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БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
1-я КАФЕДРА ТЕРАПЕВТИЧЕСКОЙ СТОМАТОЛОГИИ

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ПРОФЕССИОНАЛЬНАЯ ГИГИЕНА

PROFESSIONAL ORAL HYGIENE

Рекомендовано Учебно-методическим объединением
по высшему медицинскому, фармацевтическому образованию
в качестве учебно-методического пособия для студентов
учреждений высшего образования, обучающихся на английском языке
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PROFESSIONAL ORAL HYGIENE

Professional oral hygiene — is a scientifically based system of preventive procedures for recovery of oral organs and tissues, prevention of development and progression of dental diseases.

Steps of professional hygiene:

– motivation of patient for preserving oral health of oral cavity and treatment of dental diseases;

– individual oral hygiene education and control of effectiveness of dental plaque removal;

– professional supra- and subgingival scaling;

– polishing enamel and root surfaces;

– elimination of factors of dental plaque retention;

– application of remineralizing and antiphlogistic preparations.

Cleaning consists of the following stages:

1. Staining plaque.
2. Removal of soft plaque.
3. Solid scaling.
4. Cleaning of periodontal pockets.
5. Grinding and polishing surfaces of teeth.

Deep fluoridation is made to strengthen teeth and remove the sensitivity to bare necks. After the procedure, doctors perform individual counseling on proper oral hygiene at home.

Methods of dental deposit removal:

1. Mechanical (manual, mechanic, air-flow).
2. Physical (sound, ultrasound).
3. Chemical.
4. Combined.

Different hand instruments are used for non-surgical periodontal therapy. Scalers and curettes have the most access to subgingival calculus. Curettes can be used for root planing and effective debridement of subgingival calculus. Manual removal of dental deposits is golden standart in periodontology.

MECHANICAL METHOD OF DENTAL DEPOSIT REMOVAL

MANUAL METHOD OF DENTAL DEPOSIT REMOVAL

Instruments for manual calculus removal are divided into groups:

1. Diagnostic:

a) explorers (for root surface examination, calculus and caries detection);

b) periodontal probes (for search and measurement of periodontal pockets).

c) instruments for dental deposit removal and root planing: sickle scalers, hoe, chisel, file, curettes (universal, areaspecific), implacare, sound and ultrasound instruments, instruments for handpieces with reciprocal movement, burs.

2. Instruments for polishing.

Main advantages of the manual method of dental deposits removal:

– absence of special contraindications (common contraindications are the same as for surgical manipulation);

– a wide range of instruments;

– absence of aerosol during procedure (minimal risk of infection transmission).

Average time of instrumentation of one tooth is 7–8 min.

All instruments have three main parts: handle, shank and blade (figure 1). Instruments may be metallic, metallic with diamond coating, plastic, teflon. Traditional instruments are stainless steel. Diamond coated instruments are used for furcation treatment during flap operations. High-carbon steel instruments are also available and are considered by some clinicians to be superior. Plastic and teflon instruments are used for children and implant surfaces treatment.

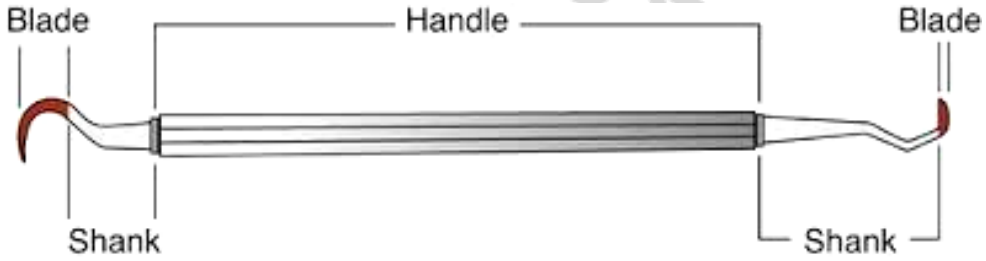


Figure 1. Parts of instrument

EXPLORER is an assessment instrument with a flexible wire like working end. Explorers are designed with different shapes and angles for a variety of uses. They are used to detect tooth surfaces for calculus and carious lesions, dental anomalies and anatomic features such as grooves, curvatures or root furcations. They are also used to detect by tactile means, the texture, and character of tooth surfaces before, during and after periodontal debridement to assess the progress and completeness of instrumentation.

PROBE is tapered rod like instrument calibrated in mm with blunt round tip. Furcation areas are best evaluated by the curved blunt Nabers probe. In case of implants plastic probes are used. Periodontal probes used to measure the depth of pockets and to determine their configuration. Probe is inserted with a firm gentle pressure (0.25 N) to the bottom of the pocket. Shank should align with the long axis of the tooth.

WHO worked out special CPITN probe (figure 2), which can be used for measurement of pocket depth, detection of subgingival calculus, used in assessment of treatment needs.

Florida probe system (consists of a computerized USB probe, a footswitch, a displacement transducer with digital readout, as well as the software proper) has

the Titanium tip (0.45 mm) of electronic probe measures pockets around teeth and implants with a normalized force of 0.25 N and with a precision of 0.2 mm (figure 3).

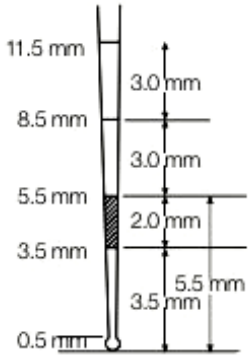


Figure 2. CPITN probe

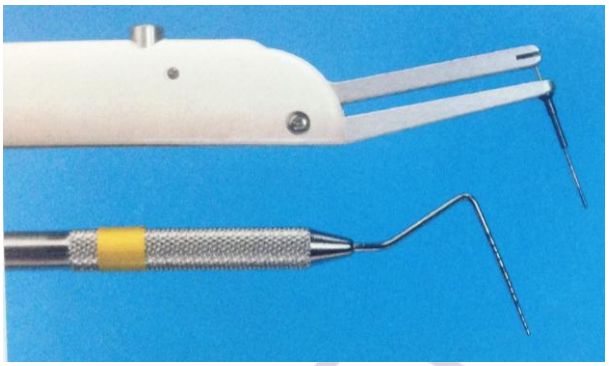


Figure 3. Florida probe system

SICKLE SCALERS are designed for moderate to heavy deposit removal around the contact areas of teeth. The face of the blade is triangular. They have a flat surface and two cutting edges that converge in a sharply pointed tip. A flat blade cut at a 90 degree angle to the shank. It is the sharp pointed toe and the first 1–2 mm of the lateral cutting edges that perform the work. The shape of the instrument makes the tip strong so that it will not break off during use. The sickle is used primarily to remove supragingival calculus, because of the design of this instrument, it is difficult to insert a large sickle blade under the gingiva without damaging the surrounding gingival tissues. A number of different sickle scalers are available in a variety of shapes and sizes. They all used with a pull stroke.

Sickles with straight shanks are designed for use on anterior teeth and premolars. Sickle scalers with contra-angled shanks adapt to posterior teeth. They have 2 blade designs:

– straight (figure 4, *a*). Also known as a Jacquette Scaler;

– curved (figure 4, *b*). Two cutting edges on a curved blade that end in a sharp point. The curved 204 sickles are available with large, medium, or small blades. Small, curved sickle scaler blades such as 204SD can be inserted under ledges of calculus a few mm below the gingiva.

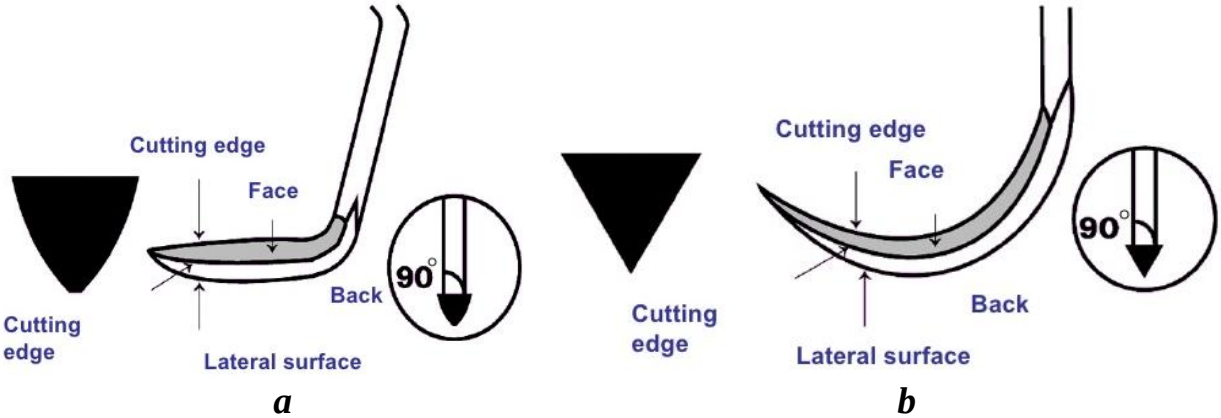


Figure 4. Sickle scaler:
a — straight, *b* — curved

To remove calculus, adapt the tip 1/3 of the cutting edge against the tooth, under the deposit. Tilt the facial surface of the blade toward the tooth to achieve an approximate 85° angle between the tooth and the blade. Apply lateral pressure against the tooth and pull the scaler firmly upward to dislodge the deposit.

Both sides (cutting edges) of the blade can be used for mesial or distal, facial or lingual application. The instrumentation sequence is the same as for universal curettes, using anterior and posterior designs. Anterior sickle scalers have a straight shank compared to the angled shank of posterior sickle scalers (figure 5).

a ***b***

Figure 5. *a* — Anterior — Straight shank; *b* — Posterior — Angled shank

HOE scalers are used for scaling of ledges or rings calculus. Its blade is bent at 99 angle, cutting edges beveled at 45 degree (figure 6). Blade is slight bowed so that it can maintain two contact at two points on a convex surface. The blade is inserted to the base of the periodontal pocket so that it makes two point contact with the tooth. This stabilizes the instrument and prevent nicking the root. The instrument is activated with a firm pull stroke toward the crown. McCall's #3, 4, 5, 6, 7, and 8 are a set of six hoe scalers designed to provide access to all tooth surfaces. Each instrument has a different angle between the shank and handle.

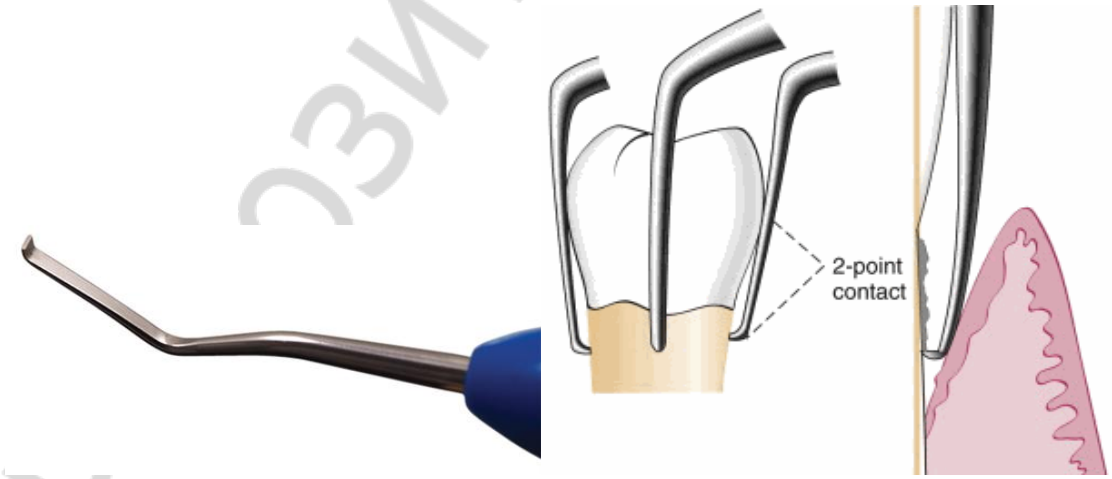


Figure 6. Hoe scaler

CHISEL SCALERS (figure 7) designed for the proximal surfaces of teeth too closely spaced to permit the use of other scalers. It is usually used in the anterior part of the mouth. It is a double-ended instrument with a curved shank at one end

and a straight shank at the other. The chisel is inserted from the facial surface. The slight curve of the blade makes it possible to stabilize it against the proximal surface, whereas the cutting edge engages the calculus without nicking the tooth. Instrument is activated with a push motion while the side of the blade is held firmly against the root.

Figure 7. Chisel scaler

FILES have a series of blades on a base (figure 8).

Their primary function is to fracture or crush large deposits of tenacious calculus or burnished sheets of calculus. Files can easily gouge and roughen root surfaces when used improperly. Therefore they are not suitable for fine scaling and root planing. Mini-bladed curettes are currently preferred for fine scaling in areas where files were once used. Sometimes may be used for removing overhanging margins of dental restorations.

