Scaling & Root Planing (S + RP)

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The S&RP are **not** separate procedures and can be carried out in sessions, the number of teeth included in each session for RP depends on the skills of the operator and the severity of the case, usually (4-6) teeth. At the beginning, the area is probed to identify:

1. The probing pocket depth (PPD). PPD measurement: is the distance from the gingival margin to the most apical penetration of the periodontal probe inserted into the gingival crevice or periodontal pocket without pressure or force and measured in mm.

2. Anatomy of the root surface.

3. Location of the deposits.

Scaling & root planning aims to:

Restore gingival health by completely removing elements that provoke gingival inflammation (biofilm, calculus & endotoxin) from the tooth surface. Deposits of calculus on root surfaces are frequently embedded in cemental irregularities. Subgingival calculus is porous and harbors bacteria and endotoxin and therefore should be removed completely. When dentin is exposed, biofilm bacteria may invade dentinal tubules. Therefore, scaling alone is insufficient to remove them, and a portion of the root surface must be removed to eliminate these deposits. Furthermore, when the root surface is exposed to biofilm and the pocket environment, its surface is contaminated by toxic substances, notably endotoxins.

Evidence suggests that these toxic substances are only superficially attached to the root and do not permeate it deeply. Removal of extensive amounts of dentin and cementum is **not** necessary to render the roots free of toxins and should be avoided. The creation of a clean & hard root surface that is as smooth as possible (which inhibits further plaque retention) must be achieved to promote tissue healing possibly with the formation of a long junctional epithelium and aids soft tissue reattachment.

Subgingival scaling & root planning are performed as either closed or open procedures under local anesthesia.

The closed procedure implies subgingival instrumentation without displacement of the gingiva, thus less trauma, pain, bleeding and minimal recession (which is important for esthetics, especially anteriorly) were achieved. In addition, wound healing occurs more rapidly following closed procedures. Closed therapy is the

definitive treatment for mild& moderate periodontitis and represents the initial therapeutic approach before surgical intervention for complex & severe cases. Closed therapy limitations include its performance without direct vision & good access for the instruments, thus its success is dependent on tactile sensation & knowledge of root morphology. Even the experienced hygienist will not always effectively treat all root surfaces, nor completely remove all plaque & calculus from all surfaces, e.g. S+RP of poorly accessible, irregular root surfaces, in deep, narrow or distal pockets and substantial furcation involvement, even in patients with minimal mouth opening capacity & with expansively progressive disease.

Open procedure: exposure of the affected root surface by the displacement of the gingival tissue, thus gingiva is incised and reflected to facilitate access for the instrument and visibility for the operator. **Instruments used for scaling & root planning** are classified as

• Hand instruments.

• Ultrasonic & sonic instruments.

• Motor driven devices incorporating diamond-coated tips (reciprocating instruments).

• Rotating instruments.

• Laser-instruments. exert antimicrobial effects. Recently laser devices have been introduced to be used in different aspects of periodontal therapy including S&RP. Depending upon the wavelength and settings employed, some lasers can ablate subgingival calculus and exert antimicrobial effects. However, recent guidelines did not suggest its use in periodontitis treatment due to the low evidence available.

Removal of Plaque retentive factors

the relation between faulty dentistry (overhang filling, defective crown margin & improperly situated clasp of P.D.) and periodontal disease due to its plaque retentive property. Such conditions should be corrected either by correction or replacement of the prostheses & restorations to prevent accumulation of plaque & facilitate self-performed tooth cleaning to maintain good periodontal health.

Recontouring Defective Restorations and Crowns Corrections of restorative defects, which are plaque or biofilm retentive areas, may be accomplished by

smoothing the rough surfaces and removing overhangs from the faulty restorations with burs or hand instruments, or complete replacement of the failing restorations may be necessary. These procedures can be completed concurrently with other phase I procedures.

Caries Control

Dental caries, particularly root caries, are a problem for periodontal patients because of attachment loss and exposed root surfaces associated with the disease process and periodontal therapy procedures. Fluoride is effective primarily by topical effects to prevent and reverse the caries process, whether in enamel, cementum, or dentin. So:

• All periodontal patients should be encouraged to use fluoride-containing toothpaste daily.

• Patients at high risk for caries should use higher-concentration fluoride toothpaste or gel. While a lower concentration can be used during maintenance therapy.

• A periodic chlorhexidine rinsing regimen to control cariogenic bacteria in the oral cavity is part of the caries risk management program for high-risk individuals.

• Other considerations in caries control, such as diet and reduced salivary flow, should be evaluated, and modifications should be made where possible.

Risk factor control

Smoking and diabetes are two proven risk factors in the etiopathogenesis of periodontitis, and therefore, their control should be an integral component in the treatment of these patients.

