Reattaching the fractured fragment in Ellis Class 3, without extraction/removal of that fragment

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Article History
Received: 04 May 2020
Reviewed: 05/May/2020 to 16/June/2020
Accepted: 17 June 2020
E-publication: 23 June 2020
P-publication: July - August 2020

Citation
Saurabh Rathi, Pradnya Nikhade, Pavan Bajaj, Nidhi Motwani, Joyeeta Mahapatra. Reattaching the fractured fragment in Ellis Class 3, without extraction/removal of that fragment. Medical Science, 2020, 24(104), 2445-2451

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ABSTRACT

The dental trauma can be considered as a public health problem. The increased prevalence of anterior tooth fracture warrants a most conservative approach for treatment of complicated tooth fracture. Currently, most common treatment option for partial fracture is to remove the fragment followed by reattachment. The present case report describes a novel therapeutic approach for reattachment of fragment without removing it. This systemic ultraconservative approach is simple and may help in minimal tooth destruction with maximum preservation of original anatomy. The mobile fracture segment is first stabilized using splinting, followed by endodontic treatment. The fracture fragment is reattached by keeping it intact and without extraction/removal. Follow up showed satisfactory result.

Keywords: Reattachment, Fracture, Partial fracture, Trauma.

1. INTRODUCTION

Traumatic Dental Injuries refers to physical injuries of dento-alveolar region; they are of immediate onset and may be mild to severe type, depending upon the type of trauma and tissues involved (Spinas et al., 2018). Traumatic injuries of certain types can be classified as Endodontic Emergency, requiring immediate attention (Moule and Cohenca, 2016). Traumatic injuries can be currently classified as a public health problem (Lam, 2016). It is uneventful and unanticipated event with increased incidence in age group below 20 years, however no age group is immune to it (Zaleckiene et al., 2014). Traumatic injuries can have a variety of causes, very much depending on the age group involved. In young age it can be due to falls and sports, and in adolescents mainly due to assaults or road traffic accidents (Enshaei and Ghasemi, 2018). Whatever might be the cause, treatment and management is multifactorial, and depends on variety of factors like tissues involved, age of the patient, eruption status with apex development of the tooth, type of injury, status of underlying pulp tissue, duration between trauma and treatment, severity and all these affects the prognosis or outcome of the treatment.

Traumatic injuries mostly involve maxillary anterior teeth with varied incidence from 37% to 66.7% (Andreasen and Andreasen, 1993; Fakhruddin et al., 2008; Kumar et al., 2011). Trauma in the anterior region is chiefly associated with the esthetic purpose and thus can affect the emotional well being and psychological status of the patient, requiring earliest intervention possible (Arhakis et al., 2017; Lopez et al., 2019). The array of traumatic injuries is from simple chipping of enamel to avulsion of the whole tooth. It can either involve the pulp or spare the pulp, complicated to uncomplicated. Treatment modality ranges from simple restorative treatment to reimplantation or extraction of involved teeth. However, a general concensus can say that ‘more conservative the treatment- better the prognosis’.

One of the fracture modality in traumatic injuries is complicated crown fracture a wide variety of options are available to restore fractured teeth. Amongst the pool of treatment options, reattachment gained the popularity in recent time. Idea of reattachment can be date back to half a century, where Chosak and Eidelman in 1964, reattached the tooth fragment of anterior teeth using a cast post. The acid etching technique to reattach first reported by Tennery NT in 1978 (Chosack and Eidelman, 1964; Tennery, 1978). In the recent times, there has been tremendous development in restorative dentistry with respect to material science and predictable bonding. Traditional composites, though widely used have certain disadvantages whereas, the newer recent nanocomposite materials provide adequate strength with superior esthetics, whereas recent generations of bonding agent helps with easy application and sufficient bond strength (Panchbhai, 2019; Sathe et al., 2019; Hegde, 2003).