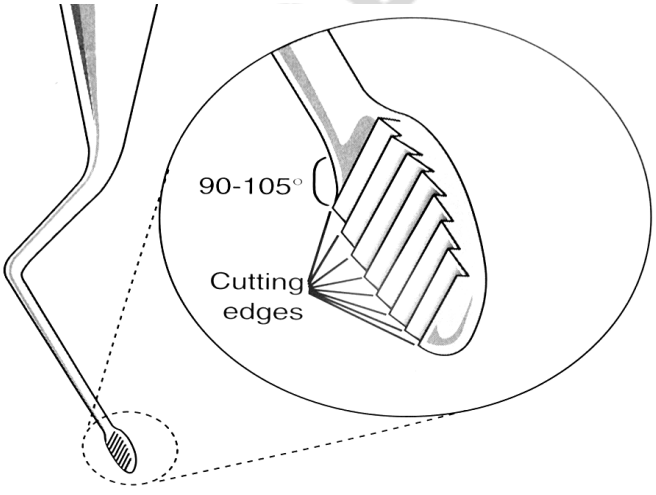


Figure 8. File scaler

Hoe, chisel and file scaler are used to remove tenacious calculus and altered cementum.

DIAMOND COATED FILES (figure 9) are also used to roughen the surface of burnished calculus deposits to facilitate removal of deposits with a curet. They can easily gouge and roughen root surfaces when used improperly. Thus not suitable for fine scaling and root planing.

Figure 9. Diamond coated files

All curettes share the same common elements:
- Rounded back;
- Rounded toe;
- Semi-circular cross section.

UNIVERSAL CURETTES are designed for easy adaptation on all tooth surfaces (thus the name «universal). The blade of a universal curette has a round toe and back, and two cutting edges for scaling, making it an efficient design for scaling the entire mouth (figure 10).

Figure 10. Universal curette

The blade is correctly adapted when the toe is directed interproximally and the terminal shank is parallel to the tooth. To remove deposits, the cutting edge is applied to the tooth surface and the facial surface of the blade is tilted toward the tooth to achieve a 70–85° angle between the tooth and the blade. Apply lateral pressure against the tooth and pull upward while maintaining contact with the tooth (figure 11, 12).

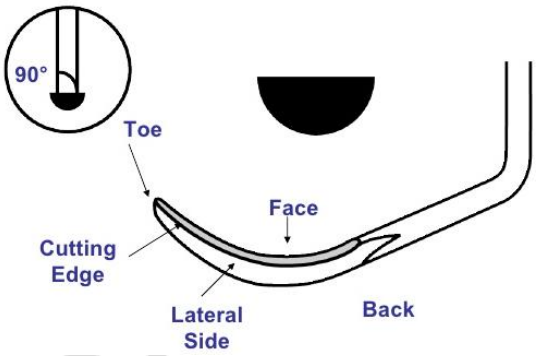


Figure 11. Universal curette

Figure 12. Universal Instrumentation

Anterior Universal. To scale the facial surfaces, place the toe of the blade toward the proximal surface with the handle parallel to the tooth. Apply strokes to remove deposits from the midline of the tooth to the proximal surface. Work from

canine to canine. Switch working ends and repeat for surfaces away from you (figure 13). Repeat all of the above for the lingual surfaces.

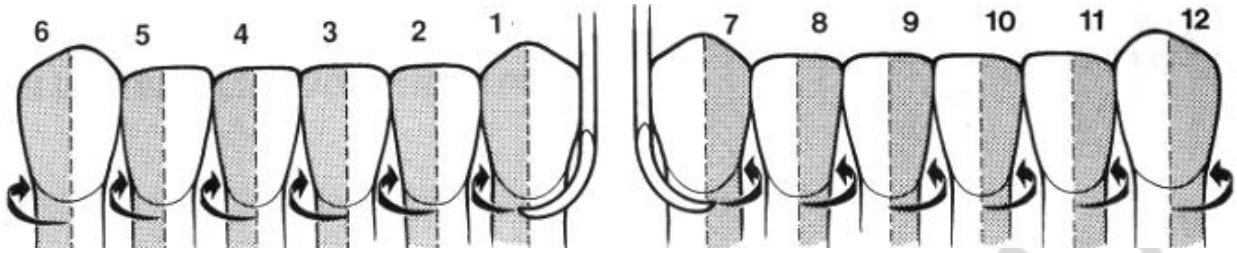


Figure 13. Anterior Universal Instrumentation Sequence

Posterior Universal. Begin at the distal line angle of the most posterior tooth. Direct the toe of the blade toward the distal with the terminal shank angled slightly toward the tooth. Apply strokes from the line angle to the contact area. Next, turn the toe toward the mesial to scale the buccal and mesial surfaces. Continue this sequence to complete the posterior region (figure 14). Switch ends and repeat from the lingual aspect.

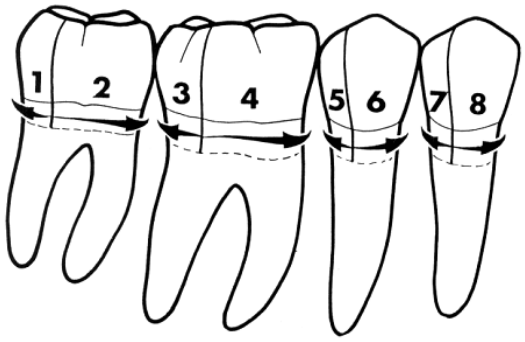


Figure 14. Posterior Universal Instrumentation Sequence

AREA SPECIFIC CURETTES. The original Gracey series was developed in the 1930's by Dr. Clayton Gracey, a periodontist at the University of Michigan. They were designed to provide better access to root surfaces in deep pockets. They feature long shanks and unique blades, some with bends improving access to complex root surface morphology. The original series contained 7 double ended instruments (1/2; 3/4; 5/6; 7/8; 9/10; 11/12; 13/14). In the 1980's, 2 modified instruments were added to the collection (15/16; 17/18) (figure 15, 16).

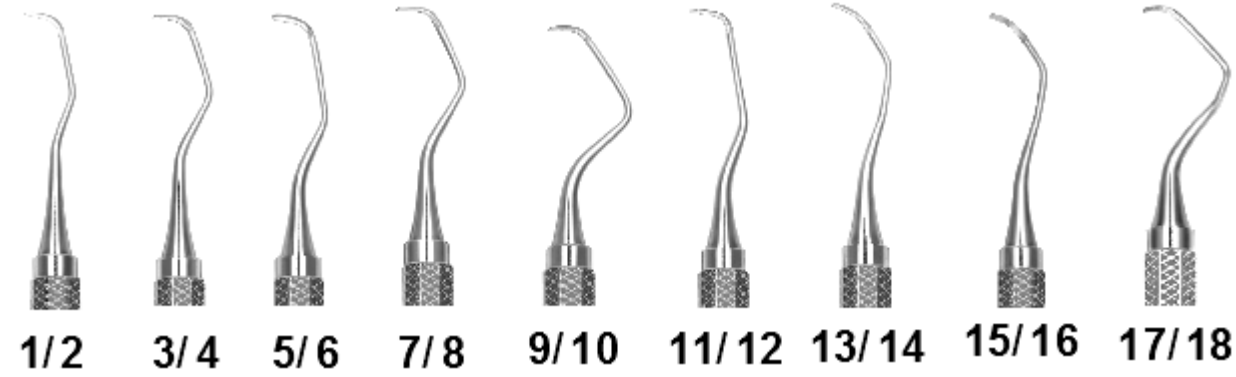


Figure 15. Gracey curette

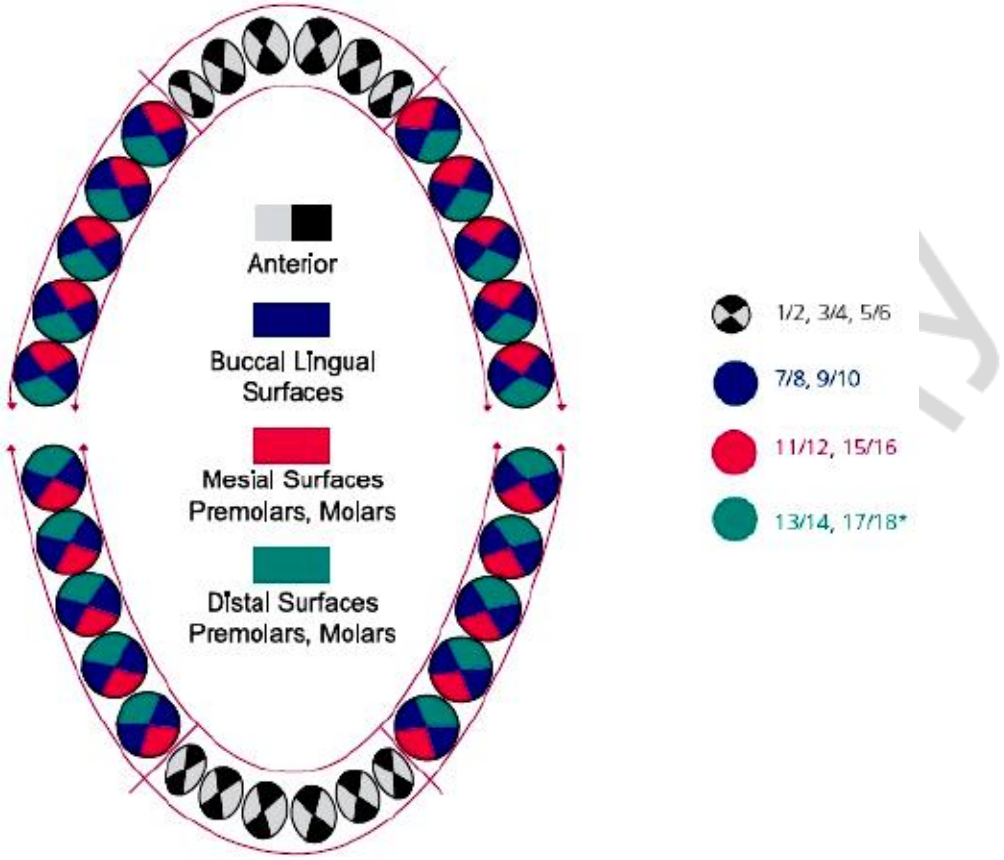


Figure 16. Gracey instrumentation

Gracey curettes 1/2, 3/4, and 5/6 are used to scale all tooth surfaces in the anterior sextants. 7/8 and 9/10 are used for scaling the buccal and lingual aspects of teeth in the posterior sextants. 11/12 and the 15/16 are used to scale the mesial aspects of the teeth in the posterior sextant. 13/14 and 17/18 are used to scale the distal aspects.

Gracey curettes are available in stainless steel or in carbon steel. Carbon steel requires more care as it rusts very easily and also wears away more quickly.

Instruments can come in the form of a solid one piece instrument (usually stainless steel) or as a cone socket instrument (usually carbon steel). With the cone socket instrument, shank and blade can be unscrewed and replaced.

The design of the Gracey curettes is unique in that each end had only one cutting edge. It can adapt closely to the specific tooth surface for which it is intended. The cutting or useable edge of the blade is the lower outer aspect of the blade. It can be identified by holding the terminal shank of the end in question, blade side lower, in a vertical position and viewing the blade portion head on. The blade of the curette is machined at a 70 degree angle and the cutting edge exhibits a curve, which is longer or convex in relation to the «non-working» edge (figure 17). When adapting the Gracey instruments to the teeth to perform scaling, the cutting edge must first be identified and placed against the surface to be scaled and the terminal shank should be parallel to that surface. In this position, the ideal working angulation for calculus removal is achieved.

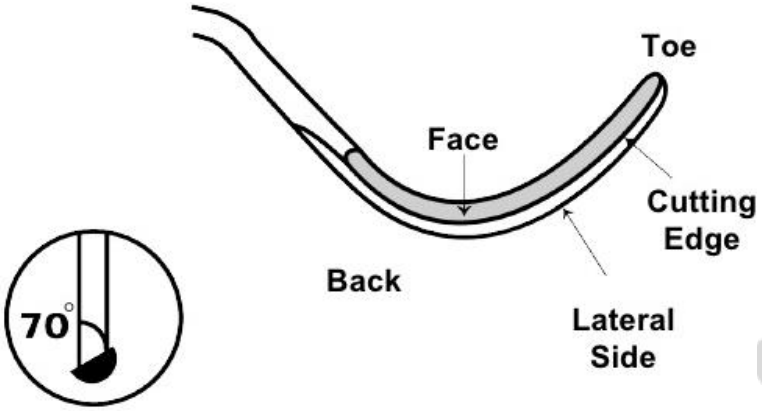


Figure 17. Gracey curette

Gracey Curettes are available in: Standard, Rigid, After Five, Mini Five.

All Gracey designs are available with a wider taper — **rigid** shank. The rigid shank may be preferred for heavier calculus removal. Although the shank is wider, the blade width is the same as the standard Gracey (figure 18).

Finishing design has thinner shank, more flexible, enhanced tactile sensitivity, used to finish root planing.

After Five® Gracey Curettes designed for instrumentation in deeper periodontal pockets. The terminal shank is elongated 3mm to provide better clearance around crowns, and superior access to root contours and pockets 5mm or more in depth. Blade thinned by 10 % to ease gingival insertion and reduce tissue distention (figure 19).

