

# A rare dental avulsion case report highlighting the importance of rapid replantation for long-term survival

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## ABSTRACT

Dental avulsion, the complete displacement of a tooth from its socket, presents a significant challenge in dental practice due to its potential impact on aesthetics, function, and child well-being. This case presentation, reports the management of a traumatic dental avulsion in a 11-year-old male patient, detailing the clinical presentation, diagnostic process, treatment protocol, and follow-up outcomes. The case underscores the importance of prompt intervention for the avulsed tooth, and timely replantation to optimize treatment outcomes.

**Keywords:** Avulsion; dental trauma; tooth injury; replantation.

## INTRODUCTION

Dental avulsion, the complete displacement of a tooth from its socket, is a traumatic injury that frequently occurs in children.<sup>[1-4]</sup> It poses a significant challenge in pediatric dentistry due to its potential long-term consequences on oral health, dental function, and quality of life.<sup>[1,5,6]</sup> Prompt and appropriate management of dental avulsion is crucial for preserving the vitality of the avulsed tooth and preventing complications.<sup>[3]</sup> This case report provides clinical information showing that teeth replanted in accordance with established protocols when avulsed teeth are delivered to a pediatric dentist within the recommended time frame and in an appropriate transport medium can maintain their function for years post-treatment. Additionally, it is demonstrated that fixed orthodontic treatment applied six months after replantation does not cause any radiological or clinical pathology in the teeth.

## CASE REPORT

A healthy 11-year-old male patient presented to the pediatric dentistry clinic immediately after sustaining a traumatic injury during a sports activity. Upon examination, it was observed that the patient had suffered an avulsion injury to the maxillary central and lateral incisors (teeth #11, #12, #21, and #22). The patient was brought to the clinic by the school nurse and parents within 60 minutes of the injury. Informed written consent was obtained before any examination and treatment were performed. Following the acquisition of consent, the patient was promptly evaluated by the pediatric dentist and consulted with an oral and maxillofacial surgeon for soft tissue injuries. A decision was made to attempt replantation of the avulsed tooth. Intraoral findings showed no carious lesions and previous restorative treatments. No periodontal pathology was observed.

The patient had been undergoing treatment with a fixed orthodontic appliance, and the avulsed teeth were still present inside the mouth but outside the socket due to the appliance wires (Fig. 1A).

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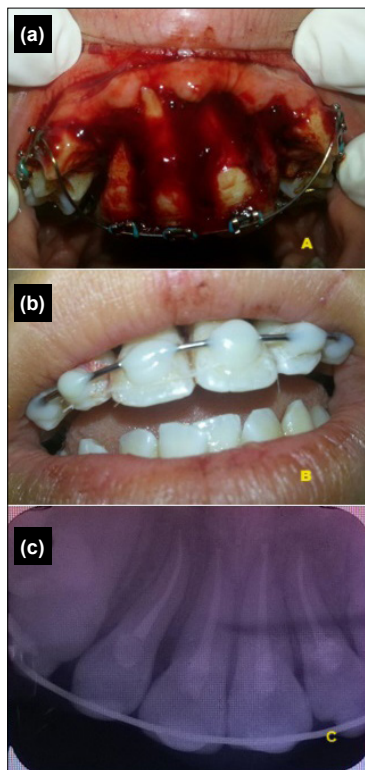
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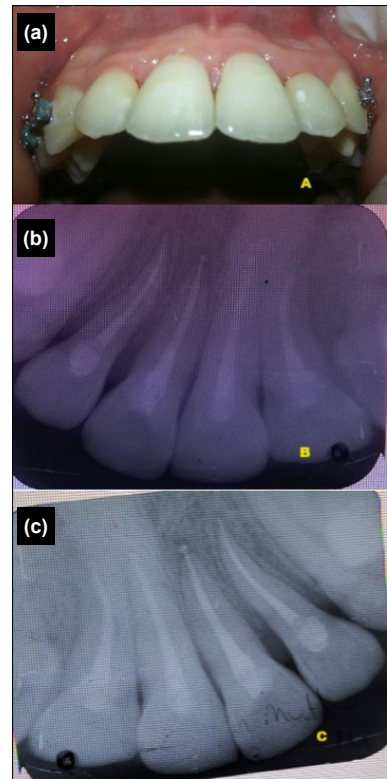


Recognizing the urgency of the situation, the patient's orthodontist was informed via phone call, and a second written consent to postpone orthodontic treatment was obtained from the parents. Immediate replantation was initiated by the pediatric dentist. Infiltrative local anesthesia was administered to control bleeding and pain. The portion of the fixed orthodontic appliance encompassing the avulsed teeth was cut away. Since no debris or dirt were observed on the teeth, rinsing was not performed. The teeth were repositioned into their sockets with gentle digital pressure, and bleeding control was achieved. After repositing and controlling the bleeding, a flexible splint was applied, and the interdental papillae were sutured to stabilize the repositioned teeth (Fig. 1B). A follow-up periapical X-ray was taken to confirm that the repositioned teeth were properly seated in their sockets. The necessary prescriptions were provided, and the patient was scheduled for regular follow-up appointments to monitor the healing process of the replanted teeth.

