Treatment of complicated crown-root fracture in a single visit by means of rebonding

Vijetha Badami, MDS; S. Kranthikumar Reddy, MDS

Dental trauma often has a severe impact on the social and psychological well-being of a patient. A large U.S. study indicated that 25 percent of the population aged 6 to 50 years may have sustained traumatic injuries to the anterior teeth. Maxillary central incisors, followed by maxillary lateral incisors and then the mandibular incisors, were the teeth most frequently involved. The most commonly observed dental trauma involved fracture of enamel, or enamel and dentin, but without pulp involvement. No single dental disturbance has a greater psychological impact on the patient than the loss or fracture of anterior teeth.

Complicated fractures of anterior teeth can be treated by means of direct or indirect restorations. The treatment options depend on the relationship of the fracture to the alveolar crest, the degree of pulpal involvement, the tooth’s level of eruption, the degree of apex formation and the patient’s esthetic requirements. The higher cost of indirect restorations, the patient’s desire to maintain remaining

ABSTRACT

Background. Crown-root fractures of anterior teeth are relatively common but often time consuming and difficult to treat. In some cases, the clinician can complete the treatment in a single visit by reattaching the fractured fragment.

Case Description. In this case report, the authors describe the treatment of a complicated crown-root fracture of the maxillary right central and lateral incisors. Among the treatment options for such cases, the treating clinician considered a single-visit rebonding procedure to be the best choice. The treatment consisted of a multidisciplinary approach involving coronal fragment removal, gingivectomy to expose the margins and single-visit endodontic therapy, followed by a rebonding of the fractured fragment by means of prefabricated posts.

Results. Evaluation at 12 months indicated stable reattachment of the fragments, good esthetics and good periodontal health.

Clinical Implications. The reattachment of a tooth fragment is a viable, conservative technique that restores function and esthetics, and clinicians should consider it when treating patients with coronal fractures of the anterior teeth.

Key Words. Complicated crown root fracture; rebonding; fiber post; reattachment; trauma.

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sound tooth structure and unfavorable anatomical conditions may render the direct restoration the first choice in many clinical situations. Technics that speed and simplify treatment, restore esthetics and improve long-term success rates, therefore, are of potential value, and clinicians should consider them.

Developments in restorative materials and techniques have facilitated reattachment of fractured teeth. Tooth-colored fiber posts were introduced in the 1990s and offer several advantages, such as esthetics, a strong bond to tooth structure and a modulus of elasticity similar to that of dentin. However, fiber posts still require dentin preparation to fit into the canal.

In this article, we will address the treatment regimen for crown-root fracture at a level below the free gingiva that offers the advantages of simplicity, esthetics and conservation of tooth structure in cases of dental trauma.

CASE REPORT
A 22-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, the Academy of Medical Education’s Dental College and Hospital, Raichur District, Karnataka, India. The patient complained of mobile and broken teeth in the maxillary anterior region. He had experienced trauma 10 days previously. His medical history was non-contributory. On extraoral and intraoral examination, the clinician (V.B.) found no apparent trauma to the soft tissues.

On clinical (Figure 1) and radiographic (Figure 2) examination, the clinician diagnosed a chisel type of crown root fracture of the maxillary right central and lateral incisors. The fracture lines of both teeth were supragingival on the labial aspect and below the gingival margin on the palatal aspect. The clinician determined biological width by measuring probing depth and conducting intrasulcular bone sounding after administering local anesthetic. Probing depth measured 3 millimeters palatally. Palatal gingiva and interdental papilla were inflamed and edematous. There was no apparent periapical pathosis. The clinician planned direct reattachment of the crown fragments, a plan that the patient accepted.

An endodontist (S.K.R.) removed the fractured coronal fragments without incurring damage by using a forceps. He cleaned the pulp chambers in the coronal fracture fragments and stored the fragments in saline to prevent discoloration and dehydration. A periodontist then performed external bevel gingivectomy, marking the depth of the sulcus with a pocket marker.

He used a no. 12 surgical blade to excise 2 mm of the inflamed and edematous gingiva, thus exposing the margins and at the same time maintaining the biological width (Figure 3).

The endodontist then extirpated the remaining pulp tissue in the root portions by means of a barbed broach. He used the radiographic method to determine the working length and cleaned and shaped the canal by means of the step-back method. Then he selected and confirmed the master cones by using intraoral periapical radiographs and obturated the canal by means of the lateral compaction method, using AH Plus Root Canal Sealing Material (Dentsply, York, Pa.). The endodontist used Peeso reamers and the precision drill provided with the Radix Fiber Post system (Dentsply) to prepare the post space, leaving the apical 5 mm of gutta-percha intact, and obtained a radiograph by which to evaluate the work. He selected a Radix fiber post (Figure 4) of a size corresponding to that of the precision drill. The endodontist etched the surface of the post and the canal by using 37 percent phos-
phoric acid for 15 seconds. He rinsed the surface with water, dried it with air and applied Prime & Bond NT (Dentsply Caulk, Milford, Del.) by using a microtip applicator. He light cured the adhesive for 10 seconds after removing the excess by using paper points.

Later, he spread Calibra (Dentsply) esthetic resin cement mix on the surface of the post and into the post preparation with a syringe tip and a lentulo spiral instrument, cured it for 10 seconds and stabilized the post for six minutes until the cement set. Isolation was maintained throughout the procedure by means of cotton rolls, a saliva ejector and gingival retraction cord.

