follow-up time of 30 months, receiving a mean of 10.4 visits (range 2-36; 4.2 per year), 1.4 biopsies (range 1-3; 0.57 per year) and 1.9 swabs (range 0-17; 0.7 per year) with a mean of 395 applications of immunosuppressive topical therapy (range 24-2610; 132 administrations per year) and 273 administrations of topical anti-mycotic (range 21-2264; 96 administrations per year); Group 2 had a mean follow-up time of 14 months, receiving a mean of 5.1 visits (range 1-17; 4.4 per year), 1.2 biopsies (range 1-3; 1.0 per year) and 0.5 swabs (0.4 per year). Within each group, it was possible to compare costs between Finnish and Italian patients: in Group 1 (treated patients) the mean cost was 1249 euros per Finnish patient, whereas 398 euros per Italian patient; in Group 2 (untreated patients) the mean cost was 805 euros per Finnish patient, whereas 352 euros per Italian patient.

**CONCLUSIONS:** This multicentric study provides a preliminary estimate of OLP patients management cost: the most interesting aspect was the different economic burden between Finnish and Italian Health Care Systems, being the Finnish one more expensive. Moreover, in both health care systems, to undergo therapy for OLP highly increased the economic impact. Some difficulties were encountered during the study, in fact many different pharmacological regimens were adopted, due to variable clinical response to therapy. Since OLP is considered a potentially malignant disorder, future studies should address the impact of neoplastic transformation on the economic burden of this disease.

### Stomatitis and VR-TKI: a review of current literature in 4369 patients

C. Arena<sup>1</sup>, G. Campisi<sup>2</sup>, V. Panzarella<sup>2</sup>, M. Procaccini<sup>3</sup>, K. Zhurakivska<sup>1</sup>, G. Troiano<sup>1</sup>, L. Lo Muzio<sup>1</sup>

<sup>1</sup>Dipartimento di Medicina Clinica e Sperimentale, Università di Foggia, Foggia, Italy; <sup>2</sup>Dipartimento di Discipline Chirurgiche, Oncologiche e Stomatologiche, Università di Palermo, Palermo, Italy; <sup>3</sup>Dipartimento di Scienze Cliniche Specialistiche ed Odontostomatologiche, Università Politecnica delle Marche, Ancona, Italy

**BACKGROUND:** Traditional treatment of malignancies with chemotherapeutic agents often cause the damage of normal healthy cells. Oral toxicities are a common cause of dose delays and interruption of cancer therapy. In the last decades, new targeted agents have been developed aiming to decrease the rate of side effects on healthy cells. Multitargeted tyrosine kinase inhibitors (TKI) represent a class of target specific anti-neoplastic agents. Even this kind of targeted therapy based

on VR-TKI shown some class specific adverse events that include fatigue/asthenia, anorexia/loss of appetite, hand-foot reactions, dysgeusia, diarrhea/abdominal pain, hypothyroidism, hypertension, myelosuppression and stomatitis. Literature reports that one quarter of patients treated with multitargeted angiogenesis kinase inhibitors develop an oral adverse event within 2 months of therapy.

**METHODS:** The following review was performed to answer to the question "What is the rate of incidence of oral stomatitis in patients treated with VEGF TKIs?". A systematic search was performed on the PubMed online database using a combination of MESH terms and free text words: "sunitinib" (free text) OR "sorafenib" (free text) OR "axitinib" (free text) OR "cabozantinib" (free text) OR "pazopanib" (free text) OR "regorafenib" (free text) OR "nintedanib" (free text) OR "vatalanib" (free text) combined through the use of Boolean operator AND with the key words "stomatitis" (MESH) OR "mucositis" (MESH). (i) performed on human subjects, (ii) reporting about the use of an mTOR inhibitor, (iii) written in the English language, and (iv) reporting about the incidence of stomatitis or oral mucositis. Case reports and studies on animal model were excluded from this study. No restrictions were applied to the year of publication.

**RESULTS:** The incidence of stomatitis of any grade according to the agent was 35.2% for sunitinib, 20.52% for sorafenib, 20.63% for axitinib and 34.21% for cabozantinib. All the agents showed high rates of low grade stomatitis (G1-G2) while the onset of severe stomatitis (G3-G4) was low.

**CONCLUSIONS:** Analysis of the reports with patients treated with sunitinib, sorafenib, axitinib and cabozantinib showed a clear prevalence of stomatitis grade 1 or 2. These data differ from that of patients treated with conventional chemotherapy in which mucositis is predominantly of grade 3 or 4.

## Celiac disease and clinical manifestations in the oral cavity in the pediatric patient

C. Dargenio<sup>1</sup>, S. Cefola<sup>2</sup>, A. Sinesi<sup>2</sup>, G. Giannatempo<sup>1</sup>, L. Lo Russo<sup>1</sup>, G. La Torretta<sup>1</sup>, E. Lo Muzio<sup>3</sup>

<sup>1</sup>Dipartimento di Medicina Clinica e Sperimentale, Università di Foggia, Foggia, Italy; <sup>2</sup>Associazione Italiana Celiachia, Puglia, Italy; <sup>3</sup>Dipartimento di Scienze Odontostomatologiche e Maxillo-Facciali, Università di Roma La Sapienza, Rome, Italy

**BACKGROUND:** Celiac Disease (CD) is extremely variable: it may arise with the typical gastrointestinal symptoms, but also with extra-intestinal signs and/or symptoms such as those of the oral cavity. Therefore, it is often detected lately or not diagnosed at all: approximately 70-80% of cases still escape diagnosis. The aim of this study is to observe the presence of alterations in the oral cavity of the celiac children and, in particular, the enamel hypoplasia, at variable degree (see Aine classification), and Recurrent Aphthous Stomatitis (RAS) in order to assess whether these have statistical significance such as to consider the dental visit useful to intercept the atypical forms of CD.

**METHODS:** We performed an accurate objective examination of the oral cavity in 38 celiac patients from 4 to 16 years (27 F - 71%, 11 M - 29%; average age 9.7, range 4-16), diagnosed according to the ESPGHAN criteria by a team of dentists at the dental clinic of the University of Foggia. The team searched changes in the enamel and the RAS. The parents were asked to complete a survey in order to bring out data concerning the manifestations of RAS and to evaluate some other

statistical and clinical aspects of Celiac Disease. Hypoplasia from Grade 0 to Grade IV were observed, according to Aine classification based on the symmetry and the bilateralism of the lesions and on the chronological coherence.

**RESULTS:** After objective examinations, 10.5% of patients did not show any defect of the enamel, while in 89.5% these alterations appear with a variable frequency, with a total of 221 affected teeth. Grade I lesions occur with a frequency of 68%, Grade II lesions in 15%, Grade III lesions in 12%, grade IV lesions in 5%. The most affected teeth were the incisors (frequency of 41%) followed by molars (frequency of 28%). The third incisor is the most involved dental portion (48% frequency). The manifestation of RAS occurred in 61% of cases and, after a gluten-free diet, ulcers disappeared or decreased in 77% of cases.

**CONCLUSIONS:** The results obtained with this study represent a significant statistical value that supports the possibility to use such clinical manifestations as markers of CD in those forms that manifest themselves in a non-specific way and to consider them equal to all other atypical clinical manifestations related to it. Starting from an objective examination of the oral cavity, the doctor may consider necessary to investigate about the familiarity with CD and any other signs and symptoms related to it and, therefore, decide whether and what exams require to make an early diagnosis.

## Oral amelanotic melanoma of the hard palate: a case report

A. Tempesta, L. Limongelli, P. Mezzapesa, S. Di Nanna, G. Barile, A. De Caro, G. Favio

Complex Operating Unit of Oral Pathology and Surgery, Department of Interdisciplinary Medicine, University of Bari, Bari, Italy

**BACKGROUND:** Oral melanoma is an uncommon malignant neoplasm which arises from melanocytes; the amelanotic one is extremely rare in oral cavity. Oral melanomas have unknown etiology because the affected sites are not exposed to solar radiations, however some studies have underlined a possible role of ill-fitting dentures, tobacco, amalgam tattoo, nevus and racial pigmentation as risk factors. This malignant neoplasm is really aggressive therefore an early diagnosis is mandatory to improve patient prognosis. Since an early diagnosis is difficult, amelanotic melanoma has a poorer prognosis than the pigmented one. Immunohistochemical staining is crucial for the histological diagnosis. The aim of this work is to describe a case of oral amelanotic melanoma occurred in a 50-years-old male patient.

**CASE REPORT:** In november 2017 a 50-years-old male patient, 10 cigarettes/day smoker since 20 years old, referred to Complex Operating Unit of Oral Pathology and Surgery, University of Bari, with a wide bleeding and painless lesion on the anterior and left hard palate. Clinical oral examination revealed a swelled, ulcerated, reddish and multi-lobular lesion with a firm-elastic consistency. Ortopantomography (OPT) and Computed Tomography (CT) with 3D reconstruction showed the presence of a wide and expansive osteolytic lesion involving the anterior part of the hard palate and extending on the left hard palate and the left nasal floor. Fine Needle Aspiration Cytology (FNAC), Fine Needle Aspiration Biopsy (FNAB) and incisional biopsy were performed to obtain a certain pre-surgical histopathological diagnosis. Histological features revealed a low differentiated malignant neoplasia with high replication index (Ki67 > 90%)



## ABSTRACT

and both epitheliomatoid and sarcomatoid (fuscellular) aspects. Immunohistochemical (IHC) staining was essential for neoplasm identification; positivity for S-100 and CKpool (dot-like) was found thus suggesting the diagnosis of oral amelanotic melanoma. Abdominal and neck ecography were performed in order to evaluate possible secondary locations and to achieve a neoplasm staging. No abdominal space-occupying lesion (SOL) came up (M0), while a lymphadenopathy (3,4 cm) at the left mandible angle and several bilateral hypoechoic neck lymph nodes with evident germinal centres were identified. Then, oral lesion was surgically removed by radical bone resection, extended to left upper jaw, premaxilla and nasal floor. The Patient was also sent to oncologist to organize both chemotherapy and radiotherapy treatment. Radical surgical treatment allowed the complete clinical healing of oral lesion and the patient has been rehabilitated with an obturator prosthesis. However Patient is undergoing chemotherapy and radiotherapy.

**CONCLUSIONS:** The oral amelanotic melanoma has a poor prognosis and an high aggressivity, therefore an early diagnosis and a multidisciplinary approach using medical and surgical treatments are essential for the correct management of the disease. Immunohistochemical stainings have an essential role for the correct diagnosis and, consequently, for a better therapeutical approach.

### Lymphoepithelial carcinoma in a HCV patient: a case report

F. Torelli<sup>1</sup>, G. Campisi<sup>2</sup>, R. Mauceri<sup>2</sup>, C. Arena<sup>3</sup>, M. Mascitti<sup>1</sup>, F. Bambini<sup>1</sup>, A. Santarelli<sup>1</sup>

<sup>1</sup>Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University, Ancona, Italy; <sup>2</sup>Department of Surgical, Oncological and Stomatological Disciplines, University of Palermo, Palermo, Italy; <sup>3</sup>Department of Clinic and Experimental Medicine, University of Foggia, Foggia, Italy

**BACKGROUND:** Lymphoepithelial carcinoma (LEC) is a rare subtype of oral squamous cell carcinoma, characterized by a prominent reactive lymphoplasmacytic infiltrate, morphologically indistinguishable from nasopharyngeal carcinoma. This tumor is mainly located in the nasopharynx region, although has been reported in other head and neck regions, such as oral cavity, oropharynx, nasal cavity, and paranasal sinuses. The average annual incidence rate of LEC is less than 1 case per 100,000 persons, but it has an endemic geographic distribution, particularly in Southeast Asia. This condition exhibits close association with Epstein-Barr virus (EBV). Diets deficiencies in vitamin C and consumption of food that contains potentially carcinogenic N-nitrosamines have been implicated as contributing factors. Tobacco also has been implicated as a risk factor; however, the magnitude of its contribution to carcinogenesis is subject to debate. To date, no concomitant HCV infection in patients with LEC has been reported. The first case of metastasized LEC in a man with concurrent EBV and HCV infection is described herein. **METHODS:** On April 2017, a 43-year-old Caucasian man was referred to dentistry clinic of Marche Polytechnic University by his general practitioner for 4.8 tooth extraction. Furthermore, a 2-months history of lateral cervical adenopathy was reported. His medical history was significant for HCV infection in treatment with interferon. A past history of heroin and cocaine abuse was reported, but denied any recent drug use. Regarding pharmacological anamnesis, the patient was in treatment with methadone and lorazepam. Extra-oral

examination showed an enlarged and firm neck mass, with a diameter greater than 4 cm. Diagnostic iter included neck ultrasonography, complete CT scan, and ENT examination.

**RESULTS:** Ultrasonographic investigation revealed a hypoechoic, not confluent group of lymph nodes with clear signs of periadenitis and colliquation in its innermost part. CT examination showed diffuse and confluent laterocervical adenomegalies which were associated to a hypodense ill-defined nasopharyngeal lesion and a volumetric increase of right side submandibular gland which reached basicranium passing through oval foramen. Given the CT results, an endoscopic investigation was performed. A neoplastic lesion on the right side of the nasopharynx spreading into the homolateral nasal fossa. Biopsy specimen was obtained. Histological examination showed mild differentiated nonkeratinizing squamous cell carcinoma with a prominent reactive lymphoplasmacytic infiltrate. The presence of the EBV within tumor cells was proven with in situ-hybridization.

**CONCLUSIONS:** The exam findings were consistent with a final diagnosis of locally-advanced LEC of nasopharynx with multiple latero-cervical lymphadenopathies. To date, this is the first case of a LEC of nasopharynx occurring in a patient affected with HCV infection. This is similar to the case reported by Terada et al. In 2013, describing a LEC of esophagus in a patient with concurrent EBV and HCV infection.

### MRONJ in patients treated with antiresorptive or antiangiogenic agents: a preliminary study

V. Zavaglia<sup>1</sup>, A. Nori<sup>1</sup>, F. Mazzoni<sup>2</sup>, A. Tesei<sup>1</sup>, N. Testa<sup>3</sup>, L. Lo Muzio<sup>3</sup>, A. Santarelli<sup>3</sup>

<sup>1</sup>Special and Surgical Stomatology Department, "Ospedali Riuniti" Hospital of Ancona, Ancona, Italy; <sup>2</sup>Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University, Ancona, Italy; <sup>3</sup>Department of Clinic and Experimental Medicine, University of Foggia, Foggia, Italy

**BACKGROUND:** Medication related osteonecrosis of the jaw (MRONJ) is a potential adverse effect related to the use of several drugs, including antiresorptive and antiangiogenic drugs. This pathology is triggered by a continuity solution of the mucosa, such as a dental extraction, and is characterized by the progressive bone destruction in the maxillofacial region. The presence of all the following characteristics may indicate that the patient is affected by MRONJ: current or previous treatment with antiresorptive or antiangiogenic agents; exposed bone or bone that can be probed through a fistula in the maxillofacial region that persists for more than 8 weeks; no history of head and neck radiotherapy or metastatic disease to the jaws. Regarding the pathogenesis, there are several hypotheses that could explain its unique localization to the jaws, involving inflammation and infection, bone remodeling suppression, and compromised angiogenesis. In this retrospective work we present the recurrence rate of MRONJ in a group of patients in treatment with antiresorptive (zoledronic acid) or antiangiogenic agents (denosumab).

**METHODS:** We report a case series of 12 consecutive patients affected by MRONJ, allocated in three groups on the basis of previous/current administered therapy: group A (zoledronic acid), group B (denosumab), and group C (zoledronic acid + denosumab). All patients were treated against osteoclast-mediated bone loss due to bone metastases. Age, sex, type of therapy, systemic and local risk factors were recorded. Treatment depended on the stage of MRONJ, consisting in medical and minimally-invasive surgical procedures. Follow-

up consists in regular clinical and radiological evaluation at days 10, 30, months 2, 4, 6, 8, 10, and 12, to ascertain the absence of recurrences.

**RESULTS:** 12 patients with MRONJ were selected (4 patients per group). Our results showed a mean patient age of 59.8 years (range 43-76 years). The mean bisphosphonate and denosumab administration time were 60 and 18.5 months, respectively. According to MRONJ staging, 7 cases were Stage 1, and 5 cases were Stage 2. The lesions were predominantly located in the mandible (n = 8). The most common predisposing factor was the presence of residual roots (n = 4), while regarding systemic risk factors was long-term use of systemic corticosteroids (n = 5). 3 cases of recurrent MRONJ were observed: 2 cases of Stage 2 MRONJ in group A (after 4 and 6 months, respectively) and 1 case of Stage 1 MRONJ in group C (after 4 months). No statistical differences were observed in these 3 groups regarding recurrence risk.

**CONCLUSIONS:** For prevention of MRONJ recurrences, periodical dental examinations are recommended.

### Peripheral odontogenic myxoma: report of two cases

M. Mascitti<sup>1</sup>, F. Badioli<sup>1</sup>, V. Panzarella<sup>2</sup>, L. Lo Russo<sup>3</sup>, C. Rubini<sup>4</sup>, M. Procaccini<sup>1</sup>, A. Santarelli<sup>1</sup>

<sup>1</sup>Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University, Ancona, Italy; <sup>2</sup>Department of Surgical, Oncological and Stomatological Disciplines, University of Palermo, Palermo, Italy; <sup>3</sup>Department of Clinic and Experimental Medicine, University of Foggia, Foggia, Italy; <sup>4</sup>Department of Biomedical Sciences and Public Health, Marche Polytechnic University, Ancona, Italy

**BACKGROUND:** Odontogenic myxoma (OM) is a benign mesenchymal odontogenic tumor characterized by stellate and spindle-shaped cells dispersed in an abundant myxoid extracellular matrix. OM is believed to originate from embryonic connective tissue associated with the tooth-bearing apparatus: dental papilla, follicle or periodontal ligament. The evidence for its odontogenic origin arises from several aspects, such as the almost exclusive location in the tooth-bearing areas of the jaws, the occasional association with missing or unerupted teeth, and the possible presence of odontogenic epithelium. Peripheral odontogenic myxoma (POM) is considered the extra-osseous counterpart of OM. It is very rare and significantly less aggressive, compared to OM. POM may be difficult to differentiate microscopically from other tumors with myxoid features. Hence, most POM is misdiagnosed as fibroma, irritation fibroma, neurofibroma, lipoma, fibro-epithelial polyp, extra-osseous odontogenic fibromas, nerve sheath tumors or oral focal mucinosis. We thereby present two cases of POM.

**METHODS:** Two male Caucasian men (47-year-old and 23-year-old) were referred to the Department of Maxillofacial Surgery with mucosal swellings in right mandible region. The lesions were completely excised, and histologic examination was performed.

**RESULTS:** Histologic examination of the first excised tissue revealed a white nodule with elastic consistency measuring 4.5 x 3 cm, while in the second case fragile fibrous fragments measuring 1 cm. Microscopically, the lesions were characterized by stellate and spindle-shaped cells, embedded in an extensively, discrete vascularized fibromyxoid extracellular matrix. Neither atypia, nor mitotic

activity were seen. The erosive mucosa was covered by epithelium free of atypia. The connective tissue proved chronic inflammatory infiltrate with hemosiderin iron deposits. Based up on these features, the diagnosis of POM was made in these two cases. No evidence of recurrence was found after a 7 and 9-year follow-up, respectively.

**CONCLUSIONS:** OMs can be classified into two types: central variant, located in the bone, and peripheral variant, located in the soft tissue overlying the tooth-bearing areas. According to 4th Edition of WHO Classification of Head and Neck Tumors, central OM is the third most frequent odontogenic tumor; however, POM is a very rare lesion with reported incidence less than that of other peripheral odontogenic tumors. Usually, POM presents as an asymptomatic, exophytic gingival mass without bony involvement. Clinically and histologically, POM resemble many other soft tissue lesions, so they must be diagnosed by histological examination. This is a benign tumor, less aggressive compared to its central counterpart. It showed no evidence of recurrence or metastasis, however a follow-up period is clearly necessary.

### Steinert dystrophy: a case report

R. Franco<sup>1</sup>, M. Miranda<sup>2</sup>, M. Benegiamo<sup>2</sup>, F. Valle<sup>3</sup>, F. Lucici<sup>3</sup>, M. B. Silvi<sup>3</sup>, M. Dauri<sup>3</sup>, A. Barlattani, P. Bollero<sup>2</sup>

<sup>1</sup>Department of Biomedicine and Prevention, University of Rome Tor Vergata, Rome, Italy; <sup>2</sup>Department of Systems Medicine, University of Rome Tor Vergata, Rome, Italy; <sup>3</sup>Department of Clinical Sciences and Translational Medicine, University of Rome Tor Vergata, Rome, Italy

**BACKGROUND:** Myotonic dystrophy 1 is an autosomal dominant genetic disorder. Myotonic dystrophy is caused by the expansion of the CGT triplet of the DMPK gene. The number of repetitions of the CGT triplet determines the severity of the pathology. Over 50 repetitions are present in affected individuals. The disease is subdivided clinically depending on the age of onset and the severity of symptoms in congenital, childhood-onset, adult-onset and late onset. The main symptoms are myotonia, weakness of distal striated muscle, cognitive and learning deficits, changes in cardiac conduction. A complication of myotonic dystrophy is malignant hyperthermia, which may occur following administration of some halogenated general anesthetics or by administration of muscle relaxants or surgical stress. Malignant hypertension is caused by the massive release of calcium from the endoplasmic reticulum. It is a fatal complication if not treated immediately by administration of dantrolene sodium. The aim of our study is to create recommendations for the treatment of patients with this rare syndrome.

**METHODS:** The patient S.B., suffering from myotonic dystrophy of Steinert, turns to our attention to perform an oral surgery. The patient has been inserted into a path of odontostomatological day hospital. Before the operation an anesthetic examination, blood tests and electrocardiogram were performed. The patient takes the following medications: eutirox, cardioaspirin. Cardioaspirin has not been suspended. The operation was performed using bupivacaine without vasoconstrictor, the syndesmotomy of the elements 3.2.3.1,4.1,4.2 was performed, affected by carious dextruent process, were dislocated using a lever and were avulsed by means of a clamp. During all the dental treatment an anesthesiologist was present with the constant presence of dantrolene sodium. The patient was observed for 5 hours after surgery.

## ABSTRACT

**RESULTS:** The patient showed no complications of any kind either perioperatively or postoperatively. There was no postoperative bleeding and no malignant hyperthermia crisis occurred.

**CONCLUSIONS:** The odontostomatological treatment of the patient with Steinert's dystrophy must be carried out in a protected regime and the use of local anesthetic without vasostrictor, anxietyolysis and with the constant presence of dantrolene sodium is advisable given the possibility of triggering a malignant hyperthermia crisis due to surgical stress.

### Bioinformatic and immunohistochemical analyses of BIRC5/survivin expression in oral squamous cell carcinoma

G. Troiano <sup>1</sup>, G. Pannone <sup>1</sup>, M. Pace <sup>1</sup>, K. Zhurakivska <sup>1</sup>, V.C.A. Caponio <sup>1</sup>, M. Mascitti <sup>2</sup>, L. Lo Muzio <sup>1</sup>

<sup>1</sup>Department of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy; <sup>2</sup>Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University

**BACKGROUND:** Survivin is a well-known protein involved in the inhibition of apoptosis in many different cancer types. Bioinformatics analysis focused on genetic mutations, mRNA expression, methylation and gene network. In addition, immunohistochemistry analysis from a single institution database was performed in order to study the prognostic significance of cytoplasmic and nuclear expression of survivin in OSCC. The aim of this study was to perform an integrate bioinformatic and histologic analysis in order to study the role of survivin and its related gene BIRC5 in OSCC.

**METHODS:** The expression level of the BIRC5 mRNA in OSCC samples compared to normal tissue was analyzed through Oncomine gene expression array datasets (<https://www.oncomine.org/>). In addition, the gene expression profile of two published databases (GSE85195 and GSE10121) were downloaded from Gene Expression Omnibus (GEO) using the GEO2R platform (<https://www.ncbi.nlm.nih.gov/geo/geo2r/>). In addition raw data from The Cancer Genome Atlas (TCGA) were also obtained in order to analysis: the rate of mutations, gene expression and methylation in patients with oral squamous cells carcinoma (OSCC). Immunohistochemistry (IHC) was also performed, on a Tissue Micro Array (TMA) of a single institution, in order to evaluate the nuclear and cytoplasmic expression of Survivin in samples from OSCC patients.

**RESULTS:** Data from this study revealed that Survivin is rarely mutated in OSCC samples, and is upregulated compared to non-cancerous tissue. Data from the TCGA database revealed that BIRC5 gene expression is an independent prognostic factor for OSCC. Analysis of the network revealed that: CDKN2a, MYC and FOXM1 control the expression of BIRC5, while: AKT1-3, PRCACA, BUB1 and CSNK2A1 controls a reaction that changes the state of the survivin protein (Figure 3). Correlations analysis between BIRC5 mRNAs expression, methylation and clinicopathologic parameters of patients with OSCC revealed a significance inverse correlation between the methylation and the mRNA expression of BIRC5, in addition mRNA expression correlated with the stage of the disease. In addition, IHC staining revealed that cytoplasmic but not nuclear expression of Survivin correlates with a poor overall survival in OSCC patients.

**CONCLUSIONS:** Aggregate bioinformatic and immunohistochemical analysis revealed that survivin is overexpressed both at mRNA and protein level. In addition, it represents an independent prognostic factor in patients with oral squamous cell carcinoma.

### PD-L1 expression in oral squamous cell carcinoma microenvironment and prognostic correlations

V.C.A. Caponio <sup>1</sup>, G. Troiano <sup>1</sup>, M. Pace <sup>1</sup>, G. Pannone <sup>1</sup>, C. Arena <sup>1</sup>, G. Campisi <sup>2</sup>, L. Lo Muzio <sup>1</sup>

<sup>1</sup>Dipartimento di Medicina Clinica e Sperimentale, Università di Foggia, Foggia, Italy; <sup>2</sup>Dipartimento di Discipline Chirurgiche, Oncologiche e Stomatologiche, Università di Palermo, Palermo, Italy

**BACKGROUND:** Tumor Microenvironment stands for the complex organization and pool of different cell types that are able to produce different molecules, which take part in different cellular mechanisms, such as cell growth and metastasis. Tumor Associated Macrophages (TAM) seems to be involved in increase of survival cells, angiogenesis and metastasis, leading to a poorer prognosis. Recently, different studies showed the importance of PD1-PDL1 interaction in the therapy of different cancers. PD1 (Programmed Death 1) is usually expressed on the extracellular side of the T-cell membrane. In many cases, PD-L1 has been showed to be overexpressed on the surface of tumoral cells. The interaction between PD1/PD-L1 leads to a T cell dysfunction, decreasing the immune response against the cancer cells. Nivolumab and Pembrolizumab, are monoclonal antibodies directed against the Programmed Cell Death Protein 1 (PD-1) receptor. They both showed a therapeutic benefit in different kinds of cancer. Anyway, in one hand, it has emerged that not all PD-L1-expressing tumors respond to PD-1/PD-L1 inhibitors. On the other hand, PD-L1-negative tumors can respond to these agents (Aguir et al. 2016). Background of this study is to investigate the PD-L1 expression in the Microenvironment of Oral Squamous Cell Carcinoma (OSCC) samples and its correlation to prognostic data.

**METHODS:** Three paraffine recipient blocks for Tissue Micro Array (TMA) were constructed by coring 44 paraffine donor blocks. The HPV status was assessed by performing In Situ Hybridation (ISH) using probes for HR-HPVs 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, e 66 (Inform HPV family-III 16 Probe; Ventana -Roche) and s for LR-HPVs, 6, 11 (Inform HPV family-II 6 Probe; Ventana - Roche). Immunohistochemistry (IHC) to detect PD-1 and PD-L1 expression was performed on consecutive 4-micron sections by using Ventana Benchmark® autostainer using rabbit monoclonal anti-PD-L1 clone SP142 and PD-1 (NAT105) by Ventana-Roche. Every 0,6 mm core section has been evaluated for degree of lymphoid cell infiltration surrounding the tumor nests, according to Wada grading system [ Wada T. et al. Nature of monoclonal cell infiltrates in oral squamous cells carcinoma and its clinical significance Wakayama Med Rep 30: 103-117. 1989]. Tumor-infiltrating lymphocytes (TILs) was identified by morphology. PD-1, PD-L1 IHC expression has been assessed in tumor cells and inflammatory cells evaluating the intensity of stain. Statistical analysis was performed by using SPSS.Ink Software v.20.

**RESULTS:** Kaplan-Meier Univariate Analysis showed correlation between presences of tumor associated lymphocytes (TIL) and better survival data (p=0,024). We observed positivity for PD-L1 tumor cells in 8 cases on 38 cases that were evaluable, 21% of total cases, against a mean of 60% in literature. This data was not significant in any association. Kaplan-Meier Univariate Analysis showed correlation between the presence of macrophages and better prognosis in patients (p=0,008) Hazard Ratio=0,092 (CI 95% 0,009-0,926). We observed a correlation between PD-L1 negative macrophages and a worst prognosis. This data was near Statistical significance p=0,054. **CONCLUSIONS:** Different studies showed a different



pattern of expression of PD-L1 in different cell types associated to the tumor, highlighting the differences in therapeutic response. A better understanding of PD-1/PD-L1 expression in the different cell types involved in the tumor environment should be the new aim of next studies, for a better understanding of this molecular process and the selection of patients, which could undergo new immune therapies.

## Relevance of hypovitaminosis D in the etiology of periodontitis in special needs patients

F. Gianfreda, M. Miranda, N. Ranieri, C. Gionta, C. Raffone, R. Franco, P. Bollero<sup>1</sup>, A. De Lorenzo<sup>2</sup>

<sup>1</sup>Associate Professor of Special Odontostomatological Pathology, University of Rome "Tor Vergata"; <sup>2</sup>Professor of Diet and Human Nutrition, University of Rome "Tor Vergata"

**BACKGROUND:** The aim of this review is to focus on the probable correlations between Periodontitis due to *Porphyromonas gingivalis*, pro-inflammatory cytokines and Hypovitaminosis D associated to several systemic diseases such as Hepatitis B and C, Morb of Crohn and Celiac Disease. **METHODS:** It proceeded with the review of the literature on the search engine PUBMED/MEDLINE, combining the keywords "Hypovitaminosis D", "Systemic Diseases" and "Periodontitis". The selection criteria were articles conducted in vitro or in clinical trial mode on humans. **RESULTS:** Periodontitis is not directly caused by *P. gingivalis* infection but has a multifactorial etiology and is associated after inflammation with the adherence and colonization of pathogenic bacteria on the gingival epithelium. The importance of Vitamin D is that reduces periodontitis related to *Porphyromonas gingivalis* by the inhibition of IL-8 expression in periodontal ligament cells (Tang et al). What is more, also IL-10 might be involved in the repair of periodontal tissue (Goutoudi et al.). Many studies suggest that 1,25(OH)2D3 improved the expression of IL-10 that might suppress the inflammatory response, promote the repair of periodontal tissue, and reduce immune-associated injury to periodontal tissue. DBP was measured in the GCF and plasma of patients with GAgP but without systemic disease. It was found that patients with GAgP had lower GCF DBP concentrations (Xin Zhang et al). The aim of this cross-study was to underline that many systemic diseases can lead to vitamin D or DBP deficiency that can involve to a predisposition to Periodontitis. Celiac disease leads to an altered intake of Calcium or Vitamin D, but it has also been hypothesized (Sadeghian et Al. 2016) that Crohn's disease leads to a deficit of the same micronutrient. Being DBP is an alpha-globulin it is synthesized by the liver and therefore its deficit is resistant to all hepatic diseases such as cirrhosis, hepatitis B and C. Therefore all these diseases can indirectly favor the presence of severe periodontitis. In these patients, subsequent studies could focus on topical administration of deficient micronutrients. In this way it could be possible to modulate the action of *P. gingivalis* and in general of many cytokines that act negatively on inflammation. **CONCLUSIONS:** Since periodontitis is a multifactorial disease it is very difficult to investigate the correlation between hypovitaminosis D, systemic diseases and oral manifestations of this. More cross studies are needed to clarify how all these factors can affect oral health.

## Salivary biomarkers for diagnosis of cardiovascular disease: a systematic review

M.E. Pezzi Margherita<sup>1</sup>, M.V. Viani<sup>1</sup>, B. Borrello<sup>2</sup>, P. Vescevi<sup>1</sup>, I. Giovannacci<sup>1</sup>, M. Meleti<sup>1</sup>

<sup>1</sup>Unit of Oral Medicine, Oral Pathology and Oral Laser Surgery, Centro Universitario di Odontoiatria, Department of Medicine and Surgery, University of Parma, Parma, Italy; <sup>2</sup>Cardio-surgery Department of General and Special Surgery, Azienda Ospedaliera Universitaria di Parma, Parma, Italy

**BACKGROUND:** Cardiovascular disease (CD) is the first cause of death for disease, approximately 17.3 million people per year in the world. The global prevalence of this group of diseases has been 422,7 million in 2015. CD has a terrific economic impact, on the basis of costs for diagnosis and therapy, early death of patients and disability. It has been estimated a total amount of expenses of around 400 billion of dollars for year. Apart the development of traditional diagnostic approaches for CD, alternative methods have gained interest in the last year. Among these salivary diagnostics if rapidly gaining popularity. Saliva is a complex fluid, easy to transport and store, non-invasive to collect, and it reflects somehow blood composition. Several molecules dispersed in saliva can be used as diagnostic and prognostic biomarkers for a wide range of diseases. The aim of the present systematic review is to define if there is scientific evidence to support the role of salivary biomarkers for diagnosis of CD. **METHODS:** We searched into Medline, Scopus and Web of Science databases using as entry terms the combination of "saliva" with "diagnosis", "systemic disease", "biomarkers", "cardiac disease", "heart", "myocardial infarction" and "coronary disease". We included only studies in English and published after 2000. We considered only studies on saliva sample, addressing CD, and evaluating biomarkers for diagnosis. We excluded studies on animals or *in vitro* samples and papers dealing with systemic microbial infections, hormones, drugs dosage. Research investigating correlation between CD and periodontal disease were not considered. References listed in reviews, were screened in order to identify papers possibly missing from the database search. Information extracted included title, Authors, publication year, type of biomarker, biochemical method and device used to analyse saliva. Quality of studies was assessed according to the guidelines of the National Institute of Health (NIH - scores ranging from "poor" to "good"). **RESULTS:** Starting from a total amount of 18348 records, we selected 13 studies meeting inclusion and exclusion criteria. Two more papers were identified through the screening of the reference lists of five reviews. One article was excluded because concerning the state-of-art of devices for detecting molecules in cardiopatic patients. Eventually, 14 papers were taken into consideration for inclusion in the present review. In all studies biomarkers were proteins. Twelve out of 14 papers reported statistically significant results of association between CD and biomarkers. Following the NIH quality assessment, twelve articles were scored as "fair quality" (85%) and two articles as "good quality" (15%). No one of the papers included was considered as having "poor quality". **CONCLUSIONS:** The use of saliva as a diagnostic tool seems to be a realistic possibility for the diagnosis of CD. Most of the articles evaluated here showed statistically significant results.

