Investing in Periodontal Instrumentation

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ABSTRACT

Knowledge of the instrument enables the clinician to select proper instrument for the procedure and the correct area in which it will be used. Some important factors that are to be considered are properly maintaining the cutting edge, use of ergonomic handles, variations in handle diameter and shape and use of balanced instruments. A due consideration to all these factors increases the operator’s efficiency for periodontal debridement. This article briefly describes various parts of instruments, their design and how these influence the efficiency of practitioner.

Keywords: Curettes, Handle, Instrumentation, Shank, Sickle scaler, Working end.

INTRODUCTION

For effective instrumentation, certain general principles are essential to be followed that are common to all periodontal instruments, such as proper positioning of the patient and the operator, illumination and retraction for optimal visibility, sharp instruments, maintaining a clear field, instrument stabilization and instrument activation. A constant awareness of tooth and root morphologic features and condition of periodontal tissues is also essential.

Knowledge of instrument design enables the clinician to select the proper instrument for the procedure and the correct area in which it will be used. Some important factors that are to be considered are properly maintaining the cutting edge, use of ergonomic handles, variations in handle diameter and shape and use of balanced instruments. A due consideration to all these factors increases the operator’s efficiency for periodontal debridement.

PARTS OF AN INSTRUMENT

The three major parts of an instrument are as follows:
1. Working end
2. Shank
3. Handle (Fig. 1).

Working End

- The working end refers to that part which is used to carry out the purpose and function of the instrument.
- Each working end is unique in the particular instrument.
- The working end of a scaler or curette is called a blade.
- The parts of a sharp blade are:
  - Cutting edge: A very fine line where two surfaces meet. For example, the face and the lateral surface meet to form a sharp cutting edge of curette.
  - Lateral surfaces: The lateral surfaces meet or are continuous to form the back of the instrument (Fig. 2).
  - Back surface: The surface opposite the face is the instrument back (Fig. 3).

FIGURES

Fig. 1: Parts of an instrument
Fig. 2: Lateral surface of an instrument

Source of support: Nil
Conflict of interest: None
Stop or tip: The cutting edge of the curette meet to form a rounded surface called a toe. The cutting edges of the sickle scaler meet in a point called a tip.  

- **Working end identification:**
  - A double-ended instrument has two design numbers, one to identify each working end of the instrument. For example, the original gracey series of the instruments include seven double ended instruments, such as the Gracey 3/4, Gracey 5/6, Gracey 11/12 and Gracey 13/14.  
  - Name and number marked along the handle: In this case, each working end is identified by the number closest to it.  
  - Name and number across the handle: In this case, the first number identifies the working end at the top and the second number identifies the working end at the lower end of the handle.  

- **The leading third of the working end:**
  - A working end has three sections:
    1. The leading third  
    2. The middle third  
    3. The heal third.  
  - The leading third is the portion of the working end that is kept in contact with the tooth surface during instrumentation.  
  - On curettes, the leading third is termed the toe-third of the working end.  
  - On sickle scalers, the leading third is termed the tip-third of the working end.  

**Shank**

- The shank connects the working end with the handle.  
- The instrument shank is the extension device that increases the length of the instrument so that the working end can be placed on the root.  
- The shanks of most of the periodontal instruments are bent in one or more places to facilitate placement of the working end against the tooth surface:  
  - Simple shank design or straight shank:  
    1. A shank that is bent at one plane (front to back).  
    2. They are used primarily on the anterior teeth.  
  - Complex shank design or curved shank:  
    1. A shank bent in two planes (front to back and side to side) to facilitate instrumentation of posterior teeth.  
    2. An instrument with complex shank is needed to reach around the crown and onto the root surface.  
- Functional shank—the portion of the shank that allows the working end to be adapted on to the root surface. It begins below the working end and extends to the last bend in the shank nearest the handle.  
- Lower shank or the terminal shank—the portion of the shank nearest to the working end.  

**Shank Length**

- The distance from the cutting edge of the blade to the junction of the shank and handle in most of instruments is 35 to 40 mm (1½ inches).  
- Too short shank limits the action.  

**Shank Flexibility**

- Instruments are made with shanks with varying degrees of thickness and rigidity that relate to the purpose for which instrument is used:  
  - Rigid shank—heavier shank is stronger and is able to withstand greater pressure without flexing when applied during instrumentation. Strong instruments are needed for heavy calculus deposits, e.g. sickle scalers.  
  - Flexible shank—thinner shank may provide more tactile sensation which is transmitted to clinician’s fingers, e.g. explorers.  

