



AN AVULSED TOOTH

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ABSTRACT

Trauma to anterior dentition has shown a steady global increase in prevalence and morbidity, being attributed to rise in societal violence as well as in the popularity of contact sports. Tooth avulsion is an extreme variant of dental injury in which there is complete ejection of tooth from its bony socket. Avulsions are the most common type of dental injury recorded for children under 15 years of age seeking treatment in hospital emergency rooms. This injury causes pain, negative aesthetics and has emotional and functional impact on children.

Avulsed tooth can be replanted in its socket following trauma, and given right conditions and clinical management; may be expected to function normally for several years thereafter. A number of longitudinal studies have validated the rationale for avulsed tooth replantation, and clinical protocols for management have a degree of consensus.

This article reviews present-day understanding of clinico-pathophysiology and management of traumatic tooth avulsion.

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INTRODUCTION

Dental trauma is now receiving epidemiological attention as an important public health problem since global reduction in dental caries prevalence and morbidity. Incidence of dental trauma has been showing a steady increase all over the world, being attributable to increase in societal violence as well as in the popularity of contact sports^{1,2}. It is recognized today that traumatic dental injuries are common and represent a serious health problem among children, occurring most commonly between the ages 8 and 12 years³. Falling accidents in crowded school environment are extremely common. The majority of dental injuries involve anterior teeth and thus may cause pain as well as negative aesthetic, emotional and functional impact.²

One of the most complicated dental injuries is complete ejection of the tooth from its bony socket (avulsion). The complete displacement of a tooth from its socket in alveolar bone entails damage to the periodontal ligament, cementum, alveolar bone, gingival and pulp tissue owing to multiple junction trauma. Avulsion most often involves a single tooth but multiple avulsions can also occur.² According to the World Health Organization (WHO) classification system, avulsion is classified as a periodontal tissue injury.

Traumatic dental injury (TDI) is also a frequent occurrence among preschool children, as these children have relatively uncertain movements, poor balance, slow reflexes and are

therefore more susceptible to falls while learning to stand, walk and run.⁴

Dental Avulsion

For a long time, the conventional wisdom held that an avulsed tooth was a lost tooth. It was as late as 1960s when Dr. J.O Andreasen and later Dr. M Cvek published studies, that this old concept was revised. They showed that an avulsed and replanted tooth could be maintained and demonstrated that five most critical factors affecting the survival of replanted avulsed tooth are^{1,2}

- Time out of the socket (extra alveolar time)
- Nature of storage medium
- Splint type and duration
- Condition of pulp and root canal space
- Stage of root formation

In dental avulsion, replantation is the treatment of choice, but cannot always be carried out satisfactorily. If immediate replantation is not possible, then a storage medium should be used to store the avulsed tooth until professional dental care is available.²

Incidence

It occurs most frequently between the ages of 7–14 years. Avulsion occurs in 0.5% to 16% of traumatic injuries in permanent dentition and 7 to 13% involving the primary

dentition. Across all age groups, it was found that males showed a higher frequency (67.4%) of dental trauma than females (32.6%).^{2,4}

Avulsion injuries are three times more frequent in boys than girls because of their active participation in sports and games.² Furthermore, boys sustain more multiple tooth injuries than girls.^{3,4} With increase in girls participation in sports activities, the number of traumatic injuries has dramatically increased. Of all 12 year old children 16.5% are likely to have an injury to permanent tooth.⁵

Predisposing / Risk Factors

Oral predisposing factors

Antunes *et al* found that risk of TDI increases proportionally to the increase in overjet.⁶ Among children younger than 5 years of age, anterior open bite has recently been found to result in twice as many TDIs when compared with their counterparts.^{7,8}

Maxillary central incisors being more prominent are more frequently injured teeth in both primary (69.6%) and permanent dentition (83.5%),⁶⁻⁸ Moreover lower jaw is flexible and tend to absorb the impact of forces directed on lower anterior teeth, whereas the upper jaw is fixed to skull and is rigid.⁸