The future for research should include the sensibility and specificity of methods and devices used in salivary diagnostics.

## ABSTRACT

**Gingival tuberculosis in a systemically compromised patient: a case report**

L. Perini, C. Zappella, P. Cappare', A. Lissoni, S. Abati

*Oral Pathology - Dept. of Dentistry IRCCS San Raffaele University hospital - University Vita Salute San Raffaele, Milano Italy; \*Military Airforce - Centro Sportivo Aeronautica Militare, Vigna di Valle (Roma) Italy*

**BACKGROUND:** This case report has the purpose to present an unusual case of gingival tuberculosis in a compromised and immunosuppressed female patient. It is crucial to perform a thorough diagnostic evaluation in a case with an unusual necrotizing gingival disease resistant to conventional treatments. Tuberculosis is an infective granulomatous disease, caused by different species of mycobacterium, especially by *Mycobacterium tuberculosis*. Even though the disease is mainly pulmonary, the infection can be present as extrapulmonary tuberculosis with several different localizations and with rather uncommon lesions in the mouth. The disease is transmitted through air droplets and, in immunocompetent patients, is usually asymptomatic. Recently an increase in the prevalence of extrapulmonary manifestations of the disease has been described.

**METHODS:** A 73 years old female patient was referred to the Oral Pathology Dept. with chronic necrotizing periodontitis with gingival pain and hemorrhage in the upper central gingiva, gingival hyperplasia, purulent secretions and upper labial swelling. The gingival disease worsened in the last weeks, in spite of repeated appointments for periodontal local treatment. The patient was in poor medical conditions and reported a previous diagnosis of granulomatous vasculitis n.o.s., Addison disease, chronic bronchitis and severe asthma; moreover she had recently a severe episode of fecal impaction due to the electrolytic imbalance. The clinical oral examination revealed a localized and severe necrotizing periodontitis with exposure of root areas of the central incisor, lateral incisor and canine in the upper right maxilla. She also had a painful gingival hyperplasia, with purulent and malodorous secretions and a remarkable upper labial swelling. In suspicion of a gingival granulomatous disease and/or infection, the possibility of tuberculosis explaining the respiratory symptoms was not confirmed as the quantiferon test and the chest radiography had negative results. Despite the poor medical condition of the patient, the oral pathologist scheduled a gingival biopsy. Unfortunately just two days before, the patient accidentally fell at home with a hip fracture. During the orthopedic admission, new exams were executed due to the respiratory symptoms and distress; the bronchoscopy revealed the presence of pulmonary nodules associated with positivity of *Mycobacterium tuberculosis* specific PCR and confirmation of the suspect for the hypothesized tuberculosis. The patient was transferred to the regional Tuberculosis Center and the specific treatment established with specific treatment with isoniazid, ethambutol and rifampin. The therapy was effective for the oral and systemic symptoms: in about three months the vasculitis, the respiratory symptoms, the upper labial swelling and the gingival disease subsided with re-epithelialization of the gingival mucosa.

**CONCLUSIONS:** Tuberculosis is mainly known as a pulmonary disease, but in the present case the gingival disease was the leading manifestation of the disease although the diagnosis was very difficult to achieve due to the systemic impairment of the patient. After the PCR confirmation the appropriate treatment has been administered and lead to the improvement of the clinical conditions and the regression of the oral lesions.

**Clinical and epidemiological differences in patients treated with denosumab and bisphosphonates with regard to medication-related osteonecrosis of the jaws (MRONJ). Analysis of 296 cases**

G. Ghidini, M. Meleti, M. Manfredi, P. Vescovi

*Oral Medicine and Oral Surgery Laser Unit, University Center of Dentistry, Department of Medicine and Surgery, University of Parma, Parma, Italy*

**BACKGROUND:** Since the update released by the American Association of Oral and Maxillofacial Surgeons (AAOMS) in 2014 new drugs have emerged as being associated to the development of medication-related Osteonecrosis of Jaws (MRONJ). Among these, denosumab, a monoclonal antibody, appears to be the most frequently prescribed drug both for oncologic and non-oncologic patients. The present study aims to highlight possible differences between patients affected by MRONJ and treated with bisphosphonates alone and patients affected by MRONJ treated with denosumab alone or in combination with bisphosphonates.

**METHODS:** We retrospectively analysed 296 patients affected by MRONJ referred at the Center of Oral Medicine and Laser Surgery of the Academic Hospital of the University of Parma, between January 2004 and March 2018. We subclassified patients into 3 groups according to therapies. Group 1 (G1) included 279 (94%) patients treated with bisphosphonates alone. Group 2 (G2): 9 patients, who were administered with denosumab in combination with bisphosphonates (3,3%) and Group 3 (G3): 8 patients (2,7%) who underwent therapy with Denosumab alone. We compared gender, stage, possible cause of MRONJ (dental extraction, placement or presence of implants, bone surgery, periodontal disease, unfitting prosthetic or "spontaneous MRONJ" when a specific cause was not to be identified) and disease for which the drug was administered (cancer or non-cancer).

**RESULTS:** G1 included 71 males (25,45%) and 208 females (74,55%), 204 were treated for cancer reason (73,12%) and 75 (26,88%) for non-cancer. Stages were as follows: 10 patients stage 0 (3,58%), 106 stage I (37%), 115 stage II (41,22%) and 48 stage III (18,2%). In 132 cases (47,31%) MRONJ followed a dental extraction, in 16 patients it was associated with dental implants or bone surgery (5,73%), 33 patients presented unfitting prosthesis (11,83%), 19 were affected by periodontal disease (6,82%) in the area of necrosis and in 79 patients (28,31%) no causes were identified. G2: 3 males (33,4%) and 6 females (66,6%), 6 of them treated for cancer reason and 3 for non-cancer. Two patients presented with stage I, 5 with stage II (55,6%) and 2 with stage III. Two patients underwent dental extractions before developing MRONJ, two had unfitting prosthesis and 5 MRONJ were classified as "spontaneous". G3 included 5 males (62,5%) and 3 females (37,5%), 7 (87,5%) treated for cancer and 1 (12,5%) for non-cancer. Stages were: 3 stage I, 4 stage II (50%) and 1 stage III. Three MRONJ were classified as "spontaneous", 3 were preceded by dental extraction, 1 was associated with implants and 1 with an unfitting prosthesis.

**CONCLUSIONS:** Even if patients undergoing monoclonal antibodies therapy are fewer than patients treated with bisphosphonates, such a category is likely to become more representative in the near future, because of the higher number of prescriptions of the newest antiresorptive-antiangiogenic drugs. Patients treated with denosumab show to be more frequently males and to develop more frequently "spontaneous" MRONJ.

A more accurate description of features of patients with monoclonal antibodies-associated ONJ might allow clinicians to better treat or prevent MRONJ. Further investigations are needed especially on epidemiological aspects and management.

### Snus, the smokeless tobacco: a digital survey in a cohort of young italians

C.M. Morini, A. Lissoni, B. Mainardi, F. Toma, P. Cappare', G. Gastaldi, S. Abati

*Oral Pathology, Dept. of Dentistry IRCCS San Raffaele University Hospital, University Vita Salute San Raffaele, Milan, Italy*

**BACKGROUND:** *Snus* is a heat-treated oral moist snuff tobacco, a kind of smokeless tobacco, that represents an alternative to traditional tobacco smoking. The purpose of this survey is to demonstrate the existence of this relatively new trend among the young Italian population, with the aim to extend and spread the awareness and acknowledgment about this substance and the possible oral lesions that may derive from its abuse.

**METHODS:** A specific digital questionnaire has been created through the Google Forms platform and released with its own link through the Internet and the social supports for 4 weeks. According to the affirmative answers of the respondents, the questionnaire automatically proceeded with more specific questions about the use, frequency and any visible change inside the oral cavity that were noticed by the consumers.

**RESULTS:** The survey was completed by 332 interviewees of which 65% were males with a mean age of 22.7 years old and 61% of them were college students. Among the 52 different areas of residence, the most representatives of the sample were in the Northern areas of Italy, with Sondrio, Milano, Bergamo, Aosta and Belluno. Two-hundred thirty-two respondents declared to know what is *snus* tobacco and one-hundred eighty-nine subjects did try it once in their lifespan. One-hundred fifty subjects use habitually *snus* tobacco: 53% more than once a day and 17% at least once a day. The 35% of the 150 users uses regularly *snus* from more than 5 years. The single tobacco pouch of *snus* is usually applied between the upper lip and the gingiva and it stays in the oral cavity for a time frame that goes from 15 to 30 minutes. The 71% of the subjects among the regular users referred a color change of the gingiva and the 53% reported a color change of the labial mucosa. Gingival bleeding is mainly reported in the subjects with a high intake of *snus*. No teeth changes were reported in 72% of the users, but gingival recessions were recorded in the 26%, increased dental sensitivity, teeth erosion and discoloration. Bad breath (halitosis) was reported by the 16% of the subjects. The 50% of the habitual users believe that their body developed an addiction and 90% of them do not smoke regular cigarettes.

**CONCLUSIONS:** The *snus* tobacco use is no longer an exclusive prerogative of the countries of Northern Europe and North America, but it is a rising phenomenon in countries such as Switzerland and with a potential diffusion in the regions and areas of Northern Italy. It is mainly used in the mountain area. This kind of tobacco can induce lesions of the oral cavity, such as gingival recessions and leukoplakia and other possible correlations with other pathologies are actually under investigation. It is essential to keep an update about the possible other alternative use of tobacco products, to be able to identify the clinical signs, to give to the patients a reliable and effective education promoting the prevention of the oral and systemic health.

### Clinical evaluation of specific oral manifestations in pediatric patients with ascertained versus potential coeliac disease

G. Matacena<sup>1</sup>, M. Cicciù<sup>2</sup>, L. di Benedetto<sup>1</sup>, M. G. Piancino<sup>1</sup>, E. Bramanti<sup>3</sup>

*<sup>1</sup>CIR Dental School, Department of Surgical Sciences, Division of Orthodontics, University of Turin, Turin, Italy; <sup>2</sup>Department of Human Pathology, School of Dentistry, University of Messina, Messina, Italy; <sup>3</sup>Resident Department of Clinical and Experimental Medicine and Stomatology, University of Messina, Messina, Italy*

**BACKGROUND:** Coeliac disease (CD) in children may present not only with classical gastrointestinal symptoms but also with a large variety of nonspecific signs and symptoms. Nowadays it is widely demonstrated that, among these atypical signs of CD, there are some oral manifestations which are strictly related to ascertained coeliac disease but no paper has analyzed these oral lesions in potential coeliac patients. The aim of this study was to investigate the presence of specific oral hard and soft tissue lesions in potential and ascertained coeliac disease children.

**METHODS:** A total of 71 paediatric patients (2-16 y.o.) referred to the Department of Pediatric Gastroenterology and Cystic Fibrosis of "AOU G. Martino Hospital" in Messina with the suspected diagnosis of CD, underwent to a specialist paediatric visit, based on the positivity of CD-related serological tests, following by histological confirmation on duodenal biopsy. They were divided into two groups, according to the histopathological diagnosis they received: A Group: 50 ascertained coeliac patients with 2 or 3 histotype according Oberhuber (i.e. patients who show positive serological patterns with damage to the intestinal mucosal architecture); B Group: 21 potential coeliac patients with 0 or 1 histotype according Oberhuber (i.e. patients who report positive coeliac-related antibodies but with normal mucosa at the jejunal biopsy). 54 healthy subjects who were age-/sex-matched, were enrolled as controls, belonging to the C Group. Every patient was subjected to a specialist dental visit performed by the same blind operator, who did not know patients' diagnosis. For all 125 children the following intra- and extraoral clinical manifestations were evaluated, recorded, classified, and finally photographed:

- specific and unspecific enamel defects (SED-unSED)
- dental delayed eruption (DDE),
- recurrent aphthous stomatitis (RAS)
- geographic tongue (GT),
- burning tongue (BT)
- atrophic glossitis (AG),
- angular cheilitis (AC)
- dental caries (DC).

**Statistical Analysis:** categorical variables were analyzed using chi-square test or Fisher's exact test, as appropriate.  $P < 0.05$  was considered statistically significant.

**RESULTS:** The overall oral lesions resulted more frequently present in coeliac patients than in healthy controls ( $P < 0.05$ ). The prevalence of oral soft tissue lesions (RAS, GT, BT, AG, AC) was 62% in A Group, 76.2% in B Group, and 12.96% in C Group ( $P < 0.05$ ). Clinical DDE was observed in 38% of A Group and 42.5% of B Group versus 11.11% of C Group ( $P < 0.05$ ). The prevalence of specific enamel defects (SED) was 48% in A Group and 19% in B Group versus 0% in controls ( $P < 0.05$ ; OR = 3.923).

**CONCLUSIONS:** The oral soft tissue lesions were more frequent in potential coeliac patients, while oral hard tissue lesions affected a greater number of ascertained coeliac children.



## ABSTRACT

Specific enamel defects could have an etiological link with the malabsorption condition induced by histopathological intestinal damage and villous atrophic lesion. The preventive recognition of these specific oral lesions by the dentist should allow preventing the disease's manifestations on the intestinal mucosa, making an early suspected diagnosis of CD, avoiding the occurrence of gastrointestinal symptoms and more severe pathological injury with a better prognosis. In this way, an early diagnosis of potential CD permits to set a gluten-free diet in order to avoid intestinal histopathological degeneration and to ensure a balanced childrens' growth.

### Salivary cytokines and chemokines in patients affected by oral squamous cell carcinoma: a case-crossover study

M. Val, L. Manini, R. Marino, M. Pentenero

University of Turin, Department of Oncology, Unit of Oral Medicine and Oral Oncology, Turin, Italy

**BACKGROUND:** Oral squamous cell carcinoma (OSCC) is the 6<sup>th</sup> most common malignancy worldwide with significant morbidity and mortality. The well-known poor survival rate are often due to diagnostic delay. Salivary biomarkers for the early detection of OSCC could be tested through non-invasive sampling performed by practitioners without specific clinical experience, thus representing an important aid in early diagnosis. The present study aims at evaluating potential variations in the salivary concentration of cytokines in presence of OSCC. **METHODS:** The salivary concentration of cytokines has been assessed in OSCC patients, in a case cross-over setting, thus eliminating the potential bias related to inter-individual variations. Patients with newly diagnosed primary OSCC who underwent surgical excision were prospectively enrolled in the present study. Unstimulated whole saliva were collected and stored  $-80^{\circ}\text{C}$  for future analyses. Samplings were performed at the moment of diagnosis (T0) and 2 months after surgery (T1) in cases with free margins, no indication to adjuvant treatments and absence of clinical suspicion of residual disease. In 2 cases, a third sample was obtained in occasion of relapsing/recurrent disease (T2). The concentration of cytokines was evaluated with the BIO-PLEX® system (Bio-Rad Laboratories Inc, Hercules, CA, USA), which exploit suspension immunofluorescence array, according to manufacturer's indications. The concentration of the following 27 salivary molecules was simultaneously analysed: IL-1 $\beta$ , IL-1 $\alpha$ , IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12, IL-13, IL-15, IL-17, basicFGF, Eotaxina, G-CSF, GM-CSF, IFN- $\gamma$ , IP-10, MCP-1, MIP-1 $\alpha$ , MIP-1 $\beta$ , PDGF-BB, RANTES, TNF- $\alpha$  and VEGF. In order to address potential intra-individual variability, in 5 patients repeated samplings before surgery were performed. Tests for repeated measures were performed: the Friedman test to analyse the intra-individual differences and the t-test or Wilcoxon test to evaluate differences in cytokines' salivary concentration before and after treatment of OSCC. Data were analysed using SPSS statistical software for Windows version 22 (IBM SPSS Software). **RESULTS:** After surgery, one patient was excluded due to the pathology report; therefore, 21 patients with an average age of 65.4 years entered the study. The analysis of intra-individual repeated measures did not show any significant variation. The comparison between samples obtained in presence or in absence of disease showed that OSCC lead to an increase in concentration of IL-8 ( $p = 0.004$ ), IL-6 ( $p = 0.005$ ), VEGF ( $p = 0.014$ ),

MIP-1 $\beta$  ( $p = 0.033$ ), IP-10 ( $p = 0.047$ ), IL-1 $\beta$  ( $p = 0.049$ ) and to a reduction in the concentration of IFN- $\gamma$  ( $p = 0.036$ ) and IL-5 ( $P = 0.048$ ). Of interest in cases with relapsing/recurrent disease IL-5 (increased), IL-6 (decreased) and MIP-1 $\beta$  (decreased) seemed to reflect the presence of carcinoma.

**CONCLUSIONS:** Very little is known about factors influencing intra/inter individual variations of salivary concentration of cytokines, so that such variations could bias their role as diagnostic biomarkers for SCC. Comparing the same subject in presence or in absence of disease reduces potential biases avoiding intra-individual factors. The present results are in keeping with previous literature citing significant variations of IL-6, IL-8, VEGF, and IL-1 $\beta$  and highlight other molecules never previously addressed. Before using such test for early detection of carcinoma, further studies are needed in order to confirm such preliminary results and to determine reference values indicating presence or absence of the disease.

### Effectiveness of treatment of oral lichen planus with a short course of topical steroids: a case report

C. Casu<sup>1</sup>, R. Botta<sup>2</sup>, L. Viganò<sup>3</sup>, L. Casula<sup>2</sup>, O. La Spesa Martinengo<sup>2</sup>, F. Mottola<sup>2</sup>, A. Lissoni<sup>2</sup>, R. Vinci<sup>2</sup>, S. Abati<sup>2</sup>

<sup>1</sup>Private Dental Practice, Cagliari, Italy; <sup>2</sup>Dept. of Dentistry, University Vita Salute San Raffaele, Milan, Italy; <sup>3</sup>University of Milan, Dept. Radiology, Milan, Italy

**BACKGROUND:** Oral lichen planus (OLP) can have severe and bothering symptoms with burning and painful lesions interfering with oral functions. Thus the dentist should take care of the affected patient and prescribe an appropriate therapy accordwith the indication with the oral physician to relieve the distress of the patient.

**METHODS:** A 76-years-old female patient came to our observation for the evaluation of the clinical condition of the oral mucosa. She reported the medical history with two episodes of myocardial infarction, occurred 7 and 9 years before and a congenital liver angioma surgically treated 26 years before. She also reported G-6-PD enzyme deficiency and several food allergies. With the clinical oral examination the oral mucosa showed diffuse inflammation, with erythematous reddish appearance localized mainly in the tongue borders, the cheek mucosa and vestibula of the lips; the diseased areas showed white striae, with a reticular arrangement, present since about 8 months. The patient was symptomatic and reported a severe burning sensation in her mouth interfering with food and beverages assumption. The clinical aspect led to an hypothetic diagnosis of Oral Lichen Planus (OLP). An incisional biopsy with cold blade surgery was programmed and obtained from a relevant area in the inferior labial mucosa. Histopathological examination confirmed the diagnostic hypothesis. Following the suggestions of the oral medicine expert, the GPD prescribed a course of topical therapy for three weeks with: 0.05% clobetasol ointment mixed with hydroxypropyl cellulose to be applied on diseased area of oral mucosa daily t.i.d.; nistatin suspension in oral rinses t.i.d.; hyaluronate and aminoacid gel (Aminogam Gel®) to be applied on injured mucosa t.i.d for 1 month.

**CONCLUSIONS:** At the one month follow-up appointment the patient showed almost complete remission of the lesions and cessation of the clinical symptoms. This clinical case showed that an approach with a correct diagnosis and an appropriate therapy could be resolutive even in a short period of time.

## Rare case of odontogenic cyst in special need patient: case report

M. Basilicata, F. Cecchetti, R. Franco, G. Vazzana, M. Iannò, L. Roselli, J. Accardo, A. Barlattani

<sup>1</sup>Department of Clinical Sciences and Translational Medicine, University of "Tor Vergata", Rome, Italy; <sup>2</sup>Special Needs Dental Unit, Policlinico University of Rome "Tor Vergata", Rome, Italy

**BACKGROUND:** Cyst is a pathological cavity that contains liquid, not ascribable to purulent material. They are divided in two main groups based on the probable origin of the coating epithelium: odontogenic cysts, whose epithelial residues derive from the organ from which the tooth originates, non-odontogenic cysts. Odontogenic cysts are classified according to the WHO 1992 classification in the gingival cyst of the infant, odontogenic keratocysts, follicular cysts, eruption cysts, lateral periodontal cyst, adult gingival cysts, odontogenic glandular cyst, inflammatory root cyst. The most frequent odontogenic cyst is the inflammatory radicular cysts (frequency 60-65%). The aim of our study is to describe the abnormal presence of a cyst located on the surface of the adherent gingiva in correspondence of the elements 4.4.4.5 and the surgical resolving approach.

**METHODS:** The special need patient, affected by Myotonic Dystrophy, presented himself to Special Needs Dental Unit of Policlinico University of Rome "Tor Vergata" for the presence of a neof ormation localized on the adherent gingiva in correspondence of the elements 4.4-4.5. All risk factors for neoplasia were excluded as non-smokers and lack of traumatic factors. Tc Dentalscan of the lower dental arch is prescribed and cortical erosion has been noted in correspondence with the dental elements in question which were vital. We have decided to perform an excisional biopsy of the lesion and to cruet the areas of bone erosion. The patient carried out a pre-operative antibiotic prophylaxis and after performing local anesthesia with vasoconstrictor a full-thickness trapezoidal flap was set up. The gingival lesion was removed and the bone has been cleaned. The area was sutured with 3.0 silk and the finding after formalin fixation was sent to the pathological anatomy service.

**RESULTS:** The histological sample has been analyzed and it has emerged that it is an odontogenic cyst with gingival localization probably attributable to gingival odontogenic cyst which is a very rare condition.

**CONCLUSIONS:** This case report showed how odontogenic cysts can occur in very abnormal localizations such as the gingiva and which can also cause cortical erosion. This abnormal localization could be linked to the genetic pathology. This correlation will surely be the object of our next research.

## YouTube content analysis for oral lichen planus

F. Loffredo, C. Maio, R. S. Paparella, M. Di Petrillo, F. Fiori, A. Romano, C. Salerno, L. Laino, A. Lucchese, R. Serpico, D. Di Stasio

Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania "Luigi Vanvitelli", Naples, Italy

**BACKGROUND:** Oral lichen planus is a chronic inflammatory mucocutaneous disorder that typically affects the oral

mucosa and the skin. The etiology of OLP is still unknown and the disease presents a multifactorial pathogenesis. Clinically, OLP may manifest in four clinical forms: papular/reticular, plaque-like, erythematous and erosive. YouTube™ is increasingly being used from patients to obtain health-related information. No studies have evaluated the content of YouTube™ videos on OLP. The aim of this work is to examine the quality of information offered by this platform about OLP.

**METHODS:** The term 'oral lichen planus' was searched on YouTube™. The first 60 videos were examined. Each video was given a score from 0 to 13 to indicate its usefulness in informing patients about clinical findings, local and general health effects, prevention and therapeutic strategies. Descriptive statistics were generated using R software, Pearson's analysis was used to examine correlations between variables; analysis of univariate variance and linear regression analysis were made to confirm the correlation hypothesis.

**RESULTS:** The main source of upload was from healthcare channel (61.54%), followed by healthcare professional (23.07%), individual users (12.82%) and generalist information channels (2.57%). 20.5% did not give any clinical informations about OLP. The majority (48.7%) presented at least one image showing the clinical presentation of the pathology and 17.9% of the videos discussed about the local health effects, in particular all of them mentioned burning sensation and pain as symptoms. Only 12.9% gave more accurate informations, showing images demonstrating the clinical presentation of OLP and describing the possible symptomatology. 62.5% gave explanations about therapy. Of these, the majority focuses on homeopathic strategies. The mean US score of all the videos analyzed was 2,18±1.62 with a maximum score of 9.0 and a minimum score of 1.0; in fact, 84.61% of them resulted to be slightly useful, the 12.82% moderately useful and only the 2.57% of them resulted to be very useful for the patient; anyway, no videos have been cataloged as not useful. Pearson's analysis revealed a strong correlation between US and VL ( $r=0.466$ ), US and NL ( $r=0.549$ ) and US with VR ( $r=0.422$ ).

**CONCLUSIONS:** The revealed evidence of a significant correlation between the effectiveness of Youtube™ video's contents and the parameters related to users allows us to reflect on how much the patient is able to perceive the didactic accuracy of what is expressed on the web platform. Nevertheless, the quality of the medical-scientific content of the videos is to be considered still poor. By virtue of the fact that most of the advisors belong to the HP and HC groups, scientific community should aim to standardize the basic requirements to disseminate contents through educational videos, or to carefully check and verify their accuracy, adequacy and appropriateness.

### References

1. Di Stasio D, Guida A, Salerno C, Contaldo M, Esposito V, Laino L, Serpico R, Lucchese A. Oral lichen planus: a narrative review. *Front Biosci (Elite Ed)*. 2014 Jun 1;6:370-6. Review. PubMed PMID: 24896212.
2. Di Stasio D, Romano A, Paparella RS, Gentile C, Serpico R, Minervini G, Candotto V, Laino L. How social media meet patients' questions: YouTube™ review for mouth sores in children. *J Biol Regul Homeost Agents*. 2018 Jan-Feb;32(2Suppl. 1):117-121. PubMed PMID: 29460528.
3. Carrozzo M, Thorpe R. Oral lichen planus: a review. *Minerva Stomatol*. 2009 Oct;58(10):519-37. Review. English, Italian. PubMed PMID: 19893476.

## ABSTRACT

**Knowledge, practice and attitude about OSCC prevention among Calabrian primary care physicians: an observational study**G. Romeo<sup>1</sup>, V. Panzarella<sup>1</sup>, A. Santarelli<sup>2</sup>, M. Giuliani<sup>3</sup>, L. Lo Muzio<sup>3</sup>, G. Campisi<sup>1</sup>, O. Di Fede<sup>1</sup><sup>1</sup>Dept. of Surgical, Oncological and Oral Sciences, University of Palermo, Palermo, Italy; <sup>2</sup>Dept. of Specialistic and Stomatological Clinical Sciences, Marche Polytechnic University, Ancona, Italy; <sup>3</sup>Dept. of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy

**BACKGROUND:** The oral squamous cell carcinoma (OSCC) is the most frequent malignant tumour of the oral cavity, covering more than 95% of all oral cancer diagnoses. Notwithstanding the therapeutic progress, the mortality of patients with OSCC remains one of the highest and most stable of the last 20 years, compared to other cancers. Primary care physicians must play an important role both in *primary prevention*, by giving advices on risk factors related to OSCC (e.g. smoking cessation, alcohol diminution), and in *early detection* of signs and symptoms. The main purpose of this observational retrospective study was to assess the knowledge, diagnostic concepts, practices and opinions about OSCC primary and secondary preventions among primary care physicians (PCP) in Calabria.

**METHODS:** The investigation was conducted using a self-administered questionnaire performed by Google Forms sent to 50 Calabrian primary care physicians. This questionnaire collects 11 items about:

- i) demographic variables of participants (e.g. age, sex);
- ii) knowledge on OSCC risk factors (e.g. smoking and drinking habits) and early clinical features (e.g. oral potentially malignant disorders);
- iii) practices and attitudes on prevention strategies (e.g. follow-up/screening approaches).

**RESULTS:** The majority (54%) of primary care physicians were female. About the professional update on OSCC, 21 (42%) of the participants answered that it was never performed, 11 (22%) of the participants performed it for at least four years, 18 (36%) of the participants have been updated this topic in the last 4 years. About the question regarding the timing of recommended preventive dental visit, a good percentage of PCP, 43 (88%), suggest it at least once a year, 5 (12%) of the participants at least once every 3 years and 2 participants at least every 5 years. Among the knowledge on risk factors related to OSCC, smoking was identified as the major risk factors by 49 (98%) of the doctors. On the contrary, only 30 (60%) and 21 (42%) of PCP identified alcohol and chronic trauma as a risk factors, respectively. 36 (72%) of PCP knew that early diagnosis of OSCC improves the survival rate. In contrast, only 26 (52%) of the physicians identified the tongue as the most common site for OSCC.

**CONCLUSIONS:** Understanding the knowledge, attitudes and practices of primary care physicians is crucial to assess their effectiveness in the primary prevention and early detection of oral cancer (particularly OSCC), thus helping to reduce its mortality and morbidity. The findings of the present study revealed that the population of PCP recruited were informed about OSCC screening strategies. However, given the presence of a reasonable percentage of general physicians with poor knowledge of these topics, there is a need for continuing education programs on OSCC prevention.

**Early detection of amyloid light-chain amyloidosis: a case report of oral primary manifestation**G. Capocasale<sup>1</sup>, O. Di Fede<sup>1</sup>, C. Rubini<sup>2</sup>, M. Dioguardi<sup>3</sup>, M. Giuliani<sup>3</sup>, V. Panzarella<sup>1</sup>, G. Campisi<sup>1</sup><sup>1</sup>Department of Surgical, Oncological and Oral Sciences, University of Palermo, Palermo, Italy; <sup>2</sup>Department of Clinical Specialistic and Dental Sciences, Marche Polytechnic University, Ancona, Italy; <sup>3</sup>Dept. Clinical and Experimental Medicine, University of Foggia, Foggia, Italy

**BACKGROUND:** Amyloidosis represents a rare disorder characterized by extracellular deposits of protein amyloid in a single organ (e.g. brain, lung, skin/localized form) or several organs (systemic form). Localized amyloidosis in the oral cavity as primary involvement of systemic amyloidosis is extremely rare. The most widely documented oral manifestations of amyloidosis are macroglossia, petechiae, papulae, nodular/exophytic and ulcerative lesions, mainly localized on the tongue and on the buccal mucosa. We present a case of early diagnosis of amyloid light-chain (AL) amyloidosis with primary involvement of oral cavity.

**CASE REPORT:** A 60-years-old man was referred to the Sector of Oral Medicine "V. Margiotta" (Department of Surgical, Oncological and Oral Sciences, University of Palermo) for the diagnostic assessment of dysphagia of the tongue and difficulty of swallowing and speech. His clinical history included hypertension and arthritis rheumatoid. The intra-oral examination showed multiple nodular/exophytic lesions on the dorsum and anterior-lateral borders of the tongue and on lower labial mucosa. Incisional biopsy was performed in the lesions of the labial mucosa and histological examination showed an amorphous eosinophilic fibrillary accumulation in the connective tissue. This sample had positive staining for Congo red, exhibiting a reddish color under light microscopy. Serum and urine protein electrophoresis were negative. So, the provisory diagnosis of oral localized amyloidosis was made. During follow-up period, the patient reported weight loss (5 kg in one month) and hands paresthesia. Then, the additional laboratory and instrumental tests were achieved in order to discover associated disorders or organ dysfunctions. Echocardiography and digestive endoscopy were negative but the fine-needle aspiration biopsy (FNA) of the abdominal fat pad was performed. Then a definitive diagnosis of AL Amyloidosis was made. The patient was treated with: proteasome inhibitor, corticosteroids and with synthetic folic acid analogue.

**CONCLUSIONS:** Dentists and pathologists as well as general practitioners should be able to cooperate for the diagnosis, treatment and follow-up of patients affected by amyloidosis. Histologic examination is the first step towards diagnosis, followed by immune-histochemical tests. The diagnosis of AL amyloidosis should always be followed by blood tests, echocardiography and digestive endoscopy to intercept organ dysfunction. Indeed, amyloidosis can have devastating consequences for patients, and this case demonstrates the heterogeneous nature of the condition and how important it is for clinicians to be aware of the unusual ways in which it may present within the oral cavity.

**Peripheral cementifying fibroma of the gingiva: a case report**

F. Caporali, G. Palaia, M. Fioravanti, L. De Vincentiis, D. Pergolini, C. Di Gioia, M. Mohsen

*International Medical School, Oral Diseases, "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** Peripheral Cementifying Fibroma (PCF), calcifying fibroblastic granuloma, peripheral fibroma with



cementogenesis and calcifying fibrous epulis are different ways to describe a benign fibro-osseous lesion of the jaws consisting of cellular fibroblastic tissue containing rounded or lobulated masses of calcified cementum. PCF is a reactive focal overgrowth of gingival mucosa that is considered to be reactive rather than neoplastic. It has also been reported that it represents a maturation of a pre-existing pyogenic granuloma or of a peripheral giant cell granuloma. It can be differentiated from the central type, that arises from endosteum or the periodontal ligament adjacent to the root apex and causes expansion of the bone; the peripheral type is localized on the gingiva or on the mucosa. PCF appears as a nodular mass, either pedunculated or sessile. The color ranges from red to pink, and the surface is frequently, but not always, ulcerated. It occurs approximately 2 to 4 times more frequently in females than in males most often between 25 and 35 years of age. It has a slight predilection for anterior jaw segments. The recurrence rate is high. It has been reported in the literature from 9 to 20%. The aim of this article is to present a case of PCF focusing on the management and the surgical approach.

