

## Sports-related eye injuries: floorball endangers the eyes of young players

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The objectives of this study were to determine the distribution of different sports-related eye injuries and to identify injury types to enable recommendations to be made about the use of protective eyewear. The study population comprises all 565 eye trauma patients examined at the Ophthalmology Emergency Clinic of the Helsinki University Central Hospital over a 6-month period. Data were collected from patient histories and questionnaires. In addition, three severe floorball eye injury cases are presented. Of the 565 eye traumas, 94 (17%) were sports related. Of these, 42 (45%) were associated with floorball. Countrywide, in Finland, estimated over 300 (+95%

CI 228–415) floorball eye injuries occur annually. The mean age of floorball patients was 22 years. The most common finding (55%) in sports injury patients was hyphema. Clinically severe eye injuries during this period accounted for one-fourth of all cases. During the study period, no eye injury was found in an organized junior ice hockey, where facial protection is mandatory. Floorball is estimated to belong to the highest risk group in sports, and thus, the use of protective eyewear is strongly recommended. We conclude that national floorball federations should make protective eyewear mandatory.

Floorball and its amateur version floor hockey have increased rapidly in popularity in recent years both as competitive disciplines and as fitness, school and workplace activities. In Finland, the estimated number of floorball and floor hockey players is approximately 335 000, and these sports are also on the rise in other countries (Suomen salibandyliitto, Finnish Floorball Federation, www.salibandy.net). Of those who play floorball and floor hockey, about half are aged under 18 years; their eye injuries can thus have a lifetime negative impact and may affect career choices. Precise information on the quantity and quality of floorball- and floor hockey-inflicted eye injuries has not been available in Finland to date, and no official recommendations or mandates regarding eye protection exist. However, eye protection in association with sports is increasingly advised as a considerable proportion of these eye injuries could be prevented with protective eyewear or other appropriate equipment (Vinger, 2000; Parkkari et al., 2001; American Academy of Pediatrics Committee, 2004). Knowledge of the quantity and quality of eye injuries incurred in different sports will provide players, coaches, parents and sports federations with the necessary information to make decisions regarding the use of protective eyewear. The objective of this study was to determine the quantity, quality

and distribution of different types of sports-related eye injuries.

### Materials and methods

The study population comprised all new eye injury patients of the Ophthalmology Emergency Clinic of the Helsinki University Central Hospital (HUCH) examined between 3.12.2002 and 3.6.2003. The hospital register was accessed to gather data on all emergency patients during this period who were assigned an ICD-10 diagnosis indicating eye injury. In addition, during their first visit all eye injury patients were given a questionnaire to fill out. The coverage of the data is estimated to be complete, as, firstly, the eye injury patients were picked up prospectively in the emergency clinic by filling out the questionnaire, and, secondly, the hospital register data were accessed to find out all missed-out patients using ICD-10 diagnosis indicating eye injury directly or indirectly, i.e. also in clinical practice occasionally incorrectly used non-trauma diagnoses were searched to find out possible missed-out cases. Thirdly, the researchers examined all case histories and confirmed the accuracy of the injury details.

The questionnaire mainly dealt with background information on the injury and the role played by the sport in causing the accident. The main section of the form requested information on the affected eye, the date of the injury, details on the environment, background information, use of drugs or alcohol, the item causing the injury (i.e. the object or person striking the eye) and use of protective eyewear. The sports injury section enquired about the sports discipline, a description of the event, competitive circumstances, cause of the

accident, sports violations, insurance, earlier eye injuries sustained by sports-mates in the same discipline, willingness to use protective goggles, self-assessment of the dangerousness of the sport to the eyes and any previous eye injuries incurred.

Personal and examination details for all eye injury patients were recorded. Information on sports injury patients' status, diagnoses, treatment, sick leave and sports restrictions was collected from case histories. If the case history did not include a physician-issued activity restriction, the researchers evaluated the need for such a restriction based on international health care recommendations (Rhee & Pyfer, 1999). This need was assessed for each patient according to their case history. For example, health care recommendations stipulate a minimum of 2 weeks' restriction for microscopic or macroscopic hemorrhage of the anterior ocular chamber in the absence of other status findings. Similarly, the number of outpatient visits required to treat the injury within a three-month period was assessed based on international recommendations (Rhee & Pyfer, 1999). If several injuries were present in the eye or its vicinity, the most clinically significant diagnosis was recorded as the main diagnosis. The prevalence of sports injuries was analyzed according to sports discipline. In the evaluation, floorball and floor hockey were combined into one discipline, as were the different forms of combat sports. Eye injuries other than sports-related ones were classified according to the causal agent.

