

Management of Avulsed Tooth Using Platelet-rich Fibrin – A Case Report

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Abstract

Avulsion is defined as the complete removal of the tooth from its alveolus, and it is a severe form of dental trauma. It is accepted that replantation is the treatment of choice for avulsed teeth. Management of an avulsed tooth is a challenge to most of the clinician as it is the most unplanned dental visit and extraoral time plays the most vital role in saving an avulsed tooth. This case report focuses on the use of platelet-rich fibrin which is a living biomaterial derived from human blood containing fibrin, platelets, growth factors, leukocytes, and stem cells entrapped in a fibrin-based scaffold/matrix. Prompt management by the dentist can save the avulsed tooth and can promote physiological events of regeneration which in turn can increase the survival rate of avulsed tooth.

Key words: Avulsion, Platelet-rich fibrin, Replantation

INTRODUCTION

Tooth avulsion is a serious traumatic dental injury (total luxation, extrusion, or avulsion). It is a dental trauma that corresponds to the complete displacement of the tooth out of the alveolar bone socket.^[1] Avulsion of permanent teeth varies from 0.5% to 16% of all traumatic injuries, as it is one of the rare and serious dental injuries. The young population is the most affected and the maxillary central incisors are the teeth most often involved due to their exposed position in the dental arch.^[2] These injuries are more likely to occur in individuals 7–20 years old and generally occur more often in males than females.

The prognosis depends on the measures taken at the site of the accident, such as immediate replantation of avulsed teeth, the use of an effective preservation medium for the avulsed tooth, and timely and professional dental treatment

performed after avulsion. The occurrence of replacement resorption increases with extended periods of dry storage. Replacement resorption ranges from only 9.5% in teeth with short dry storage of below 15 min to 100% in teeth with dry storage exceeding 60 min.^[3] Aksel *et al.* established a prospective new clinical protocol to manage avulsed teeth based on the current progress of cell-based PDL regeneration studies.^[4]

This case report highlights the reimplantation of avulsed tooth using autologous platelet-rich fibrin (PRF) granules.

CASE REPORT

A 15-year-old girl visited the Department of Conservative Dentistry and Endodontics of Rishiraj College of Dental Sciences and Research Centre, Bhopal, with the complaint that her upper central incisor had completely fallen out 1 h prior due to a fall from a bicycle. The patient was examined for extraoral signs of injury, including swelling and asymmetry of the face. On performing clinical examinations, the extraoral findings revealed a minor laceration wound of the upper lip. Intraoral examination found that tooth 11 was missing, and the alveolar socket was empty. The crown of tooth 21 was fractured due to the trauma [Figure 1].

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www.ijss-sn.com

Month of Submission : 08-2023
Month of Peer Review : 08-2023
Month of Acceptance : 09-2023
Month of Publishing : 10-2023

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The avulsed teeth had been kept in milk, from the moment of trauma until the emergency visit 60 min late [Figure 2].

The crowns of the avulsed teeth were intact, and the roots had closed apex. An intraoral periapical radiograph revealed that the alveolar socket of 11 was empty and no high-density foreign body images were noted and a crown fracture was noted with 21 [Figure 3].

It was diagnosed as an avulsion of the maxillary central incisor and decided to replant the tooth by a newer protocol using PRF. The procedure was explained to the patient and informed consent was obtained. Local anesthesia was administered. The roots of the avulsed tooth and socket were cleansed using saline and betadine solution.

PRF was prepared from 10 ml of the patient's own blood from the median cubital vein and transferred the blood into 10 ml glass tube without anticoagulation [Figures 4 and 5].

The tube was centrifuged at 2700 rpm for 12 min. Obtained PRF was placed into the socket and the teeth were replanted, manually compressed to their original position and verified for their proper position using a radiograph. A composite splint was given to stabilize the tooth in alveolar socket for 4 weeks [Figures 6 and 7].

Post-operative instructions were given, and the patient was advised for soft diet and rinse twice daily with 0.2% chlorhexidine gluconate. The patient was prescribed antibiotics – amoxicillin 500 mg thrice a day (TID) for 5 days and analgesic ibuprofen 400 mg TID was prescribed for 5 days. After 10 days, root canal therapy was initiated on the avulsed tooth and on 21 since the patient developed severe pain. CaOH dressing was placed. After 4 weeks, splint was removed and mobility was checked which was absent and root canal treatment (RCT) was completed [Figure 8].

Post-operative composite restoration was done to build up the fractured fragment. A follow-up radiograph was taken after 6 months to assess the periradicular healing [Figure 9].

DISCUSSION

Most cases of avulsion occur as a result of trauma and commonly in the younger age groups.

The choice of treatment is related to the maturity of the root (open or closed apex) and the condition of the periodontal ligament (PDL) cells. The condition of the PDL cells is dependent on the time out of the mouth and on the storage medium in which the avulsed tooth was kept. Minimizing the dry time is critical for the survival



Figure 1: Pre-operative photograph



Figure 2: Milk as storage media

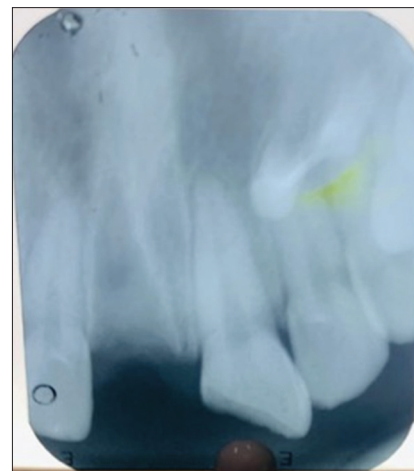


Figure 3: IOPAR showing avulsion with 11 and Ellis Class III

of the PDL cells. After an extra-alveolar dry time of 30 min, most PDL cells are non-viable. For this reason, information regarding the dry time of the tooth before replantation or before being placed in a storage medium



