

Restoring Multiple Anterior Crown Fractures with Combined Technique using Direct Composite Layering and Glass-Fiber-Post: A Case Report with 5 yrs - Follow up

Jennifer Park and Mary Anne S Melo*

Operative Dentistry Division, Department of General Dentistry, University of Maryland School of Dentistry, Baltimore, MD, USA

***Corresponding Author:** Mary Anne S Melo, Operative Dentistry Division, Department of General Dentistry, University of Maryland Dental School, Baltimore, MD, USA.

Received: August 16, 2017; **Published:** September 28, 2017

Abstract

Young patients are often frequently involved in traumatic dental injuries. The most common type fracture in permanent anterior teeth is a crown fracture. Direct restorative procedures using composite and fiber posts can be an esthetic and conservative approach in the case of extended fracture of an anterior root-filled tooth with little remaining coronal tooth structure. Currently, prefabricated glass fiber posts present favorable failure mechanism which may protect the root from the fracture. This case report demonstrates how the management of multiple anterior crown fractures was performed combining technique using direct composite layering and glass-fiber-post. This provides a cost-effective treatment with the direct approach as an option to solve crown fractures involving the esthetic zone in young patients with successful outcome after five years.

Keywords: *Composites; Aesthetic Treatment; Fiber Post; Dental Trauma; Fracture*

Introduction

Children and adolescents are often affected with traumatic dental injuries. In some of the cases, suffering multiple dental fractures in the same trauma episode [1]. Among the traumatic dental injuries, complicated crown fractures have a prevalence of 2.7 - 14.7% in primary dentition and 5 - 8% in permanent dentition [1]. Complicated crown fracture is a type of traumatic injury in which a portion of the tooth enamel, dentin and pulp are lost [1]. The fracture management can be a challenge to the general dentist when dealing with patients that not having reached dental and skeletal maturity and also present anxiety, distress, and fear [2-4]. Minimizing chairside time using a direct restorative approach is of utmost importance to treat the fractured tooth in this patients [3]. In the case of a complicated crown fracture involving the pulp, multiple disciplines must culminate towards the end goal of restoring functionality and aesthetics [1]. Therapies involve endodontics through an endodontic therapy and operative through post placement and composite resin.

Maxillary central incisors are reported to be the most frequently affected teeth in both the primary and permanent dentition [1]. For the clinician, the re-establishment of esthetics will be particularly important since the facial appearance is relevant for a positive emotional and social responses for a child affected by dental trauma [1]. Therefore conventional composite restoration techniques will not satisfy the esthetic demand of a Class IV fracture. Restoring a Class IV fracture, each third of the will have its chroma, hue, and value due to the varying thickness of enamel and dentin [5]. To maintain the natural appearance, the conventional composite material will be insufficient in replicating the extensive layers of color [5]. Multiple composite materials that vary in not only just color but also translucency must be used to successfully layer and mimic the varying shades of enamel and dentin [5]. The composite layering technique has evolved

Citation: Jennifer Park and Mary Anne S Melo. "Restoring Multiple Anterior Crown Fractures with Combined Technique using Direct Composite Layering and Glass-Fiber-Post: A Case Report with 5 yrs - Follow up". *EC Dental Science* 14.6 (2017): 242-248.

throughout the years of dentistry to a complex technique that involves the dentist's knowledge in dental anatomy and optical interaction with natural tissues [6]. The results of this technique will not only please the patient and parent but also sustain the aesthetics of the tooth as the child develops. This approach has the essential advantage of being conservative and further allows veneers and crowns be performed in the case of failure or an improved esthetic needs in adulthood of this patient.

When required, post placement is essential for the longevity of coronal restorations, regardless if direct or indirect approach is selected [7,8]. Its purpose is to retain the core build up, and without a post, long-term occlusal forces may cause the core to flex and lead to a fracture [8]. Most failures appeared to be due to biomechanical or restorative rather than biological reasons where there is a loss of post retention or fracture of the post itself [9-13]. Another issue regarding cast metal posts was the esthetics in anterior teeth where dark shadows would appear underneath ceramic crowns or restorations [14]. Glass fiber posts provide all the advantages of non-metal posts. They may concentrate less stress in the tooth and reduce the incidence of catastrophic root fractures [10,11]. Also, this is a conservative, economical method that yields aesthetically satisfying results. They are considered to cause fewer root fractures and appear more esthetically pleasing [15]. For young patients where the permanent tooth may still be developing, expanding the lifespan and integrity of the tooth are essential. Thus, the glass-fiber post is an excellent option. Here, we describe the management of crown fractures commenting the upper central incisors when the direct adhesive composite reconstructions were utilized efficiently to manage the crown fractures in a young patient.

