Reintervention on a central incisor with a fractured glass fiber post

André F. Reis[1]
Ronaldo G. Viotti[2]
Aristides Souza-Junior[3]
Fabio Y. Hirata[1]
Camila M. Esteves[1]
Rodrigo E. Ilkiu[4]

1) Universidade Guarulhos, Centro de Pós-graduação e Pesquisa, Departamento de Dentística (Guarulhos/SP, Brazil).
2) Universidade Regional de Blumenau, Departamento de Dentística (Blumenau/SC, Brazil).
3) UNIFENAS - Universidade José do Rosário Vellano, Departamento de Dentística (Alfenas/MG, Brazil).
4) Universidade do Oeste de Santa Catarina, Departamento de Dentística (Joaçaba/SC, Brazil).

Abstract: Rehabilitation of a single upper central incisor is considered an esthetic challenge for the dental team. In addition, it produces anxiety in the patient, for being an esthetic region. The present article reports a case in which a reintervention was necessary on an upper central incisor, due to mobility of the crown, related to fracture of the intraradicular retainer. Removal of crown and existing intraradicular retainer was necessary, followed by endodontic retreatment, placement of a new fiber post and cementation of a new ceramic crown. This case report presents the step-by-step of the procedures, and discusses the rationale for each step. Knowledge of the different substrates and the different adhesive protocols for each step of the rehabilitation guarantees the success of the restorative treatment. **Keywords:** Glass fiber posts. Adhesion. Dental ceramic.

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Contact address: André Figueiredo Reis. Centro de Pós-graduação e Pesquisa, Universidade Guarulhos. Praça Tereza Cristina, 229 - Guarulhos/SP - CEP: 07.023-070 - E-mail: areis@prof.ung.br

» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

INTRODUCTION

Rehabilitation of a single upper central incisor is considered to be a challenge for the dental team. Besides, it produces anxiety in the patient, for being an esthetic region. Loss of dental structure – caused by regular replacement of restorations over the years, fracture and/or trauma or even caries – lead, in many cases, to the need of endodontic treatment. Intra-radicular retainers have been commonly used, in these cases, to assist the retention of the restoration and as reinforcement of the weakened tooth.[1,2]

Selecting an adequate restoration for the endodontically treated teeth must meet both functional and esthetic criteria.[3,4] The quality and quantity of the remaining dental structure play an important role in the success of any rehabilitation treatment.[5,6] Traditionally, custom cast metal post and core used to be the choice for the rehabilitation of endodontically treated teeth[7]. However, the treatment with cast post and core, besides compromising the esthetic result, presents unfavorable tension distribution to the remaining radicular structure, when compared to glass fiber posts.[8-11] Another disadvantage of using cast posts is related to the higher number of sessions. With the increased demand for esthetic and simplified treatments, there is currently a trend to the use of posts that do not interfere in the color of the substrate, such as the glass fiber posts.

The present case report illustrates a situation in which there was fracture of a prefabricated glass fiber post, which was replaced after endodontic retreatment using the core and post system. This system uses a dual-cured composite resin for simultaneous cementation of the post and core build-up.

CASE REPORT

A 35-year-old female patient sought the dental clinic with the chief complaint that her tooth with a ceramic crown presented mobility. She told that she had a trauma in that region and, after that, she started to notice the movement. The clinical examination confirmed mobility of the right upper central incisor, with slight displacement of the crown (Fig 1). The radiographic examination showed that it had an unsatisfactory endo treatment and, despite not showing radiopacity, we noticed that there was a glass fiber post (Fig 2).

It was also noticed that there was radiopaque cementation material only in the coronary third of the root. According to the initial diagnosis, there was a fracture of the glass fiber post and dislocation of the porcelain crown, but without impairing the radicular remnant. The treatment proposed to the patient was removal of the crown and fiber post, endodontic retreatment, placement of a new intra-radicular retainer and cementation of a new ceramic crown.