Evaluation of the effect of the initial, cause-related therapy:

A thorough evaluation of the effects of phase I therapy is made no less than 1 to 3 months and sometimes as much as 9 months after the completion of phase I therapy. Reevaluation of the patient's periodontal conditions & caries activity should be performed no earlier than 4 weeks following the last session of the S+ RP procedures, to provide time for the tissues to heal by the formation of a long junctional epithelium & sufficient practice with oral hygiene skills. Although smoothness is the criterion by which scaling and root planning are immediately evaluated, the ultimate evaluation is based on tissue response. Clinical evaluation

of the soft tissue response to scaling and root planning, including probing, should not be conducted earlier than 2 weeks postoperatively.

Re-epithelialization of the wounds created during instrumentation takes 1 to 2 weeks. Until then, gingival bleeding on probing can be expected even when calculus has been completely removed because the soft tissue wound is not epithelialized. Any gingival bleeding on probing noted after this interval is more likely the result of persistent inflammation produced by residual deposits not removed during the initial procedure or inadequate plaque control. Positive clinical changes after instrumentation often continue for weeks or months. Therefore, a longer period of evaluation may be indicated before deciding whether to intervene with further instrumentation or surgery.

Reevaluation of the periodontal condition includes repeat probing of the entire mouth. Calculus, root caries, defective restorations, and signs of persistent inflammation should also be evaluated.

Increased resistance of the periodontal tissues to probing and the absence of bleeding are signs of resolution of the inflammatory lesion related to a sufficient removal of biofilm/calculus.

Thus, clinical endpoints of treatment success may be defined as:

(1) no bleeding on pocket probing and (2) “pocket closure” or reduction, that is a PPD of ≤4mm. PPD change. Generally, clinical improvement is less pronounced at molars, particularly at furcation sites, than at single-rooted teeth. Smoking is proven to negatively affect the outcome of all modalities of periodontal therapies and hence, if the patient is a smoker, the inclusion of a smoking cessation program should be considered as an adjunctive measure.

The initial phase of the therapy is completed with a thorough analysis of the results obtained concerning

1) Improvement of self-performed plaque control.

2) Reduction in plaque level (OLeary index).

3) Resolution of gingival inflammation includes less bleeding (bleeding on probing). Shrinkage of the gingival soft tissue (recession).

4) Increased resistance to probe tip penetration by the tissues at the base of the pocket. Reduction of probing pocket depth, and if possible, changes in probing

attachment level because of gingival shrinkage and formation of long junctional epi.

5) reduced tooth mobility.

BOP measurement: a periodontal probe is inserted to the bottom of the gingival crevice or periodontal pocket at six points around tooth surface, if bleeding occurs within 30 seconds the site gives score(1) and for non-bleeding site, score (0).

Clinical attachment level (CAL): is the distance from the cementoenamel junction (CEJ) to the location of the inserted periodontal probe tip (bottom of gingival crevice or periodontal pocket).

When we evaluate the results of our treatment according to these points, we can see one of the following conditions: -

1- Patient with improved oral hygiene, no gingival inflammation, no bleeding on probing with a marked reduction in probing pocket depth ≤4 mm, in such a situation no further periodontal treatment is required and the patient is directly advanced to the maintenance phase of periodontal therapy (supportive periodontal therapy).

2- Patient with proper standard of oral hygiene but having some sites of bleeding on probing with no significant reduction in probing depth. Such a patient may need to be advanced to the corrective phase including periodontal surgery. PPD≤6 mm or PPD≤ 4mm with BOP.

3- Patients with inadequate oral hygiene due to lack of motivation or lack of ability to do proper home care, such patients should be remotivated and reinstructed to improve their oral hygiene because if the oral hygiene did not improve the periodontal disease will recurrent even if we conduct periodontal surgery.

Chemical plaque control

Tooth cleaning is largely influenced by the compliance and dexterity of the individual thus the concept of using chemical plaque control is just an adjunctive means to overcome inadequacies of mechanical cleaning.

Mechanism of action

Chemical plaque control may be achieved by different mechanisms of action with a quantitative (reduction of the number of microorganisms) and/or qualitative (altering the vitality of the biofilm)

Ideal features:

• ***Specificity***. Agents and formulations for chemical plaque control should demonstrate a wide spectrum of action, including bacteria, viruses, and yeasts. More specific products, such as antibiotics, must not be used in the prevention of periodontal diseases, and their use should be limited for the prevention of bacteremia, at-risk patients, and for the treatment of some periodontal conditions.

