

Sports Dentistry: An Ounce of Prevention is Worth a Pound of Cure

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Abstract

Sports is a form of recreation that helps people to get away with everyday stress. It is also associated with the risk of traumatic injury, especially in case of contact sports. Dental injuries that are caused due to sports mostly involve the maxillofacial region. Out of all the sports-related dental injuries, the most complex injury is tooth avulsion and should be considered as real emergency. Protection from sports-related orofacial injuries currently comes in the form of three shielding equipment, namely mouthguards, facemasks, and helmets. Sports dentistry, being the most recent and upcoming field in dentistry, inculcates the prevention, maintenance, and treatment of oral and facial injuries. Dentists must have sound clinical knowledge regarding sports-related dentofacial injuries and should make it a point to inform parents regarding the orofacial injury caused due to sports and regarding various preventive measures that are available.

Keywords: Dentofacial injury, facemasks, helmet, mouthguards, prevention, sports dentistry, trauma

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INTRODUCTION

Dentistry plays a significant role in the field of sports as it helps in achieving optimal oral health conditions in athletes which in turn greatly enhances their overall performance.^[1] The most common form of recreation practiced by an individual to get away from stress in today's world is "SPORTS." However, due to this, children and adolescents become more prone to muscle injury, soft-tissue laceration, broken teeth, and contusion.^[2]

The American Academy of Sports Dentistry defines sports dentistry as the branch of sports medicine that deals with the prevention and treatment of dental injuries and related oral diseases associated with sports and exercise.^[3]

Being the most recent and upcoming field in dentistry, it inculcates the prevention, maintenance, and treatment of oral and facial injuries.^[4] It also plays an integral role in collection and dissemination of information on dental trauma. Dentists play an important role by detecting problems in athletes related to their oral cavity such as mouth breathing or poorly positioned dental arch and thereby correcting it to help them in achieving optimal oral

health condition. By doing so, their overall performance is greatly enhanced.^[1]

HISTORY

The history of sports dentistry dates back to 1958 in Brazil, where a dentist named Mario Trigo had accompanied a soccer team during their matches and observed that the athletes who were suffering from dental infection had a longer period of recovery from concussion as compared to those athletes in which infection was eliminated.^[1,5]

Aldo Forli Scocate was responsible for the oral health of Olympic players in the year 1992. It was noted that there was an increase in psychological situation and improvement in muscle performance as a result of the treatment.^[6]

The International Association of Dental Traumatology and the International Academy of Sports Dentistry collaborated after

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the first international congress of sports dentistry and dental traumatology which was held in Boston in 2001.^[7]

INCIDENCE

The incidence of sports-related orofacial injuries depends on the type of sports being played and the number of people involved in that sports. The boys between the ages of 8–11 years are more likely to such injuries as compared to girls, with the ratio being 3.1:1.5.^[8] The literature suggests that around 13%–39% of all the dental injuries are caused due to sports and mostly affecting maxillofacial region. The proclined maxillary incisors as seen in Class II Division 1 cases are more prone to such traumatic injury in as many as 80% of all the reported cases.^[8]

Soft-tissue injuries and the fracture of T zone bones which include the nose, the zygoma, and the mandible are the most common type of sports-related facial trauma.^[4] The damage caused by such traumatic impact does not remain confined only to the dentoalveolar structure but can also cause fracture of the facial bone as well as injury to the neck or brain.^[9]

HOST–AGENT–ENVIRONMENT MODEL

It is imperative for the elements of host, agent, and environment to come together in a critical manner and at a precise time for the injury to occur.

The host is the injured individual, the agent of injury is the form of energy responsible for causing the damage, and the environment includes both the physical setting where the injury occurs and the psychological environment.^[10]

Some most common sports-related injuries are as follows:

1. Soft-tissue injury: It is the form of abrasion, contusion, and laceration that are commonly seen during sporting events. It should be evaluated with utmost care to rule out the fracture or other significant underlying injuries^[11,12]
2. Fracture: Maxilla is the most common site in majority of the cases. However, in 10% of the cases, the mandible could also get fractured. The most vulnerable part of the mandible in children as well as adults is condyle. As per the recent data, the condylar fracture in children

has the potential to alter the growth of the lower jaw^[12]