Case Report

The patient was an 8 ½ -year-old boy presenting on an emergency basis after a dental trauma during soccer training. In the initial oral examination, the boy presents revealed a fracture in the middle third of the crown of the maxillary left incisor (tooth #9), exposing the pulp, and a fracture in the incisal third of the crown of the maxillary right incisor (tooth #8). The patient was accompanied by his mother who was distressed and reported not found the displaced fracture segments in the grass surround where the patient was playing. She also had concerns for the long term prognosis as well as the esthetic outcome. His medical and dental history was unremarkable. Radiographic examinations were conducted. An upper anterior periapical radiograph revealed tooth # 9 with an intact periodontal ligament space, incomplete root formation with the absence of root fracture. The patient was referred to root canal treatment and returned to the restorative procedure.

In the following restorative appointment, clinical examination revealed no signs of injury of the periodontal ligament, the fractured tooth #8 with a positive response to cold and electric pulp sensibility tests and endodontically –treated fractured tooth #9 as shown in figure 1. To ideally and esthetically restore the fracture, it is relevant that not only the anatomy is replicated. Also the various shades are placed in accurate thickness and position. For the esthetic restorations of the adjacent maxillary central incisors, the lingual matrix technique was applied. In the same appointment, the diagnostic impression of the upper arch was made with alginate, and a study model was fabricated with dental stone. A diagnostic wax-up was performed with inlay wax for the silicone lingual matrix using PVS material (Extrude XP, Kerr, Orange, CA). The following step is color selection using color mock-up technique. Local anesthesia was administered considering #8 and a low gauge non-latex dental dam (Hygenic, Coltene, Ohio USA) was placed. The lingual matrix was trimmed to position the facial-incisal edge correctly.



Figure 1: Facial view of anterior maxillary incisors presenting crown fractures with different level of severity. Tooth #8 presents fracture involving enamel and dentin with no pulp involvement. Tooth #9 presents a complicated fracture enamel, dentin and pulp involvement.

The tooth preparation refers to a short bevel at 45° to the facial surface (approximately 2 mm) on tooth #8 and a long bevel also at 45° to the facial surface of tooth #9. The tooth #9 was prepared first. After this, the prefabricated post space was prepared by removing gutta-percha from the root canal space using with special preparation drills supplied from the manufacturer, leaving 4 mm of endodontic filling at the apical area. An opaque and cylindrical fiberglass post (Exacto; Angelus, Londrina, PR, Brazil), size #2, with a 1.5 mm diameter and 17.0 mm long was selected. For the post, cementation was used Adper Scotchbond Multi-Purpose Plus (3M/ESPE, St. Paul, MN, USA) in association with Rely X ARC (3M/ESPE, St. Paul, MN, USA) dual cured resin cement. The selected post was cleaned with alcohol and then silanated (Silano Angelus) for 1 min. Intra-radicular dentin was etched with 37% phosphoric acid (3M/ ESPE) for 15 s, rinsed with water for 30s and dried with absorbent paper points as shown in figure 2A and 2B. Adhesive system was applied with a micro brush according to the manufacturers' instructions. The resin cement was mixed as recommended by the manufacturer and applied onto the post surface and into the root canal with a lentulo spiral drill. The post was then inserted into the root canal with digital pressure for the initial trigger of the self-curing process and then light cured for 40 s on each surface (Figure 2C and 2D).

