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## Multidisciplinary Approach for the Treatment of Subgingival Crown-Root Fracture: A Case Report.

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### ABSTRACT

Crown root fracture of the permanent teeth is rare and it involves damage to the pulp, cementum, dentin, enamel and periodontal ligament. Treatment of such dental trauma poses a great challenge to the clinician and requires the consideration of physiological, functional, aesthetic, economic, as well as psychological aspects. This clinical case reports the multidisciplinary approach required to successfully rehabilitate a maxillary central incisor with a subgingival crown-root fracture using endodontic treatment, fibre post cementation, composite core build up, orthodontic extrusion, gingival contouring and a final restoration with an aesthetic ceramic crown.

**Keywords:** Fracture, Fibre post, Orthodontic extrusion, Ferrule effect

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## INTRODUCTION

Crown-root fractures represent only 0.3-5% when compared to crown fractures accounting for 26-76% of dental trauma in the permanent dentition [1]. Crown-root fracture occurs below the gingival margin and may be classified as complicated or uncomplicated, depending on the pulp involvement. In situations where the fracture line is below the alveolar bone margin, and the apical root fragment is long enough to support a coronal restoration, the coronal fragment can be removed and the root is treated endodontically [2].

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 to achieve favourable coronal restoration, whilst preserving the physiological periodontal attachment [3]. Orthodontic root extrusion or forced eruption, was initially described by Heithersay [4] and various case reports have been published subsequently [5-7].

## CASE REPORT

A 40-year-old man presented with the chief complaint of mobility of upper right central incisor due to a fall from bicycle. The medical history was non contributory. Intraoral examination revealed absence of trauma to the soft tissues, severe cervical abrasion of anterior teeth and excessive mobility of the crown of maxillary right central incisor. Further, the fracture line was not visible on labial or palatal aspect but could be traced subgingivally with periodontal probe. Fractured coronal segment was attached only by periodontal ligament fibres on palatal aspect and the gingiva around the fractured tooth was inflamed (fig 1A,1B). Both the adjacent teeth showed no sign of mobility. Radiographic examination confirmed the findings of clinical examination; the fracture line could be traced 2 mm below the alveolar crest. Periapical area revealed closed apex and wide periodontal space around the maxillary right central incisor (fig 2). Electric pulp testing was negative for maxillary left central incisor. On the basis of clinical and radiographic findings, a diagnosis of complicated crown-root fracture was made.

Figure 1A, 1B: Intra oral view.

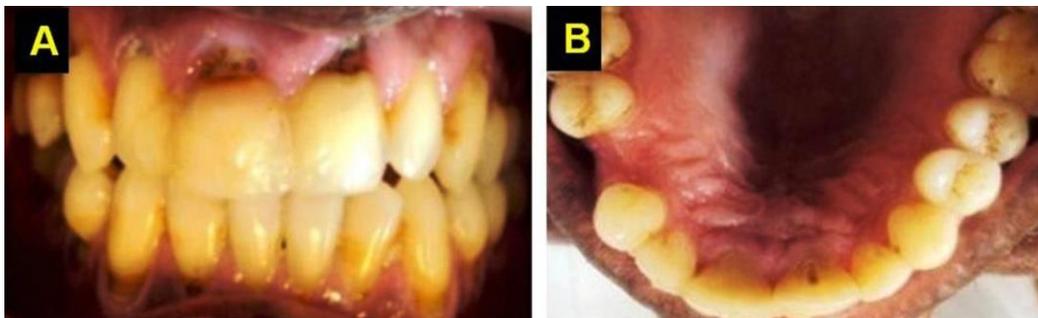


Figure 2: Pre-operative IOPA radiograph.



