

Sport-Related Eye Injury in Northern Israel

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ABSTRACT: **Background:** Eye injuries are common in sports. Sports-related eye injuries have the potential for major morbidity. **Objectives:** To investigate the occurrence and to classify sport-related eye trauma in northern Israel. **Methods:** We analyzed the records of the ophthalmology emergency department for the years 2007–2011 and classified the admissions according to type, severity of injury and demographic data. **Results:** In 2% of the patients the injuries occurred during a sport activity. Most of the injuries occurred during soccer, basketball or school sport activity (74%). The majority of patients were young males. **Conclusions:** Most sports-related eye injuries can be prevented with adequate eye protection.

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KEY WORDS: eye injury, sport-related eye injury, eye protection, hyphema

Eye injuries are common in sports. Sports-related eye injuries have the potential for major morbidity; in the United States sports are responsible for a third of all eye injuries that result in blindness [1]. Most sports-related eye injuries can be prevented with adequate eye protection.

The most common sports associated with eye injury in the United States are, in descending order: paintball, basketball, ice hockey, baseball, tennis, volleyball, soccer, golf, swimming and cycling [2]. In 1973, a Canadian ophthalmologist, Dr. Tom Pashby, investigated ocular injuries among Canadian amateur ice hockey players and reported that 287 ice hockey-related eye injuries were treated by members of the Canadian Ophthalmologic Society during one season, and that 20 of these injuries resulted in blindness [3]. Similarly, during the 1974/75 Canadian amateur hockey season, 257 ocular injuries were treated and there were 43 cases of legal blindness [4]. Martial arts is another area of eye injury, with reports of hypema, retinal detachment, lens dislocation and blindness [5,6]. However, the majority of sports-related eye injuries occur as the result of blunt trauma [2]. Penetrating eye injuries are far less common than blunt injury but the outcome is serious. Size, velocity, and hardness of the object are important for determining the severity of the injury. If an

object is smaller than the orbit, it causes injury to the eyeball. An object larger than the orbit transmits force to the orbital walls, resulting in fractures of thin or even thick bones. One of the most common injuries is corneal abrasion. Finger and nail scratches to the eyes in contact sports cause pain, tearing and irritation. Blunt trauma could cause hyphema, vitreous hemorrhage, retinal tears and detachment, choroidal rupture, macular edema, and even globe rupture, retrobulbar hemorrhage and traumatic optic neuropathy.

Recent studies show that more than 90% of these injuries are preventable [7] by the use of appropriate eye wear. The current study presents the occurrence and classification of sport-related eye trauma in northern Israel.

PATIENTS AND METHODS

The Ziv Medical Center in Safed, Israel, serves the population of the Galilee, the Golan Heights and the towns and villages around the Sea of Galilee, numbering almost 180,000 people. We analyzed the records of the ophthalmology emergency department for the years 2007–2011 and classified the admissions according to type, severity of injury, and demographic data. Sport-related eye injuries were analyzed and classified according to sport, severity of injury, and demographic data.

RESULTS

The number of patients evaluated in the ophthalmology emergency department and the eye morbidity related to sports injuries are summarized in Table 1. Every year more than 3000 patients are examined in the ophthalmology emergency department. Almost 2% of them were due to various sports activities, and this rate has increased in the last 3 years. The demographic data are summarized in Table 2. Most of the patients were young males. Sixty-nine patients (21.4% of all patients with sport-related eye injury) were hospitalized. The sports causing the injury are summarized in Table 3; most of the injuries occurred during soccer, basketball or school sport activity (74%). Other sports involved were tennis, skiing, volleyball or beach games (volleyball, soccer, ball-and-bat). Most of the injuries were mild (90%), including eyelid swelling, hematoma or lacerations, corneal erosions, conjunctival lacerations and hyphema [Table 4]. A smaller percentage was considered more complicated and

Table 1. Ophthalmology emergency department data for 2007–2011

	2007	2008	2009	2010	2011	Total
No. of patients examined in the ophthalmology ER	3123	3274	3450	3573	3571	16,991
No. of patients injured due to sport activity (n/%)	49/1.56%	56/1.7%	62/1.8%	75/2.1%	81/2.27%	323/2%

Table 2. Demographics of sport-related eye injury in 2007–2011

Gender (n/%)	
Male	270/83.5%
Female	53/16.5%
Age (yr)	
Mean \pm SD	23.4 \pm 8.9
Range	6–58

severe, e.g., traumatic mydriasis, corneal perforation (3 patients, 0.9%) and macular edema (13 patients, 4%) [Table 4].

