

roots

the international C.E. magazine of endodontics

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_C.E. article

Predictable Endo
102: Why warm and
soft is so good

_instrumentation

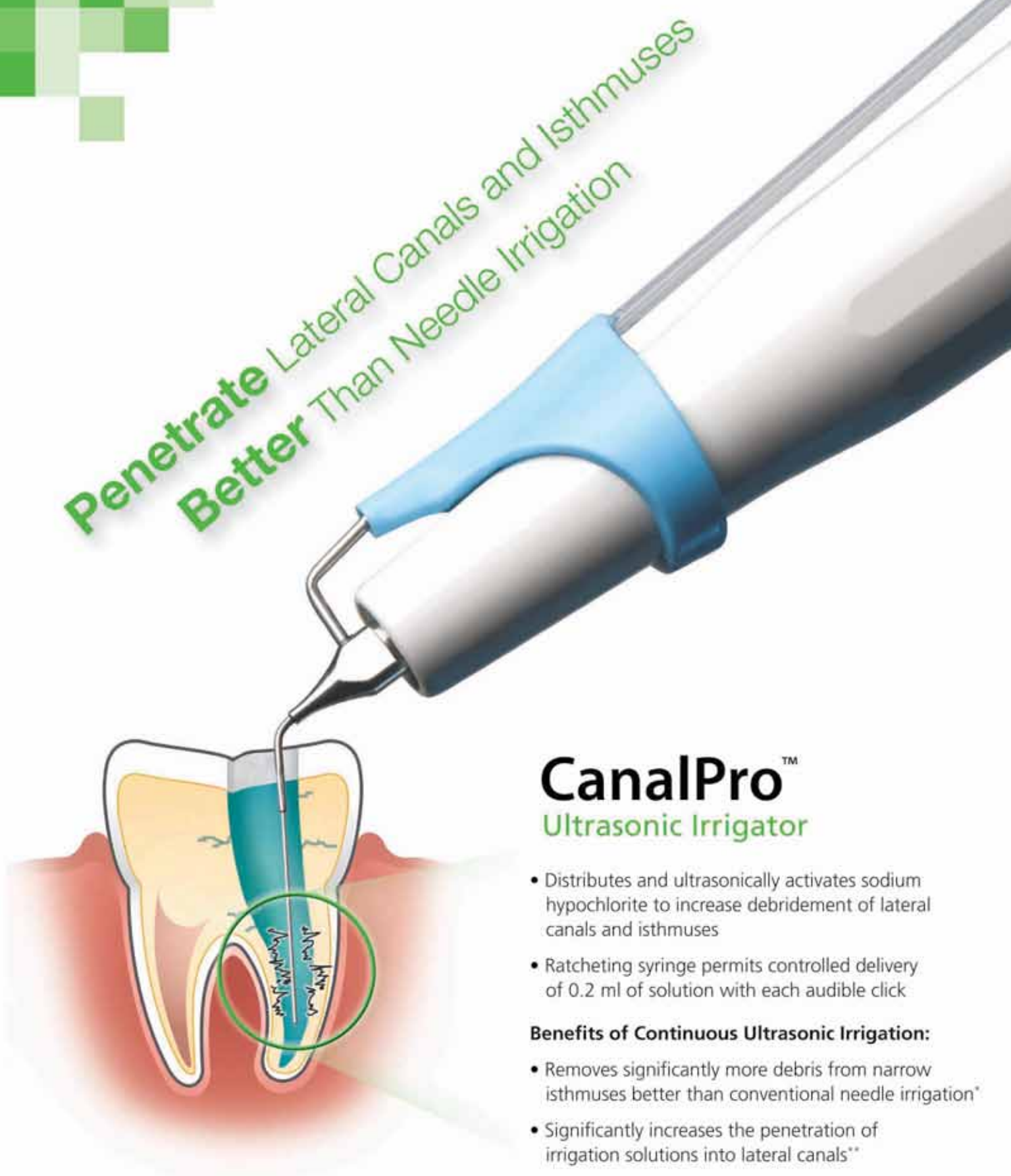
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Welcome to *roots* paradise



Fred Weinstein, DMD, MRCD(C),
FICD, FACD

As I am writing this, I am getting ready to travel to Honolulu for the American Association of Endodontists meeting. Hawaii is a wonderful place to visit, and I am thrilled that AAE is holding its annual session this year in paradise. You might very well have picked up this copy of *roots* at the event.

