Available online at www.ijpcr.com
International Journal of Pharmaceutical and Clinical Research 2015; 7(3): 173-175

ISSN- 0975 1556

Research Article

Preservation of Avulsed Tooth

Tharangini Raveenthiraraja, Pradeep Solete, sowmiya Aravindan

Saveetha Dental College and Hospitals, 162, Poonamalee High road, Vellapanchavadi, Chennai-7, INDIA

Available Online: 12th March, 2015

ABSTRACT

Avulsion is a complex and a traumatic injury affecting the pulp, PDL, cementum, alveolar bone and gingival tissues, where there is a complete displacement of the tooth from its socket. The aim of this study was to perform a literature review on the storage methods and guidelines on treatment avulsed teeth.

Keywords: Avulsion, tooth

INTRODUCTION

Dental avulsion is the complete displacement of a tooth from its socket in alveolar bone owing to trauma[1]. In normal conditions, a tooth is connected to the socket by means of the periodontal ligament. When a tooth is knocked out, that ligament stretches and splits in half[2] Maintaining the vitality of the cells that remain attached to the root surface is the key to success following replantation[3]. The treatment for permanent teeth consists of replantation, immediately if possible. Deciduous teeth should not be replanted due to the risk of damaging the permanent tooth germ[2]. Immediate replantation ensures the best possible prognosis but is not always possible since more serious injuries may be present. Studies have shown that teeth that are protected in a physiologically ideal media can be replanted within 15 minutes to one hour after the accident with good prognosis[2].

Transport media

One of the key elements for maintaining vitality is storing the tooth in an environment that closely resembles the original socket environment. This environment is one that has the proper osmolality (cell pressure), pH, nutritional metabolites and glucose. There are scientifically designed storage media that provide this environment.

Hydrogenionic potential (pH)

The acid or basic characteristic of a solution is determined based on the concentration of molar ions of hydrogen (h+). The higher the concentration of h+ , the lower will be the ph of the solution[4]. The ph of most cells of the organism are found around 7.0 which means that the concentration of h+ is approximately the same as the concentration of oh–. Because of that, even small variations on the concentration of both, may be harmful to the cells and their functioning[5].

Osmolality

The osmolality has a relation of weight/weight and its measuring unit is mosm/kg, while the osmolarity has a relation of weight/volume and its measuring unit is mosm/l. The osmolality of a solution is determined by the concentration of the molecules non-ionized dissolved and in last analysis responsible for the "osmotic pressure". The osmolality increases when there is lack of water[6] and diminishes with excess of water[7]. The pH must be between 7.2 and 7.4, but growth may occur between 6.6 and 7.8.[8,9]

Types of storing environments

Tap water

Amongst the studied environments, tap water has shown to be the one with the least desirable results, though it protect the tooth from dehydration for being a hypotonic medium – it causes rapid cellular lyses of the periodontal ligament, similarly to a dry storage[8,10-13]

Saliva

Saliva can be used as a storing medium for a short period of time. It can damage the cells of the periodontal ligament if used for longer than an hour. Its osmolality is much lower than the physiologic (60-70 mosm/kg), thus, it boosts the harming effects of bacterium contamination. Its only advantage is its availability[8,12,14,15].

Saline solution

The normal saline is a solution is 0.90%w/v of Nacl, and osmolality of 280 mosm/kg and despite being compatible to the cells of the periodontal ligament, it lacks essential, Nutrients such as magnesium, calcium and glucose; necessary to the normal metabolic needs of the cells of the periodontal ligament. Saline Solution was harmful to the cells of the periodontal ligament in Avulsed teeth if it is used for longer than two hours[16]

Milk

Milk is significantly better than others solutions for its physiological properties, including ph and osmolality compatible to those of the cells from the periodontal ligament; the easy way of obtaining it and for being free of bacteria, but it is important that it is used in the first 20 minutes after avulsion. Milk is an excellent storing solution for 6 hours, however, milk cannot revive the degenerated cells[16]

Coconut water

Coconut water is biologically pure, sterile and rich in amino acids, proteins, vitamins and minerals. This natural isotonic fluid having ph of 4.1[16].

**Author for Correspondence*

Ascorbic acid

Addition of ascorbic acid to osteoblastic cell lines can stimulate type I collagen production, followed by expression of specific markers associated with osteoblastic phenotypes such as alkaline phosphatises (alp) and osteocalcin. It is also required for in vitro mineralised nodule formation of osteoblasts[16].

Hank's balanced salt solution (HBSS)

Hank's balanced salt solution is a standard saline solution that is widely used in biomedical research to support the growth of many cells types. This solution is non-toxic; it is biocompatible with periodontal ligament cells, ph balanced at 7.2 and has an osmolality of 320 mosm/kg. It is composed of 8 g/l sodium chloride; 0.4 g/l of d-glucose; 0.4 g/l potassium chloride; 0.35 g/l sodium bicarbonate; 0.09 g/l sodium phosphate; 0,14 g/l potassium phosphate; 0.14 g/l calcium chloride; 0.1 g/l magnesium chloride and 0.1 g/l magnesium sulphate[16]. In accordance to krasner , hank's balanced salt solution is the best solution for storing avulsed teeth. It does not require refrigeration and it can be kept on the shelf for 2 years and it has been recommended and used successfully as a storage medium by clinicians and researchers. This solution is effective in preserving periodontal ligament cells of avulsed teeth, renew the degenerated periodontal ligament cells and maintain a superior success rate if an avulsed tooth is soaked in them for 30 minutes[17].

