Anatomic fiber posts, clinical technique and mechanical benefits – a case report

Rodrigo Borges **FONSECA**[1]
Carolina Assaf **BRANCO**[2]
Amanda Vessoni Barbosa **KASUYA**[3]
Isabella Negro **FAVARÃO**[3]
Hugo Lemes **CARLO**[4]
Túlio Marcos Kalife **COELHO**[5]

ABSTRACT

Introduction: Glass fiber post usage has been extensively studied due to biomechanical benefits, in addition to adhesive capacity, which makes it able to be used in several clinical situations. Studies show that a perfect root canal adaptation is important for restorative properties improvement. **Objective:** The aim of this paper is to present a technical sequence of post relining for the restoration of a fractured upper central incisor with wide root canal. **Case report:** A 12-year old male patient came to dental school with a fractured upper central incisor, exposing pulpal tissue. After endodontic treatment procedures the selected post could not fit the root canal and a microhybrid composite resin was selected for post relining. After that the post was cemented with a autopolimerizing resin cement and the final restoration completed with the same resin. **Results:** The suggested technique resulted on a functional and esthetic rehabilitation with great possibilities of long lasting restoration.

Keywords: Tooth wear. Dentistry. Esthetics. Dental. Occlusal Adjustment.

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[1]Associate Professor, Department of Prevention and Oral Rehabilitation of Dentistry Faculty of Federal University of Goiás.

[2]PhD Student of Oral Rehabilitation, Dentistry Faculty of Ribeirão Preto, São Paulo University.

[3]Graduation Student of Dentistry, State University of Londrina.

[4]Associate Professor, Restorative Dentistry, Center of Health Sciences, Federal University of Pernamburo.

[5]Associate Professor, Department of Fixed Prosthodontics and Occlusion, Dentistry Faculty, Federal University of Mato Grosso do Sul.

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Contact address: Rodrigo Borges Fonseca
Praça Universitária, s/n, Faculdade de Odontologia, Setor Universitário
CEP: 74.605-220 – Goiânia/GO – Brazil
E-mail: rbfonseca.ufg@gmail.com

Introduction

Endodontically treated teeth can significantly reduce their fracture resistance if important parts of the dental structure are affected, especially the marginal ridges, enamel bridges, pulp chamber roof and the entire structure above it towards the occlusal and palatal or lingual surfaces.[1,2] The reconstruction of endodontically treated teeth, where part of the dental crown was lost due to caries, erosion, abrasion, anterior restorations, trauma and endodontic access, is one of the greatest challenges for Restorative Dentistry.[3]

In many clinical situations, the amount of remaining tooth structure do not allow a definitive restoration without post retention.[4] The use of anatomical or custom posts is one of the techniques proposed for large roots treatment. These are obtained through root canal relining with composite resin associated with prefabricated fiberglass or even can be obtained through the indirect technique, executing an impression and post manufacture at the prosthesis laboratory.[5,6] These techniques, in addition to expanding the indication of pre-fabricated posts, reduce the excessively large cement layer that would be used to replace the lost tooth structure in root canal.[5] The individualization of the post allows a good adaptation in the root canal, which enables the formation of a thin layer of resin cement, creating favorable conditions for post retention.[7] Because the resin cements have fewer filler particles (resulting in adequate fluidity), these materials tend to have lower values of cohesive strength[8] than microhybrid composites;[9] thus, the reduction in cement layer thickness contributes to increase the resistance of the whole tooth/post set.[10] Besides the mechanical factor, post and coronal restoration can be made of similar materials in subsequent processes in the same session, saving clinical time.[11]

The aim of this study is to present the technique sequence of fiberglass post relining for a large root canal of an fractured upper central incisor.

Case Report

A 12-year-old male patient came to dental care after an accident that resulted on fracture of the #11 tooth, affecting pulp chamber (Fig 1). After the indication and execution of the endodontic treatment, an analysis was done to evaluate the extension of the lost tooth structure. It was decided to be necessary to insert a post in order to ensure greater retention for the future dental restoration (Fig 2A).

A root canal relief was produced with Gattes Glidden bur #2, preserving 5 mm of apical obturation followed by the canal preparation with the bur provided

Figure 1. Initial smile of the patient with an oblique fracture at upper central left incisor, with pulp involvement.

by the Exato post kit #3 (Angelus) (Fig 2B). The bur penetrated with free access in the cervical region of the root, effectively preparing the apical third. After testing the post into the conduct, it was decided to reline the fiberglass post with microhybrid composite resin (Natural Look, DFL, Brazil) because the diameter of the post did not fit the entire root canal (Fig 2C). The following steps describe the post surface treatment for the relining procedure.

