



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2022; 8(2): 396-399
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www.oraljournal.com
Received: 21-01-2022
Accepted: 04-04-2022

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Immediate autogenous reattachment of fractured tooth fragment post trauma: A case report

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DOI: <https://doi.org/10.22271/oral.2022.v8.i2f.1535>

Abstract

Fractures of the anterior teeth are one of the most common forms of dental injury that occur during trauma to the head and neck region. These complications can be managed conservatively and immediately through autogenous reattachment procedures. Reattachment procedures are an immediate solution in the management of coronal fractures in which the patient's own fractured tooth fragment is bonded back onto the remaining portion of the tooth after endodontic therapy. This technique restores proper form, function, and aesthetics of the tooth in a short duration of time and also significantly impacts the post traumatic psychological rehabilitation of the patient. The recent advances in bondable dental materials have made these reattachment procedures much more predictable. This paper describes a case report of a patient who reported with a fractured tooth post trauma to the face and was treated using endodontic therapy followed by reattachment of the fractured tooth fragment using anchorage from a fiber post.

Keywords: Reattachment, tooth fragment, IADT 2020 guidelines, trauma, complicated crown fracture

Introduction

The incidence of complex coronal fractures of teeth peaks during adolescence and young adult ages. Complex coronal fractures involve the enamel, dentin and the pulp. The etiology can be primarily attributed to blunt trauma to the tooth from the labial aspect that may be caused during road traffic accidents, contact sports, self-fall injuries and many more ^[1].

These traumatic injuries have a profound impact on the patient in terms of pain, discomfort, injury to the pulp of the tooth and a significant psychological impact leading to anxiety and loss of self-confidence ^[2]. It is of utmost importance to treat these injuries at the earliest using appropriate treatment protocols to ensure anatomical, aesthetic as well as psychological rehabilitation of the patient.

The management of traumatic injuries depends on the following ^[2, 3].

- The pattern and extent of injury
- Restorability of fractured tooth
- Secondary injuries
- Presence/absence of fractured tooth fragment and its clinical condition for use
- Occlusion
- Aesthetics
- Prognosis of the tooth

Clinicians have employed a variety of techniques for reattachment including Rebond Fibers, fiber posts, various techniques of beveling and grooves, all of which fundamentally are bonding techniques. With the advances in clinical materials and techniques, reattachment procedures have become simpler and more predictable.

This article reports a case of the autogenous reattachment of a complex coronal tooth fracture managed through an immediate bonded reattachment of fractured tooth fragment, post endodontic therapy.

Case Report

A 21-year-old male patient reported to with a history of self-fall 3 days ago. The patient presented with severe pain in the upper front tooth region that began after the fall, secondary to the complicated coronal fracture. The pain was insidious in onset, showed no progression, lancinating in nature and was exacerbated on consumption of hot and cold food.

On clinical examination, an Ellis Class 3 fracture was noted on tooth number 22 with frank exposure of the pulp. The tooth was sensitive to palpation and tender on percussion. The tooth showed a negative response to both EPT and heat pulp testing. The pulp was visible clinically, well surrounded by sound dentin circumferentially and was dark red in colour and coagulated in appearance. A diagnosis was made of "Complicated crown fracture (enamel-dentin fracture with pulp exposure)" according to the IADT 2020 guidelines.

The treatment was planned to start with endodontic therapy followed by placement of a fiber post and reattachment of the tooth fragment using support from the cemented fiber post. Pre-operative photographs and radiographs were taken, and the planned procedures were explained to the patient and a written consent was obtained.

Preparation and Storage of Tooth Fragment

The fractured tooth fragment inspected for cracks and fractures under 2.5X magnification (Keeler® loupes). The tooth was first washed in saline to remove all debris and blood. It was cleaned using 2% chlorhexidine solution and stored in 0.9% normal saline.

Endodontic Therapy

The treatment began with the administration of local anesthesia. An infra orbital nerve block corresponding to tooth 22 was administered using 2% lignocaine in 1:80,000 epinephrine and was supplemented with local infiltration in the region. Access opening was done, and the pulp was extirpated. Working length was determined using an apex locator (Propex Dentsply Maillefer®) and was set to 18mm. The cleaning and shaping procedure was performed first with K files (15 to 50) size (Mani®) followed by H files for circumferential filing. The canal was irrigated with 3% sodium hypochlorite and 0.9% normal saline alternately during instrumentation. The length and fit of the master cone was confirmed radiographically and obturation was done using Sealapex(Kerr®). [Figure 1]

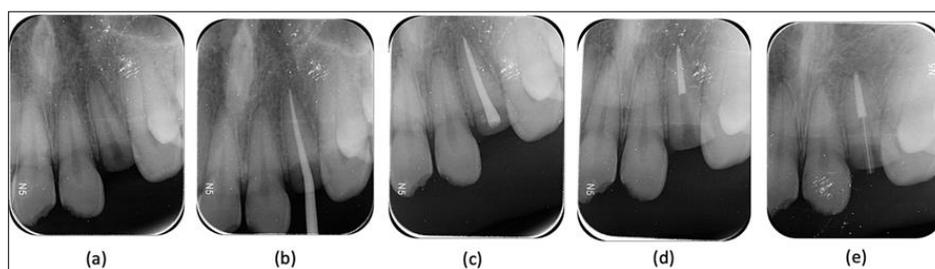


Fig 1: Radiographs of endodontic therapy - root canal treatment performed on tooth 22. (a) Pre-operative radiograph showing complex coronal fracture [enamel-dentin with pulp exposure, IADT 2020 guidelines]. (b) Master-cone radiograph (c) Final obturation radiograph (d) Post space preparation for fiber post (e) Radiograph after final cementation of the fiber post.

