Journal of Applied Dental and Medical Sciences
NLM ID: 101671413 ISSN:2454-2288
Volume 8 Issue 2 April-June 2022

https://www.ncbi.nlm.nih.gov/nlmcatalog/101671413
www.joadms.org

Case Report

Fracture tooth fragment reattachment using conventional and tunnel method:A Case Report

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ARTICLE INFO

Keywords: Reattachment; Tooth Fragment; Trauma; Cast post; Fiber-reinforced post

ABSTRACT

Coronal fractures of permanent dentition are the most frequent type of dental injury. If the original tooth fragment is retained following fracture, the natural tooth fragment reattachment, as a conservative treatment, should be the first choice to restore fractured teeth. This case report presents a clinical technique to reattachment of anterior teeth after trauma using cast post (tunnel method), fiber-reinforced post system and conservative technique with direct composite.

Introduction:

Coronal fractures of the anterior teeth are a common form of dental trauma that affect the primary and permanent teeth. It has a severe impact on the social and psychological well-being of a patient.[1]

Crown fractures have been documented to account for up to 92% of all traumatic injuries to the permanent dentition. Coronal fractures of permanent incisors represent 18–22% of all trauma to dental hard tissues, 28–44% being simple (enamel and dentin and 11–15% complex (enamel, dentin and pulp). The majority of dental injuries involves the anterior teeth, especially the maxillary incisors (because of its position in the arch), whereas the mandibular central incisors and the maxillary lateral incisors are less frequently involved[2].

The higher cost of indirect restorations, patients desire to maintain remaining sound tooth structure, and unfavourable anatomical conditions may render the direct restoration the first choice in many clinical situations.[3,4]

Tooth-coloured fiber posts were introduced in the 1990's and have several advantages, such as esthetic, bond to tooth structure, have a modulus of elasticity similar to that of dentin, but still require dentin preparation to fit into the canal.[3,5]

Crown root fractures (CRF) are fractures that originate in the crown and extend towards the root, which are further divided into uncomplicated and complicated fractures based on pulpal involvement. The prevalence of CRF being more in younger age group, the treatment modalities include both direct and indirect restorative techniques. In cases of CRF where a tooth fragment is detached, reattaching the fractured fragment is the treatment of choice as it is a minimally invasive procedure. Reattaching the fragment possesses several advantages, like reinstatement of the natural form, function, and aesthetics of the tooth[6,7,8].

Fragment reattachment techniques vary from simple attachment with adhesive cement to using core material to strengthen the remaining tooth structure. The prognosis of such cases depends on the type of injury, location of injury, and time period.[6]

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In order to restore the shape and function of the treated teeth, depending on the clinical situation, just a core build-up may be sufficient to provide retention to the dental crown, but the considerable loss of dental structure precludes this type of procedure, being necessary an intraradicular anchorage.[9]

The purpose of this report is to describe the reattachment of a crown fragment of anterior tooth after trauma with utilizing clinical approach.

This case report demonstrates the fracture tooth fragment reattachment using different methods.

CASE REPORT

CASE -1

A 37-year-old healthy male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of painful broken maxillary central incisor with fracture fragment.

Intraoral examination revealed no other hard or soft tissue injury. Clinical examination of tooth number 21 revealed a horizontal fracture line on the cervical 1/3rd of the facial aspect running obliquely and apically on the palatal surface. The fractured segment showed mobility and elicited pain on palpation (figure 1.1).

Radiograph revealed a radiolucent line on the cervical third of the crown and no other injury or lesion was found on adjacent teeth (figure 1.2). A treatment plan was compiled that comprised endodontic treatment of tooth 21 followed by reattachment of a crown fragment from an extracted and stored maxillary central incisor using a custom-made metal post. The crown fragment of the tooth was atraumatically removed under local anaesthesia and stored in normal saline until reattached (figure 1.3).

Following cleaning and shaping, the root canals were obturated with gutta-percha and resin-based sealer using the lateral compaction technique, the access was temporarily sealed (figure 1.4,1.5).

Postspace preparation was performed in root canal treated 21 using Pesso reamer number 2 and 3 leaving apical 5 mm of the filling to maintain a good apical seal (figure 1.6).

Tooth fragment which was extracted and stored is modified by making a through and through hole (Tunnel) on palatal side (Figure 1.7).

Pinjet was modified and checked for proper angulation and margin adaptation of fragment and tooth. Inlay wax was used to make canal impression with the help of modified pinjet (Figure 1.8).

