

Scaling and root planning

Scaling is the process by which biofilm and calculus are removed from both supragingival and subgingival tooth surfaces. No deliberate attempt is made to remove tooth substance along with the calculus.

Root planing is the process by which residual embedded calculus and portions of cementum are removed from the roots to produce a smooth, hard, clean surface.

Scaling and root planing are fundamental periodontal procedures and provide the basis for success of all forms of periodontal therapy. **Mastering scaling and root planing is imperative for all clinicians who hope to provide their patients with the best care.**

Rationale of Scaling and Root Planing

The primary objective of scaling and root planing is to restore gingival health by completely removing elements that provoke gingival inflammation (i.e., biofilm, calculus, and endotoxin) from the tooth surface. Instrumentation has been shown to reduce dramatically the numbers of subgingival microorganisms and produce a shift in the composition of subgingival biofilm from one with high numbers of **gram-negative anaerobes** to one dominated by **gram-positive facultative bacteria** compatible with health. After thorough scaling and root planing, a profound reduction in spirochetes, motile rods, and putative pathogens, such as *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, and *Prevotella intermedia*, and an increase in coccoid cells occur. These changes in the microbiota are accompanied by a reduction or elimination of inflammation clinically. This positive microbial change must be sustained by the periodic scaling and root planing performed during supportive periodontal therapy.

Scaling and root planing are not separate procedures; all the principles of scaling apply equally to root planing. The difference between scaling and root planing is only a matter of degree. The nature of the tooth surface determines the degree to which the surface must be scaled or planed.

Biofilm and calculus on enamel surfaces provoke gingival inflammation. Unless they are grooved or pitted, enamel surfaces are relatively smooth and uniform. When biofilm and calculus form on enamel, the deposits are usually superficially attached to the surface and are not locked into irregularities. Scaling alone is sufficient to completely remove biofilm and calculus from enamel, leaving a smooth, clean surface.

Root surfaces exposed to biofilm and calculus pose a different problem. **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. Removal of extensive amounts of dentin and cementum is not necessary to render the roots free of toxins and should be avoided.** In areas where cementum is thin, however, instrumentation may expose dentin. Although this is not the aim of treatment, such exposure may be unavoidable.

When the rationale for scaling and root planing is thoroughly understood, it becomes apparent that **mastering these skills is essential to the ultimate success of any course of periodontal therapy.** Of all clinical dental procedures, **subgingival scaling and root planing in deep pockets are the most difficult and**

exacting skills to master. subgingival scaling and root planing could be **closed** (without displacement of gingiva) or **opened** (displacement of gingiva by surgery).

Subgingival Scaling and Root-Planing Technique

Subgingival scaling and root planing are much more complex and difficult to perform than supragingival scaling. *Subgingival calculus is usually harder than supragingival calculus and is often locked into root irregularities, thus making it more tenacious and more difficult to remove.*

The overlying tissue creates significant problems in subgingival instrumentation. Vision is obscured by **the bleeding** that inevitably occurs during instrumentation and by **the tissue itself**. The clinician must rely heavily on tactile sensitivity to detect calculus and irregularities, guide the instrument blade during scaling and root planing, and evaluate the results of instrumentation. In addition, the adjacent pocket wall limits the direction and length of the strokes. The confines of the soft tissue make careful adaptation to tooth contours imperative to avoid trauma. Such precise adaptation cannot be accomplished without thorough knowledge of tooth morphologic features. The clinician must form a mental image of the tooth surface to anticipate variations in contour, continually confirming or modifying the image in response to tactile sensations and visual cues, such as the position of the instrument handle and shank. The clinician then must instantaneously adjust the adaptation and angulation of the working end to the tooth. It is this complex and precise coordination of visual, mental, and manual skills that makes subgingival instrumentation one of the most difficult of all dental skills.

