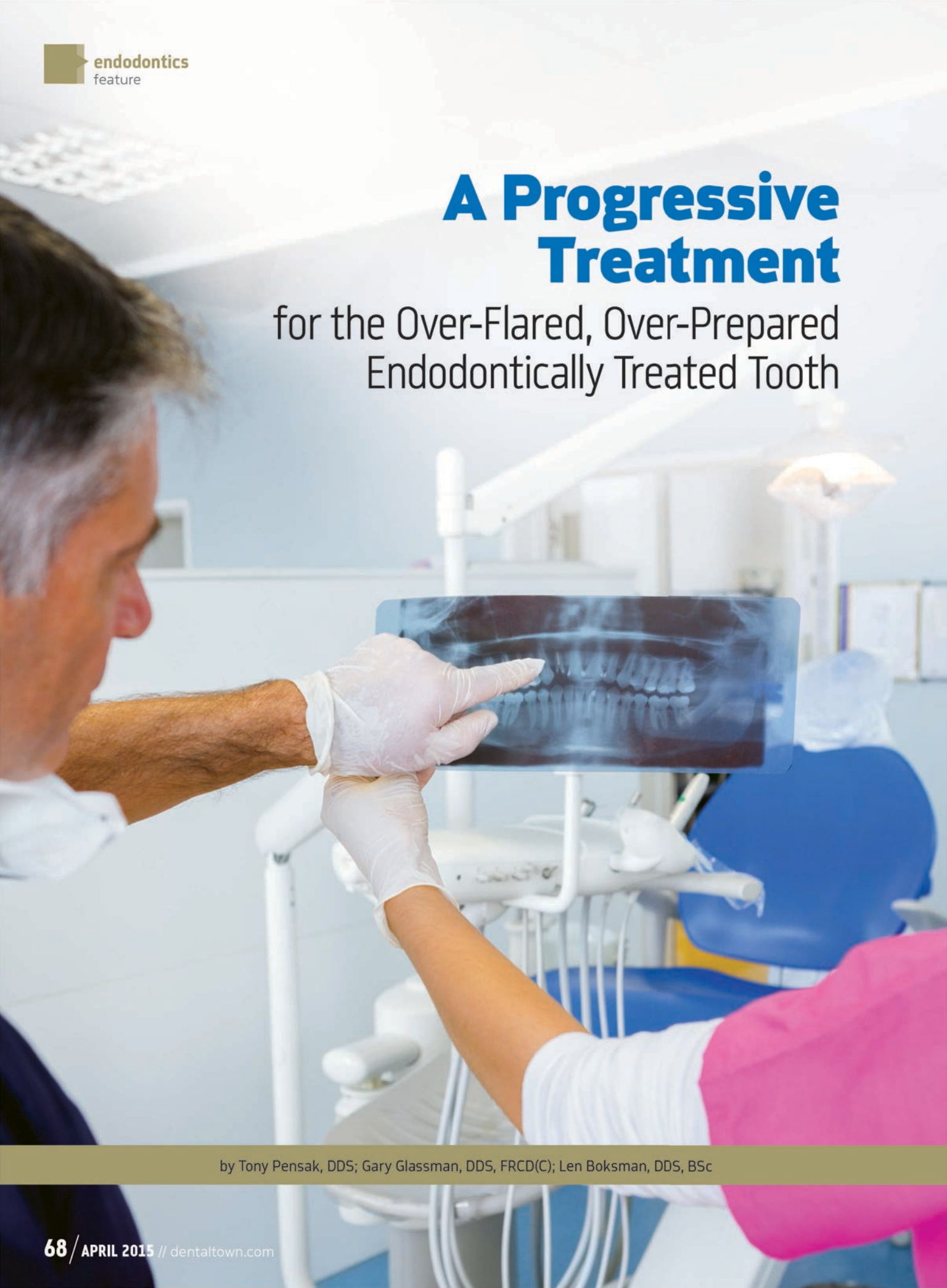
A Progressive Treatment

for the Over-Flared, Over-Prepared Endodontically Treated Tooth



by Tony Pensak, DDS; Gary Glassman, DDS, FRCD(C); Len Boksman, DDS, BSc

The treatment and restoration of an over-prepared, profoundly flared or irregularly shaped canal space presents challenges all its own, especially when it is the result of a failed cast post. The amount of remaining tooth structure is critical, as it is with any other type of major restoration, and the viability of this type of restoration is becoming more controversial, especially with the increasing frequency and availability of implants.

