Replantation of an Avulsed Tooth 30 Hours after Traumatic Injury

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Abstract:
The current study reports replantation of an avulsed tooth after 30 h. The avulsed tooth was the left maxillary permanent central incisor that was kept in a plastic envelope under dry condition in an 8.5-year-old girl. After soaking of the avulsed tooth in hydrofluoric acid gel and irrigation of the socket with sterile saline solution, mineral trioxide aggregate was placed over the apex of avulsed tooth and root canal filling was completed. Finally, the avulsed tooth was soaked in doxycycline solution and placed in the socket. Subsequently, the tooth was splinted with 0.7 mm orthodontic wire for 8 weeks. At 2-, 6- and 12-month follow ups, the clinical and radiographic findings of the tooth did not reveal any signs of replacement or inflammatory resorption.

Key Words: Avulsed tooth, tooth replantation, traumatic injury

Introduction
Traumatic injuries are common during childhood, especially in newly erupted permanent anterior teeth, and tooth avulsion is seen in 0.5-1.6% of the 7-10-year-old age group.¹ The tooth avulsion, which might be accidental or non-accidental, results in complete displacement of a tooth from its socket.² A study on Japanese children showed tooth avulsion in 5% of immature permanent teeth sustaining injuries.³ According to literature, tooth replantation immediately after avulsion usually shows excellent healing and good prognosis.⁴ The highest clinical success rates with avulsed teeth have been reported in cases of replantation within 15-20 min after the accident or keeping the tooth in a suitable storage medium until a dentist replaces the tooth in its socket.⁵ The most important factors affecting the status of periodontal ligament (PDL) cells are the duration of extra oral period and the storage medium.⁶ There is poor prognosis for a replanted tooth if the extra oral time increases or if there are unsuitable environmental conditions such as air-drying or storage in an improper medium before replantation. When a tooth is avulsed accidentally, storage in a suitable medium increases the viability of PDL cells and allows longer extra-alveolar periods before replantation is attempted.⁶,⁷

The requirements for favorable outcomes for tooth replantation are well recognized by pedodontists and maxillofacial surgeons. However, it appears that parents and general dental practitioners do not have proper knowledge about the importance of quick replantation or the need for storage media after tooth avulsion, despite the emphasis on guidelines for the management of avulsed teeth.¹,⁸-¹⁰

The aim of this study is to report a successful replantation of an avulsed immature central incisor which was kept under dry conditions for 30 h from the moment of trauma until its replantation.

Case Report
An 8.5-year-old girl was referred to the Faculty of Dentistry, Tabriz University of Medical Sciences, 30 h after dental trauma along with her parents. The parents explained that the patient’s tooth had avulsed when she was playing with her friends, 2 days previously and they had kept the traumatized tooth in a plastic envelope under dry conditions.

In medical history, no systemic disease was mentioned by the patient’s parents. The extraoral examination revealed wounds and bruises of the lower lip and chin (Figure 1a and b). In the intraoral evaluation, it was noted that the right maxillary central incisor had enamel fractures which did not involve the cervical dental pulp (Figure 1c). Tooth response to heat and cold tests (warm gutta-percha and Endo-Ice) was in the form of sharp and short pain and it had a short sensitivity to percussion. Electric pulp test of the tooth was not reliable because its apex was open and the patient had a different response each time. The left maxillary central incisor was our desired tooth which was normal in the intraoral examination (Figure 1c). Radiographic evaluation showed no root or bone fracture and the avulsed tooth was observed to have an immature apex (Figure 2a-c).

