THE EFFECTIVENESS OF MOUTH GUARDS AND FACE MASKS IN REDUCING
FACIAL AND ORAL INJURY IN ICE HOCKEY PLAYERS

ABSTRACT

Purpose: The purpose of this study was to evaluate the use and the effect of mouth guards and face
masks in minimizing the number and severity of concussions and dental injuries in male hockey players;
discuss the use of mouth guards in orthodontic wearers; and determine guidelines for the wear and
replacement of mouth guards and face masks by junior hockey players.

Methods: Data was compiled from scientific research papers published in medical and dental journals
dating from 1998 through 2003, information provided through the Canadian and American Dental
Associations, and the collaborative findings of sports medicine and sports dental practitioners actively
involved in both minor and national hockey leagues.

Results: The use of mouth guards and face masks helps prevent and minimize the extent of concussions
and dental injuries in male hockey players, especially in players wearing orthodontic equipment such as
braces. Maximal protection occurs when a mouth guard is used in conjunction with a face mask. Several
different types of mouth guards are currently available; the choice of material and construction affects the
protective ability, comfort, and durability of these various mouth guards.

Conclusion: Mouth guards and face masks are strongly recommended to minimize the number and
severity of concussions and dental injuries in hockey players.

RESULTS AND DISCUSSION

Mouth guards

Why wear a mouth guard?

- A hockey puck can reach speeds of 120 miles per hour and hit a player’s teeth with an impact force
  of 1250 pounds (12)
- The total rehabilitation costs for a single avulsed tooth are more than 20 times the cost of a
  quality professional mouth guard – lifetime dental rehabilitation costs can exceed 15,000$ US per
  avulsed tooth (12)
- Mouth guards prevent over 200,000 injuries each year (12, 15)
- An athlete is 70 times more likely to sustain damage to teeth when not wearing a mouth guard
  (12)
- Almost one-third of all dental injuries are due to sports-related accidents (12)
- During a single athletic season, athletes have a 1 in 10 chance of suffering a facial or dental
  injury (12)
- A mouth guard can also prevent concussions, cerebral hemorrhages, incidents of
  unconsciousness, jaw fractures and neck injuries (12)

It is well documented that the use of mouth guards can reduce the risk of injury (4). Mouth guards protect
not just the teeth, but also the lips, cheeks, and tongue (14). Besides warding off broken teeth and facial
bones, the use of a mouth guard will prevent the jaw from being forced back toward the brain when a
player takes a hit to the chin (17, 18). As stated by the Academy of Sports Dentistry, mouth guards thus
“protect against head and neck injuries by cushioning blows that might otherwise cause concussions or
lead to jaw fracture.” (2, 11, 15).

Of the three types of mouth guards that are currently available, a custom-made mouth guard offers the best
protection, fit and comfort level (1, 17, 18). Boil-and-bite guards are available at sporting goods stores and
are less expensive than custom-made mouth guards; however the fit is not as good and they will not last as
long (16). A stock mouth guard offers the least protection since little can be done to adjust the fit. Studies
have shown however, that any mouth guard works better than having none at all (14).
Table 1: Comparative analysis of custom, ready-made, and stock mouth guards.

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<th>Type of mouth guard</th>
<th>Description</th>
<th>Advantages</th>
<th>Disadvantages</th>
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| Custom-made         | Created by a dentist using a mold of the athlete’s upper teeth. | • Provide the highest degree of comfort, protection, and durability  
• Optimal fit, comfort, and protection  
• Designed to cover all back teeth and cushion the entire jaw; can help prevent concussions caused by blows to the chin  
• Minimal interference with breathing and speech  
• More durable and longer life than other models  
• Maintain position in mouth without effort by athlete | • More expensive than other types  
• Require two dental visits for fitting |
| Ready-made ("Boil and bite") | Purchased off the shelf, then heated and placed in the mouth to allow the mouth guard to form to the teeth and mouth. Fitting is best done under a dentist’s supervision. | • Easy to use  
• Inexpensive  
• Less bulky than stock mouth guards  
• Include a strap to attach them to the helmet  
• Potential to fit fairly well, if heated and formed properly | • Difficult to wear with braces  
• Lost thickness and shape over time  
• Deteriorate over time, become brittle  
• If not fitted properly can cause discomfort and pain |
| Stock               | Purchased off the shelf and used without any modifications or forming to the mouth | • Easy to use  
• Inexpensive  
• Acceptable properties for mouth protection  
• Easiest to fit and wear with braces | • Fit poorly  
• Least effective  
• Cause discomfort and pain  
• Low user compliance due to poor fit and discomfort  
• Lose thickness and shape over time |

Mouth guards are crucial for athletes undergoing orthodontic treatment. Without a mouth guard, contact with the face of an athlete wearing braces can severely tear the soft tissue inside the mouth, causing pain while damaging both the braces and teeth. Wearing a mouth guard will also reduce the risk of a bleeding injury (7). Athletes with braces on both upper and lower teeth may be recommended to wear a mouth guard on their bottom teeth, in addition to the standard upper jaw mouth guard (5). Athletes should never wear a retainer or removable orthodontic appliance during a contact sport (7).

Regardless of type, mouth guards should be rinsed thoroughly in cold water before and after each use, either with or without toothpaste and a toothbrush (7). Wearers should clean the mouth guard on occasion in cool, soapy water, rinsing thoroughly upon completion (16). Always store and transport a mouth guard in a firm container that permits air circulation. With proper care, custom mouth guards will last for several seasons. In contrast, regardless of how they may look or feel, stock and boil-and-bite mouth guards should be replaced every 12 to 18 months to ensure adequate protection. Mouth guards worn by growing athletes should be inspected regularly to ensure their proper fit; replace if required.

