SOUTH CALGARY ENDODONTICS

Spring 2018

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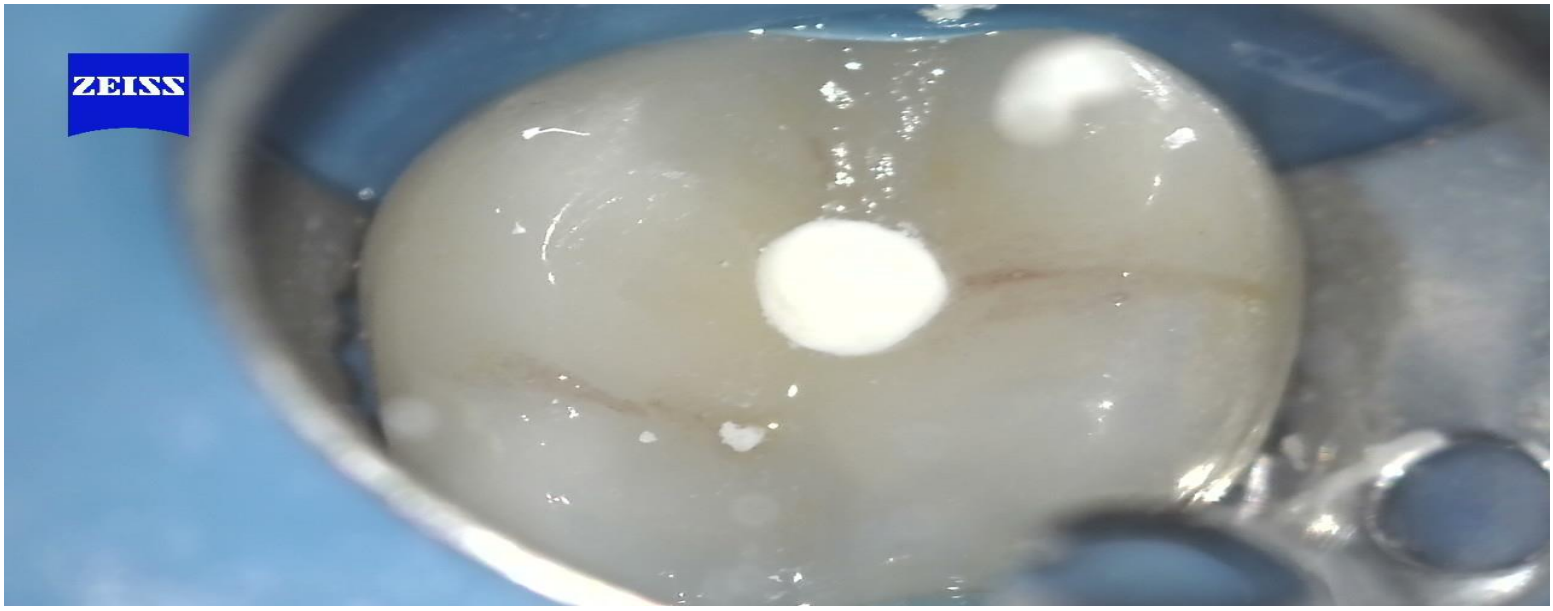
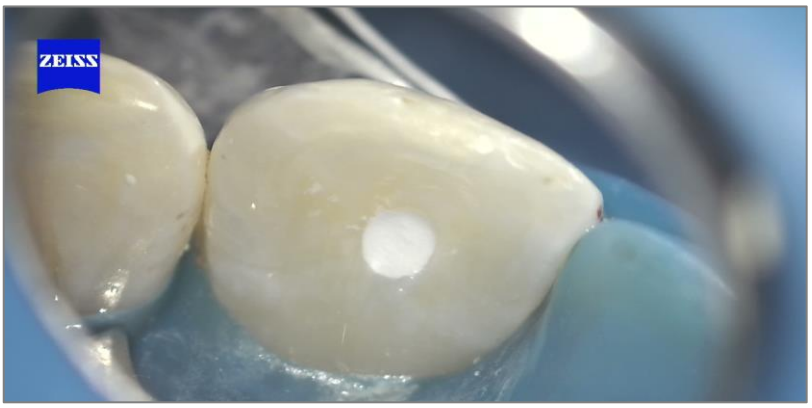
MINIMALLY INVASIVE ENDODONTICS





