Fracture fragment reattachment of young permanent maxillary central incisors: A report of two cases

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Abstract

Incidence of traumatic dental injuries in children is relatively common. Emergency management of such injuries is essential for the maintenance of its function and esthetics. Coronal fractures of maxillary central incisors are the most common type of fractures. With the advances in adhesive dentistry, fracture fragment reattachment technique offers a conservative, cost-effective, long-lasting esthetics, and restores function when the fractured tooth fragment is available. This case report discusses fracture fragment reattachment technique in conjunction with apexogenesis and apexification in two clinical cases of coronal tooth fractures in young permanent teeth.

Keywords: Apexification, apexogenesis, biodentine, reattachment, young permanent teeth

Introduction

Traumatic dental injuries in children are one of the pediatric emergency conditions which require immediate attention and clinical management to maintain its esthetics and function. Dental traumatic injuries are most commonly seen in boys than girls between 7 and 12 years of age, because of their active involvement in extracurricular activities. Permanent maxillary central incisors constitute about 37% of dental injuries, due to their anterior positioning and protrusion caused by eruptive pattern. The frequent type of dental trauma in the permanent dentition is coronal fracture and in 80% of the cases, the fracture line runs in an oblique direction from labial to the lingual aspect.

In fractures of young permanent anterior teeth, the application of more conservative methods for reconstruction such as autogenous fragment reattachment is most desirable. Tennen was the first to report the reattachment of a fractured fragment using acid etch technique. Andreasen et al. reported 25% retention of fragments for 7 years is especially useful for young patients needing apexogenesis or in mixed dentition age where delaying prosthetic restoration of tooth is required until eruption and tooth position have stabilized. The success of reattachment depends on certain factors like the site of fracture, size of fractured remnants, periodontal status, pulpal involvement, maturity of root formation, biological width invasion, occlusion, time, material used for reattachment, use of post, and prognosis.

The present case report describes the endodontic management of two cases of fractured immature central incisors in conjunction with autogenous fragment reattachment.

Case Reports

Case 1

A 10-year-old boy with no contributory medical history reported to the department of Pedodontics with the chief complaint of injury to the upper front tooth 15 days back and discomfort while chewing [Figure 1]. On examination, the upper right central incisor (tooth no. 11) showed a complicated crown-root fracture extending from the middle-third of crown and going on to palatal aspect beyond the cervical line subgingivally with no occlusal interference [Figure 1a]. The fractured fragment of 11 had Grade III mobility, the remaining intact tooth structure exhibited Grade I mobility. In addition, Grade II mobility was present in 21 and 22. The involved tooth was tender on vertical percussion. Radiographic examination of upper anterior revealed immature root apex in 11 with a horizontal coronal fracture line. Due to the presence of sufficient access between fractured tooth fragment and intact tooth structure and to prevent bleeding into the canal during endodontic treatment, it was planned to perform single sitting root canal treatment with the fragment in its place [Figure 1b]. Biodentine was placed in the apical one-third to seal...
the open apex of 11 and then obturated with gutta-percha using lateral condensation method. Following obturation, the fractured tooth fragment was removed, and the access cavity was then sealed with glass ionomer cement (GIC). The surfaces of the fractured tooth fragment and the intact tooth were cleaned and etched with 37% phosphoric acid gel for 15 s, later washed, dried and coated with Prime and Bond NT with applicator tip and cured for 20 s [Figure 1c]. Light cure microfilled anterior composite was used for the fractured fragment reattachment. Since there was Grade II mobility in 21 and 22, semi-rigid resin wire composite splinting was carried out [Figure 1d]. In the recall visit i.e., after 3 weeks, the splint was removed and esthetic restorations were performed for the enamel fractures in 21 and 22 [Figure 1e].

**Case 2**

A 12-year-old girl presented to the Department of Pedodontics 2 h following trauma to maxillary permanent central incisor. The fractured fragment was recovered and brought by the child’s parent from the site of injury [Figure 2]. Patient’s medical history was not contributory. Clinical examination revealed that the left upper central incisor (tooth no. 21) had horizontal crown fracture involving enamel, dentine and pulp and surrounding tissues were healthy [Figure 2a]. The fractured fragment was found to be in healthy condition and it fit reasonably well on the intact portion of the crown on examination. Radiograph of the periapical region showed incomplete root formation of both