Removal of the preexisting crown was necessary, so that the fractured post could be removed and the root canal retreatment could be performed. With the aim of calming down the patient, who was really worried about the provisional phase, we removed the crown by the palatal surface, preserving the preexisting crown as much as possible (Fig 3), so that it could be used as a provisional. Before removing the crown, an impression with c-silicone was made (Zeta Plus, Zhermack) to be used as a matrix for making the provisional (Fig 4), and we also made guides for the buccal, palatal and incisal preparation. The crown and the remains of the fractured glass fiber post were removed.

Figure 1: Initial aspect. The right upper central incisor showed mobility and slight extrusion of the preexisting ceramic crown. The fracture of the preexisting glass fiber post was detected, but the radicular remnant was not impaired.

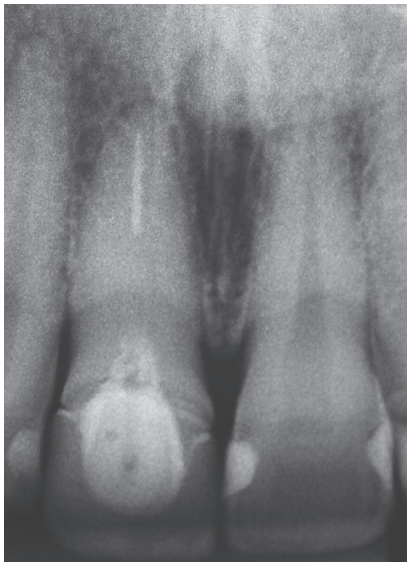

Figure 2: Initial radiographic aspect. The radiographic examination did not show evidences of fracture in the root; however, it showed the presence of cementation material of the post only in the coronary third of the root.

Figure 3: Aspect after removal of the preexisting crown. Preparation by the palatal surface was performed, preserving the buccal surface. The remaining resin cement of the internal part of the crown was removed, and adhesive procedures were done, so that the crown could be used in the making of the new provisional.