The prevalence of eye injuries in different sports was compared by determining the proportion of injuries relative to the estimated number of participants in the sport in the Hospital Districts of Helsinki and Uusimaa (HUS). The estimated number of participants was calculated by dividing the participant population in the national fitness study in 2001–2002 with the population proportion in the HUS district (27.3% of the Finnish population lived in the HUS district in 2003) (Suomen Liikunta ja Urheilu, 2002). In addition, the annual number of injuries in the different sports disciplines in Finland was calculated.

At the end of 'Results' three severe sports eye injury cases caused by floorball or floor hockey are presented. One of these cases is from the study population, and the two others occurred outside the study period, in 2003.

Informed consent and local ethics committee approval were provided for the study.

## Results

### Mechanisms of injury and background information

In a 6-month period, the HUCH Ophthalmology Emergency Clinic treated 565 new eye injury patients, 94 of whom were sports injury patients (17%; 95% CI 14–20; Table 1). The remaining 471 injuries comprised 63 assault cases and 324 accidents (data concerning deliberateness were missing for 84 patients). The questionnaire was filled out by 66 sports eye injury patients (70%) and 162 other eye trauma patients (34%). The distribution of diagnoses of sports eye injuries and other eye injuries is presented in Fig. 1. The most common main diagnosis for sports-related eye injuries was ocular hyphema.

Within the 6-month period, floorball and floor hockey caused 42 (floorball 16, floor hockey 26) new eye injuries, accounting for 45% (95% CI 35–55) of all sports eye injuries (Table 2). The mean age of floorball-related eye injury patients was 22 years,

Table 1. Sports-related eye injuries and other eye injuries between 3.12.2002 and 3.6.2003 at the Ophthalmology Clinic of the Helsinki University Central Hospital

	N	%
Sports eye injuries	94	17
Other eye injuries	471	83
Large foreign body and/or bumping	209	37
Contact with a human body (e.g. fist, finger, limb)	81	14
Metal small foreign body	50	9
Other small foreign body	42	7
Organic small foreign body	7	1
Chemicals	25	4
Gun, slingshot and combat games	18	3
Fireworks	6	1
Animal-related injury	2	0
Burn injury	2	0
Light or radiation injury	1	0
Other	7	1
Missing data	21	4
All eye injuries	565	100

and they were on average younger than the other sports eye injury patients (Fig. 2). Of floorball patients, 93% were men or boys. Of all floorball and floor hockey injuries, over half occurred at the sports site, about 20% at school or in day care and the rest at home in the yard or at the workplace; information was missing for approximately 10%. A floorball stick caused about one-third and a ball nearly two-thirds of the injuries. Over half of the injuries occurred during practices and one-fourth during competition. Data were missing for approximately 20% of cases. A sports violation contributed to 10% of cases.

### Examination findings

The status findings of sports eye injury patients' initial examinations are provided in Table 3. No statistically significant differences were present between the findings of floorball patients and those of other sports patients. At the first visit, the visual acuity of the injured eye for about half of both floorball and floor hockey patients was subnormal (<1.0). The most common deviant finding was hemorrhage of the anterior ocular chamber. Other findings were elevated intraocular pressure, a dilated and poorly reactive pupil and retinal abnormalities (Table 3).

