An update on non-rotating reciprocating endodontics

By Barry L. Musikant, DMD

There is an important distinction to be made between systems that involve 360-degree rotations, be they interrupted or continuous, and systems that purposely minimize rotation to 30 degrees. While a system that undergoes interrupted full rotations is less vulnerable to instrument separation than continuous rotations, it is still a problem and both are associated with the production of dentinal defects where concern exists that they may propagate and coalesce into vertical fractures over time.

Dentists acknowledge separation anxiety by using these rotating systems with a light touch, staying centered with minimal deviation from the conical shapes these instruments impart to the canal (see Fig. 1).

By limiting the amplitude of motion to 30 degrees, the torsional stress and cyclic fatigue associated with full rotations are reduced to the point where it virtually is no longer a factor in instrument separation. What this means in practice is the dentist’s ability to use the thinnest 02 tapered stainless-steel instrument in his/her arsenal without fear of breakage. For most dentists, this immediately leads to the use of K-files, instruments that with their horizontally oriented flute design are inclined to impact debris apically when the push stroke is employed, leading to loss of length.

We can drastically reduce the incidence of blockage, minimize resistance along length and shave dentin away far more efficiently if we employ 02 tapered instruments with fewer and more vertically oriented flutes that incorporate a flat along their working length starting with a #15.

After the tightest most tortuous canals are negotiated to the apex using our thinnest 02 tapered 06 tipped stainless-steel vertically fluted instrument manually, the same instrument is attached to a 30-degree reciprocating handpiece oscillating at 3,000 to 4,000 cycles per minute to widen the canal to a diameter larger than the instrument being used without distortion and creating a space where the next instrument in the sequence used in the reciprocating handpiece can reach the apex with minimal resistance.

This capability is utilized because the dentist quickly learns that separation simply will not occur, giving him/her the confidence to work these instruments against all the walls of the canal with special attention given to what is often the wider buccal-lingual plane. With each instrument widening the canal significantly beyond its own dimensions, the sequence to any desired dimension is rapid, risk-free and without hand fatigue.

From the point of view of dentin preservation, most of the instrumentation is done with 02 tapered instruments minimizing the amount of coronal tooth structure that is removed when greater tapered instruments are used. Straight-line access, a requirement for rotating NiTi that further compromises coronal dentin, is not a requirement when using the vertically fluted instruments in 30-degree reciprocation, further preserving tooth structure.

Where rotating NiTi prepares a conical shape along length even when the canals are highly oval and sheath-like, the thin #02 tapered stainless-steel relieved vertically fluted instruments will produce a space that reflects the original canal anatomy in larger form. If the canal was oval to begin with, the final shape will be oval, preserving tooth structure in the mesio-distal plane and extending the preparation to include the buccal and lingual tissue extensions that are present in sheath-like pulpal configurations.

By confining motion to 30 degrees, a number of advantages become available to the dentist:

• There is a reduction in procedural stress because breakage is no longer a concern.
• Knowing the instruments are virtually free of breakage, they can be used with vigor against the canal walls, assuring a greater degree of cleansing into areas that rotating NiTi does not cleanse effectively.
• The instruments can be used several times with substantial savings.
• Short amplitudes of motion are not associated with dentinal defects.

Fig. 1: Endo-Express 30-degree reciprocating handpiece.
Fig. 2: Vertically flute SafeSiders instrument in an Endo-Express 30-degree reciprocating handpiece.
Preservation of tooth structure in what is often the thinner mesio-distal plane.

There is no longer a need for crown-down greater preparations that exaggerate the amount of tooth structure removed coronally.

Hand fatigue is eliminated, starting with the first instrument through the final sequence.

With the knowledge that the width of preparations should be a minimum of 30 for effective irrigation, we can prepare an effective, well-cleaned space by using just two more instruments after preparing the glide path to a 20. By taking the 30/04 relieved NiTi instrument to within 3 to 4 mm of the apex and then following that with the 30/02 relieved stainless-steel vertically fluted instrument to the apex, we create a fine point that when the canal is flooded with epoxy resin cement creates a three-dimensional seal.

If desired, we can go up one size to a fine-medium point if we then take the 30/04 to the apex. In both cases the seal is created by the epoxy resin interface present along length via its application with a tool called the bi-directional spiral that gives the dentist the ability to flood the canal while at the same time preventing the extrusion of cement beyond its confines (see Figs. 3a, b).

If one takes a close look at the bi-directional spiral, one sees coronal flutes that drive themselves apically as it rotates. The apical three threads have the opposite orientation as the coronal flutes and drive the cement coronally.

The result is two flows of cement that collide 3 mm from the applier’s tip driving the cement laterally. The dentist uses the applier with an up and down motion that expands 175 percent as it rotates. The apical three threads have the opposite orientation as the coronal flutes and drive the cement coronally.

It’s physical and chemical bonding to both the gutta-percha and the canal walls, its dimensional stability as it polymerizes, forming a polymer, its resistance to hydrolytic degradation, being a room-temperature obturation system, the cement and gutta-percha expand at 1.75 percent as it warms from room to body temperature, is an effective seal in both thin and thick layers, has a lower level of viscosity than the most thermoplasticized gutta-percha, great penetration of the cement into the dentinal tubules, its well-documented antibacterial properties, more than 70 years of usage that attest to its effectiveness as an endodontic seal.