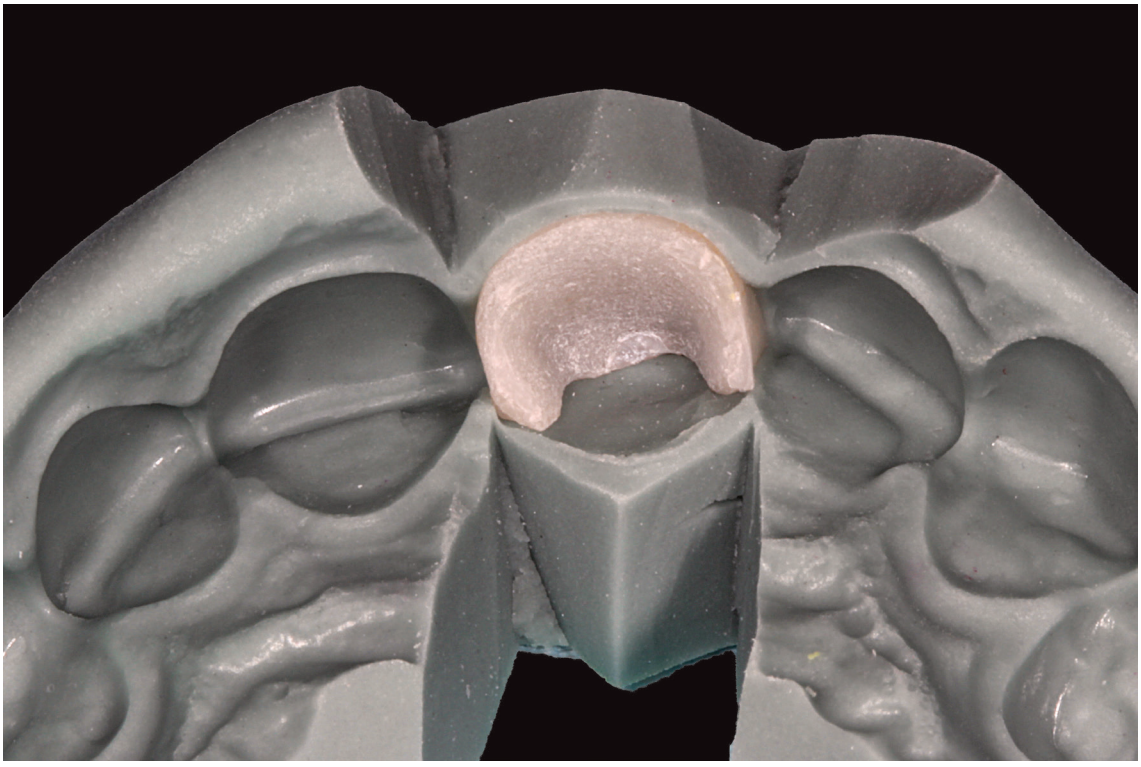

Figure 4: Before crown removal, guides were made with c-silicone, which would be helpful for making the new provisional.

After removal, the previous crown looked like a porcelain veneer (Fig 3) and was, then, internally etched with hydrofluoric acid for 20 seconds (Fig 5), silanized, and an adhesive (XP Bond, Dentsply Sirona) was applied and cured. The veneer was then fit into the silicone guide, filled with a bis-acryl resin (Integrity A1, Dentsply Sirona) and brought into position. Before making the coronary part of the provisional, an orthodontic wire was used to assist with the intra-radicular retention. The root canal was isolated with petroleum jelly, and the bis-acryl resin was applied to the root canal, together with the intra-radicular retention, allowing a retentive part of the orthodontic wire to remain uncovered by the bis-acrylic resin, so that it could be bonded together with the coronary part of the provisional that was made afterwards (Fig 6). The provisional was then placed and the patient was referred for endodontic retreatment (Fig 7, 8). After retreatment (Fig 9), a pre-fabricated intra-radicular post (X.Post, Dentsply Sirona) was placed and core build-up was made with the Core and Post technique (Core&Post System, Dentsply Sirona) (Fig 10, 11). Such technique uses a dual-cured adhesive system (XP Bond + Self-Cure Activator, Dentsply Sirona) and a dual-cured core build-up composite resin (Core.X Flow, Dentsply Sirona). After applying the phosphoric acid for 15 seconds, it was rinsed, excessive moisture was

removed with absorbent paper points and the dual-cured adhesive system was applied. It is extremely important, after applying the adhesive, to use absorbent paper points to remove excessive adhesive, which tends to accumulate in the most apical region of the root canal preparation (Fig 12). Excessive adhesive may dilute the cementation composite resin and jeopardize the adhesive procedure. The glass fiber post, which had already been selected, was cleaned with alcohol (Fig 13) and, after that, it received application of the dual-cured adhesive (Fig 14), which is not photoactivated in order not to impair adaptation of the post.

Figure 5: The internal part was etched with hydrofluoric acid for 20 seconds, silanized and received adhesive application, in order to adhere to the bis-acryl resin.

Figure 6: Aspect of the provisional made with an intra-radicular retainer, so that the patient could receive endodontic retreatment.

Figure 7: Clinical aspect of the provisional.

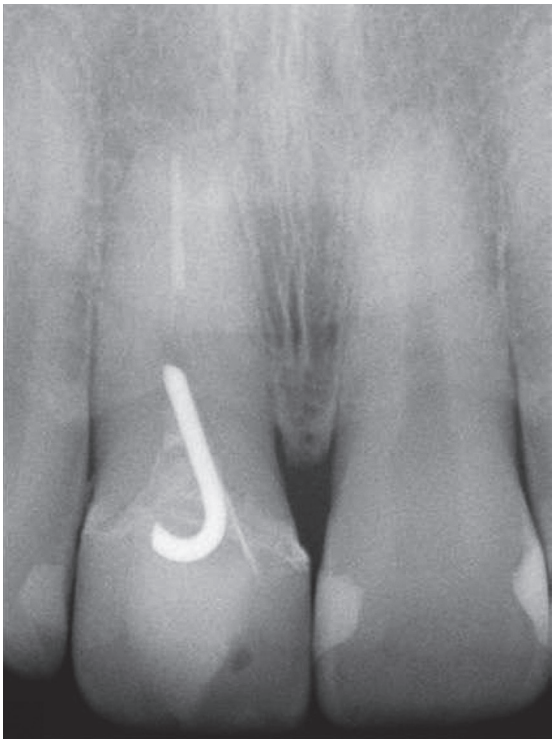

Figure 8: Radiographic aspect of the provisional with intra-radicular retainer, before endodontic treatment.

