

Multidisciplinary treatment of avulsed teeth case report and 6 years follow-up

Emre Korkut^{1*}, Arslan Terlemez², Hakkı Çelebi³, Yağmur Şener¹

Departments of ¹Pediatric Dentistry, ²Endodontics and ³Prosthodontics, Faculty of Dentistry, Necmettin Erbakan University, Konya, Turkey

ABSTRACT

Tooth avulsion is defined as the complete displacement of the tooth out of its alveolar socket. Management of tooth avulsion in the permanent dentition often presents a challenge. Replantation of avulsed teeth is the most accepted treatment approach considering esthetic and functionality. The aim of this case report is to present the multidisciplinary treatment approach and long-term follow-up of a patient (9. ♀) with avulsed maxillary central teeth.

Key words: Avulsion, Fiber-reinforced, Mineral trioxide aggregate, Root resorption, Zirconia

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INTRODUCTION

Dental avulsion term describes the complete removal of a tooth out of its socket due to trauma.^[1-4] The frequency of avulsion accounts for approximately 0.5-6.2% of dental traumatic injuries.^[1,2,5] The teeth, which are most affected from avulsion injuries, are maxillary central incisors.^[3,4,6] Immature permanent teeth have less mineralized bone structure, and periodontal ligamentum structure is looser in these teeth; therefore, these teeth have less resistance to extrusive forces.^[3,4,7] Thus; avulsion cases in dental traumas are usually seen in children between 7 and 9-year-old.^[6]

Replantation of avulsed teeth is an accepted treatment approach when evaluated in terms of esthetic and functionality.^[1,2,4,8] The average survival of replanted teeth at pediatric patients was reported as 95.6% at 1 year follow-up.^[9] However, there are many factors determining the decision of replantation and the success of replantation. The degree of periodontal damage the condition of alveolar socket, the period of tooth staying out of alveolar socket, storage conditions of the tooth, and condition of root development are the critically important factors in these cases.^[1,5,8,10-12]

One of the most seen complications after replantation in avulsed teeth is root resorption.^[2,10,11] Root resorptions are seen in about 50-76% of the cases and they are considered to be associated with storage conditions of the tooth and the period of tooth staying out of alveolar socket.^[4,10,12,13] As a result of long-term storage of a tooth in nonphysiological conditions, periodontal ligamentum necrosis, and replacement resorption is inevitable.^[2,4,7,12] Alveolar bone formation after periodontal tissue necrosis and root resorption results in ankylosis (replacement resorption). Ankylosis in young individuals may cause infraocclusion due to continuing growth.^[4,11,13] In case, there is infected

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*Address for correspondence

Dr. Emre Korkut, Department of Pediatric Dentistry, Faculty of Dentistry, Necmettin Erbakan University, Konya, 42010, Turkey.
E-mail: ekorkut@konya.edu.tr

necrotic tissues after resorption, the process may also result in inflammatory root resorption.

Even in avulsion cases where periodontal ligamentum languished, teeth may continue to function in the mouth if the treatment process is managed well.^[3,5,8,12]

In this case report, clinical findings of a 6-year follow-up of a case who had avulsed maxillary central teeth and multidisciplinary treatment approaches applied to the patient were discussed.

CASE REPORT

Avulsed maxillary central teeth were observed in a patient (9. ♀) who admitted to Selcuk University, Faculty of Dentistry, Department of Pediatric Dentistry after trauma. In the history, it was learned that the teeth were kept in a dry environment for more than 1 h. Root development of teeth was observed to be completed. Before the replantation; the socket and teeth were rinsed with saline. Avulsed teeth were soaked in 5% tetracycline. The teeth were reposed with finger pressure and splinted with semi-rigid fiber splint system (Ribbond Inc., Seattle, Washington, USA) for 2 weeks [Figure 1a and b]. Following the splint removal, endodontic treatment was administered, and the patient was called for follow-ups [Figure 2].