Among floorball patients, the clinically most severe wounds were a penetrating corneal injury (Case 2) and a high-grade hyphema associated with extensive anterior chamber hemorrhage and elevated intraocular pressure (55 mmHg). Treatment of the hyphema required a total of three surgical procedures and 24 patient visits. The visual acuity of the patient's injured eye remained permanently impaired and the pupil dilated. Other serious eye injuries that

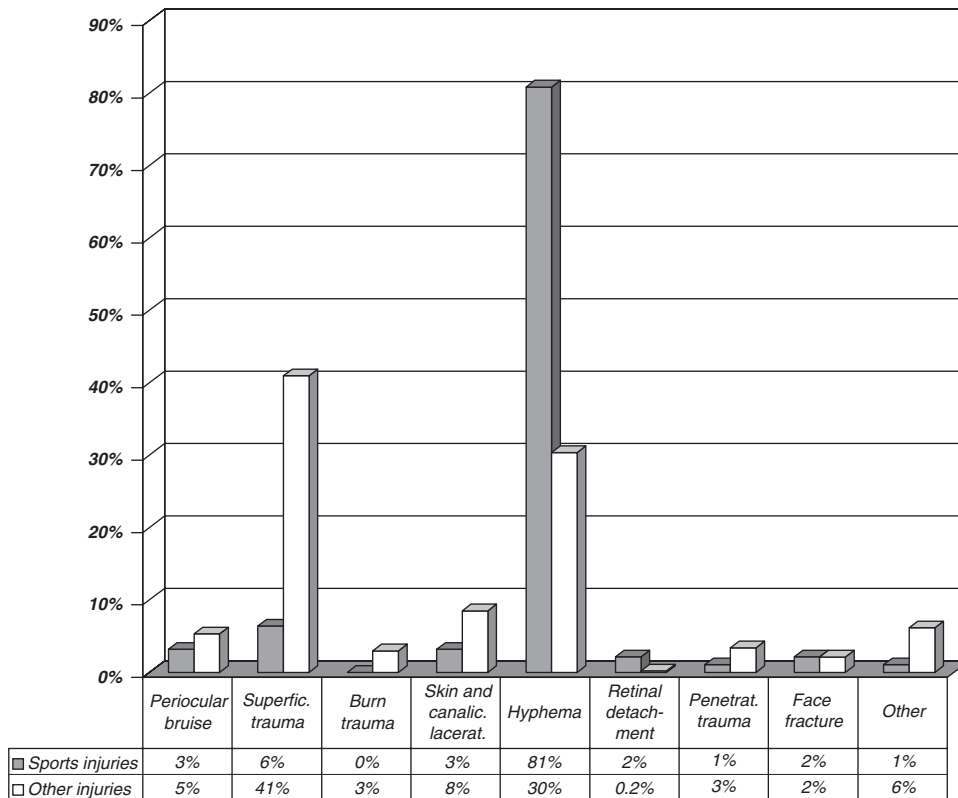


Fig. 1. Diagnoses of sports-related eye injuries and other eye injuries.

Table 2. Estimated incidence of sports eye injuries relative to the number of people participating in different sports in the Hospital Districts of Helsinki and Uusimaa (HUS) and in Finland overall

Sport (including sports here > 2 injuries in 6 months)	No. of injuries/6 months (n = 94), n (%)	No. of participants in HUS district, n	No. of injuries/1000 participants/6 months, n (95% CI)	No. of participants in Finland, n	No. of injuries in Finland in 12 months, n (95% CI)
Floorball	42 (45)	91 000	0.46 (0.34–0.62)	335 000	308 (228–415)
Badminton	8 (9)	43 000	0.19 (0.10–0.37)	157 000	60 (31–116)
Football	8 (9)	103 000	0.08 (0.04–0.15)	378 000	60 (30–113)
Rink bandy	7 (7)	18 000	0.39 (0.19–0.80)	65 000	51 (25–104)
Tennis	6 (6)	28 000	0.21 (0.10–0.47)	102 000	43 (20–96)
Squash	5 (5)	8 000	0.63 (0.28–1.46)	30 500	38 (17–89)
Ice hockey	5 (5)	52 000	0.10 (0.04–0.22)	193 000	39 (15–85)
Combat sports	4 (4)	15 000	0.27 (0.11–0.68)	53 500	29 (12–73)

In the following sports, a maximum of two eye injuries: motocross, handball, downhill skiing, cross-country skiing, Finnish baseball, orienteering, diving, gymnastics.

