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Traditional rehabilitation of endodontic treated tooth: 12-month follow-up

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Abstract
The objective of this case report is establishing aesthetic harmony through the application of a traditional rehabilitation of endodontic treated tooth with fiberglass post with lithium disilicate crown in 12-month follow-up. In the realm of restorative dentistry, meticulous planning becomes paramount when dealing with teeth that have undergone endodontic treatment. The evaluation of the remaining coronary structure and its functional requirements lays the foundation for a successful restorative procedure. A crucial aspect of this process involves the careful selection of an intraradicular pin, with studies highlighting the comparable elasticity of fiberglass post to dentin. This attribute contributes significantly to the development of a dentin-post-core monobloc system, enhancing force distribution along the root during stressful conditions. In the context of anterior teeth, achieving an accurate impression takes on heightened importance for prosthetic rehabilitation, driven by aesthetic considerations. The precision of the impression serves as a prerequisite for crafting indirect restorations that boast optimal marginal fit. Furthermore, the patient's impeccable gingival health and alignment play pivotal roles in determining the success of the overall case resolution. Remarkably, in the presented case, the alignment of the teeth required no correction, underscoring the synergistic approach of integrating restorative, orthodontic, and periodontal techniques. This strategy not only addresses functional aspects but also emphasizes the aesthetic considerations crucial for patient satisfaction. We conclude that the traditional technique of rehabilitating endodontically treated teeth with the use of an intraradicular post and crown continues to be a good aesthetic alternative.

Keywords: Fiber post, dental esthetic, dental crowns

1. Introduction
For endodontically treated teeth, restorative planning should assess the amount of remaining coronary structure and its functional requirements, the success of the restorative procedure depends crucially on the proper choice of the intraradicular pin. In this decision, it is essential to take into account factors related to the characteristics of the intraradicular post and the tooth to be restored, such as occlusion, position of the tooth in the arch, and amount of remaining tooth structure [1].

Different materials, designs, and techniques for post restorations are available for endodontically treated teeth [2-5]. The intraradicular posts can be classified according to material: metal, fiber, and ceramic posts. Through research, it has been determined that the elasticity of fiberglass posts closely resembles that of dentin [6, 7]. The bonding of dentin is thought to establish a monoblock dentin-post-core system, enhancing the distribution of force along the root when subjected to stress. Moreover, the aesthetic advantage lies in the superior light transmission facilitated by fiberglass posts through the root and surrounding gingival tissues [8].

When addressing anterior teeth, precise impressions are paramount for esthetic considerations during prosthetic rehabilitation, serving as a prerequisite for crafting indirect restorations with an optimal marginal fit [9]. In this context, intraoral scanners (IOS) can be used, as they provide a three-dimensional preview of the area of interest, reduce working time, and enhance

patient acceptance [10]. The IOS is proficient in delivering accurate digital models, minimizing the risk of distortion associated with traditional impression materials, and supplying ample information for the fabrication of single crowns and short-span fixed prostheses [11]. Another significant benefit, especially in the post-COVID-19 pandemic context, is that the digital prosthetic intraoral scanner can contribute to reducing the risk of disease transmission [11].

Therefore, the aim of this study was to report a clinical case 12-month follow-up on the implementation of the indirect restorative technique on an endodontically treated lateral upper left lateral incisor using a fiber glass post, intraoral scanner, lithium disilicate crown and its associated advantages.

Case Report

A female patient, 22 years old, sought the Dentistry clinic at Tuiuti University of Paraná to undergo the extraction of third molars. The periapical radiographic analysis uncovered a notable finding - the existence of a periapical lesion in tooth 22. This particular tooth, despite possessing a fully formed crown, presented a deficiency in esthetics, thus prompting a closer examination of this distinctive dental structure (Figure 1). The juxtaposition of the periapical lesion and the compromised aesthetic appearance of the complete crown on tooth 22 became a focal point for further investigation and intervention in order to address both the underlying pathology and the cosmetic concerns associated with this specific dental condition.

Fig 1: A) Initial frontal occlusal view. B) Initial frontal view of the upper arch. C) Initial frontal view of the tooth without the provisional crown. D) Initial left lateral occlusal view. E) Initial left lateral view of the upper arch. F) Initial left lateral view of the tooth without the provisional crown

During the anamnesis, no relevant data from the medical history was identified. In the intraoral clinical examination, percussion and palpation tests did not yield positive results, and periodontal probing indicated conditions consistent with periodontal health. The periapical radiographic examination of tooth 22 revealed the presence of a lesion at the apex. In light of the convergence of clinical and radiographic findings, the diagnosis for the mentioned tooth was established as pulpal necrosis and asymptomatic apical periodontitis. The proposed treatment plan included endodontic procedures, followed by canal preparation for the insertion of a fiberglass post and the fabrication of a new crown (Fig 2).

