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Dr. Eldho George
Junior Resident,
Department of Conservative Dentistry, Government Dental College, Thiruvananthapuram, Kerala, India

Dr. Anupama S Gopinathan
Associate Professor,
Department of Conservative Dentistry, Government Dental College, Thiruvananthapuram, Kerala, India

Dr. Mridula Parameswaran
Assistant Professor,
Department of Conservative Dentistry, Government Dental College, Thiruvananthapuram, Kerala, India

Dr. L Sai Sindhuja
Junior Resident
Department of Conservative Dentistry, Government Dental College, Thiruvananthapuram, Kerala, India

Corresponding Author:
Dr. Eldho George
Government Dental College
Thiruvananthapuram, Kerala, India

Surgical reattachment of fractured tooth fragment: A report of 2 cases

Eldho George, Anupama S Gopinathan, Mridula Parameswaran and L Sai Sindhuja

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Abstract
Traumatic dental injuries involving anterior teeth often present a clinical and esthetic challenge. Among the various treatment modalities, surgical reattachment of fractured tooth fragments offers a conservative and predictable option that preserves natural form, color, and surface texture. This case report presents two clinical cases of complicated crown fractures of maxillary central incisors managed with surgical reattachment of the fractured fragments using fiber posts and adhesive resin cement. Both cases involved subgingival fractures requiring flap reflection for adequate isolation and access. Following atraumatic retrieval, hydration, and bonding of the fragments, fiber posts were used to reinforce stability. Clinical and radiographic follow-up demonstrated satisfactory esthetic and functional outcomes over six months. The report highlights that fragment reattachment, when combined with appropriate adhesive techniques and reinforcement, is a reliable, minimally invasive, and esthetically favorable approach for managing anterior tooth fractures.

Keywords: Traumatic dental injury, crown fracture, tooth fragment reattachment, fiber post

Introduction
Dental trauma refers to any injury involving the teeth, gingiva, jawbone, or oral soft tissues. Traumatic dental injuries (TDIs) to permanent teeth are commonly observed in children and young adults [1]. Among these injuries, crown fractures are the most frequent and predominantly affect the anterior permanent teeth. It is estimated that approximately 25% of individuals worldwide experience at least one coronal fracture of an anterior tooth before reaching the age of 18. Over 75% of tooth fractures occur in the maxillary arch, with more than half involving the central incisors, followed by lateral incisors and canines [2]. The primary causes of these fractures include motor vehicle accidents, sports-related trauma, and physical violence [3]. Most TDIs result in damage to the enamel and dentin. Crown-root fractures, though less common accounting for 0.3% to 5% of all injuries typically require a complex, interdisciplinary treatment approach [2].

The management of coronal tooth fractures depends on factors such as fracture extent (biological width, endodontic, or alveolar bone involvement), fracture pattern, and tooth restorability, including associated root fractures [4]. Other considerations include fragment availability and condition, presence of secondary injuries, occlusion, esthetics, and prognosis. Patient cooperation and awareness of treatment limitations are crucial, and a systematic approach is essential for achieving favorable outcomes in anterior coronal fractures.

Choosing an esthetic restorative option for damaged anterior teeth is often challenging [5]. Available treatments include ceramic or composite restorations and fragment reattachment. With advances in adhesive technology, fragment reattachment has evolved from a temporary fix to a reliable modality for managing coronal fractures [5].

Fragment reattachment was first reported by Chosack and Eidelman in 1964, using a cast post and conventional cement in a 12-year-old boy [6]. The acid-etch technique, introduced by Tannery [7] and later supported by Starkey [8] and Simonsen [9], provided a simple, conservative solution that restores morphology, function, and esthetics while preserving the tooth's natural features [10]. This article presents a case series highlighting the successful adhesive reattachment of tooth fragments to fractured teeth.

Case reports

Case 1

A 40-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, Government Dental College, Trivandrum, with a chief complaint of a fractured tooth in the upper anterior region. The patient gave a history of trauma that had occurred one month prior to presentation.

