ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at:www.ijdsir.com

Volume – 8, Issue – 5, September – 2025, Page No. : 125 - 130

Comprehensive Esthetic Rehabilitation of a Subgingival Crown-en-Mass Fracture of Maxillary Lateral Incisor Using Diode Laser Crown Lengthening and Fragment Reattachment: A Case Report

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Citation of this Article: Dr. Ruchi Chandak, Dr. Ashwini B Prasad, Dr. Deepak Raisingani, Dr. Charu Thanvi, Dr. Sakshi Bilaiya, "Comprehensive Esthetic Rehabilitation of a Subgingival Crown-en-Mass Fracture of Maxillary Lateral Incisor Using Diode Laser Crown Lengthening and Fragment Reattachment: A Case Report", IJDSIR- September – 2025, Volume – 8, Issue – 5, P. No. 125 – 130.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

Crown-en-mass fractures of maxillary anterior teeth, especially lateral incisors, are commonly seen in adolescents following traumatic dental injuries. Due to their forward anatomical position in the maxillary arch. When such fractures extend subgingivally, they pose a clinical challenge due to biologic width violation and the demand for esthetic rehabilitation. Conservative options that preserve tooth structure and periodontal health have gained significance with the advent of adhesive dentistry, laser-assisted crown lengthening, and fiber post systems. This case report describes the conservative and esthetic management of a crown-en-mass fracture in a 15-year-old boy's maxillary left lateral incisor. A diode laser was used for precise crown lengthening to expose the fracture margin without compromising periodontal health. Endodontic treatment was followed by placement of a fiber-reinforced post, and the natural fragment was adhesively reattached using dual-cure composite. At 6-

month follow-up, the tooth exhibited excellent esthetic integration, function, and periodontal stability. This case highlights the effectiveness of a multidisciplinary, minimally invasive approach for the esthetic rehabilitation of complex anterior fractures.

Keyword: Crown-en-mass fracture, Fragment reattachment, Laser crown lengthening, Diode laser, Fiber post, Esthetic rehabilitation, Traumatic dental injury

Introduction

Traumatic dental injuries (TDIs) are a major public health concern, particularly among children and adolescents, with a global prevalence of 15–23% in the permanent dentition.[1] Maxillary anterior teeth are most commonly affected, with central incisors involved in 80–90% and lateral incisors in 6–17% of cases due to their prominent position in the arch [2–4]. These injuries can cause significant psychological and functional impairment, especially when extensive hard tissue loss occurs. Among the more complex injuries are Ellis Class VIII (crown en masse) fractures, characterized by complete detachment of the crown, often retrieved intact by the patient [5,6].

Such fractures typically result from high-impact trauma, frequently extend subgingivally with violation of the biologic width, and demand a multidisciplinary treatment approach [6,7]. When the fragment is intact, reattachment provides a conservative and esthetic solution, first described by Tennery in 1988 and subsequently improved with adhesive systems and fiber-reinforced composite (FRC) posts for enhanced retention and internal reinforcement [8,9,11]. In many cases, laser-assisted crown lengthening is required to expose sound structure and maintain periodontal health [10].

This report describes the multidisciplinary management of an Ellis Class VIII maxillary incisor fracture using crown lengthening, endodontic therapy, FRC post, and fragment reattachment. The approach was minimally invasive, biologically conservative, and esthetically favorable

Case Presentation

A 15-year-old male patient reported to the department of conservative dentistry and endodontics with pain in the upper front tooth region following a fall one day back. There was no associated swelling or soft tissue injury. Intraoral examination revealed a complicated Ellis Class VIII crown-root fracture involving the maxillary left lateral incisor (#22). The fracture line extended obliquely from the mesial crown portion to distal subgingival area, with pulp exposure. The entire crown fragment was not attached, and the patient had carried it in saliva. The fragment was intact and well-adapted to the remaining tooth structure. Medical history was non-contributory. Radiographic examination confirmed a mature root and absence of periapical pathology. After clinical evaluation, a conservative treatment plan was selected, comprising endodontic therapy, laser-assisted crown lengthening, fibre post placement, and adhesive reattachment of the natural crown fragment followed by coronal prosthesis.

After clinical and radiographic evaluation, single-visit root canal therapy was planned. Following administration of local anesthesia and rubber dam isolation, access cavity preparation was performed ensuring straight-line access. Working length was determined using an electronic apex locater (Root ZX mini, J.Marita Corp., Kyoto, Ja pan) and confirmed radiographically. Cleaning and shaping were carried out up to size 25, 04% taper (Protaper Gold®, Dentsply Sirona) using a crown-down technique. Irrigation was performed with 5.25% sodium hypochlorite, followed by 17% EDTA (RC Help®, Prime Dental) to remove the smear layer. Copious irrigation

was ensured using a side-vented needle. Master cone selection was done with gutta-percha cones, and the canals were dried with sterile absorbent paper points.

Due to the planned post placement, sectional obturation of the apical third was done using gutta-percha and AH Plus® sealer (Dentsply DeTrey, Germany) to preserve post space i.r.t 22. Following obturation, laser-assisted crown lengthening was performed to expose the subgingival fracture margin. A diode laser (Biolase® Epic X, Biolase Inc., USA) was used circumferentially around the gingival margin—both buccally and palatally—for soft tissue contouring. Bleeding points were marked prior to ablation, and biologic width preservation was ensured -.

