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Case Report

Biomimetic approach for the management of complicated crown fracture using glass fiber-reinforced adhesive splint: A case report

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ABSTRACT

The teeth that are most frequently affected by the traumatic injuries are maxillary incisors that results in complicated crown or crown root fractures involving dental pulp. Currently biological approaches are taken into consideration for the management of such injuries in order to restore aesthetics and function on the same day to prevent the social and psychological stress of the patient. This case report is about reattachment of the fractured fragment as a conservative approach for the management of complicated crown fracture using Glass Fiber-Reinforced Adhesive splint in a maxillary central incisor.

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1. Introduction

The teeth that are most frequently affected by the traumatic injuries are maxillary incisors that results in complicated crown or crown root fractures involving dental pulp. These sudden incidents resulted the loss of smile that have significant impact on the patients psychological and social state.¹ The proper diagnosis that includes the location, size, nature and displacement of fractured fragment along with associated luxation injuries and time elapsed determine the long-term prognosis of the fractured teeth.²

Various treatment procedures such as direct composite restorations, veneers, full crowns are usually followed to treat the crown fractures. Currently biomimetic restorative procedures are followed that restores the natural aesthetics and gingival health of the involved teeth. The reattachment of the fractured fragment is one the biological procedure that involves the complex adhesive protocol and can be done on the same day. This treatment modality mimics

the natural color, surface characteristics, shape and form of the adjacent teeth thus restores the function and long-term aesthetics.³ Chosak and Eidelman in 1964, first adopted the concept of reattachment and used cast post and traditional cement for the reattachment of the fractured fragment.⁴ The development of newer restorative materials, adhesive agents, interraderic reinforcing materials and procedural techniques have revolutionized the concepts in aesthetic dentistry and have made it possible to reattach the fractured fragment without compromising the long-term aesthetic and strength of the teeth.^{5,6}

In this case report the reattachment of the fractured fragment was done in a complicated crown fracture using interraderic glass fiber splint to restore the form and function of the tooth.

2. Case Report

A 33-year-old male patient presented to the Department of Conservative Dentistry and Endodontics at IGGDC Jammu with fracture of his maxillary left central incisor, having

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been injured by a blunt object, one hour earlier. When the patient was examined clinically, an oblique fracture line extending subgingivally on the palatal aspect, with no root involvement, and supragingivally on the buccal aspect. The coronal fragment exhibited mobility, whereas the remaining tooth structure was intact, with no mobility. Moreover, a traumatic ulcer was seen on the lower lip (Figure 1 a, b). Radiographic findings revealed the presence of a fracture line involving the gingival third of the maxillary left central incisor, which led to the diagnosis of complicated crown fracture (Figure 2).



Figure 1: a, b: Preoperative pictures

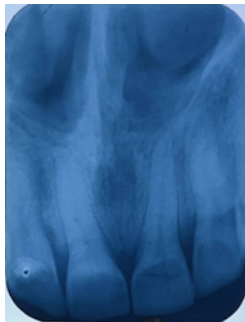


Figure 2: Preoperative radiograph

The mobile fragment was removed, cleaned under running water, and maintained in a sterile normal saline (Figure 3 a, b). This was done to prevent dessication and discoloration the patient expressed a desire of preserving the tooth. After obtaining an informed consent, root canal treatment was initiated immediately. After cleaning and shaping, obturation was completed. A key obstacle in this case was the subgingival extension of the fracture line on the palatal side; however, performing a gingivectomy in this area allowed for adequate access and isolation for the reattachment procedure while maintaining biological width (Figure 4 a, b).

