DENTAL ROTARY AND HAND INSTRUMENTS



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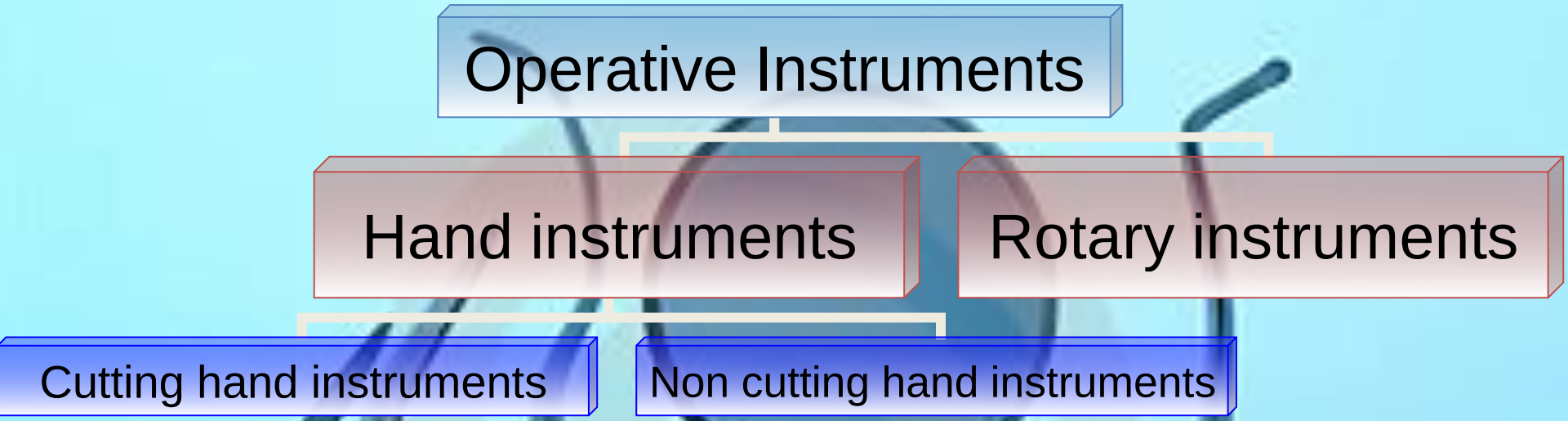
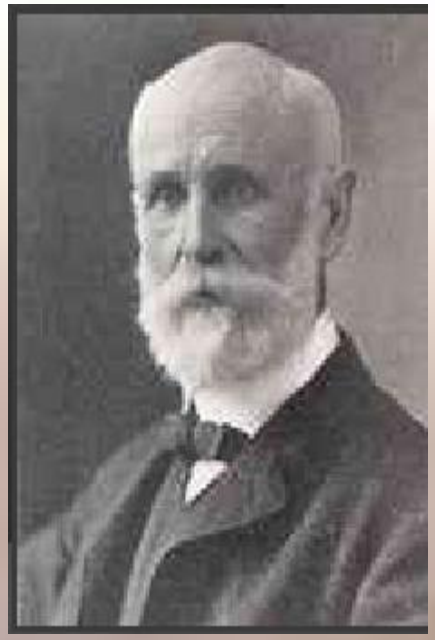


- **The removal and shaping of tooth structure are essential aspects of restorative dentistry. Initially this difficult process accomplished by the use of cutting hand and rotery instrume**nt.

