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CASE REPORT

Management of complicated crown root fracture using orthodontic extrusion procedure

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ABSTRACT

Introduction*: Complicated crown-root fracture caused by a traumatic injury poses a treatment dilemma for the dentist as these teeth most often require multidisciplinary treatment approach. Management of such injuries can be done by various procedures such as surgical crown lengthening, extraction and orthodontic extrusion.* ***Method****: In this case report we have treated a crown-root fracture by endodontic treatment followed by orthodontic extrusion/forced eruption and prosthetic rehabilitation with a crown.* ***Conclusion****: The treatment modalities basically include exposing the cervical margin of the tooth followed by appropriate coronal restoration. They all have their own limitations but orthodontic extrusion gives better results as compared to the others.*

Keywords*: Dental trauma, cervical margin, coronal restoration, forced eruption*

INTRODUCTION

Crown root fracture of the anterior teeth is defined as the fracture involving the enamel, dentin and root cementum with pulp exposure. Management of such cases involve a multi-disciplinary approach including endodontic,crown lengthening and/or orthodontic extrusion followed by prosthetic rehabilitation.Orthodontic extrusion is a conservative procedure that allows retention of a tooth without loss of bone or periodontal support.Orthodontic extrusion or forced eruptionwas first introduced by Heithersay in 1973[1] and was later supported by Ingber in 1976.[2] The case presented shows the multi-disciplinary approach for the extrusion of a sub-gingival fractured maxillary permanent incisor. A 15 year old male patient reported to the department of Paediatric and Preventive Dentistry with a complaint of missing tooth in the upper right anterior region. The patient gave a history of trauma due to a sports related injury 7 days back. When his tooth was injured, more than 2/3[rd] of the crown structure was lost.On clinical examination, there was no soft tissue injury to be found (**Fig**. **1**). On radiographic examination, the fracture line was found to be 1 mm subgingivally on the buccal side and at the level of alveolar crest on the palatal side(**Fig**. **2**). There was no damage to the adjacent tooth.

Figure 1 Pre-op photograph showing fracture in 11

Figure 2 Pre-op radiographs showing oblique crown-root fracture

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Based on the clinical and radiographic examination, it was diagnosed as complicated oblique crown root fracture.

Vital pulp was found to be present in the root canal and was extirpated with the help of small size files and broaches. Working length was determined, and the canal was cleaned and shaped with intermittent irrigation using sodium hypochlorite and normal saline. The crown-down technique was used to biomechanically prepare the canal. The canal was prepared up to ISO instrument size 30 in the apical region. The root canal was dried with sterile paper points and was obturated with gutta percha and zinc oxide eugenol sealer using the lateral condensation technique. The obturation was assessed with the help of a radiograph.

After obturation of the tooth, post space was prepared by removing the gutta percha from the coronal and middle third of the root canal and an appropriate self-threading metal post was cemented into the root canal space (**Fig**. **3**). The placement was also checked in the radiograph.

Figure 3 Placement of metallic dewel, lingual button and bracket placement

The remaining tooth structure was completely below the gingival margin. This proved to be a hindrance in achieving an adequate ferrule effect for crown placement. For this reason, orthodontic extrusion of the root was planned.

Orthodontic brackets were placed on the anterior teeth with molar bands having molar tubes. A complete periosteal flap was raised for the placement of a lingual button on the buccal surface of the tooth. The lingual button was placed so that a ligature wire could be engaged to it, which would extrude the tooth (**Fig**. **3**). A 0.016 Ni-Ti arch wire was placed and the ligature wire was engaged to it. After 4 weeks of activation the amount of tooth movement was evaluated and the root was found to be around 3 mm extruded as seen on the radiograph. Crown-root ratio was 1:1 and was adequate for prosthetic rehabilitation. After a stabilisation period of 4 weeks the arch wire was removed. At this time, it was observed that the gingiva had migrated coronally mostly in the palatal side. For this reason gingivectomy was performed and the patient was recalled after 1 week. On the next visit core build up was done over the threaded metal dowel post using light-cured composite resin and the tooth was prepared for porcelain fused metal crown rehabilitation. Gingival retraction cord was inserted into the gingival sulcus to facilitate recording of the margins in the margins in the impression. A maxillary arch impression was made in poly vinyl siloxane impression material, while an alginate impression was made for the mandibular arch. The impression was then sent to the lab for crown fabrication. A provisional crown (polycarboxylate crown) was cemented over the prepared tooth until the final restoration was complete. In the subsequent appointments, the final crown was cemented over the prepared tooth using type I luting glass ionomer cement (**Fig**.**4**, **5**) and occlusion was checked to correct any premature contact. The patient was recalled after 1 year and was found to be asymptomatic.

