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Case Report

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Conservative management of a complicated crown-root fracture in multiple teeth by adhesive fragment reattachment: A case report

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Abstract

This paper introduces a treatment approach that leads to optimum biologic tissue preservation treated in a conservative manner using fractured fragment as a restorative material. A 21-year-old boy reported for the treatment of complicated crown root fracture in the right permanent maxillary central incisor and lateral incisor (#11 and 12, Federation Dentaire Internationale), the fractured fragments were retained and remained functional by the adhesive bonding of fibre post and the fractured fragment using the surgical intervention to preserve the biologic width. A two-year follow-up revealed retained bonded fragments with acceptable esthetics and sound periodontal health.

Keywords: Fragment reattachment, Crown-root fracture, Adhesive bonding, Dental trauma, Fractured tooth.

INTRODUCTION

Complicated crown–root fractures are amongst the most frequent traumatic dental injuries that necessitate immediate dental care. These fractures pose a restorative challenge due to the subgingival extension of the fracture line, which can compromise periodontal health [1].These fractures constitute just about 0.3% to 5% of all traumatic dental injuries and often require an invasive and multidisciplinary treatment approach [2]. For fractures that invade the biological width, various therapeutic interventions have been proposed. These interventions aim to access the remnant tooth's margin, re-establishment of the biologic width, and proper isolation of the working field [3].

However, established interventions like surgical crown lengthening or orthodontic extrusion can be time-consuming and costly [4]. Adhesive fragment reattachment is particularly well suited for cases where the fracture line is supra or juxta-alveolar. Compared to traditional methods, adhesive fragment reattachment offers the advantage of mimicking the natural tooth morphology and preserving its translucency, making it a more conservative and time-efficient approach [5].

This case report details a successful application of adhesive fragment reattachment for the conservative management of complicated crown-root fractures involving the right maxillary central and lateral incisors. This minimally invasive technique allowed for optimal preservation of biological tissues while utilizing the fractured fragment itself as the restorative material.

CASE REPORT

A young 21-year-old male patient presented to the Department of Conservative Dentistry and Endodontics following a road traffic accident that resulted in traumatic fractures to the right maxillary central and lateral incisor and left maxillary central incisor. He had endured a laceration injury to his upper and lower lip and was subsequently referred for the treatment of fractured teeth. The patient's medical history was unremarkable, and he denied any loss of consciousness.

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A thorough clinical examination revealed no tenderness on palpation over the temporomandibular joint or the facial skeleton. Maximal lateral excursion and mouth opening were measured at 12 mm and 44mm, respectively. Intraorally, a transverse fracture line was observed extending circumferentially around the cervical third of the crown of the maxillary right central incisor and the middle third of right lateral incisor (#11 and 12, Federation Dentaire Internationale). An oblique fracture was observed on tooth #21(Figure 1a). The fractured fragment was not retained wrt #21.

The fractured fragments of teeth #11 and 12 were retained in position but exhibited mild mobility. The fracture lines were supragingival on the facial aspect and subgingival on the palatal aspect. Pocket probing depth and clinical attachment levels were within normal limits (2mm) using a UNC 12 periodontal probe (Hu-Friedy, Chicago, IL, USA). Although some gingival bleeding was evident. Palpation revealed no bony fragments over that area, and occlusion was slightly unbalanced due to the crown displacement (Figure 1b). Electric pulp testing (Parkell, Edgewood, NY, USA) and cold testing (Endofrost, Roeko, Germany) revealed positive responses in the anterior maxillary teeth, with a heightened response in tooth #11 and 12. A positive response was also recorded in tooth #21.

Intraoral periapical and occlusal radiographs confirmed a transverse horizontal fracture at the cervical and middle third of the crown of the right maxillary central and lateral incisors (Figure 1c and 1d). The patient was apprised of the nature of the injury, and various treatment options. After obtaining informed consent, the treatment plan involved: root canal treatment followed by fragment reattachment with a fibre post for teeth #11 and #12 and build up with composite restoration for tooth #21. At the next visit, the teeth were anesthetised with 2% Lidocaine with 1:80000 epinephrine. The fractured fragments were gently detached and examined to assess the fracture line's extent. The fragments were stored in normal saline for about two hours to prevent dehydration.

