Laterally Sliding Flap Surgical Approach for Soft Tissue Closure in Post-Extraction Alveolar Ridges: Technique and Clinical Results Presented in a Case Series

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Abstract

Background: Since the decade of the 1970s different techniques have been developed to achieve primary closure. An alternate lingual/palatal sliding flap surgical technique to obtain primary soft tissue closure in post extraction socket sites was present with followed during six months.

Methods: Ten teeth including incisors, canines and premolars were atraumatically extracted, followed by a lingual or palatal sliding flap to obtain primary closure of the sockets. Before the extraction measurements of the mucogingival junction were done with a periodontal probe for displacement evaluation.

Results: The sites were followed-up to six months, and no complications such as flap necrosis, excessive bleeding, pain, or displacement of the mucogingival junction (MGJ) were recorded.

Conclusions: The laterally sliding flap variant presented is a simple, versatile, and predictable, technique to obtain primary wound closure of maxillary and mandibular anterior teeth, while preserving the position of the mucogingival junction.

KEY WORDS: Orthodontics, periodontics, osteopenia, bone graft

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Figure 1: Male patient, 42 years. Upper central incisor with external dentin resorption. Planned treatment involves atraumatic extraction with socket preservation and laterally sliding palatal flap for soft tissue closure.

INTRODUCTION

Alveolar ridge bone defects may occur because of multiple factors: loss of periodontally compromised teeth, root fracture, extensive root decay, periapical lesions or traumatic lesions.[1,2] Also, traumatic tooth extraction injuries compromising one of the socket walls involving the alveolar ridge bone may result in alveolar process ridge defects.[3] The importance of post extraction ridge preservation grows significantly in implant therapy. The success of implants are not only measured by its survival rate but also by its functional stability and long-term esthetic outcome. The implant placement is based upon the final restauration, with a correct tridimensional placement enabling the optimum support and hard and soft surrounding tissues stability.[4,5] Several studies have documented the morphological and dimensional alveolar ridge changes following tooth extraction.[6-18]

In a clinical trial in human beings conducted by means of a volumetric analysis, Schropp et al.[13] in 2013 established that a loss of horizontal volume from 5 to 7 mm occurs within the first 12 months. The loss found corresponds to approximately 50% of the original alveolar ridge width.They further observed that the buccal bone plate was located 1.2 mm more apically than the lingual bone plate. It has been suggested that the largest resorption at the buccal aspect is due to a larger proportion of tooth derived bundle bone that loses its function following extraction and hence undergoes bone atrophy.[13] As a result of the buccal aspect resorption, collapsing of soft tissues appear.

Figure 2: Radiographic image. Note the dentin resorption and the poor restoration

Figure 3: Luxation with periotomes.

Figure 4: Extraction itself with forceps.

Figure 5: Extraction itself with forceps.

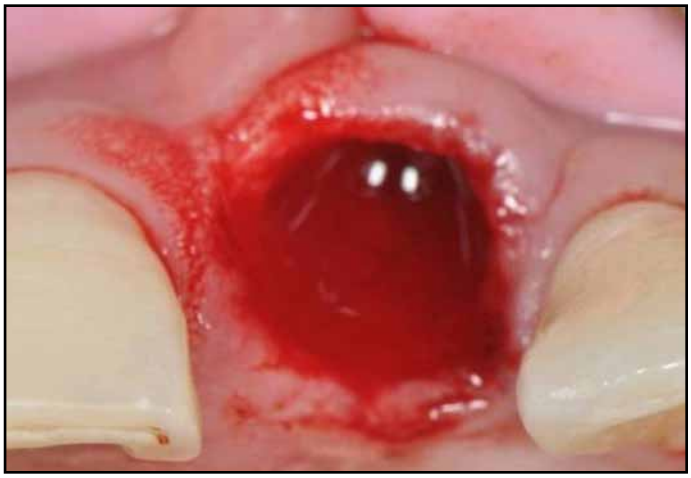

Figure 6: Socket. Note the tissues integrity.

