Complicated crown-root fractures are rare and often need complex treatment planning. This case report describes the management of an oblique crown-root fracture of maxillary right central incisor. Endodontic treatment of the tooth was performed and the tooth was provisionally restored. The tooth was then orthodontically extruded by 2 mm to raise the defect supragingivally. Gingivectomy was performed to expose the fracture line. Access cavity was restored with composite resin and porcelain fused to metal crown was fitted over the core build up. This case report demonstrates that a multidisciplinary treatment approach to an oblique subgingival crown-root fracture is a reliable and predictable option to save a tooth.

Key words: Crown-Root Fracture, Orthodontic extrusion

Introduction

A crown root fracture is defined as a fracture involving enamel, dentin and cementum. It may be classified as uncomplicated or complicated depending on the involvement of pulp. The most common etiologic factors are injuries caused by fall, bicycle and automobile accidents and foreign bodies striking the teeth. Andreasen reports an incidence of 5% of total dental injuries.

Crown root fractures in anterior teeth are usually due to direct trauma. This may result in chisel type of fracture with the apical end of the fracture line below the palatal gingiva. In anterior teeth, two types of crown root fractures may be seen, those with and those without the involvement of pulp. Usually the pulp will be involved depending on the depth of the fracture into dentin.

The complicating factor is the extent of subgingival involvement. Various problems are encountered when there is a subgingival fracture of a tooth. A perfect seal cannot be achieved at the fracture site rendering the tooth susceptible to coronal leakage, jeopardizing the outcome of the endodontic treatment. Good oral hygiene cannot be maintained, which results in persistent periodontal problems.

The following situations must be considered when choosing a treatment option for a complicated crown fracture:

- Time period between the incidence of injury and initiation of treatment
- Level and position of tooth fracture line
- Stage of root development
- Involvement of the pulp
- Crown root ratio
- Periodontal health
- Esthetic demands of the patient

This clinical report describes the multidisciplinary approach in management of an oblique crown-root fracture of the maxillary central incisor.

Case Report

A 21 year old male patient visited our department with the chief complaint of broken front tooth. History revealed that patient had fractured his maxillary right central incisor 1 year back, since then he had not received any treatment. On examination it was found that the crown of maxillary right central incisor had fractured in the
middle third. The fracture line extended from the middle third of the crown on the mesial aspect and ran diagonally towards the distal aspect (Figure 1). The fracture line especially on the distal and palatal aspect was located in the subgingival area. Palatal view (Figure 2) shows that the gingiva had grown into the fractured area. Radiographic examination revealed that the fracture line was approximately 2mm above the alveolar crest. After anaesthetizing the area, careful probing revealed that the fracture line was 2 mm above the crest of the alveolar bone. On the basis of clinical and radiographic findings, a diagnosis of complicated crown-root oblique fracture was made.

A definitive treatment plan was made as follows – endodontic treatment followed by orthodontic extrusion to move the fracture line 2 mm below the alveolar crest followed by a restoration.

**TREATMENT:**

**Endodontic treatment:**

The area was anaesthetized with 2% lignocaine and was isolated with rubberdam. Since placement of the rubber dam clamp was not feasible on the fractured tooth, split dam technique was used in this case. The gingiva which had grown into the fractured area was carefully excised using a No. 15 B.P Blade and access cavity was prepared. Working length was determined and biomechanical preparation was performed using step back method. Obturation was done with gutta percha and zinc oxide eugenol sealer using lateral condensation technique. The tooth was then provisionally restored with a temporary restoration.

**ORTHODONTIC TREATMENT:**

Orthodontic extrusion was done using Begg’s brackets and NiTi wire. Begg’s brackets were bonded in the middle third of incisors, canines and premolars except maxillary right central incisor. Bracket was bonded to the maxillary right central incisor in the cervical third to facilitate extrusion. Molar bands with buccal tubes were cemented on first molars, which acted as anchor teeth. A NiTi wire was passed through the slots of Begg’s brackets and secured in place using ligature wires. Over a period of 4 weeks the maxillary right central incisor extruded by almost 2 mm. The tooth was stabilized in this new position for a period of 8 weeks for alveolar bone remodeling.

**PERIODONTAL TREATMENT:**

After the tooth was extruded, it was noticed that the gingival attachment had moved coronally along with the tooth. So periodontal treatment had to be done which comprised of gingivectomy and osseous recontouring to a lesser extent. It was done in order to expose the fracture line completely especially on the distal and palatal aspect and to position the gingival margin at the level of the adjacent central incisor. This exposed the fracture line which was earlier in a subgingival location was moved to a more favorable supragingival location, which facilitates easy placement of finish line on the tooth.

**PROSTHODONTIC TREATMENT:**

The access cavity was restored with composite resin and the tooth preparation was performed to receive a metal-ceramic crown. Elastomeric impressions were made and a provisional crown was cemented. Later the ceramic crown was fabricated and cemented using Type I Glass Ionomer cement.

