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Case Study

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AN ANTICIPATION TO REUNITE - FRAGMENT REATTACHMENT: A CASE REPORT WITH LITERATURE REVIEW

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ABSTRACT

Complicated crown-root fracture of maxillary central and lateral incisors is frequent in case of severe trauma or sports-related injury, because of the anterior positioning of the tooth in oral cavity and their protrusive eruptive pattern. One of the best treatment protocol concerning about aesthetics, function as well as patients acceptance is reattachment of a fractured fragment to the remaining tooth, since it restores the original form, colour, contour, surface texture and also provides a psychological comfort to the patient. This clinical case report focuses on the successful reattachment of fractured crown-root segment using glass-fibre post. After a year, the reattached fragment still has satisfying esthetics and excellent function.

KEYWORDS: Fragment reattachment, Glass Fibre post, Rehabilitation, Crown Fracture, Finishing and Polishing.

INTRODUCTION

A crown-root fracture influences enamel, dentin and cementum. According to the pulpal involvement it may be categorized as either complicated or uncomplicated.[1] One of the most common traumatic injuries are crown fractures, the increased prevalence of these injuries to anterior teeth is a consequence of leisure activities.[2] 18-22% are coronal fracture of anterior tooth, 28-44% are simple fracture (involves enamel and dentin), 11-15% are of complex fracture (involves enamel, dentin and pulp).[3] Because of position in arch, maxillary central incisors involves 96% of these fractures.[4]

Various treatment options have been advocated for traumatic permanent teeth which include[5]-

a. Orthodontic extrusion
b. Osteotomy / osteoplasty
c. Intentional replantation
d. Re-attachment of fragments
e. Extraction.

With the advancement of adhesive materials, reattachment of tooth fragment has become a more predictable technique with several advantages. It is a conservative procedure that sustains the original tooth contour, texture and translucence, is budget-friendly and obtains esthetics in a single appointment.[5]

The present paper describes a case wherein reattachment procedure was successfully carried out in anterior teeth with complicated fractures involving or occurring at the subgingival level.

CASE REPORT

A 15-year-old patient reported to the department of Pediatric and Preventive Dentistry after 3 days of trauma and sustained a complicated crown-root fracture to the maxillary right central incisor. On extraoral examination, no laceration of soft tissue or swelling was found. On intraoral examination, Ellis class III fracture was seen with the tooth 11. (Figure: 1) Oblique fracture line was present extending from the gingival third of labial surface to the level of CEJ in the lingual surface. The crown fragment was mobile but still in place. Radiographic examination confirmed the same. (Figure: 2)

Figure 1: Preoperative view showing complicated crown-root fracture of maxillary right central incisor.

Figure 2: Pre-operative radiograph showing fractured 11 (Ellis Class III)

Figure 3: Fracture fragment removed from underlying tooth.

Under local anaesthesia, the fractured fragment was removed atraumatically and stored in distilled water to be used at a later stage. (Figure: 3) Root canal pulp extirpation and canal preparation was performed using the standard step-back method. The prepared teeth were dried with paper-points and filled with laterally condensed gutta-percha and root canal sealer. (Figure: 4) A post hole within root was prepared using a drill recommended by manufacturer. A glass fiber post was cemented within root canal with dual adhesive cement. (Figure: 5) A groove was made on the fractured fragment so that it fits comfortably on the fractured root without any interference from overlying post. (Figure: 6) After anaesthetising, palatal envelope flap was raised by giving crevicular incision reflecting using periosteal elevator. (Figure: 7) After etching and bonding of the coronal fragment and tooth surface, the prepared coronal fragment was reattached with tooth surface with composite and excess resin cement was finished and polished. (Figure: 8)

Figure 4: Radiograph with obturation.

Figure 5: Cementation of Fibre Post.

Figure 6: Groove prepared in the fractured fragment.

Figure 7: Partial palatal flap raised

Figure 8: Reattached fractured segment.

The surgical flap was secured and coe-pack was placed which was removed after a week. Occlusion was checked and post-operative instructions were given to the patient and the patient was recalled after 7 days for evaluation. Clinical and radiographic examinations carried out after 1 month, 3 months, 6 months and 1 year confirmed the satisfactory aesthetic and functional outcome of the treatment with no associated endodontic or periodontal problem. (Figure: 9)

Figure 9a: Intraoral Post-operative Follow Up after 1 year

Figure 9b: Post-operative radiograph after 1 year.