In this issue, be sure to read the report on tools for endodontic instrumentation by Dr. Rich Mounce, and the article on the new TrueTooth replicas by Dr. L. Stephen Buchanan.

Every issue of *roots* also contains a C.E. component. By reading the article on obturation by Dr. John Stropko, then taking a short online quiz about his article at www.DTStudyClub.com, you will gain one ADA CERP-certified C.E. credit. Keep in mind that since *roots* is a quarterly magazine, you can actually chisel four C.E. credits per year out of your already busy life without the lost revenue and time away from your practice.

To learn more about how you can take advantage of this C.E. opportunity, visit www.DTStudyClub.com. Annual subscribers to the magazine (\$50) need only register at the Dental Tribune Study Club website to access these C.E. materials free of charge. Non-subscribers may take the C.E. quiz after registering on the DT Study Club website and paying a nominal fee.

I know that taking time away from your practice to pursue C.E. credits is costly in terms of lost revenue and time, and that is another reason *roots* is such a valuable publication. I hope you will enjoy this issue of *roots* and that you will take advantage of the C.E. opportunity.

For those of you who are in Hawaii for the AAE, please say hello to me in person. It is always a pleasure to rub elbows with others in the specialty. *Roots* Managing Editor Fred Michmershuizen is also here. Watch for his report on the meeting, plus lots more educational articles, in the next issue of *roots*.

Until then, I wish you all the best.

Sincerely,

Fred Weinstein, DMD, MRCD(C), FICD, FACD
Editor in Chief



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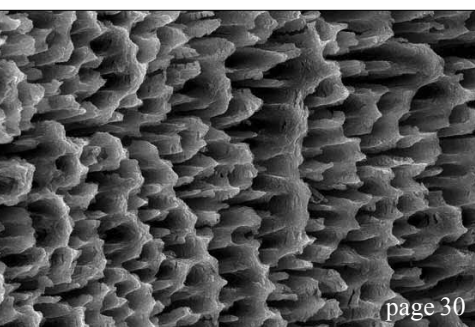
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on the cover

The image is of a TrueTooth™ training replica. Designed by Dr. L. Stephen Buchanan and re-created by a 3-D printer, these are authentic replicas of the internal and external anatomy of CT-scanned extracted teeth, with bleach-dissolvable material in the root canal passageways. TrueTooth training replicas are available exclusively from www.DELEndo.com and are patent pending.



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Predictable Endo 102: Why warm and soft is so good

System 'S' for injectable or carrier-based GP

Author_John J. Stropko, DDS

_c.e. credit

This article qualifies for C.E. credit. To take the C.E. quiz, log on to www.dtstudyclub.com. Subscribers to the magazine can take this quiz for free and will be emailed an access code after the magazine's release. If you do not receive the code, please write to support@dtstudyclub.com. Non-subscribers may take the quiz for \$20. You can access the quiz by using the QR code below. The quiz will be available on April 15.



"There's a difference between interest and commitment. When you're interested in something, you do it when it's convenient. When you're committed to something, you accept no excuses, only results."

—Ken Blanchard

_Abstract

The author has been in private practice and a continuing student for the past 50 years. The first half was spent practicing restorative dentistry, and the second half in a specialty practice limited to endodontics. On the road to predictability, it became apparent there was a definite relationship present between root canal treatment, periodontal status, prosthetics and/or subsequent restorative procedures. Each operator has to decide what steps for a more predictable outcome they are willing to trust another to do. This article is an attempt to share some "secrets of success" and perhaps serve as a checklist for a system that works in the attempt to achieve predictability of endodontic treatments.

