Do Mouthguards Prevent or Reduce Oral Injuries and Concussion during Sports Events?

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Key words: mouthguard, oral injury, concussion

Abstract

This review examines the English and Japanese literature investigating the efficacy of mouthguard use for preventing or reducing traumatic oral injuries or concussion from 1986 to 2016, using PubMed and manual searching. After careful reading and evaluation of 17 articles, we concluded that properly fitted custom-made mouthguards can prevent or reduce traumatic oral injuries. Larger cohort studies are required to clarify the efficacy of mouthguards in reducing the severity of concussion.

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Introduction

Many studies have been conducted to demonstrate the efficacy of using mouthguards to prevent or reduce traumatic oral injuries or concussion during sports events.

We conducted a systematic review in 2014[1], and concluded that there was limited evidence to support the efficacy of mouthguard use in reducing traumatic oral injuries, and that further studies were needed. We also conducted an international workshop in 2016 to prepare for a future consensus conference, where we acquired more reports and publications from various parts of the world, particularly from Japan, related to this issue.

The purpose of this report is to update the systematic reviews of the efficacy of mouthguard use for preventing or reducing traumatic oral injuries or concussion, by searching the literature written not only in English, but also in Japanese.

Materials and Methods

We used PubMed and manual searching with the key words [mouthguard, prevention, reduction, trauma, concussion, sports] from 1986 until 2016. More than 750 papers were extracted. After careful reading and evaluation, only 17 relevant articles remained.

Results

Prevention or reduction of traumatic oral injuries

Berg et al.[2] reported that high school wrestling, basketball, baseball, softball, soccer, and volleyball players with mouthguards reported fewer incidents of traumatic injury than those without mouthguards. Biasca et al.[3] reviewed head and neck injuries among ice hockey players and suggested that mouthguard use is necessary to reduce the incidence and severity of oro-facial injuries. Onyeaso and Adegbesan[4] reported that one third of attendees at national sports events in Nigeria were non-users of mouthguards, and suffered significantly more traumatic injuries than mouthguard users. Labella et al.[5] reported that mouthguard users among college basketball players had a significantly lower rate of dental injuries (0.12 vs 0.67; $P < 0.05$) and dentist referrals (0.00 vs 0.72; $P < 0.05$) than non-users.

Marshall et al.[6] reported that the use of mouthguards resulted in a reduction in the incidence of dento-facial injuries, but not concussion, among 304 rugby players.

Maeda et al.[7] reported the following findings in their review article:

(1) To prove the efficacy of mouthguards in preventing and reducing traumatic dento-oral injuries, we need well-designed studies with ethical approval.

(2) To fabricate properly fitted custom-made mouthguards, we need to pay more attention to the effects of moisture on the working models, and the thermoforming temperature and cooling time.

(3) Well fitted and designed custom-made mouthguards do not affect air intake, performance or speaking.

(4) A reduction in the severity of concussion by the use of mouthguards is still controversial and needs scientific evidence.

(5) Education of coaches and parents about the advantages of using mouthguards is essential.

McCrory et al.[8] suggested that the use of mouthguards can contribute to a reduction in dento-facial traumatic injuries, particularly in contact sports, and that mouthguards should be properly fitted and custom-made.

In 2013, Yasui et al.[9] reported on an epidemiological study among 1134 assorted sports players conducted by members of the Japa nese Academy of Sports Dentistry (JASD). This study was approved by the ethical committee of Osaka University on the basis that every player was advised to use a custom-made mouthguard before the season started. Players were then asked to report incidents of dento-oral injuries and the percentage of time they used a mouthguard. Multifactorial statistical analysis was carried out for age, sex, body weight, sports discipline, years of experience, duration of exercise, duration of gameplay, and mouthguard usage time. They found that mouthguard usage time was a statistically significant factor in reducing the incidence of traumatic injuries. Tanaka et al.[10] also described the effect of mouthguard usage among 500 rugby players using the above-mentioned JASD format. They also found that players using mouthguards were subject to fewer dento-oral traumatic injuries, and that custom-made mouthguards can reduce breathing problems.

Ilia et al.[11] conducted a survey among rugby union players and reported that 64.9% of players experienced orofacial trauma, and that wearing a mouthguard reduced the risk by 18.5% ($P = 0.009$).

Vucic et al.[12] conducted a survey among 1299 field hockey players and reported that players complained less about custom-made mouthguards than mouth-formed mouthguards ($p \leq 0.05$); however, males were still less likely to have a custom-made mouthguard than females.

Prevention or reduction of concussion

Mouthguards originated from boxing, where concussion is the main cause of fatal injury. We found that although some boxers still suffer from concussion, the number of fatal incidents has decreased. Among other preventive factors used in boxing, mouthguard use is still a contributing factor in lowering the risk of concussion.

Hickey et al.[13] investigated how mouthguards can reduce the risk of concussion by conducting experiments on cadavers; however, there has been little scientific evidence to support the effect of mouthguard use on concussion.

Based on a multi-center study among 394 soccer players and 252 rugby players, Barbic et al.[14] reported that there was no significant difference in the frequency of concussion among players using different types of mouthguards.

Benson et al.[15] reviewed the literature and concluded that no strong evidence exists for the use of mouthguards or face shields to reduce the risk of concussion.

A brain injuries consensus meeting concluded that there is no evidence to support the use of mouthguards for reducing the risk or severity of concussion.[16]

Sigurdsson[17] suggested that evidence-based dentistry and medicine requires large prospective studies with randomized interventions to investigate the actual protective effects of mouthguards.

The American Medical Society for Sports Medicine's position statement on concussion in sport stated that there is no current evidence that mouthguards can reduce the severity of, or prevent, concussion.[18]

A survey among 412 high school football players conducted by Winters and DeMont[19] indicated that there was a significant dif-

ference (P = 0.0423) in the mild traumatic brain injury / concussion injury rate between the group using laminated 3 mm thickness custom-made mouthguards (incidence of 3.6%) and the group using over-the-counter mouthguards (incidence of 8.3%). However, McGuine et al.[20] reported that the rate of sport-related concussion was higher in players who wore a custom-made mouthguard (P < 0.001) than in players who wore a generic mouthguard.

Further epidemiological data is required to determine the efficacy of mouthguards in reducing the severity of concussion. This should include the use of larger cohort groups and recording with objective measures such as the Sport Concussion Assessment Tool 5th Edition (SCAT 5)[16].

Discussion

We already have some evidence that properly fitted custom-made mouthguards can prevent or reduce traumatic oral injuries. We still need cohort studies conducted on a greater scale to clarify the efficacy of mouthguards in reducing the severity of concussion.

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Conflicts of interest

The authors report that they have no conflicts of interest related to this study.

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