Clinical examination revealed an oblique labiopalatal fracture of the maxillary left central incisor (tooth #21), with the fracture line extending in an upward direction and the fragment being retained by the gingival attachment. The patient had previously undergone initial splinting at a local dental facility and was referred to the institution for further management.

Radiographic examination confirmed a complicated oblique crown fracture extending subgingivally beyond the junctional epithelium. Periapical radiographs showed a completed root canal treatment and no evidence of any root fracture or periapical pathology.

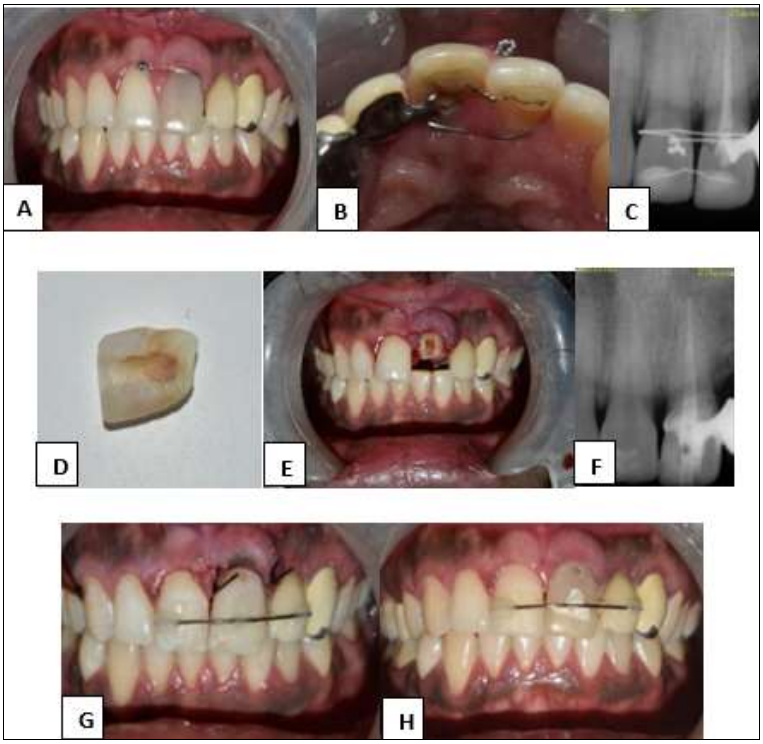
After obtaining written informed consent, a treatment plan for surgical reattachment of the fractured segment was formulated.

Local anesthesia was administered using 1.0 cc of 2% lidocaine with 1:80,000 epinephrine, and the fractured segment related to tooth #21 was addressed. Since root canal treatment had already been completed, a post space was prepared using Peeso reamers. An esthetic post with a diameter of 1.1 mm (Angelus, REFORPOST) was selected. Following the removal of the splint, the fractured segment was carefully detached (Fig. 1D), cleaned with 2% chlorhexidine solution, and stored in isotonic saline.

To expose the gingival extent of the fracture line and assess its proximity to the alveolar bone crest, full-thickness mucoperiosteal flaps were elevated on both the buccal and palatal aspects using a No. 15 BP blade (Fig. 1E). Hemostasis was achieved using tranexamic acid (TRANCIS 500 mg/5 mL) and nonwoven sterile sponges (Oro, India).

After the post length was adjusted, its fit with the fractured segment was verified. The prepared post space and the internal surface of the fragment were etched for 15 seconds with 37% phosphoric acid (3M ESPE), rinsed thoroughly with sterile water, and gently blot-dried with a cotton pellet. A universal bonding agent (Single Bond Universal, 3M) was applied to both etched surfaces and to the post, air-thinned, and light-cured for 10 seconds. The post was then luted with self-adhesive resin cement (RelyX U200 Automix, 3M ESPE) (Fig. 1F).