Particularly, in the anterior aspect of the mouth, this event can jeopardize esthetic results.[15] Several treatment modalities have been suggested to minimize the volumetric changes following tooth extraction.[19-26] Healing following immediate implant placement has been observed in a series of trials demonstrating that the procedure is not only incapable of preserving the alveolar ridge dimensions, especially at the socket buccal aspect, but also could even result in marginal osseointegration loss.[19,20] Because of it, the placement of biomaterial grafting has been suggested with the aim of preserving in some way the alveolar ridge dimensions. Many studies have shown that significant chance to avoid the alveolar ridge reduction is possible.[21-24] Nevertheless, data from experimental research have shown that biomaterial grafting is neither capable of reducing the remodeling biological process that takes place at the buccal bone plate nor the complete ridge volume preservation.[25, 26]

The major number of studies reports the predictable achievement of bone regeneration through a suitable surgical protocol pay-

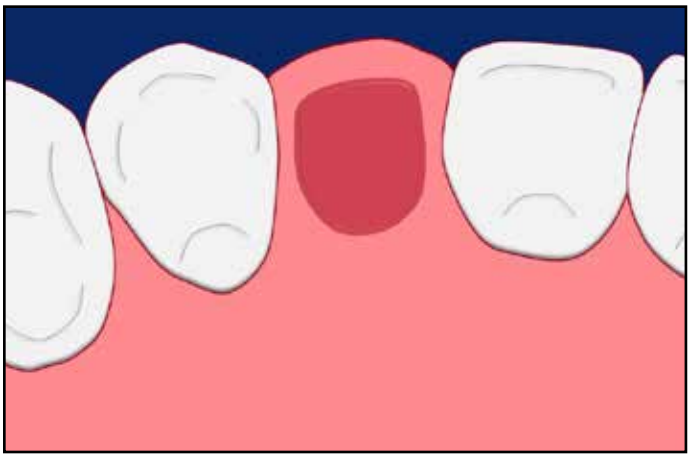

Figure 7: Schematic representation. Socket.

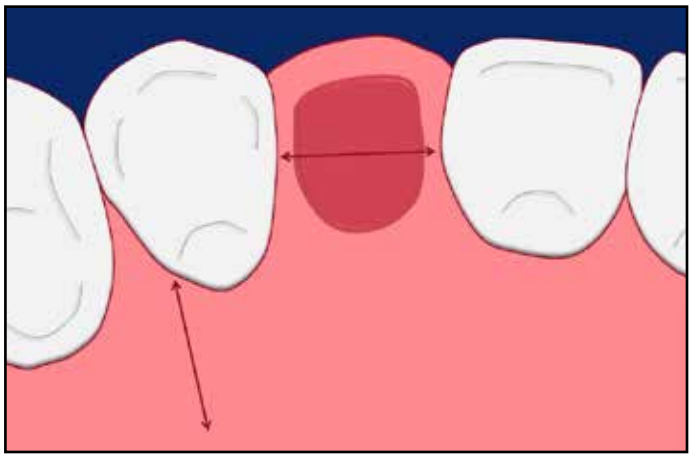

Figure 8: Schematic representation. Flap design. The incision length corresponds with socket mesiodistal diameter.

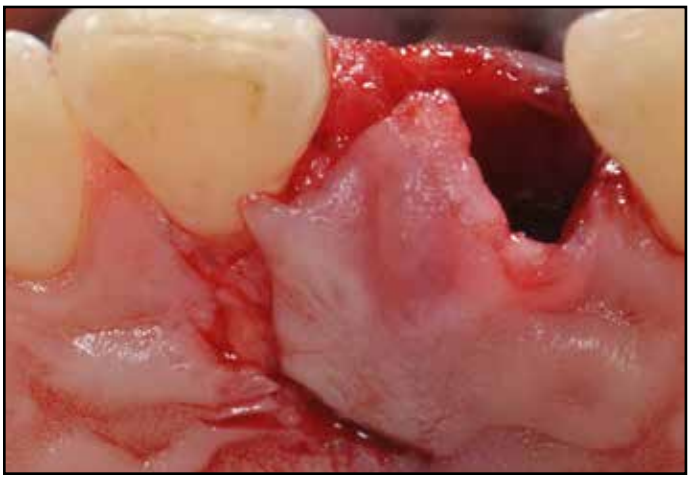

Figure 9: Flap design. Incisions. Note the releasing vertical incision and the cut-back.

