

Periodontal Diagnosis and Classification

Periodontal diagnosis has been followed according to the classification scheme defined in the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions (Caton et al., 2018; Chapple et al., 2018; Jepsen et al., 2018; Papapanou et al., 2018).

According to this classification:

- A case of clinical periodontal health is defined by the absence of inflammation [measured as presence of bleeding on probing (BOP) at less than 10% sites] and the absence of attachment and bone loss arising from previous periodontitis.
- A gingivitis case is defined by the presence of gingival inflammation, as assessed by BOP at $\geq 10\%$ sites and absence of detectable attachment loss due to previous periodontitis. Localized gingivitis is defined as 10%-30% bleeding sites, whilst generalized gingivitis is defined as $>30\%$ bleeding sites
- A periodontitis case is defined by the loss of periodontal tissue support, which is commonly assessed by radiographic bone loss or interproximal loss of clinical attachment measured by probing. Other meaningful descriptions of periodontitis include: the number and proportions of teeth with probing pocket depth over certain thresholds (commonly >4 mm with BOP and ≥ 6 mm), the number of teeth lost due to periodontitis, the number of teeth with intrabony lesions and the number of teeth with furcation lesions.
- An individual case of periodontitis should be further characterized using a matrix that describes the *stage* and *grade* of the disease. *Stage* is largely dependent upon the severity of disease at presentation, as well as on the anticipated complexity of case management, and further includes a description of extent and distribution of the disease in the dentition. *Grade* provides supplemental information about biological features of the disease including a history-based analysis of the rate of periodontitis progression; assessment of the risk for further progression; analysis of possible poor outcomes of treatment; and assessment of the risk that the disease or its treatment may negatively affect the general health of the patient. The staging, which is dependent on the severity of the disease and the anticipated complexity of case management should be the basis for the patient's treatment plan based on the scientific evidence of the different therapeutic interventions. The grade, however, since it provides supplemental

information on the patient's risk factors and rate of progression, should be the basis for individual planning of care (Tables 7 and 8) (Papapanou et al., 2018; Tonetti, Greenwell, & Kornman, 2018).

- After completion of periodontal therapy, a stable periodontitis patient has been defined by gingival health on a reduced periodontium (bleeding on probing in <10% of the sites; shallow probing depths of 4 mm or less and no 4 mm sites with bleeding on probing). When, after completion of periodontal treatment, these criteria are met but bleeding on probing is present at >10% of sites, then the patient is diagnosed as a stable periodontitis patient with gingival inflammation. Sites with persistent probing depths ≥ 4 mm which exhibit BOP are likely to be unstable and require further treatment. It should be recognized that successfully treated and stable periodontitis patients will remain at increased risk of recurrent periodontitis, and hence if gingival inflammation is present adequate measures for inflammation control should be implemented to prevent recurrent periodontitis.

Clinical Pathway for a Diagnosis of Periodontitis

A proposed algorithm has been used by the EFP to assist clinicians with this periodontal diagnosis process when examining a new patient (Tonetti & Sanz, 2019). It consists of 4 sequential steps:

- 1) Identifying a patient suspected of having Periodontitis
- 2) Confirming the diagnosis of Periodontitis
- 3) Staging the Periodontitis Case
- 4) Grading the Periodontitis Case

Differential Diagnosis

Periodontitis should be differentiated from the following clinical conditions (not an exhaustive list of conditions and diseases):

- Gingivitis (Chapple et al., 2018)
- Vertical root fracture (Jepsen et al., 2018)
- Cervical decay (Jepsen et al., 2018)
- Cemental tears (Jepsen et al., 2018)
- External root resorption lesions (Jepsen et al., 2018)

- Tumours or other systemic conditions extending to the periodontium (Jepsen et al., 2018)
- Trauma-induced local recession (Jepsen et al., 2018)
- Endo-periodontal lesions (Herrera, Retamal-Valdes, Alonso, & Feres, 2018)
- Periodontal abscess (Herrera et al., 2018)
- Necrotising periodontal diseases (Herrera et al., 2018)

Sequence for the Treatment of Periodontitis Stages I, II and III

Patients, once diagnosed, should be treated according to a pre-established stepwise approach to therapy that, depending on the disease stage, should be incremental, each including different interventions.

An *essential pre-requisite* to therapy is to inform the patient of the diagnosis, including causes of the condition, risk factors, treatment alternatives and expected risks and benefits including the option of no treatment. This discussion should be followed by agreement on a personalized care plan. The plan might need to be modified during the treatment journey, depending on patient preferences, clinical findings and changes to overall health.

