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CASE REPORT

Management of Horizontal and Multiple Crown-Root Fractures

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ABSTRACT

Traumatic injury to oral cavity with accompanying tooth fracture can be a tragic experience for the patient and is a problem that requires experience, judgment and skill of the dentist. The dental health and appearance marred by an unsightly injury must be restored to normal as soon as possible. Though, root fractures comprise 0.5 to 7% of injuries affecting the permanent dentition, improper and delayed treatment can lead to loss of tooth. This report records a clinical case of intraalveolar horizontal mid root fracture in maxillary right central incisor with subluxation of coronal segment, which was managed endodontically using mineral trioxide aggregate (MTA), as an apical barrier at the fracture site. Maxillary right lateral and left central incisors affected by oblique crown-root fracture which were restored by custom-cast post and crown. After one year follow-up, the teeth were asymptomatic and showed signs of healing apical to the MTA barrier.

Keywords: Dental trauma, Horizontal root fracture, Complicated crown-root fracture, Mineral trioxide aggregate.

INTRODUCTION

One feature common to all patients with acute dental trauma is the fact that they come to us unexpectedly. Traumatic injuries of teeth are the main causes of emergency treatment in dental practice.[1] The dental health and appearance marred by an unsightly injury must be restored to normal as early as possible. Among dental trauma, root fractures are relatively uncommon and comprise 0.5 to 7% of all injuries affecting permanent dentition. They are defined as fractures involving dentin, cementum and pulp.[2] Commonly seen in maxillary anterior teeth and are more frequent at the middle third of the root.[3,4] Crown-root fracture is a fracture involving enamel, dentin and cementum, comprising 5% of injuries to permanent dentition.[2] Complicated crown root fractures present a treatment challenge because of pulp involvement in fully erupted anterior teeth.

This report records the case of intraalveolar horizontal root fracture with subluxation of coronal segment, treated with Mineral Trioxide Aggregate (MTA) barrier and effective management of crown-root fracture using custom cast post.

CASE REPORT

A 24-year-old male patient was presented to the Department of Conservative Dentistry and Endodontics, Bangalore Institute of Dental Sciences and Research Center, after 15 days of traffic accident with a chief complaint of multiple front teeth fracture (Fig. 1). On clinical examination, tooth 11 showed Ellis class I fracture with grade III mobility. Probing depth was 2 mm and demonstrated no response to vitality test (thermal and electric pulp testing). Teeth 12 and 21 showed complicated oblique crown-root fracture with shattered crown and grade III mobility of palatal fragments. Intraoral periapical radiograph showed intraalveolar horizontal root fracture, at the junction of middle and apical third of the root with subluxation of coronal fragment in relation to 11 (Fig. 2). With respect to teeth 12 and 21, the fracture line extended below CEJ and alveolar crest.

The treatment plan comprised of reduction and rigid splinting in relation to 11 and removal of mobile palatal fragments in relation to 12 and 21, followed by root canal treatment. Tooth 11 was splinted using 0.6 mm stainless steel orthodontic wire bonded with composite resin. Root canal treatment was performed in relation to 12 and 21. A decision of endodontically treating only the coronal fragment in relation to 11 was taken, as the fracture fragments were not approximated and due to the possibility of the apical fragment retaining pulp vitality.[5] Working length determined was about 17 mm (Fig. 3). MTA (Proroot MTA, Dentsply, India) plug was placed into the apical 4 mm of the coronal fragment after cleaning and shaping, using endodontic pluggers (Fig. 4). After 24 hours, rest of the canal was obturated with warm vertical compaction of gutta percha. Four days later, the access cavity was restored with composite resin.

The patient's postoperative course was uneventful. Rigid splint was removed after 2 months of follow-up. Mobility was within normal limits. After performing crown lengthening to expose the fracture line, teeth 12 and 21 were restored with custom cast post and core (Fig. 5). Chamfer finish line was placed

Fig. 1: Preoperative clinical photograph showing crown-root fracture

Fig. 2: Preoperative radiograph showing horizontal root fracture

Fig. 3: Working length determination

Fig. 4: MTA placement

Fig. 5: Cast posts cemented

Fig. 6: Postoperative clinical photograph

on the cast core. Final restorations of porcelain fused to metal crown were given (Fig. 6).