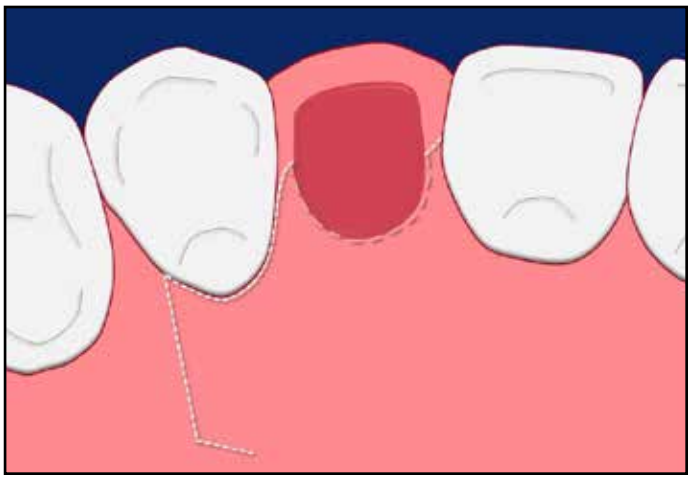

Figure 10: Schematic representation. Flap design. Incisions.

ing special attention to the achievement of a tension-free and complete wound closure. The early implant and/or membrane exposition has a negative effect on the regeneration process.[27-29] Several techniques have been described with the aim of achieving the primary closure (sliding-rotated flap, free gingival graft, subepithelial connective tissue graft).[30-46] The alveolar socket seal by means of the free gingival graft with subepithelial connective tissue was used initially to minimize the soft tissue shrinkage following tooth extraction, hold the coagulum, optimize esthetic outcomes and achieve primary wound closure avoiding biomaterial bacterial contamination and secondly, the regeneration failure.[30-34]

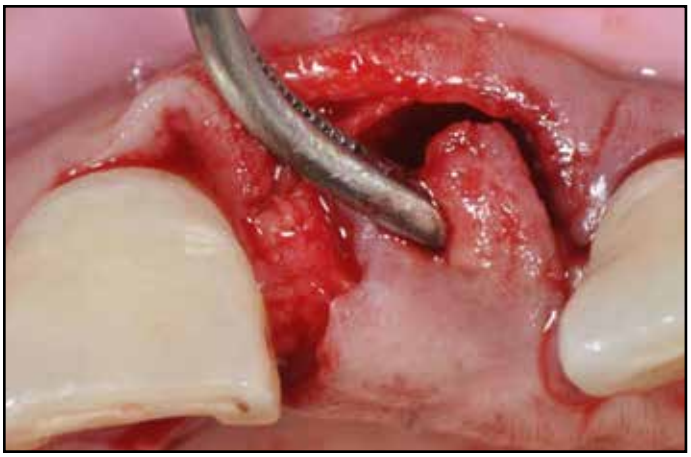

Figure 11: Split thickness flap. Note the tension-free flap rotation and the socket coverage.

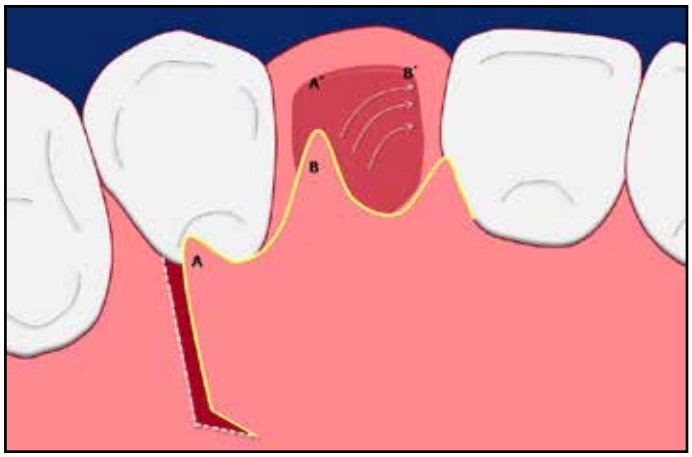

Figure 12. Schematic representation. Flap rotation (a→ a' – b→b´).