The curette is preferred by most clinicians for subgingival scaling and root planing because of the advantages afforded by its design. Its curved blade, rounded toe, and curved back **allow the curette to be inserted to the base of the pocket and adapted to variations in tooth contour with minimal tissue displacement and trauma.** Sickles, hoes, files, and ultrasonic instruments also are used for subgingival scaling of heavy calculus. **Some small files (e.g., Hirschfeld file) may be inserted to the base of the pocket to crush or initially fracture tenacious deposits.** Larger files, hoes, sickles, and standard ultrasonic tips for supragingival use are too bulky and cannot be inserted easily into deep pockets or areas where tissue is firm and fibrotic. Hoes and files cannot be used to produce as smooth a surface as curettes. Hoes, files, and standard large ultrasonic tips are all more hazardous than curettes in terms of trauma to the root surface and surrounding tissues. Although thin ultrasonic tips designed for scaling of deep pockets and furcations can be inserted more easily subgingivally, they must be used on low power. When low-power scaling is performed on heavy calculus or tenacious sheets of calculus, thin ultrasonic tips are likely to burnish the calculus rather than thoroughly remove it. **Therefore ultrasonic scaling should be followed by careful assessment with an explorer and further instrumentation with curettes when necessary.**

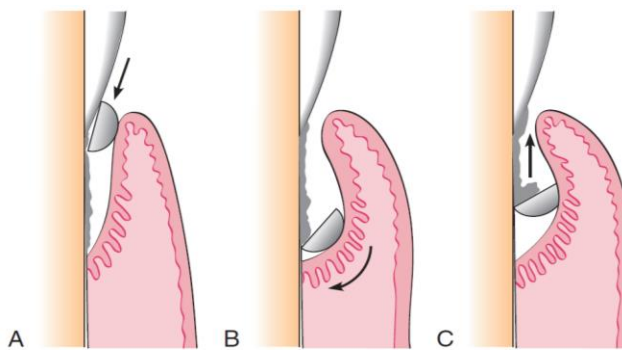
Subgingival scaling and root planing are accomplished with either universal or area-specific (Gracey) curettes by using the following basic procedure.

The curette is held with a modified pen grasp, and a stable finger rest is established. The *modified pen grasp* (eFig.50.8) is the most effective and stable grasp for all periodontal instruments. The correct cutting edge is slightly adapted to the tooth, with the lower shank kept parallel to the tooth surface. The lower shank is moved toward the tooth so that the face of the blade is nearly flush with the tooth surface. The blade is then inserted under the gingiva and advanced to the base of the pocket by a light exploratory stroke. When the cutting edge reaches the base of the pocket, a working angulation of between 45 and 90 degrees is established, and pressure is applied laterally against the tooth surface. **Calculus is removed by a**

series of controlled, overlapping, short, powerful strokes (**scaling stroke**) primarily using wrist-arm motion (eFig. 50.33). As calculus is removed, resistance to the passage of the cutting edge diminishes until only a slight roughness remains. **Longer, lighter root-planing strokes are then activated with less lateral pressure until the root surface is completely smooth and hard.** The instrument handle must be rolled carefully between the thumb and fingers to keep the blade adapted closely to the tooth surface as line angles, developmental depressions, and other changes in tooth contour are followed. Scaling and root-planing strokes should be confined to the portion of the tooth where calculus or altered cementum is found; this area is known as the *instrumentation zone*. Sweeping the instrument over the crown where it is not needed wastes operating time, dulls the instrument, and causes loss of control.



eFig. 50.8 Modified pen grasp. The pad of the middle finger rests on the shank. (Copyright A. Pattison.)



eFig. 50.33 Subgingival scaling procedure. (A) Curette inserted with the face of the blade flush against the tooth. (B) Working angulation (45 to 90 degrees) is established at the base of the pocket. (C) Lateral pressure is applied, and the scaling stroke is activated in the coronal direction.

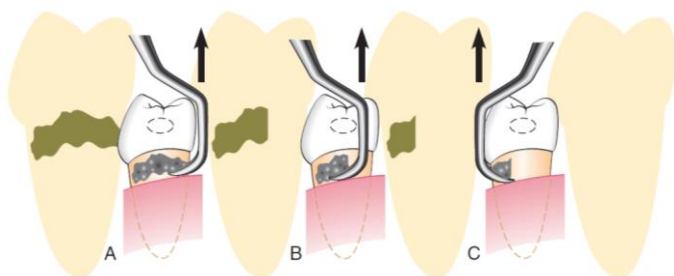
The amount of lateral pressure applied to the tooth surface depends on the nature of the calculus and whether the strokes are for initial calculus removal or final root planing. To avoid these hazards of overinstrumentation, a deliberate transition from short, powerful scaling strokes to longer, lighter root-planing strokes must be made as soon as the calculus and initial roughness have been eliminated.

