

Sports Dentistry - Education and Prevention: Play it right!



Course Author(s): Liran Levin, DMD

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Intended Audience: Dentists, Dental Hygienists, Dental Students, Dental Hygiene Students, Dental Assistants, Dental Assisting Students, Dental Educators, Office Managers **Date**

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Conflict of Interest Disclosure Statement

- Dr. Levin reports no conflicts of interest associated with this course. He has no relevant financial relationships to disclose.

Short Description

Sport injuries are prevalent and require attention by the dental professional. Our profession is sometimes too busy dealing with improving our treatment results and too often abandons the preventive interventions that should be our main goal. Each and every patient should be engaged in a comprehensive and well-organized prevention program. Preventive measures can truly change our patients' health and wellbeing. In this course, different levels of prevention will be discussed providing keys for advocacy for sport players as well as enhancing long term success of dental treatments. General, introductory, aspects of sport dentistry will be discussed as well.

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Overview

Sport injuries are prevalent and require attention by the dental professional. Our profession is sometimes too busy dealing with improving our treatment results and too often abandons the preventive interventions that should be our main goal. Each and every patient should be engaged in a comprehensive and well-organized prevention program. Preventive measures can truly change our patients' health and wellbeing. In this course, different levels of prevention will be discussed providing keys for advocacy for sport players as well as enhancing long term success of dental treatments. General, introductory, aspects of sport dentistry will be discussed as well.

Learning Objectives

Upon completion of this course, the dental professional should be able to:

- Understand the different levels of prevention.
- Recognize the main etiologic factors of sports related oral injuries.
- Discuss practical ways for prevention of sports related oral injuries.
- Provide tools for enhanced prevention programs.
- Recognize general, introductory, aspects of sport dentistry.

Introduction

Traumatic dental injuries are highly prevalent, especially during sport activities. It should be emphasized and acknowledged that many cases of dental trauma are preventable. Appropriate approach 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 role of a dental professional is not only to provide treatment of dental diseases but also to educate for prevention of diseases as well as injuries.¹

The dental profession is responsible for ensuring the public has access to proper oral health care. This includes the responsibility of dentists, dental hygienists, dental assistants, and other dental professionals to provide primary and secondary prevention of dental trauma. We should also focus on educating other medical, paramedical, and non-medical professionals, as they may not be able to maintain a high level of knowledge and service regarding dental trauma without ongoing support from dental professionals. It's important to note that, while the prevalence of dental decay has decreased in the Western world in recent decades, dental trauma has become a significant factor contributing to dental morbidity and tooth loss.¹

This course will focus on different levels of prevention and will provide resources for the dental professional regarding sport related traumatic dental injuries.



Dental Trauma Prevalence

Traumatic dental injuries (TDIs) account for a considerable proportion of bodily injuries. Studies have shown that more than one billion living people have had a TDI. The global TDI rate being estimated at 2.82 events per 100 persons per year (95% CI, 2.28-3.42) based on 233,480 individuals.² Using the 2016 World population approximately 900 million people had at least one TDI and approximately 180 million children had at least one TDI in their primary teeth. This led to a conclusion that TDI is a neglected condition which should be ranked fifth if it was included in the list of the world's most frequent acute/chronic diseases and injuries.^{3,4}

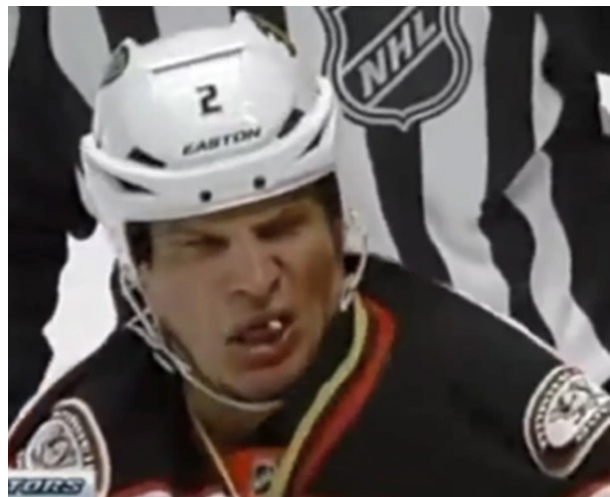
A publication in The Lancet Global Health has highlighted that traumatic dental injuries are now the fifth most prevalent disease or injury after caries, tension-type headache, iron-deficiency anemia, and age-related and other hearing loss. Traumatic dental injuries are more prevalent than a migraine and genital herpes.⁵

As outlined in these papers, although traumatic dental injuries are not lethal, they do have a very high-cost burden. It is estimated to be between \$2,000,000 and \$5,000,000 per one million inhabitants, and their management is more time-consuming than that of all other bodily injuries. Adequate dental rehabilitation for disadvantaged populations becomes less likely to occur which can lead to negative social, functional, and emotional effects, especially in children and adolescents.²⁻⁵

Please take a moment to read The Lancet Global Health paper and act with your local public health authorities to improve the recognition of traumatic dental injuries. Recognition of the extent of the problem is the first step towards improving the collection of data and towards improving access to care for all injured people.