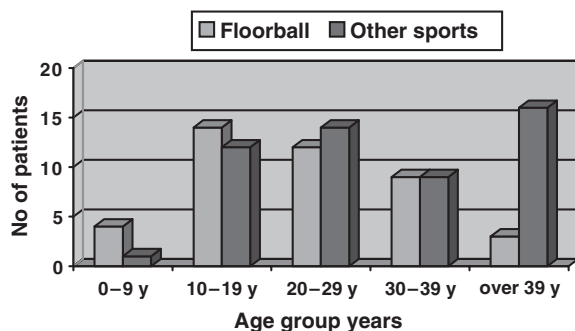


Fig. 2. Age distribution of sports-related eye injury patients.

occurred in conjunction with floorball included a rupture of the iris, three lens opacities, three central retinal edemas and a retinal hemorrhage.

Of the other sports injuries, the clinically most severe were retinal breaks sustained by two patients while playing tennis. One of these was treated with a laser and the other surgically. Injuries also included two orbital blow-outs that occurred in combat sports. Other serious injuries were rupture of the iris in football, vitreous hemorrhage in rink bandy and badminton, with the latter individual also sustaining an extensive laceration of the anterior cham-

Table 3. Clinical findings of sports-related eye injuries in the first hospital visit

Clinical finding	Floorball injury patients ( <i>n</i> = 42), <i>n</i> %	Other sports injury patients ( <i>n</i> = 52), <i>n</i> %
Visual acuity		
≥ 1.0	21 50	27 52
0.5–0.9	13 31	14 27
< 0.5	8 19	11 21
Intraocular pressure >21	5 12	9 17
Lids		
Normal	23 55	32 62
Hematoma	12 29	12 25
Superficial laceration	7 17	5 10
Penetrating laceration	0 0	2 4
Conjunctiva		
Normal	14 33	21 40
Sugillation	28 67	29 56
Small laceration	0 0	2 4
Cornea		
Normal	26 62	36 69
Abrasion	9 21	15 29
Swelling	2 5	1 2
Penetrating trauma	1 2	0 0
Other	4 10	0 0
Anterior chamber		
Normal	11 26	19 37
Microhyphema	17 40	17 33
Macrohyphema	8 19	9 17
Cell reaction	5 12	7 13
Other	1 2	0 0
Iris		
Normal	32 76	44 85
Large pupil	9 21	5 9
Rupture	0 0	2 4
Other	1 2	1 2
Lens		
Normal	41 98	52 100
Other	1 2	0 0
Vitreous		
Normal	40 95	49 94
Blood cells	0 0	2 4
Other	2 5	1 2
Retina		
Normal	24 58	34 65
Tear	0 0	2 4
Macular edema	3 7	4 8
Peripheral edema	13 31	9 17
Hemorrhage	1 2	2 4
Other	1 2	1 2
Orbita		
Normal	42 100	50 96
Blow-out fracture	0 0	2 4

The clinically most significant finding for each anatomical site is reported for each patient.

ber angle without elevated intraocular pressure. In addition, four macular edemas (rink bandy, kickboxing, ice hockey and squash), choroidal tear (football) and three peripheral retinal hemorrhages (football, ice hockey and badminton) were incurred.

#### Treatment of sports eye injuries

The main treatment provided for sports eye injuries was medication, prescribed to 39 floorball patients

(93%) and 38 other sports injury patients (73%). Of floorball patients, three (7%) also required surgical intervention. The procedures included treatment for a penetrating corneal laceration, an injection into the anterior chamber and two surgical evacuations of hyphema as well as suture of the eyelid. In addition, one eyelid was sutured at the referring health care center. Of the other sports injury patients, seven (13%) needed surgical care, which consisted of an operation to repair a retinal tear, a laser procedure to correct another retinal tear, three eyelid sutures and two conjunctival sutures. Two floorball and one other sports patient required inpatient care at the University Hospital.

The average number of visits at the Emergency Clinic for floorball patients was 2.2 and 2.0 for other sports patients. Treatment continued in the outpatient sector at the ophthalmologist's office or at another hospital for 34 floorball patients (81%) and 37 other sports patients (71%). An estimated 1.3 outpatient visits for floorball patients and 1.2 visits for other patients were required during a 3-month period from the time of injury. The corresponding figures for all visits were 4.5 and 4.2. This includes the visit to the general practitioner, visits to the University Hospital Emergency Clinic and the estimated number of follow-up outpatient visits.

