

A conservative approach toward restoration of fractured anterior tooth

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Abstract

Reattachment of the fractured anterior tooth is a highly conservative and aesthetic treatment that has gained popularity in the recent past. Presented here is one such case in which a combination of external enamel bevel and internal dentinal groove has been used to enhance the bonding between the fractured fragment and the remaining tooth. The treatment was found to be successful both functionally and aesthetically at the 18-month follow-up.

Keywords: Anterior tooth trauma, bonding, reattachment

Introduction

Uncomplicated and complicated crown fracture is the most common traumatic dental injury to permanent teeth.^[1] Most dental injuries involve just one tooth, and the majority of the affected teeth are maxillary central incisors.^[2-4] This may be attributable to their anterior position and protrusion caused by the eruptive pattern.^[5]

During the last century, clinicians used a variety of procedures (e.g., pin-retained resin, orthodontic bands, modified three-quarter crowns, full-coverage gold with bonded porcelain, porcelain jacket crowns, porcelain-bonded crowns, porcelain inlays) for the restoration of the fractured crown.^[6] Several factors influence the management of coronal tooth fractures, including extent of fracture (biological width violation, endodontic involvement, alveolar bone fracture), pattern of fracture and restorability of fractured tooth (associated root fracture), secondary trauma injuries (soft tissue status), presence/absence of fractured tooth fragment and its condition for use (fit between fragment and the

remaining tooth structure), occlusion, aesthetics, finances and prognosis.^[7-9]

If the fracture is uncomplicated (i.e., not involving the pulp) and the pulpal health is uncompromised, it may be restored with composite resin or a jacket crown. If the pulp is involved, the tooth is treated endodontically and then restored with the help of a jacket crown with or without post and core. If the fracture is sub-gingival, the tooth may require surgical crown lengthening or forced eruption (orthodontic extrusion) followed by prosthetic rehabilitation.^[10] In situations where a ferrule effect cannot be established, the only treatment left is the extraction of the tooth followed by prosthetic rehabilitation.

One of the options for managing coronal tooth fractures, especially when there is no or minimal violation of the biological width, is the reattachment of the dental fragment when it is available. Tooth fragment bonding offers the advantage of being a highly conservative technique that promotes preservation of natural tooth structure, good aesthetics and acceptance by patients, who receive a psychological benefit from amelioration of the mutilation.^[11]

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Case Report

A 13-year-old boy reported to the Department of Pedodontics and Preventive Dentistry with a history of fall from cycle 2 days back. The child complained of sensitivity in the upper anterior teeth. The medical history of the child was found to be insignificant. Proper immunization schedule was followed for the child. Clinical and radiographic examination revealed Ellis class III fracture (involvement of enamel and dentin compromising the pulp) of the maxillary left central incisor [Figure 1]. No significant hard or soft tissue injury other than tooth fracture was observed. An intraoral periapical radiograph was taken, which showed the coronal fracture with no root fracture or any other periapical changes [Figure 2]. The child was carrying the broken tooth fragment that was confirming adequately to the fractured left central incisor [Figure 3]. The tooth fragment was stored in water and did not show any significant change in color.

Access this article online	
Quick Response Code: 	Website: www.contemplindent.org
	DOI: 10.4103/0976-237X.95109

An immediate endodontic intervention followed by bonding of the fractured segment using the acid etch technique was decided. Single-visit endodontics was performed for the fractured central incisor. An access cavity was prepared and pulp extirpation was performed with the help of barbed broaches. After working length determination, biomechanical preparation was carried out with the help of K-files using the crown down technique. Copious irrigation of the root canal was intermittently done with sodium hypochlorite and normal saline. The canal was dried with absorbent point and was obturated with Gutta percha points and Zinc oxide eugenol sealer using the lateral condensation technique [Figure 4]. Now, the pulp chamber was partially filled with restorative Glass Ionomer Cement. Then, the tooth fragment and the remaining tooth structure was prepared for bonding. The tooth fragment was disinfected with sodium hypochlorite solution and then rinsed properly with water. An enamel bevel was prepared all around the remaining tooth structure as well as the fractured margin of the segment and the fragment was reapproximated to check its fit [Figure 5]. An additional internal dentinal groove was also prepared within the dentine of the fractured fragment part, which approximated the access cavity prepared

for endodontic therapy of the remaining tooth structure [Figure 6]. Acid etching of the access cavity and the approximating surfaces of the two segments were carried out for 20 s with 37% orthophosphoric acid [Figure 7]. Bonding agent (Ivoclar Vivadent Inc., Amherst, NY, USA) was subsequently applied and light cured for 10 s. The access cavity was filled with composite resin in small increments and light cured for 40 s for each increment. Then, flowable composite (Ivoclar Vivadent Inc, USA) was applied into the dentinal groove and on the approximating surfaces of the fragment and the remaining tooth. Both the fragments were reapproximated and light cured for 40 s each from the buccal and lingual aspects of the tooth. Flowable composite was applied over the bevel all around the tooth and was light cured appropriately. Finishing and polishing of the tooth was done and the patient was kept on recall [Figure 8]. The patient came for recall visit at 3 months, 6 months and 18 months and the tooth was found to be intact and functional inside the oral cavity in all the three visits.



