Instrumentation

General Principles of Instrumentation

Positioning of Patient and Operator

The clinician should be seated on a comfortable operating stool that has been positioned so that the clinician's feet are flat on the floor with the thighs parallel to the floor. The clinician should be able to observe the field of operation while keeping the back straight and the head upright.

The patient should be in a supine position and placed so that the mouth is close to the resting elbow of the clinician. For instrumentation of the maxillary arch, the patient should be asked to raise the chin slightly to provide optimal visibility and accessibility. For instrumentation on the mandibular arch, it may be necessary to raise the back of the chair slightly and request that the patient lower the chin until the mandible is parallel to the floor. This will especially facilitate work on the lingual surfaces of the mandibular anterior teeth.

Visibility, Illumination, and Retraction

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.

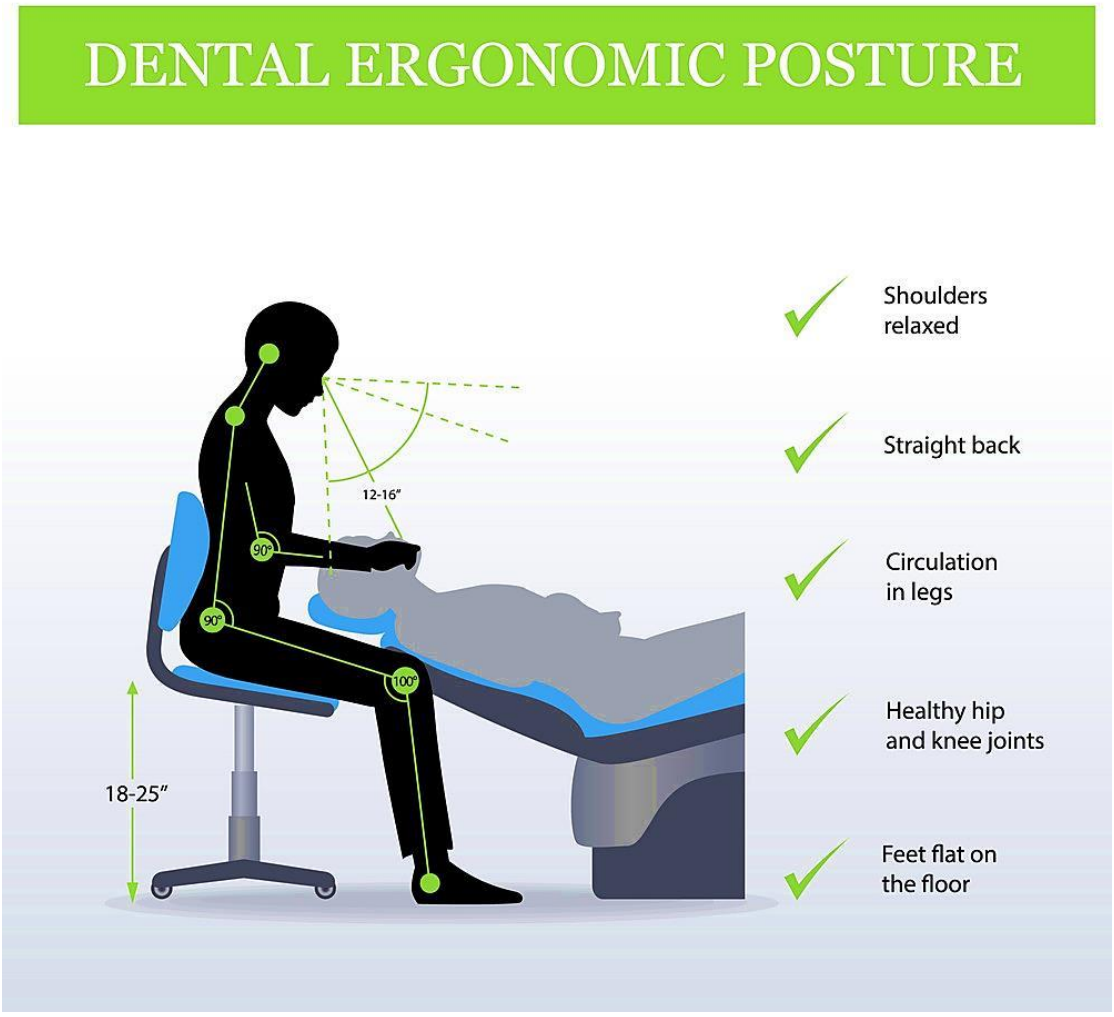

Fig. :- Positioning of patient and operator.

