Endodontics

Lecture 4 أ.د.حسين فيصل الحويزي

Intracanal Instruments

Classification of intracanal instruments

They are divided into six groups:

Group I: Manually-operated instruments, such as barbed broaches and K-type and H-type instruments.

Group II: Low-speed instruments with a latch-type attachment. Typical instruments in this group are Gates-Glidden (GG) burs and Peeso reamers. They are typically used in the coronal part of the canal and never used in a canal curvature.

Group III: Engine-driven nickel-titanium rotary instruments. They consist of a rotating blade that can safely be operated in, and adapt itself to, curved root canals. Most engine- driven instruments available today belong to this group.

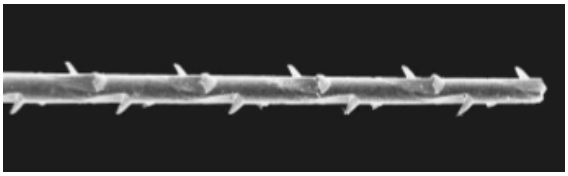
Group IV: Engine-driven instruments that adapt themselves three-dimensionally to the shape of the root canal. Like other nickel-titanium instruments, they adapt to the shape of the root canal longitudinally but additionally they adapt also to the cross-section of the root canal. There is currently only one instrument in this group: the self-adjusting file (SAF).

Group V: Engine-driven reciprocating instruments.

Group VI: Ultrasonic instruments.

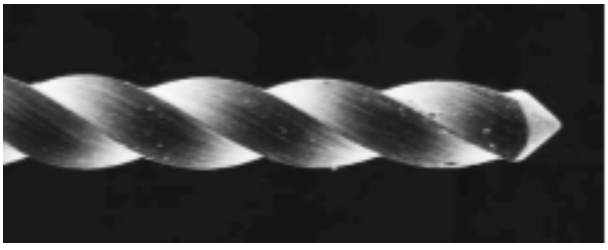
Group I: Manually-operated instruments

Barbed Broaches



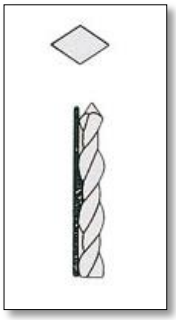
They were the earliest endodontic instruments used to extirpate the pulp. They are manufactured by hacking a round, tapered wire with a blade to form sharp, projecting barbs that cut or snag tissue. A barbed broach does not cut or machine dentin; this instrument is mostly used to engage and remove soft tissue from the canal. It is an excellent tool for removing cotton or paper points that have accidentally become lodged in the root canal.

K-type instruments.



The K-file and K-reamer are the oldest useful instruments for cutting and machining dentin. They are made from a stainless steel wire that is ground to a tapered square or triangular cross-section and then twisted to create either a file or a reamer. A file has more flutes per length unit than a reamer. K-type instruments are useful for penetrating and enlarging root canals.

The instrument works primarily by compression- and-release destruction of the dentin surrounding the canal. Generally, a reaming motion (constant file rotation) causes less transportation than a filing motion. Transportation is the excessive loss of dentin from the outer wall of a curved canal in the apical segment. As the instrument is increased in width its flexibility is decreased.



K-flex file

It has a cross-section that is rhomboid in shape. It is a twisted instrument and has a series of cutting flutes. It has 2 acute edges and 2 obtuse edges. The acute angle cuts into the dentin while the obtuse angle provides more area for debris collection and removal. The cutting efficiency and flexibility is greater than the K-type file.

Flex-O-File

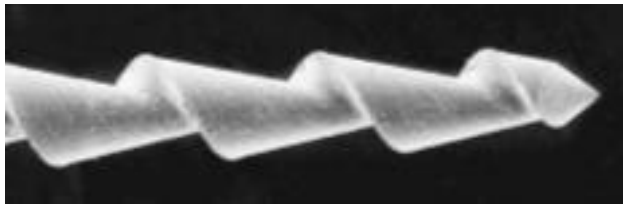
This instrument resembles the K-type file but it is triangular in cross-section. There is better cutting action and more room for the debris, better flexibility and more resistance to fracture. The tip of the instrument is non cutting so no apical ledge formation is possible.

Flex-R-file

The design of the tip of this instrument eliminates the possibility of ledge formation by removing the cutting surface of the tip's leading edge. This guides the instrument in the canal rather than cut. It has a triangular cross-section which increases its flexibility. It cuts more efficiently in anti-clockwise motion and can be used for filing action.

H-type instruments.

An H-type instrument has spiral edges arranged to allow cutting only during a pulling stroke. An example is a Hedström file. An H-type instrument is better for cutting than a K-type instrument, because it has a more positive rake angle and a blade with a cutting rather than a scraping angle. Bending a Hedström file results in points of greater stress concentration than occurs with K-type instruments. These concentration points can lead to the propagation of cracks and fatigue failure. All H-type instruments are ground from a tapered blank. Hedström files are formed by grinding a single continuous flute.



