

Avulsed Tooth - A Review

L. LEELAVATHI¹, R. KARTHICK², S. LEENA SANKARI² and N. ARAVINDHA BABU²

¹Department of Public Health Dentistry, Tagore Dental College and Hospital, Rathinamangalam, Vandalur post, Chennai - 600107, India.

²Department of Oral Pathology, Sree Balaji Dental College and Hospital, Bharath University, Pallikaranai, Chennai - 600100, India.

<http://dx.doi.org/10.13005/bpj/1015>

(Received: July 10, 2016; accepted: August 05, 2016)

ABSTRACT

Avulsion of permanent teeth is one of the most serious dental injuries, and a prompt and correct emergency management is very important for the prognosis. Tooth avulsion or exarticulation is a traumatic injury of dental tissue characterised by complete displacement of the tooth out of its socket. Successful treatment outcome of such an injury is dependent on the survival of the viable periodontal ligament cells attached to the tooth root surface. The viability of the periodontal ligament cells is best preserved either when the tooth is immediately replanted into its socket or if it is stored in an appropriate storage /transport medium till a time, the tooth can be replanted into its socket.

Key words: Trauma, Storage media, Transport media, Avulsion.

INTRODUCTION

Avulsion is the total dislodgement of an intact tooth from its socket. According to Andreasen and Andreasen, avulsion of permanent teeth accounts for approximately 0.5–3% of all dental trauma. The peak age for avulsion is between 7 to 9 years and mainly involves maxillary anteriors. Losing an anterior tooth at a young age may have severe psychological consequences. The immediate replantation of a permanent avulsed tooth is essential to restore the function and esthetics and critical for long term success of the treatment. Avulsion presents a challenge with regard to its proper emergency management. The principal challenge is to maintain the vitality of periodontal cells, as prognosis of a replanted tooth is directly proportional to the viable periodontal cells. Use of physiological storage media like milk, saliva or saline is critical to maintain the viability of periodontal cells until professional help is obtained.¹

Tooth avulsion mainly occurs during sports, physical violence, road traffic accidents, fall and other physical impacts. Many patients with avulsed tooth visit medical doctors due to lack of awareness or unavailability of a dentist.² Avulsion of permanent teeth is seen in 0.5–3% of all dental injuries³

Storage medium

A storage medium may be defined as a physiological solution that closely replicates the oral environment to help preserve the viability of PDL cells following avulsion.⁴

The ideal requirements for a storage medium are⁵

- It should have antimicrobial characteristics
- It should maintain the viability of periodontal fibres for an acceptable period of time
- It should favour proliferative capacity of the cells (clonogenic and mitogenic capacity)
- It should have the same osmolarity as that of

body fluids (290-300 mosmol/ kg) and pH balanced (7.2 – 7.4)

- It should be unreactive with body fluids
- It should not produce any antigen-antibody reactions
- It should reduce the risk of post-replantation root resorption or ankylosis
- It should have a good shelf life
- It should be effective in different climates and under different conditions
- It should wash off extraneous materials and toxic waste products
- It should aid in reconstitution of depleted cellular metabolites.

Use of such a storage media has been associated with favourable healing outcomes.

**The storage media can be classified as
Laboratory prepared and Natural source⁵**

Laboratory prepared	Natural source
Hank's Balanced Salt Solution	Milk
Normal saline	Saliva
ViaSpan	Propolis
Eagle's medium	Coconut water
Custodiol	Egg white
Dubelco's storage	Emdogain
Tooth rescue box	Morusrubra
Conditioned medium	Salvia officinalis extract
Gatorade	Honey milk
Contact lens solution	Tap water
Growth factors	
Ascorbic acid	
L-DOPA	
Cryoprotective agents	
Catalase supplementation	

There is not a single product or solution that possesses all the characteristics required to be indicated as the ideal storage medium for avulsed teeth, that is, be capable of preserving the vitality of the PDL and pulp cells, while presenting compatible physiological pH and osmolality, clonogenic capacity, antioxidant property, no or minimal microbial contamination, high availability, ready accessibility at accident sites, homes,

schools, hospitals and dental offices, and low cost. Milk is an isotonic liquid with a physiologically compatible pH and osmolality (fluid pressure) with the root-surface adhered PDL cells, has low or no bacterial content, contains growth factors and essential nutrients for cells, in addition to being highly available mostly everywhere and having a low cost. Taking together the characteristics, efficacy and availability and accessibility, milk appears as the best indication of a temporary storage medium for avulsed teeth before replantation, and its use is recommended by the International Association of Dental Traumatology and the American Academy of Pediatric Dentistry.⁶

Outcomes of avulsion

The speed with which the avulsed tooth is replanted is the most important factor for success. There are several possible effects on the root surface and attachment apparatus of an avulsed tooth.