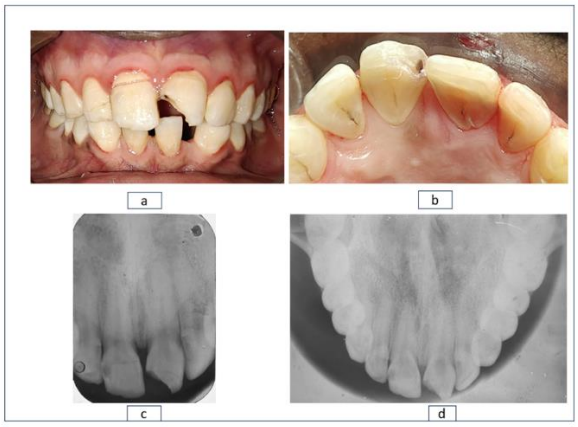

Figure 1: Preoperative images: **a**- Preoperative view showing the position and extent of fracture lines, **b**- Preoperative view showing the altered occlusal relationship, **c**- Preoperative IOPAR radiograph showing the pulp involvement of fracture line wrt #11 and 12 and uncomplicated crown fracture wrt #21, **d**- Occlusal view radiograph.

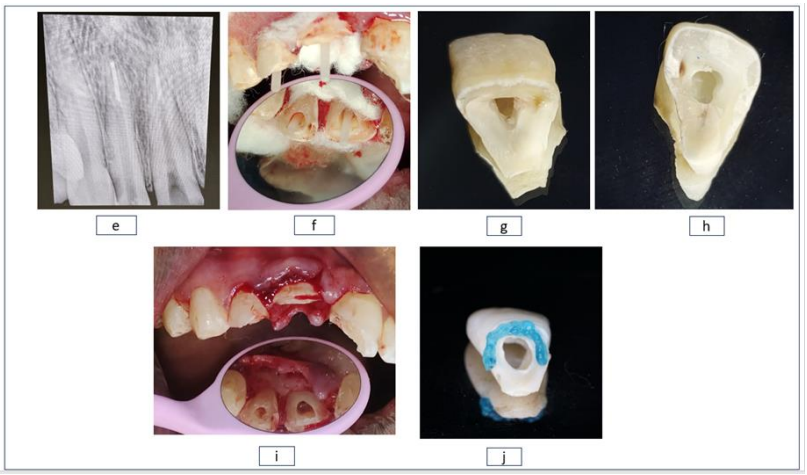

Figure 2: Intraoperative images: **e**- Prepared post space wrt 11 and 12, **f**- Verification of the fit of fibre post, **g,h**- access opening created on the palatal surface of the fractured fragments, **i**- Gingival flap from both the labial and palatal aspects allowing visualization of the fracture line, **j**- Etching of the dental fragment.

A single-session endodontic treatment was performed on teeth #11 and #12. the fragments were repositioned to verify the intimate adaptation. After completing root canal treatment, a post space was prepared to accommodate a size 1.3 glass fiber post (Tenax Fiber Trans Post, TFT Coltène/Whaledent, Cuyahoga Falls, OH, USA) (Figure 2e). The fit of the fibre posts were verified clinically to ensure intimate adaptation to the canal walls and the remaining gutta percha (Figure 2f).

It was decided to create an access opening in the palatal region of the separated fragments to provide a conduit for excess cement to escape, thus assisting in the excellent adaptation of the fractured fragment. Moreover, a circumferential retention groove was created with a small round bur within the dentin to enhance its retention (Figure 2g, h). Afterwards, a gingival crevicular incision was placed along teeth #11 and #12, and the flap was elevated on both the labial and palatal aspect under local anaesthesia (Figure 2i).

