Ice hockey injuries: a 4-year prospective study of a Swedish élite ice hockey team

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In this prospective study, we have investigated the incidence of injuries of different severity, types of injury, and mechanisms of injury during ice hockey practice and games. One Swedish élite hockey team was closely observed during four seasons (1986–1990). There were 376 injuries, of which 148 resulted in absence from practice or games. The incidence of injury (injuries associated with later absence) during practice was 2.6 per 1000 player–practice hours and 74.1 per 1000 player–game hours. Nuisance injuries (without any later absence) and minor injuries (absence <1 week) constituted the vast majority (95.2%) and only 4.8% (18 cases) were classified as moderate or major injuries (absence >1 week). Of the injuries 85% were caused by trauma and 15% by overuse. Injuries were most often localized to the lower limb (37.8%) and head/face (31.4%). The commonest injuries were contusions, lacerations/wounds, strains and sprains. Most injuries resulted from stick or player contact (predominantly checking). The results are in close agreement with those of a previous investigation of another Swedish élite hockey team covering the years 1982–1985. It should be possible to reduce the number of injuries by stricter enforcement of the hockey rules, especially against stick violations, and a more widespread use of visors.

Keywords: Ice hockey, injury incidence

A high incidence of injuries during hockey games has recently been demonstrated, while that during practice was low[1–3]. The inherent potential dangers of ice hockey primarily reside in contact between players or with stick, puck, skate blades, boards or goal posts[1–9]. The vast majority of hockey injuries (61–73%) are known to be minor[1–3], but extremely severe injuries, especially to the eye[10,11] and spine[3,12–14], have previously been reported in hockey.

One of us (RL) has already reported on the incidence, nature and causes of ice hockey injuries in a Swedish élite ice hockey team during three seasons from 1982 to 1985[1]. In the present study, using the same method of injury registration and daily close supervision of the players, we investigated another Swedish élite team over four seasons, 1986–1990. The purpose was to explore whether incidence, causes and nature of ice hockey injuries were similar in two different élite teams, and further, if any definite trends in injury rate or change in the nature of injuries could be discerned with time.

Subjects and methods

During the seasons 1986–1987, 1987–1988, 1988–1989 and 1989–1990, all the injuries that occurred during on-ice practice or games in one Swedish élite ice hockey team (AIK Solna, Stockholm, Sweden) were registered. Most Swedish élite players are subsidized amateurs having half-time employment in addition to ice hockey.

Injury was defined as any injury occurring during on-ice practice or games and requiring medical attention and treatment. Injuries causing the player to miss the next practice session or game have been analysed separately[1,2,15,16].

All injuries were recorded on a special card which has been described previously[1]. The final clinical diagnosis was always made by an orthopaedic surgeon (or in rare cases a physician from another speciality). Registration was performed by a napra-path (Michael Petterson) who attended all practice sessions and games. Attendance records for practice sessions and games were kept by the assistant coach. Each season 22–25 players joined the team. Their mean age was 25.0 years.

Injuries were classified into four categories of severity: nuisance (which did not result in any absence from practice or games); minor (absence <7 days); moderate (absence 8–30 days); and major (absence >30 days). Return to participation in practice after an injury was determined by the team physician.

During the four seasons, the team had 703 on-ice practice sessions (834 practice hours) and played 225 games. For the purposes of calculating the incidence of injury during games, six players were assumed to be on the ice at any one time.

Results

There was a total of 376 injuries. Of these 228 (60.6%) did not cause any absence from practice or games (nuisance injuries), while 130 (34.6%) were minor, 14

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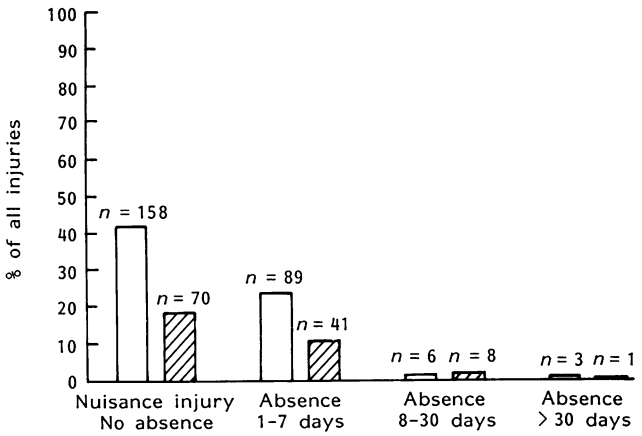

Figure 1. Distribution of 376 hockey injuries according to severity, i.e. subsequent duration of absence from practice or games. ☐ game, ▨ practice

(3.7%) were moderate, and 4 (1.1%) were major (*Figure 1*). The mean number of days of absence was 6.5.