1. The *first step in therapy* is aimed at guiding behaviour change by motivating the patient to undertake successful removal of supragingival dental biofilm and risk factor control, and may include the following interventions:

- Supragingival dental biofilm control
- Interventions to improve the effectiveness of oral hygiene [motivation, instructions (oral hygiene instructions, OHI)]
- Adjunctive therapies for gingival inflammation
- Professional Mechanical Plaque Removal (PMPR), which includes the professional interventions aimed at removing supragingival plaque and calculus, as well as possible plaque-retentive factors that impair oral hygiene practices.
- Risk factor control, which includes all the health behavioural change interventions eliminating/mitigating the recognized risk factors for periodontitis onset and progression (smoking cessation, improved metabolic control of diabetes, and perhaps physical exercise, dietary counselling and weight loss).

This first step of therapy should be implemented in all periodontitis patients, irrespective of the stage of their disease, and should be re-evaluated frequently in order to:

- Continue to build motivation and adherence, or explore other alternatives to overcome the barriers
- Develop skills in dental biofilm removal and modify as required
- Allow for the appropriate response of the ensuing steps of therapy

2. The *second step of therapy* (cause-related therapy) is aimed at controlling (reducing/eliminating) the subgingival biofilm and calculus (subgingival instrumentation). In addition to this, the following interventions may be included:

- Use of adjunctive physical or chemical agents
- Use of adjunctive host-modulating agents (local or systemic)
- Use of adjunctive subgingival locally delivered antimicrobials
- Use of adjunctive systemic antimicrobials

This second step of therapy should be used for all periodontitis patients, irrespective of their disease stage, only in teeth with loss of periodontal support and/or periodontal pocket formation*.

**In specific clinical situations, such as in the presence of deep probing depths, 1st and 2nd steps of therapy could be delivered simultaneously (such as for preventing periodontal abscess development)*

The individual response to the second step of therapy should be assessed once the periodontal tissues have healed (periodontal re-evaluation). If the endpoints of therapy (no periodontal pockets > 4 mm with bleeding on probing or no deep periodontal pockets (≥ 6 mm)) have not been achieved, the third step of therapy should be considered. If the treatment has been successful in achieving the endpoints of therapy, patients should be placed in a supportive periodontal care (SPC) program.

3. The *third step of therapy* is aimed at treating those areas of the dentition non-responding adequately to the second step of therapy (presence of pockets >4 mm with bleeding on probing or presence of deep periodontal pockets (≥ 6 mm)), with the purpose of gaining further access to

subgingival instrumentation, or aiming at regenerating or resecting those lesions that add complexity in the management of periodontitis (intra-bony and furcation lesions).

It may include the following interventions:

- Repeated subgingival instrumentation with or without adjunctive therapies
- Access Flap Periodontal Surgery
- Resective Periodontal Surgery
- Regenerative Periodontal Surgery

When there is indication for surgical interventions, these should be subject to an additional patient consent and specific evaluation of risk factors or medical contra-indications should be considered.

The individual response to the third step of therapy should be re-assessed (periodontal re-evaluation) and ideally the endpoints of therapy should be achieved, and patients should be placed in supportive periodontal care, although these endpoints of therapy may not be achievable in all teeth in severe stage III periodontitis patients.

4. *Supportive periodontal care* is aimed at maintaining periodontal stability in all treated periodontitis patients combining preventive and therapeutic interventions defined in the first and second steps of therapy, depending on the gingival and periodontal status of the patient's dentition. This step should be rendered at regular intervals according to the patient's needs and in any of these recall visits, any patient may need re-treatment if recurrent disease is detected, and in these situations, a proper diagnosis and treatment plan should be reinstated. In addition, compliance with the recommended oral hygiene regimens and healthy lifestyles are part of supportive periodontal care.

In any of the steps of therapy, tooth extraction may be considered if the affected teeth are considered with a hopeless prognosis.

The first part of this document was prepared by the steering group with the help of the methodology consultants, it was carefully examined by the experts participating in the consensus

and was voted upon in the initial plenary session to form the basis for the specific recommendations.