**METHODS:** A 12 years old female referred for an intraoral swelling lasting about one year in the anterior right maxilla; it originated from the interdental papilla between 1.1 and 1.3, with 1.2 orally sited. Medical and family history was non-contributory. The mass was painless, smooth, mobile, sessile, pink and firm in consistency, in addition, from the radiographic examination was observed the involvement of bone. The excisional biopsy and the debridement of the elements involved, to prevent the recurrence, were performed. The bone was smoothed using a surgical bur. The patient was informed about the postoperative instructions and medications were prescribed.

**RESULTS:** The complete healing was observed within 21 days and the patient was ready to start her orthodontics therapy for repositioning the element 1.2. The histopathologic exam confirmed the diagnosis of calcifying fibroblastic granuloma. **CONCLUSIONS:** Histological exam is mandatory in the diagnosis of PCF. Furthermore, excisional biopsy, flap reflection and debridement were essential to prevent recurrence. According to the literature, it is suggested to perform periodic follow-up for a period up to 10 years.

## The role of human papillomavirus in oral cancer and oral potentially malignant disorders

P.J. Fantozzi<sup>1</sup>, A. Villa<sup>2</sup>, C. Ciolfi<sup>1</sup>, G. Tenore<sup>1</sup>, G. Palaia<sup>1</sup>, A. Pierangeli<sup>3</sup>, U. Romeo<sup>1</sup>

<sup>1</sup>Department of Head and Neck, Sapienza University of Rome, Rome, Italy; <sup>2</sup>Department of Oral Medicine, Infection, and Immunity, Harvard School of Dental Medicine, Division of Oral Medicine and Dentistry, Brigham and Women's Hospital and Dana Farber Cancer Institute, Boston, MA, USA; <sup>3</sup>Department of Molecular Medicine, Sapienza University of Rome, Rome, Italy

**BACKGROUND:** Human Papillomavirus (HPV) infection (mainly HPV16 and 18) is responsible for more than 70% of oropharyngeal cancers in Europe and United States, and about 5% of oral squamous cell carcinomas (OSCC). Interestingly, High-Risk HPV types (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59 and 68) may also play a role in the development of a subset of leukoplakias, and Immuno-mediated disorders such as oral lichen planus (OLP). As such, the aim of this study was to identify and compare the presence of HPV in

patients affected by oral benign lesions, leukoplakia, Immuno-mediated lesions and OSCC.

**METHODS:** We collected demographic information, social history and HPV status for 99 patients who were seen at the Oral Medicine Unit at the Department of Oral and Maxillofacial Sciences, Sapienza Università di Roma. HPV status was classified by High Risk Type (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59 and 68) and Low Risk Type (6, 11, 40, 42, 43, 44, 53, 54, 61, 72, 73 and 81). For the purpose of this study we compared the HPV status across four groups (benign lesions vs. leukoplakia vs. OLP vs. OSCC) and by histology for those patients with a clinical diagnosis of leukoplakia (dysplasia vs. Keratosis of Unknown Significance). All p-values were considered to be statistically significant at p<0.05

**RESULTS:** Overall there were 22 patients with oral benign lesions (22,2%), 38 patients with leukoplakia (38,3%), 20 patients with OLP (20,2%), and 19 patients with OSCC (19,2%). The median age at diagnosis was 60 years (range: 12-87). Approximately 27,0% of the patients were never smokers. Alcohol consumption was reported by 35,3%. Among patients with benign lesions (n=22), three (13,6%) were HPV16 positive; among those affected by leukoplakia (n=38), four (10,5%) were HR positive (16,18), and four (10,5%) were LR positive (6,12,70). Four out of twenty (20,0%) patients with OLP were HPV positive; three were HR (16,58) positive and one LR (6) positive. No patients with OSCC were HPV positive. When histology was considered, six out of 32 patients with KUS (18,8%) were HPV-HR positive (50,0%) and LR positive (50,0%). Among patients with epithelial dysplasia, two out of eight (25,0%) were HPV positive (one HR [50,0%] and one LR [50,0%]). Among oral HPV positive patients, the tongue was the most common infected site (30,0% of positivity). There were no statistically significant differences between current smokers and never smokers and HPV status (p=0.06).

**CONCLUSIONS:** This study evaluated the prevalence of HPV infection among patients with oral benign lesions, leukoplakia, immune-related disorders and OSCC detected with a non-invasive technique. As expected, there was no association between HPV infection and OSCC. Even though the prevalence of HPV infection was similar among patients with oral benign lesions and leukoplakia and OLP, individuals with leukoplakia had the highest rate of infection (21,1%). Future studies should include a larger sample of patients and additional Immunohistochemistry (IHC) studies for the detection of HPV.

## Local anesthetics efficacy on patients affected by Ehlers-Danlos syndrome

A. Montori, A. Nuvoli, F. Rocchetti, G. Palaia, A. Del Vecchio  
International Medical School, Oral Diseases, "Sapienza" University of Rome, Rome, Italy

**BACKGROUND:** Ehlers-Danlos Syndrome [EDS] is a group of rare heritable connective tissue disorders, which vary from mildly loose joints to life-threatening complications. EDS is classified by Villefranche that recognizes six major types: the classical type (I and II), the hypermobility type (III) [EDS-HT], the vascular type (IV), the kyphoscoliosis type (VIA), the arthrochalasia types (VIIA and VIIB), and the dermatosparaxis type (VIIC). The types are distinguished by their signs and symptoms, their underlying genetic causes, and their patterns of inheritance. According to Villefranche Classification, EDS - HT is the most frequent form and is characterized by joint hyperlaxity, recurrent joint dislocations, mild skin hyperextensibility, tissue fragility and extra-musculoskeletal mani-

## ABSTRACT

festations. Hipermobility type is also tied to a sort of inefficiency of local anesthesia, most likely to an excessive dispersion of the local anesthetic in the tissues. Chronic pain is a serious complication of the condition and can be both physically and psychologically disabling. Psychological dysfunction, psychosocial impairment, and emotional problems are common. On a molecular and microscopic level, EDS is characterized by alterations of extracellular matrix: collagen fibrils are organized into tissue-specific macroaggregates because of a disorder of fibrillar collagen metabolism; there's also an increase of Mast cells (MCs) number or an increase MCs activity due to a Mast cell activation disorder (MCAD). MCs exhibit different biological properties: phagocytosis, antigen presentation, cytokine production, and the immediate release of vasoactive substances. The aim of this paper is to describe our experience with a EDS patient that come to our attention after local anesthesia multiple failures.

**CASE REPORT:** The patient was a 44-year-old woman affected by EDS-HT, rheumatoid arthritis, fibromyalgia, hyperinsulinaemia and thrombophilia. She has come to our attention because she was feeling pain in right and left upper molar regions due to destructive decays of 1.6 and 2.6; it was decided to extract both the teeth. The preliminary visit showed that the patient referred a bad experience with her previous dentist with an extreme pain during previous treatments. On the day of surgery the patient underwent sedative and analgesic premedication with 10 drops of Diazepam and Paracetamol 1000 intravenously, local anesthesia (Mepivacaine + Adrenaline 1:100.000) and a painless surgical technique like pulling mobile tissues and compressing not mobile tissues during anesthesia. Postoperative treatment consisted in 3 more days of Amoxicillin + Clavulanic Acid 1g, Paracetamol 1000mg on demand and Chlorhexidine 0,2% mouthwashes for a week. After 7 days suture was removed.

**DISCUSSION:** Vasodilatory activity of MCs may be an important aspect of the observed resistance to local anesthesia in EDS patients. Infact anesthetic residence time in the site of injection depends on blood flow: if blood flow increases, the anesthetic is quickly removed and its efficacy shorter. Furthermore, not all local anesthetics have the same duration of action, it depends on active substances and on efficacy as pharmacokinetic parameter. We have investigated the better anesthetic to use in patients affected by EDS - HT because different active substances have different effects: for example, Mepivacaine with Adrenaline could remain in place for a longer period of time than Lidocaine.

**CONCLUSIONS:** Our main target is pain control. It's important to investigate patient previous experiences with anesthesia, be flexible choosing local anesthetic and do some tests to find the effective one. Sedative premedication can be useful to control anxiety and pain perception. Local vasoconstrictor in anesthetic management of EDS patients is essential in absence of contraindication.

### Intraoral ultrasonography in oral pathology: a narrative review

F. Rocchetti, A. Montori, G. Tenore, A. Del Vecchio, V. Cantisani, U. Romeo

*Department of Head and Neck (Prof. A. Polimeni) "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** Ultrasonography has been used in medical fields for decades, but nowadays recent progress in tech-

nology have led to the applications in many maxillofacial procedures.

The introduction of latest generation equipments, different sizes of transducers, ultrasound (US) elastography and Color-Doppler has provided enhanced spatial resolution. US is generally used transcutaneously; however, intraoral US has recently been drawing more interest. US possible applications ranges from pre-operative evaluation to post-operative management of patients. US is harmlessness, non-invasive, effective cost, repeatable and avoid of metal artefacts caused by dental restorations. Disadvantages of US include difficulty in imaging intraboned structures and its dependence on a trained operator. The aim of this narrative review is to analyze the potential role of intraoral US in oral pathology, showing possibilities and limits of this technique in daily clinical practice.

**METHODS:** Bibliographical research was performed using PubMed and Embase databases, selecting original articles published from January 1990 to February 2018. The following keywords and the Boolean operators "AND" and "OR" were used in combining more keywords: "ultrasound, ultrasonography, intraoral, oral cavity, oral cancer, oral vascular lesions, oral vascular malformations, salivary glands, scialothiasis". We excluded from this search: articles not published in English, case reports, letters to the editor and/or no-human studies. Images were intraorally obtained with an E-CUBE 15 EX scanner (Alpinion®, Seoul, Korea) with an 3-12 MHz and 15 MHz transducers.

**RESULTS:** 158 publications were identified. Intraoral US can be clinically applied in oral pathology to evaluate oral vascular lesions, soft tissue diseases and salivary gland disease. About oral vascular lesions, Color Doppler US is an effective tool in the management of vascular anomalies by obviating, in many cases, the need for biopsy. Specifically, Color-Doppler spectral curve analysis of a blood vessel determines the haemodynamic characteristics, in order to plan the most appropriate and safety treatment. Furthermore, Werner and Miyazaki have suggested the use of US for driving laser fiber insertion in the intraoral photocoagulation in the vascular malformations treatment. About soft tissue diseases, recent studies have evaluated the use of US to evaluate pre-operatively tumor thickness and tumor depth in early oral cancer, in order to establish the need for neck-dissection. In fact, the decrease of tumor size corresponds to a reduced specificity and sensitivity of Computer Tomography (CT) and Magnetic Resonance Imaging (MRI). Intraoral US represents an imaging tool for oral palpable soft tissue swellings such as lipomas, lymphangiomas, liposarcomas, shwannomas. According to Gaspari and Wong, US is extremely useful in facilitating the diagnosis of abscesses and delineate their anatomic location, differentiating them from cellulitis. About salivary gland diseases, a near unanimity of authors consider US the first choice in the detection of salivary glands diseases; recent studies have shown the validity and reliability of US in the detection of small ductal calculi, while transcutaneous US is recommended for intraparenchymal calculi.

**CONCLUSIONS:** Since the recent improvements, US offers new prospects in oral pathology with a features and utility comparable with CT and MRI. Unfortunately, US is considered one of the most complex examinations to be interpreted, requiring a specialist with deep knowledge of the head-neck area. In conclusion, US should become an integral part of diagnostic flow chart in oral pathology.

## Subcutaneous emphysema, an uncommon complication of dental procedures: clinical aspects and management

M. Caputo, A. Bellisario, A. Montori, F. Caporali, G. Tenore, G. Palaia, U. Romeo

*Department of Oral and Maxillofacial Sciences, "Sapienza" University of Rome, School of Specialization in Oral Surgery, Rome, Italy*

**BACKGROUND:** *Subcutaneous emphysema (SE)* is the result of air or gas introduction into the fascial planes of the subcutaneous connective tissue. It represents an uncommon complication during dental procedures, but dentists should be able to diagnose it and know its potential life-threatening consequences. SE may result from the use of: a high-speed air-driven handpiece for endodontic, surgical and prosthetic procedures, compressed air syringes, sodium hypochlorite and hydrogen peroxide as root canal irrigants and lasers with air projection systems, such as the Er:YAG. Its usual clinical presentation is characterized by a sudden onset of hemifacial swelling with crepitation detected on palpation.

**METHODS:** This work, according to modern literature, wants to highlight the right management of SE when it occurs during or after dental treatments.

**DISCUSSION:** Unilateral facial and neck swelling is the first clinical sign of SE, so it is necessary to make a differential diagnosis with hematoma, allergic reactions and angioedema, that produce similarly a volume increase. SE pathognomonic sign is crepitation on palpation, odynophagia and dysphagia are uncommon. Air can seldom spread through the fascial planes of the neck, resulting in para and retropharyngeal emphysema, with the risk of further extension to chest and mediastinum, causing pneumothorax, pneumopericardium and pneumomediastinum. Rarely air emboli may enter blood vessels because of a pressure gradient, with the risk of patient's death for pulmonary embolism or ischemic lesions. If a subcutaneous emphysema is suspected, it is necessary to stop immediately the procedure to determine its extent and location. This can be achieved by palpation of the skin over the affected area, which may indicate the spread and extent of trapped air. Conventional radiographs (intraoral radiographs and ortopantomographies) are not helpful to diagnose SE, while cone beam computerized tomography (CBCT) can detect the extension of air diffusion more easily. Treatment of SE is based on observation and reassurance of the patient; in fact it is usually self-limited and solves in 3 to 10 days, being the gas reabsorbed into the bloodstream and eliminated through lungs. Administration of antibiotics may be recommended to prevent bacterial superinfections and corticosteroids are indicated to reduce swelling. Incision, drainage and aggressive supportive treatment, such as a chest tube, are sometimes necessary in severe cases.

**CONCLUSIONS:** In conclusion dentists and oral surgeons should be aware of the possibility of generating iatrogenic subcutaneous emphysema using compressed air, sodium hypochlorite or hydrogen peroxide and dental lasers and they should be able to diagnose and manage it quickly and properly.

## Oral ulcer induced by Paan: a case report

A. Montori, F. Rocchetti, M. Capocci, G. Palaia, G. Tenore  
*School of Dentistry, "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** The Smokeless Tobacco (ST) is the use of tobacco without combustion alone or in combination with

other substances. ST practice include: chewing, sniffing, dipping or application to the skin. Nicotine and other components are so absorbed through the oral mucosa. ST is worldwide diffuse in many countries as India, Pakistan, several Asian regions and North and Centre America, where different associations of tobacco and other substances are used by people of all ages and both genders. For example Paan, also called betel quid, is an indian kind of ST and it is made up by areca nut, slaked lime, catechu, spices and tobacco, folded in a betel leaf. People mostly use paan due to a lack of information and education, being not aware about the harmful effects associated with these products. Paan is chewed because of its stimulant and psychogenic effects and for some perceived beneficial effects, such as mouth freshening, digestion aid, astringency, mood enhancement, tension relief, and oral clearing. However, about 28 chemical constituents present in it are true carcinogens. In particular, areca nut and tobacco cause fibroblasts and DNA damages and increase collagen synthesis and reactive oxygen species (ROS) production; slaked lime has genotoxic effects and increases cells turnover and ROS production too. Oral lesions due to the use of ST include gingival bleeding, lichenoid lesions, leukoplakia, frictional keratosis, ulcers and oral submucosal fibrosis (OSF). Among these conditions, OSF is the most severe, with a potential of degeneration in oral cancer ranging between 1.9 and 10%. This report presents a case of an oral ulcer secondary to the use of Paan.

**CASE REPORTS:** A 31-years-old male from Pakistan was referred to the Department of Oral and Maxillo Facial Sciences, Sapienza University of Rome, for a painless ulcer. The medical history was negative and he denied any alcohol consumption. A long history of Paan chewing habit was established since he was 17. Intraoral examination showed an ulcer with thick and reddish irregular margins surrounding a white-yellowish surface; the lesion was localized on retromolar mucosa in the left mandible. The patient noticed the lesion since two months. Laboratory tests including complete blood cell count, erythrocyte sedimentation rate, and liver function were normal. A picture of the lesion was taken in order to evaluate its evolution. The Paan use was forbidden for at least two weeks and during the intense counselling, the carcinogenic potential effects of chewing tobacco was explained. The patient came back for follow-up control after 15 days and the lesion regressed, for this reason no scalpel biopsy was performed. A follow-up program was started to observe any oral mucosal alteration and to motivate the patient to pursue more healthy life habits.

**CONCLUSIONS:** The greater and greater presence in our country of people coming from areas in which there are different religious and cultural habits creates the necessity for our dental clinicians to enlarge their knowledge about *potential local and systemic risk factors and their impact on oral health*; we also emphasize the importance of a detailed anamnesis and of careful intra-oral soft tissue examination in these patients to preserve or re-establish oral healthy conditions.

## Clinical management of oral proliferative verrucous leukoplakia

M. Fioravanti, D. Pergolini, G. Palaia, F. Caporali, A. Mohsen  
*International Medical School, Oral Diseases, "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** The aim of this study is to emphasize the correct and early diagnosis of oral proliferative verrucous leukoplakia (OPVL).



## ABSTRACT

**METHODS:** OPVL is a rare lesion, slowly growing, considered as a rare aggressive form of leukoplakia with a high tendency of malignant transformation. However, it is an enigmatic and difficult entity to define. The etiology of OPVL remains unknown. Use of tobacco does not seem to have a significant influence on the appearance of OPVL. In fact, OPVL may occur in both smokers patients and non-smokers ones. It often affects more frequently women and elderly patients over 60 years old, especially on the buccal mucosa and tongue. Clinically, it develops initially as a white plaque of hyperkeratosis that potentially become a bilateral and multifocal with confluent, exophytic and proliferative features. In literature, case series presented OPVL as a disease with aggressive biological behavior, a high probability of recurrence and a high rate of malignant transformation. Histopathologically, the OPVL aspect may range from simple hyperkeratosis to various degrees of dysplasia up to Verrucous Carcinoma.

**RESULTS:** Despite the authors' attempts to draw up diagnostic criteria for the OPVL, there is no common agreement in international literature on clinical and histologic aspects that allows early identification and diagnosis of OPVL. Many therapeutic approaches (especially the surgical ones) have been proposed over the years to manage the OPVL. Although improvements have been noted in some of these treatments, recurrence rates after cessation of therapy are high.

**CONCLUSIONS:** Since the OPVL does not have pathognomonic histologic features, the diagnosis of OPVL is achieved through the association of its clinical aspect, the characteristics of evolution and their progression associated with histopathological analysis. The risk of malignant transformation of OPVL is around 70% and often the anatomo-pathologists hardly differentiate it from a true neoplastic lesion. The same efficacy of follow up is questionable. In fact, some authors recommend a close follow up (each 3 months) and long-lasting (never less than 5 years). While many other authors suggest a life-time follow-up. Other authors consider the possibility to make repeated and multifocal biopsies, in order to consider the dysplastic or neoplastic evolution of the lesions. Since the difficulty to treat the OPVL, its management must be done by an expert and formed practitioner of oral pathology and medicine.

### Momax project: evaluation on time management patients

L. D'Alessandro, L. Aprea, F. Rocchetti, A. Montori, G. Tenore, U. Romeo

*Department of Head and Neck (Prof. A. Polimeni) "Sapienza" University of Rome, Rome, Italy*

**BACKGROUND:** The Multidisciplinary Team Care (MDT) approach has become the care model for cancer patients worldwide and recently has been extended to oral cancer (OC) and to potentially oral malignant disorders (POMD). Three main factors affect the management delay for OC e POMD patients: first of all, patients unawareness about the real dangerousness of pathology; practitioners misdiagnosis and mistreatments; and last the time elapsing from diagnosis and the beginning of treatments. The main advantage of MDT consists in a great reduction of this latter enhancing greatly the general prognosis of these patients as widely demonstrated in the Literature. The MoMAX project (Oral

Medicine and Maxillo-facial surgery) was created on June 2014, at the Department of Oral and Maxillo-Facial Sciences, Sapienza University of Rome, to simplify the pathway of these patients ensuring the shortest and most effective therapeutic protocols. MoMAX care team involves oral pathologists, prosthodontists, maxillofacial surgeons, oral hygienists, all united in a unit. Moreover, once a week a special team, including oncologists, anatomo-pathologists and radiotherapists, called the Head and Neck Tumor Board, discuss about oral cancer cases, assuring the most appropriate and efficient therapy. To the MoMAX refer also patients requiring radiotherapy and/or chemotherapy in order to avoid oral negative side effects related to these treatments such as mucositis and osteonecrosis. The aim of this study is to evaluate the MoMAX patients elapsing time from first visit to the appropriate therapy in order to underline the efficiency of this multidisciplinary approach.

**METHODS:** A retrospective analysis of medical records and clinical database was performed. Patients data, first visit date, biopsy date and histological diagnosis were considered, differentiating OC and OPMD from other lesions. For patients requiring radiotherapy or/and chemotherapy the first examination date, eventually dental treatments date and final authorization to the therapy data were considered.

**RESULTS:** 359 patients referred to MoMAX, from June 2014 to February 2018, were evaluated. Among these patients, 256 requiring scalpel o laser biopsy and 103 requiring authorization to radiotherapy and/or chemotherapy. Among biopsies, 156 were for POMD and 33 for OC lesions. For POMD, the average time recorded from the first visit to the biopsy was 12,5 days meanwhile for OC the average time was 7,8 days. Regarding the other 77 non suspicious or non potentially malignant lesions the average time was 15,01 days. About patients requiring authorization to radiotherapy and/or chemotherapy the average time from the first visit to the release of the authorization was 18,36 days. More specifically, from first consultation to the begin of dental treatments the average time recorded was 9,16 days while about 13 days elapse from the end of treatments to authorization release. This delay is due to the biological time needing for tissue healing after teeth extractions.

**CONCLUSIONS:** Available studies in Literature support MDT approach compared to single-specialist treatment to improve not only the prognosis but also the quality of patients' life. Through this study, we could achieve awareness on the time required to manage POMD, OC and medical compromised patients in MoMAX project till now. Further research is needed to analyze MoMAX efficacy especially in patients survival rate.

#### References

1. Hong NJ, Wright FC, Gagliardi AR, Paszat LF. Examining the potential relationship between multidisciplinary cancer care and patient survival: an international literature review. *J Surg Oncol.* 2010;102(2):125-34.
2. Friedland PL, Bozic B, Dewar J, Kuan R, Meyer C, Phillips M. Impact of multidisciplinary team management in head and neck cancer patients. *British Journal of Cancer.* 2011;104(8):1246-1248. doi:10.1038/bjc.2011.92.
3. Licitra L, Bossi P, Locati LD. A multidisciplinary approach to squamous cell carcinomas of the head and neck: what is new? *Curr Opin Oncol.* 2006 May;18(3):253-257. doi: 10.1097/01.cco.0000219254.53091.35.

## Bisphosphonate related osteonecrosis of the jaws in Italy: an observational report of 24 cases

K. Zhurakivska <sup>1</sup>, G. Guglielmi <sup>1</sup>, C. Abate <sup>1</sup>, O. Di Fede <sup>2</sup>, G. Campisi <sup>2</sup>, C. Rubini <sup>3</sup>, L. Lo Muzio <sup>1</sup>

<sup>1</sup>Dipartimento di Medicina Clinica e Sperimentale, Università di Foggia, Foggia, Italy; <sup>2</sup>Dipartimento di Discipline Chirurgiche, Oncologiche e Stomatologiche, Università di Palermo, Palermo, Italy; <sup>3</sup>Dipartimento di Scienze Cliniche Specialistiche ed Odontostomatologiche, Università Politecnica delle Marche, Ancona, Italy

**BACKGROUND:** Bisphosphonates (BPs), drugs inhibiting the osteoclast function, are widely used. They are prescribed for several oncological and not diseases involving the skeletal system. Although providing excellent results, the increase in the use of bisphosphonates led to emerge a complication related to their administration, described with the term of Bisphosphonate-related osteonecrosis of the jaw (BRONJ). The most of patients affected by BRONJ are oncologic patients that frequently assume high doses of these drugs (incidence 1% to 15%), while the incidence in osteoporosis patients is estimated at 0.001% to 0.01%, due to absolutely lower doses of bisphosphonates. Among the risk factors for BRONJ development, the oral surgery procedures seem to play an important role, so that the prevention strategies include elimination or stabilization of oral disease prior to undertake a protocol of antiresorptive therapy with BPs. The present observational study aims to describe the preliminary data resulting from a sperimental protocol, still in progress, developed at IRCCS

“Casa Sollievo dalla sofferenza” for prevention, diagnosis and therapy of BRONJ.

**METHODS:** Clinical and radiological evaluation of 24 patients with BRONJ was performed in the period between 2011 and 2014. Data about age, sex, systemic pathology and modality of the pharmacological therapy with BPs were collected. An eventual presence in the medical history of oral surgery procedures was annotated. A protocol of tertiary prevention consisting of antibiotic therapy or/and surgical treatment was also undertaken. The results were evaluated after a certain period of time.

**RESULTS:** The observed group was composed of 13 males and 11 females with an average age of 73,1 years old. A history of oral BPs administration emerged in 6 (25%) patients, one case (4%) was treated with intramuscular injections, while the other 17 (71%) patients reported endovenous treatment. The mean duration of treatment with oral BPs was 44.8 months, whereas the intravenous treatments lasted 29.8 months in average. The most used molecule was zoledronic acid. Only 8 (33.3%) patients referred a previous oral procedure. In 22 cases a medical treatment was chosen with appropriate antibiotic therapy. After treatment, only about half of the patients experienced improvement or resolution of the osteonecrotic lesion, while the others had no improvement or showed worsening of the initial condition.

**CONCLUSIONS:** The present study reports data from 24 patients who developed maxillary osteonecrosis following a period of bisphosphonate intake. Only 8 (33.3%) patients referred a previous oral procedure. The epidemiological data, however, are limited because the number of patients examined.

## PREVENZIONE ED IGIENE DENTALE

### Development of the emission factor to calculate the concentration of legionellae in respirable aerosols generated by contaminated dental unit waterlines

A. Foglietta, S. Petti

Department of Public Health and Infectious Diseases, Sapienza University, Rome, Italy

**BACKGROUND:** Legionnaires' Disease (LD) is a waterborne pneumonia transmitted through inhalation of respirable water particles or aspiration of water contaminated with microorganisms of the *Legionella pneumophila* species. Although transmission from the community setting is primarily responsible for disease incidence, several episodes occur in healthcare settings. LD in dental healthcare settings would result from the exposure to waterborne droplet clouds, or aerosols, containing viable legionellae generated by the dental instruments during treatment. Paradoxically, although 4% dental units are contaminated with legionellae worldwide and, thus, yield the potential to produce contaminated aerosols, there are no confirmed LD cases despite billions of dental treatments annually provided, while the dental staff is not at occupational risk. Therefore, the aim of this study was to try to explain this paradox developing the Emission Factor (EF) to assess the level of legionellae in respirable aerosol resulting from the nebulization of contaminated dental unit water. **METHODS:** The study was performed on a dental unit highly contaminated with legionellae that was interdicted from clinical use since several months. Water and air contamination levels were assessed as follows. The day of the test, 1 L of water from air-water syringe, ultrasonic scaler, micro-motor and turbine hand-pieces, was collected and processed within 1 hour according to standardized sampling and cultivation methods. An air sampler (DUO Surface Air System (SAS) Super 360 -pbi) was placed on the dental chair mimicking dental patients. An ultrasonic scaler, flushing 16.5 mL/min of dental unit water, was put at 40 cm from the air sampler and was run during the 3 minutes necessary to collect the respirable aerosol (diameter, 1-10  $\mu$ m) produced by the dental hand-piece contained in 1 m<sup>3</sup> of air. In a second test, spatter contamination, due to larger and non-respirable particles (diameter, 10-40  $\mu$ m), was assessed removing the top of the air sampler thus leaving large droplets to sediment on the plates within 60 sec from their production. Air samples were also performed before and five minutes after the ultrasonic scaler was run and contamination levels were considered as background levels. The EF, namely, the *Legionella* concentration in respirable aerosol (colony forming units -CFU/m<sup>3</sup>) generated by dental instruments spraying dental unit water with *Legionella* concentration of 1 CFU/L, was assessed. The formula (CFU/m<sup>3</sup>)/(CFU/L) was used.

**RESULTS:** The days of the two tests, room temperature

and relative humidity ranged between 29-30 C and 68-72%, respectively. *Legionella* level ranged between 2.29 and 3.49x10<sup>7</sup> CFU/L in water, while in air was 2.00 and 2.57x10<sup>2</sup> CFU/m<sup>3</sup> in respirable aerosol and spatter, respectively. The EF was 5.73x10<sup>-8</sup> L/m<sup>3</sup> for respirable aerosol and .12x10<sup>-5</sup> L/m<sup>3</sup> for spatter. Practically, if dental unit water is contaminated with 100,000 *Legionella* CFU/L, patients and staff may ingest 1 legionella every 3 min through spatter and inhale 1 legionella every 9-10 hours through respirable aerosol.

**CONCLUSIONS:** The assessment of *Legionella* level in water is not enough to evaluate the risk of LD, since legionellae must be inhaled or aspirated for an optimal deposition in the alveolar lung region. Using data on Gram-negative bacteria produced by the dental turbine, the estimated EF was 3.62x10<sup>-7</sup> L/m<sup>3</sup>. Thus, the EF in dental healthcare settings is low compared to typical sources of LD, such as cool mist humidifiers, hot-water faucets and showers that yield EFs as high as 3.4-8.8x10<sup>-4</sup> L/m<sup>3</sup>. The low EF reported in this study helps explain why the LD risk in dental healthcare settings is minimal.

### Review of the literature on the use of an adhesive system to increase the effectiveness of occlusal seals

N. De Rossi, S. Mazzoleni, E. Stellini, S. Piovan, M. Caburlotto  
University of Padua, Padua, Italy

**BACKGROUND:** It was decided to conduct this systematic review of the literature because, as it is well known, innovations in dental exchange are constantly changing both from the point of view of materials and therapeutic technique. Concerning dental sealants, there have been innovations in sealing materials, but the application technique has remained the same for many years. For these reasons we wanted to evaluate the possible advantages of an alternative application procedure. This revision aimed to evaluate the possibility of using a modified technique in the practice of sealing compared to the traditional one, evaluating the effectiveness and convenience in its use. Specifically, it has been examined a specific technique which involves the use of an adhesive system applied before the sealant respect to the sole use of the sealant. **METHODS:** For the elaboration of this review of the literature, numerous scientific articles were searched in the PubMed, CINHAHL, Cochrane Library and MedLine databases, obtaining a first filter of the scientific literature. Several primary studies have been founded with different combinations of keywords: sealant, sealant retention, pit and fissure sealants, clinical trial, clinical evaluation, intermediate bonding, bonding agents, bonded, adhesive systems, etch and rinse, self-etch. These words have been combined in different ways within each database. Furthermore, to obtain relevant material for research purposes, some inclusion criteria have been



defined, such as: articles in Italian and English, articles written from 2000 to date, sealings performed on healthy teeth. The exclusion criteria have been: papers which were not free for the consultation and items not relevant to the research. Then, the research has been proceeded by consulting sites of interest and scientific literature in the dental and oral hygiene fields. Thanks to this research, in vivo clinical studies based on an evaluation over time have been collected and they have allowed this literature review to be carried out.

**RESULTS:** The results of the review showed that some adhesive systems applied before the sealant had a significant positive effect on micro-mechanical and micro-infiltration retention rates and, consequently, they proved to be advantageous in preventing the carious pathology of which it is the main objective. This is because the smaller molecular size of adhesives, compared to that of sealants, allows greater penetration into the microcavities of the etched enamel, leading to a consequent greater bond strength. Furthermore, concerning the type of adhesive to be used, it has emerged that etch-and-rinse adhesive systems are the most effective for this practice as they can create a better microretent bond compared to self-etching systems. The fourth generation etch-and-rinse adhesive systems are more suitable in cases where it is possible to obtain a completely dry operating field, whereas in cases where this is not possible, it is preferable to use a fifth-generation ethanol-based adhesive.

**CONCLUSIONS:** In conclusion, it has emerged that the use of the adhesive system, if used respecting the correct procedure and the necessary precautions, can be applied in place of the traditional technique.

### Fluorine prophylaxis and the caries prevention: current indications in domiciliar and professional use

S.M. Bendeac, S. Mazzoleni, S. Piovan, E. Gobatto, A. Salmaso, M. Caburlotto

**BACKGROUND:** The purpose of this work is to evaluate the current importance of the use of fluorine in dental caries prevention. In addition, emphasis will be placed on the various safeguards available for these applications and the state of the art of their use. One of the Dental Hygienist's duties is the prevention of dental caries in young peoples through the correct oral health education. That means providing advices and guide in the use of different methods for the administration of fluorine according to the different needs of the patient (individual risk level). Moreover the Dental Hygienist has to proceed with the professional topical application of various prophylactic means and above all to promote health education. **METHODS:** Search engines such as pubmed and cochrane library and textbooks on the subject matter were used using different combinations of keywords; which: fluoride varnish, fluoride toothpaste, water fluoridation, sodium fluoride, stannous fluoride, fluoride gel, fluoride foam. For the purpose of this review of the literature the scientific articles examined were from 2010 to today.

**RESULTS:** Analyzing both textbooks and articles it is clear how, even today, the most used and effective dental caries prevention method still results in the administration of fluorine. The latter is prescribed both domiciliary and professionally. To date, however, we must put the patient in the foreground and therefore we must evaluate, according to the subjective risk of the onset of caries, the most appropriate method for

the acquisition of fluorine. From the Literature's review it has been stated therefore that is still important for the entire population to wash the teeth twice a day with a toothpaste containing at least 1000 ppm of fluorine. It has also been found that, according to the subjective risk of caries development, for patients with medium risk, in addition to dentifrices, it is possible to prescribe mouthwashes or gels to use at home, while for high risk patients the use of fluoride varnish is more efficient thanks to her consistency which allows a longer stay with the tooth surface. It is the Dental Hygienist's task to identify and suggest the proper individual use method based on personal caries risk that can be performed at home and when it is appropriate the professional applications of fluoride products at the dental office. Protocols for selection and use have been identified.

