

CASE REPORT

ORTHODONTIC EXTRUSION: AN AID TO SALVAGE SUBGINGIVALLY FRACTURED INCISOR

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ABSTRACT

Traumatic injuries to permanent incisors not only cause esthetic but functional as well as psychological problems to patients. This case report describes treatment approach of a subgingivally fractured permanent maxillary central incisor. Conventional root canal treatment followed by orthodontic extrusion was performed for the fractured tooth to bring the fracture margins to supragingival level. The tooth was then restored with fiber post and core.

INTRODUCTION

Complicated crown root fracture involves enamel, dentin and root cementum with extension into the pulp. The fracture line runs obliquely to sub-gingival area compromising the biologic width.¹ Permanent maxillary incisors are more prone to such injuries. Epidemiological analysis showed that crown-root fractures represent 5% of dental injuries.² Restoration of such complicated crown-root fracture is often challenging when the biologic width has been compromised. In such cases, proper isolation with rubber dam cannot be achieved which ultimately leads to treatment failure.^{2,3}

Various treatment options have been considered for augmenting the supragingival dental structure like surgical crown lengthening, orthodontic extrusion and surgical extrusion each with proper advantages, disadvantages, limitation, prognosis and cost. Among all treatment modalities, orthodontic extrusion also known as forced eruption is the least invasive one.^{4,5}

The paper describes the management of a complicated crown-root fracture that has extended subgingivally in maxillary central incisor by orthodontic extrusion.

CASE REPORT

A 36-year-old male reported to Department of Conservative Dentistry and Endodontics with the chief complaint of pain on previously treated maxillary right permanent central incisor. The tooth got fractured 1 month back subsequent to road traffic accident. The patient had no specific medical history. Clinical examination revealed an oblique crown root fracture of maxillary right central incisor with subgingival extension at the palatal aspect (Figure 1a and b). Access opening was already done (Figure 1b and figure 2a). Of all the available treatment options, patient opted for orthodontic extrusion.



Figure 1: Clinical photographs showing the fractured central incisor (a) labial view (b) Palatal view

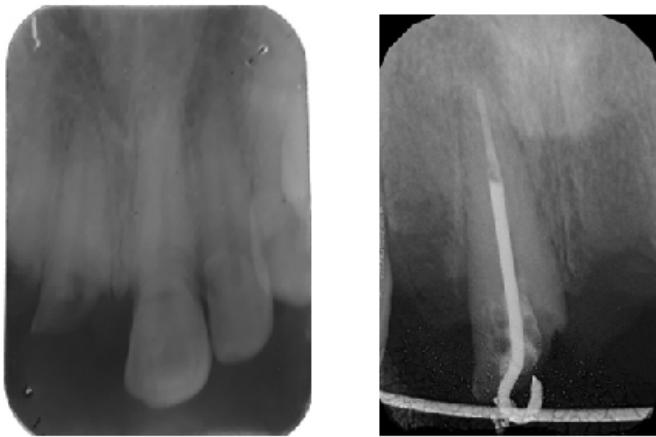


Figure 2: (a) Diagnostic radiograph showing the fractured crown (b) Radiograph after placement of J Hook in prepared post space and anchorage bar

Obturation was done using corresponding gutta-percha of ProTaper files (Dentsply Maillefer, Ballaigues, Switzerland) and ADSEAL root canal sealer (Meta Biomed Co. Ltd, Chungcheongbuk-do, Korea) after 2 weeks of chemico-mechanical preparation. Post space was prepared till passo reamer #3. It was difficult to place a bracket on the tooth as there was only 1mm of tooth structure remaining supragingivally. Therefore, a temporary intracanal post with J hook (20-gauge orthodontic wire) was cemented into the post space using zinc phosphate luting cement (Prime Dental Manufacturing, Chicago, USA) (Figure 2b). After proper etching and bonding (Dentsply DeTrey GmbH, Germany), an anchorage bar (20 gauge orthodontic wire) was retained horizontally using composite resin (Meta Biomed Co. Ltd, Chungcheongbuk-do, Korea) at a distance in such a way that it did not interfere with the occlusion and the tooth anticipated the required eruption. A slight bent was given on the anchorage bar so that the forces are directed along the long axis of the tooth. An elastic chain was put on the J hook that was passed around the bar and returned back to the hook (Figure 3a).