Sports Dentistry

Sports dentistry is a field in dentistry that include orofacial trauma, dental screening in particular pre-season assessments, prevention of acute and chronic trauma, and the role of nutrients for athletes.⁶ Sports dentistry has evolved in the last decade from treatment and prevention of injuries to support the overall health of the athlete. Prevention within sports dentistry is essential, as athletes need to be assessed for tooth wear, prevention of sporting injuries and nutritional health. Oral health is a major factor in the performance of elite athletes.^{7,8} Sports medicine contributes to healthier athletes and better performance and, in recent years, has evolved into a multidisciplinary field that recognizes sports dentistry as an essential element. Sports Dentistry is the branch of dentistry dealing with the prevention and treatment of the pathologies and injuries of the oral cavity related to sports practice. Studies have shown that athletes' oral health is often poor. Based on a systematic review, 15%–75% presented with dental caries and up to 15% with periodontal problems.



Regular oral health assessments by a dental professional, especially during the preseason, might allow for prevention plans and early treatment of any disease. Athletes need to be assessed for caries, oral diseases, third molar concerns, and oral pathologies. National sports funders and policy organizations should take the lead in integrating such an approach. The World Dental Federation (FDI) has issued the official oral health, and sports guidelines and toolkit addressed to the international community of dentists, physicians, athletes, and sports federations.⁹

The European Association for Sports Dentistry (EA4SD) and the Academy for Sports Dentistry (ASD) have recently created a working group to develop a Universal Screening Protocol for Dental Examinations in Sports (USPDES).⁷

Predicting sports-related traumatic injuries is an important concern for dental health professionals. A predictive index has been developed by Fos et al. to determine the likelihood of a sports-related traumatic dental injury in children and adolescents. This index can be used to aid in the prevention of injury by understanding who is most likely to be injured and what factors influence the chance of injury. The index has been designed for ease of use by dental health professionals and has incorporated data collection and tracking features.¹⁰

Oral and Dental Injuries

Traumatic dental injuries can be classified into soft tissue injuries, hard tissues injuries (e.g., fractures), and periodontal injuries (e.g., luxation).¹¹

Soft tissue injuries may present as abrasions, contusions, or lacerations on the extra-oral and intra-oral soft tissues, including the lips, oral mucosa, gingiva, and frenulum.

Hard tissue injuries are classified into fractures of tooth structure and alveolar bone as well as mandibular and maxillary fractures.

- **Enamel Fractures** are limited to the enamel only.
- **Enamel-Dentin Fractures** (uncomplicated crown fracture) affect the enamel and dentin without exposing the pulp.

- **Crown Fracture with Exposed Pulp** (complicated crown fracture) involve enamel and dentin, plus the pulp is exposed.
- **Crown-Root Fractures** affect the enamel, dentin, and root; the pulp may or may not be exposed.
- **Root Fractures** affect dentin, cementum, and pulp. They may occur in any direction or orientation and are generally classified as vertical or horizontal root fractures.
- **Alveolar Fractures** affect the alveolar bone (labial and palatal/lingual) and may extend to the adjacent bone.



Figure 1. Hard Tissue Injury (Enamel-Dentin Fracture)

Periodontal injuries involve the periodontal apparatus and include:

- **Concussion** : The tooth will be tender to touch, with normal mobility and no gingival bleeding.
- **Subluxation** : The tooth will show tenderness and increased mobility but no displacement.
- **Extrusive Luxation** : The partial displacement of the tooth out of its socket.
- **Lateral Luxation** : The displacement of the tooth in a palatal/lingual or labial direction
- **Intrusive Luxation** : The apical displacement of the tooth, usually through the labial bone plate.
- **Avulsion** : The complete loss of the tooth out of the socket.

