



Multi Disciplinary Treatment Approach to an Oblique Subgingival Crown-Root Fracture

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Abstract

This case report describes the management of an oblique crown-root fracture of maxillary left central incisor. After removal of the fractured fragment, endodontic treatment, the remaining tooth was provisionally restored. The tooth was then orthodontically extruded by 3 mm to raise the defect supragingivally. Periodontal fibres were cut with a surgical blade. A metallic screw type post was inserted in the root and core was built with composite restoration. Porcelain fused to metal crown was fitted over the core built 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.

Keywords: Crown-Root Fracture, Management

Introduction

Orthodontic root extrusion, or forced eruption, was first described by Heithersay in 1973 and various cases have been published subsequently.¹⁻⁸ The aim of this movement was to raise the fractured root surface from within the alveolar bone to a supragingival position. This is accomplished by providing a horizontal component, usually a wire attached to the adjacent teeth, from which a vertical force is then exerted on the root.

A straight root will be moved above the level of the bone in a matter of only a few weeks, whereas in movement of multi-rooted or curved roots, more time is needed as the tooth must also move through bone. The tooth must then be held in position to allow remodeling and retention.

Simon has described the indications for root extrusion, namely any cervical third root problem that involves or extends 0–4 mm below the crest of the alveolar bone, including horizontal fractures, caries, repair of resorption defects and iatrogenic

perforations of the coronal third of the root, and where it is necessary to slowly extract a tooth when radiation therapy presents a risk of post extraction osteoradionecrosis.⁹ It has also been advocated in the treatment of infra bony pockets.¹⁰

It is important that the patient should maintain good oral hygiene. Furthermore, a final crown-to-root ratio of at least 1:1 should be maintained, to ensure adequate periodontal support.⁹

Various problems are encountered when there is a subgingival fracture of a tooth. Perfect seal is not achieved at the fracture line, good oral hygiene is difficult to maintain and together they renders the tooth susceptible to coronal leakage, jeopardizing the outcome of the treatment. Coronal leakage is an important cause of failure in root canal treatment and justifies carrying out an orthodontic extrusion in cases of subgingival fracture, to bring subgingival margins supragingivally, whilst preserving the physiological periodontal attachment.¹¹

The following situations must be considered when choosing a treatment approach for a complicated crown fracture.¹²

1. Time period between the incidence of injury and initiation of treatment
2. Level and position of tooth fracture line
3. Root development stage
4. Pulpal involvement
5. Availability of displaced tooth fragments
6. Concomitant alveolar bone injury

This clinical report describes the multidisciplinary management of an oblique crown–root fracture of the upper central incisor.

Case Report

A 24 years old female patient was referred to Department of Periodontics, Chandra Dental College & Hospital, Brabanki with severe pain in the upper

left central incisor. Patient gave the history of a road traffic accident two months before with trauma to upper anterior teeth. His upper left lateral incisor was mobile and painful. Cold and hot stimulus aggravated the pain. The intensity of pain was increasing with time. Patient was using analgesics for the relief of pain but showed no improvement. On clinical examination, it was found that there was a horizontal fracture line at the cervical margin of the tooth going deep towards the palatal side. The tooth was mobile at the fragment. Periapical radiograph of the tooth (#21) showed a through and through horizontal fracture of the upper left central incisor. The tooth margin was visible clinically on the labial side but not on the palatal side. On probing with a periodontal probe, it was found that the tooth margin on the palatal side was subgingival and beneath the crestal bone. (Figure 1).

Fig 1: Pre Operative View



Following different treatment options were considered and explained to the patient, and informed consent was obtained for the treatment chosen;

- (1) Endodontic treatment followed by orthodontic extrusion of the remaining portion of tooth and then eventual restoration.
- (2) Endodontic treatment of the tooth, crown lengthening by surgical means and eventual restoration.
- (3) Extraction of the residual tooth and immediate or delayed implant surgery or construction of a bridge.

The patient chose endodontic treatment and orthodontic extrusion of remaining portion of lateral incisor and restoration with prosthesis for esthetics and his convenience.

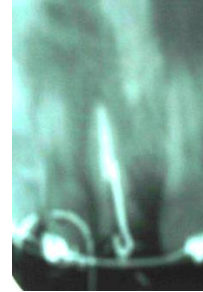
Emergency treatment consisted of extraction of the mobile fractured tooth fragment after giving local anesthesia followed by pulpectomy. The working length of the tooth was taken by radiographic method and a temporary restoration was placed. On subsequent visit, rubber dam was placed to isolate the tooth and carry out the treatment in a dry and sterile environment.