Strength of consensus strong consensus (0% of the group abstained due to potential CoI)

Clinical recommendations: First Step of Therapy

The first step of therapy is aimed at providing the periodontitis patient with the adequate preventive and health promotion tools to facilitate his/her compliance with the prescribed therapy and the assurance of adequate outcomes. This step not only includes the implementation of patient's motivation and behavioural changes to achieve adequate self-performed oral hygiene practices, but also the control of local and systemic modifiable risk factors that significantly influence this disease. Although this first step of therapy is insufficient to treat a periodontitis patient, it represents the foundation for optimal treatment response and long-term stable outcomes.

This first step includes not only the educational and preventive interventions aimed to control gingival inflammation, but also the professional mechanical removal of the supragingival plaque and calculus, together with the elimination local retentive factors.

Intervention: Supragingival dental biofilm control (by the patient)

What are the adequate oral hygiene practices of periodontitis patients in the different steps of periodontitis therapy?

Expert consensus-based recommendation (1.1)

We **recommend** that the same guidance on oral hygiene practices to control gingival inflammation is enforced throughout all the steps of periodontal therapy including supportive periodontal care.

Supporting literature (Van der Weijden & Slot, 2015)

Grade of recommendation Grade A – ↑↑

Strength of consensus Strong consensus [3.8% of the group abstained due to potential conflict of interest (CoI)]

Background

Intervention. Supragingival dental biofilm control can be achieved by mechanical and chemical means. Mechanical plaque control is mainly performed by tooth brushing, either with manual or powered toothbrushes and with supplemental interdental cleaning using dental floss, interdental brushes, oral irrigators, wood sticks, etc. As adjuncts to mechanical plaque control, antiseptic agents, delivered in different formats, such as dentifrices and mouth rinses have been recommended. Furthermore, other chemotherapeutic agents aimed to reduce gingival inflammation have also been used adjunctively to mechanical biofilm control, such as probiotics, anti-inflammatory agents and antioxidant micronutrients.

Available evidence. Even though oral hygiene interventions and other preventive measurements for gingivitis control were not specifically addressed in the systematic reviews prepared for this Workshop to Develop Guidelines for the treatment of periodontitis, evidence can be drawn from the XI European Workshop in Periodontology (2014) (Chapple et al., 2015) and the systematic review on oral hygiene practices for the prevention and treatment of gingivitis (Van der Weijden & Slot, 2015). This available evidence supports:

- Professional oral hygiene instructions (OHI) should be provided to reduce plaque and gingivitis. Re-enforcement of OHI may provide additional benefits.
- Manual or power tooth brushing are recommended as a primary means of reducing plaque and gingivitis. The benefits of tooth brushing out-weigh any potential risks.
- When gingival inflammation is present, inter-dental cleaning, preferably with interdental brushes (IDBs) should be professionally taught to patients. Clinicians may suggest other inter-dental cleaning devices/methods when the use of IDBs is not appropriate.

Are additional strategies in motivation useful?

Expert consensus-based recommendation (1.2)
We recommend emphasizing the importance of oral hygiene and engaging the periodontitis patient in behavioural change for oral hygiene improvement.
Supporting literature (Carra et al., 2020)
Grade of recommendation Grade A – ↑↑
Strength of consensus Strong consensus (1.3% of the group abstained due to potential CoI)

Background

Intervention. Oral hygiene instructions (OHI) and patient motivation in oral hygiene practices should be an integral part of the patient management during all stages of periodontal treatment (Tonetti et al., 2015). Different behavioural interventions, as well as communication and educational methods have been proposed to improve and maintain the patient's plaque control over time (Sanz & Meyle, 2010). See additional information in the next section on "Methods of motivation".

Are psychological methods for motivation effective to improve the patient's compliance in oral hygiene practices?

Evidence-based statement (1.3)
To improve patient's behaviour towards compliance with oral hygiene practices, psychological methods such as motivational interviewing or cognitive behavioural therapy have not shown a significant impact.
Supporting literature (Carra et al., 2020)
Quality of evidence Five randomised clinical trials (RCTs) (1716 subjects) with duration ≥ 6 months in untreated periodontitis patients [(4 RCTs with high and 1 RCT with low risk of bias (RoB)]
Grade of recommendation Statement - unclear, additional research needed
Strength of consensus Strong consensus (1.3% of the group abstained due to potential CoI)

Background

Intervention. Several different psychological interventions based on social cognitive theories, behavioural principles, and motivational interviewing (MI) have been applied to improve OHI adherence in patients with periodontal diseases. The available evidence has not demonstrated that these psychological interventions based on cognitive constructs and motivational interviewing principles provided by oral health professionals, have improved the patient's oral hygiene performance as measured by the reduction of plaque and bleeding scores over time.

