Successful Management of Fractured Teeth through Reattachment: Case Series with Follow-up

Sukruti S Babu1, Subha Anirudhan2, Hari Baskar3, Minu Koshy4

Received on: 21 June 2023; Accepted on: 18 December 2023; Published on: 03 February 2024

Abstract

Aim: The purpose of this case series was to show how to manage dental injuries by reattaching the patient’s own tooth fragment.

Background: Dental trauma frequently results in coronal fractures of the anterior teeth. Root canal therapy followed by reattaching the fractured segment with fiber post reinforcement is a viable alternative in cases of complicated fractures where the fractured segment is present and there is close approximation of the segment to the intact tooth. In comparison to other treatments, reattaching broken tooth fragments using a variety of procedures has several benefits, notably in terms of restoring the esthetics, functionality, form, texture, and translucency of the surface.

Case description: The present case series describes three clinical cases of reattachment using three different treatment strategies depending on the severity of fracture and the success of these treatment procedures was evaluated for a period of 6 months. All the three strategies have shown a successful clinical outcome.

Clinical significance: Besides being a conservative procedure, reattachment provides an immediate positive psychological response from the patient.

Keywords: Case report, Fiber post, Fracture fragment reattachment, Fragment reattachment.

Introduction

The most common consequences of traumatic injuries, which mostly affect the anterior permanent teeth, is a crown fracture. It is estimated that a quarter of the world population would experience at least one coronal fracture of an anterior tooth, before the age of 18, which can be due to falls, high-impact sports, and automobile accidents being the most prevalent causes.1–7 Majority of the traumatic dental injuries result in dentin and enamel damage. Of these, 0.3–5% of injuries are crown-root fractures, requiring a complex, multidisciplinary course of treatment.5

The main challenge for the dentist continues to be choosing an appropriate esthetic restorative procedure for the damaged anterior teeth. Treatment options include full or partial coverage ceramic restorations, composite resin restoration, and fragment reattachment. Of these, reattachment is the best course of treatment for managing a coronal fracture fragment when a tooth fragment is present and is functional.8

The first incidence of fracture reattachment was documented by Chosack and Eidelman in 1964 where they utilized a custom cast dowel and core for management.1 Starkey and Simonsen later supported the acid etch technique for reattachment which was first advocated by Tannery.6 It is a simple and conservative option, restoring the morphological, functional, and esthetic aspects of the dentition while maintaining the shape, contour, texture, color, and alignment of the natural teeth.7

The present article reports cases of immediate management of crown fracture by coronal fragment reattachment in permanent dentition and reports their success through follow-up.

Case Description

Case 1
A 28-year-old male patient reported to the Department of Conservative Dentistry and Endodontics at Sri Ramakrishna Dental College and Hospital with the chief complaint of broken tooth in the upper front teeth region. Patient gave a history of trauma 30 minutes before reporting to the clinic. Clinical examination revealed Elli’s Class III fracture of Maxillary Left Central-21 (Fig. 1). The intraoral periapical radiograph indicated complete root formation and a closed apex with no periapical radiolucency (Fig. 1C). Baseline pulp sensibility test was assessed and the tooth was vital. After getting a written consent, it was decided to initiate direct pulp capping on #21 followed by reattachment of the fractured segment using retention grooves.
Local anesthesia was administered (1.0 cc of lidocaine 2% with 1:80,000 epinephrine). Under rubber dam isolation, the pin point exposure of pulp was capped using mineral trioxide aggregate (MTA Angleus) (Fig. 1F), followed by the placement of retention grooves on the fractured segment and tooth with the use of a tapered fissure bur (Fig. 1D). The tooth fragment was reattached using flowable composite (Tetric N-Flow\textsuperscript{TM}) after etching and bonding (Fig. 1E). Postoperative instructions were given to the patient and he was periodically reviewed every month, the restorative treatment remained clinically acceptable through each visit. Pulp sensibility was assessed for #21 at 3 and 6 months, and a normal response was elicited at both the visits.

Case 2

A 70-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of pain and mobility in upper front region of jaw. Patient gave a history of trauma 1 day before coming to the clinic. Clinical examination revealed a complicated crown fracture of maxillary right lateral incisor-12 (Fig. 2A). The fracture line was found to be extending horizontally from the gingival third of the crown on the labial to the palatal aspect (Fig. 2B). The intraoral periapical radiograph indicated complete root formation and a closed apex with no periapical radiolucency. The radiograph also showed fracture of crown at cervical level (Fig. 2C). There was also Ellis Class II fracture in #11 and #21 and generalized cervical abrasion (Fig. 2). After taking written consent, it was decided to initiate single visit root canal treatment (RCT) on #12 followed by reattachment with fiber post reinforcement. After 2 weeks, pulp sensibility test in #11 and #21 to be assessed and if non-vital RCT to be carried out.

