

# Tooth Avulsion And Its Management Review Article

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## **Abstract**

*Traumatic dental injuries occur very frequently in children and adults due to various etiological factors such as falling, accident, sports injuries etc .It is one of the few emergencies in dentistry. The success of treatment depends on the viability of the periodontal ligament cell and its root surface of the tooth. Effective treatment percentage decrease along with the exposure of the teeth extra orally. The storage medium of the avulsed tooth play a prime factor affecting the prognosis . Proper diagnosis and treatment planning is a must for a favourable result of the treatment*

**Keywords:** *avulsion, periodontal ligament, trauma, children*

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## **Introduction**

Traumatic Dental injuries (TDIs) pose a major public dental health problem. These injuries have the tendency to occur at any phase early or late and the treatment continues for a long duration. Their prevalence in permanent dentition is around 33% for adults and 25% for children. <sup>(1)</sup> The most serious is the avulsion of permanent teeth, seen frequently in seven to ten years age group. The periodontal ligament (PDL) being loosely structured around the erupting tooth at this time provides minimal resistance to an extrusive force. <sup>(2),(3)</sup> A favourable prognosis depends on emergency intervention at the site of accident or the time immediately following avulsion. <sup>(4),(5)</sup> Avulsion of permanent teeth is one of the few emergency situations in dentistry <sup>(6)</sup>. It involves separation of the tooth from the socket resulting in attachment damage. <sup>(7)</sup> In certain areas bone gets directly attached to the root surface. This is called replacement resorption or osseous replacement. <sup>(8)</sup>

This process is usually progressive and irreversible in nature concluding in ankylosis.<sup>(7)</sup> The bacteria from the necrotic pulp evoke an inflammatory reaction in the PDL causing bone and root substance destruction. This whole chain of events is called inflammatory root resorption.<sup>10,11</sup> Thus the treatment objectives are directed towards limiting the resultant inflammation post avulsion. The maintenance of normal PDL cell physiology and morphology is of prime concern.

## MANAGEMENT

### Storage media for avulsed teeth

The ideal storage medium should be able to maintain the periodontal ligament cells so they can undergo mitosis to form clones of damaged fibroblasts of PDL which will cover the damaged surfaces of the root. The medium should also preserve the functional capacities of PDL cells.<sup>12,13,14,15</sup> Numerous media have been investigated for storing avulsed teeth. Tap water is the least desirable because it has a very low pH and osmolality. The periodontal ligament cells will burst and die in the hypotonic environment.<sup>16</sup> The patient can place the avulsed tooth under the tongue or in buccal mucosa, making saliva as the transport media. The osmolality of saliva (17mOsm) is much lower than physiological osmolality (60-70m Osm) thus causing cell lysis due to hypotonicity. In addition, it is laden with micro-organisms which can infect the root and cause necrosis. It is used for short duration, around an hour, as longer duration can damage the PDL cells.<sup>17,18,19,20</sup> Though physiologic saline solutions have osmolality (280mOsm) compatible with PDL cells, they lack the essential nutrients required by the PDL cells for their metabolic function.<sup>16, 21, 22</sup>

*Milk has been indicated by the American Association of Endodontists as the second best solution for transport of avulsed teeth after HBSS.*<sup>22</sup>

According to literature it had the following benefits:

- (I) The physiological properties like pH (6.5-6.8) and osmolality (250mOsm) are compatible with PDL cells.<sup>15</sup>
- (II) The presence of nutrients like aminoacids, carbohydrates, vitamins and growth factors;<sup>17</sup>
- (III) Pasteurisation makes it free of bacteria<sup>17</sup>. In addition, milk has a short supportive time of only 1-3 hours.<sup>15</sup> *Hank's Balanced Salt Solution (HBSS)* is a standard saline solution used to support the growth of many cell types in research.<sup>23, 24</sup> It contains metabolites necessary to maintain normal metabolism of cells.<sup>16</sup> HBSS is pH balanced (7.2), has an osmolality of 320mOsm/kg which provides an ideal osmotic pressure for PDL cells, biocompatible and is non-toxic in nature.<sup>14,22,23</sup> It is available in a container-*Emergency Tooth Preserving System (ETPS)*, invented by Paul Krasner, which serves as both an optimal storage and transport media.

### First aid for avulsion

A positive prognosis is almost assured when the tooth is replanted within the first five minutes.<sup>25</sup> Replantation at the accident site requires personnel with some knowledge of treatment protocol. Information can also be given over the phone by the dentist.<sup>2</sup> The avulsed tooth should be held gently and not by the root but by the crown. The tooth should be briefly washed for around ten seconds if it is dirty and then repositioned in the socket.<sup>26</sup> The root surface should never

be scrubbed. If this is not possible or there is doubt, avulsed tooth should be placed in a suitable storage medium and the patient should immediately sought dental treatment. The media suggested in order of preference and availability are milk, saliva, physiologic saline with water being the least desirable.<sup>27</sup>

## **MANAGEMENT IN DENTAL OFFICE EMERGENCY VISIT:**

### ***Diagnosis and treatment planning***

The position of an already replanted tooth should be assessed and a complete history taken to assess the outcome.