**DISCUSSION:**

Crown-root fractures due to dental trauma are rarely seen when compared to crown fractures. Complicated crown-root fractures involves tooth structures such as enamel, dentine, cementum and pulp. The severity of presentation also varies depending on the strength of the impact force and it’s vector. Some cases may present as vertical crown root fracture, oblique crown-root fracture or with multiple crown-root fractures. Success of treatment of complicated crown –root fracture is generally based on the degree of impact of the trauma to the tooth supporting structures especially the periodontium, crown-root ratio and extent and complexity of the fracture.

Various treatment options are available in managing crown root fractures, they are

Removal of the fractured fragment and restoration of tooth if the fracture line has not involved the pulp.
Removal of the coronal fragment supplemented with gingivectomy and osteotomy to expose the fracture in order to establish biologic width prior to restoration

Removal of the coronal fragment and initiation of endodontic treatment and restoration of tooth with post-core and crown

Removal of the coronal fragment and initiation of endodontic treatment and extrusion of the apical fragment by orthodontic or surgical means prior to restoration with post crown.

In severe crown-root fracture, the tooth may have to extracted and replaced with fixed prosthesis or an implant.

In this case it was decided to do orthodontic extrusion because the fracture line was not more than 2 mm above the crest of the alveolar bone.

Radiographic examination usually does not reveal much information regarding the extent of fracture line since the fracture line lies almost perpendicular to the central beam of X-Ray. The labial extent of the fracture is usually visible on a radiograph due to the displacement of the fractured fragments in this area. Determination of the palatal extent of fracture is difficult due to the close proximity of the fractured fragments at this level. Anaesthetising the area and meticulous probing will provide more information than the radiographs alone.

The challenge during endodontic treatment is isolation of the fractured tooth. Placement of the rubber dam clamp becomes very difficult because the fracture line is located in the subgingival area. Many alternative methods of isolation have been suggested for these teeth. In this case split dam technique was used.

Orthodontic extrusion can be carried out in different ways. A hook attached to the tooth can be used to pull the root vertically towards a horizontal bar attached to the adjacent teeth, by means of active elastic. Alternatively, extrusion can be carried by bonding brackets to the teeth. Brackets should be bonded more gingivally on the tooth to be extruded, and more incisally on the adjacent teeth. Extrusive force is provided by an orthodontic wire. It results in a controlled movement of the tooth. The latter method was chosen and an extrusion of 2 mm was achieved in this case. A period of retention is necessary to prevent reintrusion of the tooth and allow for alveolar bone remodelling.

Coronal movement of the gingiva along with the extruding tooth seems to be a function of how rapidly the root is extruded and how much force is used. If the gingival tissue moves with the tooth fragment, then surgical contouring may be required before preparation of the tooth for prosthesis. In case of rapid extrusion of the tooth, the periodontal fibers stretch and readjust, but the bone does not have time to remodel because of rapid movement. Thus there is no coronal shift of the marginal bone, and there is no need to reshape bone. Some researchers claim that a sulcular incision, either at each appointment during extrusion process or just before the stabilization period, is necessary to prevent bone and soft tissue movement.

Composite resin is the material of choice for the core build up, as it is much stronger than glass-ionomer cement. And hence was used as a core build up material in this case.

The major limitation of this procedure is the longer duration of treatment and a longer stabilization period. Esthetics may be also compromised because the extruded tooth presents a smaller cervical diameter than the adjacent tooth, which also results in a larger embrasure.

Restoration of traumatized teeth requires a close collaboration between the different specialities to avoid loss of tooth. Even though orthodontic extrusion reduces crown/root ratio and widens the embrasure, this approach allows to optimize the marginal sealing.

CONCLUSION:

The present case reports a multidisciplinary management of a complicated crown root fracture that leads to conservation of a tooth and its permanent restoration. In addition, the adjacent teeth need not be prepared for fixed prosthesis and the alveolar bone is conserved.
References:


15. Nogueira Filho GdA R et al. Reattachment of an autogenous tooth fragment in fracture with biologic width violation: A case report. *Quintessence Intl* 2002;33,181,4 a smaller cervical diameter than the adjacent tooth, which also results in a larger embrasure.}

![Figure 1: Pre operative view Labial aspect](image1)

![Figure 2: Per operative view Palatal aspect](image2)
Figure 3: Endodontic treatment

Figure 4: Initiation of Orthodontic extrusion

Figure 5: Completion of Orthodontic extrusion, Note the coronal movement of gingival attachment

Figure 6: Labial view after gingivectomy

Figure 7: Palatal view after gingivectomy

Figure 8: Crown preparation - Labial view
Figure 9: Crown preparation – Palatal view

Figure 10: Final restoration

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