Mini Five® Curettes designed with the same elongated terminal shank and thinned blades as the After Five Gracey Curettes. 50 % shorter blade for access to smaller roots, narrow pockets, furcations, and developmental grooves (figure 19).

Figure 18. Different width of shank

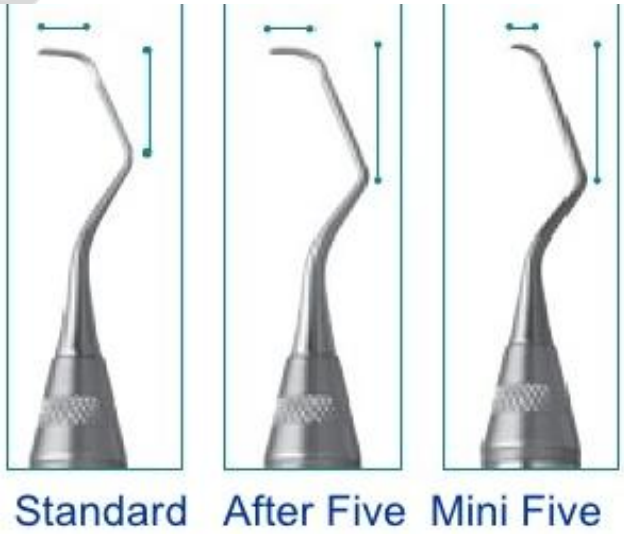


Figure 19. Gracey curette comparisons

Double Gracey™ instruments, the latest innovation from American Eagle Instruments, are a line of instruments that combine two instruments in one. This allows the operator to follow the Gracey technique, but with the economy of using

universal curettes. The face of Double Gracey™ instruments are raised, thus creating two slightly sloped faces, approximately 110 degrees, measured from the terminal (lower) shank (figure 20). This:

– allows the clinician to stay in one ergonomic position during scaling without shifting positions:

– allows clinician to keep lower shank parallel to tooth surface (axis), similar to traditional Gracey instrumentation;

– maneuver between mesial and distal surfaces without switching or flipping instruments;

– enables clinician to scale from light to heavy calculus;

– rounded toe provides safe access for subgingival scaling.

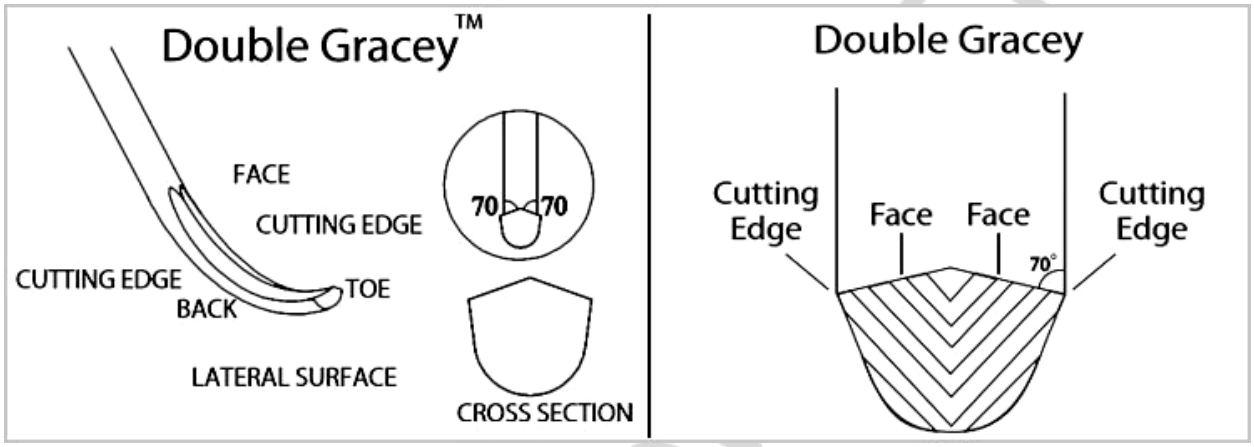


Figure 20. Double Gracey

Double Gracey Mini are used for deeper pockets in the same manner (figure 21).

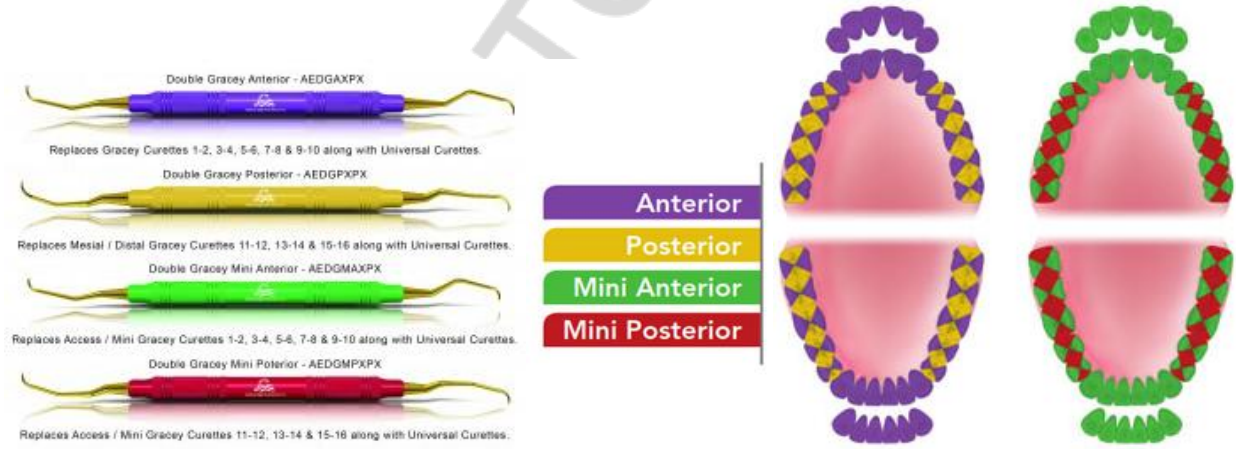


Figure 21. American Eagle Double Gracey Curettes Anterior/posterior with XP Technology

XP technology. The unique characteristics of XP Technology produce a razor sharp edge, that starts sharp and stays sharper longer than any other stainless or carbon steel instrument available on the market (figure 22). XP Technology instruments are the only sharpen free instruments in the world.

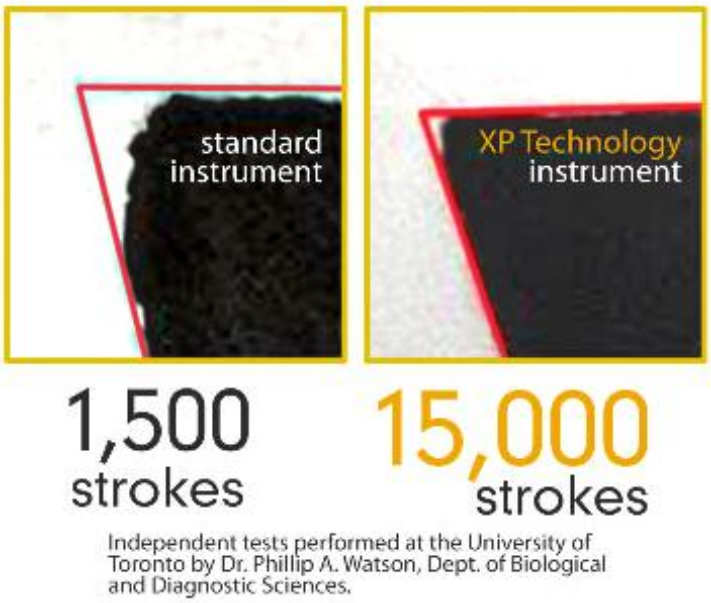


Figure 22. The Sharpest Factory Edge, Ever

These instruments have thinner Blade Design. When you get a standard stainless steel instrument, the blade is very thick to account for the sharpening it will require over time. Since XP instruments are sharpen free, they are thinner than stainless or carbon steel blades. This allows for easier access of periodontal pockets and interproximal areas for enhanced patient comfort.

More comfort, less fatigue. An instrument that is always super-sharp gives you superior tactile sensitivity, requiring a much lighter grasp. Only a slight amount of pressure is needed to slightly «plane» away calculus and tartar.

They save your time and money. When used properly, an XP instrument will outlast any standard instrument, which saves you money. By eliminating the need for sharpening, your time can be used more productively.

What makes XP instruments different from standard stainless or carbon instruments? The XP instruments undergo a patented process that hardens the stainless steel, and then encapsulates the steel with a diamond-like layer. This makes an edge that will last months without sharpening. The stroke test shows that XP Technology handles 10 times the strokes with only 1/10th the wear.

There are XP Care Recommendations for complete use and care instructions. Avoid using solutions that contain Chloride, Chlorine, Sodium and Fluoride.

XP Technology has eliminated the need to apply excess pressure. You will be able to use less force and a lighter grip. You should also avoid using them to trim margins and remove overhangs.

The XP instruments have a very fine, sharp and smooth edge that is designed to more efficiently root plane. This is why you must take care not to abuse the edge on margins, overhangs, or by burnishing difficult calculus. Let the XP do the work for you.

You will want to slightly alter your scaling technique and take nice and easy «exploratory scaling» strokes. Since the edge is much sharper and harder than traditional instruments, the blade will do all the work and slice through calculus.

Since the blade is so sharp, you will find you can hold the instrument with a lighter grasp while you scale and root plane.

Due to a thinner blade design, manufacturer does not recommend that you sharpen your XP instrument. When they become dull, manufacturer recommends purchasing a new one.

The time and effort you currently spend sharpening can be used to treat more patients, or do other professional work.

The industry has started to recognize that a larger-diameter, lighter-weight handle has many advantages. XP instruments from American Eagle allow for a larger handle, lighter grip and less pressure during procedures. These combined benefits can help reduce the risk of repetitive movement injuries (carpal tunnel syndrome).

Depending on frequency of use, you can expect your XP instruments to last about as long as your current stainless steel instruments, when they are used and cared for correctly.

EverEdge Technology Scalers & Curettes. EverEdge Technology is state-of-the-art technology in metallurgy, heat treatment and cryogenics to create a superior stainless steel alloy for scalers and curettes that stay sharper longer than any instrument you've used. That means less frequent sharpening, less hand fatigue, and greater comfort throughout the day. The improved sharpness of EverEdge instruments does not come from a superficial coating — the long-lasting wear is present throughout the entire instrument tip. Revolutionary new stainless steel alloy is super-durable to stay sharper longer. That means less time sharpening and less hand fatigue. Proprietary heat treatment and cryogenic processing ensure that the superior edge retention and wear characteristics of EverEdge Technology will last the entire life of the instrument. It's not a superficial coating — EverEdge scalers can be sharpened again and again for your best instrument value. Unique diamond knurl pattern with large diameter handle for a confident grasp. Optimal weight for reduced hand fatigue. The cushioned grip provides a smooth transition and increased comfort.

Curvette. The curvettes are modification of Gracey curettes (figure 23).

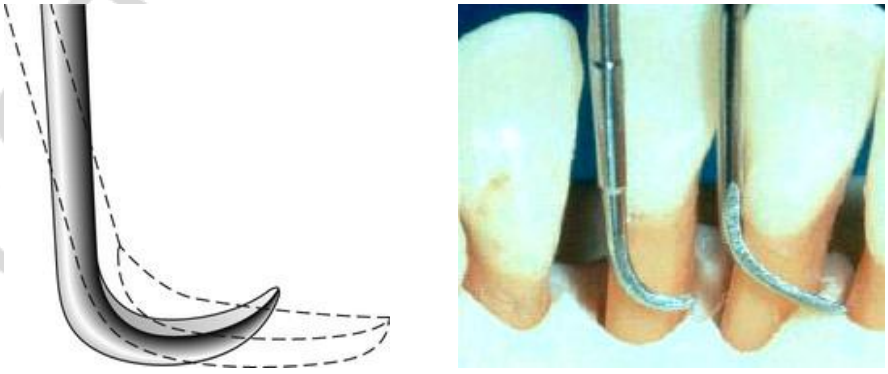


Figure 23. Comparison of curvettes and Gracey curettes

These modifications include:

- 50 % shorter blade;
- Increased blade curvature;
- Straighter terminal shank;
- Longer terminal shank.

There are plenty modifications of periodontal instruments.

Plastic and titanium instruments for implants. Several different companies are manufacturing plastic and titanium instruments for use on titanium and other implant abutment materials (figure 24). It is important that plastic or titanium instruments be used to avoid scarring and permanent damage to the implants.

a ***b*** ***c***

Figure 24. Instruments for implants:
a — Plastic probe: Colorvue (Hu-Friedy, Chicago); *b* — Titanium instruments; *c* — Implacare implant instruments (Hu-Friedy, Chicago)

These implant instruments have autoclavable stainless steel handles and three different cone-socket plastic tip designs.

