

Multidisciplinary treatment approach to a complicated crown fracture: A case report

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ABSTRACT

This case report presents multidisciplinary treatment approach in a 12-year-old male patient who suffered from a complicated crown fracture of the maxillary right central incisor that occurred due to a fall. The patient was evaluated from a multidisciplinary vantage point to provide function and esthetics. First, the fractured segment was removed from the tooth and gingivoplasty was performed. Fiber post was applied following root canal treatment and temporary restoration was performed. The axes of the teeth were corrected with short-term (4 months) fixed orthodontic treatment, and esthetic and appropriate tooth position was achieved on the zirconia-reinforced ceramic crown. A zirconia-reinforced ceramic crown was made using computer-aided design and manufacturing. A satisfactory esthetic appearance and function were achieved following the treatment. No problems were encountered in the tooth and periodontal area during the follow-up appointments. This case shows the significance of a multidisciplinary treatment approach in traumatized teeth.

Key words: Computer-aided Design, Tooth Crown, Tooth Fractures, Tooth Injuries

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INTRODUCTION

Dental injuries are commonly seen in children and adolescents due to falls, traffic accidents, or sports activities.^[1] Dental injuries in which the fracture line involves the enamel, dentin and pulp are defined as complicated crown fractures (CCFs).^[2] CCFs account for 2–13% of all dental injuries.^[3]

Treatment of the CCFs depends on several factors such as the position and location of the fracture line, exposition of roots, degree of pulp involvement, size, and color of pulpal hemorrhage and the possibility of placing the fractured segment into its position.^[3] Along with conservative therapies such as orthodontic treatment or surgical extrusion, making a crown following periodontal elongation of the crown^[4] or temporary or permanent restoration of fractured tooth part,^[5] radical treatments such as extracting the involved tooth and placing the implant or making fixed or mobile prosthesis^[6] are among the treatment options.^[7] However, in cases where the fracture line descends below the gingiva or when central occlusion is not convenient, a multidisciplinary approach

involving endodontic, orthodontic, and prosthetic treatments is required.^[8]

The aim of this case report is to present a multidisciplinary treatment approach performed on a patient with CCF in the maxillary right central incisor.

CASE REPORT

A 12-year-old male patient, who has no systemic disorders, was admitted to the Department of Pediatric

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Dentistry, Faculty of Dentistry, Cumhuriyet University, Sivas, Turkey because of a CCF in the maxillary right central incisor. Dental trauma has occurred 2 h prior as a result of a fall in school, and the fractured part was lost. The clinical examination did not reveal any abnormal notable evidence outside the mouth. The intraoral examination revealed a CCF of the maxillary right central incisor [Figures 1 and 2]. The radiologic examination, conducted with panoramic and periapical radiographies, revealed a horizontal fracture line in the maxillary right central incisor, while there was not any fracture or abnormal image of the chin, face, or alveolar bones [Figures 3 and 4].

The patient and his parents were informed, and treatment was initiated after obtaining a signed informed consent form. After removing the fractured segment

and gingivoplasty, the access cavity was prepared, and a rubber dam was applied. Necrotic pulp tissue was extirpated, and the working length was estimated as being 1 mm short of the radiographic apex. During the instrumentation, the canal was irrigated with 2.5% sodium hypochlorite (NaOCl) solution using a 27-gauge endodontic needle after each instrument. The final irrigation was performed with 2.5% NaOCl and 17% ethylenediaminetetraacetic acid (EDTA). Calcium hydroxide paste (Kalsin, Aksu Dental, İzmir) was placed as an intracanal medicament and the canal was then sealed with temporary cement. One week later, after removing calcium hydroxide paste and final irrigation with 2.5% NaOCl and 17% EDTA, the root canal was obturated using the lateral condensation method with Gutta-percha (Sure-Endo, Seoul, Korea) and AH plus sealer (Dentsply, De Trey GmbH, Germany), and



Figure 1: Intraoral buccal and occlusal view of the traumatized maxillary right central incisor with complicated crown fracture



Figure 2: Intraoral buccal and occlusal view of the traumatized maxillary right central incisor with complicated crown fracture



Figure 3: Preoperative panoramic view of the patient after dental trauma

temporary restoration of the tooth was performed with glass ionomer cement (Fuji IX, GC Corporation, Tokyo, Japan).