Available evidence. The evidence includes two RCTs on MI (199 patients) and three RCTs on psychological interventions based on social cognitive theories and feedback (1517 patients).

Risk of bias. The overall body of evidence was assessed at high risk of bias (four RCTs high and one RCT low).

Consistency. The majority of the studies found no significant additional benefit implementing psychological interventions in conjunction with OHI.

Clinical relevance and effect size. The reported effect size was not considered clinically relevant.

Balance of benefit and harm. Benefit and harm were not reported, and due to the fact that different health professionals were involved to provide interventions, no conclusion could be drawn.

Economic considerations. These studies did not assess a cost-benefit evaluation in spite of the expected additional cost related to the psychological intervention.

Patient preferences. No proper information was available to assess this issue.

Applicability. A psychological approach needs special training to be effectively performed.

Intervention: Adjunctive therapies for gingival inflammation

Adjunctive therapies for gingival inflammation have been considered within the adjunctive therapies to subgingival debridement, and therefore, they have been evaluated within the second step of therapy.

Intervention: Supragingival dental biofilm control (professional)

What is the efficacy of supragingival professional mechanical plaque removal (PMPR) and control of retentive factors in periodontitis therapy?

Expert consensus-based recommendation (1.4)

We **recommend** supragingival professional mechanical plaque removal (PMPR) and control of retentive factors, as part of the first step of therapy.

Supporting literature (Needleman, Nibali, & Di Iorio, 2015; Trombelli, Franceschetti, & Farina, 2015)

Grade of recommendation Grade A – ↑↑

Strength of consensus Unanimous consensus (0% of the group abstained due to potential CoI)

Background

Intervention. The removal of the supragingival dental biofilm and calcified deposits (calculus) (here identified under the term “professional mechanical plaque removal”, PMPR) is considered

an essential component in the primary (Chapple et al., 2018) and secondary (Sanz et al., 2015) prevention of periodontitis as well as within the basic treatment of plaque-induced periodontal diseases (van der Weijden & Slot, 2011). Since the presence of retentive factors, either associated to the tooth anatomy or more frequently, due to inadequate restorative margins, are often associated with gingival inflammation and/or periodontal attachment loss, they should be prevented/eliminated to reduce their impact on periodontal health.

Available evidence. Even though these interventions were not specifically addressed in the systematic reviews prepared for this Workshop to Develop Guidelines for the treatment of periodontitis, indirect evidence can be found in the 2014 European Workshop on Prevention, in which the role of PMPR was addressed both in primary prevention (Needleman et al., 2015) or in supportive periodontal care (SPC) (Trombelli et al., 2015). Some additional evidence can be found to support both procedures, as part of periodontitis therapy. A split-mouth RCT, with a follow up of 450 days in 25 subjects, concluded that the performance of supragingival debridement, before subgingival debridement, decreased subgingival treatment needs and maintained the periodontal stability over time (Gomes, Romagna, Rossi, Corvello, & Angst, 2014). In addition, supragingival debridement may induce beneficial changes in the subgingival microbiota (Ximénez-Fyvie et al., 2000). Moreover, it has been established that retentive factors may increase the risk of worsening the periodontal condition (Broadbent, Williams, Thomson, & Williams, 2006; Demarco et al., 2013; Lang, Kiel, & Anderhalden, 1983).

Intervention: Risk factor control

What is the efficacy of risk factor control in periodontitis therapy?

Evidence-based recommendation (1.5)
We recommend risk factor control interventions in periodontitis patients, as part of the first step of therapy.
<i>Supporting literature</i> (Ramseier et al., 2020)
<i>Quality of evidence</i> 25 clinical studies
<i>Grade of recommendation</i> Grade A – ↑↑
<i>Strength of consensus</i> Strong consensus (1.3% of the group abstained due to potential CoI)

Background

Intervention. Smoking and diabetes are two proven risk factors in the etiopathogenesis of periodontitis (Papapanou et al., 2018) and therefore, their control should be an integral component in the treatment of these patients. Interventions for risk factor control have aimed to educate and advice patients for behavioural change aimed to reduce them and in specific cases to refer them for adequate medical therapy. Other relevant factors associated with healthy lifestyles (stress reduction, dietary counselling, weight loss or increased physical activities) may also be part of the overall strategy for reducing patient's risk factors

Available evidence. In the systematic review (Ramseier et al., 2020), the authors have identified 13 relevant guidelines for interventions for tobacco smoking cessation, promotion of diabetes control, physical exercise (activity), change of diet, carbohydrate (dietary sugar reduction) and weight loss. In addition, 25 clinical studies were found that assess the impact of (some of) these interventions in gingivitis/periodontitis patients.