Instrument Stabilization

Stability of the instrument and the hand is the primary requisite for controlled instrumentation. Stability and control are essential for effective instrumentation and avoidance of injury to the patient or clinician. The two factors of major importance in providing stability are the instrument grasp and the finger rest.

Instrument Grasp. The most effective and stable grasp for all periodontal instruments is the **modified pen grasp**. Although other grasps are possible, this

modification of the standard pen grasp ensures the greatest control in performing intraoral procedures.

The thumb, index finger, and middle finger are used to hold the instrument as a pen is held, but the middle finger is positioned so that the side of the pad next to the fingernail is resting on the instrument shank. The pad of the thumb is placed midway between the middle and index fingers on the opposite side of the handle. This creates a triangle of forces, or tripod effect . This stable modified pen grasp enhances control over instrument and enhances tactile sensitivity .

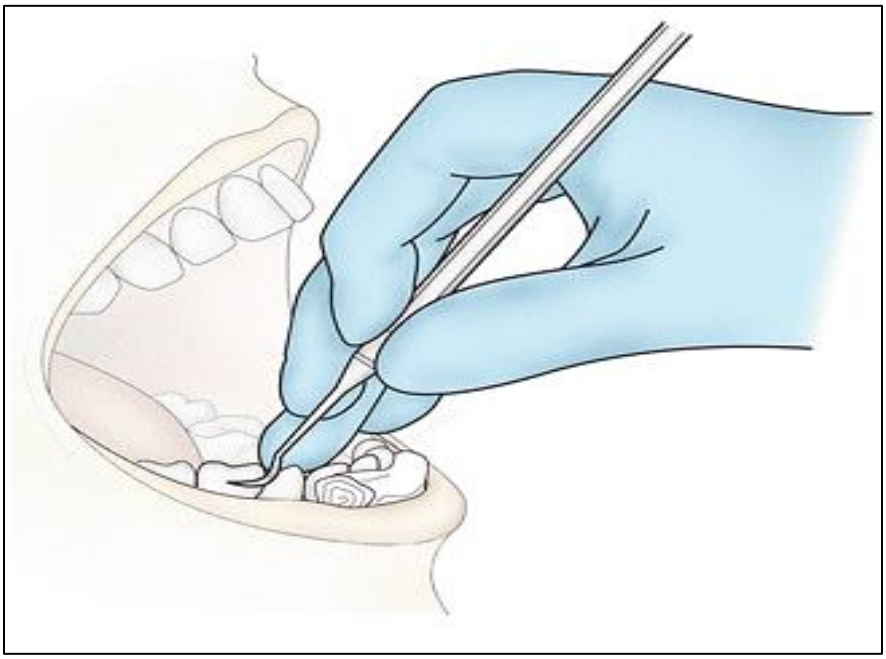

Fig. :- Modified pen grasp.

The palm and thumb grasp is useful for stabilizing instruments during sharpening, but it is not recommended for periodontal instrumentation. Maneuverability and tactile sensitivity are so inhibited by this grasp that it is unsuitable for the precise, controlled movements necessary during periodontal procedures.