The original clinician (V.B.) prepared retention boxes by using a straight fissure bur in both coronal fragments to accommodate the heads of the posts. She etched the fractured crown segments and the teeth with 37 percent phosphoric acid etchant gel for 15 seconds. She applied Prime & Bond NT on the surface of the tooth structure (enamel and dentin) with an applicator brush and light cured it for 10 seconds. After applying Calibra around the posts and the retention boxes of the fragments, the clinician reattached the fragments to the teeth (Figure 5). She removed excess material along the margins by using a No.12 Bard Parker blade (Aspen Surgical Products, Caledonia, Mich.) and light curing the material with a light-emitting diode curing light for 40 seconds from both buccal and palatal directions. She polished the tooth surface to remove excess cement.

One month later, clinical and radiographic examination revealed a stable reattachment of crown fragments. After 12 months, the clinician found a 1-mm palatal probing depth, no bleeding on probing and normal mobility, and radiographic examination showed a stable reattachment of the fragments and good periodontal health (Figure 6).

**DISCUSSION**

The treatment of complicated crown-root fractures in many cases is compromised by tooth fractures that are well below the gingival margin or bone. Today, dentists have a number of different approaches from which to choose when treating fractured teeth, depending on the location of the fracture. If the fracture line is supragingival, the procedure for reattachment will be straightforward. However, when the fracture site is subgingival or intraosseous, orthodontic extrusion with a post-retained crown may be necessary. Alternatively, surgical techniques such as electrosurgery, elevation of a tissue flap, clinical crown-lengthening surgery with removal of alveolar bone and removal of gingival overgrowth for access to the fractured site all are viable methods.

The reattachment of the crown fragment to a fractured tooth is the best method of reinstating the fragment’s natural shape, contour, surface texture, occlusal alignment and color. It eliminates the problems of differential wear of restorative materials and offers excellent...
esthetic and functional results in a single appointment while maintaining healthy periodontal attachment. Also, this procedure is relatively simple, atraumatic and inexpensive. However, because the findings of few long-term studies regarding this topic have been reported in the literature, the patient should be informed of the possible interim nature of the treatment.

Factors that influence the success of reattachment include the site of fracture, the size of fractured remnants, the patient’s periodontal status, pulpal involvement, maturity of the root formation, biological width invasion, occlusion, time since the initial trauma, the material used for reattachment and the type of post used. Extensive damage of the tooth structure and reattachment of the fragment warrants reinforcement with fiber posts. Tooth-colored fiber posts have several advantages. Their main proposed advantage is that they are esthetically pleasing, are more flexible than metal posts and have approximately the same modulus of elasticity as dentin. When such posts were bonded in place with resin cement, researchers thought, forces would be distributed more evenly in the root, resulting in fewer root fractures. In addition, the fiber-reinforced posts can be used with minimal preparation because resin cement uses the undercuts and surface irregularities to increase the surface area for bonding. Thus, it reduces the possibility of tooth fracture during function or traumatic injury. In addition, they are relatively easy to remove. In theory, a post that flexes together with the tooth during function should result in better stress distribution and fewer fractures.

With advancements in dental bonding technology, the clinician now can achieve excellent results with reattachment of dislocated tooth fragments provided that he or she assesses and manages the biological factors, materials and techniques in a logical manner. Extensively fractured fragments have to be restored in conjunction with placement of a resin. In one study, researchers achieved the highest fracture resistance by using chemically cured composite followed by light-cured and resin cement; the lowest fracture resistance they achieved by using only dentin bonding agent. They used the pulp chamber for increasing the surface area for composite bonding. In 1986, Amir and colleagues found that when endodontic therapy was required, the space provided by the pulp chamber could be used as an inner reinforcement, thus avoiding any excess preparation of teeth.

The recent trend has been toward use of resin cements because they increase retention, tend to leak less than other cements and provide at least short-term strengthening of the root. Junge and colleagues reported that posts cemented with resin cements were more resistant to cyclic loading than were those cemented with zinc phosphate or resin-modified glass-ionomer cement. Some investigators have recommended bonded resin cements for their strengthening effect in roots with thin walls. Resin may be bonded to some types of posts, so, theoretically, the dentin, resin and post can be joined via resin adhesion into a single unit, at least for a time. Unfortunately, resin cements have some disadvantages. They are more “technique sensitive” than are most of the other luting cements. They require extra steps such as preparing the canal walls with an acid such as ethylenediaminetetraacetic acid and placing a dentin-bonding agent. Contamination of the dentin or post can be a problem. Predictable delivery of etchants and adhesive materials deep into the canal space also can be problematic.

With the materials available today, in conjunction with an appropriate technique, the clinician faced with reattaching a tooth fragment can achieve esthetic results with predictable outcomes. Thus, the reattachment of a tooth fragment is a conservative option that restores function and esthetics, and clinicians should consider it when treating patients with coronal fractures of the anterior teeth.

CONCLUSION

Several aspects govern the choice of technique and selection of materials for reattachment of fractured fragments. The reattachment of a tooth fragment is a viable, conservative technique that restores function and esthetics. The
clinician should assess the potential treatment of each trauma case on an individual basis. However, because the findings of few long-term studies regarding reattachment of tooth fragments have been reported in the literature, the patient should be informed that the treatment may be only of an interim nature. ■

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