Hand instruments

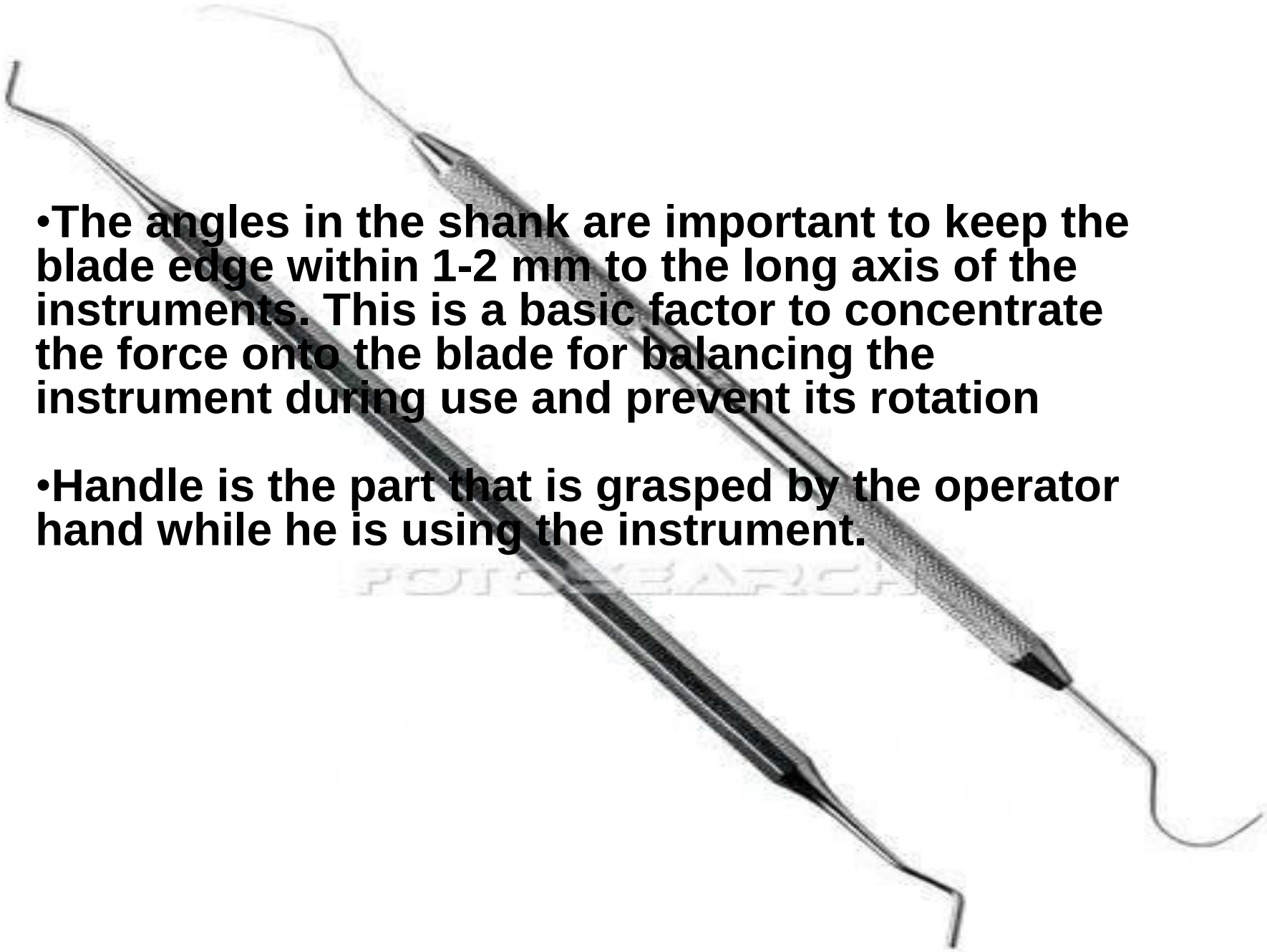


- For many years, carbon steel was the primary material because they were harder and maintained sharpness better than stainless steel.
- Stainless steel is now the preferred material because all materials must be sterilized with steam or dry heat and because the properties of stainless steel have improved by incorporating a significant amount of chromium imparts corrosion resistance and carbon imparts hardness.

Cutting instruments

- **Cutting instruments used to cut hard or soft tissue of the mouth.**
- **Hand cutting instruments are composed of three parts: handle, shank and blade.**
- **For non cutting instrument; the part corresponding to the blade is termed the *nib or working end*.**
- **The blade or nib; is the working end of the instrument and is connected to the shank.**
- **Some instruments have a blade on both ends of the handle and are known as *double ended instruments*.**
- **Shank serves to connect the handle to the blade of the instrument.**
  - **The shank may be straight,**
  - **Monoangle (with one angle),**
  - **biangle (with two angles) ,**
  - **triangle (three angles) ,**
  - **quadangle (four angles).**
  - **The term contra-angle refers to shank in which two or more angles are present.**





- **The angles in the shank are important to keep the blade edge within 1-2 mm to the long axis of the instruments. This is a basic factor to concentrate the force onto the blade for balancing the instrument during use and prevent its rotation**

- **Handle is the part that is grasped by the operator hand while he is using the instrument.**

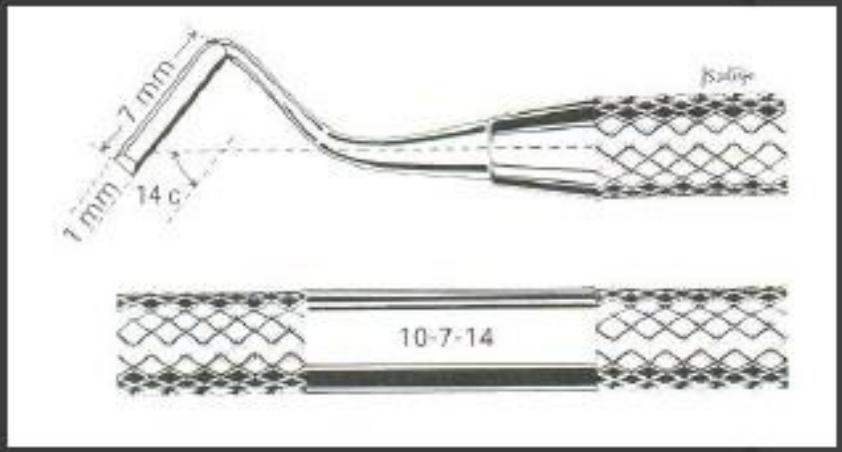
INSTRUMENT FORMULA GIVEN BY G.V.BLACK:

- **3 unit instrument formula**: Cutting edge of the instrument is at a right angle to the blade.

a. First unit – Width of the blade in tenths of a millimeter.

b. Second unit – Length of the blade in millimeter.

c. Third unit – Angle the blade forms with the axis of the handle in centigrade.



Instrument formula of enamel hatchet.

4 unit instrument formula: Cutting edge of the instrument is at an angle other than a right angle to the blade.

