

# The Effect of the Mandatory Use of Face Masks on Facial Lacerations and Head and Neck Injuries in Ice Hockey

## A Prospective Study\*

Robert F. LaPrade,†‡ MD, Quinter M. Burnett,§ MD, Robert Zarzour,|| ATC, and Robert Moss,<sup>a</sup> PhD, ATC

*From the †Department of Orthopaedic Surgery, The University of Texas Medical Branch, Galveston, Texas, §Michigan State University—Kalamazoo Center for Medical Studies, and <sup>a</sup>Department of Health, Physical Education, and Recreation, Western Michigan University, Kalamazoo, Michigan, and ||Duke University, Durham, North Carolina*

### ABSTRACT

A 4-year prospective review of lost-time injuries and facial lacerations was performed for a National Collegiate Athletic Association Division I, intercollegiate ice hockey team. The total injury exposure time consisted of 798.5 practice hours and 163 games. There were 16 facial lacerations, with an incidence of 14.9 per 1000 player-game hours and 0.1 per 1000 player-practice hours; both incidences were found to be less than in previous comparable studies where the use of face masks was not mandatory. In addition, there were eight lost-time head and neck injuries that accounted for 6.3% of all lost-time injuries. We found that the mandatory use of face masks in intercollegiate ice hockey results in a reduction in facial lacerations and no increase in overall head and neck injuries.

This prospective study reports the effects of the mandatory use of an important piece of safety equipment: face masks in ice hockey. There have been some recent discussions and anecdotal reports that face masks actually increase the likelihood of injury because the athlete feels more protected and is more likely to put himself in situations where head, face, and neck injuries can occur.<sup>11</sup>

Our goal was to assess the effects of wearing a face mask on facial lacerations and head and neck injuries in intercollegiate ice hockey by recording the number of injuries that occurred while players wore face masks and comparing the results with other ice hockey epidemiologic studies. The results of this comparison would help determine if the face masks actually facilitate or deter head, face, and neck injuries.

### MATERIALS AND METHODS

During a 4-year period, an athletic trainer daily recorded all on-ice practice or game injuries for a National Collegiate Athletic Association Division I, varsity intercollegiate ice hockey team. The trainer used structured forms; an injury was defined as an event occurring during a practice or game that caused the player to miss the next practice or game.<sup>7</sup> All injuries were evaluated by an orthopaedic surgeon (QB or RL). Facial lacerations were defined as any laceration requiring sutures and were recorded in addition to lost-time injuries.

The total practice time was 798.5 hours. The practice hours were recorded daily to the nearest 15 minutes along with the number of athletes not participating. From these data we determined there were 18,584 player-practice hours during the 4-year period. The team played 163 games during the 4-year period. We assumed that 6 players were on the ice at any one time during games, except for 5 intrasquad, full-contact exhibition games where 12 players were on the ice at all times. This resulted in a total of 1008 player-game hours.

Ninety-five percent confidence intervals were calculated for facial laceration incidence rates, which were normalized to 1000 player-game or player-practice hours. A com-

\*Presented at the First World Congress of Sports Trauma, Palma de Mallorca, Spain, May 1992.

‡Address correspondence and reprint requests to Robert F. LaPrade, MD, Assistant Professor, Department of Orthopaedic Surgery, University of Texas Medical Branch, 301 University Boulevard, Galveston, TX 77555-0792.

No author or related institution has received any financial benefit from research in this study.

parison was then made with other results in the literature to determine if other results fell within our confidence intervals.

## RESULTS

We recorded 16 facial lacerations, 15 occurring in games, with an incidence of 14.9 per 1000 player-game hours and 0.10 per 1000 player-practice hours. Eleven of the 16 facial lacerations involved the chin (Fig. 1); the remaining lacerations occurred on the forehead. One facial laceration resulted in a lost-time injury (1.0 per 1000 player-game hours). Collisions accounted for 10 (62.5%) facial lacerations, and puck contact and stick contact accounted for 3 (18.8%) each.