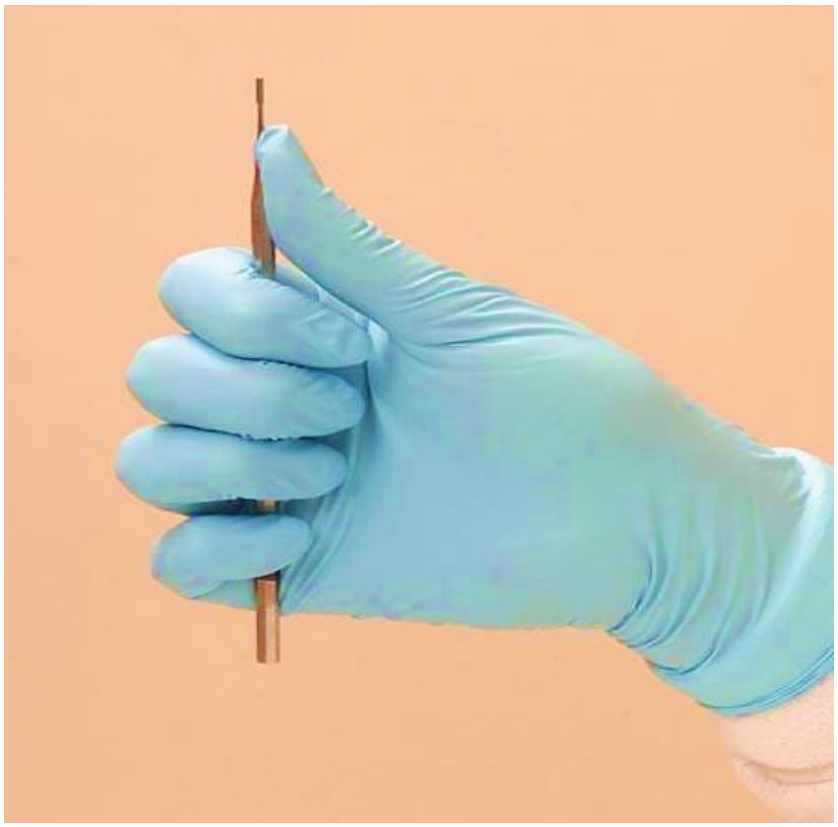

Fig. :- The palm and thumb grasp.

Finger Rest. The finger rest serves to stabilize the hand and the instrument by providing a firm fulcrum as movements are made to activate the instrument. A good finger rest prevents injury and laceration of the gingiva and surrounding tissues by poorly controlled instruments. The fourth (ring) finger is preferred by most clinicians for the finger rest.

Finger rests may be generally classified as intraoral finger rests or extra oral fulcrums. The following examples illustrate the different variations of the intraoral finger rest:

1. Conventional: The finger rest is established on tooth surfaces immediately adjacent to the working area.

2. Cross-arch: The finger rest is established on tooth surfaces on the other side of the same arch .

3. Opposite arch: The finger rest is established on tooth surfaces on the opposite arch (e.g., mandibular arch finger rest for instrumentation on the maxillary arch).