Prevention Levels

Levels of prevention could be differentiated into four types:¹²

It is important that us as dentists, dental hygienists, and dental assistants, will act for the benefit of our community and educate

Primary Prevention	Avoidance of pathology development.
Secondary Prevention	Early diagnosing and treatment of the pathology before significant morbidity occurs.
Tertiary Prevention	Reduction of adverse effects and complications of pre-established disease and restoration of function.
Quaternary Prevention	Avoidance of the consequences of overtreatment and overmedication for the specific condition.

them in terms of screening, prevention and treatment of traumatic dental injuries. Just as the dental profession is slowly moving from 'treating' established dental caries lesions toward 'managing' risk factors for dental caries and prevention of oral diseases, the new challenges of our profession are recognizing high-risk individuals for dental trauma and managing risk factors.¹

Mouthguards

Sports mouthguards are proven devices that reduce both the probability of and damage to orofacial tissues. While commonly used, clinicians may be unaware of the different sports mouthguard materials, proposed fabrication techniques, design recommendations, and newer digital fabrication methods.¹³

The Glossary of Prosthodontic Terms defines a mouthguard as a removable occlusal device that is useful in reducing mouth injuries and protecting the teeth and surrounding structures from injury. The American

National Standards Institute/American Dental Association (ADA) Standards on Dental Care Products (ANSI/ADA SCDP) Specification No. 99 (2013) delineates the following types of mouthguards (Figure 2):

Type 1. Stock: Usually an over the counter, U-shaped device containing a central groove that surrounds but does not conform to an individual's dentition. They contain no retentive features and are held in place by clenching the teeth. Studies suggest that Stock mouthguards offer fewer protective abilities, and arch form differences between different populations may also render them to be less effective. Stock mouthguards are also available and often handed out as bimaxillary devices.

Type 2. Mouth-formed: Include the "boil and bite" thermoplastic materials, that after heat softening, are placed intraorally to allow some adaptation to an individual's intraoral features. While providing improved retention and fit compared with the Stock mouthguards, some Type 2 mouthguards have been reported to demonstrate poor fit and stability, they may interfere with ventilation, and they may lose thickness during molding, which may provide less protection.

Type 3. Custom: Dentally fitted mouthguards, that provide increased protection as they are fabricated on a stone model replicating the patient's dentition and soft tissues. Improved trauma protection is provided as the Type 3 mouthguards properly covers the full dentition and soft tissues with adequate thickness and proper extensions into the vestibular areas. Furthermore, customized protection for patients with fixed orthodontic appliances is possible, and the optimal fit of the Type 3 mouthguards provides improved stability with less impairment to the user's physiologic functions. There are also ways to make custom fitted mouthguards more protective in certain areas, so they can be tailored to an athlete's individual needs.

Face Shields

Protective face shields, or facemasks, are recommended to prevent injuries to the face and mouth but they can also be used as a

protective device while recovering from an injury. Face shields can reduce injuries to the teeth, mouth, eyes, nose, and bones of the face.¹⁴

Studies have shown that upper facial injuries were observed to be less common among players wearing face shields. After the NHL mandated face shields, there were significant decreases in the mean number of craniomaxillofacial and upper facial injuries per season.^{14,15}

Face shields can be used in conjunction with mouthguards to provide extra protection to the teeth and mouth, especially after a previous injury where the teeth are extremely vulnerable. Face shields come in a variety of formats. They are often used attached to a helmet that is specifically designed for certain sports - such as American football, ice hockey, lacrosse etc.^{16,17} Face shields can also be worn independently - such as for basketball and softball fielders.

