

Crown fracture reattachment as a short-term restorative procedure: Report of two cases

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Abstract

Crown fractures of the anterior teeth are a common form of dental trauma that mainly affects children and adolescents. When the tooth fragment is available and there is no or minimal violation of the biological width, one of the management options for crown fractures is the reattachment of the dental fragment. Reattachment of fractured tooth fragments provides good and long-lasting aesthetics as a result of the followings; preservation of the tooth's original anatomic form, color, and surface texture. It also restores function, provides a positive psychological response, and is a relatively simple procedure. Patient cooperation and understanding of the limitations of the treatment is of utmost importance for good prognosis. This article reports on two anterior crown fracture cases that were successfully treated using tooth fragment reattachment.

Clinical significance

Reattachment of fractured tooth fragments offers a viable short and medium term restorative option for the clinician because it restores tooth function and aesthetics with the use of a very simple, conservative and cost-effective approach.

Crown fractures are the most frequent traumatic injuries that affect the permanent teeth^{1,2}. The majority of dental injuries involves the anterior teeth, especially the maxillary incisors (because of its position in the arch)³, whereas the mandibular central incisors and the maxillary lateral incisors are less frequently involved

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^{4,5,6}.

The management of such cases involves simple to complex restorative intervention depending upon the severity and extent of the fracture. A few approaches have already been established for such types of fractures like orthodontic extrusion; forced surgical extrusion; and periodontal crown lengthening procedures to expose the fracture site, followed by restoring the lost tooth structure by prefabricated or custom cast post and core build up with composite resin or prosthodontic restoration⁷.

In the pre-adhesive era, fractured teeth needed to be restored either with pin-retained inlays or cast restorations followed by full-coverage crowns that sacrificed healthy tooth structure and were a challenge for the clinicians to match in aesthetics with the adjacent teeth⁸.

With the development of adhesives, 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 available⁹.

Tooth fragment reattachment offers a conservative, aesthetic, and cost effective restorative option that has been shown to be an acceptable alternative to the restoration of the fractured tooth with resin-based composite or full-coverage crown^{3,6,10,11}. Reattachment of a fragment to the fractured tooth can provide good and long-lasting aesthetics (because the tooth's original anatomic form, color, and surface texture are maintained)³, can restore function, can result in a positive psychological response, and is a reasonably simple procedure¹².

In addition, tooth fragment reattachment allows restoration of the tooth with minimal sacrifice of the remaining tooth structure. Furthermore, this technique is less time-consuming and provides a more predictable long-term wear than when direct composite is used¹³.

Clinical trials and long-term follow-up have reported that reattachment using modern dentin bonding agents or adhesive luting systems may achieve functional and esthetic success⁶. This article reports on two coronal tooth fracture cases that were successfully treated using tooth fragment reattachment.

Case I

A 20-year-old male patient who presented at the conservative clinic of the Dental Hospital, Obafemi Awolowo University Teaching Hospitals' Complex, Ile-Ife, Osun State with one week history of fracture of the maxillary

left lateral incisor.

General examination revealed that patient was medical fit. Intra-oral examination revealed an oblique fracture in the cervical third of the crown of the maxillary left lateral incisor with fracture line located supragingivally running labio-palatally. The fractured segment was still partially attached to the crown with evidence of pulpal exposure. The gingivae related to the fractured tooth was slightly hyperaemic and tender to touch.



Fig.1. Photograph of the fractured maxillary left central incisor (Case I) on presentation



Fig. 2. Photograph of the fractured tooth to show the retention of the fractured segment

Periapical radiograph taken revealed a fracture line communicating with the pulp. The fracture line was above the alveolar bone. A diagnosis of complicated crown-root fracture of maxillary left lateral incisors secondary to trauma was made. The diagnosis and various treatment options were explained to the patient and he preferred the option of reattaching the fractured segment to the tooth.