After 3 years of follow-up, beginning of teeth root resorption was identified in the radiography [Figure 3a and b]. Moreover, in the clinical

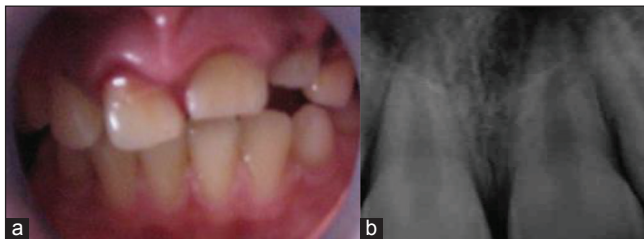


Figure 1: (a) Intraoral view after replantation, (b) radiographic image after replantation

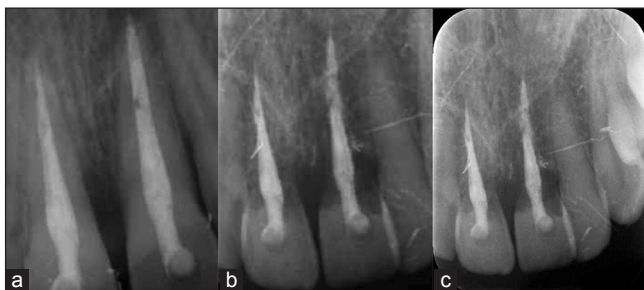


Figure 3: Radiographic images (a) after 4 months, (b) after 3 years, (c) after 4 years

examination, left maxillary central incisor was found to have infraocclusion due to ankylosis [Figure 4]. To resolve the patient's esthetic complaints, composite resin (Clearfill Majesty ES-2, Kuraray, Japan) restoration was administered to the left maxillary central incisor, and the tooth was brought to occlusal level clinically. In the examination performed after 4 years follow-up, hypermobility was identified in the left maxillary central incisor. Roots of both teeth were seen to be almost completely resorbed in the radiography [Figure 3c]. After the evaluation, since there is no clinical mobility was observed in the right maxillary central incisor, only extracting left maxillary central incisor was decided to be adequate [Figure 5]. Following that, to resolve the esthetic and functional concerns, fiber-supported (Ribbond Inc., Seattle, Washington, USA) bridge was made using the patients extracted tooth [Figure 6].

During the follow-ups and controls, around year 6, right maxillary central incisor was decided to be extracted due to its increasing mobility. Previously made fiber-supported bridge was removed, and right maxillary central incisor



Figure 2: Radiographic image after endodontic treatment



Figure 4: Intraoral view and infraocclusion of left maxillary incisor

was extracted [Figure 7]. Finally, the patient lost his replanted teeth 6 years after avulsion; therefore, prosthetic rehabilitation with zirconia was administered including the maxillary canines [Figure 8]. Follow-ups of the patient who had a satisfying result in terms of esthetic and functionality are ongoing.

DISCUSSION

One of the biggest problems that may be encountered in dentistry is to decide the treatment option to get optimal results, especially in traumatic injuries in which more than one tooth are involved.^[1,3,12] Especially in avulsion cases, the only way to get optimal results is to have an interdisciplinary treatment approach. Furthermore, there is a complicated treatment process in these type of patients, and this makes harder to estimate the prognosis.^[2,3,12,14] Even though there are more than one treatment options during the treatment process, the most ideal treatment is the one which is not only conservative but also can meet the patient's esthetic and functional requirements.^[1,5,10,15] In this case, the treatments administered to a patient who had avulsed maxillary central

teeth due to trauma given by pedodontist, endodontist, prosthodontist, and their results were submitted.

