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Immediate management of complicated crown fracture: A case series

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ABSTRACT

Trauma to anterior tooth is prevalent among adolescents. An immediate management of complicated crown fracture is reattachment of fragments or biologic tooth restoration. The present case series elucidate the fracture reattachment using conventional preparation design for resin restoration. The adhesive reattachment provides an original tooth color and contour that aids in rehabilitation of traumatized tooth. The present case series depicts that fracture reattachment is a viable, conservative and esthetic alternative for treatment of complicated crown fracture. The long-term prognosis is still obscure, but it is an immediate technique of esthetic rehabilitation.

Key words: Fracture re-attachment, management, trauma

INTRODUCTION

Complicated crown root fractures account for 5-8% of all traumatic injuries. Out of which, 11-12-year-old children showed 15.1% prevalence of traumatic dental injuries in permanent incisors with boys outnumbering girls.^[1,2] Management of such injury using fragment reattachment is well documented in the literature.^[3] In 1964 Chosack and Eidelman reported the first case of fracture reattachment using cast post and core.^[1] Tannery first introduced an acid etch technique for fracture reattachment that was later advocated by Starkey and Simonson.^[4,5]

Contemporarily, hybrid composites used for fracture reattachment allows more conservative preparation design


like feather-edge; chamfer; shoulder and long bevel (45° external circumferential). The prerequisite for these preparation designs is a satisfactory tooth restoration interface that is, the fracture line is present up to the clinical crown. The fracture line is present up to the clinical crown which is above the attached gingiva.^[1] But when it involves the biological width (which is extending from gingival sulcus to height of alveolar bone), the treatment is by orthodontic extrusion, surgical crown lengthening or extraction.^[3]

Reattachment of original tooth fragment has certain advantages such as natural tooth contours, texture, color, translucency with better esthetic.^[3] Furthermore, it enhances the durability because of natural incisal wear resistance of a sound dental tissue.^[1] The procedure is acceptable in permanent as well as primary tooth as it is a conservative, cost-effective and a less time-consuming restorative option.^[6,7] Management of traumatized tooth by biologic tooth restoration has optical and mechanical properties equivalent to a natural tooth. Therefore, in comparison to composite tooth restoration, biologic tooth restoration is always a promising treatment option.^[1]

Thus the present article reports cases of immediate management of complicated crown fracture by coronal fragment reattachment in primary and permanent teeth.

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CASE REPORT

Case 1

A 12-year-old girl came to the Department of Pedodontics and Preventive Dentistry with a sustained fractured upper anterior tooth due to a fall from bicycle the previous day. The past medical and dental history was noncontributory. Clinical examination showed Ellis Class III fracture of maxillary right central incisor with a frank clinical exposure of pulp. The fracture fragment of labial surface was chipped off and brought by the patient in dry condition. The periodontal assessment revealed that the fracture line on buccal side was invading the gingival sulcus. The endodontic treatment was initiated under an antibiotic prophylaxis and tetanus-toxoid coverage. The fractured fragment was kept in "Save a Tooth" storage media (Phoenix Lazerus, Pennsylvania). Local anesthesia (Neon, India) was administered and access preparation was done under rubber dam (Hygiene, Germany) isolation. This was followed by determination of working length and bio-mechanical preparation using step-back technique with endodontic K-file and H-file (Mani, Tochigi, Japan). After copious irrigation with 2.5% sodium hypochlorite (Vishal Dentocare, India) and normal saline (Lifusion, India), final obturation was done using endodontic sealer (NK, India) with gutta-percha (Metabiomed, Korea). Excess gutta-percha was removed and the canal was sealed by glass ionomer cement (GC corp., Germany). Surgical crown lengthening of teeth was done to expose the fracture line. The internal bevel with retentive grooves was prepared on traumatized tooth and fractured fragment using diamond bur (Diabur, Japan). The tooth surfaces were etched with 37% phosphoric acid gel (Eazetch, India) for 15 s, rinsed and dried with blotting paper. Bonding agent (Dentsply, USA) was applied and cured according to manufacturer's instruction. A small increment of composite resin (Vivadent, Liechtenstein) was applied onto the bonded surfaces and with the help of adhesive applicator tip the fragment was reattached and cured. The lost tooth structure was reconstructed followed by finishing with long needle shaped bur (Shofu, Japan) and polished with Soflex disc (3M ESPE, Germany). Pre- and post-operative intra-oral images were shown in Figure 1.

Case 2

A case 10-year-old boy reported to the Department of Pedodontics and Preventive Dentistry with traumatized upper front tooth 4 days back. Clinical examination revealed Ellis Class III fracture with maxillary right central incisor and a mobile fragment partially attached to the labial surface. Patient was not able to maintain adequate oral hygiene due to mobile fragment and soft tissue laceration. Clinically, the fracture line was above the gingival margin which was checked using Williams graduated probe (API, Germany). The mobile fragment was removed under local anesthesia, stored in HBSS media and endodontic treatment was done in a single visit. The discolored tooth fragment margins were well adapted but the incisal edge was chipped off. So, a long bevel 45° circumferential preparation was done using diamond bur FG 8780108F (Diatech, India) at the fracture margin to increase the surface area of bonding. The tooth and the fragment were acid etching using 37% phosphoric acid (Eazetch, India) for 15 s, rinsed and dried with blotting paper. A bonding agent was applied on both the substrates and cured according to manufacturer's instruction. A light cure flowable composite resin was injected in pulp chamber of the fragment and placed at fracture site and cured holding it together. Composite veneering was done to mask the discoloration and to build up the incisal third for acceptable aesthetics. The restoration was finished and polished using Soflex disc (3M ESPE, Germany). Pre- and post-operative intra-oral images were shown in Figure 1.