**Handle**

When selecting an instrument, handle specifications primarily benefit operator comfort. The position and grasp of the handle in conjunction with the finger or hand rest are significant in tactile sensitivity and the activation of the working end.  

**Overall Design**

*Single-ended instrument:* Handle has one working end.  
*Double-ended instrument:* May have paired (mirror image) or complementary working ends.  
*Cone-socket handles:* These are separable from the shank and working end. They permit screw-in instrument exchanges and replacements.
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Weight of the Handle

Handle weight is the final consideration in handle selection. These are solid-handled and hollow-handled instruments. Most clinicians find that hollow handles are lighter and less strenuous to use and improve tactile sensitivity more than solid-handled instruments.\(^8\)

Diameter

Four common diameters of instrument are available. The most common diameters available from manufacturers are 3/8, 5/16, 1/4, 3/16.

The ideal instrument for comfort and best tactile sensitivity has, e.g., a light weight, serrated, handle with a 3/8 or 5/16” diameter.

Surface Texture: Serrations/Texturing/Knurling

Instrument handles may be smooth, ribbed or knurled. A thinner, smooth handle may require a tighter grasp to prevent slipping, which can lessen tactile sensitivity and increase clinician’s fatigue.\(^5\)

Instrument Balance

A periodontal instrument that has working ends that are aligned with the long axis of the handle is a balanced instrument.

During instrumentation, balance ensures that finger pressure applied against the handle is transferred to the working end, resulting in pressure against the tooth.

CLASSIFICATION OF PERIODONTAL INSTRUMENTS

Periodontal instruments are divided into following types, or classification, based on the specific designed characteristics of the working-ends and their use.

Assessment or Diagnostic Instruments\(^7,14\)

- Periodontal probe:
  - Marquis color coded probe
  - UNC-15 probe
  - University of Michigan “O” probe with William’s markings
  - Michigan “O” probe
  - UNC-12 probe
  - Naber’s furcation probe
  - Glickman probe
  - Gilmore probe
  - World Health Organization (WHO) probe
  - Orascoptic probe
  - Vine Valley probe
  - Viva-care TPS probe
  - Florida probe
  - Foster Miller probe
  - Interprobe
  - Toronto automated probe
  - Ultrasonographic (US) probe.

- Explorers:
  - #23 Shepherd’s hook explorer
  - Pig tail explorer
  - #17 explorer
  - 11/12 explorer
  - #3—A explorer
  - Orban type explorer.

Scaling, Root Planing and Curettage Instruments\(^8,12\)

Supragingival Scaling Instruments

- Sickle scalers-curved or straight:
  - SH 6/7
  - SH 5/33
  - Sickle 204 SD
  - U 15/30 Ball and Indiana University sickle scaler.
  - Cumine scaler.

Subgingival Scaling Instruments\(^9,12\)

- Hoe scaler:
  - Mc Call’s # 3, 4, 5, 6, 7, 8
  - 6/7 orban mesial/distal.

- Chisel:
  - Weldelstaedt chisel
  - Binangle chisel
  - Straight chisel.

- File scalers:
  - 10/11 orban buccal/lingual
  - 12/13 orban mesial/distal
  - 3/7 Hirschfeld buccal/lingual
  - Quetin furcation curettes.
Curettage Instruments\textsuperscript{12}

- Universal curettes:
  - Barnhart curettes # 1–2
  - Younger good # 7–8
  - Mc call’s # 13–14, #17–18
  - Columbia curettes #13–14, 2R–2L, 4R–4L.
- Area-specific curettes:
  - Gracey # 1–2 and 3–4
  - Gracey # 5–6
  - Gracey # 7–8 and 9–10
  - Gracey # 11–12
  - Gracey # 13–14
  - Gracey # 15–16
  - Gracey # 17–18
  - Extended shank curettes
  - Mini-bladed curettes
  - Micro-mini curettes
  - Garcey curvettes
  - Langer and mini langer curettes.

Ultrasonic and Sonic Instruments

Mechanized instruments for scaling and cleansing the tooth surfaces and curetting the soft tissue wall of periodontal pocket.\textsuperscript{2,12}

Periodontal Endoscopes

Periodontal endoscopes used to visualize deeply into subgingival pockets and furcation, allowing the detection of deposits.\textsuperscript{12}

Cleansing and Polishing Instruments\textsuperscript{12,14}

- Rubber cups
- Bristle brushes
- Dental tape
- Air-powder polishing.

