Tooth fragment reattachment as a biological restorative material after dental traumatic injury - A case report

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Abstract:

Fracture of anterior teeth is a common type of dental traumatic injury. Reattachment of a fractured fragment after traumatic injury is an effective and conservative way of managing a traumatized tooth while maintaining a functional and esthetic equilibrium. If the original tooth fragment is retained following fracture, reattachment of the fractured fragment to the remaining tooth can provide better a positive psychological response and is a faster and less complicated procedure. The following report describes management of a traumatized tooth of Ellis Class III fracture category by reattachment of the fractured fragment by the means of placing a fibre-post.

Key words:

Re-attachment, fibre-post, Ellis Class III, trauma, fracture

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Introduction:

Fractures of the crowns of teeth are one of the most common type of traumatic injuries seen in clinics. This type of injury is seen to affect maxillary central incisors very commonly. This can be related to their positioning in the tooth arch and the protrusion of these teeth cause by tooth eruptive process or by adverse oral habits[1]. Traumatic injuries not only cause functional and esthetic loss but also cause adverse psychological impact on the patient.

Considering different clinical scenarios , anterior teeth with fractures involving the enamel, dentin and pulp can be treated using various techniques and materials. If the fractured fragment is intact with satisfactory and fittingly conserved margins, the adhesive reattachment to the remaining tooth structure is the treatment recommended. Moreover, re-attachment practice can be performed in situations where the detached fragment does not align completely with the remaining tooth structure as well[3]. Such cases require a critical analysis prior to the procedure to choose the best method to fill the gap between the tooth and the fragment thus improving the adhesion.

Chosak and Eidelman in 1964 were the first to report a case of reattachment. They used a cast post and cement to reattach an anterior crown segment[4]. Tennery reported the use acid etch technique for the reattachment of fractured tooth fragment[5]. Recent developments in restorative materials, placement techniques, and adhesive protocols use resin based composites for the procedure.

Fractured fragment can be reattached to the tooth via several techniques. Among these ,for an extensively fractured tooth glass-fibre post placement is a favourable option. This provides increased retention to resist displacement of the fragment.

Thus, in this case report, relining of a fractured fragment with the retained tooth with the help of a fibre-reinforced post and composite resin is illustrated so that to provide increased aesthetic and functional harmony to the tooth with minimum chair side time.

Case Report:

A 21-year old female patient, reported to the Department clinic with a complicated fracture in the left maxillary central incisor. The patient gave history of trauma from a fall 12 hours prior to her visit. Patient's medical history was non contributary.

On clinical {Figure 1(a)} and radiographic examination, it was diagnosed that the patient had Ellis Class III fracture with the fractured fragment partially attached to the tooth on the palatal margin. Patient was in acute pain and coronal tooth fragment was mobile. No mobility of the remaining tooth was recorded and surrounding intraoral soft tissues were normal.

Local anesthesia was administered (2% Lignocaine with adrenaline 1:1,80,000). Then the fractured fragment was removed with the help of tweezers {Figure 1(b)}. The fragment was then cleaned with 2% chlorhexidine solution and stored in distilled water to prevent dehydration and discolouration. The comparison of the shape of the fractured fragment with the retained tooth structure showed that there was no significant discrepancy. Additionally, the patient wanted to preserve the fractured fragment. Thus, it was planned to reattach the fractured fragment to the remaining tooth and patient's consent was obtained for the same.

Root canal treatment for initiated for the same tooth. Access to the canal was modified using a safe-end bur(EX-24). Pulp was extirpated and working length was determined using No. 15K file (Mani INC, Tochigi, Japan) {Figure 1(c)}. Biomechanical preparation was done NeoEndo Flex files (Neoendo, Orikam, India) upto No. 25, 6% files. Canals were flushed

with 2 mL of 5 % NaOCl between each instrument, delivered in a syringe with a 30-gauge needle (Dispovan, India). Canal was dried with the help of paper points and obturation was done using size 25, 2 % gutta percha point and master cone {Figure 1(d)} using cold lateral compaction technique and epoxy resin-based sealer (AH plus, Dentsply, Sirona) {Figure 1(e)}.

The patient was recalled after 24 hours for the next appointment. Post space preparation was done using Pesso reamers (Mani INC, Tochigi, Japan) till size No. 2 {Figure 1(f)}. Post space was irrigated with normal saline to clean off any debris. Glass fibre-post ((Luxapost, ø 1.5 mm, DMG, Hamburg, Germany) was inserted and checked for fit {Figure 2(a)}. The post space was ten dried with paper points. Post-space and fibre post were etched with 37% of phosphoric acid (Etchant, 3M ESPE) for 15s and then washed thoruoghly. Bonding agent was applied in the post space and on the post (Scotchbond Universal, 3M, ESPE, USA). The post space was then filled with dual cure composite (Luxacore, DMG, Hamburg, Germany). Post was inserted to the appropriate length and light cured for 40s {Figure 2(b)}.

A slot was then created into the fractured fragment {Figure 2 (c)}to accommodate the post and the approximation of tooth and fragment was verified. Grooves were prepared into the coronal fragment. Bonding agent(Scotchbond Universal, 3M, ESPE, USA) was applied on tooth and fragment and then cured for 40s.Then, flowable composite (Filtek Z350 Flowable, 3M, ESPE) was applied on the retained tooth and the fragment and they were approximated and cured for 40s {Figure 2 (d)}. During curing, firm and stable finger pressure was applied to the coronal fragment to closely oppose it to the tooth. After curing, excess composite was removed with a finishing bur {Figure 2(e)}.

