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Apical microsurgery: REF materials, techniques

Part five of a six-part series

By John Stropko, DDS

In Parts 1 through 4, the necessary steps and procedures were presented, enabling the operator to atraumatically and predictably allow the root-end preparation (REP) to be sealed using any accepted root-end fill (REF) material. The surgical crypt should be clean and dry so vision is clear and unobstructed. Remember, the steps must be followed completely in order to achieve as predictable a result as humanly possible. If, for some reason, crypt management is not complete, or the REP is not clean and finished, it is required to "go back" and repeat a step, or two, to achieve the desired result. The importance of having total control at this point in the apical microsurgical procedure cannot be over-emphasized.

The operator is now at a stage in the microsurgical procedure where the tissues have been atraumatically retracted, the crypt is well-managed and the acid etched; rinsed and dried REP is ready to fill. Removing the smear layer barrier, exposing the organic component (collagen fibrils) of the resected cementum and dentin, has been shown to enhance cementogenesis and is one of the keys to dentoalveolar healing.[1]

There are several materials that are currently available as a retrofill: amalgam, IRM, Super EBA "SEBA" (Bosworth, USA), bonded composites Optibond (SybronDental, United States), glass ionomers, such as Geristore (Den-Mat, United States) and more recently, Mineral Trioxide Aggregate "MTA" (Dentsply/Tulsa Dental Intl).

The number of publications in literature about research on the above materials is extensive, so only a few of them will be mentioned due to space. The author doesn't want to recommend or condemn any retrofill material (except amalgam), but will generalize and relate his and others' experience with them and opinions about their applications.

Amalgam and IRM were used for many years as the only commonly available retrofill materials. However, in almost every "leakage" study published during the past few years, amalgam has proven to be the worst offender, exhibiting the most leakage.[2, 3] This fact, accompanied by the general controversy about mercury in amalgam, strongly suggests that there is no valid reason to continue its use as a retrofill material. The only real

Fig. 1a: Amalgam is the most radiopaque REF material, but its use is highly controversial. (Photos/Provided by Dr. John Stropko)

Fig. 1b: SEBA has a radiopacity similar to that of gutta-percha.

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The continuous wave of obturation technique for enhanced precision

By Dr. L. Stephen Buchanan, DDS

I invented the Continuous Wave of Obturation Technique (CWOT) in 1986 and used it with the Touch'n Heat (SybronEndo) until the winter season of 1988/1989.

At this time, Johan Massreillez of Analytic Technologies asked me whether I could use his heat source with temperature control-designed for hospital surgical operating rooms. It worked better for my technique and pluggers, as it was easier to control the heat. In 1994, SybronEndo bought Analytic Technologies and the rest is history.

As with any method of obturation, its success is completely dependent upon the cleaning and shaping of the root canal system. The steps for the CWOT are detailed here.

Step 1: Down-pack

Once cone-fit has been accomplished and radio-graphically confirmed, the Continuous Wave (CW) plugger that matches the gutta-percha cone is fitted in the canal. The tip should be fitted within 5 mm from the canal terminus, never closer than 3 mm.

The canal is dried and measured one last time with feather-tipped GT Series X paper points, the cone is trimmed to be 1.5 mm short, coated with sealer and cemented in the canal. The cone can then be seared at the orifice with the tip of the preheated CW plugger at an angle to the cone, and the butt-end can then be removed. The larger stainless-steel end of a CW hand plugger is used to compact the softened gutta-percha

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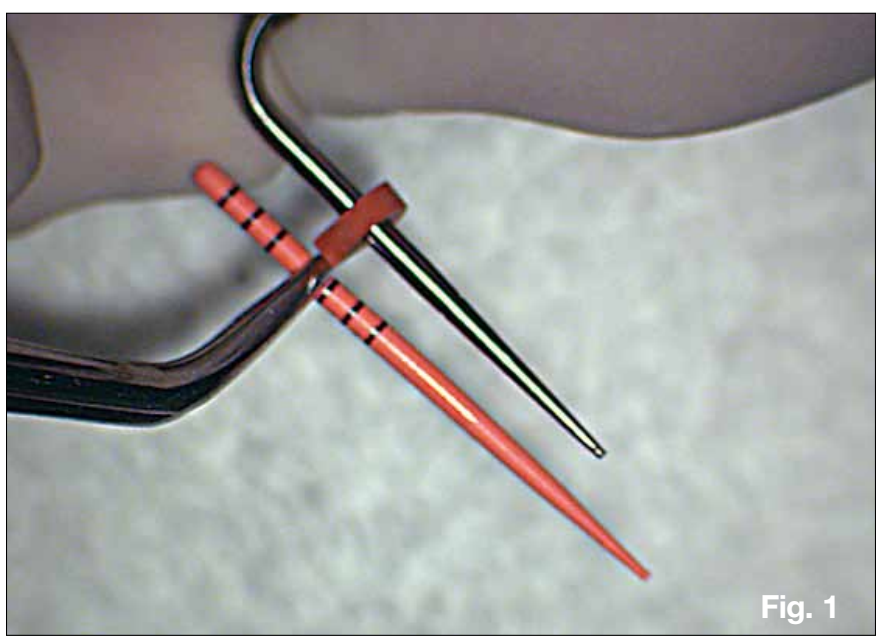