Unintentional traumatic dental injuries

Falls, collisions and being struck by an object are the major causes of TDIs.^{2,6} According to studies of Patel *et al* the most common cause of traumatic injuries was "fall" followed by "impact/collisions."⁷ Sharma *et al* reported falls to account for 34% of TDI, followed by push and sports injury.⁸

Environmental determinants may include *behavioural patterns* such as bullying among children, *Emotionally stressful states* such as use of intoxicants by teenagers that can lead to injuries which can culminate in maxillofacial and dental trauma and even *Piercings of tongue and lips* with metallic objects, that is quite a new cause of traumatic dental injuries.

Disease such as epilepsy or *physical limitations* such as hearing or visual impairment or even ADHD have been cited as frequent causal determinants of TDI.⁸

Iatrogenic procedures such as prolonged intubation, most being probably inadvertent,²¹ can also cause TDI, especially during perioperative period in hospitals. The tooth most prone to dental insult has been stated to be maxillary lateral incisor.⁹

Sports injuries have related dental trauma. Recently, a US Health Services report indicated that approximately 33% of all TDI episodes and up to 19% of injuries to the head and face were sports related. According to a study containing Federation Dentaire International citation,² provision of a well-fitting mouth guard or helmet with protection of the face should dramatically reduce the occurrence of TDIs.

Intentional traumatic dental injuries

The face is a common target in assault. Dentists could be the first healthcare providers to detect children who had suffered physical abuse.

Pathophysiology

When teeth and their supporting structures are subjected to impact trauma, the resultant injury manifests either as a separation or a crushing injury or a combination of both.¹⁰ Tooth avulsion possibly occurs following labial alveolar bone

fracture or periodontal ligament (PDL) disconnection. The viscoelastic behaviour of the PDL and the alveolar bone may also affect the mode of avulsion¹¹. PDL acts as a pan-surface shock absorber to minimize external impact. PDL disconnection commences with its initial stage on the apical side and then gradually spreads occlusally, resulting in avulsion.^{10,11}

A portion stays on tooth root and rest remains connected to socket wall. If these 2 portions can be kept alive, the tooth can be replanted, and a new healed periodontal ligament will be formed. Following replantation, proliferation of connective tissue cells commences and within 3-4 days the gap in periodontal ligament is obliterated by young connective tissue. After 1 week epithelium is reattached at cement-enamel junction.¹¹

According to Andearson, histologic examination of replanted human and animal teeth had revealed four different healing modalities in the periodontal ligament.¹

Healing with normal periodontal ligament, which is only seen when avulsed tooth has been replanted almost immediately. *Histologically*, it is characterized by complete regeneration of periodontal ligament which usually takes about 2-3 weeks to complete. This type of healing occurs only when the innermost cell layers along root surface are vital.^{1,10,11} *Radiographically*, there is normal periodontal ligament space without signs of root resorption. *Clinically*, tooth is in normal position and a normal percussion tone can be elicited. This type of healing rarely occurs under clinical conditions.¹¹

Healing with surface resorption: is repair-related resorption (also described as surface resorption). It is a transient process involving small areas on the root surface following luxation and avulsion injuries. Typically, diagnosis can be made within 4 weeks after injury. This type of resorption is reversible.¹² *Histologically* it is characterized by localized areas along the root surface showing superficial resorption lacunae repaired by new cementum. In case of deeper resorption cavities, healing occurs, but without restoration of original outline of root. *Radiographically*, due to small size surface resorptions are usually not disclosed. *Clinically*, tooth is in normal position and normal percussion tone can be elicited.