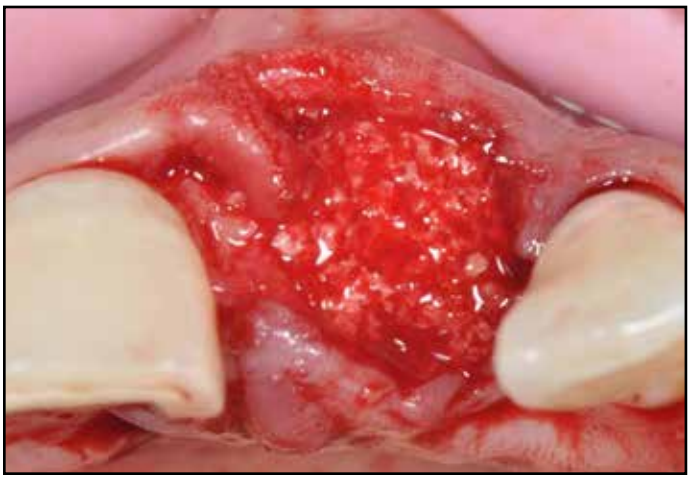

Figure 13: Socket preservation with Bone Ceramic (Straumman).

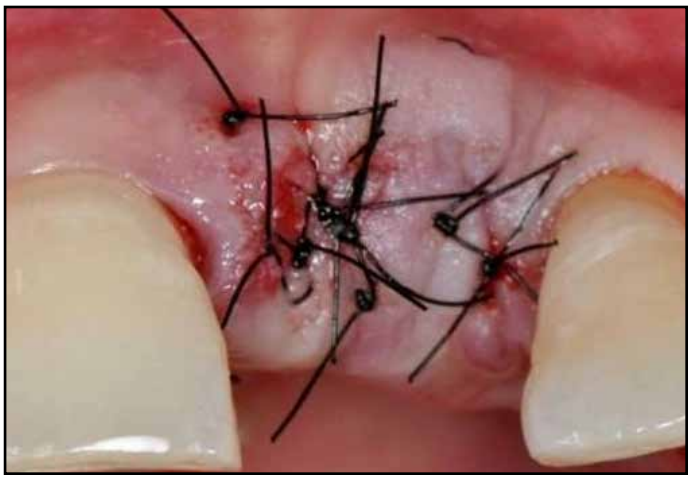

Figure 14: Internal horizontal matress suture to bring together tissues and closure with simple stitches. Note lack of tension and primary closure.

The aim of the present study is to describe an alternative laterally sliding lingual or palatal graft surgical technique to be applied in upper or lower teeth to close sockets soft tissue following tooth extraction and offer the clinical outcomes following 6 months.

MATERIAL AND METHODS

Patient Selection

This study involves 10 sockets selected from 10 patients seeking dental care at the Department of Periodontics, Universidad de Buenos Aires. (FOUBA). The mean age of patients is 42.2 years (21-62 years). All participants were considered to be in good general health.

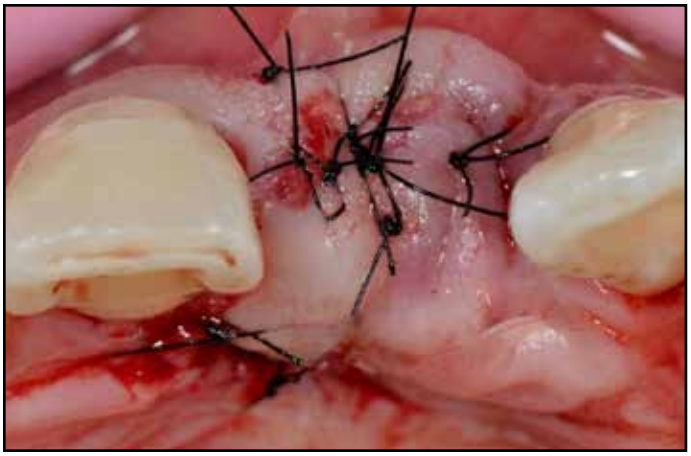

Figure 15: Internal horizontal matress suture to bring together tissues and closure with simple stitches. Note lack of tension and primary closure.