4. Finger on finger: The finger rest is established on the index finger or thumb of the non-operating hand.

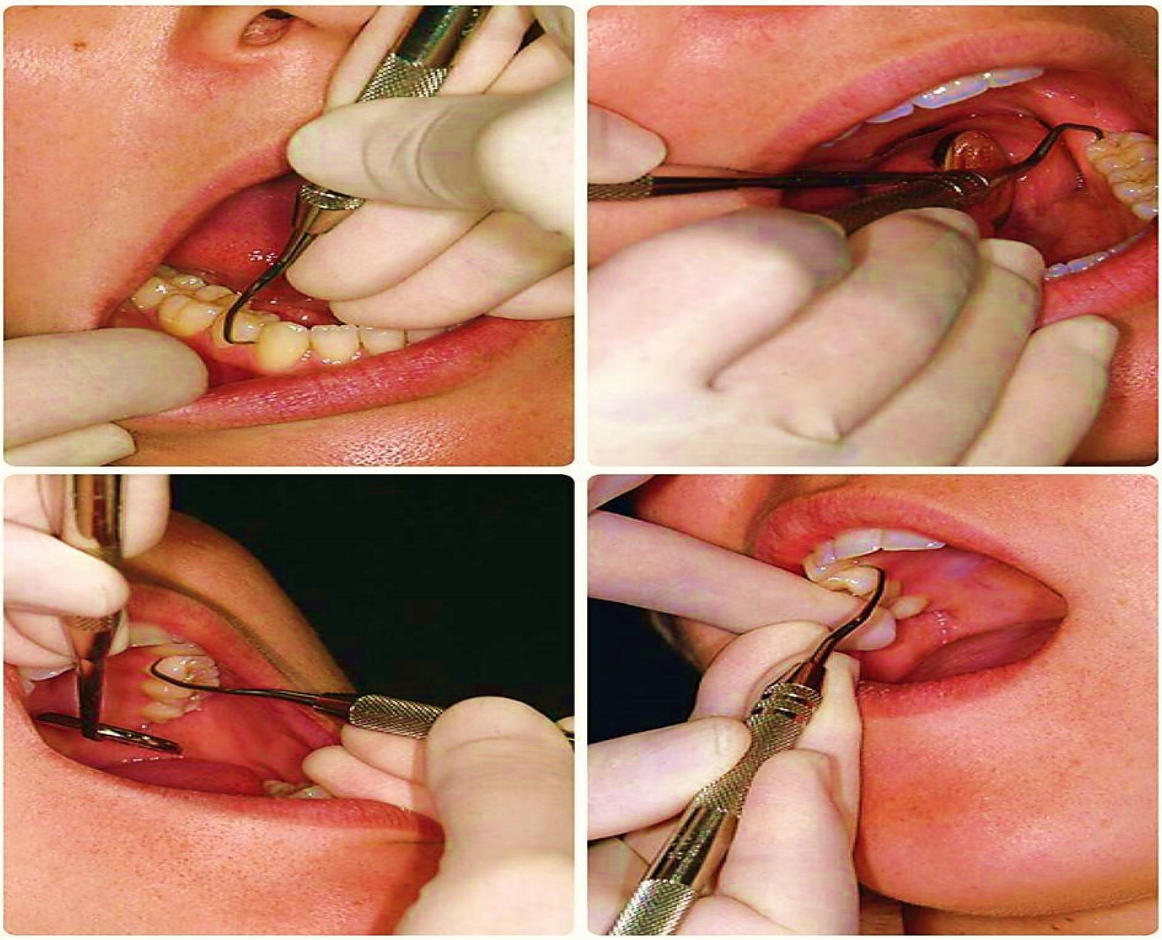

Fig. :- Different variations of the intraoral finger rest.

Extraoral fulcrums are essential for effective instrumentation of some aspects of the maxillary posterior teeth. When properly established, they allow optimal access and angulation while providing adequate stabilization. Extraoral fulcrums are not

“finger rests” in the literal sense because the tips or pads of the fingers are not used for extraoral fulcrums as they are for intraoral finger rests.

The two most common extraoral fulcrums are used as follows:

1. Palm up (Knuckle rest technique): The palm-up fulcrum is established by resting the backs of the middle and fourth fingers on the skin overlying the lateral aspect of the mandible on the right side of the face.

2. Palm down (Chin-cup technique): The palm-down fulcrum is established by resting the front surfaces of the middle and fourth fingers on the skin overlying the lateral aspect of the mandible on the left side of the face.

Both intraoral finger rests and extraoral fulcrums may be reinforced by applying the index finger or thumb of the non-operating hand to the handle or shank of the instrument for added control and pressure against the tooth. The reinforcing finger is usually employed for opposite-arch or extraoral fulcrums when precise control and pressure are compromised by the longer distance between the fulcrum and the working end of the instrument.

