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Delayed Replantation Of Avulsed Tooth In A 10-Year-Old Boy: A Case Report

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Abstract
Dental avulsions, complete dislocation of tooth from the socket, account for up to 3% of all dental injuries, most common in children between the ages of 8 and 11. Replantation is the treatment required, whose success depends on Extra alveolar time, storage media, Surface treatment of root surface of avulsed teeth prior to replantation. The case report describes avulsion of tooth 21, and delayed replantation of tooth after 60 minutes. The tooth was brought wrapped in handkerchief. After surface treatment with citric acid and fluoride the tooth was replanted. Ankylosis was not observed at 18 months follow-up.
Keywords: *Tooth Avulsion, Delayed Replantation, Citric acid, Fluoride, Splinting*

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I. Introduction

Dental avulsions, which account for up to 3% of all dental injuries, are most common in children between the ages of 8 and 11.[1] A few contributing variables are the partial development of roots, alveolar bone, and the periodontal ligament's (PDL) inadequate resistance to extrusive forces during tooth eruption. Periodontal ligament (PDL) cell viability has a major impact on the prognosis of avulsed teeth.[2,3] If PDL cells are allowed to dry up, they may cause inflammatory reactions after replantation. Bacterial contamination resulting from necrotic pulp can also result in exterior inflammatory resorption. Extended periods of extra-alveolar time longer than sixty minutes might cause necrotic PDL. It is acknowledged that a child's avulsed tooth must be replaced, even with a dismal prognosis. Replantation of avulsed tooth of a 10-year-old patient offers an understanding of the clinical and radiological observations made during the period. The results are intended to provide important insights into the course of treatment and possible side effects of proposed replantation in paediatric patients.

II. Case Report

A 10-year-old patient's main complaints when they came to the Outpatient Department (OPD) were that he had lost his tooth (tooth 21) and had cut his mouth after falling on the playground, which had resulted in tooth avulsion **(Fig 1)**. The avulsed tooth was picked up from the ground, wrapped in a handkerchief, and brought to the OPD about 60 minutes after the incident.

Intraoral examination: revealed missing 21 with laceration of adjoining gingiva, mixed dentition stage and permanent canine unerupted.

Extraoral examination: there was no visible fractures in the facial bones, neither any lacerations on the lips, chin, or nose.

Radiographic features: Periapical and panoramic radiography exams were carried out to finish the examination. CT scan of facial bones was also carried out. There were no hard tissue damage or fractures of the alveolar bone wall found in the results.

Treatment protocol:

Preparation for replantation: - After the parents were advised of the potential risks of delaying replantation, the roots were gently scraped with a scaler to remove the necrotic periodontal ligament (PDL) tissues from the root surfaces of the avulsed teeth. The tooth was cleaned with normal saline and 2.5% NaOCl. Then, it was dipped in 3% citric acid for 3 minutes. Ater rinsing again with normal saline, it was submerged in a 2% NaF solution for 5 minutes **(Fig 2)**.

Replantation and post-operative procedure: - Under local anaesthesia, socket was gently cleaned with a saline rinse and the tooth was carefully replanted into its original place with light finger pressure **(Fig 3a, 3b)**. Socket were then sutured **(Fig 3c)**, and radiograph taken to confirm the position of the teeth. A flexible splint was placed and left in place for four weeks. (Fig 4a)

Post-operative care: - Systemic antibiotic medication, amoxicillin three times a day for five days. The patient was advised to use a toothbrush with soft bristles and to maintain good oral hygiene. A mouthwash containing 0.12% chlorhexidine was also recommended for a period of two weeks.
Root Canal Treatment was initiated at the one-week post-replantation follow-up.

Necrotic pulp removed; irrigation done with 5%NaOCl. Intracanal calcium hydroxide placed, repeated a week later, and the canals were obturated with gutta-percha and resin sealer subsequently. Four weeks after the replant, the splint was taken out.