Nine of the floorball patients (21%) and 18 of the other sports patients (35%) were given sick leave as a result of their injuries. The average length of sick leave from floorball-inflicted injuries was 13 days and 10 days from other sports injuries. Based on international recommendations, an activity restriction was deemed necessary for 40 floorball patients (95%) and 43 other sports patients (81%; Table 4).

#### Insurance and use of protective eyewear

Thirty floorball players (71%) and 18 other sports players (35%) had accident insurance or a player's licence. At the time of injury, none of the floorball patients was wearing protective goggles, but one rink bandy player had protective eyewear. The rinkball patient was hit by the ball. The main findings were hyphema and elevated intraocular pressure. The patient recovered well, and the injury was clinically graded as non-severe. Of floorball players who responded to the questionnaire, 32 (76%) assessed the sport as being dangerous or somewhat dangerous to the eyes. Sixteen floorball players (44%) were willing to use protective goggles in the future. Of the players of other sports, 21 (70%) considered their sport to be dangerous or somewhat dangerous to the eyes, and 14 (47%) were willing to use protective eyewear.

Table 4. Sick leave and activity restriction of patients with sports-related eye injuries

	Floorball patients ( <i>n</i> = 42), <i>n</i>	Days	Other sports patients ( <i>n</i> = 52), <i>n</i>	Days
Sick leave, actual	9	13	18	10
Activity restriction, actual	7	13	6	11
Activity restriction (actual+estimated)	40	15	43	16

Actual activity restriction is indicated in patients' records. Estimated activity restriction is the researchers' estimate of activity restriction required based on international recommendations.

### Examples of cases

#### Case 1

The blade of the opponent's floor hockey stick forcefully struck the left eye of a 23-year-old male in September 2003. After the impact, the patient experienced a loss of sight in the injured eye for about 10 min, after which dark blurry spots hovered in his field of vision. On the day following the injury, examination at the HUCH Ophthalmology Clinic revealed left eye visual acuity to be 0.3, upper eyelid edema, conjunctival bleeding, a moderate amount of blood cells in the anterior chamber, a clear lens, blood in the lower part of the vitreous, a few small optic nerve hemorrhages, clockwise around the optic nerve at 10-4 a large choroidal tear, swelling at the peripheral retina at 11-6 and a tear at 1-4. To limit the retinal tear and prevent retinal detachment, laser surgery was performed. The detached margin of the retina was frozen 2 weeks later, and a scleral buckle was applied. At the follow-up 10 months after the injury, the best-corrected visual acuity of the left eye was 0.7. The choroidal tear had scarred, and a small connective tissue tract was present in the fovea. The choroidal tear will cause permanent deficiencies in the central field of vision.

#### Case 2

The opponent's floor hockey stick or elbow struck a 29-year-old man in the face in April 2003. The patient's eye glasses shattered on impact. Examination at the HUCH Ophthalmology Clinic revealed a penetrating corneal laceration, which was sutured in an emergency procedure the same evening (Fig. 3a). Following the surgery, intraocular pressure increased transiently; the patient was discharged 4 days post-operatively. A permanent corneal scar resulted, and functional vision was poor due to a pronounced astigmatism ( $-6.75$  cyl,  $-6.0$  ax,  $140^\circ$ ). A corneal transplant was performed in October 2004.