Then the margin was beveled with the help of tapered fissure diamond bur and surface recountouring was done with nanohybrid composite (Filtek Z550 3M ESPE) of the appropriate shade. Finishing was then carried out with Sof-Lex.

Discussion:

Dental trauma (DT) is a significant public health problem because of its frequency, impact on economic productivity, and quality of life. It affects mainly children between the age of 8-11 years and its prevalence ranges from 7.4% to 58%. Normally, the most commonly involved teeth are the maxillary incisors, both permanent and deciduous[6].

Due to the advancement in adhesion technology, it is now possible to achieve exceptional results with reattachment of the disjointed tooth fragments and thus if the fractured tooth fragment is available undamaged, then reattachment remains the first choice of treatment . The technique of use of the tooth fragment to restore the fractured tooth clearly removes the problems of differential wear of restorative material, incorrect shade matching and difficulty of contour and texture reproduction associated with other techniques. It also has the advantage of maintaining of original enamel and dentin, along with minimal chair time and no laboratory procedures and being a cost effective treatment.

Factors influencing the extent and feasibility of crown fracture repair include the site of fracture, size of fractured remnants, periodontal status, pulpal involvement, maturity of root formation, biological width invasion, occlusion, time and resources of the patient[7]. The type and location of fracture depends upon age of patient, amount of force and direction of blow but an in vitro study concluded that most of the traumatised incisors fracture in an oblique fashion from the labial to lingual aspects with the fracture line

proceeding in an apical direction[8]. Oblique coronal fractures that involve pulp and extend apically into the root (subgingival) may also invade the critical area of biologic width.

In this present case. The tooth was extensively fractures and the palatal margin was equi-gingival. Hence, reattachment was planned with the help of fibre-post. A post and core improves retention of the complex and helps to distribute stress so as to improve resistance to root fracture. The post interlocks the two fragments and minimizes the stresses on the remaining tooth structure that is replaced[9]. Fiber-reinforced composite resin post has demonstrated comparatively lesser root fractures. In addition, the fiber-reinforced posts can be used with conservative preparation because it uses the undercuts and surface irregularities to increase the surface area for bonding. Thus the possibility of tooth fracture during function or traumatic injury is reduced[10]. Use of a fibre post luted with resin cements increases the retention of the segment and provides a monoblock effect[11].

Thus, it can be said that the re-attachment of a tooth fragment is a viable option that restores function and aesthetics with a very conservative approach, but each trauma case should be endeavored to restore on an individual basis.

Conclusion:

A tooth fragment reattachment can be successfully used to restore fractured teeth with adequate strength, but long term follow up is necessary in order to predict the durability of the tooth-adhesive-fragment complex.

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FIGURE 1

Figure 1 (a) Figure 1(b)

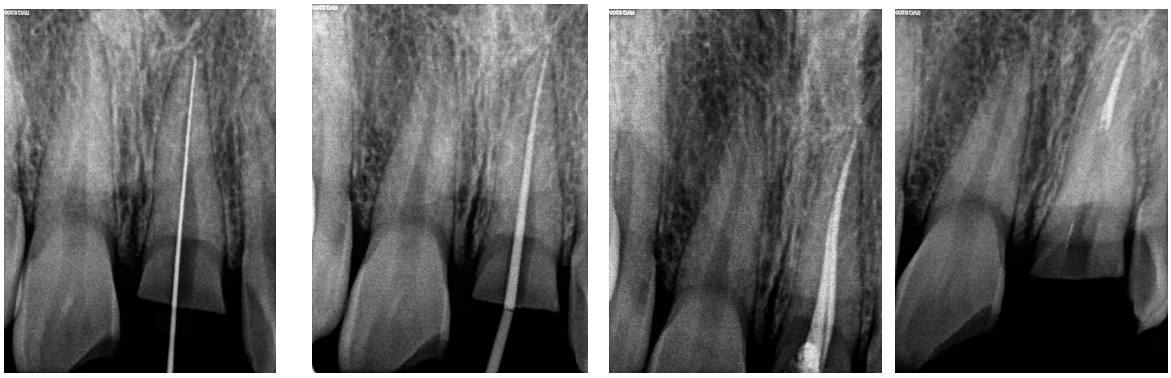

Figure 1 (c) Figure 1 (d) Figure 1 (e) Figure 1 (f)

Figure 1: (a)- Pre-operative photograph of 21 with partially attached fractured fragment (b) Clinical evaluation after removal of fractured fragment (c) Working length determination of the tooth with No. 15k file (d) Master-cone radiograph with No. 25, 2% gutta-percha point. (e) Post obturation radiograph (f) Post space preparation

FIGURE 2

Figure 2 (a) Figure 2 (b) Figure 2 (c)

Figure 2 (d)

Figure 2 (e)

Figure 2: (a)Trial of glass fibre-post (b) Cementation of post with dual cure composite resin (c) Slot preparation in fractured fragment (d)Approximation and cementation of fractured fragment with flowable composite (e) Surface recountouring and Final finishing.