If the tooth is outside the mouth, the storage medium should be evaluated.

### **Clinical examination**

A thorough clinical examination of the socket and the surrounding soft tissues is done. Alveolar fractures can be suspected if there is movement of multiple teeth together or a segment of bone. Radiographs should be taken in three vertical angulations to ascertain horizontal root fracture in adjacent teeth. Remaining teeth should be examined and soft tissue lacerations noted.<sup>28</sup>

**Preparation of root** . It depends on the maturity of the root and the dry time of the tooth before it was placed in storage medium. The point where the chances of survival of PDL cells become remote is considered to be 60 minutes.

### **Tooth With A Closed Apex : -**

a) Tooth has already been replanted prior to coming to the dental office. The area is cleaned using water, saline or chlorhexidine and normal position of tooth verified both clinically and radiographically. Endodontic treatment is initiated 7-10 days after replantation and calcium hydroxide to be used as an intracanal medicament until obturation.<sup>6</sup>

b) Tooth with extraoral dry time of less than 60 min root should be cleaned with a stream of saline and placed in the socket gently. 15-20 min is considered the optimal time upto which the viability of PDL cells remains high.<sup>30,31</sup> Endodontic treatment is initiated at the second visit which is 7-10 days after the emergency visit. Calcium hydroxide is considered the drug of choice in preventing and treating inflammatory root resorption.

c) Extraoral dry time longer than 60 min<sup>29,30</sup>  
The periodontal ligament is not expected to survive and the root is prepared to be as resistant to resorption as possible. The tooth is soaked in acid for 5 min to remove all necrotic tissue including the PDL to prevent the initiation of inflammatory response. It is then placed in 2% sodium fluoride for 20 min and replanted.<sup>33,34</sup> Endodontic treatment can be performed extraorally prior to replantation or 7-10 days later as in other cases.

### **Tooth With An Open Apex :-**

a) Tooth has already been replanted in the mouth before reaching the dental clinic

Wash the area with saline, water or chlorhexidine, do not extract the tooth and verify the position.<sup>6</sup>

b) Extraoral dry time is less than 60 min. The tooth is replanted with the goal of revascularisation of the tooth pulp. The tooth is cleaned with a stream of saline and soaked in doxycycline for 5 min or covered with minocycline hydrochloride crystals. The tooth is treated similar as a closed apex tooth, i.e, it is gently rinsed and replanted. In these patients, endodontic treatment is not initiated until signs of pathosis occur. The patient is recalled every 3-4 weeks for vitality testing to check for revascularisation.<sup>35,36</sup>

c) Extraoral dry time more than 60 min - The periodontal ligament becomes necrotic and healing is not expected to occur. Replacement resorption will ensue progressively leading to ankylosis of the tooth.

*The International Association of Dental Traumatology* recommends that avulsed teeth be *replanted*, in children also.<sup>6</sup> There are several advantages to this approach:

1. Post avulsion a coordinated treatment plan involving specialists from different fields of pedodontia, prosthodontics, endodontics, orthodontics and oral surgery should be initiated for comprehensive evaluation. This is not feasible during emergency treatment.
2. Replantation allows interdisciplinary consultation and the formulation of a definite treatment plan.
3. Replanting the tooth can alleviate the embarrassment faced by the patient.<sup>37</sup>
4. Another aim of doing delayed replantation in immature teeth is to maintain alveolar ridge contour.
5. Once the tooth is replanted, apexification procedure is started at the second visit.

A procedure was described by Malmgren in 1984 which was a conservative approach towards the management of ankylosed teeth and attempted to preserve the surrounding alveolar bone. This method was called '*decoronation*'. It involved the subcrestal removal of tooth crown. The root will resorb gradually while vertical bone growth occurs simultaneously, coronal to it. The existing bone volume is maintained avoiding the need for future ridge augmentation procedures. Malmgren recommended decoronation to be done in patients where the severity of infra-occlusion was moderate or is an index score of two ( $\geq 1/8$  but  $< 1/4$  of crown height of neighbouring tooth) or more.

**Dental implants** are only considered after the patient had completed skeletal growth.

### 1. Preparation of socket

The socket should be cleaned and free of obstacles before replantation is done. A blunt instrument is used to reposition a collapsed socket wall.