The root canal filling was removed up to the middle third of the root canal; a glass fiber post (EverStick POST, Stick Tech Ltd., Turku, Finland) that was sized appropriately to the root canal diameter was cut with a scalpel and was then applied and checked in the canal. After acid and etching, an ethanol-based dentin bonding agent was applied to the tooth surface for a moisturized link. A dual-cure adhesive (Variolink II, Ivoclar Vivadent) was stirred with a plastic tool on stirring paper and was treated with glass fiber post. The glass fiber post was placed on the relevant tooth and polymerized with 1400 mW/cm^2 – halogen light equipment (Valo, Ultradent Product, USA) for 20 s and the excess cement was cleaned. Then, composite (Spectrum TPH, Shade A2; Dentsply, USA) was polymerized by 2 mm thickness irradiation for 40 s using the layering method. The tooth was prepared, and temporary acrylic restoration was performed.

Because of impairment in axes of the adjacent teeth, there was not sufficient space for zirconium supported ceramic restoration, and therefore, fixed orthodontic treatment was indicated in the maxillary incisors. During the fixed orthodontic treatment that lasted 4 months, leveling and sequencing procedures were performed in maxillary incisors [Figure 5]. Following active orthodontic treatment, brackets were removed, and reinforcement treatment with

retainer was applied on the adjacent maxillary incisors to prevent relapse of previous positions.

The model obtained following the permanent mold taken with silicon from the patient was screened by the Dentalwings program (Yenadent D-Series, Katana™, Noritake) and transferred to a computer [Figure 6]. The restoration, which was designed on a computer, was then shaped in the router unit and treated with a sintering process for 10 h in a sinter oven. Following cementation, an appropriate esthetic appearance was achieved [Figure 7]. The patient was called for routine follow-up appointments on 1st, 3rd, 6th, and 12th months, and the radiologic follow-up was conducted [Figures 8 and 9]. In addition, orthodontic follow-up was planned for every 6 months.



Figure 4: Preoperative intraoral periapical radiograph of the patient after dental trauma

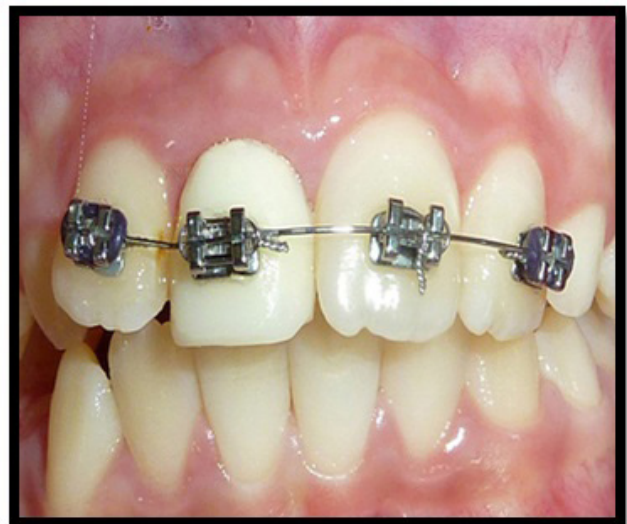


Figure 5: Leveling and sequencing maxillary incisors of the patient with a short-term (4 months) fixed orthodontic treatment

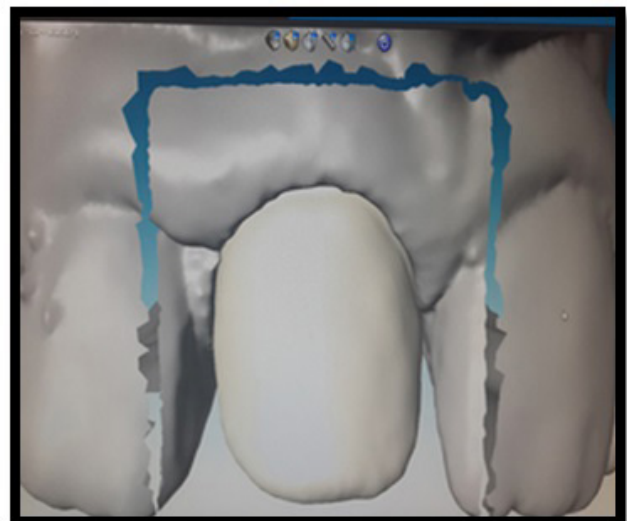


Figure 6: Preprosthetic planning of the zirconia-reinforced ceramic crown using computer-aided design and manufacturing



Figure 7: Intraoral view of the 1-week follow-up exam after prosthetic rehabilitation



