Success of Delayed Replantation of an Avulsed Tooth: A Case Report
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Abstract:
An avulsed tooth or avulsion is an emergency traumatic experience. Tooth avulsion results in the damage of attachment apparatus and pulpal necrosis. The management of avulsed tooth often presents a challenge to the clinician. Clinically, successful replantation of an avulsed teeth results in prolonged retention of teeth which improves esthetic appearance, mastication of food and maintaining the integrity of the arch. This case report presents a successful management of avulsed maxillary permanent left central incisor in a 16-year-old female patient with an extended dry storage of 30 h.

Key Words: Avulsed, replantation, mineral trioxide aggregate

Introduction
Tooth avulsion is defined as total displacement of tooth out of its alveolar socket. It accounts for 0.5-16% of all traumas to the permanent teeth.1 Avulsion in permanent dentition is generally a result of fall, fights, sport injuries, automobile accidents, and child abuse.2,3

When the tooth is outside the socket, the cells of pulp and periodontal ligament begins to deteriorate due to a lack of blood supply and bacterial contamination of the cells, favorable periodontal ligament healing is also crucial for the success of replanted tooth.4 Inflammatory resorption, replacement resorption, and ankylosis are the potential complications of replantation of the avulsed tooth.1,5 Andreason reported that if the tooth has been out of the oral cavity for more than 2 h, there is a 95% chance of external root resorption.7 This case report shows success of delayed replantation of avulsed permanent maxillary left lateral incisor tooth with an extended dry storage of 30 h.

Case Report
A 16-year-old female patient, reported to the Department of Conservative Dentistry and Endodontics, Triveni Dental College and Hospital, Bilaspur, Chhattisgarh, with her knocked out tooth (Figure 1) wrapped in a piece of dry cloth. On clinical examination, the tooth was permanent maxillary left lateral incisor. The patient had fallen down on the floor of her house 30 h before her visit to the department. In pulp vitality test, the adjacent teeth gave positive response. The patient presented with class I skeletal relationship with good oral hygiene and no carious lesions detected. Examination of the avulsed tooth revealed that the crown portion of the tooth was intact and the root had closed apex, but the root surface was covered with dried remnants of periodontal tissues. The avulsed tooth was immediately taken care and was gently debrided with saline irrigation to remove necrotic periodontal tissues and any other surface contaminants and was placed in 2.4% acidulated sodium fluoride solution.

Intraoral examination revealed empty alveolar socket of maxillary left lateral incisor and an intraoral periapical radiograph was obtained, confirming the empty alveolar socket in relation to maxillary left lateral incisor, no signs of adjacent tooth fracture or bone fracture, and no other hard tissue injury was detected in the region. Extraoral examination revealed no signs of swelling or lacerations. The patient had no relevant medical history. The available treatment options were explained to the patient and her parent with the possible treatment outcome and it was decided to replant the avulsed tooth.

After obtaining an informed and written consent, the treatment was initiated. Local anesthesia was achieved by administering 2% lignocaine with adrenaline (1:200,000), alveolar socket was gently irrigated with 2% chlorhexidine gluconate solution (Vishal Dentocare Pvt. Ltd., Gujarat, India) to remove any
granulation tissue. Extraoral endodontic treatment was initiated on the avulsed tooth. Endodontic access cavity preparation was done using endo access bur no:2 (Dentsply, Tulsa). Pulp tissue was totally extirpated using barbed broach (Mani, Inc, Prime Dental Products). Working length was determined with a no. 10 K file (Mani, Inc, Prime Dental Products) inserted into the root canal until its tip appeared at the apical foramen and then pulled back 1 mm. Biomechanical preparation was done using crown down technique with hand ProTaper files till size F3 (Dentsply, Tulsa). During the biomechanical preparation, the root canal was irrigated with 17% ethylenediaminetetraacetic acid (RC Help Prime Dental Products, Pvt. Ltd.) and 3% NaOCl (Safe Plus, Neelkanth Health Care, Pvt. Ltd.). Mineral trioxide aggregate (MTA) (ProRoot MTA, Dentsply Tulsa, OK, USA) was placed in the apical 4 mm of root canal from the coronal access with the help of amalgam carrier and finger plunger and a moist cotton pellet was placed over the MTA from the coronal access in the root canal space and the tooth was temporarily restored with hydrophilic temporary restorative material (Md-temp, Meta Biomed. Co. Ltd.) (Figure 2). Tooth was replanted into the socket with slight digital pressure. Once the tooth was properly seated in the socket, it was checked for alignment and was stabilized with its adjacent teeth using a semi-rigid fiber splint by acid-etch composite resin technique. The position of replanted tooth was verified both clinically and radiographically. To ensure that the replanted tooth was correctly positioned in the socket, intraoral periapical radiograph was taken. The splint was left in place for 2 weeks. Postoperatively, systemic amoxicillin 500 mg, thrice daily for 5 days was prescribed to prevent infection. The patient was given 0.2% chlorhexidine gluconate mouthwash (ICPA Health Products Ltd.) for maintaining good oral hygiene. The patient was advised to take soft diet and to brush with a soft bristle toothbrush during the stabilization period, and the patient was referred to a physician for evaluation of need for a tetanus booster. The patient was recalled on the next day; temporary restoration was removed, and the tooth was obturated with thermoplasticized gutta percha (E & Q Plus, META, Biomed Co Ltd., Korea) and the access cavity was restored with Type-II GIC (GC Universal restorative, GC Corp, Japan) (Figure 3). The patient was followed up at 1-, 3-, and 6-month interval for examination of the replanted tooth, and the tooth was asymptomatic. On 1 year follow-up clinical examination of the replanted tooth, there was no abnormality seen (Figure 4) and there were no signs of root resorption or ankylosis in radiographic examination (Figure 5).