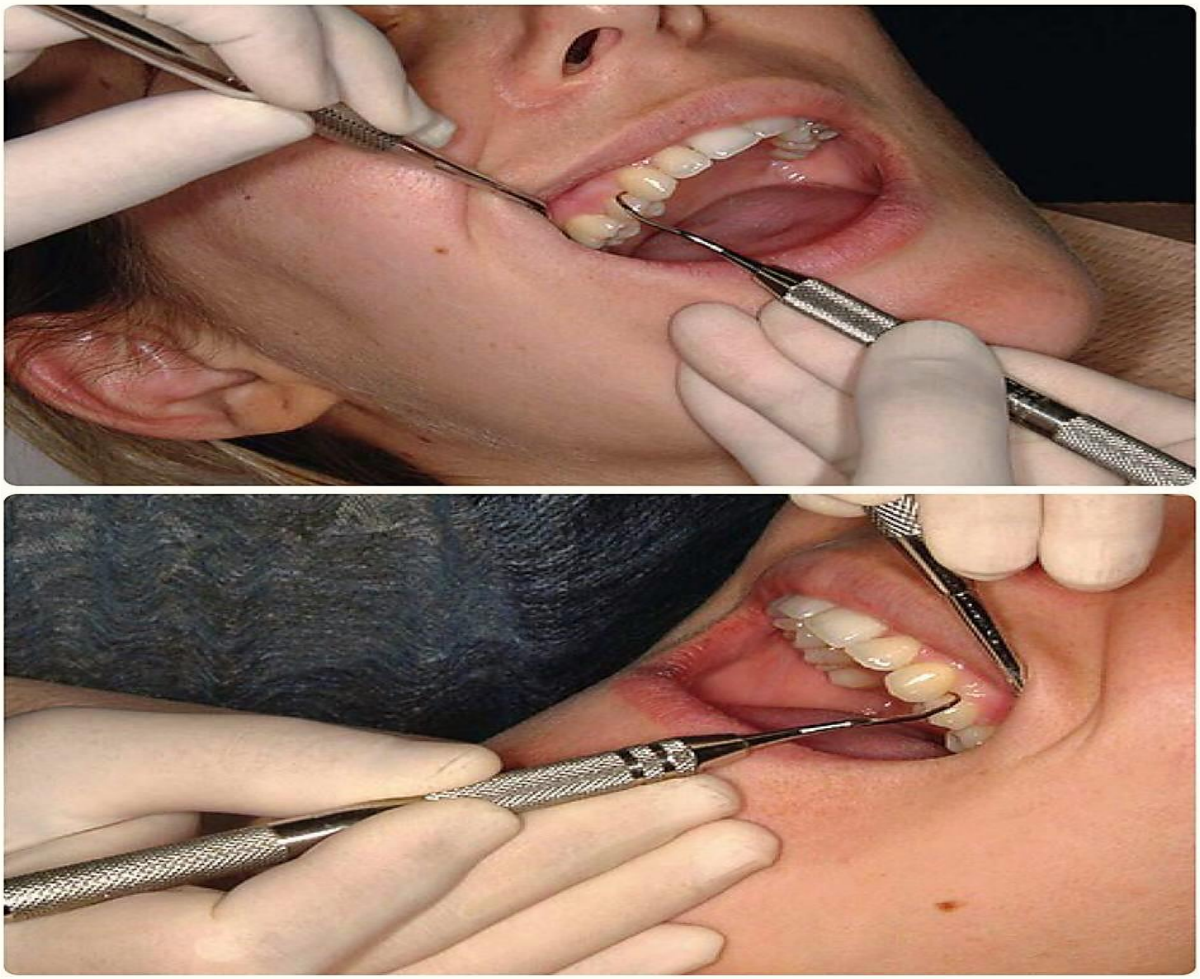

Fig.:- Extraoral fulcrums.

Instrument Activation

Adaptation:- refers to the manner in which the working end of a periodontal instrument is placed against the surface of a tooth. Precise adaptation must be maintained with all instruments to avoid trauma to the soft tissues and root surfaces and to ensure maximum effectiveness of instrumentation.

Angulation:- refers to the angle between the face of a bladed instrument and the tooth surface. It may also be called **the tooth-blade relationship**.

Correct angulation is essential for effective calculus removal. For subgingival **insertion** of a bladed instrument such as a curette, **angulation should be** as close

to 0 degree as possible . During scaling and root planing, **optimal angulation** is between **45 and 90 degrees** .

With angulation of **less than 45 degrees**, the cutting edge will not bite into or engage the calculus properly. Instead, it will slide over the calculus, smoothing or "burnishing" it. If angulation is **more than 90 degrees**, the lateral surface of the blade, rather than the cutting edge, will be against the tooth, and the calculus will not be removed and may become burnished. Angulation greater than 90 degrees is used to engage and remove the pocket lining **(gingival curettage).**