Normal PDL healing: complete regeneration of the PDL. Damage cannot be clinically or radiographically detected.

Surface resorption: the crushing injury is restricted, inflammatory response is limited and repair can occur with replacement cementum. Clinically, the tooth presents asymptomatic, with normal mobility and percussion sounds. Radiographically, there are no periradicular radiolucencies and no loss of lamina dura.

Ankylosis and replacement resorption: occurs when excessive drying damages the PDL cells and evokes an inflammatory response that results in the replacement of the cells with alveolar bone. Dentoalveolar ankylosis is the term used when precursor bone cells populate the damaged root resulting in a direct bone-root contact void of an attachment apparatus. Replacement resorption occurs when osteoclasts in contact with the root resorb dentin that is eventually replaced with new bone by osteoblasts. Clinically, the tooth will be immobile and have a high-pitched sound when percussed. Radiographically, there is absence of the lamina dura. With replacement resorption, the root surface appears moth-eaten. In young patients, infraocclusion or

submergence results when replacement resorption interferes with the tooth's ability to move with the normal downward growth of the alveolar process.

External inflammatory root resorption: the result of a combination of severely damaged attachment and bacterial contamination of a necrotic pulp. It may rapidly progress. Clinically, it presents as radiolucencies in the root and adjacent bone.⁷

Management of an avulsed permanent tooth with closed APEX⁸

The above steps in the management of an avulsed permanent tooth with an open apex followed by initiating pulpectomy/debridement within 7 to 10 days.

Adjunctive treatment and follow-up⁷

Soft tissue management: gingival tissue should be tightly secured in the cervical area of the replanted tooth to help prevent the ingress of bacteria. Lip lacerations must be thoroughly cleaned and approximated tension-free before suturing. It

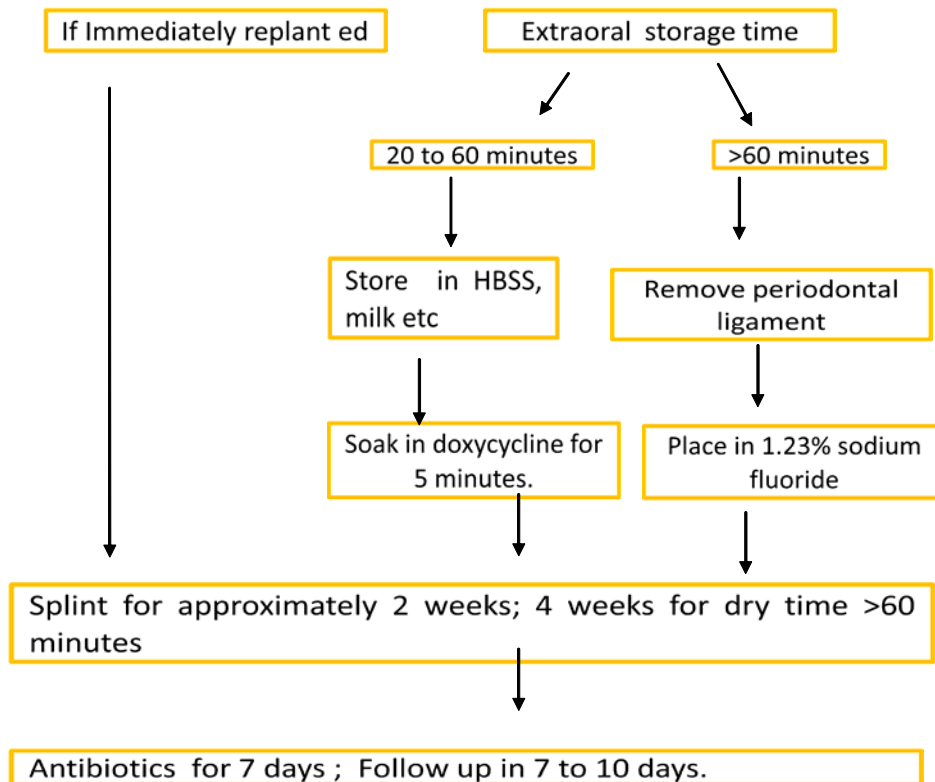
is best to consult an oral or plastic surgeon if the laceration extends through the vermillion border into the skin.