3. Temporomandibular joint injury: Although every blow to the mandible does not result in fracture. However, these force gets transmitted to temporomandibular disc and its supporting structure causing the condyle to move posteriorly and compressing the retrodiscal tissue thereby leading to intracapsular bleeding followed by ankylosis of the joint.^[12]
4. Tooth intrusion: The most severe form of displacement injury is the axially directed impact on the tooth which forces it into alveolar process and responsible for causing necrosis of pulp in 96% of the cases. The tooth becomes immobile and on percussion gives a high metallic sound^[11,12]
5. Tooth fracture: It is the most common type of dental injury. Maxillary central incisor is the most susceptible tooth to such injury^[11,12]
6. Avulsion: Avulsion of permanent teeth comprises 0.5%–16% of all the dental injuries. The injury causes the tooth to be knocked out or removed completely from the socket.^[13] Replantation is the treatment of choice, and the prognosis for the same depends on action taken at the place of accident and the time interval for which the tooth was out of the socket^[12]
7. Impact of trauma on the mandible: Whenever the impact is delivered to the inferior aspect of the mandible, it causes rotational acceleration of the head, whereas the force on the anterior aspect of the mandible causes linear acceleration of the head.^[14]

MANAGEMENT

For the management of traumatic dental injuries, the guidelines issued by the International Association of Dental Traumatology in a set of three series articles should be followed. They are:

1. Fracture and luxation of permanent teeth^[15]
2. Avulsion of permanent teeth^[13]
3. Injuries in primary dentition.^[16]

MANAGING TOOTH AVULSION

Out of all the sports-related dental injuries, the most complex injury is tooth avulsion and should be considered as real emergency. Managing this would be easier if the basic rules are printed on a leaflet and distributed to all schools and sports clubs [Figure 1].^[17]

SPLINTING

Splinting stabilizes the avulsed tooth and thereby allows pulpal and periodontal healing.^[18] For physiologic tooth movement, semi-regular flexible splinting is recommended.^[19] Dental trauma splint should be passive and should neither damage the gingival tissue nor affect the hygiene of the oral cavity.^[20] There are various kinds of splints available such as composite splints which could be either in the form

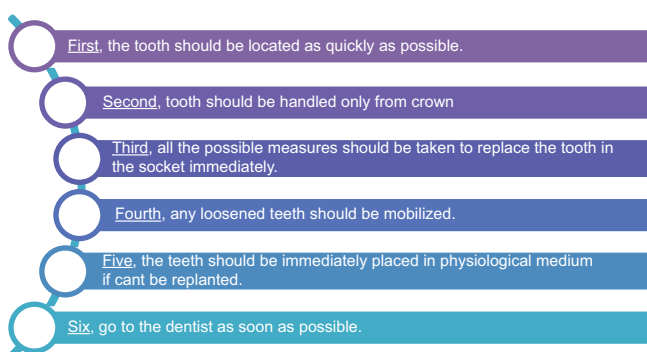


Figure 1: Managing tooth avulsion

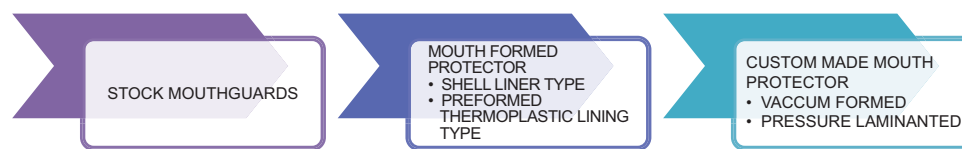


Figure 2: Types of mouthguards

of multistranded flexible orthodontic wire or rectangular orthodontic wire, titanium wire splint, titanium trauma splint, bracket splint, etc.^[21]

STORAGE MEDIA

Proper PH and osmolality are important criteria for an ideal storage medium. It should have an easy accessibility and low cost and be able to maintain the viability of pulp and periodontal ligament (PDL) cells.^[22,23]

Hank's Balanced Salt Solution

It is a PH balanced salt solution having all of the essential metabolites and glucose necessary for the maintenance of cells. It can preserve an avulsed tooth for at least 24 h.^[22,23]

Eagle's medium

Even though it is an excellent storage media, it cannot be recommended for general use as it is not readily available.^[22,23]

