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Policy on Prevention of Sports-related Orofacial Injuries

Review Council

Council on Clinical Affairs

Revised

2018

Purpose

The American Academy of Pediatric Dentistry (**AAPD**) recognizes the prevalence of sports-related orofacial injuries in our nation's youth and the need for prevention. This policy is intended to educate dental professionals, health care providers, and educational and athletic personnel on the prevention of sports-related orofacial injuries.

Methods

This policy was originally developed by the Clinical Affairs Committee and adopted in 1991. This document is a revision of the previous version, revised in ~~2010~~ 2018. The revision of this policy is based upon a review of current dental and medical literature related to orofacial injuries, including their prevention. Database searches were performed using the terms: sports injuries, injury prevention, dental injuries, orofacial injuries. Seventy citations were chosen from this method and from references within selected articles. ~~When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.~~The policies, recommendations, and listed references of the Academy for Sports Dentistry (**ASD**) and the International Association of Dental Traumatology (**IADT**) were consulted as valuable resources in preparation of this document.

Background

The tremendous popularity of organized youth sports and the high level of competitiveness have resulted in a significant number of dental and facial injuries (~~Castaldi 1986, Castaldi 1988~~. From 1990-2003, there was an average of 22,000 dental injuries annually in children <18 years of age. This is approximately 31.6 dental injuries per 100,000 children and adolescents[1]. Over the past decade, approximately 46 million youths in the United States were involved in "some form of sports" [2]. It is estimated that 30 million children in the U.S. participate in organized sport programs [3] All sporting activities have an associated

risk of orofacial injuries due to falls, collisions, contact with hard surfaces, and contact from sports-related equipment. A systemic review reported between 10-61% of athletes reported experiencing dental trauma [4]. ~~Sports accidents reportedly account for 10 to 39 percent of all dental injuries in children (Newsome, Tran and Cooke 2001).~~ A 10 year study of 3,385 craniomaxillofacial trauma cases presenting to an oral and maxillofacial surgery department found 31.8 percent of injuries in children occurred during sports activities.[5] ~~Children are most susceptible to sports-related oral injury between the ages of seven and 11 years (Tesini and Soporowski 2000, Rodd and Chesham 1997, ADA 2006, Stewart et al 2009). The administrators of youth, high school, and college football, lacrosse, and ice hockey have demonstrated that dental and facial injuries~~ Children age 17 years and younger represented 80.6% of the total (sport and not-sport related) dental injuries that presented that presented to U.S. emergency rooms from 1990-2003. In all age groups, males were more likely to have dental injuries than females.[1]

It has been demonstrated that dental and facial injuries can be reduced significantly by introducing mandatory protective equipment.[6,7] Currently football, lacrosse and ice hockey require protective equipment. Popular sports such as baseball, basketball, soccer, softball, wrestling, volleyball, and gymnastics lag far behind in injury protection for girls and boys. Baseball and basketball have been shown to have the highest incidence of sports-related dental injuries in children seven to 17 years of age.[1] More specifically, baseball accounted for ~~had~~ the ~~highest incidence~~ most dental injuries within the seven to 12 year old age group, while basketball was the most frequent sport associated with dental injuries in the 13 to 17 year age group.[1] Youths participating in leisure activities such as skateboarding, inline or roller skating, and bicycling also benefit from appropriate protective equipment. [8,9,10,11] A large national survey confirmed the bicycle as the most common consumer sports product related to dental injuries in children [1] followed by playground equipment, other riding equipment (skates, roller blades) and trampolines.

The use of the trampoline provides specialized training for certain sports. However, when used recreationally, a significant number of head and neck injuries occurs, with head injuries most commonly a result of falls.[12] The American Academy of Pediatrics (**AAP**) recommends practitioners advise patients and their families against recreational trampoline use and discuss that current safety measures have not significantly decreased injury rates.[12] The AAP also states that practitioners "should only endorse use of trampolines as part of a structured training program with appropriate coaching, supervision, and safety measures in place".[12]