The post was cleaned with 70% alcohol, conditioned with hydrogen peroxide 24% for 1 minute, washed with water and dried, and subsequently treated with coupling agent for 1 minute (Silano, Angelus) (Fig 2D). It was then applied the adhesive catalyst of Fusion Duralink adhesive kit (Angelus) (Fig 2E). A small portion of A2 dentin color composite resin (Natural Look) was placed on the post surface (Fig 2F) and after root canal isolation with a water soluble gel (K-Y®, Johnson & Johnson) (Fig 3A), the post with the resin was placed in the conduct and the resin adapted with a spatula (Fig 3B). After initial 10 seconds polymerization the anatomical post was removed from the canal (Fig 3C) and finally light cured for 40 seconds per side (Fig 3D). After that, the post was reinserted to verify the adaptation of the set (Fig 3E and 3F).

For cementation the post was conditioned with 37% phosphoric acid for 60 seconds and rinsed with water for the same time, for cleaning purposes. Post was dried and adhesive was applied (Fusion Duralink, Angelus) with lightpolymerization for 20 seconds. After that, the conduct was conditioned with 37% phosphoric acid for 15 seconds (Fig 4A), washed with water for 30 seconds (Fig 4B) and dried with cotton (Fig 4C). After that, a 3-step conventional chemically polymerized adhesive was applied (Fusion Duralink, Angelus) using a microbrush (Fig 4D and 4E). Adhesive excesses were removed with cotton (Fig 4F).

After treating the root canal and the post relining the cementation with a self-curing resin, cement was performed (Cement Post, Angelus). The cement was manipulated on a glass plate and inserted in the root canal with an endodontic file and also placed around the anatomical post (Fig 5A). The post was inserted into the conduct and the excess removed immediately, waiting 4 minutes to complete the polymerization process.

Completed the cementation, it was made a direct restoration with a microhybrid composite resin (Natural Look, DFL) (Fig 5B, 5C and 5D), through the application of a resin initial layer in incisal color (Fig 6A), followed by the A1 and A2 dentin colors (Fig 6B), ending with covering the buccal surface with A1 enamel and incisal colors (Fig 6C).

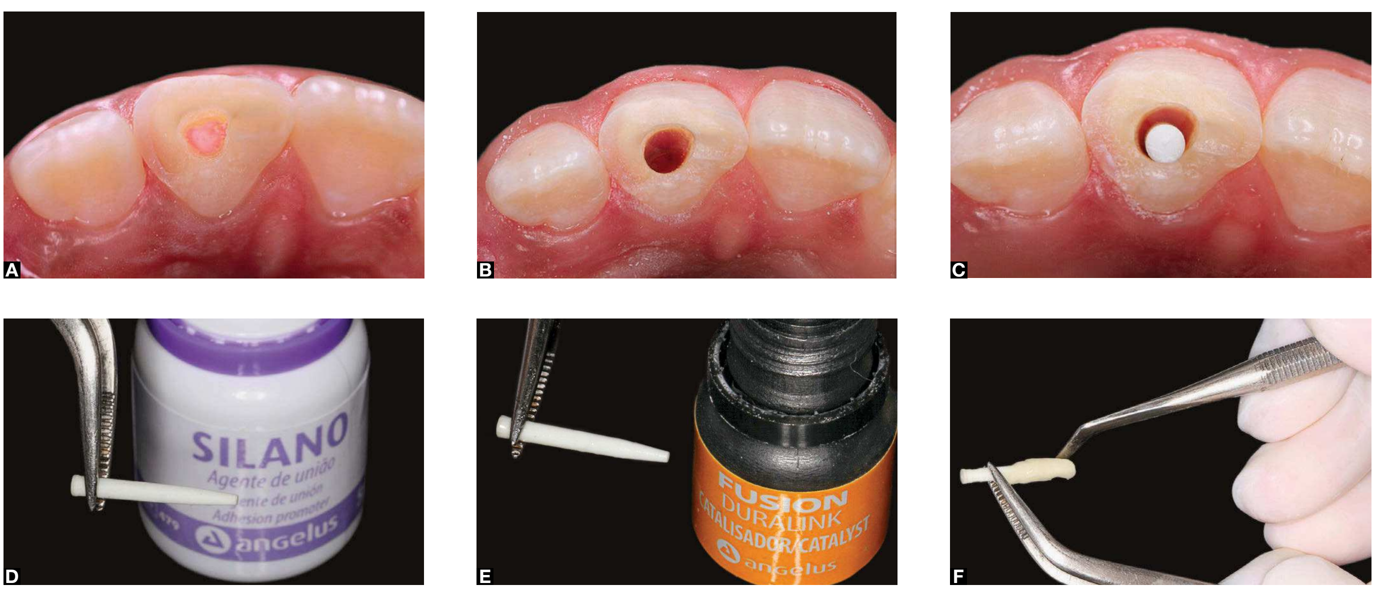
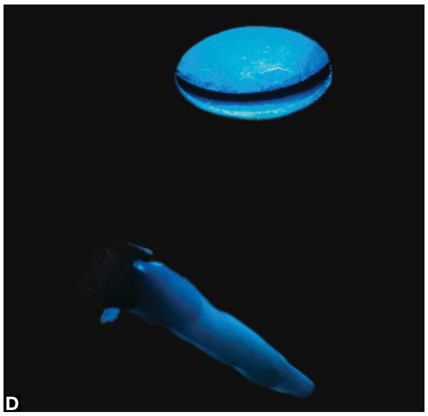