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MISSION ENDODONTICS

Part one: Shift in Paradigm

In the last two decades there has been a conceptual change in the practice of dentistry. Minimally Invasive Dentistry (MID) was introduced, which involve preventing or intercepting the progress of a dental disease with techniques that minimize healthy tissue loss. Recently there has been a paradigm shift in some of the principles in the way dentistry has been practiced for over the last century. For example, extension for prevention is no longer found to be widely acceptable, as it requires removal of sound and intact tooth structure for a only a potential chance of a future benefit. Several years ago, MID was extended to the field of endodontics. This new concept termed "Minimally Invasive Endodontics" would change how endodontic therapy would be performed, and would challenge the historical view of how endodontic treatment would be executed.

Figure 1

Figure 1.

Conservative access preparation in **Minimally Invasive Endodontics** on tooth 26. The pulp is accessed by removing a portion of the MO restoration without extension into the sound dentin laterally.

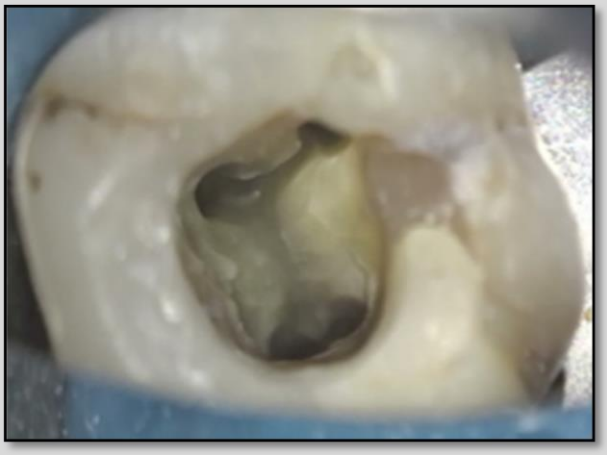

Figure 2

Figure 2.

Traditional endodontic access opening on tooth 46.

Extensive and often unnecessary removal of coronal and cervical dentin.

Minimally Invasive Endodontics relates to the techniques and instrumentation used to treat the root canal system and prevent apical periodontitis, with minimal loss of tooth structure. The idea is to disinfect the pulp chamber and the canal system in the roots, and to be able to do that without sacrificing extensive occlusal enamel and dentin in the crown and roots.

When the ability of a tooth to withstand occlusal and functional forces is measured, numerous studies indicate that a tooth with a significant loss of enamel and dentin performs much poorer than an intact tooth. A tooth with an MOD preparation loses 60% of its strength. Similarly it was shown that an endodontically treated tooth was significantly weaker than if left untreated. However, it was not the endodontic treatment in itself but the techniques and the aggressive removal of coronal tooth structure used in the access opening and canal preparation that were responsible for most of the loss of strength.

In MIE, when the diameter of the access preparation was decreased by a half, the operator removed four times less volume of the tooth structure. This additional volume of dentin significantly improved the strength of the tooth and increases the fracture resistance when compared to traditionally accessed teeth.

Figure 3

Figure 3.

Grossly overextended access preparation on tooth 46. Thin dentin/enamel walls are in danger of a fracture, even with subsequent crown placement. The strength of this tooth has been severely compromised by the dentin removal coronally and cervically.

Figure 4

Figure 4.

Minimally invasive access on tooth 46 preserves the tooth structure and decreases the risk of future crown or root fracture.

Figure 5

Figure 5.

Minimally Invasive Endodontics with an access cavity diameter of 1.5mm resulted in minimal dentin loss during the endodontic preparation and allows the tooth crown to retain most of its original strength.

