

Nine Years of Evolution of a Clinical Case of Avulsion of a Permanent Tooth

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ABSTRACT:

Introduction: A clinical case involving a 13-year-old boy with dental avulsion of his right upper central incisor and a concurrent soft tissue lesion on the lip is presented. The initial treatment involved lip suturing and reimplantation of the avulsed tooth, followed by splinting and bonding for a specified duration. **Methods:** Following the initial treatment, a control x-ray at the six-month mark revealed a radiolucent image at the tooth apex, prompting a decision to proceed with root canal treatment. Subsequently, after a period of nine years, the reimplanted tooth exhibited shortening and darkening, though its function remained unaffected. **Results:** Despite the observed changes in tooth appearance over the nine-year period, the functionality of the reimplanted tooth was not compromised. The treatment approach involving reimplantation and subsequent root canal treatment proved effective in preserving dental function and aesthetics. **Conclusion:** The findings suggest that reimplantation of a permanent tooth following avulsion can serve as an effective long-term treatment strategy. This approach not only preserves dental function and aesthetics but also delays the potential need for implant or prosthesis placement. Therefore, it should be considered as the primary therapeutic option in cases of dental avulsion, emphasizing its role in achieving favorable long-term outcomes.

Key words: dental avulsion, reimplantation

Introduction

Dental avulsion is the total expulsion of a tooth from its socket due to the rupture of the periodontal ligament, which leaves cells remaining attached to the root surface¹. It is rare in dental consultations, as it represents 0.5-3% of dental injuries^{1,2}. The age of highest incidence is between 7-14 years, especially before the age of 10 and the most frequently affected teeth are the upper central incisors^{1,3}. The etiological factor is mainly trauma caused by fights or sports activities. In addition, there are individual traits such as proinclined incisors, lack of lip seal, and increased overjet which increase the risk of this event³

Clinical case

A 13-year-old male Caucasian patient, with no relevant medical history, suffered trauma playing soccer in the schoolyard with a wound on the lip that affected the vermilion border and the oral mucosa. Also, he had suffered an avulsion of his upper right central incisor less than thirty minutes ago (Figure 1. Avulsion of the upper right central incisor and injury to the lip). The patient brought the avulsed tooth inside his mouth in the mandibular buccal vestibule.



Figure 1. Avulsion of the upper right central incisor and injury to the lip, Figure 2. lip wound

Local anesthesia was used in the area (4% articaine with 1:200,000 epinephrine) and the soft tissue was cleaned with 2% chlorhexidine. The tooth was washed with saline solution, holding it by the crown to avoid damage of periodontal

ligament fibers. The socket was lightly cleaned with water and suction and the tooth was reinserted in the correct position. The lip wound was sutured with 5-0 silk suture (Figure 2. Lip wound.). Finally, the tooth was splinted with a titanium alloy wire (Bond-a-Braid from Reliance®) and composite (Flow Tain from Reliance®) to the adjacent teeth (Figure 3. Incisor splinted to adjacent teeth with titanium arch). A periapical x-ray was performed to verify the correct placement of the tooth (Figure 4. Periapical radiography immediately after splinting). During the first 7 days, Amoxicillin 500 mg, Ibuprofen 400 mg, and 0.2% chlorhexidine rinses were prescribed.

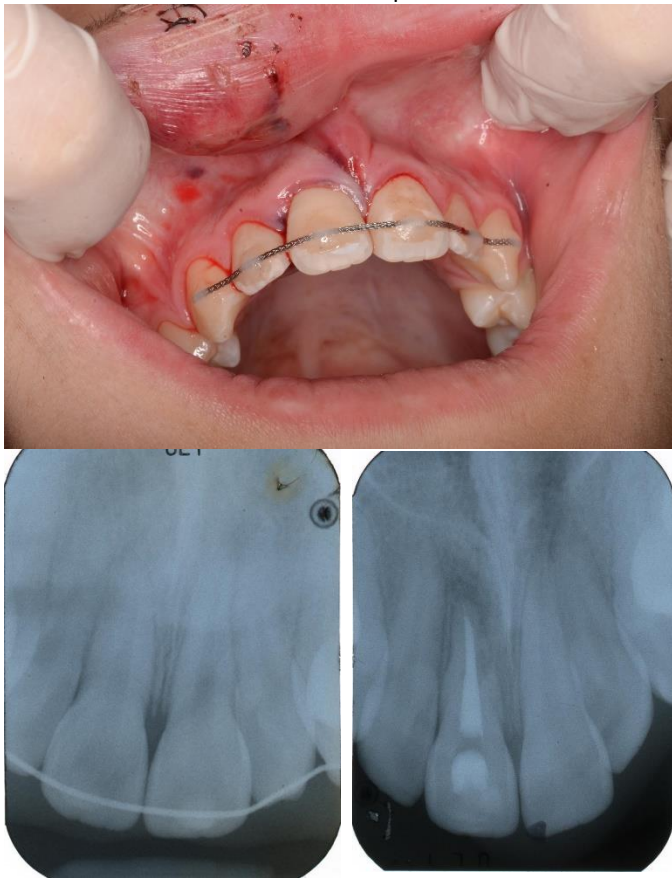


Figure 3. Incisor splinted to adjacent teeth with titanium arch.