Fragment and tooth were approximated with wax pattern and now core build up was done on palatal aspect like a button. The wax pattern was then sent to casting laboratory for converting into metal post (figure 1.9).

Now fit with cast metal post, tooth and fragment was confirmed both intraorally and on radiograph (Figure 1.10,1.11).

Margin adaptation, aesthetics, overjet, overbite assessed and the fragment is luted with the help of luting GIC (Figure1.12).

CASE 2

A 28-year-old male patient presented with severe pain and a broken front tooth (figure 2.1) after an accident 4 days before.

Clinical examination revealed a class III fracture in 12 with the fracture line running obliquely from the gingival third of the tooth on the labial aspect.

A radiograph indicated complete root formation and a closed apex with no periapical radiolucency and did not show any other fracture or injury on the adjacent teeth (Figure 2.1).

A treatment plan was compiled that comprised immediate endodontic treatment of tooth 12 and reattachment of the fractured crown fragment with the help of fibre post and dual cure luting system.

Figure 1.1 : Pre- operative

Figure 1.2: IOPA with 21

Figure 1.3: Fragment removed atraumatically

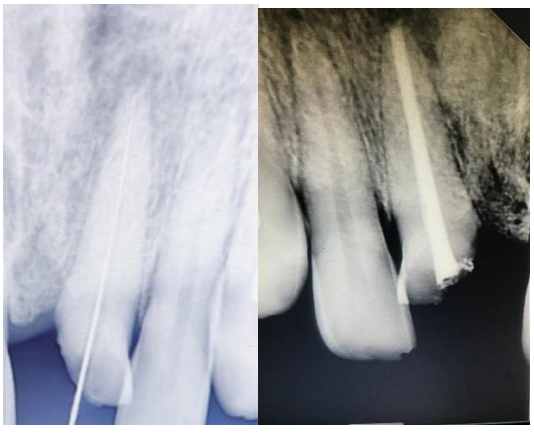

Figure 1.4: Working length IOPA; Figure 1.5: Obturation IOPA

Figure 1.6: Post Space preparation

Figure 1.7: Tunnel Prepared

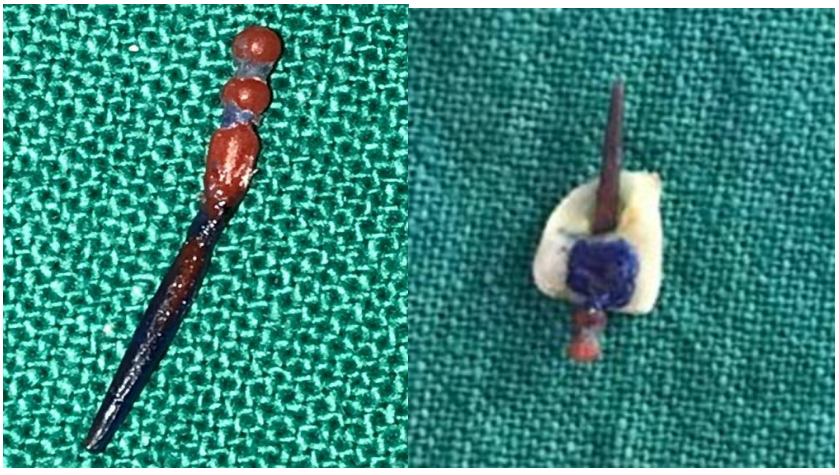

Figure 1.8: Modified Pinjet

Figure 1.9: Metal casting

Figure 1.10 and 1.11

The crown fragment of the tooth was atraumatically removed under local anaesthesia and stored in normal saline until reattached (figure 2.2).

Following cleaning and shaping, the root canals were obturated with gutta-percha and resin-based sealer using the lateral compaction technique, the access was temporarily sealed (figure 2.3).

Postspace preparation was performed in root canal treated 21 using Pesso reamer number 2 and 3 leaving

Figure 1.12: Reattached Fragment

Figure 2.1: Fractured tooth fragment IOPA

apical 5 mm of the filling to maintain a good apical seal (figure 2.4).

Tooth fragment which was extracted and stored is modified by making hole on palatal side to receive the fibre post. (Figure 2.5).

Gingivectomy procedure was done to expose the cervical margin (figure 2.6).

