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Education on and prevention of dental trauma: it's time to act!

INVITED REVIEW

Liran Levin[1,2], Yehuda Zadik[3]

[1]Department of Periodontology, School of Graduate Dentistry, Rambam Health Care Campus, Haifa; [2]Faculty of Medicine, Technion – Israel Institute of Technology, Haifa; [3]Department of Oral Medicine, Hebrew University-Hadassah School of Dental Medicine, Jerusalem, Israel

Correspondence to: Liran Levin, Department of Periodontology, School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel
Tel.: +97248542983
Fax: +97248543717
e-mail: liranl@technion.ac.il

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Abstract – Dental trauma is, unfortunately, not uncommon and may be even more prevalent in high-risk populations. It should be emphasized and acknowledged that many cases of dental trauma are preventable. Appropriate management includes *primary prevention*, i.e. avoidance of pathology development, and *secondary prevention*, i.e. early diagnosing and treatment of the pathology before significant morbidity occurs. The aim of this article is to provide a review of the current dental trauma literature with regard to education and knowledge and with relevance to primary and secondary prevention. As the duty of providing the public with measures for the maintenance of proper oral health is of the dental profession, the responsibility of providing primary and secondary prevention of dental trauma is of dentists, dental hygienists, and dental nurses. They may, and should, educate other medical, paramedical, and non-medical professionals, taking into account that those non-dental professionals could not maintain a high level of knowledge and service regarding dental trauma without a continuous backing by the dental professionals. It should be remembered that as the prevalence of dental decay has reduced in the Western world during recent decades, dental trauma plays a significant part in causing dental morbidity and mortality (tooth loss). It seems that now is the time to act for the benefit of our community and move from 'treating' toward 'managing' risk factors and prevention.

Dental trauma is, unfortunately, not uncommon (1) and may be even more prevalent in high-risk populations such as children (2, 3), special needed/handicapped individuals (4), sportsmen (5), and military personnel (6, 7). Additional preventable risk factors for tooth injury include, among others, lip or tongue piercing with intraoral ornaments (8) and other parafunctional habits (9). Tooth injury might result in continuous damage and burden in physiologic, economic, and psychological aspects (10). It should be emphasized and acknowledged that many cases of dental trauma are preventable. Additionally, appropriate and prompt management of dental trauma can prevent adverse progression and future complication. Appropriate management includes *primary prevention*, i.e. avoidance of pathology development, and *secondary prevention*, i.e. early diagnosing and treatment of the pathology before significant morbidity occurs.

The aim of this article is to provide a review of the current dental trauma literature with regard to education and knowledge and with relevance to primary and secondary prevention. Special attention will be paid to education among high-risk populations. Tertiary (i.e. reduction of adverse effects and complications of pre-established disease and restoration of function) as well as quaternary (i.e. avoidance of the consequences of overtreatment and overmedication for the specific condition) prevention of dental trauma will not be discussed here.

Primary prevention

General

Healthcare providers, such as dentists, dental hygienists, physicians, and nurses, have a significant role in primary prevention of dental trauma. This role includes providing of knowledge and motivation to patients and communities, promotion of preventive measures such as mouth guard and face masks (Fig. 1) (5, 6, 11), and treatment of dental caries and faulty restorations as well as malocclusions (12). The care provider challenge is also to detect potentially harmful parafunctional habits, such as chewing ice cubes, metal appliance and office equipment as well as using teeth to open drinking cans, bottles and food packages, and, most important, to discuss the potential consequences with patient, to motivate him or her to quit the harmful behavior and to provide the patient with measures to stop the habit or to protect the dentition. Oral and peri-oral piercing and intraoral ornament are contraindicated; however, when the individual insists on having them, the dentist has to recommend a short as possible ornament, made of semirigid acryl (13).

