CLINICAL INSIGHTS
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ESCONDIDO ENDODONTICS

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Microscopy in Endodontic Treatment

The microscope is a device that separates visualization of the tooth as a whole from highly accurate examination of specific areas of internal tooth anatomy. The microscope puts you inside the tooth. With the highest levels of magnification, only a portion of the tooth may be visible. Although this may not be practical for some restorative dental procedures, especially crown contours or overall esthetics, it is essential for efficient endodontic treatment. The microscope can no longer be considered just a high tech piece of equipment to have in the office. The microscope has been used routinely in endodontics for the past twenty years. It has assimilated into the realm of standard of care and should be held in that high regard. Loupe magnification was a giant step in dentistry but even the highest magnifying loupes do not match the low end of fixed microscopy. Loupe magnification is portrayed differently among manufacturers, and you may not actually get the magnification that is expected.

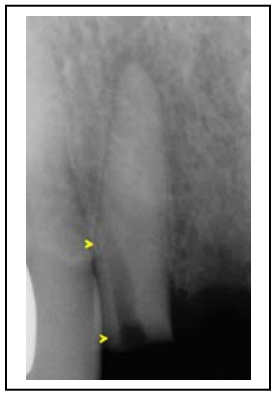

Fig. 1

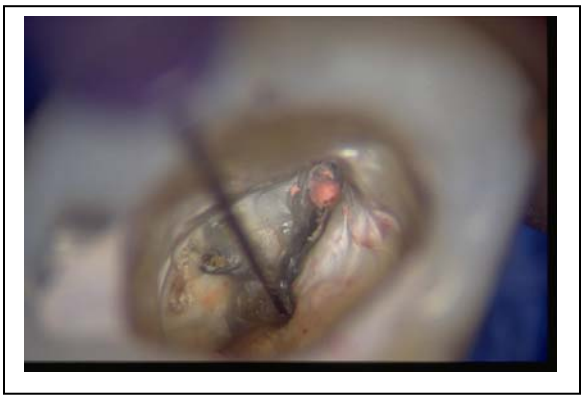

Fig. 2

Locating canal spaces by tactile exploration used to be a typical procedure. “Probe and hope” frequently resulted in perforation. “See and access” is now the standard of care. Changes in the coloration of tertiary dentin can be more easily appreciated with the intense illumination that is provided with high magnification.

In figure 1, the yellow arrows are demarcating a non-parallel axis path that resulted in a subosseous root perforation. There was no crown available to assist with determining the long axis position of the root. Microscopic examination would have aided in identifying the canal remnant. As long as the remnant can be visualized, the access will remain centered in the root. Pulp spaces calcify in a corono-apical direction. If a space can be accessed in the pulp chamber area, it is usually patent, that is, completely

open to the apex. What may be construed as apical calcification is likely canal curvature that becomes challenging to negotiate as the space gets smaller.

The mesiobuccal root of the maxillary first molar is the most common root involved with endodontic treatment failure. Figure 2 is a lower powered image of a file in the MB2 space of a maxillary first molar. The most common instance of endodontic retreatment involves revision of the initial endodontic treatment because the second space in the mesiobuccal root was overlooked. Virtually all MB roots have two canal spaces. Finding the second space with microscopy is not difficult. The MB2 is usually located in an area midway between the mesiobuccal and palatal canal orifices. The MB2 orifice is usually highly calcified because it is below a deep proximal box restoration that stimulated tertiary dentin calcification.

Highly calcified canal spaces are best located when the remnant can be seen clearly in a surrounding flat field of vision. In the microscope, the remnant will be seen as a dark dot surrounded by a smooth – flat area. The prepared flat area may be no more than a half millimeter in diameter. Bur and explorer micro divot and scratch marks can frequently be mistaken for canal remnants if the flat field of vision area is not established. Specially designed ultrasonic tips, that prepare smooth-flat areas for micro vision, are available for troughing areas of canal orifice remnants.

The size #6 02 taper hand K-file is the smallest instrument manufactured. In many instances, the microscope will assist in locating a findable space that is smaller than the tip diameter of that file. Careful apical advancement at the remnant using specially designed slow speed micro burs or flat-tipped ultrasonic instruments will usually yield a patent space. Differences in dentin coloration is easily appreciated with microscopy. As dentin is cut by a rotating bur or vibrating ultrasonic tip, the freshly shaved and crushed dentin will often be impacted into the canal space remnant. The canal remnant will be seen as a white dot in a darker filed. Another method for locating orifice remnants involves the observation of bubbles from the effect that sodium hypochlorite has on tissue dissolution. As the NaOCl dissolves the tissue, a trail of bubbles, “the champagne effect”, can be seen at the source of the tissue.

In addition to assisting in actual endodontic procedural accomplishment, the microscope is also an important device for the assessment of prognosis factors. Observation for microfractures in dentin can influence final restoration. Marginal ridge fractures may be deep enough to enter canal space orifices. Transillumination with the aid of microscopy will determine if the tooth may later have problems with vertical crown-root fractures.

While use of microscopy has been accepted as derigueur for endodontic graduate residents, dental schools are beginning to offer microscopic endodontic training for predoctoral undergraduates.

From start to completion, all endodontic treatment procedures are performed in our office using a microscope. Microscopic dentistry is here to stay.