Milk

It is the most practical storage media for short-term transport of avulsed tooth due to its readily availability.^[22,23]

Viaspan

Viaspan shows long-term superiority over Hank's Balanced Salt Solution, and the PDL cell morphology remains unchanged in this medium.^[22,23]

Gatorade, custodial, Dubelco's storage media, propolis, tooth rescue box, conditioned media, contact lens solution, saliva, normal saline, saliva extract, coconut water, castor oil, red mulberry, Euro-Collins, Ricetral, and egg white are few other storage media for avulsed teeth.^[22,23]

PROTECTION

Protection from sports-related orofacial injuries currently comes in the form of three shielding equipment – mouthguards, facemasks, and helmets.

MOUTHGUARD

The American Dental Association has estimated that faceguards and mouthguards prevent approximately 200,000 injuries each year in high school and college football alone.^[24] Due to the risk of orofacial injury, coaches and teachers should be encouraged to insist the players to wear mouthguards during training and matches. Mouthguards should be changed annually in children due to growth changes in the mouth and jaw.^[25]

There are mainly three types of mouthguards [Figure 2]

Stock mouthguards

The Academy of Sports Dentistry has stated that the stock mouthguard is unacceptable as an orofacial protective device.^[26] As stock mouthguards are available only in limited size, they lead to improper fitting and thereby develop discomfort and irritation while wearing it.^[27] However, this is recommended by an orthodontist as this allows tooth movement along with protecting soft tissue.^[26]

Mouth-formed protectors

The shell liner and the thermoplastic mouthguard are two types of mouth-formed protectors.^[27,28]

The shell liner type is made of a preformed shell with a liner of plastic acrylic or silicone rubber.^[27] The lining material is placed in the player's mouth and molded to the teeth and then is allowed to set.^[28,29] The disadvantage of this type is decreased retention which is due to repeated biting and hardening of the soft liner, increased occlusal vertical dimension, discomfort, and bulkiness.^[28]

The preformed thermoplastic lining (also known as "boil and bite") is immersed in boiling water for 10–45 s, transferred to cold water, and then adapted to the teeth.^[27,28] This mouthguard seems to be the most popular of the three types and is used by more than 90% of the athletic population.^[27]

Custom-made mouth protector

This is the superior and most expensive of all.^[27] They could be fabricated from various materials such as latex or latex-reinforced, vacuum-formed clear, or colored plastic sheets or plasticized acrylic resin.^[28]

Custom vacuum-formed mouthguards and pressure-laminated mouthguards are two kinds of custom-made mouthguards.^[28]

Custom vacuum-formed mouthguard is the most common and widely fabricated mouthguard by the dental professional.^[8,27] It provides adequate protection from sports-related traumatic dental injuries and offers the least amount of interference to speaking and breathing.^[27] However, they do not provide protection for long period of time as they retain their shape only for few weeks after wearing.^[27]

Pressure-laminated mouthguards are more retentive compared to other types of mouthguards and allow for a more balanced occlusion. It exhibits negligible deformation when worn for prolonged period of time.^[27] As per the literature, this mouthguard offers the best protection for children's teeth during all types of sporting activities as well as precise adaptation and negligible deformation.^[30]

VARIOUS MODIFICATION OF MOUTHGUARDS

Pure Power Mouthguard

A relatively new mouthguard, the Pure Power Mouthguard, uses neuromuscular dentistry techniques which focus on the alignment of temporomandibular joint (TMJ), masticatory muscles, bones, teeth, and the neural circuit associated with the oral cavity. It increases performance by improving strength, speed, endurance, agility, accuracy, and balance. It is based on a theory that when muscles in the face and jaw are properly aligned and relaxed, it will lead to improvement in strength and balance.^[31]

Bimaxillary mouthguard

Bimaxillary mouthguard stabilizes the mandible to the maxilla and thereby provides significant protection against the possibility of mandibular fracture. Therefore, Its use is highly recommended in boxing, higher grade of competitive sports such as rugby, patient undergoing orthodontic treatment and those who have recently sustained a mandibular fracture.^[32]

Edentulous patient

Edentulous patient should use a modified bimaxillary mouthguard. Vertical dimension at rest is used for fabricating the mouthguard.^[32]