Figure 1: Ellis class III fracture of the maxillary left central incisor



Figure 3: The fractured fragment

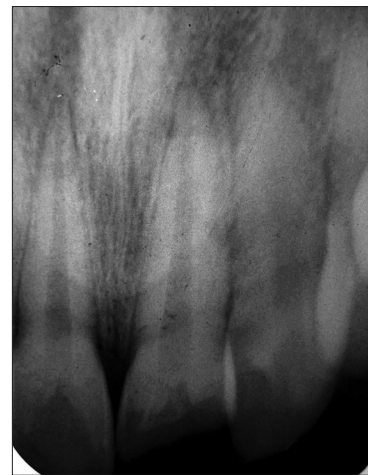


Figure 2: Intraoral periapical radiograph showing coronal fracture



Figure 4: Intraoral periapical radiograph showing the endodontic intervention



Figure 5: Circumferential enamel bevel



Figure 7: Enamel etching

Discussion

The treatment performed and presented in this clinical case report is one of the many possible options that could have been used to rehabilitate this patient. The other treatment options may have included the endodontic therapy followed by restoration of the tooth with composite resin or with a full coverage crown. Selection of the treatment plan should be made considering the advantages and disadvantages of each technique available and should be in conjunction with the desires and limitations of the patient.^[12]

Restoration with composite resin with the help of the acid etch technique is considered to be a highly aesthetic treatment for restoring fractured anterior teeth. Although composite resins do not have hydroxyapatite crystals, dentin tubules or enamel rods, these newer formulations possess secondary optical properties such as translucency, opacity, opalescence, iridescence, fluorescence and surface gloss. There is, however, no synthetic restorative material that can replicate the aesthetic characterization or color stability of the natural tooth structure.^[13]

Moreover, composite resin will be abraded more quickly than enamel by the opposing dentition.^[14] In contrast to this, when the fractured tooth fragment is reattached, the rate of wear and abrasiveness is the same as that for the intact tooth. In



Figure 6: Internal dentinal groove



Figure 8: Post-treatment: Reattached tooth fragment

addition, the treatment procedure is less time-consuming; thus, cutting the cost of the treatment.^[15]

Reattachment of the original tooth fragment also gives an emotionally and socially positive response due to the protection of the natural tooth structure. The patient and parents are at least satisfied of the original fragment being used in the restoration of their fractured tooth.^[16]

Various authors have recommended extra preparation of the fractured fragment and the remaining tooth structure to enhance the bonding of the fractured fragment to the remaining tooth.^[5,15,17] They pointed out that when reattaching without making any extra preparation for the broken incisal part and for the remaining tooth in the mouth, lower values than intact tooth fracture strength were obtained. Therefore, they stated the necessity of the application of an extra preparation on the tooth when reattaching the broken incisal part. In the case presented here, a combination of external enamel groove (bevel) in the shape of a V at the fracture interface and an internal dentinal groove has been used to enhance the bonding of the fragment with the remaining tooth. The patient was followed-up for 18 months and the results were found to be satisfactory, both aesthetically and functionally. In a similar manner, Bruke^[18] had used a combination of an internal dentin groove and the

circumferential beveling of enamel margins and found the result to be successful. Other additional preparations that have been used by different clinicians to improve adhesion between the fractured and the remaining segment include placing a chamfer at the fracture line after bonding,^[16,19] using a V-shaped enamel notch^[20] and placing an internal groove^[14,21] or a superficial overcontour over the fracture line.^[8]

In cases where the patient is undergoing fixed orthodontic treatment or is likely to undergo fixed orthodontic treatment in the near future, the reattachment technique allows performing such treatment and seems to be advantageous and reliable as reported by Simonsen.^[20,22]

The present literature shows good short-term^[2] and medium-term^[11] results of this technique. Very often, the loss of the reattached fragment occurs due to another traumatic injury to the treated tooth, non-physiological use of the tooth or horizontal traction when biting into hard and chewy foods. Thus, Andreasen *et al.* suggested fabrication of a mouth guard and patient education about the precautions and treatment limitations of this procedure. In young patients and adolescents, where a prosthetic rehabilitation or an implant is indicated but is limited by their age, reattachment may be carried out as a provisional restoration or treatment. In those cases, if the patient could benefit from the restoration for some years before receiving a more complex – and expensive – prosthetic solution, our objective will have been achieved.^[12]

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How to cite this article: Goenka P, Sarawgi A, Dutta S. A conservative approach toward restoration of fractured anterior tooth. *Contemp Clin Dent* 2012;3:S67-70.

Source of Support: Nil. **Conflict of Interest:** None declared.