Predictable Endo 102: Why warm and soft is so good
System ‘S’ for injectable or carrier-based GP

By John J. Stropko, DDS

The author has been in private practice and a continuing student for the past 50 years. The first half was spent providing general dentistry and the second half in a specialty practice limited to endodontics. On the road to predictability, it became apparent there was a significant relationship present between root canal treatment, periodontal status, prosthetic, and nursing 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 treatment.

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), Sargent points, and chloropercha. Currently there are several techniques that utilize gutta-percha as the obturation material of choice:

1) Single cone
2) Lateral condensation
3) Calamus/Obtura (System ‘C’)
4) Vertical compaction of warm gutta-percha as the obturation material of choice
5) Respect for the endo-prosthesis relationship
6) Delivery of pre-warmed GP to the apical foramen
7) Mechanically assisted compaction (Pac Mac).

The author believes that as long as the gutta-percha is introduced to the apical third of the canal system, pre-warmed and pre-separated, 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 prewarmed techniques (Obtura, Calamus/Obtura) produce a better seal than lateral condensation.1

Due to the lack of deformity inherent at room temperature, the techniques utilizing non-separated, pre-separated, and pre-separated, 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 prewarmed techniques (Obtura, Calamus/Obtura) produce a better seal than lateral condensation.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 clinically defined. Following are a few of them: After placement of the rubber dam, 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 were (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 rational for an appropriate access and correct shaping. In the early 1990s, technology brought about the introduction of rotary instruments, relieves the operator of considerable time spent creating an acceptable shape. The ProFile rotary burr (Tulsa Dental) with 0.06 taper, was introduced to the profession. Creating the shape necessary for the success 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 #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 5- to 6-percent NaOCl
2) 17 percent aqueous EDTA for approximately 30 seconds (mechanical removal)
3) Warm 5- to 6-percent NaOCl followed by direct heat and stop action of the EDTA.

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 canals are completely flushed with the desired solution; an Endo Activator is used to agitate the irrigating syringes on a beaker to create a “tsunami effect” for cleaning canals.

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Courtesy of Dentsply Tulsa Dental

with a thermal handpiece. (Photo/ Courtesy of Arnaldo Castellucci, Compaction of the softened GP. (Im-

Fig. 12. The plugger is pre-fit, short

on operator preference.

chlorhexidine, 17 percent aque

cleaning of the canal system

will clearly indicate complete

dried by using a stropko ir-

On occasion, the maxillary canal

Drying canals with F•I•R•E

are important to be aware

terminus in the correctly shaped

Sealer application

To the SOM user, the ineffec-

Strong irrigator fitted with an

is complicated and does join at

solutions (hydrogen peroxide,

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

Fig. 11b. An Obtura II Max Pack. Dual also has the thermal handpiece.

The canal(s) are

Next, with a 27- or

The Chapman-Huffman in-line air regula-

Fig. 13. The GuidoCare carriers are just one of many popular products for carrier-based GP. (Photo/Courtesy of Dentsply Tulsa Dental Specialties).

Fig. 12. The plugger is pre-fit. Short of blinding, to avoid unnecessary con-

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

Fig. 8. Fresh abutting points are used to remove excess sealer until blisty.

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

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.

