

One-year Outcomes of Reattaching Complicated Crown-Root Fracture Fragments with Fiber Posts: A Case Series

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Abstract

Coronal fractures most commonly occur in maxillary anterior teeth, especially in children and adolescents, but can happen at any age. In complex fractures, where the fractured segment is available and closely approximates the remaining tooth, root canal treatment followed by reattachment of the broken segment with fiber post-reinforcement is a feasible treatment option. This paper presents a case series of four coronal tooth fractures that were successfully reattached using fiber posts and adhesive luting material.

Keywords: Adhesion, Esthetics, Coronal fracture, Fiber post, Reattachment, Trauma.

INTRODUCTION

Crown fractures of the anterior teeth are a common consequence of dental trauma that mainly affects the maxillary incisors because of their position in the arch.^[1,2] It is of utmost importance that restorative planning succeeds in restoring the patient's esthetics and function. Rehabilitation normally ranges from composite resin restoration to dental fragment bonding. Bonding depends on how viable the tooth fragment is and on how well it will adapt to the remaining tooth to ultimately improve the prognosis. Factors that influence the management of coronal tooth fractures include the site of fracture, size of fractured fragments, periodontal status, pulpal involvement, root maturation, biological width invasion, occlusion, and time. One of the options for managing coronal tooth fractures, especially when there is minimal or no violation of the biological width, and the fractured fragment is retained, is the reattachment of the dental fragment. Reattachment of a fragment to the fractured tooth can provide good and long-lasting esthetics because the tooth's original anatomic form, color, and surface texture are maintained. In addition, it generates a positive psychological response and is a reasonably simple procedure that provides more predictable long-term durability than when a direct composite is used.^[3] Recent developments in restorative materials, placement techniques, and adhesive protocols allow reattachment using resin-based composites. Tennery was the first to use the acid etch technique for the reattachment of fractured tooth fragments.^[4]

CASE REPORTS

Case 1

A 22-year-old male presented to the Department of Conservative Dentistry and Endodontics at the Dental College and Hospital with fractured upper anterior teeth and pain after a fall the previous day. His medical history was noncontributory. Clinical examination revealed an Ellis class III fracture of the maxillary right central incisor. The fractured fragment was mobile, but the surrounding soft tissues were normal. Periapical radiographs showed intact periodontal ligament space, complete root formation, and no root fracture.

The treatment plan involved reattachment of the fractured segment following a single-visit root canal treatment (RCT) with fiber post-reinforcement. Local anesthesia, that is, 1.0 cc lidocaine 2% with 1:80,000 epinephrine (Lignox 2% A, Indoco remedies, India) was administered, and the fractured segment was atraumatically removed, cleaned with 2% chlorhexidine solution (Asep-RC, Anabond, Chennai, India), and stored in sterile normal saline. Endodontic treatment was initiated, and

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cleaning and shaping were done by hand K files (Mani, Japan) using 5.25% sodium hypochlorite (Prime dental products, India) as irrigant. This was followed by immediate obturation of #11 by cold lateral compaction technique using AH Plus sealer (Dentsply Maillefer, USA). Subsequently, the post-space was prepared using GG drills and Peeso reamers (Mani Inc, Japan). An esthetic post (1.1 mm, Angelus, REFORPOST, Londrina, Brazil) was selected, and the post-space was etched with 36% phosphoric acid (DeTrey Conditioner 36, Dentsply Sirona, USA) for 15 s. The adhesive (Tetric-N-Bond, Ivoclar Vivadent, Schaan, Liechtenstein) was applied, air-thinned, and light-cured for 20 s. The post was bonded with dual cured resin cement (Multilink, Ivoclar Vivadent, Schaan, Liechtenstein), extending 2 mm into the chamber. The tooth fragment was reattached using resin cement, and a physiological splint using ligature wire and composite resin (Ceram-X Mono+ Nanoceramic Restorative, Dentsply, Konstanz, Germany) was provided for 2 weeks.

The patient was monitored periodically, and both endodontic and restorative treatments remained clinically acceptable. Clinical and radiographic evaluations after 1 year revealed favorable healing (Figure 1).

Case 2

The second case is of a 35-year-old male who presented with pain and mobility of his fractured right maxillary central and lateral incisor after a traumatic injury due to contact sports. Intra-oral examination revealed an Ellis class III fracture of #11, #12, with no evidence of root fractures on radiographic evaluation. Endodontic treatment, fiber post (Glassix-NORDIN, Switzerland, diameter 1.3 and 1.1 mm for #11 and #12, respectively) cementation, and reattachment of the fractured segment were planned and performed on #11, and #12, and restored with composite resin, following the protocol adopted for Case 1. The 1-year follow-up clinical evaluation revealed acceptable esthetics and function, with favourable healing on radiographic evaluation (Figure 2).