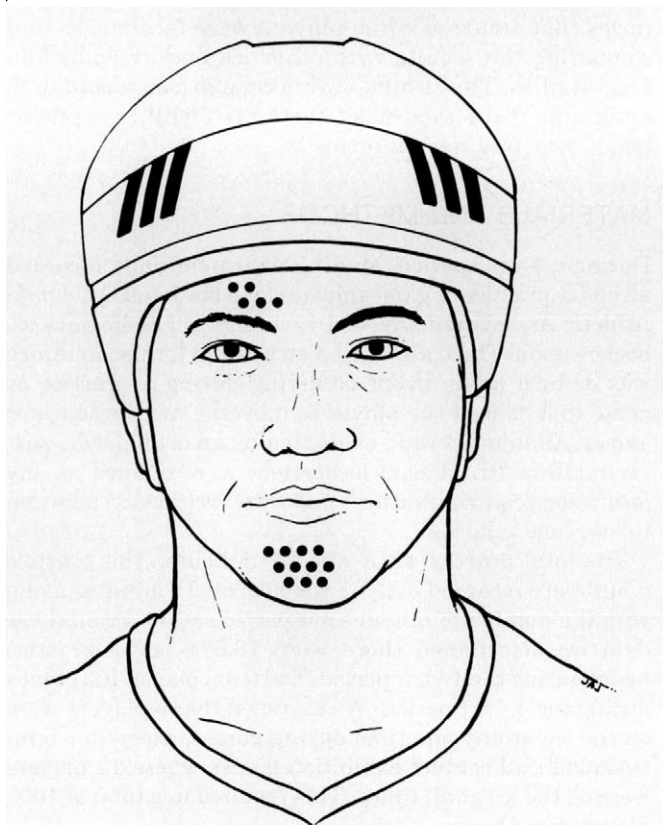
In addition, there were 8 lost-time head and neck injuries of a total of 127 lost-time injuries. These head and neck injuries consisted of four neck sprains, three mild concussions, and one mandible fracture. All eight of these injuries occurred in collisions with another player on the ice or along the boards.

A comparison of the facial laceration incidence with 95% confidence intervals was performed to compare our study with previous studies that recorded injury data in a similar manner and where face mask use was not mandatory. The facial laceration incidences with 95% confidence intervals in our study were 14.7 to 15.1 per 1000 player-game hours and 0.0 to 0.2 per 1000 player-practice hours. Lorentzon

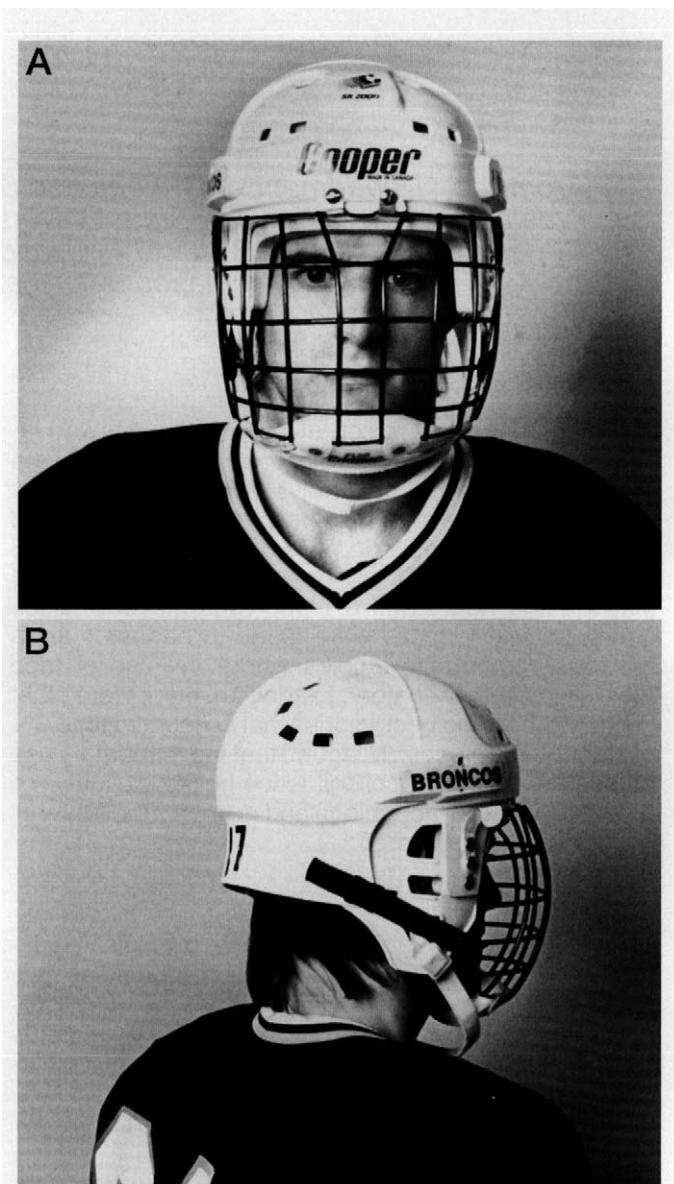
and colleagues<sup>5,6</sup> found higher incidences of facial lacerations, which were outside the upper limits of our confidence intervals, in their two studies of Swedish National semi-professional teams (70 per 1000 player-game hours and 21.8 per 1000 player-game hours, respectively). In the second study,<sup>6</sup> they reported nine facial lacerations that occurred during practices. This incidence of 0.6 per 1000 player-practice hours was also outside the upper range 95% confidence level value for our study.

## DISCUSSION

Intercollegiate ice hockey has a high injury potential because of the high speeds and intensity of the participants.



**Figure 1.** Location of facial lacerations. The majority occurred on the chin with the remainder on the forehead. Each dot symbol represents one laceration.



**Figure 2.** A, front view of full coverage ice hockey face mask. B, side view of full-coverage ice hockey face mask. The current single chin strap that is seen here does not prevent the helmet from riding back and exposing the chin during a collision. In addition, it does not protect the chin from some stick-related injuries.

