



Chairside

A New Fiber Post for Esthetic Dentistry

In the last several years, significant advances have been made in the development of bondable, fiber-reinforced, esthetic posts to reinforce endodontically treated teeth.¹⁻⁵ Fiber posts are improvements on other types of esthetic posts used in the past. The need for light translucent composite resins and ceramics to mimic natural tooth requires the use of translucent posts to replace metal posts in the esthetic zone of the oral cavity. The presence of a metal post can cause shadowing of the soft tissues adjacent to the root surface; this adversely affects the esthetic results required of bonded resin and ceramic restorations in the anterior region.^{2,6,7}

Recent articles have supported the use of a fiber post to restore endodontically treated teeth.¹⁻⁵ Compared with ceramic posts, esthetic fiber posts provide endodontically treated teeth with a higher fracture resistance.⁸ In a study evaluating post retention, serrated parallel-sided stainless steel posts were found to be no more retentive than parallel-sided or tapered tooth-colored fiber posts.⁹ In a retrospective clinical study evaluating several different types of fiber posts, the results indicated

a 96.8% success rate over 1 to 6 years.¹⁰ According to the conclusion of this study, fiber posts can be used for routinely restoring endodontically treated teeth, and root fractures are not a problem associated with this type of post.

When a fiber reinforced post is bonded within the root canal it dissipates functional and parafunctional forces, reducing the stress on the root.⁵ When a catastrophic force is placed on the crown of the tooth, the crown will fracture instead of the post, transmitting the energy of force down the root and creating a vertical root fracture.¹¹⁻¹⁴ Nicholls described an engineering approach to restoring endodontically treated teeth; the design should include a fail-safe system that prevents irreparable damage to the root.¹⁵ Consequently, a post system should be able to dissipate the function of energy and even overcome moderate trauma. Fiber-reinforced posts have demonstrated the ability to fracture at the coronal portion of a tooth restoration with the presence of catastrophic forces without root fracture.¹⁶ Also, research has demonstrated the ability of resin bonding with the root canal to reinforce endodontically



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Figure 1—Preoperative view with the presence of tetracycline staining, endodontic staining, and rotated anterior teeth.



Figure 2—Radiograph of the previously completed root canal therapy on the maxillary left central incisor.



Figure 3—Radiograph taken to verify gutta-percha removal before fitting the anchor. Although the length was acceptable for the post space, additional gutta-percha had to be removed from the lateral walls of the canal.



Figure 4—Twin Luscent™ canal reamer verified the length needed for the anchor placement.

treated teeth.^{17,18} Furthermore, when using a fiber post, to assure clinical success at least one fourth of the crown structure should remain for tooth preparation. Less tooth structure will contribute to flexion of the crown and potential postfracture.² Additionally, by having at least one fourth of the crown remaining will allow for the development of at least 1.5 mm to 2 mm of ferrule; during preparation of the teeth, this will assure clinical success.^{19,20}

When choosing an esthetic post system, the post must fulfill a number of criteria to guarantee clinical success:

1. The post must transmit light to eliminate shadowing of the post within the tooth, maximizing the esthetics of the final restoration.
2. It must be bondable within the root canal for root reinforcement.
3. It should be tapered, following the true shape of the root canal to avoid the removal of additional dentin within the canal (to accommodate a parallel post).
4. It should absorb and dissipate impact if the coronal portion of the tooth crown is traumatized.

5. Broken post can be easily removed with an atraumatic technique.
6. The post must come in multiple sizes to fit different root canal diameters.

Case Report

A 26-year-old woman presented to the dental clinic with a chief complaint of teeth discolored because of tetracycline staining, a misaligned maxillary anterior teeth, and a further discolored maxillary incisor with endodontic staining (Figure 1). Examination revealed the maxillary central incisors had been previously fractured and restored. The patient's main treatment goals were to whiten and straighten her upper teeth. After an orthodontic consultation, the patient made the decision not to have orthodontic treatment but to change the appearance of her maxillary teeth with bonded ceramic restorations.

Because of the endodontic treatment and presence of the defective restorations, the decision was made to structurally reinforce the maxillary left central incisor using a Twin Luscent™ Anchor^a. The anchor not only fulfills the previously mentioned basic criteria but

^aDentatus USA Ltd, New York, NY 10016; (800) 323-3136



Figure 5—Twin Luscent™ Anchor fitted to the root canal to the same length as the post.



Figure 6—Etchant placed into the root canal.



Figure 7—Canal was rinsed of etchant using an endodontic irrigation syringe filled with water.



