Guarding the Precious Smile: Incidence and Prevention of Injury in Sports: A Review
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Abstract:
The paper provides a review about the orofacial injuries sustained during sports and the options available to the athletes for their prevention. It was done with a purpose to determine three different aspects: incidence of dental injury during sporting activities, role of mouthguards in preventing sports injury, types of mouthguards and their properties. From this review, it is clear that sports carry a considerable risk of injury, this is not only true for the contact sports such as rugby or kickboxing, but also for seemingly less dangerous sports such as football. Amongst the different types of mouthguards, the most acceptable and safe ones are the custom-fabricated mouthguards, in particular the pressure-laminated ones. In general, mouthguard usage is less than the dental profession recommended by the American Dental Association (ADA) in 1950. Mouth guard is a resilient device placed in the mouth to prevent and reduce possible oral injuries, in particular of the teeth and surrounding structures. It acts on absorbing, distributing and dissipating the transmitted forces in the impact zone. Before the second world war, Jack Dempsey and Gene Tuney, were probably the last of the heavyweight champions to fight without a mouthpiece.

Different types of mouth guards are available. The most popular among them is self-adapted “Boil-and-bite” and custom-made mouth guards. Custom-made mouth guards have been shown to be the most efficient in preventing dental injury during sporting activities and should therefore be recommended to those participating in contact sports. Besides their role in preventing injury, some authors have shown that mouth guards help in improving performance in sports.

The purpose of this review study was to determine: Incidence of dental injury during sporting activities, role of mouth guards in preventing sports injury, types of mouth guards and their properties.

Injury Incidence
According to ADA one-half of the injuries sustained while playing soccer were pertaining to the mouth, and that majority of these injuries could have been prevented by wearing a night guard. Furthermore, it has been widely reported that participation in sports exposes a person to risk of sustaining dental injury. The type of contact can be classified as direct contact with competitors (taekwondo, jiu-jitsu, kickboxing, boxing, etc.) Figure 1 indirect contact with rival competitors (handball, basketball, football, soccer, ice-hockey, etc.) and no contact with rival competitors (volleyball, badminton, etc.) during the activity.

Prevalence of injury during contact sports like rugby and American football has been addressed considerably by the dental literature.
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Sports have 10% chance of injury during a playing season and 50% chance of injury in their playing career.15,16 Oral trauma is just as common, in basketball, soccer, basketball, bicycling, in-line skating, gymnastics, and other sports.17 A universal finding is that the injury to the central incisors accounts to 80% of the injuries affecting maxillary jaw.18,19

In children, the incidence of injuries from sports accidents is the maximum in the age group of 8-11 years.20,21 Boys are more likely than girls to be injured; with the ratio being 1.5:3.1.22 Adding significance to the above mentioned figures is the fact that most of the school teachers are not aware about the adequate measures to be taken to deal with such injuries.23

Role of mouth guard in preventing injury due to sporting activity

There are sufficient number of articles supporting the protective significance of mouthguard,16,24,25 though one study could not find a statistically significant difference in the injuries in the head and neck region in general and oral region in particular between players wearing mouth guard and those not wearing them.26

With innumerable injuries occurring to baseball players in the oral region and even more number of injuries observed in basketball players, mouth guards can offer significant protection and reduction in the number of athletes getting injured in these as well as other non-contact sports.27,28 Mouth guards have been found out to be the most efficient way of preventing traumatic dental injuries.29 However, not all contact sports recommend the use of mouth guard to prevent injury. Maxén et al. showed that floorball, having a high risk of injury, did not recommend the use of mouthguard.30

Despite of this, mouth guard has been instituted as an effective protective measure against sporting injuries. Heintz reported that two million people participating in sports in U.S. were made to wear mouth guard and this reduced the rate of injury of face and mouth to 50% and of all injuries to more than 0.5%.31

