

# Dental exarticulation

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## Abstract

Tooth exarticulation or avulsion refers to the complete displacement of the tooth out of its socket. It is a complex injury, requiring immediate intervention for optimal results. Literature indicates that prolonged dry time and improper handling may be associated with increased risk of failure. Immediate replantation of the tooth allows for immediate restoration of esthetics and phonetics. This case report presents the management of an avulsed mature tooth in a young boy, with a two-year follow-up, which had been preserved in milk after around 15-20 minutes of injury and transplanted after two hours at a dental hospital. Timely modified endodontic therapy prevented subsequent inflammatory root resorption.

**Key words:** Avulsion, tooth replantation, trauma, milk as storage media

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## Introduction

Avulsion of permanent teeth following traumatic injury is relatively infrequent (1.5 to 3%). The maxillary central incisor is the most commonly involved, due to its prominent position in the arch. It is seen to occur most often in childhood due to the resilience of the young bone.<sup>[1]</sup> Both the pulp and periodontium (periodontal ligament and cementum) are damaged following avulsion and healing is believed to depend on extraoral dry time, stage of root-end formation, and extra-alveolar handling.<sup>[2,3]</sup> Experimental studies have indicated that despite immediate replantation of the avulsed tooth, pulpal reactions may vary from apposition of the tertiary dentin to pulpal necrosis or internal resorption.<sup>[4]</sup> Ideal treatment depends on the patients' timely arrival at the dentist's office and the transporting medium of the tooth.<sup>[5]</sup> In the present case, speedy transplantation of the tooth, the patient's age, and less extraoral dry time and awareness of milk as a storage medium resulted in the acceptable prognosis and esthetics, which prevented other more extensive and more expensive options for a missing tooth.

## Case Report

A 16-year-old male patient stated that he had sustained avulsion of the maxillary left central incisor (21), three hours prior, after falling down the stairs at home. The tooth was

placed in milk after 15-20 minutes following a telephonic consultation with the family dentist. Subsequently, the patient was escorted to the dental Outpatient Department (OPD) by his parents.

Multiple angulated radiographs were taken to rule out alveolar fractures/fracture of adjacent teeth.<sup>[6]</sup>

On palpation, the socket was intact without any fracture. The tooth was intact with closed apices. The socket was gently rinsed with saline and cleared of any clot or debris. The tooth was removed from the milk taking care not to touch the root. The root was irrigated with saline to remove any debris and replanted within the socket. Proper positioning was checked using an intraoral periapical radiograph (IOPAR). Splinting of the tooth was done at the correct position using Direct composite (Esthet-x HD, Dentsply, Tulsa, USA) and a wire (orthodontic wire-1725) splint. The medical history was unremarkable and the patient had recently received anti-tetanus immunization. Systemic antibiotic therapy was prescribed for a period of one week following replantation (Initial dose: Doxycycline 200 mg divided into two doses on the first

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**Figure 1:** Depicts re-implantation of avulsed tooth with 1 year follow up

day. Maintenance dose: 100 mg/day, given once a day). The parents were informed about replantation as a treatment modality and its possible sequelae. Informed consent was obtained in the local language. The patient was advised a soft diet and use of chlorhexidine mouthwash to maintain oral hygiene.

The patient was recalled after one week when root canal therapy was initiated.<sup>[6]</sup> Calcium hydroxide intracanal medicament (Metapex, Chungcheongbuk-do, Korea) was placed and the tooth was temporized (Cavit, DENTSPLY, York, USA). At the three-week recall, a vitality test on the adjacent teeth indicated a positive response to stimuli. The obturation of the avulsed tooth was completed and the splint was removed. No mobility was elicited in the replanted tooth and IOPAR showed satisfactory obturation. The patient was recalled at 3, 6, 12, 18, and 24 months. At each visit, the vitality tests on the adjacent teeth were repeated. IOPAR at six months showed transient

root surface resorption in the tooth number # 22. At the 12-month recall, the adjacent lateral incisor tooth (22) reported negative response to vitality testing, conventional root canal therapy was performed with mineral trioxide aggregate (Pro root MTA Dentsply) at apical 3 mm. The avulsed tooth was discolored. Nonvital bleaching was performed using sodium perborate for esthetic correction. The patient was followed up for one more year and showed no further abnormality.

