

Clinical Management of a Complicated Crown-Root Fracture of Maxillary Central Incisor in a 12-Year-Old Patient

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Abstract

Traumatic injuries to permanent maxillary anterior teeth are seen commonly in children. Esthetic and functional rehabilitation of these teeth is important. A 12-year-old male patient reported to the Department of Paedodontics and Preventive Dentistry with fracture of the permanent maxillary right central incisor. Clinical and radiographic examinations revealed the presence of a complicated crown-root fracture. This case report describes the management of complicated crown-root fracture by endodontic therapy, orthodontic extrusion, fiber post placement, core build-up with composite, and esthetic restoration using polycarbonate crown.

Keywords: Crown-root fracture, glass fiber post, orthodontic extrusion, polycarbonate crown, trauma

INTRODUCTION

Traumatic injuries to teeth and their supporting tissues usually occur in children and damage may vary from enamel fracture to avulsion, with or without pulpal involvement or alveolar bone fracture. A crown-root fracture is a type of dental trauma, usually resulting from horizontal impact, which involves enamel, dentin, and cementum, occurs below the gingival margin, and may be classified as complicated or uncomplicated, depending on the presence or absence of pulp involvement.^[1,2]

Crown-root fractures of permanent anterior teeth in young patients lead to functional and esthetic problems.^[3,4] The most commonly affected tooth is the maxillary central incisor (58.3%). Crown-root fractures in maxillary arch are seen commonly between 11- and 18-year-old adolescents and frequently present treatment problems due to the complex nature of the injury.^[5-7]

This case report describes the management of complicated crown-root fracture by endodontic treatment, orthodontic root extrusion, and esthetic restoration using polycarbonate crown in a 12-year-old male patient.

CASE REPORT

A 12-year-old boy reported to the Department of Paedodontics and Preventive Dentistry, Terna Dental College with the chief

complaint of broken upper front tooth. The patient had a history of trauma to the anterior teeth 5 days ago due to fall while playing. The medical history was not significant and the findings of the extraoral examination were unremarkable. Intraoral examination revealed a complicated crown-root fracture in the maxillary right central incisor with a mobile tooth fragment that extended subgingivally in the palatal region [Figure 1]. Radiographic examination using intraoral periapical radiograph confirmed the findings of the clinical examination; the fracture line on the palatal side could be traced 2 mm below the alveolar crest. Closed apex was present with maxillary right central incisor. The periodontal space around the tooth appeared to be normal, and there were no pathologic findings in adjacent teeth [Figure 2].

On the basis of clinical and radiographic findings, a diagnosis of complicated crown-root oblique fracture, Andreasen's classification 502.54 was made.

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A definitive treatment plan was made as follows: removal of fractured fragment under local anesthesia followed by endodontic therapy of residual tooth. Following this, orthodontic extrusion to move the fracture line 3 mm above the alveolar crest was planned to regain the lost biologic width. The treatment option was explained to the parents and consent was obtained for the treatment.

Anesthesia was established by local infiltration of lidocaine with 1:80,000 adrenaline. After removal of the loose fragment, the tooth margin was clinically visible on the labial side but not on the palatal side. Probing with a periodontal probe revealed that the tooth margin on the palatal side was located subgingivally and below the alveolar crest level.

Root canal treatment was initiated. After preparing an endodontic access cavity, the root canal working length was determined to be 20 mm with a periapical radiograph. The canal was prepared using ProTaper® rotary instruments (Dentsply-Maillefer, Switzerland) till F2. After the canal preparation, F2 size gutta-percha cone was lightly coated with an epoxy resin-based sealer (AH Plus Jet, DentsplyDeTrey, Konstanz, Germany) and the root canal treatment was completed [Figure 3].

Post space was prepared with the help of Peeso reamer size 3 (Mani, INC, Japan) [Figure 3]. A “J” shaped post hook was prepared using 19-gauge stainless steel wire and cemented with glass ionomer cement. Brackets were placed on maxillary right lateral incisor and left central incisor. Extrusion was activated by elastic which was attached to the brackets and “J” hook. Within a span of 2 weeks, 1 mm extrusion was observed [Figure 4]. However, 1 mm mesial tipping of maxillary right lateral incisor was also observed. Hence, brackets were also placed on both right maxillary premolars, and E chain was placed to reposition the right lateral incisor [Figure 5]. Within 4 weeks, the desirable 3 mm extrusion was observed along with repositioning of the right lateral incisor. The brackets and J hook were then debonded [Figure 5].

