

Review Article

Tooth avulsion - A Review

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Abstract: Tooth trauma continues to be a common problem that every dental surgeon must be prepared to assess and treat when necessary. One of the serious traumatic injuries is avulsion where one or more teeth come out of the alveolar socket. Tooth avulsion is an emergency for children and adolescents requires management approaches for the survival of avulsed teeth. The objective of this article is aimed to present the review of literature on tooth avulsion.

Keywords: Tooth trauma, tooth avulsion, alveolar socket

TOOTH AVULSION: DEFINITION

Tooth avulsion (exarticulation) implies total displacement of the tooth out of its socket [1]. Exarticulation of teeth following traumatic injuries is relatively infrequent, ranging from 0.5 to 16% of traumatic injuries in the permanent dentition [1].

ETIOLOGY

According to Martins *et al* [2] the main etiologic factors in the permanent dentition are fights and sports injuries. While falls against hard objects are a frequent cause in the primary dentition

- Unknown (17%)
- Altercations (17%)
- Contact sports (15.9%)
- Motor vehicle collision (10.8%)
- Motorcycle accident (10.4%)
- Ice hockey (2.3%)

REVIEW OF LITERATURE

Blomlof and Otteskog,[3] compared the effect of milk and saliva on human periodontal ligament cell. The cells were stored in milk or saliva for 60, 120 & 180 minutes at temperatures of 4° C, 20°C & 37°C. The stored cells were analyzed for cell viabilities cell swelling cell recovery and healing. They discovered that most of the periodontal ligament cells were viable after prolonged storage in milk. According to the authors the viability of periodontal ligament cells is dependent upon the type the storage media, the temperature of the storage media, the duration of

storage, and that the osmolarity of milk seem to be the most important factor.

Andreasen, [4] studied the effect of extra alveolar period & storage media upon periodontal and pulpal healing after replantation of mature permanent incisors in monkeys. The extra alveolar period before replantation was 0, 18, 30, 60, 90 and 120 min. The storage media for the extracted teeth were examined histologically for surface, resorption, inflammatory resorption, replacement, resorption, periapical inflammatory changes, the extent of vital pulp and down growth of pocket epithelium. A significant relationship was found b/w the frequency of root resorption extra alveolar period ad storage medium.

- i. Surface restoration was found with approximately the same frequency irrespective of extra alveolar period storage media.
- ii. Inflammatory root resorption was especially common after dry storage and was related to the length of the extra alveolar period. After 30 minutes of dry storage, this resorption type was very prominent teeth stored in tap water, saline or saliva showed about the same frequency of inflammatory resorption, which increased slightly with increased extra alveolar periods.
- iii. Replacement resorption showed a strong relationship to dry storage and became very prominent after 60 minute replacement resorption was rarely found among teeth stored in saline whereas it was significantly increased among teeth stored in tap water.

- iv. Saline and saliva offer good protection against root resorption during the extra alveolar period.

Oikarinen and seppa [5] studied the effect of preservation media on proliferation and collagen biosynthesis of cultured human periodontal ligament. Fibroblast proliferation of cells was studied after 60 minutes incubation in Dulbeccos modified Eagles medium (DMEM), milk, saliva, tap water. They concluded that milk and saliva were superior to water in maintaining these cell functions.

Gamson, Dumsha, Sydiskis[6] studied the effect of drying time on periodontal ligament cell viability. They studied various dry storage time ranging from 0 to 120 minutes followed by 45 minutes storage in milk. A dual labeling fluorogenic labeling techniques was utilized in under to discriminate this viable and non-viable cell. It was found that at 30 minutes of dry storage there was a statistically significant decrease in the members of viable periodontal ligament cells when compared to 10 and 20 min of dry time. They concluded that milk is a suitable storage media for maintaining periodontal ligament cell viability.