(All photos provided by Dr. L. Stephen Buchanan)

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advantage to amalgam is the favorable radiopacity (Fig 1a). In fact, of all REF materials commonly in use today, none of them compare to the radiopacity of amalgam.

Since the advent of the anatomically correct, ultrasonic REP, one of the most popular and still-used REF material is Super EBA (SEBA). A recent follow-up study demonstrated a success rate of 91.5 percent using SEBA.[4] The author used SEBA routinely in the early 1990s with full confidence of its sealing capabilities.

To some, the major drawback of SEBA is its technique sensitivity. The surgical assistant had to mix it until it was thick enough to roll into a thin tapered point with a dough-like consistency. For even a well-trained assistant, this was often the most stressful part of the microsurgical procedure. The "dough-like" tapered end of the thin SEBA "roll" was then segmented with an instrument, such as a small Hollenbeck Carver.

The small cone-shaped endpiece was then inserted into the retroprep and gently compacted coronally with the appropriate plugger. Two to five of these small segments were usually necessary to slightly overfill the retroprep.

Another problem experienced by many was that SEBA was unpredictable as to its setting time — sometimes setting too quickly and, at other times, taking much too long for the tired surgeon.

At any rate, after the REF is complete, an instrument, and/or bur, is used to smooth the resected surface, producing the final finish. A mild etchant is then used to remove the "smear layer" produced during the final finishing process. SEBA has a radiopacity comparable to that of gutta-percha, so it was necessary to educate the new referring doctor that a retrofill had indeed been performed (Fig. 1b). However, in some recent studies, SEBA has been shown to have a better sealing ability that IRM, but not as well as MTA.[2, 3]

Bonding, using composite retrofill materials, is now completely possible due to having total control over the apical environment utilizing good crypt management procedures. Many different materials are available for use as a REF. Optibond (SybronDental) and Geristore (Den-Mat) are popular because of their ease of use. They both have good flowability, dual-cure properties and the ability to be bonded to dentine. Geristore is supported by research demonstrating biocompatibility to the surrounding tissues.[5]

The usual etching, conditioning of the dentin, insertion of the selected material, and curing by chemical or light is accomplished in a routine manner when bonding into the retroprep. (Note: Because the light source for the OM is so intense, it is mandatory to obtain an orange filter to use while placing the composite to prevent a premature set.) For most microscopes, an orange filter is available that easily and inexpensively replaces the "blood filter." After the composite is completely cured, the material is finished with a high-speed finishing bur and

Fig. 1c: The MTA has a radiopacity just slightly better than gutta-percha.

the resected root end is etched with a 35 percent blue gel etchant (Ultradent, United States) for about 12 seconds to remove the "smear layer" and to demineralize the surface.

Several studies showed no leakage with bonding techniques and many operators use it as their technique of choice.

However, there is some controversy as to whether the resected surface of the root should also be coated with a thin layer of the bonding material. A "cap" of material (usually Optibond) was placed with the intention of sealing the exposed tubules on the resected surface.

The operators who cover the resected surface believe it necessary to ensure a good seal and the predictability would be better. On the other hand, there are also operators who do not believe the exposed tubules are a factor concerning the predictability of the healing process. They reason that nothing would heal as well, or be more biocompatible, than the exposed dentin of the apically resected surface.

The author did not cover the exposed apical surface and is convinced the jury is still out on this issue!

More recently, another material has become very popular and is widely used by many. Mineral Trioxide Aggregate (MTA) has attracted many converts. There is so much research that has been done, and so many publications presented, that just one reference would be futile.

The evidence extolling the virtues of MTA, regarding its sealing capabilities and its biocompatibility with the surrounding tissues, is overwhelming. The author has talked to many respected endodontists, and most are now using MTA as their routine retrofill material. MTA is chemically similar to calcium sulfate, forgiving to work with, and has a radiopacity slightly better than gutta-percha (Fig. 1c).

