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DENTAL TECHNIQUE

Anterior composite resin crown in an adverse situation: A dental technique with a 3-year follow-up

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ABSTRACT

Endodontically treated teeth often exhibit severe coronal structure loss. Given the reversibility and tissue conservation of adhesive procedures, a conservative approach using an indirect resin crown with an adhesively cemented custom fiber-reinforced composite resin post provided a predictable and esthetic solution. The 24-hour and 3-year follow-ups of this technique showed good function, marginal adaptation, and esthetics. (J Prosthet Dent 2019;121:13-6)

Endodontically treated teeth often exhibit severe coronal structure loss because of access preparations, extensive caries destruction, previous restorations, and trauma. To restore these teeth, post-and-core retained crowns are typically used and are effective.[1,2] However, the placement of a cast post-and-core often requires extensive removal of tooth structure to obtain a suitable intraradicular preparation.[3] Additionally, the high modulus of elasticity of cast metal posts may increase the possibility of root fractures.[4] Advances in adhesive dentistry have allowed clinicians to perform a variety of minimally invasive treatments, preserving tooth structure and achieving improved esthetics.

A combination of a fiber-reinforced composite resin (FRC) post and adhesive foundation restoration has become popular.[3] Custom-made FRC posts have advantages over cast metal or prefabricated posts, including less intraradicular preparation.[5] Additionally, FRC posts have a similar elastic modulus to that of dentin, which may lead to more even distribution of stresses within the root.[2] Composite resin crowns are a less expensive and less time-consuming alternative to traditional metal-ceramic and ceramic crowns.[6] The short-time survival rate of resin crowns (96% after 3 years)[7] is acceptable, and good patient satisfaction has been reported.[6] These crowns have been recommended for long-term interim use. However, their complication rate and dental plaque accumulation restrict their indication for definitive restorations.[6]

The authors are unaware of a detailed protocol for the clinical resolution of highly damaged teeth with an indirect composite resin complete crown. The following describes a step-by-step technique for a conservative approach to an indirect resin crown with a customized FRC post on a 13-year-old boy who presented with the main complaint of an unesthetic interim restoration of a maxillary central incisor with a history of dental trauma (Fig. 1). Considering the functional and esthetic demands of the patient, the amount of tooth structure loss, patient age, and tissue conservation of the adhesive procedures, an indirect resin crown with a customized FRC post fixed with adhesive cementation was selected.

TECHNIQUE

1. Assess the endodontic treatment and, if necessary, retreat to avoid possible complications.
2. Assess the stability of the gingival margin. Provide gingivoplasty if necessary.

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Figure 1. Thirteen-year-old boy with fractured maxillary right central incisor and unesthetic interim restoration.

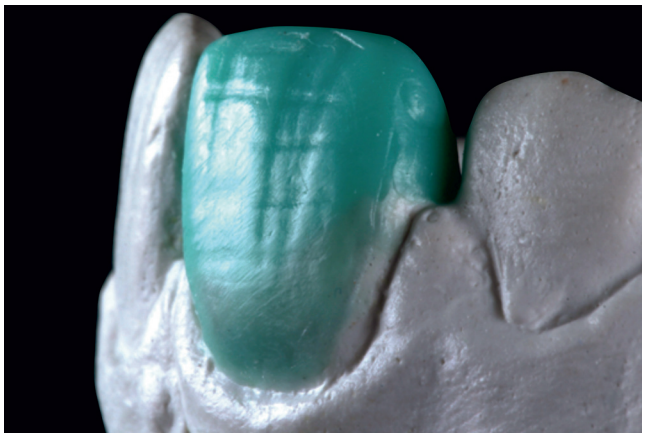

Figure 3. Diagnostically waxed maxillary right central incisor.