The mucoperiosteal flaps were sutured, and a periapical radiograph confirmed proper seating of both the post and the fragment (Fig. 1G). Occlusion was checked, postoperative instructions were provided, and the patient was scheduled for periodic reviews. Follow-up visits showed that the endodontic and restorative treatments remained clinically satisfactory (Fig. 1H).



Figs 1A to H: A) Intraoral preoperative view with subgingival fractured tooth segment (B) Preoperative palatal view (C) Preoperative periapical radiograph (D) Extracted fracture fragment (E) surgical flap elevated (F) Immediate Postoperative intraoral periapical radiograph; (G) Immediate post-operative view (H) 3 months review

Case 2

A 35-year-old male patient sustained a dental injury due to a fall and was referred to the Department of Conservative Dentistry and Endodontics for the emergency management of a fractured maxillary left central incisor (#21). Clinical examination revealed an oblique crown fracture extending from the labial to the palatal aspect in an upward direction (Fig. 2A). Radiographic evaluation confirmed a complicated crown fracture involving the pulp, with the fracture line extending subgingivally beyond the junctional epithelium. Periapical radiographs showed no evidence of root fracture or any associated periapical pathology (Fig. 2B).

As part of the emergency management, a single-visit root canal treatment (RCT) was performed on tooth #21, followed by a planned elective procedure for fragment reattachment with fiber post reinforcement on the following day. Local anesthesia (1.0 cc of 2% lidocaine with 1:80,000 epinephrine) was administered, and the fractured coronal segment of tooth

#11 was stabilized using a stainless steel splint. Root canal therapy on tooth #21 was completed (Fig. 3D), and the post space was prepared using Peeso reamers. An esthetic fiber post measuring 1.1 mm in diameter (Angelus, REFORPOST) was selected. The post access cavity was provisionally sealed with an interim restorative material (Orafil G, Prevest).

The patient was recalled the next day for the surgical reattachment procedure. Following splint removal, the fractured segment was carefully retrieved (Fig. 2C, E), cleaned with a 2% chlorhexidine solution, and stored in isotonic saline to maintain hydration. To allow optimal visualization and access to the subgingival fracture margin and to assess its proximity to the alveolar bone crest, full-thickness mucoperiosteal flaps were reflected on both the buccal and palatal aspects using a No. 15 Bard-Parker blade (Fig. 2F). Hemostasis was achieved using tranexamic acid (TRANCIS 500 mg/5 mL) in combination with sterile nonwoven sponges (Oro, India).

Following adjustment of the post length, a trial placement of the post along with the fractured segment was carried out to assess the fit. Both the prepared post space and the internal surface of the fractured segment were etched for 15 seconds using 37% phosphoric acid (3M ESPE). The surfaces were then thoroughly rinsed with sterile water, and excess moisture was gently removed using a cotton pellet. A universal bonding agent (3M Single Bond Universal) was applied to the etched surfaces as well as the fiber post, followed by air thinning and light curing for 10 seconds.

The fiber post was then luted using a self-adhesive dual-cure resin cement (RelyX U200 Automix; 3M ESPE). Once proper positioning was confirmed, the mucoperiosteal flaps were repositioned and sutured. A periapical radiograph was taken to verify accurate placement and cementation of both the post and the reattached fragment (Fig. 2G). Occlusion was carefully evaluated and adjusted as needed. Postoperative instructions were provided, and the patient was scheduled for regular follow-up visits. At subsequent reviews, both the endodontic and restorative outcomes remained clinically satisfactory (Fig. 2J).