Coronal flaring of the lateral incisor was done by Gates Glidden drills, using drills in descending order. Preparation of the tooth was done with manual filing using the step back method. Sodium hypochlorite solution (2%) was thoroughly used as an irrigant during the treatment. Obturation was done by the cold lateral condensation technique and then the tooth was sealed with a temporary restoration. (Figure 2).

Fig 2a : J-hook placed after obturation



Fig 2b : J-hook placed radiographic view



After completion of the root canal treatment, the patient was referred to an orthodontist for further management. After evaluation, it was planned to extrude the tooth up to 3mm to allow sufficient tooth area available for core buildup and crown preparation. Edgewise brackets (Gemini MBT brackets, 3M Unitek) were bonded to the teeth^{11,21,23}. Sequence of wires was 0.016 in. NiTi and 0.016×0.022 in. NiTi used for leveling and alignment for 1 month, since the arch was fairly well aligned already, and then moved on to 0.018×0.025 in.

stainless steel working wire. A button was applied to the fractured left upper lateral incisor²² on the labial aspect using light-cured composite (Transbond XT, 3M Unitek). An elastic thread attached to button was engaged with the main archwire. Elastic thread was used for extrusion of the fractured left upper lateral incisor using light continuous force and was applied for one month. Elastic thread was periodically replaced every week till required extrusion was achieved. The appliance was kept for retention purposes for further one month (Figure 3-5).

Fig 3 : After– 21 days Orthodontic extrusion with activation wire



Fig 4 : After- 45 days Tooth Extruded –2mm



Fig 5 : After- 75 days Tooth Extruded –3.5 mm



After 90-day period, the appliance was removed and gingivectomy of the patient was performed with surgical blade no. 12 to recontour gingival margin of the tooth which had also moved along with the tooth (Figure 6).

The patient was recalled after 5 days for post and core buildup. A screw type of metallic post was inserted into the tooth and then core of the tooth was built with composite restoration (Denfil, Dentsply).

Crown preparation was done and impression taken (Neocolloid, Zhermack)) and sent to laboratory. Although, all ceramic crowns are indicated in anterior teeth but due to the patient's economic limitation, porcelain fused to metal crown was fabricated. Crown was inserted and cemented with luting type of glass ionomer cement (Shofu-Dent). (Figure 7,8).

Fig 6 : After Crown lengthening



Fig 7 : Core built with Resin modified Glass Ionomer cement



Fig 8 : Metal ceramic Crown cemented



Discussion

The main reason for conducting orthodontic forced eruption in a traumatized fractured tooth is the requirement for sufficient tooth structure to provide a ferrule effect over sound dentin for the crown. The ferrule effect counteracts functional forces on the postcore- root complex.¹³

Orthodontic forced eruption can be carried out in different ways.^{14,15} A hook attached to a post can be used to pull the root vertically towards a horizontal bar attached to the adjacent teeth, by means of active elastic. Alternatively, brackets can be bonded to the teeth or restoration, more gingivally to the tooth to be extruded, and more incisally on the adjacent teeth, and extrusive force is provided by an orthodontic wire. It resulted in a good controlled movement of the tooth. The latter method was chosen in this case.

According to Simon⁹, occlusal movement of the root along with its gingiva seems to be a function of how rapidly the root is extruded and how much force is used. If the gingival tissue move 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, facilitating prosthetic restoration as there is no need to reshape bone.¹⁶

Some 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.^{17,18}

An alternative course of action is to lengthen the clinical crown by removing supporting alveolar bone, hence exposing further sound tooth structure. The

disadvantage with this technique is that reshaping the bony architecture of the involved tooth also requires the removal of supporting bone from adjacent teeth in order to achieve a smooth flow from tooth to tooth.⁹ Not only will there be an aesthetic problem which may be difficult to correct, but some additional bone resorption should also be expected after any surgical procedure. Furthermore, the resultant crown-to-root ratio can be unfavourable when such a crown lengthening procedure is carried out.

An extrusion of 3 mm was achieved in this case. A period of retention is necessary to prevent reintrusion of the tooth. Andreasen recommended one week of stabilization period, Lemon suggested one month per mm of extrusion, 7 weeks by Simon *et al.*^{19,20,21} The case described in this report was stabilized for 30 days and no reintrusion was seen subsequently.

