

# Traumatic avulsion and delayed replantation of maxillary incisors in an eleven-year-old child

Gokcen Deniz Bayrak

## ABSTRACT

**Introduction:** Management of dental trauma in pediatric patients requires not only immediate intervention but also long-term follow-up regimen. Especially, avulsion of permanent teeth is the most serious injuries of the tooth, and replantation of teeth must be carried out immediately for good prognosis. **Case Report:** This article describes the treatment of four anterior maxillary permanent incisors of an 11-year-old boy with history of traumatic avulsion and delayed replantation. The avulsed teeth were kept in unclean and dry conditions for 5 h. The root canal treatment was carried out with mineral trioxide aggregate (MTA). After treatment, the patient was referred to the orthodontic department and two of replanted teeth were extracted orthodontically. The remained replanted teeth were stable and functional position during the four-year follow-up. However, one of teeth showed an excessive root resorption on the last radiographic examination. **Conclusion:** Although the risk of progressive root resorption and ankloysis is high, delayed replantation of avulsed teeth can be a best choice to avoid early tooth loss. To prevent the complications of delayed replantation, MTA might be used for root canal treatment. Thus, the

level of alveolar bone can be preserved till the growth is completed.

**Keywords:** Avulsion, Delayed replantation, Dental trauma, Mineral trioxide aggregate

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## INTRODUCTION

An appropriate emergent surgical care and long-term follow-up regimen is necessary to manage dental injuries in the pediatric population [1, 2]. One of the most serious dental injuries is avulsion which is characterized by the complete displacement of the tooth from its socket, causing damage to the supporting tissues [3]. Replantation should be the treatment of choice, but cannot always be carried out immediately [2].

The period of extra-oral time, the stage of root development and the storage medium are the most important factors on the prognosis of an avulsed permanent tooth [4, 5]. When a tooth is avulsed, it is necessary to keep it in an adequate media for a short time in order to preserve the vitality and provide healing of the ligament until it is replanted [6]. If the avulsed tooth is exposed to a dry medium for long periods, it may cause the death of periodontal ligament (PDL) cells, which starts pathological resorption processes [7].

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Pulpal necrosis and root resorption mostly occurs after an avulsion injury. If revascularization does not occur or effective endodontic therapy is not carried out, the pulp space will inevitably become infected. The combination of bacteria in the root canal and PDL may damage on the external surface of the root results in an external inflammatory resorption that can lead to the rapid loss of the tooth [5]. Calcium hydroxide is most widely used as an intracanal dressing in replanted teeth due to its antimicrobial and tissue repair properties [7–9]. Also, MTA can induce bone regeneration and accelerate the repair of bone defects by stimulation of osteoblast differentiation. Therefore, it can be used as a root filling material in the cases of external root resorption [7, 10–12].

The aim of this case report was to present a long-term follow-up of an avulsed permanent incisors on a young patient treated with MTA.

## CASE REPORT

An 11-year-old boy was referred to Yeditepe University, Faculty of Dentistry, Department of Pediatric Dentistry, one day after the avulsion and replantation of his four anterior maxillary permanent incisors. The patient had a history of trauma occurred while he was playing soccer game and there was no history of loss of consciousness or vomiting. Any concomitant systemic disease was not defined by the patient's parents. His maxillary permanent central and lateral incisors had avulsed and his parents had kept the avulsed teeth in a cotton pad and had gone to local dentist. A panoramic radiograph had been taken to rule out any broken tooth or bony segment in the socket and it had revealed no other hard-tissue injury (Figure 1).

The teeth had been replanted and splinted with composite by local dentist approximately five hours after the injury (Figure 2). Amoxicillin and 0.12% chlorhexidine gluconate mouthrinse had been prescribed for a week. The local dentist referred the patient to our department for subsequent treatment.