Mouthguards

Mouthguards were first designed for boxers in the late 19th century, but early in the twentieth century, boxing

Fig. 1. Young semiprofessional martial art trainee with mouthguard and face guard.

officials declared mouthguards illegal. The officials later changed their ruling, and mouthguards have become a part of standard boxing equipment (14). Currently, in the US, five sports at the *amateur level* require the use of a mouthguard: boxing, football, ice hockey, men's lacrosse, and women's field hockey. The only *professional* sport organization that requires the use of a mouthguard is boxing (15). Various studies among high-risk populations reported generally low level of compliance to mouthguard usage; even when a mouthguard is compulsory, there is still general unawareness of the need for mouth protection (16–18). In a study that was aimed to evaluate the occurrence of oral and dental injuries among young amateur sportsmen in diverse sport activities, only 27% of the participants were aware of mouthguards and only 3% actually used them (5). Comfort, the ability to speak and breath, aesthetics, and the athlete's perception of how the mouthguard affects their image as a player all influence whether a mouthguard will be used. However, the key factor is inadequate information regarding the risk of injury and the long-term benefits of using a mouthguard; thus, players and coaches should be educated regarding this important issue (19). Also, actions should be made in the general social level to make the use of mouthguards obligatory during sport activities and military training. This should involve also support from the municipal or national authorities.

When recommending on mouthguard, dentists should prefer custom-made mouthguards, which offer superior protection than a boil-and-bite, prefabricated design. Nevertheless, when economic or logistic considerations are involved, boil-and-bite mouthguard can provide a fair protection (11).

A recent study reported an adequate awareness of the preventive role of mouthguard and the feasibility of avulsed tooth preservation among mothers, especially working mothers (20). However, clinicians have to notice the discrepancy between 'awareness,' and even 'knowledge,' and 'compliance'; thus, awareness and knowledge might be insufficient unless motivation and practical guides are accompanied (21). It is noteworthy that the awareness of the seemed obvious dangers of intraoral piercing was also found to be low among the high-risk young adult (22).

Secondary prevention

The prompt on-site management of dental trauma, especially in cases of avulsion, by dental professionals, emergency physicians, medics, paramedics, corpsmen, teachers, coaches, and laypersons is essential for a favorable long-term prognosis (23). Indeed, rapid replantation of avulsed tooth should be expected from everyone, including laypersons; however, we cannot put too much hope on lay people to handle tooth avulsion event (24). This should not be the case with medical (dental and non-dental) professionals who should be educated and trained in dealing with dental emergencies. Failure to fulfill these expectations can lead to premature loss of the teeth with aesthetics psychological and functional consequences.

In a recent literature review, Glendor evaluated the knowledge regarding primary care of dental trauma patients and reported on a consistent failure in the educational process of professional caregivers and lay people. This finding was rather consistent with studies from different countries and research groups. The author concluded that consideration must be given to those bothering results from different studies on education or information about dental trauma care (24).

Healthcare professionals

Pediatricians, military medical officers, and sport and emergency physicians are the physicians with the highest likelihood for being challenged with a dental trauma patient, often shortly after the injury event, within the replantation time frame. Moreover, according to Haug (25), alongside the oral surgeon office, the emergency department offers the most efficient and cost-effective setting for the treatment of traumatic fractured teeth, luxated teeth, alveolar process injuries, simple mandibular fractures, and soft tissue wounds (25). These expectations are not met, however. This might be related to the inadequate addressing of the management of dental emergencies in medical undergraduate curricula (26). Thus, a referral of the dental trauma patient to a medical center without a service of oral and maxillofacial surgery might resulted in impaired management (27). Medical students should be properly trained to deal with dental trauma cases. Efforts should be made to include those topics in graduate medical schools.

Studies regarding the knowledge of healthcare providers, with respect to the management of dental trauma, show adequate (28, 29) to poor (30, 31) knowledge among dental practitioners and poor knowledge among emergency physicians and paramedics (32–34) as well as school nurses (35). It is noteworthy that school nurses have a dual (preventive and management) role for this high-risk population of young children; first, an educational role for the pupils and school personnel; and second, first aid providence for dental trauma cases.

In 2008, 1 year after the publication of the International Association of Dental Traumatology (IADT) updated guidelines for the management of traumatic dental injuries (36–38), the adequate knowledge level among dentists was above 70% for all presented dental trauma situations (39). However, knowledge regarding several issues (e.g. medication, splinting) found to be relatively low and should be reinforced. Official instructions by local authorities and articles published in the *Dental Traumatology* were the major sources of updating the new guidelines, whereas undergraduate and postgraduate education played only a minor educational role. One-fourth of the participants were not updated with the new guidelines at all, and more than one-fifth reported verbal informal personal communication as their updating source (39). The latter method is considered less comprehensive and could lead to incorrect results and serious outcomes.

