

Policy on Prevention of Sports-related Orofacial Injuries

Review Council

Council on Clinical Affairs

Latest Revision

2013

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. 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. Sixty-two 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.^{1,2} Over the past decade, approximately 46 million youths in the United States were involved in "some form of sports".³ It is estimated that 30 million children in the U.S. participate in organized sport programs.⁴ 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 to 39 percent of all dental injuries in children.⁵ 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.⁶ Children are most susceptible to sports-related oral injury between the ages of seven

and 11 years.⁷⁻¹⁰ 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. Baseball and basketball have been shown to have the highest incidence of sports-related dental injuries in children seven to 17 years of age.¹⁰ More specifically, baseball had the highest incidence 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.¹⁰ Youths participating in leisure activities such as skateboarding, inline or roller skating, and bicycling also benefit from appropriate protective equipment.^{7,11-13} A large national survey confirmed the bicycle as the most common consumer sports product related to dental injuries in children.¹⁰

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.¹⁴ 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 decreased injury rates significantly.¹⁴ 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".¹⁴

Studies of dental and orofacial athletic injuries are reported throughout the medical and dental literature.¹⁵⁻¹⁸ 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.¹⁵⁻¹⁸ 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.¹⁷ The highest incidence of sports-related dental injuries has been demonstrated in 15- to 18-year-old-males.¹⁸ 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.^{15,16,19,20}

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.^{21,22} 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.⁴ Significant costs can accrue over a patient's lifetime for restorative, endodontic, prosthodontic, implant, or surgical treatment(s) resulting from dentoalveolar trauma. 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.²³⁻²⁶

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.^{15,16,27} 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).^{20,29} Behavioral risk factors (e.g., hyperactivity) also have been associated significantly with injuries affecting the face and/or teeth.^{30,31}

The frequency of dental trauma is significantly higher for children with increased overjet 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.^{20,34,35} Helmets, facemasks, and mouthguards have been shown to reduce both the frequency and severity of dental and orofacial trauma.²⁰ The protective and positive results of wearing a mouthguard have been demonstrated in numerous epidemiological surveys and tests.^{9,17,36-38} 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.³⁹ Several states have attempted to increase the number of sports which mandate mouthguard use, with various de-

grees 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.^{35,40}

Initially used by professional boxers, the mouthguard has been used as a protective device since the early 1900s.^{16,41} 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."⁵ 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."⁴² The mouthguard works by "absorbing the energy imparted at the site of impact and by dissipating the remaining energy."⁴³

The American Society for Testing and Materials (ASTM) classifies mouthguards by three categories⁴⁴:

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.²⁰ 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 molar.⁴⁴ A mandibular mouthguard is recommended for individuals with a Class III malocclusion. The custom-fabricated type is superior in retention, protection, and comfort.^{20,43,45-47} When this type is not available, the mouth-formed mouthguard is preferable to the stock or preformed mouthguard.^{41,48,49}
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.⁵ 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.^{9,20}
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.²⁰ 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.^{9,42,47,50} 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.⁵¹ 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.⁵¹ The practitioner also should consider the patient's vertical dimension of occlusion, personal comfort, and breathing ability.⁴⁹ 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.^{9,52}

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.⁵³ Several block-out methods used in both the dental operator and laboratory may incorporate space to accommodate for future tooth movement and dental development.⁵³ By anticipating required space changes, a custom fabricated mouthguard may be made to endure several sports seasons.⁵³

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.⁵⁴ Thus, cost may be a barrier.⁵⁴ However, in a 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.⁵⁶

Attitudes of officials, coaches, parents, and players about wearing mouthguards influence their usage.⁵⁷ 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.^{57,58} However, surveys of parents regarding the indications for mouthguard usage reveal a lack of complete understanding of the benefits of mouthguard use.⁵⁷ Compared to other forms of protective equipment, mouthguard use received only moderate parental support in youth soccer programs.⁵⁹ 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.⁶⁰ Players' perceptions of mouthguard use and comfort largely determine their compliance and enthusiasm.^{43,55,61} Therefore, the dental profession needs to influence and educate all stakeholders about the risk of sports-related orofacial injuries and available preventive strategies.^{41,44,62} Routine dental visits can be an opportunity to initiate patient/parent education and make

appropriate recommendations for use of a properly-fitted athletic mouthguard.²⁰

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.