PERIODONTAL INSTRUMENTATION

Main principles of periodontal instrumentation are:

- accessibility: positioning of patient and operator;
- visibility, illumination and retraction;
- condition and sharpness of instrument;
- maintaining a clean field;
- instrument stabilization;
- instrument activation.

Accessibility facilitates thoroughness of instrumentation. Position of patient and operator should provide maximal accessibility. Inadequate accessibility impedes through instrumentation, prematurely tired the operator diminishes effectiveness of clinician. Clinician should be seated comfortablely on a operating stool, so that clinician's feet are on the floor with the tights to the floor; be in

a straight and head erect position. Patient should be in supine position and placed so that the mouth close to the resting elbow of the clinician. For the instrumentation of the maxillary arch, the patients chin should be rise slightly; for mandibular arch, lower chin until mandible in parallel to floor.

Visibility, illumination and retraction. It should be direct vision with direct illumination from dental light. For indirection vision use mouth mirror. Retraction provides visibility, accessibility and illumination. Mirror also used for retraction cheeks or tongue. Index finger is used for retraction of the lip.

Condition and sharpness of instrument. Make sure that instruments are clean, sterile and in good condition. Working end must be sharp to be effective. Sharp instruments enhance tactile sensivity and allow the clinician to work more precisely.

Maintaining a clean field. Instrumentation can be hampered if the operative field in obscured by saliva, blood and debris.

Instrument stabilization include instrument grasp, finger rest, fulcrum.

Grasp. The firm but light hold a dental clinician has on their instruments is referred to as «grasp». A proper grasp enables the clinician to maneuver the instrument around the tooth and correctly direct pressure application for calculus removal without damaging the periodontal tissues. Four specific grasps are used. They are:

- standart pen grasp (figure 25);
- modified pen grasp (figure 26);
- inverted pen grasp;
- palm-thumb grasp;
- modified palm-thumb grasp.

Figure 25. Standart pen grasp

Figure 26. Modified pen grasp

Standart pen grasp ensures the greatest control. Modified pen grasp is more effective and stable grasp. The modified pen grasp is the most useful. Pads of thumb, index, and middle fingers contact the instrument, while the tip of the fingers is placed on a nearby tooth of the same arch as rest. Palm generally is facing away from the operator.

Inverted pen grasp — finger position same that of the modified pen grasp. However hand is rotated so that the palm faces more towards the operator. Used mostly for lingual approach of the anteriors.

Palm-thumb grasp. Handle is placed in the palm and grasped by all the fingers, while thumb is free and the rest is provided by supporting the tip of the thumb on a nearby tooth of the same arch or on firm stable structure. Palm and thumb grasp useful for stabilizing instruments during sharpening for manipulating air and water syringe.

Modified palm-thumb grasp — handle of the instrument is held by all the fingers whose pads press the handle against the distal area of the palm and the pad and first joint of the thumb. This grip fosters control against slipage.

Types of fulcrum. There are:

– Conventional finger rest is established on tooth surface immediately adjacent to working area (figure 27);

– Cross arch finger rest is established on teeth surface on the other side of the same arch (figure 28);

– Opposite arch finger rest is established tooth surface on the opposite arch (figure 29);

– Finger on finger rest is established on the index finger or thumb of the nonoperating hand (figure 30);

– Extraoral fulcrum (figure 31, 32).

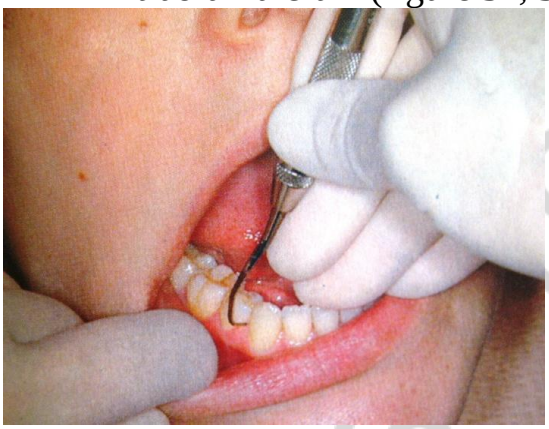


Figure 27. Conventional finger rest

Figure 28. Cross arch finger rest

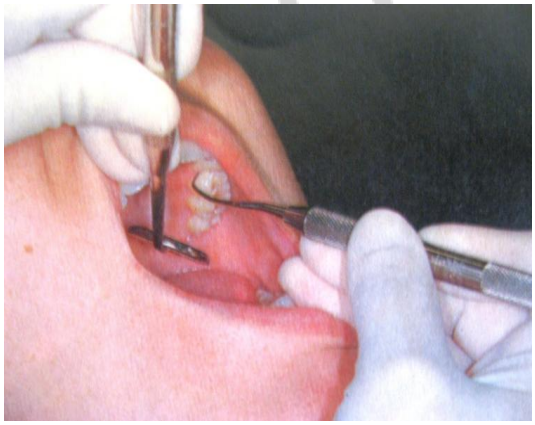


Figure 29. Opposite arch finger rest

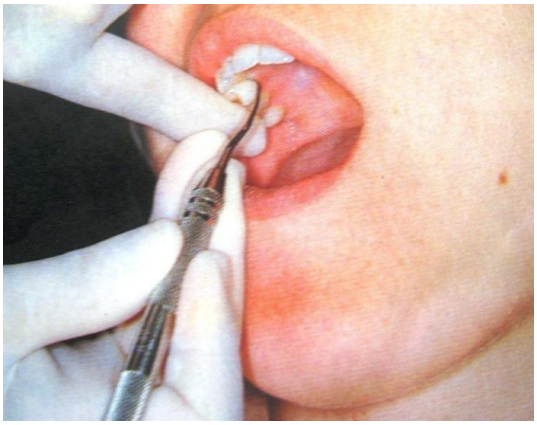


Figure 30. Finger on finger rest

Extraoral fulcrum is used for effective instrumentation of some aspects of the maxillary posterior teeth.

Palm up: fulcrum is established by resting the backs of the middle and fours finger on the skin overlying the lateral aspects of the mandible on the right side of the side (figure 31).

Palm down: fulcrum is established by resting the front surface of the middle and fours finger on the skin overlying the lateral aspects of the mandible on the left side of the side (figure 32).

Index finger reinforced rest (figure 33) and thumb reinforced rest (figure 34) also are used by clinician.

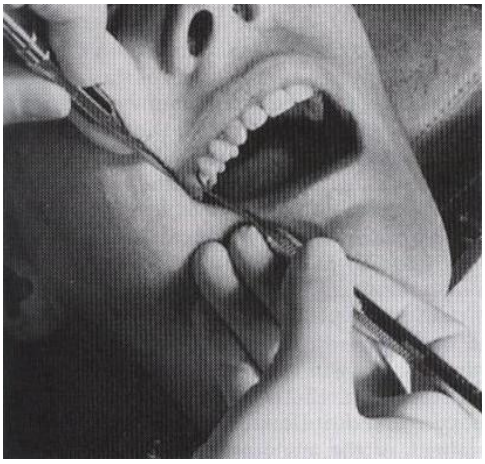


Figure 31. Palm up

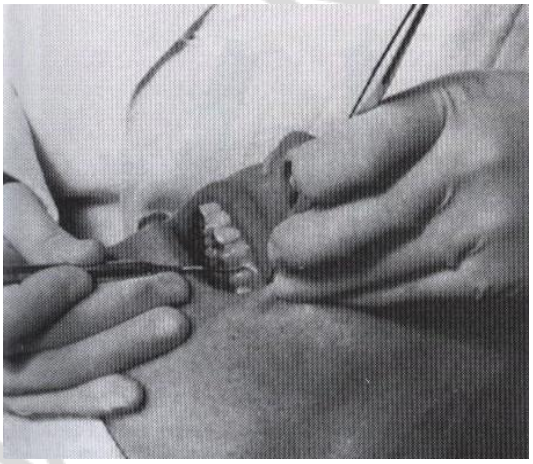


Figure 32. Palm down

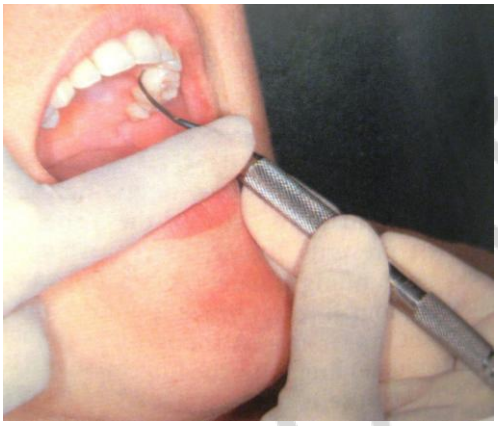


Figure 33. Index finger reinforced rest

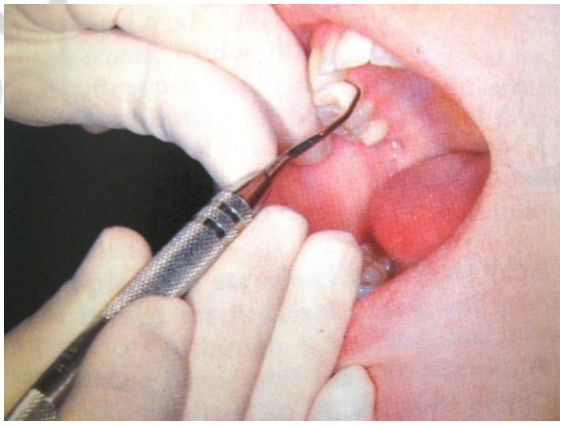


Figure 34. Thumb reinforced rest

Instrument activation. Adaptation refers to the manner in which the working end of the instrument is placed against the tooth. The working end of the instrument should be in the correct relationship to the tooth.

Angulation refers to the angle between the face of a bladed instrument and the tooth surface (also called tooth-blade relationship. Efficient cutting angulation is between 45° and 90°, and 70° degrees is considered ideal. Less than 45° degrees is considered «closed» and more than 90 degrees is considered «open» (figure 35). To avoid damaging the soft tissues when entering the sulcus with a large, sharp instrument, the working end is inserted into the sulcus with the face of the blade

«closed» or flattened to the tooth surface (figure). Once in the depth of the pocket or sulcus, the blade is opened 45 to 90 degrees for working strokes.

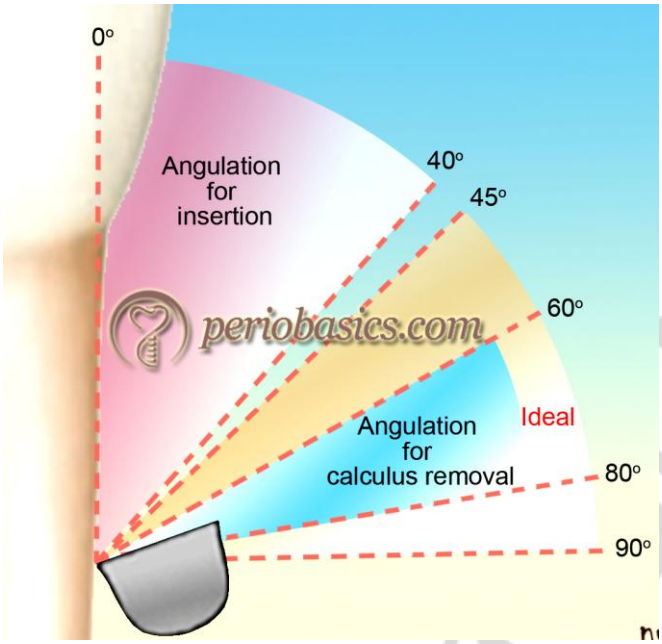
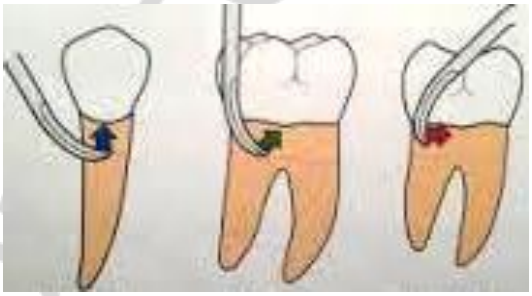


Figure 35. Angulation of instrument

Lateral pressure refers to the pressure created when force is applied against the surface of the teeth with the cutting edge of a bladed instrument. May be firm, moderate, or light. Uncontrolled application of heavy forces should be avoided.

There are three types strokes: exploratory, scaling, and root planing. Any of these strokes may be activated by pull of push motion in vertical, oblique or horizontal direction (figure 36).



Vertical direction | Oblique direction | Horisontal direction

Figure 36. Direction of the strokes

Exploratory strokes are light feeling strokes used with probes and explorers to evaluate the dimension of pocket and to detect calculus and irregularities on tooth surface.

Scaling strokes are short powerful pull strokes used with bladed instruments for removal of both subgingival and supragingival calculus. Scaling motion should be initiated in the forearm and transmitted to the wrist to the hand with slight flexion of fingers. Push scaling motion is rarely used.

Root planing stroke — moderate to light pull stroke used for final smoothening and planing of the root surface. Hoes, files, curettes and ultrasonic instruments can be used.