Trope and Fried man [7] studied histologically the periodontal healing and root resorption of replanted dog teeth stored in viaspan for different time period and compared these healing pattern to those after storage in milk or hanks balance salt solution. The extracted teeth were divided into 4 groups composing 4 teeth each are placed in vials containing viaspan or milk for 6,12, 24, 36 hours and viaspan or hanks balanced salt solution for 36, 48, 72 & 98 hours after which they are replanted, and were examined histologically for healing of the supporting tissues. They concluded that for viaspan neither replacement nor inflammatory root resorption was seen after 6 and 12 hours storage. A statistically significant rise in the incidence of replacement resorption was seen at 24 and 36, 48 hours to levels, equal to storage for 6 & 12 hours. The occurrence of inflammatory root resorption were low and significantly increased only at 48 hours after teeth it decreased significantly again. Viaspan proved superior to milk as a storage medium. Teeth stored in hanks balance salt solution showed healing, result was similar to those stored in viaspan trope.

Hiltz and Trope [8] studied the viability of human lip fibroblasts in milk, Hank's balanced salt solution and viaspan storage media. The growth medium was replaced by the storage media and average number of cells that each plate contained at confluence was counted at time zero. At times ranging from 2-16 hours the average number of vital cells remaining was measured using the trypan blue exclusion test. The result showed that.

- i. The groups stored in milk maintained at high percentage to vital cell for 6 hours (68.2%). At

12 hours milk effectiveness had dropped to 43.4 vital cells and it was not effective at 48 hours (0.024 vital cells)

- ii. Hank's balanced salt solution was extremely effective for 24 hours with 71.3% vital cells remaining. At 48 hours, the percentage of vital cells dropped to 38.07. & by 120 hours no cells survived.
- iii. Viaspan was the most effective storage medium at all observation periods and at 168 hours still had 37.6% vital cells present.

Doyle *et al.* [9] evaluated the effect of soaking in Hanks balanced salt solution or milk on periodontal ligament cell viability of human teeth stored dry for 30,60 and 90 min. Trypan blue dye exclusion test was used to assess the vitality. The results of this study demonstrates no significant difference in the number of viable cells with or without soaking in Hanks balanced salt solution or milk at any of dry storage time. In addition there was no significant difference in the periodontal ligament cell viability between the 30 and the 60 minutes dry periods.

Kitzis and Miller,[10] reported replantation of avulsed tooth after prolonged storage. This report demonstrates that if an intact avulsed teeth is retrieved stored carefully and can be treated successfully even after more than 42 hours outside the alveolus

Marino and west, [11] evaluated the ability of long shelf life milk as a storage media compared with pasteurized milk and Save A tooth. Result showed that at 8 hours, periodontal ligament cells viability in regular pasteurized milk and long shelf-life milk were significantly greater than in save a tooth. There was no significant difference between regular pasteurized milk and long self-life milk at any time period. These results suggest that long shelf life milk which has the advantage of not requiring refrigerator is an effective a storage medium as regular pasteurized milk and more effective than save a tooth.

Patil *et al.* [12] evaluated periodontal ligament cell viability from exarticulated teeth stored in saline or milk using fluorescein diacetate stain. It was concluded that there was no statistically significant difference in the number of viable cells on the root surfaces of teeth after 2 hours of storage in either milk or in saline.

Ashkenazi *et al.* [13] studied in vitro viability, mitogenicity and clonogenic capacity of periodontal ligament cells after storage in six different media. The media evaluated were culture medium, alpha minimal essential medium, milk, Hanks balanced salt solution, viaspan and conditioned medium. They concluded that hanks balanced salt solution and milk were the most effective media for preserving the viability, mitogenicity and clonogenic capacity after storage for upto 24 hours at 4°C.

Ashkenazi *et al.* [14] studied in vitro viability, mitogenicity and clonogenic capacity of periodontal ligament cells after storage in hanks balanced salt solution, culture medium alpha minimal essential medium and viaspan at room temperature. They concluded that culture medium, followed by Hanks balanced salt solutions viaspan, was the most effective media for preserving the viability, mitogenicity clonogenic capacity of periodontal ligament fibroblast stored for up to 24 hours at room temperature.

Lekie and Kenny [15] studied the relationship of clonogenic capacity to vital dye staining of human periodontal ligament cells. The cell vital dye staining (BCECF /AB dye inclusion) was done to determine the cell membrane integrity. They found that extracted teeth stored in milk as transport medium exhibit improved cell viability compared with dry conditions. They also concluded that in vitro assays of cell viability based on dye inclusion are not as closely related to clinical survival of replanted teeth as are assays of clonogenic capacity, since these dye inclusion assays provide only a measure of membrane integrity.