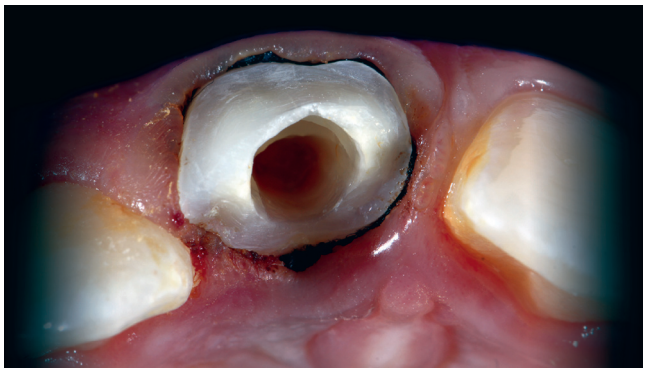

Figure 2. Tooth preparation after gingivoplasty and gingival cord application.

Figure 4. Custom fiber-reinforced resin post. Composite resin packed inside post space and post inserted. Remaining post space was filled with same composite resin and light-polymerized; custom post gently removed from post space.

3. Isolate with rubber dam and apply a gingival displacement cord (Ultrapak 000; Ultradent Products, Inc) (Fig. 2).
4. Remove the interim restoration and remove cement debris.
5. Prepare a minimal chamfer finish line with a high-speed diamond rotary instrument (6878K 314 021; Komet Dental) if possible and ensure that the preparation has an adequate ferrule to improve fracture resistance.[8]
6. Make an impression with putty and light-consistency polyvinyl siloxane (Panasil Putty and Panasil initial contact X-Light; Kettenbach GmbH).
7. Pour the cast in Type IV gypsum (Elite Rock Fast; Zhermack SpA) and duplicate this.
8. Diagnostically wax the duplicate cast (Fig. 3).
9. Customize an FRC post, choosing the post according to the post space diameter (#2 D.T. Light-Post Illusion X-RO; RTD).
10. Treat the surface with silane for 60 seconds (Monobond Plus; Ivoclar Vivadent AG), adhesive (Adper Single Bond Plus; 3M ESPE), and light-polymerize for 10 seconds at 1000 mW/cm^2 (Radii-Cal; SDI Ltd).
11. Apply a gypsum separating agent (SR Model Separator; Ivoclar Vivadent AG) over the definitive cast.
12. Customize the FRC with composite resin by packing it into the post space (UD 3 ENA HRi; Micerium SpA); insert the post and fill the root canal with the same composite resin and light-polymerize for 30 seconds at 1000 mW/cm^2 (Fig. 4).
13. Section the FRC post with a precision diamond disk (8964 104 300; Komet Dental).
14. Using a custom silicone matrix (Zetalabor; Zhermack) fabricated from the diagnostic waxing, adapt a small amount of enamel-like composite resin (UE 2 ENA HRi; Micerium SpA) to the silicone matrix positioned on the palatal surface of the definitive cast, with the custom FRC post positioned inside the post canal, and light-polymerize for 10 seconds. After the palatal composite resin has polymerized, form the internal reconstruction with dentin-like

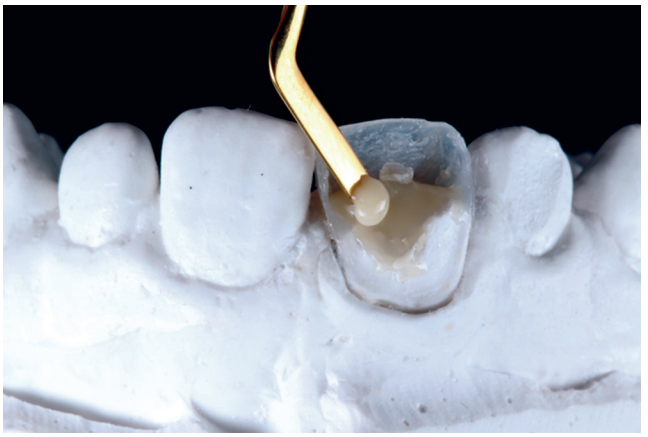

Figure 5. Anatomic reconstruction of coronal portion. After palatal enamel layer adapted from silicone index on definitive cast (with custom post positioned inside post space), internal layer made with dentin-like composite resin.