References

1. Castaldi CR. Sports-related oral and facial injuries in the young athlete: A new challenge for the pediatric dentist. *Pediatr Dent* 1986;8(4):311-6.
2. Castaldi CR. Athletic mouthguards: History and present status. *Sports Med Digest* 1988;10:1-2.
3. Barron M, Powell J. Fundamentals of injury prevention in youth sports. *J Pediatr Dent Care* 2005;11(2):10-2.
4. Adirim T, Cheng T. Overview of injuries in the young athlete. *Sports Med* 2003;33(1):75-81.

5. Newsome P, Tran D, Cooke M. The role of the mouthguard in the prevention of sports-related dental injuries: A review. *Int J Paediatr Dent* 2001;11(6):396-404.
6. Gassner R, Tuli T, Hachl O, Moreira R, Ulmer H. Craniomaxillofacial trauma in children: A review of 3,385 cases with 6,060 injuries in 10 years. *J Oral Maxillofac Surg* 2004;62(4):399-407.
7. Tesini DA, Soporowski NJ. Epidemiology of orofacial sports-related injuries. *Dent Clin North Am* 2000;44(1):1-18.
8. Rodd HD, Chesham DJ. Sports-related oral injury and mouthguard use among Sheffield school children. *Community Dent Health* 1997;14(1):25-30.
9. American Dental Association Council on Access, Prevention, and Interprofessional Relations and Council on Scientific Affairs. Using mouthguards to reduce the incidence and severity of sports-related oral injuries. *J Am Dent Assoc* 2006;137(12):1712-20.
10. Stewart GB, Shields BJ, Fields S, Comstock RD, Smith GA. Consumer products and activities associated with dental injuries to children treated in United States emergency departments 1990-2003. *Dental Traumatol* 2009;25(4):399-405.
11. Ranalli DN. Prevention of sports-related dental traumatic injuries. *Dent Clin North Am* 2000;44(1):35-51.
12. Finnoff JT, Laskowski ER, Altman KC, Diehl NW. Barriers to bicycle helmet use. *Pediatrics* 2001;108(1):4-10.
13. Fasciglione D, Persic R, Pohl Y, Fillippi A. Dental injuries in inline skating – Level of information and prevention. *Dent Traumatol* 2007;23(3):143-8.
14. Council on Sports Medicine and Fitness American Academy of Pediatrics, Briskin S, LaBotz M. Policy statement on trampoline safety in childhood and adolescence. *Pediatrics* 2012;130(4):774-9.
15. Kumamoto D, Maeda Y. Global trends and epidemiology of sports injuries. *J Pediatr Dent Care* 2005;11(2):15-25.
16. Kumamoto D, Maeda Y. A literature review of sports-related orofacial trauma. *Gen Dent* 2004;52(3):270-80.
17. Glendor U. Aetiology and risk factors related to traumatic dental injuries: A review of the literature. *Dental Traumatol* 2009;25(1):19-31.
18. Huang B, Wagner M, Croucher R, Hector M. Activities related to the occurrence of traumatic dental injuries in 15- to 18-year-olds. *Dental Traumatol* 2009;25(1):64-8.
19. Gassner R, Tuli T, Hachl O, Rudisch A, Ulmer H. Craniomaxillofacial trauma: A 10 year review of 9,543 cases with 21,067 injuries. *J Craniomaxillofac Surg* 2003;31:51-61.