Then the post, and the tooth fragment, were approximated to the tooth to check for any discrepancies. The post space, fiber post, and tooth fragment were etched using 37% phosphoric acid for 20 seconds, followed by the application of a universal bonding agent

Figure 2.2: Crown fragment removed atraumatically

Figure 2.3: Obturation IOPA

Figure 2.4: Post space prepared

Figure 2.5: Hole prepared on palatal aspect

Figure 2.6: Gingivectomy done to expose Cervical margin

Figure 2.7: Fibre post cemented

Figure 2.8: Final Cementation of Crown fragment

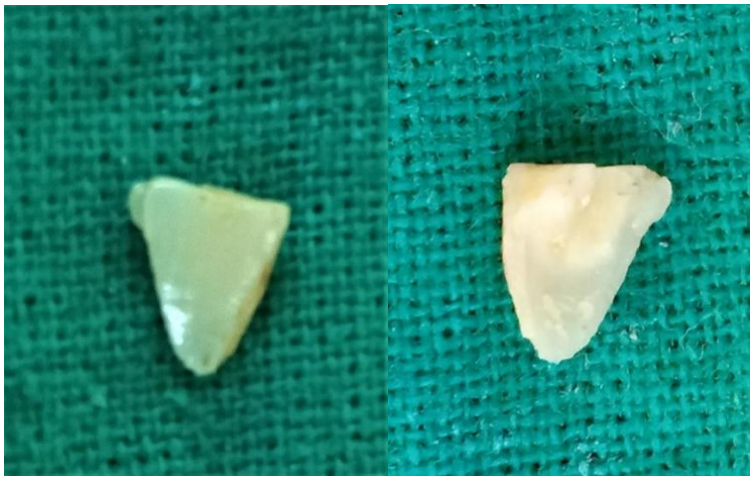

Figure 3.1: Tooth Fragment

Figure 3.2: Intraoral examination

Figure 3.4: Fragment with groove and etched

Figure 3.5: Reattached fragment follow-up after 2 years

for 30 seconds, and light-cured for 20 seconds. The fibre post was cemented into the post space using dual-cure resin cement. (Fig. 2.7)

The final position of the fragment in centric and lateral occlusion was checked and light-cured immediately. (Figure 2.8)

CASE 3

A 38 years old patient reported to department of conservative dentistry and endodontics with complaint of fractured tooth in lower front region of jaw.

He brought the fragment of the broken tooth (Figure 3.1) stored in a plastic container in order to get the fragment glued back on the tooth and was complaining tooth sensitivity while exposed to air and drinking of water.

A comprehensive intraoral (figure 3.2) and radiographical (figure 3.3) examination was performed to diagnose, locate, and measure the extent of tooth breakage. Clinical examination revealed a class II fracture.

It was found that tooth 31 was intact and immobile after fracturing, with no sign of gingival inflammation. A vitality test was conducted to evaluate the blood supply to the tooth, and a sensitivity test (thermal cold test) was performed to assess the sensory response.

The outcomes were positive, and a normal response was noticed. Fragment of tooth 31 was cleaned and checked with the broken tooth in order to ensure that no part was lost. The fragment was in good condition and fit reasonably well on the fractured tooth. However, the perceptible shade difference was observed between the broken tooth and the fragment due to the dehydration of the broken fragment during the last two days. Patient were informed about the difference in hue and shade. On their consent to proceed with the reattachment procedure, the fragment was stored in saline (for one hour) until reattached with the tooth. Bevels were created on a broken tooth to help in increased retention. The beveling was performed from the palatal as well as the buccal surfaces. Retentive grooves were placed on fractured fragment. The fractured tooth and fragment were etched for 15 sec the rinsed with water and blot dried. (Figure 3.4)

Bonding agent was applied with the help of applicator tip and light cured. Using flowable composite resin the fragment was reattached to the fractured tooth and light cured. While curing, a gentle yet stable pressure was applied over the coronal fragment to closely adhere it to the tooth. Finishing and polishing were performed (figure 3.5). High points were checked using articulating paper. Follow up examinations were carried out. No clinical or radiographical signs of pain or swelling

reported. The tooth remained sound in aesthetics and function. Follow up was taken after 6 months and after 2 years. Tooth is healthy and functioning.

