

Aesthetic Rehabilitation of Anterior Tooth with Dental Trauma, Horizontal Root Fracture and Complicated Crown of Fracture: A Case Report

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Abstract

It is well known that the majority of dental injuries occur in children especially in maxillary anterior teeth; the injuries that occur in these teeth cause loss of function, problems in phonation in aesthetics and cause pain; furthermore psychological problems in the patient who undergo dental trauma may occur. Considering these reasons, it is extremely important to try to increase the retention time of these teeth with accurate-rapid diagnosis and treatment planning. In the treatment to be applied for this purpose, function and aesthetics should be restored, and the remaining tooth structure should be able to continue the jaw-face development. In this case report, it was aimed to restore the loss of aesthetic appearance of the patient with the help of endodontic treatment with MTA, glass fiber post and strip crown application in a horizontal root fracture in the maxillary left central tooth and a crown fracture including the pulp as a result of trauma.

Keywords: Dental trauma, horizontal root fracture, fiber post, strip crown, MTA.

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Introduction

Dental injuries often result from falls, traffic accidents, physical violence and sports events. These injuries occur with the greatest frequency in preschool, school age and young adults and cover 5% of all injuries that require treatment in humans. The teeth most affected by injury are the maxillary incisors due to the protrusive positioning of the teeth (1).

Dental injuries do not only occur at tooth, but often there's a combination of tooth injury and the structures that support the tooth. While the severity and shape of the injury affect the severity of the damage, the direction of the trauma and the tightness of the periodontal structures also change the shape of the injury. If the trauma force comes directly to the tooth, it will cause crown fracture, lip injuries and change in the position of the tooth, while if the force comes from a horizontal blow to the jaw, it is more likely to be a crown fracture or crown-root fracture. In addition, fracture of the lower jaw, temporo-

mandibular-joint (TMJ) luxation and concussion may also occur (2).

Dental injuries can range from a minor enamel fracture to more complex injuries in which one or more fractures of the crown or root occur. While the incidence of crown fractures in permanent teeth in dental injuries is 26-76%, this rate decreases to 0.3-5% in crown root fractures. Crown root fractures are a type of dental trauma involving enamel, dentin, pulp and cementum. This type of injury is defined as a complicated crown root fracture when it involves the pulp (1,3). In crown root fractures, it is seen that the maxillary central teeth are frequently affected. It is stated that the incidence of crown root fractures involving this type of pulp in the maxillary central incisors is 1.2% (4). Root fractures constitute 0.5-7% of permanent dentition injuries and 2-4% of primary dentition. According to the anatomical structure of the root, the fractures that occur in the root of the tooth as a result of trauma; coronal, middle and apical triple fractures are examined. Fractures occur mostly in the middle third of the root. Horizontal root fractures constitute 0.2-0.7% of them (1,5).

The prognosis in horizontal root fractures depends on the age of the patient, the localization of the root fracture, the mobility of the coronal fragment, and the root development stage (6).

As a treatment for horizontal root fractures is recommended filling of the coronal part, surgical removal of the apical part, surgical or orthodontic extrusion of the apical part, endodontic implants and intracanal splint application combining fractures (7,8). If the fracture line is close to the cervical region, osteoplasty and osteotomy procedures can be performed in addition to flap surgery (6). Sometimes, if the traumatized tooth is still alive, it has also been observed that root fractures can heal spontaneously without any treatment (8,9).

Many techniques and materials are preferred, such as restoration of fractured teeth caused by trauma, direct or indirect composite restorations, ceramic or metal crowns, post-core applications, reattachment treatment with the patient's own tooth fragment (10).

Pulp necrosis is seen in 5-25% of root fractures (1). In the case of a root fracture, the coronal fragment apex can be considered an open tooth and an adequate crown:root ratio should be considered (11). For a successful outcome, closure of the open apex with a biocompatible material followed by guttapercha obstruction is essential

(12). Mineral Trioxide Aggregate (MTA), one of the most preferred biocompatible materials, seems to be an ideal material to be used as a fracture line plug in horizontal root fractures. However, the number of studies on the use of MTA for this purpose is limited. There are no cases with long-term follow-up, especially in children. Pulp necrosis of the apical fragment is extremely rare in cases of root fracture (13). In these cases, endodontic treatment of the coronal fragment and surgical removal of the infected apical fragment are recommended because adequate sealing of the root canal in the apical fragment is not possible with conventional endodontics (14).