Wrist and Arm Motion. The instrument/wrist/ forearm complex must act as a unit rocking firmly but smoothly on the fulcrum. Wrist twisting or independent finger movement should be avoided. This would result in pain, muscle fatigue, and inflammation of the ligaments and nerves of the wrist.

SHARPENING OF HAND INSTRUMENTS

Sharpening hand instruments requires because instruments with dull cutting edge cause more pain, prolong operating time, more difficult to control, reduce quality in tooth preparation.

Mounted rotary stones are mounted on a metal mandrill, have cylindrical, conical or disc shape. They are difficult to control, create heat, tend to wear the instrument easily.

Unmounted stones are rectangular, cylindrical or cone shaped. Either instrument stabilized and stone drawn across it or stone stabilized and instrument drawn across stone. Stationary sharpening stones (oilstones) available in coarse, medium and fine grit. Commonly used stones are: Arkansas, India stone, silicon carbide, aluminium oxide, ceramic, and diamond.

Silicon carbide widely used as an industrial abrasive. Hard enough to cut steel but not to sharpen carbide instruments.

Instrument Sharpening Kit (figure 37) includes a #4 Flat Arkansas Stone, a #299 Conical Arkansas Stone, Plastic Test Sticks (5), Sharpen-EZ Stone Oil, and a Magnifying Lens. Medical-grade oil floats away metal particles, prevents damaging build-up on stone, and decreases friction heat. Plastic magnifying lens with case used to evaluate condition of instrument blades before and after sharpening. Hard Plastic Test Stick used to determine the sharpness of an instrument.

a ***b***

Figure 37. Instrument sharpening adaptations:
a — instrument sharpening kit; *b* — technique to evaluate sharpness of instrument

Technique. Thin film of light oil should be placed on working surface. Grasp the instruments with modified pen grasp. Use light stroke. Establish proper 45 degree angle of the bevel and the cutting edge of the stone. Sharpen instruments only after they have been clean and sterilized. After sharpening, resterilize the instrument. Keep sharpening stones clean.

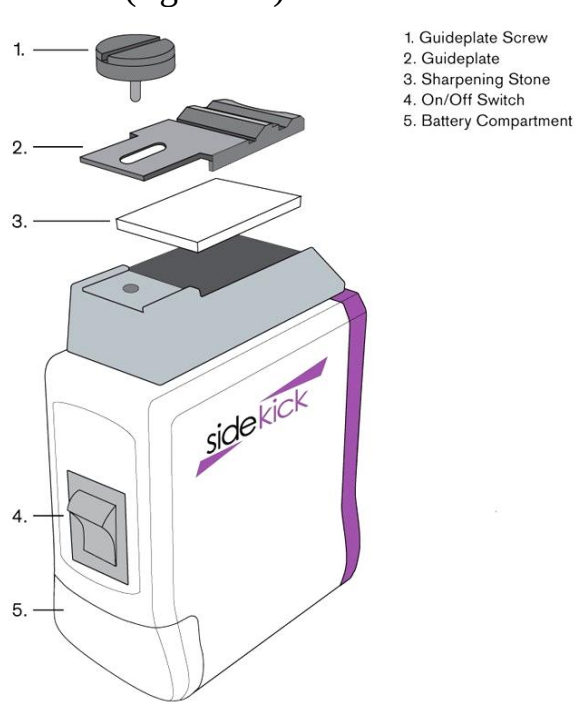
Sharpening stones are manufactured in a wide range of shapes and materials. However, it appears that the dental supply houses only stock a very limited range, and therefore you may feel that your choice is restricted to those few. It is important to use a stone that is large enough for you to secure a firm grip, to reduce the chance of accidental slippage and trauma to your fingers during sharpening. Recommended stones for sharpening both Gracey and Universal style curettes include:

1. No 6. India wedge shape (SS6) (Hu-Friedy) 4 1/2" x 1 7/8" x 3/8" down to 1/8" thick. This stone is good for sharpening up extremely dull instruments, but is too coarse for everyday maintenance of your curettes.

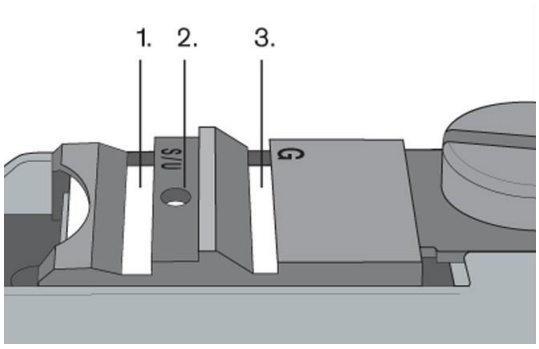
2. No 6A. Arkansas wedge shape (SSG6A) (Hu-Friedy) 4" x 1 7/8" x 3/8' – 1/8". This stone is made for a finer grit material, and is suitable for regular sharpening of curettes.

3. No 299. Arkansas Conical (SS299) (Hu-Friedy) 3 1/2" x 5/16" base. This is a hard stone with a super-fine grit. Suitable for sharpening the facial surfaces of curettes.

There are special instrument sharpening devices. The Hu-Friedy Sidekick™ Sharpener makes routine maintenance sharpening fast and easy. This straightforward device guides you and your scaler to sharp, consistent results time after time (figure 38).



1. Guideplate Screw
2. Guideplate
3. Sharpening Stone
4. On/Off Switch
5. Battery Compartment



1 — **S/U channel** — for sickle scalers and universal curettes; 2 — **Toe guide** — for gracey curettes and universal curettes; 3 — **G channel** —— for gracey curettes

a ***b***

Figure 38. a — Sidekick sharpener; *b* — Scheme of sharpening part

Instrument Guide Channels and Vertical Backstops are «template like» guides that help control blade angulation, providing consistent results.

Reciprocating stone provides for efficient sharpening.

The ceramic stone requires no oil to help keep a clean working environment.

Easy to use — can be used by any trained staff.

The vertical backstop supports the back of the instrument blade while the terminal shank guide provides the resting support for the terminal shank of the instrument.

The toe guide is used for both Gracey and Universal Curettes.

Stones (ceramic or arcansas) as additional parts and accessories may be purchased separately. It is fully sterilizable.

Principles of sharpening:

1. Learn how to detect a blunt instrument. With experience, you can judge when to resharpen an instrument during root-planing through tactile feedback. A dull cutting edge will require the use of greater lateral forces against the root, and will crush or burnish the calculus rather than removing it cleanly. A visual cue to an instrument's sharpness is that a dull instrument will reflect light along the line of it's cutting edge, whereas a sharp cutting edge will not reflect light. Sharpen at the first sign of dullness. Detection of a dull instrument:

- visibility of a reflection off the cutting edge. Sharp edge not reflect light. Dull edge reflect light/ presence of a «glint»;
- obvious irregularities in the cutting edge;
- won't shave thumb nail;
- won't cut tooth structure.

2. Understand the design of your periodontal instrument. It is important to retain the curvature of the blade and the angle of the cutting edge. The angle between the face of the blade and the lateral surface of any curette is 70–80 degrees. The best way to judge this angle is to place the sharpening stone to the lateral surface of the curette so that the angle between the face of the blade and the stone is 90 degrees. Next, open this angle 10–20 degrees by rotating the stone laterally (figure 39).

3. Maintain this angle during sharpening. Using short up and down strokes with consistent light pressure, sharpen the entire blade from shank end to toe. When approaching the toe, sharpen around it to prevent it from becoming pointed.

4. Only the cutting edge of Gracey curettes should be sharpened. The curvature of the cutting edge of the Gracey curette blade from shank to toe needs to be preserved during sharpening. If the stone is kept in one place for too many strokes, the blade will be flattened. This can be avoided by turning the stone slowly as you sharpen with up and down strokes.

5. Avoid excessive pressure that will lead to unnecessary shortening of the life of the instrument.

6. Avoid formation of a «tvire edge», which occurs when the direction of the sharpening stroke is away from, rather than into or towards the cutting edge.

7. The face of the blade can be sharpened using a cone-shaped stone applied to the face of the blade and moved with a side-to-side, back and forth motion. This procedure should be performed infrequently, as it weakens the blade by narrowing it from face to back.

8. Sharpness test. Tested by lightly resting the cutting edge on a hard plastic surface. If it digs in during sliding, the instrument is sharp. If it slides, the instrument is dull.

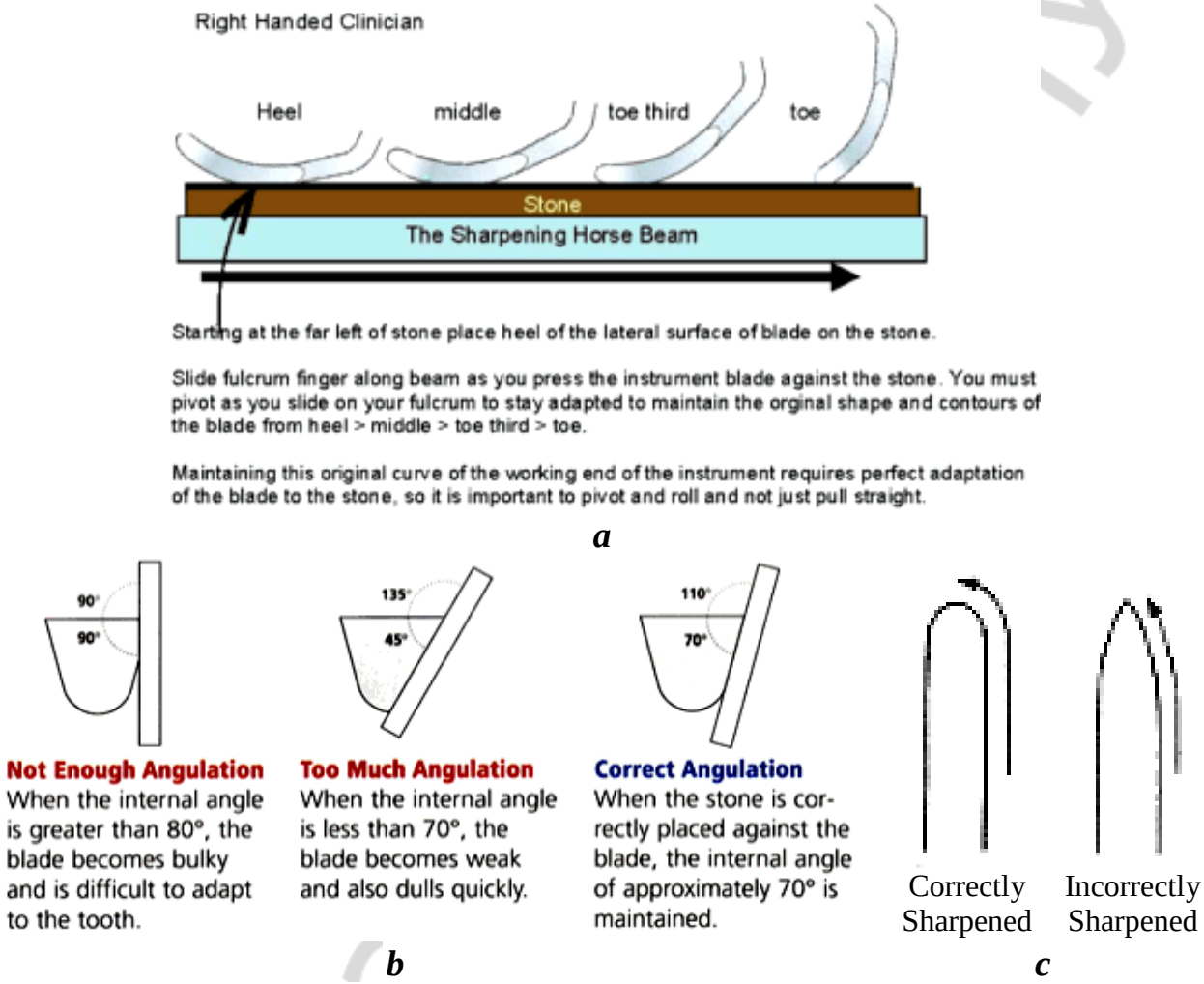


Figure 39. Instrument sharpening:
a — bird's eye view from the beam; *b*, *c* — sharpening mistakes

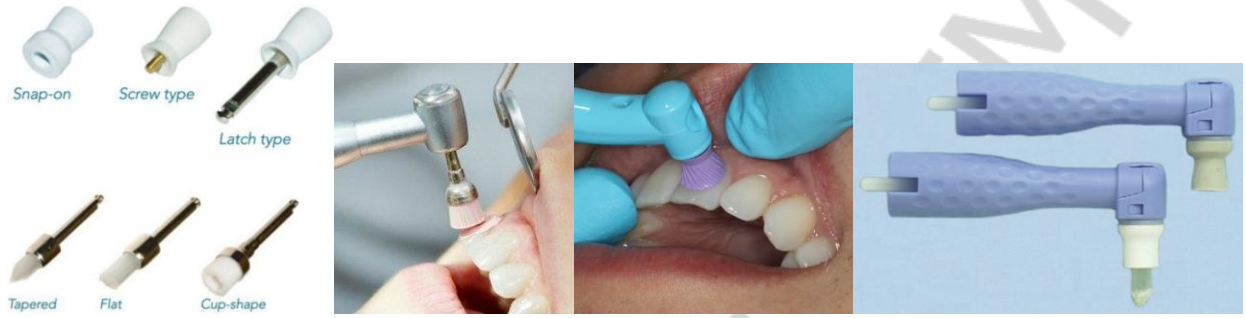
If you need further guidance on sharpening of periodontal instruments, an excellent text is: Pattison G., Pattison A. M. (1992) Periodontal instrumentation — a clinical manual. 2nd edition. Reston Publishing Company, Inc. Virginia, USA.

