Case Report – Fracture Reattachment, to Restore the Natural Tooth Fragment

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Abstract

Dental fractures comprise the most frequent form of traumatic dental injury and often require an immediate procedure for their treatment. The repositioning of fractured crown fragments using the bonding fragment technique offers several advantages, including the reestablishment of function, esthetics, shape, shine, and surface texture, in addition to the maintenance of the original contour and alignment of the teeth. The aim of this article is to describe a therapeutic approach used with a patient who suffered varying degrees of crown fractures in three teeth that were treated with adhesive fragment reattachment. The natural crown bonding technique, using tooth fragments and a direct composite resin, successfully restored all of the fractured anterior teeth. The clinical examinations showed good esthetics and periodontal health after a 4-month follow-up, proving that the technique is a good option for tooth fractures.

Keywords: Crown fracture, Dental trauma, Fragment reattachment treatment.

Introduction

Traumatic dental injuries (TDIs) have been frequently observed in preschool children, school-age children, and young adults, comprising 5% of all injuries for which people search for treatment.[1,2] A study reported that 25% of children have already suffered dental trauma and 33% of adults have experienced trauma in the permanent dentition.[3] The treatment of TDIs presents a challenge to clinicians worldwide. Consequently, the proper diagnosis, treatment planning, and follow-up are critical to assure a favorable outcome. Among the treatments, the restoration of fractured teeth by reattachment of the tooth fragment to its tooth remnant is a viable clinical procedure to treat tooth fracture due to trauma, because it is considered a highly conservative technique.[4-7] Reattachment of a tooth fragment must occur immediately or soon after the dental crown fracture.

The immediate reattachment procedure consists of bonding the dental fragments in the first visit after TDI. In contrast, it is also possible to perform the bonding in a subsequent session when the oral conditions are more favorable to the treatment.[7] Furthermore, the recovery of the fractured fragment makes the diagnosis and especially the treatment easier. Accurate repositioning of coronal fragments and bonding using adhesive techniques offers advantages such as the restoration of function, esthetics, texture, shape, and surface brightness, in addition to the maintenance of the contour and the original alignment of the restored teeth. The aim of this study is to report a therapeutic approach in a patient who suffered dental trauma with varying degrees of coronal fractures, describing the reattachment of fractured tooth fragments using the direct bonding technique.

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Case Report

A 27-year-old male patient reported to the department of conservative dentistry, esthetics, and endodontics with the chief complaint of broken upper right front tooth associated with pain. Detailed history revealed the etiology as a fall from bike accident 24 h back. The fractured tooth fragment was retrieved by the patient from the site of injury and was stored in water. In the right central incisor, we observed an

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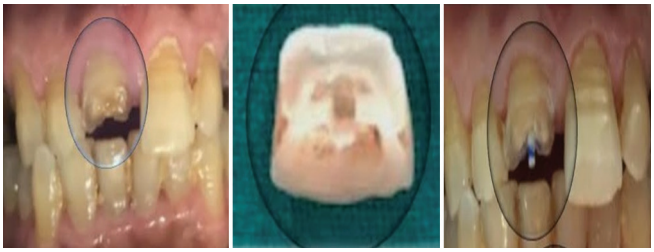
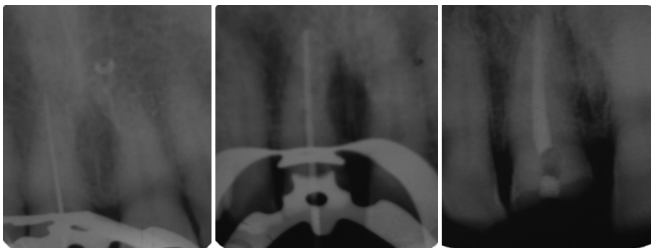
oblique coronal fracture located below the middle third and pulp exposure. Clinically, the patient still had a visible plaque index of 46.4% and gingival bleeding of approximately 31.2%. The residual roots of the #16 and #26 teeth were present as well as white spots in all molars and an active cavity at #46. Furthermore, there was a need for endodontic therapy in a lower right premolar.

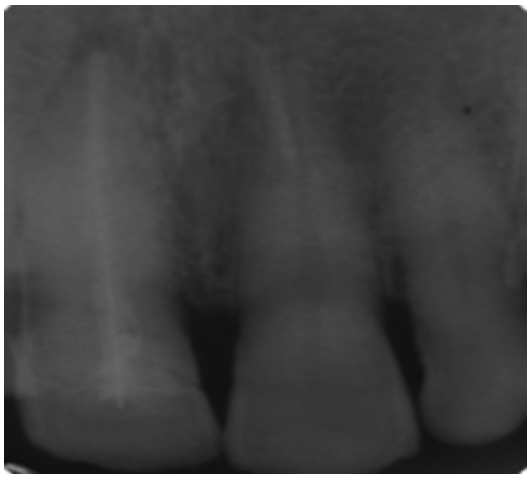


The treatment planning strategy for the treatment was carried out in two stages. In the first stage, endodontic procedures were performed the bonding procedure and restoration was performed. The teeth involved had irreversible pulp involvement, and due to the extent of the fractures associated with an occlusion overbite, the possibility of bonding failure was considered. This fact would provide the need for intraredicular pins for the reconstruction of the teeth. Thus, endodontic treatment was the choice of the professionals responsible for the patient. After the endodontic access of the incisors as described above, irrigation of the pulp chamber and cervical third with 5% sodium hypochlorite was performed with an endodontic instrument type K (Dentsply-Maillefer, Ballaigues, Switzerland). The mechanical chemical preparation was performed with irrigation, aspiration, and inundation with 5% sodium hypochlorite and 17% ethylenediaminetetraacetic acid.