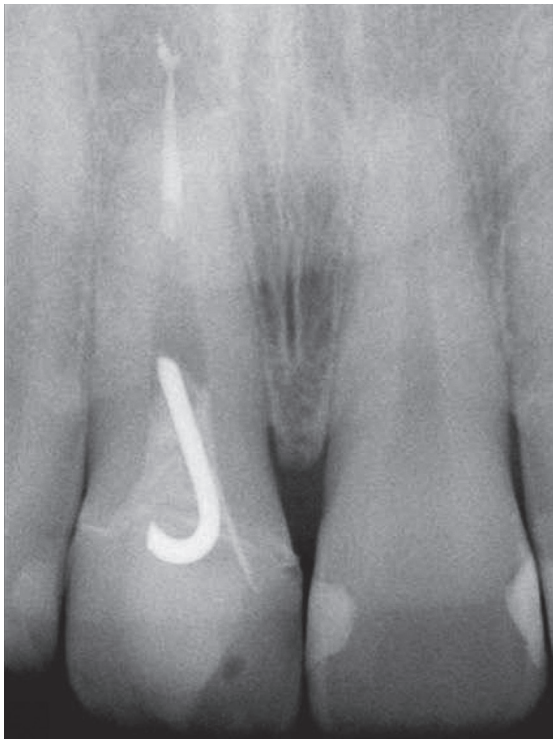

Figure 9: Radiographic aspect after endodontic retreatment.

Figure 10: Aspect of the radicular remnant.

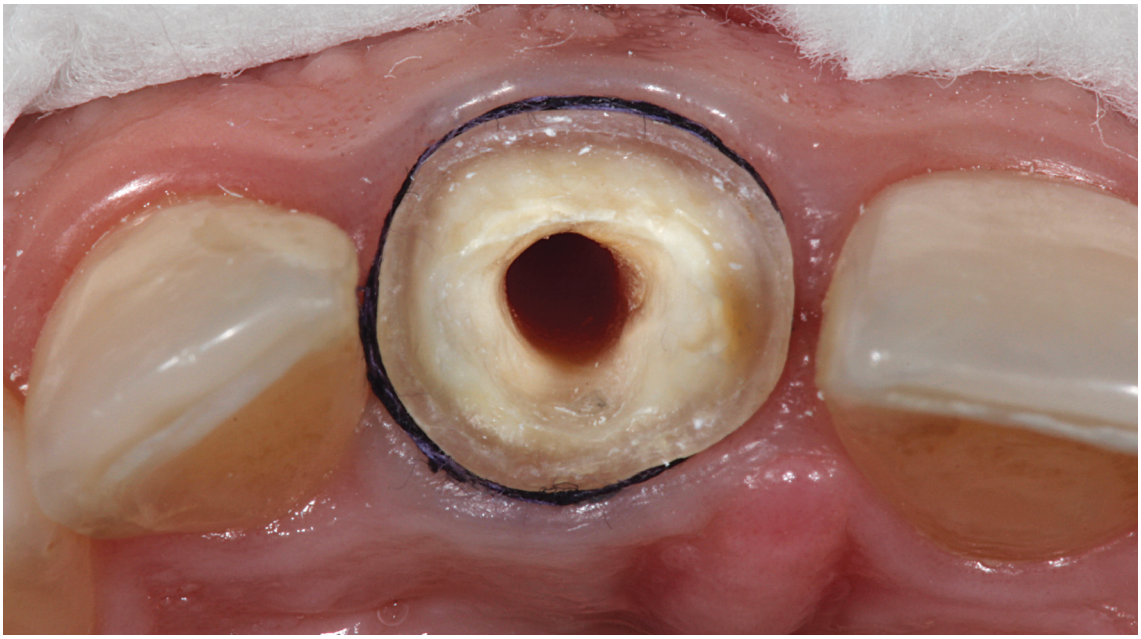

Figure 11: Incisal view of the radicular remnant, before placement of the glass fiber post and core build-up.