Of the 376 injuries, 259 (68.9%) occurred during games and 117 (31.1%) during practice. The game injuries resulted in absence in 38.6% of the cases. The corresponding figure for practice injuries was 41.0%. There was an average of 1.2 injuries (all types) per game and 0.14 injury per practice hour. The total incidence of all injuries was 202.2 per 1000 player–game hours, and 74.1 per 1000 player–game hours concerning injuries resulting in absence (*Figure 2*). The corresponding practice injury rate was 5.4 and 2.6 per 1000 player–practice hours, respectively. Of injuries during games 20% occurred in the first game period, 31.5% in the second period and 21.5% in the third period.

Twenty-six injuries (7%) affected goalkeepers, 213 (57%) defencemen, and 137 (36%) forwards. There was no specific anatomical distribution of injuries by playing position, nor did the injury type vary by playing position.

Injuries were caused by trauma in 318 cases (84.6%) and by overuse in 58 (15.4%). The types of traumatic injuries are shown in *Table 1* and the localization of all injuries is shown in *Figure 3*. The injuries were localized to the upper limb in 22.1% of the cases, and to the lower limb in 37.8%. The corresponding figures for head–face and back–trunk were 31.4% and 8.0%, respectively.

Contusions most often affected the thigh, knee, ankle, foot and hand. Lacerations were almost exclusively localized to the face region. The majority of sprains affected the knee (n = 13). There was no total rupture of the collateral or the cruciate ligaments. The acromioclavicular joint was affected in 11 cases, 10 of which were grade I–II sprains and one a grade III sprain. All acromioclavicular sprains were treated conservatively. Strains (injuries to the muscle

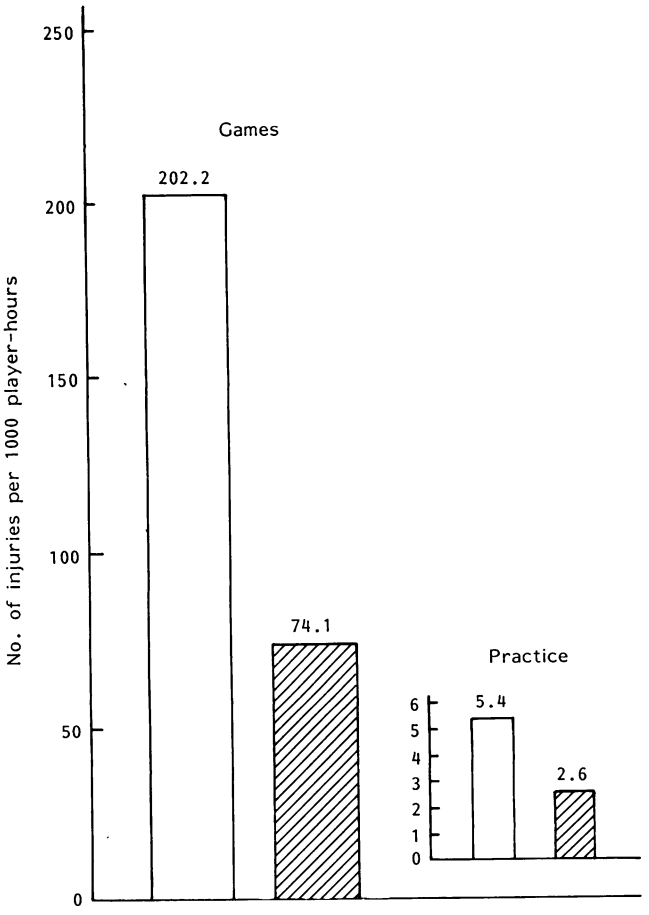

Figure 2. The incidence of injury (number of injuries per 1000 h) for the individual player during games and practices. ☐ all injuries, ▨ injuries associated with absence

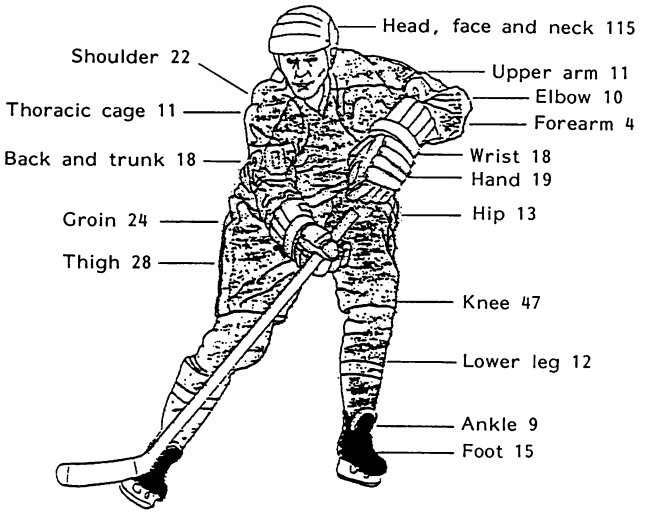

Figure 3. Localization of 376 hockey injuries

Table 1. Types of traumatic injuries (n = 316)

Type of injury	*No. (%)*
Contusions	139 (43.4)
Laceration	82 (26.0)
Sprain	38 (12.0)
Strain	30 (9.5)
Head concussion	12 (3.8)
Fracture	8 (2.5)
Tooth lesion	7 (2.2)

tendon unit) were most frequently localized to the groin and shoulder regions. Fractures were localized to the metacarpals (n = 3), metatarsal bone (n = 1), the scaphoid (n = 1), rib (n = 1), sternum (n = 1) and femoral condyle (n = 1). The most common types of overuse injuries (n = 58) affected the groin (n = 20), shoulder–elbow–wrist (n = 12) and knee (n = 7).

