RUDDLE ON

The Radar

Gauging the terminus

A novel method

Never in the history of clinical endodontics have dentists been able to prepare root canals with such safety, efficiency, and predictability. Regardless of the current shaping systems utilized, the mechanical and biological objectives for predictably successful outcomes may be found in Dr. Herb Schilder's famous article entitled "Cleaning and Shaping the Root Canal." Yet, dentists unfamiliar with this paper frequently ask, "What is the actual size of the finished foramen?"

From the late 1970s to the mid-1990s, I taught a rather straightforward method, termed gauging and tuning (G&T), for confirming when the canal is properly shaped. Gauging is a clinical technique for mechanically determining the size of the terminus of the preparation. Tuning is a clinical technique for verifying there is uniform taper in the apical one-third of the shaped canal. In that era, regardless of which instruments were used to shape a canal, G&T was performed using stainless steel (SS) 2% tapered hand files.

The clinician could be confident that the size of the foramen corresponded to the D0 diameter of the largest file that was snug at length if, and only if, each successively larger file uniformly backed out of the canal in 0.5 mm increments. In fully formed canals without resorption, this method does not confirm a round versus an irregularly shaped foramen; rather, this method confirms the narrowest cross-sectional diameter of the preparation is at the terminus and, importantly, that there is uniform taper in the apical one-third of the shaped canal.

With the evolution of larger tapered NiTi shaping files, as compared to 2% tapered SS files, the endpoint of canal preparation can now oftentimes be determined by inspecting the apical flutes of the largest D0 diameter and tapered NiTi file that is carried to length. If the apical 3-5 mm of a file are fully loaded with dentin, then there is visual confirmation that this file cut its shape in the apical one-third of the canal. When using greater tapered files to prepare root canals, tuning procedures, as previously described, are generally not indicated.

When a file does cut its shape apically, dentinal debris can unload and wash off a file that is mechanically driven in a fluid-filled preparation. In this instance, it is useful to gauge the terminal diameter of the canal using a 2% tapered hand file that has the same D0 diameter as the largest greater tapered shaping file taken to length. As an example, if the clinician carries a 25/08 shaping file to length, then the mechanical preparation is confirmed finished when a 25/02 hand file is snug at length.

Canals that exhibit curvatures or recurvatures pose uncertainties when gauging the foramen with stiffer SS 2% tapered hand files. This uncertainty is because, even when an SS gauging file is judged to be snug at length, the clinician cannot be 100% confident where this file is physically binding against dentin along the length of the preparation. Certainly, there is a need to improve on the methods previously described to gauge the size of the prepared foramen.

I would like to propose a finishing method I discovered many years ago. Simply stated, the idea is to gauge the relative size of any given foramen utilizing a smooth, non-cutting, and highly flexible gutta-percha master cone. I generally use either a 6% tapered feather-tipped nonstandardized or a 6% tapered system-based gutta-percha master cone for this purpose. Although the terminal end of a system-based gutta-percha master cone theoretically matches the D0 diameter of the correspondingly-sized file, appreciate that the manufacturing tolerances of gutta percha are ± 0.05 mm, whereas those of machined files are ± 0.02mm.

What is critically important is to select a gutta-percha master cone with a taper less than the taper of the prepared canal. This means the cone selected for gauging the size of the apical foramen must be loose over its length to ensure the cone binds only at its terminus and not within the body of the shaped canal. The apical end of a feather-tipped nonstandardized master cone may be precisely trimmed to the same machining tolerances as the last file carried to length utilizing a Gutta-Percha Gauge from Dentsply Maillefer. The Gutta-Percha Gauge has a variety of precisely machined holes that are within the same tolerances as the D0 diameters of machined files.

Because of wider tolerances, at times a system-based gutta-percha cone cannot be inserted to full working length. In these instances, select and, if necessary, trim a smaller apically-sized cone of the same taper utilizing the Gutta-Percha Gauge. Regardless of the gutta-percha master cone selected, when at length, gently pump this cone up and down two, three, or four times. Upon removal, inspect the terminal aspect of the cone for rub marks that verify the cone is engaging dentin only at its terminal extent.

To summarize, a smooth, flexible, and non-cutting gutta-percha master cone will readily slide to length when its taper is slightly less than that of a well-prepared canal. A Gutta-Percha Gauge can be used to precisely trim the apical extent of this cone. In turn, this cone can be used to gauge the terminal diameter of the shaped canal. Keep this novel endodontic gauging method on your radar. EP

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