**CONCLUSIONS:** The revision work carried out reiterated the importance that the use of fluorine preserves in caries prevention. It was also possible to identify current protocols that allow the dental hygienist to determine the most appropriate, home and / or professional use in the study of the most suitable fluoride products for individual prevention of caries based on the risk of the individual subject

### Clinical efficacy of lactobacillus reuteri containing lozenges in the supportive therapy of generalized aggressive periodontitis: six months results of a randomized placebo-controlled study

S. Bossini <sup>1</sup>, S. Calza <sup>2</sup>, V. Cappa <sup>2,3</sup>, G. Garzetti <sup>1</sup>, E. Scotti <sup>1</sup>, M.G. Grusovin <sup>4</sup>, M. Mensi <sup>1</sup>

<sup>1</sup>Section of Periodontics, School of Dentistry, Department of Surgical Specialties, Radiological Science and Public Health, University of Brescia, Brescia, Italy; <sup>2</sup>Unit of Biostatistics & Bioinformatics, Department of Molecular and Translational Medicine, University of Brescia, Brescia, Italy; <sup>3</sup>Big&Open Data Innovation Laboratory (BODaL-Lab), University of Brescia, Brescia, Italy; <sup>4</sup>Vita-Salute San Raffaele University, School of Dentistry, Milan, Italy

**BACKGROUND:** The aim of this 12-months mono centric double-blind randomized placebo-controlled clinical study was to evaluate the efficacy of Lactobacillus Reuteri containing lozenges as adjuvants during the supportive therapy of patients affected by Aggressive Periodontitis (AgP) with residual pockets. Clinical endpoints are pockets closure and BoP reduction.

**METHODS:** Patients that were treated for AgP trough Full Mouth Instrumentation and following periodontal supportive therapy for at least 6 months were selected. A sample size of 20 patients was deemed necessary and patients were randomly divided in two groups. The test group received two 3-months-long administrations of L. Reuteri (2 lozenges/day after brushing) with a 3-months washout period, while the control one received a placebo with the same modality. The patients were taught to slowly chew the lozenges until they dissolve into saliva and not to eat or drink during the subsequent hour. Professional follow-up and oral hygiene sessions were fulfilled quarterly. Outcome measures were: tooth survival, complications and adverse events, Probing Pocket Defect, Probing Attachment Level, Bleeding on Probing, Plaque Index patient compliance and feedback about treatment. Measurements were collected at 3, 6, 9 months and 12 months. Binary coded outcomes were modelled with multi-level mixed models using binomial family function and con-

## ABSTRACT

sidering three nested random levels, patient, tooth and sites. RESULTS: At 6 months no drop out, tooth loss, complications or adverse event were recorded. Patients reporting a baseline PPD higher than 4 mm increased over time probability of closure of probing pocket, especially if they used probiotic, although interaction between type of treatment and visit is not statistically significant. BoP decreased over time in both treatments but reduction is more remarkable in patients treated with probiotic (from 14.6% to 11.6% in controls and from 22.0% to 9.9% in cases, interactions  $p < 0.051$ ). Treatment partially influenced also PAL, reduction of plaque was observed in both treatments (from 16.7% to 10.7% in controls and from 24.6% to 15.4% in cases) although interaction between treatment and time was statistically significant only at visit 1 ( $p = 0.003$ ). CONCLUSIONS: After 6 months, a significantly higher rate of pocket closure was observed in the treatment group. Pocket closure in the placebo group was satisfactory but inferior. BoP reduction also suggest probiotics efficacy in the management of periodontal inflammatory rate. Within the limitation of the study, the use of L. Reuteri probiotics lozenges improved clinical out-comes during the maintenance therapy in patients with diagnosis of AgP, and could be considered a safe adjunct to the supportive therapy in this group of patients.

### Efficacy of sonic toothbrush compared to manual brushing in reduction of plaque index and gingival index: randomized clinical trial

V. Brognoli<sup>1</sup>, S. Calza<sup>2</sup>, V. Cappa<sup>2,3</sup>, G. Garzetti<sup>1</sup>, E. Scotti<sup>1</sup>, M. Mensi

<sup>1</sup>Section of Periodontics, School of Dentistry, Department of Surgical Specialties, Radiological Science and Public Health, university of Brescia, Brescia, Italy; <sup>2</sup>Unit of Biostatistics & Bioinformatics, Department of Molecular and Translational Medicine, University of Brescia, Brescia, Italy; <sup>3</sup>Big&Open Data Innovation Laboratory (BODaL-Lab), University of Brescia, Brescia, Italy

BACKGROUND: The aim of this study is to compare in healthy subjects two methods (manual VS sonic) of tooth brushing in terms of impact on the bleeding on probing (BoP), gingival index (GI) and plaque index (PI) at 6 weeks after one session of Professional Mechanical Plaque Removal (PMPR) with Erythritol Powder and ultrasonic tips.

METHODS: 32 healthy subjects, after GBT, were randomly trained and motivated to use sonic or manual toothbrush. Binary coded outcomes (1/0) BoP, GI, PI were collected at baseline and after 6 weeks (visit 1), aggregated as counts within patient for each visit and then modelled using Generalized Poisson mixed models. Differences between two methods (manual VS sonic) over time, were estimated.

RESULTS: Generally, the sonic toothbrush use, statistically reduced BoP, GI and PI more than manual method. In particular, the reductions of BoP and GI were about 3 times higher than manual method and the PI was 4 time higher ( $p < 0.0001$ ). Additionally, differences between baseline and visit 1 among two tooth-brushing methods, were more remarkable using sonic toothbrush. Mean reductions over time were 85.4% for BoP, 92.3% of PI and 78.0% of GI using sonic toothbrush ( $p < 0.0001$ ) and 60.3%, 68.6% and 35.4% for BoP, PI and GI respectively with the manual one ( $p < 0.0001$ ).

CONCLUSIONS: The results of this study indicate that sonic toothbrush can significantly help in reduction of plaque and gingival margin inflammation more than a manual toothbrush.

Moreover, this study shows that the benefits of professional oral hygiene are influenced by home-use compliance in terms of the outcomes, and it may be that the greatest improvements in oral health derive from devices that increase compliance. In addition to instruction and motivation, satisfaction questionnaires were administered to patients, and it was found that sonic toothbrush is most appreciated than manual one, due to the greatest ease of use and to the comfort perceived during brushing. It can be concluded that sonic toothbrush gives more benefits in terms of clinical results and patient compliance compared to the manual one.

### Efficacy of disclosing plaque agent as a guide to the supra-gingival biofilm removal: randomized clinical trial

R. Agosti<sup>1</sup>, M. Mensi<sup>1</sup>, E. Scotti<sup>1</sup>, V. Cappa<sup>2,3</sup>, S. Calza<sup>2</sup>

<sup>1</sup>School of Dentistry, Section of Periodontics, Department of Surgical Specialties Radiological Science and Public Health, University of Brescia, Brescia Italy; <sup>2</sup>Unit of Biostatistics, Department of Molecular and Translational Medicine, University of Brescia, Brescia, Italy; <sup>3</sup>Big&Open Data Innovation Laboratory (BODaL-Lab), University of Brescia, Brescia, Italy

BACKGROUND: Evaluate the efficacy of disclosing plaque agent as a guide to the supra-gingival biofilm removal during recall appointment, in periodontally healthy patients, with a plaque index exceeding 25%.

METHODS: 32 healthy patients, who needed prophylaxis, divided in two groups, were treated either with (A) or without (B) disclosing plaque agent application before treatment. After therapy, disclosing plaque agent was applied and three photos (frontal, lingual and palatal) were taken and digitalized to quantify residual plaque area (RPA). The quantification of RPA was made thanks to an image processing software (Image-J) that allowed us to highlight the percentage of area with residual plaque colored by disclosing plaque agent on the tooth. Statistical evaluations were performed separately for different portions, specifically overall measure and gingival margin only. Treatments effect were tested using linear mixed models. All data analysis will be carried out according to a pre-established analysis plan by a biostatistician blinded to group allocation. Comparison between treatments will be performed using independent sample t-Test. All statistical comparisons will be conducted at the 0.05 level of significance.

RESULTS: Percentage of tooth surface with RPA was significantly higher in patients treated with B compared to A, both for the overall measurement ( $p = 0.006$ ) (OR = 2.68, 95%CI: [1.35;5.33]) and gingival margin only ( $p = 0.004$ ) (OR = 2.44, 95%CI: [1.36;4.38]), with an interaction 90.1 (17.8) that can be interpreted the proportional variation of the OR (B vs A) in gingival margin only versus the overall measure. That is the OR in gingival margin is reduced by approximately a 10% compared to the overall measure.

CONCLUSIONS: Within the limits of this study we can confirm the efficacy of disclosing plaque as a guide to remove supra-gingival biofilm during the professional hygiene, especially in less accessible areas, as gingival margin or interdental space. The clinical approach that not include the guide of the disclosing plaque is still valid, therefore it's up to the clinician the evaluation and pick the better technique in the different patients and clinical set-ups.

## Relationship between periodontal disease and hashimoto's thyroiditis: literature review and a pilot study

G. Laurenti, E. Brun, M. Gargari, L. Cerroni

Department of Clinical Science and Translational Medicine  
University of Rome Tor Vergata

**BACKGROUND:** Autoimmune thyroid diseases (AITDs), including the Hashimoto's thyroiditis (HT) are the most common autoimmune diseases and are often observed together with other autoimmune diseases. Periodontal disease is a multifactorial infectious disease caused by mixed microbiota and modulated by environmental and genetic factors. The involvement of autoantibodies in the pathogenesis of aggressive periodontitis has been observed, suggesting the role of autoimmunity in periodontitis. Autoimmune disease may be correlated to periodontal disease, as for example Rheumatoid arthritis (RA) and to a lesser extent, systemic lupus erythematosus (SLE). A common feature of autoimmune diseases is the breakdown of tolerance of self antigens, a consequence of which is the production of autoantibodies reactive with multiple self proteins. This is a condition found both in periodontal disease, although not classified as autoimmune disease, and in thyroid diseases on an autoimmune basis. The purpose of this study was to perform a review and a pilot study to estimate the possible association between Hashimoto's thyroiditis and periodontal disease.

**METHODS:** A literature search was performed using Pubmed and Cochrane databases from January 1990 to December 2017, search was carried using the keywords "thyroid" and "periodontal". 10 female patients with a mean age of 45 years, from 25 to 60 years with autoimmune thyroid disease in pharmacological therapy (Group I), were sent by the Department of Endocrinology to the Operative Unit of Odontostomatology "Fra G.B. Orsenigo", San Pietro Hospital, Rome. 10 female subjects with a mean age of 45 years, from 25 to 60 years of good general and oral health with no thyroid dysfunction were included in Group II. Periodontal parameters such as Plaque Index (PI), Bleeding on Probing index (BOP), Periodontal Pocket Depth (PPD) were recorded. Groups were compared using the t test and linear regression.

**RESULTS:** The electronic search identified 39 citations. Two possible hypothetical models that can be extrapolated for the causal relationship between Hashimoto's thyroiditis (HT) and periodontitis include: 1) apoptosis, B-cell-activated superantigens, reactive T cells with clonal expansion, pro-inflammatory cytokine activity mediated by genetic and environmental factors; 2) a reduced caliber of capillaries, as well as a greater number and tortuosity of capillary loops is considered as a risk factor for periodontal disease in patients with HT. The results of the pilot study showed that in all 10 HT the PI was  $24 \pm 6\%$ , BOP was  $35 \pm 11\%$  and PPD  $> 4\text{mm}$  was  $16 \pm 7\%$ , while in control group the PI was  $29 \pm 8\%$ , BOP was  $30 \pm 13\%$  and PPD  $> 4\text{mm}$  was  $6 \pm 4\%$ . The clinical condition in HT patients showed deeper probing depth ( $p < 0,05$ ) and higher gingival bleeding respect to the control group, while the plaque index was higher in the control group.

**CONCLUSIONS:** Limited data are available regarding the relationship between thyroid hormone imbalance (thyroid disease) and periodontal health. This study reported preliminary results on a small sample of patient affected by Hashimoto's thyroiditis, in all HT patients bleeding and therefore inflammation were highlighted respect to the con-

trol group. The presence of gingival bleeding not justified by the presence of abundant plaque, should make one think of a thyroid involvement, especially in women of 35-55 years with no other systemic disease. In this regard the role of the dental hygienist in terms of prevention appears to be very important. Dental hygienist should be familiar with the signs and symptoms of thyroiditis, so they can send the patients to the endocrinologist.

## Probiotics and oral health: a cognitive survey on knowledge and use in dentistry

C. Cossu, E. Brun, L. Cerroni, M. Gargari

Department of Clinical Science and Translational Medicine  
University of Rome Tor Vergata

**BACKGROUND:** The use of probiotics for oral health has been recently introduced, as scientists have discovered that they could be effective against periodontal disease, pathogenic bacteria and halitosis. Introducing probiotics in diet, can stop, slow or delay the process of infection that leads to oral disease. The effect of probiotics can be divided into three main categories: normalization of the gut microbiota, modulation of the immune response, and metabolic effects. From the literature analysis resulted that: *L. reuteri* and *L. brevis* have improved gingival health, by decreasing gingival bleeding; probiotic chewing gums containing *L. reuteri* decreased levels of pro-inflammatory cytokines in GCF; the use of *L. brevis* decreased MMP (collagenase) activity and other inflammatory markers in saliva. The use of *L. casei* Shirota decreased PMN elastase and MMP-3 activities in GCF, and gingival inflammation was lower in the group consuming the probiotic product, as measured by MPO activity. *L. salivarius* decreased the gingival pocket depth, particularly in high-risk groups such as smokers. The aim of this pilot study, was to evaluate the knowledge and the use of probiotics among dental practitioners. The study is aimed at the cognitive survey, to then expand and evolve into a project for dental personnel, to raise awareness regarding the recognition and the daily use of most effective probiotics for oral health.

**METHODS:** A single multiple-choice and open reply questionnaire, was administered to a sample of 100 dental operators including Physicians, Dentists and Dental Hygienists, to evaluate their knowledge and use of probiotics in daily practice first, and they were asked also, to express their willingness to deepen their knowledge regard probiotics. Data were processed by using descriptive and inferential statistical analysis methods. For each question, an alphanumeric label corresponding to each answer has been assigned. Tests of statistical significance by using Pearson's  $\chi^2$  calculation were taken into consideration only for generated p-values  $< 0,05$ , which determine that the observed associations have less than 5% of possibility to be due to fortuity.

**RESULTS:** 86% of the professionals interviewed said they knew about probiotics, of which 85.7% of the Physicians, 78% of the Dentists and 100% of the Dental Hygienists. 73.91% of Dental Hygienists have used probiotics against the 46.34% of Dentists and 14.28% of Physicians. 56% of Dental Hygienists recommended probiotics, followed by 14.30% of the Physicians and finally by only 3.65% of dentists. From the total of sample emerged that 30% of the operators advised probiotics for oral health promotion, 23.3% for antibiotic therapy support, 20% in support of periodontal therapy and only 10% for of all three purposes. 82% of the sample agreed on the benefit of receiving further information about probiotics.



## ABSTRACT

**CONCLUSIONS:** Probiotics could be a valid support for oral health, through mechanisms of competition with periodontopathogenic species, their protective action towards hard and soft tissues and their ability to work synergistically with antibiotic therapy and SRP techniques. They could reduce periodontal indexes and promote a good balance of the resident microflora. Accordingly the significance of the data collected in this study, emerged that professionals has few and confused knowledge about probiotics for oral health. Probiotics are more known by the class of dental hygienists. Furthermore, the most encouraging data showed that high percentages of professionals, declared the wish to receive further information about probiotics and their application in the dental field to corroborate knowledge and strategies of causal and non-causal intervention.

### Oral health conditions and cardiovascular diseases in elderly italian patients

A. Visca, F. De Angelis, M. Senatore, P. Lomelo, S. Di Carlo  
*Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Rome, Italy*

**BACKGROUND:** The objective of this study was to investigate the associations between oral health status and presence of cardiovascular diseases (CVD) in elderly patients.

**METHODS:** The study population consisted of 533 patients (308 females, 225 males) aged 65 to 98 years. The mean age of patients was 73.93 ( $\pm 7.8$  standard deviation (SD)). Patients were asked to visit the Geriatric Dentistry Department of "Policlinico Umberto I" of Rome for a routine check of their oral health status. All subjects gave informed, signed consent to participate in the study. A predesigned medical history questionnaire including social status, habits, medical history, general health and drug assumption were filled by each patient. Medical history, particularly focused on CVD and common atherosclerotic risk factors (arterial hypertension, diabetes, body mass index, etc.) have been recorded. Dental status was detected measuring the Decayed, Missing, and Filled Teeth (DMFT) and Community Periodontal Index (CPI) indexes. Geriatric Oral Health Assessment Index (GOHAI) was also used to evaluate masticatory function, oral self-perception and psychosocial impact on patients. The chi-square test with a 95% confidence level was used to assess qualitative variables. Odds ratios (ORs) and stepwise logistic regression were used to calculate risk estimates; the independent variables: age, gender, DMFT, CPI index, GOHAI index score, and tooth loss were included in the statistical model. P value  $< 0.05$  was considered a statistically significant cut-off.

**RESULTS:** The mean of the DMFT was 13.8 (SD: 7.1). Among all patients, 8.6% (n = 46) had more than 12 decayed teeth, 43.7% (n = 233) had more than 12 missing teeth. A total of 122 patients (52.4%) had more than 18 missing teeth. No difference between females and males was seen in DMFT and CPI index. GOHAI data were worst for females and it significantly decreased with age. Vascular diseases affected 69.8% of subjects (n = 372). Patients with CVD had less education and oral care (P  $< 0.05$ ), higher CPI index and lower of filled teeth (P  $< 0.05$ ). Moreover, the number of missing teeth was higher in patients with vascular disease and patients with more than 18 missing teeth have 2.5 times greater risk of CVD. CVDs are also associated with type 2 diabetes mellitus, underweight, and obesity (P  $< 0.05$ ).

**CONCLUSIONS:** From the finding of this study, it can be confirmed a significant link between CVD and oral health. A cooperation among geriatrician, cardiologist, and dentist is suitable to counteract the development of CVD and to early identify patients risk of CVD.

### Long term evaluation of oral health indices in patients who undergone head and neck radiation therapy in association with vitamin E (case-control group)

I. Casula, R. Rossini, T. Anzaldi, E. Marchesini, A. Ganda, L. Bonfanti, M. Bianchi

*Department of Medical and Surgical Specialties, Radiological Sciences, and Public Health (DSMC), University of Brescia*

**BACKGROUND:** Most head and neck cancers are squamous cell carcinomas that develop in the upper aerodigestive epithelium (oral cavity, pharynx, larynx) after exposure to carcinogens such as tobacco, alcohol, or to some virus (HPV, Epstein Barr). Treatments for this kind of cancer are: surgery, radiotherapy and chemotherapy, which are often combined. Many are the complications associated with radiotherapy such as xerostomia, mucositis, caries, trismus, candidiasis, dysgeusia, dysphagia and osteoradionecrosis. Management of oral health is especially important in order to limit side effects. Therefore, the aim of this study was to evaluate, in the long term, the maintenance of oral health indices in patients who had undergone head and neck radiation therapy, in association with vitamin E (case-control group).

**METHODS:** An observational study was conducted to evaluate, in the long term, the oro-dental characteristics of patients undergoing head and neck radiotherapy, in association with vitamin E. This study is the forth stage of work which started in April 2013. It includes an oro-dental assessment in 41 months. 17 patients with cancer (4 f., and 13 m.), aged between 48 and 72, were selected, then divided into a case group (7 patient) which received products containing vitamin E, and a control group which didn't receive products containing vitamin E. Each patient was informed about the protocol approved by the ethical Committee of our Institution. They sign an informed consent and have been evaluated by a single dental hygienist. During each visit (T0, T1, T2) the patients received a questionnaire, then the dental hygienist performed an extra-oral examination, an intra-oral examination, a detection of oral health indices through the use of a plaque index and a bleeding index (Ainamo & Bay 1975), motivation and home oral hygiene education, professional cleaning. Professional cleaning was performed using an ultrasonic scaler above and below the gum, soft non-abrasive cups, prophylaxis paste (RDA  $< 40$ ).

**RESULTS:** To manage the side effects a good oral health is necessary, which can be reached by a perfect plaque control (patient compliance). The effectiveness of our protocol of study is evident, as both indices (plaque and bleeding) were significantly reduced from T0 to T1. Plaque index average: T0: 79%, T1: 5%. Bleeding index average: T0: 69%, T1: 3%. The vitamin E reduced pain and burning sensation.

**CONCLUSIONS:** Patients who undergone radio-therapy, are special needs patient. The role of a dental hygienist is essential in following up oral hygiene and food habits, in short, medium and long term. Also vitamin E, can give a good relief from pain and burning sensation (although more clinical evaluation need to be done).

## Oral microbiota and oral aspects in celiac disease before and after gluten free diet

C. Occhipinti, N. Marziali, P. Cressoni, C. Iovane, A. Bernier, E. Aref, V. Benvenuto, A. Zanoncelli, V. Zana, U. Garagiola

*Università degli Studi di Milano, Irccs Ca' Granda Fondazione Ospedale Maggiore Policlinico - UOC Odontostomatologica and Unit, Milan, Italy*

**BACKGROUND:** Celiac disease is an autoimmune disease. The immune reaction produces an inflammation that damages the lining of the small intestine, in particular the duodenal mucosa, leading to a general malabsorption of nutrients that causes intestinal symptoms and manifestations to the oral cavity. The aim of the work is to identify any dental or mucosal manifestations of celiac disease before and after the gluten-free diet, in order to find a new diagnostic method for this disease. The oral examination could make a significant contribution to the revelation of celiac disease. Finding the connection between this disease and oral problems, the oral clinical examination could be considered an easy, non-invasive and effective method for the identification of autoimmune disease. **METHODS:** 300 celiac patients will be examined before the gluten-free diet (T0) and then they will be reevaluated three months after the beginning of diet (T1).

In T0 will be performed:

- anamnesis;
- DMFT / dmft (decayed, missing, filled, teeth);
- evaluation of mucosal lesions such as recurrent aphthous stomatitis;
- collection of information related to the last professional oral hygiene and the brushing habits;
- pH through a saliva sample examined with pH meter;
- quantitative analysis of basal salivary flow;
- identification of C-reactive protein that detects and controls an inflammation in the organism;
- FMPS (full mouth plaque score) and FMBS (full mouth bleeding score) considering six surface a tooth in order to exclude poor oral hygiene as a cause of inflammation;
- microbiological analysis (GENOMIC KIT for the extraction of bacterial DNA processed in PCR-Real-Time)

The patients will be treated with professional oral hygiene to remove tartar and plaque. In the second visit (T1) the parameters considered in T0 will be re-evaluated using the initial methods. The data obtained will be compared with those observed in T0. **RESULTS:** Comparing 300 patients' clinical exams, it will be possible to define if celiac patients have more oral manifestations than healthy people.

**CONCLUSIONS:** The identification of oral signs caused by celiac disease will give more importance to clinical oral examination because this exam will be considered an easy, non-invasive and effective method to identify the autoimmune disease.

## Biostimulation of salivary glands in the prevention of oral problems related to diseases with reduced salivary volume

C. Occhipinti, A. Zanoncelli, P. Cressoni, C. Mauro, E. Aref, V. Zana, A. Bernier, C. Iovane, N. Marziali, V. Benvenuto, U. Garagiola

*Università degli Studi di Milano, Irccs Ca' Granda Fondazione Ospedale Maggiore Policlinico - UOC Odontostomatologica and Unit, Milan, Italy*

**BACKGROUND:** Multiple test procedures were performed for patients with Xerostomia and oral saliva reduction, which promote a higher production of saliva in order to choose the

most effective. Biostimulation will be carried out using different methods, such as with low-energy polychromatic and incoherent polarized light, which will stimulate cellular mitochondrial activity and Diode laser and comparing the results with two other types of salivary stimulators, such as lemon juice and chewing gum.

**METHODS:** Randomized study on a population of healthy adult subjects non-smoking and of both sexes of basal and stimulated salivary flow with:

- Low energy polychromatic and incoherent polarized light for five minutes
- Diode laser 810 nm-1w defocused handpiece (distance 1 cm time 50 seconds)
- Chewing-gum for three minutes
- Lemon Juice (one drop 0,04 mL minute for five minutes, and after subtracting 0,04 x 5)

The salivary collection will be carried out at a distance of 2 hours from the consumption of food and beverages and also from home and professional oral hygiene. The collection technique is that of spitting in a container for five minutes. The measurements will be compared with the standard values of Leo M. Sreeley and Arijan Vissin. (0,25 mL/min  $\leq$  Vflu.sal-basale  $\leq$  0,35 mL/min; 1mL  $\leq$  Vflu. sal-stimolata  $\leq$  3 mL/min.)

Our interest will be mainly on the stimulation of the glandular secretion through with polarized light and Diode laser.

**RESULTS:** The use of Polarized light and Diode laser in patients with Xerostomia or saliva reduction give hope for positive and better results of salivary stimulation than using lemon juice and chewing-gum.

**CONCLUSIONS:** It was identified the salivary stimulation method more effective and without side effects for the daily management and for prevention oral problem of the patient with reduced salivary. The use of low-energy polarized light and Diode laser use in this study do not have any known side effects, either short or long term and no risk of tissue damage. Therefore there are no restrictions even for pediatric use.

## Evaluation of the oral microbiota in surgical extraction of symptomless third molar enclosed: oral hygiene instructions associated with chlorhexidine without antibiotic therapy

C. Occhipinti, A. Bernier, P. Cressoni, N. Marziali, V. Benvenuto, A. Zanoncelli, V. Zana, E. Aref, C. Iovane, U. Garagiola  
*Università degli Studi di Milano, Irccs Ca' Granda Fondazione Ospedale Maggiore Policlinico - UOC Odontostomatologica and Unit, Milan, Italy*

**BACKGROUND:** Surgical site plaque accumulation is one of the problems that leads to bad healing. Of clinical relevance is the fact that the structure of the plaque biofilm might restrict the penetration of antimicrobial agents, while bacteria grows on the surface; only with mechanical therapy we can to destroy it.

Antibiotic Prophylaxis (AP) represents a common but often misused procedure in dental practice, thus aggravating the risk for antimicrobial resistance and adverse effects occurrence. Aim of the study is to prove that on healthy individuals a good oral hygiene associated to an antiseptic is enough in order to prevent from infections.

**METHODS:** Randomly selecting healthy individuals for the extraction of the impacted symptomless mandibular third molar. We take a sample of dental plaque before the extrac-

## ABSTRACT

tion and another one after 7 days, that will be subjected to microbiological analysis. To half of the selected patients (that for convenience we will call the "educated patients") we provide an accurate oral hygiene lesson using models and brushes in order to show the correct movements to be implemented; in addition, to that half of sample, we will prescribe Chlorhexidine (CHX) mouthwash and toothpaste and we will recommend to use them for the following 7 days twice a day (every 12 hours). Each patient will fill out a questionnaire in order to be divided into 3 groups:

- educated patients who didn't have AP and post-operative antibiotic therapy but used CHX;
- uneducated patients who didn't have AP and post-operative antibiotic therapy but used CHX;
- uneducated patients who didn't have AP and post-operative antibiotic therapy and didn't use CHX.

**RESULTS:** An efficient oral hygiene and the use every 12 hours of CHX gives hope for a faster and better healing of the treated gingival tissue and in a lower and less aggressive presence of bacterial plaque compared to patients who don't follow these measures.

**CONCLUSIONS:** The plaque biofilm is the main cause of postoperative complications in the extraction of the third molar, and since we are not able to destroy it if not through the brushing, an exclusively antibiotic therapy would not prevent the infection. Providing a good education to oral health instructions is essential for oral cavity health. A mechanical therapy associated with the use of an antiseptic is sufficient to avoid an infection.

## Oral microbiota and clinical variations in Ramadan fasting patients

C. Occhipinti, E. Aref, P. Cressoni, V. Benvenuto, C. Iovane, A. Bernier, N. Marziali, V. Zana, A. Zanoncelli, U. Garagiola

*Università degli Studi di Milano, Irccs Ca' Granda Fondazione Ospedale Maggiore Policlinico - UOC Odontostomatologica and Unit, Milan, Italy*

**BACKGROUND:** Evaluate, compared to standard parameters, changes in diet, nutrition frequency and other health-related habits and identify guidelines aimed to preventing oral issues of fasting in the month of Ramadan: Muslim religious fasting belief, which it believers shall refrain from taking food or drink from Sunrise until sunset.

**METHODS:** The study will be conducted at the dental clinic, IRCCS Ospedale Maggiore Policlinico of Milan, where they'll be selected 60 adults who follow the Ramadan fasting, divided randomly in two groups of people:

- A. 30 subjects educated and motivated to correct oral hygiene habits and maneuvers at home;
- B. 30 subjects not educated and not motivated to correct oral hygiene habits and maneuvers at home.

Both groups are evaluated at 3 different moments:

- from 1 to 30 days prior to the commencement of fasting (T0);
- 7 days before the end of the fasting period (T1);
- 7 days after the end of the fasting period (T2).

Initial treatment at T0 will be: scaling, DMFT/dmft (decayed, missed, filled, teeth), caries receptivity index and, considering 6 surfaces for each dental element, full mouth plaque score (FMPS), the semi-qualitative plaque index of Sinless and Loë (IP), full mouth bleeding score (FMBS) and semi-qualitative bleeding index (IS). Will be evaluate the oral microbiota following a dental plaque levy, processed afterwards in PCR-real time for amplification and quantization of bacterial DNA.

Analyzed, by means of a pH meter, the salivary pH and, through the Griess reagent (NO), the endothelial dilation factor, that represents the degree of gingival/periodontal inflammation expressed as concentration of  $[\text{NO}_2]$  g/L:  $4\text{NO} + \text{O}_2 + 2\text{H}_2\text{O} \rightarrow 4\text{NO}_2 + 4\text{H}^+$ . For last, they will be given a questionnaire to rate their eating habits and their initials oral hygiene habits at home. In T1 and T2 will be again recalculated as well the same indexes and repeated the same analysis.

**RESULTS:** The results of the data collected in the three moments of the study, compared to standard parameters, will allow us to identify any risks to the oral health of these patients. In addition, may advance in the month of Ramadan fasting guidelines modeled on the Group A or group B.

**CONCLUSIONS:** Fasting inevitably causes dietary changes. Therefore, there may be a correlation between caries receptivity and/or periodontal disease in correspondence to a shift in the timing of eating. It highlights, therefore, the importance of knowing any changes of the oral microbiota and oral health related to the month of Ramadan in the two different groups considered in the study.

## Low energy polarized light in the care of inflammations and gingival injuries in patients affected by juvenile idiopathic arthritis

P. Cressoni, V. Benvenuto, C. Occhipinti, V. Zana, E. Aref, C. Iovane, A. Zanoncelli, A. Bernier, N. Marziali, U. Garagiola

*Università degli Studi di Milano, Irccs Ca' Granda Fondazione Ospedale Maggiore Policlinico - UOC Odontostomatologica and Unit, Milan, Italy*

**BACKGROUND:** Testing a useful procedure based on a complex periodontal repair and regeneration system through the use of a photobiomodulator device in which light, at low energy levels, modulates intra- and extracellular photoreceptors through molecular and cellular processes that can stimulate both anti-inflammatory mechanisms that a cell proliferation response.

**METHODS:** Healthy orthodontic patients (A) and affected by juvenile Idiopathic Arthritis (B) are selected at the dental clinic of the IRCCS CA' GRANDA Ospedale Maggiore Policlinico in Milan. Both groups will be submitted to the Griess test to quantify the degree of gingival / periodontal inflammation, found at the salivary level as  $\text{NO}_2^-$ .

The quantitative bleeding (FMBS) and semi-qualitative (IS) indices will be evaluated, the latter using four different codes:

- Code 0: absence of bleeding in the survey;
- Code 1: presence of bleeding in the survey, without redness and edema;
- Code 2: bleeding in the survey with redness and edema;
- Code 3: spontaneous bleeding.

In addition, the quantitative (FMPS) and semi-qualitative plaque indices of Silness J & Loe H (IP) will be calculated, considering six surfaces per tooth; the latter attributing four different codes:

- Code 0: lack of plaque;
- Code 1: 1/3 of the dental surface covered with plaque;
- Code 2: 2/3 of the dental surface covered with plaque;
- Code 3: more than 2/3 of the dental surface covered with plaque.

Our attention will focus on the use of the medical device Light Therapy System that emits polarized, polychromatic, non-coherent and non-invasive light. Subjects with gingival / periodontal inflammation will be treated with the following method: 1st and 4rd quadrantà treated with phototherapy; 2nd



and 3th quadrant à not treated with phototherapy. In this way each patient will be, at the same time, the case group and the control group.

**RESULTS:** The use of phototherapy, compared to not using this therapeutic procedure, is very effective in the treatment of inflammatory processes of the oral cavity.

**CONCLUSIONS:** The use of polarized light in patients affected by a compromising pathologies such as Juvenile Idiopathic Arthritis could represent a solution and an ideal complement to the health of the oral cavity, as it guarantees fast healing and rapid pain relief. Therefore it represents a safe and effective clinical treatment devoid of known side effects.

