

AESTHETIC REHABILITATION OF A COMPLICATED CROWN-ROOT FRACTURE : A MULTIDISCIPLINARY APPROACH

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ABSTRACT

Treatment for anterior teeth with subgingival fractures is complex, considering the biologic, functional, and aesthetic considerations. The treatment of a maxillary right central incisor with a complicated crown root fracture is covered in this case. The procedure was complicated; thus, an interdisciplinary approach was taken to restore the tooth. Fracture fragment was reattached with reinforcement from a 22-gauge stainless steel wire, made into a J hook. Endodontic treatment was done. The fracture line was exposed above the alveolar bone using orthodontic extrusion, followed by gingival margin recontouring. The tooth was reinforced with fiber post and core followed by a full coverage acrylic jacket crown. Good aesthetics and stable periodontal health were the outcomes of the treatment.

KEY WORDS

subgingival fracture, complicated crown root fracture, biologic width, orthodontic extrusion.

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INTRODUCTION

Complicated crown-root fractures account for up to 17% of all traumatic injuries in permanent teeth and can involve pulp, dentine, or enamel. They are typically the result of direct trauma. A combination of endodontic, periodontal, orthodontic, and restorative therapies may be necessary to address the clinical problem of biological width invasion by fracture line¹. The quantity of remaining tooth structure and the extent of fracture line determine the kind of therapy that should be used². The goal of the operation is to reveal the subgingival fracture line and ensure that all processes can be isolated from bleeding and moisture. Orthodontic extrusion of the apical tooth structure is planned. It is a conservative procedure with good prognosis and does not involve loss of periodontal support or alveolar bony support of the surrounding teeth^{3,4}. In this case report, an interdisciplinary management of a subgingivally fractured tooth assisted by orthodontic extrusion is presented.

CASE REPORT

A 13-year-old female patient reported to the department of Pediatric and Preventive Dentistry with a chief complaint of broken right upper front tooth due to fall four days back. Clinical examination revealed, fractured 12 with a hanging fracture fragment. Patient had moderate pain that aggravated on touch, was tender on percussion. Pain relieved on taking medications. Subgingivally, the fracture line extended on the mesial aspect 2mm beyond the alveolar bone as seen on the radiograph. IOPAR revealed a complicated fracture, with the fracture line involving the pulp [Fig1]. There was no evidence of extraoral or intraoral laceration. No relevant past medical or dental history was reported. Hence a diagnosis of Ellisclass III fracture (with subgingival extension) with symptomatic apical periodontitis with respect to 12 was made.

The treatment plan was considered in three phases: a) Endodontic treatment of 12 and reattachment of the fractured fragment; b) Orthodontic extrusion with fixed orthodontics to

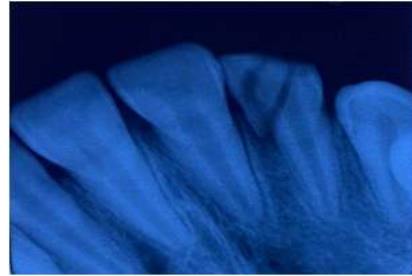


Fig1: Pre-operative clinical and radiographic findings



Fig2a: Stainless steel wire fragment placed in canal.



Fig2b: Radiograph showing obturation of 12 followed by reattachment of the fractured fragment with SS wire fragment.

expose the fracture line; c) Gingivectomy for aesthetics and further exposure; d) Post endodontic restoration of 12 (post core fabrication followed by acrylic jacket crown). Accordingly, the infected pulp was extirpated, profuse bleeding was observed due to pulp hyperemia. 5.2% hypochlorite solution was used for irrigation followed by normal saline. Canal was dried with absorbable paper points, Ca(OH)₂ paste was used as intracanal medicament followed by Zinc oxide temporary restoration. The patient was recalled after 14 days. As tooth was found asymptomatic it was obturated with gutta percha and zinc oxide eugenol sealer. The fracture fragment, which was soaked in distilled water, was grooved to receive a 22-gauge stainless steel wire fragment. Cervical portion of the gutta percha was removed from the canal. After proper isolation, both the fracture fragment and the canal were etched (Prime dental etching gel etchant -3Gm), dried and bonded (FGM Ambar bonding agent- 4ml). The fracture

fragment was then repositioned with reinforcement with the stainless-steel wire fragment [Fig2a] into the canal by light cure flowable composite (Ivoclar Vivadent Te-Econom flow refills flowable composite resin-A2). The remaining fractured portion of the tooth was also built up and recontoured with bulk filling composite restoration (Ivoclar Te-.Econom Plus composite Refill-A2).

