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Case Report

Treatment of Complicated Crown Root Fracture in a Single Visit by Direct Reattachment Technique : A Case Report

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ABSTRACT

Coronal fractures of the anterior teeth, where the fractured segment is available and there is a close approximation of the segment to the remaining tooth, root canal followed by reattachment of the fractured segment with fiber post reinforcement is a feasible option. The procedure is simple, economical and needs less chair time as compared to many other conventional methods. In addition, this procedure provides good and long lasting aesthetics because it maintains tooth morphology, colour and surface texture. Following is a case series of complex crown root fractures successfully managed by tooth fragment reattachment.

Introduction

A trauma with complicated crown root fracture of anterior tooth is an agonizing experience for a young individual. Crown root fracture represents about 0.3 - 5% of all traumatic injuries[1], which requires immediate attention, not only because of the physical disfigurement but also because of the psychological impact on the patient.[2]

Literature shows various treatment modalities for crown root fracture in permanent teeth, where the esthetics is severely compromised. These are further influenced by various factors such as the extent of fracture, the patient's age, dental eruption and root formation, alveolar bone fracture, pulpal and periodontal involvement, soft-tissue injuries, presence/absence of fractured tooth fragment, amount of remaining tooth structure, secondary traumatic injuries, occlusion and aesthetics.[(3-5)] The use of natural tooth fragments is an excellent biological approach for restoring fractured anterior teeth, when the fragment is available.[(6-8)] Biological restoration using autogenous tooth fragment requires minimal healthy tooth preparation, is esthetic, faster than a complete composite restoration and has a psychological benefit to the patient that his own tooth has been retained.[5]

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figure 1

figure 2

Figure 3

Figure 4

Recent restorative materials viz. composites in combination with the use of acid-etch technique and bonding techniques have made the treatment of fractured teeth easy with little or no additional tooth Preparation.[9]

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.[10,11]

This article reports a complicated anterior tooth fracture case that was successfully treated using tooth fragment reattachment.

Case report

A 25 year old male patient reported to the Department of Conservative Dentistry and Endodontics, having a fractured upper left anterior tooth and pain as chief complaint. Patient had a history of fall 1 week before. There was complicated crown fracture with upper left central incisor. His medical history was non-contributory. On extraoral and intraoral examination, there was very minor 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 left central. The fracture line of tooth was supra-gingival on the labial aspect and below the gingival margin on the palatal aspect. The clinician determined biological width by measuring probing depth and conducting intra-sulcular bone sounding after administering local anaesthetic. Probing depth measured 3 millimeters palatally. Palatal gingiva and interdental papilla was inflamed and edematous. There was no apparent periapical pathosis. The clinician explained different treatment options to the patient like direct reattachment, fiber post followed by crown; extraction followed by implant etc., out of which patient opted for direct reattachment procedure.

Fractured coronal fragment was removed without incurring damage by using a forceps. Cleaning of pulp

Figure 5

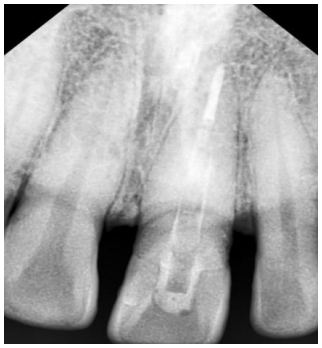

Figure 6

chamber in the coronal fracture fragment was done and it was stored in saline to prevent discoloration and dehydration.

Extirpation of the remaining pulp tissue in the root portion was done by means of a barbed broach. Radiographic method was used to determine the working length and step-back method was used for cleaning and shaping of canal. Selection and confirmation of the master cone was done using intraoral periapical radiograph and canal obturated using lateral compaction method, using AH Plus Root Canal Sealing Material. 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.

Peeso reamers and the precision drill provided with the Radix Fiber Post system (Dentsply) were used to prepare the post space, leaving the apical 5 mm of gutta-percha intact, and a radiograph was obtained to evaluate the work. Radix fiber post was selected of

Figure 7

size corresponding to that of the precision drill (figure5). Etching of the surface of the post and the canal was done using 37 % phosphoric acid for 15 seconds. The surface was rinsed with water, dried with air and Prime & Bond NT (Dentsply Caulk, Milford, Del.) dentin bonding agent was applied using a microtip applicator. Light curing of adhesive was done for 10 seconds after removing the excess using paper points. The post was then luted in the canal using dual cured resin luting cement (Ivoclar Vivadent). The inner portion of the coronal fragment was similarly etched and bonded to the tooth using flowable composite resin (Ivoclar Vivadent) after proper shade matching. The tooth was polished with polishing discs.

Occlusion was verified and postoperative instructions were given to the patient in order to prevent any excess loading of the anterior teeth. Clinical and radiographic examinations were carried out after 1 month, 3 months, and 6 & 12 months and the tooth responded favourably.

DISCUSSION

Reattachment of fractured fragments has been reported in the literature since 1960s, with the first study published in 1964,[12] where the authors had reattached the fractured fragment using post and core. The fragments have also been attached with dentinal pins.[13] 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.[14] 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.[15]

The reattachment of the crown fragment to a fractured tooth is the best method to reinstate the natural shape, contour, surface texture, occlusal alignment and colour of the fragment. It eliminates the problems of differential wear of restorative materials and offers excellent aesthetic and functional results in a single appointment, while maintaining healthy periodontal attachment.[16,17] Also, this procedure is relatively simple, atraumatic and inexpensive.[18]

Adhesive post is used as it has the potential for increased retention, is more flexible, and has modulus of elasticity approximately same as dentin, and when bonded with resin cement it distributes forces evenly along the root.[19] The most common complication of post and core system is debonding;[20] another reason for failure is root fracture.[21] Restoration with cast metal posts can cause wedging forces coronally that may result in irreversible failure because of fracture of an already weakened root.[22] Whereas fiber reinforced composite resin post has demonstrated negligible root fracture. Studies have indicated that dentin-bonded resin post-core restorations provide significantly more resistance to failure than cemented custom cast posts and cores.[23,24] In addition, the fiber-reinforced posts are used with minimal preparation because it uses the undercuts and surface irregularities to increase the surface area for bonding, thus reducing the possibility of tooth fracture during function or traumatic injury.[25]

The recent trend has been toward use of resin cements because they increase retention,[27,28] tend to leak less than other cements[29-31] and provide at least short-term strengthening of the root.[32] Junge and colleagues[33] 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.[34-36] 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 ethylene diaminetetraacetic 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.

The clinician must consider that a dry and clean working field and proper use of bonding protocols and bonding materials are the key to achieve success in adhesive dentistry. Reattachment failures occur as a result of new trauma or parafunctional habits, so fabrication of a mouth guard and patient education about treatment limitations enhance clinical success.[36]

Conclusion

The combined use of a fiber-reinforced composite resin post and the original crown fragment is a simple and efficient procedure for the treatment of traumatized anterior teeth that appears to offer pleasing esthetic and functional results that is less invasive than conventional prosthodontic treatment and other treatment modalities available till date.

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