Risk of bias. It is explained specifically for each intervention.

Consistency. The heterogeneity in study design precludes more consistent findings, but adequate consistency may be found for studies on smoking cessation and diabetes control.

Clinical relevance and effect size. No meta-analysis was performed; effect sizes can be found in the individual studies.

Balance of benefit and harm. In addition to periodontal benefits, all the tested interventions represent a relevant beneficial health impact.

Economic considerations. The various studies do not indicate a cost-benefit evaluation. However, it cannot be discarded an additional cost related to the psychological intervention. However, the systemic health benefits that can be obtained from these interventions, if they are successful, would represent reduced cost of health-care services in different comorbidities.

Patient preferences. Interventions are heterogeneous, but the potential systemic health benefits may favour preference for them.

Applicability. Demonstrated with studies testing large groups from the general population; the practicality of routine use is still to be demonstrated.

What is the efficacy of tobacco smoking cessation interventions in periodontitis therapy?

Evidence-based recommendation (1.6)

We **recommend** tobacco smoking cessation interventions to be implemented in patients

undergoing periodontitis therapy.
Supporting literature (Ramseier et al., 2020)
Quality of evidence Six prospective studies with, at least, 6-month follow up
Grade of recommendation Grade A – ↑↑
Strength of consensus Unanimous consensus (1.2% of the group abstained due to potential CoI)

Background

Intervention. Periodontitis patients may benefit from smoking cessation interventions to improve periodontal treatment outcomes and the maintenance of periodontal stability. Interventions consist of brief counselling and may include patient referral for advanced counselling and pharmacotherapy.

Available evidence. In the systematic review (Ramseier et al., 2020), six prospective studies of 6-24 months duration and performed at university setting were identified. Different interventions were tested (smoking cessation counselling, 5 A's [ask, advise, assess, assist, and arrange], cognitive behavioural therapy [CBT], motivational interview, brief interventions, nicotine replacement therapies). In three of the studies, the intervention was programmed in parallel with non-surgical periodontal therapy (NSPT) and followed by SPC, in one study SPC patients were included and, in another, patients in NSPT and in SPC were compared; in one study, it was unclear. The success of smoking cessation was considered as moderate (4-30% after 1-2 years), except in one study. Two studies demonstrated benefits in periodontal outcomes, when comparing former smokers to smokers and oscillators.

Additional factors have been discussed in the overall evaluation of risk factor control.

What is the efficacy of promotion of diabetes control interventions in periodontitis therapy?

Evidence-based recommendation (1.7)
We recommend diabetes control interventions in patients undergoing periodontitis therapy.
Supporting literature (Ramseier et al., 2020)
Quality of evidence Two 6-month RCTs
Grade of recommendation Grade A – ↑↑
Strength of consensus Consensus (0% of the group abstained due to potential CoI)

Background

Intervention. Periodontitis patients may benefit from diabetes control interventions to improve periodontal treatment outcomes and the maintenance of periodontal stability. These interventions consist of patient education as well as brief dietary counselling and in situations of hyperglycaemia, the patient's referral for glycaemic control.

Available evidence. In the systematic review (Ramseier et al., 2020), two studies on the impact of diabetes control interventions in periodontitis patients were identified, two of them 6-month RCTs, all of them performed at university settings. Periodontal interventions were not clearly defined. Different interventions were tested, including individual lifestyle counselling, dietary changes and oral health education. Some improvements were observed in the intervention groups, in terms of periodontal outcomes.

Additional factors have been discussed in the overall evaluation of risk factor control.

What is the efficacy of increasing physical exercise (activity) in periodontitis therapy?

Evidence-based recommendation (1.8)
We do not know if interventions aimed to increasing the physical exercise (activity) have a positive impact in periodontitis therapy.
Supporting literature (Ramseier et al., 2020)
Quality of evidence One 12-week RCT, one 12-week prospective study
Grade of recommendation Grade 0 – Statement: unclear, additional research needed
Strength of consensus Consensus (0% of the group abstained due to potential CoI)

Background

Intervention. Overall evidence from the medical literature suggests that the promotion of physical exercise (activity) interventions may improve both treatment and the long-term management of chronic non-communicable diseases. In periodontitis patients, the promotion may consist of patient education and counselling tailored to the patients' age and general health.