The patient agreed to the treatment, formalizing her consent through the signing of an informed consent form.

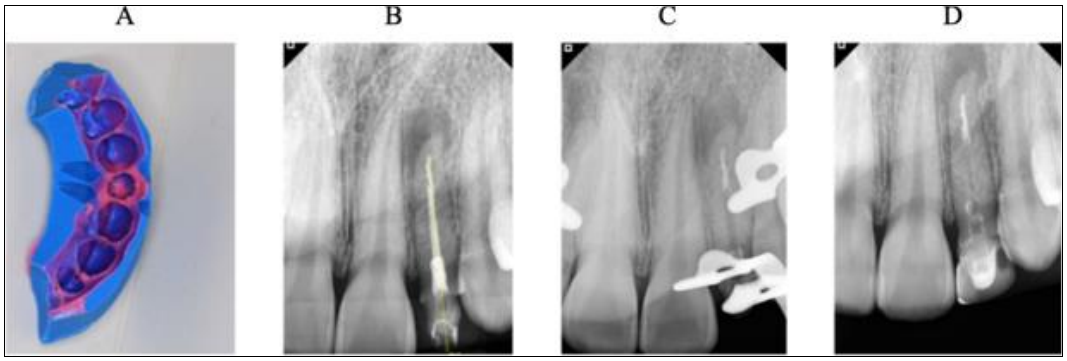

Fig 2: A) Addition silicone matrix. B) Initial periapical radiograph. C) Periapical radiograph after root canal clearance. D) Final periapical radiograph

Following the endodontic treatment of tooth 22, it was observed that the outcome was satisfactory, with 21.2mm of obturating material present within the canal and a healthy periapical region (Figure 2). Consequently, a rehabilitative intervention was opted for, employing an intraradicular aesthetic retainer, fiberglass post, in conjunction with an indirect restoration involving a lithium disilicate crown (Fig 2).

During the initial session, the quantification of obturating material for removal was computed through the analysis of the initial radiograph, measuring 17mm, adhering to a protocol involving the retention of 4mm of gutta-percha to ensure apical sealing (Fig 2). Following this, a matrix was meticulously crafted using addition silicone for the subsequent fabrication of the tooth (Fig 2).

The procedure commenced with absolute isolation using #00 clamps for the uni-radicular canal clearance, employing Largo drills #1 and #2, verifying the necessary length with a millimeter-marked endodontic ruler and a rubber stopper. The canal was cleaned with a T-File #20 endodontic file of 25 mm and alcohol-soaked cotton, followed by thorough drying using absorbent paper points. Subsequently, fiberglass posts were trialed, and the most fitting option, the Whitepost System fiberglass post (FGM, Joiville, Brazil), was chosen and utilized (Fig 3).