Cement, Maxion R (FGM Dental Products, Joinville, SC, Brazil), provisionally until the next clinical appointment for the definitive obturation of the incisors. In the next session, a dental prophylaxis was carried out.



To bond the fragment in tooth #11, the composite resin Amelogen enamel B1 and A1 (Ultradent Dental, South Jordan, UT, USA) was chosen. The fragments were cleaned with chlorhexidine digluconate solution at 2% (FGM Dental Products, Joinville, SC, Brazil) for 1 min; a rubber dam (Dental Dam Hygenic, Coltène/Whaledent GmbH, Langenau, Germany) and the adjacent dental elements fracture were insulated with polytetrafluoroethylene tape (Polytubes, Pulvitec, São Paulo, SP, Brazil). The coronary fragment and the remaining tooth structure were etched with gel phosphoric acid 35% (Ultra-Etch, Ultradent Products, South Jordan, UT, USA) for 30 s on the enamel and 15 s on the dentin, followed by extensive washing with air/water spray and subsequent drying air jets.



To facilitate the bonding, we used a securing device, OptraStick (Ivoclar Vivadent AG, Schaan, Liechtenstein), and photopolymerization for 40 s in the buccal and 40 s on the lingual surface using polymerizing halogen light with an intensity of 1400 mW/cm^2 (Radii LED Curing Light, SDI, Australia). The beveled end was used superficially on the tooth fragment of the vestibular external interface enamel of the teeth with the latest aid spherical diamond, FG 1012 (KG Sorensen, Cotia, SP, Brazil), and reinforced composite microhybrid Amelogen (enamel B1). The final polishing was performed using interface Sof-Lex disks (3M ESPE, St. Paul, MN, USA) and a high gloss polishing slurry (Opal L, Renfert GmbH, Hilzingen, Germany) with the aid of fur brushes mounted goat suede and cotton on the labial surface and palate of all external enamel. Clinical and radiographic controls were performed 4 months after the adhesive bonding procedure.

The color disharmony that was encountered initially in the restored teeth resolved significantly on its own accord within the preservation period after the reattachment of the fragments.

Discussion

Treatment options for complicated fractures should be evaluated carefully based on the location of the fracture line and the

patient's age, preference, and systemic health condition. The bonding technique for dental fragments was chosen due to the patient's young age and the simple, fast, cheap, esthetic, and conservative nature of the technique. The use of the natural tooth minimizes problems due to aging and degradation of the restorative material, color difference discrepancies, and difficulties in reproducing the texture and contours associated with other restorative techniques. Another advantage is the advancement of adhesive restorative materials, which allows not only the creation of accession to the lost dental structures but also the preservation and strengthening of the tooth structure.

Studies have shown that one out of every four persons under the age of 18 will sustain a traumatic anterior crown fracture.[8,9] Whenever the fracture fragment is available, reattachment should be the first choice of treatment.[10,11]

Depending on the intensity of the impact, a tooth may fracture or there may only be damage to the supporting tissues. The extent of the trauma and its impact on the supporting tissues is directly proportional to the impact energy. Creating fractures dissipate the energy of the impact trauma, which reduces the transmissibility in the direction of the support tissue, thus reducing the occurrence of inflammatory resorption.[12]

Moreover, the hydration of dental fragments is a key factor in maintaining their optical characteristics.[13] A systematic review shows that the fragment color change could be linked to dentinal tissue dehydration.[14] The enamel and dentin have different characteristics with features that greatly influence these properties. The enamel is characterized as a highly mineralized structure that consists of prisms. A small amount of its composition is water, and it is better at reflecting light. Dentin, which has a tubular structure, is organic and less mineralized and has a larger amount of water.

The patient placed the dental fragments in a dry empty vial, and during the first visit, the fragments were reconditioned in a humid environment and hydrated in water until the bonding procedure was performed. Fragment hydration proved to be an important step in the clinical context, because it prevented disharmony in the fragment of color in relation to the remaining tooth in addition to increasing the strength of the bonding. The time between the tooth fracture and the reattachment of the tooth fragment associated with rehydration fragment may have helped to avoid displeasing esthetics. Rehydration of the fragment should be performed for 30 min before the direct bonding process, which contributes to the improved esthetic results and its resistance. The color discrepancy may disappear within 30 days–12 months due to water absorption of the fragment after their reinsertion.[11,15]

A clinical study and an *in vitro* study supports the conclusion that the type of storage medium, in which the tooth is stored, has no influence on the survival, color, and bond strength of the restored tooth after the fragment reattachment.[16] Furthermore, this study shows that the color disharmony may normalize on its own within 12 months, and according to *in vitro* tests, teeth with fractures and reattachment show a significantly lower resistance force than unrestored natural teeth.[16] In the presented clinical description, the location and characteristics of the fracture and its good adaptation to the fractured elements (left central incisors and right lateral incisors) may have contributed to the clinical success observed in this 14-month clinical follow-up case study.

Conclusion

The direct bonding technique of fragment reattachment has proven to be a good alternative for the rehabilitation of anterior teeth. Moreover, it is a conservative esthetic procedure that can restore the masticatory function.

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