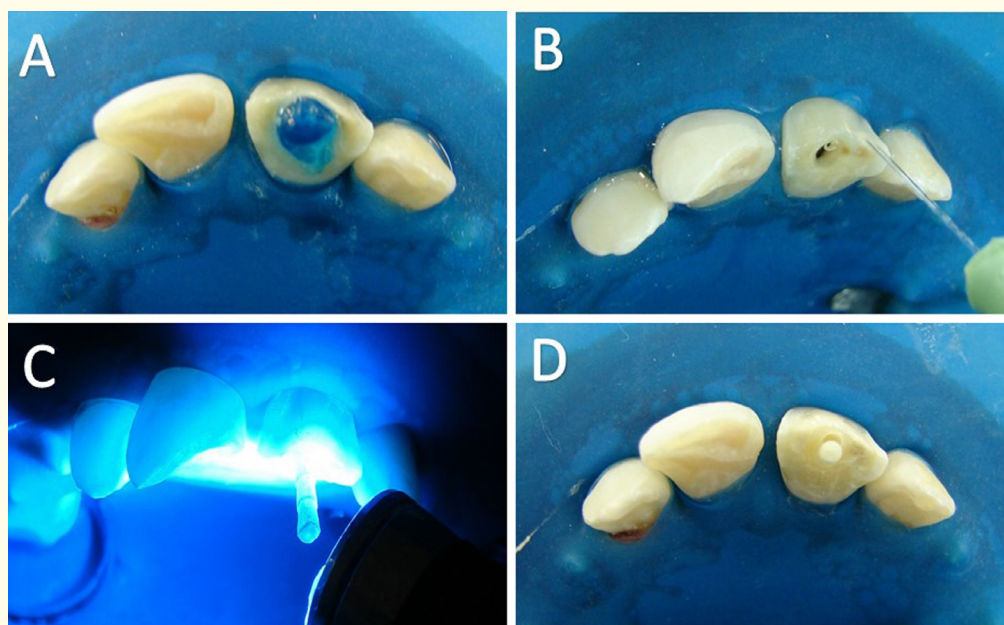


Figure 2 (A-D): Bonding and placement procedures for the prefabricated fiber post selected to provide retention for direct composite restoration on tooth #9.

Once the post was placed, the coronal portion was reconstructed with composite resin (Amelogen Plus, Ultradent, Sandy, Utah) on the shade of dentin composite A3 and Enamel composite shade natural. Initially, the tooth #8 was prepared. The position of the lingual matrix was confirmed (Figure 3A and 3B). On both teeth, adjacent teeth were wedged, and mylar strips were placed to prevent etching of adjacent area. 37.5% phosphoric gel was placed for 15 seconds and washed for the same period (Figure 3C and 3D). Following the bonding procedures, a two-step etch-and-rinse adhesive (Peak, Ultradent) was applied to the teeth surfaces and polymerized using a 600 mW/cm² intensity halogen light source (HiluxUltra, Ankara, Turkey) for 20s. Then, the composite layers were applied in a layering technique from lingual to facial using the lingual matrix for the creation of the initial of the lingual shelf (Figure 4A and 4B). The incremental buildup of the composite were using the previously selected shades, and the restorations were finished using carbide finishing burs and highly polished with SoftLex discs (Figure 4C and 4D). The occlusion was adjusted carefully to avoid any primary contacts or traumatic occlusal forces to the restored tooth.