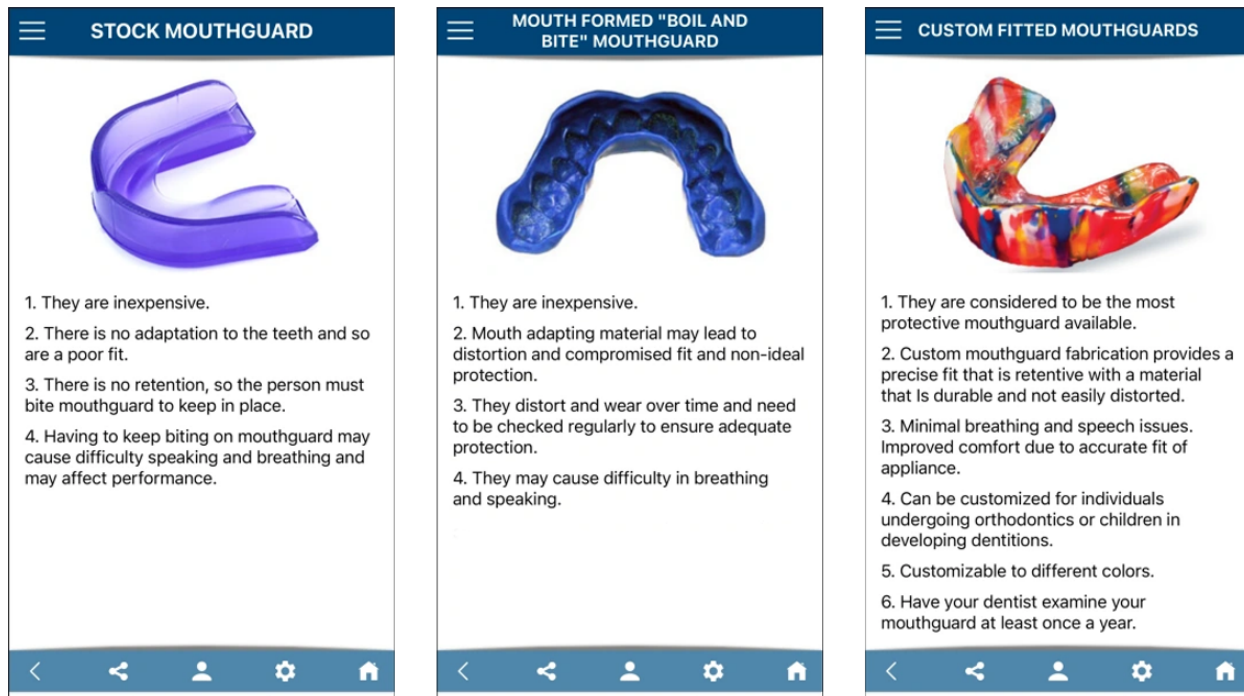


Figure 2. Figure 2. Types of Mouthguards. Source: IADT ToothSOS app

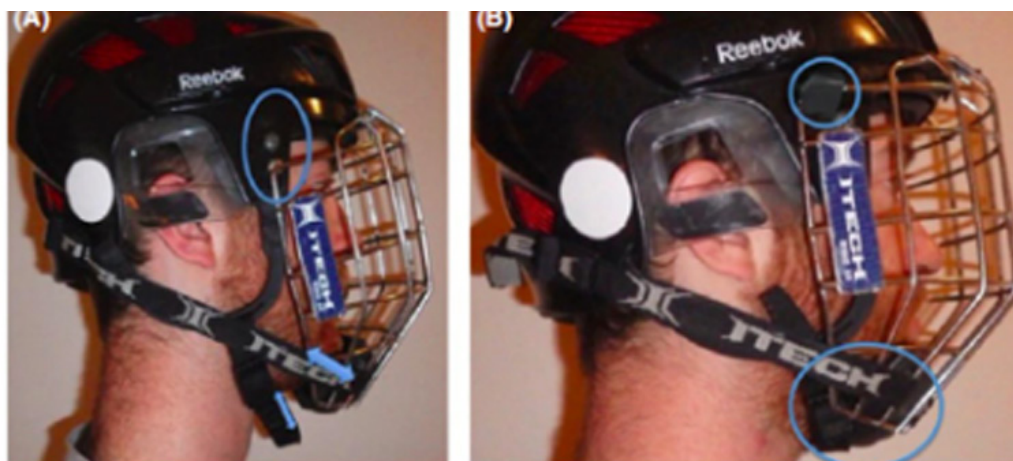


Figure 3. Photographic depictions of an improperly (A) worn helmet and face shield. Notice the gap between the chin and the chin cup, loose side and chin straps and missing temporal vertical force clips. A properly worn (B) helmet and face shield. Notice the chin cup is positioned against the chin and all the straps are tight. Vertical force clips in the temple region help to reduce forces upwards into the chin. Source: Wiley – Dental Traumatology

ToothSOS app

Incorporating technology into dental public health education may help share preventive strategies and improve treatment outcomes. The International Association of Dental Traumatology (IADT) created an app (software application for mobile devices), ToothSOS, to share information about trauma and management with the general public.¹⁸ In emergency and non-emergency situations, the app can be a useful resource for the lay person dealing with traumatic dental injuries. The app was first launched in April 2018 as a free service developed, provided and sponsored by the IADT. The purpose of the app is to provide the general public, patients, parents, educators, and professionals with information relating to traumatic tooth injuries. The app was developed by the Education Committee of the IADT and then validated by an international group of experts selected by the IADT. The app is user-friendly and can be downloaded on any Apple or Android mobile device at no charge. In the patient section, individuals can find instructions for how to handle dental injuries prior to visiting their dentist. The steps provided are for teeth that have been knocked out, moved, pushed in, loosened, broken and if there is injury to the skin, lips and gums, and to the jaws and joints (Figure 4). The

trauma management algorithms in the patient section of ToothSOS is solely based on the official guidelines of the IADT. As well, patients are able to view information on preventive strategies and the types of mouthguards (Figure 2).

In the professional section, published guidelines for dental trauma by the IADT can be found. As well, continuing education resources, information about the IADT and the dental trauma guide are provided. These links might help the dental professional in making treatment decisions and keep them informed about the latest evidence-based trauma guidelines. The user can navigate between the two sections and choose which language they would like to set the app to.

