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Immediate Esthetic Management of Complicated Crown - Root Fracture: A Case Report

Abstract

Dental trauma sometimes causes fractures in the maxillary anterior teeth leading to esthetic, functional and phonetic quandaries. In this report, we describe the treatment of middle third root fracture of maxillary centrals and cervical third crown fracture of lateral incisor simultaneously fractured due to dental trauma. Treatment involved reattachment and splinting of fractured fragments with glass –fibre and composite resin in case of lateral incisor. This reattachment technique, which uses advanced adhesive systems, is an alternative that offers satisfactory esthetic and functional results. For the two maxillary central incisors with horizontal root fractures, the management and 2 year follow-up with mineral trioxide aggregate (MTA) as apical plug is described. Among the treatment options for such cases, the treating clinician considered splinting procedure to be the best choice. Healing was achieved without any need for further interventions.

Key Words

Horizontal root fracture; MTA; ribbon splinting; traumatic injury

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INTRODUCTION

Mid root fractures due to trauma occur most commonly in maxillary anterior teeth due to their position. These fractures can be transverse to oblique and may be single or multiple, complete or incomplete. The diagnosis of root fracture is established by the radiographic examination; clinically the fractured tooth is slightly extruded and displaced palatally.^[1] The treatment principle for horizontally fractured teeth is to reposition and stabilize the coronal fragments in its anatomically correct position as soon as possible to optimize healing of the periodontal ligament and neurovascular supply.^[1] In permanent teeth location of root fracture has not been shown to effect pulp survival after injury. So, preservation of teeth with root fractures even in tooth's cervical third should be attempted.^[2] Significant factor which influences healing process in cases of horizontal fractures is the presence or absence of communication of the fracture line with the oral environment because of contamination from bacteria present in the sulcus.^[3]

Clinical management of a horizontal root fracture depends on unlike variables, such as age of the patient, mobility of the coronal fragment, location of the root fracture and stage of root formation.^[2] Young age, immature root formation, positive pulp sensitivity at the time of injury and approximating the dislocation within 1mm have been found to be advantageous to both pulp healing and hard tissue repair of the fracture.^[2] Root fracture treatment options include either stabilization of tooth with a splint only, obturation of the coronal fragment, surgical extraction of the apical fragment, extraction of the coronal fragment and orthodontic or surgical extrusion of the apical fragment, endodontic implants and intraradicular splinting to coalesce them.^[2] Also, spontaneous healing of the root fractures without treatment has been documented.^[4] When the coronal fragment is nonvital, root canal treatment should be performed. The use of an intracanal calcium hydroxide dressing may provide a hard tissue barrier at the apical end of the coronal fragment.^[5] However, the intracanal calcium



Fig. 1: Fractured Crown of Maxillary Right Lateral Incisor



Fig. 3: Clinical Picture Showing wire splint



Fig. 5: Clinical picture showing Ribbon splint after crown fabrication



Fig. 7: Radiograph after 24 months

hydroxide dressing requires a long treatment time and this application needs periodic changes of the material. Mineral trioxide aggregate (MTA) has been shown to be very effective in sealing the pathways of communication between the root canal system and the external surface of the tooth.^[6] It has several potential clinical applications owing to its superior sealing property and biocompatibility.^[7] MTA has been recommended and also used



Fig. 2: Radiograph of 11 and 21 showing fracture line and periapical status



Fig. 4: Radiograph of 11 and 21 showing MTA in the fracture line and canal obturation



Fig. 6: Clinical picture after Ribbon removal

successfully in teeth with necrotic pulp with open apices.^[6] The aim of this article is to report successful management of mid root fracture with MTA. The fractured maxillary teeth were successfully brought to an acceptable immediate esthetics using ribbon splinting material.

CASE REPORT

A 17 year old boy presented with the chief complaint of mobile and deranged maxillary central incisors, maxillary right lateral incisor. The patient was in good health with no abnormal medical abnormalities. Extraoral examination showed a balanced facial pattern. Intraoral examination revealed lingually displaced and extruded maxillary central incisors (Fig. 1), cervical third crown fracture of maxillary right lateral incisor and cervical third oblique fracture of mandibular right central incisor. Mandibular incisor fracture line was oblique, elongating in apical direction from labial to lingual surface. All the effected teeth had grade II

mobility. The patient had a history of trauma one day back. Pulp test of the involved teeth was non responsive and sensitive to percussion. A radiographic examination showed middle third horizontal root fracture of the maxillary central incisors, cervical third crown fracture of maxillary lateral incisor (Fig. 2).

Treatment Plan

Treatment objective included restoring the normal esthetic appearance of maxillary and mandibular anterior region. Various treatment options were presented to the patient with their advantages and disadvantages, including: 1) extraction of the traumatized maxillary central incisors and replacement with prosthesis; 2) root canal treatment of coronal and apical segments (if segments are not separated); 3) placement of endodontic implant with or without periapical surgery; 4) root canal treatment of coronal segment only. Of the various treatment options explained to the patient, he preferred to retain his natural teeth as he was very apprehensive about his fractured teeth. He was assured and the condition was explicated to the patient.

