Endodontic Treatment
IN THE AGE OF Bioceramics
I just changed the sealer I use in practice after 40 years.

For an endodontist, this is a big deal. Ask any endodontist what part of their RCT procedure they’re least willing to change, and 9 out of 10 them would say they’d be most anxious about changing their filling materials, because that’s the greatest long-term risk to an endodontic specialty practice. (The 10th endodontist just doesn’t know any better.) Think about it: If you’re a typical endodontist who does 800–1,000 cases a year and you change filling materials because somebody persuaded you that a new sealer is better because of blah, blah, blah, but the new material starts failing after three years, you could have thousands of cases coming back to haunt you. Practices have died over less.

Sound like an overdramatization? It isn’t. The most recent new obturation material to flame out was Resilon, a polycaprolactone-based endodontic composite filling material that had been designed to replace traditional gutta percha and sealers. This insidious material began failing after six years, doubling the failures in the example above because, over the additional three years, 3,000 more cases were treated with it before the chickens came home to roost. Let’s be conservative and say the fees averaged $500/RCT. $500 x 3,000 potential failures = $1,500,000 of liability! And that one is not a made-up number.
A biocompatible, antibacterial and nonstaining sealer

What would persuade me to change from the sealer I’ve successfully used with my continuous wave obturation technique for 40 years? I changed to BC HiFlow Sealer because all of Brasseler’s claims have been proven by our best researchers for more than a decade. Spangberg, Haapasalo, Kim, Setzer, Kohli and scores of others have shown BC Sealer to be completely biocompatible with pulp cells1–14; to be an excellent pulp-capping agent that incites odontoblastic proliferation, mineralization and osteogenesis15–21; and somehow, at the same time, this bioceramic material has significant antibacterial properties.22–24 All this in a material that seals like MTA,25–32 but doesn’t stain dentin.33–36 It also has 20 percent greater radio-opacity.

The functional characteristics of these bioceramic materials profoundly change everything in endo obturation—in more ways than first meets the eye.

Slight expansion, profound changes

The literature tells us that BC Sealer has a slight net expansion (0.2 percent) when it sets,37 instead of the significant shrinkage (up to 21 percent seen in other previous sealers.38 How does this change things in profound ways? From a practitioner’s perspective, it streamlines continuous wave obturation (CW), increasing my practice productivity. From an educator’s perspective, it simplifies
the technique, making warm gutta percha obturation more accessible to dentists of all skill and experience levels.

The most complex parts of traditional warm gutta percha condensation methods have always been:
• The need to downpack within 4–6mm of the terminus, even when obturating small, curved molar canals.
• Syringe-backfilling these narrow spaces without leaving voids.

Continuous wave obturation, with its dead-soft stainless steel electric heat pluggers (Elements Free by Kerr Endodontics) and its nickel titanium hand pluggers (Buchanan Pluggers, also by Kerr), enables clinicians to downpack within 4–6mm of the end of most any small, curved canal—a huge improvement over the Schilder technique with its rigid pluggers. However, the CW technique, as done with traditional sealers, requires prefitting the electric heat pluggers in the canals before cementing the master cone in the canal with sealer.

This prefitting routine is done by pressing the appropriate-sized plugger into the canal as it is rocked back and forth. This rocking action causes the plugger to work its way into the canal; in the process, the canal very accurately bends them to match its curvature (Fig. 1a). It was this improvement that enabled a much deeper downpack than the Schilder Warm Vertical Technique, while filling all lateral canals in less than 2 seconds (Fig. 1b).

Why have we felt compelled to downpack that far into the canal? Sealers are a needed component of a successful RCT fill, because gutta percha is not an effective sealing medium; however, all conventional sealers shrink as they set. Because of this sealer shrinkage, our best procedural workaround to prevent this shrinkage from pulling the sealer off canal walls has been to downpack deeply into even small curved canals, to thermoplastically move the heat-softened gutta percha into the intaglio of the canal, thereby thinning the sealer layer.

This is a well-thought-out procedure, considering previous sealer constraints; however, this is also a setup to backfilling voids. Despite voids being clinically the least important part of the CW procedure, seeing a backfill void on a post-RCT radiograph leaves the clinician with disappointment instead of the thrill of the fill.

**Good riddance to lateral condensation**

Change 21 percent shrinkage to 0.2 percent expansion, and suddenly nobody cares how thick the sealer layer is; we only care if we can move it into all the lateral irregularities.

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**Fig. 3a**: Mesial CBCT view of an MB root of a maxillary molar after a fruitless search for the MB2 canal. Note the 4mm-long MB2 canal that bifurcates midroot off the MB1 canal, makes a 90-degree turn, and exits. Cementing a single gutta percha cone with BC Sealer without a downpack won’t fill this anatomy.

