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REVIEW ARTICLE

Nature's Transport Media For Avulsed Tooth – A Short Review

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Abstract

Approximately 0.5-16% of traumatic injuries to the permanent anterior teeth results in tooth avulsion. The most common treatment for this type of injury is replantation. Although immediate replantation is always desirable, it is not always possible. In such situations, the tooth must be stored in a suitable medium to preserve periodontal ligament cell viability. Since accidents can occur anywhere, the availability of the transport media at the site of accident is important. The present review discusses the use of three commonly available natural transport media namely Coconut water, Egg white and Milk.

INTRODUCTION

Dental trauma is one of the most common reason for emergency appointments in the dental clinic. Approximately 0.5-16% of traumatic injuries to the permanent anterior teeth results in tooth avulsion .[1] Avulsion injury, one of the most severe forms of dental trauma, is characterized by complete displacement of the tooth from its alveolar socket. Because of the complexity of this injury, the neurovascular supply is severely compromised and usually results in loss of pulp vitality.[16] The most common treatment for this type of injury is replantation. When replantation is done within 20 minutes or if the avulsed tooth is placed in a suitable storage medium until a dentist can replant the tooth, the chances for successful treatment of the tooth is maximized. [2,3,7]

Although immediate replantation is always desirable, it is not always possible. In such situations, the tooth must be stored in a suitable medium to preserve periodontal ligament cell viability. As far as prognosis is concerned, the choice of storage media is more important than extra alveolar time. [10]

A storage media is a physiologic solution that is similar to the oral environment and helps preserve periodontal cell viability during the extra alveolar period.[12]

This article will discuss three naturally available transport media namely Coconut water, Milk and Egg white.

COCONUT WATER

Coconut (Cocos nucifera L) is popularly known as the "Tree of life" and the coconut water is a natural sterile product biologically produced and hermetically sealed inside the coconut. [10] Coconut water is composed of cations potassium, calcium and magnesium. Sodium, chloride and phosphate are found in lower concentrations. It has a high osmolarity because of the presence of glucose and fructose. It is also rich in essential amino acids including lysine, cystine, phenylalanine, histidine and tryptophan. [6]

The high osmolarity of coconut water helps in maintaining viability of periodontal ligament cells.[4] Both physiologic saline and saliva which are different in composition but have similar osmolarity demonstrated reduced incidence of root resorption.[3] This observation emphasizes the fact that osmolarity rather than chemical composition is more significant in maintaining cell viability.

Studies comparing Coconut water with Milk, Propolis and HBSS have demonstrated the superiority of coconut water in maintaining periodontal ligament cell viability.[9,10] Considering storage time upto 120 mins, coconut water was as effective as HBSS .[22] The avulsed tooth may be carried in the coconut shell as exposure to air leads to the coconut water losing most of its organoleptic and nutritional properties.[9]

The coconut tree is grown in more than 93 countries in the world from Asia (India, Sri Lanka) to the Pacific (Fiji, Western Samoa). Due to its ease of availability locally at the time of an accident and its sterile nature combined with low cost, it may be recommended as a transport media for avulsed teeth.[9]

On the contrary, the use of coconut water was associated with increased incidence of inflammatory resorption when compared to Milk.[19] The acidic pH of coconut water (4.1) is an added concern because of its deleterious effect on cell metabolism.[17]

EGG WHITE

Cell growth occurs at an osmolality of 230-400 mOsm/kg but is optimum at 290-300mOsm/kg. Egg White has an osmolality between 251 and 298mOsm/kg.[18] Khademi et al[13] demonstrated that teeth stored in egg white for 6-10 hours had a better incidence of repair when compared to storage in milk.

Microscopic analysis of human periodontal cells attached to the extracted tooth after 1 hour of extra oral dry time, compared to milk, egg white and saliva was done. The teeth stored in milk and egg white showed similar organization of collagen fibers and number of cells. These findings led the authors to suggest that egg white can be the perfect storage media for avulsed teeth.[21]

The eggs high pH is a matter of concern as it leads to some loss of efficacy over time. Also the presence of egg proteins could cause the periodontal ligament cells to target them as foreign bodies. The wide variations in egg composition and quality necessitates further research to confirm these effects.[20]

MILK

Milk with a osmolality of 275 mOsm/kg and a pH of 6.5 to 6.8 has been used as a transport media.[11] The American Academy of Endodontics indicates milk as a storage media for avulsed teeth to maintain periodontal cells viability. [14] The presence of amino acids, carbohydrates and vitamins are probably responsible for its effectiveness.[15] Long shelf life milk which does not require refrigeration is as effective as pasteurized milk.

The use of milk has shown to reduce inflammatory response after replantation when compared to saliva.[5] Milk is easily available and free of bacteria when pasteurized and hence may be recommended as a transport media for avulsed teeth.

Milk is a compatible storage medium only when fresh and cold .[4] Although milk maintains the optimum osmotic pressure required to maintain the periodontal ligament cells, it is unable to reconstitute cell metabolites.[8]

Conclusion

Although HBSS with its osmolality and pH similar to plasma is probably the best transport media for avulsed teeth, it may not necessarily be available at the site of accident. Any appropriate media prevents dessication of the periodontal ligament cells following trauma and improves chances for successful replantation.

Natural transport media like coconut water, milk and egg white score over HBSS based on their ease of availability and economical price. In an emergency, it is important for dentists to consider the circumstances of the accident, the location and suggest an appropriate transport media.

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