

Reattachment and Orthodontic Extrusion in the management of an incisor crown-root fracture: A case report

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This article describes the management of a case of oblique crown root fracture of a central incisor where the fractured fragment was used as a temporary replacement crown in order to maintain esthetics during the period of orthodontic extrusion of the remaining root. Placement of the final restoration after orthodontic extrusion resulted in good esthetics and periodontal health postoperatively. The merits and demerits of this treatment modality are discussed.

J Clin Pediatr Dent 30(3): 211–214, 2006

INTRODUCTION

Management of traumatized teeth sometimes requires multi disciplinary approach to obtain better esthetic results as well as for conservation of tooth structure. Crown root fractures which comprise of five percent of all injuries affecting permanent teeth is one such example. These injuries are recognized most commonly by a fracture line superior to the marginal gingiva on the facial aspect of the crown, following an oblique course below the marginal gingiva on the lingual surface.¹ A subgingival fracture such as this, presents problems in completing endodontic therapy because of the difficulty of establishing adequate isolation. This type of fracture also creates a number of restorative problems.² Since the remaining root is typically flush with the bone or below the bone preparation of adequate margins of the crown is impossible. Impressions obtained may also be imprecise. As the margins of the restoration will be located subgingivally, chronic periodontitis may occur.³ Hence, exposure of the fractured margin into the oral cavity is desirable. This may be achieved by: (i) crown lengthening, (ii) surgical extrusion, (iii) orthodontic extrusion.⁴

Crown lengthening procedures require trimming of alveolar bone, therefore causing apical shift of gingival margin which could compromise esthetics. Hence Andreasen and Andreasen¹ recommended immediate orthodontic extrusion because immediate surgical repositioning may increase the possibility of root resorption and ankylosis.

Because of the emphasis on esthetics, patients often wish to recover their smile immediately at the first appointment and maintain it through out subsequent treatment procedures. Due to current adhesive dental materials the fractured crown fragment can be successfully reattached to the remaining crown portion.⁵ This clinical report describes a multidisciplinary treatment approach of crown root fracture of a maxillary central incisor where reattachment of the fractured fragment was done in order to maintain esthetics during the period of orthodontic extrusion.

A CASE REPORT:

A 13-year-old male patient reported to the dental clinic the day after a cricket ball had hit him. Initial clinical examination revealed no soft tissue injury but intra oral examination revealed an oblique crown root fracture of left maxillary central incisor and crown fracture of right maxillary central incisor. The patient had visited a dentist prior to this injury for endodontic treatment due to a previous episode of trauma to the incisors. The fragment of 21 was extremely mobile and patient complained of pain on biting. The mobile tooth fragment was removed and stored in physiological saline solution. The fracture line was located subgingivally on the mesiobuccal and mesiolingual aspect. Intraoral periapical radiograph revealed that the fracture line was extending up to the level of alveolar crest mesially. Due

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to bleeding at the fracture area, a two visit root canal treatment was planned. After cleaning and shaping, the canal was filled with a zinc oxide eugenol sealer and gutta-percha using lateral condensation technique. In order to place a preformed post, the gutta-percha was partially removed leaving the apical 5 mm to maintain good periapical seal and the post was sealed with zinc phosphate cement. In the coronal fragment which was stored in physiologic saline, space was created to receive the head of the preformed post. After etching the coronal fragment and the root fragment with 37% phosphoric acid for 20 seconds, both were rinsed under running water for 20 seconds. An adhesive was applied onto both surfaces according to manufacturer's instructions. The cavity was filled with composite resin, with the head of the post occupying the prepared cavity. Light curing was done for 60 seconds from both buccal and palatal aspects after removing the excess with explorer and occlusion was checked. Endodontic treatment of 11 was completed and restored with composite.

Since the fracture line of 21 extended up to the alveolar bone crest, a 3mm orthodontic extrusion was

planned for long term attachment health. A 0.016 inch S.S. Australian Special Plus wire with reverse curve of spee and a step bend on either side of the tooth to be extruded was used. Anchorage was gained by inserting the free ends of wire into buccal tube welded on to molar bands. The wire was covered with a sleeve to prevent soft tissue irritation. 3 mm extrusion was achieved in 2 months. The reattached crown fragment remained stable during the period of orthodontic extrusion.

A small amount of both labial and palatal mucosal recontouring was done using electrosurgical method to allow for proper finishing of the crown margins.

The temporary post and crown fragment were removed. A new preformed metallic post 10 mm in length was cemented using luting glass ionomer cement. A composite core build up was done and finally a metal ceramic crown was cemented on both 11 and 21. During the three month follow up appointment,



Figure 1. Clinical view after the removal of coronal fragment; coronal fragment seen in the box.



Figure 2. Preoperative radiograph.

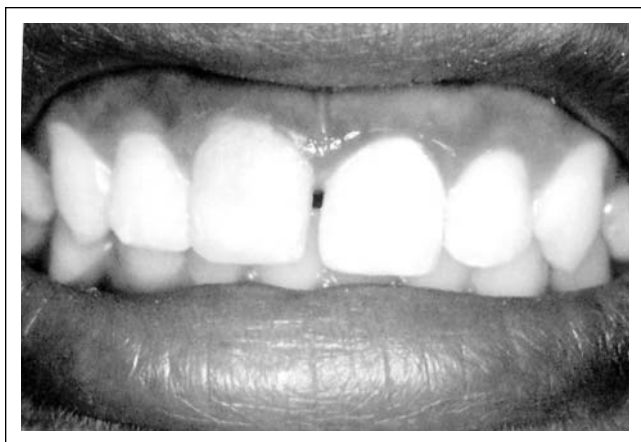


Figure 3. Labial view after reattachment of coronal fragment.



