

# Policy on Prevention of Sports-related Orofacial Injuries

## Originating Committee

Clinical Affairs Committee

## Review Council

Council on Clinical Affairs

## Adopted

1991

## Revised

1995, 1999, 2002, 2006, 2010

## 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 is an update of the previous document, revised in 2006. The update included an electronic search using the following parameters: Terms: "sports injuries", "injury prevention", "dental injuries", "orofacial injuries", and "mouthguard"; Field: all fields; Limits: within the last 10 years; humans; English; clinical trials and literature reviews. The reviewers agreed upon the inclusion of 48 articles that met the defined criteria. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

## 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.<sup>1,2</sup> Over the past decade, approximately 46 million youths in the United States were involved in "some form of sports".<sup>3</sup> It is estimated that 30 million children in the US participate in organized sport programs.<sup>4</sup> All sporting activities have an associated risk of orofacial injuries due to falls, collisions, contact with hard surfaces, and contact from sports-related equipment. Sports accidents reportedly account for 10-39% of all dental injuries in children.<sup>5</sup> Children are most susceptible to sports-related oral injury between the ages of 7 and 11 years.<sup>5-8</sup> The administrators of youth, high school, and college football, lacrosse, and ice hockey have demonstrated that dental and facial injuries can be reduced significantly by introducing mandatory protective equipment. Popular sports such as baseball, basketball, soccer,

softball, wrestling, volleyball, and gymnastics lag far behind in injury protection for girls and boys. Youths participating in leisure activities such as skateboarding, inline or roller skating, and bicycling also benefit from appropriate protective equipment.<sup>6,9-11</sup>

Studies of dental and orofacial athletic injuries are reported throughout the medical and dental literature.<sup>12,13</sup> A review of literature published over the past 20 years showed that the injury rate varied 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.<sup>12,13</sup> 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.<sup>5,12-15</sup>

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.<sup>16,17</sup> The yearly costs of all injuries, including orofacial injuries, sustained by young athletes have been estimated to be as high as 1.8 billion dollars.<sup>4</sup> The National Youth Sports Safety Foundation in 2005 estimated the cost to treat an avulsed permanent tooth and provide followup care is between \$5000 and \$20,000 over a lifetime.<sup>18</sup> 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.<sup>19-22</sup>

The majority of sport-related dental and orofacial injuries affect the upper lip, maxilla, and maxillary incisors, with 50-90% of dental injuries involving the maxillary incisors.<sup>5,12,13,23</sup> Use of a mouthguard can protect the upper incisors. However, studies have shown that even with a mouthguard in place, up to 25% of dentoalveolar injuries still can occur.<sup>24</sup>

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 (eg, practice vs game).<sup>15,25</sup> Behavioral risk factors (eg, hyperactivity) also have been associated significantly with injuries affecting the face and/or teeth.<sup>26</sup>

The frequency of dental trauma is significantly higher for children with increased overjet and inadequate lip coverage.<sup>27,28</sup> 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 >3 mm has the potential to reduce the severity of traumatic injuries to permanent incisors.<sup>27</sup>

Although some sports-related traumatic injuries are unavoidable, most can be prevented.<sup>15,18,29,30</sup> Helmets, facemasks, and mouthguards have been shown to reduce both the frequency and severity of dental and orofacial trauma.<sup>15</sup> However, few sports have regulations that require their use. The National Federation of State High School Associations mandate mouthguards for only 4 sports: football, ice hockey, lacrosse, and field hockey.<sup>30</sup> Several states have attempted to increase the number of sports which mandate mouthguard use, with various degrees of success and acceptance. Four New England states have been successful in increasing the number of sports requiring mouthguard use to include sports such as soccer, wrestling, and basketball.<sup>30,31</sup>

Initially used by professional boxers, the mouthguard has been used as a protective device since the early 1900's.<sup>13,32</sup> 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."<sup>5</sup> 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."<sup>33</sup> The mouthguard works by "absorbing the energy imparted at the site of impact and by dissipating the remaining energy."<sup>34</sup>

The American Society for Testing and Materials (ASTM) classifies mouthguards by 3 categories<sup>35</sup>:

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.<sup>5,15</sup> The ASTM recommends that for maximum protection, cushioning, and retention, the mouthguard should cover all teeth in one arch, customarily the maxillary arch, less the third molar.<sup>35</sup> A mandibular mouthguard is recommended for individuals with a Class III malocclusion.

