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Case Report

Delayed replantation and reattachment of avulsed and fractured fragment of central incisors – Resurrecting the original

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ABSTRACT

While managing cases of trauma, the main goal is to effectively manage pain while promptly restoring function, appearance and phonetics. Even though all injuries require some sort of rapid care and management, tooth avulsion, is a unique type of injury where the prognosis is related to the amount of time that passes between the time the tooth is avulsed and when it is replanted. Excellent prognosis of avulsed tooth is achieved with immediate transplantation of the tooth, albeit this may not always be feasible. Even if delayed, replantation still remains the better option for management of avulsed tooth instead of replacing the natural tooth with an artificial one.

Another such ultraconservative procedure that yields rapid, safe, and aesthetically acceptable outcomes for fractured tooth fragment management is reattachment; which is done with the help of advanced adhesive materials.

The present case shows delayed replantation of avulsed maxillary central incisor and reattachment of the fractured tooth fragment of a 20 years male patient having a history of trauma 10 hours back with one year follow-up.

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1. Introduction

Anterior tooth trauma is an unpleasant event in young patients that requires immediate management due to the potential psychological effects on the patient as well as parents and damage to dentition and the surrounding structures.¹ Approximately 37% of cases of trauma involve the maxillary central incisors due to their anterior positioning and protrusion.² These traumatic injuries may be categorized as concussion, subluxation, lateral luxation, intrusive or extrusive luxation and avulsion.³

Avulsion or exarticulation is defined as complete extrusion or displacement of a tooth from its socket⁴ and accounts for 0.5 -16% of all permanent tooth injuries.⁵ Permanent dental avulsions are typically caused

by falls, conflicts, abuse and sports injuries⁶ and successful outcomes in such cases can be achieved through immediate replantation, however it requires efficient time management and adequate storage of the avulsed tooth.⁷

Fractured teeth have been rehabilitated using a variety of strategies and procedures such as orthodontic bands, composite build up, porcelain jacket crowns, post and core, etc.⁸ With the availability of the fractured segment, reattachment can be cost-effective and conservative procedure⁹ that reinstates the patient's positive emotional and social reaction to the preservation of their natural tooth structure.¹⁰ It also helps to restore the fragment's natural shape, contour, translucency, surface texture, occlusal alignment and colour.²

This case report would discuss the management of avulsed and fractured maxillary central incisors by replantation and reattachment procedure respectively.

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2. Case Report

A twenty year old male patient reported to the Department of Conservative dentistry and Endodontics with trauma to maxillary anterior region 10 hours back while playing. Patient's medical history was non-contributory. Clinical examination showed laceration and swelling in upper lip, Ellis class V fractures in 11 and Ellis class IV fracture in 21 (Figure 1). The patient had brought an intact, avulsed 11 and the fractured fragment of 21 (Figure 2a,b) to the hospital immersed in water. OPG radiograph (Figure 3) revealed no evidence of fracture lines in the alveolar bone or presence of root fractures in 11 and 21. Potential treatment options (with their pros and cons) were discussed with the parents and due to their priority to retain natural teeth, informed consent was obtained for delayed replantation of 11 and reattachment of fractured fragment of 21.



Figure 1: Pre-operative intraoral view showing Ellis class V and IV fracture in 11 and 21 respectively