The patient had gingivitis due to poor oral hygiene. Periapical radiographs were obtained to confirm proper positioning of the replanted incisors and also they displayed that the apices of teeth was not closed completely (Figures 3 and 4). One day after replantation, access cavities were prepared and necrotic pulps were removed. The root canals were irrigated with 2.5% sodium hypochlorite (NaOCl), dried with sterile paper points and then packed with calcium hydroxide dressing material (Kalsin, Aktu Tic., Turkey). The splint was kept for five weeks. One month after replantation, calcium hydroxide was removed and the root canals were packed with triple antibiotic paste (Ciprofloxacin, Metronidazole, and Largopen) for three weeks. After removal of triple antibiotic paste, the root canal treatment of maxillary right permanent central and lateral incisors (Tooth 11, 12) was completed with gutta-percha points (Dentsply,



Figure 1: Initial panoramic radiograph revealing empty alveolar sockets.

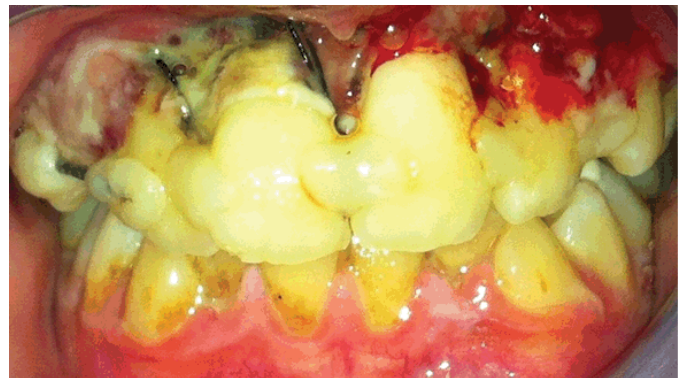


Figure 2: Splinting of the avulsed teeth with composite resin.

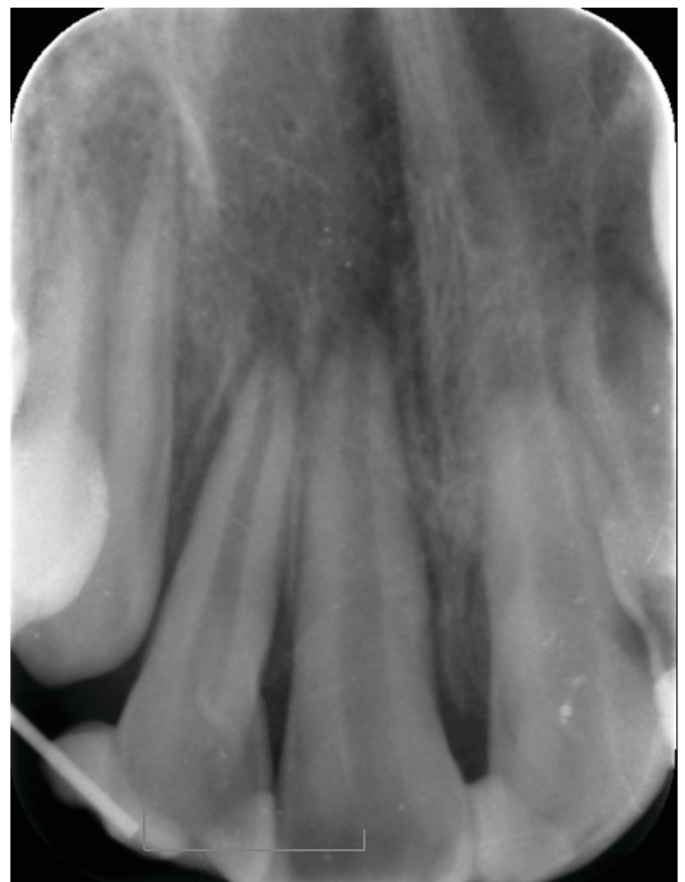


Figure 3: Periapical radiographs of replanted maxillary right central and lateral incisors.

Maillefer, Ballaigues, Switzerland). However, due to progressive root resorption, the canal space of maxillary left permanent central and lateral incisors were filled with MTA (Pro Root, Dentsply Tulsa Dental, Tulsa, OK, USA) to arrest the root resorption along the length of the root canal. After one month, gutta percha points were removed from endodontically treated root canals of maxillary right permanent central and lateral incisors (tooth 11, 12) due to tooth mobility and the canal spaces were filled with MTA. The patient has been recalled periodically for four years in pediatric department. Clinically, the teeth revealed adequate clinical function with absence of adverse symptoms such as pain, mobility and swelling.