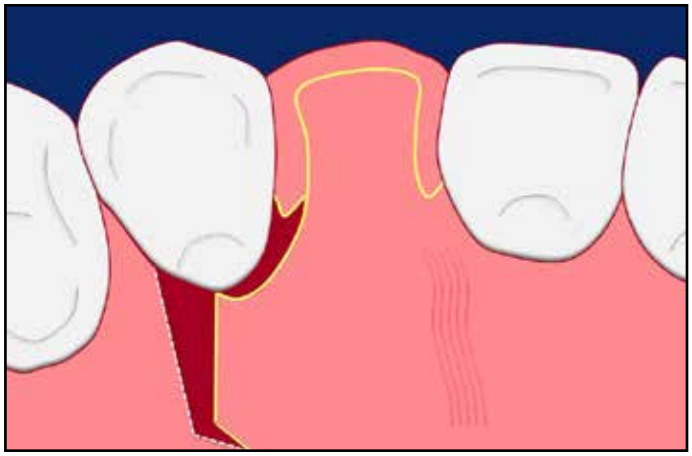

Figure 16: Schematic representation. Closure. Note minimally exposed tissue. Moving flap generates tissue folds.

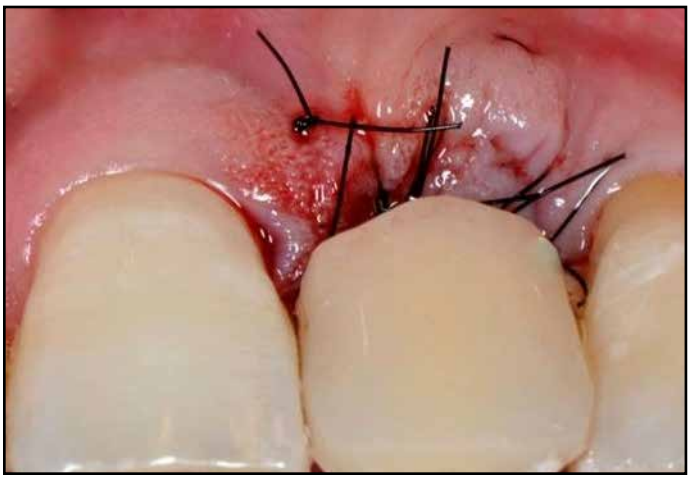

Figure 17: Provisional adaptation. Note lack of tissue contact.

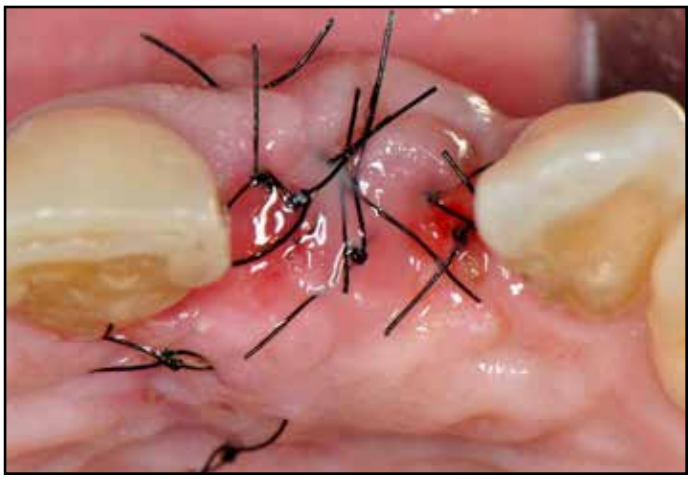

Figure 18: Postsurgical examination at 7 days. Note the soft tissue closure.

Smokers were excluded. The sample included upper incisors and premolars (4 central incisors, 3 lateral incisors, 1 cuspid, 2 first premolars. The reasons for performing tooth extraction were: caries (n = 4), periodontal disease (n = 3), longitudinal root fracture (n = 2) or transverse root fracture (n = 1). All the patients signed the informed consent accordingly to the approved FOUBA Ethics Committee rules.

