CORRECTION OF ESTHETIC AFTER COMPLICATED FRACTURE OF MAXILLARY ANTERIOR CENTRAL INCISORS USING A GUIDED ANATOMICAL INCREMENTAL TECHNIQUE: A CASE REPORT WITH A SIX-YEAR FOLLOW-UP

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ABSTRACT
The fracture of anterior teeth is a relatively frequent injury in children and young adolescents. This report describes the restoration procedures for severely fractured maxillary central incisor teeth using a guided anatomical incremental technique with the fiber-reinforced posts as well as an incremental resin composite and presents a 6 year follow-up outcomes. Clinical and radiographic examinations revealed no periodontal or periapical pathology, and no fracture or no serious discoloration on the restorations, suggesting the efficacy of the treatment for survival of the teeth.

Keywords: Anterior Layering Technique, Esthetics, Fiber-Reinforced Posts

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REHBER ANATOMİK TABAKALAMA TEKNİĞİ KULLANILARAK KOMPLİKE KIRIKLI ÜST ANTERIOR SANTRAL KESİCİLERİN ESTETİK OLARAK DÜZELTİLMESİ: BİR OLGU BİLDİRİMİ VE 6 YILLIK KLINİK TAKİBİ

Öz

Anahtar Kelimeler: Anterior Tabakalama Tekniği, Estetik, Fiberle Güçlendirilmiş Postlar

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INTRODUCTION

One of the most common dental problems during childhood and young adolescence is the fracture of anterior teeth by a traumatic injury. The majority of dental injuries include the maxillary incisors due to their position in the dental arch. It is important to maintain an immediate repair of these teeth not only to fix esthetic, functional and phonetic damage but also to overcome the psychologic effect of the trauma. Resin composites are preferred as a first-choice of material to restore fractured anterior teeth because of their quick and easy implementation, biocompatibility of the material, low cost, and minimal hard tissue removal. Furthermore, it is possible to imitate the optical properties of natural teeth with the new direct resin composite kits by using various dentine and enamel colors and make-up techniques. Fiber-reinforced posts are used with the resin composites to create a central support stump to restore the natural tooth morphology in the case of complicated crown fractures. Translucent fiber posts have gained popularity in the last few years, mainly due to the fact that they can be used in high-demand cosmetic procedures to mimic natural tooth especially under the composite restorations. It has been provided high esthetic results and similar mechanical properties to dental hard tissues by restoring endodontically treated teeth with extensive loss of tooth structure using the fiber-reinforced posts. This article describes the restoration procedures for horizontally fractured maxillary central incisor teeth using a novel guided anatomical incremental technique with the fiber-reinforced posts as well as an incremental resin composite and presents this clinical case of a 6-year follow-up.

CASE REPORT

A 19 year-old male patient was referred with a complaint of fractured composite restoration on the maxillary left central incisor during mastication. Both of the maxillary anterior central incisors had been fractured by an accident 2 years ago. Afterwards, the fractured teeth were endodontically treated and restored with composite resin using prefabricated metal pins by another private dentist. First of all, teeth were evaluated meticulously using radiographs and clinical evidences. Intraoral clinical examination revealed a half-part crown fracture on the maxillary left incisor, and an unesthetic as well as altered composite restoration with the gray shadow of a prefabricated metal pin on the maxillary right incisor (Figure 1). Initial color of the teeth was determined as A3 by using a color scale (Vita classical shade guide, Brea, CA, USA). After opening the endodontic access cavities in both teeth 1 mm below the cemento-enamel junction, resin modified glass-ionomer cement (Vitrebond, 3M ESPE, Seefeld, Germany) was inserted onto the gutta percha as a thin film (Figure 2). Devital bleaching was performed using a 35% hydrogen peroxide gel (Opalescence Endo, Ultradent, South Jordan, UT, USA) until the color of the teeth become A1 (Figure 3a and b). Diagnostic casts were obtained from the dental impression and waxed-up. A silicone guide was fabricated using a putty addition silicone material (Aquasil Soft Putty, Dentsply DeTrey, Konstanz, Germany). An impression of the palatal and incisal third of the teeth surfaces from the waxed-up cast was used as a dimensional guide for composite placement and symmetry (Figure 4). Unesthetic composite restoration and metal pins were removed from the right central incisor tooth. Then, enamel beveling was performed. Post spaces were prepared using a drill [size 3] from the fiber post system (FRC Postec, Ivoclar Vivadent, Schaan, Liechtenstein), according to the manufacturer’s instructions. Teeth were prepared with the help of the radiographs leaving at least 4 mm gutta percha apically. The root canal and coronal walls were etched with 35% phosphoric acid 15 seconds for dentin and 30 s for enamel, washed with water syringe and gently air-dried. Excess water was removed from the post space using paper points. Three step adhesive component (Syntac Primer, Syntac Adhesive and Heliobond, Ivoclar Vivadent, Schaan, Liechtenstein) was applied to the root canal and coronal
walls according to the manufacturer’s instructions. After the posts were silanized (Monobond-S, Ivoclar Vivadent, Schaan, Liechtenstein) for 60 seconds, a dual-cured resin cement (Variolink II, Ivoclar Vivadent, Schaan, Liechtenstein) was applied and the posts were inserted into the root canals. Excess material was removed with a microbrush and then the posts were light-cured for 60 seconds from each directions of labial, palatal and vertical.