Local anesthesia was administered (1.0 cc of lidocaine 2% with 1:80,000 epinephrine). Access was initiated through the fractured coronal segment in #12 and working length was determined using intraoral periapical radiograph. After thorough cleaning and shaping of root canal using Neoendo rotary system and enlarging the canal up to 30.6%, copious irrigation was done using 5.25% NaOCl and saline, the canal was obturated using sectional obturation with master cone size 30. Post space preparation was done using size 1 Peeso Reamer and Esthetic post (Fiber Reinforced Post-FRC Postec Plus) of size 0 was selected. Assessment of post was done radiographically after adjusting the post length. The prepared post space was etched for 15 seconds using 37% phosphoric acid (3M ESPE Scotchbond\textsuperscript{TM}). It was then rinsed thoroughly with water and excess water was removed with a cotton pellet. After that the bonding agent (Tetric N-Bond Universal, Ivoclar) was applied on the etched surface as well as the post. The adhesive
Management of Tooth Fracture Using Reattachment

Fig. 3A to F: (A) Preoperative intraoral view; (B) Fracture tooth-12; (C) Preoperative intraoral periapical radiograph; (D) After fragment reattachment in 12 using fiber reinforced post; (E) Follow-up after 6 months; (F) Postoperative intraoral view

was air thinned and light cured for 10 seconds. The post was then luted with resin cement (3M RelyX™ U200 self-adhesive resin cement Refill). A periapical radiograph was taken to ensure the proper cementation of post as well as fragment (Figs 2D and E). The occlusion was checked and postoperative instructions were given to the patient. Composite restoration was done to improve the esthetics and to mask-fracture line.

After 2 weeks, patient was recalled and pulp vitality was assessed, where #11, 21 was non-vital. Root canal treatment was carried out followed by composite restoration, since the patient was not willing for crown. The cervical abrasion was restored using gingival colored composite (Amaris Gingiva, VOCO) (Fig. 2F). The patient was kept on periodic review after every month and it was observed that both endodontic and restorative treatments remained clinically acceptable through each visit.

Case 3
A 20-year-old female patient reported with the chief complaint of pain and mobility in upper front region of jaw. Patient gave a history of trauma 1 day before coming to the clinic. Patient also gave the history of trauma before one and half years, where she had undergone splinting of the luxated tooth and patient had not reported to the respective clinic for recall. Clinical examination revealed the complicated crown fracture of maxillary left central incisor-21 (Fig. 3A). Fracture line was running horizontally from the gingival third of the crown on the labial aspect to subgingival level palatally (Fig. 3B). Fractured fragment was stabilized due to the previous splinting. There was also Ellis class 2 fracture of #11 (Fig. 3A). Preoperative intraoral periapical radiograph showed fracture of crown at cervical level (Fig. 3F). After taking written consent, it was planned to perform single visit RCT on #21 followed by reattachment with fiber post reinforcement (Fig. 3G).

Local anesthesia was administered. Access cavity preparation was carried out through the fractured segment, working length determined and after thorough cleaning and shaping of root canal was carried out followed by obturation using sectional obturation. After post space preparation using peeso reamers, esthetic post (Fiber Reinforced Post-FRC Postec Plus) of size 0 was selected. Assessment of post was done radiographically after adjusting the post length. Then, the splinting was removed, followed by the atraumatic removal of the fractured segment in relation to 21 (Fig. 3C). It was then cleaned with 2% chlorhexidine solution and stored in 25% dextrose (as hypertonic solution increases bond strength of reattached fragment). Fractured fragment was stored in 25% dextrose to prevent drying and desiccation (Fig. 3D). Labial and palatal views after removal of fractured fragment (Fig. 3E). The fiber post was cemented using the same protocol previously described in the second case report. Periapical radiograph was taken to check the proper cementation of post as well as fragment (Fig. 3H).

Discussion
The development of adhesive material has opened new opportunities in the restoration of fractured teeth. It is now possible to get excellent outcomes with the reattachment of a broken tooth fragment given that the biological aspects, materials, and techniques are logically examined and managed.8 The present case series presents three cases of effective maxillary anterior tooth fracture reattachment with a 6-month follow-up.

In the present case series, three different treatment protocols were carried out for reattachment of fractured tooth segment. In case report 1, reattachment was carried out by placing grooves in the lingual aspect. In the second case report, reattachment was carried out using fiber reinforced post with the tooth fragment kept intact. Whereas, in the third case report, the fractured tooth was atraumatically extracted and then reattached using fiber reinforced post. All the three cases had shown a successful treatment outcome in a span of 6 months.

The use of posts to reinforce the reattached fragments has been widely documented in the literature. Even though numerous methods using various materials have been proposed, resin-based restorative materials with tooth-colored fiber posts may be the best choice due to their numerous benefits, including a suitable elastic modulus, esthetics, good post-cement bonding, shorter chairside time, and minimal tissue removal. The stresses acting on the reattached tooth fragment is said to be reduced when a fiber post is used with fractured teeth as it interlocks the two fragments.9,10 In the present case series, fiber reinforced post was used in two of the three cases.

Additionally, certain limitations, such as difficulty in attaching a fractured fragment due to commuted fracture, fragment
dehydration, might cause a loss of translucency or original hue. In the current study, the fractured fragment was stored in a medium in two cases to keep it from drying out. According to some authors, moisture loss is the cause of the discoloration of the reattached fracture fragment. This in turn causes dentinal tubules to contract, jeopardizing the bonded interface. In the event that other treatments are unsuccessful, crowns or veneers can be an alternative solution.

Some of the benefits of fragment reattachment are:
- It offers accurate reproduction of the shape, contour, and texture of the original tooth;
- It maintains the same color and optical characteristics;
- It is a predictable, quick, conservative, and an affordable approach.

The drawbacks include:
- It poses the risk of the fragment detachment.
- Can result in alteration of color as a result of inadequate rehydration.

**Conclusion**

This case series demonstrates that fracture reattachment is a feasible, conservative, and esthetically pleasing approach for treating crown fractures. It is an immediate procedure for esthetic rehabilitation in the management of traumatized teeth, while the long-term prognosis is still unclear.

**ORCID**

Subha Anirudhan  [https://orcid.org/0000-0002-1319-3097]

Hari Baskar  [https://orcid.org/0000-0003-3259-7860]

**References**