Surgical Instruments\textsuperscript{9,10,12,13}

Excisional and Incisional Instruments

- Periodontal knives
  - Kirkland knife
  - USC Towner 19/20
- Interdental knives
  - Orban’s knife
  - Merrifield knife
- Surgical blades
  - No. 11
  - No. 12
  - No. 15
- Electrosurgery

Surgical Curettes\textsuperscript{9,12}

- Prichard curette
- # 3/4, 5/6, 7/8, 11/12, 13/14 surgical curettes.
- Kirkland curettes.

Sickles\textsuperscript{12}

- Ball-scaler #B2-B3.

Periodontal Elevators\textsuperscript{9,12}

- Woodson elevator
- Prichard elevators
- No. 24 G
- Goldman fox no. 14
- No. 9 Molt periosteal elevator.\textsuperscript{5}

Surgical Chisels

- Wielandtch chisel
- Oschsenbein chisel
- Rhodes chisel
- Kirkland 13 K/TG.

Surgical Files

- 9/10 Schluger curved file
- 1S/2S Sugarman file mesial/distal file
- 3S/4S Sugarman file buccal/lingual.

Scissors

- Goldman fox no. 16 scissors\textsuperscript{12}
- #9 Dean’s scissors\textsuperscript{9}
- Metzenbaum scissors.\textsuperscript{10}

Tissue Nippers

- Goldman fox bone/soft tissue nipper
- Tissue pliers 1 × 2 curved.

Tissue Forceps\textsuperscript{10}

- Debakey forceps
- Allis tissue forceps.

Needle Holders\textsuperscript{1,6}

- Castroviejo needle holders
- Crile wood needle holders.

BP Handle\textsuperscript{10}

- Graduated handle no. 3
- Long handle no. 5, 7, 9.

Hemostat\textsuperscript{10}

- Curved
- Straight.
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Rongeur Forceps
- A side cutting forceps
- The side and end cutting forceps (Flow Chart 1).

Accessibility facilitates thoroughness of instrumentation. The position of the patient and operator should provide maximal accessibility to the areas of operation. Inadequate accessibility impedes thorough instrumentation, prematurely tires the operator and diminishes his or her effectiveness.12

The patient and the operator positions are of great importance. With low seated dentistry, the patient's head is placed in the lap of the operator with the light directed into the mouth from a position round the patient14 (Table 1).

Whenever possible, direct vision with direct illumination from the dental light is most desirable. If this is not possible indirect vision may be obtained by using the mouth mirror and indirect illumination may be obtained by using the mirror to reflect light to where it is needed. Indirect vision and indirect illumination are often used simultaneously.12

EFFECTS OF ADEQUATE VISION AND ACCESSIBILITY
- Instrumentation is more thorough
- Trauma to the oral tissues is minimized
- Length of time required may be lessened, thereby lessening fatigue for patient and clinician
- Patient cooperation can be increased because of shortened treatment time and less discomfort.

Contributing Factors for Adequate Vision and Accessibility
- Patient and clinician positions.
- Efficient use of direct or reflected illumination by mouth mirror for each tooth surface.

Flow Chart 1: Sequence of instrumentation

[Diagram of sequence of instrumentation]
• Adequate yet gentle, retraction of lips, cheeks and tongue with consideration for patient’s comfort and clinician’s convenience.
• Use of magnifying loops.\textsuperscript{11}

**INSTRUMENT GRASP**

A proper grasp is essential for precise control of movements made during periodontal instrumentation.

**Functions of the Instrument Grasp**

**Dominant Hand**

• The right hand is the dominant hand for the right-handed clinician.
• A few rare people are completely ambidextrous and others are partially dexterous with the non-dominant hand, a useful capability when carrying out dental and dental hygiene procedures.
• The dominant hand is used to hold and activate the treatment instrument. The manner in which the instrument is held influences the entire procedure.\textsuperscript{11}

**Non-dominant Hand**

• The right-handed clinician uses the left hand and the left-handed clinician uses the right hand for essential supplementary functions to assist the dominant hand.
• The mouth mirror is held by the non-dominant hand.
• With the appropriate grasp and finger rest, the following effects can be provided
  – Control of the position of the mirror for indirect vision, indirect lighting and retraction.
  – Assistance in providing the dominant hand with an auxiliary finger rest.