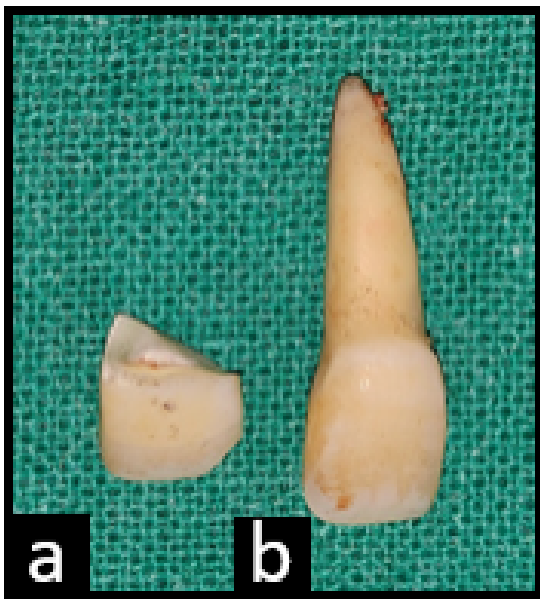


Figure 2: a: Fractured fragment of 21; b: An intact, avulsed 11



Figure 3: Pre-operative OPG

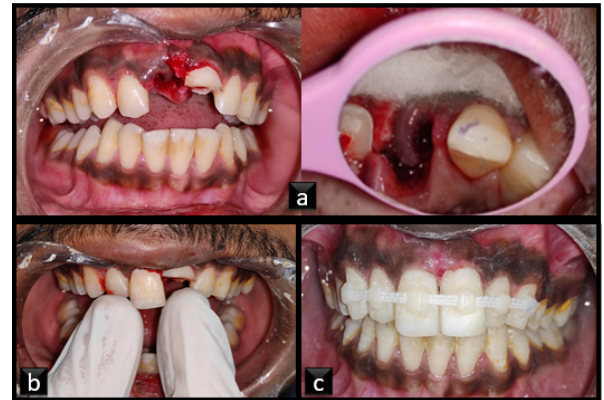


Figure 4: Reimplantation: a: Pre-operative view; b: Replantation of avulsed tooth using mild digital pressure; c: Ribbon splinting of avulsed tooth.

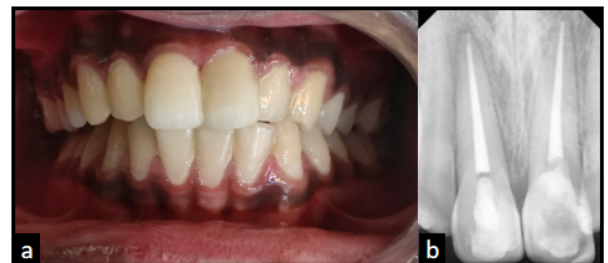


Figure 5: Post-operative: a: Clinical view; b: Radiograph



Figure 6: Fracture reattachment of 21; a: Pre-operative intraoral picture; b: Placement of dentinal grooves; c: Intraoral picture after reattachment of 21



Figure 7: 1 year follow-up; **a:** Clinical view; **b:** Radiograph (no evidence of root resorption/ankylosis)

2.1. Delayed reimplantation of 11

Since the extraoral time exceeded 2 hours, the decision was made to perform delayed reimplantation of the tooth initially, before proceeding with splinting and root canal treatment.

The avulsed tooth was thoroughly cleansed with running water to eliminate any residual necrotic periodontal ligament and debris attached to it. Physiologic saline solution was utilized to gently debride the alveolar socket to eradicate any coagulum and granulation tissue. Avulsed tooth was immersed in 2% sodium fluoride for 20 min after which the tooth was gently repositioned into its socket with the aid of finger pressure (Figure 4a,b). The tooth was assessed for its occlusion and alignment after being placed and was subsequently splinted to the adjacent teeth using ribbon flexible splint from canine to canine (Figure 4c) with the use of composite resin technique for four weeks. Antibiotics and analgesic were prescribed for five days.

2.1.1. Root canal treatment

The patient was recalled after one week and root canal treatment was performed on the replanted tooth. Following the administration of local anaesthesia, access opening was done and the working length was determined using #15 K file (Dentsply Maillefer, Ballaigues, Switzerland). Calcium hydroxide intracanal medicament was placed after performing cleaning and shaping of the root canal for 1 week. In the recall visit, the obturation and post endodontic restoration was done. On removal of splinting after a 4-week period (Figure 5), only physiologic mobility was observed.

2.2. Reattachment of 21

Single visit root canal treatment was completed in 21 before reattaching the fragment. The tooth fragment was examined for approximation with fracture line and positional stability. Using a round bur, two dentinal grooves (1.0-1.5 mm) were created (Figure 6a,b) on both the tooth and its fractured fragment. Chamfer margins were created on the fractured tooth across the fracture line. Both the tooth and the fragment were etched with 37% phosphoric acid for 15 sec. After rinsing and drying, dental adhesive was

applied, fragment was repositioned and cured for 20sec. This was followed by application of flowable composite resin (Brilliant NG, Coltene Whaledent Inc., USA) in the grooves, chamfer margin and across the fracture line. Excess composite material was removed and finishing and polishing was completed thereafter (Figure 6c).

The clinical and radiographic examination revealed no evidence of root resorption, ankylosis or increased mobility in 11 and 21 at one year follow-up (Figure 7).