CLEANSING AND POLISHING INSTRUMENTS

Rubber cups consist of a rubber shell with *or* without webbed configurations in the hollow interior. They are used in the handpiece with a special prophylaxis angle. The handpiece, prophylaxis angle, and rubber cup must be sterilized after each patient use, or a disposable plastic prophylaxis angle and rubber cup may be used and then discarded (figure 40, *d*).

A good cleansing and polishing paste that contains fluoride should be used and kept moist to minimize frictional heat as the cup revolves. Polishing pastes are available in fine, medium, or coarse grits and are packaged in small, convenient, single-use containers. Aggressive use of the rubber cup with any abrasive may remove the layer of cementum, which is thin in the cervical area.

Bristle Brushes. Bristle brushes are available in wheel and cup shapes. The brush is used in the prophylaxis angle with a polishing paste. Since the bristles are stiff, use of the brush should be confined to the crown to avoid injuring the cementum and the gingiva (figure 40).

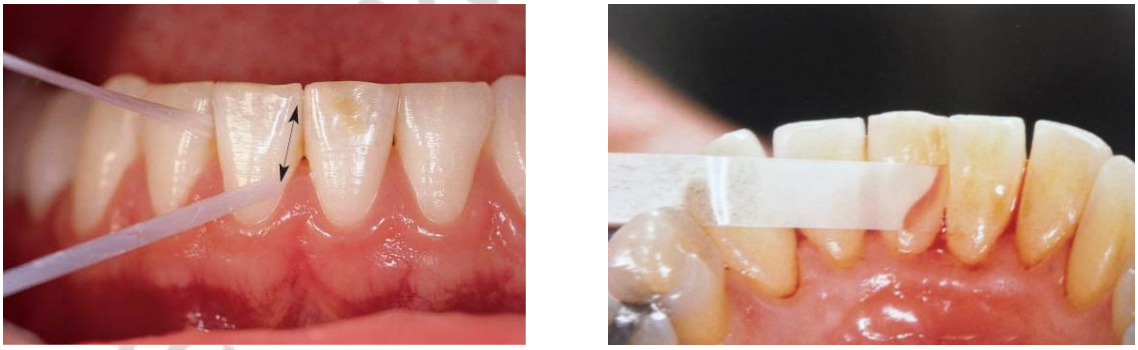


a ***b*** ***c*** ***d***

Figure 40. Bristle brushes and rubber cup:
a, *b* — Bristle brushes; *a*, *c* — Rubber cup; *d* — Disposable plastic prophylaxis angle with rubber cup and with brush

Dental Tape with polishing paste is used for polishing proximal surfaces that are inaccessible to other polishing instruments. The tape is passed interproximally while being kept at a right angle to the long axis of the tooth and is activated with a firm labiolingual motion. Particular care is taken to avoid injury to the gingiva. The area should be cleansed with warm water to remove all remnants of paste (figure 41, *A*).

Strips can be used for polishing proximal surfaces (figure 41, *b*).



a ***b***

Figure 41. Polishing proximal surfaces:
a — dental tape; *b* — strips

MECHANIC METHOD OF DENTAL DEPOSIT REMOVAL

Instruments for mechanical root planing and overhung restoration edges removal are used in handpieces with reciprocal movement. Reducing handpieces (2:1) make reciprocating movement with amplitude 0.4 or 1.2 mm. Inserts may be fixed in bushing in twelve positions with step 30°. When sonic, ultrasonic, and reciprocating scaling instruments were compared for calculus removal, the reciprocating inserts gave similar results to the ultrasonic instruments.

PROFIN

The Profin® Reciprocating System (figure 42) is the instrument of choice for shaping, contouring and polishing natural dentition and cosmetic restorations with easy access and flexibility. It is also the perfect instrument to remove bulk, interproximal (figure 43) and subgingival residual bonding materials in all parts of the dental arch.

Figure 42. Profin® Reciprocating System

Figure 43. Removal overhanging edges of restorations

The system comprises a choice of contra/angles and the flat Lamineer® diamond tips, which move in a reciprocating axial direction (1.2 mm stroke).

The tips can be set to rotate freely and follow tooth contours naturally, or they can be locked radially for direct and specific modifications. Because they are flat, the tips are also very thin, which allows optimal access. The diamond coating is only on one side for safety and control. They come in a variety of shapes, sizes and grits. Plastic and wooden tips are also available for polishing and burnishing.

The new Profin PDX Contra/Angle for Standard E-fitting has tactile ergonomics, smooth glare-free surface, and a miniature head for even easier access in hard-to-reach areas (figure 44).

Figure 44. Profin PDX Contra/Angle for Standard E-fitting

Profin can be used for:

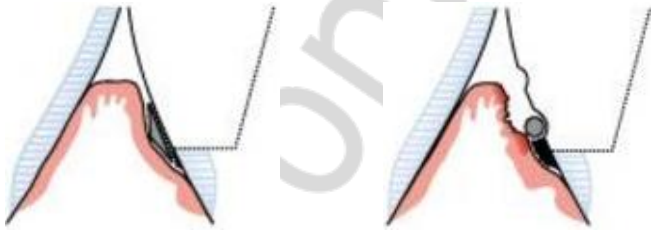
1. **Cosmetic Dentistry.** Touch-ups can be performed safely, allowing you to create anatomical shapes for your patient's esthetics and comfort.

2. **Hygiene.** Profin's gentle mechanical function and reach make it the perfect instrument for dental prophylaxis. Plastic tips are recommended for scrubbing and polishing. V-shaped wings collapse to fit fine interdental spaces.

3. **Orthodontics.** Profin's reciprocating motion allows for easy interproximal reduction with greater control and efficiency. The tungsten Lamineer tip quickly cleans up residual ortho cement without scratching healthy enamel.

4. **Periodontics.** An outstanding concept for scaling, root-planing and debridement, the PER-IO-TOR instruments are specially designed to optimize cleaning and planing of the rough root cementum and prevent further removal once the surface is clean and smooth.

Differences between rotary instruments and Profin (figure 45).



a ***b***

Figure 45. Risk of injury and groove:
a — preparation with Profin; *b* — formation with rotary instruments

The Profin PDH hand instrument enables you to achieve the best manual finishing work in daily use, even in the most inaccessible areas. Profin PDH uses the Lamineer Tips, which can be set at either end of the instrument. At one end, the tip is perpendicular to the instrument, typically for work on posteriors. At the other end, the tip is parallel with the instrument, typically for work on anteriors. The tip may also be set in locked position, typically for controlled material reduction, or it can be set to freely rotate around its axis, typically to follow the tooth contours during fine finishing and polishing (figure 46, 47).

Figure 46. PROFIN PDH

Figure 47. Using Profin PDH hand instrument with Lamineer Tips

PROFINET. For the challenge of interproximal access Profinet with the flat Lamineer Tips may be used, which remove easily overhangs and excess adhesive cement, finish and polish, in interproximal spaces and all around the teeth. Profinet makes work more effective and ensures great esthetic results.

TIPS. The IPR, Lamineer and Eva Tips are offered in a choice of different shapes and grits for many applications unique to the reciprocating Profin® System.

IPR Tips allow interproximal reduction safely and with optimal control: simply choose the tip with the thickness (0.25, 0.3, 0.4 or 0.5 mm) for the prescribed amount of reduction. Like all Profin tips, they are harmless on soft (gingival) tissue. All IPR tips have a grit of 50 microns. Color coding corresponds to the thickness of the blade (figure 48).

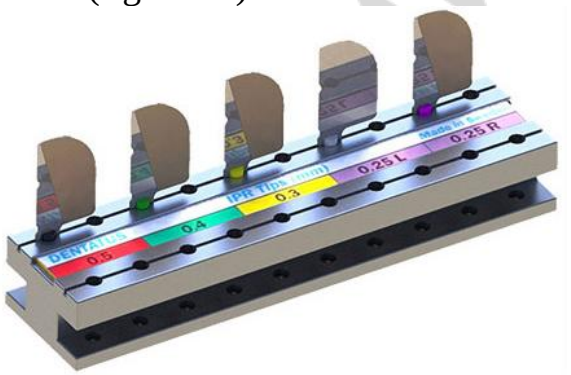


Figure 48. IPR Tips:
LTA-P25R/2: violet shank, safe-sided — abrasive on right side when shank points down and back of tip towards user. Blade thickness 0.25 mm. LTA-P25L/2: violet shank, safe-sided — abrasive on left side when shank points down and back of tip towards user. Blade thickness 0.25 mm. LTA-P3/2: yellow shank. Double sided. Blade thickness 0.3 mm. LTA-P4/2: green shank. Double sided. Blade thickness 0.4 mm. LTA-P5/2: red shank. Double sided. Blade thickness 0.5 mm

Lamineer Tips designed for use with Profin and Profinet, the Diamond Lamineer Tips are safe-sided and do not harm soft (gingival) tissues. They are available in a wide range of color-coded diamond grit sizes, from coarse (150 microns) for gross removal of all restorative materials, to extra-fine (15 microns) for polishing (figure 49, table 1). Wolfram tungsten tips are also available for even finer polishing. This abrasive has the added advantage of not scuffing enamel.

Eva tips are presented in the table 2.

Figure 49. Lamineer Tips

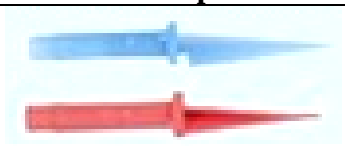
Table 1

Lamineer Tips

Abrasive	Color	Tip	Purpose
Diamond Diamond Diamond Diamond Diamond Diamond Wolfram	Red Green Gold Yellow White Violet Black		For removal of gross overhangs and shaping of all restorative material use tip with large particle size For shaping and polishing all prosthetic materials and enamel For final polishing use tip with small particle size
Diamond Diamond Diamond Diamond Diamond Diamond Wolfram	Red Green Gold Yellow White Violet Black		Same use as above Smaller and thinner tip provide better access to narrow areas and closer to interdental contact points
Diamond Diamond Diamond Diamond	Gold Gold Yellow Yellow		Coated on left or right side For stripping and removal of contact point
Diamond	Yellow		For occlusal and concave surfaces
Diamond	Yellow		For finishing shoulders, bevel etc.
Diamond	Red Green Yellow White		For shaping diverging surfaces and incisial adges
Diamond Diamond	Red Green		For opening incisal and gingival, approximal areas

Table 2

Eva Tips for polishing with polishing paste (disposable plastic and wooden tip)

Abrasive	Color	Tip	Purpose
Plastic	Blue Pink		Apply polishing paste in groove. The groove is pushed together when used approximally. Can be used either fixed or freely rotating
Plastic	Green Blue		Universal tips, only used freely rotating
Wooden			The wooden tip slightly absosbs the paste for long action
Wooden			For vibrating the cement when placing inlays/onlays

PER-IO-TOR

The PER-IO-TOR instruments are specially designed to optimize cleaning and planing of the rough root cementum, and prevent further removal once the surface is clean and smooth. The secret is the unique design of the PER-IO-TOR instruments, which have planing grooves set on a smooth surface (figure 50, table 4, 5).

