



Step by step of the clinical protocol for retainers reinforced with fiberglass: from chemical adhesive cementation to preparation of full crown

Paulo Vinícius Soares¹, Fabrícia Araújo Pereira², Lorraine Vilela de Souza³
Giovana Milito⁴, Bruno Rodrigues Reis⁵, João Vitor Soares⁶, Michelle Pereira Costa Mundim⁷

1 - Adjunct Professor II of Cosmetic Dentistry and Dentistry Materials - FOUFU. Full-time Professor of the Graduate program - FOUFU. Undergraduate Coordinator - FOUFU (2009-2013). Specialist in Cosmetic Dentistry - FOUFU. Master's in Oral Rehabilitation - FOUFU. Doctorate in Clinical Dentistry - UNICAMP.

2 - Specialist in Cosmetic Dentistry - FOUFU. Master's in Oral Rehabilitation - FOUFU

3 - Specialist in Endodontics - FOUFU. Master's in Oral Rehabilitation - FOUFU.

4 - Master's in Oral Rehabilitation - FOUFU.

5 - Specialist in Cosmetic Dentistry - FOUFU. Master's in Oral Rehabilitation - FOUFU Doctoral Student in Dentistry Materials - FO. USP.

6 - Bachelor's in Dentistry -UFU.

7 - Bachelor's in Dentistry -UFU. Master's in Oral Rehabilitation - FOUFU.

Introduction

Endodontically treated teeth are weaker when compared with healthy teeth mainly due to coronal destruction of dental caries, fractures, previous restorations and endodontic access. Restoration of endodontically treated teeth with a reduction of 50% or more of the total height of the clinical crown is requested through the prior indication of intraradicular retainers. 1

Among intraradicular retainers, the efficiency of molded and fused cores stands out for its adaptation within the root canal and for the technical simplicity of preparation and cementation. In recent decades, prefabricated retainers systems have been developed and have become a clinical option in rehabilitation of teeth with extensive destruction of the coronary portion of the dental element. For this option there is a need for reconstruction of the coronary portion with polymeric material and the use of micro or nano hybrid composite resins becomes necessary. These retainers are divided into pre-fabricated ones reinforced with fiber and pre-fabricated metal ones. The latter present

the disadvantage of not mechanically mimicking the dentinal structure and not presenting any chemical interaction with the adhesive interface and with the core of composite resin filling. These factors associated with mechanical retention that can be screwed into the dentin favor catastrophic root fractures (Figure 1).

The use of retainers reinforced with fiberglass allows for the rehabilitation of structurally weakened roots, mainly due the formation of an adhesive interface with the dentin, 2 and biomechanical behavior similar to radicular dentin permitted by the polymer pin/adhesive/cement/dentin interface.3.4 Due to the variety of polymeric materials and the criticality of the adhesive technique, the protocol for adhesion of these retainers are diversified in the literature. However, the quality of hybridization of the dentin structure, constant verification of the quality of light energy of the photo-activator devices and correct surface treatment of fiber pin are fundamental factors for the success of adhesive retention and clinical longevity of the restoration. 4-6 There are several options for fixative adhesives, divided into photo-activatable, chemically activatable and duals. The minimum light energy intensity for safe photo-activation of photo-dependent resin cements is approximately 850 mW/cm². 4 LED appliances of the first and second generation, and halogen lamps with a long period of use do not reach this light intensity. In these cases, the periodic maintenance of the photo-activator devices is required and cementation with fully chemical adhesive agents and resin cements is a clinical option.

The objective of this study of this case report is to highlight the major steps of mounting of prefabricated fiber-reinforced retainers, emphasizing the steps of chemical cementation, regardless of photo-activation and construction of the fill core with resin composite.