The main advantage of MTA is its ease of use, much like handling "Portland Cement." One of the secrets to using MTA is to keep it dry enough so it doesn't flow too readily (like wet sand), but yet is moist enough to permit manipulation and maintain a workable consistency.

The desired "thickness" is easily

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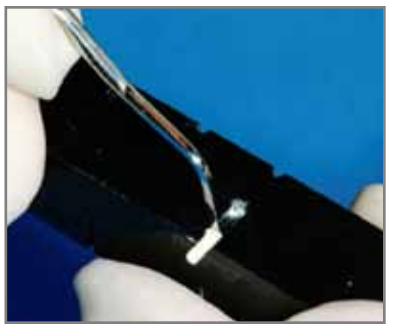
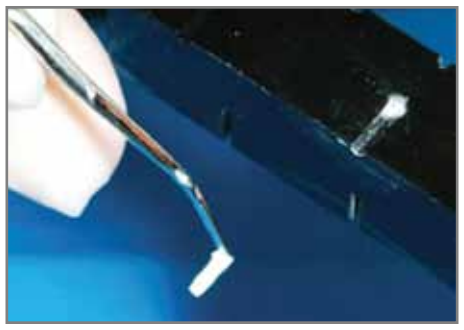
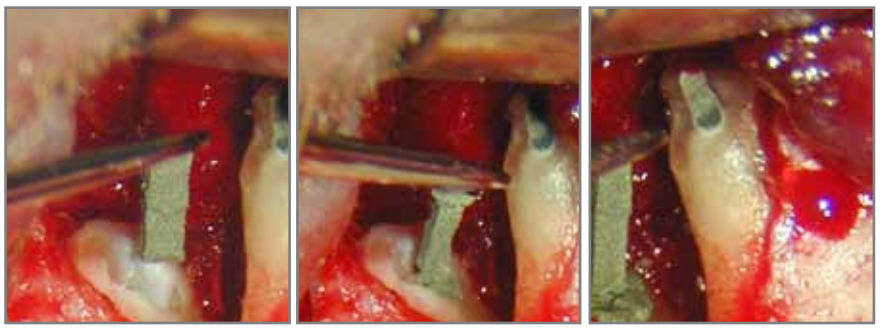




Figs. 2a, 2b: Lee MTA Pellet Forming Block.



Figs. 2c-2e: Using the Lee MTA Pellet Forming Block system, it takes fewer 'passes' with the instrument to complete the fill of the REP with MTA.

Fig. 3a: MTA should be carved flush with the REB.

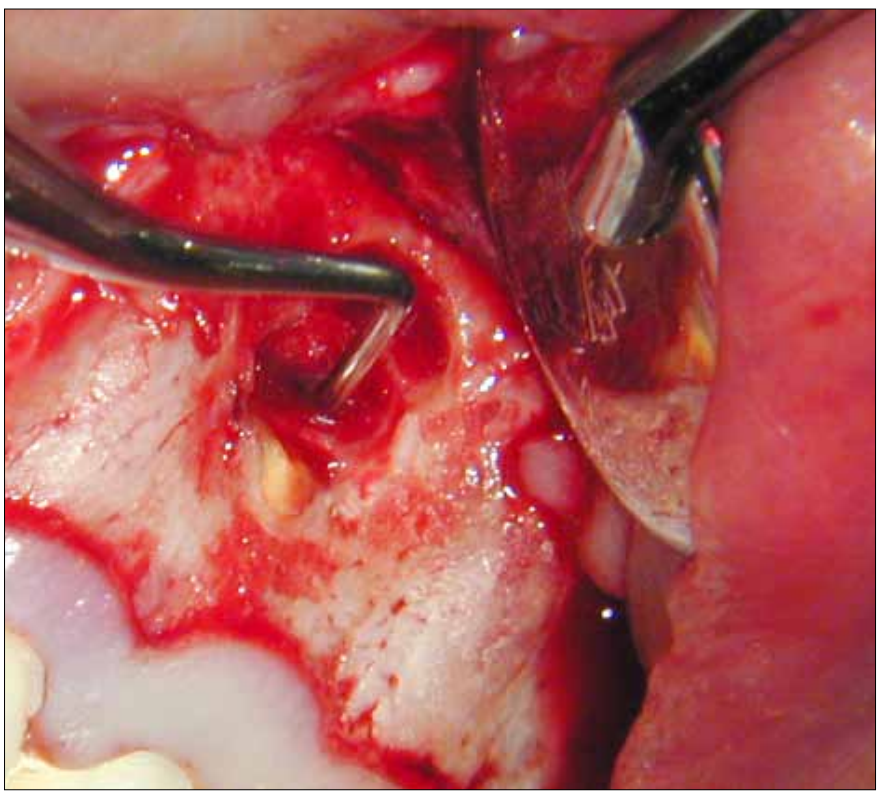


Fig. 3b: Blood supply re-established to cover MTA.

