Replantation of an avulsed permanent central incisor: a case report with an 8-month follow-up

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ABSTRACT

Background: Avulsion accounts occur in young children. An avulsed permanent tooth that is dropping out from its socket causes a breakdown of the periodontal ligament (PDL) surrounding the tooth root. An avulsed tooth can be replanted and saved if replantation is performed within 30 minutes to 1 hour of the incident.

Case Presentation: The case of an 8-year-old male patient with a central incisor in a glass of milk after a fall for 2 hours. The tooth was slowly replanted in the socket and stabilized using a flexible wire and resin composite splint. The patient came for the second appointment, the splint was removed, and a radiograph was taken to ensure no inflammation or root resorption had occurred in the replanted tooth for 8-month follow-ups. The tooth developed ankylosis with a positive response to the cold test and electronic pulp tester, indicating that the tooth was vital and sensory nerve supply was regenerated.

Conclusion: The prognosis of avulsed teeth depends on receiving proper emergency care at the right time. A proper storage medium is important to keep the dental pulp and PDL viable.

Keywords: Case report, avulsion, replantation, permanent central incisor.

Background

Avulsion accounts for up to 16% of all dental traumatic injuries and most commonly occurs in children aged 7-9 years [1]. An avulsed permanent tooth is a true dental emergency because the forceful dropping of the tooth from its socket causes a breakdown of the periodontal ligament (PDL) surrounding the tooth root [2]. The PDL is responsible for providing blood supply to the pulp tissue that resides in the center of the tooth [3]. Traumatic injury causes dental pulp necrosis, which further damages the surrounding periodontium.

An avulsed tooth can potentially be replanted and saved. However, the patient and dentist must act quickly. The tooth is the most viable for successful replantation within 30 minutes to 1 hour of the incident. The longer the tooth has been outside the socket, the lesser the chance that it can be reattached [1].

Case Presentation

An 8-year-old male patient visited the College of Dentistry at University dental clinics after a fall. Extraoral examination on arrival revealed no other facial injury or swelling. Intraoral investigation revealed an avulsed maxillary right central incisor with no other abnormalities. The avulsed tooth had been stored in cold fresh milk for 2 hours. After infiltration with 2% lidocaine local anesthesia. The socket was irrigated using saline. The tooth was carefully removed from the milk using a 2 × 2 saline-soaked gauze, rinsed with saline, and inspected for any residual debris on the root. Thereafter, the tooth was slowly replanted in the socket, ensuring that it was parallel to the maxillary left central incisor, and the position was verified using a radiograph (Figure 1). The tooth was stabilized using a flexible wire and resin composite splint on the labial surface of teeth # 53, 11, and 21 (Figure 1).

The patient was given postoperative instructions, including reporting for follow-up at 2 weeks; 1, 2, 3, and 6 months; 1 year; and once a year, thereafter, for 5 years.

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After 2 weeks, the patient came for follow-up, the splint was removed, and a radiograph was taken to ensure no inflammation or root resorption had occurred in the replanted tooth.

At the 1-month follow-up, no abnormalities were observed on radiographic examination. However, the metallic sound on percussion suggested that the tooth had developed ankylosis (replacement root resorption). Notably, tooth #11 showed a positive response to the cold test and electronic pulp test, which indicated that the tooth was vital and sensory nerve supply was regenerated. Similar test results were observed at the 2-, 3-, and 8-month follow-ups (Figure 2). The radiographic finding was almost similar for up to three months of follow-up. In the 8-month follow-up, tooth #11 is shorter than the left central incisor on the other side. The legal guardian of the patient provided informed consent for the publication of this report.

Discussion

According to the International Association of Dental Traumatology (IADT) guidelines, the treatment choice for avulsed teeth varies depending on the apical closure, storage conditions, and time between avulsion and replantation [1].

This case was managed according to the IADT guidelines, which advise tooth replantation as soon as possible to give the pulp a chance for revascularization and root development even if it was outside the socket for >1 hour [1]. In this case, the tooth vitality was maintained mainly because it was stored in a suitable medium. This maintains the vitality of the pulp as well as the PDL cells, which reduces the chances of root resorption [4].