Healing with inflammatory resorption: This is a very aggressive type of injury-related resorption, described as inflammatory resorption and is currently identified as infection-related resorption.^{1,12} Failure to remove bacteria from the root canal can result in this type of inflammatory resorption proceeding at a rapid pace, resulting in total root resorption within a very short period of time. Inflammatory resorption is especially more frequent and aggressive after replantation in patients aged 6-10 years, possibly because of the large diameter of dentinal tubules facilitating bacterial invasion.^{11,12}

Histologically, inflammatory resorption is characterized by bowl-shaped resorption cavities in cementum and dentin associated with inflammatory changes in adjacent periodontal tissue. Numerous Howship's lacunae and osteoclasts are seen. *Radiographically*, characterized by radiolucent bowl shaped cavities along the root surface with corresponding excavations in adjacent bone. First radiographic sign can be demonstrated as early as 2 weeks after replantation and is usually first recognized at cervical third of the root. *Clinically*, replanted tooth is loose and extruded. Moreover, tooth is sensitive to percussion and percussion tone is dull.

4. Healing with ankylosis (replacement resorption), is a relatively slower, but not necessarily more benign, process described as replacement resorption.^{11,12} This is progressive and irreversible. In growing children it is particularly problematic as replacement resorption impedes jaw growth. Ankylosed root becomes part of the normal bone remodelling system and is gradually replaced by normal bone. After sometime little of the tooth substance remains.

Histologically, represents fusion of alveolar bone and root surface and can be demonstrated 2 weeks after replantation. *Radiographically*, characterized by disappearance of normal periodontal ligament space and continuous replacement of root substance by bone. It is found that even 10 years can elapse before a radiographic diagnosis can be made.¹² *Clinically*, ankylosed tooth is immobile, and in infraposition in children. An ankylosed tooth can be diagnosed clinically within 1 month by its percussion sound (high, metallic).

Effect of loss of primary teeth on permanent successors

Distance between the apex of primary central incisor and the incisal edge of permanent central incisor range from 2.97 mm at age of 3 to 1.97mm at age of 6.¹³ Studies suggest that traumatic dental injuries to primary teeth can cause changes in their successors.¹⁴ Traumatic injuries to primary teeth are serious problems especially in young children due to their effect on appearance, quality of life, eating, speech development, arch integrity and the development of middle third of the face.¹⁵

The affected permanent successor may appear white clinically because of a lower mineral content compared with the surrounding enamel.¹⁴ *Crown dilaceration* can be the result of already formed hard tissue being displaced non-axially in relation to not yet mineralized enamel matrix.¹⁵ *Misalignment and delayed eruption of the permanent successors* may be attributed to deflection of the developing bud from its eruptive path at the time of trauma.^{14,15} *Compromised biting/mastication efficiency*: In primary dentition, anterior teeth have almost as much significance in mastication as posterior teeth. Thus injuries to primary dentition are considered emergency situations and require immediate attention, representing a challenge to professionals as it may have not only a physical component, but a psychological consequence for children and their parents.¹⁵

Management of avulsed teeth

Ideally, an avulsed tooth should be replanted immediately or should be stored in a physiological medium such as saline for only a short period before replantation.¹⁶ Chance of pulpal and periodontal healing is inversely related to period of dry storage. Although in many successful cases a replanted tooth survives only a matter of years, during this period it serves as a natural space maintainer whilst growth occurs, and also enables alveolar height to be preserved. This greatly simplifies future prosthetic rehabilitation by means of bridge or implant placement. Moreover it is generally recommended that implants should not be placed in children who are still actively growing. It is therefore very crucial to replant teeth even if the long term prognosis is poor. If the tooth can be maintained until the child reaches 16 years, alveolar bone is preserved and simplifies implant placement.¹⁶

Primary teeth: Avulsed primary teeth should **never** be replanted due to the risk of damaging the permanent successor.^{13,14}

Contraindications

Among possible contraindications for replantation are: i. The avulsed tooth has extensive caries and evidence of advanced periodontal disease, ii. Excessively dry or inappropriate storage, iii. The alveolar socket has major comminuted fractures, iv. Uncooperative patients; and v. Immature avulsed permanent tooth with short root and wide open apex. There are also some *Definite contraindications* such as where other injuries are severe and require preferential emergency treatment or intensive care and when there is compromised medical history. An example is a patient who can be at risk of bacteraemia with a possibility of developing infective endocarditis or patients with depressed immunity.

