Evaluation of knee braces in Swedish ice hockey players

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In this retrospective investigation we have determined the rate and types of knee injuries among Swedish ice hockey players, and related these data to the use of knee braces. Thirty-seven of the originally selected 50 hockey teams (74%) of elite or first division calibre took part in the study, and 600 players answered a questionnaire. A total of 254 previous knee injuries sustained while playing hockey were reported by 243 players; tears of the medial collateral ligament (60%), meniscus (15%) or anterior cruciate ligament (12%) were the most commonly reported injuries. Prophylactic knee braces were worn by 138 (23%) of the players. Of these, 122 (88%) had earlier sustained a knee injury, and 16 had not. A total of 17 knee injuries had occurred while the players were wearing a brace. Six of these players had previously uninjured knees while 11 had repeat injury in a brace despite earlier successful rehabilitation or operation. The most common injury in braced knees was a tear of the medial collateral ligament.

We conclude that the number of knee injuries is high among Swedish ice hockey players, and that the efficacy of functional knee braces to reduce knee injuries is questionable.

Keywords: Functional knee brace

Ice hockey is inherently associated with many potential dangers, because of the fast and random nature of the game with frequent and often forceful contact between players. A high incidence of injury during hockey games has recently been demonstrated, but major injuries were rare (8%), complete tear of knee ligaments being the most common severe injury. According to insurance statistics, knee injuries account for approximately 30% of all injuries that result in significant disability and handicap. In an effort to prevent or to minimize these serious injuries, or to prevent repeated injury, orthotic braces for the knee have been developed and marketed. These braces have gained widespread use in hockey players despite the paucity of scientific documentation on their efficacy.

The purpose of this investigation was to determine the number of hockey players of elite and first division calibre who had knee injuries. We also wanted to relate these injuries to the use of functional knee braces and to find out whether knee injuries occurred while wearing a brace.

Material and methods

All teams playing in the two highest divisions of the Swedish ice hockey league were selected for this study. A total of 50 teams was included. The players in 12 of these teams (the elite teams) are semi-professional hockey players, while those of the first division teams, in most cases, are pure amateurs. We prepared a comprehensive questionnaire which was distributed by the team physicians to all players. It contained questions about previous knee injury, type of injury, treatment, the use of a knee brace, and type of brace. After a group briefing, the players, one by one in cooperation with the physician, completed the questionnaire. All knee injuries that had occurred during the players’ hockey career were to be reported but only those that had been diagnosed by a physician were registered. The players were especially asked if knee injuries had occurred when wearing a knee brace.

Results

A total of 600 players answered the questionnaire. These players belonged to 37 of the originally selected 50 teams (74%). The players in nine out of 12 elite teams answered.

A total of 254 previous knee injuries sustained during hockey play were reported (42% of the players). The most common injuries were a tear of the medial collateral ligament (60% of all injuries), a meniscal lesion (15%) or a tear of the anterior cruciate ligament (12%) (Table 1).

The treatment of players wearing braces was as follows: players with medial collateral ligament injuries were all treated without surgery and had thus an instability in their knees. All meniscus lesions were treated with arthroscopic meniscectomy. Players with posterior cruciate injury were also treated without surgery. Of the 27 patients, 18 with anterior
cruciate ligament injury had had surgery. Some of them still had a demonstrable instability after the operation.

The indication for bracing the players was thus in some instances purely prophylactic and in some instances in the light of a demonstrable rotatory instability. In most of the cases the brace was used to protect a previously injured knee.

Among the 600 hockey players, 138 (23%) currently used a derotation brace to protect one or both knees. The brace most frequently used was the Swedish Knee Brace (LIC, Solna, Sweden) (Figure 1), which is a modification of the Lennox Hill derotation brace. Of the 138 players using the brace, 122 (88%) had earlier sustained a knee injury, and 16 had not. A total of 462 players were not using a brace, and 130 (28%) of them had had a previous knee injury. The present use of knee brace in relation to previous knee injury diagnoses is shown in Table 2.