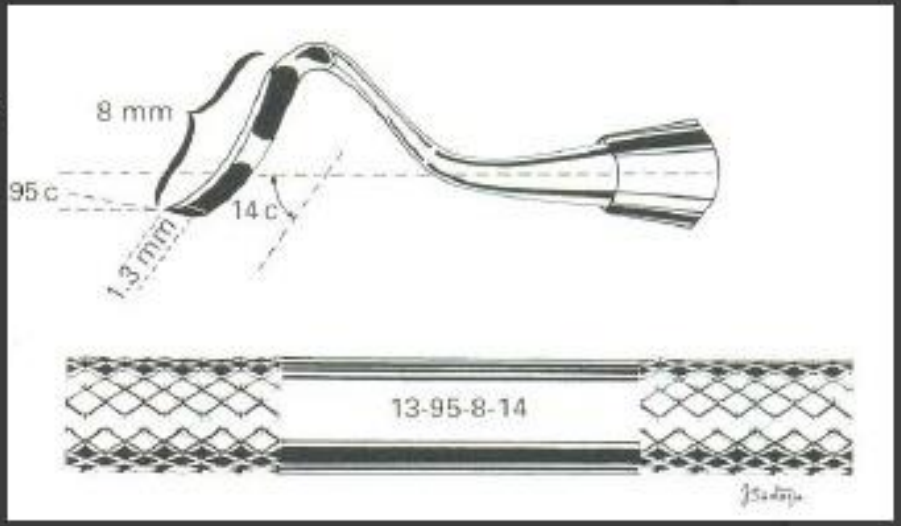
a. **First unit** – Width of the blade in tenths of a millimeter.

b. **Second unit** - Angle the cutting edge forms with the axis of the handle in centigrade.

c. **Third unit** – Length of the blade in millimeter.

d. **Fourth unit** – Angle the blade forms with the axis of the handle in centigrade.

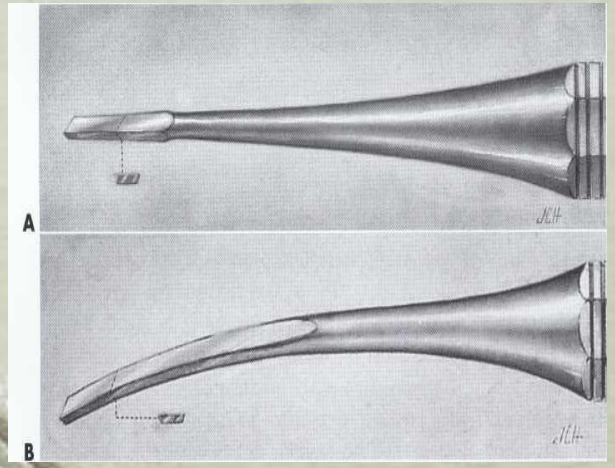
Example:- Gingival marginal trimmer & angle former.



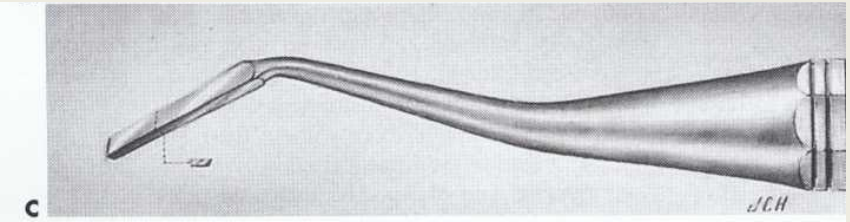
Instrument formula of distal GMT

Examples of the cutting instruments

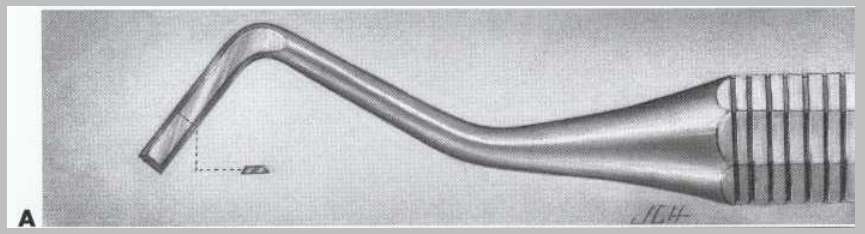
- **Chisel**
  - **either has a straight shank or with slight angle, and the blade has bevel only on one side of the edge.**
  - **Its cutting edge is perpendicular to the axis of the blade. The chisels are used for cutting enamel and dentin with pushing motion.**



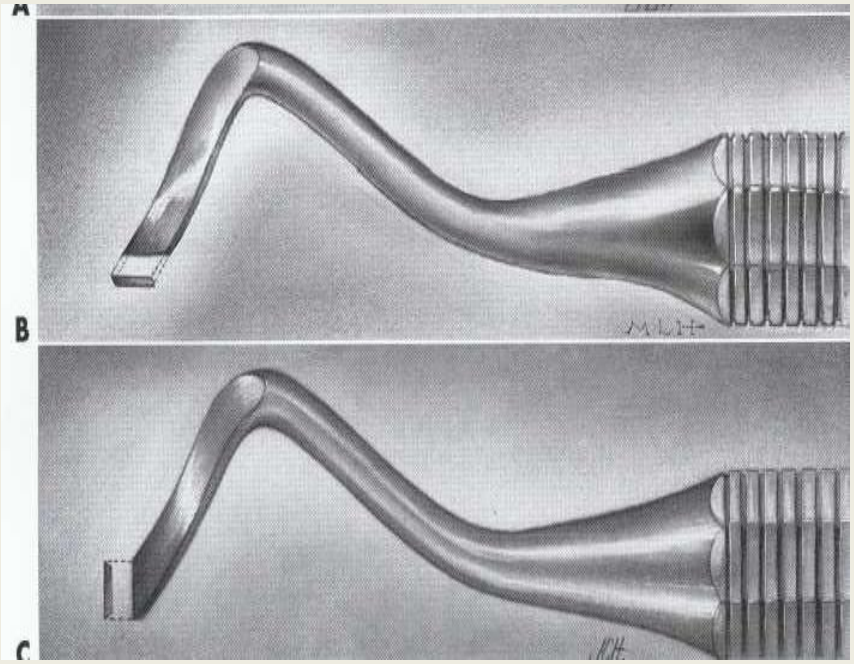
- **Hoe**
  - **It is like chisel with cutting edge is perpendicular to the axis of the blade, however its blade has a greater angle from the long axis of the handle than does that of the chisel. It has the same uses of the chisel.**



