Case Report

Delayed replantation of an avulsed maxillary premolar with open apex: A 24 months follow-up case report

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ABSTRACT

Avulsion of permanent teeth is most serious of all dental injuries and accounts for 1-16% of all traumatic injuries, of which maxillary incisors are most commonly involved. However, in this report a rare case of isolated avulsed immature incisors has been described. The patient had reported more than 3 hours after the trauma with a tooth stored in dry condition and soil contamination. The prognosis depends on measures taken at the place of accident or the time immediately after avulsion. Replantation is the treatment of choice, but cannot always be performed immediately. An appropriate emergency management and treatment plan is important for good prognosis. In this report stepwise management of an avulsed immature maxillary premolar with extended period of dry storage has been described followed up for a period of 2 yrs.

KEYWORDS: Avulsion, delayed replantation, immature premolar

Introduction

Avulsion accounts for 0.5-16% of traumatic injuries in the permanent dentition. Avulsion of permanent teeth can occur at any age, but is most common in young permanent dentition due to roots being incompletely formed and resilient periodontium and bone.

Prognosis depends on measures taken at the place of accident or the time immediately after avulsion. When a tooth is avulsed, attachment damage, pulp necrosis, and small localized cemental damage occurs. If the periodontal ligament (PDL) left attached to the root surface does not dry out, the negative consequences of tooth avulsion are usually minimal. However, if excessive drying occurs, following replantation these PDL cells will elicit a severe inflammatory response, with physiologic bone re-contouring on the root surface that will cause tooth loss. Andreason has reported that if the tooth has been out of the mouth for more than 2 h, there is 95% chance of external resorption.

Nevertheless, if managed appropriately, avulsed teeth with viable PDL when reimplanted can remain functional for some years. This article describes the rare case of management of an immature avulsed premolar with an extra-alveolar dry storage of more than 3½ h.

Case Report

A healthy 11-year-old boy reported to the Department of Pediatric Dentistry with a chief complaint of missing upper right back tooth and lip laceration. History revealed that patient has had bicycle accident about 3 h ago resulting in loss of upper right back tooth. Intraoral examination revealed lip laceration along with clinically missing maxillary right first premolar [Figure 1]. Following which parents were asked to visit the site of accident to find the avulsed tooth if possible and meanwhile periapical radiographic investigation carried out revealed no evidence of any associated hard tissue injury. The tooth was subsequently found at the site of accident with soil contamination [Figure 2]. Examination of avulsed tooth revealed intact crown and root with wide apical...
foramina and necrotic dried remnants of periodontal tissue due to extensive extraoral dry storage of over 3½ h. Patient had bimaxillary protrusion and was referred to the Department of Orthodontics for possibility of extraction of other premolars and orthodontic correction. Despite advisability of orthodontic treatment and poor prognosis associated with replantation of an avulsed tooth, parents declined any kind of dental intervention and wanted the tooth to restored back. Treatment plan was established to carry out root surface treatment and extraoral root canal treatment (RCT). The tooth root was treated with triple antibiotic paste consisting of ciprofloxacin, metronidazole, and minocycline in the ratio of 3:1:1 mixed with propylene glycol for a period of 10 min. Conventional enlargement and cleaning of root canal was performed. The canals were dried with sterile paper points and obturated with Gutta Percha (Dentsply Maillefer Swiss made, Ballaigues) and the root ends were sealed with glass ionomer cement (GC Fuji IX, Tokyo, Japan). Under local anesthesia the socket was gently curetted to remove any coagulum, granulation and pathologic tissue, and thoroughly debrided with physiologic saline solution. The tooth was gently replanted with digital pressure, occlusion was evaluated and wire splinted with acid etch composite resin attached to adjacent teeth for a period of 2 weeks [Figures 3 and 4]. Patient was administered 5 days course of 250 mg amoxicillin thrice daily to prevent infection and advised to be on soft diet. Oral hygiene instructions were given and chlorhexidine mouthwash (Hexidine 2%, ICPA Health Products LTD, India) recommended twice a day for 2 week. Splint was removed after 2 weeks with no post-operative clinical or radiographic complications and patient was followed-up regularly at 6, 12, 18, and 24 months [Figures 5-8]. Tooth showed no clinical symptoms such as mobility, periodontal pocket or color change. Dull note on percussion was yielded at 24 months follow-up visit and periapical radiographic examination showed no sign of external root resorption.