Sealer EWT, mixed per usual di-

the canal walls by the sealer is complete and there is a

the canal is in fact dry, not just

the moment there is a sensa-

In a completed canal, the unsta-

the carrier-based techniques fill

the injection technique

important consideration be-

in the canal won’t be

the carrier, the Chapman-Huffman

When a post space is required,

be added to the repair in a very consis-

The consistent flow of the Calamus

the carrier-based obturation, the author

the相对ively large muscle action of

in order to prevent any possibility of

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Table 1. A comparison of thermo-plasticized GP obturation with Calamus vs. Fil plus. (Photo/Courtesy of Stephen P. Niemczyk, Drexel Hill, Pa.)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Calamus</th>
<th>Fil Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Flow is consistent and can be preset</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>2) GP is evenly spread in all packaging</td>
<td>90%</td>
<td>85%</td>
</tr>
<tr>
<td>3) Barrier protection easy to place</td>
<td>90%</td>
<td>85%</td>
</tr>
<tr>
<td>4) Barrier protection easy to place</td>
<td>90%</td>
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<tr>
<td>5) Proper &quot;squeeze&quot; a longer learning period</td>
<td>80%</td>
<td>90%</td>
</tr>
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<td>8) Proper &quot;squeeze&quot; a longer learning period</td>
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</tr>
<tr>
<td>9) Proper &quot;squeeze&quot; a longer learning period</td>
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<td>90%</td>
</tr>
<tr>
<td>10) More time consuming to clean</td>
<td>80%</td>
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</tr>
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Fig. 1a. A Prep bur (Dentsply) is used to prepare the canal to the orifice level of the sealer. (Photo/Courtesy of Stephen P. Niemczyk, Drexel Hill, Pa.)

Fig. 1b. Carrier shaft and GP are seated in the orifice of the canal. (Photo/Courtesy of Stephen P. Niemczyk, Drexel Hill, Pa.)

Fig. 1c. A second carrier is inserted alongside the previously placed carrier for re-obturation. (Photo/Courtesy of Stephen P. Niemczyk, Drexel Hill, Pa.)

Fig. 1d. APX of the immediate post-op (left) and two-year post-op (right).
cement is placed on the tooth with a taper of 1.5 degrees and 35 to 50 degrees of tapering freedom. The margin is then adapted to the tooth by hand or with the aid of a bur or other instrument. The operator should be careful not to damage the existing restoration or the tooth structure. The restoration should be finished and polished to ensure a smooth and even surface. The tooth should be evaluated for any remaining caries or areas that may require additional restoration. The patient should be instructed on proper oral hygiene techniques and scheduled for a recall appointment.
tooth is lost to disease? Once the referring doctors are made aware of the favorable benefits that will be derived, it becomes difficult for a conces- sioning person to ignore the concept of eliminating untoward possibilities that can lead to fail- ure of treatment.

Conclusion

The System “S” protocol de- mands thoroughness in treat- ment of the entire endodontic canal system. The author uses a Calamus for obturation, but carver-based techniques of using warm GP can be used with the same de- grees of success, as long as they are done correctly. System “S” requires a commitment to com- plete all six steps to avoid the many pitfalls that present them- selves during treatment of the entire endodontic canal system. A survey of endodontists taken about nine years ago stated that 36 percent always used an SOM, 30 percent sometimes used it, and 32 percent never used it.12 Hopefully, things have changed.

The use of an SOM is essen- tial for us, as “endo-doers,” to achieve the high level of predictabil- ity our current technology al- lows us to deliver. We only know what we see, and if we don’t see it we don’t know it. A good ex- ample is the high percentage of fourth canals (95 percent) that can be found in the maxillary molar segment.

The clinical use of the SOM sig- nificantly increased the number of canals that were prepared.13 If these canals are not found, and the operator doesn’t take the time to locate and treat them, the predictability of success will be far less. It behooves all of us to do everything humanly possible to give our patients dental treat- ment that will create the health they expect from our profession.

In general, our current endod- ontic vision has been directed to treatment of the apical half of the root canal system. It should not be a problem in degrading the basic principles of bonding technology, restorative princi- ples and post core placement into our normal endodontic treatment protocol. We, as a specialty, should be thinking in terms of being responsible for de- termining everything humanly possible to increase the predictability of our treatment. When endodon- tics treatment fails, it seems like everyone “stands around in a circle and points at one another.” Adhering to proven princi- ples eliminates the probability of contamination of the canal sys- tem by providing a solid founda- tion for the restorative aspect of the patient treatment. Obviously, those who are so con- cerned with the endodontic lack of respect for root canal structure have not witnessed what often happens to that same tooth when preparing it for a crown. It is im- pertinent for the endodontic and restorative to be a team, work- ing together for predictability, in the interest of the patient.

Our job as “endo-doers” is to learn, become teachers and educate the patients, staff and doctors we work with, so we can achieve dental health as a team. Let’s not “cave into” the demands of public convenience or political pressure, but rather be governed by proven dental principles, so we can achieve predictable endodontic success, saving the teeth our patients are born with, isn’t that what endo- dentists is all about?

References