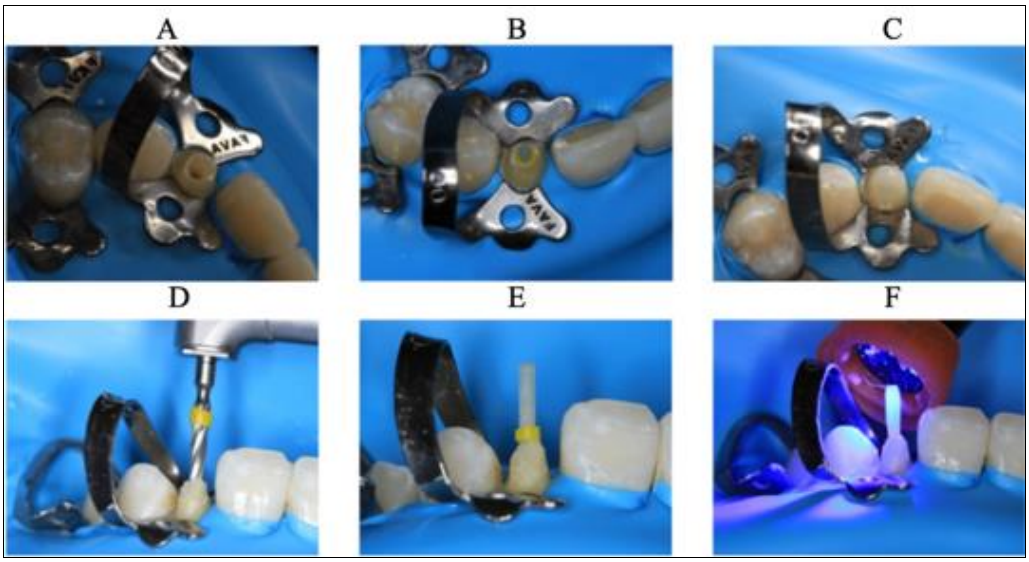

Fig 3: A) Clearance of tooth 22. B) Intraradicular post-test. C) Preparation process of tooth 22. D) Clearance with Largo drills. E) Intraradicular post. F) Photopolymerization of the intraradicular post

For post cementation, the Dual Resin Cement RelyX U200 (3M™ Littmann, São Paulo, Brazil) with dual curing and A2 shade was meticulously chosen. It was manipulated and carefully introduced into the canal. Following proper canal filling, the cement was applied to the surface of the post, cleaned with alcohol, and moistened with Universal Ambar Adhesive (FGM, Joiville, Brazil), previously activated by photoactivation. Subsequently, the post was inserted into the canal, excess resin cement was removed, and the photopolymerization process ensued (Fig 3). The surplus intraradicular post was then precisely trimmed using high-speed rotation and the No. 2135F bur (KG Sorensen, São Paulo, SP, Brazil).

Following the cementation of the retainers, the surface of the remaining tooth was conditioned with 37% phosphoric acid (Condac 37; FGM, Joiville, Brazil) for 30 seconds (Fig 4). Subsequently, Universal Amber Adhesive (FGM, Joiville, Brazil) was applied using a micro applicator and subjected to photopolymerization. Coronary reconstruction was executed using a resin system in incremental steps, with individual photoactivation, preparing the tooth for crown placement (Fig 4). To achieve both aesthetic and functional outcomes, the decision was made to fabricate a lithium disilicate crown.

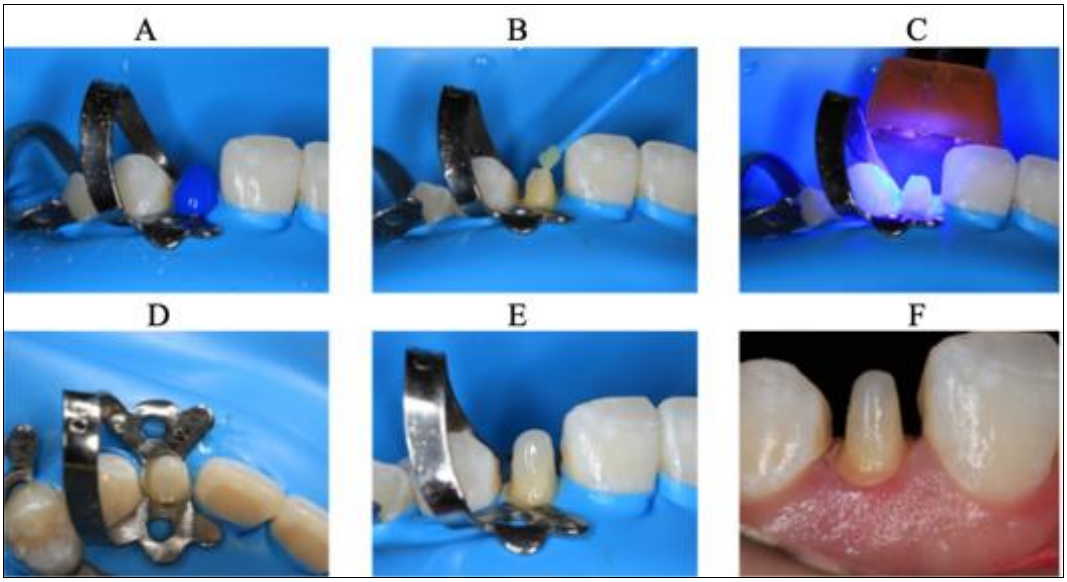

Fig 4: A) Phosphoric acid etching on tooth 22. B) Application of the adhesive system on tooth 22. C) Photopolymerization of tooth 22. D) Coronary reconstruction. E) Frontal view of coronary reconstruction. F) Coronary reconstruction without absolute isolation, vestibular face