When scaling strokes are used to remove calculus, force can be maximized by concentrating lateral pressure onto the lower third of the blade. This small section, the terminal few millimeters of the blade, is positioned slightly apical to the lateral edge of the deposit, and a short vertical or oblique stroke is used to split the calculus from the tooth surface. Without withdrawing the instrument from the pocket, the lower third of the blade is advanced laterally and repositioned to engage the next portion of the remaining deposit. Another vertical or oblique stroke is made, slightly overlapping the previous stroke. This process is repeated in a series of powerful scaling strokes until the entire deposit has been removed. **The overlapping of these pathways or “channels” of instrumentation ensures that the entire instrumentation zone is covered** (eFig. 50.34).

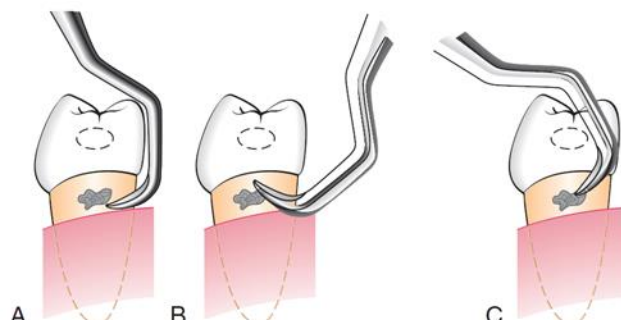
Engaging a large, tenacious ledge or piece of calculus with the entire length of the cutting edge is not recommended because **the force is distributed through a longer section of the cutting edge** rather than concentrated. **Much more lateral pressure is required** to dislodge the entire deposit in one stroke. Although some clinicians may possess the strength to remove calculus completely in this manner, the heavier forces required **diminish tactile sensitivity** and contribute to a **loss of control** that results in tissue trauma. A single heavy stroke usually is not sufficient to remove calculus entirely. Instead, the blade skips over or skims the surface of the deposit. Subsequent strokes made with the entire cutting edge tend to shave the deposit down layer by layer. When a series of these repeated whittling strokes is

applied, the calculus may be reduced to a thin, smooth, burnished sheet that is difficult to distinguish from the surrounding root surface.

A common error in instrumenting proximal surfaces is failing to reach the midproximal region apical to the contact. This area is relatively inaccessible, and the technique requires more skill than instrumentation of buccal or lingual surfaces. It is extremely important to extend strokes at least halfway across the proximal surface so that no calculus or roughness remains in the interproximal area. With properly designed curettes, this can be accomplished by keeping the lower shank of the curette parallel with the long axis of the tooth (eFig. 50.35A). With the lower shank parallel to the long axis, the blade of the curette will reach the base of the pocket and the toe will extend beyond the midline as strokes are advanced across the proximal surface. **This extension of strokes beyond the midline ensures thorough exploration and instrumentation of these surfaces.** If the lower shank is angled or tilted away from the tooth, the toe will move toward the contact area. Because this prevents the blade from reaching the base of the pocket, calculus apical to the contact will not be detected or removed. Strokes will be hampered because the toe tends to become lodged in the contact. If the instrument is angled or tilted too far toward the tooth, the lower shank will hit the tooth or the contact area, thereby preventing extension of strokes to the midproximal region (eFig. 50.35B and C).



eFig. 50.34 Instrumentation for calculus removal. (A) Calculus is removed by engaging the apical or lateral edge of the deposit with the cutting edge of a scaler; vertical movement of the instrument will remove the fragment of calculus engaged by the instrument, as seen in the shaded drawing. (B) The instrument is moved laterally and again engages the edge of the calculus, thus overlapping the previous stroke to some extent; the shaded drawing shows further removal. (C) The final portion of the deposit is engaged and removed. Note how the procedure is performed in an interdental space by entering facially and lingually.



eFig. 50.35 Shank position for scaling proximal surfaces. (A) Correct shank position, parallel to the long axis of the tooth. (B) Incorrect shank position, tilted away from the tooth. (C) Incorrect shank position, tilted too far toward the tooth. Sextant: lingual aspect.

The relationship between the location of the finger rest and the working area is important for two reasons. **The finger rest or fulcrum must be positioned to: 1-allow the lower shank of the instrument to be parallel to the tooth surface and 2-enable wrist-arm motion to activate strokes.** On some aspects of the maxillary posterior teeth, these requirements can be met only with the use of extraoral or opposite-arch fulcrums. When intraoral finger rests are used in other regions of the mouth, the finger rest must be close enough to the working area to fulfill these two requirements.

A finger rest that is established too far from the working area forces the clinician to separate the middle finger from the fourth finger in an effort to obtain parallelism and proper angulation. Effective wrist-arm motion is possible only when these two fingers are kept together in a built-up fulcrum.