Periapical radiographs were taken at six months follow-up and evident root resorption was shown on maxillary left central and lateral incisors (Tooth 21, 22) (Figure 5). Then, the patient was referred to the orthodontic department with the chief complaint of crowding. In the orthodontic department, extraction of both maxillary and mandibular first premolars was considered to eliminate the crowding. However, it was decided that maxillary right and left lateral incisors were extracted due to poor prognosis instead of maxillary first premolars. Hence, maxillary right and left lateral incisors were extracted orthodontically after two months (Figure 6). The next follow-up was done four months later and clinically there were no perceptible mobility of the involved teeth. Radiographic evaluation revealed that there were no

further root resorption from the previous radiograph and there was arrest of root resorption (tooth 11,21) (Figure 7). During the 18-month follow-up, clinically and radiographically there was no any symptom associated with tooth 11 and 21 (Figure 8). Also, orthodontic brackets had been attached to the teeth in the lower dental arch. In the 30-month follow-up, orthodontic brackets had been attached to the teeth in the maxillary dental arch and a periapical radiography revealed that there were no progressive root resorption on tooth #21 (Figures 9 and 10). Excessive orthodontic force to the traumatized teeth was avoided during orthodontic treatment. During the four-year follow-up, there were no perceptible mobility of involved teeth. A periapical radiography showed that there were further root resorption on tooth #21. However, there were no sign of root resorption on tooth #11 (Figure 11). The patient will be monitored till her growth is complete and appropriate treatment will be carried out if needed.



Figure 4: Periapical radiographs of replanted maxillary left central and lateral incisors.



Figure 5: Six-month follow-up of Tooth 21 and 22.



Figure 6: Intraoral photograph after extraction of both maxillary lateral incisors orthodontically.

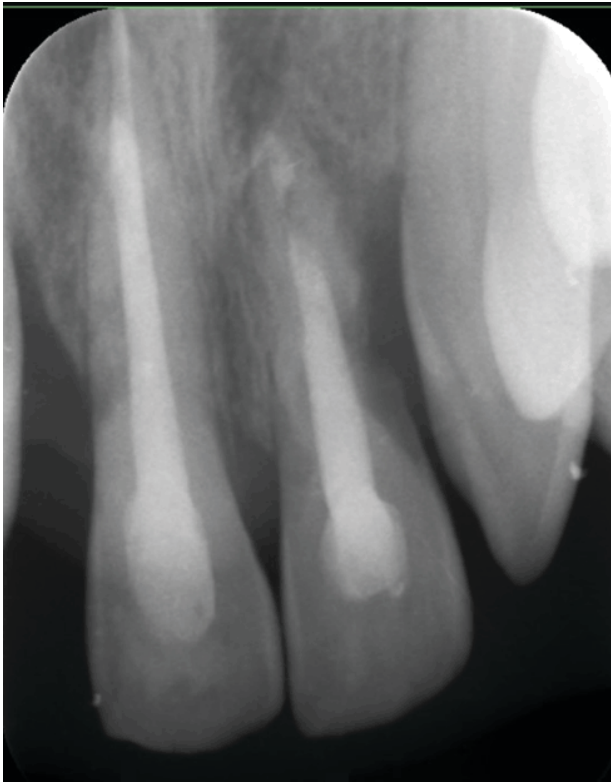


Figure 7: One-year follow-up radiograph of Tooth 11 and 21.



Figure 8: A 18-month follow-up radiograph of Tooth 11 and 21.



Figure 9: Intraoral photograph after attaching of orthodontic brackets.



Figure 10: A 30-month follow-up shows arrest of root resorption.

## DISCUSSION

Tooth avulsion is a serious injury resulting in complete displacement of the tooth outside the socket [13] and replantation is the treatment of choice in most situations [14]. Replantation may successfully save the tooth, but it is important to realize that some of the replanted teeth have lower chances of long-term survival and may even be lost or extracted at a later stage [2].