Management principles

Treatment of teeth that have completed root development is different from that involving an immature root. It is very important to take into consideration how long and under which conditions the tooth was kept out of the mouth.¹⁶

Emergency treatment at the accident site

An avulsed permanent tooth is one of the few real emergency situations in dentistry. Immediate replantation is the best treatment at the place of accident.^{1,16} The time spent outside of its socket ("extra-alveolar time") is the most critical factor affecting the survival of an avulsed and replanted tooth, particularly if the root surface was allowed to dehydrate because the tooth was left in open air ("extra-alveolar dry time"). Complete healing can only be guaranteed if the tooth is replanted in the first 5 min. However from a practical point of view every effort should be made to replant the tooth within the first 15–20 min. If for some reasons this cannot be carried out, there are alternatives such as using various storage media¹⁷

Researchers have demonstrated that storage medium is one of the most important factors other than the extra oral time as short period of dry storage shows comparatively poor prognosis than prolonged storage in a suitable medium.^{17,18} A storage medium may be defined as a physiological solution that closely replicates tooth socket environment to help preserve the viability of PDL cells following avulsion.¹⁷

Different types of extra-alveolar storage media for intentional (tooth extracted then replaced after treatments) and accidental (avulsed tooth) replants procedure have been investigated. There is consensus that pH and the osmolality of the storage medium are more important than the chemical composition.^{17,20} Optimal cellular growth is reported to occur at an osmolality of 290–300 m osmol /kg and at a pH between 2.2 and 7.4.

The ideal storage medium should be readily available or easily accessible at the site of an accident. It should preserve vitality, adherence and clonogenic capacity of PDL cells so that the nude surface of the root be repopulated by fibroblasts, thus avoiding the adherence of osteoclasts on this area.¹⁷ It should also aid in reconstitution of depleted cellular metabolites.^{17,21}

It is recognised that best storage media may not be readily accessible at accident site and readily accessible media may not be ideal for storage of avulsed tooth. Various storage media with their advantages/disadvantages. *Saliva, Normal*

Saline and even tap water have been studied and found to be hypotonic, containing detrimental agents and generally poor storage media.^{18,21} Normal saline can be used only for a short period of time.²¹

Milk is significantly better than others solutions for its physiological properties; 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.¹⁸ Milk has a pH of 6.5 to 7.2 and osmolality of 270 mOsm/kg, which is similar to extracellular fluid. Milk can potentially maintain PDL cell viability for up to 2 h.^{18,19}

Hank's balanced salt solution (HBSS) 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, biocompatible with periodontal ligament cells with pH balanced at 7.2 and has an osmolality of 320mOsm/kg. According to Krasner²⁰, HBSS is the best solution for storing avulsed teeth. It has a shelf life of upto 2 years at room temperature.¹⁷ HBSS is the only medium that can replenish metabolites in depleted PDL cells.²⁰⁻²²

Egg white has been stated to be a better storage medium than milk in a study by Khademi *et al* (osmolality 251-298 mOsm/kg and pH 8.6–9.3).¹⁹ **ViaSpan** (Belzer VW-CSS, Du Pont Pharmaceuticals, Wilmington, USA) is a medium used for the transportation of organs for transplant and it has been very effective for storing avulsed teeth.²³ PDL cell morphology remains unchanged in the medium, providing optimal pressure for cell growth.²⁴ **Propolis** is a multifunctional material used by bees in the construction and maintenance of their hives.²⁵ Ozan *et al* compared the efficacy of propolis 10%, propolis 20%, milk and HBSS. They found that propolis was significantly more effective than HBSS and milk at 3, 6, 24, 72 hours.²⁶

