

Periodontics

Lec.2

Scaling & Root Planing (S + RP):

Scaling is the process by which plaque & calculus are removed from both supragingival & subgingival tooth surfaces.

Root planing is the process by which residual embedded calculus and softened cementum are removed from the roots to produce smooth, hard & clean root surfaces.

The supragingival scaling is the initial phase of debridement of the dentition in patient with periodontal disease in order to facilitate the subsequent subgingival scaling, so supragingival calculus and gross overhang or metal crown should be removed first, then the dentition are polished so that the patient can start self performed plaque control program.

Subgingival S&RP, although they are considered as two separated procedures with different objectives but in clinical work they always carried out together 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 insert into the gingival crevice or periodontal pocket without pressure or force and measure in mm.

2. Anatomy of the root surface.
3. Location of the deposits.

Scaling & root planing **aims** to:

- Restore gingival health by the removal of bacterial plaque (which is responsible for periodontal tissue destruction), calculus & the superficial layer of cementum however, calculus & plaque grow in surface irregularities of cementum furthermore, bacterial products (such as endotoxin) penetrate into the cementum surface.
- 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 planing 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 prior to 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 pocket and substantial furcation involvement, even in patients with minimal mouth opening capacity & with expansively progressive disease.

Open procedure calls for 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 planing are classified as

- Hand instruments.
- Ultrasonic & sonic instruments.
- Motor driven devices incorporating diamond-coated tips (reciprocating instruments).
- Rotating instruments.
- Laser-instruments.

Reciprocating instruments: a special designed hand piece will give 20000-30000 strokes per min. with a 1.2mm reciprocating motion of a specially designed working tips for

S & RP (e.g. a set of PER-IO-TOR instruments), its use is less time consuming than hand instrument, results in less root surface loss and produce equivalent clinical outcome compared to hand, sonic or ultrasonic scalers.

Rotating instruments: used to debride root furrows, furcation

areas and root surface in deep narrow pockets because in these situations cannot be properly debride with hand inst. A fine grained diamond bur is usually used with great care to avoid excessive removal of tooth substances.

Laser: recently laser devices been introduced to be used in different aspects of periodontal therapy including S&RP.

Removal of Plaque retentive factors

Epidemiological studies had document 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. overhang restorations can be removed using diamond stone mounted on a hand piece

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

Reevaluation of the patients periodontal conditions & caries activity should be performed no earlier than 4 weeks following the last session of the S+ RP procedures, in order to provide time for the tissues to heal by the formation of a long junctional epithelium & sufficient practice with oral hygiene skills. The initial phase of the therapy is completed with a thorough analysis of the results obtained with respect to

- 1) Improvement of the self-performed plaque control.
- 2) Reduction in plaque level (plaque index).

3) Resolution of gingival inflammation include less bleeding, redness & swelling (gingival index and bleeding on probing).

BOP measurement :a periodontal probe inserted to the bottom of gingival crevice or periodontal pocket and move gently along the root surface,if bleeding occurs within 30 seconds the site give score(1) and for non-bleeding site, score (0).

4) Shrinkage of the gingival soft tissue (recession).

5) Increased resistance to probe tip penetration by the tissues at the base of the pocket

6) Reduction of probing pocket depth, and if possible changes in probing attachment level as a result of gingival shrinkage and formation of long junctional epi.

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

7) reduced tooth mobility.

The Pockets should not be probed sooner than 4-6 weeks after S&RP as this may interfere with healing process.

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 marked reduction in probing pocket depth, in such situation no further periodontal treatment is required and the patient directly advanced to maintenance phase of periodontal therapy.

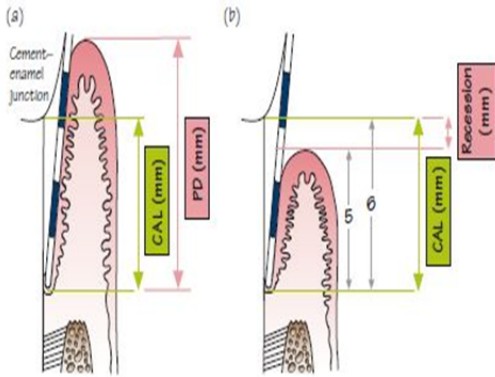
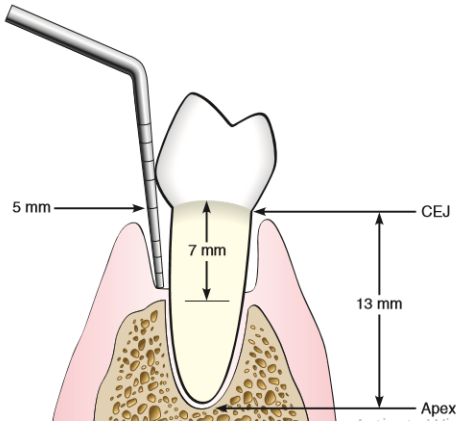
2- Patient with proper standard of oral hygiene but having

some sites of bleeding on probing with no significant reduction in probing depth. Such patient may need to be advanced to corrective phase including the periodontal surgery.