Good root canal treatment should be carried out before commencing orthodontic extrusion of a traumatized tooth with pulp involvement and where apexification is not necessary. This should be under aseptic conditions; hence with rubber dam isolation.²² Composite is the material of choice for the actual core, as it is much stronger than glass-ionomer cement.²³

The goals of treatment were achieved in this case, namely, preserving biological width, sterility of the root canal system, the ferrule effect and aesthetics.

References

- 1 Heithersay GS. Combined endodontic-orthodontic treatment of transverse root fractures in the region of the alveolar crest. *Oral Surg* 1973;36:404-15.
- 2 Delivanis P, Delivanis H, Kuflinec M. Endodontic-orthodontic management of

- fractured anterior teeth. *JADA* 1978;97:483–85.
- 3 Johnson GK, Sivers JE. *J Prosthet Dent* 1986;56:424–27.
 - 4 Ziskind D, Schmidt A, Hirschfeld Z. Forced eruption technique: rationale and clinical report. *J Prosthet Dent* 1998;79:246–48.
 - 5 Villat C, Machtou P, Naulin-Ifi C. Multidisciplinary approach to the immediate esthetic repair and long-term treatment of an oblique crown–root fracture. *Dent Traumatol* 2004;20: 56–60.
 - 6 Cengiz SB, Kocadereli I, Gungor HC, Altay N. Adhesive fragment reattachment after orthodontic extrusion: a case report. *Dent Traumatol* 2005;21:60–64.
 - 7 Emerich-Poplatek K, Sawicki L, Bodal M, Adamowicz- Klepalska B. Forced eruption after crown/root fracture with a simple and aesthetic method using the fractured crown. *Dent Traumatol* 2005;21:165–69.
 - 8 Terata R, Minami K, Kubota M. Conservative treatment for root fracture located very close to gingiva. *Dent Traumatol* 2005;21:111–14.
 - 9 Simon JHS. Root extrusion. Rationale and techniques. *Dent Clin North Am* 1984;28:909–21.
 - 10 Ingber JS. Forced eruption. I. A method of treating isolated one and two wall infrabony osseous defects – rationale and case report. *J Periodontol* 1974;45:199–206.
 - 11 Saunders WP, Saunders EM. Coronal leakage as a cause of failure in root canal therapy: a review. *Endod Dent Traumatol* 1994;10:105–08.
 - 12 Aggarwal V, Logani A, Shah N. Complicated crown fractures management and treatment options. *Int Endod J* 2009;42: 740-53.
 - 13 Saunders WP. Restoration of the root filled tooth. In: Pitt Ford TR, Ørstavik D, editors. *Essential endodontology: prevention and treatment of apical periodontitis*. Oxford: Blackwell Science; 1998. p. 333.
 - 14 Simon JHS, Kelly WH, Gordon DG, Ericksen GW. Extrusion of endodontically treated teeth. *JADA* 1978;97:17–23.
 - 15 Stern N, Becker A. Forced eruption: biological and clinical considerations. *J Oral Rehabil* 1980;7:395–402.
 - 16 Malmgren O, Malmgren E, Frykholm A. Rapid orthodontic extrusion of crown root and cervical root fractured teeth. *Endod Dent Traumatol* 1991;7:49–54.
 - 17 Ivey DW, Calhoun RL, Kemp WB, Dorfman HS, Wheless JE. Orthodontic extrusion: its use in restorative dentistry. *J Prosthet Dent* 1980;43:401–07.
 - 18 Bondemark L, Kurol J, Hallonsten AL, Andreasen JO. Attractive magnets for orthodontic extrusion of crown–root fractured teeth. *Am J Orthod Dentofac Orthop* 1997;112:187–93.
 - 19 Lemon RR. Simplified esthetic root extrusion techniques. *Oral Surg* 1982;54:93.
 - 20 Simon JHS, Lythgoe JB, Torabinejad M. Clinical and histological evaluation of extruded endodontically treated teeth in dogs. *Oral Surg* 1980;50:361.
 - 21 Andreasen JO. *Traumatic injuries of the teeth*. Copenhagen: Munksgaard; 1997.
 - 22 Moller AJR. Microbiological examination of root canals and per apical tissues of human teeth. Methodological studies. PhD Thesis, *Odontologisk Tidskrift* (special edition); 1966;74:1–380.
 - 23 Kao EC, Hart S, Johnston WM. Fracture resistance of four core materials with incorporated pins. *Int J Prosthodont* 1989;2:569–78.