Under proper rubber dam isolation, the post space preparation was done using a Peeso reamer, leaving 5 mm of gutta-percha in the apical third (Figure 5). This was followed by cementation of a prefabricated glass fiber post (Coltene Tenax Fiber Post) using a dual-cure resin cement

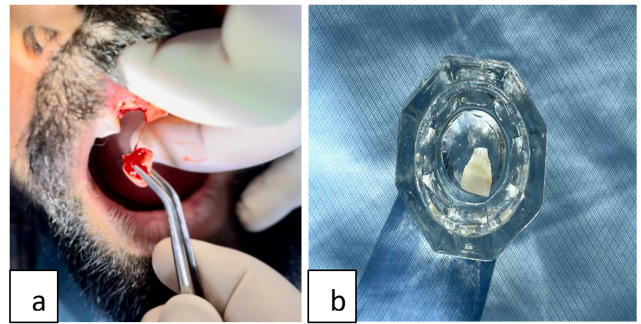


Figure 3: a, b): Removal of fractured fragment followed by storage in saline

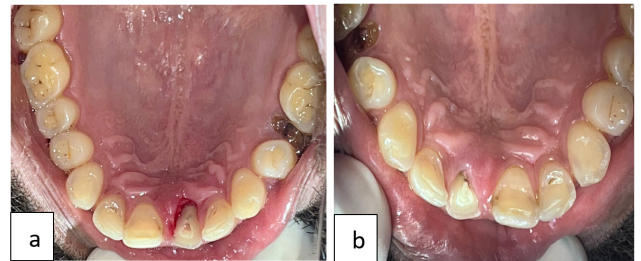


Figure 4: a, b): Intraoral pictures showing before and after gingivectomy procedure

(3M Espe RelyX Ultimate). A hole was drilled in the fractured fragment in order to facilitate its placement over the coronal end of the fiber post as well as the proper approximation of fractured fragment to the tooth. After that, an enamel bevel was prepared around the fractured margin and adjacent tooth structure. 37% phosphoric acid was used to etch the approximating surfaces followed by rinsing and blot drying using paper point absorbent (Figure 6). A bonding agent (Single Bond Universal, 3M ESPE) was applied and light-cured for 20 seconds. The fragments were reapproximated after the application of resin cement (3M Espe Rely X Ultimate), and light-cured for 40 seconds each from both the facial and palatal sides (Figure 7). A flowable composite resin (Fusion Flo, Prevest Denpro) was applied to the beveled area and subsequently light-cured for 40 seconds. Finally, the finishing and polishing of the tooth was done with a series of diamond burs and Sof-Lex disks. As seen in Figures 8 and 9, the postoperative assessment reveals satisfactory aesthetic outcomes and restored functionality, achieved through a conservative and cost-effective treatment approach.

3. Discussion

With the progressive advancements in adhesive dentistry, the reattachment of fractured tooth fragments can yield impressive results. Several issues that are typically connected with alternative procedures are addressed when



Figure 5: Post-space preparation



Figure 6: Etching of fractured fragment



Figure 7: Fragment reattachment



Figure 8: Post operative radiograph



Figure 9: Post operative picture

using natural tooth material, such as uneven wear of restorative materials, establishing an optimal shade match, and difficulties in attaining adequate contour and texture.⁷ The treatment plan is also influenced by a number of other variables, including potential biological width encroachment, patient and clinician preferences, time and cost concerns, and more. Research by Yilmaz et al. indicates that the success rates for reattached fragments may be as high as 90% within a follow-up period of up to 24 months.⁸

Compared to more invasive therapies, this strategy has a number of advantages. It maintains uniform color and optical properties and allows for the precise replication of the original contour and texture. Moreover, it is an economical and time-saving solution, which is particularly beneficial in underdeveloped countries. On the negative side, problems such as the possibility of fragment separation and color changes brought on by inadequate rehydration of the fragment may occur. Moreover, the heavy occlusal forces applied on the tooth may also lead to its detachment.⁹

4. Conclusion

Various treatment approaches are available to restore a tooth after complex crown fracture. A number of issues, including the possibility of jeopardizing biological width, the patient's and dentist's preferences, time limits, and related expenses, influence the treatment approach. This case study demonstrates that a glass fiber-reinforced adhesive splint is a reasonable, time saving, cost-effective, and conservative treatment choice for fractured incisors when used in conjunction with appropriate clinical procedures and readily available materials. To support this therapy method, further evidence might be required if future research intends to extend follow-up durations.

5. Source of Funding

None.

6. Conflict of Interest

None.

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