Treatment

Local anaesthesia was administered and the fractured part was carefully removed. The removed fractured part was kept in normal saline to prevent dehydration. The operating field was isolated to ensure moisture control. Single visit root canal treatment was done. About 3mm GP was removed from the coronal end of the canal and the root canal orifice was sealed with a glass ionomer cement (GIC) plug. The pulp chamber, dentin, and enamel were etched with a 37% phosphoric acid gel, rinsed, and coated with adhesive system (Prime-Dent, Chicago USA). The adhesive was not light-

cured at this point. The fractured surface of the fragment was treated with 37% phosphoric acid gel for 30 seconds, followed by delicate rinsing. The adhesive system was then applied to the etched surface. Visible light cure Composite resin (Prime Dent, Chicago USA) was applied to both fragment and tooth surfaces. The fractured segment was then accurately placed on the tooth, paying special attention to the fit between the segments. When the original position had been reestablished, excess resin was removed and the area was light-cured for 40 seconds on each surface, making sure that no displacement of the fragment occurred before adhesive/resin polymerization was complete. The margins were properly finished with diamond burs and polished. Clinical examination at 6 months follow-up visit revealed no discoloration, and the tooth was symptomless.

Case II

A 19-year-old female student of Obafemi Awolowo University Ile-Ife presented with trauma to her anterior teeth resulting in fracture of the maxillary left central incisor. Trauma had occurred the previous day before presentation. The fractured segment was partially retained. Clinical and



Fig. 3. Photograph of the fractured segment after the application of the adhesive.



Fig. 4. Photograph of the maxillary left central incisor immediately after reattachment.

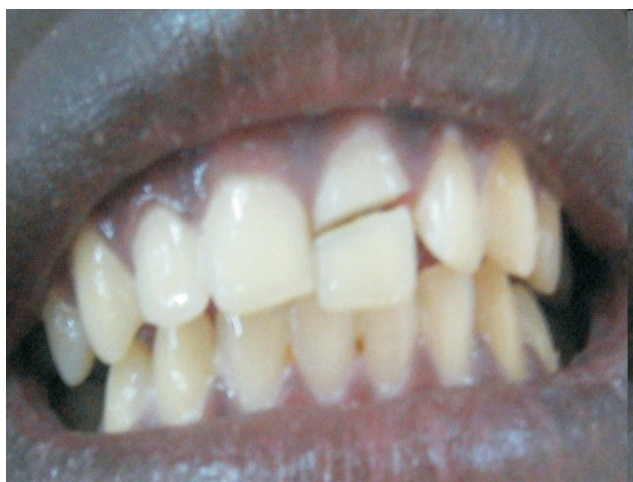


Fig. 5. Photograph of the fractured maxillary left central incisor (Case II) on presentation

radiographic examination showed no periodontal disease or alveolar bone injury. There was exaggerated response to vitality test. A diagnosis of complicated crown fracture was made.

Treatment

The treatment chosen was root canal treatment and fracture reattachment. The fractured segment was completely detached. The remaining tooth was isolated with rubber dam, the radicular pulp extirpated, working length determined and canal prepared to size 80. Irrigation was carried out using 2.5% sodium hypochlorite (NaOCl), and normal saline, canal dried with paper points and obturated with gutta-percha cones using the lateral compaction technique. A dentatus screw post and core was placed after preparation of post hole. The fractured segment was tried in to establish a good fit. The tooth was etched with 37% phosphoric acid for 30 seconds after which it was rinsed with water and air dried. Adhesive bonding system (Prime Dent, Chicago USA) was applied with a micro-brush rubbing for 20-30 seconds to give time for the bonding agent to penetrate into the dentinal tubules and to form a correct hybrid layer. It was then polymerized for 20 seconds. The fragment was treated the same way as the tooth; the cavity within the fragment was filled with a self polymerizing composite. They were then luted with a thin layer of light-cured composite (Prime Dent,