The bleeding was managed by applying pressure packs until the operative field was clean and dry. It was confirmed that the fracture line extended to the alveolar bone level, violating the biological width. The dental dam was reapplied with a 212 Brinker retraction clamp (Coltene/Whaledent, OH, USA) to expose the fracture lines. Gingival

bleeding was managed with a liquid resin barrier (Opaldam Green, Ultradent, South Jordan, UT, USA) and Teflon tape to create a favorable environment for restorative treatment. Both the tooth and the fragment (Figure 2j) were etched with 37% phosphoric acid for 30 s and rinsed with water, and gently air-dried.

Two coats of Prime &Bond NT (Dentsply De Trey GmbH, Konstanz, Germany) bonding agent were applied, followed by gentle air-drying until a glossy appearance was achieved. After light curing (Optilux 400, Demetron Research Corp., Danbury, CT, USA) the adhesive, a small amount of light cure flowable resin (FiltekZ350 XT, 3M, USA), was then applied to both the tooth and the fragment. The fragment was repositioned and manipulated with finger pressure to ensure the correct spatial position.

Again, the resin was light-cured (Optilux 400, Demetron Research Corp., Danbury, CT, USA) for 40 s each from labial and palatal aspects. However, the post space and the fibre post were etched using a non-rinse etchant and treated with ParaBond (ParaCore Coltene, Switzerland). Afterwards, the posts were cemented using dual-cure glass-reinforced composite (Para Core Coltene, Switzerland), and the access pathway was restored with composite resin shade A3 (TPH Spectrum; Dentsply Ind. e Com. Ltda).

To reinforce the attachment, a bevelled groove was created extending 2mm coronally and apically around the fracture line. This groove was etched using 37% phosphoric acid for 30 sec followed by the application of Prime & Bond NT (Dentsply De Trey GmbH, Konstanz, Germany) and subsequent placement of composite resin (TPH Spectrum; Dentsply Ind. e Com. Ltda.). The excess composite was removed carefully using abrasive discs and finishing burs. Final finishing and polishing of the buccal and palatal aspects were carried out with Sof-lex polishing discs (3M ESPE St Paul, MN, USA). For tooth #21, composite build up (TPH Spectrum; Dentsply Ind. e Com. Ltda) was done to restore the esthetics and normal anatomic contours. A postoperative radiograph was taken to confirm treatment completion (Figure 3k). During the follow-up clinical examination two years after the trauma, the fracture line was not discernible, and satisfactory esthetics and periodontal health were exhibited (Figure 3l, 3m).

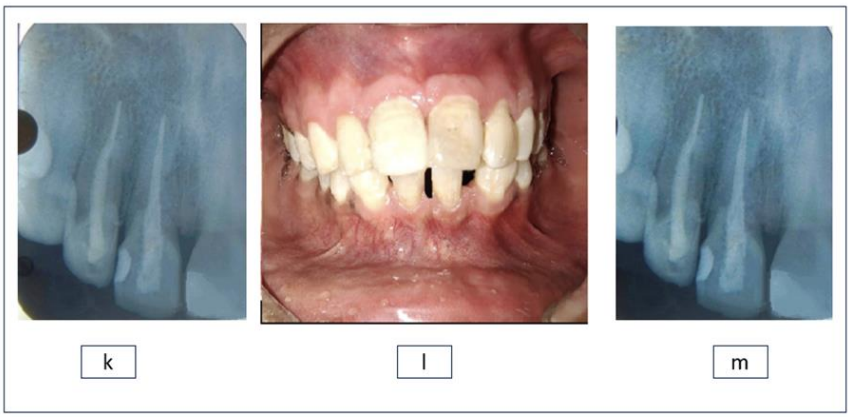

Figure 3: Postoperative images: **k**- Intraoral radiograph after reattachment procedure, **l**- Clinical view two years after the trauma, **m**- A two year follow-up intraoral periapical radiograph showing no sign of periodontal bone loss.

