

Case Report

Replantation of an avulsed permanent anterior tooth

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ABSTRACT

This case report describes a case of avulsed left maxillary central incisor tooth which was replanted in the dental office. The tooth was gently rinsed of any debris and placed in normal saline during the examination and preparation of the replantation socket. The tooth was replanted and functionally splinted. The following week the tooth was opened for pulp extirpation and placement of calcium hydroxide. Two weeks later, the root canal was filled with gutta-percha and zinc oxide eugenol sealer, and the access cavity was restored with a bonded composite restoration; the splint was removed. Two year clinical and radiological follow up of the case showed ankylosis and infraocclusion of the replanted tooth

Introduction

Avulsion or exarticulation occurs when a traumatic injury totally displaces a tooth from the socket.¹ Traumatic injuries are quite common. Unfortunately, no valid statistics is available regarding this in our country. According to the National Clinical Guideline of The Royal College of Surgeons, England, the incidence of traumatic avulsion of teeth has been reported as 0.5-16% of all traumatized teeth. Upper central incisor teeth are most frequently avulsed, and in the age group 7-9 years.² The common cause of injury are falls, collisions and accidents during common childhood activities such as contact sports, cycling, swimming, fight etc.³

Pathophysiology lies in the fact that extrusive forces impinging on the teeth, when severe enough, can cause a tooth to be displaced out of its socket. For this to happen, the periodontal ligament would have ruptured with remnants remaining on the cementum of the root of the tooth and the inner walls of the alveolar socket. The vessels entering the pulp through the apical foramen would also have been severed with cessation of blood supply to the pulp. The extent of injury sustained by the periodontal ligament and the pulp, and the subsequent healing of these tissues will depend on the extra-alveolar period i.e. the time remains out of its socket and the handling of the tooth.³

Treatment is directed at avoiding or minimizing the resultant inflammation from the two main consequences of the avulsed tooth-namely, attachment damage and pulpal infection.⁴ The best outcome for a tooth avulsion is when the tooth can be replanted

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within a few minutes after the accident. A very high percentage of teeth replanted within 15 minutes will have the PDL restored within a few weeks.⁵

The present case report describes the management of an avulsed permanent anterior tooth by replantation and functional splinting followed by endodontic treatment.

Case Report

A 16-year old boy lost his maxillary left central incisor tooth in a bicycle accident. The available tooth was not replanted on site, but brought to the dentist 15 minutes after accident. The patient was unaware and transported the tooth in a tissue paper. In the dental wing, CMH, Dhaka, the tooth was gently rinsed of any debris and placed in normal saline during the examination and preparation of the replantation socket. The tooth was replanted and splinted with a soft 0.5 SS wire bonded with glass ionomer cement. Radiograph was taken after replantation. Systemic antibiotic and mild analgesic was prescribed, sent to physician for consultation regarding tetanus booster.

The following week the tooth was opened for pulp extirpation and placement of calcium hydroxide. The splint was left in place. Two weeks later; the root canal was filled with gutta percha and zinc oxide eugenol sealer using lateral condensation technique. The access cavity was restored with a bonded composite restoration; the splint was removed. At one month, clinical and radiological follow up-good healing of the soft tissue surrounding the replanted tooth was evident

Patient was recalled after three months for clinical and radiological evaluation. His maxillary right central incisor tooth was diagnosed as pulp necrosis and treated endodontically. At one year follow replacement resorption and infraocclusion was noticed on maxillary left central incisor tooth. The patient was informed about the next level of treatment options.

He accepted resorption of the tooth. At two year follow up, clinically replanted tooth was sound but radiograph showed marked resorption.

Discussion

Favourable healing after an avulsion injury requires quick emergency intervention followed by evaluation and possible treatment at decisive times during the healing phase. The urgency of the emergency visit and the multidisciplinary nature of follow-up evaluations require that both the lay public and clinicians from many dental disciplines be knowledgeable about the treatment strategies involved.⁴

The period between tooth avulsion and re-implantation is normally outwith the control of a dentist but this period is important with regard to the prognosis of the tooth.² A dry time of less than 15-20 minutes is considered optimal where periodontal healing would be expected. A continuing challenge is the treatment of the tooth that has been dry for than 20 minutes (periodontal cell survival is ensured) but less than 60 minutes (periodontal survival unlikely). In these cases, logic suggests that the root surface consists of some cells with the potential to regenerate and some that will act as inflammatory stimulators.⁶ In the present case, the extra-alveolar dry time was 15 minutes.

The medium in which the tooth has been stored prior to re-implantation has been shown to affect the incidence of root resorption and pulp healing. The most recent guidelines established by the American Association of Endodontists, or AAE, list Hank's Balanced Salt Solution or HBSS, a tissue culture medium as the medium of choice. However, its lack of availability at the accident site greatly limits its use. Milk has been shown to be successful in maintaining PDL cell viability for about three hours, and its relatively universal availability further enhances its utility. Skim or low-fat milk at a cool temperature is preferred for ensuring PDL cell viability. In decreasing order of suitability, physiological saline, saliva and water can be used in the absence of milk. Ultimately, the latter two may be detrimental to cell viability owing to the presence of bacteria, unfavourable p^H and osmolarity.⁷ In the present case, though the transport media was undesirable (dry storage), extra-oral time period was favourable.