Available evidence. In the systematic review (Ramseier et al., 2020), two 12-week studies on the impact of physical exercise (activity) interventions in periodontitis patients were identified, one RCT (testing education with comprehensive yogic interventions followed by yoga exercises) and one prospective study (with briefing followed by physical exercises; the control group was a dietary intervention), performed at university settings. Periodontal interventions were not clearly

defined, although in the yoga study, standard therapy was delivered (by not described) in periodontitis patients, while no periodontal therapy was provided in the second study. Both studies reported improved periodontal parameters, including bleeding scores and probing depth changes, after 12 weeks (although in the yoga study also, the influence on psychological stress could not be discarded).

Additional factors have been discussed in the overall evaluation of risk factor control.

What is the efficacy of dietary counselling in periodontitis therapy?

Evidence-based recommendation (1.9)
We do not know if dietary counselling may have a positive impact in periodontitis therapy.
Supporting literature (Ramseier et al., 2020)
Quality of evidence Three RCTs, four prospective studies
Grade of recommendation Grade 0 – Statement: unclear, additional research needed
Strength of consensus Consensus (0% of the group abstained due to potential CoI)

Background

Intervention. Periodontitis patients may benefit from dietary counselling interventions to improve periodontal treatment outcomes and the maintenance of periodontal stability. These interventions may consist of patient education including brief dietary advices and in specific cases patient’s referral to a nutrition specialist.

Available evidence. In the systematic review (Ramseier et al., 2020), seven studies on the impact of dietary counselling (mainly addressing lower fat intake, less free sugars and salt intake, increase in fruit and vegetable intake) in periodontitis (with or without other comorbidities) patients were identified: three RCTs (6-month, 8-week, 4-week) and four prospective studies (12-month, 24-week, 12-week, 4-week), performed at hospital and university settings. Periodontal interventions were not clearly defined, although in the 6-month RCT, periodontal treatment was part of the protocol. Some studies showed significant improvements in periodontal parameters, but the RCT with the longest follow up was not able to identify significant benefits (Zare Javid, Seal, Heasman, & Moynihan, 2014).

In the systematic review (Ramseier et al., 2020), two studies specifically on the impact of dietary counselling aiming at carbohydrate (free sugars) reduction in gingivitis/periodontitis patients were identified, one 4-week RCT (including also gingivitis patients) and one 24-week prospective

study. Periodontal interventions were not clearly defined. Both studies reported improved gingival indices.

Additional factors have been discussed in the overall evaluation of risk factor control.

What is the efficacy of lifestyle modifications aiming at weight loss in periodontitis therapy?

Evidence-based recommendation (1.10)
We do not know if interventions aimed to weight loss through lifestyle modification may have a positive impact in periodontitis therapy.
Supporting literature (Ramseier et al., 2020)
Quality of evidence Five prospective studies
Grade of recommendation Grade 0 – Statement: unclear, additional research needed
Strength of consensus Strong consensus (0% of the group abstained due to potential CoI)

Background

Intervention. Available evidence suggests that weight loss interventions may improve both the treatment and long-term outcome of chronic non-communicable diseases. In periodontitis patients, these interventions may consist of specific educational messages tailored to the patients' age and general health. These should be supported with positive behavioural change towards healthier diets and increase in physical activity (exercise).

Available evidence. In the systematic review (Ramseier et al., 2020), five prospective studies, in obese gingivitis/periodontitis patients, on the impact of weight loss interventions were identified, with different follow ups (18 months, 12 months, 24 weeks and two studies of 12 weeks).

Periodontal interventions were not clearly defined. Intensity of lifestyle modifications aiming at weight loss interventions ranged from a briefing, followed by counselling in dietary change, to an 8-week high-fibre, low-fat diet, or a weight reduction program with diet and exercise-related lifestyle modifications. Three studies reported beneficial periodontal outcomes and, the other two, no differences.

Additional factors have been discussed in the overall evaluation of risk factor control.

Clinical recommendations: Second Step of Therapy

The second step of therapy (also known as cause-related therapy) is aimed at the elimination (reduction) of the subgingival biofilm and calculus and may be associated with removal of root surface (cementum). The procedures aimed at these objectives have received in the scientific literature different names: subgingival debridement, subgingival scaling, root planning, etc. (Kieser, 1994). In this guideline, we have agreed to use the term “subgingival instrumentation” to all non-surgical procedures, either performed with hand (i.e. curettes) or power-driven (i.e. sonic/ultrasonic devices) instruments specifically designed to gain access to the root surfaces in the subgingival environment and to remove subgingival biofilm and calculus. This second step of therapy requires the successful implementation of the measures described in the first step of therapy.