DISCUSSION

Crown-root fractures carry necessary insinuation for endodontics, restorative and periodontal procedures as the prognosis is highly dependent on the location of the fracture line. Therefore, treatment considerations specifically revolve around exposing the fracture line either supragingivally or juxtagingivally, in an environment of strict isolation and moisture control to properly realise the restorative requirements [2]. Furthermore, the most conservative approaches should be weighed in managing traumatic dental injury, such as preservation of the natural tooth structure and contour, with the least amount of trauma to pulpal tissues. Therefore, any treatment plan finalised should incorporate endodontic, restorative, and periodontal considerations that facilitate the best prognosis for the tooth.

Endodontic and restorative implications

The current International Association of Dental Traumatology (IADT) guidelines [6] emphasize various treatment options depending on the fracture location and tooth maturity. While traditional approaches like orthodontic extrusion or surgical crown lengthening may be necessary in certain scenarios, they can be time-consuming and potentially compromise long-term periodontal health. To date, adhesive fragment reattachment is still considered a provisional treatment rather than a definite treatment plan. Such recommendations can be attributed to poor moisture control during the procedure followed by improper adhesion, which results in a poor prognosis [2]. However, the advances in adhesive restorative materials have shifted the paradigm resulting in excellent adhesion if proper isolation can be ensured throughout the procedure.

Adhesive fragment reattachment can be considered the most conservative approach, especially in young patients. It can preserve natural tooth morphology and translucency apart from providing natural rehabilitation of form and function without sacrificing a large amount of tooth structure. Additionally, it can be considered a relatively faster and cheaper treatment option, thus instituting a positive emotional and psychological effect on the patient [3]. A recent systematic review [7] reported that fragment reattachment after complicated crown-root fractures of anterior teeth could be considered a viable treatment option if the clinical conditions are conducive. In cases where endodontic treatment was performed, reattachment was successful in 78% of the cases after one year of follow up. The fragment's reinforcement was accomplished using the fibre post, a dual-cure cement, and composite as a core material, with literature replete with the evidence of these materials helping achieve retention and a mono-block effect. The elastic modulus of the fibre post is comparable to that of dentin which assists in relatively uniform stress distribution to the tooth structure, thereby reducing the potential root fracture. Additionally, the unfavourable condition for adhesion is usually present in the post space because of the high configuration factor and compromised light transmission, so a dual-cure glass-reinforced composite was preferred due to the viscosity of these types of cement, which facilitate easy manipulation and polymerization, where the apical most portions of the luting interface may not be light-cured [3].As the fragment was preserved in normal saline, the hydration was sustained, and the fragment was able to replicate the natural colour, translucency and morphology of the tooth. The hydrated fragment is postulated to retain its fracture strength due to no collapse of collagen fibres. The present case employed a light-cured flowable resin cement to reattach the fractured fragment as the low viscosity permits better adaptation while minimizing and facilitating the removal of excess cement. Better

esthetics can further be attributed to its colour stability [4]. Reinforcement of the fracture margin post-reattachment is advocated to increase retention and fracture resistance. Demarco and others [8], De Santis et al. [9] have reported that placement of bevels and circumferential chamfer filled with composite restoration can reinforce the area of fragment adhesion and increase the fracture resistance of the reattached crown. Similarly, as reported by Reis [10], the preparation of an internal dentin groove recovered the fracture resistance by a significant percentage. Additionally, the bevel and over-contoured composite restoration successfully veiled the fracture line exhibiting an excellent esthetic appearance [3].