S-file (Uni-file)

This instrument is a ground S-shaped cross-section instrument. This is stiffer than the Hedstrom file. The cutting mode may be with filing or reaming action.

Traditional instruments modifications

1- Nickel titanium file.

Files made from nickel titanium showed greater elastic flexibility and resistance to torsional fracture than stainless steel. This file has a non cutting tip and it tends to maintain the curvature of the root canal.

2- Golden mediums

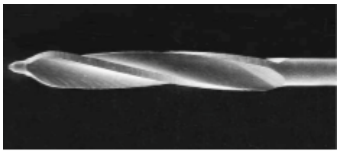
These instruments are a series of intermediate size instruments. They correspond in size to halfway between standard ISO sizes and correspond to 12,17,22,27,32 and 37 in number.

3- Canal Master U

This hand instrument is used to prepare the apical third of the canal. It has a non cutting pilot tip, 1 mm length cutting blade and a narrow parallel sided shaft. It is used to allow for better cutting with more space for debris accumulation and further removal. It reduces the possibility of ledge or transportation.

Group II: Low-Speed Rotary Instruments

Many types of rotary instruments are used during endodontic procedures. In addition to conventional burs, burs with extended shanks for low-speed contra-angle handpieces are useful for providing good visibility during deep preparation of the pulp chamber. This is particularly important when using an operating microscope when performing such procedures after access to the pulp chamber has been achieved. Straight-line access to the initial point of curvature can be accomplished using rotary instruments such as Gates-Glidden burs and Peeso instruments. Use of these instruments should be limited to the straight portion of the canal preparation. The risk of perforation with these instruments is a possibility. The risk of lateral cutting resulting in perforation is lower with Gates-Glidden burs than with the Peeso drills. The Peeso reamer is used mostly for post space preparation.



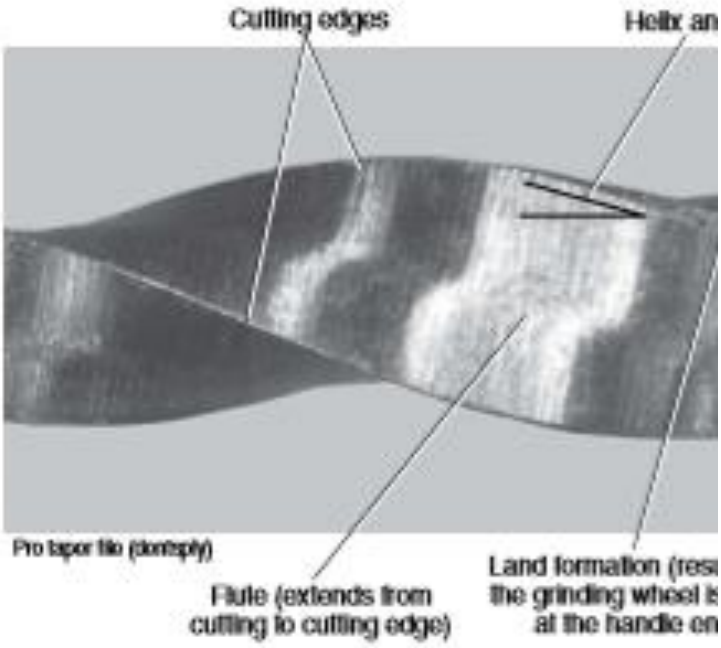
Group III: Rotary Instruments for Canal Preparation

Components of a file

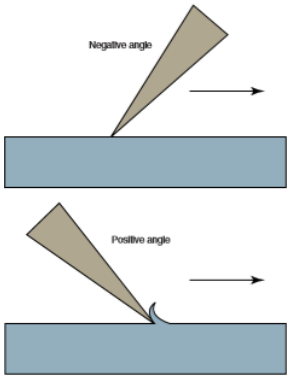
1- The taper. It is expressed as the amount the file diameter increases each millimeter along its working surface from the tip toward the file handle. for example, a size #25 file with a #.02 taper would have a 0.27 mm diameter 1 mm from the tip, a 0.29 mm diameter 2 mm from the tip, and a 0.31 mm diameter 3 mm from the tip. Some manufacturers express the taper in terms of percentage (e.g., a #.02 taper is a 2% taper).

2- The flute of the file. It is the groove in the working surface used to collect soft tissue and dentin chips removed from the wall of the canal. The effectiveness of the flute depends on its depth, width, configuration, and surface finish.

3- Helix angle. It is the angle the cutting edge forms with the long axis of the file. It gathers debris collected in the flute from the canal. This angle is important for determining which file technique to use.



4- If a file is sectioned perpendicular to its long axis, the rake angle is the angle formed by the leading edge and the radius of the file. If the angle formed by the leading edge and the surface to be cut (its tangent) is obtuse, the rake angle is said to be positive or cutting. If the angle formed by the leading edge and the surface to be cut is acute, the rake angle is said to be negative or scraping.



5- The pitch of the file is the distance between a point on the leading edge and the corresponding point on the adjacent leading edge. The smaller the pitch or the shorter the distance between corresponding points, the more spirals the file has and the greater the helix angle.