Types of mouth guards

Mouth guard is defined as a resilient device or appliance placed inside the mouth to reduce oral injuries, particularly to teeth and surrounding structures.32 A properly fitted mouth guard should be protective, comfortable, resilient, tear-resistant, odourless, tasteless, inexpensive, easy to fabricate and should not interfere with speech.9 There are three types of athletic mouth guards according to American Society for Testing and Materials:33

- Type I: Stock mouth guards, purchased over the counter and require modifications. These are no longer sold widely (Figure 2)
- Type II: Mouth-formed “boil-and-bite” mouth guards. They are available commercially. Made of thermoplastic resin, they need to be immersed in hot water and adapted in the mouth using tongue, finger and biting pressure (Figure 3)
- Type III: Custom made on a model in patient’s mouth (Figure 4).

A wide variety of materials is currently being used for fabricating mouth guards, most common among them being polyvinyl-acetate-polyethylene copolymer and polyvinyl chloride. Silicone rubber, natural rubber, polyurethane, and soft acrylic resin are less widely used.34

Both stock mouth guards and “boil-and-bite” mouth guards are bulky and are loose, so they require occlusal pressure for adequate retention. Loose fit with these types of mouth guards was found in 42% athletes when compared to none with custom made ones.35

To provide adequate retention, mouth guard should:

- Be properly fitted and accurately adapted to the wearer’s mouth and his/her oral structures.
- Be made of resilient material approved by the U.S. Food and Drug Administration and cover all remaining teeth on one arch, customarily the maxillary.
- Stay in place comfortably and securely.
- Be physiologically compatible with the wearer.
- Be relatively easy to clean.
- Have high-impact energy absorption and reduce transmitted forces upon impact.36

Conclusion

It is clear that mouth guards offer protection against dental injuries sustained during sporting activities. It is equally clear that the custom-made mouth guards offer better protection as compared to the “stock” or “boil-and-bite” type, many people do not use them because they are expensive and also necessitate a visit to the dentist.
There has been a growing belief that though progress has been made in the use of mouth guards, the profession should expand its use to governing bodies, coaches and schools; also should make them comparatively cheaper for its wide acceptance and increased use.