An ongoing dialogue within the profession debates the issue of who should do the post placement (if a post is required) and whether this post placement should be delayed. A growing body of research indicates that the second treatment by the general practitioner—reopening a sealed root canal treatment and retrieving as much as two-thirds of the gutta-percha—significantly increases the chance for reinfection and further damage to the tooth.[1] Therefore, *if* a post is indicated, the clinician who performs the root canal treatment (RCT) should place the post at the time of root-canal treatment. Furthermore, many materials available today for obturation and sealing do not necessitate the traditional delay between RCT and post placement. New insertion techniques can place the gutta-percha apically so that the space is left open for the placement of a fiber post without re-preparing the space.

One of the two direct techniques for providing treatment of this over-flared condition offers biocompatibility, mechanical compatibility, aesthetics, radiopacity, and if necessary, reversibility, in one appointment.

The persistent problem with posts

Custom cast posts have been described in the dental literature since the 1700s, metal prefabricated posts since the 1950s, and fiber-reinforced composite posts since the 1990s. While there is something to be said for creating a custom-fitted prosthesis, especially with an unusually shaped canal and minimal remaining tooth structure, the cast post technique has a number of drawbacks, both clinical and economical.

- It requires a minimum of two appointments.
- It involves additional cost due to a laboratory fee, both labor and materials.
- Although gold is biocompatible, questions remain about base metal alloys or semiprecious alloys.
- Base metals can have a tendency to corrode, particularly when in contact with (base metal) crowns.
- They can be difficult to remove if retreatment is ever required.
- They are not aesthetically compatible with today's all-ceramic crowns.
- Because of the general wedge shape of these castings, the physics involved (including a large differential in their elastic moduli) dramatically increase the risk of catastrophic root fracture over a period of service.

Similar shortcomings exist with prefabricated metal posts such as titanium, but predominantly with stainless-steel posts. The advent of fiber-reinforced composite posts in 1988 (Composipost/C-Post, RTD, Saint-Égrève, France) solved many of these problems, but these still had radiopacity and aesthetic deficiencies.

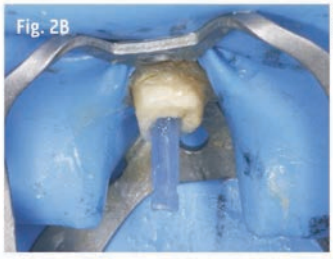
Early comparative in-vitro studies have shown that when minimal remaining tooth structure is present, the fiber post was more likely to protect the tooth from root fracture than the cast post.[2] More recently, published clinical trials have shown that the use and placement of a quartz fiber post becomes more and more beneficial as the number of remaining dentin surfaces decreases.[3] With an overwhelming body of positive clinical research[4-8] and published laboratory data, there is little doubt that fiber posts are here to stay and are becoming the standard of care in most countries. The majority of these studies involve high-silica quartz fiber posts (second through fourth generations).

The devil is in the details

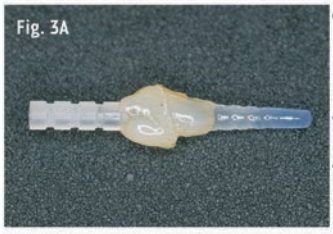
When a root treatment is very conservative, the post space created remains more or less round. However, the majority of root canals are elliptical (Fig. 1).[9] All prefabricated posts are round.

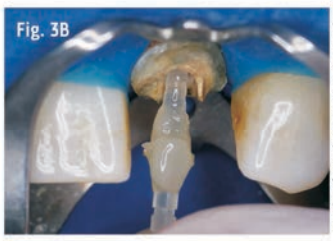
There is a challenge facing the clinician when he or she is presented with restoring a compromised, endodontically treated tooth, where the coronal opening is significantly larger


Fig. 1

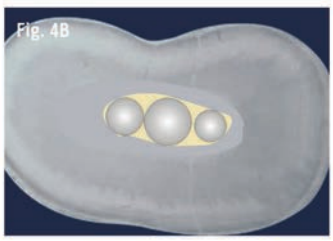


Figures 2A & 2B Courtesy of Dr. Enrique Kogan, Mexico City, D.F. Mexico





Figures 3A & 3B Courtesy of Dr. Alejandro Bertoldi Hepburn, Universidad de Desarrollo, Concepcion, Chile



than any of the prefabricated posts available in the prefabricated post kit or system. In 2012, Dr. Len Boksman and his colleagues[10] published a guideline with criteria for selection of the various materials and techniques available for treating different levels of severity. The guidelines were:

- If the coronal opening is less than 25 percent wider than the coronal and of the largest pre-fabricated fiber post available in the kit, then the largest post can be used by itself with bonded resin cement (Figs. 2A and 2B).
- If the opening is more than 25 percent but less than 50 percent wider than the diameter of the largest post, a direct/indirect anatomic post is indicated, using a highly filled composite and cementation technique (Figs. 3A and 3B).
- If the opening is more than 50 percent wider than the largest post, the accessory post technique offers a straightforward treatment approach (Figs. 4A and 4B).

