

Operative Dentistry: Hand Instruments

Part 1: Instrument Parts

Even though there is great variation among hand cutting instruments, they have certain design features in common. Each hand instrument is composed of three parts: the handle, the shank, and the blade. The handle can be small, medium, or large, smooth or serrated. On the handle are two numbers. One is the instrument formula, and in this case, it is 15-8-12. The instrument formula describes the dimensions and angulation of the instrument. The other number is the manufacturer's number which is used for ordering purposes.

The next section is the shank. It connects the handle to the blade. The shank may be straight or angled. If it is angled, the shank may be mono, bin, or triple angled. The angulation provides for access and stability.

The blade is the last section. It is the working part of the instrument. The blade of the instrument is beveled to create the cutting edge. In some instruments there are three bevels. Two are on the side and one is at the end. The edge on the end is called the primary cutting edge and the edges on the sides are called the secondary cutting edges.

The hand instrument can be either double ended if there are working ends at both sides or long handled if there is just one working end.

Part 2: Instrument Formula

The basic instrument formula consists of three units. The handle here has the instrument formula of 15-8-14. The number 15 indicates the width of the blade in tenths of a mm. The fifteen, therefore, represents 1.5mm. The second number, 8, represents the length of the blade in millimeters, that is, from the shank to the cutting edge. It is 8mm in this case. Fourteen represents the angle the blade makes with the long axis of the handle, or the plane of the instrument. This angle is expressed in "hundredths" of a circle or centigrade. To calculate the measurement of the angle, you place the instrument on the center of the circle and move it until the blade lines up with one line of the ruler. This measurement represents the angulation of the blade from the long axis of the handle, which is fourteen degrees in this case.

When the cutting edge of an instrument is at an angle other than a right angle to the length of a blade, a fourth unit is added to the basic three unit formula. This number is placed in the second position of the formula. The first number, 15, tells the width of the blade in tenths of a millimeter. The second number, 95, represents the angle that the cutting edge of the instrument makes with the long axis of the handle. The third number, 8, is the length of the blade; and the fourth number, 12, is the angle the blade makes with the plane of the instrument or the long axis of the handle. To measure the fourth number, the instrument is placed in the center of the

measuring circle and moved to the left until the cutting edge lines up with one of the lines on the ruler; in this case, it is 95 degrees.

Part 3: Instrument Families

There are two families of instruments: the chisel family and the hatchet family. In the chisel family, we have the chisel, hoe, angle former, and cleoid-discoid.

In the hatchet family, we have the hatchet, gingival margin trimmer, and spoon excavator.

At one time all instruments were called excavators and were used for removal of carious lesions as well as shaping cavity walls and refining line angles and point angles. At the present time, excavators are used only for removal of carious lesions.

Part 4: Chisel Family

Chisels are used for cleaving, planing, and lateral scraping. The cutting edge of the chisel makes a 90 degree angle to the plane of the instrument. Chisels are used with a push motion.

The hoe is another member of the chisel family. By definition, the hoe is any instrument where the blade makes more than a 12.5 degree angle with the plane of the instrument. While the chisel is normally used with a push motion, the hoe modification is frequently used with a pull motion.

There are two sets of angle formers. Each instrument in the set is a double-ended instrument. One is the mesial angle former, the other is the distal. The mesial angle former is used in the mesial box to plane the gingival cavosurface margin; the distal angle former is used in the distal box to plane the gingival cavosurface margin as well. These instruments are very useful in shaping and refining.

The final member of the chisel family is the cleoid-discoid. One end is claw-like and the other end is disk-like, in that, instead of having a sharp edge, the edge is rounded. Previously, this instrument was used to remove carious lesions. But presently, the cleoid-discoid is used to carve and form the occlusal surface of amalgam restorations.

Part 5: Hatchet Family

Any instrument where the cutting edge is parallel or close to parallel to the plane of the instrument is called a hatchet. Basically, a hatchet is the same as an axe and is used for cleaving and planing.