From a procedural standpoint, the obturation procedures recommended here do not change length.

The application of excessive force via lateral and vertical condensation that can lead to over extension of the preparation, the expansion of already existing dentinal defects that in turn can lead to vertical root fracture.

The application of heat that can lead to the overextension of obtrusion material, damage to the periodontal ligament via exposure to excess prolonged heat; the creation of voids as overly complete that drive rebursts to its original shape after the interface cement has been displaced.

It should be noted that I am not against the use of lateral or vertical condensation, only the degree of force applied. When creating a space for the placement of auxiliary points, I will never use more force on a spreader than the weight of my hand. I do not want to apply sufficient pressure to distort the gutta-percha, knowing as it rebounds it will create a void. In addition, I do not want to add significant stress to the root that may already have preexisting defects or new ones as a result of rotating NiTi instrumentation.

If we consider the two aspects of endodontics, instrumentation and obturation, we can see where techniques can be simplified while adding safety and precision to the procedure. This is the true paradigm shift that has been observed by the constant introduction of newer rotating NiTi instruments. All the new rotating NiTi entries require some degree of crown down preparation even if a so-called single instrument is used.

The result will predictably be excessive removal of tooth structure in the mesio-distal plane and inadequate preparation in the bucco-lingual plane exacerbated by the dentist’s concern that any deviation from the centered position increases the incidence of instrument breakage.

To further alleviate separation anxiety, difficult apical curves are to be first negotiated to a 20 with K-files, a holderover from an earlier time period making initial pathway a tiresome hand-fatiguing proposition.

Vertically fluted instruments are relieved through a 10 and relieved thereafter with a flat long length used in the 30-degree reciprocating handpiece oscillating at 3,000 to 4,000 cycles per minute eliminate hand fatigue from the start. In the smaller dimensions, stainless-steel 02 tapered vertically fluted instruments are quite flexible while retaining enough body to effectively remove dentin when directed against all the walls. In these thin dimensions, NiTis can be expected to be far more flexible for effective shaping of dentin when pressed against these walls.

As we work ourselves up to a 30 preparation, one might think that particularly in curved canals the stainless-steel instruments are too stiff to negotiate without disturbing the tooth. To understand why this is not a problem, one must realize that the pathway has already been well-defined by the previous use of thin, highly flexible, stainless-steel instruments that have widened the canal space beyond their own dimensions, creating a pathway that less flexible instruments can follow.

Furthermore, the instruments used to negotiate the canals are relieved with a flat starting with a 15, making them more flexible just when unrelieved comparable sized instruments might become excessively stiff. Most important, the amplitude of motion confined to 30 degrees keeps the instruments centered on the down stroke preventing distortion and can then be applied to all the walls on this stroke.

The idea is to replace complex with simple, unpredictable with predictable while preserving as much tooth structure and may already have preexisting defects or new ones as a result of rotating NiTi instrumentation.

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Wykle Research offers Calasept Endo line

Wykle Research offers Calasept Endo products, which it distributes for Nordiska Dental of Sweden, the manufacturer of Calasept and Calasept Plus. Calasept Irrigation Needles are high-quality, double-side-vented, luer-lock irrigation needles that optimize the cleansing of canals, creating a “swirl effect.” The needles are available in 27 g or 31 g, in packs of 40 needles.

Features include the following:
- Bendability
- Luer-lock hub
- Sterile and disposable
- Designed for ease in cleaning roots
- High-quality stainless steel

Calasept Irrigation Syringes are 3 ml luer-lock, single-use syringes. They are color coded to eliminate risk when using multiple irrigation liquids. They are available in packs of 20 syringes, 10 white and 10 green.

Features include the following:
- High-quality, three-part syringe
- Color coded
- Luer lock

These products complement Wykle’s popular Calasept line, which includes Calasept and Calasept Plus calcium hydroxide paste for temporary filling of root canals, sold in packages of four syringes with 20 needles. Calasept EDTA is 17 percent EDTA solution. Calasept CHX is 2 percent chlorhexidine solution for irrigation. Both solutions are packaged with a luer adaptor for easy filling of syringes.

For more information, contact Wykle Research at (800) 859-6641 or visit the company online, at www.wykleresearch.com.

(Source: Wykle Research)

EZ-Fill Xpress and Ti-Core Flow+

Essential Dental Systems Inc. (EDS) recently announced several improvements to its EZ-Fill Xpress obturative technology. The new improvements include easier flowability, increased radiopacity and easy expressibility.

EZ-Fill Xpress is used in conjunction with the EZ-Fill bi-directional spiral. The apical spirals rotate in an unwinding motion, whipping the cement laterally, creating a complete seal while preventing excess cement from going over the apex.

EDS also announced its new and improved Ti-Core Flow+ — a reinforced core material and post cement, all in one. According to EDS, the new improvements include enhanced NANO particle technology, increased radiopacity and easier flowability. It is more than 40 percent stronger, EDS says.

The products are available immediately through dental dealers worldwide. More information is available at www.edsdental.com or by calling (800) 223-5394.

(Source: Essential Dental Systems Inc.)
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