Figure 8: Intraoral view of the 12-month follow-up exam

DISCUSSION

Various treatment approaches have been indicated for CCFs including; fragment removal followed by restoration, fragment reattachment, crown lengthening by gingivectomy, orthodontic extrusion, surgical extrusion or extraction followed by prosthetic rehabilitation.^[2,3,9,10] In the treatment of CCFs, treatment options depend on the type and level of the fracture.^[3]

In the treatment of the supragingival CCFs, the fragment reattachment technique provides an esthetic restoration with original form and color of the tooth.^[5,7] The treatment options for teeth with subgingival fractures aims to recontour a supragingival margin.^[11] Exposing the fracture line supragingival lets to achieve clinical

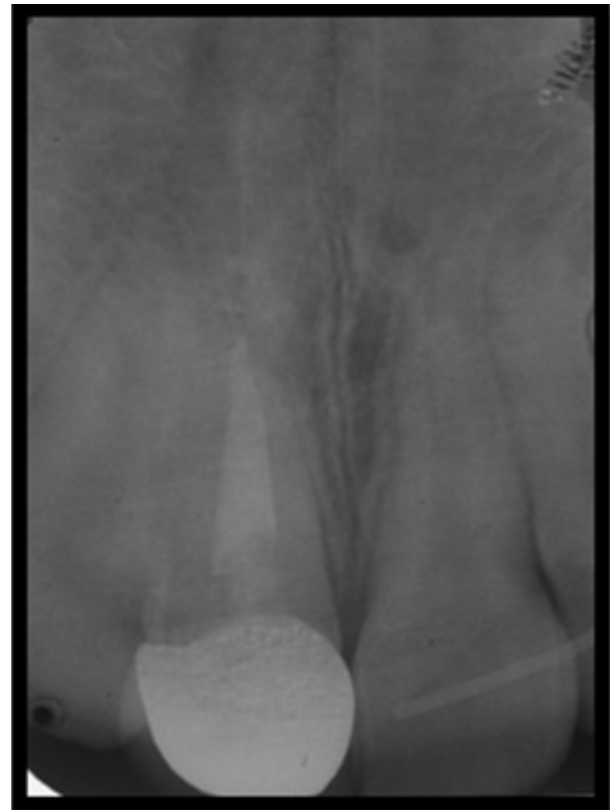


Figure 9: Intraoral periapical radiograph of the 12-month follow-up exam

treatment procedures under saliva and hemorrhage control. Gingivoplasty and osteotomy are simple crown lengthening procedures to perform clinically,^[3] but these techniques cannot meet esthetic requirements, and also decrease the crown-root ratio.^[12] Orthodontic and surgical methods are used to enhance the presence of healthy tooth tissue at the gingival level.^[13] Orthodontic extrusion lets physiological periodontal attachment and preserves alveolar bone,^[6] but as a clinical disadvantage, the technique requires multiple visits and patient cooperation.^[3] The surgical extrusion is one-visit and relatively simple procedure which also lets to examine the teeth extraoral.^[11] The disadvantage of this technique is the risk of pulpal vitality, which occurs in the 7–12% of cases.^[14] In the current study, the removal of the fractured part and gingival correction were sufficient because the fracture line was at the supragingival level. Furthermore, since the remaining coronal tooth tissue was sufficient in the prosthetic aspect, there was no need for extrusion or coronal elongation of the tooth.

In patients who received endodontic treatment and who displayed excessive amounts of crown loss, root support is needed because the remaining tooth tissue is not sufficient to support restoration.^[15] The use of the postsystem is recommended in teeth exposed to trauma where the fracture involves two-third of the crown part.^[16]

Fiber posts meet the esthetic needs. Furthermore, the elasticity modulus of the fiber posts are close to the root dentin. Therefore, they decrease the possibility of the development root fractures by leading to the accumulation of less stress.^[17] In the current case, who had esthetic concern in the first place, fiber postapplication was carried out.

Leveling and sequencing of the teeth in this region was accomplished with bonding done between the lateral teeth in the anterior maxilla. It is necessary to prevent the relapse of previous positions in traumatized teeth roots before permanent restoration is conducted.^[18] In this study, a retainer application was performed to avoid the relapse of the positions of the teeth roots.

In the current study, a zirconium-supported ceramic crown was created with the computer-aided design and manufacturing system to obtain a more esthetic appearance and to achieve more precise work.

In this clinical case report, which shows the importance of a multidisciplinary approach to meet the esthetic and functional needs, the traumatized maxillary right central incisor was in a satisfactory condition to meet the desired esthetic and functional need after the treatment. The clinical and radiological evaluation of the patient after 12 months revealed that the tooth and periodontal tissues were healthy.

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Conflicts of interest

There are no conflicts of interest.

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