Pileggi and Dumsha, [16] assessed post traumatic periodontal ligament cells, viability stored in Hanks balanced salt solution, milk, saline and water using collagenase and dipase treatment. The viable cells were assessed using trypan blue exclusion test. It was concluded that following 30 minutes dry storage & 45 minutes storage in transport media, milk appeared superior compared to saline and hanks balanced salt solution for storage of avulsed teeth. They also suggested that collagenous and dipase assay appeared to be a viable method for evaluating periodontal ligament cell viability.

Martin and Pileggi [17] made a quantitative analysis of propolis, a new storage media. They showed that within the parameters of the study it appeared that propolis may be better alternate to hanks balanced salt solution, milk or saline in terms of maintaining periodontal ligament cell viability after avulsion and 45 minutes storage concluded among 4 storage media that us hanks balanced salt solution, tender coconut milk and saline that hanks balanced salt solution is the most effective media for maintaining the viability. Tender coconut water maintaining viability less than HBSS but greatest than milk and saline but further detailed studies are required to validate the results, before it is recommended for clinical use.

Aydin and Kargul, [18] described the replacement of patients own tooth as a pontic in glass-fiber reinforced composite materials in case of reimplantation failure avulsed anterior tooth advantages includes conservative, esthetic, metal free tooth replacement, saving of time, elimination of second visit, ease of application, ease of cleaning and naturalness of

feel and its limitation include occlusal factors, and the presence of unsuitable abutment teeth, presence of diastema.

Pohl *et al.* [19] described a case report about the auto-alloplastic transplantation of primary canine after traumatic loss of a central incisor in an 8 old boy. 7 month follow up revealed normal periodontal healing with absence of infection, ankylosis or progressive resorption. The transplantation of a primary canine seen as a promising method to replace a lost permanent tooth and maintain the surrounding tissues in very young patients.

Shashikiran N. D [20] The study was done to evaluate the parental knowledge and attitude of urban and rural population regarding the emergency management of avulsed teeth in children. It found that awareness with respect to immediate management of avulsed permanent incisors in children was very poor in case of rural parents compared to the parents from urban areas.

Adil N. F [21] reported a case where replantation was done after 36 hours of avulsion in which the root canal was done extraorally. He explained the importance of vitality of PDL and also the stability of the replanted tooth was better when splinting was done with orthodontic brackets and Australian wire.

Paul Chalakkal [22] reported a case of successful management of an avulsed tooth which was replanted after an extended extra oral dry time by performing extra oral endodontic treatment followed by root treatment with 1.23% acidulated phosphate fluoride solution prior to replantation.

Shweta Jain [23] reported a case of delayed replantation of avulsed teeth after extended extraoral period and nonphysiological storage. This article presented a alternative treatment modality to immediately restore esthetic and function as well as to promote the growth of alveolar crest for proper eruption of adjacent unaffected teeth until a definite prosthetic treatment seems appropriate.

Yin- Hua Zhao, Min Zhang [24] found that the PRF induced a significant and continuous stimulation of proliferation in human PDLSCs throughout the 7-day incubation period. The PRF suppressed the osteoblastic differentiation of PDLSCs by decreasing ALP activity and the gene expression of BSP and OCN while up-regulating the mRNA expression levels of Col-I and CP23 during the testing period. They suggested that the PDLSCs/PRF construct may be a useful tool for alveolar surgery that has the potential to improve the clinical outcomes in future avulsed tooth reimplantations.

Hassan Suliman Hanawany and Vimal Jacob [25] evaluated the level of knowledge about tooth avulsion and its management among dental assistants in Riyadh, Saudi Arabia and assessed its relationship with their educational background.

Al Jazairy YH, Hanawany HS. [26] evaluated the level of knowledge about permanent tooth avulsion and its management among dentists working in Riyadh, Saudi Arabia. They observed that among dentists there is moderate knowledge of avulsion and its management but a relative lack of knowledge was observed regarding the duration of follow-up after replantation.

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