

## Tooth Avulsion: Etiology and Management

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**An avulsion is defined as a complete dislodgment of the tooth outside the alveolar socket resulting in disturbance of the periodontium and its structures. It is a relatively uncommon type of dental injury and affects both permanent and deciduous dentitions, in particular, the maxillary central incisors. Avulsed permanent teeth require an emergency intervention, intermediate and long term management aiming to preserve aesthetics and function and prevent the psychological impact of teeth loss.**

**A seven-year-old male had avulsed upper right maxillary incisor which was re-implanted after more than 2 hours in a dry media, root canal was treated and followed up 6 months post-trauma with successful outcomes.**

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An avulsion is one of the complex traumatic injuries to the periodontium where a tooth completely comes out from its alveolar socket due to an injury. It causes damage to its periodontium, vasculature and nerve connections. It requires an emergency reimplantation<sup>1</sup>. Avulsion prevalence is 0.5 to 16% amongst dental trauma of the permanent dentition. It is usually frequent in the maxillary anterior permanent teeth with undeveloped root apex. An avulsion is usually a consequence to patients of a younger age with a history of facial trauma<sup>2</sup>.

Trauma with high risk of tooth injury and avulsion include motor vehicle accidents, contact sports, increased overjet and severe malocclusion<sup>1</sup>. The highest trauma incidence is in the anterior dentition and occurs between seven and twelve years of age<sup>3</sup>.

Treatment of such an incident requires replantation of the avulsed tooth and splinting to support and protect the traumatized tooth and to avoid damage to the neurovascular bundles and surrounding periodontium<sup>1</sup>. Immediate reimplantation is advisable, if not possible, a storage media could be used for implantation later<sup>5</sup>.

The aim of this presentation is to report a case of avulsed tooth, which has been successfully treated by reimplantation and splinting.

### THE CASE

A seven-year-old male presented with a history of fall on his face on a hard floor while playing at home. The child had no body or head injuries, but there was a tooth injury, which resulted in bleeding and swelling of the anterior region of the mouth and maxillary anterior teeth were very mobile. The very mobile maxillary right central incisor (MRCI) was thrown accidentally in the trash by the patient with disposable tissue.

Dental examination after 3 hours, revealed that the patient was moderately anxious, there was minimal upper lip swelling with no facial asymmetries, normal TMJ and lymph nodes. The avulsed MRCI with almost complete root length and open apex was still in the tissue, see figure 1.



**Figure 1: Avulsed MRCI before the Replantation**

There was a minimal tear of the gingiva with a dilated socket of the maxillary right central incisor, see figure 2.



**Figure 2: Socket of the MRCI after Avulsion**

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The oral hygiene was fair, but there were gross caries in all deciduous teeth; the occlusion was mixed dentition stage with class I (occlusion) molar relationship.

Two periapical radiographs of upper right 2 and upper left 1 revealed an empty socket for UR1; no root fracture of UL1/UR2, and an open apex of UL1 and dense invagination of unerupted UL2. Baseline sensibility of UR2 and UL1 revealed no response to electrical pulp test and cold test, no tenderness to palpation or percussion, no swellings or fistula, mobility grade I of UL1, no discoloration, and no ankylotic sounds.

Three hours after the injury, the patient underwent reimplantation of the UR1 under local anesthesia. The wire used was 0.7mm stainless steel wire for splinting the central incisor and bonded with composite to lateral incisor and upper left central incisor, see figure 3.



**Figure 3: Postoperative Frontal View after Splinting the Anterior Teeth Using 0.7mm Stainless Steel Wire and Composite**

Five days postoperatively, the patient presented with mild pain of the anterior maxilla. The avulsed incisor underwent an elective root canal treatment under local anesthesia and rubber dam. Canal length was estimated and dressed with non-setting calcium hydroxide (CaOH) (AH Temp from DENTSPLY).

Two weeks postoperatively, the swelling and pain had subsided. The splint was removed after both centrals were checked for mobility (graded 1), and were found more firm in the socket, and no tenderness. An intraoral X-ray revealed that CaOH was short about 2 mm from root apex; therefore, the canal was re-opened irrigated with sodium hypochloride (NaOCL), dried and dressed with CaOH to root apex, see figure 4a.

After 2 months, the examination revealed that the maxillary incisors were unresponsive to the electric pulp and thermal tests. No signs and symptoms of pathology were present (i.e. mobility, sinus, swelling, tenderness, discoloration, ankylotic sound).

After 4 months, there was an evidence of continuous root formation and apical stop formation when the canal was re-opened. The obturation of the MRCI was done using cold lateral condensation technique and periapical, see figure 4b.

After completion of the root canal, the patient was given an appointment for a composite filling. No evidence of any pathology was present. The MRCI was filled using composite material (3M ESPE Nano Hybrid Universal restorative).



**Figure 4a: Intraoral X-ray with Root Canal Incorporated with Calcium Hydroxide Medicament**



**Figure 4b: Postoperative Root Canal Treatment of Right Maxillary Central Incisor Showing Mild Periapical Changes**



**Figure 4c: 6-Months Post-root Canal Treatment Intraoral X-ray Showing Reduction of Periapical Radiolucency**

After 6 months of post-root canal treatment, the patient was doing very well. No signs of pain, swelling or pathology, see figure 4c.

## DISCUSSION

Tooth avulsion ranges from 0.5 to 16% amongst dental trauma. It is defined by the complete dislodgement of a tooth from its socket<sup>1,2</sup>. Many factors may influence the success rates of replantation; they include the storage media, contamination, and manipulation of the cementum<sup>2</sup>.

Storage media for avulsed teeth include Hanks' Balanced Salt Solution (HBSS), normal saline, pasteurized milk and saliva<sup>5</sup>. It has been found that the best solution is saliva to prevent dehydration. Milk has various physiological properties such as pH and osmolality that is good for the periodontal regeneration. The storage in milk should not exceed 20 minutes. The use of HBSS has also been beneficial for its biocompatibility; it is a sterile, isotonic media used in many types of researches for cell growth and regeneration<sup>1</sup>.

An extraoral dry time of more than 60 minutes renders the periodontal ligament regeneration poor. It is recommended to pre-treat the tooth before replantation in the case of extraoral dry time exceeding 60 minutes. It has been found that with every 5 minutes of dry time, the risk of resorption increases<sup>4</sup>. In delayed replantation, maintain alveolar bone contour for future implant placement; the eventual outcome could be ankylosis and resorption<sup>5</sup>.

In delayed replantation, root canal treatment could be performed prior to replantation or 7–10 days later. To slow down osseous replacement of the tooth it is recommended to treat the tooth surface with fluoride (2% sodium fluoride solution for 20 min)<sup>5</sup>.

Splinting is the treatment of choice to establish physiological occlusal functions and stimulus. The splint is usually used to immobilize the injured tooth. The splint could be rigid, semi-rigid, and flexible. When no alveolar fracture is present, it is best to use the semi-rigid<sup>2</sup>.

Recent evidence indicates that the success of replantation depends on many factors. Decision trees for acute management has been developed to encourage the best possible outcomes for managing these teeth in children and adolescents<sup>6</sup>.

## CONCLUSION

**Splinting using a semi-rigid wire has been found to be the most effective treatment of choice in dental trauma and**

**avulsion. The use of splinting improves the success rates in dental trauma.**

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