Glass fiber post (Reforpost, Angelus® Ind. e Com Ltda. Londrina, PR, Brazil) was placed into the root canal for supporting the coronal fragment. Size 2 glass fiber post (Reforpost, Angelus® Ind. e Com Ltda. Londrina, PR, Brazil) with a 1.4 mm diameter was placed at the length of 12 mm and was luted. After cutting the excessive post, core buildup was done using composite resin (SDI, Australia) [Figure 6]. Tooth preparation was done to receive polycarbonate crown. Following tooth preparation and necessary adjustments in the crown, the polycarbonate crown was cemented using luting glass ionomer cement and postoperative radiograph was taken (Fuji 1, GC Europe) [Figure 7].

DISCUSSION

For cases of complicated crown-root fractures, there are several proposed treatment options including a mucogingival flap, an osteotomy/osteoplasty, and orthodontic or surgical extrusion followed by the reattachment of the original fragment. Another



Figure 1: Preoperative intraoral photograph showing complicated crown-root fracture with right maxillary central incisor.



Figure 2: Preoperative intraoral periapical radiograph showing radiolucent line seen below cemento enamel junction.

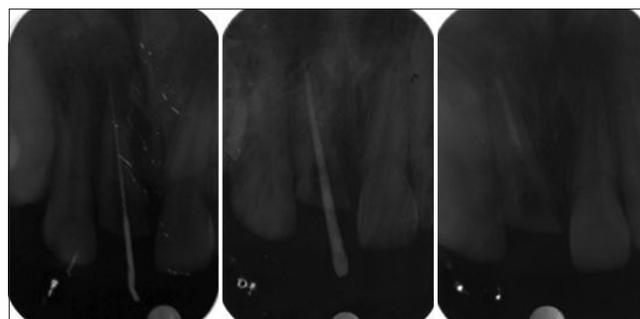


Figure 3: Root canal treatment with 11 done with rotary ProTaper files followed by postspace preparation.

option includes the restoration of the tooth crown with a restorative material or prosthetic rehabilitation of the tooth depending on the location of the fracture line.^[8-10] Extraction is also an option followed by tooth replacement.

Orthodontic extrusion of a fractured tooth maintains the periodontal tissues at the same level and restores physiological



Figure 4: Intracanal J hook placement and brackets placement.



Figure 5: Distalization of right lateral incisor.



Figure 6: Core buildup and tooth preparation.



Figure 7: Postoperative photograph and radiograph following cementation of polycarbonate crown.

attachment. A 3–4 mm distance from the alveolar crest to the coronal extension of the remaining tooth structure has been recommended for optimal periodontal health.^[11] The forced eruption should be maximum 5 mm according to Ingle and was limited to 3 mm in the present case.^[12] Orthodontic extrusion leads to supragingival positioning of the fracture line.

To reinforce the cervical portion of the tooth to receive a coronal restoration, it is recommended to use an intracanal post. The post also minimizes the stresses.^[13] It has been suggested that the use of a long, thin fiber post is effective for reducing the tensile stress that can lead to tooth root fractures of the anterior teeth with endodontic treatments.^[14] In the present case, the fracture line was extending subgingivally, and the tooth required root canal treatment. Hence, it was decided to gain intraradicular retention using fiber posts.

At 6-month follow-up, patient was asymptomatic. Clinical evaluation revealed 0.5 mm apical migration of gingival margin and incisal edge of 11. However, there was no tooth mobility or periodontal pocket formation. Radiographic evaluation at 6 months revealed no abnormality [Figure 8].

Long-term follow-up of the present case is needed to ascertain the long-term clinical success based on clinical and radiographic examinations.

CONCLUSION

Crown-root fractures localized in the anterior region need to be evaluated from several perspectives including tooth vitality, tissues involved, fracture location, and the quantity of remaining tooth structure. In the present case, a tooth with complicated crown-root fracture was successfully managed by endodontic therapy, orthodontic extrusion, fiber post placement, core build-up with composite, and esthetic restoration using polycarbonate crown. Long-term follow-up is required to evaluate the long-term clinical success of the case.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published and due efforts will be made to conceal patient identity, but anonymity cannot be guaranteed.



Figure 8: Six-month follow-up photograph and radiograph.

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Conflicts of interest

There are no conflicts of interest.

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