Figure 3: (a) Clinical photograph after placement of J Hook and anchorage bar (b) Clinical photograph after orthodontic extrusion

The elastic chain was placed such that it provided 50g of force needed for eruption which was measured using a Dontrix Gauge (Precision Canada Inc, Edmonton, Alberta). The orthodontic extrusion was carried out for a period of 6 weeks. After 6 weeks, 3 mm of extrusion was observed (Figure 3b). Elastic chains were changed every week. A supracrestal fibrotomy along with root planing was performed once a week during the time of eruption. The tooth was stabilized for a period of 12 weeks using ligature wire. At the end of treatment, 3 mm of extrusion was observed. A glass fiber post was placed and core build-up was done with

paracore (Coltene, Whaledent, Switzerland) (Figure 4).



Figure 4: Clinical photograph after core build-up

DISCUSSION

The structurally compromised teeth with subgingival cervical margin represent treatment challenges to clinicians as they often invade the biological structures compromising periodontal health.⁴ The restoration of such teeth require a multidisciplinary approach consisting of endodontic therapy, crown lengthening or/and orthodontic extrusion and prosthetic rehabilitation.⁶

Heithersay⁷ in 1973 was first to describe orthodontic extrusion of a root to facilitate restoration. Orthodontic extrusion, also called as forced eruption, is conservative to surgical crown lengthening as there is no loss of alveolar bone and periodontal support thus maintaining the gingival biologic width. Here the margin can be placed supragingivally with a good ferrule effect.^{1,3} A minimum of 3.5-4 mm of tooth structure from alveolar crest to the coronal extent of the remaining tooth structure has been recommended for optimum periodontal health.⁸ It helps to maintain the bone volume for an implant, if the patient opts in future.⁹ The tooth can be orthodontically extruded if a favourable crown-root ratio of 1:1 can be maintained after orthodontic extrusion. But it requires longer treatment time and longer period of stabilization.¹ Besides these it may also adversely affect oral hygiene and might be unesthetic to patients.¹⁰

The time required for extrusion depends on the amount of tooth to be extruded. Simon et al. suggested 1-3 weeks for the activation and 8-12 weeks for the retention of teeth in final position.⁶ Some authors recommend 4 weeks of retention for every millimeter of extrusion.¹⁰ In this case report, 12 weeks retention was done.

Though continuous light forces have usually been recommended for orthodontic extrusion, it may cause reverse osseous architecture around the extruded tooth. So as to correct this periodontal discrepancy, periodontal surgery might be needed at the end of the procedure. Rapid extrusion, however does not shift the marginal bone coronally and there is no need of reshaping. Rapid extrusion has a minimum risk of root resorption and ankylosis.¹ It has been suggested that the maximum force should not be more than 30 g for slow extrusion and forces greater than 50 g for rapid extrusion. But the amount of force used depends on the physiologic response of the patient and others factors such as root surface morphology. It is difficult to quantify the force applied.¹⁰ In the

present case, extrusion of the tooth has been done using force of 50 g.

Stretching of the supracrestal gingival fibres might cause relapse as the tooth is moved to a new position. So as to prevent the coronal displacement of the gingival margin that occurs during extrusion and to avoid the relapse of treatment, a supracrestal fibrotomy is indicated.¹ In this case report, a supracrestal fibrotomy was done on every visit.

Thus, the present case reinforces orthodontic extrusion as

a novel approach for maintaining the health of periodontal tissues and esthetics in subgingivally fractured tooth in a cost effective way.

CONCLUSION

Orthodontic extrusion, though requires multidisciplinary approach is the simplest technique to salvage a natural tooth and its supporting structures that would otherwise require more invasive technique. Thus, it should be thought of before resorting to implants or prosthesis.

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