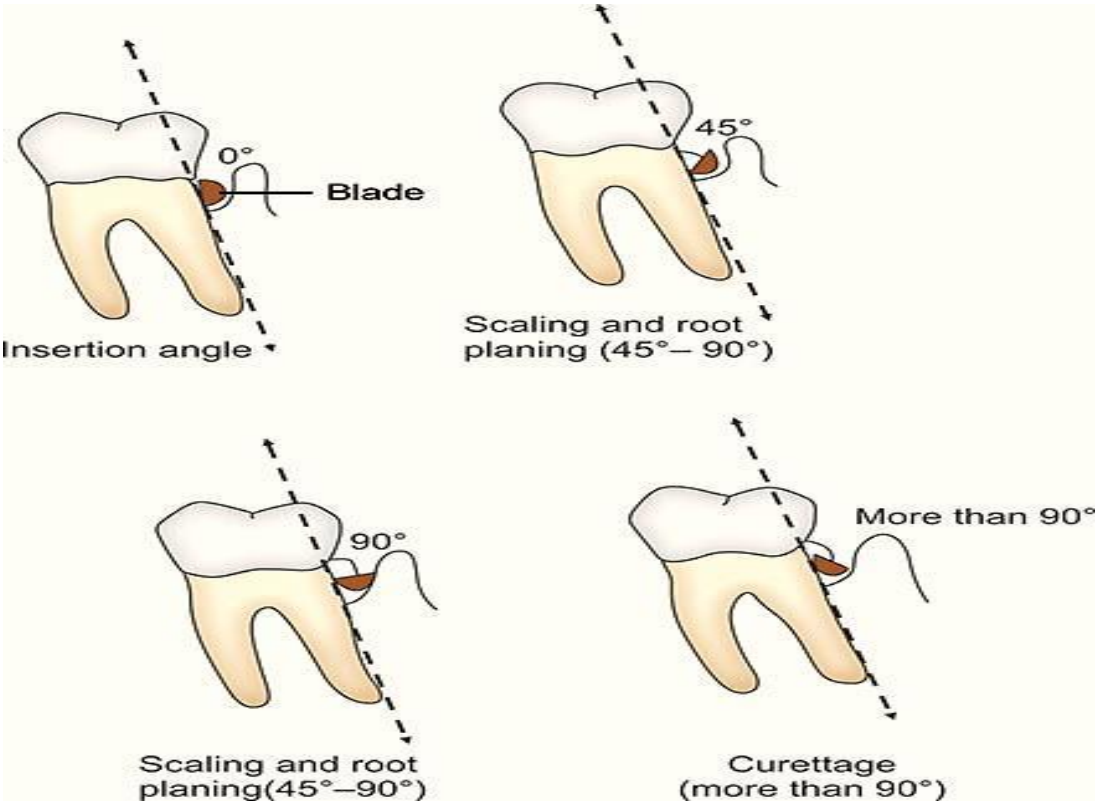

Fig.:- Tooth-blade relationship.

Lateral Pressure:- refers to the pressure created when force is applied against the surface of a tooth with the cutting edge of a bladed instrument.

Strokes:- Three basic types of strokes are used during instrumentation: the exploratory stroke, the scaling stroke, and the root planing stroke.

The direction, length, pressure, and number of strokes necessary for either scaling or root planing are determined by **four major factors**: (1) gingival position and tone, (2) pocket depth and shape, (3) tooth contour, and (4) the amount and nature of the calculus or roughness.

The **exploratory stroke** is a light, "feeling" stroke that is used with probes and explorers to evaluate the dimensions of the pocket and to detect calculus and irregularities of the tooth surface.

The **scaling stroke** is a short, powerful pull stroke that is used with bladed instruments for the removal of both supragingival and subgingival calculus. The cutting edge engages the apical border of the calculus and dislodges it with a firm movement in a coronal direction.

The **root-planing stroke** is a moderate to light long, overlapping pull stroke that is used for final smoothing and planing of the root surface. Although hoes, files, and ultrasonic instruments have been used for root planing, curettes are widely acknowledged to be the most effective and versatile instruments for this procedure.

Principles of Scaling and Root Planing

Definitions and Rationale

Scaling is the process by which biofilm and calculus are removed from both supragingival and subgingival tooth surfaces. No attempt is made to remove tooth substance along with the calculus. Root planing is the process by which residual embedded calculus and portions of cementum are removed from the roots to produce a smooth, hard, clean surface.

Scaling alone is sufficient to remove biofilm and calculus completely from enamel, leaving a smooth, clean surface.

Deposits of calculus on root surfaces are frequently embedded in cemental irregularities. Subgingival calculus is porous and harbors bacteria and endotoxin and therefore should be removed completely. When dentin is exposed, biofilm bacteria may invade dentinal tubules. Therefore scaling alone is insufficient to remove them, and a portion of the root surface must be removed to eliminate these deposits (root planing).

Scaling and root-planing strokes should be confined to the portion of the tooth where calculus or altered cementum is found; this area is known as the instrumentation zone.

Various approaches to instrumentation in different areas of the mouth are mentioned here. The examples shown provide maximal efficiency for the clinician and comfort for the patient. For most areas, more than one approach is presented.

Maxillary right posterior sextant: facial aspect.

- ☒ **Operator position: Side position.**
- ☒ **Finger rest: Extraoral, palm up.**

Maxillary right posterior sextant, premolar region only: Facial aspect .

- ☒ **Operator position: Side or back position.**
- ☒ **Finger rest: conventional Intraoral .**

Maxillary right posterior sextant: palatal aspect .

- ☒ **Operator position: Side or front position.**
- ☒ **Finger rest: Extraoral, palm up**.

Maxillary right posterior sextant palatal aspect .

- **Operator position: Front position.**
- **Finger rest: Intraoral, finger on finger.**

Maxillary anterior sextant: Facial aspect, surfaces away from the operator .

- **Operator position: Back position.**
- **Finger rest: Intraoral. Conventional.**

Maxillary anterior sextant: Facial aspect, surfaces toward the operator .