The gingival margin trimmer (or GMT) is a hatchet with two distinct differences. First, the GMT has a curved blade rather than the straight blade of the hatchet. The curved blade accentuates the lateral scraping ability of the GMT. Second, the cutting edge of the hatchet makes a 90 degree angle to the plane of the blade. However, the cutting edge of the GMT makes an angle with the plane of the blade. With the GMT, the cutting edge is at an angle. The gingival margin trimmer is a set of two double ended instruments. One gingival margin trimmer is used for the distal box

of the class II cavity preparation, and the other is used for the mesial box. The GMT with 95 in the second place of the formula is used in the distal box; the one with 80 in the second place is used in the mesial box. The GMT and angle formers are used for planing of the gingival cavosurface margin in the class II cavity preparation. Remember that planing means removal of unsupported enamel.

The spoon excavator is another member of the hatchet family. There are two distinct differences between the spoon excavator and hatchet. First, the blade of a spoon excavator is curved to accentuate the lateral scraping motion of this instrument. Second, the cutting edge of the spoon excavator is rounded. At the present time, the spoon excavator is used for removal of caries.

Part 6: Areas of Use

The chisel family is used in the upper right quadrant of the patient if you are a right handed operator. The hatchet family is used in the upper left, lower left, and lower right of the patient if you are a right handed operator. The chisel family is used in the upper left of the patient if you are a left handed operator. The hatchet family is used in the upper right, lower right, and lower left if you are a left handed operator.

Part 7: Methods of Use

The instruments are effectively used when they are used from the bevel side to the non-bevel side. These instruments are used to remove unsupported enamel or any roughness of the walls and should always be held parallel to the wall you are working on. They should also be used in a way to allow the cutting edge to remove any unsupported enamel or irregularities.

Never hold the instrument at this angle. This angle may be more effective in cutting but it may also cause damage or fracture of the tooth. Always use the instrument parallel to the wall that is being worked on. For the buccal wall, one side of the instrument is used, and on the lingual wall, the other side of the instrument must be used.

There are two directions we must consider when using hand instruments on the proximal box: occluso-gingival and axio-proximal. Occlusal-gingivally, you want to hold the instrument parallel to the wall and proximal-axially you want to always hold the instrument 90 degrees to the tangent of the tooth structure. You do not want to be at an angle to the tangent of the tooth structure.

If the instrument is held in this manner, unsupported enamel from this area is missed. Therefore, the other side of the instrument, from the bevel side to the non-bevel side, must be used. Then, turn the instrument around and do the same thing to the other side, from the bevel side to the non-bevel side. The primary cutting edge is placed on the pulpal floor and the secondary cutting edge is placed against the buccal or lingual wall and any unsupported enamel is removed.

One gingival margin trimmer is used in the distal box of a class II preparation to plane the cavosurface margin and one is used in the mesial box. To plane the gingival cavosurface margin, place the instrument in the center and move it from the bevel side to non-bevel side.

If one were to try to use the mesial gingival margin trimmer in the distal box, it would not work correctly. The blade of the instrument must be kept at 90 degrees to the gingival cavosurface margin. Do not angle the blade of the gingival margin trimmer.

Attention is brought to the proximal corners. Place the instrument on the bucco-proximal wall or linguo-proximal wall and bring it down to the gingival cavosurface margin just above the corner. For the other side, use the other end. The same distal GMT is used to round the pulpal-axial line angle and the distal GMT is also used in the mesial box to accentuate the axial gingival line angle retention groove. The mesial GMT is used to plane the mesial gingival cavosurface margin, round the mesio-pulpal-axial line angle, and accentuate the distal groove at the axial gingival line angle.

Part 8: Holding the Instrument

Hand instruments should be held with a modified pen grip. A pen is held with the thumb and index finger, with the middle finger placed under the pen. An instrument is held with the thumb and index finger in the same manner, but the middle finger goes to the side of the instrument rather than going under the instrument. This position stabilizes the instrument and allows the middle finger to help push the instrument down.