Splinting

A flexible (semi-rigid) splint is recommended for 7-10 days. There are many acceptable types of splints available and it is left to the provider to choose one that is effective and easy to use. The splint should allow physiologic movement of the tooth, should not have memory and not impinge on the gingiva. Proper repositioning of the replanted tooth should be verified with a radiograph. Avulsions that have concomitant alveolar fractures should be splinted for 4-8 weeks.

Systemic antibiotics: recommended

If the patient is not susceptible to tetracycline staining, the antibiotic of choice is doxycycline at an appropriate dose for patient age and weight. Penicillin V can be substituted for doxycycline. Adult dosage of doxycycline is 100mg b.i.d. x 7 days. Adult dosage of Penicillin V is 1-2g



Management of an avulsed permanent tooth with an open APEX⁸

stat, then 500mg q.i.d. x 7 days. Fractures of the alveolus may have their own indications for antibiotic coverage

Tetanus

Refer the patient to a physician within 48 hours for a tetanus booster if the avulsed tooth contacted soil or if the status of the tetanus coverage is uncertain.

Analgesics

Prescribe if needed. Typically, an over the counter nonsteroidal anti-inflammatory drug suffices.

Diet

Post-operative instructions should include a soft diet for 2 weeks.

Oral hygiene

Instruct the patient to brush with a soft toothbrush after every meal and prescribe a 0.1%

chlorhexidine mouth rinse 2x per day for 7 days.

Follow-up appointments: include splint removal and initiation of endodontic treatment, if required, at one week. Clinical and radiographic exams should be scheduled at 2-3 weeks, 3-4 weeks, 6-8 weeks, 6 months, 1 year and annually for 5 years.

CONCLUSION

Avulsion is one of the most serious dental injuries. It has psychological, esthetic and functional consequences and the prognosis is mainly related to the injury to periodontal membrane. Knowledge levels of the individuals should be improved related to the emergency management of tooth avulsion. This can be done through targeted education programs. Posters and videos to be designed about the management and should be delivered to the public through camps and mass media.

REFERENCES

- Jyothi KN, Venugopal P, Soumyaranjan Nanda, Mahaveer kumar Shah. Knowledge And Attitude Of Medical Doctors Towards Emergency Management Of Avulsed Tooth- A cross sectional survey. *Journal of Dental Sciences & Research* 2(1): 156-167
- Abu Dawoud M, Al Enezi , Andersson L, Knowledge of emergency management of avulsed teeth among young physicians and dentist. *Dental Traumatology* 2007; 23: 348-55.
- Lars Andersson et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. *Dental Traumatology* 2012; 28: 88-96
- Suresh Kotumachagi Sangappa1, Dr A. Pravin Kumar2, Dr Shruti3, Dr Pooja Srivastava. Extra-Alveolar Storage Media for teeth: A Literature review. *International Journal of Advanced Research* 2014; 2(7): 963-972.
- Siddiqui *et. al.*, Storage Media for An Avulsed Tooth: Nature to the Rescue. *Br J Med Health Res.* 2014; 1(3)
- Wilson Roberto Poi, Celso Koogi Sonoda, Christine Men Martins, Moriel Evangelista Melo, Eduardo Pizza Pellizzer, Marcos Rogério de Mendonça, Sônia Regina Panzarini. Storage Media For Avulsed Teeth : A Literature Review. *Brazilian Dental Journal* 2013; 24(5): 437-445
- Lieutenant Sherma Saif, DC, USNR, and Commander Patricia A. Tordik, DC, USN. Avulsed permanent teeth - new treatment guidelines. 2004; 26(2).
- McIntyre J, Lee J, Trope M, Vann WJ, Permanent tooth replantation following avulsion: Using a decision tree to achieve the best outcome. *Pediatr Dent* 2009; 31(2): 137-44.