The accessory post technique is widely accepted in Europe and South America, and has been tested in vitro, providing and cumulatively confirming positive attributes such as:

- Increased fracture resistance[11-14]
- Increased internal adaptation to reduce polymerization shrinkage orinterfacial deficiencies[15]
- Enhanced retention[16]
- Better survivability through reduced likelihood of catastrophic failure[17-20]

Accessory posts, such as Fibercone (RTD, Saint-Égrève, France /RTD USA), are placed in an approach reminiscent of placing the gutta-percha points. A larger "master" post is fitted apically and, when cemented, one or more accessory posts is inserted, displacing and replacing the cement. Even the best of resin cements lack tensile or compressive strength in bulk. Resin cements are meant to be used in thin film thicknesses for best results. In cases where the coronal opening is 25 to 50 percent larger than the diameter of the largest post, often an anatomic post and core (think "core build-down") can be employed as an indirect technique, using high-strength lighter composite and a separating medium as described by Drs. Simone Grandini[21] and Boksman's aforementioned work, respectively. (Figs. 3A and 3B).

With larger and wider canal and post spaces, including the "figure eight," "kidney bean" and other irregular spaces—any of which could include undercuts—the accessory post technique may be the approach of choice.

One of the objectives when filling with a large space is to control and minimize the potential for polymerization shrinkage (C-factor), which creates a space between the restoration and the internal walls. The C-factor is at its highest in post-cementation cases, which usually involve three or four remaining dentin surfaces. By inserting the very thin Fibercone, the resin cement, which can shrink on polymerization, is replaced by a factory-made, high-strength composite which is already 99.9 percent crosslinked and cannot shrink. These Fibercones also gently compress the remaining thin layer of cement against the internal surfaces, and fill undercuts or voids that the operator may not even see.

A growing body of research indicates that the second treatment by the general practitioner significantly increases the chance for reinfection and further damage to the tooth.

The Fibercone accessory posts, when used with a quartz fiber post or some other translucent glass post brands, help transmit light energy to help polymerize the cement in the deepest (apical) areas of the restoration. In theory, glass ionomer cements have been used in this technique. However, a long clinical track record and the majority of in-vitro research indicate that a bonded, dual-cure resin cement is still favored for this clinical indication if moisture control can be achieved.

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Fig. 5

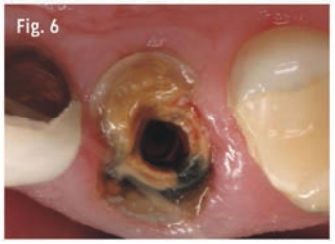
Fig. 6


Fig. 7

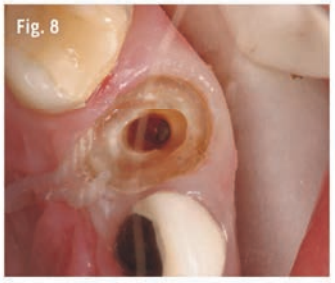
Fig. 8


Fig. 9A

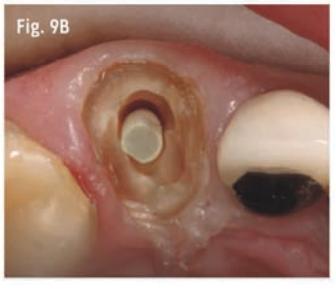
Fig. 9B

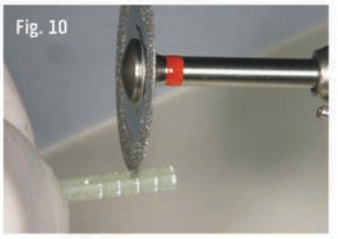
Fig. 10

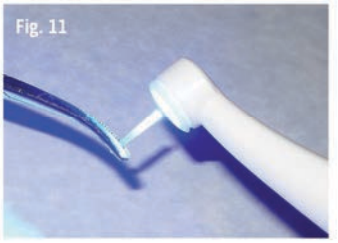
Fig. 11


Fig. 12


Fig. 13

Continued from p. 70

Furthermore, having multiple posts emerge coronally from the space imparts additional strength to the core buildup in the same way and having several divergent posts connecting the core buildup to the tooth inherently prevents rotation. A factory-cured composite is always stronger than a chairside-cured composite!