Since reattachment of the gingival connective tissue and periodontal membrane of the root occurs within 2 to 7 days, the sutures of the healed interdental papillae were removed using a scalpel. Two weeks after replantation, calcium hydroxide



**Figure 1.** (a) Intraoral view showing the avulsed maxillary central and lateral incisors (teeth #11, #12, #21, and #22) inside the mouth but outside their sockets, held in place by the fixed orthodontic appliance wires. (b) Post-replantation view of the maxillary incisors, stabilized in their sockets with a flexible splint and sutured interdental papillae to ensure stability. (c) Periapical X-ray at three weeks.



**Figure 2.** (a) Intraoral view at the 6-month follow-up showing the resumed orthodontic treatment for the maxillary incisors with no clinical complications observed. (b) Radiographic image at the 12-month follow-up demonstrating complete healing of the maxillary incisors, with reattachment of periodontal ligament fibers and bone remodeling around the root. No signs of root resorption or ankylosis are evident. (c) Periapical view at the 4-year follow-up, showing the maxillary incisors maintaining their function and periodontal health, reflecting the long-term success of the rapid replantation procedure.

was placed into the root canals. The root canal treatments were completed in three weeks (Fig. 1C), and the splint was removed during the same appointment. Since no clinical or radiological complications were detected at the 6-month follow-up after replantation, the patient's orthodontic treatment was resumed (Fig. 2A). At the 12-month follow-up appointment, the patient's maxillary incisors showed complete healing, with no evidence of root resorption or ankylosis on clinical and radiological examinations. The healing process included the reattachment of periodontal ligament fibers and bone remodeling around the root (Fig. 2B). The teeth continued to function properly, and periodontal health was maintained 4 years after the incident, indicating the high success of the rapid replantation procedure (Fig. 2C).

## DISCUSSION

The primary causes of dentoalveolar injuries commonly involve accidents such as falls, particularly in children, cycling incidents, participation in full-contact sports, traffic collisions, and instances of assault. Dental trauma frequently occurs in

domestic environments, educational institutions, and sports facilities.<sup>[1,7]</sup> The highest occurrence of dental injuries is observed in the 7-11 age group, with males experiencing incidents at twice the rate of females. Permanent teeth are more susceptible to injury compared to primary teeth, accounting for 60% versus 40%, respectively.<sup>[4,8]</sup> A study involving 800 children aged 11-13 revealed that slightly more than half had experienced dental trauma affecting their permanent front teeth.<sup>9</sup> Furthermore, it has been documented that at least 32% of athletes engaged in full-contact sports have suffered some form of dental injury.<sup>[7]</sup>

When a dental avulsion occurs, immediate action is essential to maximize the chances of successful replantation and minimize the risk of complications. Emergency precautions play a crucial role in ensuring the optimal outcome of avulsed tooth management. Key emergency precautions include rapid response, careful handling, avoiding dehydration, minimizing additional trauma, and proper storage. Time is critical in dental avulsion cases. Immediate action should be taken to locate the avulsed tooth and administer appropriate first aid measures. The tooth should be handled with extreme care to avoid damaging the delicate periodontal ligament (PDL) fibers attached to its root surface. Touching or scrubbing the root surface should be avoided to prevent further injury.<sup>[2-4]</sup> In addition to careful handling, keeping the avulsed tooth moist is vital for preserving the vitality of the PDL cells. If possible, the tooth should be repositioned in its socket immediately. If replantation is not feasible, the tooth should be stored in an appropriate medium to prevent dehydration.<sup>[2,8]</sup> The choice of storage medium for an avulsed tooth significantly influences the chances of successful replantation and long-term prognosis. Ideally, the medium should maintain the vitality of the PDL cells and prevent desiccation. Commonly recommended storage media include milk, saline solution, saliva, and cell culture media. In this case, since the avulsed teeth were extra-alveolar but remained in the oral cavity due to the fixed orthodontic appliance, the teeth were promptly delivered to the clinic without the need for any storage medium. As the avulsed teeth were within the patient's mouth, there was no additional trauma to the PDL. Replantation was attempted as soon as possible, approximately within 30 minutes of the patient arriving at the dental chair.

In addition to managing the avulsed teeth, any associated soft tissue injuries should be promptly assessed and treated to minimize trauma and facilitate healing.<sup>[2-4,8]</sup> In the presented case, the soft tissue injuries were sutured, and their healing was supported with appropriate splinting techniques.

Stabilization of the replanted tooth is essential to promote healing and prevent displacement. Splinting with a flexible splint or composite material is typically performed for a period of 7 to 21 days to immobilize the tooth and facilitate reattachment of the PDL fibers,<sup>[10,11]</sup> as was applied in this case.