The teeth were bonded with MBT brackets. The bracket on 12 was placed apically to allow extrusion of the tooth. 0.012" NiTi (nickel titanium) wire was secured to the brackets.[Fig3]. The wires were changed sequentially to higher wires until 0.018" SS wire. The 0.018" SS wire was stepped down to 2mm with respect to 12 maintaining the arch form. E-chain was used to tie the wire to the bracket slot to aid further extrusion [Fig4]. An extrusion of 4mm was achieved within 9 weeks followed by a retention phase of one month.



Fig3 : Bonding of teeth with MBT bracket system



Fig4 : The 0.18" SS wire has been stepped down



Fig 5: radiographic evidence showing fracture line coronal to alveolar bone.



Fig6: LASER gingivectomy done with respect to 12



Fig7: Final post-op photograph after acrylic jacket crown cementation

Once the desired extrusion was achieved and retained, the patient underwent DIODE LASER gingivectomy with respect to 12 for aesthetic gingival margin and more exposure of the fracture line [Fig 6]. On the very same day the fracture fragment was removed, and the stainless-steel wire fragment was separated and discarded. Post space was prepared, fiber optic post was cemented with resin cement. Reattachment of the fracture fragment without the stainless-steel wire fragment was done. Tooth preparation was done, followed by cementation of an acrylic jacket crown on the very same day to completely cover the exposed fracture line [Fig7]

DISCUSSION

Handling complicated crown-root fractures continues to be difficult. This is because it is challenging to provide isolation in a dry operational field using a rubber dam, which could jeopardize the restoration's hermetic seal. For crown-root fractures, several treatment strategies have been put forth, such as coronal fragment removal followed by repair above gingival level. As a result, a long junctional epithelium forms to repair the subgingival section of the fracture. The second alternative is to use gingivectomy and osteotomy surgeries to change the subgingival fracture into a supragingival fracture. It is contraindicated in aesthetic zone. The third method involves surgical repositioning. Root resorption is markedly increased by this technique, as the periodontal ligament may fail to reattach to the root surface. Orthodontic extrusion of the tooth constitutes the fourth modality of treatment. Despite the drawn-out treatment process, the gingival and periodontal health benefit from it. Moreover, it produces good cosmetic outcomes and does not lead to the loss of alveolar bone or periodontal support.⁵ Subgingival margins or subcrestal margins caused by tooth fractures make the remaining tooth difficult to restore. The biological width will be impacted due to subcrestal fracture margin. Through orthodontic extrusion, the biological width is attained, and adequate supragingival tooth tissue is obtained.

Forced orthodontic extrusion can be defined as a movement of vertical translation in a coronal direction obtained through the application of continuous light forces⁶. Orthodontic extrusion of a subgingival fracture was reported as early as 1973 by Heithersay. In the present case report orthodontic extrusion after endodontic treatment was considered, but inadequate tooth structure left was a problem. Hence the fracture fragment was initially reattached to the tooth with the help of a stainless-steel wire fragment. The rigid wire was used as a reinforcing scaffold for exact reattachment of the fragment, which otherwise did not likely create a proper marginal seal after restoration of the fragment with light cure composite only. This attachment made bonding of bracket to the fractured tooth feasible. After reattachment of the fracture fragment orthodontic extrusive force was applied. Surgical exposure followed by reattachment was not a choice because biological width could not be restored. However, there is an increased possibility of external root resorption and loss of bone support⁷. Malmgren et al. also suggested that there were more chances of resorption of the root in traumatized teeth than uninjured teeth⁸. Orthodontic treatment was carried out for 9 weeks followed by a retention for 4 weeks. Although the recommendation varies from 1 week to about 1 month per millimetre of extrusion⁹. In this instance, we additionally restricted our forced eruption to a maximum of 5 mm¹⁰ in order to prevent recurrence and preserve the appropriate crown-root ratio for a prosthetic restoration. Following the extrusion, a coronal migration of the gingival margin was noted. Gingival recontouring was carried out to improve aesthetics by realigning the gingival margin with the opposing tooth. A circumferential core ferrule of 1 mm and another 1 mm of crown ferrule which is mandatory for proper stress distribution and prevention of microleakage and failure of restoration was obtained. Care was taken not to compromise on the crown-root ratio of at least 1:1 for a good long-term prognosis¹¹. A fibre post and core was preferred as it has a good long-term prognosis and improves the fracture resistance of endodontically treated tooth. An acrylic jacket crown was provided since she was Thirteen years of age.

CONCLUSION

Orthodontic extrusion is a conservative approach to provide orthodontic-endodontic treatment to a tooth as it preserves the natural tooth and maintains periodontal architecture. Additional reinforcement from the stainless steel wire fragment helped in reattachment of the fracture fragment with adequate seal. Conservation of the fracture fragment retains the fracture strength of the tooth and provides good prognosis.

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