Save Your Tooth Poster

Children between 7 and 10 years of age are more exposed to suffer avulsion due to the elasticity of the bone at this age. The IADT had created a “save your tooth” poster to be disseminated among schools, sport arenas, coaches, trainers, etc. The poster describes the steps to be taken following an avulsion of a permanent tooth. The poster was translated to more than 60 different languages and is available free of charge on the IADT website.

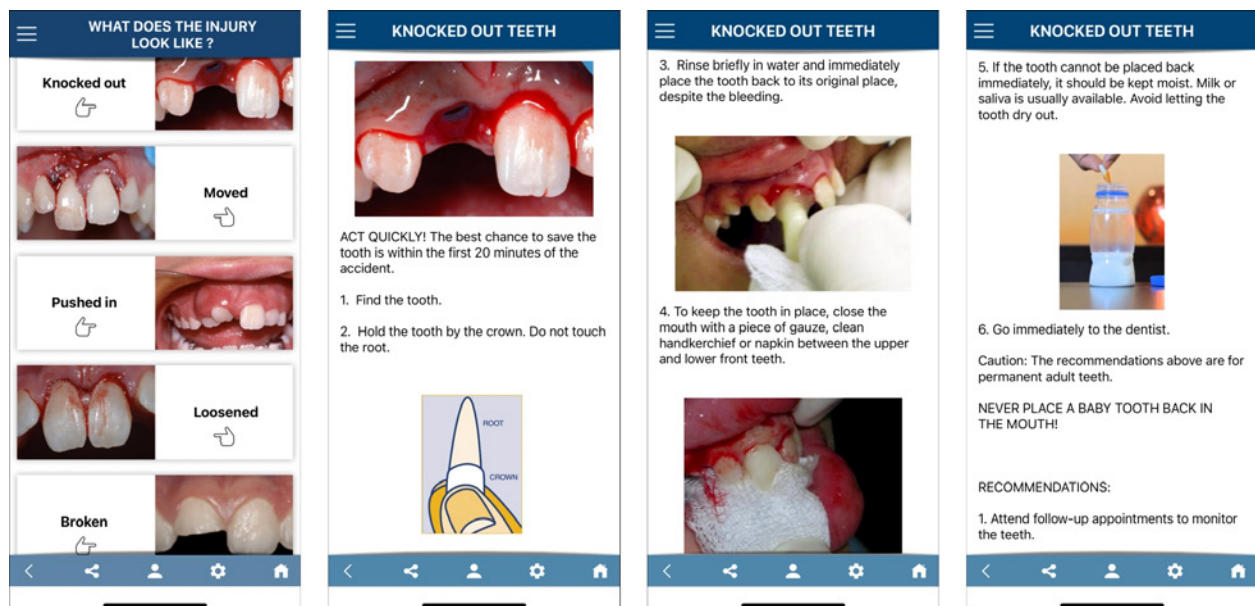


Figure 4. Example of Patient Section, tooth injury types and recommendation screens for knocked out tooth.
Source: IADT ToothSOS app