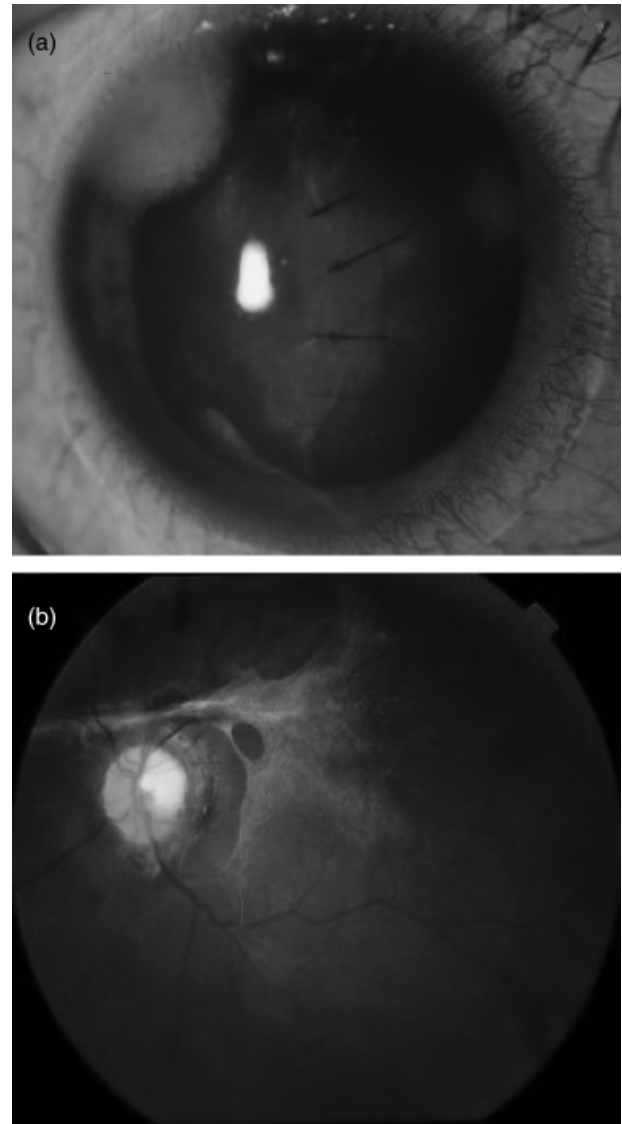


Fig. 3. (a) Penetrating corneal laceration sewn using 10-0 nylon sutures, and a contact lens placed on the surface of the cornea. (b) Macula covered with scar tissue that extends to the vicinity of the optic nerve.

#### Case 3

The opponent's floor hockey stick struck a 23-year-old male in the left eye in October 2003. A scar was present in the fovea 3 months later (Fig. 3b), and visual acuity had weakened to 0.2. The patient was a student in a field requiring normal visual acuity in both eyes. To improve vision, surgical extraction of vitreous chamber contents and scar tissue (vitrectomy) was performed in April 2004. During the surgery, it was noted that the central region (fovea) of the fine vision area was displaced, and attempts were made to move it closer to its correct location. After the operation, the patient continues to have difficulties in focusing, with the best visual acuity attained being 0.4. Further surgery will not improve the situation.

## Discussion

This study represents a detailed survey of sports-related eye injuries in HUCH during a 6-month study period. Of the 565 eye trauma patients, 94 (17%) had sustained their injury while engaged in sports. Of these, 42 (45%) were associated with floorball. The average patient was a young male, and the most common finding was hyphema. Clinically severe eye injuries accounted for one-fourth of all cases.

The objective of this study was to determine the distribution of sports-related eye injuries and the types of acute injuries according to sports disciplines. The strength of the study is excellent coverage of all the new eye-injury cases in a major referral center during the 6-month study period. However, no long-term follow-up was conducted; only the treatment provided for the injury at the University Hospital was evaluated. The majority of treatment measures for acute eye injuries and the long-term follow-up occur through outpatient care.

Data were collected prospectively over a 6-month period at the HUCH Ophthalmology Emergency Clinic. Owing to graded allocation of care, some of the sports-inflicted eye trauma were treated at the local hospitals or in outpatient units, which is a clear limitation of the study material. The study population likely represents well severe sports-related eye injuries in the Hospital Districts of Helsinki and Uusimaa during the study period, although the actual total number of eye injuries is larger than the number here.

The response rate of non-sports injury patients was relatively low (34%), probably because personnel during the execution of their regular duties had no time or forgot to distribute the questionnaire to all patients. Very rarely did a patient refuse to fill out the form. Owing to the low number of responses, the details of other eye injury patients are not reported in this study. The response rate of sports-related eye injury patients was higher: 71%. This has a minor impact on the study, as the questionnaire data were used only when reporting the details of the sports-injury mechanism and environment, insurance, willingness to use protective goggles and self-assessment of the dangerousness of the sport to the eyes. All other data were obtained from the patient records for the whole study population.