During the earlier years of the past century, several techniques were devised for the obturation of the canal system after removal of the diseased pulp, or necrotic tissue. Some of the most popular were silver points, lateral condensation of gutta-percha (GP), Sargenti paste and chloropercha. Currently there are seven techniques that utilize gutta-percha as the obturation material of choice:

- 1) Single cone
- 2) Lateral condensation
- 3) Chloropercha technique
- 4) Vertical compaction of warm GP (Schilder, continuous wave, System "B," McSpadden, System "A")
- 5) Carrier-based (Thermafil)
- 6) Injection of thermo-plasticized GP (often referred to as "squirtling" using a Calamus or Obtura unit)
- 7) Mechanically assisted compaction (Pac Mac).

In 1967, Dr. Herb Schilder, often referred to as "the father of modern endodontics," introduced the concept of filling the root canals in three dimensions.¹ The Schilder Technique involved a new and different approach for obturation of the canal system and resulted in much controversy.

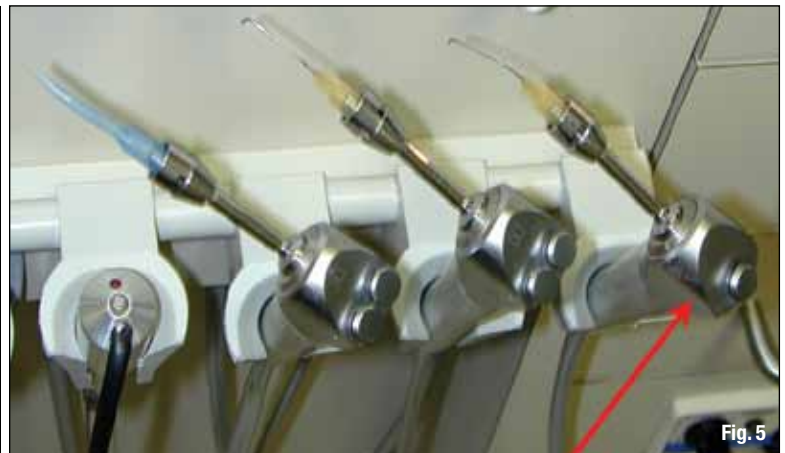
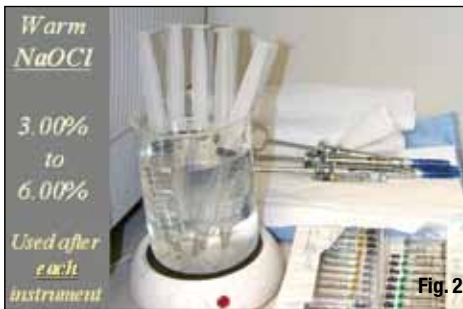
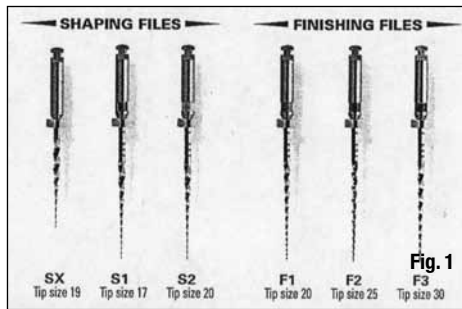
Evidently, the controversy did create interest from some doctors, because in the mid 1970s new ideas and techniques evolved that became most of what are the currently accepted concepts of modern endodontic principles and techniques. Today, the numerous clinical reports, published research and the rapid advancements in technology have significantly changed the operator's obturation preferences. Ease of communication, along with modern marketing, has become a very important determinant when making a choice of techniques.

More recent studies have discounted some previous obturation materials that were popular, but some form of GP still remains the most acceptable and widely used. The purpose of this article is to share a simple, six-step protocol (System "S") in a straightforward manner, to achieve predictability of endodontic treatment for the benefit of the patient.

