Endodontic Techniques for Scouting the Apical Thirds of Root Canals

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Abstract

It might be said that there are as many endodontic instrumentation techniques as there are operators, although no two clinicians perform the procedure in exactly the same manner. Despite differences, there are basic principles (correct diagnosis, adequate access, adequate irrigation, removal of the entire pulp, instrumentation to the minor constriction of the apical foramen, three-dimensional obturation, etc.) whose observance are consistent with long-term endodontic success. As a subset of these time-honored principles, there are guidelines and techniques for apical third "scouting" and instrumentation, which can also be considered universal, irrespective of the particular instruments or technique used for canal preparation.

The purpose of this paper is to describe a scouting technique that is designed to optimize the apical part of root canal preparation. The author first heard the word "scouting" used in the context described by Dr. Clifford J. Ruddle.

While the coronal and middle thirds are relatively straightforward to instrument, the apical third is certainly the most challenging portion of root canal anatomy to cleanse shape and obturate adequately. Managing the apical third might be thought of as one of the last steps in a process, which began with coronal access. Like an ascent of Mt. Everest, which starts many months before the final summit push in its planning, scouting and subsequent instrumentation of the apical third is the final result of the many smaller steps that preceded it and whose quality is dependent on those previous actions.

It is noteworthy that many "short" obturations and "calcified" canals are in fact, simply underprepared. Such underpreparation results from a lack of understanding of the anatomy present

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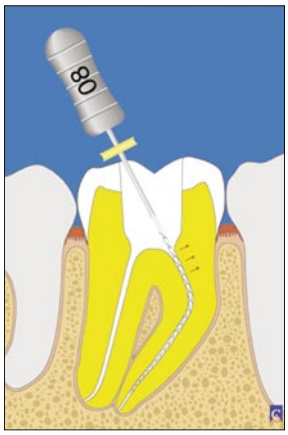

Figure 1a.

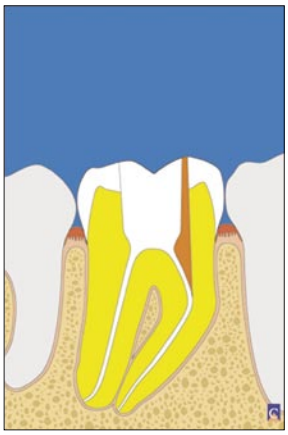

Figure 1b.

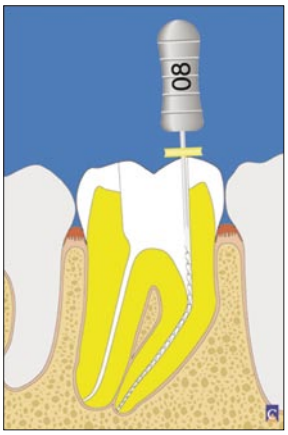

Figure 1c.

Figures 1a-c. Straight line access is essential to avoid iatrogenic events and have tactile control over files apically.

and the delicacy and care with which this complex and fragile region must be addressed.[1,2] Advancing up the file sizes too quickly (hand or rotary) with excessive force, filing without an estimated or confirmed true working length, compacting pulp and dentin into the narrowing cross-sectional diameters of the canal, and losing apical patency amongst other misadventures, all preclude proper cleansing and shaping, and predispose to an increasing failure rate and iatrogenic misadventure. It is ill advised to be in the apical third with a rotary file without having first "scouted" the canal, established true working length, and/or created a glide path as will be described. Scouting provides an essential understanding of the existing anatomy within a root and provides, along with radiographs, a mental and tactile road map to the canal.

Preliminary Steps

Excellent management of the apical third is predicated on assumptions, which make up the needed previous stages mentioned prior. These assumptions are:

■ Before any instruments are placed into the apical third (and before access is made) that there are multiple radiographic images of the tooth to give the operator the best 3-D picture of a space, which must be felt and cannot be seen. Various angles can also fully determine if there is a widened periodontal ligament or periapical lesion and fully give the clinician a reliable estimate of the length of the root before beginning.

■ Straight line access is also important for creating optimal control of the hand and rotary instruments, which will subsequently be placed into the apical third. Straight line access can prevent iatrogenic furcal perforation, ledging and instrument separation accentuated by the deflection of instruments against the walls of the coronal access (**Figures 1a-c**).

■ Crown down instrumentation, which facilitates optimal apical third shaping. Removal of restrictive dentin in the coronal and middle third of root canal systems before entering the apical third allows a greater volume and exchange of irrigation as well as provides a much greater level of tactile control to the operator over the files. In essence, files placed into the apical third (with the upper two-thirds of the canal pre-enlarged) can more fully provide the operator with the ability to detect abrupt canal curvatures, narrowing cross-sectional diameters and the exact location, length and shape of the apical foramen. With the enhanced tapered (.08, .10, .12 taper-fixed tip size 25) K3 body shapers (SybronEndo, Orange, Calif.) which act as orifice openers, it is possible in many cases to instrument the coronal and middle thirds often with a single instrument. Irrespective of the rotary file system used though, in general terms, on average, 25 tip sized .06 tapered instruments should be used to the junction of the middle and apical third at which point, the apical third is ready for scouting.