Surgical Procedure

All the patients received antibiotic prophylaxis (2 g amoxicillin) 1 hour prior to the clinical procedures. Before the extraction measurements of the mucogingival junction were done with a periodontal probe (UNC probe, Hu-Friedy). The distance till the intersection was measured with another periodontal probe hold horizontally from the gingival cenit of neighboring teeth. The

Figure 19: Postsurgical examination at 180 days. Note the scars lack.

Figure 20: Postsurgical examination at 180 days. Note the volume preservation.

extractions were done atraumatically by means of intrasulcular incision, luxation with periotomes and elevators to minimize tissue trauma and preserve the buccal bone plate (Figures 1-3). The extraction itself was done with forceps avoiding rough movements (Figures 4 and 5). The socket wall was debrided thoroughly.

The socket site was irrigated with saline physiological solution (Figures 6 and 7). It is important to point out that in the present technique, the sliding tissue movement can be done in upper teeth as well as in lower teeth taking into account the anatomic landmarks of each site.

Initially, the width of the tissue to slide was measured by a bone sounding to assess whether the flap is to be full thickness flap (less than 4 mm) or split thickness flap (equal or greater than 4 mm).[42,43] The laterally sliding flap incisions length correspond with the socket mesiodistal diameter (Figure 8). A releasing vertical incision was made from the distal angle of the neighboring tooth, with a length similar to the socket mesiodistal length. The releasing incision ends in a cut-back of a minimal length of 3 mm to enable flap rotation to minimize tissue pulling (Figures 9 and 10). According to the previous statements, a full-thickness flap or a split flap was elevated. Once performed the disection, the rotation is checked out, rotation that could be modified extending the cut-back (Figures 11 and 12). Socket preservation was achieved with Bone Ceramic® biphasic calcium phosphate (Straumann, Switzerland) (Figure 13). To bring together tissues an internal horizontal matress suture was made and simple stitches for the closure (Nylon 5-0) (Figures 14-16). To avoid pulling on the tissues, the provisionals adaptation was performed thoroughly (Figure 17).

Follow-up

Patients were prescribed 0,12% chlorhexidine mouthrinses twice a day during 3 days and analgesic (ibuprofen 600 mg every 8 hours only for 24 hours).The sutures were retrieved after 7 days. Postsurgical checkup

examinations were performed after 7, 15, 30, 60, 90 and 180 days (Figures 18-20).

RESULTS

Following 6 months, assesment of the mucogingival junction (MGJ) was repeated applying the same mesurement method previously described. Postsurgical complications such as edema, excessive bleeding, pain, infection, necrosis and dehiscence of tissues have been assessed. In the case series presented no postsurgical complications were observed. Soft tissue closure was observed in every site. The pedicle graft has perfectly integrated to the surrounding tissues.

DISCUSSION

Since the decade of the 1970s different techniques have been developed to achieve primary closure. At the beginning, the concept of retaining de teeth roots was introduced with the aim of preserving de alveolar bone.[35-37] At the end of the decade of the 1980, Bowers[37] proposed the root submertion under the alveolar crest to promote granulation tissue growth for its further epithelization arriving this way to a primary closure. At a second stage of reentry, the tooth extraction would be performed and then, the implant placement. Disadvantages of this procedure would be related to the possibility of complications due to periapical lesions in the submerged roots and with the coronal mucogingival junction (MGJ) repositioning because a coronally sliding flap is performed to achieve the primary closure.

Becker y Becker[38] in 1990 developed a technique consisting in rotating a full thickness vestibular flap from the adjacent tooth to achieve the primary closure when placing immediate implants along with bone regeneration. They propose performing a sliding flap to cover the exposed donor site. Limiting factors of this procedure are: 1) the availability of sufficient width of keratinized tissue, 2) possible alterations of the mucogingival junction and the fornix depth and 3) potential donor site recession.

Tinti and Parma-Benfenati[39] in 1995 introduced a new procedure consisting in a full thickness coronally positioned palatal sliding flap to provide a primary closure in implants performed along with bone regeneration. It can be employed in single and multiple teeth. The main drawback is the time and the sensitiveness and the requirement of having an adequate palatal thickness.

The use of a connective tissue over an immediate implant was described for the first time by Edel[27] in 1995.