Figs 2 A to J: A) Intraoral preoperative view with subgingival fractured tooth segment (B) Preoperative intraoral periapical radiograph (C) After removal of fracture segment (D) RCT completion (E) Extracted fracture fragment (F) Surgical flap elevated (G) Immediate Postoperative intraoral periapical radiograph (H) Immediate post-operative view after suturing (I) Postoperative intraoral view after splinting (J) 6 months review

Discussion

Reattachment of a fractured tooth fragment offers a reliable and esthetically pleasing outcome, as it preserves the tooth's original anatomical shape, colour, and surface texture. This technique not only restores functional integrity but also elicits a favourable psychological response in patients. Furthermore, it is considered a relatively straightforward and minimally invasive procedure. Clinical outcomes have shown that reattachment of fragments involving both enamel and dentin remains satisfactory for at least one year [11]. Incisal fractures of anterior teeth have been successfully managed using this approach, and even complicated crown fractures involving pulpal exposure have been effectively treated through reattachment with post and core support [12, 13].

In the present case series, a standardized treatment protocol was followed for the reattachment of fractured tooth segments. The fractured fragments were carefully and atraumatically removed, followed by reattachment using a fiber-reinforced post to enhance retention and stability. All cases demonstrated favorable clinical outcomes over a 6-month follow-up period, indicating the effectiveness and reliability of this approach.

Fragment reattachment offers several significant advantages in the management of anterior tooth fractures

1. **Rapid and conservative approach:** It allows for prompt restoration while preserving maximum tooth structure.
2. **Superior esthetics:** The original tooth fragment provides an ideal shade match, surface texture, and translucency, resulting in a highly natural appearance.
3. **Physiological wear:** The reattached incisal edge exhibits wear behavior comparable to adjacent natural teeth, ensuring harmonious occlusion.
4. **Positive psychological impact:** The use of the patient's own tooth fragment often leads to enhanced emotional and social acceptance of the treatment outcome.

Despite its advantages, fragment reattachment also presents certain limitations

1. **Potential color changes:** Over time, the bonded fragment may undergo discoloration, affecting the esthetic outcome.
2. **Compromised esthetics due to dehydration:** If the fragment becomes dehydrated prior to reattachment, it may result in a noticeable mismatch in shade and translucency.
3. **Uncertain long-term prognosis:** The longevity of the reattached fragment remains variable and is influenced by multiple clinical factors.
4. **Requirement for regular/long term follow-up:** Continuous clinical monitoring is essential to assess the integrity of the reattachment and to manage any complications [14].

The prognosis of a reattached tooth depends on several factors:

1. Recent advances in adhesive systems and resin composites have significantly enhanced the predictability and durability of tooth fragment reattachment. When a fractured tooth fragment is intact and fits closely with the remaining tooth structure, these modern materials allow for strong bonding, improved esthetics, and functional longevity, making reattachment a reliable long-term treatment option in suitable clinical cases [15].
2. Rehydration of the tooth fragment is crucial for

successful reattachment, as it preserves esthetics, maintains collagen integrity, improves bond strength and fracture resistance, and enhances adhesive penetration for superior mechanical interlocking [16].

3. The orientation and location of the fracture line are key to tooth restorability and prognosis; supragingival fractures usually allow predictable bonding and better outcomes, whereas subgingival or intraosseous fractures may require additional interventions such as orthodontic extrusion, electrosurgery, flap elevation, crown lengthening, or gingival management, with minimal osteotomy/osteoplasty when biologic width is involved [17, 18].
4. In extensive anterior tooth loss, fiber posts provide reinforcement with superior esthetics, dentin-like elasticity, enhanced fracture resistance, and even stress distribution, while resin cement luting improves bond strength, strengthens the restoration, and minimizes air void entrapment [18, 19].

Long-term follow-up is critical for evaluating the clinical success of the reattachment. This includes periodic assessments of fragment retention, tooth color, form, and periodontal health, along with periapical radiographs to detect subtle changes in the periodontal ligament. Medium- to long-term follow-up is imperative for assessing the pulpal and structural integrity of the traumatized tooth.