Figure 4: Collection of patient's blood



Figure 7: Radiograph after positioning avulsed tooth



Figure 5: Prepared platelet-rich fibrin



Figure 8: Obturation radiograph with composite restoration

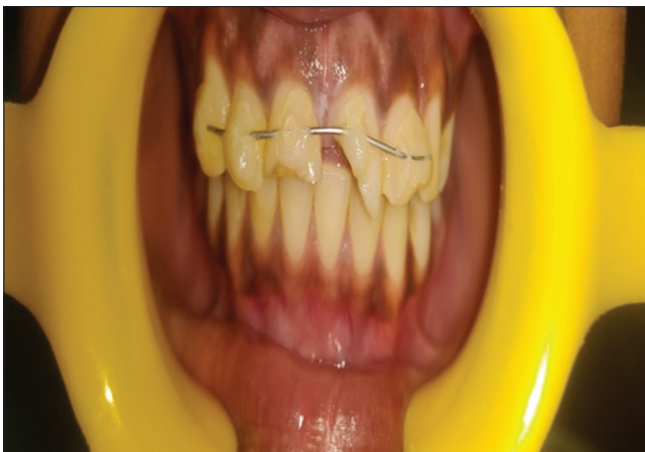


Figure 6: Replantation and splinting



Figure 9: 6-month follow-up radiograph

is very important to obtain as part of the history. From a clinical point of view, it is important for the clinician to assess the condition of the PDL cells by classifying the avulsed tooth into one of the following three groups before commencing treatment:

1. The PDL cells are most likely viable. The tooth has been replanted immediately or within a very short time (about 15 min) at the place of the accident.
2. The PDL cells may be viable but compromised. The

tooth has been kept in a storage medium (e.g. - milk, HBSS (save-a-tooth or similar product), saliva, or saline, and the total extraoral dry time has been <60 min).

3. The PDL cells are likely to be non-viable. The total extraoral dry time has been more than 60 min, regardless of whether the tooth has been stored in a medium or not.^[5]

The success and long-term prognosis of an avulsed tooth depend on the time lapse between avulsion and replantation. Incidence of the external root resorption (inflammatory/replacement) can be high and varies between 59% and 80% in patients with so-called correct replantation which is mainly due to storage of the avulsed tooth.^[6] Literature suggests that milk remains the correct balanced storage medium. It is the most relevant medium since it preserves the cells of the PDL for several hours and keeps them in good condition until replantation. A balanced salt and saliva solution also has the same effects as milk.^[7]

Avulsed teeth always require stabilization to maintain the replanted tooth in its correct position, provide patient comfort, and improve function.^[5,8] Current evidence supports short-term, passive, and flexible splints for stabilization of replanted teeth. Studies have shown that periodontal and pulp healing is promoted if the replanted tooth is subjected to slight mobility and function, achieved with stainless steel wire up to a diameter of 0.016" or 0.4 mm or with nylon finishing line (0.13–0.25 mm), and bonded to the teeth with composite resin. Replanted permanent teeth should be stabilized for a period of 2 weeks depending on the length and degree of maturation of the root. An animal study has shown that more than 60% of the mechanical properties of the injured PDL return within 2 weeks following injury.^[5] However, the likelihood of successful periodontal healing after replantation is not likely to be affected by splinting duration.^[5]

When endodontic treatment is indicated (teeth with closed apex), treatment should be initiated within 2-week post-replantation. Endodontic treatment should always be undertaken after isolation with the dental dam. This may be achieved by placing the dental dam retainer on neighboring uninjured teeth to avoid further trauma to the injured tooth/teeth. Calcium hydroxide is recommended as an intracanal medicament for up to 1 month followed by root canal filling.

Prospective new clinical protocol for the management of avulsed tooth proposed by – Aksel *et al.*^[4]

- Extraoral time is <1 h and the tooth is kept wet. Immediate replantation along with PRF is advised.
- Extraoral time is more than 2 h but <7 days and the

tooth is kept wet. RCT should be done followed by replantation with PRF. The outcome of this situation is certainly less favorable.

- Extraoral time is <7 days but the tooth is dry. RCT followed by cell-mediated therapy is the only optimal way.
- Extraoral time is more than 7 days either tooth is kept wet or dry; RCT followed by cell-based therapy is the only option.
- Extraoral time is longer than weeks, either kept wet or dry. RCT is followed by creating socket space, which by then has been filled with granulation tissue or immature bone, for the cell-based replantation procedures.

In this present case, the avulsed tooth was kept in the milk and the time lapsed was 60 min. This was a favorable condition as the apex of the root was closed. The avulsed tooth was reimplanted immediately to minimize the extraoral time and RCT was performed intraorally after a week.

PRF has been used to regenerate the PDL cells which is a 2nd-generation platelet concentrate and it has the ability to enhance tissue regeneration, accelerate wound healing, and induce stem cell differentiation through its growth factors. Therefore, in this case, PRF was used to improve the success rate of avulsed teeth.

CONCLUSION

Delayed replantation of an avulsed tooth was not considered an ideal treatment option to date but the use of superior biomaterials can increase the survival rate and better outcomes can be achieved. PRF is one of the superior biomaterials that promote physiological events of regeneration and is ideal for such treatment modalities.

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How to cite this article: Hema BS, Chakkarwar YR, Jain S, Gautam M, Saify M, Mewada P. Management of Avulsed Tooth Using Platelet-rich Fibrin – A Case Report. *Int J Sci Stud* 2023;11(7):5-9.

Source of Support: Nil, **Conflicts of Interest:** None declared.