Post Space Preparation and Fiber Post Cementation

The patient was recalled after 24 hours for the reattachment procedure. The post space was prepared using piezo reamers size 3 and 4 up to a length of 13mm, leaving 5mm of the obturation material in the apical 1/3rd of the canal. The obturation material was further condensed using a heated hand plugger. A fiber post was selected of the appropriate size

and cemented into the canal using RelyX U200 (3M) resin cement and light cured, leaving a 3mm projection of the post coronally. The separated fragment was placed over the projected portion of the fiber post. The pulp chamber of the coronal fragment was appropriately sized to accommodate the projection of the fiber post. [Figure 2]

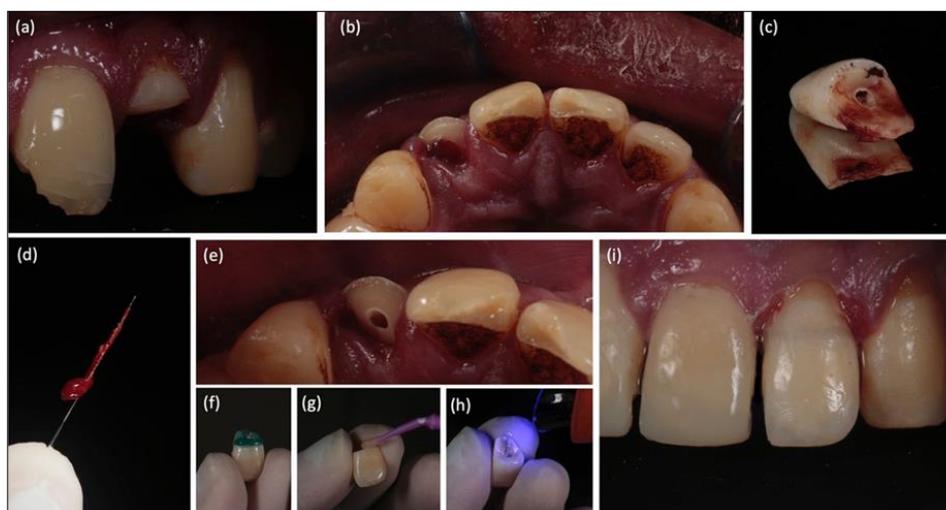


Fig 2: (a) Pre-operative photograph depicting a complicated corona! Fracture of the upper left lateral incisor. (b) Occlusal view depicting exposed pulp tissue. (c) Fractured coronal tooth fragment. (d) Extirpated pulp tissue after commencement of endodontic therapy. (e) Debrided pulp chamber and root canal. (f) Etching of tooth fragment using an acid etchant. (g) Application of bonding agent over etch tooth surface. (h) Light curing of bonding agent over tooth surface. (i) Post-operative photograph of reattached tooth fragment (using resin cement) and final restorative procedures.

Reattachment Procedure

The tooth fragment was etched with the Etchant-N (Ivoclar Vivadent®) then washed and dried using a three-way syringe. The bonding agent -ESPE Adper Single Bond 2 (3M®) was applied onto the tooth according to manufacturer's instructions and light cured for 30 seconds. Care was taken to avoid pooling of the bonding agent in the approximating area

of the fragment. Resin cement was then flowed into the pulp chamber space and the fragment was seated over the projected portion of the fiber post and light cured for 60 seconds from both the buccal as well as the labial aspect. The excess cement was trimmed using diamond abrasives and airer. The final finishing and polishing procedures were postponed to a later date as the tooth was still tender. [Figure 3]