Figure 1 Pre-operative
2. CASE REPORT
A 20 year old male had a complaint of broken tooth in upper front region of jaw 1 day back. It was associated with pain. Patient revealed a history of fall. On clinical examination, maxillary central incisor revealed a horizontal fracture line at a junction of middle and cervical third region extending from mesial to distal (figure 1). Fragment or part of tooth was mobile, but was supported and intact palatally (figure 2).

![Image of teeth with fractured tooth](image)

**Figure 2** Intact Palatal Fragment

**Investigations**
To evaluate the status of root and supporting structure, intraoral periapical radiograph was advised. Radiograph revealed no signs of root fracture (fig. 3). Periapical tissues appeared normal. Also, the extent of fracture line, if any below the gingival tissue was examined. Periodontal examination suggested that, there was no requirement to expose the fracture line surgically. Thus, based on above examination, clinico-radiographic diagnosis of ‘Ellis Class III’ with respect to 21 was established. Endodontic treatment was planned to relieve the symptoms and for fractured segment of tooth, it was first examined and approximated, and since it did not show any gross changes reattachment of the same fragment was planned without extracting it.

![Image of pre-operative radiograph](image)

**Figure 3** Pre-operative Radiograph
**Endodontic procedure**

Local anesthesia with 1:1,000,000 adrenaline was administered. Isolation was maintained using rubber dam. To stabilize the fractured fragment, splinting was done with composite resin (figure 4).

![Figure 4 Splinting of fractured segment](image)

Access opening was done with small round diamond bur (BR-45, Mani, INC) with minimal tooth structure removal. Coronal Pulp was extirpated. Pulp chamber copiously irrigated with 5.25% NaOCl (Cholrazid - 5.25%, Cerkamed) and normal saline. Patency was established with 10 K-file (Mani, INC), and working length was determined based on apex locator (Propex pixi, Denstply). It was confirmed with digital radiograph on PSP. The root canal was prepared chemico-mechanically, with hand files in conjunction with irrigants hypochlorite, EDTA 17% and normal saline alternatively. Step back technique was used to prepare the canal, with MAF size being 70 k-file. Thorough irrigation was performed with saline and hypochlorite, and then dried with paper point. Obturation was done using lateral condensation technique with 2% Gutta percha points and AH plus sealer. Post obturation radiograph revealed satisfactory obturation (figure 5).

![Figure 5 Obturation](image)

**Reattachment procedure**

Before proceeding to reattachment, fractured fragment was again checked for approximation. Segments approximated each other and no gross abnormality was seen. The intact tooth surface and the fragment, both were acid etched using 37% orthophosphoric acid (Etching gel, Prime Dental) for 20 seconds, then rinsed with water and air dried. Then, two coats of bonding agent (3M ESPE, Adper Single Bond 2) were applied and light cured for 40 seconds. For reattachment, flowable composite was used (3M Filtek Z350x). Flowable composite was applied in a thin layer, over the junctional surface of fractured fragment and intact tooth, and segments approximated with each other. It was then pressed to remove the excess cement, which was wiped off. Fit was evaluated and then light cured for 40 seconds. Following reattachment, tooth preparation was done for overcontouring. Tooth preparation was done of buccal surface, coronal and apical to the fracture line using diamond finishing bur. Etching and bonding was done on prepared tooth surface followed by restoration with microhybrid resin composite (Spectrum, Dentsply). Tooth was light cured for 40
seconds and complete build up was done. Restoration was completed by further finishing and polishing (Super Snap Minikit, Shofu) (figure 6).

Oclusion was evaluated. Postoperative instructions to avoid excessive forces in the anterior region were explained. Patient was recalled after 1 week, a month and 6 months for follow up. Patient was asymptomatic at 1 week and 3 month follow up period. Three month postoperative period was uneventful.

Figure 6 Postoperative

3. DISCUSSION

Fracture of anterior teeth is not uncommon sequelae after trauma to maxillofacial region and it is of prime concern to the patient, as it is related to esthetic appearance. Thus, clinician should efficiently manage such type of injury. Management should be as conservative as possible with maximum positive outcome (McDonald et al., 2004). The present case describes the simple, conservative approach for management of incomplete/partial crown fracture.