Scuba divers

Diver's mouth syndrome may be caused by the forward posturing of the mandible while wearing commercial mouthpieces with a lack of posterior occlusal support and uneven loading of the masticatory muscles and TMJs. The local inflammation of the TMJ may result in a blockage of the Eustachian tube and possibly lead to labyrinthine dysfunction and associated vestibular disturbances such as vertigo and disorientation. A well-designed custom mouthpiece is therefore recommended for relieving and preventing diver's mouth syndrome.^[32]

Mouthguard Replacement

As a general rule, it is recommended that a standard mouthguard should be replaced after about every 2–3 years as there is some degree of deterioration of the physical properties, especially resilience. Earlier replacement is indicated if tearing, “bite through,” or distortion occurs, or if fit or retention becomes unsatisfactory. In the case of the bimaxillary mouthguard, the replacement life is also about 3 years if proper care is taken with storage.^[32]

FACEGUARDS

A faceguard is a prefabricated cage of metal or composite which is attached to a helmet or a head strap and provides good protection to the face and teeth.^[33] According to a new study, wearing full-face shields is related to a slightly lower incidence of facial and dental injuries without an increase in the risk of neck injuries, concussions, or other injuries.^[34] Faceguards must fulfill the following three requirements that is protection ability, safety, and maintaining performance.^[35]

A faceguard is normally made of a thermoplastic resin as the core material to form a specific shape and shield the face area from injury. It has a cushioning material on both the inside and outside. The faceguard fabrication process largely depends on the forming temperature of the thermoplastic resin. The faceguards made of thermoplastic resins are usually thicker than those made of thermoset resins.^[35] The faceguards made of thermoplastic resins are usually thicker than those made of thermoset resins. The player's efficiency suffers as a result of their increased thickness. Abe *et al.* reported that faceguard constructed from fiber-reinforced thermoplastic has remarkable shock absorption abilities.^[36]

HELMET

Protective helmets are essential in high-risk sports because they reduce the risk of dental, facial, and skull injuries. Modern helmets' outer layers are normally made of polycarbonate or high-quality polymers, which promote a proper distribution of stresses and forces that reduce impact energy. The right use of the helmet can shield against head injuries among riders snowboard when exposed to falls or collisions. According to research, 52.9% of the riders who experienced dental, nasal, or facial injuries did not wear a helmet.^[1]

Since the location of the nasal bone is anatomically more fragile, it is important that the material used to make the nose shield has enough shock absorption capability, such as ethylene-vinyl acetate.^[1]

CONCLUSION

Public dental health problem has been increasing with the rise in the incidence of traumatic dental injury. Sports participation is a frequent cause of injury, especially to children and adolescents because of the high level of competitiveness. Most of the orofacial injuries occurring during sports activities are largely preventable. Sports dentistry governs all the preventive and therapeutic measures of orofacial athletic injuries. Sporting organization in the country is not very proactive regarding the information about the risks that are associated with sports or the strategies needed to prevent it. Since the dentist is not present at all the sporting events, the only way to prevent such traumas is educating coaches, players, and their parents, specifically in terms of prevention of sports-related oral and maxillofacial trauma using educational posters so as to provide immediate help on the field and thereby minimizing severe future consequences occurring due to trauma.

While assessing the patient with dental trauma, it is imperative to maintain a good record of the case since the beginning as it will help in future treatment planning as well as act as a reference for subsequent follow-up.^[3] Such trauma causes functional, esthetic, and psychological problems, since the natural teeth lack healing power.^[37] Injuries can lead to abnormalities associated with exfoliation of primary teeth and eruption of permanent teeth, hypoplastic teeth, or abscesses.^[38]

Thus, the goal of prevention can be achieved by proper use of protective devices such as mouthguards, faceguards, and helmets which will reduce the chances of injury to teeth as well as the surrounding structures. Dentists must have sound clinical knowledge regarding sports-related dentofacial injuries and should make it a point to inform parents regarding the orofacial injury caused due to sports and regarding various preventive measures that are available. The coaches should insist the player to compulsory wear protective equipment in order to prevent dental trauma as well as head-and-neck injuries, concussion, and fracture of jaws.

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Conflicts of interest

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