Subsequently, digital scanning was conducted, capturing all dental units within the patient's oral cavity, and promptly transmitting the data to the 3 Shape program (CEREC, Sirona Dental Systems, Bensheim, Germany) on the computer (Fig 5). The model was accessible through an emailed link, facilitating 3D printing. The CEREC software initiated the scanning process, commencing from the cervical and vestibular aspects of the teeth using the scanner tip, followed by the occlusal and palatal surfaces. #000 and #00 retraction cords (Biodinâmica, Ibiporã, PR, Brazil) were placed with a 3059 retraction cord placement instrument (Golgran, São Caetano do Sul, SP, Brazil) to expose the preparation margins, manage moisture around tooth 22, and optimize scanning for prosthetic marginal adaptation. Following digital scanning, the provisional crown was fabricated and cemented using Provicol provisional cement (VOCO GmbH, Germany).

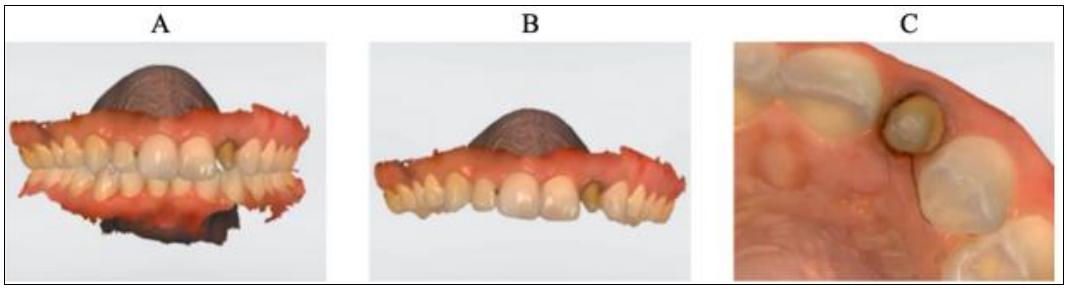

Fig 5: A) Intraoral scanner (IOS) in the 3Shape program, in occlusion. B) IOS in the 3 Shape program, upper arch. C) IOS in the 3Shape program, three-dimensional visualization of tooth 22

Subsequent to the laboratory fabrication of the crown, a modified absolute isolation technique was applied, involving the removal of provisional restorations and prophylaxis of preparations using water and extra-fine pumice stone (SS White, Brazil). The dental structures were conditioned by applying 37% phosphoric acid (Condac, FGM, Joiville, Brazil) for 30 seconds exclusively to enamel margins, followed by rinsing and hybridization with the universal adhesive system (Ambar Universal APS, FGM, Brazil) using a microbrush across the entire cementation surface for 20 seconds. Photoactivation was performed, and the crowns were cemented using Allcem Veneer Try-In cement in a translucent shade (FGM Dentscare Ltda, Joinville, SC, Brazil). Post-cementation, occlusal adjustments were executed with carbon paper, and worn areas were polished using an abrasive rubber system (Fig 6).

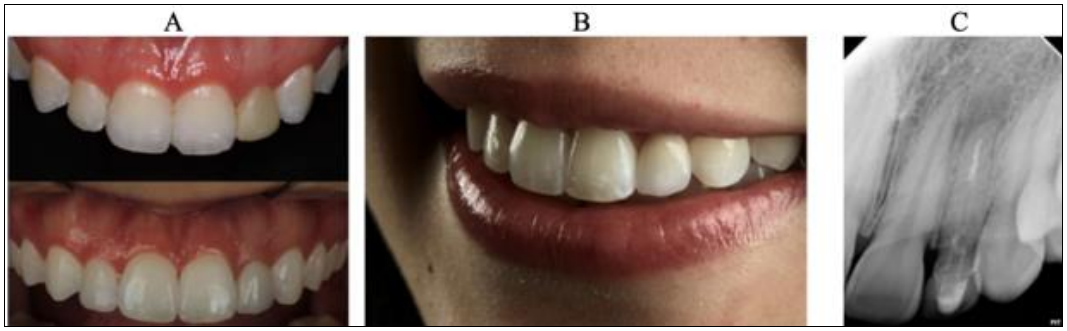

Fig 6: A) Before and after esthetic restorative treatment. B) Final smile with the lithium disilicate crown after 12 months. C) Final periapical radiograph after 12 months of treatment

After 12 months, the patient returned for clinical and radiographic follow-up and a reduction in the periapical lesion of element 22 and good marginal adaptation and color of the crown were detected.

Discussion

The tooth featured in the case exhibited a previously unsatisfactory endodontic treatment, as a consequence of prior restorative interventions. Endodontically treated teeth experience substantial loss in both coronal and radicular dental structures, leading to diminished capacity for tension-bearing due to compromised coronal integrity. Clinical efficacy of the tooth necessitates the resilience to tensions over the time [8].