The accessory post technique is widely accepted in Europe and South America, and has been tested in vitro, providing and cumulatively confirming positive attributes ...

Fibercone accessory posts can be employed with any brand of fiber post being used as the master post. The recommended method favors tapered instead of parallel, and translucent rather than opaque posts. Furthermore, some brands of fiber post are more radiopaque than others. The Fibercone, patented by RTD, is made from a proprietary fiber developed specifically for dental application to demonstrate high tensile strength. In addition, it offers a superior rate of radiopacity and translucency.

A final note: no additional or special drills are required for the placement of the accessory posts. The drill system that is provided with the master post is used to create an optimal fit at the apical end. The clinician has the opportunity, once the master post is fitted, to determine if—and how many—Fibercones will be needed, and trial-fit those, as well.

The clinical technique shown here uses a master post from RTD as the Macro-Lock Post. The adhesive primer and resin cement and core used were Sealbond Ultima and Corecem, respectively (both from RTD). Clinicians must be aware that there can be an incompatibility with a dual-cure composite when acidic bonding agents are used. This can interfere with the amine reaction which polymerizes the composite in the absence of light. It is critical that compatible systems are used.

Clinical placement technique

The patient presented with a viable crown on a threaded post that was failing due to corrosion (Fig. 5). Options for extraction, implant and endodontic retreatment were discussed, and the patient declined, opting for a new post-core. The patient refused rubber dam, and it was determined that moisture could be controlled alternatively.

Once the post was removed, the corrosive damage to post and tooth is obvious (Fig. 6).

Once the necessary gutta-percha and damaged tooth structure are removed and the space cleaned (Fig. 7), the post space is prepared apically, and a new (coronally) wider space is presented for treatment (Fig. 8).

The master post is trial-fitted to confirm the apical fit. The Fibercone accessory posts can also be tried-in to the extra space (Figs. 9A and 9B).

The master post is trimmed to length with a diamond disc (Fig. 10), and any posts that have been tried-in are cleaned in alcohol. Adhesive bonding system is applied to *all* posts, air-dried and light-cured, according to manufacturers' instructions (Fig. 11).

The post space and all involved tooth structure are etched with phosphoric acid, rinsed and excess water removed with a bottom-up technique (Fig. 12).

Adhesive bonding system is applied and excess removed, then air-dried and light-cured according to manufacturer's instructions (Fig. 13).

The dual-cure resin cement is injected, and the master post is placed (Figs. 14A and 14B). Fibercones are placed immediately.

Light-cure timing and light intensity[21] are critical here. The type of light, and energy over distance and the self-cure reaction must be compatible with the bonding agent used.

Additional core build-up resin is applied to the posts and light-cured (Figs. 15A and 15B).

The core is prepared for a crown and temporized. Due to an inadequate available labial ferrule of healthy tooth structure it was necessary to excise approximately 1.5mm of labial gingival tissue. This was done without concern for biologic width invasion as the depth of the bone was sounded prior to the excision and it was determined that excess tissue could be excised without concern, using a 980nm diode laser. This photo is how the tissue appeared immediately following the procedure (Figs. 16A and 16B).

Finished case and post-op radiograph (Figs. 17A and 17B, see next page).


Fig. 14A


Fig. 14B


Fig. 15A


Fig. 15B


Fig. 16A


Fig. 16B


Fig. 17A

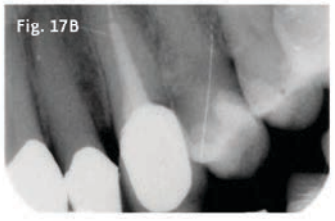
Fig. 17B

Conclusion

The accessory post technique creates a *custom-fitted*, well-bonded, integral post and core at a fraction of the cost of providing a cast post. The fiber post and accessory post combination technique with a compatible bonding and resin cement system which minimized the amount of residual composite in the canal has been shown to positively reinforce the remaining tooth structure. At the same time, this technique minimizes the risk for catastrophic root failure as seen with cast posts. It was done in a single appointment using a combination of techniques that are well-documented and known to the profession. ■

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