20. Ranalli DN. Sports dentistry in general practice. *Gen Dent* 2000;48(2):158-64.
21. Cortes M, Marcenes W, Sheiham A. Impact of traumatic injuries to the permanent teeth on the oral health-related quality of life in 12-14-year old children. *Community Dent and Oral Epidemiol* 2002;30(3):193-8.
22. Berger TD, Kenny DJ, Casas MJ, Barrett EJ, Lawrence HP. Effects of severe dentoalveolar trauma on the quality-of-life of children and parents. *Dent Traumatol* 2009;25(5):462-9.
23. Sane J, Ylipaavalniemi P, Turtola L, Niemi T, Laaka V. Traumatic injuries among university students in Finland. *J Am Coll Health* 1997;46(1):21-4.
24. Ngyuyen PM, Kenny DJ, Barret EJ. Socio-economic burden of permanent incisor replantation on children and parents. *Dent Traumatol* 2004;20(3):123-33.
25. Gift HC, Reisine ST, Larach DC. The social impact of dental problems and visits. *Am J Public Health* 1992;82(12):1663-8.
26. McIntyre JD, Lee JY, Trope M, Vann WF. Elementary school staff knowledge about dental injuries. *Dent Traumatol* 2008;24(3):289-98.
27. Takeda T, Ishigami K, Nakajima K, et al. Are all mouthguards the same and safe to use? Part 2. The influence of anterior occlusion against a direct impact on maxillary incisors. *Dent Traumatol* 2008;24(3):360-5.
28. Onyeaso C, Adegbesan O. Knowledge and attitudes of coaches of secondary school athletes in Ibadan, Nigeria regarding orofacial injuries and mouthguard use by the athletes. *Dent Traumatol* 2003;19(5):204-8.
29. Fos P, Pinkham JR, Ranalli DN. Prediction of sports-related dental traumatic injuries. *Dent Clin North Am* 2000;44(1):19-33.
30. Lalloo R. Risk factors for major injuries to the face and teeth. *Dent Traumatol* 2003;19(1):12-4.
31. Sabuncuoglu O. Traumatic dental injuries and attention-deficit/hyperactivity disorder: Is there a link? *Dental Traumatol* 2007;23(3):137-42.
32. Bauss O, Rohling J, Schwestka-Polly R. Prevalence of traumatic injuries to the permanent incisors in candidates for orthodontic treatment. *Dent Traumatol* 2004;20(2):61-6.
33. Forsberg C, Tedestam G. Etiological and predisposing factors related to traumatic injuries to permanent teeth. *Swed Dent J* 1993;17(5):183-90.
34. 1st World Congress of Sports Injury Prevention. Abstracts. *Br J Sports Med* 2005;39:373-408.
35. Mills S. Can we mandate prevention? *J Pediatr Dent Care* 2005;11(2):7-8.
36. Ranalli, DN. Sports dentistry and dental traumatology. *Dental Traumatol* 2002;18(5):231-6.
37. Maeda Y, Kumamoto D, Yagi K, Ikebe K. Effectiveness and fabrication of mouthguards. *Dental Traumatol* 2009;25(6):556-64.
38. Takeda T, Ishigami K, Mishima O, et al. Easy fabrication of a new type of mouthguard incorporating a hard insert and space and offering improved shock absorption ability. *Dental Traumatol* 2011;27(6):489-95.

