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Replantation of Primary Avulsed Teeth: A Myth or a Boon ?

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Abstract

Replantation of an avulsed primary tooth possesses the possibility of several unfavourable outcomes hence frequently it is not recognized as a treatment option. Compared with the abundant literature on the replantation of avulsed permanent teeth, the literature on replantation of avulsed primary teeth is significantly more limited. Although there are very few studies published in literature in favour of replantation of primary teeth. Hence it always creates a dilemma for clinicians. Present article focuses on the risks and benefits of replantation of avulsed primary teeth and the steps to be followed while replantation in case of appropriate clinical scenario.

Key words: Avulsion, Primary teeth, Replantation

Introduction

In medicine, an avulsion is an injury in which a body structure is forcibly detached from its normal point of insertion by either trauma or surgery (from the Latin *avellere*, meaning "to tear off").[1] Injuries to developing teeth can influence their further growth and maturation, usually leaving a child with a permanent and often readily visible deformity. Especially when injury occurs during initial stages of development, enamel formation can be seriously disturbed. [2] Tooth avulsion is a serious traumatic injury which leads to disruption of blood supply to the pulp and exposure of the cells of the periodontal ligament to the external environment.[3] Avulsion of primary teeth has been reported to comprise between 5.8% and 19.4% of all types of traumatic injuries to the primary dentition and 19.2% of luxation injuries only. It occurs most often in 2–4- year-old children and affects boys 1.2–1.5 times more than girls.[4] As an apex of the primary tooth has very close relationship to the developing permanent successor explains the risk of developmental disturbances in a permanent tooth after avulsion of the primary predecessor.[5] Holen et al in 2013 suggested three primary otptions of an avulsed primary incisor: No treatment (i.e., avoid replantation), prosthetic replacement of the missing tooth and replantation of the avulsed tooth .[4]

Aim of this paper is to put a glance on published literature regarding various treatment options on management of avulsed primary teeth.

Risk verses benefits of replantation of primary teeth

Risks

Since no published guidelines for the management of avulsed primary incisors exist, there is no consistency in the management techniques described in the cited papers.

In recently issued updates of guidelines for the treatment of avulsed primary teeth, the American Academy of Pediatric Dentistry (AAPD) and the International Association of Dental Traumatology (IADT) recommended avoiding replantation of avulsed primary teeth because of potential damage to the developing permanent tooth germ.

Major drawbacks of replanting primary teeth includes

Andreasen JO[3] stated the classification used in regards of developmental disturbances in the permanent successors is as follows;

Discolouration

White or yellow-brown discolouration of enamel, sharply demarcated. Extent varying from small spots to larger areas, without detectable defects in the enamel surface.

Hypoplasia

White or yellow-brown discolouration of enamel with detectable defects in the enamel surface. Extent varying from small spots to larger areas.

Horizontal enamel hypoplasia

A narrow horizontal indentation encircling the crown. Incisally discolouration and/or hypoplasia might be found.

Crown dilaceration

A deviation of part of the crown in relation to the long axis of the tooth.

Along with these factors some adjoing factors which may role in argument on replantation of primary teeth are-

1) **Risk of pulp necrosis and external root resorption**

Andreasen and Andreasen , claimed that replantation of primary teeth is not justified due to the risk of pulp necrosis. Obviously, the pulp of an avulsed tooth is expected to become necrotic, due to detachment from its original blood supply: revascularization of the pulp can be expected only in young permanent teeth with an open apex.[3]

In primary as in permanent teeth, if the pulp is not removed after replantation, external inflammatory root resorption is an obvious complication. The association between pulp necrosis and external inflammatory root resorption has been known for many years.