• ***Efficacy.*** Antimicrobial capacity must be demonstrated against microorganisms implicated in gingivitis and periodontitis. Although bactericidal effects may be only achieved at high dosages, antimicrobial effects should also be present at lower dosages.

• ***Substantivity***. Substantivity has been defined as the duration of the antimicrobial and as a measurement of the contact time between the agent and the substrate in a defined medium. This time may be longer than expected with simple mechanical deposition.

• ***Safety.*** This must be demonstrated in animal models, before its use in humans. Because of the chronicity of the conditions to be prevented and the foreseeable long- term use, the secondary effects must be minimal.

• ***Stability***. Agents must be stable at room temperature for an extended period. Care should be taken when mixing different ingredients in a formulation to avoid interference between molecules.

The action of these chemicals could fit into four categories:

1. Anti-adhesive agents

They would act at the pellicle surface to prevent the initial attachment of the primary plaque-forming bacteria and development of biofilms.

2. Antimicrobial agents:

They could inhibit plaque formation through one of two mechanisms alone or combined. The first would be the inhibition of bacterial proliferation therefore

could exert their effects either at the pellicle-coated tooth surface before the primary plaque formation bacteria attach or after attachment but before the division of these bacteria, this effect would be bacteriostatic in type while, the second effect could be bactericidal, whereby the antimicrobial agent destroys all of the microorganisms either attaching or already attached to the tooth surface.

3. Plaque removal agents:

Such agents contained in a mouth rinse to reach all tooth surfaces and act in an identical manner to a toothbrush and remove bacteria from the tooth surface have attracted the terminology of the chemical toothbrush e.g. Hypochlorite's.

4.Anti-pathogenic agents:

These agents might inhibit the expression of plaque microorganisms' pathogenicity without necessarily destroying them and directly approach to altering plaque ecology to a less pathogenic flora, e.g. antimicrobial agents with bacteriostatic effect.

Vehicles for the delivery of chemical agents

Tooth paste- mouth rinse- spray-irrigators-chewing gum- varnishes,gel,chips.These agents should have persistent action **(substantivity)** measured in hours which depend on

1. Adsorption and prolonged retention on oral surface including pellicle coated teeth.

2. Maintenance of antimicrobial activity once adsorbed.

3. Slow release from the oral tissues.

After many studies and clinical trials, it was found that chlorhexidine (CHX) is the best chemical supra-gingival plaque control agent.

Chlorhexidine digluconate:

CHX is Bisquanide antiseptic frequently used as a mouth rinse (o. 2% or 0.12% w/v). The compound can also be applied as a gel, spray, varnishes, lozenges and has been incorporated into toothpaste, chewing gum, slow sustained release vehicles (perio chip), periodontal packs and sub-gingival irrigation.

Characteristics

CHX is nontoxic even if digested or topically applied and has a broad antimicrobial action including a wide range of gram-positive & gram-negative m.o.; it is also effective against fungi and yeast **including Candida and some viruses including human immunodeficiency virus and hepatitis B virus** (HIV and HBV). No reports of bacterial resistance even after prolong use of CHX were recorded.

• **Antimicrobial effect.** The mode of action of chlorhexidine in killing bacteria is dependent upon the drug having access to cell walls. This is facilitated by electrostatic forces, since chlorhexidine is positively charged, while the phosphate and carboxyl groups of bacterial cell walls carry negative charges. Binding disrupts the osmotic barrier, interference and disturbs membrane transport of bacteria & keeps them in a state of bacteriostasis.

Depending on the concentration, CHX may show different antimicrobial effects. At low concentrations, it increases the permeability of the plasmatic membrane, leading to a bacteriostatic effect. At higher concentrations, it induces precipitation of cytoplasm proteins and cell death, thus having a bactericidal effect. Against biofilms, CHX has demonstrated the capacity to penetrate and actively act inside the biofilm, both altering biofilm formation or having a bactericidal effect. Rinsing with chlorhexidine reduces the number of bacteria in saliva by between 50% and 90%. A maximum reduction of 95% occurs around 5 days, after which the numbers of bacteria increase gradually to maintain an overall reduction of 70%-80% at 40 days.

• **Plaque inhibitory effect.** In addition to the antimicrobial effect, CHX molecules adhere to the tooth surface and interact with bacterial cells that are also trying toadhere to the tooth surface; therefore, CHX interferes with bacterial adhesion; also, this interaction reduces bacterial ability to stick to tooth surface.

CHX also interacts with salivary glycoproteins, thus leading to reduced salivary pellicle formation. In addition, it has been suggested that CHX affects the activity of bacterial enzymes involved in glucan production (glycosil tranferase C)

• **Substantivity.** CHX molecules bind reversibly to oral tissues, with a slow release that allows for sustained antimicrobial effects for up to 12 hours. An important property of chlorhexidine is its substantivity, that is, the retention in the mouth and

subsequent release from oral structures, after a 1 minute oral rinse of 10ml chlorhexidine 0.2% approximately 30% of the drug is retained, and within 15 seconds of rinsing, half will have bonded to receptor molecules.