The goal of the treatment in this present case was to alleviate the pain of the patient, restore the aesthetics, and reinforcing strength required for mastication. To alleviate the pain, root canal treatment was performed. Here, the fracture fragment not detached completely, and was attached to the tooth palatally. Pretreatment evaluation of fracture segment is important in this type of treatment modality. The extent of fracture line (supragingival or subgingival), approximation of fragment, and occlusion of the patient needs to be evaluated. Patient reported with intact palatal tooth surface, so it was planned to perform the endodontic treatment by keeping the segment intact as it is and reattaching it, without completely removing it. The fracture and endodontic treatment decreases the strength of the tooth. To provide maximum strength, Superficial over contour of restorative material over the fracture line and was done.

Endodontic treatment should always be performed after stabilizing the tooth, so as to avoid further trauma to tissues. In this case, splinting was done with resin composite to stabilize tooth prior to access opening. Reattachment of the same tooth fragment without extraction of fractured portion, offered numerous advantages over fracture extraction and reattachment such as: No trauma as extraction is avoided; Simplicity of procedure; Dehydration of fractured tooth is avoided; Better approximation and optimal esthetics; Easy to perform and relatively simple; More comfortable to patient (no fear of extraction).

In case of reattachment, literature suggest to improve the retention of reattached structure and to provide strength to the tooth, by various procedures - that range from no addition tooth preparation to various preparation techniques such as placement of circumferential bevel, overcontouring, internal groove, notching of enamel, external chamfer after bonding at the fracture line (McDonald et al., 2004; Pusman et al., 2010; Reis et al., 2001). Pusman et al. suggested that fracture resistance of reattached fragment depends upon preparation of tooth prior to bonding and type of adhesive used (Pusman et al., 2010). He also stated that internal grooving showed greater resistance to force than other techniques. However, this case with partial fracture makes this technique difficult to be employed. Reis et al. stated that, when no additional preparation of the fragment/ tooth was done with simple reattachment tooth only recovered 37.1% strength, whereas it gained - 60.6% strength in a buccal chamfer, 97.2% with over contouring and 90.5% with internal grooving as compared to intact tooth’s fracture resistance (Reis et al., 2001). Srlatha et al. in 2012 in her study concluded that overcontouring technique resulted in highest strength recovery, almost similar to intact teeth. It was attributed to increased area for adhesion thus better forces distribution over large area (Srlatha et al., 2012). In present case,
subsequent to reattachment, buccal surface of teeth was prepared in apical and coronal area of fracture line. It was then restored with composite resin, which masked the fracture line and restored esthetics.

In terms of retention, reattachments also rely on bonding of restoration. With increased demand of adhesive dentistry, various adhesive procedures and types of adhesives are being used for favorable bond at tooth-restoration interface. Etch and rinse adhesives are considered as gold standard adhesive with adequate bond strength of nearly 30 MPa. Pusman et al. in his study concluded that apart from the adhesive technique used, reattachment of fragments with an in-between resin composite layer made fracture strength superior (Pusman et al., 2010). Davari et al. stated that flowable composite showed superior shear bond strength to reattached fragment due to its adequate flow into reattachment site (De Munck et al., 2005; Davari and Sadeghi, 2014). The fracture fragments were thus approximated with thin layer of flowable composite resin, followed by restoration with microhybrid composite. This case report describes an alternative method of treatment of partial/complicated fracture. Though convincing to use, it is not a universal approach for treatment of fractures. Studies with long term follow-up should be undertaken to warrant this approach.

4. CONCLUSION

This case presented the alternative treatment approach for reattaching the fractured fragment without extraction/removal of that fragment. This ultraconservative approach is simple, safe, fast and esthetically pleasing. However, it cannot be used in every case and careful case selection and preoperative assessment is required to achieve long term favorable prognosis.

Funding: This research received no external funding.

Conflict of Interest: The authors declare that they have no conflict of interest.

Informed consent: Written informed consent was obtained from all individual participants included in the study.

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