Figure 12: The glass fiber post X.post (Dentsply Sirona) was cleaned with alcohol.

Figure 13: The dual cure adhesive system XP Bond + Self-Cure activator (Dentsply Sirona) was applied to the post and was not photo-activated, in order not to interfere in its adaptation.

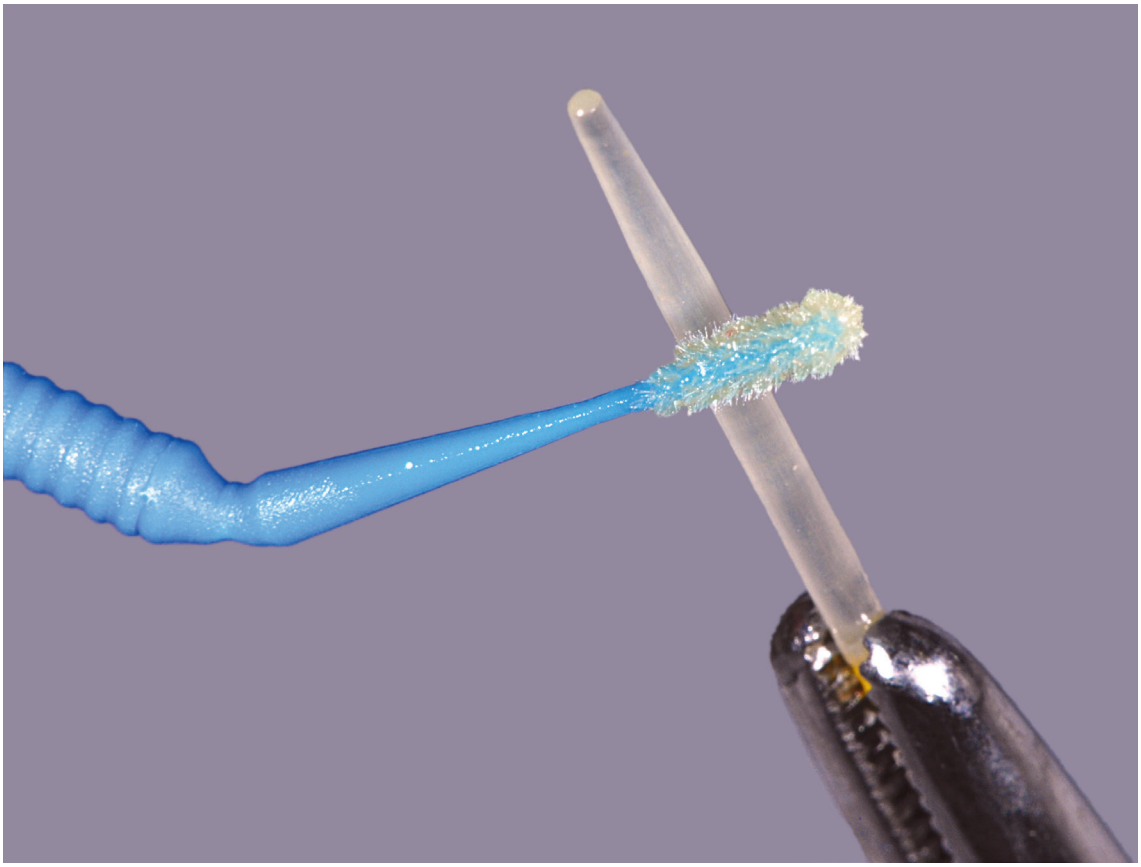

Figure 14: After applying the adhesive system to the root canal, it is extremely important to remove the excess of adhesive with absorbent paper points.

The composite resin for core build-up and post cementation (Core.X Flow) was then applied with an auto-mix intra-radicular tip that has a small diameter and allows its insertion into the root canal, which reduces the chance of incorporating air bubbles and failures in the post adhesion. After insertion of the resin into the root canal, the post was inserted and the coronary portion was also filled with the dual-cured composite resin, for core build-up. Then, photo-activation was performed for 40 seconds on the buccal, palatal and incisal surfaces, totaling 120s (Radii Plus, SDI).