Contra indications: History of hypersensitivity to CHX.

Uses:

Single use: Different objectives may be considered for single use.

1. To decrease the bacterial load

2. To decrease the risk of bacteremia

3. To decrease the risk of infection in the surgical area

Short-term use for the prevention of dental biofilm formation:

1. After subgingival instrumentation, periodontal surgery or root planning.

2. Prevention of postsurgical infection

3. Patients with intermaxillary fixations

4. Patients with mucosal or gingival acute Infections

Short-term use for therapy:

1. Gingivitis therapy as an adjunct to oral hygiene and professional prophylaxis

2. Candidiasis therapy (denture stomatitis).

3. Peri-implant mucositis therapy4. Peri-implantitis therapy

Long-term use for the treatment and or prevention of:

1. Long-term use for the prevention of dental biofilm formation

2. Patients carrying fixed or removable orthodontic appliances

3. Patients with disabilities for oral hygiene and gingival health benefits in the mentally and physically handicapped.

4. Patients with gingival overgrowth or enlargement

5. Periodontitis patients

6. Patients with dental implants

7. Predisposed patients, with high risk of suffering oral infections

8. Oral mucositis prevention (associated with radiation or chemotherapy in head and neck cancer patients)

9. Caries prevention

10.Candidiasis prevention

11.Prevention of recurrent aphthous ulcers

12.Halitosis therapy and secondary prevention

The side effects:

1. Brown discoloration of the teeth and some restorative materials and the dorsum of the tongue.

2. Taste perturbation where the salt taste appears to be preferentially affected to leave food and drinks with a rather bland taste.

3. Enhanced supra-gingival calculus formation. The supragingival calculus formation may be due to precipitation of salivary protein onto the tooth surface there by increasing pellicle thickness & or precipitation of inorganic salts onto or into the pellicle layer. This type of calculus is free of bacteria.

4. Unilateral or bilateral parotid swelling.

5.Oral mucosal erosion.

6. Chlorhexidine also has a bitter taste which is difficult to mask completely. For these reasons, the prolonged use of CHX should be avoided in normal periodontal patients. It is useful for short periods (up to two weeks) when oral hygiene may be difficult or impossible, such as during acute oral infections or following periodontal surgery.

It was demonstrated that rinsing for 60 seconds twice per day with l0 ml of a 0.2% CHX gluconate solution in the absence of tooth cleaning inhibited plaque regrowth and development of gingivitis, after that the patient should not eat or drink anything for up to 30min. With tooth brushing by using toothpaste, CHX mouthwash should be used after brushing otherwise cross reaction may occur and reduce the plaque inhibition of CHX since chlorhexidine is neutralized by common toothpaste additives such as sodium lauryl sulfate (SLS) and sodium monofluorophosphate (MFP). To maximize effectiveness, it may be best to keep a

30- minute to 2-hours interval between brushing and using the mouthwash (rinse thoroughly with water after brushing if it precedes the use of chlorhexidine or use at a different time of the day). CHX mouth rinse adsorbed to the pellicle-coated enamel surface of the tooth surface, bacterial surface, oral mucosa and produces a persistent bacteriostatic action with slow sustained release into the oral cavity lasting 12 hours so it is used twice daily

Nonprescription Essential Oil Rinse

Essential oil mouth rinses (Listerine) contain thymol, eucalyptol, menthol, and methyl salicylate. These preparations have demonstrated plaque biofilm reductions of 20% to 35% and gingivitis reductions of 25% to 35%. This type of oral rinse has had a long history of daily use and safety. These products also contain alcohol (up to 24% depending on the preparation), which must be a consideration for some patients not to use these products.

Other Products

A preparation containing triclosan has shown some effectiveness in reducing plaque biofilm and gingivitis. It is available in toothpaste form. Other oral rinse products on the market have shown some evidence of plaque biofilm reduction. These include stannous fluoride, cetylpyridinium chloride (quaternary ammonium compounds), and sanguinarine. Evidence suggests that these and other available mouth rinse products do not possess the antimicrobial potential of either chlorhexidine products or essential oil preparations.

References

Lang, N.P., Berglundh, T., Giannobile, W.V. and Sanz, M. eds., (2021). *Lindhe's clinical periodontology and implant dentistry*. John Wiley & Sons.

Newman, M.G. *et al.* (2011). *Carranza's clinical periodontology*. Elsevier health sciences.