Clinical opinion

Relieved reamers and the 30-degree reciprocating handpiece

By Barry L. Musikant, DMD

As a practicing endodontist and manufacturer of endodontic instrumentation systems, it is fascinating to me to observe the initial evaluation of greater tapered rotary NiTi instrumentation as a paradigm improvement over traditional manual techniques morph into a far more cautious view where more and more evidence documenting its deleterious effects on the dentin is becoming increasingly evident.

To support that observation, research has found a correlation between the use of greater tapered rotating NiTi and the production of dentinal micro-cracks.1—4 Research has also found a decrease in resistance to vertical fracture as the taper of the preparations increase, suggesting there is a clear gap between the actual pulpal anatomy that exists and some of the tools being used to cleanse and shape canals for obturation.

At last year’s American Association of Endodontists meeting, the AAE president noted that he has seen a greater number of vertical fractures over the past 20 years, a time consistent with the introduction of greater tapered rotary NiTi instrumentation. His observations were supported by a large number of endodontists present at the meeting.

It is difficult to dismiss the reality that rotation of instruments within curved canals leads to torsional stress and cyclic fatigue, the two factors responsible for instrument separation. To reduce instrument separation, dentists have learned to do the following:
1) Establish straight-line access in the mesio-distal plane.
2) Use a crown-down technique that minimizes instrument engagement along length.
3) Employ heat-treated NiTi that are more resistant to cyclic fatigue.
4) Employ the instruments only once.
5) Create a more instrumented glide path prior to the use of rotary NiTi.
6) Remain centered when negotiating to length.
7) Use the instruments in interrupted rotation rather than continuous rotation.
8) Reduce the dimensions of the final canal preparation.

The above techniques and strategies are employed to reduce the stresses that occur in the instruments as they rotate within the confines of the canal.

I n response to new developments and research indicating the effectiveness of 3-D imaging for endodontic diagnosis and treatment, the American Association of Endodontists and the American Academy of Oral and Maxillofacial Radiology have issued a revised position statement on the use of cone-beam computed tomography in endodontics. The joint statement is an update to a 2010 position statement on CBCT use in endodontics.

An AAE-AAOMR committee reviewed the scientific literature from the past five years and updated the position statement to include specific recommendations for the appropriate use of CBCT. The statement emphasizes that CBCT should not be used routinely for endodontic diagnosis or screening purposes in the absence of clinical signs and symptoms, and it provides 11 specific recommendations and supporting evidence for when CBCT should be considered the imaging modality of choice. The statement is consistent with principles of ALARA — keeping patient radiation doses “as low as reasonably achievable,” and notes that the patient’s history and clinical examination must justify the use of CBCT by demonstrating that the benefits to the patient outweigh the potential risks.

“Endodontists continue to have excellent results with two-dimensional radiography,” said AAE President Dr. Terryl A. Proppe. “However, limited field-of-view CBCT does have a place in endodontics when dealing with more complex cases, which are reflected in the position statement. Our goal is to help AAE members and general dentists determine where it fits for them.”

The position statement is available at www.aae.org/guidelines.
The emphasis is placed on maintaining the integrity of the instrument with minimal thought given to the impact they have on the integrity of the remaining root structure. Straight-line access is purchased at the expense of removing additional amounts of coronal tooth structure. Crown-down preparations significantly increase the amount of coronal dentin removed so the instruments will contact a reduced amount of canal length at any one time. Heat treatment is a technique that increases the life span of the instrument without a comparable increase in the life span of the dentin, a tissue that is not amenable to technological improvements at present.

The instruments may be used once, but the impact of stress on dentin is cumulative. If all new instruments are employed or not. A single instrument will simply work longer in a canal to achieve its goals of cleansing and shaping. This is one area that is understood with a multiple sequence technique.

Keeping instruments centered in canals that are highly oval, anatomy that is more the rule than the exception, keeps the instruments intact at the expense of compromised cleansing most often in the bucco-lingual plane. The single file interrupted rotary systems are prone to instrument separation because they are still generating a minimum of 200 full rotations per minute, a speed that is used in the industry today. Losing length when using K-files is familiar to most dentists, especially if curves exist in the apical third. Rather than employing instruments with predominantly horizontal flute orientations as our initial tools, we should be using instruments with predominantly vertical flute orientations, similar to the designs incorporated into most rotary systems.

A predominantly vertical flute orientation will shave dentin from the canal walls with the first clockwise stroke. When the instrument is removed and reintroduced into the canal, the vertically oriented flutes will tend to glide past any debris present rather than impinging it apically. These instruments are defined as reamers.