Several other media including Own serum, Contact lens solution, various culture media / Eagle's medium, and plant derivatives such as Green tea extract (GTE),²⁷ Aloe Vera,²⁸ Pomegranate Juice and Coconut water have also been used in different studies with varying degree of success in maintaining PDL viability.³⁰⁻³²

Tooth rescue box

A tooth rescue box containing Special Cell Culture Medium (SCCM) including amino acids, vitamins and glucose has been developed. In Europe it is marketed as Dentosafe (DentosafeGmbH, Iserlohn, Germany) and in the USA as EMT Tooth Saver (SmartPractice.com, Phoenix, AZ, USA). An unopened box can have a shelf life up to three years. Avulsed teeth stored in a rescue box for 15 minutes have exhibited functional healing irrespective of storage duration.³³

Management at dental office

Emergency visit

It is essential to recognize that the dental injury might be secondary to a more serious injury. If, on examination, a serious injury is suspected, immediate referral to the appropriate expert is the first priority.³⁴

Diagnosis and treatment planning

A good history-taking followed by a thorough examination and a full assessment of site of injury should be made along with evaluation of adjacent and opposing tooth.³⁵

If the tooth was replanted at the site of injury, the position of the replanted tooth is assessed and adjusted if necessary. If the patient's tooth is already out of the mouth, the storage medium should be evaluated and, if necessary, the tooth should be placed in a more appropriate medium while the history and clinical evaluation is taken. HBSS is presently considered the best medium for this purpose.³¹

Extra-oral examination is made for any facial lacerations, bony injuries, haematomas and bleeding is required. Radiographic examination is to be undertaken if needed to ascertain embedded root fragments or complete intrusion rather than avulsion.^{34,35} Intra-oral examination is accomplished by facial and palatal palpation. The socket is gently rinsed with saline and, when clear of the clot and debris, its walls are examined directly for the presence, absence, or collapse of the socket.

Submucosal haemorrhage under the tongue can be suggestive of fracture of the mandible. Examination of the alveolar bone and occlusal abnormalities is done.³⁴

Preparation of the socket

The socket should be left undisturbed before replantation. Emphasis is placed on the removal of obstacles within the socket to facilitate the replacement of the tooth into the socket.³⁶ The condition of socket does not seem to be as important as condition of root surface because studies have shown that PDL cells of an avulsed tooth tend to remain on root surface rather than the socket wall.^{34,35}

Preparation of the root

From a clinical point of view it is important for the clinician to roughly assess the condition of the PDL cells as to whether these are (i) most likely viable (the tooth has been replanted within 5 min), (ii) viable but compromised (the tooth has been kept in storage medium and the total dry time has been less than 60 min) or (iii) non-viable (when extra-oral dry time has been more than 60 min).³⁷

The tooth is best replanted with slight digital pressure, without use of force.³⁶ Apply a flexible splint for up to 2 weeks, keep away from the gingiva. An acid etch/resin splint is usually method of choice.³⁵ Teeth that have been outside the mouth for 15 minutes or more should not be immediately replanted but rather soaked in a pH-balanced cell-reconstituting medium such as HBSS for 30 minutes and then replanted. Some studies have suggested that 70% of PDL cells can remain viable for as long as 4 days in HBSS.³¹

Recent studies have evaluated the effectiveness of the placement of tetracycline/corticosteroids or corticosteroid alone inside the root canal in order to block the surrounding inflammation. Results have been extremely positive even when the roots have been dry for over 60 min emphasizing again the importance of the destructive inflammation in the resultant unfavourable healing with osseous replacement.³⁸

Delayed replantation has a poor long-term prognosis. The periodontal ligament will be necrotic and not expected to heal. The expected eventual outcome is ankylosis and resorption of the root and the tooth will be lost eventually.³⁷ Root canal treatment should be initiated 7–10 days after replantation.³⁴