In the past, low success rates were obtained in the restoration of teeth whose coronal part was broken as a result of excessive material loss and trauma, and mostly the teeth in this situation were extracted. In today's conditions, this type of complicated fractures allows a tooth to be used for many years with optimum treatment conditions after endodontic treatment (15). Post-core restorative systems are one of these treatment methods. Thus, the remaining dental tissues are used more effectively and it is possible to increase the durability of the tooth and restoration. Nowadays, aesthetic post-core systems have been developed with the increasing aesthetic expectations of patients. Fiber posts show higher bond strength with dentin and/or composite core, and better force transmission under force (16).

In this case report, it was aimed to treat the complicated crown fracture of the maxillary left central incisor and the horizontal root fracture in the middle third, endodontic treatment with MTA, and aesthetic treatment with fiber post and strip crown application.

Case Report

A 12-year-old girl, came to the attention of the pediatric dentistry clinic of Harran University, Şanlıurfa/TURKEY 1 month after a fracture in her maxillary left central incisor due to a traffic accident. She previously went to 2 different dental clinics.

In the intra-oral examination, tooth number 21 was fractured from the cervical region and its pulp was perforated; a horizontal root fracture was detected in the radiographic examination. Patient and parents referred that the broken coronal piece could not be found. The patient had no systemic health problems. (Figure 1-2)



Figure 1. Radiographic image taken before treatment.



Figure 2. Clinical image taken before treatment.

Informed consent was obtained from the parents and treatment was started. Endodontic treatment of teeth 21 was started in the same session. Pulp extirpation was performed by opening the access cavity. Irrigation was performed with 2 ml of 2.5% sodium hypochlorite in tooth number 21. Afterwards, the canals were dried with sterile paper points and filled with calcium hydroxide temporary canal sealer (calcine), and the access cavities were closed with temporary filling material (Cavit, 3M, ESPE, Seefeld, Germany). After 1 month, when the patient came for a new appointment no pain on percussion and palpation in tooth 21 was detected. Root canal irrigation was performed with 2 ml of 17% EDTA and 2 ml of 2.5% NaClO solution to remove calcium hydroxide and smear layer in the canal. The plug was created by

widening with standard canal files (Denco K and H File standard Canal file, Shenzhen perfect medical, China) until the fracture line between the coronal and the apical fragment. Then, after the canal was dried with sterile paper points, MTA (MTA Angelus, Brazil) was placed on the coronal fracture line and closed with temporary filling material (Cavit, 3M, ESPE, Seefeld, Germany). (Figure 3-4)



Figure 3. Radiographic image of endodontic treatment with MTA.



Figure 4. Intraoral view of endodontic treatment with MTA.

One week later, gingivectomy was performed. (Figure 5) Afterwards, the bleeding was controlled and glass-fiber post application was carried out. Cementation of the fiber post was performed with a dual-cure bonding system (Panavia SA Cement Universal,

Kuraray Noritake Dental, Japan) according to the manufacturer's instructions. First of all, the fiber-post was rehearsed in the prepared post cavity (Figure 6) and irrigated with 2ml saline and dried with paper points. Self etch universal bond (single bond universal, 3M, ESPE, Germany) was applied to both posts and canal walls with the help of a bond applicator and dried slightly. Resin cement (Panavia SA Cement Universal, Kuraray Noritake Dental, Japan) was mixed with catalyst and base at a ratio of 1:1 and applied to the post surface and sent to the canal. The post was placed in the canal and cured with light (Woodpecker LED-C beam filler, China) for 40 seconds.

applicator and polymerized with light (Woodpecker LED-C beam filler, China) for 20 seconds. First, the flowable composite A1 was applied to the tooth enamel and polymerized with light (Woodpecker LED-C beam filling device, China) for 40 seconds. Then, composite tube A3 (Filtek Z250,3M, ESPE, Germany) was inserted into the strip crown, which was aligned with the crown of the tooth, and adapted to the tooth, and final light-curing was performed. In the session after 1 week, the upper central teeth were splinted with 0.9 mm orthodontic wire due to the mobility of the tooth, and occlusal contacts were prevented. The patient was followed up. (Figure 7-8)



Figure 5. Intraoral image after gingivectomy.