Face masks
According to a study done by Paul D. Reynen and William G Clancy Jr., which was published in the American Journal of Sports Medicine, “one of the greatest changes over the last 30 years has been the use of the face mask and helmets (in hockey)” (10). During a study of the Finnish Hockey League, Lahti et al determined that 39.4% of all hockey injuries involve the head or face, with dental injuries accounting for 11.5% of all ice-hockey-related injuries. Lahti et al. further report that being hit by a stick is the most common reason for dental or facial injuries, resulting in 54% of all facial trauma (8). Lahti et al. determined that a noncomplicated crown fracture is by far the most common dental injury among ice hockey players (8). Crown fractures can lead in turn to root resorption, periapical lesion, pulpal obliteration, and loss of vitality. These complications may eventually lead to loss of the injured tooth.

Despite the severity of these findings, Lahti et al’s research indicated that only 10% of players with a face and/or head injury were wearing some kind of a dental or facial guard at their time of injury (8). Several studies have shown that facial guards reduce the number of injuries. Indeed, the most frequent injury, a noncomplicated crown fracture, can easily be prevented by the proper use of dental or facial guards.

The implementation of full coverage face protectors has greatly reduced eye injury and significantly reduced risk of dental and facial injuries to those players who wear full face protection as part of their headgear (10). In 1998, researchers compared the head and neck injuries among Canadian Inter-University Athletics Union ice hockey players wearing full face shields versus half shields. This study clearly indicated that intercollegiate ice hockey players wearing half shields compared with full face shields, had the risk of sustaining a head injury (excluding concussions), facial laceration, and dental injury 2.52, 2.31, and 9.90 times greater, respectively (6). There was no evidence that full face shield use increases players’ risk of sustaining a neck injury or concussion.

As reported to the Journal of the American Medical Association, the significant results to this study revealed:

- The risk of concussion, facial laceration and dental injury was 2.52 times greater wearing a half shield (6).
- No evidence was found to substantiate that the full face shield increases a player’s risk of neck injury or concussions (6).
- Stick and skate related injuries are far higher in the group that wore the half shields. Seven out of 11 athletes wearing mouth guards and half shields sustained injuries concluding that the use of the full shield significantly reduces the risk of dental injuries (6).
- Considering concussions sustained by players wearing half shields, more game time was lost than players wearing full shields. Lose chin straps, and half shields worn incorrectly contributed to this. Studies have indicated that use of full face shield results in a significant reduction in the risk of facial and dental injuries, without increasing the risk of neck injuries, mild traumatic brain injuries, or other injury rates (overall) (6).

**Mouth guards and face masks**

Athletes who use face masks should still wear mouth guards, since the mouth guards will protect against head and neck injuries by cushioning blows that could otherwise cause concussions or jaw fractures (5). Documentation clearly demonstrates that rules mandating face masks and mouth guards are associated with a decrease in both dental and head injuries (8). Since 1973, all NCAA football athletes are required to wear both a mouth guard and face mask. Prior to then, dental injuries averaged 2.26 per 100 players. The introduction of mandatory face mask wear reduced injuries to 1.0 – 1.4 per 100 players. Oral injuries were further reduced to 0.3 – 0.6 per 100 players following the passage of rules mandating both mouth protectors and face guards (13). The proven benefits of mouth guards - protection against dental injuries, concussion, neck injuries, and some serious central nervous system injuries by decreasing the force transmitted through the temporomandibular joint to the base of the skull – in conjunction with those found through use of a face mask – reduction of head injury, facial injury and dental trauma – has decreased the incidence of oral trauma from 50% of all football injuries to about 0.4% today (13). Although no similar research was found regarding the reduction of oral injury in hockey players following the mandated use of both face masks and mouth guards, the intensely physical nature of both hockey and football strongly suggest a similar correlation would exist.

The current NHL policy states that a mouth guard is an important piece of protective equipment even in athletes already wearing a face mask/shield. In addition to preventing dental injuries, there is good evidence to suggest it may minimize the extent of a concussion caused by impact to the jaw by absorbing some of the force (Paul Kariya and Eric Lindros are 2 players from the NHL who have suffered concussions as a result of impact to their jaws) (6). More research is currently being done in this area.

**CONCLUSION**

Mouth guards and face masks are strongly recommended to minimize the number and severity of concussions and dental injuries in hockey players. Mouth guards offer protection against dental injuries, facial trauma, concussion, neck injuries, and central nervous system injuries by decreasing the force transmitted through the temporomandibular joint to the base of the skull. The use of mouth guards by orthodontic wearing athletes will help prevent serious soft tissue injury, damage to the braces, and injury to the teeth themselves upon physical contact to these athletes’ faces. There are advantages and disadvantages to all three types of mouth guards currently available to Canadian athletes. Regardless of type, routine inspection is required – especially in growing athletes – to ensure proper fit.

Like mouth guards, face masks have been proven to reduce the incidence and severity of head injury, facial injury and dental trauma among hockey athletes. Helmets must be worn correctly for maximal protection to occur. Full face shields offer greater protection than half shields.

The results of the present study emphasize the role of both mouth guards and face masks in preventing injuries. The most frequent hockey injuries are preventable through proper use of dental and facial guards. The use of a mouth guard on conjunction with a face mask provides the best protection in terms of minimizing risk, decreasing incidence, and reducing the severity of injury. Based on the findings of this study, it is strongly recommended that hockey associations make mouth guards and face masks mandatory for all players.