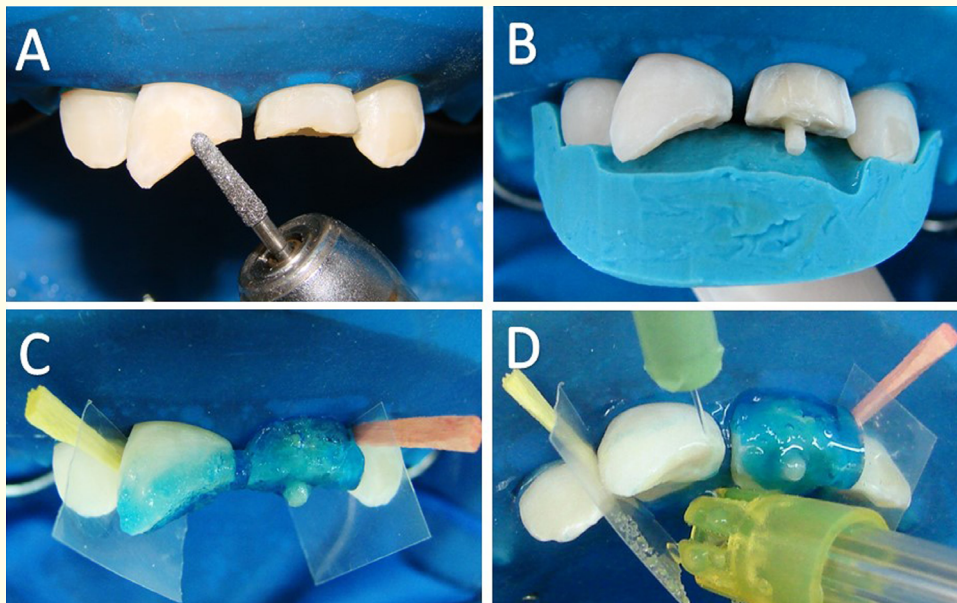


Figure 3 (A-D): Bevel preparation, silicone matrix adjustment, and bonding procedures before resin composite incremental buildup.

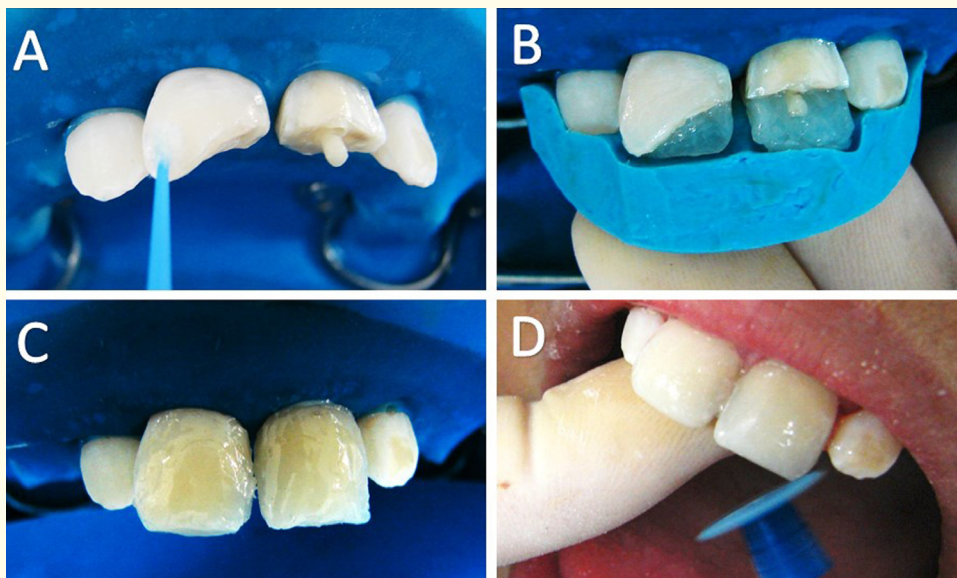


Figure 4 (A-D): Incremental build-up procedures of the coronal reconstructions with composite resin using silicone matrix as guidance. Previously selected shades were used in the both incremental build up using a layering technique. The restorations were finished using carbide finishing burs and highly polished with SoftLex discs.

The patient and his mother were instructed about oral hygiene and care of his restorations and were subsequently discharged. At the initial 2-week follow-up, no signs of debonding or composite fracture were observed. Orthodontic treatment was recommended to the patient, along with instructions on oral hygiene and periodontal maintenance. Regular follow-ups were scheduled, and the mother was instructed to contact the clinic in the event of any complication. The patient, now a 14-year-old adolescent, returned for follow-up after five years and was satisfied with the aesthetic and stability of the restorations. The patient has not be submitted to orthodontic treatment for correction of malocclusion. The initial facial view of the final restoration is shown in figure 5A and the final restoration after five years is shown in figure 5B-5C.