Studies of dental and orofacial athletic injuries are reported throughout the medical and dental literature. [13,14,15,16] Injury rates vary greatly depending on the size of the sample, the sample's geographic location, the ages of the participants, and the specific sports involved in the study. [13,14,15,16,17] Rates of traumatic dental injuries also differ in regards to the athlete's level of competition; less-professional athletes exhibit a higher prevalence of sports-related injuries.[15] ~~The highest incidence of sports-related dental injuries has been demonstrated in 15- to 18-year-old males (Huang 2009).~~ Most of the current data regarding injuries comes from the National High School Sports-Related Injury Surveillance Study and captures information such as exposure (competition vs practice), the injury, and details of the event and type of protective equipment used.[18] Data from this source found that in 2016-2017 school year, of the 699,441 injuries reported during competition; of those, 223,623 (32 percent) occurred to the head/face; another 91,410 occurred during practice . A similar study using this database followed athletes from 2008-2014 and found the rate of dental injuries in competition was three times higher than in practice. For the majority of these reported injuries, the athlete was not wearing a mouthguard. Review of this database found the highest rates of dental injuries in high school athletes occurred in girls' field hockey and boys' basketball [17], Although the statistics vary, many studies reported that dental and orofacial injuries occurred regularly and concluded that participation in sports carries a considerable risk of injury.[14,15,5,9]

Consequences of orofacial trauma for children and their families are substantial because of potential for pain, psychological effects, and economic implications. Children with untreated trauma to permanent teeth exhibit greater impacts on their daily living than those without any traumatic injury.[19,20] The yearly costs of all injuries, including orofacial injuries, sustained by young athletes have been estimated to be between 500 million [21] and as high as 1.8 billion dollars.[3] Significant costs can accrue over a patient's lifetime for restorative, endodontic, prosthodontic, implant, or surgical treatment(s) resulting from dentoalveolar trauma. Piccininni et al suggested that the lifetime cost of an avulsed tooth in a teenage athlete can reach $20,000, exceeding the maximum benefits for most insurance companies. [22] Traumatic dental injuries have additional indirect costs that include children's hours lost from school and parents' hours lost from work, consequences that disproportionately burden lower income, minority, and non-insured children.[23,24,25,26]

The majority of sport-related dental and orofacial injuries affect the upper lip, maxilla, and maxillary incisors, with 50 to 90 percent of dental injuries involving the maxillary incisors.[13,14,27,22] The most

common dental injuries were lacerations (36.5%), chipped front teeth (23.9%) and avulsions (11.3%).[21] Use of a mouthguard can protect the upper incisors. However, studies have shown that even with a mouthguard in place, up to 25 percent of dentoalveolar injuries still can occur.[28]

Identifying patients who participate in sports and recreational activities allows the healthcare provider to recommend and implement preventive protocols for individuals at risk for orofacial injuries. In 2000, a predictive index was developed to identify the risk factors involved in various sports. This index is based upon a defined set of risk factors that predict the chance of injury including demographic information (age, gender, dental occlusion), protective equipment (type/usage), velocity and intensity of the sport, level of activity and exposure time, level of coaching and type of sports organization, whether the player is a focus of attention in a contact or non-contact sport, history of previous sports-related injury, and the situation (e.g., practice vs game). [9,29] Behavioral risk factors (e.g., hyperactivity) also have been associated significantly with injuries affecting the face and/or teeth.[30,31] While this predictive index looked at contact versus non-contact sport as a factor, non-contact sports can carry significant risk. For example., basketball is one of the sports with the highest incidence of dental injury, but these injuries usually involve player-player contact whereas greater than 87% of all dental injuries sustained by baseball, softball and field hockey players are due to player-object contact.[17]

The frequency of dental trauma is significantly higher for children with increased overjet (>6 mm) and inadequate lip coverage.[32,33] A dental professional may be able to modify these risk factors. Initiating preventive orthodontic treatment in early- to middle-mixed dentition of patients with an overjet greater than three millimeters has the potential to reduce the severity of traumatic injuries to permanent incisors.[32]

Although some sports-related traumatic injuries are unavoidable, most can be prevented.[33,34,35] Helmets, facemasks, and mouthguards have been shown to reduce both the frequency and severity of dental and orofacial trauma.[33] While facemasks may not significantly reduce the risk of orofacial trauma due to player-player contact, they might have a significant effect with player-object contact. The protective and positive results of wearing a mouthguard have been demonstrated in numerous epidemiological surveys and tests. [36,15,37,39,40] However, few sports have regulations that require their use. The National Federation of State High School Associations mandates mouthguards only for football, ice hockey, lacrosse, and field hockey and for wrestlers wearing braces.[41]Several states have attempted to increase the number of sports which mandate mouthguard use, with various degrees of success and acceptance. Four states