After photo-activation, preparation for the new crown was made (Fig 16, 17). Impression was made with addition silicone using the double cord one-step putty-wash technique (Aquasil XLV and Aquasil Putty DECA, Dentsply Sirona) (Fig 18). A new provisional was made (Fig 19) using the same remnant of the previous crown. The provisional intra-radicular retainer was removed, as well as all the bis-acryl resin. The porcelain 'veneer' was again etched, silanized and bonded. This 'veneer' was placed on the silicone guide and taken into position with bis-acryl resin, in order to be, once more, used as a provisional.

A new crown was made (Fig 20) with a lithium disilicate infrastructure, with the stratification technique (e.max, Ivoclar Vivadent; Laboratório Specialized, by Luiz Alves). For cementation, we made use of a photo-activated adhesive system that uses phosphoric acid (XP Bond, Dentsply Sirona), which was applied and was not photo-activated. Afterwards, the base (photo-activated) resin cement (Variolink II, shade A1, Ivoclar Vivadent) was applied and the whole set was photo-activated for 40 seconds from the buccal, palatal and incisal surfaces (Radii Plus, SDI). Figure 21 illustrates the final aspect of the case, 1 month after cementation. Figure 22 shows the comparison of the radiographic aspect before and after treatment.

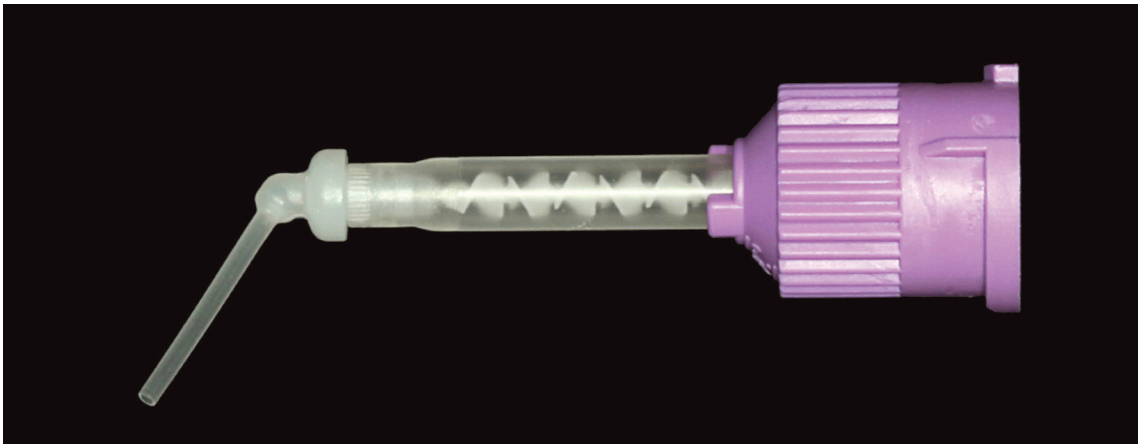

Figure 15: Aspect of the intra-radicular auto-mixing tip, for insertion of the composite resin inside the canal. It facilitates insertion and reduces the chance of air bubbles incorporation.

Figure 16: Aspect after core build-up with Core.X Flow (Dentsply Sirona). The system used for cementation was Core&Post System (Dentsply Sirona).

Figure 17: Incisal aspect of the preparation.