As instrumentation proceeds from one tooth to the next, the body position of the operator and the location of the finger rest must be frequently adjusted or changed to allow parallelism and wrist-arm motion.

Removal of plaque-retentive factors

Plaque accumulation and biofilm development are the primary causes of periodontal inflammation and destruction. Therefore factors that facilitate plaque accumulation or prevent plaque removal by oral hygiene procedures can be detrimental to the patient. Plaque-retentive factors are important in the

development and progression of chronic periodontitis because they retain microorganisms in proximity to the periodontal tissues, providing an ecologic niche for biofilm maturation. Therefore the removal of these factors considered an important part of periodontal therapy. Calculus is considered the most important plaque-retentive factor because of its ability to retain and harbor plaque bacteria on its rough surface as well as inside. As a consequence, calculus removal is essential for the maintenance of a healthy periodontium.

In addition, the tooth morphology may influence plaque retention. Roots may show grooves or concavities, and in some instances, enamel projections on the surface or furcation entrances. Those morphologic variations may facilitate plaque retention, subgingival calculus formation, and disease progression.

In addition, subgingival and overhanging margins of restorations, carious lesions that extend subgingivally, and furcations exposed by loss of bone promote plaque retention.

Use of adjunctive systemically administered antibiotics to subgingival instrumentation

It has been well established that the various periodontal diseases are caused by bacterial infection. Bacteria begin reattaching to tooth surfaces soon after the teeth have been cleaned and start to form a *biofilm*. Over time, this supragingival plaque biofilm becomes more complex growing in an apical direction and become subgingival. Eventually, as **bone is destroyed, a periodontal pocket is formed**. As this process continues, the bacterial biofilm extends so far subgingivally that the patient cannot reach it during oral hygiene efforts. This complex biofilm may now offer some protection from **the host's immunologic mechanisms** in the periodontal pocket as well as from **antibiotics** used for treatment. It is therefore logical to treat periodontal pockets by mechanically removing local factors (including the calculus that harbors bacteria) and by disrupting the subgingival plaque biofilm itself. Mechanical removal can be considered “**anti-infective therapy**.”

Systemic antibiotic therapy is administered to **reinforce** mechanical periodontal treatment and **support** the host defense system in overcoming the infection by killing subgingival pathogens that remain after conventional mechanical periodontal therapy. Many antibiotics have been used according to the target microflora, with varying degrees of success.

The decision regarding when to use systemic antimicrobials **should be made on** the basis of the clinician's consideration of the clinical findings, the patient's medical and dental history, the patient's preferences, and the potential benefits of adjunctive therapy with these agents.

No class of drugs has made more of an impact on periodontal therapy than the **tetracyclines**. They have been used in **conjunction with scaling and root planing** and with **respective and regenerative surgical** procedures. The tetracyclines have been used **locally and systemically** as **antimicrobial** agents and as **host modulation** agents (i.e., SDD). **Sub-antimicrobial dose doxycycline** (SDD) is the only FDA-approved, systemically administered host modulating therapy indicated specifically for the treatment of periodontitis. SDD is used as an adjunct to SRP and must not be used as a stand-alone therapy (i.e., monotherapy).

Tetracyclines have been advocated for treatment of patients with **systemic diseases** such as diabetes, rheumatoid arthritis, and rosacea (i.e., treated with Oracea). Doxycycline has led to improvements in the periodontal health of compromised diabetic patients and long-term markers of glycemic control (i.e.,

glycated hemoglobin). As an adjunct to mechanical therapies, the goal of tetracycline therapy has been to enhance reattachment or stimulate new attachment of the supporting apparatus and osseous formation.

Systemic antibiotic therapy in combination with mechanical therapy appears to be valuable for the treatment of **recalcitrant periodontal infections and aggressive periodontitis infections that involve A. actinomycetemcomitans**. Antibiotic treatment should be reserved for specific subsets of periodontal patients who do not respond to conventional therapy. The use of **amoxicillin and metronidazole** as an adjunctive therapy to scaling and root planing for the treatment of aggressive periodontitis has been shown to significantly improve clinical attachment gain and pocket depth reduction when compared with scaling and root planing alone

Re-evaluation of the cause-related therapy

After scaling, root planing, and other phase I procedures, the periodontal tissues require approximately **4 weeks to heal**. This time allows the connective tissues to heal, and accurate probe depths can be measured. Patients will also have the opportunity to improve their home care skills to reduce gingival inflammation and adopt new habits that will ensure the success of treatment.