Figure 2. Technique for post relining - post treatment. **A**) Extensive fracture involving the entire palatal surface. **B**) Preparation of the root canal with burr #3. **C**) Exato post #3 testing, poor adaptation observed. **D**) Application of coupling agent. **E**) Application of adhesive catalyst Fusion Duralink. **F**) Application of Natural Look composite resin at the treated post.



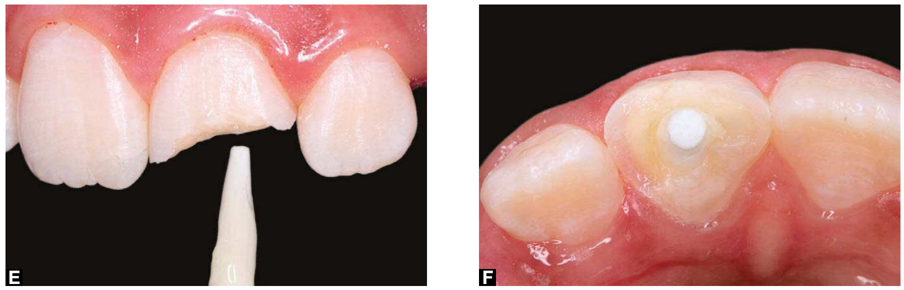


Figure 3. Technique for post relining - adaptation of the post into the conduct. **A**) Isolation of the conduct with water soluble gel. **B**) Positioning the post into root canal with composite resin. **C**) Post removal after initial polymerization for 10 seconds. **D**) Final polymerization for 40 seconds per side. **E** and **F**) Checking the adjustment of the anatomic post.