Figure 8—The canal was dried from the root canal using a paper point.

it also has an hourglass shape and a true-root taper to enhance retention. It is the only fiber post with longitudinal venting grooves to prevent air-entrapment during cementation, and these vents also provide an antirotational effect on the post. The definitive esthetic restorative treatment was to place all-ceramic crowns on the maxillary central incisors and restore the maxillary lateral incisors, canines, and first premolars with porcelain veneers.

Clinical Technique

The maxillary left central incisor was first restored with a fiber post and composite resin buildup. After placing a rubber dam the defective composite resin was removed from the lingual-access opening. A preoperative radiograph confirmed the gutta-percha could be removed and a post space made while still maintaining an adequate apical seal. A heated endodontic plugger and a Probos® I™,^a flexible-shank canal finder were used to create the post space for the Twin Luscent™ Anchor. The Probos® I™ has the benefits of atraumatic removal of gutta-percha after the canal without disturbing the apical seal. After creating the post space, a radiograph (Kodak InSight™,^b) was made to verify the post-

space length and removal of the gutta-percha from the walls of the canal (Figure 3). The presence of gutta-percha on the canal walls required further instrumentation of the canal.

The post size was determined with the canal reamer. A stopper was not necessary on the reamer because its length to the shank was coincidental to the length of the canal preparation (Figure 4). The depth of the canal preparation was cross-verified by placing a matching size of anchor into the canal and using a red stopper (Figure 5). The anchor was cut the desired length using a diamond on a high-speed handpiece with water spray to. Fiber posts must be cut to length with a diamond abrasive or separating disk to avoid separation of the glass fibers from the post's resin matrix.

After the root canal was irrigated, flushed of all debris, and dried, the canal was etched for 15 seconds using a 32%-phosphoric-acid-gel etchant (UNI-ETCH®.^c) The etchant was placed with a needle to assure complete flow to the depth of the canal (Figure 6). The root canal, the canal was thoroughly rinsed using an endodontic irrigation syringe filled with water (2 syringe-fuls) (Figure 7). An air-water

^aEastman Kodak Company (Kodak Dental Products), Rochester, NY 14603; (800) 933-8031

^cBisco, Inc, Schaumburg IL, 60193; (800) 247-3368

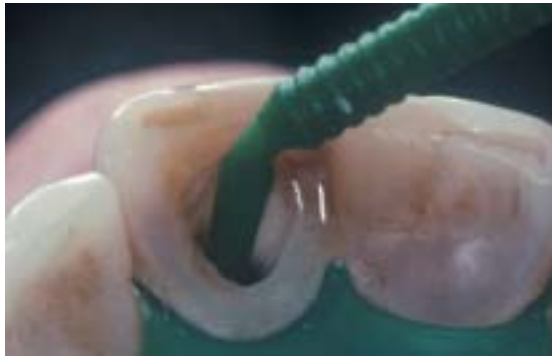


Figure 9— OptiBond™ Solo Plus Dual Cure Activator was applied into the root canal using a Benda® Brush MINI.



Figure 10— NEXUS 2™ dual-cure composite resin cement was injected into the root canal using a needle tube (Accudose® Needle Tubes™).

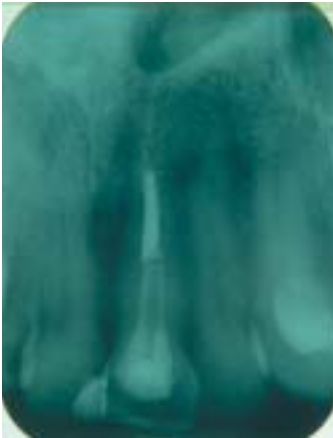


Figure 11— Postoperative radiograph of fiber post cemented in the canal.



Figure 12—Maxillary teeth prepared for crowns and veneers.

syringe cannot totally rinse an etchant from the interior of the root canal. The canal was dried of excess moisture using paper points (Figure 8). If the paper point had any blue colorant present, the root canal was irrigated and rinsed again. Finally, the canal was ready for placement of the dentin adhesive.

The dentin bonding system used for this

A post system should be able to dissipate the function of energy and even overcome moderate trauma.

technique was a dual-cure adhesive. Recent research has demonstrated that many of the fifth-generation single-component adhesive systems are incompatible with dual-cure and self-cure composite resins.^{21,22} Self-etching systems are also contraindicated for use with dual-cure and self-cure composite resins.²¹ By using a dual-cure bonding system (OptiBond™ Solo Plus Dual Cure Activator^d), one can be assured the adhesive will polymerize within the root canal. The dual-cure adhesive was applied to the full depth

of the root canal using a Benda® Brush MINI^c (Figure 9).