At the reevaluation appointment, periodontal tissues are probed (plaque level, bleeding on probing, pocket depth and clinical attachment level should be checked) and all related anatomic conditions are carefully evaluated to determine whether further treatment, including periodontal surgery, is indicated. Calculus, root caries, defective restorations, and signs of persistent inflammation should also be evaluated. Additional improvement from periodontal surgical procedures can be expected only if phase I therapy results in gingival tissues that are free of overt inflammation and the patient has adopted effective daily plaque control procedures.

Many patients can attain periodontal disease control with phase I therapy alone and do not require further surgical intervention. For patients who require surgical intervention, phase I therapy is an advantageous element of treatment in that it permits tissue healing, thus improving the surgical management and healing response of the tissues. Periodontal surgical intervention should be considered for patients with deep pocket depths and those with 5 mm or more of attachment loss after phase I therapy.

Almost every patient undergoes the so-called initial or preparatory phase of therapy, which basically consists of thorough scaling and root planing and the removing of all irritants responsible for the periodontal inflammation. When these procedures are executed well and are combined with patient education, the results will: **(1)** eliminate some lesions entirely; **(2)** render the tissues firm and consistent, thereby allowing for accurate and minimally invasive surgery; and **(3)** acquaint the patient with the office, the clinician, and the assistants, thereby reducing the patient's apprehension and fear.

Decision to Refer for Specialist Treatment

It is fortunate that many periodontally involved cases do not require any further therapy beyond phase I therapy. Therefore, these patients can be seen by general dentists for routine maintenance therapy. However, advanced or complicated cases benefit from specialist care. It is critical to be skilled in determining which patients would benefit from specialist care and deciding when a patient should be referred.

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 therapy will

result in clinical attachment gain and below which it will result in clinical attachment loss. This determination was made based on statistical analysis of surgical outcomes data. A similar 5-mm *standard* 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.

When there is 5 mm of clinical attachment loss, the crest of bone is about 7 mm apical to the cemento-enamel junction, 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 procedures. Fig. 47.4 depicts the relationship of clinical attachment loss to tooth support.

* In addition to the 5-mm probing depth criterion, other factors must be considered in the decision to refer to a periodontal specialist:

1. *Extent of the disease and generalized or localized periodontal involvement.* The amount of bone loss, even in localized areas, suggests the need for specialized surgical techniques.
2. *Root length.* Short-rooted teeth are jeopardized to a greater extent by the 5-mm clinical attachment loss criterion than teeth with long roots.
3. *Hypermobility.* Excessive tooth mobility suggests that contributing factors may be responsible for the mobility. The extent of mobility could mean that the prognosis for the tooth may be guarded to poor.
4. *Difficulty of scaling and root planing.* The presence of deep pockets and furcations makes instrumentation difficult, but the results can often be improved with surgical access.
5. *Restorability and importance of particular teeth for reconstruction.* Long-term prognosis of each tooth is important when considering extensive restorative work.
6. *Age of the patient.* Younger patients with extensive attachment loss are more likely to have aggressive forms of disease that require advanced therapy.
7. *Lack of resolution of inflammation after thorough plaque or biofilm removal and excellent scaling and root planing.* If inflammation and progressive deepening of the pocket continue, further therapy will be necessary. Such cases require an understanding of the etiology to determine the best course of treatment.

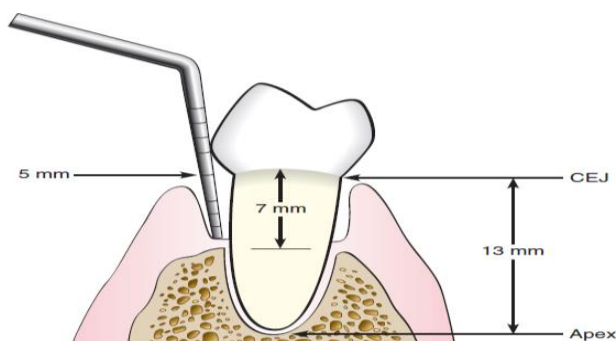


Fig. 47.4 The 5-mm standard for referral to a periodontist is based on root length, probing depth, and clinical attachment loss. The standard serves as a reasonable guideline to analyze the case for referral for specialist care. CEJ, Cemento-enamel junction. (Redrawn with permission from Armitage G, editor: Periodontal maintenance therapy, Berkeley, CA, 1974, Praxis.)