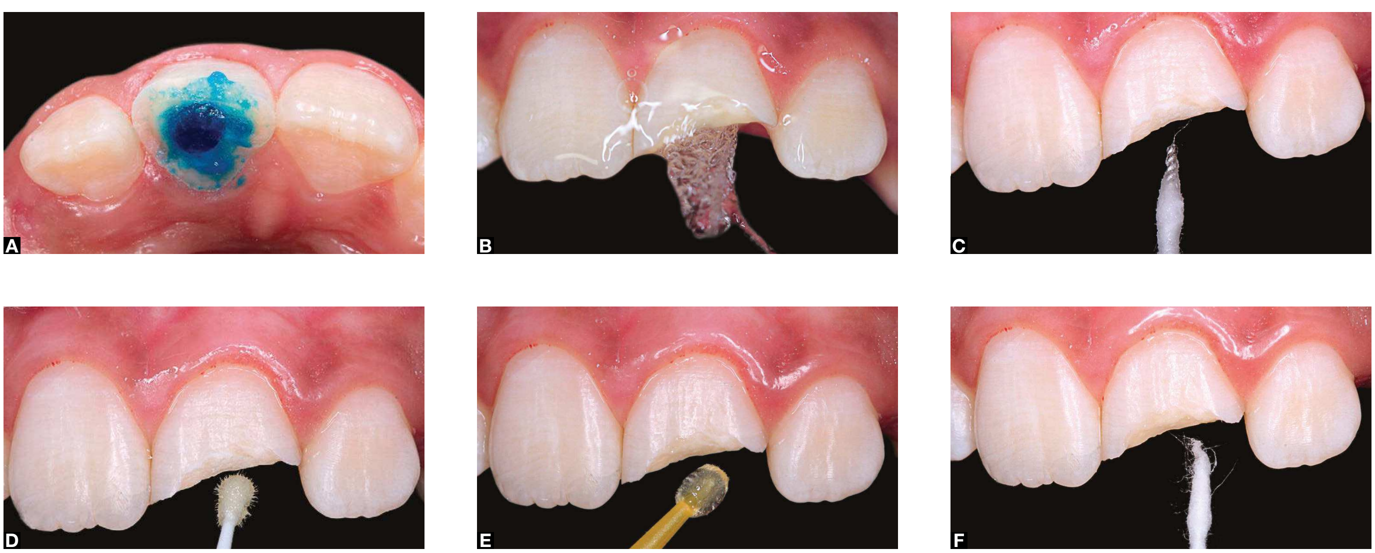


Figure 4. Conduct treatment for post cementation. **A**) Etching with phosphoric acid for 15 seconds. **B**) Drying for 30 seconds. **C**) Removal of moisture excesses. **D**) Application of primer. **E**) Application of the catalyst. **F**) Removal of adhesive catalyst excesses.

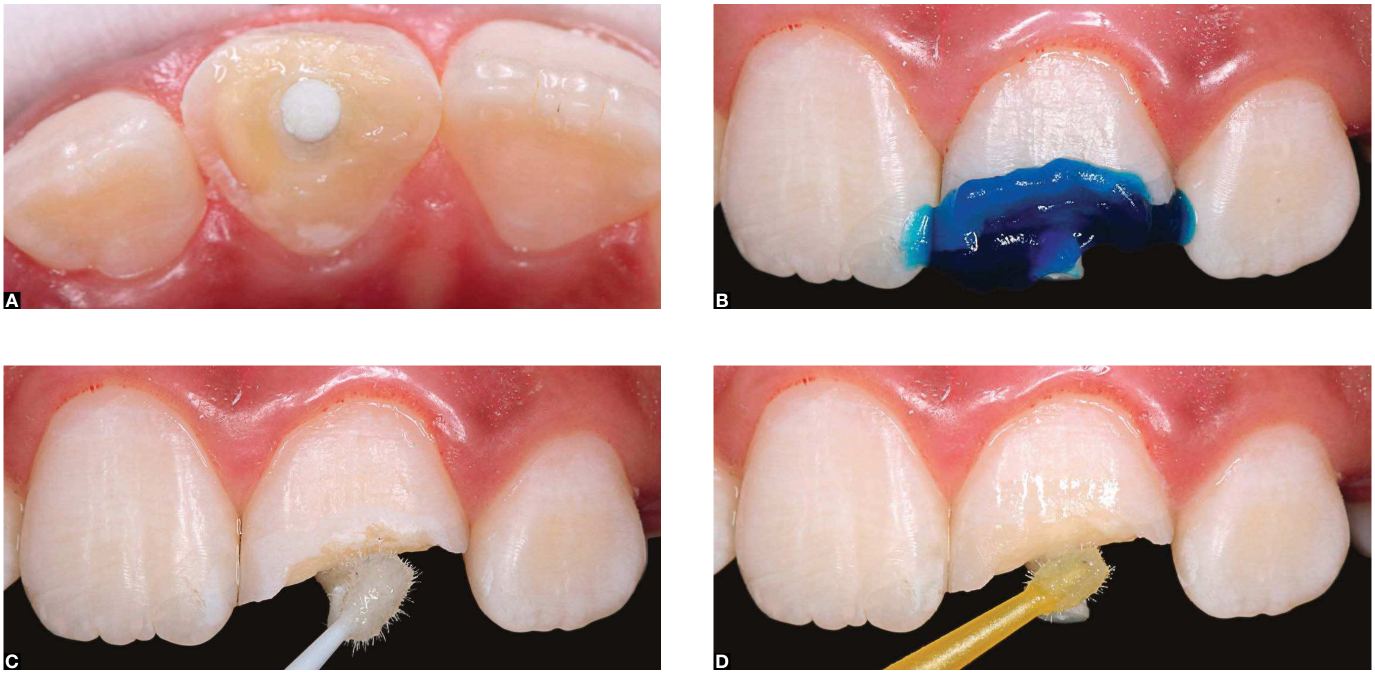


Figure 5. Adhesion to tooth structure. **A**) Cemented anatomic post. **B**) Etching with phosphoric acid for 15 seconds. **C**) Application of primer. **E**) Adhesive application and curing for 20 seconds.