**Grasp Dynamics**

• A rigid grasp, in which the instrument is gripped tightly, lessens the tactile sensitivity, and hence the effectiveness of instrumentation.
• The appropriate grasp is controlled, displays the confidence of the clinician in the work being done and provides increased fingertip tactile sensitivity, positive control of the instrument with the balance and flexibility during motion, decreased hazard of trauma to the dental and periodontal tissues, which in turn results in less post care discomfort for the patient and prevention of fatigue to clinician’s fingers, hand and arm.

**Types of Grasp**

**Modified Pen Grasp**

*Description:* The modified pen grasp is a three finger grasp with specific target points of the thumb, index finger and middle (second) finger all in contact with the instrument.
*Thumb:* The center of the upper aspect of the pad.
*Index finger:* The center of the upper aspect of the pad.
*Middle finger:* The inside upper corner of the pad, behind the upper corner of the nail.

*Location on handle:* The instrument is held by thumb and index finger on handle. The upper corner of the middle finger is placed on the upper portion of the shank to hold and guide the movement.

*Role of middle finger:* The shank of the instrument is held against the inside upper corner of the pad of the middle finger. The instrument is not held across the nail or the side of the middle finger, as in pen grasp usually used for writing.

*Specific position:* The specific position of the middle finger is essential to instrument control to prevent the instrument from slipping during adaptation and activation and to optimize application of lateral pressure.

*Role of ring finger:* The ring finger is used to establish a finger rest/fulcrum.

*Additional support:* The side to side contact of index, middle and ring fingers allows for greater stability, strength and control during instrumentation.

<table>
<thead>
<tr>
<th>Table 1: Positioning of patient and operator</th>
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<tbody>
<tr>
<td><strong>Treatment area</strong></td>
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<tr>
<td>Maxillary arch</td>
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<tr>
<td>Anterior surfaces toward operator</td>
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<td>Anterior surfaces away from the operator</td>
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<td>Posterior aspects facing toward operator</td>
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<td>Posterior aspects facing away from the operator</td>
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<tr>
<td>Mandibular arch</td>
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**Palm Grasp**

*Description:* The handle of the instrument is held in the palm by cupped index, middle, ring and little fingers. The thumb is free to serve as the fulcrum.

*Limitations of use:* Instruments for calculus removal, root planing and maintenance of root debridement are not used with a palm grasp. The possible exception is a chisel scaler when it is used to remove gross calculus by push stroke.

*Examples of uses for palm grasp:* Air syringe, rubber dam clamp holder, chisel for restorative work, non-dominant hand stabilizing the instrument for sharpening.

When a variation in finger rest is used, basic rules for stability and control are applied, and rests on movable tissues are avoided. Three types of variations are:

**Substitute**

- Missing teeth where finger rest is usually applied.
  - For an edentulous area, a cotton roll or gauze sponge may be packed into the area to provide dry finger rest.
  - Otherwise, a rest across the dental arch or in the opposite arch may be required to provide stability.
- Mobile teeth or teeth with inadequate bony support.
  - Avoid mobile teeth for finger rests or use only with minimal pressure for brief periods. Not only would the rest on a mobile tooth be unstable, but also the pressure, movement and undue stress on the tooth could traumatize and tear the periodontal ligament fibers.
  - Index finger of the non-dominant hand may be placed in the vestibule over a cotton roll or dry gauze square.
  - The usual finger rest can be placed on the index finger to aid retraction and visibility, particularly in the mouth of a small child.

**Supplementary**

- Place the index finger of the non-dominant hand on the occlusal surfaces of teeth adjacent to the working area. The finger rest can then be applied to the non-dominant index finger. This is known as finger on finger.
- Such supplements are helpful for achieving a parallel orientation to the terminal shank to proximal surfaces.
- Supplemental rests are not useful for certain distal surfaces where the mouth mirror is essential for vision.

**Reinforced**

- In this type, a support is placed between the instrument handle and the working end to provide additional strength and force, particularly for hard, tenacious calculus in pockets.
- Index finger of non-dominant hand can be rested on the tooth adjacent to the one being scaled, while the thumb is placed on the instrument shank (or handle) for a reinforcement.
- Greater control of the instrument can result and when applied correctly, the danger of instrument breakage is reduced.
- A definite rest for both hands is needed to distribute the pressure.

**CONCLUSION**

Correct knowledge of instruments is mandatory before their clinical usage. It enables the clinician to select the proper instrument for the procedure and the correct area in which it will be performed. Small variations in shank length, curvature and flexibility of periodontal treatment instruments profoundly affect their use and effectiveness. Moreover, minimizing occupational risks in the workplace increases the likelihood of long-range health and wellness for the practitioner.

**REFERENCES**