Additional key management strategies following immediate replantation and splinting include antibiotic therapy, pain

management, clinical and radiographic evaluations, pulp treatments, and orthodontic interventions when necessary. Prophylactic antibiotic therapy may be prescribed to reduce the risk of infection after dental avulsion. Broad-spectrum antibiotics, such as amoxicillin or penicillin, are commonly used, especially in cases with soft tissue injuries or open fractures. Analgesic medication may also be prescribed to alleviate pain and discomfort associated with the dental avulsion injury and subsequent treatment. Nonsteroidal anti-inflammatory drugs (NSAIDs) are often recommended for pain relief, with appropriate dosage adjustments based on the child's age and weight.<sup>[2-4,8]</sup> In this case, following the completion of replantation, the patient was prescribed amoxicillin and ibuprofen, with the dosages tailored to the patient's weight and age. The use of a sodium bicarbonate-based mouthwash was also recommended to maintain oral hygiene.

Long-term follow-up care is essential for monitoring the healing process, assessing the vitality of the replanted tooth, and detecting any signs of complications. Follow-up appointments should be scheduled at regular intervals, initially on a weekly basis during the first month, and then gradually extending to monthly intervals over the following months.<sup>[2,3]</sup> Regular clinical examinations are necessary to evaluate the stability of the replanted tooth, assess periodontal health, and detect any signs of root resorption or ankylosis.<sup>[1,5,6]</sup> Periodic radiographic assessments, using periapical or panoramic radiographs, are performed to evaluate the integrity of the root structure, detect signs of root resorption, and monitor the healing process.<sup>[2,3]</sup>

In this case, the patient was monitored according to current dental avulsion protocols, with weekly dental check-ups during the first month and both clinical and radiographic examinations conducted in the second week following replantation. The patient was subsequently evaluated clinically and radiologically at 6 and 12 months post-replantation, and again at 2 and 4 years. No clinical or radiological pathology was detected in the replanted maxillary incisors during all follow-up visits.

Endodontic treatment may be indicated if signs of pulp necrosis or periapical pathology develop in the replanted tooth. Root canal therapy can help preserve the tooth's functionality and prevent further complications. In a mature (closed-apex) tooth, endodontic treatment begins before splint removal (1 to 2 weeks after replantation). A calcium hydroxide preparation is used for the initial filling and to monitor periodontal healing. In an immature (open-apex) tooth, it is recommended to wait until pulp necrosis is confirmed, as the pulp tissue may revascularize. If inflammatory root resorption is detected, endodontic treatment must be performed immediately.<sup>[2-6,8]</sup> In this case, since the apices of the avulsed maxillary incisors were completely closed, root canal dressing was performed in the second week after replantation according to protocol, and root canal treatment was completed in the third week, after which the splint was removed.

Orthodontic treatment may be required to address any occlusal disturbances or malalignment resulting from dental avulsion. Early intervention can help optimize the aesthetic and functional outcomes of treatment.<sup>[1]</sup> In this case, the patient was undergoing fixed orthodontic treatment due to malocclusion prior to the trauma, and a fixed orthodontic appliance was present on the maxillary teeth at the time of injury. Due to the avulsion trauma, orthodontic treatment was interrupted for 6 months and then resumed, with the treatment being completed in the second year after replantation. Throughout the orthodontic treatment period, no clinical and/or radiological pathology was detected in the replanted teeth.

## CONCLUSION

In conclusion, this case highlights the paramount importance of prompt and effective management in achieving successful outcomes following dental avulsion. Rapid replantation, supported by immediate emergency care, is crucial for optimizing the prognosis of avulsed teeth and reducing the risk of complications. Key interventions include careful handling of the avulsed tooth, appropriate storage in a suitable medium if immediate replantation is not possible, and comprehensive follow-up care. The involvement of a multidisciplinary dental team, with expertise in emergency response, endodontics, orthodontics, and ongoing monitoring, is vital to ensuring the long-term success of avulsed tooth treatment. Additionally, raising awareness among emergency departments and emergency physicians about the critical nature of dental avulsion and its management can significantly improve patient outcomes. Effective coordination between dental professionals and emergency healthcare providers is essential for the timely and efficient management of such injuries. This case illustrates that adherence to established protocols, swift action, and cross-disciplinary collaboration can greatly enhance the preservation of oral health and functionality in patients with dental avulsion.

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## OLGU SUNUMU - ÖZ

### Nadir bir dental avulsiyon vakası: Uzun dönem başarıda hızlı replantasyonun önemi

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Dental avulsiyon, bir dişin diş soketinden tamamen çıkması durumudur. Dental avulsiyonun hızlı ve doğru tedavisi, çocuğun genel sağlığı ile estetik ve çiğneme fonksiyonu üzerinde potansiyel etkileri nedeniyle diş hekimliği pratiğinde önem arz eder. Bu olgu sunumu, 11 yaşında bir erkek hastada travmatik dental avulsiyonun klinik bulgularını, tanı sürecini, tedavi protokolünü ve takip sonuçlarını ayrıntılı olarak rapor etmektedir. Olgu, dental avulsiyonda hızlı müdahalenin ve zamanında replantasyonun, tedavi sonuçlarını optimize etmedeki önemini vurgulamaktadır.

**Anahtar sözcükler:** Avulsiyon; dental travma; diş yaralanması; replantasyon.

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