■ Avoidance of dentinal shavings and pulverized pulp being compacted into the apical third in the initial stages of treatment, which can be prevented by copious irrigation as well as the placement of EDTA in a gel form to emulsify the pulp in coronal and middle third instrumentation, especially in vital teeth. Copious irrigation with sodium hypochlorite (ideally 5.25 percent) is essential, as is the presence of a viscous chelator (RC Prep, Premier Dental Products (Plymouth Meeting, Penn.) and Glide (Dentsply Tulsa Dental, Tulsa Okla.) in vital cases.[3,4]

Scouting Technique

With the previous assumptions and precautions exercised, the clinician is ready to scout the apical third. Initially, a pre "J" curved K file 6-10, canal size dependent, is placed into the canal in the direction of the apical curvature determined radiographically. The Endo Bender pliers (SybronEndo, Orange, Calif.) (**Figure 2**) is ideal for creating this apical "J" curve in the file. The file is advanced gently in the canal with the intent to discover as much tactile information about the canal as possible and advanced only as far as the canal will accept without forcing the file to a preconceived length. Scouting requires a determined mental focus on the tac-

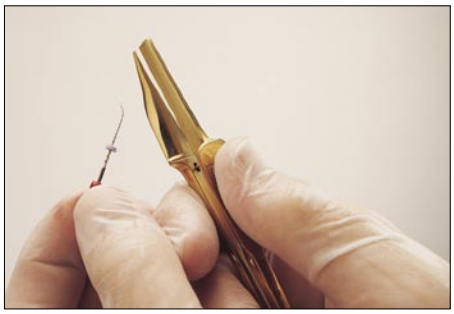

Figure 2. "J" file created with the EndoBender pliers (SybronEndo, Orange, Calif.).

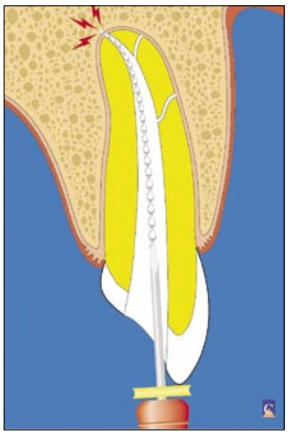

Figure 3. Apical patency demonstrated.

tile sensations that the canal reveals. Usually, in most canals, this size of a K file will be easily accepted (except in the most narrow and calcified cases). When the file reaches the actual apical foramen, which should match fairly closely to the estimated working length determined preoperatively, the operator may perceive a "pop" or a "push" as the file exits the apical foramen. It is important to note the length at which this sensation is observed as this is the true working length and represents the minor constriction of the apical foramen (**Figure 3**). This length should be identical to the reading given by an apex locator and that determined radiographically and/or determined by a bleeding or moisture point after instrumentation is completed.

If the operator is beginning with a 6-10 K file and can reach the estimated working length, it is advisable to then gently advance each subsequent file to the same length until a 10 or 15 K file reaches the same depth and an electronic apex locator reading should be taken as well as a radiograph from at least two angles to confidently determine true working length.

Exploration with the 6-10 K files should be unhurried, gentle and reproducible. In other words, the files should be placed back into the canal in the

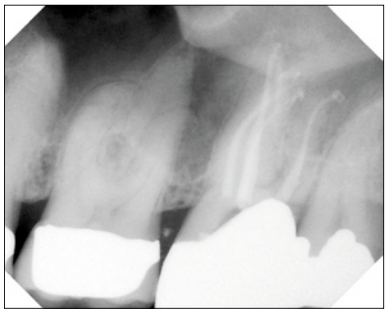

Figure 4. Completed case demonstrating the principles described.

same orientation each time. If the 10 K file will spin loosely at the estimated true working length, then it is time to advance to the 15 K file. If the 6-10 K file will not advance the same way every time, it is possible the file has traversed down a different aspect of the canal anatomy (i.e. another portal of exit or canal branch) than the original orientation. It may take multiple insertions of the 6-10 K files to reach the estimated length. Irrigation is copious and frequent, after every file. When the operator is using the files, and the full, estimated length of the canal has been reached, the file should be removed in a straight coronal direction, which will minimize the possibility of foramen transportation. In other words, when scouting files reach the estimated or true working length, they should not be rotated so as to not cut at the foramen.

A 15 K file, which spins freely at the true working length, has created a "glide path" for subsequent rotary files. Next, a .02 tapered 15 tip size K3 (SybronEndo, Orange, Calif.) can be placed to the true working length, which will accentuate the glide path and fully refine the path for the rotary instruments that will subsequently finish the preparation. Generally, a .02 20 K3 can follow the 15 easily to true working length and completion of the canal preparation via a rotary method (irrespective of the file used) can be performed easily. The author prefers the .02 K3 for glide path refinement to other file brands due to its fracture resistance, cutting ability and easy tracking of the canal.

Coincident with this entire process, it is important the operator be certain to achieve and maintain apical patency. In other words, once a file will exit the apical foramen, it is important that the path through the foramen be maintained during the scouting process and final instrumentation, but not be enlarged. Achievement and maintenance of apical patency minimizes the creation and accumulation of dentin mud and minimizes the chance for ledging and perforation (**Figure 4**).

From this platform of scouting and glide path creation, it is then possible to fully instrument the apical third ideally either by hand or by rotary files. It must be borne in mind there are certain canals, which cannot be instrumented with rotary files and must be finished by hand, especially those with abrupt apical curvatures, merging canal systems, recurvatures, etc. It is a matter of clinical judgment to appreciate when such a root presents itself. CDA

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