Treatment Method

The treatment implemented was immediate repositioning of displaced teeth by digital manipulation. Position of reduced segments was checked radiographically. Following reduction, a steel wire passive splint (Fig. 3) was applied to teeth with flowable light cure composite (Ivoclar Vivadent, Bendererstrasse Liechtenstein) for a period of 4 weeks to ensure hard tissue consolidation. Endodontic treatment was carried out, the access cavity was prepared ideally, the contaminated canal remnants were removed and the working length was obtained. The root canal was instrumented to the fault line for maxillary central incisors with size 60 K-file (Dentsply-Maillefer, Ballaigues, Switzerland) using a step-back technique. During the instrumentation, the canal was irrigated with normal saline after each instrument and 2% chlorhexidine gluconate (Klorhex; Drogosan, Ankara, Turkey). The canals were dried with sterile paper points (Diadent, Chongju City, Korea). Initially a paste of calcium hydroxide was packed into the canals to the fracture lines. The coronal access was sealed with zincoxide eugenol cement. After one week the teeth were reinstrumented, the intracanal dressings were removed and the fracture lines plugged with ProRoot MTA (Dentsply Tulsa Dental). MTA was

mixed in a 3:1 proportion and taken to the fracture line with a plugger and condensed with a large reverse gutta percha point. Radiograph was taken to ensure control of the filling. After MTA placement the root canal was left with a cotton pellet moistened with distilled water for 24 hours. After 24 hours the cotton pellets were taken out and the teeth were obturated with gutta percha and AH Plus (De Trey Dentsply). The access cavities were restored with Filtek Z250 composite resin (3M-Espe). For Maxillary right lateral incisor access was prepared after stabilizing the crown by bonding with flowable composite. Canal was instrumented with hand K files using a step-back technique and subsequently obturated with gutta percha and AH Plus sealer (Fig. 4). Post space was prepared and a fiber post (Para Post[®] Taper Lux[™], Coltene Whaldent, USA) was tried in and was bonded to the tooth utilizing an etchant, primer, adhesive and resin composite technique. A total-etch bonding agent (Adper[™] Single Bond 2, 3M ESPE, USA) was applied to the canal. The post and the canal were coated with resin-based cement (Rely X[™] ARC, 3M ESPE, USA) and post was cemented in the canal. The Fiber post further reinforced coronal fragment in its anatomic position. After 2 weeks wire splint was removed, lateral incisor was prepared for crown and a crown was cemented. A labial fiber reinforced composite (Ribbond[®], Ribbond Inc., USA) was done after cementation of crown (Fig. 5). Root canal treatment followed by post placement and crown fabrication was done for mandibular central incisor. Short term follow up for both of the cases showed promising results (Fig. 6). Patient was comfortable and no periapical pathology had developed. Twenty four month recall radiograph showed complete healing between the fragments (Fig. 7).

DISCUSSION

Facial trauma that results in fractured, displaced or lost teeth can have paramount negative functional, esthetic and psychological effects on patients. Quick restoration of the esthetic appearance and relief of discomfort may lead to a positive emotional and social response from the patient. Since the patient had high level of esthetic demand, an attempt to preserve the tooth was chosen. The technique described in the present case report is simple, expeditious and economic compared with other more invasive procedures. Root fracture involves the pulp, dentin, cementum and the periodontal ligament. Intra-alveolar root fractures occur less

frequently compared with other dental injuries and account for probably less than 3% of all dental traumas.^[8] When pulp necrosis arises, the apical part of the fractured tooth generally remains vital. Therefore, root canal therapy is applied only to the coronal fragment, but it is arduous to seal the coronal part, because an apical stop is often infeasible to achieve.^[9] The initial treatment for root fracture consists of repositioning the coronal segment and then stabilizing the tooth to allow healing of the periodontal ligament supporting the coronal segment. It is recommended that when the coronal segment has been luxated, the treatment should be semi-rigid stabilization for a few weeks.^[8] Rejuvenating in teeth with horizontal fracture is with one of these types: rejuvenating with hard tissue, interposition of connective tissue, interposition of bone and connective tissue and interposition of granulation tissue. While the first three types are considered auspicious and the 'healing with hard tissue' is the most desired, the last one represents inflammatory state and is unpropitious.^[10] With the materials available today, in conjunction with a congruous technique, esthetic results can be achieved with prognosticable outcomes.

CONCLUSION

In this case treatment of horizontal root fractured tooth was carried out with MTA plug and Gutta Percha obturation. Ribbond splint was used to provide esthetic. Availability of bondable material, like fiber posts and MTA have put forth varied treatment options for clinicians in the management of mid root fractures. The final result is a conservative restoration that required little time to complete.

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