Follow-up examination was done every month for one year. On percussion hollow sound of ankylosis was not observed. (Fig 4b)

Radiographic assessment: - During the follow-up period, periapical and cone-beam computed tomography (CBCT) tests were conducted sequentially to check for root resorption. There was no sign of root resorption in the radiographic examinations.

Periodontal assessment: Periodontal stability was determined by periodontal probing, which showed no discernible loss of periodontal bone and no gingival irritation or bleeding upon probing.

III. Discussion

The best course of therapy for a permanent tooth that has been avulsed is prompt and urgent replantation. Viability of PDL and maturity of root apex, open or closed are the primary determinants of success of treatment. Storage medium and the amount of time the tooth is kept outside the oral cavity also have an impact on PDL cells' survival. [1,2,3] Rapid replantation within 5 minutes, as highlighted by Andreason's 1990 research, ensures the most favourable prognosis, while dry durations surpassing sixty minutes render all PDL cells nonviable. [4,5]

Although the right storage media such as saline, milk, saliva, or Hank's Balanced Salt Solution (HBSS) is essential for viability of PDL, the present case had multiple drawbacks. The tooth was brought wrapped in handkerchief 60 minutes after the incident, The patient was in mixed dentition stage, the jaw bones were in a developing stage. Considering cosmetics and psychological trauma as well as preservation of bone, replantation was decided. As suggested by many authors like Trope M et al,[6] and Finucane D et al. [7] The main concern of tooth with delayed replantation was inflammatory root resorption, caused by microbes in necrotic pulpal and periodontal tissues which induce osteoclastic activity, resulting in external root resorption. Thus, the goal of therapy is to remove non-viable periodontal ligament (PDL) fibres and pulpal tissue responsible for inflammatory resorption. [6,8]

Tooth was retrieved from the ground. So essential cleaning and disinfection were needed. Following guidelines of Donaldson M et al. 2.5% sodium hypochlorite was used to clean the root surface to reduce the risk of infection-related resorption.[8] It was noted from previous studies that dry storage above 60 minutes resulted in replacement resorption (ankylosis). If ankylosis occurs after replantation, it often affects the growth of the alveolar ridge and the eruption and position of the adjacent teeth. [7,8,9] Therefore, the aim was to prepare the tooth to delay osseous replacement of the root. Tooth surface was scrapped with a scaler and dipped in 3% citric acid for 3 minutes. Citric acid demineralized the root surface and exposed the collagenous matrix of the root surface which acts as a substrate for mesenchymal cells as well as inhibit bacterial adhesion. Areas of ankylosis and replacement resorption was also noted in tooth treated with citric acid as reported in studies by Skoglund A (1991).[10]

The tooth was rinsed with normal saline again, then immersed in a 2% sodium fluoride (NaF) solution for 5 minutes only to reduce extra alveolar time. Avulsed teeth were immersed in a 2% acidulated fluoride solution for five minutes by Harris A et al. with favourable result.[11] Andreasen L et al, immersed teeth in a 2.4% acidulated sodium fluoride solution (pH 5.5) for 20 minutes.[1] It was assumed that demineralized dentin surface would be more prone to fluoride incorporation and might become more resistant to resorption. Fluoride directly acts on the bone tissues, cementum, and dentin, by converting hydroxyapatite into fluorapatite.[12]

After insertion in the socket, the tooth was splinted with fibre splint using composite resin. It has been shown that a splinting technique that allows physiologic movement of teeth during healing, and that is in place for a minimal time results in a decreased incidence of ankylosis. Also forces needed to apply the splint were much less stressful. After 7 days, primary inflammation subsided, sutures were removed. Splint was retained which was removed after 4 weeks. International Association of Dental Traumatology (IADT) guidelines instructs RCT to be initiated within 2 weeks of replantation.[4] The pulp becomes necrotic due to injury. Toxins from necrotic pulp may gain access to the periodontal ligament through various portals of exit such as places of cemental destruction, thus contributing to the process of aggressive external root resorption. In the past, it was advised to perform root canal therapy extra-orally before replantation. However, the current guidelines recommend root canal therapy be performed intra-orally. This minimizes the extra-oral time and associated risk

factors. [1,3,7,13,14]

