CASE REPORT

Emergency Management of an Avulsed Tooth

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Abstract
An avulsed tooth or avulsion (exarticulation) is an emergency traumatic experience. Tooth avulsion results in damage to attachment and pulp necrosis. Although the possibility of the eventual loss of the tooth should be explained to the patient, replantation reduces the traumatic / physiological effect to the accident. Clinically, successful replantation result in prolonged retention which improves esthetic appearance, arch form, chewing, and integrity of the arch. This case report presents successful emergency management of an avulsed maxillary left central incisor of a 6 year old child patient with extra oral time of 5 hours. Treatment at the dental office involved immediate replantation and acid-etch composite splint followed by root canal treatment of the tooth and subsequent follow-up.

KEY WORDS: Avulsion, replantation, Composite splint.

Introduction
Tooth avulsion refers to total displacement of the tooth out of its alveolar socket. It accounts for 0.5% to 16% in permanent dentition 7 to 13% in the primary dentition. In permanent dentition, fights and sports injuries are the main causes for the tooth avulsion where as in primary dentition, it results from fall against hard objects. Tooth avulsion results in the attachment damage and pulp necrosis which is infects the severing of periodontal ligament fibers and the neurovascular bundle. There may be associated injuries to the alveolus and adjacent teeth. When the tooth is outside the socket, the cell of pulp and periodontal ligament begin to deteriorate due to the lack of blood supply to the cells and other environmental factors like drying and/or bacterial contamination. It is important to note that favorable periodical ligament healing is the crucial factor of the success of replanted teeth. Healing with a normal periodontal ligament (i.e. regeneration) after replantation is possible if innermost cell layer among the root surface are vital. Prognosis is the best for teeth replanted within 5 minute after avulsion, yet such optimal treatment is not possible. Inflammatory resorption, and replacement resorption, ankylosis, and tooth submergence can be the potential complications after replantation. Nevertheless, if managed properly, avulsed teeth which a vital periodontal ligament can be replanted and will remain functional for the same year.

Case Report
A 6 year old male child patient came to dental hospital with avulsed maxillary left central incisor. He had slipped and fallen in
his house 5 hours back. Maxillary left central incisor was brought wrapped in a piece of cloth. On examination, the patient did not show any signs or symptoms of neurological or extra oral injury. Tooth 21 was avulsed, and a blood clot was found in the alveolar socket. Tooth 11 and 22 were sublimated and showed grade 1 mobility. An intraoral periapical radiograph (IOPA) was obtained to verify if not alveolar fracture around tooth socket and the conditions of adjacent teeth. Electric pulp test was conducted on effected as well as adjacent teeth and result recorded as a baseline for comparison in near future. Tooth 11, 21 and 22 were giving a negative response. Examination of the avulsed tooth revealed that the crown was intact and that the root had a closed apex, but the root surface appeared quite dry. The available treatment options were explained to the patient, and it was decided to replant the avulsed incisor as an intermediate treatment. The root surface of the avulsed tooth was treated with citric acid, 2% SnF solution, and doxycycline. Blood clot was removed from the socket by gentle aspiration and the tooth was replanted and splinted to adjacent teeth using acid-etch composite and orthodontic ligature wire lingually. Bite was also adjusted to make sure that the occlusion was not traumatic. An intraoral periapical radiograph was obtained to confirm its position and splint was left in place for 10 days. Antibiotic therapy was prescribed for 5 days, chlorhexidine mouthwash for 15 days, and the patient was referred to a medical practitioner for anti-tetanus booster. Patients advised to avoid eating solid foods. The splint was removed after 10 days and a radiograph was taken. Tooth 21 showed increased widening of periodontal ligament space at the apex. Root canal treatment was planned in tooth 11 and 21. Patient was instructed to come for follow up after every 6 months after root canal treatment also. Patient was also informed about the later consequences and future treatment that may be required after root canal treatment.