Harrison in 1968 concluded that replantation of primary teeth can hardly be justified based on the observation of rapid external resorption of the root.[6]

2) **Replantation may inflict damage to the permanent successor**

This is considered as most common reason to avoid replantation of primary teeth because of its risk to cause the damage to permanent successor. Andreasen & Andreasen stated that the damage to the developing permanent successor may result from a coagulum that is forced into the area of the follicle during insertion of the avulsed primary incisor back into its socket.[7]

Apex of the primary tooth and the germ of the permanent successor are usually only separated by a thin layer of soft tissue. Avulsion of a primary tooth can mechanically affect the developing permanent tooth by interfering with the enamel mineralization. The affected enamel will appear white clinically because of a lower mineral content compared with the surrounding enamel. If breakdown products from bleeding spread to an area where formation of enamel is still taking place the result will be a yellow brown discolouration.[8]

3) **Ankylosis**

According to Levine, ankylosis of replanted primary teeth occurs when the root has been stripped of its periodontal membrane, allowing the joining of the cementum and the bone.[9]

Fried and Erikson attributed the development of ankylosis to the splint used to immobilize the replanted tooth. Ankylosis of a replanted primary tooth has been considered to interfere with eruption of the permanent tooth and to cause delayed or ectopic eruption of the permanent successor. However, a thorough review of reports on replantation of avulsed primary teeth did not reveal any mention of ankylosis.[10]

4) **Risk of aspiration**

Killian suggested the splinting of replanted teeth, and thus avoiding exposure of a child to the danger of aspiration.[11]

5) **Children have no esthetic demands**

Moss stated that: 'children do not become aware of the loss of a primary incisor prior to age five or six. It doesn't make a great deal of difference to them because their classmates also lose their incisors'.[12]

6) **Financial costs, time consumption, and lack of children's cooperation**

Hill in 1984 and Kenny et al. in 2001 have suggested that treatment costs, as well as the time required for dental visits, are factors to be considered before reaching a decision on replantation of avulsed primary teeth. [13,14]

7) **Lack of scientific evidence**

Controlled experimental studies in humans and animals have not been performed, nor has a single reliable case report demonstrating damage of replantation of a primary incisor to the permanent teeth been published. However, several surveys have reported incidence rates of defects to permanent incisors following avulsion of primary predecessors in the range of 38%–85%

Benefits

Replantation of primary teeth helps in maintenance of natural tooth in function providing good aesthetics. This may relieve parental guilt or concerns that a child's self-esteem and social acceptance will be compromised by premature loss of a maxillary incisor.[15]

Beyond aesthetics, natural space maintenance, prevention of articulation problems, prevention of tongue thrust habit could be achievable through replantation of primary teeth.

Friedlander LT suggested that the replantation of primary incisors may be feasible and effective if performed under optimal conditions.[16]

Holen G [4] suggested technical steps for replantation of avulsed primary teeth

Immediate treatment

When primary tooth has been replanted immediately at site of injury

1 Assure the tooth is in its appropriate position by clinical observation and a radiograph.

2 Splint the replanted tooth to adjacent unaffected stable teeth. Splint should be as close as possible to the incisal edge to allow effective cleaning of the tooth at the gingival margin. The splint should be removed when risk of spontaneous exfoliation no longer exists.

Expected time:14 days.

3 Remove necrotic pulp within 7–10 days, fill the root canal with a resorbable paste and restore the crown and seal the margins of the restoration to avoid leakage.

After extended extra-oral time

1 Shorten the root by resection of 2–3 mm of the apex.

2 Drill the palatal aspect of the crown to get access to the pulp chamber. Remove the necrotic pulp and fill the root canal and pulp chamber with a resorbable paste, and remove any excess of material extending through the apex. Restore the crown.

3 Remove any remnants of the necrotic PDL mechanically by scraping the root surface and chemically by soaking the root in sodium hypochlorite.

4 Soak the root in a saturated citric acid solution for 3 min, rinse with normal saline, embed in 1% Stannous

Fluoride solution for 5 min, rinse with normal saline, embed in 1% doxycycline (or tetracycline) solution for 5 min and rinse with normal saline. The aim of this procedure is to slow the pace of external replacement root resorption.

5 Provide local anesthesia.

6 Rinse the socket with saline to remove the blood clot. If necessary gently use an instrument to check the socket for fractured alveolar bone.