DISCUSSION

The current study presents the occurrence and classification of sport-related eye trauma in northern Israel for the period 2007–2011. Almost 2% of patients examined in the ophthalmology emergency department, mostly males, had sport-related trauma. In Israel, as in the U.S., the most popular sport is basketball, a sport with a high risk for eye injury [2]. Baseball and ice hockey are less popular, compared with North America, hence the low incidence of eye trauma occurring in these sports in Israel. Our study found that soccer was the most common sport related to eye injury (35% of injuries). Ocular injury from soccer is an important eye health problem in Europe and probably worldwide [8–10]. The injury is caused by the soccer ball hitting the orbit and anterior surface of the eye [11,12]. Similar to the U.S., in Israel, volleyball, tennis and skiing are sports with a moderate and low risk for eye injuries [2]. School sport activity and beach games were responsible for 16% and 4% of eye injuries respectively. Similar to the findings by Cass [2], we noted that corneal abrasion, hyphema and eyelid lacerations were the most common types of eye trauma (32%, 23% and 28%, respectively). Penetration, macular edema and traumatic mydriasis were less common, responsible for 0.9%, 4% and 5% of sport-related eye injuries, respectively

Due to the nature of the mechanism and kinematics in most injuries, it is reasonable to state that most sports-related eye injuries can be prevented with adequate eye protection, as shown by recent studies showing that more than 90% of these injuries are preventable [7]. Vinger and Capão Filipe strongly recommend that protective eyewear conforming to ASTM (American Society for Testing and Materials) standard F803 be worn for soccer [11,12]. The Canadian Amateur Hockey Association mandated full facial protection in 1978 for all athletes under its jurisdiction [13]. Research conducted after the implementation of these rules showed a marked reduction in ocular injuries [14,15–17]. For example, although 93 eye injuries were treated by members of the Canadian Ophthalmologic Society during the 1986/87 season (compared to 257 in 1974/75), with 18 cases of legal blindness (compared to 43 in 1974/75), no eye injuries were sustained by players wearing Canadian Standard Association-approved face shields [16]. Clearly, the use of protective face shields is associated with a dramatic decrease in the incidence of eye injuries.

Martial arts are considered contact sports, where participants deliberately target an opponent's face with strikes and kicks. Many manufacturers of martial arts equipment produce clear plastic face guards or padded metal grilles that are integrated into standard sparring headgear. These devices provide an adequate level of eye and face protection. Currently, few martial art practitioners wear this type of protection, and many participants would likely regard the equipment as a nuisance and an impairment to their vision or breathing.

In conclusion, eye protection reduces the possibility of sport-related eye injury. Ophthalmologists should encourage the use of eye wear appropriate for the sport. Government authorities, namely, the Ministry of Health, the Ministry of Education, and the Ministry of Culture and Sport, should enact eye protection regulations.

Table 3. Distribution of eye injury according to sport for 2007–2011

Sport	Soccer	Basketball	Volleyball	Coast games	School sport activity	Tennis	Skiing	Other	Total
n/%	113/35%	74/23%	13/4%	12/4%	52/16%	8/2.5%	17/5.25%	34/10.5%	323/100%

Table 4. Distribution according to type and severity of injury

Type of injury	Eyelids	Conjunctiva	Cornea	Hyphema	Traumatic mydriasis	Macular edema	Perforation/penetration	Total
n/%	90/28%	23/7%	103/32%	75/23%	16/5%	13/4%	3/0.9%	346*

*Some patients had more than one injury

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Capsule

B lymphocytes trigger monocyte mobilization and impair heart function after acute myocardial infarction

Acute myocardial infarction is a severe ischemic disease responsible for heart failure and sudden death. Zouggart et al. show that after acute myocardial infarction in mice, mature B lymphocytes selectively produce Ccl7 and induce Ly6Chⁱ monocyte mobilization and recruitment to the heart, leading to enhanced tissue injury and deterioration of myocardial function. Genetic (Baff receptor deficiency) or antibody-mediated (CD20- or Baff-specific antibody) depletion of mature B lymphocytes impeded Ccl7 production and monocyte mobilization, limited myocardial injury and

improved heart function. These effects were recapitulated in mice with B cell-selective *Ccl7* deficiency. We also show that high circulating concentrations of CCL7 and BAFF in patients with acute myocardial infarction predict increased risk of death or recurrent myocardial infarction. This work identifies a crucial interaction between mature B lymphocytes and monocytes after acute myocardial ischemia and identifies new therapeutic targets for acute myocardial infarction.

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Capsule

Renal tubular Sirt1 attenuates diabetic albuminuria by epigenetically suppressing Claudin-1 overexpression in podocytes

Sirtuin 1 (Sirt1), a NAD⁺-regulated deacetylase with numerous known positive effects on cellular and whole-body metabolism, is expressed in the renal cortex and medulla. It is known to have protective effects against age-related disease, including diabetes. Hasegawa et al. investigated the protective role of Sirt1 in diabetic renal damage. They found that Sirt1 in proximal tubules (PTs) was down-regulated before albuminuria occurred in streptozotocin-induced or obese (*db/db*) diabetic mice. PT-specific *SIRT1* transgenic and *Sirt1* knockout mice showed prevention and aggravation of the glomerular changes that occur in diabetes, respectively, and non-diabetic knockout mice exhibited albuminuria, suggesting that Sirt1 in PTs affects glomerular function. Down-regulation of Sirt1 and up-regulation of the tight junction

protein Claudin-1 by SIRT1-mediated epigenetic regulation in podocytes contributed to albuminuria. The authors did not observe these phenomena in 5/6 nephrectomized mice. They also demonstrated retrograde interplay from PTs to glomeruli using nicotinamide mononucleotide (NMN) from conditioned medium, measurement of the autofluorescence of photoactivatable NMN and injection of fluorescence-labeled NMN. In human subjects with diabetes, the levels of SIRT1 and Claudin-1 were correlated with proteinuria levels. These results suggest that Sirt1 in PTs protects against albuminuria in diabetes by maintaining NMN concentrations around glomeruli, thus influencing podocyte function.

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