In 1996, Chen y Dahlin[28] perform subepithelial connective tissue grafts to achieve primary closure in immediate implants along e-PTFE membranes. According to the authors, the advantages of this approach are related to the need of only one vertical incision reducing surgical trauma and preserving dental papilla, of utmost importance in esthetic sites. Since there is no displacement of the coronal flap, the mucogingival junction (MGJ) keeps its original position.

In 1997 Landsberg[29] proposed the epithelial-connective tissue graft instead of using a membrane to seal the socket in immediate implants with bone filling. According to the author, the advantages of this procedure imply avoiding the flap elevation, minimizing trauma to soft and hard tissues and improv-

ing the alveolar ridge topography. The procedure is a simple one and highly esthetic.

The previous procedures shortcomings[27-29] arise from the requirement of a second surgical site and especially because the procedure success depends on the blood supply of the recipient bed. Moreover, when there are multiple sites, the graft size can limit the sites coverage.

In 1997 Rosenquist[40] proposed that gingival graft or vestibular pedicled flap should be used to seal sockets at the immediate implant placement. It is a limited technique since the thickness of the buccal tissue has to be enough in order not to be perforated.

Novaes and Novaes[41] introduce a variation to the technique developed by Becker and Becker[38] to offset its limitations. The procedure consists in carrying out a split-thickness flap with vertical incisions at mesial or distal aspects (according to the side the tissue is displaced). The exposed periosteum at the site from which the flap has been rotated is covered with a free gingival graft taken from the flap distal portion, which is harvested to achieve an adequate tissue cooptation. This avoids the need for involving another tooth, as proposed by Becker and Becker.[38] This technique shortcomings relates to the variations in the mucogingival junction (MGJ) position and its sensitivity.

In 1999 Nemcovsky and Artzi[42] proposed a rotated pedicled split-thickness palatal flap to achieve the socket primary closure following extraction. The technique allows the highest preservation of hard and soft tissues prior to implant placement and neither modifies the mucogingival junction (MGJ) position nor reduces the vestibulum depth. When membranes are used, the closure can be achieved at the expense of the connective tissue harvested from the split-thickness flap and not because of the coronal displacement of the flap[39] nor the adjacent tooth flap rotation.[38] The pedicle flap preserves vascular supply unlike the techniques that utilize gingival grafts.[27-29] The limitations appear in palates with scarce thickness (< 4mm).[42,43] As a result, authors developed a variant of the proposed technique carrying out the full thickness flap, whose disadvantage lies in the greater patient discomfort rising from the wound created in the palate.[44,45]

In 2002, Goldstein[46] developed an advancement of the palatal tissue in a coronal direction by means of the split pedicle palatal advanced flap. The author claims as advantages that the procedure is useful, fast, and simple to be performed, it does not change the MGJ and can be performed in multiple sites. A shortcoming related to this procedure could be generated at the palatal area left exposed by the flap displacement.

Most of the aforementioned approaches present shortcomings: changes in the MGJ position, reduction of the buccal fornix deepness, patient discomfort and its sensitivity.

The rotated split palatal flap introduced by Nemcovsky y Artzi[42-45] offers several advantages but it is a sensitive procedure and the flap design involves the teeth mesial and distal to the extraction site.

By performing the lateral sliding flap procedure proposed in the present study only one tooth lateral to the site extraction to be done is involved, therefore reducing the patient discomfort. The technique is simple and highly versatile.

CONCLUSIONS

The procedure described in the present study to achieve the soft tissue closure in sockets following the extraction offers many advantages:

- The technique is simple and minimize trauma and tissue invasion.
- Due to its versatility it is feasible both in upper and lower teeth always taking into account the anatomical landmarks (major palatine arteria in the maxilla and lingual artery in the mandible).
- The MGJ position does not change nor is the buccal vestibule deepness reduced.
- The displacement of the graft exposed area left is minimum and does not require a second surgical site, reducing thus the patient discomfort and minimizing the potential postsurgical complications.
- The pedicle flap preserves the vascular supply.

Within the boundaries of the present study, it is possible to conclude that the proposed alternative surgical procedure is a predictable, simple and highly eligible approach thus enabling the achievement of the soft tissues closing at sockets following extraction. ●

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