7 Replant the tooth back to its socket.

8 Assure the tooth is in its appropriate position by clinical observation and a radiograph.

9 Splint, as described above

Postoperative instructions

1 Soft diet till replanted tooth becomes immobile.

2 Consider the use of antibiotics.

3 The importance of oral hygiene should be stressed to the parents. Thorough oral hygiene should be kept especially at the gingival margins surrounding the replanted teeth where chlorhexidine gluconate should also be applied.

4 The parents should be asked to return for periodic follow-up examinations or earlier if they have any suspicion of deterioration of the condition.

Follow up

The purpose of the follow-up examination is not only early detection of postoperative complications but also for identification of conditions that have the potential to elicit pathological processes that may endanger the developing permanent teeth or be indicative of failure of replantation. Poor oral hygiene is the most prominent example of such a condition as infection of the PDL is the main cause of failure.

The first follow-up examination of the child should be 24 hour after replantation to assure the integrity of the splint. Two week later, tooth mobility is checked and splint removal considered; root canal treatment performed (if not done at the first visit); and oral hygiene evaluated and instructions reinforced. The time interval till the next follow-up examination depends on the findings in the last check-up and on the risk potential. If no complications observed or suspected, the visits can be at 1, 3, and 6 months and then every 6 months.

Successful replantation of a primary tooth can be defined as retention of the replanted tooth till natural exfoliation at the appropriate dental age and eruption of the permanent successor.

Discussion

Tooth avulsions occur in very young children when they learn to walk and run. Other causes are play, fight and child abuse.[17]

The maxillary central incisors are the most commonly avulsed teeth due to their slight buccal apical inclination and forces directed to the palatal surface.[18]

Replantation of primary incisors has been carried out in some studies and reported for some individuals where the criteria adopted appear to be based on the protocol relating to replantation of permanent incisors.[5]

Smelhaus , Kokich et al. and Filippi et al. proposed a simple and elegant solution to the risk of damage to the permanent tooth. They suggested resection of the apex of the root of the primary tooth by one-fourth to one-fifth of its length prior to replantation.[19,20]

Although all recent guidelines for treatment of traumatic dental injuries in primary dentition does not recommend replantation of primary teeth some authors carried out replantation of avulsed primary incisor under optimal protocol when parents urge them to save the tooth and came up with good outcome.

Maria Jose´ de and colleagues carried out a case of replantation of primary teeth with successful clinical outcome till the eruption of succedaneous permanent incisor, in that clinical scenario the tooth had spent less

than 30 min out of the alveolus and was hydrated because it was properly stored in milk, the alveolar bone tissue was not damaged hence according to the Federal University of Santa Catarina (UFSC) protocol of treatment of traumatized primary teeth replantation of avulsed tooth was done.[21]

Haalaswamy Kambalimath et al published a case report on replantation of deciduous maxillary canine and opted for endodontic treatment of avulsed tooth prior to replantation.[22]

Sonu Acharya et al considered replantation of avulsed primary incisor as feasible option.[23]

Warning signs of failure in the reimplantation of the primary teeth, as described in the literature, include: crown color alteration, dental mobility, and periapical bone rarefaction associated or not with external root resorption. All of these factors are associated with the reimplantation of the primary tooth, which does not undergo endodontic treatment. On the other hand, the success of a dental reimplantation is associated with the time the tooth was kept out of the alveolus, the storage means, and the contamination absence. The stage of the root development may also be considered, as it is associated with these factors. Teeth that present the clinical signals of physiological root resorption are not recommended for reimplantation, as they do not present the strategic value (proximity to the eruption period of the permanent successors). [21]

Conclusion

Aesthetic demands by parents as well as children are increasing day by day. For replantation of avulsed primary teeth, all optimal conditions should be taken into considerations, only the technical indications, but also the importance of such an act to the child and to the family, explaining the treatment options, risks, and benefits of each option. More number of long term clinical trials is advisable to decide the solidified treatment plan for avulsed primary teeth in future.

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