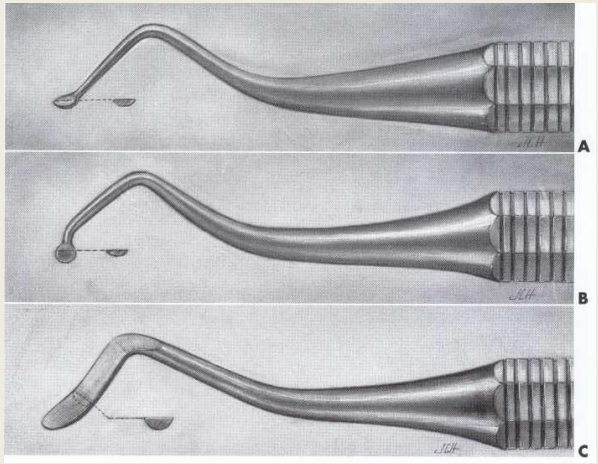
- **Hatchet**
  - **also called enamel hatchet. It is used for cutting enamel and dentin and comes as right or left types for using on opposite sides of the cavity .**

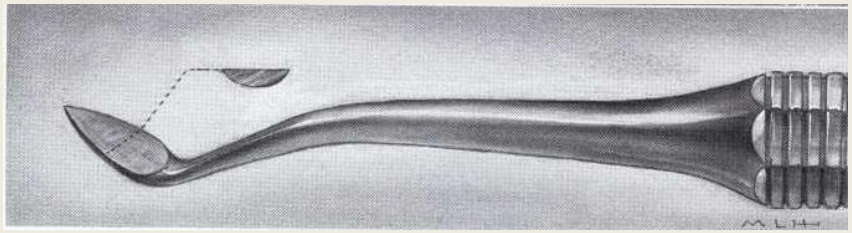


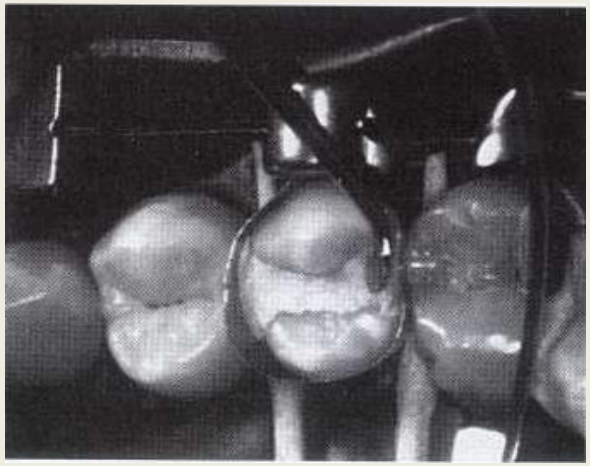
- **Gingival margin trimmer**
  - **This instrument is used for beveling of the gingival enamel margin of proximo-occlusal preparations.**
  - **Also it is using for beveling of axiopulpal line angle of two surface preparation as in class II cavities .**
  - **It is similar in design to the hatchet, except the blade is curved, and cutting edge is at an angle to the long axis of the blade.**
  - **It is made as right and left types.**



- **Spoon excavator**
  - **The blade is curved and the cutting edge at the end of the blade is in the form of a semicircle. This gives the instrument an outer convexity and inner concaving that makes it looks like a spoon**
  - **there are left cutting and right cutting spoons.**
  - **The shank of some spoons holds a small circular (disk blade) or claw – like blade at its end. The disk blade is known as a discoid, where the claw – like blade is termed a cleoid**
  - **Spoon excavator is used for removal of soft caries and for carving of amalgam restorations.**