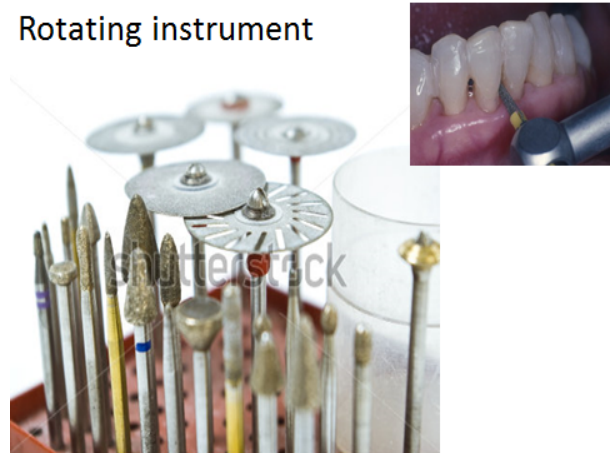
3- Patient with inadequate oral hygiene due to lack of motivation or lack of ability to do proper home care, such patient should be remotivated and reinstuctured to improve their oral hygiene because if the oral hygiene not improved the periodontal disease will recurrent even if we conduct periodontal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

Decision to refer for specialist periodontal treatment

The concept of the critical probing depth of 5.4 mm has been advanced to assist in making the determination to proceed to surgical intervention. This is the measurement above which surgical therapy will result in clinical attachment gain and below which it will result in clinical attachment loss. A similar 5 mm standard of clinical attachment loss has been commonly used as a guideline for identifying candidates for surgical referral based on the understanding that the typical root length is about 13 mm and the crest of the alveolar bone is at a level approximately 2 mm apical to the bottom of the pocket and about 7 mm apical to the CEJ and therefore only about half of the bony support for the tooth remains. Periodontal surgery can help improve support for teeth in these cases through pocket reduction, bone augmentation and regeneration procedure.



Rotating instrument



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Chemical plaque control

Gingivitis and periodontitis are highly prevalent diseases and prevention of occurrence or recurrence is dependent on supra-gingival 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 mean to overcome inadequacies of mechanical cleaning.

The action of these chemical could fit into four categories:

1. Anti-adhesive
2. Antimicrobial
3. Plaque removal.
4. Anti-pathogenic.

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, although the amine alcohol, delmopinol, which appears to interfere with bacterial matrix formation and therefore fits between the concepts of anti-adhesion and plaque removal, has been shown effective against plaque and gingivitis.

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 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.

Plaque removal agents:

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

Anti-pathogenic agents:

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

Vehicles for the delivery of chemical agents

Tooth paste-mouth rinses-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 the chlorhexidine (CHX) is the best chemical supra-gingival plaque control agent.

Chemical supra-gingival plaque control :

Chemical agents have been incorporated into mouth rinses and tooth pastes with the objective of inhibiting the formation of plaque and calculus. Antiplaque agents may also have a significant clinical effect of resolving an established gingivitis.

Chlorhexidine digluconate:

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

At low concentrations, chlorhexidine is bacteriostatic, at high concentrations, it is bactericidal. 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 causes disruption of the osmotic barrier and interference with membrane transport.

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.

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, within 15 seconds of rinsing, half will have bonded to receptor molecules.

Clinical uses of chlorhexidine

1. As an adjunct to oral hygiene and professional prophylaxis.
2. Post oral surgery including periodontal surgery or root planing.
3. For patients with jaw fixation.
4. Medically compromised individuals predisposed to oral infections.
5. High risk caries patients.
6. In denture stomatitis.
7. Oral mal odor.
8. Recurrent oral ulceration.
9. Removable and fixed orthodontic appliance wearers.
10. Immediate preoperative chlorhexidine rinsing and irrigation.
11. Reduced salivary flow.
12. For oral hygiene and gingival health benefits in the mentally and physically handicapped.