**Discussion**

Best available treatment for avulsed teeth is immediate replantation, but for a variety of reasons this can be
difficult for nonprofessional person and teeth are often covered with debris. Clinical evidence suggests that macroscopic contamination on the root surface results in significant higher percentage of teeth healing with ankylosis following avulsion and replantation. An explanation for this is that any foreign material and bacteria will increase the extent and duration of inflammatory response.

In the present report, the time elapsed from occurrence of trauma up to emergency care was more than 3½ h, worsened by dry storage and soil contamination on root surface. The anticipated healing of pulpal and periodontal tissues was extremely low as per scientific literature. However, despite unsatisfactory conditions replantation was the treatment option due to parents’ insistence and young age of the patient as the young permanent tooth loss leads to severe arrest of alveolar bone formation in a growing child. Alveolar ridge would be narrow and difficult to restore in future with either a bridge or implant. Most conservative approach for managing the avulsed teeth is to reimplant them as soon as possible.

The prerequisite for functional healing of an avulsed tooth is absence of infection. Early infection related complications derive from infected pulp space leading to tooth loss. Hence, pre-replantation extraoral RCT was performed in this case to prevent a common complication of inflammatory root resorption, that occurs more rapidly in young patients as the dentinal tubules are more patent and readily transmit inflammatory products from pulp to the root surface.

In this report, the root surface of premolar suffered extensive damage from improper storage conditions. Acc to Trope, when severe additional damage cannot be avoided and osseous replacement of the root is considered certain, steps are taken to slow the replacement of root by bone to maintain the tooth in mouth for as long as possible. Root surface treatment with various agents such as tetracycline, dexamethasone, stannous fluoride, sodium fluoride, and tetracycline have been suggested by various authors. In this case, root surface treatment was carried out with triple antibiotic paste containing ciprofloxacin, metronidazole, and minocycline mixed...
with propylene glycol to decontaminate the surface and exert prolonged bactericidal effect on PDL.\cite{17} According to Makkes et al. uncontaminated devitalized tissue cause low/no inflammatory reaction, and thereby accounting for good periodontal healing in this case at 24 months follow-up.\cite{19}

Experimental studies in non-human primates have demonstrated that rigid splinting, i.e., immobilization or a prolonged splinting period may lead to extensive PDL healing complications, such as dentoalveolar ankylosis or external root resorption (replacement resorption).\cite{16} Hence, splinting technique that allows physiologic movement of the tooth during healing, and that is in place for a minimal time period should be used.\cite{9} Wire-composite resin splint was used in this case for a period of 2 weeks as it allows good oral hygiene maintenance and well tolerated by patient.

An avulsed tooth will be exposed to bacterial contamination both extraorally and intraorally and reduction in bacterial inflammatory stimulus by the use of antibiotics may have some role in improving periodontal and pulpal healing.\cite{10} Patient in this report was prescribed 5 days course of amoxicillin as the bacteria found within the alveolar socket of avulsed teeth have been found to be sensitive to penicillin based antibiotics in an investigation carried out by Parry et al.\cite{20}

During 2 years follow-up, patients’ esthetics and occlusal function have been maintained. Clinically, dull note on percussion was yielded at last follow-up visit, but radiographically there was no evidence of any resorption. The expected outcome in this case was replacement resorption, but radiographic normal appearance of root could be attributed to limitation of intraoral radiography, i.e., unable to visualize the teeth 3-dimensionally. However, the patient is still under follow-up to determine the ultimate fate of this tooth replanted under unfavorable conditions.

**Conclusion**

Despite the fact that tooth had extended extra-alveolar dry storage, root surface treatment with triple antibiotic paste rendered the root surface more resistant to resorption, indicating the possibility of its long survival in oral cavity. This case report highlights the need for in depth investigation of root surface treatment options and the importance of replanting avulsed teeth even when the conditions are not very favorable.

**References**