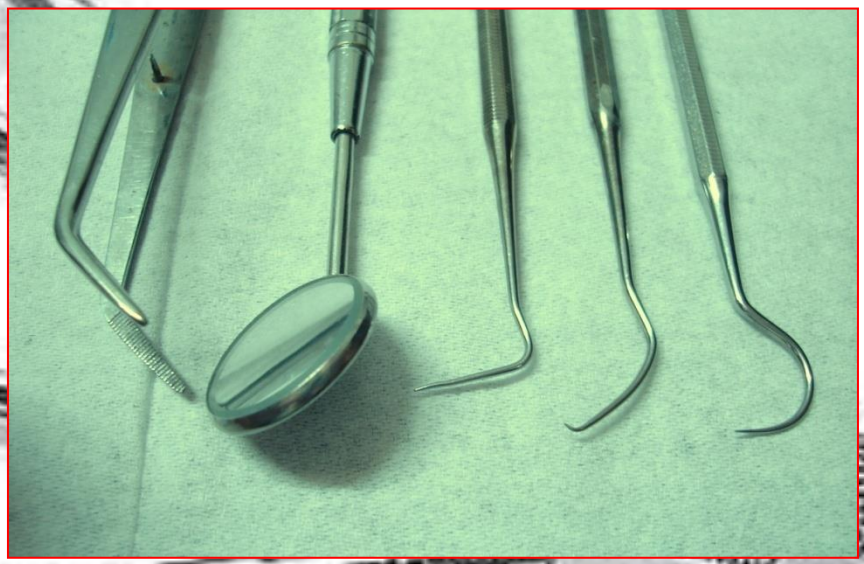


Non cutting instruments

- In these instruments the blade is replaced by a nib or point. These are divided according to function into
  - 1- Diagnostic Instruments
  - 2- Plastic Instruments
  - 3- Amalgam Instruments

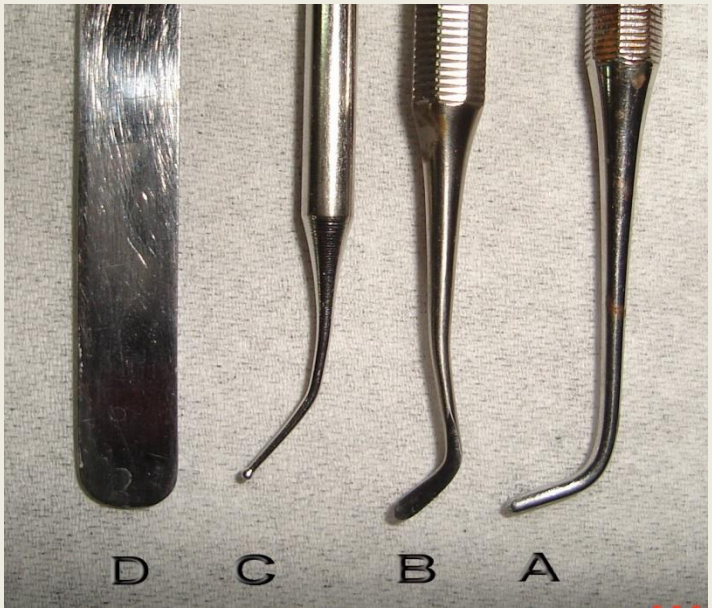
Diagnostic instruments

- **Mirror:-** used for indirect visualization, reflection of light into the area. The mirror also served as a retractor of soft tissue to aid access and visualization .
- **Probe or explorer:**- pointed instruments used to feel tooth surface for irregularities and to determine the hardness of exposed dentin and caries detection. Probes have different shapes either sickle, straight or angled
- **Tweezer or cotton forceps:**- used for aiding the operator to carrying small items to the mouth of the patient .



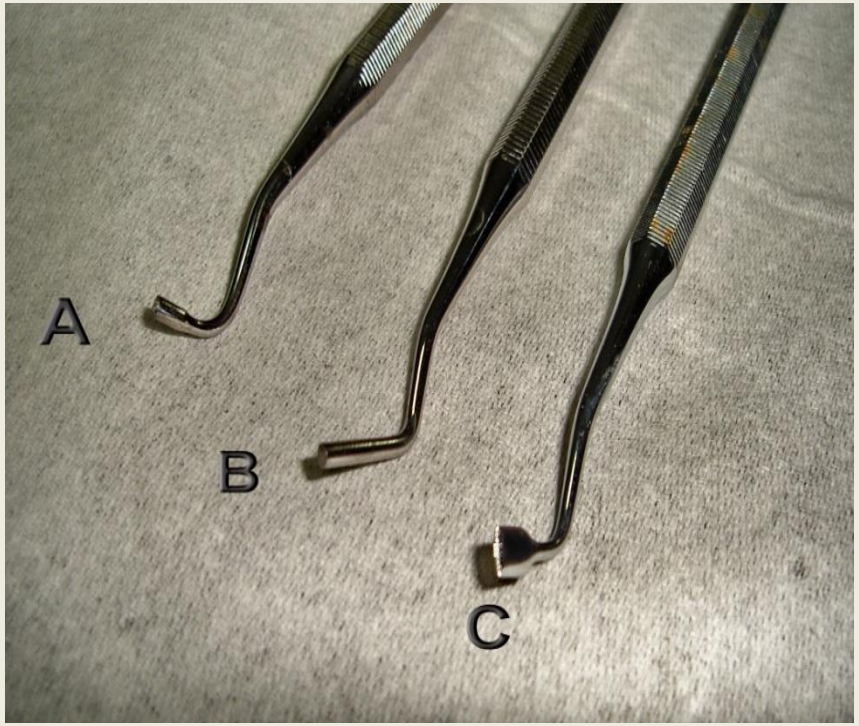
Plastic instruments

- Or plastic filling instrument are used to carry and shape tooth colored restorative, or for packing temporary filling material, or for placing of basing and lining material
- In past these instruments are made of plastic, but now are available in either hard plastic or metal.
  - Ash 49 is double ended instrument with cylindrical nibs and rounded ends (A).
  - Ash 6 is similar to carver but the margin of its working end is not sharp (B).
  - Dycal applicator is small instrument with small round nib used for mixing and placing dycal (C).
  - Cement spatula is used for mixing variety of materials on glass or on a paper pad (D).