If there is a delay in replantation, the pulpal tissue becomes necrotic. Thus, microorganisms and toxins can easily pass through the canal system and activate inflammatory cells that cause external root resorption [15, 16]. The severity of inflammatory external root resorption depends on the time lag between avulsion and replantation [2, 15]. The storage and transport media



Figure 11: Four-year follow-up radiograph reveals progression root resorption on maxillary left central incisor.

during the extra-oral time are also quite significant [4, 17]. Moreover, when periodontal ligament was damaged and necrosis occurs, ankylosis can be seen as well as external root resorption [18]. In this case, no signs of ankylosis were observed during the recalls. However, there was an inflammatory root resorption within two months after replantation. This can be attributed to the five hour time lag between avulsion and replantation and to the dry storage conditions. The teeth were kept in dry extraoral conditions, and the extra-oral dry time was more than 60 minutes. Also, it was unknown under what conditions replantation was carried out because the patient had been gone to local dentist and the teeth had been replanted by local dentist before he referred to our department.

Access cavities were prepared and the root canals were filled with calcium hydroxide because it has antibacterial effects and promotes hard tissue formation [19, 20]. However, the calcium hydroxide should be kept to a minimum because it may damage root surface due to its necrotizing effects on the cells [18]. Also, triple antibiotic paste has the advantage of being a very effective antibiotic combination against intracanal microorganisms [21, 22].

In the present case, after removal of calcium hydroxide, the triple antibiotic paste was placed into the canals for three weeks.

In this case, the root canal treatment of maxillary right permanent central and lateral incisors was carried out with gutta-percha. However, after one month, gutta-percha was removed and the canal spaces were filled with MTA because there was no decrease in mobility. Studies showed that MTA can be considered as a treatment procedure in the management of severe inflammatory external root resorption due to its high pH and ability to stimulate cementoblasts/ odontoblasts [11, 15, 19, 23, 24]. Therefore, the whole root canal of maxillary left permanent central and lateral incisors was filled with MTA to prevent progressing of external root resorption.

Marão et al. found that MTA can be used for root canal filling in delayed tooth replantation, in which external root resorption is an expected sequela [7]. Jacobovitz et al. obtained a successful outcome in replanted maxillary incisor followed-up during 8 years and 7 months. They used calcium hydroxide as a dressing material and MTA as a root canal filling material but avulsed tooth had been replanted immediately [3]. In the present study, if the teeth could have been replanted immediately and the root canal treatment was completed in a few weeks, the prognosis could have been much better in terms of the resorptive process.

External root resorption is one of the major problems associated with orthodontic treatment [3, 25]. Orthodontic tooth movements involve a series of biologic reactions due to force application which makes teeth vulnerable to root resorption [26]. In this case, although the excessive orthodontic force was not applied to the replanted teeth, orthodontic treatment may be responsible for the progressing root resorption on tooth #21. Moreover, resorptive signs can be attributed that the teeth were saved poor conditions and replanted delayed. Despite the negative aspects shown in the last radiograph, the use of MTA for root canal treatment may have an important role in the maintenance of the tooth for a long period. This treatment may allow the teeth to be protected as much as possible in children until skeletal growth and development are completed.

## CONCLUSION

It can be concluded that the use of MTA as root canal filling material can be considered as a viable clinical option in delayed tooth replantation; in which external root resorption is more likely to occur. In an adolescent, the maintenance of alveolar bone is the most important factor until jaw growth has reached its full potential. Thus, MTA should be preferred to prevent the tooth resorption due to trauma. Also, extremely orthodontic forces should not be used to avoid postoperative complications.

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**Author Contributions**

Gokcen Deniz Bayrak – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

**Guarantor of Submission**

The corresponding author is the guarantor of submission.

**Source of Support**

None.

**Consent Statement**

Written informed consent was obtained from the patient for publication of this case report.

**Conflict of Interest**

Author declares no conflict of interest.

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