Furthermore, subgingival instrumentation may be supplemented with the following adjunctive interventions:

- Use of adjunctive physical or chemical agents.
- Use of adjunctive host-modulating agents (local or systemic).
- Use of adjunctive subgingival locally delivered antimicrobials.
- Use of adjunctive systemic antimicrobials.

Intervention: Subgingival instrumentation

Is subgingival instrumentation beneficial for the treatment of periodontitis?

Evidence-based recommendation (2.1)
We recommend that subgingival instrumentation be employed to treat periodontitis in order to reduce probing pocket depths, gingival inflammation and the number of diseased sites.
Supporting literature (Suvan et al., 2019)
Quality of evidence: One 3-month RCT (n=169 patients); 11 prospective studies (n=258) ≥6 months
Grade of recommendation Grade A - ↑↑
Strength of consensus Unanimous consensus (2.6% of the group abstained due to potential CoI)

Background

Intervention. Subgingival instrumentation aims at reducing soft tissue inflammation by removing hard and soft deposits from the tooth surface. The endpoint of treatment is pocket closure, defined by probing pocket depth (PPD) ≤ 4 mm and absence of bleeding on probing (BOP).

Available evidence. One RCT on 169 patients with 3-month outcomes addressed the PICOS question. Further 11 prospective studies (n=258) with a follow-up of ≥ 6 months which considered baseline measures and post-treatment reductions in probing pocket depth (primary outcome) and bleeding on probing and percentage of closed pockets (secondary outcomes) were analysed.

Risk of bias. Study quality assessment identified a low risk of bias in all but one study, which had a high risk of bias.

Consistency. Evidence was consistent across all 11 studies that were included in the pre- and post-treatment analysis and was therefore considered strong. Patient reported outcomes were inconsistently reported and adverse events, when reported, were rare. No indications of publication bias were observed but heterogeneity was high.

Clinical relevance and effect size. The evidence suggested a mean reduction of PPD of 1.7 mm at 6/8 months, a mean proportion of closed pockets of 74% and a mean reduction of BOP of 63%.

Deeper sites (>6 mm) demonstrated a greater mean PPD reduction of 2.6 mm.

Balance of benefits and harm. An overall consideration of the benefit versus harm of subgingival instrumentation supports the strength of the recommendation.

Ethical considerations. Evaluation of the efficacy of subgingival debridement is ethically challenging as it would entail comparison with no subgingival intervention. Due to the lack of relevant RCTs, prospective studies were included and their data analysed.

Applicability. The majority of studies were conducted in well controlled research environments and included specifically selected populations, i.e. those with no systemic disease. Whilst results from studies involving populations with systemic diseases were not included in the systematic review, there is a consensus that subgingival instrumentation is efficacious in these groups (Sanz et al., 2018; Sanz et al., 2019), but the magnitude of the effect requires further study.

The evidence presented illustrates “efficacy” rather than “effectiveness”, therefore generalisability to general dental practice settings is unclear.

Are treatment outcomes of subgingival instrumentation better after use of hand, powered (sonic/ultrasonic) instruments or a combination thereof?

Evidence-based recommendation (2.2)

We **recommend** that subgingival periodontal instrumentation **is performed** with hand or powered (sonic/ultrasonic) instruments, either alone or in combination.

Supporting literature (Suvan et al., 2019)

Quality of evidence: Four RCTs (n=132) with a follow-up of ≥ 6 months.

Grade of recommendation Grade A - $\uparrow\uparrow$

Strength of consensus Unanimous consensus (6.2% of the group abstained due to potential CoI)

Background

Intervention. Numerous types of instruments are available to perform subgingival instrumentation.

Available evidence. Four RCTs (n=132) with a low overall risk of bias were included. Findings were evaluated at 6/8 months for PPD reduction (primary outcome) and clinical attachment level (CAL) gain (secondary outcome).

Risk of bias. Study quality assessment identified all 4 studies to be at low risk of bias.

Consistency. The evidence demonstrated that outcomes of treatment were not dependent on the type of instrument employed. The evidence was considered strong and consistent. No indications of publication bias were observed but heterogeneity was high.