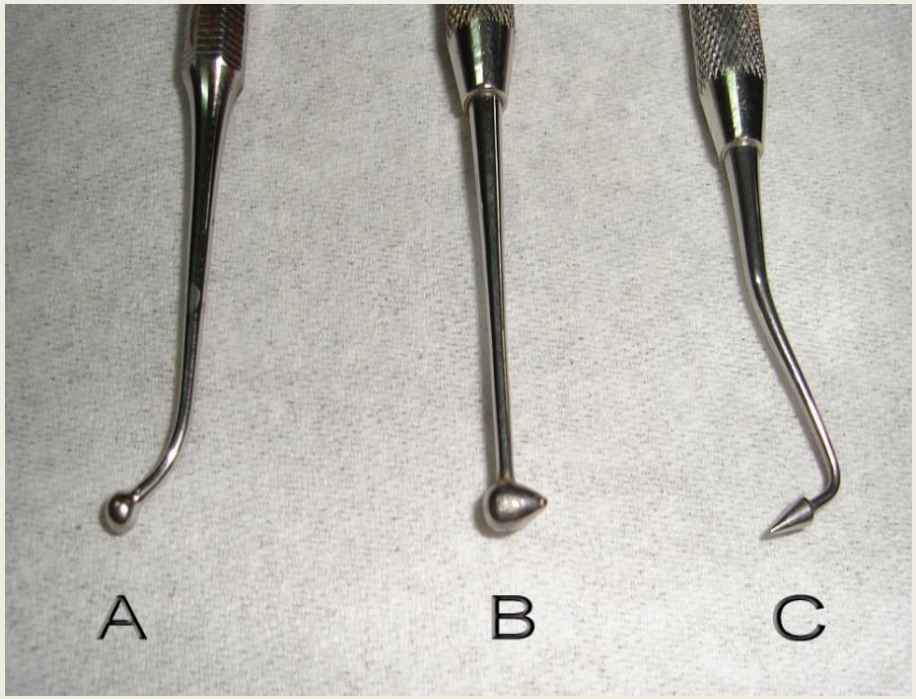
Amalgam instruments

- **Those instruments used to place dental amalgam, and to a certain extent, resin composite restorative material.**
  - **Condensers:- condensers are used to compress the amalgam. The working end or nib of the condenser is usually round with flat end (face), but also the nibs may have different shapes as triangular, rectangular or diamond shape ends.**

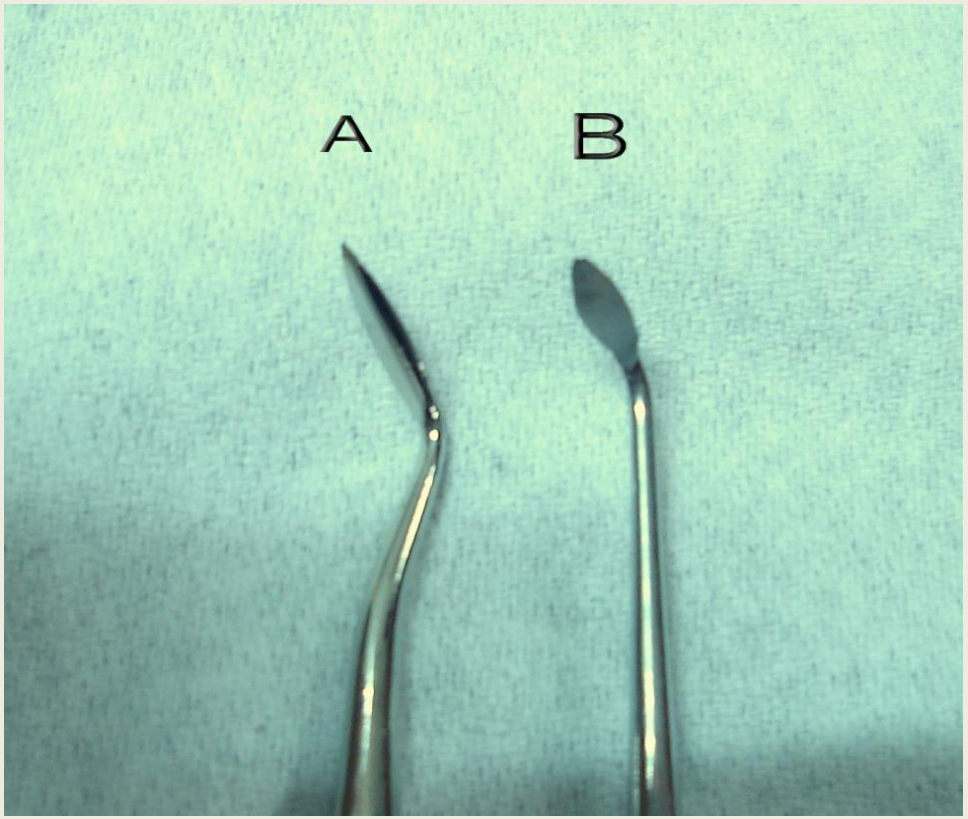


– Burnisher:

- have different nib shapes, also with different sizes.
- Burnishers are used for several functions such as; burnishing of the amalgam on the margins of the cavity, and also smoothing of the carved amalgam surface.
- Burnishers also used for shaping metal matrix band to have more desirable contours for restoration.
- Other uses of the burnishers are to bend cast gold restoration (inlay or onlay) near the margin of the prepared cavity to narrow the gap between gold and the tooth .