In oral use as a mouth rinse chlorhexidine has been reported to have a number of local side effects, thus it is only used for a few weeks at a time when it is not possible to carry out other oral hygiene procedures.
These side effects are:

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.
4. Unilateral or bilateral parotid swelling.
5. Oral mucosal erosion.
6. Chlorhexidine also has a bitter taste which is difficult to mask completely.

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

It was demonstrated that rinsing for 60 seconds twice per day with 10 ml of a 0.2% CHX gluconate solution in the absent 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 tooth paste, CHX mouth wash should be used after 30min. of brushing otherwise cross reaction may occur and reduce the plaque inhibition of CHX.

Studies suggest a slow release of CHX from surface to produce a persistent bacteriostatic action lasting for about 12hours that's why it should be used twice a day.

Nonprescription Essential Oil Rinse

Essential oil mouthrinses contain thymol, eucalyptol, menthol, and methyl salicylate. These preparations have been 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 mouthrinse products do not possess the antimicrobial potential of either chlorhexidine products or essential oil preparations.

One type of agent has been marketed as a prebrushing oral rinse to improve the effectiveness of toothbrushing. The active ingredient is sodium benzoate.

It has been reported that chemical plaque biofilm control has been effective for both plaque biofilm reduction and improved wound healing after periodontal surgery. Both chlorhexidine and essential oil mouthrinses have significant positive effects when prescribed for use after periodontal surgery for 1 to 4 weeks.

Antimicrobials

The use of systemic antimicrobials in the management of periodontal disease should be restricted to the following conditions

1. Severe necrotizing ulcerative gingivitis.

2. Multiple or sever periodontal abscesses with involvement of regional lymph nodes.
3. Some cases of aggressive periodontitis.
4. Refractory periodontitis.

Routs of administration

Two disadvantages of the nonspecific mechanical treatment which repeated at recall visits are the irreversible and ever increasing damage to tooth hard structure especially roots within pockets as well as gingival recession. In addition, it is impossible to mechanically remove plaque completely from narrow grooves, narrow furcation's and other bacterial reservoirs within the pockets. Thus it is appropriate to combine mechanical plaque control with antimicrobials. Since only a few bacterial species are potentially periodontal pathogenic, it is reasonable to eliminate these groups specifically. These groups contain bacteria can invade periodontal tissues, making mechanical therapy alone in-effective.

This situation can be effectively combated using systemic or topically applied antimicrobials to achieve, within the periodontal environment a concentration of the drug that is sufficient either to kill (bactericidal) or arrest growth (bacteriostatic) of pathogenic microorganisms.

Systemically ingested antimicrobials, whereby the drug enters the crevicular fluid and able to bathe sub-gingival flora,

Advantages

- Eliminating pathogens, not only from periodontal lesions but also from the oral cavity. (Reach widely distributed microorganisms).

- Such an action may have prophylactic benefits and reduce the risk of reinfection of the periodontal sites.
- Broad spectrum of activity.

Disadvantages

- Systemic side effects.
- The possible elimination of non-pathogenic "beneficial" bacteria.
- Low concentration within the tissues.
- Bacterial resistance.
- Requires good patient compliance.
- Interaction with other medications.
- Allergic reactions.
- Super infections of opportunistic bacteria.
- High doses of antimicrobials are administered.

Antimicrobials have also been incorporated into formulation that can be applied **locally** into periodontal pockets.

Advantages of local route of administration

- Lower dose of antimicrobials are administered.
- High local concentrations of the drugs are achieved locally in periodontal pockets so better effect against biofilms.
- Minimal or no side effects.
- Administration is not dependent upon patient compliance.
- Placement is site specific.
- When the matrix (vehicle) biodegrades to release the drug (controlled slow release device), an antimicrobial sustain its localized concentration of effective levels for a sufficient time.

Disadvantages:

- Narrow, limited spectrum of efficacy,
- Possible reinfection of non-treated sites.
- The placement can be time consuming when the treatment of multiple sites is indicated.
- The extent to which the drug penetrates the connective tissues may be less predictable than when systemic dosing is undertaken.

Choice of antimicrobial agent :

The choice depends upon the presence and sensitivity of so called periodontal pathogens and the risks of adverse reactions that can arise from antimicrobial usage. The Tetracycline and metronidazole are the drugs that have been evaluated most extensively in the treatment of periodontal disease as an adjunct to mechanical therapy.