The loose fragment of crown was removed under local anesthesia and root canal therapy of the residual tooth was performed. The canal was obturated using lateral condensation of gutta percha technique and the post space was prepared. The fibre post was cemented using dual cure resin cement and the core was built up using composite resin. The left maxillary central incisor was endodontically treated and restored with composite resin (fig 3A,3B,3C). Orthodontic treatment was initiated with passive bonding of standard edgewise brackets from maxillary right canine to maxillary left canine and a 0.016 x0.022 inch nickel–titanium arch wire was attached to the brackets. The bracket on the right central incisor was positioned more apically, to provide an extrusive component. An orthodontic elastic was engaged between the bracket of right central incisor and the main arch wire to induce extrusion using light continuous force (fig 4). The elastic was replaced every week till the required extrusion was achieved. Approximately 4 weeks later, the active treatment was completed and an extrusion of about 4 mm was achieved. Before removal of the bracket, gingivectomy around the tooth was performed with electrocautery to recontour gingival margin of the tooth that moved along with the root, to improve aesthetics (fig 5). There was clear evidence, both clinically and radiographically, of about 4 mm extrusion of the tooth (fig 6A,6B). There were no complications during or after the orthodontic treatment. After the completion of extrusion, a temporary acrylic crown was cemented and lingual splinting was done to prevent reintrusion (fig 7). After four weeks of stabilization, a ceramic crown was fabricated and cemented (fig 8A,8B). The patient returned for follow up after 3 months and the tooth was intact and stable.

Figure 3A, 3B, 3C: Root canal treatment.

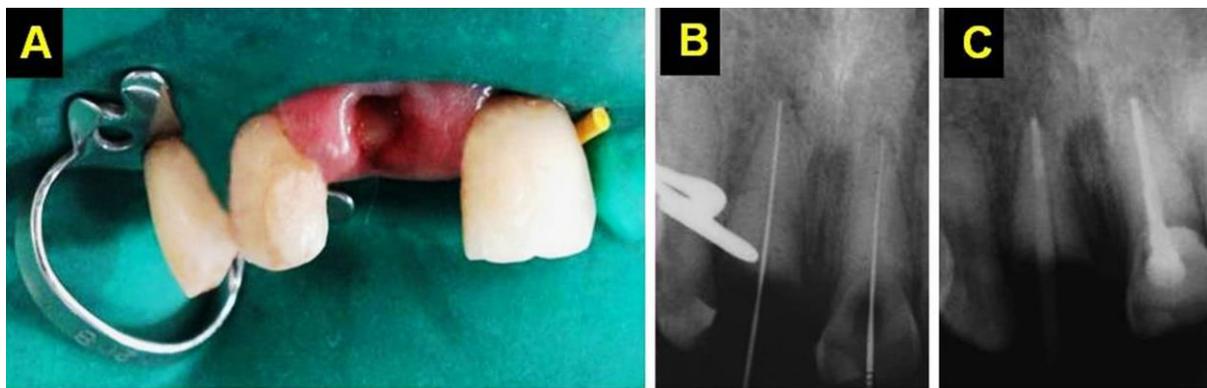


Figure 4: Orthodontic extrusion.



Figure 5: Gingivoplasty by cautery.



Figure 6A, 6B: Pre and post orthodontic extrusion IOPA radiograph.