Seventeen new knee injuries had occurred while the players were using a brace (Table 3). Six players wearing a functional brace as pure prophylaxis had a knee injury in previously uninjured knees. Five of these players sustained medial collateral ligament injuries, and one a tear of the anterior cruciate ligament. Eleven players had repeat injury despite wearing a knee brace. Four of these 11 injuries occurred in anterior cruciate-deficient knees. Two cases had a subluxation resulting in Grade I–II medial collateral ligament injuries, one case had a tear of the medial meniscus, and another case had a successful anterior cruciate ligament reconstruction ruined. The remaining seven players who had repeat injuries had earlier had a tear of the medial collateral ligament. Five of these had a new tear of the medial collateral ligament, one a tear of the medial meniscus, and one an unspecified major knee injury.

### Discussion

This investigation reveals a high number of significant knee injuries among Swedish ice hockey players of elite or first division calibre. Thus, in a population of 600 players, 243 (40.5%) had sustained a knee injury during hockey play. Although most injuries are Grade II–III medial collateral ligament tears, even more serious knee injuries might occur by the same type of trauma. Therefore, there is definitely a need for an effective prophylactic knee brace in ice hockey players.

#### Table 2. Number of players using a knee brace, in relation to previous knee injury diagnoses

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>No. using brace</th>
<th>No. not using brace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tear of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medial collateral ligament</td>
<td>69</td>
<td>83</td>
</tr>
<tr>
<td>Meniscus</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>Anterior cruciate ligament</td>
<td>27</td>
<td>4</td>
</tr>
<tr>
<td>Meniscus and medial collateral ligament</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Posterior cruciate ligament</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>130</td>
</tr>
</tbody>
</table>

#### Table 3. Knee injuries in players wearing a brace

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>No. of players</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tear of</td>
<td></td>
</tr>
<tr>
<td>Medial collateral ligament</td>
<td>12</td>
</tr>
<tr>
<td>Medial meniscus</td>
<td>2</td>
</tr>
<tr>
<td>Anterior cruciate ligament</td>
<td>2</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
</tr>
</tbody>
</table>
The efficacy of functional knee braces to protect the knee in hockey players has hitherto not been reported. On the other hand, there are several studies evaluating the effectiveness of prophylactic knee braces in American football players. Four of these studies found a reduction of medial collateral ligament injuries associated with using a brace, while two of them reported increased knee injury incidence. No consensus arises from these studies because of conflicting results as well as methodological problems. The number of knee injuries among hockey players wearing a knee brace seems to be unacceptably high. Despite bracing, serious knee injuries do still occur in previously uninjured knees as well as in earlier injured, but fully rehabilitated, knees.

The efficacy of a knee brace is certainly dependent upon its design and stability. The brace most commonly used by Swedish hockey players has been investigated earlier in goniometric and biomechanical studies. It has been clearly shown that this brace will reduce rotation and abduction/adduction of the knee. The ability of this brace to resist externally applied forces is low. This might explain a bad prophylactic effect of this brace.

In a study of this nature there are several methodological problems. The study is retrospective, where the ice hockey players answered a questionnaire. There is a risk that the individuals may forget a significant knee injury and to overestimate another one. In order to reduce this error the questionnaires were answered by the players in cooperation with their team physician, and only injuries diagnosed by a physician were registered.

Another problem is non-response of a number of the teams to the questionnaire: their injury rate could have differed from that of the teams answering the questionnaire. In an ongoing prospective study, where we register all injuries in Swedish elite ice hockey, we have, after 2 years of registration, found no major difference in knee injury rate between different teams (Tegner and Lorentzon, to be published). One might thus assume that there does not exist any major differences in injury rate between different teams.

Correlation between injury rate and exposure time is also of interest, but, because of the design of this study, we could not perform such a correlation study.

The absolute efficacy of the braces in preventing knee injuries in hockey players cannot be determined in this study. Nor is it possible to determine any change in severity of knee injuries introduced by the braces. To be able to make accurate comparisons between players wearing, or not wearing, knee braces, a large study population must be prospectively followed.

We can conclude, however, that the number of knee injuries among Swedish elite hockey players is high and that most of the knee-injured players do wear a brace and, at the present time, the injury-preventive effect of the knee braces is questionable. Today there is no persuasive evidence to recommend the use or to advise against functional braces as prophylactics to reduce knee injuries in ice hockey players.

References