Figure 4. Initial view after orthodontic wire placement.



Figure 5. Radiograph showing the extent of extrusion and final post placement.



Figure 6. Labial view after cementation of metal ceramic crown.



Figure 7. Labial view after 3 months post operatively

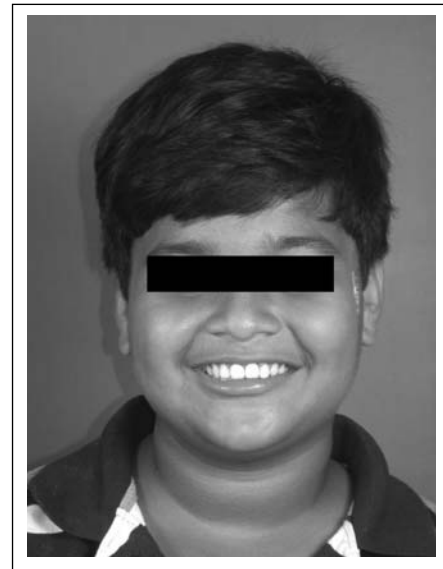


Figure 8. Facial view after 3 months post operatively.

the periodontium appeared to be healthy and good esthetics was maintained.

DISCUSSION

In the case described above, fracture had occurred due to direct trauma to incisors where access cavity had been prepared for endodontic treatment. The presence of access cavity may have resulted in diminished resistance of the tooth to crown-root fracture.⁶

Re-attachment of the fractured crown fragment followed by orthodontic extrusion was done prior to the final post endodontic restoration. In this case, reattachment of the fragment served as a provisional restoration during orthodontic extrusion. Original crown fragment instead of temporary resin crown restoration was used as the technique is faster, economical as it saves laboratory time and cost and also more esthetic as it restores the original color and contour of the tooth.⁷ As the tooth structure was flush with alveolar bone crest

mesiobuccally, optimal seal was difficult to achieve only with reattachment. Hence, a 3mm of orthodontic extrusion was planned.

Prior to orthodontic extrusion, there should be at least 14mm overall root structure – 4mm guttapercha to maintain the apical seal and 10mm for post retention. Also, the distance from fracture level to apex should be no less than 12mm. After extrusion of 2mm at least 10mm of root should be within the bone to maintain 50:50 crown/root ratio. A much shorter root may not have long term stability.^{1,3} The root length was 18mm in this case, which was adequate to maintain 50:50 crown ratio after orthodontic extrusion. The complete edification of the root using a preformed post and reattachment allowed for quick orthodontic extrusion.

Movement of a tooth by extrusion involves applying traction forces in all regions of the periodontal ligament to stimulate marginal apposition of crestal bone. When stronger traction forces are applied, as in rapid

extrusion, coronal migration of tissues supporting the tooth is less pronounced because rapid movement exceeds their capacity for physiologic adaptation.⁸ Rapid extrusion involves stretching and readjusting of periodontal fibres, thereby avoiding marked bone remodeling by virtue of rapid movement. Since there is no coronal shift of alveolar bone, no bone reshaping is required prior to coronal restoration.⁹

This treatment, the easiest orthodontic movement to obtain has been preferred to crown lengthening and removes alveolar bone and compromises esthetics which is not desirable in young adolescent patients. However, the amount of forced eruption is limited to 5mm. The cooperation of the patient is an important criterion during the period of orthodontic treatment as the treatment time is prolonged compared to surgical repositioning and crown lengthening.¹⁰

Coronal shift of the marginal gingival which is actually proliferation of gingival tissue occurs due to rapid extrusion and demands mild gingival recontouring. Also, fibrotomy should be done to prevent relapse.¹¹ In this case, both were achieved by electro surgical method.

The drawback of using reattachment of fragment is that the strength is only 50% of intact teeth and half life is only 2.5 years. Such teeth have tendency to refracture with subsequent traumatic incidents.³ This problem has been overcome by giving metal ceramic crowns. Metal ceramic crowns are shown to have predictable structural performance with only 5-10% failure rate after 6 years.¹² Even if orthodontic extrusion reduces the clinical crown-root ratio and widens the embrasures, this approach allows the practitioner to seal the crown without any risk of leakage. The disadvantage of widened embrasures can be overcome during the fabrication of crown.⁸

However, there is a great possibility that crown will have to be redone in the future, if esthetics become compromised due to the exposure of the cervical margin of the crown from physiological eruption of the central incisors.

CONCLUSION

Using a combination of reattachment of fractured fragment along with rapid orthodontic extrusion may be considered for treatment of oblique crown root frac-

tures because:

- 1) Esthetics is maintained until the final restoration placement by highly cost effective and less time consuming method of reattachment.
- 2) Excellent esthetics and periodontal health is maintained if the final restoration is made after orthodontic extrusion.
- 3) It is a simple and safe method and hence more acceptable to the patient.

The prospects of this treatment modality for crown root fractures of posterior teeth needs to be investigated.

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