Case 3

The third case is of a 35-year-old male who presented with pain and mobility of his fractured left maxillary lateral incisor. Intra-Oral examination revealed an Ellis class III fracture of #22. Endodontic treatment, fiber post (Glassix-NORDIN, Switzerland, diameter 1.1 mm) cementation, and reattachment of the fractured segment were planned and performed on #22, and restored with composite resin, on the same visit, following the protocol described in Case 1. The 1-year follow-up clinical evaluation revealed acceptable esthetics and function, with favourable healing on radiographic evaluation (Figure 3).

Case 4

The fourth case is of a 22-year-old female who presented with complaints of pain with respect to fractured left maxillary lateral incisor. Intra-oral examination revealed an Ellis Class III fracture of #22. No root fractures were evident on periapical radiograph. Endodontic treatment, fiber post (Glassix-NORDIN, Switzerland, diameter 1.1 mm) cementation, and reattachment of the fractured segment were planned and performed on #22, on the same visit, following the protocol described in Case 1. The 1-year follow-up clinical evaluation revealed acceptable esthetics and function, with favourable healing on radiographic evaluation (Figure 4).

DISCUSSION

Traumatic injuries involving tooth fractures can be treated by reattachment to provide what is considered to be the most conservative form of restoration.^[5] Survival rates for such restoration have shown to be good. Factors influencing the extent and feasibility of such repair include the site of the fracture, size of fractured remnants, periodontal status, pulpal involvement, maturity of root formation, biological width invasion, occlusion, time, and resources of the patient.^[6,7] If the fracture involves two-thirds or more of the crown a post reattachment is more commonly used. The use of posts

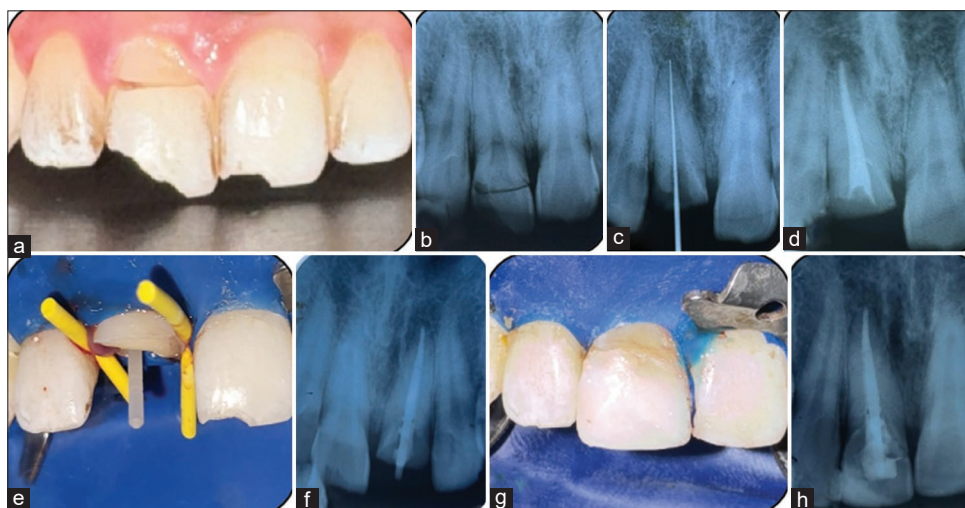


Figure 1: (a) Pre-operative view, (b) Pre-operative radiograph, (c) Working length determination. (d) Post-obturation radiograph, (e) Fiber post cemented on #11, (f) Immediate Post-operative radiograph, (g) coronal fragment re-attached, (h) 1-year follow-up radiograph



Figure 2: (a) Pre-operative view, (b) Pre-operative radiograph, (c) Fractured segment, (d) Post-obturation radiograph, (e) Fiber post cemented on #11, #12, (f) Post-operative radiograph, (g) Post-operative view. (h) 1-year follow-up radiograph