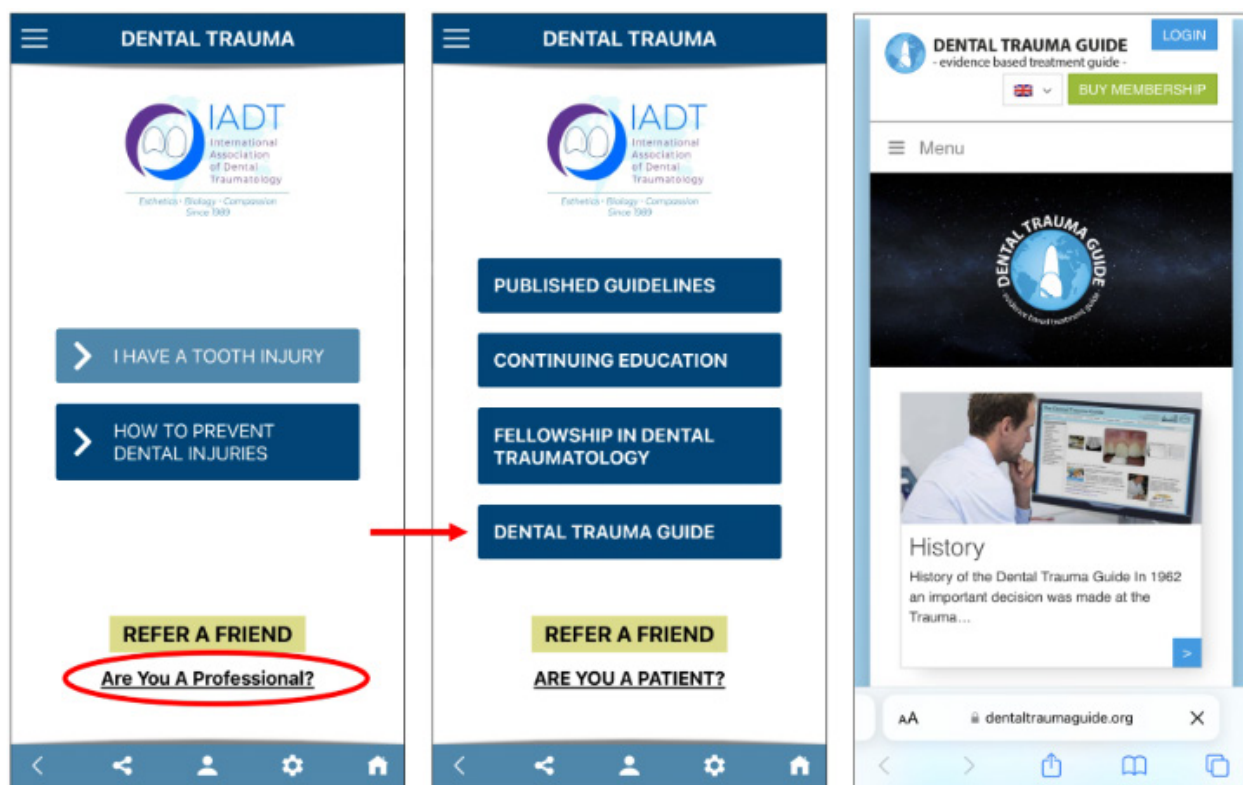


Figure 5. Professional Section of the ToothSOS app showing access to trauma guidelines, IADT website and the Dental Trauma Guide. *Source: IADT ToothSOS app*

The steps to be followed are:

1. Find the tooth. Hold the tooth by the crown (the white part), not by the root (the yellow part).
2. Replant immediately, if possible.
3. If contaminated, rinse shortly with cold tap water and put the tooth back in its place. This can be done by the child or an adult.
4. Hold the tooth in place. Bite on a handkerchief to hold it in position and go to the dentist immediately.
5. If you cannot put the tooth back in, place it in a cup of milk or saline.
6. Seek immediately specialized dental treatment.

Good oral hygiene is absolutely necessary in the healing period!

Save a Tooth Kit

The 2020 IADT guidelines list milk as the first storage media to use followed by Hanks Balanced Salt Solution.

Save-A-Tooth is an easy and effective way to save a knocked-out (avulsed) tooth.

If you knock out a tooth there are very few options available to you without proper care on the spot. The best treatment is to reposition the tooth in its socket. However, if this is not possible, that's where Save-A-Tooth kit comes in. It helps keeping the PDL cells vital until a dentist can replant the tooth.

The Hanks Balanced Salt Solution in Save-A-Tooth preserves the vitality of the PDL cells on the root. The more cells you have alive before replanting, the better chance you have of saving the tooth. Moreover, Abrasion and physical cell crushing can do serious harm to the root. Each tooth that goes into Save-A-Tooth gets its own protective slot, preventing any serious damage.

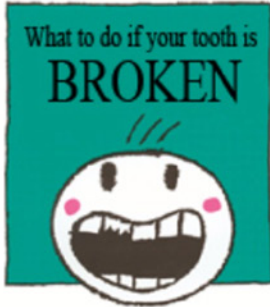
The design of the slots in Save-A-Tooth allows the dentist to remove the tooth without accidentally damaging the root. It also gives the dentist a way to store the tooth to do additional prep work.

The kit is good to have in schools, sports arenas, playgrounds etc.

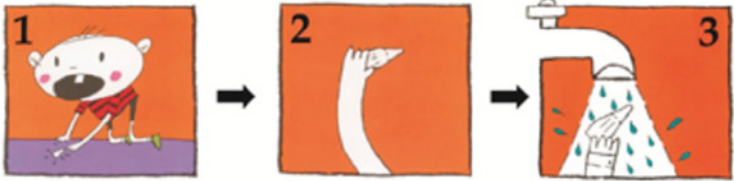
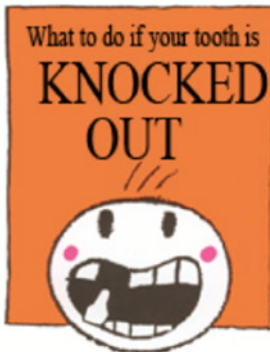


Save your tooth

Most of your permanent teeth may be saved if you know what to do after a blow to the mouth



1 Find the piece of the tooth → 2 The piece can be glued on → 3 For this to be possible, seek attention immediately from a dentist