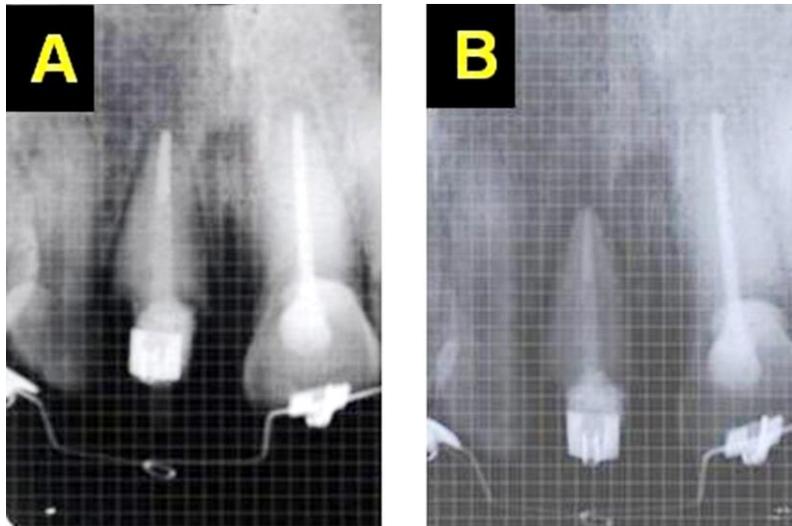
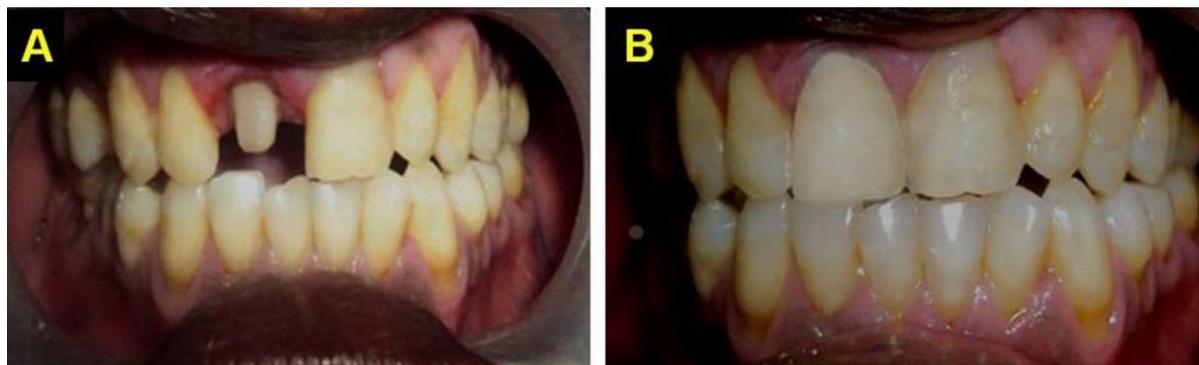


Figure 7: Lingual splinting.



Figure 8A, 8B: Crown fabrication.



### DISCUSSION

Aesthetic restoration of teeth with complex crown root fracture is one of the greatest challenge to the dentist. Maintenance of a proper crown root ratio and thereby periodontal health is the main requirement of any restoration. The location of root fracture is the best indicator of tooth survival [8]. Treatment options for crown root fracture include: (i) fragment removal followed by restoration; (ii) gingivectomy and osteotomy (crown lengthening); (iii) forced orthodontic extrusion with/without gingivoplasty; (iv) forced surgical extrusion; (v) vital root submergence and (vi) extraction followed by implants or fixed partial denture [5].

Sufficient tooth structure is required to provide a ferrule effect over sound dentin for the crown. The ferrule effect counteracts functional forces to the root and the post-core complex [9]. Extrusion is the easiest orthodontic movement to achieve because it nearly resembles natural tooth eruption. Approximately 3 to 4 mm distance from the alveolar crest to the coronal extension of the remaining tooth structure has been recommended for optimal periodontal health [10].

Although orthodontic extrusion requires multiple visits and is more time-consuming than surgical extrusion, it is the preferred treatment. The reason is that orthodontic forces allow a biological way of extruding the tooth, with no removal of the alveolar bone when compared to surgical extrusion [5]. The 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 [11]. If the gingival tissue moves with the tooth fragment, then surgical contouring may be required before preparation of the tooth for prosthesis.

In the present case, an extrusion of 4 mm was achieved, gingival contouring was performed and the stabilization was implemented for 4 weeks. The fibre post cementation along with composite core buildup was carried out once and for all to achieve good aesthetic results; further the fibre post may also increase the retention and distribute the stresses along the root [12]. The use of wire hook as temporary post requires removal after extrusion and may result in widening of the post space. The cast post/core is not aesthetically pleasing and requires laboratory procedure.

### CONCLUSION

The key factor in a successful functional and aesthetic rehabilitation of complicated crown-root fracture is multidisciplinary approach. Even though the orthodontic extrusion and stabilization requires at least 2 months duration and multiple visits, this approach allows maintaining the biologic width and optimizing the marginal seal.

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