References

1. Lephart SM, Fu FH. Emergency treatment of athletic injuries. Dent Clin North Am 1991;35(4):707-17.
2. Borsøn E, Holm AK. Traumatic dental injuries in a cohort of 16-year-olds in northern Sweden. Endod Dent Traumatol 1997;13(6):276-80.
3. Ozbay G, Bakkal M, Abbasoglu Z, Demirel S, Kargul B, Welbury R. Incidence and prevention of traumatic injuries in paediatric handball players in Istanbul, Turkey. Eur Arch Paediatr Dent 2013;14(1):41-5.
4. Hegde V, Kiran DN, Anupama A. Mouthguard in sports: A review. Indian J Stomatol 2012;3(1):50-2.
5. Yesil Duymus Z, Gungor H. Use of mouthguard rates among university athletes during sport activities in Erzurum, Turkey. Dent Traumatol 2009;25(3):318-22.
6. Duarte-Pereira DM, Del Rey-Santamaria M, Javiere-Garcés C, Barbany-Cairó J, Paredes-Garcia J, Valmaseda-Castellón E, et al. Wearability and physiological effects of custom-fitted vs self-adapted mouthguards. Dent Traumatol 2008;24(4):439-42.
7. ADA Council on Access, Prevention and Interprofessional Relations, ADA 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.
8. Knapik JJ, Marshall SW, Lee RB, Darakjiy SS, Jones SB, Mitchener TA, et al. Mouthguards in sport activities: History, physical properties and injury prevention effectiveness. Sports Med 2007;37(2):117-44.
9. Scott J, Burke FJ, Watts DC. A review of dental injuries and the use of mouthguards in contact team sports. Br Dent J 1994;176(8):310-4.
10. Garner DP, McDivitt E. Effects of mouthpiece use on airway openings and lactate levels in healthy college males. Compend Contin Educ Dent 2009;30 Spec No 2:9-13.
11. Roettger M. Performance enhancement and oral appliances. Compend Contin Educ Dent 2009;30 Spec No 2:4-8.
12. Davies RM, Bradley D, Hale RW, Laird WR, Thomas PD. The prevalence of dental injuries in rugby players and their attitude to mouthguards. Br J Sports Med 1977;11(2):72-4.
13. Sane J, Ylipaavalniemi P. Dental trauma in contact team sports. Endod Dent Traumatol 1988;4(4):164-9.
14. Dorney B. Dental screening for rugby players in New South Whales, Australia. FDI World 1998;7:10-3.
15. Clegg JH. Mouth protection for the rugby football player. Br Dent J 1969;127(7):341-3.
16. Champman P. Concussion in contact sports and importance of mouthguards in protection. Aust J Sci Med Sport 1985;17:23-7.
17. Maestrello CL, Mourino AP, Farrington FH. Dentists’ attitudes towards mouthguard protection. Pediatr Dent 1999;21(6):340-6.
18. Hedegård B, Stålhane I. A study of traumatized permanent teeth in children 7-15 years. I. Sven Tandlak Tidskr 1973;66(5):431-52.
19. Cavalleri G, Zerman N. Traumatic crown fractures in permanent incisors with immature roots: A follow-up study. Endod Traumatol 1995;11(6):294-6.
20. Rodd HD, Chesham DJ. Sports-related oral injury and mouthguard use among Sheffield school children. Community Dent Health 1997;14(1):25-30.
21. Petti S, Tarsitani G. Traumatic injuries to anterior teeth in Italian schoolchildren: Prevalence and risk factors. Endod Dent Traumatol 1996;12(6):294-7.
22. Rotherman D. Pediatric orofacial injuries. J Clin Dent Assoc 1996;24:37-49.
23. Chan W. An investigation of lay knowledge of physical education teachers in the emergency management of dental trauma in Hong Kong. Masters Thesis, Hong Kong Polytechnic University; 1999.
24. Morton JG, Burton JF. An evaluation of the effectiveness of mouthguards in high-school rugby players. NZ Dent J 1979;75(341):151-3.
25. Champman P. Attitudes to mouthguards and prevalence of orofacial injuries in international rugby: A study of the 1990 Wallabies. Aust J Sci Med Sport 1991;23:115-7.
26. Blignaut JB, Carstens IL, Lombard CJ. Injuries sustained in rugby by wearers and non-wearers of mouthguards. Br J Sports Med 1987;21(2):5-7.
27. Mueller FO, Marshall SW, Kirby DP. Injuries in little league baseball from 1987 through 1996: Implications for prevention. Phys Sportsmed 2001;29(7):41-8.
28. Gutmann JL, Gutmann MS. Cause, incidence, and prevention of trauma to teeth. Dent Clin North Am 1995;39(1):1-13.
29. Kerr IL. Mouth guards for the prevention of injuries in contact sports. Sports Med 1986;3(6):415-27.
30. Maxén M, Kühl S, Krastl G, Filippi A. Eye injuries and orofacial traumas in floorball – A survey in Switzerland and Sweden. Dent Traumatol 2011;27(2):95-101.
31. Heintz WD. Mouth protectors: A progress report. Bureau of Dental Health Education. J Am Dent Assoc 1968;77(3):632-6.
32. Newsome PR, Tran DC, Cooke MS. The role of the mouthguard in the prevention of sports-related dental injuries: A review. Int J Paediatr Dent 2001;11(6):396-404.
33. American Society for Testing and Materials. Standard Practice for Care and Use of Mouthguards. Designation: F 697-80. Philadelphia: American Society for Testing and Material; 1986. p. 323.
34. Auroy P, Duchatelard P, Zmantar NE, Hennequin M. Hardness and shock absorption of silicone rubber for mouth guards. J Prosthet Dent 1996;75(4):463-71.
35. 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.
36. Powers JM, Godwin WC, Heintz WD. Mouth protectors and sports team dentists. Bureau of Health Education and Audiovisual Services, Council on Dental Materials, Instruments, and Equipment. J Am Dent Assoc 1984;109(1):84-7.