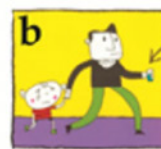


1 Find the tooth → 2 Hold it by the crown → 3 (plug the sink) Rinse in cold tap water

4 FOLLOW ONE OF THESE ALTERNATIVES



a Put the tooth back in its place



b Place the tooth in a cup of milk or saline



c When milk is not available, place the tooth in the mouth between the cheeks and gums



5 Seek immediate specialized dental treatment, within a two hour time period

Universidad de Valparaíso
CHILE
Children's Dental Traumatology Service
Faculty of Dentistry.
mail: clinfo@uv.cl



IADT Administration
4425 Cass Street, Suite A
San Diego, CA 92109
www.iadt-dentaltrauma.org

Figure 6. Save Your Tooth Poster Source: iadt-dentaltrauma.org



Figure 7. Save-A-Tooth®
Image Source: [Save-A-Tooth | American Dental Association \(ada.org\)](https://www.ada.org)

Additional resources for the emergency treatment of athletic dental injuries can be found on the Academy for Sports dentistry website: [ASD Emergency Treatment of Athletic Dental Injuries](https://www.asd.org).

IADT Guidelines for Treatment of Traumatic Dental Injuries

In 2020, the International Association of Dental Traumatology (IADT) had published the revised guidelines for the management of traumatic dental injuries.¹⁹ The original Guidelines were first published in 2001. They were revised and published in 2007 and then again in 2012. It is important that the Guidelines are revised on a regular basis since we learn more about the various injuries and how to manage them as time progresses. New research is being published regularly as experiments are conducted and as clinical cases are analyzed. Our search for more predictable ways to manage traumatic dental injuries is ongoing and also essential. Adopting and adhering to an evidence-based approach in the management of our trauma cases is of paramount importance. We are yet to discover the “perfect treatments” for every injury! We will probably never discover them, but we must strive to provide our patients with treatments based on the best available evidence at the time of the injury. Thus, the IADT Guidelines provide an extremely valuable source of information to help and guide

clinicians in their quest for better outcomes following trauma to the soft and hard tissues in the oral cavity.¹⁹

The main aim of the Guidelines is to provide readers with easy-to-access information that can be consulted when faced with a traumatic dental injury. The Guidelines outline the emergency treatment that should ideally be provided for each injury and then some further general information is given regarding the follow-up management and possible outcomes. As they are Guidelines, they will not always be as detailed or prescriptive as some clinicians would prefer—however, it is not possible to cover every likely scenario. The Guidelines should be considered as general guides, and then the clinician must apply these and adapt them to each individual patient and each injury, based on a thorough case assessment.

Please take some time to get yourself familiarized with the 4 sections of the [2020 IADT Guidelines for the Evaluation and Management of Traumatic Dental Injuries](https://www.iadt.org):

- [General Introduction](#)
- [Fractures and Luxations](#)
- [Avulsion of Permanent Teeth](#)
- [Injuries in the Primary Dentition](#)

Dental Trauma Guide (DTG)

The [Dental Trauma Guide](#) is a world-leading, web-based tool to evidence based dental traumatology. The Dental Trauma Guide is rooted in the University Hospital of Copenhagen (Rigshospitalet) and is a research-based non-profit organization.

The website offers easily accessible evidence-based guidance for clinicians in order to perform optimal diagnosis, treatment and prognosis of traumatic dental injuries in the primary and permanent dentition. The website is developed in cooperation with University Hospital of Copenhagen and the International Association of Dental Traumatology (IADT) and recognized as the legacy of Dr. Jens Ove Andreasen and his dental trauma team.

Conclusion

Orofacial injuries during sports activities are largely preventable. Mouth and face protection

for athletes is one of dentistry's contributions to sports medicine. It is the responsibility of the dental profession, therefore, to become more active in sports injury prevention programs. Mouthguards and face shields provide protection against injuries to the orofacial area, including the teeth, lips, cheeks and tongue, thereby reducing the incidence and severity of injuries that occur during athletic practice and competition. They also have been shown to prevent head and neck injuries, concussions and jaw fractures. Many athletes are not aware of the health implications of a traumatic injury to the mouth or of the potential for incurring severe head and orofacial injuries while playing.²⁰

Dental professionals can play an imperative task in informing athletes, coaches, and patients

about the magnitude of dental sciences in preventing orofacial injuries in sports. Education of all those involved is the key. Team physicians, dentists, athletic trainers, and coaches must take into consideration both the athlete's previous medical history and the sport. There is need to popularize the use of orofacial protective devices in a variety of sports events by interacting with coaches, sports administrators, and athletes. Furthermore, dental professionals need to be familiar with the emergency management of traumatic dental injuries and spread the word about the proper management in the field to the general community.