There are six important components to the System "S" protocol:

- 1) Proper shaping with patency
- 2) Adequate cleaning, disinfection and drying
- 3) Delivery of pre-warmed GP to apex (Calamus/Obtura)
- 4) Coronal seal for the rest of the system
- 5) Respect for the endo-pros relationship
- 6) Use of the surgical operating microscope (SOM) for the entire endodontic treatment.

The author believes that as long as the gutta-percha is introduced to the apical third of the canal system, pre-warmed and pre-softened, the deformation and adaptation to the canal walls is more predictable, resulting in a better seal that is significantly less "sealer-



dependent." It has been shown that the pre-warmed techniques (Obtura and Thermafil) produce a better seal than lateral condensation.² Due to the lack of deformity inherent at room temperature, the techniques utilizing non-softened GP are more "sealer-dependent." The two most popular thermoplastic obturation techniques are the "carrier-based" (e.g., Thermafil) and "direct injection" (e.g., Calamus/Obtura). The pros and cons of each will be discussed, but regardless of the technique used, the "shape" of the prepared canal system is of utmost importance and must be discussed.

Access and shaping the canal system

In the early '70s, Schilder clearly stated the requirements for the proper shape using GP to achieve three-dimensional obturation of the canal system:

- 1) The root canal preparation should develop a continuously tapering cone shape.
- 2) It should have decreasing cross-sectional diameters at every point apically and increasing at each point as the access cavity is approached.
- 3) It should have multiple planes, which introduces the concept of "flow."
- 4) The foramen should not be transported.
- 5) The apical opening should be kept as small as practical in all cases.

There were several other requirements more clinically definitive. Following are a few of them: After placement of the rubber dam, an appropriate access is made. Unless the access is large enough for adequate

vision, appropriate instrumentation may be compromised and canals missed. A perfect example is a maxillary first molar; if the access is made as though there was an MB2, it is amazing how many times an MB2 is found. A general rule of thumb is, if you access for it, you are more likely to find it. A proper access will also facilitate the creation of the continuously tapering shape of the canal, necessary for the warm GP technique.

Occasionally after caries or old restorations are removed, a "pre-endodontic" restoration may be required to control and maintain a sterile environment until the endodontic treatment is complete. This can usually be accomplished using a bonded composite technique.

Shaping should be confined to the anatomy of canal system, following the natural curvatures. Instrumentation beyond the apex is unnecessary and may needlessly enlarge and deform the apical foramen.³ Using the Schilder protocol to achieve the desired shape of the canal system was a time-consuming process. It involved the tedious use of pre-curved files and reamers to follow the anatomical curvatures of the canal.

Other requirements that caused some controversy then (and still does), besides the size of the access opening, was the need to keep the apical foramen as small as possible, and to maintain patency throughout the entire process. The majority of more recently published research and clinical studies have confirmed the rationale for an appropriate access and correct shaping.

In the early 1990s, technology brought about the introduction of rotary instruments, relieving the op-

Fig. 1 Typical rotaries, one of several popular brands. (Photos/ Provided by John J. Stropko, DDS, unless otherwise noted)

Fig. 2 NaOCl irrigating syringes can be warmed in a beaker on a coffee warmer. Note the anesthetic syringes on a heating pad in the background.

Fig. 3 The Endo Activator is used for the 'tsunami effect' for cleaning canals.

Fig. 4a The canal system can be very complicated.

Fig. 4b The Walter Hess studies with vulcanite clearly demonstrated the complexity of canal systems.

Fig. 5 Set of three Stropko Irrigators with various 27-gauge tips bent for use. Arrow points to the dedicated 'air-only,' single-button DCI syringe.

Fig. 6_When drying canals with air, needles must be notched or side-vented (arrows).

Fig. 7_The Chapman Huffman in-line air regulator and 0-15 psi gauge works well.

Fig. 8_Fresh absorbent points are used to remove excess sealer until 'blotchy.'

Fig. 9_Only a very thin layer of sealer needs to coat the walls for lubrication. (Photo/Courtesy of Bob Sharp, Sacramento, Calif.)

