Evaluating Endodontic Treatment

Does the obturation material go to the end of the root on the final radiograph? This is usually the first thing we look at when evaluating endodontic treatment, and often all we have to go on. It is difficult to evaluate how well the most important steps of the endodontic procedure were performed because they do not show up on the final radiograph. Was patency achieved? Was all of the pulp tissue removed? Was the canal thoroughly irrigated? Were all of the canals located and treated? Was the canal obturated in three dimensions? Was the apex clean and free of debris before being obturated? Was the smear layer removed? Most importantly, was the canal clean? Final radiographs do not completely answer any of these important questions.

Endodontic treatment is one of the few procedures in dentistry where key steps important for long-term success can be done poorly, yet the final result (radiograph) looks good. Said another way, the clinician can cut corners and hide sloppy work. Obturating an unclean canal space with remaining diseased pulp tissue is the equivalent of leaving decay under a new restoration. In the short-term there may not be any signs of a problem, but as time progresses the problem always comes to the surface. The following is a discussion of some important aspects of evaluating endodontic treatment.

Evaluating Shape

The continuous tapered canal preparation is the desired shape for obturation with a warm gutta-percha technique or carrier based obturation. As the name implies, the preparation has a continuous taper from orifice to apex. The tapered shape in the apical region is important for warm gutta-percha obturation because it provides the needed resistance form for compacting the warm gutta-percha against. Another benefit of the continuous tapered shape is that it allows for better irrigation into the apical region. Nickel-Titanium rotary instrumentation has allowed for consistent predictable tapered canal shapes. These same shapes when carved with hand instruments, is a painstakingly long and laborious process, and often takes multiple appointments to accomplish.

When evaluating canal shape the following five rules apply. (1) There should not be any parallel canal walls. (2) There should not be any abrupt changes in canal size. (3) There should be adequate deep canal shape for irrigation to be effective. (4) There should be a smooth consistent flowing taper from orifice to apex. (5) The finished canal shape must also maintain the original fidelity of the canal curvature without straightening or transporting the canal path.
Evaluating Length

Evaluating length on a radiograph is difficult at best. We all know that radiographs are the least accurate technique for determining canal length because the canal terminus rarely ends at the radiographic apex. An apex locator is the most accurate method for determining working length. The final radiograph can show obvious short fills or obvious over fills, but is not very good at determining if the obturation length is accurate.

Evaluating Obturation

The objective of canal obturation is to fill and seal the entire canal system including all lateral anatomy and portals of exit in three dimensions. The most successful technique for accomplishing this objective employs the use of warm gutta-percha. Warm gutta-percha obturation includes centered compaction of a heated master cone with a heat source such as a System-B (SybronEndo, Orange, CA), vertical compaction of warm gutta-percha, and heated carrier systems such as Thermafil (Tulsa Dental Specialties, Tulsa, OK).

The benefits of warm gutta-percha include: consistent density without voids, excellent adaptation to the internal canal anatomy, and hydraulic forces that fill lateral canals with sealer and gutta-percha. Sealer may extruded through the apical foramen forming what is known as a “sealer puff” which confirms canal patency and good apical obturation. When done correctly, the final film should demonstrate a dense, flowing obturation with a small puff of sealer out the apex.

Evaluating the Unknown

As previously mentioned, certain key elements of an endodontic procedure cannot be evaluated on the final radiograph. Complete tissue removal from all canals, thorough irrigation, and cleanliness of the canals prior to obturation being the most significant. That said, if the finished treatment has a beautiful tapered flowing shape, a small puff of sealer out the apex, and a dense obturation that exhibits good length control, then the case should be given the benefit of assuming the same careful attention was placed on the other key steps that cannot be evaluated on the final radiograph.

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