DISCUSSION

The loss or fracture of anterior teeth has enhanced psychological impact on the patient than any other dental disturbance. The selection of a relevant treatment option depends on various factors – the type of fracture and its relationship to the alveolar crest; degree of pulpal involvement; apex formation; level of eruption and occlusal characteristics; prognosis, and the patient's needs and attitude towards treatment.[6] Each treatment has its relative advantages and disadvantages. Chosack and Eidelman published the first case of reattachment of a fractured tooth fragment in the year 1964 and the procedure was described as a 'temporary restorative modality'.[7] Inspite of large number of publications depicting different approaches of reattachment of tooth fragments, longevity of the procedure is not predictable. Few of the clinical studies have shown that these restorations last beyond 7 years.[8]

Reattachment of a displaced fragment is a simple and cost-effective method having the potential to preserve the incisor tooth structure, providing improved longer-lasting aesthetic results.[9]

Various re-attachment strategies have been advocated for re-attaching a detached tooth fragment to the remaining tooth:[10]

1. Placement of a circumferential bevel before re-attaching the fragment.
2. Positioning of an external chamfer at the fracture line after bonding.
3. V-shaped enamel notch.
4. Internal groove placement.
5. Leaving a superficial overcontour of restorative material over the fracture line.

Injured tooth requires post-placement to retain the core, particularly when more than half of the tooth structure is lost. Preference of fibre post by the clinicians is due to the fact that they are tooth coloured, has a modulus of elasticity similar to that of dentin, bonds to the tooth and have high fracture resistance.[11] A post and core improves retention, by distributing stress and improving resistance to root fracture.[6] Usage of a fibre post luted with resin cements enhances the retention of the segment and provides a monoblock effect.[12] Resin luting cement provides good bond strength to the tooth.[11] A study conducted by *Andreasen FM et al* concluded that the good retention of fragment, acceptable aesthetics, and pulp vitality indicated that re-attachment of coronal fragment is a realistic substitute to placement of conventional resin composite restoration.[13] Natural tooth substance clearly eliminates the problems of differential wear of restorative material, unmatched shades, difficulty of contour and texture reproduction associated with other restorative techniques.[14] Follow up in these patients is of critical importance since the bonded interface between the tooth and the reattached fragment is vulnerable to effects of cyclic fatigue and hydrolytic degradation with time.[10] The different treatment modalities executed by various authors in the last 10 years case reports on the reattachment of the fractured segment of anterior tooth,those were published in various journals. (Table no. 1)

Our treatment modality met the immediate rehabilitation requirements of the patient and provided for the functional and esthetic need till a follow up period of 1 year without any complications.

Table 1: Few reported case on reattachment of fractured segment of anterior tooth which were published in various journals in last 10 years.

Type of fracture	Treatment followed	Reference
Complicated crown-root fracture of lateral incisor at the subgingival level with grade III mobility of fractured segment	Single visit root canal treatment was done and fragment was reattached using fiber post and dual cure resin cement.	Akhil Rajput *et al.*[15]
Case 1 – Oblique subgingival fracture in upper left lateral incisor with no mobility	Root canal treatment followed by gingivectomy and placement of detached drilled fragment to tooth	Gul Tosun *et al.*[16]