### Discussion

This report focuses on avulsed maxillary central incisors in children, as these are the most commonly avulsed teeth. Such patients present with a curious problem impacting facial esthetics, phonetics, and growth of jaw bones. Retention of the tooth is essential as a temporary measure to allow growth of the alveolar bone and for immediate esthetic improvement during puberty.<sup>[7]</sup>

Avulsion or complete displacement of permanent teeth in the esthetic zone at a very young age or before completion of skeletal growth of the jaw presents many challenges. Immediate esthetics may be the prime concern of these patients. The presence of teeth within the jaw bones stimulates and modulates their growth. Their absence at a young age may lead to retarded facial growth, which adversely affects the esthetics. Prolonged extraoral dry time and poor handling may lead to progressive root resorption. A slow process, it may still allow for retention of the tooth within the alveolus, promoting its growth. If a subsequent loss of the tooth does occur at a later stage, an implant may be placed as a replacement. In this case, systemic antibiotic therapy was prescribed to allow for host modulation, thereby reducing chances of progressive root resorption and loss of the tooth.<sup>[3,8]</sup>

The patient presented to the Dental Department with minimal dry time and storing the tooth in milk as soon as possible. Hanks balanced salt solution, Via span, Propolis, and Coconut water have been advocated as very good storage media.<sup>[1,9]</sup> Milk, due to its common availability and economic cost is well suited for developing countries. It is known to be isotonic and osmolar, and has a physiological pH, growth factors, and nutrients, thereby preventing cell death. Moreover, being a gland secretion, milk contains the epithelial growth factor (EGF), which stimulates the proliferation and regeneration of epithelial cell rests of Malassez.<sup>[10,11]</sup> A previous study showed no significant difference between regular pasteurized milk and long shelf-life ultra high temperature (UTH) pasteurized whole milk at any time period.<sup>[12]</sup> This indicates that most forms of milk available across the world could be used for storing an avulsed tooth. Ideal treatment depends on the patient's timely arrival at the dental office and tooth storage till that time. It is essential to educate school teachers and general medical practitioners about the importance of storing the avulsed tooth in a moist environment, as these individuals are first contacted following trauma.

Gentle cleaning of the socket was done to remove any source of contamination and clots, allowing the tooth to be replaced into its ideal position. No root surface treatment was done in this case in order to preserve any viable periodontal ligament cells. Short duration (two weeks) physiological splinting was done, to allow the tooth to be functional while being held in its correct position. Calcium hydroxide was placed as a long-term intracanal medicament to allow for re-establishment of the periodontal ligament.<sup>[2]</sup>

Inflammatory root resorption is a common problem reported with replantation when the dry oral time is more than 60 minutes and the necrotic pulp has not been removed for long, which may eventually lead to loss of the tooth.<sup>[13]</sup> This may be prevented by limiting the periradicular inflammation, storage in suitable media, and careful handling of the tooth. Anti-resorptive measures, such as, use of citric acid to remove any remaining periodontal cells, followed by the application of 1.23% acidulated phosphate fluoride (NUPRO™ FLOURIDE dentsply) [Figure 1]

solution for 20 minutes to prevent external root resorption, may be used. Removing the periodontal ligament is essential for teeth with prolonged dry time (>1 hour), as it reduces any potential source of inflammation.<sup>[6]</sup> Previous studies have used Emdogain as an alternative to APF, but the former is also unable to prevent root resorption; especially in delayed replantation cases.<sup>[14]</sup>

As far as our case went, no root resorption of the replanted tooth resulted due to many factors, such as, a tooth dry oral time that was less than 60 minutes, which meant some vital cells were present, the patient's young age, and use of triple antibiotic paste as long-term intracanal medicament, done to provide superior disinfection within the canal. These resulted in a favorable prognosis, with a two-year follow-up. The action of tetracyclines against collagenases slowed down the action of resorptive cell osteoclasts.<sup>[8]</sup>

This report highlights the importance of educating parents, teachers and students about the role of storing avulsed teeth in a wet environment and seeking urgent dental care.

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