DISCUSSION

For rehabilitation of traumatised anterior teeth, both asthetic and mechanical aspects should be considered. Trauma to the anterior teeth may cause disturbance not only in aesthetics, phonetics, and function, but also has a profoundly negative psychological impact on the patient. Thus, making immediate restoration of the fractured tooth imperative.[6]

Reattachment should be the first choice of treatment when the fracture fragment is available.[1]

In order to restore the shape and function of the treated teeth, depending on the clinical situation, just a core build-up may be sufficient to provide retention to the dental crown, but the considerable loss of dental structure precludes necessity of an intraradicular anchorage.[9]

Intraradicular devices have been used for several years to increase retention, provide stability for the final restoration and re-establish dental element function. Such devices range from a cast metal post to prefabricated post that aim to reduce clinical deficiencies and fulfill functional and aesthetic requirements.[10]

The main purpose of this procedure is to provide retention for the core restoration, which replaces the lost coronal structure. Post and core can be prefabricated post with composite build up or one-piece custom-made post. The custom-made post and core is indicated in various situations wherein gross tooth structure is lost, anterior deep bite, teeth with wider canals and where a change in angulation is required for enhancing aesthetics.[4]

A number of treatment options have been proposed for coronal tooth fractures depending upon the circumstances like immediate reattachment; surgical exposure, crown and root recontouring and fragment reattachment; using splints; and without radicular anchorage, each with their own advantages and disadvantages.[1]

The current case 1 presented with a complete oblique fracture. The coronal fragment was anchored to the tooth solely due to soft tissue attachment. The fractured margin was above the alveolar crest and accessible; therefore, immediate reattachment without gingivectomy was planned. Custom cast post and core is preferred over prefabricated post for any change in labiopalatal and mesiodistal angulation of proclined or angulated teeth. Custom cast post and core can be shaped until satisfactory aesthetic is achieved although, the core might not be in the same axis as the post or the root.

In cases with extensive crown and root destruction, cast metal posts are considered the first choice, demonstrating a high long-term success rate.[11] Also the root anatomy defines the selection of the intraradicular reatainer. The selection of the post will depend on the location of the tooth in the arch and especially on the amount of dental remnant.[12]

Cast metal post are indicated for teeth with little remnant in the crown portion, especially at the height of the cervical region. In the region of the ferrule effect, the margin volume should be at least 0.5mm.[13]

The advantages of cast retainers are related to their high stiffness and better adaptation to the canal, which favors antirotational characteristics. Its disadvantages are related to an additional dentin reduction and the need of laboratory procedures.[14]The purpose of cementation is to seal the area between the post and core and the dental

structure, protecting it from irritating products of physical, chemical and bacterial nature, preventing caries recurrence.

However, in case 2 there were sufficient contact area available for adhesion and provide correct stress distribution indicating the fiber post. Glass fiber post are indicated in cases with an intact clinical crown region, at least 2.0 mm of supra-gingival tooth structure.[15]

The fiber post serves as an anchor and allows the reattachment by preparing a internal dentinal groove through the displaced fragment. Fiber post has dentin-like properties and creates a monobloc effect when cemented with dual-cure resin cement. It also reinforces

the tooth and ultimately increases the fracture resistance of the tooth. [16,17]

In case 3, there were no pulpal involvement seen in such cases beveling of the enamel margins of tooth and fragment before reattachment of the fragment can improve the retention and mask the finishing line with a resin composites.[18,19]

None of the factors (reattachment technique, adhesive system and

luting agent) was capable to restore the original strength of the teeth, regardless the other factors. However, an appropriate association between reattachment technique and adhesive system can completely rehabilitate the reattached teeth, providing impact strength similar to sound teeth.[7]

The cast metal post have as their main property their stiffness and high mechanical strength that must be taken into consideration when selecting metallic retainers, since the post fixed in the root canal aims to retain and stabilize a coronal component. Therefore, they are indicated in cases of extensive rehabilitation, dental realignment and in cases with elliptical or excessively tapered canals where the prefabricated post does not fit tightly to the canal walls, resulting in higher cement thickness. Their use is also justified by the claims that cast metal posts have a versatility of indication, thus allowing their use in almost all cases. Through these retainers it is possible to reconstruct the coronal portion, restoring biomechanical conditions to the tooth to maintain its perfect functioning.[20]

The success of the final restoration associated with a post and fragment is in most cases related to radicular preparation and cementation, which if properly followed, enable a high success rate.

CONCLUSION

The aesthetic rehabilitation of traumatised labially inclined tooth poses tough challenge to the dentist. Custom cast post offers advantages in form of higher strength, precise fit with minimal luting surface and inherent anti rotation mechanism. In this case report, considering the age and aesthetic concerns of the patient we devised a treatment plan which was cost effective, had long lasting results and provided desirable aesthetics.

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