Using a resin composite instrument, a thin layer of opaque enamel composite (Shade EA1, Opallis, FGM Products, Joinville, Brazil) was placed onto the silicone guide as a lingual shelf to establish the palatal contour and the new incisal edge (Figure 5). The excess material was removed and the resin composite was light-cured in position for 20 seconds. The artificial dentin (Shade DA1) was placed over the facial portion and sculpted in the shape of the lobes and developmental depressions (Figure 6). To mimic the halo effect of the natural enamel, a small increment of translucent composite (Shade T-Neutral, Opallis) was applied to the region of the incisal third between the mamelon spaces and extremities (Figure 7). The final layer, which corresponded to the artificial enamel, was restored.
with the same composite of shade EA1.

Increments of resin composite were light-cured according to the manufacturer’s instructions. A Mylar strip was placed interproximally and pulled through to aid in creating a tight contact point and the correct facial embrasure forms. Finally, both the buccal and palatal surfaces were cured for 40 seconds. Finishing and polishing procedure was performed with aluminium-oxide polishing discs (Kerr, Orange, USA) (Figures 8, 9).

DISCUSSION

Natural teeth exhibit translucency, opalescence, and fluorescence, all of which should be imitated by the restorative materials to maintain the clinical success.\textsuperscript{12}
Modern composite resins have different colors, hues, and opacities that mimic the chromacity and translucency of enamel as well as dentin. The composite used for the present case is a nano-hybrid, radiopaque, and light-curing resin with lifelike opalescence and fluorescence properties as well as a wide variety of enamel and dentin shades. The use of described anatomical incremental layering technique with this variety of composite shades allows imitation of the natural tooth color, contour, translucence, and texture. However, it is very difficult to layer artificial enamel and dentin composites according to the actual thickness of the missing natural enamel and dentin. In the present case, the silicone guided layering technique easily allowed the appropriate implementation of the enamel and dentin thicknesses by working directly from the buccal side after the formation of palatal enamel layer.

In the current case, glass-fiber-reinforced posts with an adhesive dual-curing resin cement were used to restore the fractured maxillary central incisors. This combination can increase the durability and survival of the restorations. Fiber-reinforced posts are often preferred in restorative dentistry because of their superior properties, such as dentin-like modulus of elasticity. These posts have also excellent esthetic properties, require less dentin removal, and can be bonded to dentin with the adhesive resin cements. Furthermore, the use of fiber-reinforced posts allows for the reduction of stress concentration and decreases the incidence of root fractures.

The efficiency of the combined restorative materials of fiber-reinforced posts and layering composite resins with the guided anatomical incremental technique was confirmed after the 6-year follow-up examination (Figures 10-13). No periodontal or periapical pathology (Figure 13), as well as no restoration fracture or dimensional changes were detected on the restored teeth after 6 years. Furthermore, patient satisfaction was high, and tooth functioning was good at baseline and after 6 years. Therefore, the restoration procedures described in this case report exhibit a successful prognosis.

The direct resin composite restoration technique continues to be popular for the restoration of fractured anterior teeth, as it is a conservative, less expensive, more simple procedure when compared to the prosthetic approach. There are some case reports describe the restoration of fractured anterior teeth with composite resins and/or post systems. However, there is a lack of well-controlled, independent and adequately-powered long-term randomized clinical trials on the restoration of fractured anterior teeth with contemporary adhesives and composites.
CONCLUSION

Glass-fiber-reinforced posts and composite materials can be a simple and efficient procedure for the treatment of anterior traumatized and fractured teeth by providing excellent esthetic and functional results. The adhesive bonding of a post to the root canal improves the prognosis of the restored tooth by strengthening tooth structure.

REFERENCES