### 2. Splinting

The splinting should be functional that allows physiologic movement of teeth. It is recommended for 7-10 days. However in cases of avulsion occurring in association with alveolar fractures, it is done for 4-8 weeks.<sup>32</sup>

### 3. Management of soft tissues-

Soft tissue lacerations are sutured and the assistance of a plastic surgeon might be prudent in areas of aesthetic importance like the lips.

4. Adjunctive therapy of Pharmacologic treatment: It is recommended to prescribe antibiotic therapy to prevent the occurrence of infection and root resorption in the first week after replantation. The antibiotic of choice is *doxycycline given twice daily for seven days*. In children *under 12 years of age, penicillin V (500 mg, four times daily for seven days)* can be prescribed.<sup>40,41</sup>

5. Tetanus: If the tooth has contacted soil, the patient should be referred to a physician regarding tetanus booster.
6. Diet: The patient should be advised to take soft diet for two weeks.
7. Oral hygiene: Patient is advised to brush after every meal and rinse with chlorhexidine mouthwash twice daily for one week.

1. Glendor U. Epidemiology of traumatic dental injuries – a 12 year review of the literature. *Dent Traumatol* 2008;24(6):603–611. | 2. Fountain

## REFERENCES

1. Glendor U. Epidemiology of traumatic dental injuries – a 12 year review of the literature. *Dent Traumatol* 2008; 24 (6):603-611
2. Foundation SB, Camp JH. Traumatic injuries. In: Cohen S, Burns AC, editors. *Pathways of the Pulp*. 6th ed. St Louis: Mosby; 1994.
3. Andreasen JO, Andreasen FM. Classification, etiology and epidemiology. In: Andreasen JO, | Andreasen FM, editors. *Textbook and color atlas of traumatic injuries to the teeth*. | Munksgard, Copenhagen: Mosby; 1994. 383-425.
4. Andreasen JO, Andreasen FM, Andersson L, editors. *Textbook and color atlas of | traumatic injuries to the teeth*. Oxford: Blackwell Munksgaard; 2007.
5. Sigurdsson A, trope M, Chivian N. The role of endodontics after dental traumatic injuries. In: Hargreaves KM, Cohen S, editors. *Pathways of the pulp*. 10th ed. St Louis: Mosby; 2011. pp. 620-654.
6. Flores MT, Andersson L, Andreasen JO, Bakland LK, Malmgren B, Barnett F, et al. Guidelines for the management of traumatic dental injuries. II. Avulsion of permanent teeth. *Dent Traumatol* 2007;23:130–136.
7. Glendor U, Marcenes W, Andreasen JO. Classification, Epidemiology and Etiology. In: Andreasen JO, Andreasen FM, Andersson L, editors. *Textbook and Color Atlas of Traumatic Injuries to the Teeth*. 4th ed. Oxford: Blackwell Munksgaard; 217-254.
8. Andreasen JO, Hjorting-Hansen E. Replantation of teeth. I. Radiographic and clinical study of 110 human teeth replanted after accidental loss. *Acta Odontol Scand*. 1966;24(3):263-86.
9. Tronstad L. Root resorption - etiology, terminology and clinical manifestations. *Endod Dent Traumatol* 1988;4(6):241-52.
10. Andreasen JO, editor. Exarticulations. In: *Traumatic injuries of the teeth*. 2nd ed. Copenhagen: Munksgaard; 1981. 203-42.
11. Ten cate AR, editor . *Oral histology, development, structure and function*. St. Louis: The | CV. Mosby Co; 1980. pp.150-1.