After informing the patient’s parents about the possible risks, the avulsed tooth was soaked in the hydrofluoric acid gel (Ultradent®) for 5 min to eliminate necrotic and dried PDL,
and then, the socket was irrigated with saline solution. Then, mineral trioxide aggregate (MTA) (White Angelus MTA; Dentsply Maillefer) was placed over the apex of the avulsed tooth, and the root canal was obturated with gutta-percha points and a resin-based sealer (AH26) by warm vertical compaction technique using an extraoral technique. The access cavity was restored with dentin-bonding composite resin. Finally, the avulsed tooth was soaked in doxycycline solution (doxycycline dissolved in water in a ratio of one to one) for 5 min and placed in the socket with slight pressure. Subsequently, the tooth was stabilized using a flexible orthodontic wire and acid-etch composite resin technique for 8 weeks (according to International Association of Dental Traumatology instructions) (Figure 3a) and recall visits were scheduled. The occlusion and position of the replanted tooth were checked both clinically and radiographically to avoid any traumatic interferences (Figures 3b and 4a). Prophylactic antibiotic therapy with amoxicillin capsules at a dose of 50 mg/kg/day in two or three divided doses and a chlorhexidine mouth rinse (0.12%) twice a day was prescribed for a week. A soft diet was recommended during the stabilization period. Instructions were given in good oral hygiene.

In the third and fourth follow ups (6 and 12 months later), a periapical radiograph was taken to evaluate the status of the replanted tooth (Figure 4b and c); radiography did not reveal any signs of root resorption. The tooth exhibited normal clinical mobility. Subsequently, the pulp tests of the right central incisor (adjacent to the replanted tooth) did not reveal any abnormality.

**Figure 1:** Clinical appearances of patient (a) wound and bruises of the lower lip and chin (b) and (c) avulsed maxillary left central incisor position.

**Figure 2:** (a and b) Avulsed upper left central incisor in clinical and radiographic appearance (c) position of avulsed tooth in upper anterior periapical radiography.

**Figure 3:** (a) Splinting of the avulsed tooth with 0.7 mm orthodontic wire and composite resin (b) clinical view, at 8 weeks follow-up, after removal of splint.

**Figure 4:** Radiography of replanted tooth (a) after immediate tooth splinting (b) at 6-months follow-up (c) and (d) at 12-months follow-up (periapical and cone-beam computed tomography radiography).
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In addition, the patient underwent a cone-beam computed tomography (CBCT) examination during the last follow-up, which did not reveal replacement resorption or inflammatory resorption (Figure 4d).

Discussion
Immediate replantation after the injury is the most preferable management for the avulsed tooth. According to traumatology guidelines and previous studies, delayed replantation (an extra oral dry time longer than 60 min) results in poor prognosis in the long-term, with the necrosis of the PDL and absence of healing. Immediate replantation of the avulsed tooth yields the best results; however, rapid replantation is not a common occurrence due to emotional stress of the parents and poor knowledge in relation to first-aid measures immediately after injury.

Based on previous studies PDL cells maintain their vitality after 30 min of storage in an appropriate medium, with vitality decreasing remarkably after 60 min. In the present case, the injury occurred 30 h earlier, and the avulsed left maxillary central incisor was kept in a plastic envelope under dry conditions. The alternative treatment of avulsed tooth similar to the situation in this study situation is replantation, but this treatment was not possible because of the patient’s age. Another choice is the prosthetic replacement of the missing incisor, orthodontic treatment to close the space or autotransplantation of another tooth in the empty space. If the tooth is not replanted, the alveolar bone of that area will resorb. With regard to the patient’s age and importance of maxillary anterior area esthetically, we decided to replant the avulsed tooth according to the above-mentioned protocol. Delayed replantation aims to induce alveolar bone growth to support the replanted tooth. Ankylosis and resorption of the root are expected as the eventual outcome. In children, under 15 years of age, in the case of ankylosis and in the cases in which the infra-position of the tooth crown is over 1 mm, it is recommended that decoronation be carried out to protect the normal contour of the alveolar ridge.

In this case, clinical and radiographic (CBCT, periapical) findings after 12 months did not reveal replacement resorption, ankylosis or mobility, indicating successful healing of the avulsed tooth.

Therefore, the hypothesis that delayed replantation of teeth with open apices, kept in a dry environment for more than an hour, is not successful proved questionable.

In addition, we should pay attention to the fact that although root resorption and ankylosis are not observed in 1 year; they might be discovered in the long-term. Therefore, longer clinical and radiographic follow ups are necessary.

Conclusion
Delayed tooth replantation might be a suitable treatment option in a tooth with open apex until the patient is a good implant candidate. This treatment might preserve the stability and functional position of the tooth in the alveolar ridge.

References

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