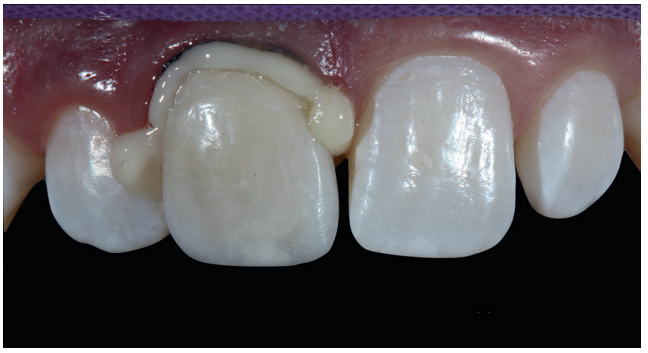

Figure 7. Luting crown. After conditioning and applying adhesive on tooth preparation, dual-polymerizing luting agent applied to post space and coronal tooth preparation, and crown slowly inserted to allow cement to escape.

composite resin (UD 3 ENA HRi; Micerium SpA) in shades according to the patient's natural teeth (Fig. 5).

15. Apply a universal enamel-like composite resin layer in combination with intensive enamel-like composite resins to characterize the opalescent (OBN ENA HRi; Micerium SpA) and the hypoplastic enamel (IWS ENA HRi; Micerium SpA) and light-polymerize for 20 seconds at 1000 mW/cm^2.
16. Polymerize the crown in a dental laboratory light-polymerization unit (Laborlux 3; Micerium SpA) to improve monomer conversion rate.
17. Shape and finish the restoration with abrasive disks (Sof-Lex XT Coarse; 3M ESPE). Use low-speed, small round burs (H41 204 018; Komet Dental) to replicate developmental grooves. Polish the whole restoration with diamond paste on a goat-hair brush (Shiny A and Shiny B; Micerium

Figure 6. Definitive restoration after laboratory fabrication.

Figure 8. Restoration after 3 years. A, Clinical photograph. Chip on facial surface near incisal edge repolished. B, Periapical radiograph.

SpA). Apply aluminum oxide paste with a felt wheel at low speed to obtain high gloss (Shiny C; Micerium SpA) (Fig. 6).

18. Clinically evaluate the crown. Etch the enamel with 37% phosphoric acid (Ultra-Etch; Ultradent Products, Inc) for 15 seconds and then apply ParaBond non-rinse conditioner over the entire preparation followed by application of the adhesive (ParaBond Adhesive A and ParaBond Adhesive B; Coltène) according to the manufacturer's instructions.
19. Cement the restoration with a dual-polymerized glass-reinforced composite resin (ParaCore; Coltène). Apply the cement inside the Post space using a mixing tip (Mixing Tip super fine; Coltène) and insert the crown slowly to allow the cement to escape (Fig. 7). Light-polymerize for 5 seconds and remove excess with a periodontal instrument.

DISCUSSION

Different materials and techniques are available for restoring badly damaged teeth with fixed tooth-supported restorations, but conclusive evidence of an advantage of one method over another is lacking. The overall quality of recording prosthodontic outcome measurements has not improved greatly in the last 8 years.[9]

This example illustrates a challenging situation for a restorative solution. Crown lengthening was contraindicated on account of the patient's age, as was dental implant placement; therefore, a minimal invasive resin crown was considered the most appropriate alternative despite the absence of a lingual ferrule and the short post length. After 3 years of follow-up, the restoration was still in function and esthetically satisfactory (Fig. 8).

The benefits of conserving tooth structure by minimizing operative procedures include minimizing the development of secondary caries; reducing the incidence of early restoration failure; and decreasing the incidence of tooth fracture related to a weakened tooth remnant resulting from larger restorations.[10] The resin crown used for this patient allowed a minimally invasive preparation design. A further advantage of the resin crown was that the stress distributed appears to be concentrated at the loading point and is not transmitted to marginal areas as in ceramic crowns.[11]

A composite resin crown will require periodic recalls for repolishing the crown, identifying and correcting fractures, and assessing the occlusion, which may alter with the wear of the composite resin crown.[6]

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