Avulsed permanent tooth with an open apex

Avulsed teeth with immature roots has potential for pulpal revascularization as well as continued root development but

these teeth are also subject to root resorption.³⁸ Teeth with apical foramen larger than 1.1mm have potential for pulp revascularization after replantation. The rate of revascularization has been shown to vary between 8% to 40%.³⁹

Many pediatric dentists consider the prognosis to be so poor and the potential complications of an ankylosed tooth so severe that they recommend that these teeth not be replanted. However, considerable debate exists as to whether it would be beneficial to replant the root even though it will inevitably be lost due to resorption.³⁹

Splinting of replanted teeth

A splinting technique that allows physiologic movement of the tooth during healing and that is in place for a minimal time period results in a decreased incidence of ankylosis. Semi-rigid (physiologic) fixation for 7–10 days has been recommended.³⁵ The splint should allow movement of the tooth, and should not impinge on the gingiva and/or prevent maintenance of oral hygiene in the area.³⁶ should maintain the repositioned tooth in correct position, provide patient comfort and improve function.

Antibiotics

Systemic antibiotics given at the time of replantation and prior to endodontic treatment are effective in preventing bacterial invasion of the necrotic pulp and, therefore, subsequent inflammatory resorption.³⁵ In addition, the patient's medical status or concomitant injuries may warrant antibiotic coverage.

Endodontic considerations

It is not recommended to initiate root canal therapy on an avulsed tooth at time of injury. Delaying the initiation of root canal treatment and placement of calcium hydroxide for at least 2 weeks is recommended to allow enough time for PDL to reattach.³⁶ The only indication for performing extra oral root canal treatment following avulsion is when the tooth has been dry for several hours.³⁹

Revascularization in teeth with open apex; <60 min dry time

Replantation in such teeth is performed with expectation of revitalization and continued root development. Patients are recalled every 3–4 weeks for sensitivity testing. Recent reports indicate that thermal tests with carbon dioxide snow placed at the incisal edge or pulp horn is the best methods for testing sensitivity.³⁵

Restorations

Recommended *temporary restorations* for effective sealing of coronal access and to prevent infection of the canal are reinforced zinc-oxide-eugenol cement, acid-etch composite resin, or glass-ionomer cement. A depth of at least 4 mm is recommended, Root filling (*obturation*): can be carried out if the disinfection protocol was initiated 7–10 days after the avulsion and clinical and radiographic examinations do not indicate pathosis. If more than 10 days have elapsed, then pulp space must first be disinfected before root filling. The canal is re-instrumented and irrigated under strict asepsis before canal obturation.³⁶ Following obturation, a *Permanent restoration* preferably in composite resins with the addition of dentin bonding agents is usually recommended.^{35,36,39}

Follow-up

Replanted teeth should be monitored by clinical and radiographic control after 4 weeks, 3 months, 6 months, one

year and yearly thereafter.³⁴⁻³⁶ A replanted tooth with closed apex and *favorable outcome* is asymptomatic and has normal mobility, normal percussion sound and no radiographic evidence of resorption or periradicular osteitis. Lamina dura should appear normal. In open apex, continued root formation and eruption should be evident in addition to all of above signs; pulp canal obliteration is to be expected.

A tooth with closed apex and *unfavorable outcome* is symptomatic, has excessive mobility or no mobility (ankylosis) with high-pitched percussion sound. Radiographic evidence of resorption (inflammatory, infection-related resorption, or ankylosis-related replacement resorption) is seen. In open apex, the tooth may be symptomatic, have excessive mobility or no mobility (ankylosis) with high-pitched percussion sound. In ankylosis, the crown may be infrapositioned.