and uncomplicated fracture in left upper central incisor. Case 2 – Complicated oblique fracture in upper left central incisor extending subgingivally with mobility	surface. Polyethylene fiber was placed through groove in coronal fragment. Composite build up was also done in left central incisor. After Root canal treatment mucoperiosteal flap was raised followed by resective osseous surgery in the vertical axis to reshape the alveolar margin. The fragments were reattached with a self-cure dental adhesive. A seat was constructed on the palatal surface of the crown fragment in order to lay polyethylene fiber, which was further cemented.	
Ellis class III fracture violating the biological width, the fracture was extended till the level of gingiva in the labial aspect.	Osteoplasty and gingival recontouring were carried to maintain the biological width. After root canal treatment, post space was prepared. Groove was created on the fractured segment and reattachment was done with the fibre post along with dual-cure composite bonding.	Mohammad Aminul Islam *et al.*[14]
Case 1 – Complicated fracture at the cervical region of crown (Ellis Class III). Case 2 – Ellis class III fracture	Root canal treatment with fibre post for the intact portion of the tooth was done in both the cases followed by box like preparation on the fracture segment which was reattached with the help of nanohybrid composite.	Mohammad A Arnaout *et al.*[17]
Case 1 – Oblique crown-root fracture in maxillary right central incisor with bucco-palatal extent. Case 2 - Horizontal fracture of maxillary left central incisor with mobility of the tooth fragment, fracture of maxillary left lateral incisor without mobility of fragment and enamel-dentin fracture of right central incisor.	Root canal treatment was done followed by repositioning of fragment with 'v' shaped grooves and filled with GIC. Later post space preparation and cementation of fiber post was done followed by a circumferential V-shaped groove made along the line of fracture and the entire groove was filled with flowable light cure composite. RCT was done in tooth 21 and 22 followed by post space preparation. An over contour preparation was made after adhesion of the fragment in 22 and filled with flowable light cure composite. Later fiber post was cemented in the prepared post space to reinforce the fragment against dislodging forces. Treatment modality of 21 was similar to that of first case.	Saleem Akhtar *et al.*[18]
Oblique crown root fracture of maxillary left central and lateral incisor extending subgingivally with mobility of the fragments and bleeding between the fragments.	Flap was raised to expose the area and single visit root canal treatment was carried out. Post space was prepared in both the tooth and fragments. After luting of the post, the fragments were reattached onto the surface using dual cure composite.	Rachid Fawzi *et al.*[19]
Ellis Class III fracture extending obliquely from incisal edge to the middle 3rd of tooth in relation to right central incisor.	Under rubber dam, single sitting RCT was carried, bevel was created on labial surface of tooth and fracture fragment was attached using flowable composite.	Mariyam Layak Pathan *et al.*[20]
Ellis class I fracture in left central incisor, Ellis class III fracture in right central incisor and left lateral incisor.	Fractured segment of 21 was reattached, root canal treatment of 11 and 12 was completed in a single sitting using AH plus sealer and gutta-percha cones. Post space was prepared in 11, 12 and cemented using flowable dual-cure resin cement. Retentive grooves were prepared in fractured fragment of 12 and reattached onto tooth surface. Polycarbonate crown was used to restore 11 due to loss of fractured fragment.	Deepak Khandelwal *et al.*[21]
Case 1 – Complicated crown-root fracture in upper right central incisor with mesiopalatal extension. Case 2 – Ellis class III fracture of the maxillary left lateral incisor	Root canal treatment done followed by post space preparation. Post was luted in the canal with resin cement, a hole was prepared in the fractured tooth fragment which was attached onto the tooth surface using resin cement. Single visit root canal treatment was done followed by	Gourav Thapak *et al.*[22]

	post space preparation. Prefabricated glass fiber post was luted in the canal with dual-cure resin cement. A hole was made in the fragment with enamel and dentin bevel to enhance retention followed by reattachment of fractured segment with the help of flowable composite.	
Case 1 – Ellis class III fracture of left central incisor with oblique fractutre line. Case 2 – Horizontal fracture line with Class III fracture in mandibular right lateral incisor.	Single visit root canal treatment was done in both the cases followed by preparation of post space. A trough was created in the centre of the separated fragment. Fibre post along with fractured segment was reattached on to the tooth by the help of dual cure resin.	Satabdi Pattanaik *et al.*[23]
Case 1 – Subgingival oblique fracture line in maxillary right central incisor. Case 2 – Ellis Class III fracture in maxillary right central incisor	A palatal intrasulcular incision, gingival flap was performed to remove the fragment. Single visit root canal treatment was done in both the cases followed by post space preparation and grooving in the fractured fragment was done. Fibre post along with fragment was attached on to the tooth by dal cure resin cement.	Vishwakarma Sucharita *et al.*[24]
Complicated oblique crown fracture in maxillary right central incisor that extended sub gingivally in the mesiopalatal aspect.	Root canal treatment was done followed by post space preparation. The metal post was luted using glass ionomer cement. Access preparation was done in the fractured fragment followed by bevel placement to enhance retention. The fragment was attached on the tooth via flowable resin composite.	Shreeshail Indi *et al.*[25]

CONCLUSION

The reattachment of an intact tooth fragment is found to be a simple, biological and conservative approach of treatment. Authors recommend the combination of polyethylene fiber and resin materials to support the reattached tooth fragments in the treatment of subgingival complicated crown-root fractures, particularly for young patients. Patient as well as parents should be illustrated about the possible outcomes of this treatment approach and should be motivated for regular follow up visits. They should also be explained about the provisional nature of this treatment and should be educated about the future prospects of age specific permanent treatment options.

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