Case report

Management of Complicated Crown Fracture with Rapid Orthodontic Extrusion and Glass Fibre Post: A Case Report

ABSTRACT

Complicated crown fractures involving the pulp present significant challenges in dental trauma management, particularly when the fracture extends subgingivally. This case report describes a multidisciplinary treatment approach involving rapid orthodontic extrusion and glass fibre post placement for the restoration of a fractured maxillary lateral incisor. The treatment effectively repositions the fractured tooth structure, allowing for optimal restoration while maintaining the integrity of the natural tooth. This protocol highlights a minimally invasive, aesthetic, and functional solution for complex crown fractures.

1. INTRODUCTION

Complicated crown fractures involving the pulp account for a significant percentage of dental injuries, especially in children and young adults. The incidence of complicated crown fractures ranges from 2% to 13% of all dental injuries and the most commonly involved tooth is the maxillary central incisor. Immediate and appropriate management is essential to preserve the vitality of the tooth, prevent infection, and restore aesthetics and function. Various treatment modalities exist, including root canal therapy (RCT), orthodontic extrusion, crown lengthening, and the use of fibre posts for reinforcement. This case report demonstrates the successful management of a complicated crown fracture with a novel approach involving rapid orthodontic extrusion and reinforcement using a glass fibre post.

2. PRESENTATION OF CASE

A 28-year-old male patient reported to the department of Conservative Dentistry and Endodontics of Govt Dental College Kottayam with a history of trauma of front tooth 4 days back. Clinical examination showed complicated crown fracture with margins extending sub gingivally in relation to upper left lateral incisor. The fractured segment was lost and the tooth was negative to electric pulp test. The periodontal condition was normal, with no abnormal mobility.

Complete medical, dental and trauma history was taken. Periapical radiographs (PA) were

taken at different angulations. PA radiograph revealed mature root and complicated crown fracture of maxillary left lateral incisor.

Treatment Plan:

The treatment plan involved three main phases:

1.Root Canal Therapy (RCT): The immediate priority was to manage the pulp exposure through endodontic treatment.

2.Rapid Orthodontic Extrusion: To manage the subgingival fracture line and allow adequate tooth structure for crown placement.

3.Glass Fibre Post Placement and Final Restoration: Reinforcement of the remaining tooth structure with a glass fibre post followed by a full-coverage crown.

Treatment Procedure

Root canal treatment was completed in a single visit. Pulp extirpation was performed, and the working length was determined using an electronic apex locator (J Morita Root ZX mini). Biomechanical preparation was done with ProTaper Gold files, enlarging the apex to F4. Obturation was done using the lateral condensation technique, followed by temporary restoration (3M ESPE Cavit ™ G). Four days later, post space was prepared using peesoreamer upto size 3 leaving the apical 5 mm gutta percha.

Orthodontic extrusion was performed using a fixed appliance to re-establish the biological width. A 0.018- inch round stainless steel orthodontic wire (Konark ever bright dental stainless steel wire) was fixed with orthodontic brackets bonded to the labial surface of the maxillary left central incisor and maxillary left canine, at the incisal third, to provide the necessary anchorage for tooth movement. A 19 gauge stainless steel wire (Konark ever bright dental stainless steel wire) was bent to form a 2-mm diameter loop with a 4-mm radicular extension, which was further roughened with diamond disks to provide retention and was cemented with glass ionomer cement (GC Gold Label 1) in the coronal root canal third of the fractured tooth. Next, a 1/8 diameter orthodontic elastic was placed through the coronal loop and tied to the labial wire fixed between the neighbouring teeth. The elastic string was changed once a week. Orthodontic extrusion was terminated when a circumferential ferrule of 1 mm was achieved, which was in 45 days.

After obtaining adequate ferrule, the prefabricated glass fibre post was selected according to root canal width. A prefabricated glass fibre post of diameter 1.80 mm was cemented into the canal using dual curing resin cement. The fibre post provided additional support to the weakened tooth structure. Core buildup was completed using the Paracore system, followed by crown preparation. A porcelain jacket crown was fabricated and cemented onto the prepared tooth. Patient was put on follow up. At 12 months follow up there were complete

absence of any signs and symptoms and with no radiographic changes.

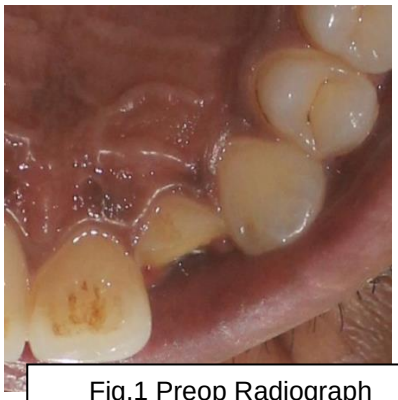

Fig.1 Preop Radiograph

Fig.2 Preop Clinical - Buccal View

Fig.3 Preop Clinical -Palatal View

Fig. 4 Radiograph - After RCT

Fig. 5 Orthodontic extrusion -After 1 month.

Fig. 6 After orthodontic extrusion (after 45 days)

Fig. 7 After orthodontic extrusion – Palatal View

Fig. 8 Fibre post placement

Fig. 9 Crown preparation

Fig. 10 Post OP after crown placement

3. DISCUSSION

The functional and aesthetic success in managing complicated crown-root fractures largely depends on a multidisciplinary approach, involving surgery, endodontics, periodontics, and prosthodontics (1). Studies indicate that restoring teeth with crown-root fractures is often difficult, especially when the fracture extends below the bone level (2), as was the case in this instance.

In this case, orthodontic extrusion was the preferred treatment option to re-establish the biological width. This technique is deemed safe regarding the risk of root resorption and does not compromise the periodontal support or bone tissue of adjacent teeth, thereby enhancing aesthetics. (3), (4), (5)

Aesthetics is a primary concern in the anterior region, and orthodontic extrusion helps maintain the position of the gingiva. (6) However, rapid orthodontic extrusion has certain limitations, including the necessity for patient cooperation, (7) which is crucial since it requires an extended retention period for the stabilization of the periodontium in its new position. Additionally, there may be aesthetic concerns during the treatment process. The increased traction forces applied during rapid orthodontic extrusion also pose risks of root resorption or tooth ankylosis. (8)

In this case the use of a glass fibre post reinforced the remaining tooth structure, ensuring long-term stability of the restoration. Glass fiber posts offer several advantages over other types of posts, including superior flexural strength, ease of handling, suitability for high-stress areas, aesthetic appeal, and compatibility with various composites. (9) The current study highlights their excellent retention within the canal over an extended period. These benefits make glass fiber posts the preferred choice for severely mutilated anterior teeth.

4. CONCLUSION

The combination of rapid orthodontic extrusion and glass fibre post placement presents an effective and conservative strategy for managing complicated crown fractures. This multidisciplinary approach not only enhances functional and aesthetic outcomes but also prioritizes the preservation of the natural tooth structure. Additionally, the minimally invasive nature of this technique reduces the need for extensive surgical interventions, thereby promoting better patient comfort and satisfaction. Long-term follow-up is essential to assess the treatment's success, ensure the stability of the restoration, and monitor the health of the surrounding tissues. Future studies may further elucidate the benefits and limitations of this approach, contributing to improved protocols for managing dental trauma.

CONSENT

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki."

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