Prognosis of replanted teeth

Replantation of teeth has been considered a temporary measure as many teeth succumb to root resorption. However, a number of cases have been reported where replanted teeth have been in service for 20-40 years with normal periodontium as revealed clinically and radiographically. Such reports suggest that replanted teeth under certain conditions can maintain their integrity and function.³⁷

Survival rate

Studies have shown the replanted tooth survival rate to be 50% - 89%.³⁷⁻³⁹ The outcome of treatment depends on the physiological condition of the periodontal ligament cells and pulp tissue at the time of replantation. Immediate replantation gives better prognosis.^{1,37,39}

Pulpal healing and pulp necrosis

In rare cases revascularization of pulp will occur in replanted teeth with completed root formation provided that replantation was carried out immediately. Pulp of teeth with incomplete root formation can become revascularized if replantation was carried out within 3 hours.¹²

Pulpal sensibility tests are unreliable immediately after replantation. In absence of reaction to electrical stimulation, it should be borne in mind that a decrease in size of coronal pulp chamber or root canals on radiograph is sign of vital pulp tissue than thermal or electric pulp testing. Most significant predictors of pulpal healing are as follows:

The width and length of root canal

The relationship between the diameter of apical foramen and chance of pulpal revascularization apparently is an expression of size of contact area at the pulpo-periodontal interface whereas the length of root canal reflects the time necessary to repopulate the ischaemic pulp. With a favourable ratio i.e wide apical foramen and short root canals the odds for intervening pulpal infection are reduced. A limiting factor in pulpal revascularization after replantation appears to be apical diameter under 1mm.^{12,37}

Dry extra-alveolar period and storage media

In a follow up study of 400 replanted teeth, 73% of teeth replanted within 5 minutes demonstrated PDL healing; in contrast PDL healing occurred in only 18% teeth which were stored prior to replantation.³⁷

The prognosis of the tooth re-implantation depends on the existence of feasible cells in the periodontal ligament. The portion of the periodontal ligament attached to the alveolar wall remains alive and does not need treatment while that attached to the tooth relates to the repairing process after replantation. There is good probability of reinsertion of dental fibers with the alveolar ones, when reimplantation is immediate; that is, when it is done up to one hour after avulsion.³⁷

Replacement resorption or ankylosis

Based on animal and human studies, it has been concluded that teeth stored dry prior to replantation show significantly more ankylosis-related resorption than teeth replanted immediately after avulsion.¹² Ankylosis can usually be diagnosed clinically by percussion test after 4-8 weeks, whereas radiographic evidence of root resorption usually requires a year. The progression of ankylosis is dependent on age of patient or rather the bone turnover rate. Thus, replacement resorption is very aggressive in young individuals and runs a very protracted course in older patients.³⁷ In old patients ankylosed tooth can be retained as the ankylosed tooth may last for 10-20 years, due to slow remodelling rate of bone in older age group.¹²

CONCLUSION

Majority of tooth avulsion incidents occur at home and school during leisure and sports activities. The health policy makers seeking prevention of accidents should implement educational and preventive strategies⁴¹ that could reduce the probability of occurrence of TDIs.

These could include;

1. Caretakers and educational institutions should provide safe environments and equipments for children activities;
2. Children should be encouraged to use helmets, mouth guards or any other protective device during sport activities;
3. Sports such as contact sports or the sport which involves aggression should be played under competent supervision on appropriate surfaces;
4. National and local campaigns to increase social awareness about TDIs;
5. Education of the parents and teachers regarding the TDIs and their consequences;
6. Specific local laws requiring and regulating the use of safety equipment are necessary.

The high rate of incorrect manipulations of the avulsed teeth shows the need for public campaigns about how to proceed when faced with tooth avulsion and the importance of immediate replantation as outlined in IADT's 2014 guidelines.

Knowledge about availability of appropriate treatments and protocol can reduce stress and anxiety for both patients and the dental team. Therefore, it is important to promote awareness and up-to-date information among professionals as well as population groups at risk regarding treatment modalities.⁴¹

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