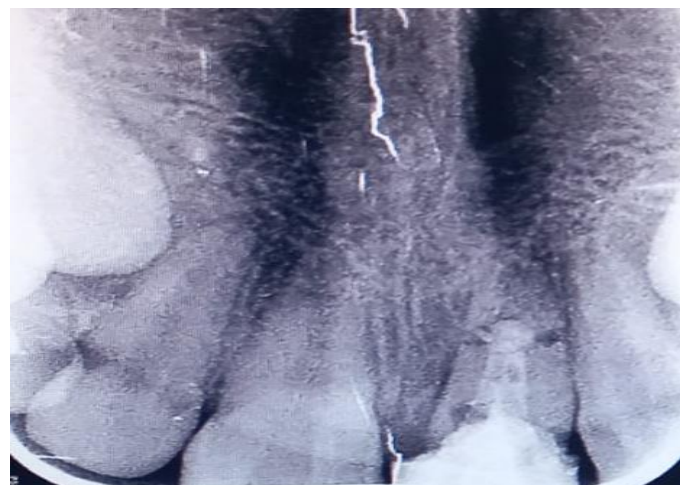


Figure 7. Fiber-post final radiographic image.



Figure 6. Fiber-post rehearsal image of the patient's mouth.



Figure 8. Final restoration image of the patient.

In the next step, the restoration was completed with the appropriate strip crown (anterior translucent crowns, Tor Vm, Russia). First of all, 37% phosphoric acid (President dental etching gel, Germany) was applied to the enamel for 30 seconds, washed and dried slightly. Self-etch universal bond (single bond universal, 3M, ESPE, Germany) was applied with the help of a bond

Discussion

In cases of horizontal root fractures, in cases where there is no bacterial entry from the coronal pulp tissue to the deteriorated epithelial attachment and proper fixation is provided, the healing of the fractured

tooth without any treatment can be expected with splint applications. However, complications such as pulpal necrosis, radicular resorption and pulpal canal obstruction may occur(14). Lindahl suggested that root fractures could heal with endodontic treatment(17). Basically, 4 types of conservative endodontic treatment methods have been defined in teeth with horizontal root fractures: Endodontic treatment of the coronal fragment using guttaperca, endodontic treatment of both fractured fragments, endodontic treatment of the coronal fragment and surgical removal of the apical fragment. It has been observed in many studies that the vitality of the apical fragment is generally preserved in cases where there is necrosis of the pulp(18). There fore, endodontic treatment of only the coronal fragment was sufficient in our case. However, it is very difficult to create an apical stop and seal the coronal fragment. Endodontic treatment of the coronal fragment of fractured teeth using guttaperca is similar to the difficulties that may occur in the treatment of immature teeth. The coronal fragment of the fractured tooth is accepted as an immature tooth and its treatment is similar to that of these teeth. The wide root canal opening in the fracture area and the increase in the inter-fragment distance will cause difficulties during proper mechanical preparation of the root canal and adaptation of the canal filling(17) Cvek et al., in their study compared the treatments applied in root fracture cases and reported that teeth with an apical barrier using calcium hydroxide and then filled with guttaperca showed 86% improvement and the treatment of these teeth was found to be more successful than teeth treated with gutaperca without calcium hydroxide application(14). In our case, we considered the apex of the coronal fragment of the upper left central tooth with a root fracture as an open tooth and used MTA material, which has a better quality due to its content of calcium hydroxide treatment procedure.

Treatment options for anterior teeth lost in pediatric patients; removable partial dentures, Maryland bridges, adhesive bridges, fixed partial dentures, or dental implants. The treatment method depends on the number of missing teeth, the size of the edentulous space, the patient's occlusion, the presence of parafunctional habits, the level of alveolar bone, the patient's aesthetic expectations and the age of the patient. According to many studies, dental implant applications are the most advantageous of these treatment options. However, the use of dental implants in pediatric patients whose growth and development continues is not recommended; it has been stated that the implants to be applied at an

early age may be displaced due to the growth of the jaws and adversely affect the growth in the area where they are applied.(19).

In pediatric patients, loss of anterior teeth at an early age, especially due to trauma, causes resorption in the alveolar bone after tooth extraction. Thus, aesthetic problems occur when implant applications are required after the completion of growth and development in the same patients. As a result, in this case, while MTA endodontic treatment was applied to the coronal fragment of the tooth with an indication for extraction, its apical fragment was not touched. In addition, strip crown application was made with fiber post for aesthetic appearance. With this procedure, it is aimed to prevent bone loss that may occur due to tooth extraction at an early age, and to allow an aesthetic implant application when the patient's growth development is completed. With the strip crown application, it was aimed to prevent the negative impact of the patient's psychology by restoring the lost aesthetic appearance of the patient.

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