### Drug-induced gingival overgrowth: observational study

F Vecchiet <sup>1</sup>, E Ferrara <sup>1</sup>, L Cacchio <sup>1</sup>, P Pignatelli <sup>2</sup>

<sup>1</sup>*U.O.C. Ospedale "S.S. Annunziata", Chieti, Italy;* <sup>2</sup>*Università degli Studi "G. D'Annunzio", Chieti, Italy*

**BACKGROUND:** Drug-induced Gingival overgrowth (GO) is a common side effect caused by three categories of drugs: anticonvulsants, calcium channel blockers, and immunosuppressants. Furthermore, levels of dental plaque and gingival inflammation appear to be associated with this phenomenon. Cyclosporin A (CsA) and Tacrolimus (FK506) are a powerful immunosuppressive agents given to solid organ transplant recipients widely used for prevention of transplant rejection, as well as for the treatment of autoimmune disorders. Gingival overgrowth is one of several oral side-effects of cyclosporine-A, with a quoted prevalence of between 10-35%. Tacrolimus, which is a macrolide antibiotic with a different side-effect profile, has emerged as a substitute for cyclosporin in organ transplantation. However, there have been conflicting reports of its side-effects and its capacity to cause gingival overgrowth. The aim of the study was to evaluate the prevalence of GO in renal transplanted patients treated with CsA compared with FK506 treatment and if clinical periodontal parameters may be associated with outcome. Furthermore, the effectiveness of a chlorhexidine digluconate 0,12% and Cetylpyridinium Chloride 0,05% solution in management of pre-operative and post-operative phases of GO was investigated.

**METHODS:** The study enrolled 68 renal transplanted patients with a mean age  $46.4 \pm 8.12$  years medicated with Cyclosporine-A or Tacrolimus. The patients were divided into two groups: CsA treatment and FK506 treatment. Periodontal clinical examination was carried out using a Williams probe (Hu-Friedy, Chicago, IL, USA). Gingival Index (GI) and Plaque Index (PI) were used to record the presence of plaque on six surfaces (disto-facial, facial, mesio-facial and lingual surfaces). The severity of Gingival Enlargement was graded according to the index originally described by Angelopoulos and Goaz 1972 and later modified by Miller and Damn 1992 (GO index). Gingival tissue was measured from the cemento-enamel junction to the free gingival margin. GO was treated with non-surgical mechanical debridement, surgical excision of the excessive tissue, followed by chemical plaque control with Chlorhexidine Digluconate 0,12% and Cetylpyridinium Chloride 0,05% solution for 10-14 days. **RESULTS:** About GO, there were no statistically significant differences between the groups receiving cyclosporine-A or tacrolimus. The GO prevalence and severity rates were lower than those reported in previous studies. The mean GI and PI

between two groups were not statistically significant (PI - P = 0.950, GI - P = 0,05).

**CONCLUSIONS:** Drug-induced gingival enlargement is frequently induced by immunosuppressant drugs. Dental plaque and poor oral hygiene exacerbate this side effects, and therefore correct management of oral care associated with chemical plaque control with Chlorhexidine Digluconate 0,12% and Cetylpyridinium Chloride 0,05% of transplanted patients should be included before and after transplantation, to prevent and control this side effect.

### Oral health and nutrition in elderly patients: behavioral aspect

S. Ceraulo <sup>1</sup>, I. Ceraulo <sup>2</sup>, F. Pulicari <sup>3</sup>, G. Luparelli <sup>4</sup>, F. Autenzio <sup>5</sup>

<sup>1</sup>*Università degli Studi Milano Bicocca, Milan, Italy;* <sup>2</sup>*Residenza Sanitaria Assistenziale (RSA) di Milano, Milan, Italy;* <sup>3</sup>*Igiene Dentale, Scienze delle Professioni Sanitarie Assistenziali;* <sup>4</sup>*Operatore Socio Sanitario, Residenza Sanitaria Assistenziale (RSA);* <sup>5</sup>*Assistente Studio Odontoiatrico*

The increase of geriatric population, due to the promotion of healthy lifestyles and by preventive healthcare, favoured the birth and increment of hospices. In these structures, the feeding of the patient plays a fundamental role in quality of life and in the development of chronic diseases, and sometimes it could be very difficult due to the onset of oral diseases. In fact, it has been studied how the malnutrition of long-term hospitalizations influences the course of chronic diseases in a pejorative way, increasing the healing time of the curable complications associated with them, worsening the quality of life and increasing costs.

**BACKGROUND:** The aim of this study is to evaluate how oral health can improve behavioral status during the feeding of elderly subjects hosted in Residence Health Elderly (RSA). **METHODS:** A sample of 60 guests of an RSA over 75 years of age divided into three groups: group "A" self-sufficient guests; group "B" collaborating non self-sufficient guests; group "C" guests affected by Alzheimer. For each patient was recorded: the Decayed Missing Filled Teeth (DMFT) index, the presence of mobile or fixed prostheses and nutritional status using the MNI tool. Then basic dental care was performed on patients where needed. After one week a questionnaire was submitted to operators to evaluate a possible improvement of the attention.

**RESULTS:** The results obtained showed significant differences for DMFT in the three groups. The highest value is found in the self-sufficient and collaborating subjects this is due to the free choice of the subject not conditioned by a legal guardian. In addition, subjects over the age of 85 in the "C" group have the lowest average value because family members have provided the family member during the first period of the curable disease. Surprising is the result of the multiple choice questionnaire given to the OSS staff.

**CONCLUSIONS:** From the analysis of the questionnaires compiled by the different operators at the time T0 and T1 show that a high percentage of guests in the three groups had positive reactions (vigilance and attention) during the main meals.

## ABSTRACT

**Comparison among three caries risk assessment methods**G. Bontà<sup>1,2</sup>, M.G. Cagetti<sup>1</sup>, G. Sciarappa<sup>1</sup>, G. Campus<sup>1,2</sup>, L. Strohmeier<sup>1</sup><sup>1</sup>Department of Biomedical, Surgical and Dental Sciences, University of Milan, Milan, Italy; WHO Collaboration Center for Epidemiology and Community Dentistry, Milan, Italy; <sup>2</sup>Department of Surgery, Microsurgery and Medicine Sciences – School of Dentistry University of Sassari, Sassari, Italy**BACKGROUND:** The purpose of this study was to compare the caries risk level using three different multifactorial caries risk models Cariogram, CaMBRA and PreViser, in a sample of Italian adults and compare the results obtained in order to verify whether the judgment expressed by the three methods was concordant.**METHODS:** A sample size calculation for pilot study was performed following Viechtbauer et al. (2015), resulting in a number needed of 65 subjects. One hundred subjects attending the Dental School of the University of Milan (mean age 23±3.11 yy), were invited to participate. Sixty-eight subjects were enrolled and interviewed to record general health, oral hygiene practices, dietary habits and fluoride exposure. Caries experience (DMFT index) and amount of plaque (Silness and Loe plaque index) was measured. Salivary flow rate, salivary buffer capacity and concentration of cariogenic bacteria, mutans streptococci and Lactobacilli, were recorded. Finally, for each subject the risk level was calculated using CaMBRA, PreViser and Cariogram models. Lin's concordance Correlation Coefficient for Agreement (CCA) was calculated to determine how far the observed data deviate from the line of perfect concordance. The Bradley-Blackwood test (BBt) was used for a simultaneous test of their means and variances.**RESULTS:** Data show a range of agreement from low to good between the risk level calculated using the three models. CCA was 0.37 (95%CI 0.21 – 0.53) with a BBt = 21.22 (p<0.01) between Cariogram and Cambra, CCA=0.43 (95%CI 0.26 – 0.60) with a BBt = 13.11 (p<0.01) between Cariogram and Previser, and finally CCA=0.65 (95%CI 0.52 – 0.78) with a BBt = 8.97 (p<0.01) between Cambra and Previser. Only in 29 subjects out of 68 (42%) there was a perfect agreement among results obtained through the three models. Considering caries level obtained using CaMBRA and PreViser, a quite high correspondence was observed (53 subjects on 68 - 78%). Comparing Cariogram model and PreViser a lower agreement was noted (37 subjects on 68 - 54%). Finally comparing CaMBRA and Cariogram the lowest agreement was found (30 subjects on 68 - 44%). The CaMBRA method tends to overestimate the risk, with 43 subjects on 68 high risk caries, unlike the PreViser method where the number of high risk subjects corresponds to the number of low-risk subjects and unlike the Cariogram method that yields much more positive results, only 12 subjects over 68 are placed in the high risk band. The factor “a visible cavitation” or “filling in the last three years” was removed and a new comparison with PreViser was performed; an agreement of 91% was observed. **CONCLUSIONS:** Cariogram, CaMBRA and Previser do not produce concordant results. The findings of this pilot study underline how the calculation of the risk level even using standardized models is a very difficult goal not yet fully achieved. The results showed that different caries risk assessment models evaluate the risk differently, probably due to the multifactorial aetiology of the disease. It is urgent to develop valid and reliable methods for caries risk assessment based on best evidence for caries prediction and disease management.**Gluten free diet and oral health status on North East Sicily patients**

R. Mastroieni, L. Fiorillo, S. Marino, C. D'amico, G. Amoroso, G. Cervino, M. Cicciù

*Department of Biomedical and Dental Sciences and Morphological and Functional Imaging, Messina University, Messina, Italy***BACKGROUND:** The increment of recording atypical oral manifestation in young patients, often related with systematic disease is today a challenge for the clinicians. Sometimes, the presence of tooth enamel lesion correlated with soft tissue lesion is just a symptom or a trigger signs for a deeper and undetermined disease. Recently high impact has been developed toward the influence of the diet as a controlled and modifiable factor in “weak” patient affected by celiac pathologies. Celiac disease (CD) is an autoimmune reaction to gluten, leading to intestinal inflammation, villous atrophy, and malabsorption. It is the most common autoimmune gastrointestinal disorder, with an increasing prevalence. Gluten is a proline- rich and glutamine-rich protein present in the wheat (gliadin), barley (hordein) and rye (secalin). The gluten free diet (GFD) seems to better influence the oral manifestation of this kind of patient. Timely diagnosis is important in order to start a gluten-free diet and prevent complications. The main aim of this revision was to analyse the international literature highlighting the relationship between diet quality and the individual oral health status. **METHODS:** A comprehensive review of the current literature was conducted according to the PRISMA guidelines by accessing the NCBI PubMed database. Authors conducted the search of articles in English language published from 2008 to 2018. The first analysis with filters recorded about 34 manuscript accordingly with the selected keywords. Finally a number of 25 appropriate published papers were comprehended in the review. The searched keywords were “celiac disease”, “oral manifestations”, “dental enamel defect”, “gluten free diet” and “oral aphthous ulcers”.**RESULTS:** Symptoms of coeliac disease vary widely and are certainly not restricted to the intestine. They may include, among others, dental and oral manifestations. Most of them are non-specific like aphthous ulcers, stomatitis, painful mouth, gingival problems, burning sensation (particularly of the tongue), caries score, reduction of salivary flow (dryness), chemical alterations in the enamel. but symmetric enamel defects are very specific to coeliac disease. Particular attention should be paid to typical dental enamel defects with a various degree of advancement: discolorations, horizontal groves and pits, and even significant structural destruction causing the change of the dental crown.**CONCLUSIONS:** A life-long gluten-free diet (GFD) is an effective treatment to alleviate symptoms, normalize autoantibodies, and heal the intestinal mucosa in patients with CD, and it is important to consider, as far as oral manifestations are concerned, what is more important for the patient's lifestyle.**The dental hygienist in Europe and in Italy: survey on future expectations of the profession**

I. Casula, C. Manenti, T. Anzaldi, E. Marchesini, A. Ganda, L. Bonfanti, M. Bianchi

*Department of Medical and Surgical Specialties, Radiological Sciences, and Public Health (DSMC), University of Brescia, Brescia, Italy***BACKGROUND:** The purpose of this study is to learn about training, skills and regulation of the dental hygienist profes-

sion in the European Union/ European Economic Area (EU/EEA) countries and at the same time to highlight the skills that the Italian dental hygienists believe can improve their professional practice.

**METHODS:** This work is split into two parts: the first one consists of a review of literature and legislation regarding the current status of dental hygienist in the EU/EEA countries; information was also found on the main dental hygienist institutions websites (IFDH, EDHF, CECDO) and on the official websites of training schools in Europe. The second part consists of a questionnaire, which was provided to graduated Italian dental hygienists to evaluate their professional status. The questionnaire is divided into three parts: biographical data, current skills, desirable skills.

**RESULTS:** The dental hygienist profession is regulated in two thirds of EU/EEA countries. In Austria, Belgium and Germany is not yet recognized, but the situation seems to be evolving. Northern Europe has the highest level of dental hygiene education. The harmonization of dental hygiene profession has not been achieved yet. At the same time, the range of professional responsibilities today is not the same for each country. Instead, the survey included a total of 601 participants, 77% females and 23% males. 52% of the sample is between 20 and 30 years old and 31% comes from Lombardy. According to the questionnaire results, 71% of dental hygienists are satisfied with their current skills, but the main competencies that they consider to improve are the ability to take X-rays (62%), to make diagnosis (56%) and to administer topical anesthetic under the dentist supervision (41%) or autonomously (39%). These skills would be able to put him in better professional conditions, improving his cultural and professional autonomy. The need is to expand the range of professional skills.

**CONCLUSIONS:** The dental hygienist has made a lot of progress since birth, but today is not recognized and educated in the same way in all countries. The goal is to reach a more common identity at European level. Even if the Italian dental hygienist performs less skills than the European one, his training is often better. So the profession needs to expand beyond traditional roles. The invitation is to prosper and grow to face future challenges with competence and professionalism.

### Oral health promotion in 3-5 year aged children in relation to the behavioral habits of parents and children

D. Pietrunti, D. Corridore, G. Di Giorgio, F. Calcagnile, I. Voza  
*Dental Hygiene School Course B, Sapienza University of Rome, Isernia, Italy*

**BACKGROUND:** From the latest WHO updates, in line with official data of Ministry of Health, it emerges that the prevalence of caries in Italy still corresponds to about 25% in children aged 0 to 5 and over 50% in children above 12 years, concentrated more on those categories that experience serious economic hardship. The aim of this experimental study is to teach parents about the proper management of their child's oral hygiene.

**METHODS:** The study took place in the kindergarten of Colozza Institute, Campobasso. Anonymous questionnaires were administered to the parents of the 155 children enrolled in the aforementioned kindergarten, aged between 3 and 5 years. The study began on 01st June, 2017 and ended on 30th September, 2017.

**RESULTS:** The final analysis of the study involved a sample of 101 parents / children, including 45 boys and 56 girls; among the parents who collaborated in the study, 53 were at their first experience as a parent and 48 were found to have more than one child. The results of this study brought to our attention four main points on which it is still necessary to intervene in an incisive manner: Transmission of dental caries from mother or father to child: 24% of parents believed that dental caries can be transmitted, 62% answered negatively and 14% were unaware of it. Children's bad habits: 49% of children continued to use or have used the baby bottle at night and the dummy for a long period of time (41% over 2 years). Oral home hygiene for children: 57% of parents said that their child started brushing their teeth for the first time between 2 and 3 years of age and only 30% after the eruption of their first tooth. Role of the school: of the 101 children in the sample, 35% took part in the afternoon return, having lunch at school; among them School offered the possibility to dedicate time to their oral hygiene only to 11%.

**CONCLUSIONS:** These results show that much has yet to be done for the organizational goals of prevention. Much has been done in the direct education of families, through a "pressing" of media and health care professionals, but leaving aside the school, where unfortunately there is still a lot of shortage.

### Management of the pacifier and infant oral health: epidemiological survey in adults

I. Casula, M. Bettinsoli, T. Anzaldi, E. Marchesini, A. Ganda, L. Bonfanti, E. Bianchi

*Department of Medical and Surgical Specialties, Radiological Sciences, and Public Health (DSMC), University of Brescia, Brescia, Italy*

**BACKGROUND:** The positive and negative effects associated to pacifier are controversial. Many studies try to investigate, in some situation, if the use of pacifiers could be a protective or a risk factor. The aim of this study was to investigate the adults level of knowledge about the use of pacifier and the prevention of oral diseases related to it.

**METHODS:** A literature review about the use of the pacifier correlated to breastfeeding, oral infection (oral candidiasis and tooth decay), Sudden Infant Death Syndrome (SIDS) and malocclusion was conducted. The study was carried out by using key words such as infant oral health, pacifiers, breastfeeding, oral candidiasis, thrush, tooth decay, early childhood caries, malocclusion of teeth, and SIDS on specific database searches (Pubmed, Cochrane Library, Istat, Ministero della Salute, American Academy of Pediatrics). Then an anonymous questionnaires, which includes 20 items, have been carried out in a group of adults, from April to July 2017. The questionnaire was made up of questions concerning various topics:

- Adult habits about oral health care;
- Child common oral infections and their prevention (candidiasis and tooth decay);
- Sudden Infant Death Syndrome (SIDS);
- Breastfeeding;
- Management of the use of pacifiers.

The data have been analyzed with a descriptive statistical analysis.

**RESULTS:** It has been shown that adults knowledge about oral candidiasis, SIDS and the management of pacifier is superficial and incomplete. In particular, the 69% of adults know oral candidiasis, but the 51% don't know if it could be prevent. The 84% of them are aware about SIDS, but only



## ABSTRACT

30% believe it is preventable. Instead, they are well informed about caries and breastfeeding, actually the 91% know that caries are preventable and most of the women (56%) breastfeeding for 6 month or more.

**CONCLUSIONS:** Most of the people who filled the questionnaire need to be informed and trained about the use of the pacifier. Therefore here is a guideline about the correct use of it:

— keep all the removable protections away from children, in order to avoid the risk of choking;

— check the integrity of the pacifier every time before using it; stretch and twist it. Substitute it immediately if it is damaged or broken;

— don't tie ribbons or free thread on it: child could strangle himself. If you want to avoid the pacifier from falling down, please use the appropriate tools;

— if the pacifier completely got into the mouth, please do not panic. Thanks to its shape, it cannot be swollen. Just pull and take it off the mouth, being careful.

don't leave the pacifier right under the direct sun light or close to heat sources. Live it in the disinfecting solutions just for the time it needs otherwise it can be damaged;

don't put sugar or honey on it because they damage babies' teeth;

nobody should suck the pacifier before it gets into the child mouth;

clean the pacifier every time it is used.

In order to insure the correct hygiene before using the pacifier for the first time, put it in boiling water, and then dry it off. In alternative, you can use disinfectant solutions. The pacifier should be substituted every one or two months;

if you don't use it for a long time, put it in its box after disinfection.

## Comparative evaluation of the effectiveness of a toothpaste containing fluoride-hydroxyapatite and bio-active complex, compared to a toothpaste containing olaflur, for the treatment of the white spot lesions in patient in pediatric age

A. Candeo<sup>1</sup>, N. Zerman<sup>2</sup>

<sup>1</sup>Dental Hygiene, Degree course of Dental Hygiene, University of Verona, Verona, Italy; <sup>2</sup>Department of Surgery, Dentistry, Paediatrics and Gynaecology, University Hospital of Verona University, Verona, Italy

**BACKGROUND:** The aim of the study was to perform a comparative assessment of the effectiveness, or inefficiency, of a professional toothpaste containing Fluoride - Hydroxyapatite and Bio - Active Complex, compared to a toothpaste containing Olaflur, to remineralize demineralized enamel areas in the patient in paediatric age. The second objective was to verify if the patient's compliance could contribute to modify positively, or in a negative way, any results obtained with the use of the two different toothpastes.

**METHODS:** 23 patients between the ages of 6 and 14 were selected diagnosed with demineralization of local enamel or widespread at both deciduous and permanent teeth. The 14 patients who had the most evident lesions, or at a more advanced stage, were asked to use the toothpaste containing Fluoride - Hydroxyapatite and Bio - Active Complex, while the 13 patients in the control group were asked to use the toothpaste containing Olaflur. In both cases the treatment was followed both in the long term, 6 months, and in the short

term, 3 months. Two sessions were held: the first for the collection of anamnestic data, photographic documentation, the delivery of samples and the protocol, specifically created for experimentation; the second one for the new data collection, such as plaque index, DMFT and dmft, presence of pigmentations, halitosis and alimentary anamnesis, and for the control of the obtained results.

**RESULTS:** After the treatment the number of the white spot lesions has been reduced or, in some cases, the milky white color has been modified, a light transparency becoming. Our preliminary results suggest that using a toothpaste containing 1400 ppm of fluoride, both containing Fluoride - Hydroxyapatite and Bio - Active Complex and containing Olaflur, may represent a valid choice in the treatment of demineralized enamel areas. The best results were obtained with the long-term treatment, 6 months, in patients who changed their habits of oral hygiene, food habits and used toothpastes twice a day with the correct brushing technique or with the electric toothbrush. The statistical results were verified by performing the Student's t-Test.

**CONCLUSIONS:** The use of both toothpaste, in patients who brush their teeth twice a day, follow a minimally cariogenic diet, limiting carbohydrates and carbonated beverages, could be effective to remineralize demineralized enamel areas. Vice versa, in patients who use the fluoride-containing toothpaste in an inconsistent manner, which do not change their habit of oral hygiene and food habits, there are no results. Therefore also the patient's compliance with the treatment is fundamental.

## Health education intervention in a health residence for disabled: socio-sanitary operator training

I. Casula, L. Giroletti, T. Anzaldi, E. Marchesini, A. Ganda, L. Bonfanti, M. Bianchi

Department of Medical and Surgical Specialties, Radiological Sciences, and Public Health (DSMC), University of Brescia, Brescia, Italy

**BACKGROUND:** Patients with disabilities can't take care of themselves. Socio-sanitary operators have to help them managing daily routine and, sometimes, oral care is underestimate. Therefore, the aim of this study was to evaluate the effectiveness of an oral hygiene training program to socio-sanitary operators for people with disabilities in a nursing home.

**MATERIALS:** The Dental Hygiene Course of the University of Brescia and the Social Cooperative Nikolajewka Onlus created a collaboration in 2008, 2012, 2016 to monitor and control oral care in patients with disabilities. A correct and complete hygiene for these individuals can only be achieved through constant training and motivation; therefore in 2017 a new health education program began. The project consisted of theoretical and practical lessons, based on the knowledge level of the socio-sanitary operator involved. To simplify the healthcare assistant work, poster showing the correct oral hygiene procedures have been created. The lessons were performed in six meetings about two hours long (four theoretical and two practical) and were addressed to 52 healthcare workers. The theoretical and practical lessons had the following purpose:

To choose the correct oral hygiene techniques and instruments for specific type of patient disability;

To prevent the need of urgent dental and periodontal treatments;

To contribute to the entire patient's health, with oral health being an integral part of it;

To help improving the aesthetics look for a better social acceptance.

The research has included three stages:

1° stage: administration of a survey with specific questions about knowledge and attitude towards oral hygiene of the socio-sanitary operator.

2° stage: theoretical and practical lessons based on different topics of oral hygiene.

3° stage: practical verification of the theoretical and practical lessons and compilation of an evaluation questionnaire by the dental hygienist.

In the practical part, these aspects have been verified:

The correct position of the healthcare workers;

The correct application of the provided protocol for the patient's specific physical or mental condition;

The accuracy of the brushing technique;

The duration of the brushing;

The hygiene of the prosthesis;

The condition of the toothbrush;

The availability of all materials needed for daily oral hygiene.

The results obtained from this new educational project were then compared with those obtained from the previous studies in 2008, 2012 and 2016 in order to verify the evolution of theoretical and practical knowledge of healthcare workers.

**RESULTS:** After comparing the results obtained from this study with those obtained from the previous projects, it is possible to notice significant changes. Today we can affirm that healthcare workers are well informed about the etiology and the prevention of dental and periodontal diseases. In the practical part, the healthcare workers were able to apply the correct brushing technique and to choose the correct position. However, the brushing time for patient's teeth could be improved.

**CONCLUSIONS:** The dental hygienist plays an essential role in the health department thanks to a constant updating in oral hygiene. Motivation and instruction are the fundamental reference point to promote oral health. So, the dental hygienist has to motivate and teach all those involved in the care and treatment of other people, especially patient with disabilities, in order to avoid pathological diseases.

## Dentistry sealant comparison: hydrophobic versus hydrophilic materials for first permanent molars

C. Pegoraro, N. Zerman, L. Bombasini

*Università degli Studi di Verona, Corso di Studi di Igiene Dentale, Verona, Italy*

**BACKGROUND:** Hydrophilic compounds are resinous materials that are compatible with humid environments by easily polymerizing in the presence of water. The aim of this study is to provide empirical evidences of the usage of these materials and test their resistance in the oral hole in the short and long term and makes a comparison with the hydrophobic material in first permanent molars.

**METHODS:** 20 patients were selected between the 6 and the 14 year of age, with sealing necessity. The oral cave was then divided into two halves: the elements in the 1<sup>st</sup> and 4<sup>th</sup> quadrants were treated with the composite hydrophobic photo-polymerizing material. The elements in the 2<sup>nd</sup> and 3<sup>rd</sup> quadrants were treated with composite hydrophilic photo-polymerizing materials. The sealing elements were immediately checked

and evaluated in their quality by the dental hygienist and a second check was performed after 6 months from the operation. All patients were tested for plaque index and dmft/ DMFT.

**RESULTS:** Collected data demonstrate that the hydrophobic sealant guarantees higher retention after 6 months with respect to the hydrophilic one (93% hydrophobic implants succeeded with respect to 76% hydrophilic ones). In the statistical analysis of the sample we decided to use the "test on two independent bernoulliane population" double frequencies". The sealant loss proportion different between hydrophobic and hydrophilic material in the dental elements resulted statistically significant at 0,05, at p-value=0,045. The quality of the seals performed with the hydrophobic material was higher, since after probe testing they resulted smooth; on the contrary seals performed with hydrophilic materials resulted rough, thus promoting plate accumulation. The average index of dmft/ DMFT in the sample is 3,25; with median value of 2. The plaque index, considering the Turesky-Quigley-Hein modified index, is 1,79; with median value of 2. The relative incidence of caries and plaque collected in this study is significantly higher with respect to the national pediatric average. According to literature studies, this difference is possibly caused by the fact that a high percentage of the patients belongs to lower economical classes and they have a foreign origin, they often come from underdeveloped countries.

**CONCLUSIONS:** The wetbond composite materials do not represent a valid alternative to the established drybond, nevertheless this study represent a pilot screen which needs to be implemented by a more consistent amount of data to reach statistical significance. We can hypothesize that the results obtained by the hydrophilic sealants could be optimized in particular in order to use them in the case of difficulties in isolating the operatory field, due to low collaboration by the child-patient.

## Oral health promotion in pregnant women and correlation with pre-term delivery

A. Ferrante, D. Corridore, O. Brugnoletti, G. Di Giorgio, I. Voza

*Dental Hygiene School Course B, Sapienza University of Rome, Isernia, Italy*

**BACKGROUND:** Pre-term birth, is before the 37th week, is responsible for the instability of numerous diseases. Etiology is multifactorial, there is no single cause. Among the various hypotheses there is a growing evidence of acute inflammatory processes of the mother, both intra-uterine and located in the body districts far from the genitourinary tract such as the oral cavity. Inflammation is caused by bacterial infection, as occurs for periodontitis, so the pathogenetic motive could be both the dissemination of bacteria through the bloodstream and the release of inflammation mediators by the white blood cells that try to contain it. The aim of this study was to evaluate the behavioral habits of 100 pregnant women related to their hygiene and oral health, considering the existence of any correlations with adverse pregnancy outcomes.

**METHODS:** This study was carried out at the Family Counseling Center in Campobasso during the period from February to September 2017, through the administration of anonymous questionnaires to pregnant women attending the center.

**RESULTS:** The final analysis involved a sample consisting of

## ABSTRACT

100 women. The women's age were between 18 and 40 years, with a mean age of between 34 years. Out of 100 women interviewed 97 were followed until the end of pregnancy. No woman found particular problems related to delivery and oral health, birth occurred in the right time, between the 38th and 40th weeks and the weight of newborns was between 3,000 and 3,600 kg.

**DISCUSSION:** Our study did not show or demonstrate the existence of an association between oral problems and adverse pregnancy outcomes because none of the interviewed woman had a pre-term birth and a low weight of the newborn. From the data collected, however, it emerged that more than 50% of the interviewed women made the last visit to the dentist more than a year before, maybe because most of them did it only in an emergency. This is also due to gynecologists and midwives not sensitized to refer women to the dentist in order to carry out controls and avoid the onset or progression of problems in the oral cavity (this emerged in 90% of women's answers to the administered questionnaires). It is essential, however, not to postpone dental treatment in order to avoid complications during pregnancy.

**CONCLUSIONS:** From these data emerged as information and knowledge regarding the importance of dental controls and maintenance of optimal oral health in order to avoid adverse outcomes during pregnancy, seem to be poor. For this reason, action should be taken to include dental periodic checks for pregnant women with intervention and prevention programs aimed at promoting oral health and dental care.

## Prevention of periodontal disease with a tailor-made approach in children and adolescents

L. Lardani, S. Semeraro, M. Miceli, M. Pasini

*Specialisation School of Pediatric Dentistry, Department of Surgical, Medical and Molecular Pathology and Critical Care, University of Pisa, Unit of Pediatric Dentistry, Pisa, Italy*

**BACKGROUND:** To examine the periodontal status in a pediatric and adolescent sample by measuring the BPE (Basic Periodontal Examination) index and to observe possible improvements after a dental hygiene tailor-approach. Moreover, possible differences between males and females were evaluated.

**METHODS:** 93 patients (45 males and 48 females) between the ages of 3 and 16 years old were selected at the pediatric dentistry unit of the University of Pisa, Department of Surgical, Medical and Molecular Pathology and Critical Care and were included in the present study. A drop out of 7 patients from the first sample of 100 children was observed. All procedures were conducted according to the principles expressed in the Declaration of Helsinki and the local committee approved the study. The BPE was recorded for each patient before (T0) and after (T1) a tailor treatment plan that included dental hygiene instructions, professional dental hygiene and periodic follow-ups in order to improve motivation. After 1 month, the BPE index was recalculated by a dental hygienist and the adherence to the dental prevention program was recorded. Moreover, CAL (clinical attachment level) was measured in each patient. A statistical analysis was performed in order to evaluate possible changes between the two time points. Student T-test was adopted and the level of significance was set at  $p < 0.05$ . The statistical analysis was performed with the SPSS (Statistical Package for Social Sciences, Chicago, USA)

22.0 program. Differences between males and females were also evaluated.

**RESULTS:** At T0, a high mean BPE value was found (0.69), with high prevalence of gingivitis but absence of periodontal pockets (CAL > 3 mm). The BPE index decreased significantly from 0.69 to 0.32 ( $p < 0.05$ ) at the end of the treatment. Females showed a greater improvement ( $p < 0.05$ ) than males. At the end of the follow-up, good adherence to the personalized hygiene program was observed.

**CONCLUSIONS:** In children and adolescents, a high prevalence of gingivitis was found at the beginning of the treatment; however, after one month the BPE value was significantly lowered. In girls there was a slight higher improvement in clinical parameters in comparison to boys. A tailor dental hygiene approach in pediatric dentistry was able to decrease gingivitis and to prevent periodontal diseases.

## Dentistry and sports devices for sports prevention: the mouthguard

M. Mauri, M. Deias, F. Mulas, C. Pinna, E. Spinaz

*Department of Surgical Sciences, Division of Sport Dentistry, University of Cagliari, Cagliari, Italy*

**BACKGROUND:** Among various oral and dental pathosis, dental traumas involves the 25-30% of the Italian population. Traumatic events such as domestic accidents, traffic accidents and fights are not always preventable and predictable. However, this characteristics do not apply for sports trauma since they can be preventable by using different sports protections such as the mouthguard. The mouthguards are teeth and lips protecting devices which amortize shocks and stabilize teeth. The mouthguards exist in different types and are manufactured with multiple techniques, for this reason the aim of this study is to compare three different types of mouthguards that differ for the label of the manufacturer, their structure and the material used.

**METHODS:** The mouthguard was wore by 10 athletes (futsal players) 14 years to 28 years of age for one week (5 times during training and during the match). During this period, athletes had to express their opinion about the mouthguard with an evaluation scale (0= low, 1= sufficient, 2= good, 3= excellent) referring to the parameters: insertion, removal, comfort, retention, encumbrance, breathing, phonation, possibility of liquid assumption, complaints and salivation. The mouthguards used in this study were: Ortophan mouthguard with a thickness of 4 mm on the vestibular side, 2,5 mm palatal and 3 mm occlusal; D-Fender mouthguard with a thickness of 2,5 mm vestibular, 1 mm palatal and 1,5 mm occlusal without the space for lateral frenuli; Dreve mouthguard with 5 mm vestibular, 2,5 mm palatal and 3 mm occlusal either in a reinforced form and in a no-reinforced form with the latest not having the space for the lateral frenuli.

**RESULTS:** The results demonstrated that every mouthguards had the best score for the parameter "insertion". The highest score for the "removal" was achieved by the D-Fender mouthguard, although this parameter was inversely proportional to the "retention", where it had the lowest score. Ortophan mouthguard was the most difficult to remove, but it had the best retention score. Comfort and encumbrance reached the best score for D-Fender mouthguard, whereas Dreve reinforce mouthguard had the worst evaluation. Thickness and palatal extension were examined for the phonation and also in this case D-Fender showed the best results, while the Dreve no-reinforced mouthguard showed the lowest score. Equal results



were achieved in every mouthguard for the other parameters: presence of complaints, liquid assumption, presence or absence of salivation.

**CONCLUSIONS:** In conclusion, after the evaluation of every parameter, the most appreciated mouthguard was the D-Fender mouthguard. However, this finding does not compromise the good structure of the other mouthguards. Furthermore, this is a preliminary study that needs other tests with a bigger sample of athletes (possibly mainly involved into contact sports) and additional physical tests of load and break.

### School-age dental screening: oral health and eating habits

F. Calcagnile, F. Capasso, D. Corridore, A. Anelli, L. Ottolenghi, I. Vozza

*Dental Hygiene School C, Latina, Italy*

**BACKGROUND:** The aim of this work was to correlate the clinical data collected from dental screening carried out on children with their eating habits, especially those related to the consumption of sugars

**METHODS:** The dental screening was carried out on a sample of 73 eight-year-old children (34 males and 39 females) attending the third grade of the elementary schools of Gaeta (Latina). Clinical data and periodontal status indexes were recorded on a special clinical folder: in addition to the personal data, the number of present teeth, number of decayed, missing or filled teeth, both deciduous and permanent, were detected; the degree of oral hygiene was expressed with a judgment (insufficient, poor, good, excellent), the type of malocclusion, the frequency of brushing and the frequency of dental checks were identified. Data analysis was performed by recording the frequency distribution and using Anova analysis for the correlation of variables.