Viaspan

Viaspan has osmolality of 320 mosm/kg, which enables excellent cellular growth. Its ph is around 7,4 at room temperature; ideal for the cellular growth[10,11,18,19] The viaspan was the best storage medium observed at all times, and after 18 hours, there was still 37.6% of living cells[19].

Eagle's medium

Eagle's minimal essential medium contains 4 ml of l-glutamine;105 iu/l of penicillin; 100µg/ml of streptomycin, 10µg/ml of nystatin and calf serum (10% v/v)[4]. Many studies demonstrated that the cell culture medium (eagle's medium at 37◦c) can preserve periodontal ligament fibroblasts for extended periods before dental reimplantation[10,11,18,19].

CONCLUSION

An appropriate storage medium can provide immediate protection from desiccation of PDL cells following trauma. Several acceptable storage media, such as culture medium, HBSS and milk, have been proposed for avulsed teeth, with HBSS considered optimal. The long-term prognosis of replanted knocked out teeth is very variable. The treatment for knocked-out teeth has progressed from a success rate of 10% to over 90%. However, this success rate can only be achieved with the institution of optimum care within fifteen minutes to an hour of the accident. In the case of knocked-out teeth, being prepared and knowing what to do can mean the difference between a person retaining or losing replanted knocked-out teeth for life. Teeth that have been knocked out when they are fully matured, that is, when the root has completely formed, have a much better prognosis than those teeth that are immature and not fully formed. This is due to the fragility of the root. When teeth have not fully formed, the walls of the root are thinner and thus more fragile. Another complication for the prognosis is the length of time that the tooth has been out of its socket. Teeth that are replanted within fifteen minutes of the accident have an excellent prognosis. Teeth that have been extra-oral and dry stored for more than one hour have a poor prognosis. Teeth that have been placed in an optimal storage medium within one hour of the accident also have an excellent prognosis. All teeth that have been knocked out should be replanted but watched carefully for the development of root resorption. Teeth that do not have root canal treatment within two weeks of replantation also have a poor prognosis.

REFERENCES

1. Zadik Y, Levin L. "Oral and facial trauma among paratroopers in the Israel Defense Forces". Dental Traumatology 2009; 25 (1): 100–102.
2. Krasner P., Rankow H. New philosophy for the treatment of avulsed teeth. Oral Surg Oral Med Oral Pathol 1995;79:616-23.
3. Andreasen JO: Etiology and pathogenesis of traumatic dental injuries, Scand J Dent Res 78:329, 1970.
4. Lehninger AL, Nelson DL & Cox MM. 1995. Princ´ıpios de bioqu´ımica. S˜aoPaulo: SarvierEditora. 839p.
5. Usberco J & Salvador E. 1997. Qu´ımica: F´ısico-qu´ımica. S˜ao Paulo: SaraivaEditora. 494p.
6. Remington J P and Gennaro A R.2000. Remington: the science and practice of pharmacy. Philadelphia: Lippincott Williams and Wilkins. 2077p.
7. Blomlof L,Otteskog P and Hammarstrom L. Effect of storage in media with different ion strenghts and osmolalities on human periodontal ligament cells. Scand J Dent Res.1981;89: 180–7
8. Marino T G, West L A, Liewehr F R, Mailhot J M, Buxton T B, Runner R R et al.Determination of periodontal ligament cell viability in long shelf-life milk. Journal of Endodontics. 2000;26: 699–702.
9. Melo D F, Sell A M, Lopes C M and Hidalgo M M.Viabilidade das c´elulas mononucleares de sangue perif´erico humano em diferentes meios de estocagemdedentesavulsionados. Acta Scientiarum Health Sci.2003;25: 69–74.
10. Ashkenazi M, Marouni M and Sarnat H. In vitro viability, mitogenicity and clonogenic capacity of periodontal ligament cells after storage in four media at room temperature. DentTraumatol. 2003;16: 63–70.
11. Ashkenazi M, Sarnat H and Keila S. In vitro viability, mitogenicity and clonogenic capacity of periodontal ligament cells after storage in six different media. DentTraumatol. 1999;15: 149–56.
12. Blomlof L, Lindskog S, Andersson L, Hedstrom K-G & Hammarstrom L. Storage of experimentally avulsed teeth in milk prior to replantation. J Dent Res. 1983;62: 912–16.
13. Pearson R M ,Liewehr F R,West L, Patton W R,Mc Pherson J and Runner R R. Human periodontal ligament cell viability in milk and milk substitutes. J Endod.2000;29: 184–60

14. Blomlof L, Lindskog S, Hedstrom K G and Hammarstrom L.Vitality of periodontal ligament cells after storage of monkey teeth in milk or saliva. Scand J Dent Res.1980;88: 441–5.
15. Sonoda C K, Poi W R, Panzarini S R,Sottovia A D and Okamoto T.Tooth replantation after keeping the avulsed tooth in oral environment: case report of a 3-year follow-up. DentTraumatol. 2008;24: 373–6.
16. Badruddin Ahmed Bazmi, Anil Kumar Singh, Sudipta Kar, Hajara Mubtasum. Storage Media For Avulsed Tooth- A Review.IJMD.2003 Vol 3, Issue 3.
17. KrasnerP.1992.Tooth avulsion in the school setting. J Sch Nurs,8:20–6.
18. Ashkenazi M, Marouni M and Sarnat H. In-vitro viability,mitogenicity and clonogenic capcity of periodontal ligament fibroblasts after storage in four mediasupplementedwithgrowthfactors. DentTraumatol.2001;17: 27–35.
19. Hiltz J and Trope M.Vitality of human lip fibroblasts in milk, Hank's balanced salt solution and Viaspan storage media. Endod DentTraumatol. 1991;7: 69–72.