The patient stored his teeth in milk at the time of the accident. A cardinal rule of replantation is to keep the tooth moist throughout the process, either inside the mouth (between the cheek and gums) or in a storage medium. The most widely used and accepted storage medium is a glass of milk [5]. If milk is unavailable, saliva can be collected in a container to store the tooth [5]. However, emergency tooth preservation kits (such as Save-a-Tooth®) or buffered liquids, such as Hanks’ balanced salt solution, are ideal for storing avulsed teeth long enough to bring them to the dentist’s office for replantation [1]. As these storage media also act as transport media to maintain the viability of avulsed teeth, the tooth should be fully submerged in any of the aforementioned liquids. However, storing avulsed teeth in regular tap water should be avoided, as prolonged exposure of the tooth root to water can harm the root surface cells and impact its ability to be replanted [6].

Splinting stabilizes a replanted tooth in its position while allowing functional movement. The three most common types of splints are rigid, semi-rigid, and flexible. The benefits and drawbacks of wearing a splint depend on the specific type being used [7]. Although rigid splints provide improved stability, they may damage the PDL if worn for too long [8]. Semi-rigid splints, which maintain sufficient PDL contact, may prevent the movement difficulties associated with fully flexible splints. The appropriate splint is selected based on the degree of displacement, tooth location, and clinician’s expertise [7]. It is essential to consider both the patient and the

Figure 1. Radiographic findings at the initial visit. (a and b) Periapical radiographs of the socket at different angulations prior to tooth reimplantation and (c) panoramic radiograph after splinting.

Figure 2. Periapical radiographs during the follow-up. At (a) 2 weeks; (b) 1 month; (c) 3 months; and (d) 8 months.
tooth when selecting a splint for an avulsed tooth. To maintain the viability of the PDL cells, balancing rigidity and the demand for mobility is essential since the latter might damage the partially rejoined PDL. In this patient, we used a passive flexible splint for 2 weeks, which is a sufficient period to stabilize the tooth in its position according to the IADT guidelines [1].

Ankylosis is defined as the fusion of the tooth to the alveolar bone after replantation due to direct contact of the root surface with the bone. Avulsion injuries might lead to ankylosis for various reasons [9]. Avulsion causes significant destruction of the PDL fibers. When these fibers are broken, the standard suspension mechanism that allows for tooth movement and stress absorption is lost, and ankylosis occurs [10]. Delaying replantation increases the risk of ankylosis, where the root fuses to the bone in the absence of the PDL. Ankylosis may severely weaken a tooth’s structure and impair its ability to function [11]. Because of the rigidity due to the loss of the PDL, an ankylosed tooth cannot withstand the occlusal forces experienced by a natural tooth. Therefore, the tooth is less resilient and more likely to fracture owing to its inability to adapt to its changing functional environment [12]. The tooth in this case report developed anklyosis, most probably due to loss of vitality of the PDL fiber, which can be expected from the metallic sound during the percussion test.

The avulsed tooth was vital according to the cold test and EPT; however, no increase in root length was noticed during the eight-month follow-up. Revascularization, the restoration of a tooth’s blood supply, is a complex procedure that relies on several factors. Revascularization following avulsion is more likely to be successful if treatment is started quickly [13]. Careful handling and the use of an appropriate storage medium may help maintain the viability of the PDL, which might speed up the revascularization process [14]. The success of these methods is crucial to the long-term health of replanted teeth. The chances of survival and successful long-term retention of a tooth improve if it suffers minor PDL damage, remains vital, and undergoes revascularization [15]. Conversely, PDL disruption, loss of vitality, and related difficulties may negatively affect the tooth’s stability and functioning.

Conclusion

The prognosis of avulsed teeth depends on receiving proper emergency care at the right time. Factors affecting successful replantation include the interval between avulsion and replantation. A proper storage medium is crucial in keeping the dental pulp and PDL viable. However, further studies are required to verify the effect of different storage media on pulp vitality. Further follow-up is needed in this case to evaluate the tooth development.

List of Abbreviations

PDL Periodontal ligament

Conflict of interest

Not necessary for this manuscript.

Funding

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Consent for publication

The legal guardian of the patient provided informed consent for the publication of this report.

Ethical approval

Ethical approval was received from the ethics committee of the College of Dentistry, Taibah University (protocol no. TUCDREC/240823/MAMirah), (dated: 27-08-2013).

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