Figure 4. Periapical radiograph immediately after splinting, Figure 5. Periapical radiography after root canal treatment. Figure are organized from left to right

In the first follow-up appointment the suture was removed. After 14 days, vitality tests were performed, obtaining positive results. Therefore, the root canal treatment was not performed, and the splinting was removed. The patient was scheduled for review in a month to repeat vitality tests that again tested positive. The control x-ray six months later, showed a radiolucent image at the apex of the tooth. Therefore, we decided to perform a root canal treatment (Figure 5. Periapical radiography after root canal treatment). Annual follow-up appointments were carried out, and two

years later a 1mm intrusion of the reimplanted incisor was observed. In the 9-year follow-up appointment, this intrusion was very evident in both the incisal and cervical areas (Figure 6. Intrusion and discoloration of the upper right central after nine years). A periapical x-ray was taken, and no image was observed although the root was shorter than the contralateral incisor (Figure 7. Periapical radiography after nine years). There was also a slight darkening of the tooth that remained asymptomatic. The patient was referred to the orthodontist and began orthodontic treatment with dental aligners.



Figure 6. Intrusion and discoloration of the upper right central after nine years, Figure 7 Periapical radiography after nine years. Figure are organized from left to right

Discussion

Reimplantation delays the need for a dental implant or prosthesis⁴. For the periodontal cells to maintain their vitality, the tooth must remain hydrated, and the root must not be manipulated. The most suitable means of transport are Hank's balanced salt solution, conventional saline solution, milk, the patient's saliva, or water^{1,2}. However, water is the least recommended since it produces cell lysis and increases inflammation⁵. In the clinical case presented, the means of transport was the patient's mouth on the advice of his teacher. It is not ideal due to the osmolarity of the saliva and its high bacterial content.

To keep the tooth in its position, once reimplanted, it is splinted to the adjacent teeth using a flexible wire to allow physiological movements. According to the International Association of Dental Traumatism (IADT), this should be maintained between 7-14 days after reimplantation^{2,3}. The splint should be placed on the buccal surface of the tooth to allow free access to the lingual surfaces for endodontic treatments and to avoid occlusal interference².

There is strong evidence that early replanted immature teeth have the potential for revascularization⁶. Therefore, root canal treatment should be avoided unless there is evidence of pulpal necrosis². If revascularization of an immature tooth does not occur, the therapeutic alternative will be apical formation and root canal treatment of the tooth⁶. When extraoral time is minimal, periodontal healing will occur. If a root canal treatment is indicated, the optimal time to perform it is 7-10 days after reimplantation. Even though the apex could be considered closed due to our patient's age, we attempted to

achieve revascularization. The patient at all times referred to response to cold tests, which is why the endodontic treatment was not performed before. During the root canal treatment procedure, the pulp showed signs of being necrotic. Therefore, cold vitality tests gave false positives. Reimplantation of avulsed teeth in growing children can lead to a position of infra occlusion as they grow. This was observed in our patient.

In general, the prognosis is poor, with up to 96% of the teeth being lost⁷. The lower the root maturity, the greater the success. The main complications are inflammatory root resorption and/or ankylosis^{3,4,8}. Discoloration of the crown may also occur. This may be related to cases in which endodontic treatment is not performed early. In our case, the patient had some discoloration, however, he was not concerned.

Multiple factors determine the success of the treatment, the most decisive being the extraoral dry time, which should be as short as possible. The theoretically estimated time to ensure 100% success is 5 minutes, although in practice it can be up to 15-20 minutes^{1,2}. Between 20-60 minutes after the trauma, resolution will be a challenge, so it may be viable but with a compromised prognosis^{1,2}. After 60 minutes of extraoral dry time, it is considered that the time limit has been exceeded and the survival of the periodontal cells is unfeasible since the fibroblasts do not survive more than this time^{1,2,9}. However, several clinical studies have shown that reimplanted teeth with a time between 6 and 48 extraoral dry time, have shown long-term survival¹⁰. The objective in these cases is to delay root resorption as much as possible. Before reimplantation the root must be prepared by immersing the tooth in different substances proposed. One of them is 1% sodium hypochlorite, this will remove the periodontal ligament from the root surface which, if not removed, would cause inflammation at the time of reimplantation¹¹. According to the American Association of Endodontics (AAE), when there is more than 60 minutes of extraoral dry time, the necrotic periodontal ligament must be removed from the root surface by immersing the tooth in 2% sodium fluoride solution for 20 minutes and then in saline solution⁶. Emdogain has been recommended to be applied in the surface of the root. This protein of the enamel matrix could provide greater resistance to resorption by applying it to the tooth surface and alveolus. There is some controversy among authors about its beneficial effect¹². Yang¹³ proposed the use of platelet-rich plasma for these teeth that have been out of the socket for hours.

Post-treatment indications are to avoid contact sports, a soft diet for two weeks, and the use of a soft toothbrush^{2,3}. Antibiotic coverage with Amoxicillin 500mg 3 times a day (in children 50mg/kg/day) or Doxycycline 100mg 1 time a day (2mg/kg/day) is usually prescribed for a week¹⁴. The patient must have been vaccinated against tetanus and must attend periodic follow-up appointments after reimplantation³.

Conclusion:

In cases of dental avulsion, rapid treatment is a priority. The extraoral dry time, the conservation medium, adequate splinting, and the degree of maturity of the tooth are decisive for the long-term survival of the tooth.

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