Fig. 6. Photograph of the restored tooth immediately after reattachment

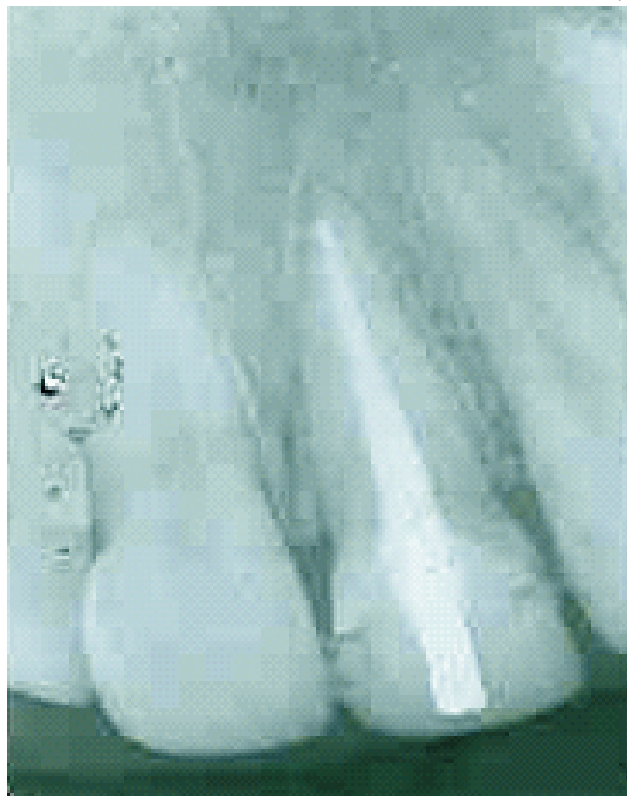


Fig. 7. Periapical radiograph of the tooth showing a dentatus screw post

Chicago USA) to cover the fractured line. The margin was properly finished and polished. Patient was satisfied with the treatment outcome.

Discussion

The two case reports show that reattachment can be done with simple and straightforward techniques, at the same time restoring function and aesthetics with a very conservative approach. However, Macedo et.al.¹⁵ suggested that professionals conducting such procedure have to keep in mind that a dry and clean working field and the proper use of bonding protocol and materials is the key for achieving success in adhesive dentistry. It must be noted that clinical reports and experience of various researchers indicate that the reattachment of fractured coronal fragments results in successful short- and medium-term outcomes^{11,13,14}.

Reattachment of fractured fragments has been reported in the literature since 1960s, with the first study published in 1964,⁸ where the authors had reattached the fractured fragment using post and core. The fragments have also been attached with dentinal pins¹⁶.

Though different methods have been employed for restoring fractured anterior teeth, Baratieri et al.¹³ said fragment reattachment is the preferred method because of improved esthetics, due to restoration of original color and translucency. Also the original surface texture is maintained, and the rate of incisal wear is similar to adjacent natural teeth, and this procedure is less time-consuming.

In the second case of this report; post placement was employed in addition to bonding because of the slightly lower level of the fracture line. Post-placement in addition to bonding, serves to retain the coronal portion via a friction bond, and assist in preventing non-axial dislodgement forces¹⁷.

In the two cases, dentine bonding agent and light-cured composite were used. Literature shows that the most commonly employed are the dentin-bonding agents with the flowable resin composite materials. Other materials which have been employed are dentin-bonding agents only,^{18,19,20} dual or self-cured luting cements^{3,21} or light-cured luting cements,²² and viscous light-cure hybrid or microfilled resin composites²³.

Worthington et al.²⁴ showed that placement of any kind of preparation did not improve the fracture resistance, and the incisal edge reattachment restored appropriately have the fracture resistance of sound teeth. The advantage of using the fractured tooth fragment over all other materials includes color, morphology, translucency, physicochemical characteristics, patient acceptance, structurally conservative, and economical.²⁵

Andreasen et al.⁶ reported that patient education about treatment limitations enhances clinical success as reattachment failures may occur with new trauma or parafunctional habits. With the materials available today, in conjunction with an appropriate technique, aesthetic results can be achieved with predictable outcomes. Thus, the reattachment of a tooth fragment is a viable technique that restores function and esthetics with a very conservative approach, and it should be considered when treating patients with coronal fractures of the anterior teeth, especially younger patients.

Conclusion

The reattachment of fractured crown segment using dentin bonding adhesives is a viable treatment option demonstrating short and medium term successful treatment outcome.

Disclosure

The authors do not have any financial interest in the companies whose products were mentioned in this article.

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