Delayed Reimplantation of Avulsed Teeth: A Conservative Approach - Case Report

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Abstract: Avulsion and luxation injuries represent a significant portion of dental trauma, accounting for up to 16% of all injuries in the permanent dentition and 7.2% in the primary dentition. Treatment varies with injury severity, but avulsed teeth may be lost, especially when prognosis is poor. Replantation, even with uncertain outcomes, serves as a valuable interim solution to maintain esthetics, function, and space, particularly in growing children where early tooth loss complicates prosthetic management. This article presents a case demonstrating the replantation of an avulsed tooth as a conservative and functional solution in the management of anterior tooth loss in a young patient.

Keywords: Repimlantation, Avulsion, anterior tooth

1. Introduction

According to the World Health Organization (WHO) classification of dental injuries, avulsion refers to the complete displacement of a tooth from its alveolar socket. In the permanent dentition, the maxillary central incisor is the most frequently avulsed and luxated tooth. Avulsed teeth are totally dislodged from the socket and require prompt recognition and treatment. Avulsion and luxation are complex dental injuries that affect multiple tissues, accounting for up to 16% of all traumatic injuries in the permanent dentition.¹

Sports-related incidents and automobile accidents are common causes of trauma. Dental trauma is more frequently reported in boys than in girls. The maxillary primary central incisors are the most commonly affected, followed by the maxillary lateral incisors and the mandibular central incisor. The highest incidence of trauma to primary teeth occurs between the ages of 2 and 3 years, a time when motor coordination is still developing ^{(2).} In permanent dentition avulsion occurs in children aged 7–10 years. Although rare, avulsion of primary canines and molars has been documented ^{(7,8).} Avulsion of a primary incisor is often accompanied by luxation injuries to adjacent teeth, fractures of the facial bones, and lacerations of the surrounding gingival tissue and lips ^{(9).}

Public awareness about first-aid measures and the importance of seeking prompt dental care could significantly improve outcomes. Immediate assessment and intervention are key to achieving optimal treatment results ^{(4).}

Replantation is a procedure used to treat avulsed teeth and should be performed promptly ^{[5].} Replantation is to prevent aesthetic, functional, and phonetic problems as well as preserve the edentulous space and maintain proper arch length. Success of reimplantation of avulsed tooth depends on factors such as time, condition of periodontal ligament, and storage media used. Time is the most critical factor in the treatment of avulsed teeth. The longer the delay between tooth avulsion and reimplantation, the greater the risk of complications such as replacement resorption and inflammatory root resorption. Recommended storage media to be used for avulsed teeth are hank's balanced salt solution (HBSS), coconut water, saline, isotonic drinks, and green tea. Hank's balanced salt solution (HBSS) is considered as ideal storage media for avulsed tooth due to its ability to maintain viability of periodontal ligament cells. The vitality of the periodontal ligament plays a crucial role in the prognosis of an avulsed tooth. If managed appropriately, a tooth with a viable periodontal ligament can be successfully reimplanted and remain functional for several years⁻³

In this case Since the extraoral time was more than 60 minutes intentional root canal treatment was done and the tooth was reimplanted and splinted.

2. Case Report

A 10-year-old girl presented to the Department of Preventive and Pediatric Dentistry with the chief complaint of dislodged teeth. Clinical examination revealed avulsion of two maxillary incisors, which was not stored in any storage media. The traumatic incident occurred while the child was playing outside her home and accidentally fell. She was conscious, with no history of vomiting or bleeding from the nose or ears.



Figure 1: Intraoral photograph showing avulsed teeth of 11 and 12

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Extraoral examination revealed no soft tissue injuries, facial asymmetry, or cervical lymphadenopathy. Intraoral examination also showed no evidence of soft tissue injury. The alveolar socket of the avulsed maxillary permanent right central incisor appeared intact. An intraoral periapical radiograph (Fig 2) confirmed the absence of any remaining tooth fragments or debris in the socket. No trauma was observed in the adjacent teeth. Examination of the avulsed tooth revealed an intact crown and root with no visible damage. Root completion of tooth had taken place.



Figure 2: pre operative radiograph of 11,12



Figure 3: Avulsed teeth of 11,12

Examination of the avulsed teeth revealed intact crowns and complete root development. (Fig 3) Preoperative radiographs confirmed the absence of other hard tissue injuries. The roots of the avulsed teeth exhibited necrotic, dried periodontal tissue due to being kept dry for approximately more than 60minutes. After discussing available treatment options with the parents, it was decided to proceed with replantation of the avulsed incisors.

The necrotic periodontal tissue on the roots was gently removed. Access cavities were prepared through the crowns, and biomechanical preparation was performed using hand Kfiles (Dentsply, Maillefer, Ballaigues, Switzerland) with 2.5% sodium hypochlorite and normal saline as irrigants. The root canals were dried with absorbent points and obturated using gutta-percha and a zinc oxide eugenol-based sealer.