The management of dental trauma is rarely taught in first aid training courses (35, 40) and scarcely appears in first aid textbooks and manuals (41). As the on-site first aid management of dental trauma is probably inadequate, the rapid professional treatment is of utmost importance. In dental trauma, the main role of the medic, paramedic, and corpsman, often the only available health care provider on-site, is to determine the urgency of referring the wounded to professional care center (42). Familiarity with the regionally available emergency service after office hours is needed as well, so there will be no need to waste precious time searching for professional assistance.

Non-medical professions

There are situations in which the potentially affected person is not capable to provide adequate self-care. These include young children and handicapped individuals; thus, education of parents, caregivers, teachers, sport coachers, and others is of high importance.

Inadequate knowledge in proper management of dental trauma has been found among parents (20, 43), elementary school teachers (44–46), and physical education teachers (47, 48). In a study of physical education students, 33% reported that treatment of avulsed teeth should be carried out immediately, 9% within 30 min and 8% within 1 h from the time of injury (49). In other survey among physical education teachers, Chan et al.(48) found that 62% of the participants would seek professional assistance for tooth avulsion immediately, 8% within 30 min, and 27% within few hours. Among Swiss and German handball team members, the average time given for the replantation of an avulsed tooth was more than 13 h (50). About half of physical education teachers and students stated that they would contact the closest dentist for professional help in cases of dental avulsion (48, 49), whereas 30% would go to a general hospital (48). Nevertheless, as little as 15% and 26% of Singapore preschool teachers and lay people, respectively, had this knowledge (43, 45).

Short educational interventions may raise the relevant knowledge for the short term, even among non-professional population with no pre-existed biological background (51). Holan et al.(52) emphasized the 'contamination effect' according to which, in a group of non-professionals (e.g. teachers), an educational effort has a positive influence even on individuals who have not personally participated in the intervention. However, as the effect of a single lecture regarding dental trauma management for laypersons is proved to be of little value for the long term (53), other methods for the knowledge provision in real time are needed. Such methods might be first aid manuals, hand-out brochures, and 24-h telemedical call center. Unfortunately, first aid manuals and textbook, which supposed to be a reliable source for teaching and real-time consulting, were found to have inadequate information, although recently published texts were of a greater practical value in comparison with older texts (41). The telephone consultation service seemed to be of practical value in real-time trauma event (54). A recent study

Box 1. Example of hand-out for a free distribution

What you should know about dental trauma?

In most Western countries, the prevalence of dental caries is decreasing during the last decades owing to fluoride in drinking water, daily fluoridated oral hygiene self-care, and professional periodic oral cleansing (by the dental hygienist or the dentist). However, life style may put us in increased risk for damage to the teeth from trauma, i.e. an impact that may cause fracture of part of the tooth, fracture of the tooth bearing jawbone, and/or tearing of the fibers that connect the tooth and bone. Most of injuries involving upper front teeth, thus significant impairment of aesthetics and self-esteem with social implications, may result. Treatment of damage caused by dental trauma is sometimes impossible by conservative means and necessitates massive reconstruction (e.g. bone augmentation, dental implantation, and prostheses).

Here are some recommendations for the prevention of dental injuries.
For more details, please refer your dentist:
Mouthguard should be employed in every sport activity, including cycling
Chewing of ice or stationery (e.g. paper clip, pen) should be avoided
Oral piercing and intraoral ornaments should be avoided
Alignment of protruding upper teeth may reduce dental injury (consult your orthodontist)
Periodic dental checkups are essential

Once dental trauma occurred, prompt and proper management has significant influence on long-term prognosis

All dental traumas should be evaluated by dentist for occult damage. In most dental traumas, prompt evaluation and treatment enhance prognosis.

In all oral trauma cases, good oral hygiene with 0.12% chlorhexidine mouthwash, a soft and cold diet, as well as avoidance of smoking are recommended for several days. Mild to moderate analgesics can be useful. Avoid overdose or overmedication.

Long-term complications can arise. In case of long-term pain, tooth mobility, color change, swelling, or other disturbing changes in hard or soft tissues of the face and mouth, refer to the dental office. In any case of doubt, consult with the dentist.