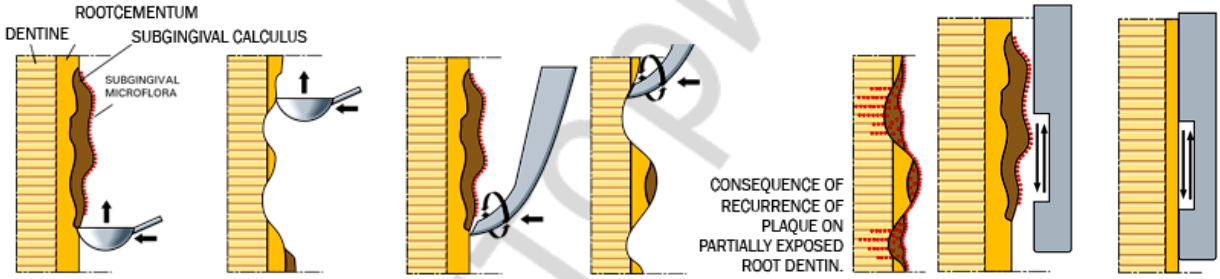


Figure 50. Cleaning and planing of the rough root cementum by PER-IO-TOR

Table 4

PER-IO-TOR for use with Profin reciprocating handpieces

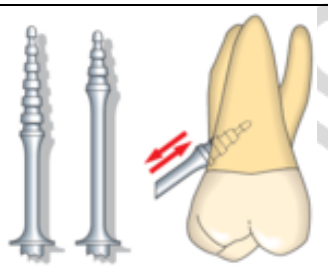
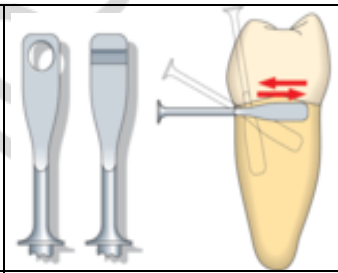
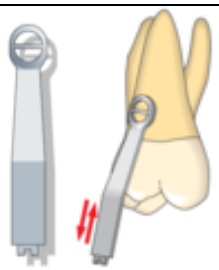
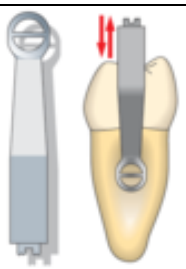
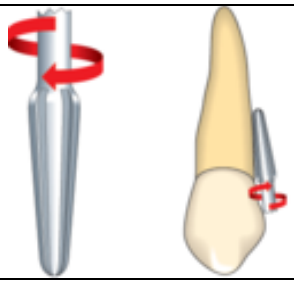
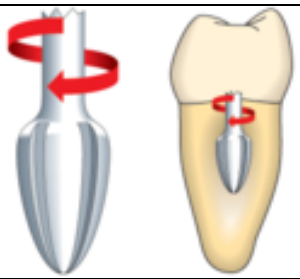
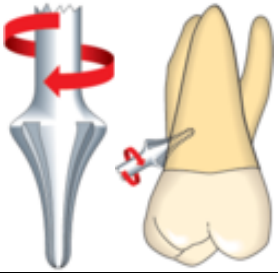
			
PER-IO-TOR 1 and 2 are designed for root grooves and furcation areas.	PER-IO-TOR 3 and 4 should be used on plane and convex approximal surfaces. No 3 is extra thin for very narrow interproximal areas, such as lower anteriors	PER-IO-TOR 5 has a concave working surface for vertical use on convex buccal and lingual surfaces	PER-IO-TOR 6 has a convex working surface for vertical or diagonal use on concave approximal surfaces

Table 5

PER-IO-TOR for use with conventional handpieces

		
PER-IO--TOR 7R is a tapered cone for vertical use on root surfaces and especially in root grooves	PER-IO-TOR 8R is a parabolic cone for use on concave root cavities	PER-IO-TOR 9R is a hyperbolic taper for furcation areas

Recent research has shown that a clean smooth root cementum is of great importance for good healing of periodontal disease and for the regeneration of the periodontal supportive tissue. The root cementum is only between 0.03 and 0.1 mm thick in the coronal third of the root. Therefore 10–20 strokes with a curette or 5–10 rotations with a 15 micron diamond bur may result in the complete removal of the root cementum. This can lead to an invasion of subgingival microflora in the dentinal tubules which may result in an infection of the pulp. Additionally, microflora and their toxins in infected root canals may go the other way, which will lead to disturbances in the healing of the periodontal diseases.

All PER-IO-TOR instruments are made of high quality stainless steel and may be cleaned in ultrasonic baths, in thermal washers/disinfectors and in autoclaves at 135 °C.

PER-IO-TOR 1–4 may be used in all Profin and EVA handpieces.

PER-IO-TOR 5–6 should be used in a Profin handpiece, since these instruments should be used in a locked position.

PER-IO-TOR 7R–9R have a standard rotating right-angle fitting (RA).

Degree of removal: approximately 0.005 mm at 2–3 minutes use until the root cementum is smooth.

All PER-IO-TOR instruments should be used at approximately 10.000 rpm.

The PER-IO-TOR instruments have been developed by Prof. Per Axelsson, Sweden, and are carefully documented.

PARADONTOLOGIC BURS

Paradontologic burs for root treatment have elongate shank and working part of different shape. Different grit allows grind dental calculus (20–40 mcm, red ring), grind and polish treated surface (grinding — 11–22 mcm yellow ring, polishing — 6–12 mcm white ring, figure 51).

Paradontologic burs are used for polishing root surface after removal calculus. Significant shortcoming is inevitable damage of gingiva.

Figure 51. Paradontologic burs «Komet»

AIR-FLOW

Air flow, a first specially designed handpiece to deliver an air-powered slurry of warm water and sodium bicarbonate for polishing, was introduced in the early 1980s. This device, called the Prophy-Jet (Dentsply International, York, PA) is very effective for the removal of extrinsic stains and soft deposits. The slurry removes stains rapidly and efficiently by mechanical abrasion and provides warm water for rinsing and lavage. The flow rate of abrasive cleansing power can be adjusted to increase the amount of powder for heavier stain removal. Studies on the abrasive effect of the air-powder polishing devices using sodium bicarbonate and aluminum trihydroxide on cementum and dentin show that significant tooth substance can be lost. Damage to gingival tissue is transient and insignificant clinically, but amalgam restorations, composite resins, cements, and other nonmetallic materials can be roughened. Polishing powders containing glycine rather than sodium bicarbonate recently have been introduced for subgingival biofilm removal from root surfaces. Air-powder polishing can be used safely on titanium implant surfaces.

The method removes dental plaque and hence:

– helps preventing periodontal diseases such as gingivitis or periodontitis;

– removes teeth stains;

– helps maintain implants sound;

– cleans and opens fissures for sealing;

– cleans prior to bonding orthodontic brackets.

The air-flow method involves projecting a jet of compressed air, water and fine powder particles onto the surface of the tooth to polish the surface and remove debris. Plaque, soft deposits and colorations disappear quickly and painlessly — even from interproximal areas. To combat biofilm, the air-flow system from EMS reaches down to 5 mm pocket depth. For deeper pockets, subgingival air-polishing is granted by EMS's Original PERIO-FLOW® Method. With the new PERIO-FLOW® nozzle and the new AIR-FLOW® Powder PERIO,

the Original AIR-FLOW® Method now reaches the deepest periodontal pockets and delivers greater efficacy and more patient comfort than conventional curettes or other instruments.

The device, which combines piezoelectric scaler and air-flow method, allows simultaneous removal of dental deposit and polishing teeth.

Distance between nozzle and tooth should be 3–5 cm. Nozzle should be directed away from the gingiva, movements should be circular. Ideal angle between nozzle and tooth surface is 30–60° (figure 52). Slurry evacuated via highspeed evacuation by assistant.

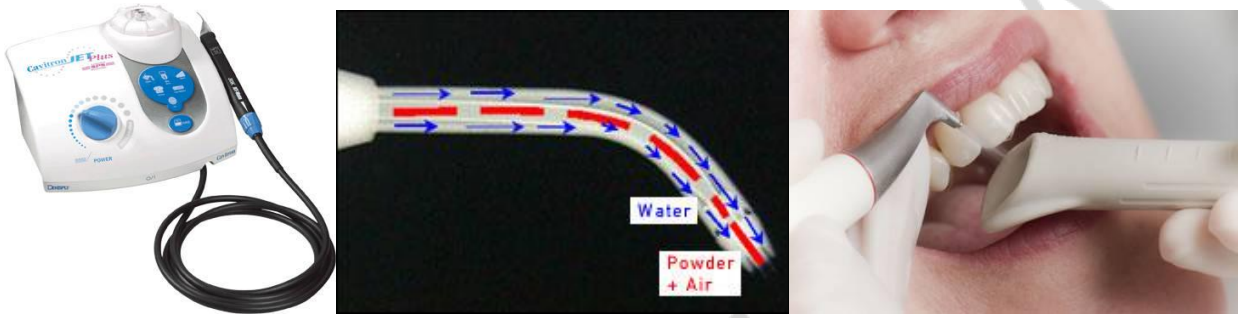


Figure 52. Ultrasonic Scaler and Air Polishing Prophylaxis System

There is cloud of aerosol so eyes protection of patient and staff, respiratory masks and face napkin for patient are needed. Air-flow is recommended for enamel debridement. It is not recommended to polish composite filling, erosions, vedge-shaped defects, area of gingival recession, in case of gingival inflammation.

Contraindications:

1. Patients with medical histories of respiratory illnesses (bronchial asthma) and hemodialysis are not candidates for the use of the air-powder polishing device.
2. Powders containing sodium bicarbonate should not be used on patients with histories of hypertension, sodium-restricted diets, or medications affecting the electrolyte balance.
3. Patients with infectious diseases should not be treated with this device because of the large quantity of aerosol created.
4. Pregnancy.

A preprocedural rinse with 0.2 % chlorhexidine gluconate should be used to minimize the microbial content of the aerosol.

Highspeed evacuation should also be used to eliminate as much of the aerosol as possible.

Powder for this procedure consists of sodium bicarbonate, calcium carbonate and hydroxyapatite. Powder particles have different size and shape that defines indications and contraindications for use.

Particles of sodium bicarbonate (76 mcm) have oblong shape. Contraindication for using is necessity sodium-free diet.

Particles of calcium carbonate have spherical shape (55 mcm) and slide along cleaned surface at an angle 10–60°. It contributes to increase area of exposure. This powder can be used for implants cleanup and for patients with sodium-free diet.

Particles of hydroxyapatite (25 mcm) are applied for removal of biofilm from periodontal pockets, handling gingival part of implants, for prevention of periimplantitis.

Representatives: Air-flow (EMS), Prophyflex (KaVo), Prophy — Mate NEO (NSK), RONDOflex 2013 (KaVo), Prophy-Jet Cavitron (Dentsply), ProphyEST (Geosoft Pro), Air-N-Go (Satelec).

PHYSICAL METHOD OF DENTAL DEPOSIT REMOVAL

Physical method may be used in case of removing large dental calculus or for polishing root surfaces after scaling. Different aspects of hand and ultrasonic instrumentation methods have been compared. Ultrasonic instrumentation consumed less time for calculus removal than instrumentation by Gracey curettes. There was no microscopic difference between the Cavitron ultrasonic scaler and Gracey curettes. Ultrasonic instruments are the principle treatment modality for removing plaque and calculus. These power-driven instruments oscillate at very high speeds, causing micro vibrations that aid in calculus and subgingival plaque removal. Two different mechanisms are used to create these oscillations of the ultrasonic tip. Comparisons of magnetostrictive, piezoelectric, and hand instruments have had inconclusive results. Piezoelectric system was more efficient in calculus removal compared to magnetostrictive and hand instrumentation, but they left tooth surface rougher.

SONIC INSTRUMENTS

Sonic instruments consist of a hand piece that attaches to a compressed air line (table 6). Vibrations in sonic tip range from 2 000 to 9 000 cycle per seconds. Tip rotates with circular tapping motion (amplitude 1.5 mm) — all sides of tip are effective. Tight pressing instrument to the tooth surface dampens oscillations. Maximum oscillations are observed at a pressure 80 g. There is less power for calculus removal than ultrasonic units. Low power protects root surface from mechanical injury. It is noisy, minimal heat generated-needs water, inexpensive ($600–800), portable. Absence of water cooling may lead to thermal injury of tooth and soft tissue. Limitations: absence of power adjustment, scarce choice of scalers, removal of only supragingival calculus.

Representatives: SONICflex LUX, quick, paro (KaVo), Ti-MAX S950 Air Scalers, AS2000 (NSK), Titan-S, Titan-Univer (Syntex Dental Co.). There are modifications with fiber optics.

ULTRASONIC INSTRUMENTS

Ultrasonic instruments are used for removing plaque, stains, for scaling and curettage (figure 53). They are effective in complicated areas, allow using of

antiseptic as washing solution, remove biofilm from periodontal pocket, are more comfortable for patient. There are 2 types — magnetostrictive and piezoelectric.

a ***b***

Figure 53. *a* — piezoelectric scaler; *b* — magnetostrictive scaler

Piezoelectric scalers (crystal quartz converts electrical energy into mechanical vibrations) have 40 000–60 000 cycle per seconds, pattern of vibration is linear — two sides of the tip are active. This limits nozzle adaptation in bifurcation and complicated areas. Piezoelectric scalers generates heat-needs water, is light and quiet, most expensive of all the mechanical scalers.

Representatives: Varios (NSK), Piezon Master 402 (EMS), SP NEWTRON (Satelec Sas Acteon Group division), Siroson L (Sirona).

Magnetostrictive scalers (magnetized metal stacks convert electrical impulses into mechanical vibrations) have 25 000–30 000 cps, elliptical motion of the tip-all sides of tip effective, generate the most heat-water is critical to degree of cooling.

Representatives: Parkell (USA), Cavitron (Dentsply), Odontoson-M (Denmark).

Ultrasonic/sonic and hand instrumentation are both utilized in initial and supportive periodontal therapy. Clinical studies have shown results (periodontal tissue health) to be the same following ultrasonic/sonic or hand instrumentation. The goal of both hand instrumentation and ultrasonic/sonic instrumentation is debridement to a state of periodontal health.

Power refers to the electrical energy in the handpiece used to generate insert movement. The «Power» knob adjusts the stroke. Stroke is the distance the insert moves during one cycle. Amplitude is equal to one half the stroke. Lower amplitude/stroke/power is generally more comfortable for the patient.