Figure 1 Pre-operative photograph

Figure 2 Avulsed tooth (21) treated with citric acid, 2% SnF Solution and doxycycline

Figure 3 Pre Operative Radiograph
Figure 4 Socket made ready for replantation

Figure 5 Photograph after replanting

Figure 6 Photograph after splinting

Figure 7 Radiograph after replanting

Figure 8 Radiograph after splint removal

Figure 9 Photograph after splint removal
Discussion
Avulsion is a more serious assault on the gingival, periodontal ligament and the pulp. Chance of pulpal and periodontal healing is inversely related to the stage of root development and the period of dry storage. Ideally, an avulsed tooth should be replanted immediately or should be stored be stored in a physiological medium such as saline for only a short period before replantation. Other storage media for extended storage of avulsed tooth before replantation include milk, saliva, ViaSpan, Eagle’s Medium, Hank’s balanced salt solution (HBSS), etc. Of the other suggested solutions, the options that provide acceptable storage have limited availability and the options that are readily available are either far inferior to HBSS or are actually damaging to the PDL cells. HBSS has unquestionably been the most tested solution. Hanks balanced salt solution reagent composition Potassium Phosphate 0.44 mM Potassium Chloride 5.37 mM Sodium Phosphate, Dibasic 0.34 mM Sodium Chloride 136.89 mM D-Glucose 5.55 mM. 0.9% normal sterile saline has a compatible osmolality with the PDL cells, but does not contain any nutrients to help maintain cell vitality. Therefore, sterile saline is only good as a short-term storage medium for avulsed teeth and should not be used if the tooth cannot be reimplemented within 1 hour. Milk has a compatible osmolality with the PDL cells of an avulsed tooth and has been tested as effective to store teeth for no more than 2-3 hours. Milk does not contain the necessary nutrients to maintain the PDL cells for any longer periods of time. Additionally, there are issues related to the practicality of using milk that severely impact its efficacy. Milk sounds, like an easy, inexpensive method for storage, however, using milk is not as effective as other media available and is logistically more difficult than other, more effective options. Like water, saliva is not compatible with the PDL cells. In addition to the damage the saliva can cause to the cells, saliva also contains bacteria that can cause the PDL cells to become infected. Therefore, it is not recommended to store teeth in neither a cup with saliva nor in the mouth of the victim or another person. There have been some recommendations to use tap water with a pinch of salt. Some believes this recommendation to be a misunderstanding of what HBSS and sterile saline are. HBSS is not a saltwater solution, but a scientifically designed researched fluid that contains all of the essential metabolites and glucose necessary for maintenance of cells. Adding salt to water will create a solution that is damaging to PDL cells.

According to a study concluded in 2008, egg white could be suggested as a suitable storage medium. Its principle advantage is its availability. The results of another recent study showed that 10% propolis was a more effective storage medium than other groups used in the study i.e. 20% propolis, long shelf-life light milk with lower fat content, Hank’s balanced salt solution, and tap water. Propolis is a multifunctional material used by bees in the construction and maintenance of their hives. Propolis possess several biologic activities such as anti-inflammatory, antibacterial, antioxidant, antifungal, antiviral, and tissue regenerative, among others. Another new study used a collagenase-dispens assay to investigate the potential of a new storage medium, coconut water, in comparison with propolis, Hank’s balanced salt solution and milk in maintaining viable periodontal ligament cells on stimulated avulsed teeth. Coconut water is easily available, is biologically pure and sterile with a rich presence of amino acids, proteins, vitamins, and minerals. Coconut medium can be used as a superior transport medium for avulsed teeth. Replanted tooth should be splinted flexibly to adjacent teeth for maximum of 7 to 10 days to enhance periodontal healing. 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. In the present case, the avulsed incisor had a closed apex and had been air dried for some more than 4 hours. So, after explaining the possible consequences to the patient and his parents, it was replanted and splinted to adjacent teeth immediately, maintaining esthetics and function and reducing psychological trauma. Systemic antibiotics are often recommended after replantation, but their effectiveness in preventing root resorption is questionable. In case of avulsed teeth with a vital periodontal ligament, treatment with various agents as tetracycline, citric acid
and fluoride has been recommended in the hope of slowing down the resorptive process. A relatively new material “Emdogain” is being tried in avulsed teeth to promote regeneration of periodontal ligament. However, its use in replantation is still experimental, and more data is required to support its clinical effectiveness. The long term prognosis for the 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 years may remain functional for considerably longer periods. Other than replantation, other treatment options in the present case include implant or removable partial denture since he is young patient that contraindicated the use of fixed partial denture.

**Conclusion**

The study has helped to take heed of the Emergency management of the avulsion is very important for the physiologic aspect of the patient. In cases of avulsed permanent teeth with more than 60 minutes dry storage time, replantation should be performed if the patient is aware of the outcomes and request such treatment, although the risk of progressive replacement of inflammatory resorption and eventual loss is high. Root canal is necessary when necrotic tooth pulp becomes infected. Infection can pass from the pulp through the dentin tubules and stimulate an inflammatory response, resulting in inflammatory root resorption. The success of a successful replantation is dependent upon the amount of time the tooth has been out of the socket.

**References**