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FRAGMENT REATTACHMENT: A BIOMIMETIC SOLUTION – A CASE REPORT

Endodontics

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ABSTRACT

Traumatic crown fractures of anterior teeth are common and can significantly affect esthetics and function. Fragment reattachment is a conservative and effective treatment when the fractured tooth fragment is available. This case report describes the management of an Ellis Class III fracture of the maxillary left central incisor in a 24-year-old patient following an accidental fall. Clinical and radiographic examination revealed a horizontal crown fracture involving enamel, dentin, and pulp, with complete root formation and no associated root fracture. The fractured fragment was preserved in saline to prevent dehydration. Single-visit root canal treatment was performed, followed by reattachment of the original tooth fragment using an etch-and-rinse adhesive protocol and flowable composite resin. The procedure restored the tooth with excellent esthetics, proper function, and preservation of natural tooth structure. This case highlights that fragment reattachment combined with endodontic therapy is a simple, minimally invasive, cost-effective, and reliable treatment option for the management of complicated crown fractures.

KEYWORDS

Complicated Crown Fracture, Fragment Reattachment, Trauma, Adhesive Dental Materials, Esthetic Rehabilitation

INTRODUCTION

Traumatic dental injuries (TDIs) are among the most prevalent problems encountered in clinical practice, with anterior teeth being the most commonly affected due to their anatomical position in the arch[10]. Approximately 5% of all physical injuries involve the oral cavity, and dental trauma accounts for nearly 92% of patients seeking oral treatment[11]. Crown fractures represent the most frequent type of injury, with a reported prevalence of 18–22% among permanent incisors[1]. These injuries not only compromise function and esthetics but also exert a significant psychological impact on patients, particularly children and adolescents[7].

Management of fractured anterior teeth has evolved considerably over the years. Traditional restorative options include composite resin restorations, post and core build-ups, and full-coverage crowns[2]. However, with the advent of adhesive dentistry, fragment reattachment has emerged as a conservative and highly esthetic alternative[3]. First described by Chosack and Eidelman in 1964, fragment reattachment preserves the natural tooth's shape, color, translucency, and surface texture, while restoring function and providing immediate esthetic satisfaction[6]. Compared to composite restorations, reattachment offers superior wear resistance, better color stability, and psychological reassurance to patients[5].

Several techniques have been proposed to enhance the longevity and strength of reattached fragments, including simple reattachment, enamel beveling, internal dentin grooves, external chamfers, and over-contour methods[10]. The choice of technique depends on factors such as the extent and pattern of fracture, pulpal involvement, biological width invasion, and the condition of the fragment[5]. Additionally, the storage medium of the fractured fragment plays a crucial role in maintaining esthetics and bond strength; hydrated storage in solutions such as milk or saline is preferred to prevent dehydration-related discoloration and reduced fracture resistance[10] [11]. Thus, fragment reattachment represents a biologically favorable, cost-effective, and esthetically superior treatment modality when the fractured segment is available and properly preserved. This case report highlights the clinical management of fractured anterior teeth using fragment reattachment, emphasizing the conservative approach and functional outcomes achieved.

Case Report

A 24-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of fractured upper front tooth following an accidental fall one day earlier. The patient had no history of loss of consciousness or any associated systemic injury. Extraoral examination revealed no facial asymmetry or significant soft tissue injury except for minor mucosal bruises. The patient's medical history was non-contributory.

Clinical examination revealed a horizontal crown fracture involving the middle third of the clinical crown of the maxillary left central incisor (Fig. 1). The fracture extended through enamel and dentin with pulpal exposure, consistent with an Ellis Class III fracture. The fractured coronal fragment was completely separated from the remaining tooth structure and had been brought by the patient at the time of presentation (Fig. 2). The fragment showed good adaptation with the remaining tooth structure and was free from additional cracks or defects. To prevent dehydration and preserve its optical properties, the fragment was immediately stored in normal saline until the reattachment procedure was completed.

An intraoral periapical radiograph confirmed complete root formation of tooth 21 with no evidence of root fracture, periodontal ligament injury, or periapical pathology (Fig. 3). Based on the clinical and radiographic findings, a diagnosis of Ellis Class III fracture of tooth 21 was established, and a treatment plan consisting of single-visit nonsurgical root canal treatment followed by fragment reattachment was formulated after obtaining informed consent from the patient.

Local anaesthesia was administered using 2% lignocaine with 1:80,000 adrenaline under strict aseptic conditions, and access cavity preparation was initiated using a BR45 bur (Mani, Japan). Working length determination was carried out using an electronic apex locator (Eighteeth E-Pex) and was confirmed radiographically. The working length was established at 22 mm. Biomechanical preparation was completed up to ISO size 60 at the established working length. Throughout instrumentation, the canal was irrigated with 2.5% sodium hypochlorite followed by normal saline. After completion of cleaning and shaping, the canal was dried using sterile absorbent paper points. Obturation was performed during the same visit using the lateral condensation technique with gutta-percha cones and a resin-based root canal sealer. A postoperative radiograph confirmed satisfactory obturation.

Following completion of endodontic treatment, the fractured fragment was retrieved from saline and checked for complete adaptation with the remaining tooth structure. Both the tooth surface and the fractured

fragment were conditioned using an acid-etch adhesive protocol (Fig. 4). After application of the bonding agent according to the manufacturer's instructions, Fusion Flo Flowable Composite (Prevest DenPro, India) was applied to the fractured surfaces (Fig. 5). The fragment was carefully repositioned with gentle finger pressure to achieve precise adaptation and restoration of the original tooth morphology. Excess composite resin was removed before light polymerization. After complete polymerization, the restoration was finished, occlusion was evaluated, and necessary adjustments were performed to eliminate premature contacts. Final polishing was carried out to obtain a smooth surface and satisfactory esthetic integration with the adjacent dentition.