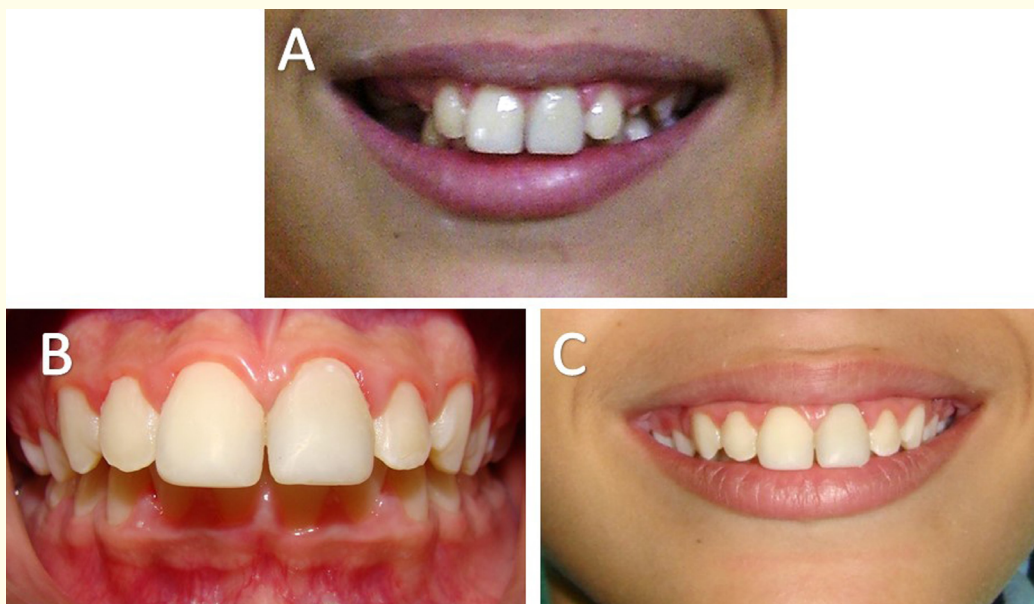


Figure 5: A. Facial view of the restorations with satisfactory immediate esthetic and functional results. B-C. Facial view at the five years of follow-up. No evidence of periodontal and endodontic injuries in the involved teeth and the restorations were satisfactory both esthetically and functionally.

Discussion

The management of adjacent crown fractures of maxillary central incisors presenting different degrees of severity can be demanding challenge for general dentists. In this case, the teeth fragments were not recovered, and the direct adhesive restorative approach was selected considering the overall set of demands of the case. The patient presents deficiency in the spatial arrangement of teeth in the dental arch and lack of the maturation of the soft tissue contours with needs of esthetics, tooth structure preservation, and further orthodontic treatment. For the most extensive fracture, a glass fiber post was used to increase retention of restorative material as an alternative method for reestablishing the esthetics and function. The crown fracture management frequently results in time and cost consequences, and these factors were also considered in the approach for this case.

Dental trauma associated with crown fractures of maxillary incisors has been associated to malocclusion. A previous cross-sectional study [15] has observed that children with malocclusion have a 64% higher chance of suffering dental trauma. Increased overjet was the type of malocclusion related to a higher rate of tooth fracture. In the reported case, the patient presented inadequate alignment of the den-

tal arches with poor positioning of the anterior teeth in the maxilla. The found condition of overjet with a protrusion was a risk factor for the occurrence of anterior dental trauma. In the literature, studies have also described and supported overjet as a risk factor for trauma [16,17]. Early prevention, acting on any risk factor for dental trauma, can reduce its incidence.

The use of composites for crown reconstruction of traumatized teeth that were endodontically treated associated with reinforcement with prefabricated fiber post has been proposed in the literature among the treatment options for extensive crown fractures [18,19]. Due to the loss of more than 50% of the coronal structure, the use of a post was recommended before restoration [16]. Conventional composite restorations and prefabricated metal posts can result in a less than ideal esthetic outcome where there could be discoloration and mismatches of texture, contours and incisor translucency [3]. Glass fiber post was used to meet the patient's esthetic demand and also reduce the chances of fracture [3]. Reattachment of teeth fragments with adhesives and flowable composites and indirect restorations as feldspathic porcelain and lithium disilicate all-ceramic crowns have also been reported [20,21]. However, in stated case, the fragments were not recovered. Full crown restorations, although can provide a long-term natural appearance, requires from an occlusion point of view, a well stabilized Class I sagittal dental relation.

Conclusion

In the present case, a direct adhesive restorative approach using resin composite and prefabricated fiber post provided satisfactory immediate esthetic and functional results regarding maintaining the tooth's structural integrity for adjacent anterior crown fractures in a young patient. Furthermore, after 5 years of follow-up, clinical and radiograph examinations have shown that there was no evidence of periodontal and endodontic injuries in the involved teeth and the restorations were satisfactory both esthetically and functionally. This result supported that the approach used in this case can be a good option for restoring fractured anterior teeth with different degrees of severity.

