Management of an Avulsed Permanent Incisor with a Long Extra Oral Dry Time : A Case Report

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Abstract

Tooth avulsion occurs commonly in children. However, most caretakers either do not recognize the relative urgency of this injury or do not know proper management when this does occur. Such injuries should be recognized and treated expeditiously because several studies support a more likely favorable prognosis with timely and appropriate initial management. Avulsion of the permanent tooth is a true dental emergency and appropriate on-site management can help determine the ultimate prognosis.

Key words: Avulsion, Replantation, Splinting, Reparative Root Resorption.

Introduction

Tooth avulsion is defined as complete displacement of the tooth out of its alveolar socket. Avulsion of a permanent tooth is estimated to represent 0.5% to 16% of all dental injuries. The most commonly affected teeth are the maxillary central incisors. Concomitant injury to the soft tissues and alveolar bone fractures are also associated with tooth avulsion. Avulsion of permanent teeth occurs most often in children 7 to 9 years old, an age when the relatively resilient alveolar bone provides only minimal resistance to extrusive forces.[1] Management of an avulsed permanent teeth often presents a challenge. Healing with a normal periodontal ligament (i.e. regeneration) after replantation will occur only if the innermost cell layers along the root surface are vital.[1] Clinical studies have shown that the prognosis is best for teeth replanted within 5 minutes after avulsion,[2-5] yet such optimal treatment is not always possible. Long extraoral dry time and/or non-physiological storage of avulsed teeth before replantation results in total necrosis of the periodontal ligament, and healing by replacement root resorption (i.e. repair) becomes the only option.[5] In this situation, the periodontal ligament, as well as the root surface of the replanted tooth is resorbed and replaced by the surrounding alveolar bone, a process that results in ankylosis.[1] Ankylosis of the teeth eventually leads to infra-occlusion, because of growth in young patients.[6] If the resorption process exposes dentinal tubules and root canals that contain infected necrotic tissues, inflammatory root resorption may also occur. Nevertheless, if managed properly, avulsed teeth with nonvital periodontal ligament can be replanted and will remain functional for some years.[8] This article describes the management of a child with an avulsed maxillary permanent incisor that had been kept dried for about 15 hours.

Case Report

A 15-year old male patient reported for emergency dental treatment. He had fallen from a swing in the playground the previous evening, and his tooth 11 had been avulsed. The avulsed tooth had been left dry and kept in a handkerchief after the injury. The patient's medical history was non-significant. On examination, the patient did not show any signs or symptoms of neurological or extraoral injury and he presented with a class I skeletal relationship. The intraoral examination revealed permanent dentition. Oral hygiene was fair, and no carious lesions were detected clinically. Tooth 11 was avulsed, and a blood clot was found in the alveolar socket (Fig. 1 & Fig. 2). Crown of the tooth 21 was also fractured and showed negative response to pulp vitality test. No other oral injury was detected clinically. All other adjacent teeth showed positive response to vitality test. A maxillary occlusal radiograph was obtained, and no other hard-tissue injury was detected in that region. Examination of the avulsed tooth revealed that the crown was intact and that the root had a nearly closed apex, but the root surface was covered with dried remnants of periodontal tissue. It was estimated that the avulsed tooth had been kept dry for about 15 hours. The available treatment options were explained to the parents, and it was decided to replant the avulsed incisor as an intermediate treatment. Local anesthetic was administered and the blood clot removed from the socket. The root of the avulsed tooth was planed to remove the necrotic periodontal tissue. The tooth was placed in 2.4 % acidulated sodium fluoride solution for 20 mins and was then root filled with gutta-percha points and sealer. The tooth was then replanted into its socket (Fig. 3) and splinted to the adjacent teeth with 0.018 × 0.025 inch stainless steel rectangular wire and composite (Fig. 4). Another radiograph was obtained to confirm proper positioning of the replanted incisor and the splint was left in place for 4 weeks. Root canal treatment of the nonvital left maxillary incisor was done. The patient was seen again at 4, 6 and 12 weeks after replantation and then half-yearly. After 1 year follow up mild infraocclusion and progressive replacement root resorption of replanted tooth was evident (Fig. 5). Nevertheless, it remained functional and was esthetically acceptable. Composite build up of tooth 11 and 21 was done to restore the aesthetics (Fig. 6). All of the adjacent anterior teeth remained symptomless and showed no sign of pulp death or root resorption. Because both the patient and his parent wanted to avoid orthodontic treatment in the future, it was decided to keep the replanted incisor as long as possible. The patient and his parent were informed that the infraocclusion would become more severe as the patient grew and that esthetic buildup of the incisal edge with composite resin might be needed. The replanted incisor will be replaced with prosthesis when its root has been totally resorbed. Long-term treatment may also include prosthodontic replacement with an implant when the patient finishes his pubertal growth.

Discussion

Of all the dental traumatic injuries tooth avulsion is the most serious. According to clinical studies, teeth replanted within 5 minutes after avulsion had the best prognosis. For the favorable prognosis, the avulsed tooth should be replanted immediately or should be stored in a physiological medium such as saline for only a short period before replantation.[8,9] The replanted tooth should be splinted to the adjacent teeth for 7 to 10 days to enhance periodontal healing.[9] If the tooth apex is closed or almost closed, prophylactic root canal treatment should be carried out on the day of splint removal to prevent the onset of inflammatory root resorption.[1,9] In the case presented here, the avulsed incisor had a nearly closed apex and had been air-dried for a prolonged period, so it was anticipated that the chance of pulpal and periodontal healing would be extremely low. As a result, the management of this case differed from the accepted replantation protocol. The treatment objective was to retain the avulsed incisor to maintain esthetic appearance and occlusal function, to prevent inflammatory root resorption and to achieve periodontal healing with replacement root resorption. Therefore, the avulsed incisor was splinted to the adjacent teeth with rigid wire for 6 weeks to facilitate rapid, solid ankylosis.[1,7] The root of the avulsed incisor was also filled extraorally. Given that replacement root resorption was inevitable after the prolonged period of dry storage, it was thought that further drying and handling of the root surface was unlikely to worsen the prognosis.[1,9] In cases of avulsed teeth with non vital periodontal ligament, chemical root treatment with various agents such as tetracycline before replantation have been suggested in the hope of slowing down the resorption process.[12] Andreasen and Andreasen[1] recommended that, after planing of the root to remove necrotic periodontal tissue, such teeth be soaked in 2.4% acidulated sodium fluoride solution (pH 5.5)

for 20 minutes before extraoral root filling and replantation to slow the root resorption.