12. Ashkenazi M, Marouni M & Sarnat H. In vitro viability, mitogenicity and clonogenic capacity of periodontal ligament cells after storage in four media at room temperature. *Dent Traumatol*, 2000;16: 63–70.
13. Ashkenazi M, Marouni M & Sarnat H. In vitro viability, mitogenicity and clonogenic capacity of periodontal ligament fibroblasts after storage in four media supplemented with growth factors. *Dent Traumatol* 2001;17: 27–35. |
14. Ashkenazi M, Sarnat H & Keila S. In vitro viability, mitogenicity and clonogenic capacity of periodontal ligament cells after storage in six different media. *Dent Traumatol*, 1999;15: 149–56.
15. Ashkenazi M & Shaked I. In vitro clonogenic capacity of periodontal ligament fibroblasts cultured with Emdogainr. *Dent Traumatol* 2006;22: 25–9.
16. Blomlof L. Milk and saliva as possible storage media for traumatically exarticulated teeth prior to replantation. *Swed Dent J Suppl* 1981;8:1-26. |
17. Blomlof L, Lindskog S, Andersson L, Hedström K-G & Hammarström L. Storage of experimentally avulsed teeth in milk prior to replantation. *J Dent Res* 1983;62:912–16.
18. Blomlof L, Lindskog S, Hedström K-G & Hammarström L. Vitality of periodontal ligament cells after storage of monkey teeth in milk or saliva. *Scand J Dent Res* 1980; 88 : 441–5.
19. Marino TG, West LA, Liewehr FR, Mailhot JM, Buxton TB, Runner RR et al. Determination of periodontal ligament cell viability in long shelf-life milk. *J Endod* 2000;26: 699–702.
20. Sonoda CK, Poi WR, Panzarini SR, Sottovia AD & Okamoto T. Tooth replantation after keeping the avulsed tooth in oral environment: case report of a 3-year follow-up. *Dent Traumatol* 2008;24: 373–6.
21. Alacam T, Gorgul G, Omurlu H & Can M. Lactate dehydrogenase activity in periodontal ligament cells stored in different transport media. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1996;82: 321–3.
22. Krasner P. Tooth avulsion in the school setting. *J Sch Nurs* 1992;8: 20–6.
23. Krasner P & Person P. Preserving avulsed teeth for replantation. *J Am Dent Assoc* 1992; 23: 80–8.
24. Ozan F, Polat ZA, Er K, Ozan U & Deger O. Effect of propolis on survival of periodontal ligament cells: new storage media for avulsed teeth. *J Endod* 2007;33:570–3.
25. Andreasen JO, Barrett EJ, Kenny DJ. Is anti-resorptive regenerative therapy working in case of replantation of avulsed tooth. *Dent Traumatol* 2005;6:344–6.
26. Weinstein FM, Worsaae N, Andreasen JO. The effect on the periodontal and pulpal tissues of various cleansing procedures prior to replantation of extracted teeth. An experimental study in monkeys. *Acta Odontol Scand* 1981;39:251–5.
27. Hiltz J, Trope M. Vitality of human lip fibroblasts in milk, Hanks Balanced Salt Solution and Viaspan storage media. *Endod Dent Traumatol* 1991;7:69.

28. Andreasen JO, Andreasen FM, editors. Textbook and color atlas of traumatic injuries to the teeth. 3rd ed. Copenhagen:Munksgaard; 1994. pp.383–425.
29. Sigurdsson A, trope M, Chivian N. The role of endodontics after dental traumatic injuries. In: Hargreaves KM, Cohen S, editors. Pathways of the pulp.10th ed. St Louis: Mosby; 2011.pp.620-654.
30. Andreasen JO. Effect of extra-alveolar period and storage media upon periodontal and pulpal healing after replantation of mature permanent incisors in monkeys. *Int J Oral Surg.*1981; 10(1):43-53.
31. Söder PO, Otteskog P, Andreasen JO, Modéer T. Effect of drying on viability of periodontal membrane. *Scand J Dent Res* 1977;85(3):164-8.
32. Andreasen JO, Andreasen FM, editors. Textbook and Color Atlas of Traumatic Injuries to the Teeth.3rd ed. Copenhagen and St. Louis : Munksgaard and CV Mosby; 1994.
33. Bjorvatn K, Selvig KA, Klinge B. Effect of tetracycline and SnF<sub>2</sub> on root resorption in replanted incisors in dogs. *Scand J Dent Res* 1989;97:477–482.
34. Selvig KA, Zander HA. Chemical analysis and microradiography of cementum and dentin from periodontally diseased human teeth. *J Periodontol* 1962;33:303–310.
35. Cvek M et al. Effect of topical application of doxycycline on pulp revascularization and periodontal healing in reimplanted monkey incisors. *Endod Dent Traumatol* 1990;6:170–177.
36. Yanpiset K, Trope M. Pulp revascularization of replanted immature dog teeth after different treatment methods. *Endod Dent Traumatol* 2000;16:211–217.
37. Marcenes W, Ryda° U. Socio-psychological aspects of traumatic dental injuries. In: Andreasen JO, Andreasen FM, Andersson L, editors. Textbook and Color Atlas of Traumatic Injuries to the Teeth. 4th ed. Oxford:Blackwell; 2007.pp. 197–206.
38. Malmgren B. Decoronation: how, why, and when? *J Calif Dent Assoc* 2000;28:846–54.
39. Malmgren B, Malmgren O. Rate of infraposition of reimplanted ankylosed incisors related to age and growth in children and adolescents. *Dent Traumatol* 2002;18:28–36.
40. Sae-Lim V, Wang C-Y, Choi G-W, Trope M. The effect of systemic tetracycline on resorption of dried replanted dogs' teeth. *Endod Dent Traumatol* 1998;14:127.
41. Sae-Lim V, Wang C-Y, Trope M. Effect of systemic tetracycline and amoxicillin on inflammatory root resorption of replanted dogs' teeth. *Endod Dent Traumatol* 1998;14:216–228