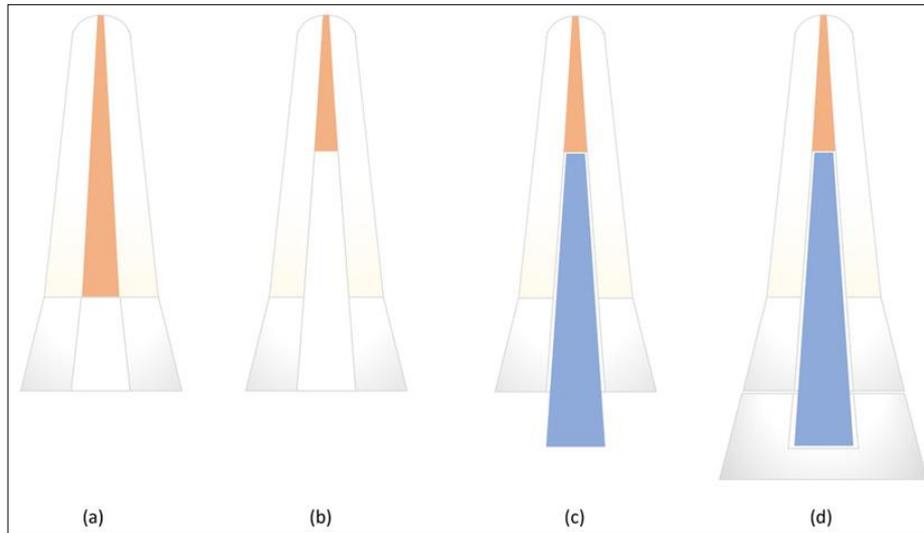


Fig 3: Illustration depicting placement of fiber-post in the root canal. (a) Endodontically treated tooth with obturation material up to the CEJ. (b) Post space preparation, leaving 5mm of obturation material intact in the apical 1/3rd of the canal. (c) Placement of fiber-post into the post space and leaving 3mm of the post extruded. (d) Reattachment of the tooth fragment on to the tooth using the extruded portion of the fiber post as anchorage.

Discussion

The management of traumatic injuries to the tooth is crucial and time dependent. The International Association of Dental Traumatology provides revised guidelines annually that are based on the evolving evidence in the field of dental traumatology. These guidelines are the gold standard for treatment planning and management of dental trauma.

Complicated crown fractures involving enamel, dentin, and pulp (IADT 2020 guidelines), have been managed through various techniques including all ceramic restorations, custom cast posts, digi-posts and even bonded restorations depending on the extent of the lesion. The key to successful treatment in such situations is to assess the status of the pulp. However, during trauma and luxation injuries, there is a transient damage to the nerve fibers present in the apical region of the root tip [3]. This can result in false negative responses elicited up on immediate thermal and electric pulp testing. Hence, the endodontic treatment plan cannot be determined on the sensibility assessment of the pulp through these tests, but rather should be determined through vitality testing using pulse oximetry and laser Doppler flowmetry [4]. The current use of these tests are limited to the lack of sensors specifically designed to fit dental use, lack of availability of the devices as well as greater expense. Pulp status can be assessed clinically, based on the amount of pulp exposure, duration of pulp exposure to the oral environment and presence or absence of foreign bodies and other contaminants.

Autogenous reattachment is a clinical procedure in which a fractured tooth fragment is fixed onto the remaining tooth material post trauma to restore proper function, tooth form and aesthetics. This treatment was first suggested by Chosalk and Eidelman in 1964 [2]. The advantages of reattachment are - aesthetics, immediate treatment, biocompatibility, preserving existing occlusion and low economics. The techniques for reattachment range from the use of fiber posts

for fragment attachment to the use of pins. The treatment plan mainly depends on the level of fracture. Subgingival fractures can be managed through the use of extrusion orthodontics after primary endodontic therapy [3]. Majority of the fractures confined to enamel and dentin with pulp exposure usually present with no mobility, mild sensitivity to percussion and palpation. The exposed pulp will be sensitive to stimuli such as air, cold and sweet food [4, 5, 6]. It is recommended to take an intra oral periapical radiograph using the paralleling technique and a film positioner. One parallel radiograph aimed through the midline to show the two maxillary central incisors, two parallel periapical radiographs aimed at the maxillary right and left lateral incisors and an occlusal radiograph are the views recommended [7].

In teeth with immature apices, it is of utmost importance to preserve the pulp. Various vital pulp therapy techniques like partial pulpectomy and pulp capping procedures can aid in root formation [7]. Non-setting calcium hydroxide as well as non-staining calcium silicate cements are suitable materials to be placed over a pulp wound. Follow up radiographs taken at 8 weeks, 3 months, 6 months and 1 year should be taken and compared with the baseline radiograph to assess continued root development. Symptomatic teeth with periapical lesions are a negative prognostic factor and may need endodontic intervention. Teeth showing positive response to sensibility testing and root development indicate good prognosis as well as healing and may not require endodontic intervention in the future [7, 8].

In teeth with mature apices, endodontic therapy followed by rehabilitation of the tooth is recommended. The use of a post after endodontic therapy to anchor the tooth fragment is a simple yet effective treatment modality to restore the tooth functionally, anatomically as well as aesthetically. The signs of no symptoms in the follow up appointments is a sign of a favorable outcome [8].

The technique described in this paper is an uncomplicated technique in the management of complicated fractures with a conservative approach and preserves a significant amount of tooth structure. The operator must keep in mind that the prognosis of the attached fragment significantly depends on the efficacy of the bonding protocols used. Numerous case reports have described the success of reattachment cases. Cavalleri and Zerman stated that the long term prognosis of reattached crown fragments was better than that of bonded restorations^[9]. Macedo *et al*, stated that the fabrication of a mouth guard could further increase the long term success of reattachment cases by eliminating the stresses generated during parafunctional habits^[10].

The advances in bonded restorations have resulted in a paradigm shift in the long term prognosis of restorations today. Thus, reattachment of a tooth fragment is a feasible technique in the immediate management of trauma to the anterior teeth and should be a treatment of choice especially in younger individuals.

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