**Fig. 3b**: Postoperative CBCT shows MB2 filled with a shortened CW downpack.
that have been cleaned out. Combine net expansion on setting with extremely low surface tension and high wettabillity, and suddenly we find that a downpack of just 3–4mm will fill every nook and cranny in the most complicated anatomy. This pivot in the continuous wave obturation procedure simplifies the downpack, because electric heat pluggers no longer need to be prefitted and bent before cementing master cones. This reduced need to achieve depth in the downpack also means it is much easier to cold gutta percha is single-cone technique with a conscience. Now we can say that single-cone obturation is far better than lateral condensation because:

• This sealer will fill the primary canal next to the master cone and lateral canals 1–2mm long by simply cementing the master cone into a BC Sealer-laden canal (Fig. 2, p. 72).

• Lateral condensation of cold gutta percha requires overcutting coronal canal shapes so a spreader (basically a thin wedge) can be forced into the canal (an enormous root-splitting force) to push the master cone aside and allow an inconsequential accessory cone to be placed in that space.

I don’t mind the fact that lateral condensation, in terms of the seal created, is no better than single-cone obturation. What I do mind is unnecessarily weakening tooth structure for no clinical advantage. If you buy the Hippocratic Oath to do no harm, lateral condensation should be anathema. BC HiFlow Sealer, with its net expansion upon setting, has provided a safer, simpler and more effective way to fill root canal systems.

**Continuous wave obturation 2.0**

If BC Sealer fills lateral canals 1–2mm in length when doing single-cone obturation, why do we need to heat gutta percha up and downpack at all? Unfortunately, lateral canal spaces in molars are way bigger than that. Forget about the 4mm wide isthmus forms found in mesial roots of lower molars. Forget about the fins, webs, loops and lateral canals that commonly project off single primary canals. Be worried about MB2 and MB3 canals in upper molars that bifurcate midroot off the MB1, turn 90 degrees and bifurcate before exiting (Figs. 3a and 3b, p. 73). These can be 7–8mm in length, so for me, I’m still a warm gutta percha guy. No longer do I have to work as hard to get the 3D results I expect to see on postobturation radiographs. (Fig. 4)

How does this simplify warm gutta percha obturation? Primarily by shortening the required downpack distance into the canal. As mentioned above, with the
Figs. 6a and 6b: Mandibular molar with severe, multiplanar curvatures of all canals. The D canal was instrumented with a single 3D Shaper; the mesial canals were shaped with a 15-.06 Edge rotary file. All the canals were filled with BC HiFlow Sealer and EdgeCore gutta percha carriers (Edge Endo).
no-net-shrinkage of bioceramic sealers, the warmed gutta percha and the sealer beneath it need just half the previous depth of continuous wave downpack to move sealer into the full apical and lateral extents of root canal systems (Figs. 5a and 5b, p. 74). The shortening of the downpack means that pluggers no longer need to be prefitted in canals before cementation of the master cone, and it also means that backfilling can be done with a small squirt of GP from a backfill syringe—or, better yet, with a sealer-coated backfill cone (Autofil Backfill Gutta Percha, Kerr Endodontics).

Carrier-based obturation also works well paired with bioceramic sealer. Three millimeters of sealer is syringed into each canal, an XP-Finisher (Brasseler) is used to spread a thin coat of sealer on canal walls, then the oven-heated obturator is placed 1mm short of full length. With improved heat resistance, carrier placement with bioceramic sealer is now identical to placement of carriers with traditional sealers, except patients have little or no postoperative discomfort because of the complete biocompatibility (Figs. 6a and 6b, p. 75).

Conclusion

Changing sealers is a big, scary deal for an endodontist because thousands of patients could be hurt if the new sealer fails before a couple of decades go by—especially if the sealer cannot check all the required safety boxes such as biocompatibility, antibacterial, etc.

The net expansion upon setting is the most crucial advantage of BC HiFlow Sealer. Why? Besides proving a safer, simpler and more effective way to fill root canal systems, it is the death knell for lateral condensation. Good riddance! The king is dead, long live the king.


23. Levato K, Sedgley M. Antibacterial Activity of EndoSequence Root Repair Material and ProRoot MTA against Clinical Isolates of Enterococcus facalis JOE, 37(11); 1542-6, 2011.


35. Shokohinejad N, Nekoeijer MH, Pirmoraei P, Shamshei AR, Dummer PM. Evaluation and Comparison of Occurrence of Tooth Discoloration after the Application of Various Calcium Silicate-based Cements: An Ex Vivo Study JOE, November 24, 2015 (Published online).


39. CW paper in pathways of the pulp


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