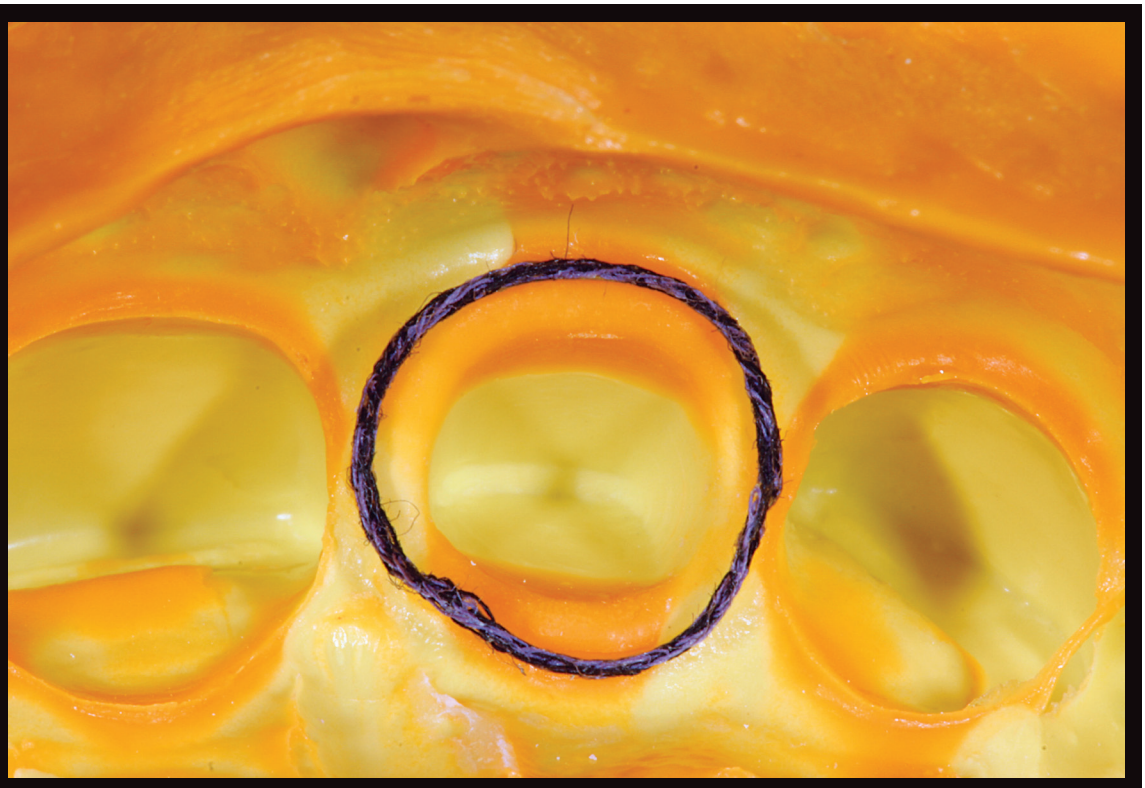

Figure 18: Impression was made with addition silicone, using the double cord one-step putty-wash technique (Aquasil XLV and Aquasil Putty DECA, Dentsply Sirona).

Figure 19: After impression, a new provisional was made, using the same remnant of the porcelain crown which had already been removed.

Figure 20: Aspect of the new porcelain crown before cementation.

Figure 21: Aspect of the new crown, one month after cementation.