Frequency is the number of times per second the insert tip moves back and forth during a cycle. A cycle is one complete linear, circulat or elliptical stroke path.

«Water» Terminology. Lavage refers to flushing of the sulcus; disruption of plaque biofilm, and removal of necrotic tissue and blood. Cavitation refers to the formation of bubbles in oral liquids/creation of shock waves in fluids. Acoustic streaming refers to fluid movement caused by ultrasonic waves.

Advantages of power instrumentation:
– increased efficiency;
– no need to sharpen;
– less chance of repetitive strain injuries;
– reduced lateral pressure required;
– water lavage and irrigation;
– biofilm disruption.

Disadvantages of power instrumentation:
– more precautions and limitations;
– client comfort – sound and water;
– aerosol production;
– less tactile sensation;
– reduced visibility.

Precautions:

− pacemakers — newer models are insulated and bipolar — electromagnetic interference is unlikely;

− communicable diseases — hepatitis, tuberculosis, strep throat and respiratory infections — transmission via aerosols is possible;

− demineralized tooth structure, hypersensitive areas, veneers, cast crowns and implants ultrasonic instrumentation may irritate;

− children — primary and newly erupted teeth have larger pulp areas — more susceptibility to heat;

− immunosuppression — creation of aerosols may increase patient risk for infection.

Contraindications:

− arrhythmia, heart disease;

− acute and chronic infectious diseases (acute respiratory diseases, bacterial endocarditis, rheumatoid arthritis, hepatitis, tuberculosis, HIV-infection);

− chronic pulmonary disease (chronic bronchitis, bronchial asthma);

− cardiovascular disease with secondary pulmonary disease — aspiration of biofilm MOs into lungs;

− blood coagulation disorders;

− malignant neoplasms, corticosteroid or immunosuppressive therapy;

− surgical treatment of retina;

− a severe form of diabetes;

− epilepsy;

− localized osteomyelitis;

− defects in the soft tissues of the oral cavity (erosions, sores e. g.);

− dysphagia or swallowing difficulty with water flow.

Aerosol production. No studies link aerosols from dental instrumentation to disease transmission. Aerosol — fine, airborne particles (liquids and solids) less than 50um in size — likely to be airborne and be aspirated or inhaled by

the patient. Spatter – particles greater than 50 um in size that can be found on surfaces, masks and gowns. Droplet nuclei — Mycobacterium tuberculosis — may penetrate the mask. Large and small particles may contain HIV or HBV. Always use appropriate universal precautions.

Antimicrobial Pre-Rinse. Chlorhexidine (0.12 % oral rinse) or Listerine rinse during one — two minute «swishing» with an antimicrobial rinse prior to ultrasonic debridement. It will significantly reduce the bacterial count in a dental aerosol.

Table 6

Power scaling comparison

	Magnetostrictive	Piezoelectric	Sonic
Optimal Frequency	20-42 kHz	29-32 kHz	2,500 to 7,000 cycles per second
Transducer (converts energy to vibration)	Nickel alloy wafers or solid rod	Ceramic	Driven by compressed air
Stroke Pattern	Elliptical	Linear	Elliptical or orbital
Power Dispersion to Tip	All surfaces active	Lateral surfaces more active	All surfaces active

Insert selection. Universal straight thick tip — ledges of supra calculus — heavy and moderate subgingival deposits. Universal straight thin tip — shallow pockets — narrow deep pockets — explore for deposits.

Wear Tip wear is critical to efficiency of the instruments. One mm loss on tip equates to 25 % loss of efficiency and two mm loss on tip equates to 50 % loss in efficiency (throw out) (figure 54).

Figure 54. Efficiency Indicator for Cavitron inserts on the left indicates the level of wear. Tip indicator for piezo on the right allows the operator to see when the inserts are no longer effective

Ultrasonic Set-Up:

1. Attach handle or sheath.

2. Step on rheostat to bring water bubble to top of sheath opening.

3. Flush water line for 2 minutes at the beginning of the day (30 seconds between patients).

4. Push ultrasonic insert into the handle/sheath.

5. Adjust water and power levels.

Working tip. Use probing depths and radiographs as guides for ultrasonic activation. Use «painting» strokes/tapping strokes for large deposits. Keep insert moving at all times. Use light lateral pressure. Work from coronal areas apically to root surfaces. Control water — use saliva ejector or HVE to control aerosols. Desensitizing agents are available. Always keep tip moving to prevent soft tissue damage.

Using sonic and ultrasonic scalers for patients with cardiopacemakers

Cardiac pacemakers are increasingly common in the aging population. With an estimated 3.25 million functioning cardiac pacemakers worldwide, dental hygienists are encountering clients with cardiac pacemakers and implantable cardioverter defibrillators (ICD) more frequently than in the past. In planning individualized dental hygiene services, dental hygienists assess the current medical status of all clients to determine those who are at high risk for emergency situations and to determine whether special precautions are necessary.

Background. Implanted cardiac devices (ICD) and implanted pacemakers are used to treat cardiac arrhythmias associated with damaged heart muscle. A pacemaker and ICD consist of a battery generator contained in a small metal box (approx. 5 × 5 cm) usually implanted subcutaneously, in the chest wall below the clavicle. Attached to the generator are one or two thin wires (leads) that pass into the venus circulation into the heart. The leads both monitor the heart rate and deliver the pacing impulse as required. An ICD has the capacity to deliver a cardioversion/defibrillation current. Most clients who have implanted cardiac devices have been provided with a device identification card by their cardiologist. This card identifies the model number, manufacturer and medical contacts. This information will assist the dental hygienist in identifying any contraindications for proceeding with dental hygiene treatment.

Risk Factors. If a client reports having a pacemaker, or any other implanted device, a medical consultation may be required prior to initiating dental hygiene care. The usual health history should be supplemented with information contained in the identification card along with the underlying disease condition.

Endocarditis. There is a theoretical risk of bacterial endocarditis due to the presence of the pacemaker as a foreign material in the circulatory system. However, the American Heart Association has classified the pacemaker and ICD as a negligible risk factor for endocarditis and does not recommend prophylactic antibiotic coverage for dental hygiene treatment. A medical consultation would be prudent if the client reports any other heart or medical conditions that may be

indicators of additional risk or if the implant has been inserted within the last 6 months.

Electromagnetic Interference. Pacemakers and ICDs are sensitive to strong electromagnetic signals that may temporarily interfere with function. Most devices are now designed with safeguards that include electronic filters or shields that insulate in the presence of electromagnetic interference (EMI). Most dental hygiene/dental procedures do not involve strong electromagnetic signals and are unlikely to interfere with a shielded pacemaker or ICD. Those considered safe are: dental radiographs; dental hand pieces; composite curing lights; sonic scalers and piezoelectric scalers. There is some evidence that, older ferromagnetic ultrasonic scalers, magnetostrictive (Cavitron) scalers, Transcutaneous Electrical Nerve Stimulators (TENS), ultrasonic cleaning baths and electrosurgical units caused marked interference with cardiac implant devices when tested in an in-vitro setting and placed at close proximity. Manufacturers of the Dentsply/Cavitron ultrasonic scaler advise users not to operate the unit if the operator or client has an implanted cardiac device. Exposure to magnetostrictive scalers may contribute to a temporary increase in pace rate but this is not considered clinically significant as the pacemaker is not easily damaged and usually resumes normal operation immediately when external interference ends. To date, there have been no actual reported incidences of interference with the operation of a cardiac pacemaker from dental equipment.

Power Toothbrushes. There are no known or reported interactions from electric and most battery powered toothbrushes. A precaution has been issued by one leading cardiac implant manufacturer for the use of sonic toothbrushes with a battery charger. They caution clients to maintain a distance of at least 6 inches between the battery charger unit and the implanted device and to have a distance greater than 1 inch between the toothbrush and the implanted device.

Local Anaesthetic. Epinephrine or other vasoconstrictors are contraindicated in all intractable arrhythmias and should be used with caution (reduced dose with careful monitoring) in clients with pacemakers and implanted defibrillators.

Symptoms of Pacemaker Malfunction. Clients may report unusual activity or discomfort from their implanted device. Observable symptoms of a malfunction include, difficulty breathing, dizziness, lightheadedness, changes in pulse rate, swelling in chest, ankles, arms, wrists, chest pain, prolonged hiccoughing, and muscular twitching. In the event of a suspected malfunction, turn off all suspected sources of interference and activate your medical emergency protocol. In most instances, the implanted cardiac unit will return to normal function when interference has been discontinued. An interference incident should be reported to the client's cardiologist to determine the need for a medical follow-up.

Implications for Dental Hygiene Treatment. The presence of a pacemaker or an ICD indicates a medically compromised heart condition. The usual health history should be supplemented with information about the underlying condition and the specifics of the implanted device.

Consultation with the client's cardiologist or the cardiological unit responsible for follow up of the client's pacemaker or ICD is recommended when planning therapeutic services.

Antibiotic prophylaxis is NOT recommended unless indicated by the cardiologist.

Magnetostrictive (Cavitron) instruments may affect unshielded cardiac implanted devices. If the use of a magnetostrictive ultrasonic is contraindicated, a sonic or piezoelectric instrument may be used.

Covering unshielded pacemakers with a lead apron may offer protection from electrical interference. Care should be taken not to place electrical cords over the client's chest or operate the magnetostrictive hand piece within 6 inches of the implanted cardiac device.

Caution should be taken in the selection of local anaesthetic.

In the event of a suspected implanted device malfunction, follow your medical emergency protocol. Dental hygiene records should be accurate and all-inclusive with a detailed record of the incident. A report of the incident should be forwarded to the CDHO and your liability insurer.

CHEMICAL METHOD OF DENTAL DEPOSIT REMOVAL

Chemical method is used for preliminary calculus softening before its mechanical removal. There are special gels or liquids for this goal. Destruction of calculus occurs due to chelation (EDTA and its salts) or acid dissolution (hydrochloric or organic acids). This method is used rarely in the following cases:

– tightly attached dental deposits;

– teeth mobility;

– psychological discomfort of the patient during professional hygiene.

Preparations are applied for 30–60 sec, removed by swab or rinsed by water. Then removal of dental deposits starts. Shortcoming of this method is damage of the tooth, that leads to hyperesthesia. Besides that there is high probability damage of oral mucosa.

Preparations: Deterspad (Spad), Depuration solution (Products Dentaires), Detartrol ultra (Septodont).

DENTAL ENDOSCOPE

A dental endoscope has been introduced for use subgingivally in the diagnosis and treatment of periodontal disease. The Perioscopy system (Perioscopy, Inc,Oakland, CA) consists of a 0.99-mm diameter, reusable fiberoptic endoscope over which is fitted a disposable, sterile sheath. The fiberoptic endoscope fits onto periodontal probes and ultrasonic instruments that have been designed to accept it. The fiberoptic endoscope attaches to a medical-grade charged-coupled device (CCD) video camera and light source that

produces an image on a flat-panel monitor for viewing during subgingival exploration and instrumentation.

This device allows clear visualization deeply intosubgingival pockets and furcations. The sheath delivers water irrigation that flushes the pocket while the endoscope is being used, keeping the field clear. It permits operators to detect the presence and location of subgingival deposits and guides them in the thorough removal of these deposits.

Using this device, operators can achieve levels of root debridement and cleanliness that are much more difficult or impossible to produce without it. Magnification ranges from 24X to 48X, enabling visualization of even minute deposits of plaque and calculus. The Perioscopy system can also be used to evaluate subgingival areas for caries, defective restorations, root fractures, and resorption (figure 55).

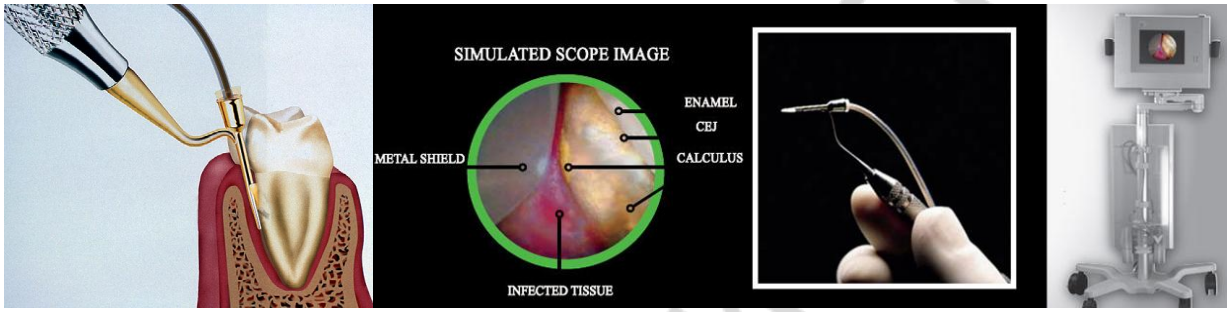


Figure 55. Perioscopic instrumentation permits deep subgingival visualization in pockets and furcations

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Учебно-методическое пособие

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