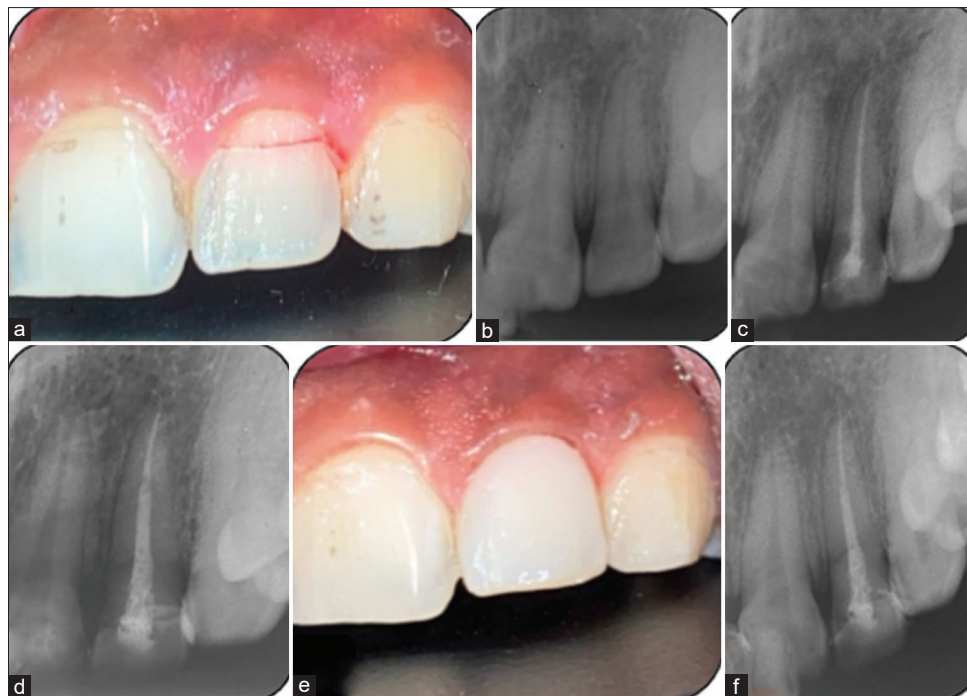


Figure 3: (a) Pre-operative view, (b) Pre-operative radiograph, (c) Post-obturation radiograph, (d) Fiber post-cemented on #22, (e) Post-operative view, (f) 1-year follow-up radiograph

increases retention and distributes stress along the root. The advantages of using the original tooth fragment over other materials include better color match, morphology, translucency, physiochemical characteristics, patient acceptance, and economic status. Other treatment options possess limitations such as multiple visits and stabilization and are less conservative. The psychological trauma caused to the individual due to loss of esthetics can be managed by this procedure successfully.^[8] The treatment of complicated crown-root fractures in many cases is compromised by fracture margins that are well below the gingival margin or bone. At present, a number of different approaches are available from which to choose when treating

fractured teeth, depending on the location of the fracture. If the fracture line is supragingival, the procedure for reattachment will be straightforward. However, when the fracture site is subgingival or intraosseous, orthodontic extrusion with a post-retained crown may be necessary. Alternatively, surgical techniques such as electrosurgery, elevation of a tissue flap, clinical crown-lengthening surgery with removal of alveolar bone, and removal of gingival overgrowth for access to the fractured site all are viable methods.^[9,10]

If the extraoral time of the fractured fragment increases, dehydration of the fragment can occur. Therefore, to prevent



Figure 4: (a) Pre-operative view, (b) Pre-operative radiograph, (c) trial for fiber post, (d) fiber post cemented in #22, (e) Post-operative view, (f) Post-operative radiograph, (g) 1-year follow-up radiograph

this case, it is recommended that the fragment be kept in a medium such as physiologic saline. According to Toshihiro and Rintaro, if the fractured fragment that was reattached is rehydrated, the fragment recovers its original color and translucency without any negative changes. It is generally expected that fragment dehydration and discoloration will not have a significant impact on the final reattachment outcome.^[11,12] The clinical importance of an intact biological width is in the maintenance of periodontal health. Once the biological width is compromised due to fracture, surgical correction must be performed to restore the area.^[13]

In the abovementioned cases, the fracture was complicated crown fractures, i.e., fracture of the crown involving pulp.^[12] Endodontic therapy provides pain relief and space for post-placement. Various materials such as composite resin, dual-cure resin cement, light-cured Glass Ionomer Cement (GIC), can be used for reattachment purposes.^[11] Treatment decisions have to be made case by case for the individual patient. The tooth reattachment technique produces a good esthetic and functional result. Moreover, the patient's self-esteem remains positive due to maintaining a natural tooth appearance. Important factors for tooth reattachment are the degree of the fragment's adaptation to the remaining structure; fragment retention; fracture location; and pattern. The quality of fit between the segments is a clinically important factor for the longevity of the reattached crown.^[14] Cavalleri and German.^[13] reported that the reattachment of the crown fragment seemed to offer a more favorable long-term outlook compared to composite resin restoration.^[15] During the procedure, the fragment must be stored in sterile saline or distilled water to avoid dehydration.^[16] Lasting dehydration of the tooth's fragment can cause disturbance of the esthetics as the longer the dehydration of the fragment is, the greater the probability of not matching the original tooth's color will be. In most case, the fractured fragment which is dehydrated is lighter than the remaining tooth structure. Return of the natural color may need time or may never occur. The assessment of occlusion after reattachment is essential as occlusal forces generated