At recall visits of 3 months and 1 year (Fig. 7), teeth were asymptomatic and responded normally to palpation and percussion. There was evidence of healing at the fracture line in relation to 11 with normal periapical features.

DISCUSSION

Root fractures occur most frequently in the middle or the apical third of the root with coronal fragment extruded or luxated. The angulation of the X-ray in the radiographic detection of a horizontal root fracture is critical. If a horizontal root fracture

Fig. 7: One year follow-up radiograph showing healing at the fracture site

is suspected, it is advisable to take several radiographs at varied angles.

The principles of treating root fractures in permanent teeth consist of reduction of displaced coronal fragment and immobilization.[6,7] The splints are usually left in position for 1 to 2 months. According to Adreasen and Hjorting Hansen,[5] there are four healing patterns at the fracture site: Hard tissue union, connective tissue union, connective tissue and bony union and nonunion or healing with interposition of granulation tissue. Treatment and prognosis may be affected by factors like extent of fracture line, its proximity to gingival sulcus, severity of dislocation, stage of root development, age and sex of the patient.[8] Although the outcome of a root fracture is generally favorable (77%), complications, such as pulpal necrosis (20%), radicular resorption and pulpal canal obliteration, can arise.[9]

Successful management of root and crown root fractures often involves a multidisciplinary combination of endodontic, periodontal, orthodontic and prosthetic therapy. Root canal treatment is indicated when vitality test reveals nonvital pulp tissue or if patient complains of persistent discomfort.[10] In cases where coronal pulp has become necrotic, following treatment options can be considered:[2,11]

1. Root canal treatment for both coronal and apical fragment, when they are not separated.
2. Use of intraradicular splints with metal post used to stabilize both fragments.
3. Root canal treatment only for coronal fragment.
4. Root canal treatment for coronal segment and surgical removal of apical fragment, if there is a sign of periapical pathology.
5. Metal implant replacing apical fragment.

Healing of root fracture without treatment has been reported in many case reports.[1,12,13] In the present case, tooth 11 had lost its vitality, probably due to luxation of coronal fragment. Radiographically, space between the fragments was persistent even after splinting, suggestive of granulation tissue preventing reduction. So, root canal treatment was initiated limiting to coronal segment. It was decided not to treat the apical fragment, as apical fragment almost always contains vital pulp tissue and invariably scleroses.[5,14] Rarely, they may require surgical removal (Fayle, 1999; Saroglu and Sonmez, 2008). Coronal segment needs to be treated like a tooth with large apical exit. It would become difficult to limit the obturating material without an apical barrier. Here, we used MTA as a barrier at the coronal aspect of the fracture line similar to apexification procedure. In addition to having excellent biological and physical properties, it has shown to induce regeneration of periapical tissue and hard tissue deposition.[15,16] MTA also shows excellent marginal adaptability and is nonresorbable.[17] Follow-up radiograph of this case report confirmed repair of root fracture with mostly hard and connective tissue interposition and there were no signs of resorption or periapical pathology (Fig. 7).

In case of oblique crown-root fractures, the fracture line begins a few millimeters incisal to marginal gingiva facially, then progressing obliquely below the gingival crevice lingually.[2] In the present case, teeth 12 and 21 showed similar presentation with palatal fragment displacement and mobility. These fragments were removed to allow gingival healing prior to restoration. To convert subgingival fracture line to supra-gingival, periodontal surgery (crown lengthening) was performed on palatal aspect to achieve predictable and faster results. Orthodontic extrusion could not be considered as a treatment option due to time constraints. After cementation of cast post, chamfer finish lines were placed on palatal portions of the cast core instead of the tooth surface. This was done to avoid violation of biologic width and to maintain root length. This also helped to achieve good marginal adaptation.

CONCLUSION

Management of traumatic injuries of teeth can be both demanding and challenging that requires immediate intervention as they are accompanied by emotional factors on the patient part. Adopting appropriate treatment strategy of using cast post and core to restore crown fractures and using material, like MTA, for treatment of horizontal root fracture can result in optimum healing and prolonged retention of the teeth, which would otherwise require extraction. In the present case, after 12 months follow-up, fractured teeth were asymptomatic and showed excellent healing.

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