(Minnesota, New Hampshire, Maine and Massachusetts) have been successful in increasing the number of sports requiring mouthguard use to include sports such as soccer, wrestling, and basketball.[35,42,43] It is likely that the mandated mouthguard rule has not expanded to other sports due to complaints by athletes, parents, and coaches that mouthguards interfere with how the game is played and the athletes' enjoyment.[44,42] Regardless of the relatively limited use of mouthguards in sports, the American Dental Associations and International Academy of Sports Dentistry currently recommends the use of mouthguards in 29 sports or activities.[45]

Initially used by professional boxers, the mouthguard has been used as a protective device since the early 1900s.[14,4,46] The mouthguard, also referred to as a gumshield or mouth protector, is defined as a "resilient device or appliance placed inside the mouth to reduce oral injuries, particularly to teeth and surrounding structures."[47] The mouthguard was constructed to "protect the lips and intraoral tissues from bruising and laceration, to protect the teeth from crown fractures, root fractures, luxations, and avulsions, to protect the jaw from fracture and dislocations, and to provide support for edentulous space."[48] The mouthguard helps to prevent fractures and dislocations of teeth by absorbing and redistributing shock during forceful impacts and decreases the likelihood of jaw fracture by a similar mechanism and also by stabilizing the mandible.[40] The mouthguard decreases the incidence of soft tissue injuries by separating the teeth from the tissues. ~~works by "absorbing the energy imparted at the site of impact and by dissipating the remaining energy." (McClelland, Kinirons and Geary 1999).~~ Recent data suggests that a properly fitted mouthguard of 3.0 mm thickness might reduce the incidence of concussion injuries from a blow to the jaw by positioning the jaw to absorb the impact forces which without it would be transmitted through the skull base to the brain.[49]

The American Society for Testing and Materials (**ASTM**) classifies mouthguards by three categories (ASTM 2006)[50]:

1. Type I – Custom-fabricated mouthguards are produced on a dental model of the patient's mouth by either the vacuum-forming or heat-pressure lamination technique.[33] The ASTM recommends that for maximum protection, cushioning, and retention, the mouthguard should cover all teeth in at least one arch, customarily the maxillary arch, less the third mola.[50] A mandibular mouthguard is recommended for individuals with a Class III malocclusion. The custom-fabricated type is superior

in retention, protection, and comfort.[33,51,52,53,54] When this type is not available, the mouth-formed mouthguard is preferable to the stock or preformed mouthguard.[55,56,57]

2. Type II – Mouth-formed, also known as boil-and-bite, mouthguards are made from a thermoplastic material adapted to the mouth by finger, tongue, and biting pressure after immersing the appliance in hot water.[47] Available commercially at department and sporting-good stores, as well as online, these are the most commonly used among athletes but vary greatly in protection, retention, comfort, and cost.[36,33]
3. Type III – Stock mouthguards are purchased over-the-counter. They are designed for use without any modification and must be held in place by clenching the teeth together to provide a protective benefit.[33] Clenching a stock mouthguard in place can interfere with breathing and speaking and, for this reason, stock mouthguards are considered by many to be less protective.[36,48,54,58] Despite these shortcomings, the stock mouthguard could be the only option possible for patients with particular clinical presentations (e.g., use of orthodontic brackets and appliances, periods of rapidly changing occlusion during mixed dentition).