We report the effects of the mandatory use of face masks in ice hockey on facial lacerations and lost-time head and neck injuries. To our knowledge, this is the first prospective study on this topic.

An analysis of the location of the facial lacerations (Fig. 1) revealed that a majority, 69%, occurred on the chin. Chin lacerations were caused by either a collision where the force of impact forced the helmet to ride up on the head and exposed the chin (eight), or by a stick coming up under the face mask (three). The single chin strap used during this study appears to allow the helmet to ride back on the head when a force is directed to the frontal region (Fig. 2). This is a typical force that occurs in collisions. In addition, this chin strap will not prevent a stick from sliding under the face mask and rising up to lacerate the chin or face. Further modification of the single chin strap to prevent the helmet from riding back or a neck guard addition to the helmet may reduce the incidence of these chin lacerations. It has been recommended that a double chin strap be used in intercollegiate ice hockey to prevent the helmet from riding back on the head during collisions (R. Broxterman, ATC, University of Minnesota, personal communication, 1994).

The remaining five facial lacerations occurred on the forehead. Three of these lacerations were caused by puck contact and one resulted in a lost-time injury. The remaining two forehead lacerations occurred during collisions. All three puck contact lacerations would have been severe injuries if the mask did not dissipate the force of the puck before it struck the forehead.

Head and neck injuries (excluding facial lacerations) accounted for 6.3% of lost-time injuries in our study. Other studies have demonstrated a range of 6.3% to 45.12% for the incidence of head and neck injuries.<sup>1-3,5,6,12</sup> A comparison of our study with previous studies was difficult because of the varying methods of data collection, differences in the definition of a reportable injury, the retrospective nature of some of the studies, and the small number of injuries recorded.<sup>1-5,12</sup> Therefore, no statistical comparison will be reported here. However, we saw no qualitative evidence to support the recent discussion and anecdotal reports that the use of face masks may increase head and neck injuries because players play more aggressively.

We found a lower incidence of facial lacerations for our study, based on 95% confidence intervals, compared with previous studies that recorded data in a similar manner and where the use of face masks was not mandatory.<sup>5,6</sup> Pashby<sup>8-10</sup> noted a similar general overall reduction in hockey-related ocular injuries once face masks began to be used in Canadian amateur hockey. Based on our findings of a lower incidence of facial lacerations with no evidence of an increase in head and neck injuries, we recommend the continued use of full-coverage face masks in amateur ice hockey to enhance on-ice safety. Mandatory implementation of the face mask in professional football 40 years ago resulted in a significant decrease in facial injuries also.<sup>14</sup> We recommend that a full coverage face shield be used rather than a half visor. Although the half visor can be helpful in preventing some upper facial lacerations<sup>6</sup> and probably most ocular injuries,<sup>13</sup> the visor will not prevent chin lacerations or other facial injuries that can be prevented with the use of the full coverage face mask.

## REFERENCES

- Downs JR: Incidence of facial trauma in intercollegiate and junior hockey. *Physician Sportsmed* 7(2): 88-92, 1979
- Hayes D: Hockey injuries: How, why, where, and when? *Physician Sportsmed* 3(1): 61-65, 1975
- Hornof Z, Nápravnik C: Analysis of various accident rate factors in ice hockey. *Med Sci Sports* 5: 283-286, 1973
- Jorgensen U, Schmidt-Olsen S: The epidemiology of ice hockey injuries. *Br J Sports Med* 20: 7-9, 1986
- Lorentzon R, Wedrén H, Pietilä T: Incidence, nature, and causes of ice hockey injuries. *Am J Sports Med* 16: 392-396, 1988
- Lorentzon R, Wedrén H, Pietilä T, et al: Injuries in international ice hockey. *Am J Sports Med* 16: 389-391, 1988
- Noyes FR, Lidenfeld TN, Marshall MT: What determines an athletic injury (definition)? Who determines an injury (occurrence)? *Am J Sports Med (Suppl)* 16: S65-S68, 1988
- Pashby TJ: Ocular injuries in hockey. *Int Ophthalmol Clin* 28: 228-231, 1988
- Pashby TJ: Eye injuries in Canadian amateur hockey still a concern. *Can J Ophthalmol* 22: 293-295, 1987
- Pashby TJ: Eye injuries in Canadian amateur hockey. *Am J Sports Med* 7: 254-257, 1979
- Reynen PD, Clancy WG Jr: Cervical spine injury, hockey helmets, and face masks. *Am J Sports Med* 22: 167-170, 1994
- Sutherland GW: Fire on ice. *Am J Sports Med* 4: 264-269, 1976
- Vinger PF: Ocular injuries in hockey. *Arch Ophthalmol* 94: 74-76, 1976
- Wilson K, Rontal E, Rontal M: Facial injuries in football. *Trans Am Acad Ophthalmol Otolaryng* 77: 434-437, 1973