at protrusive movements of the mandible are extremely destructive to the reattached tooth fragment.^[16] The possible afterward complications include discoloration of the attached fragment and fractured reattached teeth showing a high degree of failure to labial horizontal forces with a new trauma. Follow-up visits are critically important for all traumatic injuries. The patient should be followed for 3, 6, and 12 months and yearly for 5 years.^[9] Esthetics, tooth mobility, and periodontal status should be confirmed both clinically and radiographically on these follow-up visits. Fracture tooth reattachment allows restoration of the tooth with minimal damage to the remaining tooth structure. Various problems such as differential wear of restorative material, unmatched shades, and difficulty of contour and texture reproduction associated with other restorative techniques can be eliminated by the use of natural tooth structure.^[15]

CONCLUSION

This case series demonstrates that the reattachment of complicated crown-root fracture fragments using fiber posts is a viable and effective treatment option. Over the 1-year follow-up period, patients exhibited favorable outcomes in terms of esthetics, function, and psychological response. The use of fiber posts in combination with resin cement and modern adhesive techniques ensured durable and predictable results. The preservation of the natural tooth fragment maintained the original anatomy, color, and texture, which are crucial for achieving satisfactory long-term results. This approach offers a conservative, patient-friendly solution to managing complicated crown-root fractures, highlighting the advancements in restorative dentistry. Long-term follow-up is necessary to predict the durability of the tooth-adhesive fragment complex and to address any potential complications.

REFERENCES

1. Kirzioglu Z, Ozay Erturk MS, Karayilmaz H. Traumatic injuries of the permanent incisors in children in southern Turkey: A retrospective

- study. *Dent Traumatol* 2005;21:20-5.
2. Kargul B, Caglar E, Tanboga I. Dental trauma in Turkish children, Istanbul. *Dent Traumatol* 2003;19:72-5.
3. Baratieri LN, Monteiro S Jr., Caldeira de Andrada MA. Tooth fracture reattachment: Case reports. *Quintessence Int* 1990;21:261-70.
4. Tennery NT. The fractured tooth reunited using the acid-etch bonding technique. *Tex Dent J* 1978;96:16-7.
5. Dhingra AN, Srivastava DK. Immediate reattachment of fractured crown fragment: A case report. *Endodontology* 2006;18:94-6.
6. Taguchi CM, Bernardon JK, Zimmermann G, Baratieri LN. Tooth fragment reattachment: A case report. *Oper Dent* 2015;40:227-34.
7. Kulkarni V, Bhusari C, Sharma D, Bhusari P, Deshmukh J, Bansal A. Autogenous tooth fragment reattachment: A multidisciplinary management for complicated crown-root fracture with biologic width violation. *J Indian Soc Pedod Prev Dent* 2014;32:190-4.
8. Naudi AB, Fung DE. Tooth fragment reattachment in multiple complicated permanent incisor crown-root fractures-a report of two cases. *Dent Traumatol* 2008;24:248-52.
9. Jagannath-Torvi S, Kala M. Restore the natural-a review and case series report on reattachment. *J Clin Exp Dent* 2014;6:595-8.
10. Shetty P, Metgud S, Jain A, Dhillon G, Astekar M. A conservative single visit reattachment of fractured crown fragment. *Clin Pract* 2012;2:175-77.
11. Toshihiro K, Rintaro T. Rehydration of crown fragment 1 year after reattachment: A case report. *Dent Traumatol* 2005;21:297-300.
12. Baratieri LN, Ritter AV, Monteiro Júnior S, De Mello Filho JC. Tooth fragment reattachment: An alternative for restoration of fractured anterior teeth. *Pract Periodontics Aesthet Dent* 1998;10:115-25.
13. Cavalleri G, German N. Traumatic crown fractures in permanent incisors with immature roots: A follow-up study. *Endod Dent Traumatol* 1995;11:294-6.
14. Pasini S, Bardellini E, Keller E, Conti G, Flocchini P, Majorana A. Surgical removal and immediate reattachment of coronal fragment embedded in lip. *Dent Traumatol* 2006;22:165-8.
15. Dean JA, Avery DR, Swartz ML. Attachment of anterior tooth fragments. *Pediatr Dent* 1986;19:731-43.
16. Maia EA, Baratieri LN, De Andrada MA, Monteiro S Jr., De Araújo EM Jr. Tooth fragment reattachment: Fundamentals of the technique and two case reports. *Quintessence Int* 2003;34:99-107.