Conclusion

With the advent of modern adhesive materials and the application of proper clinical techniques, tooth fragment reattachment can yield highly esthetic and predictable outcomes. This conservative restorative approach effectively restores both function and appearance, making it a valuable treatment option. It is particularly advantageous in managing coronal fractures of anterior teeth in young patients, where preservation of natural tooth structure is of utmost importance. Therefore, fragment reattachment should be considered a primary option in appropriate clinical scenarios.

Conflict of Interest

Not available

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Not available

References

1. Chrishantha Joybell DC. From Breakage to Brilliance, The Power of Fragment Reattachment- A case report. JRTDD. 2024 Apr. 17;7(4):44-50.
2. Babu SS, Anirudhan S, Baskar H, *et al*. Successful Management of Fractured Teeth through Reattachment: Case Series with Follow-up. J Oper Dent Endod. 2022;7(2):33-37.
3. Feldens CA, Borges TS, Vargas-Ferreira F, Kramer PF. Risk factors for traumatic dental injuries in the primary dentition: concepts, interpretation, and evidence. Dent Traumatol. 2016 Dec;32(6):429-437.
4. Macedo GV, Diaz PI, De O Fernandes CA, Ritter AV. Reattachment of anterior teeth fragments: a conservative approach. J Esthet Restor Dent. 2008;20(1):5-18; discussion 19-20. doi:10.1111/j.1708-8240.2008.00142.x.
5. Murchison DF, Burke FJ, Worthington RB. Incisal edge reattachment: Indications for use and clinical technique. Br Dent J. 1999;186(12):614-619. doi:10.1038/sj.bdj.4800178.
6. Chosack AB, Eidelman E. Rehabilitation of a fractured incisor using the patient's natural crown. Case report. J Dent Child. 1964;31(1):19-21.
7. Tennery TN. The fractured tooth reunited using the acid-etch bonding technique. Tex Dent J. 1978 Aug;96(8):16-7.
8. Starkey PE. Reattachment of a fractured fragment to a tooth--a case report. J Indiana Dent Assoc. 1979 Oct;58(5):37-8.
9. Simonsen RJ. Restoration of a fractured central incisor using original tooth fragment. J Am Dent Assoc. 1982 Oct;105(4):646-8.
10. Singla S, Agrawal N, Shashikiran ND. Immediate management of complicated crown fracture: A case series. SRM J Res Dent Sci. 2015;6(3):194-197. doi:10.4103/0976-433X.162183.
11. Hegede RJ. Tooth fragment reattachment - an esthetic alternative: Report of a case. J Indian Soc Pedod Prev Dent. 2003;21:117-9.
12. Oz IA, Haytaç MC, Toroglu MS. Multidisciplinary approach to the rehabilitation of a crown-root fracture with original fragment for immediate esthetics: a case report with 4-year follow-up. Dent Traumatol. 2006;22:48-52.
13. Lehl G, Luthra R. Reattachment of fractured fragments of maxillary central incisors report of a case. J Indian Soc Pedo Prev Dent. 2004;22:54-5.
14. Surya Kumari NB, Sujana V, Ram Sunil CH, Reddy PS. Reattachment of complicated tooth fracture: An alternative approach. Contemp Clin Dent. 2012;3:242-4.
15. Simonsen RJ. Traumatic fracture restorations: An alternative use of the acid etch technique. Quintessence Int Dent Dig. 1979;10:15-22.
16. AlQhtani FA. Reattachment of a Dehydrated Tooth Fragment Using Retentive Holes. Cureus. 2020 Jan 13;12(1):e6640.
17. Amir E, Bar-Gil B, Sarnat H. Restoration of fractured immature maxillary central incisors using the crown fragments. Paed Dent. 1986;8:285-288.
18. Andreasen JO. Buonocore memorial lecture. Adhesive dentistry applied to the treatment of traumatic dental injuries. Oper Dent. 2001;26:328-35.
19. Trope M, Maltz DO, Tronstad L. Resistance to fracture of restored endodontically treated teeth. Endod Dent Traumatol. 1985;1:108-11.

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