Clinical Case

Patient M.A.S., female, appeared at the integrated undergraduate clinic of the Dental Hospital, College of Dentistry of the Federal University of Uberlândia, reporting the fall of the cast-metal retainer system and metal-ceramic crown of element 12. Figure 2 shows the initial aspect of element 12 with extensive reduction of the coronary portion. Weakening of the proximal walls and root staining were observed, a consequence of multiple replacements using fused metallic cores. Rehabilitation of this element was indicated, employing full chemical cementation of a fiberglass-reinforced retainer and coronary reconstruction with composite resin for preparatory creation for a full crown. Radicular conduit preparation was carried out for Exacto pin no. 2 (Angelus Ind., Londrina, Paraná, Brazil) translucent, using an Exacto System bit at low rotation. Note the maintenance of approximately 5 mm of gutta-percha in the apical third. Clinical test of the pin after absolute isolation (Figure 3).

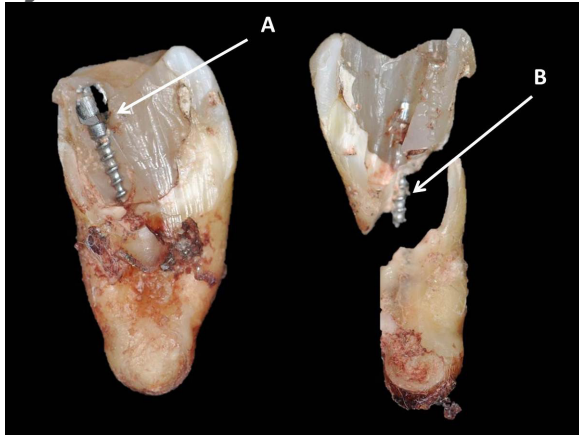
Conditioning of dentin structure was conducted with 37% phosphoric acid (Angelus) for 15s. Injecting the phosphoric acid starting on the deeper root portion reduces chances of bubbles (Figure 4). The excess phosphoric acid was subsequently suctioned with an endodontic suctor, and it was cleaned internally and externally with water by using an endodontic syringe for at least 15 seconds. Excess moisture removed with absorbent paper cones. Carefully observe the end of the cones to detect remnants of phosphoric acid (Figure 5). Next, the Primer of the Duralink Fusion Adhesive System (Angelus) was applied with a micro-brush. 60s was given for evaporation of the solvent, removing excess primer with an absorbent paper cone. Then with another micro-brush, the catalyst of the Duralink Fusion Adhesive System (Angelus) was applied. The excesses were removed with an absorbent paper cone. 4 min was given for the polymerization reaction of the adhesive layer (Figure 6). In this interval of 4 min, treatment was done on the fiberglass pin's surface with the protocol described below, aiming at superficial exposure of larger amount of fiberglass without structural impairment of the pin⁴:

- 1) Immersion in 24% Hydrogen peroxide for 60 seconds
- 2) Washing with air/water spray for 60s
- 3) Drying
- 4) Application of Silane (Angelus) – waiting 60s for full volatilization
- 5) Application of layer of Duralink Fusion Adhesive on the coronary portion of the pin - Photoactivation for 40s

The chemical-set cement was compounded, followed by insertion of the cement with a file, spreading it on the walls of the radicular conduit. Insertion of the fiber pin covered with resin cement. Removing the excess cement with a micro-brush (Figure 7). Figure 8 shows the reconstruction of the coronary portion with Ice nano-hybrid composite resin (SDI Ind., Australia) in the color OA2. Incremental insertion involving the dental remnant and retainer, planning geometry of the preparation for a full crown and opacifying the dark base of the root. Photoactivation of each increment of composite resin for 40s.

In Figure 9, you can see the initial aspect and final aspect of the preparation for the full crown. At this moment, the professional is responsible for suitability of the preparation according to the constituent material of the full crown, i.e. metal infrastructure employing diamond tips 2214 and 2215, or reinforced ceramic infrastructure using diamond tips 2135 and 4138.

Figure 1



Catastrophic fracture of premolar restored with composite resin retained by a prefabricated metallic screw-post retainer. A. Region of impaired interaction of the metal/composite resin interface; B. Region of the root fracture intensified by the type of pin.