**RESULTS:** The results showed an average of 1.4 carious teeth per child ( $ds \pm 2.3$ ) with a slightly higher average in females compared to males. More than 68% of the sample had poor or insufficient oral hygiene conditions with plaque presence in 64% of cases even if 80% of children reported to wash their teeth two or three times a day. In more than half of the children (70%) there was no presence of calculus and gingivitis. 57% of children had class II malocclusion with increased overjet and oral breathing respectively in 37% and 30% of cases. 12% of the sample had a premature delivery, only 24% were breastfed in the first months of life and more than 40% maintained a bad habit for over two years of age. About eating habits, more than 80% of the sample consumed sweets or sweet drinks every day or almost every day. More than 38% of children did not eat fruit during the week and 21% did not eat vegetables. The analysis of the data showed as children consume several snacks throughout the day, 55% make at least three and 47% eat while watching TV.

**CONCLUSIONS:** The results of this study show how, although parents are very attentive to the health of their children by periodically bringing them to dental controls, this is often not enough to motivate and sensitize children to perform proper home hygiene. In fact, the critical issues emerge both in the evaluation of the quality of child's oral hygiene and in the choice of foods to be eaten out of the meal.

This is why prevention program carried out through the School is more effective on children for learning of content especially when the acquisition of knowledge follows the application and verification of theoretical and practical skills in terms of oral health.

### Experimental study on the oral health approach of cancer patients

E. Camedda, D. Corridore, V. Caldarazzo, L. Ottolenghi, I. Vozza

*Corso di Laurea in Igiene Dentale C-ASL Latina, "Sapienza" Università di Roma, Rome, Italy*

**BACKGROUND:** Chemotherapy is associated with both acute and chronic systemic side effects, including oral complications. The immediate ones can be: hyposcissalia, xerostomia, dysphagia, dysgeusia, mucositis and opportunistic infections; the delayed ones are: dental caries, bone friability and osteonecrosis. These conditions can further compromise the patient's well-being as they interfere with normal oral swallowing, chewing and phonation functions, preventing nutrient uptake and slowing down treatment time. The study aims to realize an operative protocol able to INFORM cancer patients on the importance of their oral hygiene and correct diet to be pursued and then to INSTRUCT, showing them the means to achieve these objectives. All of this in order to prevent or limit the onset of oral complications.

**METHODS:** The study took place at the oncological Day Hospital of A. Fiorini Hospital in Terracina (ASL of Latina). An anonymous questionnaire was administered to the patients after signing an informed consent. The survey included a section dedicated to oral hygiene habits and risk factors and one to eating habits; one containing a remote and proximate pathological anamnesis and the antiblastic therapy established by the oncologist; one dedicated to the IOHIP-14 questionnaire and a clinical diary; one about the extra and intra-oral clinical examination notes as well as the evaluation of restorations and prostheses congruity. The following indices were noted: plaque, calculus, bleeding, DMFT in order to establish the onset of a gingivitis or periodontitis. Photographs were taken for a better evaluation in order to allow the patient to participate in his initial situation and progress. Personalized information and instructions were provided through the delivery of equipment useful for the maintenance or achievement of good oral hygiene and for the correct management of fixed and / or removable prostheses as well as the management of the resulting complications. All of this was accompanied by specific dietary advice according to the oral complications that the patient expressed.

**RESULTS:** The study was conducted on a sample of 30 people, including 19 women and 11 men, with an average age of 64 years. 40% of patients were uninformed about oral complications that may occur during and / or after chemotherapy, 23% did not remember, 37% were informed. 57% of patients showed hyposcissalia of which 13% associated with dental and labial hypersensitivity, 3% associated with mucositis with over candida infection; 27% did not show any immediate consequence, 16% other. 50% of patients did not have a dental check-up for more than a year, 37.5% from 12 months, 12.5% from 6 months. Informed patients: 10% have a plaque index of 2.35, 14% a plaque index of 1.38 and 3% a plaque index of 0.9. Uninformed patients: 17% have a plaque index of 2.15, 7% a plaque index of 1.24 and 3% a plaque index of 0.9.

**CONCLUSIONS:** The study allowed to approach the cancer patient paying attention to the clinical aspects but also to the psychological state, through an attitude of courtesy, availability and active listening. The data show us that there is not adequate information about the oral side effects of antiblastic therapies and that patients, even if they are informed, have a

## ABSTRACT

high plaque index. This is because there is no awareness about limitation of some side effects through a good oral hygiene. The cancer patient converges all his energies in the resolution of the main pathology, therefore he needs a constant motivation to oral hygiene.

### Flipped classroom teaching in dental education

C. Alpaslan <sup>1</sup>, G. Alpaslan <sup>1</sup>, Y. Boucher <sup>2</sup>, P. Bouchard <sup>2</sup>, K. Vandamme <sup>3</sup>, L. Ottolenghi <sup>4</sup>, A. Battaglia Mayer <sup>4</sup>, M.M. Jensen <sup>5</sup>, T.R. Mikkelsen <sup>5</sup>

<sup>1</sup>Gazi University, Ankara, Turkey; <sup>2</sup>Paris Diderot, Paris, France; <sup>3</sup>KU Leuven, Leuven, Belgium; <sup>4</sup>Sapienza University, Rome, Italy; <sup>5</sup>VIA University College, Horsens, Denmark

**BACKGROUND:** For decades, the way of teaching in higher education has traditionally been teacher-centered. In such educational model, students put all of their focus on the teacher. The teacher talks, the students exclusively listen as interaction and collaboration is discouraged, and the students write the memorized content back in exams with low level of analysis or comprehension. However, this way of teaching has been claimed not only tedious, but ineffective as well. Moreover, teaching is limited with the teacher's current knowledge and capacity to teach. With the easy access to vast information through information and communication technology (ICT), the traditional model of teacher as the sole steward of knowledge has become obsolete. Flipped classroom teaching or 'inverted teaching' is a method that allows to use class time to engage students in active learning activities, rather than traditional lectures. Moreover, flipping the classroom may be considered to be a win-win situation for both students and teachers. In this report, the Erasmus+ Partnership Project on Flipped Classroom Model (FCM) in Dental Education is presented. The context of the project is developing a certified FCM teaching course for teachers in dental education that will provide a guidance to use this teaching model effectively and empower them to integrate technological tools into teaching. Also, specific priorities in higher education are addressed, as promoting more student-centered learning approaches, better use of different ICT tools and supporting innovation and creativity.

**METHODS:** Partners from five European Countries (Belgium, Denmark, France, Italy, Turkey) are involved in the project, to develop a course for teachers to flipping the classroom in dental education. Emphasis is put on the methodology ('how to'), providing know-how on planning, creating and implementing FCM in dental education. Main priority contents of the FCM course are (i) the concept, advantages, limitations and challenges of FCM; (ii) the FCM planning; (iii) the offloading of specific syllabus parts through e.g. video production; (iv) the design of in-class activities, student-centered active learning; and (v) methods for evaluation of FCM. Educators will be provided with all the knowledge and tools they need to deliver high-quality educational activities and meet the increasingly diverse student needs. ICT will be used effectively at all levels as well as enhancing digital integration and promoting access to and learning through Open Educational Resources.

**RESULTS:** After completing the course, teachers will be capable of providing a short module or a complete course according to the FCM, and will have learned new educational skills such as the ability to identify the course parts

suitable for the offloading, creating and producing videos and other digital learning tools, and implementing active learning activities in class.

**CONCLUSIONS:** There is an actual need of modernization in higher education, through a shift from teaching to learning, by implementing innovative pedagogical models and empowering dental students to take responsibility of their learning activities by blended learning. The course on flipped classroom for dental educators will contribute to the modernization of dental education through dissemination in local, national and European levels.

### The management of xerostomia by the dental hygienist

A. Lissoni, M. Ballanti, G. Pasini, E. Polizzi, S. Abati

*Oral Pathology - Dept. of Dentistry - IRCCS San Raffaele University Hospital - University Vita-Salute San Raffaele, Milano Italy; Dental Hygiene - Dept. of Dentistry - IRCCS San Raffaele University Hospital - University Vita-Salute San Raffaele, Milan, Italy*

**BACKGROUND:** The aim of this study was to highlight the prevalence and characteristics of the "dry mouth" subjective disorder in a cohort of consecutive patients in the dental hygiene department of San Raffaele Hospital. Dry mouth or "xerostomia" is a condition characterized by the subjective perception of dryness of the oral mucosa mainly due to the reduction or absence of the salivary flow, but it should not be confused with hypocalcemia that refers to an abnormal salivary reduction determined by a reversible or irreversible damage to the functions of the salivary glands. The causes underlying this symptom may be different, and should generally be sought through a careful review of the medical history of the patient. The severity of the disorder is related to the patient's habits, which often complains a constant need to take liquids to swallow or chew foods, especially the dry ones, the need to drink liquids even at night time to relieve the symptom of aridity and the effectiveness of commercially available oral lubricants to improve the dryness.

**METHODS:** Sixty patients have been enrolled in this study (age range from 21 to 84 years), divided in three groups: systemically healthy patients, patients with Sjögren syndrome (SS), and patients previously undergoing radiotherapy in the head/neck area. They were thirty-five females and twenty-five males, who reported the "oral dryness" symptom. Each of them was given a specially developed questionnaire aimed at gathering the most information about their state of general health, home oral hygiene habits and the oral cleansers used daily by the patients. In addition, specific questions were asked about their oral conditions and the severity of the "dry mouth" symptom. Following this preliminary phase, each patient was subjected to a visual examination of the oral cavity to assess whether they had lesions associated with decreased or not salivary flow. Each patient was advised to use a saliva lubricant substitute at least three times a day for a two-week period. After two weeks, each patient was asked to go back to the oral hygiene department to assess the benefits of using the recommended lubricant.

**RESULTS:** The data were analyzed using a statistical software, and the results showed that the female component was superior in healthy subjects and those with Sjögren's syndrome, while in the case of radio and chemotherapy of the head-neck region they were predominantly male. Each

patient's disorder was evaluated using the NRS scale (Numeric Scale, from 0 to 10 in which 0 corresponds to the absence of the symptom and 10 indicates the utmost discomfort), and it emerged that before using the lubricant the mean values of the intensity of the disorder were 6.98. After fifteen days the symptomatology of oral dryness was reduced by 45%.

**CONCLUSIONS:** From the analysis and the results obtained, the efficacy of salivary substitutes in the treatment of xerostomia and hyposalivation is clearly highlighted. The dental hygienist must take care of the patient's oral health, especially those who have undergone radiotherapy in the head and neck region, motivating them to have a proper oral hygiene and to use permanently oral lubricants to relieve their symptoms.

### The management of children with autism spectrum disorder in orthodontic treatment

N. Conselmo, D. Corridore, G. Ierardo, V. Luzzi, I. Vozza

Autism spectrum disorder (ASD) refers to a group of neurodevelopmental disabilities with a core set of defining criteria that comprise impaired social interaction, communication, and restricted or repetitive behavioural stereotypes. Most dental manifestations diagnosed are bruxism, tongue thrusting, caries, erosion, xerostomia, gingivitis. In literature a few studies discuss about the management of children with autism spectrum disorder in orthodontic treatment. For this reason, the Unit of pediatric dentistry, Head-Neck Department, Policlinico Umberto I in Rome has taken up a study about management and oral prevention in autistic individuals, using tell-show-do technique, visual pedagogy (CAA), sounds and shapes, verbal reinforcement, and several basic behaviour methods for accommodation of these patients including the presence of parents. We have employed these innovative methods to start an orthodontic treatment on autistic patients following their improvement in oral health.

**METHODS:** For our study was selected a 7-year-old autistic child who presented eruptive difficulties of 2.1 because of the permanence of 6.1 and single-left posterior cross bite. The dmft was 0.17 and the plaque index was code 3 of silness and loe index, indicating abundant plaque accumulation over the gingival margin.

Orthodontic treatment was performed with a rapid palate expander activated twice a day for 15 days. After 15 days it was held for 6 months, during which, due to the annoyances caused to the child, it was replaced with an upper plate with a transversal expansion screw as maintenance without activating the screw. During each appointment a blackboard was used and images related to the oral hygiene devices were presented on it, adopting the Alternative Aid Communication (CAA). This technique improved communication with the patient and influenced the success of orthodontic treatment and oral health management.

**RESULTS:** From the beginning of orthodontic therapy, once a month, oral hygiene instructions were given, motivating the child and his mother with plaque detectors and toothbrush. During each follow-up, the plaque index was significantly reduced and no caries were reported. The dmft remained, therefore, unchanged and no gingival inflammation or lesions to the oral mucosa were found and the eruption of 21 was successfully achieved.

**CONCLUSIONS:** In literature only one case of orthodontic treatment on a patient with Autism spectrum disorder was

found but this deals with the subject from the orthodontic point of view. In our project the dental hygienist plays a fundamental role in the management of oral hygiene, contributing decisively to prevent the appearance of dental and gingival problems in autistic patient wearing orthodontic appliances, which could result in needing anesthesia sessions for the resolution of these problems.

### Analysis of antimicrobial effect and antibiofilm of two toothpastes at different fluorine concentration

S. Vitali, A. Perrone, M. Saccucci, F. Covello, G. Ottaviani, C. Sbarbaro, A. Salucci

*"Sapienza" University of Rome, Department of Oral and Maxillo-Facial Sciences, Unit of Pediatric Dentistry, Pediatric Dentistry Specialization School, Rome, Italy*

**BACKGROUND:** Our research was focused on the analysis of the antimicrobial and antibiofilm power of two commonly used oral toothpastes containing different concentrations of fluorine. These toothpastes were tested in vitro on deciduous teeth.

**METHODS:** Culture of *S. mutans* was inoculated in 1 mL of sterile phosphate buffered saline (PBS) with a 5% of toothpaste concentration. with 500ppm e 1400ppm of fluorine. The ability of the bacteria to form colonies was measured by counting the number of Colony Forming Units (CFU). Results were compared with the control sample, represented by untreated solution. Later A selection of 20 deciduous molars was prepared. The teeth were extracted as a result of orthodontic treatments or physiological replacements. The procedures were performed at the UOC of Pediatric dentistry Sapienza University of Rome department of Oral and Maxillo-Facial Science. Each element, was preserved in normal saline and then sectioned at a cementum-enamel junction level. Successively the external and occlusal surfaces have been etched with 37% orthophosphoric acid for 1 minute in order to reproduce the demineralization that occurs in the oral environment. Subsequently, 10 elements were treated, by manual brushing, with a toothpaste containing 500 ppm of fluorine, the remaining 10 with a toothpaste at 1400 ppm of fluorine. The brushing process was performed with a duration of two minutes, three times a day for a period of 15 days. In a second phase, each sample was exposed to a bacterial suspension of *S. mutans* for biofilm cultivation. After growing, a Crystal Violet (CV, Sigma) assay was performed to quantify biofilm formation on teeth samples.

**RESULTS:** The microbiological tests performed on 5% solutions of the two toothpastes, compared to the untreated aqueous solution (UT), showed a statistically very similar antimicrobial effect. The viability rate of bacterial colonies decreases with the passage of exposure time and is similar for the two products. The analysis of bacterial biofilm formation on the surfaces of the dental elements indicates an inhibiting action of the biofilm, similar for both toothpastes.

**CONCLUSIONS:** The present study demonstrated that the use of two toothpastes has been shown to have similar antimicrobial and antibiofilm characteristics. The use in pediatric patients of a low-fluoride toothpaste as well as providing protection against the bacterial attack also reduces the potential risk of fluorosis.



## ABSTRACT

**A randomized clinical trial study comparing efficacy between two salivary substitutes in radiotreated patients for head and neck cancer**G. Rivetti, G. Gassino, M. Carossa, N. Bocca, P. Ceruti, F. Bassi  
*Università degli Studi di Torino, Turin, Italy*

**BACKGROUND:** Management of xerostomia following radiation therapy is difficult. When residual gland function remains it may be possible to stimulate gland function by means of local measures or with systemic medication. When saliva cannot be stimulated, use of wetting agents or salivary substitutes are considered. The aim of this study is to compare differences in salivary flux, salivary pH and VAS in patients using two types of salivary substitutes, Hydral Gum® and Biotene®, before and after the radiotherapy in order to identify the most satisfactory for the radio-treated patients, to keep the oral conditions under control and to guarantee the best possible lifestyle to the patient.

**METHODS:** Subjects were recruited from patients starting the radiation therapy to the head and neck at Città della Salute e della Scienza di Torino. The patients have been divided randomly in group A (Biotene®) and group B (Hydral Gel®). At T0 salivary flux and pH before radiotherapy were registered; at T1, one month after the beginning of radiotherapy, results of VAS scale have been collected; at T2, two months after the end of radiotherapy, salivary flux, pH and VAS have been registered. Criteria of inclusion were diagnosis of head and neck tumors, need of radiation therapy, age between 18-75, minimum 10 teeth. Patients with preexistent hyposalivation, radiotherapy already started, advanced periodontal disease, diabetics and severely debilitated patients with advanced tumors (stage IV) or treated only with surgery or chemotherapy has been excluded. Patients were motivated and instructed to the correct techniques of oral hygiene, and to use the oral gel a minimum of four times a day. Whole unstimulated saliva was collected in the morning for 5 min and paraffin-stimulated saliva was collected after 5 min at each visit; pH measurements and the buffering capacity has been recorded. Patients were asked to record the severity of symptoms using visual analogue scales (VAS) for the following symptoms: dry mouth at rest/when eating, difficulty speaking/swallowing due to dry mouth, altered taste.

**RESULTS:** A group of 26 subjects (23 men and 3 women, medium age 55 years old) were recruited. Every test has a 5% level of significance, the maximum error that allows to make is 0,05. Data from both groups have been analyzed using T-student test: 1) Group A (Biotene®): VAS T1-T2 p value > 0,5; salivary flux T0-T2 p value < 0,5; salivary pH T0-T2 > 0,5; 2) Group B (Hydral Gel®): VAS T1-T2 p value > 0,5; salivary flux T0-T2 < 0,5; salivary pH T0-T2 p value > 0,5; 3) Comparison between group A and B reveals p value > 0,5 at T2 for VAS, p value > 0,5 at T2 for salivary flux, p value > 0,5 at T2 for salivary pH.

**CONCLUSIONS:** The statistical analysis reveals 1) in Group A no significant differences for salivary flux and VAS but statistically significant improvement of salivary flux 2) in Group B no significant differences for salivary pH and VAS but a significant improvement of salivary flux 3) no differences between substitutes A and B at T2 for VAS, salivary flux and salivary pH. However, patients went through an improvement assessable from the statistic analysis of the single group; patients from both groups reported improvement in swallow, speaking, dysphagia and gum burning. The study underlines how continuative use of salivary substitutes improves the quality of life of patients undergoing radiation therapy of head and neck.

**Risk factors between I, II, III class occlusion and periodontal disease: appraisal through TC-Cone Beam**

P. Cressoni, C. Iovane, C. Occhipinti, V. Benvenuto, A. Bernier, A. Zanoncelli, N. Marziali, V. Zana, E. Aref, U. Garagiola

*Università degli Studi di Milano, School of Orthodontics, Dental Hygienist School; IRCCS Ca' Granda Fondazione Ospedale Maggiore Policlinico - UOC Odontostomatologica and Unit*

**BACKGROUND:** The aim of this study is to measure the periosteal bone loss of some dental elements, previously chosen as benchmarks, in the I, II and III skeletal class and to evaluate the correlation between malocclusion and periodontal disease. **METHODS:** 90 TC-Cone Beam of healthy patients, between the ages of 14 years and 20 years, in the pre-orthodontic phase will be examined. 30 of these TC-Cone Beam will be related to patients with I skeletal class, 30 with II skeletal class and 30 with III skeletal class. The TC-Cone Beam for each group studied will be randomly selected. Some dental elements will be taken as samples for each patients. Maxillary and mandibular dental incisors (11, 21, 31, 41), maxillary and mandibular canines (13, 23, 33, 43) and maxillary and mandibular first permanent molars (16, 26, 36, 46) will be the samples. Through the use of the Materialise 3-matic software, the distance between the cemento-enamel junction (CEJ) and the alveolar bone will be evaluated considering all the sites of the dental elements: disto-vestibular, vestibular, mesio-vestibular, distal-lingual / palatal, lingual / palatal and mesio-lingual / palatal. If a correlation between a specific skeletal class and periodontal disease is noticed, in vivo studies will be performed in order to confirm what has been noted in TC-Cone Beam. In the oral clinical examination will be evaluated periodontal disease in relation to some indices like FMPS (full-mouth plaque score), FMBS (full mouth bleeding score), loss of attachment, gingival recession, mobility and furcations. The dental elements considered in this exam are the same of the evaluation on the TC-Cone Beam.

**RESULTS:** The study of TC-Cone Beam relative to the bone level of the dental elements taken into consideration could reveal a correlation between malocclusion and periodontal disease in pre-orthodontic patients. There could also be a different incidence of bone defect between I, II, III skeletal class.

**CONCLUSIONS:** It is important to evaluate the periodontal parameters in patients in the pre-orthodontic phase to intercept any problems related to the skeletal class. In this way it may be possible to draw up personalized protocols during the orthodontic treatment plan in order to prevent any periodontal risks.

**Treatment of periodontal pockets with hydrogen peroxide and hyaluronic acid: evaluation of oral microbiota**

P. Cressoni, V. Zana, C. Occhipinti, A. Zanoncelli, N. Marziali, V. Benvenuto, E. Aref, C. Iovane, A. Bernier, U. Garagiola

*Università degli Studi di Milano, School of Orthodontics, Dental Hygienist School; IRCCS Ca' Granda Fondazione Ospedale Maggiore Policlinico - UOC Odontostomatologica and Unit*

**BACKGROUND:** Evaluation of the oral microbiota after treatment with hydrogen peroxide and hyaluronic acid, of periodontal pockets in order to alleviate the pain symptoms, reduce the pathogenic bacterial load, the probing depth and reduce bleeding in the survey.

**METHODS:** 25 adult patients of both sexes are randomly

selected. The patients under examination are treated with two product applications at a distance of 5 minutes from each other, 1 mL of hydrogen peroxide undiluted and 1 mL of hyaluronic acid undiluted at application, performed by sterile syringe directly inside the periodontal pockets greater than 3.5 mm of multirooted and monoradicular elements. During the first visit (T0) and / or after a week from the latter (T1), the quantitative bleeding (FMBS) and semi-qualitative (IS) indices will be performed, considering six surfaces per tooth, the latter using four different codes:

- Code 0: absence of bleeding on probing;
- Code 1: presence of bleeding on probing, without redness and edema;
- Code 2: bleeding on probing with redness and edema;
- Code 3: spontaneous bleeding.

Furthermore, the quantitative (FMPS) and semi-qualitative plaque indices of Silness J & Loe H (IP) will be calculated considering six surfaces per tooth; the latter attributing four different codes:

- Cod.0: absence of plaque;
- Cod.1: 1/3 of the dental surface covered with plaque;
- Cod.2: 2/3 of the dental surface covered with plaque;
- Cod.3: greater than 2/3 of the dental surface covered with plaque.

Moreover, before washing the pocket (T0) and after 5 minutes from the last application of the solution (T1) a bacterial plaque pick-up will be performed, positioning a periopaper for 30 seconds inside one of the periodontal pockets with greater probing depth, processed in PCR-Real-Time.

Painful symptomatology is evaluated by administering two different tests:

Numerical Reating Scale - NRS (Downie, 1979; Grossi, 1983);

Visual Analogical Scale - Vas (Scott Huskisson, 1976);

Verbal Rating Scale - VRS (Keele, 1948; successive validations JPSM, 2002).

**RESULTS:** The formulation thus constituted seems to possess antibacterial and hemostatic action and alleviate painful symptoms.

**CONCLUSIONS:** After treatment of periodontal pockets, it is therefore advisable to wash with hydrogen peroxide, hyaluronic acid and glycine to relieve painful symptoms, reduce the pathogenic bacterial load and bleeding on probing.

### Oral health in the population held at the third district house of rebibbia

D. Corridore, E. De Paolis, M. Mazur, M. Capocci, N. Ndokay, F. Rinaldo, D. Salvi, P. Patti, D. Pasqualotto, F. Ripari, G. M. Nardi, F. Guerra, L. Ottolenghi

*Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy; School of Dentistry, "Sapienza" University, Rome, Italy; Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome; Dental Hygiene School, Sapienza University of Rome, Italy*

**BACKGROUND:** The Third District House is a weakened custodial institution that houses drug addicts who want to participate in a recovery and rehabilitation program. The aim of the study is to evaluate the state of oral health of prisoners and the impact it has on the quality of life, bearing in mind that the problems related to the oral cavity are the most frequent among those associated with drug abuse.

**METHODS:** Three different questionnaires were used, admin-

istered in a face to face interview mode: EGOHID II - Full Standard Clinical Survey From 2007, which collects clinical data such as CPI and DMFT; Questionnaire OHIP-14, which assesses the quality of life in relation to oral health and the EGOHID Adult Questionnaire which collects data on various habits and lifestyles.

**RESULTS:** The survey was attended by 29 of the 32 prisoners present, with a compliance of 91%. The age of the participants ranges from 23 to 62 years, with an average age of 42.9 years. The population examined results to have a lower level of education and disadvantaged socio-economic conditions compared to the free Italian population. Furthermore, the survey showed that almost all the participants use tobacco; that 10 out of 29 prisoners are infected with Hepatitis C and 4 of them also have co-morbidities with HIV. The high incidence of these diseases is linked to substance abuse that involves 100% of the population, in which cocaine is the most widely used substance. Regarding the clinical data, the DMFT results to be equal to 15, of which the component of the decayed teeth is 5.1; that of the treated teeth 2.6 and that of the missing teeth 7.3. The latter value is probably linked to the lack of prosthetic rehabilitation services for prisoners. The CPI (Community Periodontal Index) shows that only 14% of subjects enjoyed periodontal health, while 19% had bleeding at the survey and 25% were detected periodontal pockets with depths greater than 6 mm. Although we have found negative oral health conditions, it seems that they have a low perception of the problems related to their oral cavity, not feeling any particular discomforts associated with them.

**CONCLUSIONS:** The investigation showed that the oral health of prisoners is precarious and oral hygiene is very poor. In this regard, it would be advisable to promote a prevention program in the prison context and a course of oral health education aimed at improving the care of oral hygiene and consequently preventing the diseases related to it. To this end, it might be useful to disseminate brochures from the various instructions for proper home hygiene and to distribute eligible devices in the interproximal oral hygiene penitentiary institutions. This preventive program would reduce the incidence of diseases, thereby decreasing the therapeutic interventions for their care and consequently their health care costs. Furthermore, it would increase the detainee's confidence and self-esteem, thus fostering the possibility of reintegration in an easier way within society.

### Oral health and quality of life correlated in a population of female prisoners in the city of Latina

D. Corridore, G. Verre, M. Mazur, M. Capocci, A. Ndokay, F. Rinaldo, D. Salvi, P. Patti, D. Pasqualotto, F. Ripari, G. M. Nardi, I. Vozza, L. Stamegna, F. Guerra, L. Ottolenghi

*Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy; School of Dentistry, "Sapienza" University, Rome, Italy; Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome; Dental Hygiene School, Sapienza University of Rome, Latina, Italy*

**BACKGROUND:** For many years the WHO has dealt with the issue of prisoners health through the publication of specific reports that outline a picture made up of a rather young population suffering mainly from psychic, infectious and oral

## ABSTRACT

diseases. Women in prison often come from unfavorable environments and many of them have suffered psychologic problem, from alcohol or drug addiction and inadequate health care prior to detention, and bad condition of oral cavity are nothing more than the direct consequence. Moreover this population presents a greater risk of traumas of the complex gold-facial, due to the health implications of the frequent episodes of violence and abuse that they are found. The aim of the study is to pay particular attention to the specific health needs of the inmates and to guarantee a system of promotion of sensitive oral health, recognizing the opportunity to strengthen and support the care of one's own person, promoting the recovery of esteem and safety.

**METHODS:** The study took place at the Latina District House "in which prisoners awaiting trial are present and those sentenced to sentences of less than five years. Inside the prison there are also 35 prisoners belonging to the high security AS2 and AS3 circuit, traditionally dedicated to the detainees belonging to organized terrorist and mafia groups. Three different questionnaires were used, administered in a face to face interview mode: EGOHID II - Full Standard Clinical Survey From 2007, which collects clinical data such as CPI and DMFT; Questionnaire OHIP-14, which assesses the quality of life in relation to oral health and the EGOHID Adult Questionnaire which collects data on various habits and lifestyles. The informed consent was made verbally for each detainee who took part in the visit, and for completing the questionnaires.

**RESULTS:** The total female sample is 26 inmates. The age range is between 20 and 79 years with an average age of 42 and 96.4% is a smoker. 96.2% of the prisoners (25) are Italian nationals, 3.8% (one inmate) of foreign nationality. The sample presents a DMFT of 13.84 and poor management of soft tissue presenting generalized loss of attack in 61.6% of cases, a plaque index corresponding to 3 in 65.5% and accumulation of generalized tartrate in 57.7% of cases. The data related to the OHIP-14 show the presence in more than 50% of the sample of painful points inside the mouth, difficulty in relaxing and chewing. In fact, in 62% of the cases the last dental visit was requested for an emergency intervention.

**CONCLUSIONS:** Very often visit of the oral cavity is able to intercept situations of abuse and violence otherwise silenced. Good oral health also makes it possible to communicate effectively and relate positively with the community once the sentence has ended, also in relation to a potential job placement, possibly incurring a minor percentage in abuses and acts of psycho-physical violence. For this reason, the promotion of a management and prevention campaign in the field of oral health is desirable to improve the living conditions during and after the period of detention.

## Oral health survey in the adult Barbadian population

M.A. Straker, D. Corridore, M. Mazur, F. Guerra, L. Ottolenghi  
*Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy; School of Dentistry, "Sapienza" University, Rome, Italy; Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome*

**BACKGROUND:** To understand the current state of oral health in the adult Barbadian population (35-64yrs) with

a particular focus on the relationship between oral health and diabetes. The World Health Organization (WHO) has indicated that the same risk factors for oral disease are the same as those of Non-Communicable Diseases (NCDs). Barbados has one of the highest rates of type 2 diabetes in the Americas and it is fundamental that both medical and dental practitioners collaborate in the treatment needs of diabetic patients. In preparation for the future oral health survey to be conducted in Barbados a review of the literature was conducted to determine the quantity and quality of information available regarding adult oral health surveys and oral health and diabetes.

**METHODS:** An electronic database search was conducted during September – October, 2017 using the MEDLINE database, Google Scholar and the Cochrane Library. Key words used for the searches conducted included: 'oral health assessment', 'adult oral surveys', 'diabetes mellitus and oral health', 'oral hygiene index', 'periodontal status', 'periodontitis and diabetes'. Abstracts were read to determine topic significance and relevant articles with full-text were extracted. 70 full-text articles meeting the inclusion criteria were read.

**RESULTS:** No published literature regarding oral health surveys solely conducted on adults in the Americas was found. Published studies on adult oral health surveys are severely lacking and are almost non-existent in developing countries. Literature reviewed established the connection between diabetes and the prevalence of severe periodontitis in adult populations compared to nondiabetic adult populations with a near three-fold susceptibility for diabetic patients of developing chronic periodontitis. In particular the majority of recent studies are focusing on the bidirectional nature of the relationship; diabetes increasing the risk of periodontitis and periodontitis having a negative impact on glycemic control. Results also highlighted the shortcomings regarding health practitioners' knowledge on oral health and diabetes. In Barbados there is currently no data available as to the periodontal status of the nearly 40,000 Barbadian adults living with diabetes. Added to this, is the realization that oral health is not included in the developed guidelines for Caribbean medical practitioners. The dietary habits of Barbadians is concerning as intake of carbonated and sugary beverages exceeds the Caribbean recommendation by four-fold.

**CONCLUSIONS:** To continue to lack detailed information in the area of oral health and diabetes prevents Barbados from interpreting the true success of earlier implemented childhood oral health programs, the current state of oral health status and behavior of adults in Barbados and to understand what protocols and guidelines should be implemented specifically for adult diabetics.

### References

1. Noncommunicable diseases and their risk factors. World Health Organization. <http://www.who.int/ncds/en/Oral Health Surveys Basic Methods>. 5th Edition. 2013.
2. World Health Stanko P1, Izakovicova Holla L. Bidirectional association between diabetes mellitus and inflammatory periodontal disease. A review. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub*. 2014;158
3. Preshaw PM1, Alba AL, Herrera D, Jepsen S, Periodontitis and diabetes: a two-way relationship. *Diabetologia*. 2012 Jan;55(1):21-31
4. Oral Health in the Caribbean. Office of Caribbean Program Coordination. 2003. Pan American Health Organization (PAHO)
5. Loe H. Periodontal Disease: The sixth complication of diabetes mellitus. *Diabetes Care* 1993 Jan; 16(1): 329-334.



## Microbiome and periodontitis: a systematic review and meta-analysis

A. Ndokaj, M. Mazur, D. Corridore, M. Capocci, F. Rinaldo, D. Pasqualotto, D. Salvi, P. Patti, F. Ripari, G. M. Nardi, L. Ottolenghi, F. Guerra

Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy; School of Dentistry, "Sapienza" University, Rome, Italy; Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome

**BACKGROUND:** The term microbiome signifies "the ecological community of commensal, symbiotic, and pathogenic microorganisms that literally share our body space and have been all but ignored as determinants of health and disease" (1). The association between the oral microbiome and periodontal diseases is still unclear. The aim of the present study was to perform a systematic review and meta-analysis of the existing literature to (i) identify the association between the variation of the oral microbiome and periodontitis; and (ii) to estimate the risk of developing inflammation of the periodontal space in subjects who present a specific variation of the taxonomy of the oral microbiome.