Figure 4: Intentional Extraoral root canal treatment of permanent teeth

Teeth were soaked in a tetracycline solution for about 20 minutes. Under local anesthesia with 2% lidocaine containing 1:20,000 epinephrine (Xylocaine), irrigation of the alveolar sockets was done and gently explored to check for any remaining tooth or bone fragments. Since the extraoral time was, more than 60 minutes intentional root canal treatment was done extraorally (Fig 4). Bleeding was reestablished in the sockets before the teeth were replanted and stabilized using an acid-etch resin and splinting. (Fig 5 and 6)



Figure 5: Reimplantation of avulsed teeth



Figure 6: Splinting of the teeth

Postoperative care included a 7-day course of Augmentin 375 mg, Flagyl 200 mg, Zerodol-SP, and Betadine mouthwash. A tetanus booster was administered to prevent systemic complications. Both the patient and parent were given oral hygiene instructions and patient was also advised to consume soft diet for 1 week and to avoid biting from the front two teeth. A confirmatory radiograph was taken to ensure correct positioning of the replanted teeth. (Fig 7)

The splint was removed after 14 days. Follow-up evaluations were conducted at 4 weeks, and 12 weeks post-replantation. (Fig 8,9 and 10)

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Figure 7: Postoperative radiograph of splinted teeth



Figure 8: Follow up radiograph at 4 weeks



Figure 9: Follow up radiograph at 12weeks



Figure 10: Follow up intraoral radiograph

The replanted teeth developed mild replacement root resorption but remained functional and esthetically acceptable. The patient and her parents were informed about the potential for ankylosis or progressive root resorption over time.

3. Discussion

According to the International Association of Dental Traumatology (IADT) 2007 guidelines, replantation of avulsed permanent teeth with open apices and extraoral dry time exceeding 60 minutes is generally not recommended.⁶ However, in this case, the patient was very young, and the loss of anterior teeth could have a significant negative impact on her physical appearance and psychological well-being. As other prosthetic options were deemed unsuitable, the decision to replant the avulsed teeth was made with parental consent.

When a tooth has been dry for more than 60 minutes, preservation of the periodontal ligament is no longer considered viable⁷. Therefore, extraoral endodontic treatment was initiated. Given that replacement root resorption was expected due to prolonged dry storage, further drying and handling of the root surfaces were unlikely to worsen the prognosis. The avulsed incisors were obturated extraorally,

Chemical treatment of the root surface using agents such as tetracycline prior to replantation has been suggested to help slow the resorption process. After removing necrotic periodontal ligament remnants, roots are typically treated with a 2.4% acidulated sodium fluoride solution (pH 5.5) for 20 minutes or with tetracycline. In the present case, the avulsed incisors were treated with tetracycline prior to replantation.

Treating avulsed tooth roots with tetracycline helps:

- Prevent infection
- Reduce root resorption
- Enhance PDL healing
- Support revascularization (in young teeth)

This is especially useful in delayed replantation cases, or where the tooth is immature or contaminated.

The avulsed tooth root is soaked in a tetracycline solution (e.g., doxycycline 1 mg/20 mL saline) for 5 minutes before replantation

Flexible splinting of the replanted teeth to adjacent teeth for 7 to 10 days is advised to support periodontal healing. Systemic antibiotics are commonly prescribed following replantation, although their effectiveness in preventing root resorption remains inconclusive. Both systemic and topical medicaments are employed as part of antiresorptive-regenerative therapy (ART) to reduce resorption activity and promote regeneration of the periodontal ligament.

Doxycycline (topical/systemic), minocycline, bisphosphonates (e.g., zoledronate, etidronate, alendronate), dexamethasone¹¹, propolis, and low-level laser therapy have been studied for their potential to reduce inflammatory and replacement resorption, though their use remains experimental and requires further clinical validation.¹⁰

Reimplantation remains the most effective method for ensuring long-term success. Thus, education of parents, sports coaches, and first responders is essential to facilitate prompt replantation. Visual aids such as instructional posters and hands-on training should be promoted. The use of customfitted mouthguards should also be encouraged to minimize the risk of dental trauma during sports activities.

Teeth replanted after more than 60 minutes of dry time often become ankylosed and are typically resorbed within 7 years in younger patients. In contrast, in patients older than 16 years, these teeth may remain functional for significantly

longer due to slower bone remodeling rates. Teeth replanted between 6 and 48 hours after avulsion and treated with endodontic therapy can still remain clinically functional for several years, with reported average survival times ranging from 57.3 months to approximately 5 years.¹²

In growing patients, replantation of incisors may eventually lead to infraocclusion. In such cases, decoronation has been recommended as a surgical intervention to preserve the alveolar ridge contour, particularly when the tooth becomes more than 1 mm infraoccluded Although various alternative treatments such as orthodontic space closure, auto transplantation, implants, or prosthetic rehabilitation have been suggested, early extraction can negatively impact the developing alveolar ridge, causing bone resorption and asymmetrical space closure. Therefore, fixed prostheses or implants should be deferred in young patients whenever possible.

Reimplantation is contraindicated only in cases where the patient has a medical condition that precludes the procedure.

4. Conclusion

Although the risk of progressive root resorption and eventual tooth loss remains high in cases of delayed replantation, the procedure can still offer significant short-term benefits. Replanting avulsed teeth, even after extended extraoral dry time, can help restore the patient's esthetic appearance, maintain arch integrity, and preserve occlusal function soon after the injury. In growing patients, this temporary retention of natural teeth supports both psychological well-being and alveolar bone development. While long-term prognosis may be compromised due to the potential for ankylosis and resorption, the replanted incisors can often remain functional and esthetically acceptable for several years, providing a critical window for growth before more definitive treatment options, such as implants or prosthetic replacements, become viable.

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