- **Operator position: Front position.**
- **Finger rest: Intraoral conventional.**

Maxillary anterior sextant: palatal aspect, surfaces away from the operator (surfaces toward the operator are scaled from a front position) .

- **Operator position: Back position.**
- **Finger rest: Intraoral conventional.**

Maxillary left posterior sextant: Facial aspect .

- **Operator position: Side or back position.**
- **Finger rest: Extraoral, palm down.**

Maxillary left posterior sextant: Facial aspect .

- **Operator position: Back or side position.**
- **Finger rest: Intraoral. Conventional.**

Maxillary left posterior sextant: palatal aspect .

- **Operator position: Front position.**
- **Finger rest: Intraoral, opposite arch, reinforced with index finger of the nonoperating hand.**

Maxillary left posterior sextant: palatal aspect .

- **Operator position: Front position.**

- ☒ **Finger rest: Extraoral, palm down.**

Maxillary left posterior sextant: palatal aspect.

- ☒ **Operator position: Side or front position.**
- ☒ **Finger rest: Intraoral. Conventional.**

Mandibular left posterior sextant: Facial aspect .

- ☒ **Operator position: Side or back position.**
- ☒ **Finger rest: Intraoral. Conventional.**

Mandibular left posterior sextant: Lingual aspect .

- ☒ **Operator position: Front or side position.**
- ☒ **Finger rest: Intraoral. Conventional.**

Mandibular anterior sextant: Facial aspect, surfaces toward the operator .

- ☒ **Operator position: Front position.**
- ☒ **Finger rest: Intraoral. Conventional.**

Mandibular anterior sextant: Facial aspect, surfaces away from the operator.

- ☒ **Operator position: Back position.**
- ☒ **Finger rest: Intraoral. Conventional.**

Mandibular anterior sextant: Lingual aspect, surfaces away from the operator.

- ☒ **Operator position: Back position.**
- ☒ **Finger rest: Intraoral. Conventional.**

Mandibular anterior sextant: Lingual aspect, surfaces toward the operator .

- ☒ **Operator position: Front position.**
- ☒ **Finger rest: Intraoral. Conventional.**

Mandibular right posterior sextant: Facial aspect .

- ☒ **Operator position: Side or front position.**
- ☒ **Finger rest: Intraoral. Conventional.**

Mandibular right posterior sextant: Lingual aspect .

- ☒ **Operator position: Front position.**
- ☒ **Finger rest: Intraoral. Conventional.**

Ultrasonic and Sonic Instrumentation

Sonic/ultrasonic instrumentation requires removal from the coronal to the apical portion of the deposit. The aerosol produced by sonic and ultrasonic instrumentation may contain potentially infectious blood-borne and airborne pathogens. Pneumococci, staphylococci, α-hemolytic streptococci, and *Mycobacterium tuberculosis* are among the bacteria that have been found in dental aerosols. Aerosols also subject dental personnel and patients to many viruses, including covid-19 , herpes simplex, hepatitis, influenza, common cold, Epstein-Barr, and cytomegalovirus.

The instrument is grasped with a light to moderate pen or modified pen grasp . Extraoral hand rests should be used for the maxillary teeth. For the mandibular teeth, either intraoral or extraoral fulcrums may be used. The purpose of the extraoral fulcrum is that it allows the operator to maintain a light grasp and easier access physically and visually to the oral cavity.

The working end should be kept in constant motion, and the tip should be kept parallel to the tooth surface or at no more than a 15-degree angle to avoid etching or grooving the tooth surface. Surface should be examined frequently with an explorer. Any remaining irregularities of the root surface may be removed with sharp curettes if necessary.

Instrument Sharpening

Evaluation of Sharpness

Sharpness can be evaluated by sight and touch in one of the following ways:

1. When a dull instrument is held under a light, the rounded surface of its cutting edge reflects light back to the observer. It appears as a bright line running the length of the cutting edge. The acutely angled cutting edge of a sharp instrument, conversely, has no surface area to reflect light. When a sharp instrument is held under a light, no bright line can be observed.

2. Tactile evaluation of sharpness is performed by drawing the instrument lightly across an acrylic rod known as a "sharpening test stick." A dull instrument will slide smoothly, without "biting" into the surface.

Sharpening Stones

India and Arkansas oil stones are examples of **natural** abrasive stones. **Carborundum, ruby, and ceramic stones** are **synthetically** produced.

Sharpening stones can also be categorized by their method of use.