The custom-fabricated type is superior in retention, protection, and comfort.<sup>5,15,34,36,37</sup> When this type is not available, the mouth-formed mouthguard is preferable to the stock or preformed mouthguard.<sup>32,38,39</sup>

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.<sup>5</sup> Available commercially at department and sporting-good stores, these are the most commonly used among athletes but vary greatly in protection, retention, comfort, and cost.<sup>8,15</sup>
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.<sup>5,15</sup> 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.<sup>5,8,33,40</sup> Despite these shortcomings, the stock mouthguard could be the only option possible for patients with particular clinical presentations (eg, use of orthodontic brackets and appliances, periods of rapidly changing occlusion during mixed dentition).

The Academy for Sports Dentistry (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."<sup>9,41</sup> 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.<sup>41</sup> The practitioner also should consider the patient's vertical dimension of occlusion, personal comfort, and breathing ability.<sup>39</sup> 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.<sup>8,42</sup>

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.<sup>43</sup> Several block-out methods used in both the dental operator and laboratory may incorporate space to accommodate for future tooth movement and dental development.<sup>43</sup> By anticipating required space changes, a custom fabricated mouthguard may be made to endure several sports seasons.<sup>8,43</sup>

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.<sup>44</sup> In a study to determine the acceptance of the 3 types of mouthguards by 7- and 8-year old children playing soccer, only 24% of parents surveyed were willing to pay \$25 for a custom mouthguard.<sup>45</sup> Therefore, cost may be a barrier.<sup>44</sup>

Attitudes of officials, coaches, parents, and players about wearing mouthguards influence their usage.<sup>46</sup> 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.<sup>46,47</sup> However, surveys of parents regarding the indications for mouthguard usage reveal a lack of complete understanding of the benefits of mouthguard use.<sup>46</sup> Players' perceptions of mouthguard use and comfort largely determine their compliance and enthusiasm.<sup>34,45</sup> Therefore, the dental profession needs to influence and educate all stakeholders about the risk of sports-related orofacial injuries and available preventive strategies.<sup>32,44,48</sup> Routine dental visits can be an opportunity to initiate patient/parent education and make appropriate recommendations for use of a properly-fitted athletic mouthguard.<sup>15</sup>

### Policy statement

The AAPD recommends:

1. dentists 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;
2. continuation of preventive practices instituted in youth, high school and college football, lacrosse, field hockey, and ice hockey;
3. for youth participating in organized baseball and softball activities, an ASTM-certified face protector be required (according to the playing rules of the sport);
4. mandating the use of properly-fitted mouthguards in other organized sporting activities that carry risk of orofacial injury;
5. prior to initiating practices for a sporting season, coaches/administrators of organized sports consult a dentist with expertise in orofacial injuries for recommendations for immediate management of sports-related injuries (eg, avulsed teeth);
6. continuation of research in development of a comfortable, efficacious, and cost-effective sports mouthguard to facilitate more widespread use of this proven protective device;
7. dentists of all specialties, including pediatric and general dentists, provide education to parents and patients regarding prevention of orofacial injuries as part of the anticipatory guidance discussed during dental visits;
8. dentists should prescribe, fabricate, or provide an appropriate referral for mouthguard protection for patients at increased risk for orofacial trauma;
9. that third party payors realized the benefits of mouthguards for the prevention and protection from orofacial sports-related injuries and, furthermore, encourages them to improve access to these services;
10. the ASD and the International Association of Dental Traumatology be consulted as valuable resources for the professions and public.

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