Re-implantation of a tooth may be carried out without local anaesthesia, especially if presentation to the dentist is soon after avulsion and a soft blood clot only is present. In many cases local anaesthetic is desirable to enable adequate socket preparation and positioning of the tooth.² In this case local anaesthetic was used for patient comfort.

A past favoured method of treatment involved carrying out root canal treatment of avulsed teeth prior to re-implantation. In most cases this method of treatment is no longer acceptable as it imparts a poorer prognosis because of increased damage to the periodontal ligament cells by prolonged drying and handling. It is also desirable to maintain a patent root canal as a vehicle for application of medicaments to reduce infection and/absorption. However, in a few cases it may be acceptable to complete endodontic treatment prior to re-implantation.² In the present case, root canal treatment was initiated in second visit.

is in place for a minimal time period results in a decreased incidence of ankylosis. The splint should allow movement of the tooth, should have no memory (so the tooth is not moved during healing) and should not impinge or prevent maintenance of oral hygiene in the area. Many splints satisfy these requirements. In the present case, 0.5 mm SS wire with glass ionomer cement was used, Titanium Trauma Splint (TTS) which has been shown to be particularly effective could not be considered because of non-availability.

Semi-rigid (physiologic) fixation for 7-10 days is recommended. The splinting period can be extended for up to eight weeks if there is a concomitant alveolar process fracture. If excessive mobility persists after ten days, splinting time can be extended until mobility acceptable.² In this case splinting was removed after 14 days due to persistent mobility.



Fig 1. Absence of tooth # 21 Following bicycle accident



Fig 2. The avulsed tooth # 21



Fig 3. Replantation of tooth #21



Fig 4. Functional splinting



Fig 5. Root canal filling



Fig 6. After removal of splint

Fig: Clinical steps of replantation, splinting and root canal treatment

A splinting technique that allows physiologic movement of the tooth during healing and that



Fig 7. Periapical image after replantation of tooth #21.



Fig 8. Periapical image after root canal filling.



Fig 9. Periapical image after three months.



Fig 10. Periapical image after six month



Fig 11. Periapical image after one year.



Fig 12. Periapical image after two years.

Fig: Clinical and radiographic follow-up

Systemic antibiotics given at the time of replantation and prior to endodontic treatment are effective in preventing bacterial invasion

of the necrotic pulp and therefore subsequent resorption. Tetracycline has the additional benefit of decreasing root resorption. For patients not susceptible to tetracycline staining, doxycycline is the antibiotic of choice. Penicillin V has also been shown to be beneficial. The need for analgesics should be assessed on an individual case basis. Mild analgesics are usually adequate, or a non-steroidal anti-inflammatory drug may be recommended. In cases of environmental contamination a tetanus booster may be required.⁶

Early removal of the pulp has been advocated as this will prevent the production of inflammatory products. Inflammatory resorption appears to occur more rapidly in young patients and the proposed reason for this is that the dentine tubules, which have not yet become less patent as is the case with advancing age, readily transmit inflammatory products from the pulp to the root surface.² Pulp removal was performed on 7th day in the present case.

Inflammatory resorption may be arrested by endodontic treatment which removes the source of inflammation, but ankylosis may still occur because of irreversible damage to the periodontal ligament. Use of an intra-canal medicament has been advocated as this has been shown to reduce the occurrence of root resorption. The high p^H of calcium hydroxide renders it bactericidal and therefore a suitable intra-canal dressing where inflammatory resorption has occurred.² A new strategy of use of intracanal antibiotic and corticosteroid paste is still under investigation.⁶ In the present case, calcium hydroxide was used as intracanal medicaments.

The root canal can be filled at the practitioner's convenience or, in the case of long-term calcium hydroxide therapy, when an intact lamina dura can be traced. If the endodontic treatment was initiated 7 to 10 days after the avulsion and clinical and radiographic examinations do not indicate pathosis, filling of the root canal at third visit is acceptable, although the use of long-term calcium hydroxide is a proven option for these cases.⁶ In this case, root filling was completed after 7 days of calcium hydroxide placement.

Healing of replanted teeth may subject to complications. The main complication is that of root resorption, especially replacement resorption (ankylosis). In adolescents, the ankylosed tooth will fail to erupt and will gradually go into infra-position. The younger the age, the more pronounced is the infra-position. Presently, there are five treatment approaches-decoronation, luxation of the tooth, vertical distraction, prosthetic elongation and acceptance of the resorbing tooth. For the children and adolescent decoronation is suitable.⁸ In the present case, the patient accepted the resorbing tooth.



Fig 13a and 13b. Position of tooth #21 after replantation and after two years (infraocclusion).

Conclusion

Although in many cases a replanted tooth survives only a matter of years, during this period it serves as a natural space maintainer whilst growth occurs and also enables alveolar height to be preserved. Therefore in most cases re-implantation of an avulsed tooth is the best treatment. However, in certain instances of excessively prolonged extra-oral time/ poor storage medium or where the tooth is grossly carious / general oral condition is poor, or patient co-operation is poor or medically compromised, a clinician may judge that re-implantation is better not to be attempted.

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