Based on University Hospital treatment records, we estimated that the injuries of two floorball patients were sufficiently serious that the visual acuity of the injured eye would remain significantly impaired. In addition, eight other floorball patients and 15 participants of other sports had sustained injuries that we assessed as having a clearly greater risk of weakened visual acuity.

Owing to the fact, that the study patients have been treated at University Ophthalmology Clinic, the diagnostic accuracy of the data is good. In addition, the study represents thoroughly the acute sports-related eye injuries and their treatment, as the researchers (ophthalmologists) collected and recorded all the clinical data directly from the case histories. However, sports-related eye injuries create long-term health and financial hardships that are not apparent in the study population. For approximately half of our patients, the main diagnosis was hyphema (hemorrhage in the anterior chamber), agreeing with the result (54%) of a Portuguese study of the commonness of hyphema in conjunction with sports (Filipe et al., 1997). In follow-up, a rupture of the anterior chamber angle (angle recession) was observed in 56% of their patients (Filipe et al., 1997). An examination of the anterior chamber angle is generally performed 2–4 weeks after injury. In our study, the hyphema patients were usually followed up outside the hospital, which is why angle recessions are not included in the list of clinical findings. In the Portuguese long-term (3 months to 3 years) follow-up of sports injuries, the most common clinical diagnoses were angle recession 35%, retinal tear 6%, traumatic enlargement of the pupil 6%, contusion maculopathy 4.8%, iris malformation 3.6% and secondary glaucoma 2.4% (Filipe et al., 1997). A hyphema causes a lifetime increased risk for glaucoma and also necessitates lifetime monitoring of ocular pressure (Walton et al., 2002). If the hyphema is associated with an angle recession or if family history includes glaucoma, a comprehensive follow-up examination with an ophthalmologist is recommended at 1- to 2-year intervals (Walton et al., 2002). When no recession is present, ocular pressure measurements every 1–2 years are sufficient (Walton et al., 2002).

Sports-related eye injuries comprised a considerable proportion (17%) of the eye injuries treated at the HUCH Ophthalmology Clinic. A large proportion of injuries to children and youths are sustained while playing floorball and floor hockey. Most sports-related eye injuries were ocular hyphemas, which may have serious sequelae. National recommendations for protective eyewear in conjunction with sports have, for example, been given in North America (Vinger, 2000; American Academy of Pediatrics Committee, 2004). American guidelines divide sports disciplines into three categories of eye injury risk (American Academy of Pediatrics Committee, 2004). Of the sports played in Finland, those belonging to the most dangerous group include basketball, ice hockey, squash, baseball and combat games. The moderate risk group comprises tennis, badminton and football/soccer, and the low-risk group gymnastics (American Academy of

Pediatrics Committee, 2004). In our judgment, floorball, a sport that has attained wide popularity in Finland and other North European countries, should be ranked in the highest risk group, and use of protective goggles is recommended. In this study, almost half (45%) of the sports-related eye injuries occurred while playing floorball or floor hockey, a figure consistent with a Swedish study result of 46% (Ghosh & Bauer, 1995). In a Norwegian study, approximately one out of five sports eye injuries was associated with floorball ( $n = 17$ ). Two floorball-inflicted injuries were severe, leading to glaucoma (Drolsum, 1999). In a Finnish one-year prospective study, out of 295 floorball players, three sustained eye injuries, and two of these were considered serious (Snellman et al., 2001).

Of the mainstream sports, playing squash without protective goggles has the greatest risk for eye injury. Although no severe squash-inflicted eye injuries were present in our study population, the literature describes several high-grade, high-impact eye injuries among squash players (Knorr & Jonas, 1996; Drolsum, 1999). Most sports eye injuries in Finland occur in conjunction with floorball and floor hockey. According to our estimate, several hundred floorball and floor hockey injuries requiring treatment in a central or university hospital occur each year in Finland, and some of these are extremely serious. The actual number of injured persons is likely considerably higher, but these individuals recover from their eye injuries without medical assistance, or a general health care visit is sufficient to treat the wound. The small proportion of eye injuries received in ice hockey is also noteworthy. Not a single eye injury was present in our study population that would have arisen in organized junior ice hockey, where facial protection is mandatory.