Figure 2



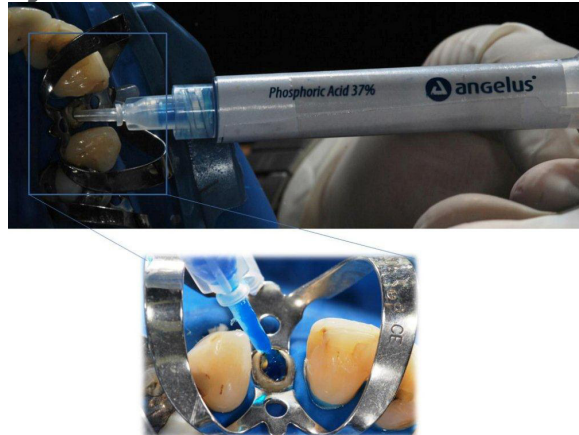
Initial aspect of the root of element 22. Note the reduced thickness of the proximal walls and the height of 2 mm of the dental remnant, important for strength of the tooth/pin/crown assembly.

Figure 3



Periapical Radiography - 5.0 mm gutta percha apical remnant, fittin of the bit of the Exacto system, and test of the pin.

Figure 4



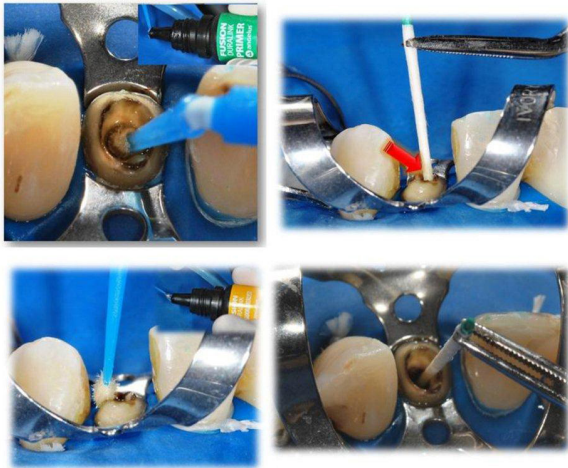
Conditioning of the dental structure.

Figure 5



Removal of excess phosphoric acid, washing and moisture control.

Figure 6



Hybridization of the dental structure – Application of the Primer and Catalyst, removal of excess.

Figure 7



Application of the chemical resin cement.

Figure 8



Reconstruction of coronary portion - fill core prior to preparation.

Figure 9



Final aspect of the coronary portion and preparation.

Conclusions

It can be concluded that the hybridization of the dental structure and fully chemical adhesive cementation are entirely relevant options in clinical situations where the depth factor and quality of the activator unit negatively influence bond quality of the pin/cement/radicular dentin interface.

References

1. Ross IF. Fracture susceptibility of endodontically treated teeth. *J Endod* 1980; Mar;6(1):560-5.
2. Soares CJ, Soares PV, de Freitas Santos-Filho PC, Castro CG, Magalhaes D, Versluis A. The influence of cavity design and glass fiber posts on biomechanical behavior of endodontically treated premolars. *J Endod*. 2008 Aug;34(8):1015-9.
3. Menezes M, Queiroz EC, Soares PV, Faria-e-Silva AL, Soares CJ, Martins LR. Fiber post etching with hydrogen peroxide: effect of concentration and application time. *J Endod*. 2011 Mar;37(3):398-402.
4. Schwartz RS, Robbins JW. Post placement and restoration of endodontically treated teeth: a literature review. *J Endod* 2004; Oct;30(2):289-301.
5. Faria e Silva AL, Casselli DS, Ambrosano GM, Martins LR. Effect of the adhesive application mode and fiber post translucency on the push-out bond strength to dentin. *J Endod* 2007;Apr;33(3):1078-81.
6. Silva NR, Castro CG, Santos-Filho PC, Silva GR, Campos RE, Soares PV, Soares CJ. Influence of different post design and composition on stress distribution in maxillary central incisor: Finite element analysis. *Indian J Dent Res*. 2009 Apr-Jun;20(2):153-8.