Bibliography

1. Gungor HC. "Management of Crown-Related Fractures in Children: An Update Review". *Dental Traumatology* 30.2 (2014): 88-99.
2. Shah PV, et al. "Clinical success and parental satisfaction with anterior veneered primary stainless steel crowns". *Pediatric Dentistry* 26.5 (2004): 391-395.
3. Manju M., et al. "Esthetic and biologic mode of reattaching incisor fracture fragment utilizing glass fiber post". *Journal of Natural Science, Biology and Medicine* 6.2 (2015): 446-449.
4. Welly A., et al. "Impact of dental atmosphere and behaviour of the dentist on children's cooperation". *Applied Psychophysiology and Biofeedback* 37.3 (2012): 195-204.
5. Rauber GB., et al. "Evaluation of a technique for color correction in restoring anterior teeth". *Journal of Esthetic and Restorative Dentistry* (2017).
6. Dietschi D and Fahl N. "Shading concepts and layering techniques to master direct anterior composite restorations: an update". *British Dental Journal* 221.12 (2016): 765-771.
7. Torres-Sanchez C., et al. "Fracture resistance of endodontically treated teeth restored with glass fiber reinforced posts and cast gold post and cores cemented with three cements". *The Journal of Prosthetic Dentistry* 110.2 (2013): 127-133.
8. Mamoun J. "Post and core build-ups in crown and bridge abutments: Bio-mechanical advantages and disadvantages". *The Journal of Advanced Prosthodontics* 9.3 (2017): 232-237.
9. Naumann M., et al. "Risk factors for failure of glass fiber-reinforced composite post restorations: a prospective observational clinical study". *European Journal of Oral Science* 113.6 (2005): 519-524.

10. Naumann M., *et al.* "Randomized controlled clinical pilot trial of titanium vs. glass fiber prefabricated posts: preliminary results after up to 3 years". *International Journal of Prosthodontics* 20.5 (2007): 499-503.
11. Ferrari M., *et al.* "Post placement affects survival of endodontically treated premolars". *Journal of Dental Research* 86.8 (2007): 729-734.
12. Bitter K., *et al.* "Randomized clinical trial comparing the effects of post placement on failure rate of postendodontic restorations: preliminary results of a mean period of 32 months". *Journal of Endodontics* 35.11 (2009): 1477-1482.
13. Dietschi D., *et al.* "Biomechanical considerations for the restoration of endodontically treated teeth: a systematic review of the literature. Part II (Evaluation of fatigue behavior, interfaces, and in vivo studies)". *Quintessence International* 39.2 (2008): 117-129.
14. Habibzadeh S., *et al.* "Fracture resistances of zirconia, cast Ni-Cr, and fiber-glass composite posts under all-ceramic crowns in endodontically treated premolars". *The Journal of Advanced Prosthodontics* 9.3 (2017): 170-175.
15. Antunes LA., *et al.* "Increased overjet is a risk factor for dental trauma in preschool children". *Indian Journal of Dental Research* 26.4 (2015): 356-360.
16. Norton E and O'Connell AC. "Traumatic dental injuries and their association with malocclusion in the primary dentition of Irish children". *Dental Traumatology* 28.1 (2012): 81-86.
17. Glendor U. "Aetiology and risk factors related to traumatic dental injuries: A review of the literature". *Dental Traumatology* 25.1 (2009): 19-31.
18. Vitale MC., *et al.* "Combined technique with polyethylene fibers and com-posite resins in restoration of traumatized anterior teeth". *Dental Traumatology* 20.3 (2004): 172-177.
19. Gbadebo OS., *et al.* "Randomized clinical study comparing metallic and glass fiber post in restoration of endodontically treated teeth". *Indian Journal of Dental Research* 25.1 (2014): 58-63.
20. Macedo GV., *et al.* "Reattachment of anterior teeth fragments: a conservative approach". *Journal of Esthetic and Restorative Dentistry* 20.1 (2008): 5-20.
21. Sevuk C., *et al.* "Fabrication of one-piece all-ceramic coronal post and laminate veneer restoration: a clinical report". *Journal of Prosthetic Dentistry* 88.6 (2002): 565-568.

Volume 14 Issue 6 September 2017

© All rights reserved by Jennifer Park and Mary Anne S Melo.