Case 3

An 11-year-old boy came with a week old complaint of fractured upper front tooth to the Department of Pedodontics and Preventive Dentistry. On clinical examination, maxillary right central incisor showed Ellis Class III fracture with an attached labial fragment. The horizontal fracture line involved the middle third of clinical crown but was above the gingival sulcus. The coronal fragment was removed under local anaesthesia and stored in HBSS media. The endodontic treatment was carried out and the fragment was verified for proper adaptation. A chamfer preparation was done using diamond bur FG85901010 ML (Diatech, India) at the interface. The tooth and the fragment were etched with 37% phosphoric acid (Eazetch, India), patted dry with blotting



Figure 1: Pre- and post-operative intraoral images of fracture reattachment

paper, bonding agent was applied and cured. The fracture re-attachment was done using increments of composite resin (Dentsply, USA), finished and polished with Soflex disc (3M ESPE, Germany). Pre- and post-operative intra-oral images were shown in Figure 1.

Case 4

A 5½-year-old boy reported to Department of Pedodontics and Preventive Dentistry with a 3 days old fractured upper front tooth. Ellis Class IX fracture was found on clinical examination with respect to left upper deciduous central incisor. The fracture line involved the entire length of the clinical crown. The periodontal assessment revealed that the fracture line was above the gingival margin. After administration of local anesthesia, pulpectomy was carried out and initial reduction of the fracture was done to check the marginal fit without any tooth preparation. Both the fragment and the tooth were etched using 37% phosphoric acid (Eazetch, India) for 30 s and thoroughly rinsed. Bonding agent was applied and cured according to the manufacturer instruction. The fragment was placed on the fracture site, and flowable composite was used for the re-attachment, which was followed by core built up with composite resin (Dentsply, USA). The restoration was finished and polished using Soflex disc (3M ESPE, Germany). Pre- and post-operative intra-oral images were shown in Figure 1.

Case 5

An 11-year-old boy reported to Department of Pedodontics and Preventive Dentistry with a day old fractured and partial loss of a crown fragment of upper front tooth region. Clinical examination revealed complicated crown fracture with a frank pulp exposure; therefore the endodontic treatment was initiated. The fracture line involved the entire length of the crown but was above the gingival margins. The feather-edge preparation of fractured fragment was done to add a bulk of composite resin for crown built-up. Both the fragment and the tooth were etched with 37% phosphoric acid (Eazetch, India) for 15 s, followed by application of bonding agent and reattachment using adhesive resin (Dentsply, USA). The restoration was finished and polished using Soflex disc (3M ESPE, Germany). Pre- and post-operative intra-oral images were shown in Figure 1.

DISCUSSION

Biologic tooth restoration suffices the purpose of esthetics rehabilitation as well as form and function. It is a noninvasive and less technique sensitive procedure restoring the tooth in original anatomic form and contour.^[8] Thus, it helps in overcoming the psychological trauma undergone by an individual.^[9] Rehabilitating tooth by biological means is often a daunting challenge.^[10] However, newer adhesive systems have, phenomenally increased the prognosis of such treatment options.^[11] In an adolescent, a preponderant pulp volume, progressive eruption and instability of marginal

gingiva intend to eliminate the prosthetic rehabilitation. Besides this restoring a complicated crown fracture adopting conventional composite resin restoration proves to have an under-esthetic acceptability.^[10]

The present case series elicit the management of complicated crown fracture through the tooth reattachment technique in primary as well as a permanent tooth with minimal tooth preparation. The numerous modifications for fragment reattachment include bevel, chamfer and dentinal grooves preparation, which enhances esthetics and its durability.^[10] No preparation at the fracture margin, appears to be sufficiently stable, according to Giudice *et al.*^[12] While Reis *et al.* advocated the need of bevel, a chamfer or internal groove, which concomitantly improves fracture resistance.^[13] This can be attributed to increased surface area leading to greater extension of the restorative material with distributed force around the fracture margin.^[14]

To achieve success, an appropriate clinical protocol for isolation and material manipulation is required.^[7] Moreover, certain limitations like difficulty in the attachment of fractured fragment or dehydration can result in loss of translucency or original hue.^[10] In the present study, the fractured fragment were placed in a storage media so as to prevent its dehydration. According to Toshihiro *et al.* discoloration of re-attached fracture fragment occur due to loss of moisture. This in turn results in shrinkage of dentinal tubules thus compromising the bonded interface.^[15] In case of failure, an alternative treatment can be crowned or veneers.^[10] The acceptable space between the bone crest and the base of the gingival sulcus is 2.04 mm, according to Baratieri *et al.* This was clinically evaluated in the present case series by measuring the biological width.^[16] Therefore, the need of surgical intervention and bone re-contouring were not required except in case 1. Chronologically the apical closure of root (2.5 years after the eruption) had been completed, and frank pulpal exposure was present. Hence, the root canal treatment was chosen over pulpotomy or direct pulp capping. The literature also suggested that a complicated crown root fracture has a lower chance of maintaining its vitality and can result in periapical diseases. The possible reason could be a fragile dentinal wall in cases of the newly erupted permanent tooth.^[1] Moreover, endodontic procedures will aid in structural strength and integrity of the tooth. Many studies have stated the importance of the adhesive system as an effective means of sealing the pulp dentin interface, whereas reattachment procedure is considered as a transitional restorative therapy.^[1]

Thus, it can be concluded from the case series that fracture reattachment is a viable, conservative and esthetic alternative for treatment of the complicated crown fracture. The long term prognosis is still obscure, but it is an immediate technique of esthetic rehabilitation in the management of traumatized tooth.

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