One of the primary challenges encountered in the restoration of teeth following endodontic treatment pertains to the risk of irreparable fractures. This risk is frequently linked to the disparity in strength between the root dentin and the intra-radicular devices employed in the restoration process. Consequently, this scenario gives rise to the development of stress concentration regions [12].

For this reason, the patient was proposed a treatment involving intra-radicular posts. Resin-based composite posts, reinforced with fibers and exhibiting a modulus of elasticity comparable to dentin, appear to significantly reduce the likelihood of vertical root fractures. Primary factors contributing to potential failures with these fiber posts include subsequent detachment, the development of secondary caries, and restorable fractures in the cervical region [13].

A fiberglass pin, affixed within the root canals and characterized by a modulus comparable to dentin, imparts heightened flexibility to teeth subjected to endodontic treatment when exposed to occlusal forces. This engenders a more uniform distribution of fusion at the interface among the pin, cement, and dentin along the root surface, resulting in a restored homogeneous stress distribution reminiscent of an intact tooth, as elucidated in teeth rehabilitated with fiber pins [12]. Another advantageous attribute lies in the esthetic property to the rehabilitation of the tooth [8]. The enhanced distribution of tension between the fiberglass pin and dentin is facilitated by the equivalent modulus of the fiberglass pin, thereby augmenting the flexibility of teeth under stress

conditions. The utilization of retractable fiber pins aims to reduce the probability of irreparable root fractures.

The cementation process involves the application of resin adhesive cement for fiberglass pins. Employing an adhesive bonding strategy, this cement establishes a robust bond between the pin and the core, ensuring sustained adhesion to the remaining tooth structure [8]. The scientific literature extensively documents that teeth restored with fiberglass pins exhibit a more homogeneous stress distribution, akin to that of a healthy tooth.

In the present case, to impression of the tooth the digital intraoral scanning was chosen, providing an advantage over conventional molding by allowing rescanning of lost areas and pre-visualization of regions, enabling immediate feedback. Unlike conventional impressions, where errors are often identified only after the molding material has fully solidified or a plaster mold has been poured, intraoral scanning offers the opportunity to correct imperfections in the scan, resulting in a reduction in the overall procedure time [11].

In the context of prosthetic rehabilitation, especially for anterior teeth, obtaining an accurate impression is crucial due to its aesthetic importance. This precision is an essential requirement for the production of indirect restorations with an adequate marginal fit [9].

The choice of crown rehabilitation material took into account the fact that in recent years, there has been a significant increase in aesthetic requirements for smiles in dentistry, encompassing both anterior and posterior teeth [14]. Lithium disilicate is favored for its properties as a glass-ceramic material, providing maximum aesthetics and good fracture resistance [15]. A retrospective study by Rauch *et al*., monitoring the durability of monolithic crowns made of lithium disilicate, reported a success rate of 99.1% over a period of up to 4 years [16]. The study affirms that lithium disilicate crowns can be employed without aesthetic and functional deficiencies. Moreover, the natural response of soft tissues adjacent to subgingival restorations crafted from lithium disilicate vitreous ceramic is positive, establishing it as an excellent choice for total crowns [17].

Therefore, this case report demonstrates the effectiveness of fiberglass posts as intraradicular retainers for rehabilitating teeth with compromised structure [2, 6, 18]. The properties of fiberglass posts closely resemble root dentin, offering enhanced stability and resistance to fractures during installation procedures [6, 7]. The transmission of light through a fiberglass-reinforced pin in the root and surrounding gingival tissues provides an aesthetic benefit. Additionally, the patient's perfect gingival health and alignment were crucial factors, requiring no correction of tooth alignment for the successful resolution of this case. Frequently, achieving a beautiful and functional outcome necessitates the integration of restorative, orthodontic, and periodontal techniques. Notably, for tooth restoration, the metal-free crown crafted from lithium disilicate stands out as an excellent material, particularly for rehabilitating anterior teeth [15]. It remarkable superiority in aesthetics compared to metal or metal-ceramic crowns is noteworthy. The amalgamation of this material with a fiberglass pin creates a synergy that mimics the tooth structure, yielding a favorable aesthetic and functional result [19].

Conclusion

The traditional technique of rehabilitating endodontically treated teeth with the use of an intraradicular post and crown continues to be a good aesthetic alternative.

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Conflict of Interest

Not available

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