The mechanisms of injury are shown in *Table 2*. Injuries were most often caused by player contact, including checking, and by stick or puck contact. When mechanisms of injury for head and face lesions were analysed separately (*Table 3*), the great majority of injuries were found to be caused by stick or player contact. Forty-one face injuries were localized within the area that theoretically would have been protected by a visor. Nevertheless, 16 of these 41 injuries occurred in players who did wear a visor, and nine of the injuries were localized around the eyes (one injury was associated with an intraocular haemorrhage).

Discussion

In this investigation, the majority of injuries (69%) occurred during games. The risk for the individual player to sustain any injury was 29 times higher during games. This reflects a higher intensity during games, with more frequent and forceful body contact and more stick violations. We have previously reported a high game incidence of injury in another Swedish élite hockey team that was closely observed during three seasons[1]. The total incidence of injury during games in the previous study was 78.4 per 1000 player–game hours for injuries resulting in later absence from practice and games. The corresponding figure in the present study was 74.1 per 1000 player–game hours. These almost identical figures indicate that the reported injury incidence during games is probably valid for most Swedish élite teams, and that the incidence has not changed markedly during the 1980s. In the previous study[1], as well as in this one, we have observed a stable injury rate from season to season. The lower incidence of 53.0 per 1000 player–game hours reported for all 12 Swedish élite teams for the 1988–1989 seasons[3] was, as we have previously pointed out, most probably due to incomplete registration of injuries, especially minor ones. In this study, the incidence of injury during practice is low (2.6 per 1000 player–practice hours for injuries resulting in later absence from practice and games). Nevertheless, this figure is 1.9 times higher than the corresponding figure (1.4) in our previous investigation[1]. There is no obvious explanation for this discrepancy, although training design (e.g. time of playing during practices and training intensity) may certainly influence injury rate.

When comparing the absolute number of injuries of different severity per team and season in various Swedish investigations (*Table 4*) it is obvious that minor injuries have increased and moderate–major injuries have decreased in the late 1980s. The decrease might be explained, at least in part, by change in therapy for certain lesions, e.g. aggressive conservative treatment instead of surgery and prolonged rehabilitation for ruptures of the medial collateral ligament of the knee.

In the present study, as well as in the previous one[1], there is a higher incidence of injury in defencemen compared with forwards. The reason for this finding is not obvious, although the individual defenceman more often has body contact (e.g. checking) compared with the individual forward.

Contusions were the predominant type of injury and most often resulted from body or puck or stick contact. Some of these injuries should be possible to prevent by better protective devices and stricter enforcement of rules prohibiting stick violations. The types of injuries and the mechanisms of injuries in the present study are in agreement with the findings in our previous studies[1,3]. Still, 57% of the facial lacerations were caused by the opponent's stick (high sticking), and this figure is unfortunately not much improved compared with the first half of the 1980s (62%)[1]. Besides stricter enforcement of rules, attitudinal changes on the parts of hockey officials and coaches are required.

Visors are known to protect from facial wounds[1]. It is, therefore, alarming that in the present study we found that 16 injuries occurred in players wearing a visor and were localized within the face area that

Table 2. Mechanism of injury for all injuries (n = 376)

Mechanism	*No. (%)*
Stick contact	98 (26.1)
Player contact (including checking)	90 (23.9)
Puck contact	60 (16.0)
Collision with boards	27 (7.2)
Fall – no contact	15 (4.0)
Skate contact	8 (2.1)
Miscellaneous	78 (20.7)

Table 3. Mechanism of injury for head and face injuries (n = 109)

Mechanism	*No. (%)*
Stick contact	62 (56.9)
Player contact (including checking)	25 (22.9)
Puck contact	16 (14.7)
Skate contact	3 (2.8)
Collision with boards	2 (1.8)
Unspecified	1 (0.9)

Table 4. Number of ice hockey injuries per season and team in different reports

Report	*Minor*	*Moderate*	*Major*
Lorentzon, Wedrén and Pietilä (1988)[1]	23.0	6.0	2.7
Tegner and Lorentzon (1991)[3]	14.5	5.5	2.1
Present study	32.5	3.5	1.0

Only injuries resulting in absence from practice or games are considered

theoretically would have been protected by the visor. Of course, the stick blade might slip in beneath the visor in rare cases, but our high incidence of such cases indicates inappropriate handling of the visors and helmets. The same mechanisms of injury that cause harmless facial wounds can also cause much more severe eye injuries resulting in blindness[10,11]. This further underlines the need for more widespread use of correctly applied visors. In Sweden, visors are now mandatory for all players born in 1966 and later.

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