Subsequently, post space was prepared, and a fiber post (Reforpost®, Angelus, Brazil) was trial-fitted and adjusted to the desired length. The canal was etched with 37% phosphoric acid (Total Etch®, Ivoclar Vivadent), rinsed, and dried. A total-etch bonding system (Adper™ Single Bond 2, 3M ESPE, USA) was applied. The fiber post was luted using dual-cure resin cement (RelyX™ U200 Automix, 3M ESPE, Germany). To reinforce the coronal fragment attachment, a bevelled groove was created extending 2mm coronally and apically around the fracture line and then etched, bonded, and reattached precisely to its original position using the same resin cement, followed by light curing from both labial and palatal aspects for 40 seconds each.

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), and occlusion was evaluated and adjusted. The patient was recalled after 1 week for clinical evaluation of reattachment integrity and gingival health. At this visit, crown preparation was initiated. Since diode laser crown lengthening had been performed and soft tissues exhibited satisfactory healing with no inflammation or marginal discrepancies, the coronal prosthesis was fabricated and delivered within 2 weeks of reattachment. Follow-up at 1 month and 6 months demonstrated favourable esthetics, functional stability, and healthy periodontal response.

Figure 1: Pre-operative photograph (frontal view)

Figure 2: Pre-operative radiograph

Figure 3: Fractured tooth fragment i.r.t. 22

Figure 4: Laser Crown Lengthening i.r.t #22

Figure 5: Coronal Structure post Laser crown lengthening

Figure 6: Post space Preperation

Figure 7: Fibre post placement

Figure 8: Radiograph of Fragment Reattachment (post-op)

Figure 9: Post-operative photograph

Figure 10: 6-month post-operative photograph

Figure 11: 6-months post-operative radiograph

Discussion

Crown-root fractures pose a complex clinical scenario multidisciplinary strategy that integrates endodontic, restorative, periodontal, and prosthodontic considerations. The long-term prognosis is closely linked to the vertical position of the fracture line. Treatment planning should aim to expose the fracture margin at or above the gingival level, ensuring proper isolation and moisture control to meet restorative and prosthodontic requirements[12]. Emphasis should be placed on conservative approaches that preserve the natural tooth structure and minimize trauma to the pulp.

Endodontic and restorative implications

The current guidelines from the International Association of Dental Traumatology (IADT)[13]. recommend various approaches for crown–root fractures, including composite restorations, post-and-core prostheses, orthodontic extrusion, crown lengthening, or extraction. With advances in adhesive dentistry, minimally invasive techniques such as fragment reattachment have become preferred, especially in younger patients, as they preserve natural tooth structure, esthetics, and function with psychological and economic benefits [14]. A systematic

review supports this approach, reporting ~78% one-year success when combined with endodontic therapy and fibre post reinforcement [15]. Fibre posts, with elasticity similar to dentin, distribute stresses uniformly, while dual-cure resin cements ensure polymerization in deeper regions [14.] Hydration of the fragment in saline maintains strength and aesthetics, as drying reduces bond and fracture resistance [15,16]. Reinforcement techniques like chamfer, internal grooves, and over contouring enhance fracture strength, with the latter restoring up to 97.2% [17]. In our case, internal groove preparation, enamel bevelling, and flowable resin cement were used to improve retention and aesthetics [18].

Restorative and periodontal implications

In this case, adhesive fragment reattachment restored function and aesthetics without adverse periodontal effects. Key factors included preservation of biologic width, adequate ferrule and crown–root ratio, occlusion, and fragment condition. While margins encroaching on the biologic width may risk bone loss and gingival recession, proper finishing and intimate margin fit can maintain periodontal health, as confirmed by the absence of inflammation [18].

Endodontic and periodontal implications

Diode laser-assisted crown lengthening was used to access the subgingival fracture line conservatively, ensuring precise gingival contouring, hemostasis, minimal trauma, and better visibility. Compared to scalpel techniques, diode lasers reduce bleeding, improve healing, and enhance patient comfort [19]. At 6 months, stable gingival margins and healthy periodontium were observed, confirming the success of this approach.

Periodontal and prosthodontic implications

Long-term success depends on adhesive technique, isolation, and appropriate prosthetic planning. Literature recommends delaying full-coverage crowns for 1–2 weeks to allow soft tissue healing and ensure fragment stability [19]. In this case, crown preparation was done after one week, with definitive prosthesis planned to reinforce function, distribute occlusal loads, and protect the adhesive interface, especially in combination with fibre post reinforcement.

Conclusion

As with traditional restorative procedures, the success of fractured fragment reattachment is largely dependent on careful case selection and strict adherence to established periodontal and endodontic protocols, along with the principles of contemporary adhesive dentistry. With the advancement in dental materials and techniques, predictable and highly esthetic outcomes are now achievable. Fragment reattachment offers a conservative solution that preserves natural tooth structure while restoring both function and appearance. Therefore, this approach should be strongly considered, particularly in managing coronal fractures of anterior teeth in younger patients, where esthetics and minimal intervention are of paramount importance.

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