The long-term prognosis for the replanted incisor in the case presented here is not good. Teeth replanted after 60 minutes of dry storage become ankylosed and are resorbed within 7 years in young patients, whereas teeth replanted under similar conditions in patients older than 16 may remain functional for considerably longer periods.[13] Ebeleseder and others[7] also found that replacement resorption of replanted mature teeth was more extensive and the overall prognosis worse for children and adolescents than for adults. It has been suggested that the more rapid resorption of teeth in children is related to the higher rate of bone remodelling in children than in adults.[8]

Ankylosis of the incisors in young patients also results in infraocclusion as the patients grow.[6] If the avulsed incisor had not been replanted in the present case, other treatment options might have included prosthetic replacement of the missing incisor, space closure with orthodontic treatment or autotransplantation of the premolar together with orthodontic treatment of the malocclusion. Replantation can restore the patient's esthetic appearance and occlusal function shortly after the injury and the replanted incisor can remain functional for some years. Nevertheless, replantation is usually not recommended if the avulsed tooth has a very immature root and has been air-dried for a prolonged period or if the patient's medical condition contraindicates replantation.[9]

Conclusion

In cases of reimplantation of avulsed permanent teeth with prolonged extra oral dry time, the risk of progressive replacement resorption and subsequent tooth loss is high. However if managed properly such teeth can remain functional for some years. Replantation in such cases could be performed if the patient and his or her parents are aware of the outcomes and request such treatment.

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Legends

Fig. 1: Avulsed maxillary right cental incisor form alveolar socket.
Fig. 2: Radiograph showing avulsed tooth.
Fig. 3: Replantation of avulsed tooth after root canal treatment.
Fig. 4: Splinting of avulsed tooth.
Fig. 5: One year follow up radiograph.
Fig. 6: Esthetic composite restoration of teeth.

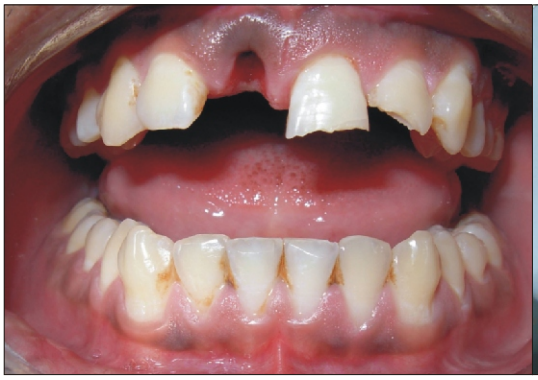

Fig. 1

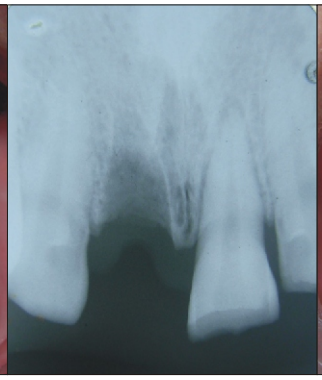

Fig. 2

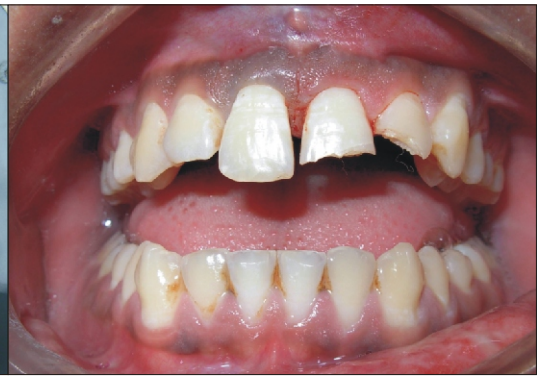

Fig. 3

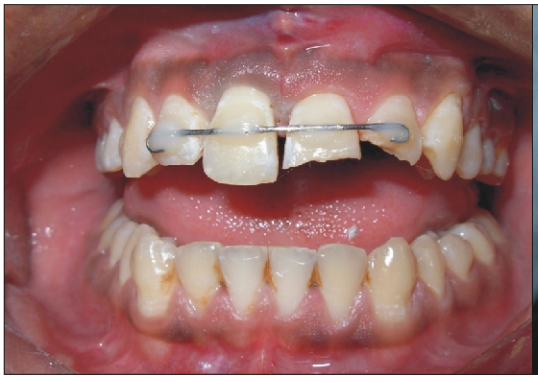

Fig. 4

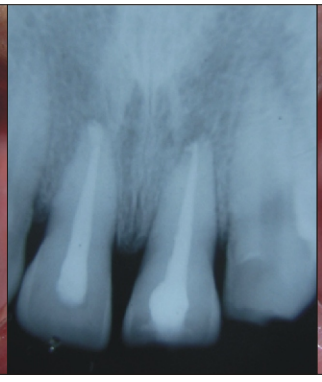

Fig. 5

Fig. 6

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