The Twin Luscent™ Anchor was painted with the adhesive resin. A dual-cure composite resin cement (NEXUS 2™^d) was mixed with an automixing tip, dispensing the cement directly into a needle tube (Accudose® Needle Tubes™^e). The composite resin cement was also applied to the anchor. The needle tube was placed into the root canal, and the resin cement was syringed into the canal (Figure 10), completely filling it with cement.²³ A lentulo spiral will leave the canal incompletely filled. The Twin Luscent was gently seated into the cement-filled canal. Excess cement was removed before light curing. With the light curing probe touching the Twin Luscent™ Anchor, the entire complex was light cured for 1 minute with a second generation LED curing light (Rembrandt® Allegro™^f). The lingual surface was restored with a total-etch adhesive hybrid composite resin. The radiograph of the cemented post shows its very slight radiopacity (Figure 11).

The maxillary central incisors were prepared for all-ceramic crowns, and the maxillary

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^cCentrix Inc, Shelton, CT 06484; (800) 235-5862

^eDen-Mat® Corporation, Santa Maria, CA 93455; (800) 445-0345



Figure 13—Teeth isolated with a split rubber dam for crown and veneer try-in and adhesive cementation.



Figure 14—Completed ceramic crowns and veneers after adhesive cementation.

lateral incisors, canines, and first premolars were prepared for porcelain veneers (Figure 12). As soon as the left maxillary central incisor was prepared, an existing composite resin, white opaque core material used previously to lighten up the shade of the tooth (because of endodontic discoloration) was discovered. Removal of that composite might contribute to loss of tooth substrate important to the structural integrity of the crown, so no additional composite resin was replaced. An impression was made using a monophasic, automix polysiloxane impression material (Examix™,g) in a bite impression tray (3.n.ONE™,e). The all-ceramic crowns and veneers were fabricated with a fired feldspathic porcelain (Cerinate®.f). The choice of a fired feldspathic porcelain was made because of the tetracycline staining of the teeth. With veneers, pressed porcelain requires a greater depth for the tooth preparation on the facial surface and does not have the masquing ability of a fired feldspathic porcelain.²⁴

To best control the operating field for

By using a dual-cure bonding system one can be assured the adhesive will polymerize within the root canal.

crown and veneer placement, a split rubber dam was placed (Figure 13). The crowns and veneers were tried in and fitted, and the internal surfaces of the porcelain restorations were pre-etched in the laboratory. The etched porcelain was treated with a silane porcelain primer (Cerinate® Prime™,f) and a resin adhe-

sive (Tenure® S^f). The cementation of the crowns consisted of a 15-second etch of the tooth preparation with a 32% phosphoric acid etchant, which was rinsed. Excess moisture was blotted from the tooth leaving the etched dentin surfaces slightly moist. A multiple-bottle bonding agent with a separate primer and adhesive resin (Tenure® MP^f) was applied in multiple coats to the crown preparation with a brush but not light cured. The ceramic crown (Cerinate®) was cemented with a dual-cure composite resin cement (Ultra-Bond Quik®.f), and the crowns were light-cured for 20 seconds with the LED curing light. The porcelain veneers were cemented with a light-cure composite resin veneer cement (RelyX™ Veneer Cement^h). The slight excess of resin cement was removed from the crown margins with fine and ultrafine diamonds (ET Diamondsⁱ) in a high-speed handpiece with water spray on the facial and lingual surfaces, and the gingival interproximal surfaces were smoothed with a PROFIN®.a reciprocating handpiece with a lamineer tip. At completion of treatment, the final result was well accepted by the patient as fulfilling her goal of whiter, straighter teeth (Figure 14).

Discussion

The clinician has many choices with the current generation of bonding systems, fiber posts, composite resins, and ceramics. When using these materials, the practitioner needs to understand the chemistry and instructions to decide which dental materials to use for a given clinical situation. For this case, the choice of adhesives was based on chemical compatibility for cementation. Light-cured

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^h3M ESPE, St Paul, MN 55144; (800) 216-9502

ⁱBrasseler USA®, Savannah, GA 31419; (800) 841-4522

total-etch single-component adhesives (fifth generation) and self-etching systems (sixth and seventh generations) are contraindicated with self-cure and dual-cure composites.²¹ Total-etch, multiple-bottle, (fourth generation), and dual-cure adhesives are the adhesives of choice when cementing a post within a root canal, where light penetration and depth of cure are limited. When choosing a fiber post for esthetic indications, the Twin Luscent™ Anchor light-transmitting translucent fiber post fulfills these goals. The anchor offers an excellent alternative to metal or ceramic posts in the esthetic zone. Fiber-reinforced posts are energy-dissipating compared with the energy transmittance with potential root fracture of more rigid metals and ceramics that might be used as post materials. Darkly discolored teeth are difficult to mask with pressed ceramics. With porcelain veneers, fired feldspathic porcelain more predictably achieves masking. By making evidence-based choices, the final result will fulfill the goals and needs of the patient.

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