Endodontic trends that do and don’t make sense

By Barry L. Musikant, DMD

With the increasing awareness that greater tapered rotary instruments can induce dentinal micro-cracks, which in turn can lead to vertical fractures and tooth loss over time, a growing number of endodontists are preparing canals more conservatively, with smaller apical preparations and reduced tapers along length. We're apical preparations of a 35-40 mm were once the norm, today those preps are being reduced to 25 mm or less, with tapers no greater than 0.04 mm/ mm. The result is the preservation of tooth structure in the mesio-distal plane with the additional bonus of needing fewer instruments, lowering costs and reducing the time needed for instrumentation. It should also be stated that lesser tapered instruments are more flexible and more resistant to cyclic fatigue that, if excessive, leads to instrument separation.

From the perspective of iatrogenic events, the implementation of conservative endodontics as defined above reduces instrument breakage and leaves a tooth less prone to vertical fracture. On the other hand, we must not forget that pulpal tissue is most often configured as a highly oval body with buccal and lingual isthmus-like extensions.

When preparing canals with greater tapered rotary NiTi instruments, these buccal and lingual extensions are left untouched and, worse, are blocked off from the irrigants by a smear layer that coats their entry points. From the point of tissue removal, thinner less tapered preparations are removing less tissue and leaving a space where a smaller volume of irrigant will be applied.

Stated simply, rotary shaping produces round conical preparations. Reduce the tip size and taper of the shaping instrument and we still produce a conical preparation, only smaller. Dentin is preserved, but more pulpal tissue and the bacteria they support are left untouched.

We are left with a bit of a dilemma. Use greater tapered instruments and we will remove more tissue but increase the likelihood of producing dentinal micro-cracks while definitively weakening the remaining tooth structure and increasing our costs and the time needed for the shaping procedure. Switch to lesser-tapered preparations and the canals are not adequately cleaned, particularly in the bucco-lingual plane.

What appears to be a set of choices, each of which have their strengths and weaknesses, does not give us the tools we need to attain our goals of optimum cleansing with minimal tooth removal. Since its implementation more than 25 years ago, those who use rotary instruments have learned that care must be taken to minimize the incidence of instrument separation. That learning curve includes:

1. The creation of a glide path that allows the unimpeded progress of the rotary instrument to the apex.
2. Crown-down shaping that reduces the engagement of the instrument along the full canal length.
3. Straight-line access.
4. Single access.
5. The application of minimal apical pressure using a light pecking motion when negotiating apically.
6. Staying centered with minimal lateral brushing.
7. The possible adoption of interrupted rotations (a version of reciprocation that includes full rotations) to reduce torsional stress and cyclic fatigue.
8. The implementation of newer heat-treated alloys that reduce without eliminating instrument separation.

A learning curve that must incorporate so many precautions conditions a dentist using a rotary system to be cautious when shaping canals. The result is the creation of conically shaped canals, because deviating laterally from that centered approach increases the chances of instrument separation.

The fact that a good deal of tissue and bacteria exist in lateral spaces is underappreciated in the quest for procedural safety. It is also a fact that the mesio-distal perpendicular X-ray of a tooth fully obturated from stem to stern without any obvious distortions is considered proof of a job well done, despite the dearth of information on the shaping and obturating done in the bucco-lingual plane.

Until we develop techniques that can remove tissue and bacteria without any instruments touching the walls of the canals and then obturating them completely, we will remain dependent on metal instruments physically shaping the canals. To resolve the present dilemma, we must primarily have an approach that is virtually immune to instrument separation.

Instruments break for two reasons: excessive torsional stress and cyclic fatigue, both resulting from varying degrees of rotation. If we limit the amplitude of motion to 30 degrees to 45 degrees, we limit the arc of motion to either a 1/12 or 1/8 of a single full rotation, a reduction so significant that neither torsional stress (produced by an instrument locking apically) nor cyclic fatigue (produced by rotations around a curve) becomes a destructive factor.

The fact that an instrument is now virtually free of breakage means the dentist no longer has to employ the precautions that were necessary when using instruments that undergo complete rotations. Straight-line access and crown down preparations are no longer required, preserving more tooth structure in the mesio-distal plane while significantly reducing the incidence of dentinal micro-cracks. Not only is more tooth structure preserved but the integrity of the remaining dentin is not degraded.

Studies have repeatedly shown that small amplitudes of motion are far less likely to induce dentinal damage.