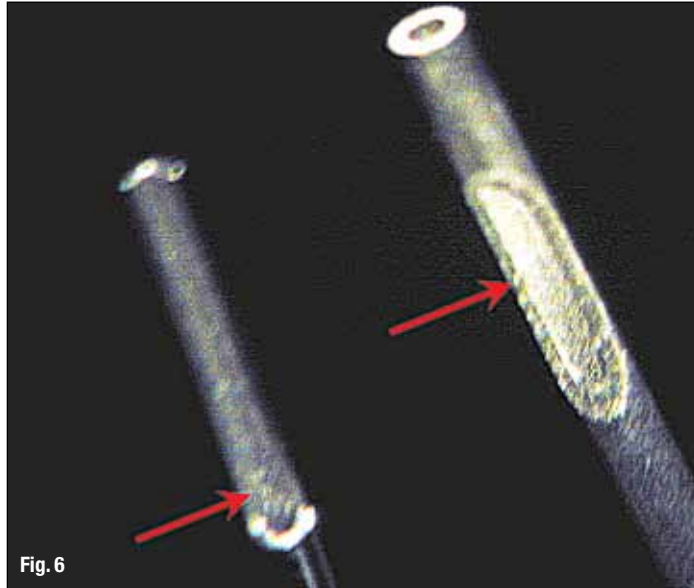


Fig. 6



Fig. 7

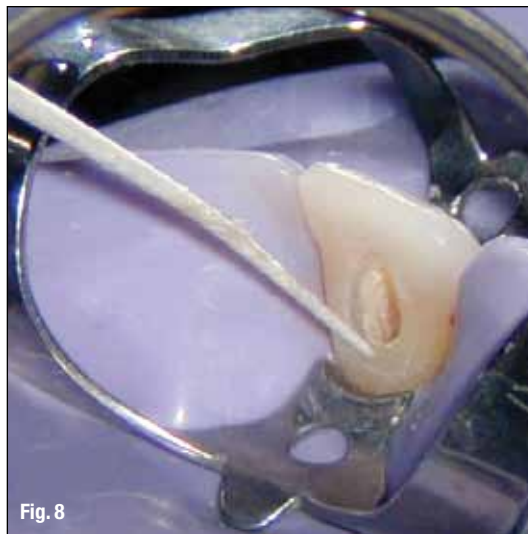


Fig. 8



Fig. 9

erator of considerable time spent creating an acceptable shape. The ProFile rotary bur (Tulsa Dental) with 0.04 and 0.06 taper, was introduced to the profession. Creating the shape necessary for the successful use of the warm obturation techniques was made easier and faster.

By the beginning of this century, numerous designs gradually evolved utilizing varying tapers, active or passive cutting blades, etc. (Fig. 1). At first, the biggest problem with the rotary files was breakage during use. But modern nickel titanium (NiTi) metallurgy technology has developed more, and more dependable, rotary files. As a result, today the separation of a rotary instrument during use is of virtually little or no concern.

It has also been shown that proper shape permits more thorough irrigation and the removal of significantly more debris from the prepared canal system. Disinfecting irrigation should be used between each instrument during the entire shaping process and patency continually maintained with a #10 file. Note:

The quantity of irritants used is not as important as the frequency of use. The irrigation protocol, instruments, fluids, etc., are in constant evolution and becoming more effective. However, a clean and sterile environment of the canal system prior to obturation is still the objective.

Irrigation for cleaning the canal system

After shaping is completed, final cleaning can be effectively accomplished by the alternative use of:

- 1) Warm 3- to 6-percent NaOCl
- 2) 17 percent aqueous EDTA for approximately 30 seconds (smear layer removal)
- 3) Warm 3- to 6-percent NaOCl (further disinfect and stop action of the EDTA).