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accomplished by using dry cotton pellets, or the MTA mix can be gently dried with a dedicated, air-only Stropko Irrigator (*www.stropko.com*). If the MTA is too dry and needs moisture added, that, too, is easily done with a cotton pellet saturated with sterile water. Properly mixed MTA can be extruded in pellets of various sizes (depending on the size of the carrier used) using a Dovgan Carrier (Quality Aspirators) and condensed with an appropriate plugger.

More recently, a simple method for delivery of the MTA into the REP was introduced (Fig. 2a). The Lee MTA Pellet Forming Block has several differently sized grooves to create the desired aliquot of MTA. The MTA adheres to the instrument, allowing for easy and efficient placement into the REP (Figs 2c-2e).

For a denser and stronger consistency, the assistant can touch the non-working end of the plugger, or explorer, with an ultrasonic tip during the condensation process. The flow is increased and a much denser fill is achieved. As a result, "ultrasonic densification" also increases the radiodensity of the MTA's appearance in the post-op radiograph, but it is still similar to gutta-percha (Fig. 1c).

MTA has approximately an hour of working time, which is more than adequate for apical microsurgery and takes much "time pressure" out of the surgical procedure. Finishing the MTA is simply a matter of carving away the excess material to the level of the resected root end (Fig. 3a). The moisture necessary for the final set is derived from the blood, which fills the crypt after surgery. The MTA is very hydrophilic and depends on moisture for the final set, so it is imperative that there is enough bleeding re-established after crypt management to ensure the crypt is filled. If any material, such as ferric sulfate, has been used for crypt management, it must be judiciously removed to restore blood supply to the crypt.

This can be considered the final step in "crypt management" and is especially important when MTA is used for the REF. If the size of the lesion indicates the use of guided bone regeneration, good blood supply is indicated anyway, so allow the blood to cover the MTA before placing the GBR material of choice. In a large lesion, it is sometimes difficult, even after curettage, to restore bleeding into the crypt (perhaps the crypt management was a little too effective), and it may be necessary to use a small round bur in the surgical handpiece to make several small holes in the surface of the crypt to aid in the re-establishment of the desired flow of blood.

Based on current studies, the operator can choose any one of the above mentioned REF materials and be comfortable that, if the proper protocol is followed, the apical seal will be predictable and healing uneventful. ET

Look for the final part to this series in the October edition of Endo Tribune. Previous parts can be found on the Dental Tribune website at www.dentaltribune.com/articles/content/scope/specialities/region/usa/id/929.

References

1. Craig KR, Harrison JW. Wound healing following demineralization of resected root ends in periradicular surgery. J Endod 1993 Jul; 19(7): 339-47.
2. Martell B, Chandler NP. Electrical and dye leakage comparison of three root-end filling materials. Quintessence Int 2002 Jan; 33(1): 30-4.
3. Aqrabawi J. Sealing ability of amalgam, super EBA cement, and MTA when used as retrograde filling materials. Br Dent J 2000 Mar 11; 188(5): 266-8.
4. Rubinstein RA, Kim S. Long-term follow-up of cases considered healed one year after apical microsurgery. J Endod 2002 May; 28(5): 378-83.
5. Dragoo MR. Resin-ionomer and hybrid-ionomer cements: Part I. Comparison of three materials for the treatment of subgingival root lesions. Int J Periodontics Restorative Dent 1996 Dec; 16(6): 594-601.

ET About the author

Dr. John J. Stropko received his DDS from Indiana University in 1964, and he practiced restorative dentistry for 24 years. In 1989, he received a certificate for endodontics from Boston University and recently retired from the private practice of endodontics in Scottsdale, Ariz.

Stropko is an internationally recognized authority on micro-endodontics. He is the inventor of the Stropko Irrigator, has published in several journals and textbooks and is an internationally known speaker. He is the co-founder of Clinical Endodontic Seminars and and was an instructor of microsurgery for the endodontic courses presented at the Scottsdale Center for Dentistry. Stropko and his wife, Barbara, currently reside in Prescott, Ariz. You may contact him at *topendo@aol.com*.