Of most importance, with a 30 degrees to 45 degrees arc of motion, we are now free to work on thinner stainless-steel relieved reamers vigorously against the buccal and lingual extensions. These are the most appropriate instruments because, twelfth resist the least resistance when being worked buccally and lingually.

Highly flexible in thin dimensions, stainless-steel relieved reamers maintain a sharp cutting edge, shaving dentin away as they rapidly oscillate in the 30 degrees to 45 degrees reciprocating handpiece at 3,000 to 4,000 cycles per minute. Unlike rotary NiTIs continuous or interrupted, we now have a means to shape canals that reflect their original anatomy in larger form, something that can only be done predictably because the dentist knows the instruments will stay intact.

Rotary NiTs for some has proven itself to be more efficient in shaping canals compared to the traditional hand techniques, and the idea of abandoning such an approach may bring back memories of hand fatigue and reduced rates of efficiency. It is a reasonable question to ask whether or not the implementation of 30 degrees to 45 degrees engine-driven reciprocation will impact their expectations of efficiency.

The best way to answer that is for the dentist to realize that after the first reamer is negotiated to the apex manually, all instruments after that are placed in the reciprocating handpiece oscillating at 3,000 to 4,000 cycles per minute. Short arcs of motion utilized at high frequency allow a sequence of instruments to rapidly negotiate to the apex. In fact, the entire glide path preparation, a task often taking a good deal of time prior to the use of rotary NiTIs, is now done quickly and efficiently.

To better understand the innate advantages of the use of relieved reamers with short arcs of motion at high frequency, one must appreciate the fact that thin instruments can widen canals beyond their own dimensions. In the thin mesio-distal plane, there is minimal need for that, but in what is often the far wider bucco-lingual plane, a thin, rapidly oscillating reamer can extend the canal preparation several times its own size, extending the...
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Komet USA’s F360 endodontic file system permits preparation of root canals with a simplified sequence that the company says is perfect for even beginning endodontists.

Requiring only two files, the F360 files use the same torque (.8 Ncm) and speed values (250-350 rpm), doctors don’t need to adjust speed or torque when changing files during the preparation sequence.

Thanks to the small taper of the files (.04), the system is suitable for almost any canal anatomy — whether straight, curved or S-shaped.

**GPR gutta-percha remover**

Komet USA’s growing line of endodontic instruments and accessories now features the GPR gutta-percha remover, which maximizes the efficient removal of gutta-percha from endodontic canals undergoing retreatment.

The specialized nickel-titanium bur is engineered with non-cutting edges, enabling gutta-percha to be softened and removed through frictional heat generated from rotation.

Supplied in packages of five, the bur is offered in sizes 025 and 030 GPR RA 025 and GPR RA 030.

**GrBoA Gates-Glidden Reamer**

Designed for tapered reaming in the straight, coronal portion of the root canal, the GrBoA Gates-Glidden short reamer is constructed of stainless steel.

The bur’s total length is only 28 mm (compared to the standard 32-mm length), and it can be applied using the crown-down technique after the canal has been opened.

The reamer is offered in sizes 090, 090, 110, 130, and 150 and is supplied in packages of six. Also available is the GrBo standard-length Gates-Glidden reamer.

All of Komet USA’s Gates-Glidden burs are color coded according to ISO sizes.

(Source: Komet USA)

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**References**


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**The means exist today to fully shape canals that reflect the original canal anatomy, addressing both the mesio-distal and bucco-lingual planes in a way that respects both the structural integrity of the root and the shaping instruments. The root is left stronger, and the instruments may be used multiple times with significant cost savings. The preservation of dentin combined with increased removal of pulp tissue and the bacteria it supports are consistent with safer, more effective endodontics.

The goal of this article is to inform dentists that less destructive, safer and more effective means exist to cleanse and shape canals, combining reduced loss of dentin with a greater removal of pulp tissue and bacteria.

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**About the author**

Barry Lee Musikant, DMD, FICOI, is a member of the American Dental Association, American Association of Endodontists, Academy of General Dentistry, the Dental Society of New York, First District Dental Society, Academy of Oral Medicine, Alpha Omega Dental Fraternity and the American Society of Dental Aesthetics. He is also a fellow of the American College of Dentistry (FACD). He is a partner in one of the largest endodontic practices in Manhattan. Musikant’s 35-plus years of practice experience have established him as one of the top authorities in endodontics. To find more information from Musikant, visit www.essentialseminars.org, email info@essentialseminars.org or call (888) 542-6376.