TITLE: Management of Complicated Crown-Root Fracture Using Fiber Post and Fragment Reattachment: a case report

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ABSTRACT:

Anterior crown fractures are the most common traumatic injury of tooth. This can range from simple enamel-dentin fracture to complete crown fracture, affecting the aesthetics of the patient. Fracture re-attachment provides a conservative treatment option that restores the tooth functionally and aesthetically. Conventional techniques employed in the restoration of fractured teeth include partial and full coverage crowns, laminate veneers, and composite resins all of which are time-consuming, high priced, and not conservative. The advancement in adhesive material creates new perspective in the reconstruction of fractured teeth; it is now possible to achieve excellent results with the reattachment of fractured tooth fragment. This article reports fragment reattachment technique with clinical case of complicated crown fracture.

INTRODUCTION

Fracture re-attachment is most conservative method of treatment of crown fracture allowing restoration of original tooth anatomy, thus rehabilitating function and esthetics in a short time and preserving tooth structure. Traumatic dental injuries have become more common over the past few years; these injuries can be brought on by accidents, physical activities, falls and sports injury. Dental professionals face a significant problem when restoring endodontically treated teeth with complicated crown or crown-root fracture since it necessitates a thorough and precise diagnosis. [1] Traditional methods of treating complex crown fractures include definitive crown placement after crown lengthening, orthodontic or surgical extrusion, extraction followed by implant placement or fixed partial dentures, and post and core-supported restorations. [2] Reattaching the crown fragment has various benefits over other types of restorations, including accurate restoration of the crown form, surface morphology, colour, and minimum violation of biologic width, if the fragment is retrieved at the moment of injury.[3,4] However, factors such as the fracture site, the size of the fractured remnants, the periodontal condition, pulpal involvement, the age of the root development, biological width encroachment occlusion, the material utilised for reattachment, the use of posts, and the prognosis all played a role in successful reattachment.[5] The purpose of this paper is to describe a successful crown reattachment case with a 1.5-year follow-up.

Case report

A 29 year old male reported to the Department of Conservative Dentistry and Endodontics, KGMU with the chief complaint of pain and broken upper front teeth since 2 weeks. Patient gave history of road traffic accident 2 weeks before. Upon clinical examination, it was found

that his right maxillary canine had a complicated crown fracture and that his right maxillary lateral incisor had an Ellis class I fracture from a fall onto the ground.(Fig.1) The extraoral and intraoral examination revealed that the coronal fragment was movable, loosely linked to soft tissue, and that there was no evidence of soft tissue trauma. Hard tissue examination revealed a fracture line that extended from the labial aspect of the cervical third of the crown to the lingual aspect approximately 0.5 mm subgingivally.

Figure1: Preoperative clinical photo.

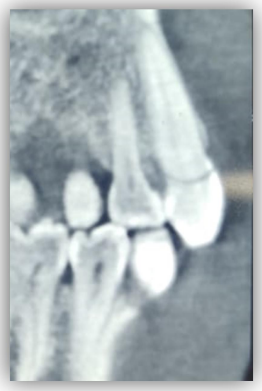

Figure 2: Preoperative CBCT images

Complete root development was seen on CBCT, Fracture Line was also visible. (Fig.2) There was no luxation. The patient received a thorough description of the treatment strategy, which comprised root canal therapy and reattachment with a fibre post. The patient agreed to the treatment plan. A local anaesthetic was administered, and the fragment was gently removed, collected, and preserved in normal saline to avoid discoloration and dehydration. A careful examination was followed by a review of the fragment's adaption was done check accurate fit. A palatal envelope flap was raised for visualisation of margins fractured tooth structure. (Fig.3) An electronic apex locator was used to measure the working length, and radiography

was employed to confirm itThe root canal's coronal enlargement was accomplished with gates glidden drills (Mani Inc., Japan). Protaper Gold (Dentsply) was used to prepare the root canal to its working length. During the preparation, an irrigant consisting of 2.5% sodium hypochlorite was utilised. The root canal was dried using paper points, sealed with endodontic sealer (AH Plus, Dentsply), and sectionally obturated with gutta-percha (Protaper GP, Dentsply) to an extent of 4-5mm.

Fig 3: Removal of fracture fragment and placed in saline & Envelope flap

Peso reamers were used for post-preparation. The fibre post (Coltene) was placed in the canal and modified as appropriate length. Space was also prepared in the pulp chamber of the fractured crown fragment for receiving the coronal portion of the post and also the core. The alignment of the coronal fragment was verified with the post in place. Finally, a bonding agent (PRIME and BOND NT, DENTSPLY) was applied after the root canal had been etched with 37% orthophosphoric acid, washed, and blot dried with paper points. Using dual-cured resin luting cement (RelyX, 3M, USA), the post was then luted in the canal. Using flowable composite resin (Esthet-X Flow, DENTSPLY) and correct shade matching, the inner portion of the coronal fragment was similarly etched and attached to the tooth. Final steps included repositioning the flap, suturing it, checking the occlusion, and providing the patient with postoperative

instructions.(Fig.4) Periodic clinical and radiographic examinations were conducted, and the tooth showed positive results.

Fig 4: Fibre post placement, Reattched fracture segment and Postoperative Radiograph

Discussion

All trauma to the incisors accounts for 11%–15% of complicated coronal fractures, and 96% of them involve the maxillary central incisors.[6] The preferred method of treatment for these kinds of intricate crown fractures was a custom cast post and core followed by a metal ceramic crown. In contrast, tooth fragment reattachment is a more conservative, inexpensive, and speedier procedure with benefits including maintaining connections, incisal translucency, the original colour, and contour.[7,8] Additionally, there has been a discernible shift away from metal alloy posts and towards fiber-reinforced resin-based composite (FRC) posts, particularly with teeth in the aesthetic zone like maxillary incisors and caninesFRC posts have fewer and less severe in vitro root fracture failures because of their dentin-like modulus, which enables a more equal distribution of occlusal pressures in the root dentin[9]. FRC post

uses undercuts and surface imperfections to enhance the surface area for bonding, requiring less dentin removal and reducing the risk of tooth breakage.[10] Additionally, a monoblock, a multilayered construction with no naturally weak interlayer interfaces, can be obtained using glass fibre post with composite core and adhesive materials, which strengthens the tooth structure.[11]

For the reattachment of the fractured fragments in the aforementioned case, a dual cure resin cement RelyX 3M, which is a self-etching and self-adhesive system, was used. This dual cure resin cement enables thorough curing, minimises microleakage, and has a strong bond strength. Esthet-X Flow, a flowable composite resin that gives great colour stability, reduces the inclusion of air gaps, and aids in obtaining higher bond strengths of the fractured segments, was used to connect the coronal fragment to the remaining tooth.

In the aforementioned situation, where the fracture line was below the gingival level, the gingival flap was raised to gain access to the fractured location for the bonding of the fractured component. The biological width was barely encroached upon, and the restorative margin could be positioned at or above the level of the cementoenamel junction, therefore the present instance would not need for the bone to be recontoured through crown lengthening. According to the research, surgery should be done with the least amount of osteotomy and osteoplasty possible whenever biologic width is invaded. [12]

Conclusion

A case study highlighted the significance of developing a multidisciplinary approach for the effective care of severe crown fracture and any potential complications. The attached coronal fragments are in position with good aesthetics and clinical and radiographic indicators of

periodontal health and root integrity after over 1.5 years of follow-up, demonstrating the success of the therapy.

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