Dental Research Journal

Case Report

Multidisciplinary management of subgingival crown–root fracture of an immature permanent maxillary central incisor

Samir Zahedpasha[1], Hengameh Safarcherati[2], Manouchehr Rahmati-Kamel[3], Javad Mehrani-Sabet[4]

[1]Departments of Endodontics, [2]Restorative Dentistry, [3]Orthodontics, Faculty of Dentistry, Babol University of Medical Sciences, Babol, [4]Department of Periodontics, Mazandaran University of Medical Sciences, Sari, Iran

Received: February 2011
Accepted: December 2011

Address for correspondence:
Dr. Samir Zahedpasha, Department of Endodontics, Faculty of Dentistry, Babol University of Medical Sciences, Babol, Iran.
E-mail: Samirzahedpasha@gmail.com

ABSTRACT

This case report describes the multidisciplinary management of subgingival horizontal crown–root fracture of an immature permanent maxillary central incisor in a 10-year-old boy. After removal of the fractured fragment, pulpotomy was performed within 48 h from the injury to promote apexogenesis. The tooth was orthodontically extruded until the fracture line was located above the alveolar bone level. Frenectomy, supracrestal fiberotomy, and crown lengthening were performed after adequate stabilization of the extruded tooth for 5 months. Finally, the tooth was restored with composite resin by using the acid etch technique. This report highlights that a multidisciplinary treatment approach with strict cooperation among specialists to manage a complicated crown–root fracture can save and restore a traumatized immature permanent tooth.

Key Words: Complicated crown–root fracture, immature incisor, traumatized tooth

INTRODUCTION

Subgingival fracture or fracture of a tooth below the gingival attachment or alveolar crest level presents esthetic, functional, and psychological sequelae.[1,2] Teeth with such injury are often considered hopeless and are extracted.[3] The time between the injury and the initiation of treatment, level of the fracture line, and stage of root development are some criteria to be considered when choosing a treatment approach for a complicated tooth fracture. In young permanent teeth, pulpotomy is classically performed to promote apexogenesis;[4] if this procedure ensures a tight seal, root canal treatment is not necessary.[5] Further, orthodontic extrusion, or forced eruption, is as an alternative to crown lengthening, which involves the removal of supporting alveolar bone and can compromise esthetics.[6] This case report describes the multidisciplinary management of subgingival horizontal crown–root fracture of an immature permanent maxillary central incisor.

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CASE REPORT

A 10-year-old boy was referred to our dental clinic 12 h after he had slipped on the ground and injured his anterior tooth. He did not have a significant medical history, and the results of the extraoral examination were unremarkable. The patient had Class II deep bite, which increases susceptibility to anterior tooth injury. Intraoral examination revealed horizontal fracture at the cervical margin of tooth #9 extending toward the palatal side. Tooth #23 also had a small coronal fracture. All the incisors and canines except tooth #9 responded normally to thermal and electric pulp testing, which signifies healthy pulp tissue. The apices of the maxillary central incisors were not completely formed. Radiographic examination verified the fracture of tooth #9 [Figure 1]. Anesthesia was established by local infiltration of 1.8 mL

lidocaine with 1:100,000 epinephrine. After removal of the loose fragment, the tooth margin was clinically visible on the labial side but not on the palatal side [Figure 2]. Probing with a periodontal probe revealed that the tooth margin on the palatal side was located subgingivally and below the alveolar crest level.

Different treatment options were explained to the patient, and consent was obtained from his parents for the treatment chosen. The tooth was isolated with a rubber dam. Vital pulp therapy with mineral trioxide aggregate (MTA) and temporary restoration with glass ionomer cement (GIC) were performed [Figure 3]. The orthodontic treatment consisted of forced eruption of the fractured tooth [Figures 4 and 5]. Four millimeter extrusion was considered adequate to provide sufficient biological width. An extrusion force of about 20–40 g was applied. After 4 weeks of orthodontic treatment, a favorable response was observed, but adequate extrusion occurred after 9 weeks [Figures 6 and 7]. At this time, active orthodontic treatment was stopped, and the tooth was stabilized for 5 months to allow sufficient time for healing of the socket. Thereafter, frenectomy and supracrestal fiberotomy were performed. Two months later, crown lengthening was also performed [Figure 8]. Eight weeks after crown lengthening, the tooth was finally restored with composite resin by using the acid etch technique [Figures 9 and 10]. Periodic follow-up examinations were carried out: pulp sensitivity was tested and periapical radiographs were recorded to follow the root development. The periapical region appeared normal and the root apex completely formed during the treatment. Two years later, hard bridge formation was evident under the MTA dressing [Figure 11].