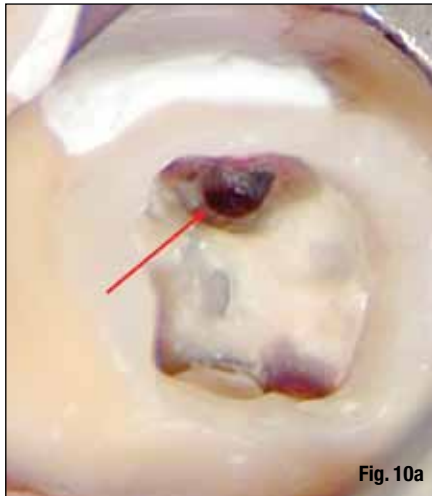


Fig. 10a

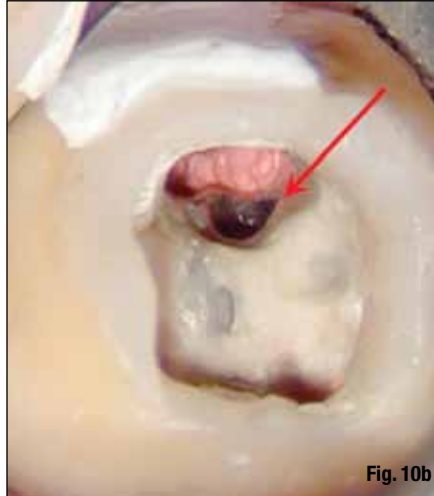


Fig. 10b



Fig. 10c



Fig. 11a



Fig. 11b

Fig. 10a_A furcal perforation in the distal root of a mandibular first molar.

Fig. 10b_Canal filled just apical to furcal perforation.

Fig. 10c_MTA placed to repair the perforation.

Fig. 11a_The Calamus Dual unit with a thermal handpiece. (Photo/ Courtesy of Dentsply Tulsa Dental Specialties)

Fig. 11b_An Obtura III Max Pack Dual also has the thermal handpiece.

The NaOCl can be effectively warmed by placing the irrigating syringes in a beaker of water set on a small coffee warmer (Fig. 2). The canal(s) are completely flooded with the desired solution; an Endo Activator (Dentsply) is appropriately used for the "tsunami effect," then re-irrigated with the same solution for flushing of debris (Fig. 3). The NaOCl is then effectively removed with a capillary tip (Ultradent) attached to a high-speed evacuator. Other solutions (hydrogen peroxide, chlorhexidine, 17 percent aqueous EDTA, MTAD, etc.) can also be used alternately, depending on operator preference.

Close observation with an SOM will clearly indicate complete cleaning of the canal system when no debris is flushed out during the irrigation process. During the evacuation with the capillary tip, it becomes apparent if there is a joining of the canal systems within the root. For example, if using the SOM as the MB1 canal is being evacuated and it is noted that fluid is simultaneously being drawn from the MB2 canal, there is a good indication that the system is complicated and does join at some point (Figs. 4a,b). There are occasions, especially in lower molars, where the mesial root canal system unexpectedly joins with the distal root canal system.

On occasion, the maxillary canal system will have the DB or MB canal system connected to the palatal system. These "surprises" are important to be aware of, before obturation of the canal system, especially when using either carriers or injectable GP.

Drying canals with F•I•R•E

The canal(s) are **F**looded with 95 percent ethanol (Everclear, available at local liquor store), agitation of the fluids are **I**nitiated with an activator for the tsunami effect, then **R**e-irrigated with the 95 percent ethanol, and then **E**vacuated with the capillary tip. The canal(s) are then best dried by using a Stropko Irrigator on a dedicated, air-only syringe (DCI), but if a three-way syringe is used, be sure to express all water from the line first (Fig. 5).

Next, with a 27- or 30-gauge notched or side-vented needle (Monoject), fitted to the tip of the Stropko Irrigator and bent as necessary, to easily dry the canal system (Fig. 6). Important note: It is essential to regulate the air pressure to the syringe at 1 to 3 psi and use a side-vented or notched needle, to prevent any possibility of inadvertently forcing air through the apical foramen. This is easily achieved