Restorative and periodontal implications

In the present clinical case, adhesive fragment reattachment successfully managed the crown root fracture without any catastrophic effect on the periodontium. Preservation of biologic width, the patient's age, esthetic demands, an optimum ferrule and crown–root ratio, and the occlusion and condition of the fragment are considered a few paramount factors. It has been proposed that restorative margins encroaching the biologic width cause loss of alveolar bone level and gingival recession. However, the justification for osseous contouring to regain the biologic width remains contested, with many studies emphasizing gaining adequate access to the exposure margin and consequently providing proper intimate fit and finish for the restorative margins. An adhesive-bonded fragment with no discernible margin gap or excess restoration showed no signs of gingival inflammation [4]. A conservative treatment strategy by abrasion of the tooth fragment and dental hard tissue with a diamond or carbide burs helps relocate the fracture margin to a more coronal position respecting the biological parameters, can be considered in lieu of more invasive procedures like osteotomy or osteoplasty. Furthermore, treatment options like flap surgery to restore the biologic width can have an adverse effect on bone and pose esthetic problems in the form of widening of cervical embrasures. Interestingly, in terms of toxicity, a properly placed and finished subgingival composite restoration showed a favourable reaction of gingival tissues [4].

Endodontic and periodontal implications

In the present case, the gingival crevicular incision was employed along the facial and palatal aspect to expose the subgingivally placed fracture line because the location of the fracture line impeded its accessibility. An advantage of this technique is establishing an intimate adaptation of healthy connective tissue to the tooth surface. Since the bone architecture was not modified, and the papillae were preserved, the technique was conservative in its approach. The two-year follow-up showed the patient reporting satisfactory esthetics and periodontal health despite the infringement of the biologic width. Excellent adhesive bonding, strict isolation, and intimate adaptation of the fragment can be considered necessary prerequisites for a good prognosis.

CONCLUSION

A conservative treatment strategy for managing complicated crown-root fracture by adhesive fragment reattachment without catastrophic implications on periodontal health can be a viable, cost-effective treatment option if careful consideration is given to all biological parameters. The best treatment strategy should always provide a conducive environment to recover and maintain the health of dental and periodontal tissue on a short and long-term basis. Using this strategy, predictable esthetic outcomes can be achieved by applying appropriate techniques and materials and can be considered a sound replacement for more expensive and invasive endodontic and restorative treatment.

Conflicts of Interest

The author reports no conflicts of interest.

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REFERENCES

1. Andreasen FM, Noren JG, Andreasen JO, Engelhardtsen S, Lindh-Stromberg U. Long-term survival of fragment bonding in the treatment of fractured crowns: a multicenter clinical study. Quintessence International. 1995;26:669–81.
2. Olsburgh S, Jacoby T, Krejci I. Crown fractures in the permanent dentition: Pulpal and restorative considerations Dental Traumatology. 2002;18(3):103-115.
3. Taguchi CM, Bernardon JK, Zimmermann G, Baratieri LN. Tooth fragment reattachment: A case report. Operative Dentistry. 2015;40(3):227-34.
4. Eichelsbacher F, Denner W, Klaiber B, Schlagenhauf U. Periodontal status of teeth with crown-root fractures: results two years after adhesive fragment reattachment. J Clin Periodontol. 2009;36:905–11.
5. Oh S, Jang JH, Kim HJ, Seo NS, Byun SH, Kim SW, et al. Long-term Follow-up of Complicated Crown Fracture With Fragment Reattachment: Two Case Reports. Oper Dent. 2019;44(6):574-580.
6. Bourguignon C, Cohenca N, Lauridsen E, Flores MT, O'Connell AC, Day PF, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. Dent Traumatol 2020; 36: 314-330.
7. Garcia FCP, Poubel DLN, Almeida JCF, Toledo IP, Poi WR, Guerra ENS, et al. Tooth fragment reattachment techniques-A systematic review. Dent Traumatol. 2018;34(3):135-143.
8. Demarco FF, Fay RM, Pinzon LM, Powers JM. Fracture resistance of re-attached coronal fragments--influence of different adhesive materials and bevel preparation. Dent Traumatol. 2004;20(3):157-63.
9. De Santis R, Prisco D, Nazhat S, Riccitiello F, Ambrosio L, Rengo S, et al. Mechanical strength of tooth fragment reattachment. J Biomed Mater Res. 2001;55(4):629-36.
10. Reis A, Francci C, Loguercio A, Rocha Carrilho M, Filho L. Re-attachment of anterior fractured teeth: Fracture strength using different techniques. Oper Dent. 2001;26(4):287-94.

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