Figure 6. Restoration with composite resin. **A**) Initial application of the incisal resin at palatal surface. **B**) Application of A1 and A2 dentin resin for the body construction. **C**) Finishing with enamel A1 and incisal resin.

Figure 7. Final smile of the patient.

Results

The technique used was extremely effective, allowing the rehabilitation of the patient in a single session on a predictable manner and with satisfactory quality and esthetics (Fig 7). The fiber post relining technique generated a reduced cement layer with a tooth-resin-post set possibly more resistant.

Discussion

The use of composite resin for fiber post relining promotes close adaptation to the root canal walls, ensuring greater bond strength[7,12] and increasing the resistance of the set formed by the remaining tooth structure and the fiber post.[10] According to Clavijo et al[10] the use of anatomical direct and indirect manufactured posts warrant similar fracture resistance results to cast metallic posts. The present case used the direct technique for relining a glass fiber post, a faster procedure, with immediate high quality outcomes (Fig 7).

This technique provides the benefit of reducing resin cement thickness. Some studies have shown that dual-polimerizable cements do not polymerize effectively at great depths,[13] i.e., near the apex. Thus, the use of anatomic posts reduces the amount of cement that would display poor polymerization. In order to avoid this problem the use of self-curing resin cements can ensure better polymerization quality throughout the root canal, as used in this case.

Besides this fact, it is extremely important to have an effective adhesion between the employed materials, in order to ensure the formation of a single set that promotes better stresses distribution into the restored structure.[14] Therefore, the use of hydrogen peroxide post conditioning before silanization and adhesive application, has been shown to be the best surface treatment for adhesion to glass fiber posts.[15,16] According to Naves et al[17] the use of 24% hydrogen peroxide for 10 minutes on glass fiber or carbon posts promotes a greater availability of surface irregularities for bonding with resin cement due to the removal of the epoxy resin which lines the post fibers. In addition, Menezes de Souza et al[16] showed that the conditioning time (1, 5 or 10 minutes) with hydrogen peroxide does not affect the bond strength, and that the use of this substance at a concentration of 24% promotes similar results as the concentration of 50%. However, some authors showed no difference between various techniques for surface treatment of fiber posts.[18] Due to the benefits cited in several studies, the use of H_2O_2 conditioning appears to be important in order to avoid failure during fiber posts adhesive cementation.

Despite this concern be often overvalued, Ferrari et al[19] evaluating a total of 985 fiber posts for a period of 7-11 years have seen a failure rate of only 7-11% of cases, with only 21 posts detachment due to loss of adhesion (among other failures observed). Therefore, the promotion of a better adhesion for fiber posts seems important but few failures can be attributed to this factor. In order to ensure a good adhesive quality, the use of conventional 3-step adhesive systems (acid, primer and adhesive) avoids the occurrence of chemical incompatibility between auto or dual polymerized resin cements and single-bottle adhesives.[20] In this case we used an adhesive system (Duralink Fusion Catalyst, Angelus, Brazil) whith a self-curing "adhesive" ensuring efficient adhesion inside the entire root canal. For every cementation process it is mandatory that the clinician recognizes which material is in contact with the resinous cement, in order to provide better surface treatment. In an anatomic post, the composite resin used to reline the post will adhere with the resin cement in a direct technique, since they are both resinous materials polymerized almost at the same time during the clinical appointment. If an indirect technique is to be done, relined post surface needs to be faced as an indirect resin composite restoration, needing aluminum oxide sandblasting and silane application.[21]

The tooth final restoration can be made at the same operative time, right after post cementation, and after the polymerization of the resin cement (in this case, 4 minutes). The use of microhybrid resin composites produces good esthetic results combined with good final strength.[22] Case follow-up must be carried out regularly because the patient is a child, in spite of the fact that a high success rate have been cited by published studies.

Conclusion

The restoration of endodontically treated teeth with fiber posts can be improved with the use of anatomical posts created by post relining with microhybrid composites. The reported case resulted in biomechanical and esthetic success.

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