- **Carver**
  - **carvers are used to shape amalgam or resin composites material.**
  - **Carvers have many shapes but usually the nibs are flat with sharp margins for carving as in Fig.**

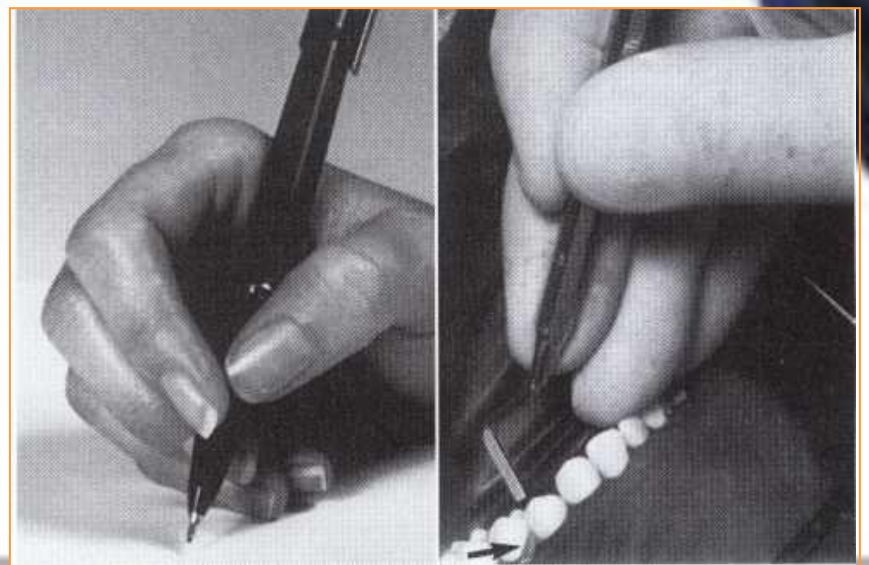


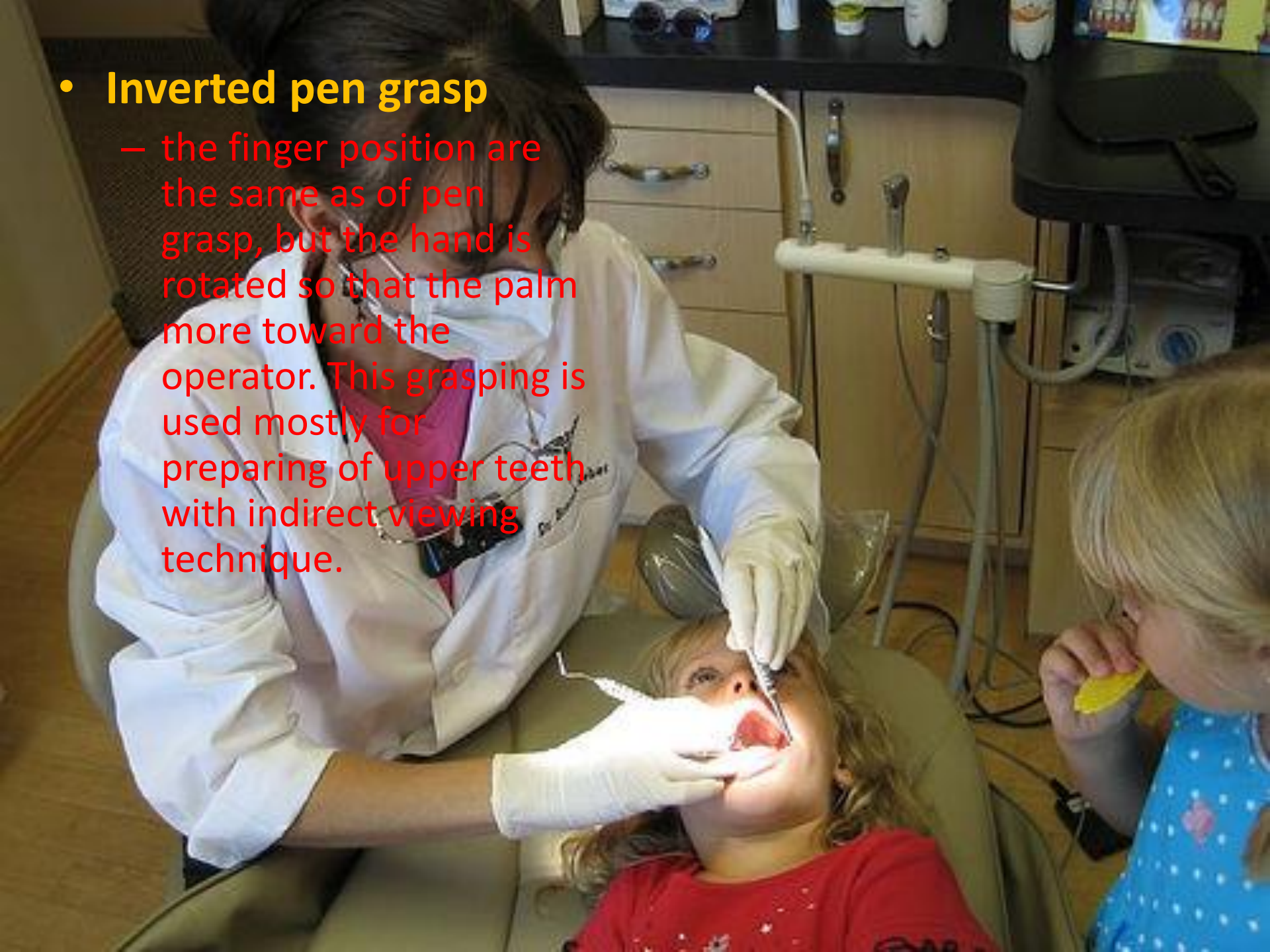
- **Amalgam carrier:- used to carry the amalgam and place into the prepared cavities.**



