

WHEN IMMEDIATE REPLANTATION OF AVULSED TEETH CANNOT BE DONE. DIFFERENT STORAGE MEDIUM USED IN DENTISTRY: A REVIEW OF LITERATURE

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Abstract

Immediate replantation is the treatment of choice for avulsed permanent teeth, however sometimes immediate replantation can't be possible and avulsed tooth is stored in a suitable storage medium. The prognosis of replanted teeth largely depends upon the time gap between avulsion and replantation, and the type of storage medium used. Different storage medium have been tried, ranging from normal tap water to Hank's Balanced Salt Solution and Viaspan. This review has tried a comparative evaluation between different storage medium. By far the best known storage medium is HBSS for its physiologic pH, osmolarity and mitogenic and clonogenic ability.

Key Words Avulsion, replantation, HBSS, Viaspan, storage medium

INTRODUCTION

Traumatic dental injuries occurring in children and young adults, comprising 5% of all injuries. Twenty-five percent of school going children experience dental trauma and 33% of adults have experienced trauma to the permanent dentition, with most of them occurring before age 19.^[1] Avulsion of permanent teeth is seen in 0.5-3% of all dental injuries.^[1] In most of the situations replantation is the treatment of choice, however in some situations replantation is not indicated for example severe caries, periodontal disease, non cooperating patient and in severe medical conditions. The prognosis of replanted tooth depends on the existence of feasible cells in Periodontal ligament (PDL) and also those, which can proliferate on the damaged root surface.^[2] It has been suggested in literature that reinsertion within 5 minutes has the best outcome with least loss of viability of PDL cells and hence PDL fibres will be re-established.^[3] However immediate replantation is not possible in all cases. The storage or transport medium used for such cases is also a determining factor for prognosis of replanted tooth. Ideally this storage medium should have antimicrobial properties, should maintain the viability of PDL cells, should have osmolarity between 290-300 mosmol/kg and pH between 7.2-7.4 and should reduce the risk of post replantation root resorption and ankylosis.^[4]

Different storage medium like HBSS, saline, salivad, milk, Viaspan are used for transporting avulsed tooth, and many more have been studied.

MATERIAL AND METHODS

Computer databases, including PubMed, Google search, were searched. Internationally published articles, review literature were included. Search was restricted to those articles which deal with storage and transport

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medium of avulsed teeth. Exclusion criteria, articles that do not deal with the objective of this review and articles in a language other than English.

Water : water or commonly tap water used as storage medium is considered unsuitable as far as viability of PDL cells is concerned. Its hypotonic osmolarity, acidic pH, chlorine and microorganism contamination produce fast necrosis of PDL cells and radicular resorption.^[5,6,7,8-10]

Saliva : saliva may be considered as storage or transport medium. The avulsed tooth can be either carried in buccal vestibule or in a recipient that contain saliva expelled by the patient.^[11] Due to its hypotonicity (osmolarity 60-80osm/l) PDL cells swell and burst. Furthermore bacteria and their by products present in saliva may initiate inflammatory process.^[12]

Saline : The saline solution provides osmolarity of 280 mosm/kg, which is compatible to the cells of PDL, but it lacks essential nutrients like magnesium, glucose, potassium; necessary for PDL cells metabolic process.^[13] Cvek et al reported that, avulsed tooth soaked in isotonic saline solution for 30 mins before replantation were associated with less root resorption as compared to dry storage for 15-40 mins.^[14]

Hank's Balanced Salt Solution (HBSS) :

It has physiologic pH between 7.1 to 7.4 and osmolarity and contains essential metabolites which is advantageous for viability of PDL cells. It maintain the viability, clonogenic and mitogenic ability of PDL cells for up to 48 hrs.^[15,16] This solution is also recommended by Inter National Association of Dental Traumatology and American Academy of Endodontists for storage of avulsed tooth. HBSS is commercially available as Save-A-Tooth. The composition of this solution include Sodium Chloride, D-Glucose, Potassium Chloride, Sodium Bicarbonate, Sodium Phosphate, Calcium Chloride, Magnesium Sulphate as active ingredients and water as inactive ingredients. In a study conducted by Krasner, HBSS was found to be the best medium for storing avulsed teeth.^[17] It has a shelf life of 2 years and does not need cooling or refrigeration, provides a good success rate if avulsed tooth is soaked in it for 30 mins or less.^[18]

Milk : Milk is a popular storage medium for avulsed tooth as it is readily available, cost effective and also have physiologic osmolarity and pH (270 mosm/kg, 6.5-7.2). various types like low fat milk, skimmed milk, whole milk have been investigated as storage and transport medium for avulsed tooth. Milk

containing amino acids and vitamins, is capable of inactivating harmful enzymes, that cause injury to PDL cells.^[19] According to literature milk can maintain the viability of PDL cells for up to 2 to 6 hrs.^[16,20,21] Milk is equally effective storage medium for avulsed tooth as HBSS at cellular level, although the effectiveness reduces after 2 hrs.^[22] The main drawback is the presence of antigen within milk may hinder the reattachment of PDL fibres after replantation.^[23] Milk containing low fat is more effective as storage medium than milk with high fat content.^[31] If ice is added to the low fat milk, viability of PDL cells increase^[32] and it can be used as alternative storage medium to HBSS if HBSS is not available.

Viaspan : Viaspan is the trade name under which University of Wisconsin Solution was sold. It contains Potassium Lactobionate, Magnesium Sulfate, Raffinose, Adenosine, Glutathione, Allopurinol, Hydroxyethyl Starch and KH₂PO₄. It is mainly used for organ transport in united staes. It has a pH of 7.4 and it's osmolarity is 320 mosm/kg.^[2] It has similar result to HBSS and superior to milk for storage of avulsed tooth with 37.6% viable fibroblast after 168 hrs of storage.^[24] It has mitogenic ability due to the presence of adenosine within it. The only disadvantage is its high cost.^[25]

Coconut water : Coconut water is a sterile, biological liquid rich in proteins, amino acids, vitamins and minerals which help in maintaining the viability of PDL cells. Gopikrishna et al. assed the potential of coconut water in maintaining the PDL cell viability and compare it with propolis, HBSS and milk.^[26] Coconut water mixed with sodium bicarbonate may be more effective as storage medium, but some studies contradict it.^[27]

Propolis : It is a resinous substance produced by bee in the construction and maintenance of their hives. It has anti- microbial, anti- fungal, anti-inflammatory and tissue regenerative actions. It can inhibit the late stage of osteoclast maturation and hence useful for reducing root resorption.^[28] According to Krell viability of PDL fibroblast is maintained as long as 20 hrs.^[29] Studies have been conducted using 10% propolis for storing avulsed teeth and compared it with HBSS and milk^[30]

CONCLUSION

Several storage medium for avulsed teeth are suggested in literature. Though HBSS, Viaspan are more effective in maintaining the viability of PDL cells and also maintain clonogenicity and mitogenicity of PDL cells for a longer time, their cost and availability are the disadvantages. Whereas

storage medium like milk, coconut water, saliva are readily available and potential alternative to HBSS and Viaspan. So far commercially available storage medium is concerned; HBSS and Viaspan are the best choices. However they may not be readily available in all situations and for that low fat milk, coconut water may be used as effective alternative.

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