39. National Federation of State High School Associations, Sports Medicine Advisory Committee. Position Statement and Recommendations for Mouthguard Use in Sports. October, 2011. Available at: "<http://www.nfhs.org/content.aspx?id=5786>". Accessed June 22, 2013.
40. Kumamoto D. Establishing a mouthguard program in your community. *Gen Dent* 2000;48:160-4.
41. Patrick DG, van Noort R, Found MS. Scale of protection and the various types of sports mouthguard. *Br J Sports Med* 2005;39(5):278-81.
42. Biasca N, Wirth S, Tegner Y. The avoidability of head and neck injuries in ice hockey: A historical review. *Br J Sports Med* 2002;36(6):410-27.
43. McClelland C, Kinirons M, Geary L. A preliminary study of patient comfort associated with customised mouthguards. *Br J Sports Med* 1999;33(3):186-9.
44. American Society for Testing and Materials. Standard practice for care and use of athletic mouth protectors. ASTM F697-00. Philadelphia, Pa: American Society for Testing and Materials; Reapproved 2006.
45. Warnet L, Greasley A. Transient forces generated by projectiles on variable quality mouthguards monitored by instrumented impact testing. *Br J Sports Med* 2001;35(4):257-62.
46. Greasley A, Imlach G, Karet B. Application of a standard test to the in vitro performance of mouthguards. *Br J Sports Med* 1998;32(1):17-9.
47. Duddy FA, Weissman J, Lee, RA Sr, Paranipe A, Johnson JD, Cohenca N. Influence of different types of mouthguards on strength and performance of collegiate athletes: A controlled-randomized trial. *Dent Traumatol* 2012; 28(4):263-7.
48. Bureau of Dental Health Education and Bureau of Economic Research and Statistics. Evaluation of mouth protectors used by high school football players. *J Am Dent Assoc* 1964;68:430-42.
49. DeYoung AK, Robinson E, Godwin WC. Comparing comfort and wearability: Custom-made vs. self-adapted mouthguards. *J Am Dent Assoc* 1994;125(8):1112-8.
50. Ranalli DN. Prevention of craniofacial injuries in football. *Dent Clin North Am* 1991;35(4):627-45.
51. Academy for Sports Dentistry. Position statement: Mouthguard mandates. 2010. Available at: "<http://www.academyforsportsdentistry.org/Organization/PositionStatement/tabid/58/Default.aspx>". Accessed March 24, 2013.
52. Waliko T, Bir C, Godwin W, King A. Relationship between temporomandibular joint dynamics and mouthguards: Feasibility of a test method. *Dent Traumatol* 2004;20(5):255-60.
53. Croll T, Castaldi CR. Custom sports mouthguard modified for orthodontic patients and children in the transitional dentition. *Pediatr Dent* 2004;26(5):417-20.
54. Walker J. Parents plus: Getting mouthguards into kids' mouths. *J Pediatr Dent Care* 2005;11(2):39-40.
55. Walker J, Jakobsen J, Brown S. Attitudes concerning mouthguard use in 7- to 8-year-old children. *J Dent Child* 2002;69(2):207-11.
56. Matalon V, Brin I, Moskovitz M, Ram D. Compliance of children and youngsters in the use of mouthguards. *Dental Traumatol* 2008;24(4):462-7.
57. Gardiner D, Ranalli DN. Attitudinal factors influencing mouthguard utilization. *Dent Clin North Am* 2000; 44(1):53-65.
58. Diab N, Mourino A. Parental attitudes toward mouthguards. *Pediatr Dent* 1997;19(8):455-60.
59. Khodae M, Fettes MD, Gorenflo DW. Football (soccer) safety equipment use and parental attitudes toward safety equipment in a community youth sports program. *Res Sports Med* 2011;19(2):129-43.
60. Academy for Sports Dentistry, American Academy of Pediatric Dentistry, American Association of Oral and Maxillofacial Surgeons, American Association of Orthodontists, American Dental Association. Play It Safe: Prevent Facial Injuries With Simple Sports Safety Precautions. April 1, 2013. Available at: "http://www.aapd.org/play_it_safe_prevent_facial_injuries_with_simple_sports_safety_precautions/". Accessed July 3, 2013.
61. Raaii F, Vaidya N, Vaidya K, et al. Patterns of mouthguard utilization among atom and pee wee minor ice hockey players: A pilot study. *Clin J Sport Med* 2011;21(4):320-4.
62. Woodmansey K. Athletic mouth guards prevent orofacial injuries: A review. *Gen Dent* 1999;47(1):64-9.