Mounted Rotary Stones:- These stones are generally not recommended for routine use because they (1) are difficult to control precisely and can ruin the shape of the instrument, (2) tend to wear down the instrument quickly, and (3) can generate considerable frictional heat, which may affect the temper of the instrument.

Unmounted Stones:- come in a variety of sizes and shapes.

Sharpening Universal Curettes. The angle between the face of the blade and the lateral surface of any curette is **70 to 80** degrees . This is the most effective design

for removing calculus and root planing. To maintain the 70- to 80-degree angle , a flat, handheld stone should be correctly applied to the lateral surface of a curette, the angle between the face of the blade and the surface of the stone will be **100 to 110 degrees .**

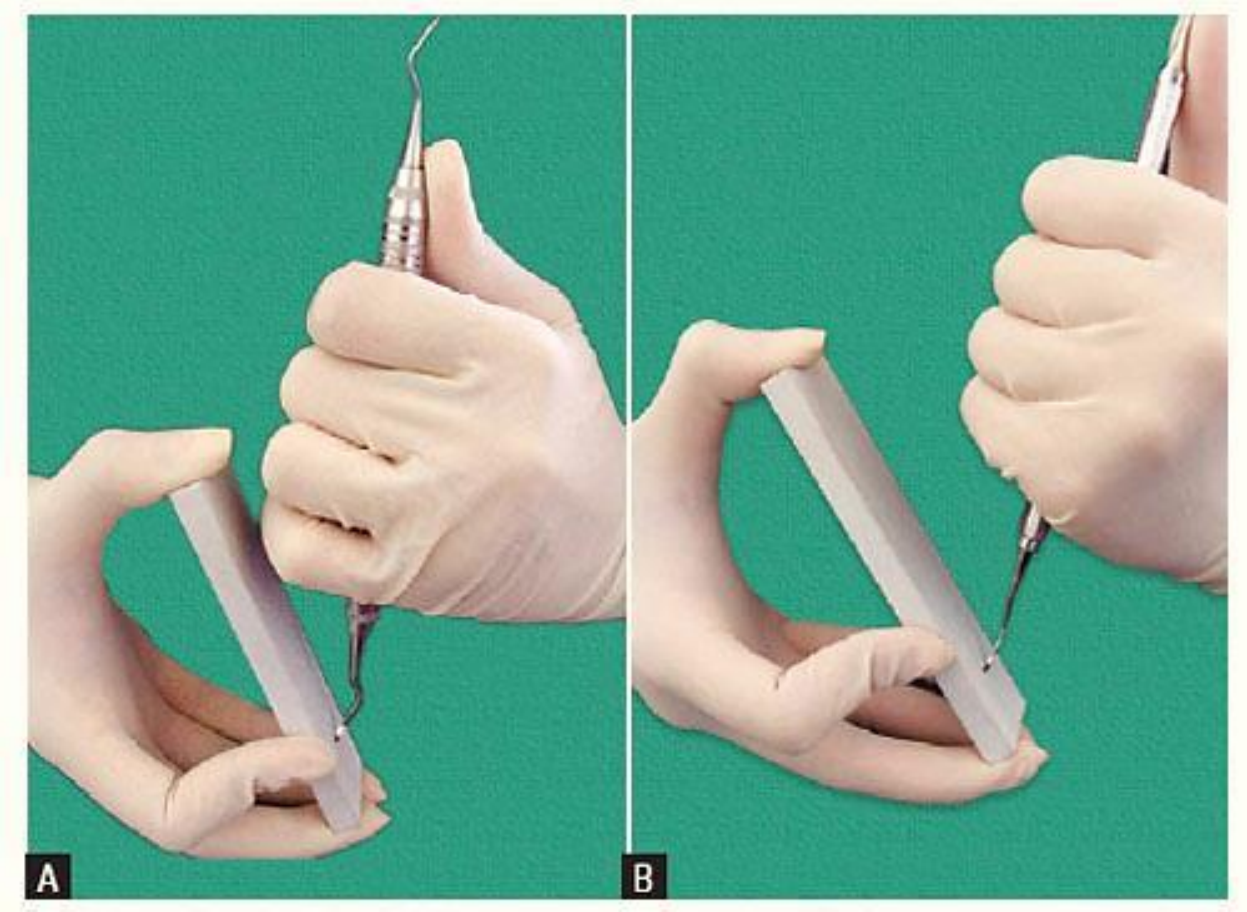

Fig.:- Instrument sharpening.