The long-term effects of sports-inflicted eye injuries on the individual are considerable. In the worst case, vision can be permanently impaired, and this can influence a child's or youth's functional capacity and career choices. Moreover, the expenses incurred by society in treating sports eye injuries and following up long-term complications, such as glaucoma, should not be overlooked.

## References

- American Academy of Pediatrics Committee on Sports Medicine and Fitness, American Academy of Ophthalmology Eye Health and Public Information Task Force. Protective eyewear for young athletes. *Ophthalmology* 2004; 111: 600–603.
- Drolsum L. Eye injuries in sports. *Scand J Med Sci Sports* 1999; 9: 53–56.
- Filipe JA, Barros H, Castro-Correia J. Sports-related ocular injuries. A three-year follow-up study. *Ophthalmology* 1997; 104: 313–318.
- Ghosh F, Bauer B. Sports-related eye injuries. *Acta Ophthalmol Scand* 1995; 73: 353–354.
- Knorr HL, Jonas JB. Retinal detachments by squash ball accidents. *Am J Ophthalmol* 1996; 122: 260–261.
- Parkkari J, Kujala UM, Kannus P. Is it possible to prevent sports injuries?

## Perspectives

According to a Swedish study (Ghosh & Bauer, 1995), floorball caused 46% of sports eye injuries, in contrast to a Norwegian study (Drolsum, 1999), which reported a corresponding figure of about 20%. Our investigation at the HUCH Ophthalmology Emergency Clinic over a 6-month period revealed 42 floorball eye injuries, comprising 45% of all sports eye injuries. In the entire country (population 5.3 million), over 300 floorball-related eye injuries occur each year. Clinically severe eye injuries in the University Hospital during our study period accounted for one-fourth of all cases. Over half of the injuries were hyphemas (anterior chamber hemorrhages), which carry a significant risk for long-term complications as well as a need for lifetime monitoring. The number of floorball eye injuries is high because the number of participants is large and because this sports discipline carries a high risk to the eyes. Relative to the number of participants, floorball was the most dangerous sport after squash. Based on research, the use of protective eyewear could prevent over 90% of eye injuries (Vinger, 2000; Parkkari et al., 2001; American Academy of Pediatrics Committee, 2004).

Mandatory use of protective eyewear in floorball is not yet in effect in any country. In Finland, only a small proportion of players use protective goggles. The Finnish Floorball Federation recommends that amateur players and the youngest of their juniors wear protective goggles. After publishing our results in Finnish in Suomen Lääkärilehti, several articles on this topic have appeared in recent months in the Finnish Floorball Federation newsletter as well as in the general media. This year the Swedish Floorball Federation has developed a consumer authority-approved protective eyewear testing procedure, which will enable the use of CE marking for goggles that have passed the test. Based on the results of our study, we strongly recommend that all floorball players use protective eyewear and conclude that national floorball federations should make the use of protective eyewear mandatory.

**Key words:** floorball, eye injury, eye trauma, sports-related injury, sports injury.

- Review of controlled clinical trials and recommendations for future work. *Sports Med* 2001; 31: 985–995.
- Rhee DJ, Pyfer MF. *The Wills eye manual: office and emergency room diagnosis and treatment of eye disease*, 3rd edn. Philadelphia: Lippincott Williams & Wilkins, 1999.
- Snellman K, Parkkari J, Kannus P, Leppala J, Vuori I, Jarvinen M. Sports injuries in floorball: a prospective one-year follow-up study. *Int J Sports Med* 2001; 22: 531–536.
- Suomen Liikunta ja Urheilu, Nuori Suomi, Kuntourheiluliitto, Olympiakomitea, Helsingin kaupunki. *Suuri kansallinen liikuntatutkimus 2001–2002*. SLU 2002.
- Suomen Salibandyliitto. *Salibandy Suomessa*. [www.salibandy.net](http://www.salibandy.net).
- Vinger PF. A practical guide for sports eye protection. *Phys Sports Med* 2000; 28: 49–69.
- Walton W, von Hagen S, Grigorian R, Zarbin M. Management of traumatic hyphema. *Surv Ophthalmol* 2002; 47: 297–334.