Tetracycline:

Tetracycline is a group of related bacteriostatic antimicrobials. They provide a broad spectrum of activity against both gram-positive and gram-negative microorganisms. Tetracycline is effective against most spirochetes and many anaerobic and facultative bacteria. Additional properties of Tetracycline that may be valuable in the management of periodontal disease are

- Inhibition of collagenase (inhibit tissue destruction).
- Anti-inflammatory actions.
- Enhancement of fibroblast attachment to root surfaces.
- Inhibition of bone resorption and may aid bone regeneration.
- High drug concentration to be delivered into pocket (concentration in gingival sulcus 2-10 times that in serum)

- Inhibition of neutrophil chemotaxis
- Inhibition of microbial attachment
- Host modulation
- antimicrobial

In chronic periodontitis, systemic tetracycline has little advantage when used as an adjunct to other procedures. systemic Tetracycline is valuable in the management of localized aggressive periodontitis and refractory periodontitis. In localized aggressive periodontitis, the prime pathogen is Aggregatibacter actinomycetem comitans (A.a), which is very susceptible to tetracycline.

This microorganism is difficult to eliminate from patients with aggressive periodontitis by mechanical debridement alone, presumably because of its ability to invade the gingival connective tissues. A 3-6 weeks course of tetracycline of 1g per day will halt the progression of aggressive periodontitis, although it is more usual to give the tetracycline in a 2 weeks course as an adjunct to non-surgical or surgical management. Tetracycline medication should be continued for 1 week after obtaining negative culture results for A.a. this minimizes the chance of recolonization.

Sub-antimicrobial dose of doxycycline 20 mg (periostat) 2/d for 3 months for a maximum of 9 months approved and indicated as an adjunct to S+RP in the treatment of periodontal diseases, e.g. refractory periodontitis, which act by a mechanism called host modulation that refers to the concept of modulating the host response to the presence of bacteria with methods such as inhibiting collagen destructive enzymes hence, this regimen create no bacterial resistance.

Tetracycline has been incorporated into slow release devices for adjunctive local treatment following S+ RP. e.g. Minocycline ointment, Minocycline in biodegradable powder (Arestin), doxycycline hyclate in a biodegradable polymer gel (Atridox) and tetracycline in a non-resorbable fiber (Actisite) have also been available for local application.

Metronidazole:

Antibacterial activity against anaerobic-cocci, gram-negative and gram-positive bacilli has led to the use of metronidazole in the treatment of periodontal disease.

The microbial effects of the drug depend upon its selective reactivity, which is achieved through the actions of electron transport proteins of susceptible bacteria. Once in the cell, metronidazole binds and disrupts DNA synthesis leading to cell death. This process results in rapid killing of anaerobic microorganisms (Bactericidal). It is effective against porphyromonas gingivalis.

In periodontal treatment, metronidazole has been used systemically; common dosage is 200mg three times a day for 3-5 days. For more severe infections the dose is increased to 400mg twice daily for 3-5 days.

Metronidazole is effective in controlling necrotizing ulcerative gingivitis. Gingival ulceration, bleeding, pain and halitosis usually resolve rapidly within about 48-72 hours of starting therapy. The

dosage and duration of metronidazole therapy used will depend upon the severity of the disease.

Systemic metronidazole appears to be useful as an adjunct to non-surgical management in advanced or refractory periodontitis. Metronidazole has been found to be very effective when combined with amoxicillin in the treatment of refractory localized aggressive periodontitis that has not responded to conventional periodontal treatment and tetracycline therapy. A 7 days (250mg of each drug) regimen three times a day, combined with further sub-gingival debridement results in almost total elimination of A.a. In addition this combination used for treatment of periodontal abscess. Efficacies studies suggest that two applications of 25% metronidazole gel (1 week apart) in periodontal pocket are as effective as conventional non-surgical management in reducing probing depths and bleeding on probing.

Amoxicillin:

Had extended antimicrobial spectrum that includes gram positive and gram negative bacteria by inhibiting bacterial cell wall production and therefore are bactericidal, hence may be useful in the management of patients with aggressive periodontitis, the dosage is 500 mg 3/d for 8 days.

Augmentin (Amoxicillin with clavulanate), this combination makes it resistant to penicillinase enzymes produced by some bacteria, hence may be useful in the management of patients with refractory or localized aggressive periodontitis. The Augmentin with Metronidazole combination have an additive effect regarding suppression of A.a in localized aggressive periodontitis.

Nonsteroidal Antiinflammatory Drugs (NSAID):

May be of therapeutic value in treating **periodontal disease** because of their ability to inhibit the **inflammatory process**, drugs such as **flurbiprofen** , **ibuprofen** , **mefenamic acid** and **naproxen**.