**METHODS:** This systematic review was conducted according to the PRISMA statement (2) and the Cochrane Handbook for Systematic Reviews of Interventions (3). Literature searches of free text and MeSH terms were performed by using MedLine (PubMed) and Scopus (30<sup>th</sup> May 2017). Articles from 1950 were searched using the following keywords: A) ["oral flora" OR "oral ecosystem" OR "dental microflora" OR "microbial consortium" AND ("periodontitis" OR "periodontal inflammation")]; B) ["oral flora" OR "oral ecosystem" OR "dental microflora" OR "microbial consortium"]. The search strategy identified 275 potential articles, 99 from Pubmed and 176 from Scopus. After removal of duplicates, 170 articles were analyzed. Subsequently, 146 papers were excluded because they did not meet the inclusion criteria. Of the remaining 24 papers, 7 were excluded because not relevant to the subject of the study. The remaining 17 papers were included in the qualitative synthesis, and 11 of them in the meta-analysis (Fig 1).

**RESULTS:** 11 RCTs involving 2111 patients were included. The retrieved case-control studies evaluated the presence or absence of different targeted pathogens. Among the microorganisms evaluated *Porphyromonas gingivalis* [OR (95% CI) 2.93(0.98,8.87); P< 0.0001] and *Streptococcus mutans* [OR (95% CI) 1.77 (0.89-3.54); P=0.03] were found to be risk factors for the development of periodontitis, while *Aggregatibacter actinomycetemcomitans* [OR (95% CI) 0.52 (0.33-0.83)] played a protective role for periodontitis.

**CONCLUSIONS:** Our results show that *Porphyromonas gingivalis* and *Streptococcus mutans* were found to be associated with an increased risk for the development of periodontitis, while *Aggregatibacter actinomycetemcomitans* was found to be protective for periodontitis. Better understanding of the relationship between oral microflora composition and host oral and systemic conditions (plaque, calculus, oral hygiene behaviors, smoking) in health and disease can be of value to develop new diagnostic and therapeutic tools, which could be oriented toward a more topic or holistic approach.

### References

1. Lederberg J, McCray A. 'Ome sweer' omics- a genealogical treasury of words. The Scientist. 2001; 15(8).
2. Lederberg J, McCray A. 'Ome sweer' omics- a genealogical treasury of words. The Scientist. 2001; 15(8).

3. Liberati A, Douglas G, Altman G. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. J Clin Epidemiol. 2009; 6(354).
2. Higgins J, Grrren S. [Online].; 2011. Available from: <http://www.cochrane-handbook.org>.

## Dental erosion in patients affected by eating disorders: a preliminary study

M. Capocci, D. Corridore, M. Mazur, N. Ndokaj, F. Rinaldo, D. Pasqualotto, D. Salvi, P. Patti, F. Ripari, G. M. Nardi, F. Guerra, L. Ottolenghi

Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy; School of Dentistry, "Sapienza" University, Rome, Italy; Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome

**BACKGROUND:** Dental erosion, which is the irreversible loss of hard tissues of the tooth due to a chemical process on the dental surface, sees the presence of acids as a fundamental prerequisite: erosive wear is complex and depends on the interaction of biological, chemical and behavioral disorders, making it a multi-factor etiology injury. This preliminary study aims to show the correlations between Eating Disorders and the onset of dental erosion, from the point of view of clinical objectivity and focusing on the subjective perception of oral health in this type of patients. The long-term goal is also to promote an interdisciplinary collaboration to deepen the knowledge of the most frequent oral and perioral manifestations in people affected by Eating Disorders and to determine operational, preventive and clinical paths.

**METHODS:** This study was conducted by evaluating oral health in two experimental groups organized in a coherent way by number of participants, gender and age. In the first phase, the complete Italian version of the Oral Health Impact Profile 49 (OHIP 49) on the Oral Health related Quality of Life (OHRQoL) was administered to both groups. A dental visit was then proposed to all patients whose data concerning the experience of caries (D<sub>3</sub>MFT), periodontal health (CPI) and the presence of erosions (BEWE) were recorded on a specific clinical chart.

**RESULTS:** The summary of the OHIP-49 questionnaire reported that the Study Group was the one with the greatest perception of oral health interference on the quality of life, especially regarding psychological and social disability, with repercussions on the sleep-wake rhythm and consequent depression, difficulty in concentration or relaxation and impediments in social relationships. From the objective examination, in the Studio Group the average BEWE score was 2.0 compared to 0.9 of the control group; the CPI was found to be 2 (presence of tartar) in 57.9% of patients with DCA (against 9.4% of the Control Group) and the total DMFT in the two groups was 9.2 and 4.2 respectively.

**CONCLUSIONS:** In the last twenty years various studies in the literature report a significant prevalence of enamel erosions in patients with eating disorders. The incidence of these disorders is constantly increasing, therefore more and more dentists and dental hygienists, through intra-oral clinical examination, will play a fundamental role in the identification and early diagnosis of such food pathologies. To further investigate the perception that these patients have of their oral health status about both their daily life and their relationship with themselves and others may be important for their clinical management.

## ABSTRACT

**Effect of biofilm removal from the occlusal tooth surfaces on fluorescence measurements: a clinical study**

F. Rinaldo, N. Ndokaj, M. Mazur, D. Corridore, M. Capocci, D. Salvi, P. Patti, D. Pasqualotto, F. Ripari, A. Spota, F. Guerra, L. Ottolenghi, G.M. Nardi

*Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy; School of Dentistry, "Sapienza" University, Rome, Italy; Oral Diagnosis Unit (Sted 02), Policlinico Umberto I Rome*

**BACKGROUND:** Early diagnosis and monitoring of caries lesions are the most important issues of primary and secondary prevention policies. This is crucial especially in case of initial lesions that if not recognized or underestimated could be delayed in treatment and can evolve in destructive dentine lesions. The intraoral auto-calibrated camera Vista Cam iX (Durr Dental, Bietigheim-Bissingen, Germany) uses the fluorescence phenomenon for a non-invasive, quantitative caries diagnosis, by scanning demineralized lesions of enamel and dentin. In order to make a precise evaluation, according to the camera manufacturer instructions, the tooth surface must be completely cleaned and without biofilm. The air polishing with glycine powder allows removing completely the biofilm from the enamel surface giving a whole cleanse of the tooth surfaces. In this study, we used the air-polishing protocols using the Combi device (Mectron SpA). The current study aimed to evaluate the effects of biofilm removal, using air-polishing device with glycine, on fluorescence VistaCam iX camera quantitative measurements of caries. The null hypothesis is that the presence of the bacterial biofilm on the tooth surface does not affect the values assigned by the camera VistaCam iX given to the occlusal surfaces of the analysed teeth.

**METHODS:** Patients with complete permanent dentition without any kind of restorative treatments in the lateral and posterior section of upper and lower dental arches were enrolled. Patients with inadequate oral hygiene, orthodontic treatments and systemic diseases that could influence oral health were excluded. One skilled dentist using the fluorescence terminal Proof of the intraoral camera VistaCam iX photographed the occlusal surfaces of molars and premolars and registered the highest values. A professional dental hygienist performed oral hygiene with air polishing procedures using the Combi device with glycine. In order to evaluate the influence of biofilm, fluorescence assessment was repeated after air-polishing procedures by a third blind skilled dentist, with the same fluorescence terminal Proof, registering the highest value gained for each occlusal surface.

**RESULTS:** In this in vivo study, 133 cuspidate permanent teeth, 62 molars and 71 premolars of patients aged between 13 and 25 were analysed. Descriptive analysis showed an average of 0.82 (SD= 0.65; Min= 0.00; Max= 1.80; Median= 1.20) and of 0.93 (SD= 0.60; Min= 0.00; Max= 1.70; Median= 1.20) for values before and after treatment, respectively. However, descriptive analysis and non-parametric Wilcoxon signed-rank test show that, even if the median value does not change and so do the min and max values, analysed data have statistically significant different distribution. This results demonstrated that, the scores assigned by VistaCam iX Proof fluorescence based camera to the occlusal surfaces, after the air-polishing treatment, are averagely higher than those before treatment, especially in the diagnosis of initial tooth decay.

**CONCLUSIONS:** From the data obtained, we can affirm that biofilm removal with glycine air-polishing improves the VistaCam camera accuracy in recognizing healthy tissue from the decayed one, due to the fact that air-polishing treatment increases the decayed tissue reaction to the fluorescence.

**Spectrophotometric measurements and its correlation to human eye color perception. Influence of white/black vs. Cuspal/non cuspal backgrounds on tooth color assessment**

D. Pasqualotto, A. Ndokaj, M. Mazur, F. Rinaldo, D. Corridore, M. Capocci, D. Salvi, P. Patti, F. Ripari, G.M. Nardi, L. Ottolenghi, F. Guerra

*Department of Oral and Maxillo-Facial Sciences, "Sapienza" University, Rome, Italy*

**BACKGROUND:** The aim of this in vivo study was to compare spectrophotometric backgrounds - white (WB) with cuspal (C), black (BB) with non cuspal (NC) - in order to determine if the oral natural conditions could be used as reliable backgrounds instead of the traditional black and/or white for in vivo color matching.

**METHODS:** Spectrophotometric measurements were performed on ninety-three upper right permanent central incisor. Among inclusion criteria were A1, A2, A3 (Vita Classical scale) tooth shade. Each tooth was measured on black, white, cuspal and non cuspal backgrounds.  $\Delta E$  between black and non cuspal ( $\Delta E_{BBNC}$ ) and  $\Delta E$  between white and cuspal ( $\Delta E_{WBC}$ ) were calculated and correlated to human eye color perception (AT, PT). Opalescence (O) and contrast ratio (CR) were calculated on the four different backgrounds.

**RESULTS:** The comparison between black and oral cavity natural backgrounds shows high clinical acceptability: 98.9% in the central, 96.8% in the gingival and 92.4% in the incisal tooth area. Clinical acceptability between white and oral cuspal backgrounds was 90.3% in the gingival, 79.6% in the central and 7.6% in the incisal tooth area.

**CONCLUSIONS:** Natural oral black background can always be used instead of the artificial one, while the natural bright oral background can be used instead of the artificial one only for an overall tooth shade matching. Our results support the natural backgrounds as valid alternatives to artificial ones. Using individual oral features as referral points, sustain personalized practices and provide a sustainable and easy clinical procedure.

**Dental, ophthalmological, audiological screening on a sample of population from Togo: results and clinical appearance and criticism of the intervention**

P. Palattella, S. Spagnolo, A. Musacchio, F. Mallone

*Dirigente Medico, Dipartimento Testa-Collo dell' Azienda Policlinico Umberto I di Roma; Medico specializzanda in Oculistica Università Sapienza di Roma*

**BACKGROUND:** Identify, through a screening, the most relevant diseases in Togo at a dental, ophthalmic and audiological level, in order to plan subsequent step, regarding clinical and surgical treatments.

**METHODS:** A dental, ophthalmological and audiological screening was carried out on a sample of 1097 subjects, out of which 65% were school age, inhabitants in the central area of Togo in the village of Amakpapè and surroundings. Along with a prevention work carried out in three schools and an orphanage. A training has been carried out in three schools and an orphanage to stimulate children (and where possible to the families) proper personal hygiene and appropriate use, for example, of the dental toothbrush.

**RESULTS:** The most common pathologies from dental point of view were: dyschromies from drugs, due to the wide use of antibiotic treatments carried out also , during the periods of pregnancy and malocclusions; from ophthalmic point of view were : cataracts , pterigium, glaucoma, chronic conjunctivitis results of viral, bacterial and parasitic infections, amblyopia; from audiological point of view were: chronic purulent average otitis, hipoacusias and deep deafness.

**CONCLUSIONS:** The poor and insufficient health care and poverty conditions in Togo affect both the high level of infant mortality (56.8%) and the low average age of the population (59 years) and therefore medical action are necessary also through an external support to the country. The most important thing beside the screening of the population of the villages was that a lot of medicines has been supplied such as antibiotic, anti inflammatory, painkillers, glasses and sunglasses ,very expensive for the greatest part of our patients. In addition we are planning to collect material from Italy to send in Togo, also with the help of some Onlus. Prevention and training to people in order to train personal in various specialist aspects at local level represent the strengths of the next actions and therefore a long-term planning must be carried out in order to obtain a sufficient level of health in this country compared to other world realities that makes the lives of the inhabitants of this of this forgotten African dignified .A project that takes into account the primary need to train local staff, both through training in Togo, and through specialization courses in Italy. With the common goal of being able to create a medical school that would represent a revolution in the health field for the African country.

### Plaque detector evaluation to improve the quality of domiciliary oral hygiene

M. Caburlotto, S. Piovani, J. Martin, A. Zuccon, A. De Stefani, S. Mazzoleni

**BACKGROUND:** Dental plaque is difficult to be identified during the domiciliary oral hygiene, so the dentist or dental hygienist can promote an oral prophylaxis at planned intervals. The domiciliary oral hygiene is an essential aspect in order to remove the dental plaque and to

avoid decay development and periodontal disease. A correct domiciliary hygiene can preserve teeth and periodontal tissue health. An accurate evaluation of plaque sites is essential to prevent the accumulation. The purpose of this study is to assess the effectiveness of domiciliary plaque detector, which would allow the patient to recognize sites with the plaque accumulation, in order to improve the quality of daily oral hygiene.

**METHODS:** The clinical trial was conducted among 26 patients, without orthodontic devices or prosthetic rehabilitation, with at least 20 natural teeth. A control group was not evaluated in the study. Before the clinical evaluation, all the patients received a professional hygiene by a dental hygienist and a month later plaque and bleeding indexes were detected (T0) using the "Plaque Control Record of O'Leary, Drake and Naylor, 1972", and the "Bleeding Index of Ainamo & Bay,1975". After the use of a two-tone liquid detector Mira-2-Ton® (Hager & Werken GmbH & Co. KG) with food dye inside (C45010 and C42090) the plaque and bleeding indexes were evaluated. Each tooth was divided into six sections and a percentage value was obtained by dividing the dental areas covered by the plaque and the number of total dental areas. The same procedure was applied for the bleeding index. Patients were requested to use plaque tablets during the domiciliary oral hygiene once a week for the following month. They had to brush their teeth, chew the tablet for a minute, rinse and brush another time the teeth to remove colour residues. A month later plaque and bleeding index were evaluated by the dental hygienist (T1). The data collected for each patient at T0 and T1 were compared.

**RESULTS:** The data were processed through the SPSS Statistics® program. The quantitative variables were synthesized through averages and standard deviations and a t-Student test was performed. A p-value lower than 0.05 was considered statistically significant. The difference between the measurements of the plaque index at T0 and T1 was statistically significant. Despite there was a decrease between the bleeding index at T0 and the bleeding index at T1, the difference wasn't statistically significant.

**CONCLUSIONS:** The result of the study shows that the use of plaque detectors improves the domiciliary oral hygiene procedures in a plaque reduction and periodontal tissue health improvement.



---

## PROTESI

---

### Mechanical characterization of uni-directional vs. multi-directional carbon fiber frameworks for dental implant applications

L. Repetto <sup>1</sup>, P. Pesce <sup>1</sup>, F. Barberis <sup>2</sup>, P. Pera <sup>1</sup>, A. Lagazzo <sup>2</sup>, M. Menini <sup>1</sup>

<sup>1</sup>*Implant and Prosthetic Dentistry Unit, Department of Surgical Sciences (DISC), University of Genoa, Ospedale S. Martino, Genoa, Italy;* <sup>2</sup>*Department of Civil, Chemical and Environmental Engineering, University of Genoa, Genoa, Italy*

**BACKGROUND:** The aim of the present study was to investigate the mechanical characteristics of a unidirectional carbon fiber-reinforced composite (UF) to be used for dental implant frameworks and to compare them with those provided by multidirectional carbon fiber-reinforced composite (IF).

**METHODS:** 7 identical UF beam samples were manufactured with standard dimensions (70x5x3 mm) by Micro Medica s.r.l., following their Bio Carbon Bridge Protocol. A microscopic analysis was performed using Nikon® Eclipse LV100 microscope (Nikon Instruments Europe BV, Amsterdam, Netherlands). The magnifications used were 50×, 100×, 200× and 500×. The transversal sections of the samples were analyzed using two digital microscopes perpendicularly positioned (one oriented along the vertical axis of the samples, while the other one along their horizontal axis). Pictures were elaborated using Dinocapture software (Dinolite, New Taipei City, Taiwan). An experimental Complex Modulus apparatus, developed at the Department of Civil, Chemical and Environmental Engineering of the University of Genoa (Italy), was used to perform a non-destructive mechanical test in order to evaluate dynamic elastic modulus. Classic destructive stress-strain tests were performed using an Instron-like machine (Zwick Roel ProLine Z010, Zwick Roell Italia Srl, Genoa, Italy) in order to evaluate static elastic modulus.

Wettability was evaluated measuring the contact angle of deperated water small drops brought into contact with the solid surface of the samples through a precision pipette.

The outcomes were compared with those of 6 IF samples tested following the same protocol – data reported in Menini M et al. 2017.

**RESULTS:** UF samples presented mean values of 107.6 GPa and 53.1 GPa respectively for dynamic and static modulus, whereas IF ones presented a mean dynamic modulus of 92.2 GPa and a static modulus of 84.5 GPa. UF contact angles presented mean values of 94.2° after five seconds, 90.1° after one minute and 82.5° after three minutes; such values are similar to the IF ones.

**CONCLUSIONS:** According to the present results, unidirectional carbon fiber-reinforced composite appears suitable for the fabrication of frameworks for implant-supported full-arch dentures. Dynamic elastic modulus was higher for UF, while

static elastic modulus was higher for IF. However in a clinical evaluation, longer carbon fibers can be placed in a UF framework compared to the ones placed in an IF framework, which needs a cutting-fabric technique, and the use of longer fibers probably allows better stress dissipation.

Further research is needed to evaluate the clinical significance of such differences.

### Screw-retained versus cemented provisional prosthesis on implants: evaluation of per-implant tissues health. Pilot study

G. Gastaldi, F. Bova, F. Manazza, F. Cattoni, E. F. Gherlone  
*Università Vita-Salute San Raffaele, Milan, Italy*

**BACKGROUND:** Implant-prosthetic techniques result in a high long-term survival rate, which in scientific literature reaches about 98%. This result depends on mechanical and material and microbiological factors, which are related to the absence of inflammatory phenomena in the per-implant tissues that provide implant stability through osteointegration. An important aspect for the outcome of the implant-supported rehabilitation is a correct implementation of the prosthesis, as early as the provisional phase. In this first phase of functional load, the clinician can choose between a screwed-retained or a cemented solution. To evaluate if at 4 months from the functional load the temporary type of prosthesis can be related to the health status of the peri-implant tissues.

**METHODS:** 40 patients were evaluated: 20 patients rehabilitated with cemented provisional prosthesis on 27 implants and 20 patients with cement solution on 31 implants. In these subjects, appropriate clinical parameters were observed to describe at 4 months from the functional load, the state of health of per-implant tissues: probing depth, bleeding on probing, plaque accumulation. At 4 months, clinical stability tests of the provisional restorations and a radiologic control were also performed. The collected data were then analyzed with an inferential and descriptive statistical method to investigate if there was any correlation with the type of provisional used.

**RESULTS:** Within the limits of the sample taken in exam, the data collected and analyzed by applying the Chi-square test and the Manova Test did not allow to reveal any significant correlation between the type of provisional restoration and the health status of per-implant tissues ( $p > 0.05$ ). Within the two observed groups, the incidence of mechanical complications, as partial deconstruction of the prosthesis, is also not correlatable. As regards to the marginal bone levels, mean values result very close to each other in both groups: 0,3906 mm (s.d. 0,0364) in the case of the cemented prosthesis and 0,3885 mm (s.d. 0,0284) in the case of the screwed prosthesis. **CONCLUSIONS:** The comparison between the two methods

does not show any correlation between the type of provisional, screwed or cemented, and the health of per-implant tissues, according to the parameters that have been taken into account for this study. In the absence of statistically significant correlations, the clinical observations suggest, within the limits of a pilot study, that both the observance of precise surgical and prosthetic protocols, and a home and professional effective management of oral hygiene in patients rehabilitated by implant-prosthetic solutions represent an effective method for the maintenance of the health of per-implant tissues when provisional prosthesis is under functional load.

### Margin relocation in cavities restored with CAD/CAM lithium silicate endocrowns: load to fracture analysis

D. Angerame <sup>1</sup>, M. De Biasi <sup>1</sup>, M. Moratti <sup>2</sup>, M. Lenhardt <sup>1</sup>, G. Marchesi <sup>1</sup>

<sup>1</sup>Clinical Department of Medical Science, Surgery and Health, University of Trieste, Trieste, Italy; <sup>2</sup>Private Practice, Gorizia, Italy

**BACKGROUND:** To assess the resistance to fracture of CAD/CAM lithium silicate endocrowns luted on maxillary molars with or without the margin relocation with flowable composite in a proximal box simulating a deep defect.

**METHODS:** Sixteen sound maxillary third molars were selected from a pool of freshly extracted teeth and randomly divided into two experimental groups of eight elements each. The teeth were horizontally cut with a cylindrical diamond bur 2 mm above the cemento-enamel junction and were subjected to standardized preparation to receive an endocrown restoration. After the preparation of the endodontic access cavity, the teeth were endodontically treated with nickel-titanium instruments (Mtwo, Sweden & Martina) and the canals filled with the continuous wave of condensation technique. In the control group, no further preparation was carried out. The canal orifices and the undercuts of the access cavity were sealed with a flowable composite (AP+ flow, Sweden & Martina) after standard self-etch adhesive procedures (Clearfil SE, Kuraray). In the experimental group, a 4 mm-wide box was prepared 2 mm below the cemento-enamel junction and the margin relocated with the flowable composite. The prepared teeth were scanned to obtain zirconia-reinforced lithium silicate endocrown restorations (Celtra DUO, Dentsply) with the Cerec 3 CAD/CAM system (Dentsply Sirona). The milled endocrowns were luted with self-adhesive cement (RelyX Unicem 2, 3M ESPE). The restored teeth were subjected to thermomechanical aging with a chewing simulator and loaded to fracture with a universal testing machine. The type of failure was classified as crack/fracture and above/below the cemento-enamel junction. The difference in maximum load to fracture between the groups was evaluated with an independent sample t-test, while the fracture pattern was compared with a chi-squared test ( $p < 0.05$ ).

**RESULTS:** The mean value of maximum load to fracture was 1459.12±308.24 N and 1298.67±306.52 N in the control and margin relocation group, respectively. All the restored teeth experienced fractures, which were more frequently localized below the cemento-enamel junction. The statistical analysis did not point out significant differences between the groups in terms of both resistance to load and fracture pattern.

**CONCLUSIONS:** Zirconia-reinforced lithium silicate endocrown restorations showed high values of resistance to fracture, which exceeded the maximum force that can be applied

during the masticatory function. The margin relocation in an interproximal box with flowable composite did not negatively affect the maximum load to fracture or the modality of restoration failure. Further studies are needed to test the clinical performance of lithium silicate endocrowns with margin relocation.

### Effect of combined therapy : postural and prosthetic in the adult

**BACKGROUND:** To evaluate the effect on the articular movement in the older patients, after combined treatment : postural and prosthetic

**METHODS:** The old patient in general has double problem: postural problem with a pathologic position of body on the space and loss of teeth (in general posterior teeth) and consequential change of position of mandible on the space and the pathologic position of head. The postural therapy involves the use of foot soles that have at the center of the foot plan a stack that reprograms the posture of the patient. The operator then inserts thicknesses under the foot plan to eliminate muscular interferences. Oral level apply occlusal evaluation to eliminate occlusal interferences of the head and neck.

**RESULTS:** Immediately after application of the foot soles and the occlusal elevation, the patient can better flex his torso forward and rotate his neck better. Distance he changes in the plantar contact. The results of the treatment are immediately in the improvement of the patient's flexibility and the rotation of the head. Obviously to have a stabilization it is necessary to wear the soles at least 12/18 months. (also because the patient is adult). At occlusal level, such a massive and immediate increase in the vertical size had been made (usually the technician recreate the usual occlusion of the patient by restoring in practice the pathological occlusion than was created over time)

**CONCLUSIONS:** After therapy the patient improves articular movement of body and improves its posture

### An aesthetic and neuro-muscular balanced implant-prosthetics rehabilitation achieved with the provisional restoration and a functional activator: a case report

E. Simeoni, J. Lai, P. Bursi, E. Sartori, L. Tomasi, S. Orlandi, G. Lombardo, L. Malchiodi

Department of Surgery, Dentistry, Pediatrics and Gynecology, Università degli Studi di Verona, Verona, Italy

**BACKGROUND:** The aim of the present study was to verify the achievement of occlusal stability obtained using the wax up, the provisional restoration and a functional activator.

**METHODS:** A sixty-two-year-old woman with an inadequate implant prosthetics and signs and symptoms of temporomandibular disorder has been selected for a complete new functional and aesthetic prosthetic rehabilitation. Firstly, the patient was radiographed and photographed with the purpose of making a meticulous investigation as basis for treatment planning. After a thorough skeletal and morphological analysis (respectively assessment of palatal and mandibular asymmetries and evaluation of facial asymmetry) the traditional prosthetics criteria consisting of face bow, bite registration waxes and articulator were followed to produce an appropriate wax up that led to a provisional restoration. Measuring the

## ABSTRACT

distance between 1.4 and 2.4 on the provisional restoration, an Equilibrator O.S.A. device (equilibrator designed by Ovidi, Santi, and Aprile for Eptamed SRL; Cesena, Italy; www.eptamed.com) was delivered to the patient in order to check the occlusion and balance the function of the muscles around the temporo-mandibular jaws by the thickness and consistency of the functional activator itself. The patient underwent radiographic checks. Following the verification of aesthetics and occlusal stability achieved with the functional activator and the provisional restoration, final dental impressions were recorded and the definitive restoration realized. The definitive restoration has been manufactured in respect of late occlusal stability reached by the patient through the functional activator and provisional restoration. Both the prosthetic and dental volumes settled by the provisional restoration were considered in order to optimise the support of the peri-oral tissues.

**RESULTS:** A satisfying functional and aesthetic result has been achieved. No biological and mechanical complications were recorded. On the contrary, forces generated while using the activator resulted in a complex reduction of muscular tension in the area around the temporal-mandibular jaws. The patient referred improvement of symptoms relatively to her previous temporo-mandibular disorder. No clinical signs of the disorder were noticeable either. Occlusal stability was maintained throughout further periodical recalls every 6 months for 5 years. Moreover, the patient's desire for a better and more harmonious aesthetics was fulfilled.

**CONCLUSIONS:** Not only was the occlusal stability attained, but also a neuromuscular balance was promoted on the basis of a preparatory study which includes traditional prosthetic criteria, a correct and precise management of the provisional restoration and a proper application of the recently introduced functional activator.

### No-preparation ceramic veneers: a systematic review

F. Zarone <sup>1</sup>, R. Leone <sup>2</sup>, M.I. Di Mauro <sup>3</sup>, M. Ferrari <sup>4</sup>, R. Sorrentino <sup>5</sup>

<sup>1</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University "Federico II" of Naples, Naples, Italy; <sup>2</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University "Federico II" of Naples, Naples, Italy; <sup>3</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University "Federico II" of Naples, Naples, Italy; <sup>4</sup>Department of Medical Biotechnologies, Division of Fixed Prosthodontics, University of Siena, Siena, Italy; <sup>5</sup>Department of Neurosciences, Reproductive and Odontostomatological Sciences, University "Federico II" of Naples, Naples, Italy

**BACKGROUND:** The main objective of the present systematic review was to investigate the validation of no-preparation ceramic veneers as restorations.

**METHODS:** A systematic search for papers published between 1980 and 2017 was performed, since particular attention to a non-invasive approach in restorative dentistry began to be paid in the 80s; only articles written in English were considered. The search strategy was based on a literature review of papers available in electronic databases: Pubmed, Evidence-Based Dentistry, BMJ Clinical Evidence, Embase, Dynamad and OpenGrey were analyzed in order to identify randomized controlled clinical trials evaluating the

clinical outcomes of no-preparation ceramic veneers; manual researches were performed as well. The systematic review was structured following the PRISMA guidelines. The eligibility of investigations was assessed according to the P.I.C.O. and the quality assessment of the included studies was carried out using the criteria reported by the Cochrane Handbook for Systematic Reviews of Interventions.

**RESULTS:** Database search produced 2551 records. After removal of duplicates and a careful examination of titles and abstracts, the reviewers excluded all of the studies. Manual and grey literature did not yield any other relevant article. The main reasons for exclusion were: not the topic of interest, non-RCTs and studies without control.

**CONCLUSIONS:** Due to the lack of data, at the moment achieving a definitive clinical statement regarding the "no-prep" technique is not possible. Further clinical studies are needed to assess the effectiveness of no-preparation ceramic veneers. No-prep veneers can be considered as conservative treatments which should be carefully recommended and request a cautious selection of cases. Although prepless and minimally invasive veneers are sometimes described as simplified techniques, they actually represent operator-sensitive procedures, due to the frequent difficulty in obtaining a fairly natural and harmonic shape, avoiding detrimental and unaesthetic overhangs. Further controlled clinical researches are necessary to clearly identify predictable clinical protocols and evaluate the long-term outcomes of such restorations.

### Approach to total prosthetic rehabilitation on implants: review of the literature and presentation of the innovative technique ex assembly system

C. Pinna, F. Mulas, M. Deias, E. Spinaz

Department of Surgical Sciences, Division of Sport Dentistry, University of Cagliari, Cagliari, Italy

**BACKGROUND:** The current dental market is looking for techniques that facilitate the design and production of prosthetic structures for dental rehabilitations which very often concern edentulous patients. With increasing frequency, patients require implant-supported rehabilitations and today the clinician has the possibility to use different surgical techniques. In this research work, space is given to the type of materials that can be used for the manufacture of total dental prostheses on implant support and how the production technique influences the success of the product. The work consists in the presentation of a dental assembly technique on CAD-CAM method called EXE Assembly System and how the technique allows the clinician to choose among the different prosthetic materials available on the market previously tested in the laboratory.

**METHODS:** In this study it is presented the protocol for the design of a prosthetic product according to the EXE Assembly System technique in its CAD component using Dws and CAM software through the use of software for Hyperdent cutting strategies and machining using Roland DWX-51D. Laboratory tests have been performed on the latest generation materials found in the literature and applicable to the EXE method, specifically, specimens of glass fiber, PEEK, reinforced PEEK and PMMA have been tested. Bending and traction tests were performed using the Graphwork2 software and the Galdabini sun 500 electromechanical tensometer.



**RESULTS:** The result shows that the latest generation materials are compatible with the manufacture of dental prostheses and can be used successfully in the aforementioned technique. From the bending tests carried out, the material with the highest breaking strength turns out to be the glass fiber. The two technopolymers based on PEEK are comparable in terms of resistance.

**CONCLUSIONS:** Concluding: the EXE Assembly System technique not only allows an unlimited reproducibility of the prosthetic product but allows its production in different metal-free materials, without jeopardizing its structure or fidelity.

### Masticatory performance of older patients: impact of prosthodontic fixed rehabilitation

E. Coccia<sup>1</sup>, L. Aquilanti<sup>1</sup>, A. Santarelli<sup>1</sup>, A. Vignini<sup>2</sup>, M. Mascitti<sup>1</sup>, G. Rappelli<sup>1</sup>

<sup>1</sup>Dipartimento di Scienze Cliniche Specialistiche ed Odontostomatologiche, Sezione di Scienze Odontostomatologiche; <sup>2</sup>Dipartimento di Scienze Cliniche Specialistiche ed Odontostomatologiche, Sezione di Biochimica, Biologia e Fisica

**BACKGROUND:** Chewing ability is closely related to the number and distribution of teeth remaining: it seems to be satisfactory with more than or equal to 20 teeth. Especially in elderly, with a decreased number of teeth, a reduction in chewing function can contribute to changes in food choices and ultimately impact on overall nutritional status. Patients treated with fixed prostheses have better quality of life and better masticatory function than patients treated with removable prostheses. Nowadays an increasing number of older adults retain their natural teeth for longer in life. However few evidence about how teeth should be saved and restored to guarantee satisfactory oral functionality is available in literature. The aim of this study is to verify the impact of the fixed prosthetic rehabilitation for partially dentate older patients on masticatory performance.

**METHODS:** 40 subjects over 65 years old, all having more than 20 teeth, were visited the dental clinic of the Polytechnic University of Marche. For each patient age, sex, number of teeth in the mouth, presence of fixed prosthesis, presence of partial and/or complete removable prosthesis were recorded. Patients were divided in two groups: 20 subjects showing fixed prosthodontics (group A) and 20 with without fixed prosthetic rehabilitation (group B). Presence of removable rehabilitation was an exclusion criteria. In all 40 patients masticatory efficiency was assessed with a colour mixing test, using two pieces of chewing gum of different colours. In order to calculate the mixed fraction (mixed pixel/2 total pixel), digital images were realised and analysed with dedicated software.

**RESULTS:** In the group A the mean number of teeth was 22,95 among which the mean number of fixed prosthodontics (crown and bridge elements) is 5,5. The masticatory performance was 0,2397. In the group B the mean number of teeth was 26,7. The masticatory performance was 0,2403. No statistical difference was found between the masticatory efficiency of two groups.

**CONCLUSIONS:** These results indicate that, in cases of few number of prosthetic elements, fixed rehabilitation is equivalent to natural teeth in terms of chewing capacity for older patients. Therefore, treatment plan should focus on the preservation and rehabilitation of the strategic parts of the dental arch that are critical for adequate oral function.

### Telescopic overdenture using innovative metal free TRINIA<sup>®</sup> material: a case report

**BACKGROUND:** In edentulous cases, Telescopic Overdenture on dental implants, could be an efficient and valiant alternative to traditional dentures, which are usually considered unsatisfying by the patient, since the extent of tissue coverage and their lack of stability (particularly in the lower arch)<sup>1</sup>. It also facilitates the maintenance of oral hygiene, being removable, and increases the retention of the prosthesis. TRINIA<sup>®</sup> material provides for the aesthetic and resilience features.