In dental school, we were all instructed in order to achieve proper endodontic access we must achieve direct-line access to the apical foramen and strive to eliminate the initial curvature. We were also instructed to establish tapering walls, with its widest dimension at the occlusal surface. Those two recommendations are responsible for what we consider the “classical” appearance of the endodontic access. This type of endodontic access is also destructive to the crown of the tooth. The reasoning behind the straight line or direct access to the canals was to reduce the amount of forces acting on an endodontic file when stiff nickel titanium or stainless steel files were used. However, with the invention of newer nickel-titanium files without shape memory, straight-line access is no longer necessary. The new nickel-titanium files now exert very little lateral force and are able to adapt to much more severe curvature than the regular stiff nickel titanium files or stainless steel K-files.

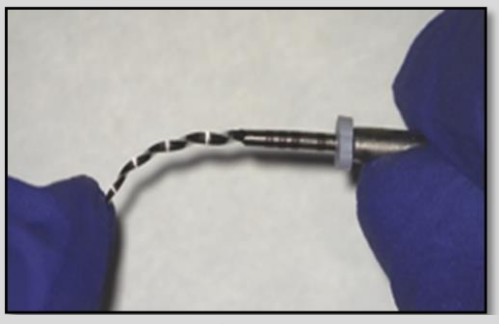

Figure 6

Figure 6.

Standard nickel titanium files with shape memory require lateral force to bend. As the file diameter increases, more force is required to bend the file. As the diameter of the file increases the likeliness of instrument fracture due to lateral force also increases.

Figure 7

Figure 7. As the standard nickel-titanium file attempts to return to their "original" memory shape, it exerts lateral force. In the canal that force is exerted on the outer wall apically and inner wall coronally leading to canal straightening, canal transportation or strip perforation. To reduce the occurrence of mishaps, straight line access is necessary.

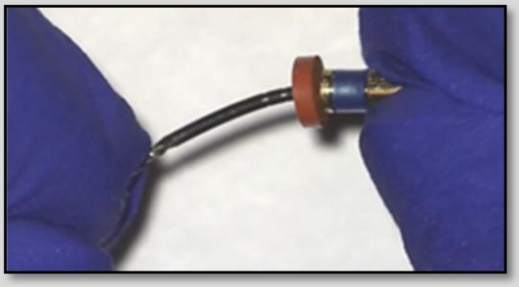

Figure 8

Figure 8.

New nickel titanium files without shape memory. Very little lateral force is needed to bend the file. Even as the diameter of the file increases and the additional force required is still small. Therefore the likelihood of file fracture is decreased.

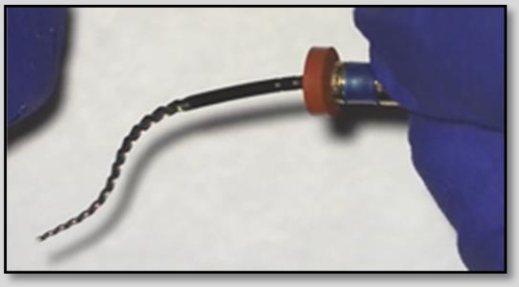

Figure 9

Figure 9.

As the file has no shape memory, very little force is exerted by the file laterally on the canal walls. Straight line access is not necessary as long as the orifices are visible.

The other advantage of the classical tapering appearance of the conventional access opening was allowing an unaided eye of the dental practitioner to visualize the pulp floor and the orifices, using only an overhead light. With the assistance of a microscope and the associated powerful light, the need for extended occlusal access is no longer required. During endodontic preparation in MIE, it is routine to use a magnification of 10x to 16x and multiple viewing angles are needed to be able to visualize all canals.

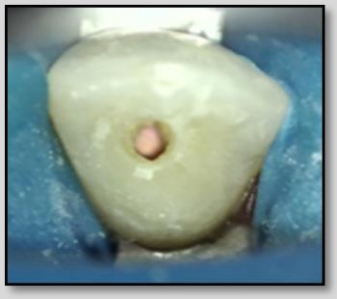

Figure 10

Figure 10.

Minimally Invasive access on tooth 43 is approximately 1.2mm in diameter just slightly larger than a diameter of a shaft of an endodontic file (usually 1mm).

Figure 11

Figure 12

Figure 11/12.

Viewing from a distal direction three mesial canals are visible. To see the distal canals, a more mesial viewing angle is necessary.