Clinical relevance. No clinically or statistically significant differences were observed between the different types of instruments.

Balance of benefits and harm. The use of all types of instruments is technique-sensitive and therefore requires specific training. Patient-reported outcomes and adverse events were inconsistently reported. If present, no obvious differences between hand and powered instruments in terms of post-operative sensitivity were noted.

Ethical considerations. There is a potential ethical dilemma in that patient preference may conflict with the clinician's preference in terms of type of instrument. Patient autonomy should be respected.

Economic considerations. Cost-effectiveness has not been evaluated in these studies. Furthermore, there is no evidence that the use of one type of instrument is superior in terms of requisite treatment time.

Applicability. The majority of studies were conducted in well controlled research environments, in specifically selected populations and under local anaesthetic. Clinicians should be aware that new

instrument choices (i.e. mini instruments) were not evaluated in the available studies. The choice of instrument should be based upon the experience/skills and preference of the operator together with patient preference.

Are treatment outcomes of subgingival instrumentation better when delivered quadrant-wise over multiple visits or as a full mouth procedure (within 24 hours)?

Evidence-based recommendation (2.3)
We suggest that subgingival periodontal instrumentation can be performed with either traditional quadrant-wise or full mouth delivery within 24 hours.
Supporting literature (Suvan et al., 2019)
Quality of evidence: Eight RCTs (n=212) with a follow-up of ≥ 6 months.
Grade of recommendation Grade B - \uparrow
Strength of consensus Strong consensus (3.8% of the group abstained due to potential CoI)

Background

Intervention. Subgingival instrumentation has traditionally been delivered during multiple sessions (e.g. quadrant-wise). As an alternative, full-mouth protocols have been suggested. Full-mouth protocols included single stage and two-stage therapy within 24 hours, however protocols including antiseptics (full-mouth disinfection) were not included in this analysis.

Available evidence. Eight RCTs (n=212) with a follow-up of ≥ 6 months were included demonstrating a low risk of bias. Outcome measures reported were PPD reduction (primary outcome), CAL gain, BOP reduction and pocket closure (secondary outcomes).

Risk of bias. Study quality assessment identified all 8 studies at low risk of bias.

Consistency. The evidence suggested that outcomes of treatment were not dependent on the type of delivery (protocol) employed. The evidence was considered strong and consistent. No indications of publication bias were observed, and heterogeneity was low. The results confirm the findings of a recent Cochrane systematic review (Eberhard, Jepsen, Jervoe-Storm, Needleman, & Worthington, 2015).

Clinical relevance. No substantial differences were observed between the two treatment modalities.

Balance of benefits and harm. Clinicians should be aware that there is evidence of systemic implications (e.g. acute systemic inflammatory response) with full-mouth protocols. Thus, such an approach should always include careful consideration of the general health status of the patient.

Ethical considerations. There is a potential ethical dilemma in that patient preference may conflict with the clinician's recommendation in terms of mode of treatment delivery. Patient autonomy should be respected.

Legal considerations. Potential adverse systemic effects of full mouth treatment protocols in certain risk patients should be considered.

Economic considerations. Limited evidence on the cost-effectiveness of different modes of delivery is available.

Patient preferences. Patient-reported outcomes were inconsistently reported and there is no evidence supporting one approach over the other. Reports of increased discomfort and side effects, evident in studies on full-mouth disinfection, were not included in the present analysis.

Applicability. The majority of studies were conducted in well controlled environments, included specifically selected populations and were undertaken in a number of different continents.

Intervention: Use of adjunctive physical agents to subgingival instrumentation

Are treatment outcomes with adjunctive application of laser superior to non-surgical subgingival instrumentation alone?

Evidence-based recommendation (2.4)
We suggest not to use lasers as adjuncts to subgingival instrumentation.
<i>Supporting literature</i> (Suvan et al., 2019)
Quality of evidence: 2 RCTs (n=46, wavelengths 2780 nm and 2940 nm) and 3 RCTs (n=101, wavelength range 810-980 nm) with single laser application reporting 6-month outcomes. 2 RCTs reported mean PPD changes.
Grade of recommendation: Grade B - ↓
Strength of consensus Simple Majority (3.8% of the group abstained due to potential CoI)

Background

Intervention. Lasers offer the potential to improve outcomes of subgingival root surface treatment protocols when used as adjuncts to traditional root surface instrumentation. Depending upon the wavelength and settings employed, some lasers can ablate subgingival calculus and exert