Figure 4 Prosthetic rehabilitation with a Porcelain Fused Metal crown

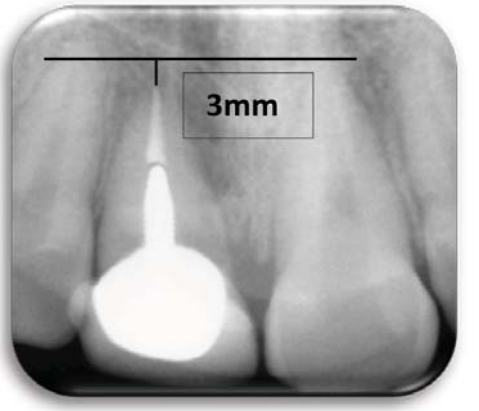

Figure 5 Post-op radiographs showing the placement of the PFM crown

DISCUSSION

An oblique crown root fracture with the fracture line lying subgingivally presents a complex case where in there is insufficient sound tooth structure for the placement of restorative margins that do not violate the biologic width. Three treatment options are available for such cases: surgical crown lengthening, extraction with subsequent prosthetic replacement, or forced eruption of the involved tooth to expose sound tooth structure.[3]

Surgical crown lengthening is the most commonly applied technique in such cases as it is simple and less time consuming method. But it has many unfavourable consequences like, gingival retraction, possible loss of gingival papilla, clinical crown higher than the adjacent teeth and unfavourable crown-root ratio.[2, 4] Also extractions with prosthetic rehabilitation was not

considered due to the psychological taboo of extraction as presented by the patient.

To avoid this limitation, extrusion by using orthodontic forces was used. Extrusion of a fractured tooth can also be done by surgical methods to re-establish the biological width, expose the fractured sub gingival margins and access the root canal. In this case, orthodontic extrusion was used instead of a surgical extrusion because root resorption is rarely seen and does not involve the loss of periodontal support or bony tissue of the surrounding teeth.[5, 6] Also orthodontic extrusion helps to retain a crown-root ratio of approximately 1:1 while undergoing the necessary amount of extrusion. This ratio is favourable in maintaining periodontal support.[7] In this case the crown-root ratio was favourable.

There are many indications for orthodontic extrusion of which the important ones are treatment of a sub-gingival or infraosseous lesion of the tooth between the cement-enamel junction and the coronal third of the root, treatment of trauma or impacted teeth, treatment of a restoration impinging on the biological width, orthodontic extraction where surgical extraction is contraindicated.[8]

Orthodontic extrusion is contraindicated in ankylosis or hypercementosis, vertical root fracture, short roots, which do not allow for adequate support of the restoration (that is, when the crown–root ratio is less than 1:1), insufficient prosthetic space and exposure of the furcation.[8]

In some cases due to use of higher forces there may be pulpal necrosis,[9] but in case of an endodontically treated tooth, it is not a concern.[10] In this case the root was endodontically treated before orthodontic extrusion was applied.

When one tooth has luxated or fractured, the adjacent tooth might have also suffered some injury, hence anchorage of 2-3 healthy teeth should be taken.[11] So in this case bracket placement was done in all the anterior teeth with banding of the molars.

In normal course of events, low-intensity extrusive forces lead to bone and gingival movements. Whereas stronger traction forces are exerted as in rapid extrusion, the coronal migration of the tissues supporting the tooth is less pronounced. This is because the rapid movement exceeds the capacity for physiologic adaptation of the supporting tissues.[12] Thus, rapid extrusion is necessary toprevent movement of the gingival collar and alveolarbone with the elevated tooth.One of the main considerationsduring forced eruption is to have harmony of the esthetic and periodontal health of the tooth. Thus for the esthetic rehabilitation we have used porcelain fused metal crown.

CONCLUSION

Orthodontic extrusion is a process that helps in preserving the natural tooth and it also maintains the periodontal architecture. Thus it is a conservative procedure. The disadvantages of a fixed bridge, loss of bone or periodontal support, as commonly occurs during extraction can be avoided. The use of orthodontic extrusion is also advantageous over surgical crown lengthening as it does not involve additional resection of supporting bone. Thus, this simple technique can be considered as a saviour for both the natural tooth and its supporting tissues as it requires a relatively easy movement and helps in subsequent restoration of the tooth.

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