![Figure 1: Clinical management of case 1, (a) Crown fracture i.r.t 11, (b) working length determination, (c) after surface preparation of the fractured fragment, (d) resin wire composite splinting, (e) After 6 months](image1)

![Figure 2: Clinical management of case 2, (a) Ellis Class III facture i.r.t 21, (b) mineral trioxide aggregate (MTA) pulpotomy, (c) Intra-oral periapical after MTA pulpotomy, (d) after reattachment of the fractured fragment, (e) After 14 months](image2)
11 and 21 and there was no associated root or alveolar bone fracture. The treatment option suggested to the patient was the removal of the coronal portion of the pulp and placement of medicament to induce apexogenesis, followed by reattachment of the fractured tooth fragment with light cure composite resin. After obtaining the consent from the parent, access cavity was prepared under local anesthesia from the site of fracture. Amputation of coronal pulp was done with a high-speed sterile round diamond bur and by passive instrumentation and irrigation. The access cavity was carefully wiped clean with a moist cotton pellet soaked in sterile saline. After achieving the desired hemostasis, pro root mineral trioxide aggregate (MTA) plug was mixed and placed and sealed it with intermediate restorative material for 24 h as per the manufacture instructions [Figure 2b and c]. Till next day the fractured fragment was placed in saline to maintain hydration. After 24 h, temporary restorative material and moist cotton pellet were removed and checked for the hard set of MTA followed by sealing of access cavity using GIC. Subsequently Fractured tooth fragment was reattached using light cure composite resin [Figure 2d]. The patient was recalled every 3 months to assess the physiological root growth in 21. After a period of 14 months complete apexogenesis was observed with no clinical discoloration in 21 [Figure 2e].

Discussion

Re-establishing natural esthetics of a traumatized tooth is one of the major challenges for the clinician. Traditionally such injuries were restored with composite resins, but they lack exact color match and exhibit variable wear. Therefore if a broken fragment is available, the restoration of the tooth using its own fragment has been suggested as an alternative.[12]

Reattachment method has a number of advantages shown in clinical and experimental studies.

• Restores esthetics as it uses original tooth’s shape, color, translucence and surface structure[5]
• Easy to practice and economic method, ensures increased wearing steadiness and thus creates better function[13]
• Psychological comfort to the patient, less chair side time, exact reconstruction of tooth morphology and usage of structure that wears out as the antagonists.[14,15]

The advancements in adhesive systems and resin composites has made reattachment of tooth fragments a procedure that is no longer provisional restoration, but rather a restorative treatment offering a favorable prognosis[16] and requires no additional tooth preparation.[17,18] Similarly, in our both cases fractured tooth fragment was reattached using acid-etch composite resin.

The extent of dentin dehydration plays a key role in the success of fragment reattachment procedure. Dentin’s dehydration causes collapse of collagen fibers and obstruction of adequate resin monomer’s penetration, leading to poor adhesion between dentin and composite material.[19] Farik et al. reported that when the fractured fragment was rehydrated for 24 h following dehydration, it did not lose its strength which could be due to shear bond strength when the dentin is wet.[20] It was reported that there is return of shear bond strength after only 30 min of rehydration before fracture reattachment in a contemporary experimental study.[21] Similarly, in case two rehydration was maintained and then reattached.

MTA and biodentine are calcium silicate based materials. Biodentine is a relatively new bioactive material introduced as a dentin substitute. It can be used for vital and non-vital pulp therapies. Biodentine showed biocompatibility and ability to induce odontoblast differentiation and mineralization in cultured pulp cells.[22] Main advantages of biodentine over other calcium silicate materials are reduced setting time, better handling and mechanical properties.[23] In one case, biodentine was opted as the choice of material for apexitogenesis considering its short setting time, whereas MTA was used for apexogenesis, where in both the cases showed promising results.

In a contemporary clinical study after 2 years of follow-up of reattached fractured incisors in 11 children aged 8-14 years, the authors received “satisfying” and “very satisfying” clinical and roentgen results concerning periodontal, pulpal, color harmony and occlusion.[11] In the two presented cases, patients were followed up for 16 months and they remained asymptomatic with good prognosis.

Conclusion

Based on the above cases, it can be concluded that immediate management of fractured fragment through reattachment procedure benefits the patient functionally, psychologically, and esthetically. Therefore, it requires thorough knowledge of the materials and techniques used with appropriate planning for achieving good results. The major concern is to make the population aware of preserving the fractured fragment and to seek immediate dental care.

References