In this case, endodontic treatment was initiated one week after replantation followed by placement of calcium hydroxide intracanal medicament for one week. Calcium hydroxide has antimicrobial effects, inhibits bacterial enzymes, activates tissue enzymes such as alkaline phosphatase, and stimulates mineralisation; thus, helping in thorough disinfection and reducing the chances of replantation-associated root resorption. Although the current guidelines recommend placing calcium hydroxide for a longer duration of four weeks, it has been shown to have similar efficacy when placed for a shorter duration in the absence of pathology.[15] Obturation was done after 1-week using gutta percha and resin sealer. Splint was removed after 4 weeks. Tooth became stable, it was observed every month for 1 year. On percussion hollow sound of ankylosis was not observed, permanent canine erupted, following shedding of deciduous teeth.

IV. Conclusion

In this case, contamination was tried to be controlled by means of periodontal, endodontic treatment and systemic antibiotic therapy, inflammatory root resorption might also be prevented, but the occurrence of ankylosis and replacement resorption was expected because of the loss of the PDL. However, it was not recorded after 18 months follow-up (Fig4b). Even with extended extra-alveolar dry storage, delayed dental replantation preserves adequate alveolar bone for future functionality and stability, particularly in young patients until after the growth spurt associated with puberty. To confirm that tooth avulsion treatment has been successful, regular follow-up is essential.

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Figures And Legends

Fig 1: Tooth avulsed from socket

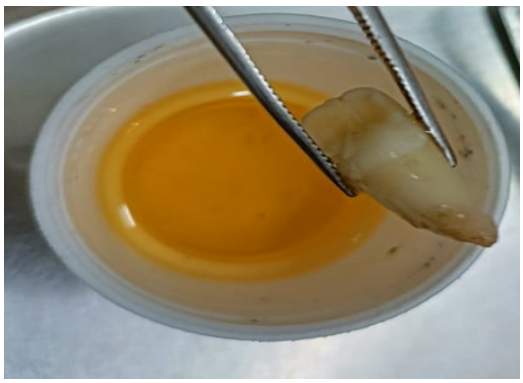

Fig 2: Pretreated tooth with normal saline, 2.5% NaOCl3% citric acid and 2% NaF

Fig 3a: Socket irrigated with normal saline; Fig 3b: Tooth placed in socket; Fig 3c: Socket sutured

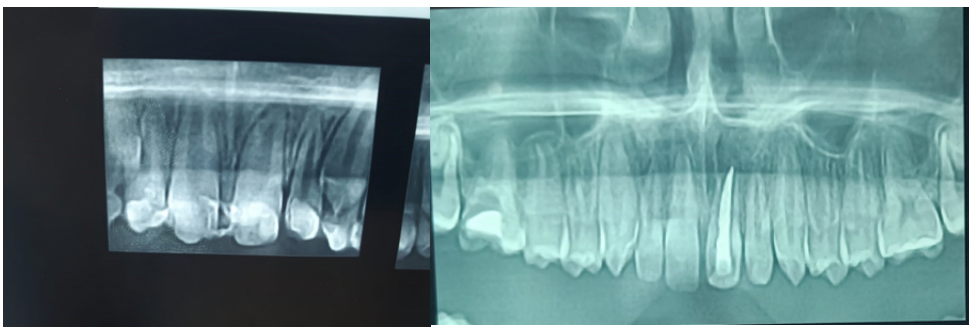

Fig4a: Tooth Replanted, Splinting Done Deciduous Canine Unerupted
Fig4b: 18 months follow up, canine erupted.