Figure 1: Pre-operative photograph showing avulsed maxillary left lateral incisor tooth from its alveolar socket.

Figure 2: Periapical radiograph showing mineral trioxide aggregate placed as root-end filling material.

Figure 3: Periapical radiograph after the completion of endodontic treatment.

Figure 4: Post-operative photograph: 2 weeks after the replantation of the avulsed tooth.
In this case, the patient visited us 1 day after the tooth was avulsed and it was brought wrapped in a dry piece of cloth and the extraoral dry time was 30 h. Kinirons et al.8 indicated that the risk of resorption increases dramatically after 5 min of dryness, with the probability of resorption increasing by 29% for every additional 10 min of dryness. However, considering the patient age, our main treatment objective in this case was to retain the avulsed lateral incisor, thus maintaining the esthetic appearance and function, so extraoral endodontic treatment of the avulsed tooth was done, and the tooth was replanted in its alveolar socket. In cases of avulsed tooth with extended dry time, in the hope of slowing down the resorption process, Andreasen and Andreasen9 recommended planning of the root surface to remove necrotic periodontal tissues and tooth to be soaked in 2.4% acidulated sodium fluoride solution (pH 5.5) for 20 min before extraoral root canal treatment. Hence, in this case, the avulsed tooth was soaked in 2.4% acidulated sodium fluoride solution (pH 5.5) for 20 min before the initiation of the root canal treatment. Root canal treatment is necessary as the pulp tissue of the avulsed tooth was necrosed and infected. Infection can pass from the pulp tissue through the dentinal tubules to the external root surface and stimulate an inflammatory response, resulting in inflammatory root resorption after the tooth is replanted.

Massler10 suggested that root end resection is not necessary for an ideal reposition of the avulsed tooth. Hence, in this case, root end was not resected and alveolar socket was gently irrigated with 2% chlorhexidine gluconate solution and the apical 4 mm of the root canal was filled with MTA, as it induces proinflammatory and pro-wound healing environment.11 MTA facilitates regeneration of periodontal ligament fibers, helps in bone healing and in eliminating clinical symptoms. MTA expands during its setting, which is responsible for its excellent sealing ability. MTA being hydrophilic material requires moisture to set, so in this case, a moistened cotton pellet was placed over MTA in the root canal space, and the tooth was temporarily restored. The presence of moisture during setting improves the flexural strength of set cement. Therefore, it is advised to place a wet cotton pellet over the MTA in the first visit. Kinirons et al.12 demonstrated that using semi-rigid or flexible splint for 2 weeks of time is best to avoid ankylosis of the tooth and is sufficient to create adequate periodontal support to maintain the avulsed tooth in position. The splint should have no memory (so the tooth is not moved during healing) should not impinge on the gingiva and not prevent maintenance of proper oral hygiene in the area. Hence, in this case, a flexible splint was used for 2 weeks, and the patient was prescribed systemic amoxicillin 500 mg for 5 days as systemic antibiotics13 helps in preventing infection of the tooth.

**Conclusion**

In an avulsed tooth with extended dry storage of 30 h, the treatment plan followed in this case has an advantage of maintaining the patient esthetic appearance and function. On 1 year follow-up clinical and radiographic examination, the replanted tooth was asymptomatic, suggestive of successful delayed replantation of an avulsed tooth. Further long-term follow-up visits will confirm the final success of the delayed replantation of the avulsed tooth.

**References**