The ASD "recommends the use of a properly fitted mouthguard. It encourages the use of a custom fabricated mouthguard made over a dental cast and delivered under the supervision of a dentist. The ASD strongly supports and encourages a mandate for use of a properly fitted mouthguard in all collision and contact sports."[59] During fabrication of the mouthguard, it is recommended to establish proper anterior occlusion of the maxillary and mandibular arches as this will prevent or reduce injury by better absorbing and distributing the force of impact.[59] The practitioner also should consider the patient's vertical dimension of occlusion, personal comfort, and breathing ability.[57] By providing cushioning between the maxilla and mandible, mouthguards also may reduce the incidence or severity of condylar displacement injuries as well as the potential for concussions.[36,60,49]

Due to the continual shifting of teeth in orthodontic therapy, the exfoliation of primary teeth, and the eruption of permanent teeth, a custom-fabricated mouthguard may not fit the young athlete soon after the impression is obtained.[61] Several block-out methods used in both the dental operatory and laboratory may incorporate space to accommodate for future tooth movement and dental development.[61] By anticipating required space changes, a custom fabricated mouthguard may be made to endure several sports seasons.[61]

Parents play an important role in the acquisition of a mouthguard for young athletes. In a 2004 national fee survey, custom mouthguards ranged from $60 to $285.54 In a study to determine the acceptance of the three types of mouthguards by seven and eight-year-old children playing soccer, only 24 percent of surveyed parents were willing to pay $25 for a custom mouthguard.[62] Thus, cost may be a barrier[62], however it could be more likely that children do not accept mouthguard use easily. Ina study of children receiving mouthguards at no cost, 29 percent never wore the mouthguard, 32 percent wore it occasionally, 15.9 percent wore it initially but quit wearing it after one month, and only 23.2 percent wore the mouthguard when needed.[63]

Attitudes of officials, coaches, parents, and players about wearing mouthguards influence their usage.[44] Although coaches are perceived as the individuals with the greatest impact on whether or not players wear mouthguards, parents view themselves as equally responsible for maintaining mouthguard use.[44,64] However, surveys of parents regarding the indications for mouthguard usage reveal a lack of complete understanding of the benefits of mouthguard use.[64] Compared to other forms of protective equipment, mouthguard use received only moderate parental support in youth soccer programs.[65] A survey commissioned by the American Association of Orthodontists (**AAO**) reported that 67 percent of parents stated their children do not wear a mouthguard during organized sports. The survey also found that 84 percent do not wear mouthguards while participating in organized sports because it is not required, even though other protective equipment such as helmets and shoulder pads is mandatory.[66] Players' perceptions of mouthguard use and comfort largely determine their compliance and enthusiasm.[51] Realizing athletes' speech as a potential hindrance to mouthguard compliance, the Academy for Sports Dentistry recommends that a properly fitted mouth guard should provide for adequate speech commiserate with the playing status of the athlete.[59] Given the multiple reasons for lack of compliance in wearing mouthguards, the dental profession needs to influence and educate all stakeholders about the risk of sports-related orofacial injuries and available preventive strategies. [55,50,70] Routine dental visits can be an opportunity to initiate patient/parent education and make appropriate recommendations for use of a properly-fitted athletic mouthguard.[33]

Policy statement

The AAPD encourages:

- Dentists to play an active role in educating the public in the use of protective equipment for the prevention of orofacial injuries during sporting and recreational activities.

- Continuation of preventive practices instituted in youth, high school and college football, lacrosse, field hockey, ice hockey, and wrestling (for wrestlers wearing braces).
- An ASTM-certified face protector be required for youth participating in baseball and softball activities.
- Mandating the use of properly-fitted mouthguards in other organized sporting activities that carry risk of orofacial injury.
- Coaches/administrators of organized sports to consult a dentist with expertise in orofacial injuries prior to initiating practices for a sporting season, for recommendations for immediate management of sports-related injuries (e.g., avulsed teeth).
- Continuation of research in development of a comfortable, efficacious, and cost-effective sports mouthguard to facilitate more widespread use of this proven protective device.
- Dentists of all specialties, including pediatric and general dentists, to provide education to parents and patients regarding prevention of orofacial injuries as part of the anticipatory guidance discussed during dental visits.
- Dentists to prescribe, fabricate, or provide referral for mouthguard protection for patients at increased risk for orofacial trauma.
- Third-party payors to realize the benefits of mouthguards for the prevention and protection from orofacial sports-related injuries and, furthermore, encourages them to improve access to these services.
- Pediatric dentists to partner with other dentists and child health professionals, school administrators, legislators, and community sports organizations to promote the broader use of mouthguards.
- Pediatric dental departments to teach dental students fabrication of custom-fitting mouthguards.

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