Figure 1: Horizontal Crown Fracture Irt 21

Figure 2: Fractured Tooth Fragment

Figure 3: Preoperative Radiograph Irt 21

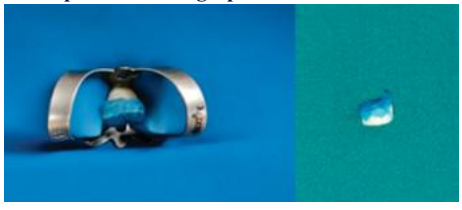

Figure 4 : Etching of Fractured Tooth and Fragment

Figure 5 : Application of Flowable Composite

Figure 6 : Immediate Postop After Finishing and Polishing

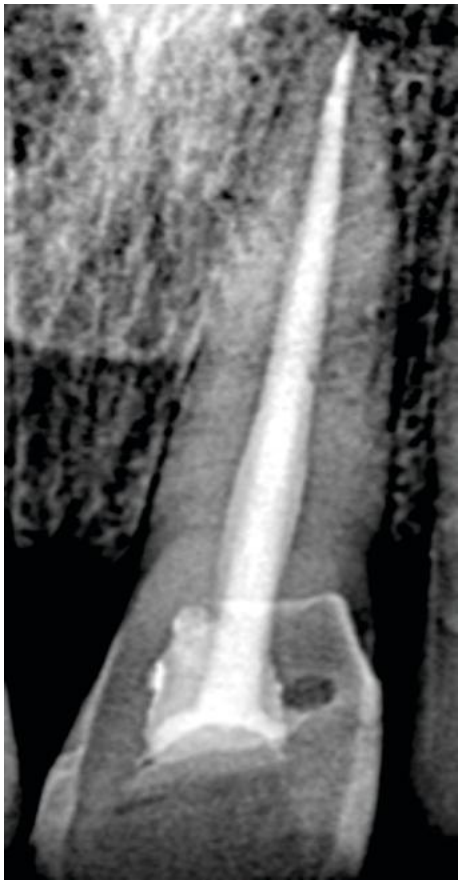

Figure 7 : Postop Radiograph

Immediate postoperative clinical examination demonstrated excellent adaptation of the fractured fragment with satisfactory esthetics, restoration of the original tooth contour, and functional occlusion (Fig. 6). A postoperative periapical radiograph confirmed satisfactory root canal obturation and proper adaptation of the reattached fragment (Fig. 7). The patient was advised to avoid excessive loading of the restored tooth, maintain good oral hygiene, and attend periodic follow-up visits for clinical and radiographic evaluation.

DISCUSSION

The management of fractured anterior teeth remains a clinical challenge due to the need to balance esthetics, function, and conservation of tooth structure[11]. Fragment reattachment has gained prominence as a conservative treatment modality, particularly when the fractured segment is intact and promptly recovered[2]. Compared to conventional composite restorations, reattachment offers superior esthetic outcomes by preserving the natural translucency, color, and morphology of the tooth[3]. It also provides psychological reassurance to patients, who often experience distress following traumatic dental

injuries[7].

The success of fragment reattachment depends on several biological and technical factors. The condition of the fragment and its storage medium are critical; dehydration for more than one hour can reduce fracture resistance and compromise esthetics, whereas storage in hydrated media such as saline or milk helps maintain optical and mechanical properties[10 11]. In the present case, the fragment was preserved appropriately, which contributed to favorable outcomes.

Various techniques have been proposed to enhance the longevity and strength of reattached fragments, including simple reattachment, enamel beveling, internal dentin grooves, external chamfers, and over-contour methods[10]. Studies have shown that internal dentin groove and over-contour techniques provide higher fracture resistance compared to simple reattachment alone[10]. However, the choice of technique must be individualized, depending on the fracture pattern, pulpal involvement, and biological width invasion[5]. In cases with subgingival extension, adjunctive procedures such as crown lengthening, orthodontic extrusion, or flap surgery may be required to achieve proper isolation and bonding[6 9].

Long-term success also depends on careful adhesive protocols. Total-etch systems with phosphoric acid conditioning remain the gold standard for enamel bonding, as self-etch systems may result in lower bond strength and increased microleakage[10]. Additionally, flowable composites are often favored for reattachment because of their low viscosity and ability to adapt well to the limited interfacial space between fragment and tooth[11].

Clinical follow-up is essential to monitor pulp vitality, periodontal health, and esthetic stability. Studies have reported success rates of up to 90% for reattached fragments over 24 months, provided that biological and technical considerations are respected[9]. In the present case, the tooth remained functional and esthetically pleasing during follow-up, underscoring the reliability of fragment reattachment as a treatment option.

CONCLUSIONS

Fragment reattachment is a conservative and esthetic option for managing anterior tooth fractures when the fragment is intact and well preserved[11]. It restores natural morphology and function while minimizing tooth preparation[2]. Success depends on proper storage of the fragment, careful adhesive protocols, and reinforcement techniques such as fiber posts[5 8]. With appropriate case selection and follow-up, this approach provides predictable, cost-effective, and biologically favorable outcomes, making it the treatment of choice whenever feasible[10 11].

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