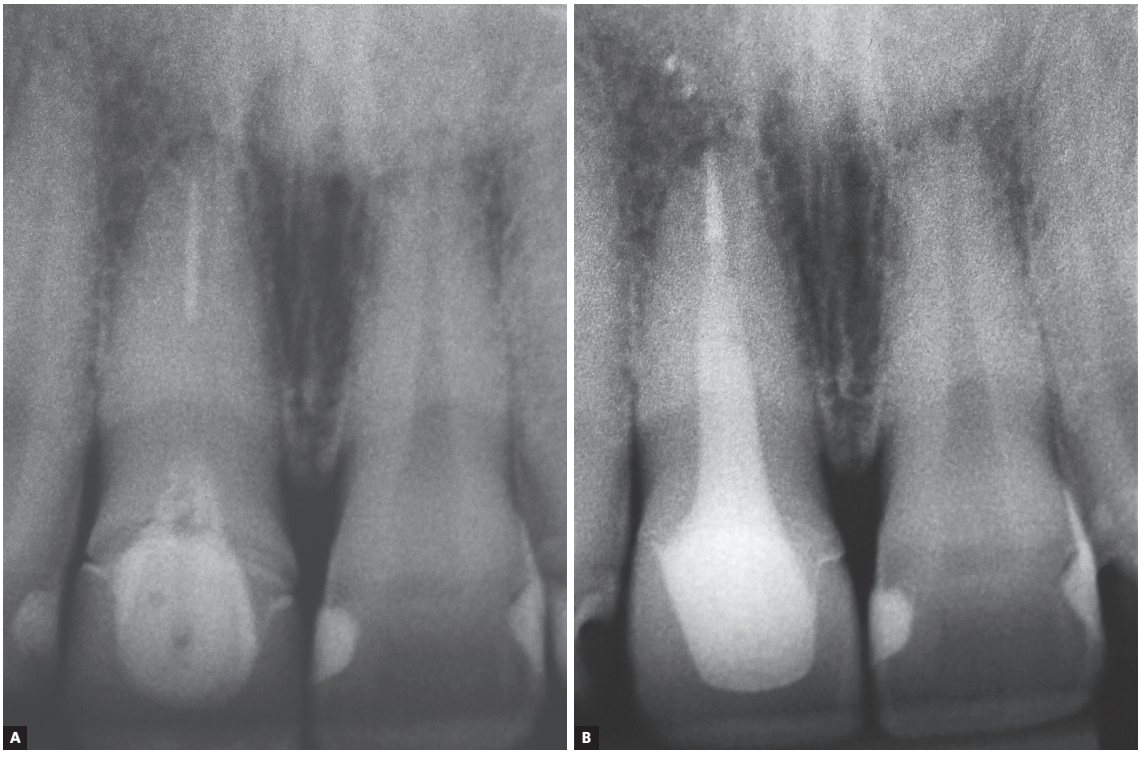

Figure 22: Comparison of the radiographic aspect before (**A**) and after treatment (**B**).

DISCUSSION

As the fiber posts are passively placed inside the root canals, its retention depends mainly on the success of the adhesive procedure to the intra-radicular dentin.[12,13] Whereas adhesion to coronal dentin is more reliable, several factors that affect adhesion to intra-radicular dentin have been described.[14,15] The histological characteristics related to the high number of tubules and small amount of intertubular dentin available for hybrid layer formation may result in lower bond strength, in comparison with the coronary dentin.[16]

The irrigation agent can also be a problem.[14,17] According to Santos et al.[17], bond strength produced by self-etching adhesive systems is impaired when NaOCl is used as an irrigation agent. The difficulty of moisture control can also be a problem when etch-and-rinse adhesive systems are used.[18,19] In addition, difficulty in light transmission through the deepest regions of the root canal can result in a lower degree of conversion of the adhesive system, as well as the resin cement, resulting in impaired mechanical properties and bond strength.[20] The high C-factor of the root canal could also be a problem due to the tensions generated during polymerization shrinkage.[15,21,22]

Recently, dual cure composites for core build-up have been indicated for the cementation of glass fiber posts.[23-27] Some examples of this class of materials are: Luxacore (DMG), Fluorocore (Dentsply Caulk), Core.X Flow (Dentsply De Trey), Rebilda (Voco). These materials show higher filler content than conventional resin cements and, consequently, better mechanical properties. Some recent studies analyzed the mechanical properties and pointed that some of these materials show good curing even without light.[28,29]

Most of these materials are presented in auto-mix syringes, that is, they do not need to be hand-mixed with a spatula. Another big advantage is the use of intra-radicular tips, which allows the material to be injected inside the root canal (Fig 15). In the present case, it is possible that the glass fiber post failure occurred due to a cementation failure, since the presence of resinous cement in the most apical regions of the root canal was not verified. The intra-radicular auto-mixing tips are advantageous because they reduce the chance of air voids incorporation during cementation. The big advantage of this technique is that the cementation of the post and core build-up are performed in a single procedure. Thus, cementation becomes a simple, fast and reliable procedure.

Due to its low elastic modulus, the treatment with glass fiber posts shows a more favorable tension distribution to the radicular structure, when compared to cast metal posts.[8-11] The fact that the patient had a preexisting glass fiber post may have been fundamental to the occurrence of a repairable fracture of the post at the moment of the trauma, instead of a root fracture, which would be irrepairable.

CONCLUSION

In the Core and Post technique, cementation of the post and core build-up are performed in a single procedure, using a dual-cure adhesive system and a dual-cure composite resin applied with an intra-radicular auto-mixing tip. This way, cementation becomes a simple, fast and reliable procedure.

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