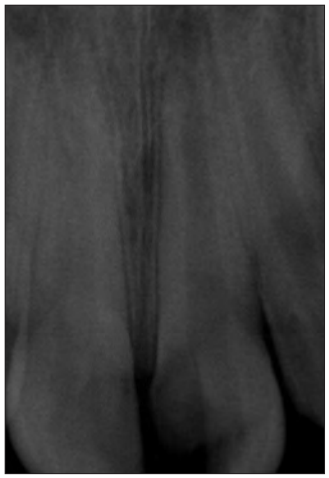

Figure 1: Radiographic image of the fractured tooth (#9)

Figure 3: Vital pulp therapy of the tooth #9 using MTA on the exposed pulp

DISCUSSION

Subgingival fracture of a tooth presents a challenging restorative problem and needs efficient assessment

Figure 2: Occlusal view of the remained crown

Figure 4: Buccal orthodontic appliance bonded to #9

Figure 5: Lingual view of tooth #9 on the first day of bonding orthodontic appliance

Figure 6: Buccal view at 9 weeks of extrusion

Figure 7: Radiographic view at 9 weeks of extrusion

Figure 8: Buccal view at 2 weeks after crown lengthening procedure

Figure 9: Restoration of the tooth #9 with a composite resin using the acid etch technique

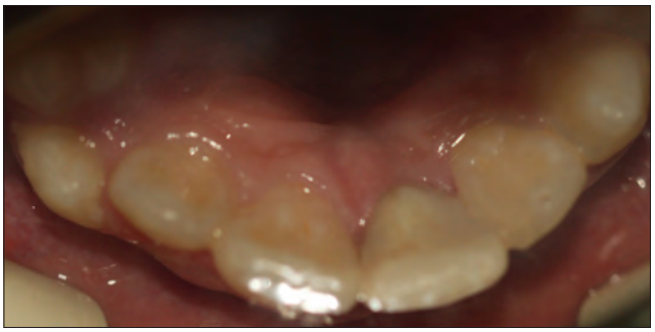

Figure 10: Palatal view of the restored tooth

for treatment.[7,8] Extraction should not be the first choice of treatment for extensively damaged young permanent teeth in the anterior region; instead, alternative treatment modalities must be considered.[1] Age is an important criterion for managing a tooth with pulp exposure,[9] because older pulps are less cellular and more fibrous, and may have less blood supply, affecting the treatment outcome.[10]

In our case, we used white MTA because of esthetic concerns. We waited for 45 min to allow the material to set before placing GIC.[4] The main reason for forced eruption was to ensure sufficient tooth structure to create a ferrule effect over sound dentin. This conservative approach preserves the natural tooth and maintains the periodontal architecture.[11] An

Figure 11: Postoperative radiograph after two years showing apical end closure and intact lamina dura

alternative option is crown lengthening by removing the supporting alveolar bone; however, this procedure further exposes sound tooth structure and produces a high gingival contour, hampering the soft-tissue esthetics and leading to additional bone resorption. In addition, the resultant crown–root ratio may be unfavorable.[6,11] In our case, orthodontic extrusion of about 4 mm was followed by crown lengthening only after adequate stabilization of the tooth. The root length of the fractured incisor allowed the necessary amount of extrusion and still maintained a crown–root ratio of approximately 1:1, which is favorable for maintaining periodontal support. The follow-up radiograph showed normal periodontal ligament space and dense lamina dura. Further, no relapse from the achieved tooth position was noted. Root canal treatment was not necessary because vital pulp therapy was performed within 48 h after the injury and a tight seal was achieved.[4]

CONCLUSION

In conclusion, the traumatized immature tooth was saved and restored by a multidisciplinary treatment approach with strict cooperation among specialists. The keys to long-term success in this case are efficient assessment, appropriate treatment, and reassurance and motivation of the patient throughout the course of treatment as well as regular recall examinations and careful prognostic evaluation.

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How to cite this article: Zahedpasha S, Safarcherati H, Rahmati-Kamel M, Mehrani-Sabet J. Multidisciplinary management of subgingival crown-root fracture of an immature permanent maxillary central incisor. Dent Res J 2012;9:357-60.

Source of Support: Nil. **Conflict of Interest:** None declared.