Last, we should make an effort to advocate for proper dental follow-ups and treatments whenever we can.

Course Test Preview

To receive Continuing Education credit for this course, you must complete the online test. Please go to: www.dentalcare.com/en-us/ce-courses/ce679/test

1. How many people are estimated to have had traumatic dental injuries worldwide?

- A. About a million.
- B. More than a billion.
- C. 345,221 people.
- D. More than 50% of the population.

2. Sports dentistry is:

- A. A field in dentistry that include orofacial trauma, dental screening in particular pre-season assessments, prevention of acute and chronic trauma, and the role of nutrients for athletes.
- B. A group of dentists playing sports on a professional team.
- C. A dentist who treats only professional sports players who got injured.
- D. A worldwide recognized specialty of dentistry trained to produce mouthguards to athletes.

3. What is uncomplicated crown fracture?

- A. A fracture of the alveolar bone.
- B. Enamel-Dentin Fracture that affect the enamel and dentin without exposing the pulp.
- C. Crown Fracture with Exposed Pulp.
- D. Root fracture with necrotic pulp and bleeding from the gums.

4. What is complicated crown fracture?

- A. A fracture of the alveolar bone.
- B. Enamel-Dentin Fracture that affect the enamel and dentin without exposing the pulp.
- C. Crown Fracture with Exposed Pulp.
- D. Root fracture with necrotic pulp and bleeding from the gums.

5. Primary prevention is:

- A. Avoidance of pathology development.
- B. Early diagnosing and treatment of the pathology before significant morbidity occurs.
- C. Reduction of adverse effects and complications of pre-established disease and restoration of function.
- D. Avoidance of the consequences of overtreatment and overmedication for the specific condition.

6. Tertiary prevention is:

- A. Avoidance of pathology development.
- B. Early diagnosing and treatment of the pathology before significant morbidity occurs.
- C. Reduction of adverse effects and complications of pre-established disease and restoration of function.
- D. Avoidance of the consequences of overtreatment and overmedication for the specific condition.

7. The “boil and bite” thermoplastic mouthguard belongs to what group?

- A. Type 1. Stock.
- B. Type 2. Mouth-formed.
- C. Type 3. Custom.
- D. Type 4. Colored.

8. What mouthguard is considered to give the best protection?

- A. Type 1. Stock.
- B. Type 2. Mouth-formed.
- C. Type 3. Custom.
- D. Type 4. Colored.

9. What is ToothSOS?

- A. A storage media for broken tooth crowns.
- B. A comprehensive textbook for the professional management of traumatic dental injuries.
- C. A call for help following traumatic dental injuries.
- D. An app developed by the IADT to share information about trauma and management with the general public.

10. The International Association of Dental Traumatology (IADT) had published the revised guidelines for the management of traumatic dental injuries in what year?

- A. 1990
- B. 2000
- C. 2020
- D. 2030

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Additional Resources

- The International Association of Dental Traumatology
- The IADT Guidelines for the Evaluation and Management of Traumatic Dental Injuries
- The Academy for Sports Dentistry
- The Dental Trauma Guide
- Save Your Tooth Posters
- Tooth SOS app: Android
- Apple

About the Author



Liran Levin, DMD

Prof. Liran Levin is a professor of periodontology at the Faculty of Medicine and Dentistry, University of Alberta, Canada. He is also a visiting professor at the Harvard School of Dental Medicine, Boston, MA.

Prof. Liran Levin was the Head of Research at the School of Dentistry, Rambam Health Care Campus, and Faculty of Medicine - Technion IIT Haifa, Israel.

Prof. Liran Levin received his DMD degree with distinction at Tel Aviv University and completed his Post Graduate Periodontology Program at the Department of Periodontology, Rambam Health Care Campus. He also received his Periodontology Specialist Certificate from the European Federation of Periodontology as well as a Fellow of the Royal College of Dentists of Canada in Periodontology.

Prof. Liran Levin has published more than 300 articles and book chapters in the international professional literature and is involved in research mainly in periodontology, dental implants and dental trauma. His papers received more than 13,000 scientific citations. He has been lecturing extensively both nationally and internationally in the fields of dental implants and periodontal diseases.

Prof. Levin serves as the Editor-in Chief of Dental Traumatology, an Associate Editor for the International Dental Journal, Scientific Associate Editor for the Quintessence International and as an Editorial Board Member and a manuscript reviewer for some of the leading international professional journals in the fields of periodontology, dental implants, dental trauma and general dentistry.

Prof. Levin is the President-Elect of the Periodontal Research Group of the International Association for Dental Research (IADR). He is currently the President of the International Association for Dental Traumatology (IADT) and was chairing the 2020 IADT dental trauma guidelines committee.

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Email: liran@ualberta.ca