Essentially, we are using a watch-winding motion, similar to that used with K-files, but with far greater efficiencies and far less likelihood for apical blockage. We further improve the mechanics by incorporating a flat along the length of the reamers, further reducing engagement and creating an instrument that now has two columns of cutting chisels that work in both the clockwise and counter-clockwise motion.

A watch-winding motion eliminates the full rotations that lead to excessive torsional stress and cyclic fatigue that produce the instrument separations we want to avoid. The hard fatigue associated with the use of K-files is completely eliminated when generating the watch winding motion in a 30- to 45-degree reciprocating handpiece. The speed of the procedure is significantly increased because the reciprocating handpiece has the added advantage of oscillating at 3,000 to 4,000 cycles per minute.

For those dentists using greater tapered rotary NiTi systems, the goal of the K-files was limited to creating a glide path producing an 02 tapered centered space up to at most a 20. The relieved reamers also have that function, but with the power of a reciprocating handpiece generating oscillations of 3,000 to 4,000 cycles per minute, the instruments have the added ability to vigorously work the buccal and lingual extensions of highly oval, sheath-like pulp anatomy.

One need not be concerned about the reduced flexibility of stainless steel relieved reamers. In their smaller dimensions they are easily flexible enough to negotiate complex curved canals. As the thinner, highly flexible instruments faithfully enlarge the original canal anatomy free of distortions, they are defining a pathway that the somewhat larger and less flexible relieved reamers will then faithfully follow.

The goal in most situations is to produce an apical preparation of 30 applied to all the walls of the canals, be they round or not. Please realize that this goal will ultimately produce a larger version of the original canal anatomy rather than the imposition of a large conical shape that bears little relationship to the original anatomy.

For the most part, we do not want to exceed a taper of 04. Such a conservative preparation preserves coronal dentin and in combination with the relieved reamers allows us to remove tissue from those thin extensions that are off limits to rotary NiTi instrumentation. The system we are defining is based primarily on 02 tapered stainless steel relieved reamers (Fig. 1). After the glide path creation using the relieved reamers (SafeSiders), crown-down preparations are no longer necessary. Rather the final preparation is a simple extension of instrumentation that widens the canal from a 20/02 preparation to a maximum of 30/04 in most situations (Tango Endo, Fig. 2). A final result that requires only two more instruments after the 20/02 preparation has been achieved.

Given our clinical experience, along with the insights that are being documented from recent research, we can make the following conclusions regarding the use of this approach to endodontic instrumentation.

1) Instrument separation is virtually eliminated, producing a much more favorable mindset for the dentist.

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2) Dentinal micro-cracks associated with rotary NiTi are not associated with the short amplitudes of motion produced by the 30- to 45-degree reciprocating handpieces.1-4

3) Lesser tapered preparations reduce the amount of coronal dentin being removed, increasing the resistance of the tooth to the forces that produce vertical fractures.1-4

4) The thin 02 tapered stainless steel relieved reamers are capable of removing tissue from the often thin buccal and lingual extensions that are not touched by the greater tapered systems and where canal blockages occur when using K-files.

5) The recommended relieved reamers will negotiate to the apex with far less resistance than the traditional use of K-files.

6) Due to their limited exposure to torsional stress and cyclic fatigue, a result of the 30- to 45-degree reciprocating handpieces, the instruments may be used several times before replacement, yielding dramatic savings.5

In our endodontic practice, the feeling of security is most important. We seek out ways to produce highly effective predictable results. For us, that means no instrument separation as a cause of concern with the full appreciation that our procedures must primarily maintain the original integrity of the remaining tooth structure as much as possible.

References

New Tango-Endo: It only takes two

With new Tango-Endo, available from Essential Dental Systems (EDS), it takes only two instruments! Tough and reusable Tango-Endo instruments boast a unique, patented flat along the entire length. This flat, according to EDS, allows for faster engagement with less resistance, increased flexibility without sacrificing strength and virtually eliminates instrument separation.

The Tango-Endo system includes its own reciprocating handpiece. The latch-type handpiece is designed to aid in the prevention of binding, and to assist in the preservation of the canals’ unique anatomy. The kit also includes precision matched gutta-percha points, designed for a perfect fit.

“Tango-Endo was simple and easy to use, and I did not find it to have much of a learning curve,” says Dr. Joshua Austin of Texas. “If you are looking for an endo file system that is simple and safe, Tango-Endo is an excellent choice that is also very cost-effective.”

“I was blown away by how efficient and easy it was to clean and shape the three canals in about 10 minutes,” says Dr. Scott Graham, of Michigan. “The fit of the Tango gutta-percha points was excellent, too. No tip trimming required. I’m excited about [this] new system.”

For more information, visit EDS at booth No. 3319 at the Chicago Midwinter meeting, or go to www.edsdental.com/tangoendo.

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