3. Discussion

The most suitable course of therapy of avulsion is generally agreed to be immediate reimplantation. However, for a variety of reasons, this might not always be feasible. The International Association of Dental Traumatology (IADT) (2017) states that patients who undergo delayed reimplantation of an avulsed closed apex tooth with a dry duration of more than 60 minutes have a bad long-term prognosis.¹¹ The extra-oral time directly correlates with PDL cell survival and has a substantial impact on the result.¹²

The teeth in the present case was stored in water by the patient and the extra-oral dry period exceeded sixty minutes. However, reimplantation was chosen as the treatment of choice.

Reimplantation can minimise physiological harm that could be brought on by an anterior tooth loss, as well as restore the patient's occlusal function and aesthetics. Other treatment options may have included prosthetic replacement of the lost incisor, space closure with orthodontic treatment or autotransplantation of another tooth.¹³ However, all these would required time, expenditure and delayed treatment.

According to IADT recommendations, root canal therapy should be started within two weeks following reimplantation as the necrotic pulp and its toxins may enter the periodontal ligament through different exit portals, therefore accelerating the process of resorption. Previously, extra-oral root canal treatment was recommended in case of delayed reimplantation. However, recent guidelines advice intraoral RCT since it reduces the extraoral time and related risk factors. In this case, calcium hydroxide was placed as intracanal medicament for one week. Calcium hydroxide is recommended as intracanal medicament in such cases since it aids in lowering the likelihood of root resorption associated with reimplantation by inhibiting bacterial enzymes and activating alkaline phosphatase which promotes mineralization.¹⁴

Splinting is preferred to maintain the reimplanted teeth in proper position. Since rigid splints have demonstrated to hasten root resorption in both mature and immature teeth,¹⁵ ribbon splint which is a flexible splint (semi rigid) is recommended in such cases.

Prognosis of delayed replantation is questionable as it may lead to ankylosis or replacement resorption. Lopes

LB et al¹⁶ and Rai A et al¹⁷ presented the case of delayed replantation of avulsed incisor with extra-oral dry time of 16hr and 72hrs which shows signs of resorption after 4yrs and 6 yrs follow-up.

However, some cases of delayed replantation have also shown successful outcomes, Harris A et al¹⁸ and Chalakkal P et al¹⁹ presented similar cases in which delayed replantation of avulsed tooth (with extra-oral dry time of 48hrs and 10hrs respectively) have shown successful outcome after 2yrs and 5yrs follow-up, thereby referring that replantation still remains a better option in any case of avulsion, be it immediate or delayed. Therefore, decision on treatment plan in such cases should be made depending upon clinical factors, economical factors and patient related factors.

Reattachment was preferred in 12 for restoring the fractured tooth fragment. The longevity of the fragment reattachment has been shown to be influenced by a number of parameters, including the technique of reattachment, the adhesive materials used, the presence or absence of an intermediary material, fragment's rehydration before reattachment and the preparatory designs employed.²⁰ Clinicians can now predictably reattach fractured teeth using advanced adhesive materials, placement techniques and preparatory designs e.g. use of chamfer margin, groove etc.²¹ Adhesive dentistry has made such biological restorations easier, predictable and more durable due to newer adhesive materials with increased bond strength. Benefits of reattachment include preserving the natural tooth, better fit with good colour matching with the remaining fragment of the crown, preservation of high aesthetics and incisive translucency with preservation of the natural tooth shape and less chair- side time.²²

Devi AG et al in his case series on reattachment of tooth fragment showed successful outcomes after 12 and 18 months follow-up when reattachment was done by beveling enamel or dentinal groove placement.²³ Additionally, reattached fragment may also be retained by retentive holes or fiber post. AlQhtani FA et al showed a successful 15 months follow up where retentive holes were used to retain fractured fragment.²⁴ Sapna CM et al²⁵ and Choudhary A et al²¹ reported a case with 1yr and 20 months follow-up where fiber post was used for reattachment.

4. Conclusions

In permanent dentition, replantation in avulsed tooth can minimize physiological harm that could be brought on by an anterior tooth loss, by immediately restoring the patient's aesthetics. However delayed reimplantation requires careful consideration and long term follow-up. Similarly, when the fractured fragment is accessible, the tooth fragment reattachment treatment provides an ultraconservative, safe, quick, and aesthetic solution.

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None.

6. Conflict of Interest

None.

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