Hand instrument grasping

- **Pen graspit is similar to that used in holding a pen. The palm of the hand generally is facing away from the operator**





- **Inverted pen grasp**
  - the finger position are the same as of pen grasp, but the hand is rotated so that the palm more toward the operator. This grasping is used mostly for preparing of upper teeth with indirect viewing technique.

Rotary instruments

- Handpiece
  - straight handpiece is used more frequently for laboratory work
  - contra angle handpiece, used in the mouth, and classified according to their speed of rotation into-:
    - Low speed handpiece (500 - 15,000 rpm (revolution per minute)

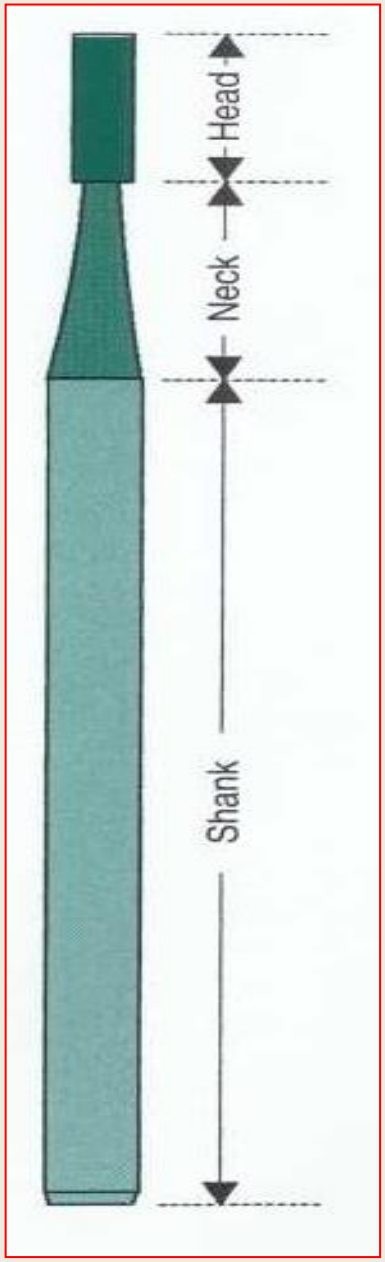


- Low speed contra – angle handpiece, with round bur rotating slowly, are used for removal of carious dentin.
- Also may be used with different bur shapes to finish the prepared cavity (e.g. rounding of sharp edges, or flatting of the floor),
- used in finishing and polishing of restorations.

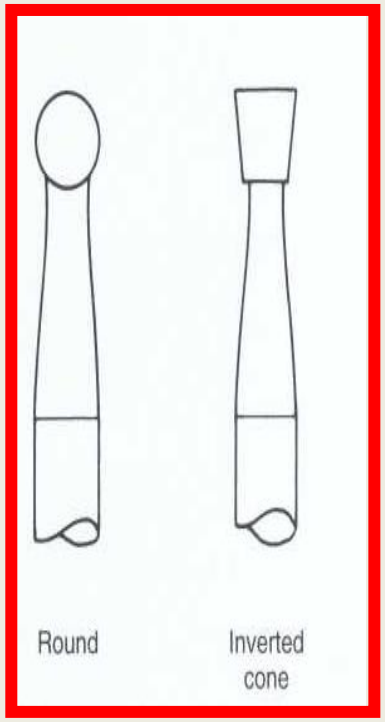
    - High speed handpiece : above 160,000 rpm and some have speed up to 500,000 rpm .

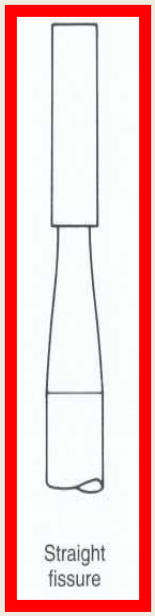
- High speed techniques are generally preferred for cutting enamel and dentin.
- Small diameter burs should be used in the high speed handpiece.
- Should be used with water coolant and high efficiency evacuation.

- **Burs**
- **A group of instruments that can turn on an axis with different speed of rotation to perform different types of work. The characteristics of this work are either cutting , abrasive, finishing or polishing**
- **Burs used for cutting are manufactured from stainless steel, carbide or diamond. Each bur consist of three parts: shank, neck, and head.**
- **burs are classified according to the shapes of their heads .**



- **The basic bur shapes are round, inverted cone or fissure burs.**
  - **Round bur: the head is spherical so it is used for initial entry into the tooth, preparation of retentive holes or for removal of caries dentin .**
  - **Inverted cone bur :the head is a cone – shape with the apex of cone directed toward the bur shank. This bur is used for flatting the floor of the cavity, increasing the depth of cavity or for providing undercuts in cavities preparation.**
  - **Straight fissure bur: - is an elongated cylindrical head bur used for obtaining the outline form of the cavity and to cut walls, floor, or margins of the cavity .**



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