**CASE REPORTS:** A 70 years old, complete edentulous female patient, was referred to our clinical department with the chief complaint of difficulty in masticatory functions and high aesthetics expectation. After medical and radiological 3D investigations, four Bicon<sup>®</sup> short implant (1 out of 8 was of 5mm, the rest were of 8mm length) were inserted in each dental arch, a split crest technique was performed where required. The choice of short implants comply with the necessity of any bone grafting procedure, reducing the waiting time of functional loading required. After four months, impressions and diagnostic wax rim, were taken and a conometric connection was chosen for the realization of a removable telescopic dentures. This kind of prosthesis ensure better stability, due to its better distribution of transferred compressive forces which are converted into tensile, reducing movements that dislodge the denture and forces that increase residual ridge resorption<sup>2</sup>. Moreover, TRINIA<sup>®</sup> framework (a CAD-CAM made fiber resin) was used for its features of being biocompatible, lightweight, aesthetic, durable and resilient/flexible, allowing up to 21mm distal cantilever. Policeramic composite material was hence used for final restoration, thus allowing within the aesthetic, a better attitude toward stress loading forces and parafunctional cycles<sup>3</sup>. This particular prosthesis enables patients to better follow hygienic instructions and reduces mucosal tissues compression compared to the traditional dentures.

**CONCLUSIONS:** Conometric coupling connection, improved with the innovative features of TRINIA<sup>®</sup> and policeramic composite restorative materials, allows Clinicians to offer to edentulous patient a valid and more suitable alternative option to traditional removable dentures. Improving both aesthetic, stability and tissue comfort as referred by patients<sup>5</sup>. Moreover, the use of short implants allows to expand the portion of patients that meet eligible surgical criteria with no need of additional bone grafting.

#### References

1. Telescopic Overdenture: A Case Report. Shruthi CS, Poojya R, Ram S, Anupama. Int J Biomed Sci. 2017 Mar;13(1):43-47.
2. Singh K, Gupta N. Telescopic Denture – A treatment modality for minimizing the conventional removable complete denture problems: A case report. Journal of Clinical and Diagnostic Research. 2012 Aug;6(6): 1112-1116.
3. Mechanical fatigue degradation of ceramics versus resin composites for dental restorations. Belli R, Geinzer E, Muschweck A, Petschelt A, Lohbauer U. Dent Mater. 2014 Apr;30(4):424-32. doi: 10.1016/j.dental.2014.01.003. Epub 2014 Feb 17. Erratum in: Dent Mater. 2014 Oct;30(10):1204.
4. Fiber-Reinforced Resin Fixed Prostheses on 4 Short Implants in Severely Atrophic Maxillas: 1-Year Results of a Prospective Cohort Study. Wagner F1, Seemann R2, Marincola M3, Ewers R4. J Oral Maxillofac Surg. 2018 Feb 19. pii: S0278-2391(18)30114-9.

## ABSTRACT

**The snap-on smile: a new clinical option**

M. Iervolino, G. Leonetti, R. Leone, R. Sorrentino

*Department of Neuroscience, Reproductive Sciences and Dentistry, University of Naples "Federico II", Dental Prosthesis Area, Naples, Italy*

**BACKGROUND:** The Snap-On Smile (SOS) is a removable, multi-purpose appliance that requires no preparation or altering of tooth structure, no injections and no adhesives. Its action is reversible. It is made of thermoplastic acetal, which is a poly-oxy-methylene based material. It is very strong, flexible, resists wear and fracturing. The SOS material can be as thin as 0.5 mm and maintains its strength and is highly resistant to odors and stains. It does not impinge on gingival tissue, it does not cover the palate. Retention is completely tooth-borne, it literally snaps on at the third gingival of teeth because of the material's unique memory properties. Clinical indications are: cosmetic smile enhancement; removable partial denture; implant provisional; raising and restoring vertical dimension; patients with parafunctional habits; as a transitional, removable new smile before the patient commits to a permanent prosthodontic treatment. Depending on the treatment objective, the occlusal design of Snap-on Smile can be: 1) where it is necessary to increase or restore the vertical dimension, the occlusal surfaces of the posterior teeth will be covered by the device; 2) if the occlusion of the patient is to be maintained, the occlusal surfaces of the posterior teeth will not be covered by the device; 3) in the case of a deep bite, the palatal surfaces of the central incisors will also be uncovered by the device. Contraindications are: severe periodontal cases, edentulous, severe class III bites, cantilever distal extensions >22mm, edentulous spans > 40mm. The aim of this study is to describe some clinical cases in which the SOS was used for several reasons. In the first case, the SOS was used in a dystonic patient, whose illness led to the abrasion of all his teeth. In this case, no traditional procedure can be performed due to the extreme difficulty of the various operating phases and the poor predictability of the long-term results. The SOS represented the only possible alternative to restore the smile to this patient, for its easy manufacture and insertion. Other cases show patients with abraded teeth for various reasons, in which the SOS has been used both to obtain an increase in the vertical dimension, and as an aesthetic and functional guide for the final prosthetic treatment.

**METHODS:** Using a polyvinylsiloxane or polyether material or a digital scanner, an impression was taken of the patient's dental arches, as well as a bite registration. Next, the clinician selected the shade and shape of the SOS. The impressions were sent to the laboratory where the appliance was made. The patients were instructed to properly insert and remove the appliance, and to perform the minimal routine maintenance.

**RESULTS:** from the review of the clinical cases, the Snap-On Smile can be a valid alternative to the traditional procedures, it can be used in the diagnostic phase, in the phase of provisioning and in the definitive phase of a treatment. **CONCLUSIONS:** The Snap-On Smile represents another clinical option in the range of prosthetic treatments. In some cases Snap-On Smile is considered as a medium/long-term solution; in others it is an intermediate cosmetic device that provides patients with a "trial run" with regard to available and appropriate permanent options.

**The functional implant prosthodontic score (FIPS) as an objective and reproducible tool for implant and prosthetic assessments**

S. Sgroi, R. Sorrentino, M.I. Di Mauro, F. Zarone

*Dipartimento di Neuroscienze, Scienze Riproduttive e Odontostomatologiche, Università degli Studi "Federico II" di Napoli, Area di Protesi Dentaria, Naples, Italy*

**BACKGROUND:** The aim of this study was to investigate the reproducibility and observer variability of the Functional Implant Prosthodontic Score (FIPS) and, secondly, to validate the clinical application of the FIPS for objective outcome evaluation of implant crowns, considering different levels of dental expertise for intra- and inter-examiner analysis and its potential influence. The following null hypothesis was tested: there was no association between the participants' expertise and FIPS outcome.

**METHODS:** The study setting and the material submitted to all the enrolled subjects in this research are part of a previously published study. According to the participants' level of dental experience, a total of 62 examiners, were divided into 2 groups, representing undergraduate dental students and skilled dentists. All examiners of this study were calibrated before completing the questionnaires in order to avoid overconfidence bias. Including clinical and radiographic examinations, the 5 FIPS-variables defined for calculation of total FIPS score were applied to a series of 10 sample cases for an objective outcome validation and to assess the implant restorations. The FIPS evaluations of the ten sample cases, each showing one implant-supported single crown for premolar and molar replacements, were performed by the different groups of examiners (group A: n = 31 undergraduate dental students; group B: n = 31 skilled dentists). Furthermore, all the participants carried out 2 FIPS ratings for each sample case with a break of 2 days between the compilations of the experimental questionnaires (round 1 and round 2). For the second round of evaluation, the sequence of cases was reversed to reduce any kind of possible bias.

**RESULTS:** The mean values of the total FIPS scores of all participants were 5,96 +/- 0,08 for round 1 and 5,99 +/- 0,06 for round 2. The mean age of all examiners was 35 years (min 23 years – max 68 years), while the mean age for the undergraduates and for skilled dentists were respectively 25 years and 45 years. The mean value of dental experience for the Group B was 20 years (min 2 years – max 42 years). K Cohen calculation for the defined five FIPS-variables pointed out high correlation for both groups high correlation between the evaluations in round 1 and round 2. There were statistically no significant differences in relation to the different variables and there is a very good degree of agreement between the values. For both groups, calculations pointed out strong correlation for all the five FIPS-variables between the 2 time-points applying FIPS. The inter-examiners analysis showed very congruent results for reproducibility testing of FIPS. The intra-examiners analysis demonstrated no significant differences between round 1 and round 2. The analysis of homogeneity in relation to the five FIPS's different variables showed congruent values, so FIPS can be considered as a potential valid and reliable instrument.

**CONCLUSIONS:** The null hypothesis was accepted, since there was no association between the participants' expertise and FIPS outcomes. Independently from the dental experience level, the FIPS-variables seem to be valid parameters for standardized evaluations of implant reconstruction in posterior sites. The findings of this study confirm the poten-

tial of FIPS as an objective and reliable tool not only in evaluating fixed implant restorations in a research setting and in daily clinical practice, but also to compare follow-up observations and to identify potential risks of failure.

### Plaque detectors on acrylic resin for removable prostheses: a comparative *in vitro* analysis

A. Antonelli, V. Pizzo, R. Leone, B. Borelli, R. Sorrentino

*Dipartimento di Neuroscienze, Scienze Riproductive e Odontostomatologiche, Università degli Studi "Federico II" di Napoli, Area di Protesi Dentaria, Naples, Italy*

**BACKGROUND:** Acrylic resin prostheses have microporous surfaces easily colonized by oral biofilm. Poor hygienic maintenance as well as aging of restorative materials can contribute to determine the onset of oral and systemic pathologies, that can be prevented, therefore, by accurate cleansing of the prostheses. The aim of this study was to evaluate the motivational effectiveness of 3 different plaque detectors, testing their ability to highlight the oral biofilm and ease of removal from acrylic resin.

**METHODS:** Thirty discs of acrylic resin were used, with thickness of 0.5 mm and diameter of 2.5 cm; just one surface on each specimen was polished to simulate the surface of removable resin prostheses. Resin aging was performed immersing all the discs in 96% ethanol for 15 days; subsequently, they were exposed to sunlight for 15 days to promote aging. Four volunteers were selected to collect physiological saliva; then, all the specimens were stored in saliva with the addition of 15 gr of sucrose to promote bacterial growth for 15 days. Three different plaque detectors were used for the experimental tests: RED-COTE, MIRA-2-TON and PLAQUE TEST tablets; each plaque detector was applied onto 10 discs. To test the removability of the detectors, the samples were eventually cleaned with an electric toothbrush and handwash detergent. **RESULTS:** After performing ethanol aging, a noticeable amount of porosities was detected on both surfaces of the discs; at the same time, a color change was observed. The MIRA-2-TON solution showed 12% of plaque on the porous surface and 9% on the smooth surface but its easy removability did not allow to accurately highlight the plaque on both resin surfaces. The RED-COTE tablets detected 70% of plaque on the porous surface and 30% on the smooth surface. The PLAQUE TEST solution showed 60% of plaque on the porous surface and 37% on the smooth surface. The RED-COTE tablets highlighted the plaque more effectively but, being chewable tablets, their application was difficult; consequently, even though the results were similar to the PLAQUE TEST, it was not possible to confirm its reliability. Moreover, being a fluorescein sodium-based material, the Plaque Test requires a light-curing unit to detect plaque on the surface. After cleansing, all the different plaque detectors were removed without any residual stain. The present study, however, did not take into account the possibility of staining artificial teeth.

**CONCLUSIONS:** Within the limitations of the present *in vitro* study, it was possible to conclude that:

- the plaque detectors that showed greater ability to detect the oral biofilm were

PLAQUE TEST and RED-COTE;

- the use of the PLAQUE TEST may be useful in dental practice as an efficient motivational tools;

- RED-COTE tablets can be considered a valid and simple home aid for the correct hygienic maintenance of resin removable prosthesis.

### Decontamination of tissue conditioning materials for removable dentures: an *in vitro* study

D. Melilli <sup>1</sup>, D. Geraci <sup>2</sup>, C. Mirrione <sup>1</sup>, G. Pizzo <sup>1</sup>

*<sup>1</sup>Department of Surgical, Oncological and Oral Science, University of Palermo, Palermo, Italy; <sup>2</sup>Department of Health Promotion Sciences and Mother-Child Care, University of Palermo, Palermo, Italy*

**BACKGROUND:** To evaluate the *in vitro* antifungal activity of chlorhexidine gluconate (CHX), magnesium oxide (MgO) and cetylpyridinium chloride (CPC) against yeasts of the genus *Candida* contaminating two tissue-conditioning materials (Visco-gel VG and GC Tissue conditioner). Two disinfection techniques were tested: a) immersion in liquid solution for 10 minutes; b) inclusion of the three tested substances in the mixture of the conditioning material in the form of powder (MgO and CPC) or liquid solution (CHX).

**METHODS:** A contaminating broth was prepared by mixing cultures of three species of *Candida* (*C. albicans* ATCC 90029, *C. glabrata* ATCC 90030, *C. tropicalis* ATCC 70050) in peptone water up to a turbidity of 5 Mc Farland, corresponding to a total microbial load of 10<sup>7</sup> CFU/ml. **Technique a):** 24 specimens of each conditioning material (VG and GC) were prepared according to the instructions of the manufacturers and using a silicone mold for standardizing the dimensions (2 cm in diameter and 0.8 in thickness). All specimens were immersed in 50 ml of contaminating broth for 24 hours at 35°C, then rinsed with sterile water, divided into three test groups and one control group for each material. The specimens of the test groups were immersed for 10 minutes in a disinfectant solution (CHX 0.2 %, MgO 7% or CPC 0.3%). The specimens of the control group were immersed in sterile water for 10 minutes. Then all the specimens were swiped into *Candida* CHROMagar plates, incubated for 48 hours at 35°C. **Technique b):** 30 specimens were prepared for this technique and divided into four test groups and one control group. The test specimens were made incorporating the disinfectant agents into the conditioning materials during their mixing in proportions of 0.2% and 1% for CHX, 7% for MgO and 0.3% for CPC; the controls did not contain disinfectants. After contamination for 24 hours in the broth, the specimens were plated. All tests were performed in duplicate.

**RESULTS:** **Technique a):** Immersion in CHX 0.2% and in CPC 0.3% for 10 minutes almost completely reduced the fungal load of the 3 species of *Candida* of both the conditioning materials (CFU <20 and CFU <10 for CHX 0.2% and for CPC 0.3% respectively), while 7% MgO immersion was not effective (CFU > 330) for any conditioning material. **Technique b):** In the inclusion technique, no tested disinfectant agent resulted effective in the disinfection of GC and VG (CFU > 330); only 1% CHX incorporated in the GC moderately reduced *C. tropicalis* (CFU <100).

**CONCLUSIONS:** The immersion of the conditioning materials in CHX 0.2% and in CPC 0.3% proved to be effective against fungal contamination. The inclusion of disinfectants in the material mixture proved to be ineffective, with the exception of 1% CHX which exhibited moderate antifungal activity. In conclusion, the immersion of relined dentures for at least 10 minutes a day in CHX 0.2% or in CPC 0.3% can help to drastically reduce the fungal colonization of the conditioning materials.



## ABSTRACT

**RCT on clinical performances of lisi-press vs. e.Max: 24-month recall**

G. Corsentino, G. Bonadeo, M. Carrabba, M. Ferrari

*University of Siena, Department of Medical Biotechnologies, Division of Prosthodontic and Dental Materials, Siena, Italy*

**BACKGROUND:** To evaluate clinical parameters in terms of marginal discoloration and integrity, secondary caries, vitality test crown integrity and retention, restoration failure and post-operative sensitivity of lithium disilicate onlays luted with proprietary bonding materials after 2 years of clinical service. **METHODS:** Hundred restorations were placed in 53 patients in need of one or more single partial crowns. Patients' written consent to the trial was obtained after having provided complete explanation of the aim of the study. Ethical committee approval was obtained a priori. Preparation design provided at least 0.5-1 mm space at the margin and 1.0-1.5 mm occlusally. Margins were placed mainly into enamel (only interproximal box may have cervical margin on dentin-cementum). At least one cusp was covered. The Residual Dentin Thickness (RDT) was evaluated on a periapical radiograph after preparation, and teeth with RDT thinner than 0.5 mm were excluded. After preparation, an impression of the prepared tooth was taken and sent to the laboratory. A temporary restoration was made for each abutment. Restorations material were randomly assigned, 50 restorations were made with LiSi Press (GC; Group 1) and the other 50 with IPS e.max (Ivoclar; Group 2). Restoration were wax-designed, hot-pressed and manually finished and polished by a single laboratory. At the day of delivery, restorations were bonded with their proprietary cement (Group 1: G-Premio Bond+LinkForce and Group 2: AdheSE Universal+Multilink Sprint) after sandblasting, etching with 10% hydrofluoric acid for 30 seconds and application of Resin Primer and Monobond Plus, respectively. The restorations were examined for clinical criteria at baseline, after cementation, 1 and 2-weeks and 6, 12 and 24-months by the same operator. Data were collected in accordance with the USPHS criteria. Sensitivity was defined on a scale from 0-10. Failures were classified as: material fracture/chipping, endodontic failure, debonding. All data were collected and statistically evaluated ( $p < 0.05$ ).

**RESULTS:** There were no statistically significant differences for the evaluated clinical parameters. There were no failures in Group 1 at 24-month recall. In Group 2, 3 teeth reported mild sensitivity. After 8-months one restoration reported an endodontic failure and was consequently excluded.

**CONCLUSIONS:** In this study, no failures due to esthetic and/or mechanical issues were recorded when lithium disilicate crowns were bonded in combination with their proprietary bonding system. Post-op sensitivity might be an issue in Group 2, even though no statistically significant differences were found.

**Performances of porcelain-fused-to-zirconia crowns, chamfer vs. knife-edge margin: 2-years recall**

E. Ferrari Cagidiaco, S. Roberto, G. Bonadeo, M. Carrabba, M. Ferrari

**BACKGROUND:** To evaluate the clinical performances in terms of marginal discoloration and integrity, secondary caries, vitality test, crown integrity or retention, veneer fracture and post-operative sensitivity of porce-

lain-fused-to-zirconia crowns with two different finishing margins (chamfer or knife edge) after 2-years of service. **METHODS:** Sixty restorations were placed in 30 patients. Subjects were recruited from the pool of patients attending the department of Prosthodontics and Dental Materials of the University of Siena. Patients' written consent to the trial was obtained after having provided a complete explanation of the aim of the study. Ethical approval was obtained a priori. Sixty teeth were randomly divided in two groups of 30 samples each: Group 1: chamfer finishing line; Group 2: knife edge finishing line. A standardized preparation was performed with occlusal and axial reduction of 1.5 mm and a chamfer or knife edge finishing line intracrevicularly (0.5 mm into the sulcus) on the buccal margin and iuxtagingivally on the interproximal and lingual margins. Preparations provided at least 0.5-1 mm space at the margins and 1.0-1.5 mm occlusally. All margins were in dentin-cementum. Dentin was sealed using a universal bonding system (G-Premio Bond, GC). After preparation, and conventional impression, a temporary restoration was made and luted with eugenol-free temporary cement. Impressions were sent to the lab and the obtained master model was scanned using Aadva lab scanner (GC) and Exocad (Exocad GMBH) was used for zirconia framework design. Veneering were made strictly following manufacturers' instructions. The crowns were made on Zirconia Aadva (GC) and luted with G-CEM LinkAce (GC) following manufacturer's instructions. Restorations were examined for clinical performance at baseline, after 1-week, 1-month and after 6, 12 and 24-months by the same operator. The values were analyzed with the one-way ANOVA; in order to verify whether statistically significant differences were found among the experimental groups, the Tukey's post hoc test with Bonferroni's correction was applied. In all the analyses, the level of significance was set at  $\alpha = 0.05$ . **RESULTS:** There were no statistically significant differences in all the tested criteria; no post-operative sensitivity was found in Group 1 and Group 2 after 24 months of clinical service. Also, no chipping was recorded in either group after 24 months of clinical service. 100% clinical success was recorded.

**CONCLUSIONS:** The type of finishing line (chamfer or knife edge) of zirconia crowns did not influence post-operative sensitivity and clinical performances after 24 months of clinical service. Consequently, both chamfer and knife edge finishing lines are reliable and predictable when zirconia material is used.

**Radiotherapy of oral cavity, sequelae and treatment: a narrative review**

G. Gassino, F. Erovigni, A. Dell'Acqua, M. Carossa, N. Bocca, P. Cerutti, F. Bassi

**BACKGROUND:** Treatment approaches for head and neck cancer (HNC) include: surgery, radiotherapy, adjuvant systemic therapy (chemotherapy) and a combination of the previous depending on the clinical manifestation and pathological findings. Patients undergoing radiation therapy for the head and neck are susceptible to a significant and often abrupt deterioration in their oral health. The aim of this study is to carefully identify the complications and the most effective treatments.

**METHODS:** Different primary studies were summarized and conclusion were drawn into a holistic interpretation contributed by the reviewers' own experience.

**RESULTS:** The adverse effects of radiotherapy can be acute or chronic. The most frequent acute complications are: skin erythema, mucositis, loss of taste, dysphagia, hyposalivation and infections. Therapy of these adverse effects is saliva stimulants or saliva substitutes for hyposalivation, corticosteroid therapy or interruption of radiotherapy in case of severe skin erythema or mucositis, antibiotic treatment in case of infections and diet modification in case of dysphagia. The most frequent chronic complications are: hyposalivation, radiation caries, trismus, fibrosis, osteoradionecrosis. The dose of radiation received by the salivary glands by the end of therapy causes long-term effects. The literature showed a 96% reduction in salivary flow at doses above 60 Gy. At doses lower than 50 Gy, the reduction in salivary flow is 89%. Hypocalcemia increases the number of caries, due to the lack of cleansing by the reduced salivation, and the number of fungal infections. In the oral mucosa the irradiation effect occurs early in the course of therapy and is secondary to radiation induced mitotic death of the cells composing the basal layer of the epithelium. Prevalence is up to 80%. After therapy there are significant changes in the field of irradiation (epithelium reduced in thickness and fibrosis of the submucosa) that predispose to tissue breakdown and delayed healing. Chronic skin changes are characterized by atrophy, teleangiectasia and loss of skin appendages. Impairment of taste has a significant impact on patients' quality of life. In six months taste thresholds gradually returns near to normal levels even though taste acuity may not return to normal level in patients with severe xerostomia. Trismus is usually not noticed until 3 to 6 months. In some patients reduction of maximum mandibular opening becomes clinically significant (5 to 15mm). It can impair mastication and prevent convenient access for the food bolus. The incidence of clinically significant trismus has been reported to be as low as 10% and as high as 45%. Possible therapies are physiotherapy exercises, dynamic bite openers and bite stents

**CONCLUSIONS:** Specific approaches to oral care must be adapted to each patient and his therapy and condition. Oral and dental care is impacted by the patient's oral and dental status prior to radiation therapy, the specific cancer type, location, stage, and its treatment and potential comorbid conditions. The multidisciplinary approach and the collaboration in the treatment planning of the oncologic patient is necessary for preserving oral residual structures.

### The design of removable partial prosthesis and of final prosthetic obturators for the treatment of soft palate deficiencies: a narrative review

G. Gassino, S. Calì, D. Cavagnetto, N. Bocca, P. Ceruti, F. Bassi

*University of Turin, CIR Dental School, Città della Salute, Department of Surgical Sciences, Unit of Oral Rehabilitation and Maxillofacial Prosthodontics and Implantology, Turin, Italy*

**BACKGROUND:** Describe a technique for the design of maxillofacial removable prosthesis in dentate patients with congenital or acquired soft palate deficiencies. Patients with acquired or congenital defects of the soft palate manifest speech disturbances, as hypernasality, nasal emissions, and lower speech intelligibility. Tumor resection is the most common cause of acquired defect of the palate, palatoschisis is the most common cause of congenital defects. Palatal defects can be treated with reconstructive surgery and/or with a prosthe-

sis. When surgery is not viable, prosthetic treatment of soft palate insufficiency requires the execution of a removable denture where the insufficiency is corrected by the means of an obturator.

**METHODS:** Different primary studies were summarized and conclusion were drawn into a holistic interpretation contributed by the reviewers' own experience

**RESULTS:** The design of removable partial dentures for patients with congenital or acquired soft palate defects follows the same principles of conventional ones with some biomechanical forethought. The obturator is anchored to metal framework and it has to extend posteriorly to cover and close the soft palate during function. The obturator must be stiff to avoid undesired movements during function. Its extension goes beyond hard palate. The cantilever and the additional weight of the obturator may have dislocating effects. In Kennedy class 1 and 2 this event is particularly evident. Alginate impression of residual dentition is taken and poured, using a parallelometer the model is analyzed and metal structure is designed. The mouth is then prepared accordingly and final impression is taken. Multiple indirect retentions are needed to provide resistance to dislocating forces on the obturator and to increase stability and retention of the prosthesis. Stability and support should be increased covering as much hard palate as possible. In Kennedy class 4 it is advisable to increase retention by the means of additional direct retentions. In all cases it is necessary to use the altered cast technique to obtain a correct and complete impression of the palatal defect. The tray resin anchored to the metal structure is modified until the lateral and posterior walls do not contact the walls of the defect when the patient utters the letter "a". Patients report significant improvement in oral function: chewing, drinking, swallowing, talking. These improvements have a positive impact on patients' self-perception and social life.

**CONCLUSIONS:** In these patients it is particularly important to follow the principles of removable partial denture design in order to improve retention, stability and support of the prosthetic rehabilitation

### The procedure of risk management in dentistry in a hospital setting

G. Gassino, F. Troglia Ieri, S. Dao, M. Carossa, D. Cavagnetto, P. Ceruti

*University of Turin, CIR Dental School, Città della Salute, Department of Surgical Sciences, Unit of Oral Rehabilitation and Maxillofacial Prosthodontics and Implantology, Turin, Italy*

**BACKGROUND:** Clinical risk management in hospital setting is a management methodology that allows to analyze, communicate, eliminate and manage the risks associated with any activity or process related to the hospital stay so as to minimize losses and maximize opportunities. The concept of "Risk Management" has also been introduced in dentistry. A system of risk management increases the quality of services offered to patients, including improving the image of structures that adopt it. In dentistry, inside hospital setting, this system can be applied to manage risks associated with dental and prosthetic procedures like intubation and hospitalization (loss/fracture dentures).

**METHODS:** In dentistry there are two ways to implement this procedure: before the treatment (preventive procedure) and after the treatment (healing procedure). Preventive procedure is accomplished before a patient undergoes a surgery

## ABSTRACT

that can, mainly through intubation maneuvers, damage the dental structures:

- 1- Anaesthesiological visit, during which patients let us know their dental problems
- 2- Return (Form A), dental examination, during which patients are visited, informed about dental problems encountered, and possibly subjected to radiological examinations (Form B and C).
- 3- Patients undergoing treatment: removal of unstable teeth or prosthetic restorations that can be further damaged during intubation maneuvers and / or inhaled while patients are under anesthesia.

Healing procedure takes place after patients have undergone surgery, during which an adverse event happened:

- 1- The hospital ward in which the damage occurs fills the form E, which is sent to SC Quality, Risk Management and Accreditation dentists.
  - 2- The dentists are put in contact with the patient and set an appointment for a first visit.
  - 3- Clinical and economical evaluation and planning of recovery case are done during this appointment.
- Patients then choose whether to accept the rehabilitation proposed by the dentist or contact a private dentist, and then later claim for compensation to the SC that deals with Protection Services and Insurance, Inventory and handling goods, contracts, utilities and administration goods.
- 4- Presenting the budget prepared by their dentist.

**RESULTS:** The case studies analyzed covering a period from 2010 to 2015, have been visited a total of 108 patients. The damage found most frequently was the avulsion or rupture of a dental element 25% of which 37% were dental elements 1.1, then follows the loss of dentures 10.18% , dislocation borne by the upper central incisors and less than 7.40% , 4.62% broken bridges , loss of removable partial dentures 2.77% , breaking prostheses 0.92% , while patients who did not show up to visit are the 8.33% , those underwent a pre-anesthetic are 4.62% , while the claims submitted to the Heritage are the 24.07 % of the total.

**CONCLUSIONS:** The advantages offered by the development and application of a system of risk management are multiple and involve:

- the quality of care, reducing the risks associated with the diagnostic process, therapeutic care, with greater guarantees of safety for the patient (improved relations with users and the image of the hospital);
- professionals, protecting them with respect to allegations of malpractice (reduction of litigation).

A system of risk management increases the quality of services offered to the patient, including improving the image of the structure that adopts the process

### Ideal dimensions of pharyngeal-nose obturator: literature review and clinical indications

G. Gassino, S. Calì, M. Carossa, D. Cavagnetto, N. Bocca, P. Ceruti

*University of Turin, CIR Dental School Città della Salute, Department of surgical sciences, Unit of Oral Rehabilitation and Maxillofacial Prosthodontics and Implantology, Turin, Italy*

**BACKGROUND:** Obturator comes from the Latin “*obturare*”, which means ‘to close’. This is the appropriate description to define the objective of the obturator in patients with velo-pharyngeal incompetency. Compared to the obturator for the hard palate deficiencies, where the anatomical struc-

tures are static, the defects of the soft palate are dynamic, subject to continuous movement. Accurate planning of the dimensions of the obturator is crucial to succeed in making the patient able to swallow and avoiding mucosal pressure ulcers on the soft tissues of the pharynx.

**METHODS:** a review of the literature on the subject was performed. Peer reviewed studies indexed in MEDLINE until 5<sup>th</sup> February 2018 were included in the review. The papers selected were 13. Most of them were observational studies (11), case series (3) and case reports (8), and only 2 were non randomized clinical trial. The evidence and the quality of evidence present in literature is low due to the low number patients needing this kind of prosthetic rehabilitations. Most of the prosthetic passages are still based upon clinical evidence and expert opinions.

**RESULTS:** According to the literature, the upper extension should not exceed 10 mm when the obturator is correctly positioned in the nasopharynx. The lateral dimensions of the obturator are determined by the posterior and lateral movements of the musculature. The position and the extension in length are determined and controlled by the prosthodontist. One of the most common mistakes seems to be related to its position (low or high). Many factors need to be considered about the position and extension of the obturator. The closing of the soft palate against the pharynx posterior wall usually extends vertically from 5 to 7 mm in height and closure comes at or above the palate. Furthermore, the upper extension should not replay normal contact with the lateral and posterior pharyngeal walls. The pharynx is a conical tube, with the base pointing upward, so the upper extent of the obturator can increase its weight and depth. The constant contact of the obturator with the pharynx tissues leads to the occlusion of the nasopharynx, with consequent difficulty in breathing and in speaking (nasal voice). If the obturator is too low in the oro-pharyngeal cavity the function of the tongue will be altered and the gag reflex will be evident. The positioning level and the vertical extension of the obturator are designed considering the phonetics. The literature reports large variations in the size and position of the obturator. The obturator position varies from 20 mm below the palate plan to 6 mm above it. The vertical extension varies from 11 to 35 mm. Once the follow-up period is over, only the benefit of a speech therapist or a phoniatrist will make prosthetic treatment effective.

**CONCLUSIONS:** No evidence is present on the gold-standard procedures for rehabilitating these patients. Some useful indications, that have to be followed, are present in literature. These indications mainly comes from the experience of clinicians and are mainly published in case reports and case series.

### Post-operative sensitivity of e.Max vs. lisi-press onlays: a 20-month recall

R. Favero, E. Ferrari Cagidiaco, G. Bonadeo, M. Carrabba, M. Ferrari

*University of Siena, Department of Medical Biotechnologies, Division of Prosthodontic and Dental Materials, Siena, Italy*

**BACKGROUND:** To evaluate post-operative sensitivity of lithium disilicate onlays luted with their proprietary bonding-luting materials after 2 years of clinical service.

**METHODS:** Sixty restorations in 30 patients in need of one or two single partial crowns were placed. Patients' written consent to the trial was obtained after having provided a complete explanation of the aim of the study. Ethical committee



approval was obtained a priori. Thirty restorations were made with LiSi Press (Group 1, GC) and the other 30 using IPS e.max (Group 2, Ivoclar). Preparations provided at least 0.5-1 mm space at the margin and 1.0-1.5 mm occlusally. Margins were mainly located in enamel (only interproximal box might have cervical margin on dentin-cementum). At least one cusp was covered. All teeth were tested for vitality. Test stimuli and assessment: Before applying the adhesive material, pain was measured was performed utilizing a simple pain scale based on the response method. A score of 0 was defined as no pain, 1-4 as mild sensitivity (which was provoked by the dentist's air blast), and 5-10 as strong sensitivity (which was spontaneously reported by the patient during drinking and eating). Dentin was sealed using the adhesive and the deepest part of the cavity was built up with a proprietary flowable resin composite (G-aenial Universal Flo, GC and Tetric Flow, Ivoclar, respectively) and the cervical margin was relocation when needed. After preparation, an impression of the prepared tooth was taken and sent to the laboratory. In the lab, the disilicate crowns were made strictly following manufacturers' instruc-

tions. In Group 1, LiSi onlays were luted with G-Premio Bond in combination with G-CEM LinkForce resin cement after sandblasting, etching with 10% Hydrofluoric acid for 30 seconds and application of Resin Primer for 1 minute. In Group 2, IPS e.max onlays were luted with AdheSE Universal in combination with Multilink Sprint after sandblasting, etching with 10% hydrofluoric acid for 30 seconds and application of Monobond Plus for 1 minute. The status of the gingival tissues adjacent to the test sites was observed at baseline and at each recall. Patients were recalled at our department for testing post-operative sensitivity after 2 weeks, 6 months, 1 and 2 years.

**RESULTS:** There were no statistically significant differences even though no sensitivity was reported in Group 1 at the 24-month recall, while in Group 2, mild sensitivity in two teeth was reported.

**CONCLUSIONS:** When lithium disilicate crowns were luted in combination with their proprietary bonding-luting materials, there was almost no post-operative sensitivity after 24 months of clinical service.