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Reattachment of hydrated fractured fragment of permanent maxillary central incisor, one of its kind (2 year follow up): A case report

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Abstract
Background: Traumatic injuries to maxillary anterior teeth are seen in children and adolescents to major extent resulting into anterior teeth fractures. Different treatment strategies are available for its management, although tooth fragment reattachment is considered to be a feasible treatment option due to its comprehensibility, aesthetics, and functional success.
Case Description: Present case reports a case of a 10-year-old girl patient with a fractured permanent maxillary left central incisor (Ellis class II) with emphasis on hydration and reattachment of the fractured fragment. The present paper reports the reattachment of the stored fractured fragment in milk as a hydrating medium. The fragment was reattached using an adhesive bonding system and a resin composite material on the mesioincisal angle of 21 and the distoincisal angle was built up with traditional method. At 2-years follow up tooth maintain its vitality along with aesthetics and function.
Conclusion: The retrieved fractured fragment of anterior teeth can be stored in milk till patient report to clinic followed by hydrating the fractured fragment using normal saline in dental office before reattachment.
Clinical Significance: Management of available fractured tooth fragment by reattachment technique, offers a feasible and minimal non-invasive option for the dental clinician.

Keywords: trauma, reattachment, fractured tooth fragment, hydration storage media, case report

Introduction
Trauma to the anterior teeth is common among children and adolescents [1]. Traditionally, the crown fractures were treated, conservatively with composite resin and dental bonding system. With the evolution of adhesive dentistry, came the concept of "fragment reattachment" [2], If the crown fragment is retrieved at the time of injury, its reattachment provides several advantages over other forms of restoration [3]. There have been numerous benefits of this technique reported in literature, in concern with dental practitioner and child patient so this can be an appropriate treatment of choice [2]. The successful reattachment of the crown fragment is dependent upon the crown fragment retrieval at the time of injury [3]. Reattachment procedure takes less chair side time than composite resin construction [4]. The concept of reattachment depends mainly on two factors; retrieval of the fragment from injury site and storing it in a suitable preserving medium to avoid dehydration and discoloration [5].

Case Report
A 10-year-old female patient reported to college of Bharati Vidyapeeth Dental College and Hospital, with the complaint of fractured crown in upper front tooth region from trauma that happened 15 hours before reporting. The fractured fragment was retrieved by the parent from the site of injury and mother stored the fragment in milk, (Figure 1) after having a telephonic conversation regarding the trauma with a pediatric dentist. Clinical and radiographic examination of the patient revealed Ellis class II fracture with maxillary left central incisor 21. (Figure 2 and Figure 3).

Fig 1: Immersion of fragment in milk by parent

Fig 2: Clinical examination of Ellis class II fracture

Fig 3: Radiograph 21 at the Patient reported to dental office

Complete examination of the patient was done. No other injury was found all over the body. The patient was oriented in time, place and person after injury. Complete and detailed medical and dental history was recorded. On enquiry mother explained the fall of the child on the floor and fractured 21. The vitality of fractured tooth was assessed using heat and cold test and positive response was recorded. Parent was explained regarding the different treatment options such as conventionally building the tooth or reattaching the available fragment and building up the remaining tooth. Parent said as the fragment was retrieved, if it could be used in treatment. After obtaining the parent consent, it was decided to reattach the fragment as it was retrieved and stored in milk. The fragment was removed from milk and rinsed with distilled water and placed in normal saline in dental office for 1 hour before being repositioned. Fragment was approximated first to check the fit of the fractured fragment. (Figure 4)

Fig 4: Approximation of the available fragment of 21

GIC lining was placed, grooves were made on the palatal surface. The tooth as well as fractured fragment were etched using 37% phosphoric acid gel for 20 seconds each followed by washing, air drying of the tooth as well as fragment followed by bonding agent and light cured for 20 seconds each. The fractured fragment was approximated and stabilized to its original position with help of flowable composite resin. The distoincisal angle was built up with conventional method. (Figure 5 and Figure 6). Abrasive discs and polishing pastes were used to carry out the finishing and polishing of buccal and palatal surfaces.

Fig 5: After the reattachment of the available fractured fragment

Fig 6: Completely restored 21

On four months follow-up, it was observed the tooth was periodontally healthy and no fracture line was notice. Follow-up clinical evaluation was conducted two years later, which revealed 21 to be fine esthetically as well as functionally (Figure 7).

Fig 7: Follow up after 2 years

Vitality heat test was done which gave a positive response. The radiographic examination at 2 years follow up, of 21 showed no presence of periodontal ligament widening or any pathologic mobility and radiolucency. (Figure 8)

Fig 8: 21 Radiograph shows no PDL widening and radiolucency

Table 1: Materials used

GIC
Phosphoric acid 37% (etching gel)
Adper Single Bond (adhesive)
Composite resin (A2 shade)
Bluephase (LED unit)
Polishing disc
Polishing paste
Normal Saline

Discussion

Management of crown fractures (Ellis 1 and Ellis 2) by fragment reattachment may be considered a biologically practicable option, which is minimally invasive treatment as well. [6] This technique was pioneered by Chosak and Eidelman, when they first published in 1964, a case involving the reattachment of a natural tooth fragment.

Change in dental colour due to dehydration of the fractured fragment leading to decrease fracture strength of the tooth. A well rehydrated Proper rehydrated fragment has the capability of restoring both color and strength. Farik *et al*., in his studies observed that additional drying of fractured fragment beyond 1 hour decreases the fracture resistance significantly, thus concluding the importance of keeping the fragment moist [7] Shirani *et al*, concluded that 50% of the fracture strength of the original tooth· Is restored with hydration or without dehydrating of the surfaces with storage medium and without any additional preparation [8].

Hydration maintains the vitality and original esthetic appearance of the tooth [9]. Farik *et al*, have explained that etched, rinsed, but not dried dentin has a surface of partly demineralized hydroxyapatite which is covered with uncollapsed collagen fibers. Dentin bonding agents when applied on this surfaces creates a bond by mechanical interlocking with collagen and fill the space in the partly demineralized hydroxyapatite on polymerization. If the etched and rinsed surface is dried to a certain extent, the collagen fibers will collapse and prevent the bonding agent penetrating to the partly demineralized zone. This results in relatively low bond strength and therefore may have important consequences for the reattachment procedure for fragments [7].

David Ditto *et al*. used normal saline, milk and dry environment for 24 hours in a study on effect of rehydration on fragment reattachment and observed normal saline gave the highest fracture resistance amongst the tested media [2]. Shirani *et al*, studied effect of rehydration environment on the bond strength of reattached fragments using milk, normal saline, saliva, water and dry environment and concluded that superior results are obtained when fractured tooth fragment is kept in milk or saliva [10].

Milk was chosen as it is easily available and has better physiologic properties, including pH and osmolality [11]. Milk was used in study as the hydration media to test the its effect on fracture resistance after hydration of tooth fragment for time interval of 1hr, 6hrs and 24 hrs showed effective fracture resistance when compared with dry storage [12].

The operator has to undertake periodic follow-up consultations to accomplish clinical, radiographic, and periodontal examinations as well as pulp vitality tests in order to ensure the integrity, the esthetics, and the functional health of the operated fractured tooth.

Conclusion

The reattachment of fractured fragment is possible only if the fragment is retrieved from the site of injury. Milk can be used as storage media for fractured fragment which keeps the fractured fragment hydrated till the patient reaches clinic. Milk enables to maintain the strength and aesthetic of the tooth after re-attachment.

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