Replantation time and storage condition of the tooth are critically important factors in avulsion cases.^[2,3,14] Length of dry storage has a negative effect on replacement resorption.^[9] Optimal time for replantation is 20-30 min.^[5,14] Donaldson and Kinirons^[16] underline that early resorption risk is higher for teeth that kept in dry conditions for longer than 15 min than teeth kept in physical conditions. In cases where replantation is not possible within this time, the tooth is needed to be kept in the proper environment. Among various options, the most ideal environment for this is HBSS (Hank's Balanced Salt Solution) and Viaspan.^[2,14,17] However, since these solutions are not easy to provide, it is recommended to keep the tooth in environments such as milk or physiological saline solution until replantation in the case of emergency. In a study performed by Cho and Cheng,^[4] a tooth was replanted after storing for 18 h in a dry environment, followed up for 2 years, and satisfying results were obtained in terms of esthetic and functionality. In a case reported by Khalilak *et al.*,^[18] a tooth was replanted after 270 min, and ankylosis findings were observed after 5 years follow-up; however, the tooth was reported to continue to function without causing any symptom in the mouth. In our case, even though the tooth was stored in a dry environment and the replantation was performed after 1 h, the teeth continued to function for a long period, 4 years.



Figure 5: The crown of the left maxillary incisor



Figure 6: (a and b) Intraoral view of the adhesive prosthesis after tooth extraction, (c) radiographic image of adhesive prosthesis



Figure 7: Intraoral view after removal of adhesive prosthesis and extraction of right maxillary incisor tooth



Figure 8: Intraoral view of the final prosthetic treatment

Another factor important in the prognosis of avulsed teeth is the developmental degree of tooth apex. Petrovic *et al.*^[19] found that incisors with open apices have a lower survival and requires prolonged treatment, whereas incisors with closed apices have a high survival rate. In teeth with open apex, vitality of the teeth may be followed up after replantation by also considering the revascularization possibility. In teeth with closed apex, a canal operation following the replantation is recommended to preclude a possible inflammatory resorption.^[2,3,12,14] Since apex development of the avulsed teeth has been completed in this case, root canal operations were performed for the teeth after 1 week.

Many researchers recommended to apply semi-rigid splints for a time ranging 7-14 days following replantation. The prolonged time of splinting may cause ankylosis of teeth that occur trauma.^[6] In this case, semi-rigid splitting is applied for 2 weeks after replantation as like by Tzigkounakis *et al.*^[6]

Ankylosis (replacement resorption) is defined as fusion of alveolar bone and root surface. The languished periodontal tissue around the avulsed tooth is the main factor in ankylosis formation.^[2,4,7,12] In ankylosed teeth, the root is remodeled, and replaced with alveoli bone. This process is clinically characterized with infraocclusion or metallic sound in percussion.^[2,4,11] In radiographic evaluation, periodontal space cannot be observed, and then resorptions can be seen to be started in the root, and the cavitations can be seen to be filled with bone.^[1,5,14] In this case, ankylosis findings were seen in the replanted teeth from the 4th month. At the end of the 3 years, left maxillary central incisor was seen to have infraocclusion. However, since there was no symptom, only composite restoration was performed to rehabilitate the unesthetic appearance caused by infraocclusion, and the teeth were followed-up for 4 years.

Fiber-supported composite use for the treatment of single anterior missing tooth is a frequently preferred restoration type as it is a conservative approach, less costly compared to other alternatives, and as it meets the esthetic and functional expectations of the patient fast and at optimum level.^[20-23] After 4 years follow-up in this case, the left maxillary central incisor was decided to be extracted due to its increasing mobility. Fiber-supported composite restoration was administered by considering the patient's esthetic concerns and his being at growth and development period. To obtain a more natural appearance in terms of esthetic during the administration, crown part of the extracted tooth was used.

Many treatment alternatives are present for the permanent prosthetic treatment of anterior missing tooth based on the patient's age, esthetic expectations,

and economic condition.^[21-23] Another alternative treatment for teeth that performed extraoral endodontic treatment is retrograde insertion of ceramic or titanium posts.^[24] Even though implant treatment is seen to be the ideal treatment among these alternatives, zirconia bridge was administered to the patient due to economic reasons.

Consequently, root resorption and tooth loss possibility are known to be high in the replantation of the avulsed permanent teeth which were kept in improper physiological conditions and stayed outside of the mouth for a long period. However, replantation treatment can be administered by considering that the missing tooth will create esthetic and functional needs, and permanent prosthetic solutions are not suitable for the growth and development period in pediatric patients.

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Conflicts of interest

There are no conflicts of interest.

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