In case of permanent tooth avulsion ('Knock Out')
- Hold the tooth by its crown (white part). Do not touch the root (yellow part)
- Wash the teeth 10 s under cold tap water. Do not scrub
- Replant the tooth in the original socket in jaw
- Bite on handkerchief (to hold in position)
- Refer to the dental office for fixation and antibiotics
- If the tooth cannot be replanted, place the tooth in cold milk and refer the dental office immediately (within 20 min)

Box 2. Example of pocket-sized laminated waterproof card for a free distribution

Permanent tooth avulsion ('Knock Out')
- Hold the tooth by its crown (white part). Do not touch the root (yellow part)
- Wash the teeth 10 s under cold tap water. Do not scrub
- Replant the tooth in the original socket in jaw
- Bite on handkerchief (to hold in position)

- Refer to the dental office for fixation and antibiotics
- If the tooth cannot be replanted, place the tooth in cold milk and refer the dental office immediately (within 20 min)

Modified from IADT 2007

According to the recommendations of International Association for Dental Traumatology (2007), only permanent (not deciduous) teeth should be replanted. All dental traumas should be evaluated by dentist for occult damage.
In most dental traumas, prompt evaluation and treatment enhance prognosis. Good oral hygiene and periodic follow ups are essential for good healing!

Dr. John Doe, DDS
16 Street St., Israel
Tel: 0000000
Emergency Tel: 0000000
email: JhonDoe@mail.net

found that all non-professional population segments preferred the obtaining of information on tooth avulsion management from health care professionals, in comparison with other methods such as internet, television, radio, etc. that were preferred only by a small group of population (55).

Time to act!

As the duty of providing the public with measures for the maintenance of proper oral health is of the dental profession, the responsibility of providing primary and secondary prevention of dental trauma is of dentists, dental hygienists, and dental nurses. They also may, and should, educate other medical, paramedical, and non-medical professionals, taking into account that those non-dental professionals could not maintain a high level of knowledge and service regarding dental trauma without a continuous backing by the dental professionals. It should be remembered that as the prevalence of dental decay has reduced in the Western world during recent decades, dental trauma has played a significant part in causing dental morbidity and mortality (tooth loss). This might also be a growing niche of professionalization. It seems that now is the time for each dentist, dental hygienist, and dental nurse to act for the benefit of their community. Just as the dental profession has moved from 'treating' established dental caries lesions toward 'managing' risk factors for dental caries and prevention of oral diseases (56), the new challenges of the profession are recognizing high-risk individuals for dental trauma and manage risk factors. This should, obviously, involve support from national to municipal authorities. Based on the IADT guidelines (36–38), the steps indicated below might be recommended for dental professionals:

1 Publication of communicative articles regarding prevention and management of dental trauma in local professional (dental and non-dental) (57–59) as well as non-professional journals.
2 Providing lectures about prevention and management of dental trauma in front of specific key groups: school staff and parents, youth guides, country club staff (e.g. fitness trainers, swimming pool lifeguard), and healthcare personnel. These lectures should address specific situations and knowledge, according to the audience. Suggested dental trauma topics for inclusion are dental nomenclature, prevention of dental trauma, oral hemorrhage control, reimplantation of avulsed tooth, and the management of dental infections. In addition, a lecture in front of general dental practitioners should also emphasize antibiotic converge (60) and splinting in the management of trauma (39, 61). Education programs should contain multiple instructional techniques, use multiple media measures, and involve multiple educational exposures for reinforcement (26); it is recommended to use clinical pictures as many as possible.
3 Recognize the individuals in high risk for dental trauma by asking each patient for the above risk factors.
4 Confirm that all your dental clinic staff (including the assistants and the secretaries) know exactly what should be done in case of dental trauma. Injured people may refer to them for immediate guidance.
5 During examination, look for intraoral signs of potentially damaging habits of the patient (bruxism, foreign bodies). Educate your patients against lip and intraoral piercing/ornaments.
6 Offer mouthguards to professional sportsmen and teams as well as semi professional (e.g. high school teams) and amateur sportsmen.
7 Offer orthodontic treatment for sportsmen and other high-risk individuals with potentially damageable malocclusion.
8 Recommend the provision of a medium solution kit for avulsed teeth in the first aid box in schools, gyms, swimming pools, etc.
9 Publish outside your clinic your after-hours emergency telephone number and/or nearby 24-h emergency dental clinic.
10 Distribute hand-outs regarding prevention and first aid of dental trauma (Box 1).
11 Distribute pocket-sized laminated waterproof cards with 'what to do' algorithm and the emergency telephone numbers for health care providers to your patients and audience (Box 2). Encourage them to keep the card in their wallet. This will help your patients and community to improve their practical knowledge of dental emergencies.

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