

# Eye Injuries in Sports Practice: Mini-Review

## Abstract

Sports are a very common activity practiced around the world, to such an extent that they are completely integrated into our daily lives. The main reason is because sports practice is good for our health, but sometimes can have some risks that must be taken into account. Particularly, eyes are an irreplaceable organ that could suffer an injury due to a sport, especially those in high risk sports. In this mini-review, we classify the sports according to the risk of eye injury, later we describe the most common injuries and how to prevent them, with the optimum solution depending on the characteristics of each sport.

**Keywords:** Sports; Eye; Injury; Risk; Protection; Trauma; Goggles

## Mini Review

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## Introduction

As stipulated in the International Charter on Physical Education and Sports, the practice of sports is an entitlement and a duty for each person [1]. In Spain, more than half of the population over 15 years old practiced sports in the last year, 53.5%, either regularly or occasionally [2]. From people who practice weekly, a high percentage play sports with risk of eye injury such as football (12.9%), paddle tennis (7.9%), tennis (4.1%), basketball (4.1%), etc. Therefore, eye injuries in sports are an issue that deserves special attention. The results of the United States Eye Injury Registry (USIER) showed that 13% of the eye injuries were due to recreation or sports; and they were characteristic of young people under 30 and males [3]. Similarly, Cillino et al. [4] found that sport activities were one of the causes of eye injury in men (17.5%), while in women the prevalence was more home-related or outdoor activities. Most of these injuries are considered preventable [3-5]. The main aim of this mini-review is to describe the common eye injuries depending on the type of sport practiced and to suggest some protections for prevention.

## Discussion

### Sport classification according to risk of eye injury

If sports are categorized in different groups according to the risk they involve, the low risk category would include sports as swimming, gymnastics, and cycling, which do not imply the use of a ball, puck, bat, stick, or racquet, and no body contact. Conversely, high-risk sports involve the use of a ball, puck, bat, stick, or racquet and/or body contact, such as baseball, hockey, football, basketball, racquet sports, tennis, golf, and water polo. Other sports such as boxing, wrestling, and contact martial arts could be considered very-high-risk sports, because eye protectors normally are not worn [5,6]. According to the study of Ong et al. [7] football was the sport most related to eye injuries with a prevalence of 62.5%, followed by squash (10.4%) and cricket (6.3%). Badminton, rugby and tennis had a lower prevalence around 4%, and below them were baseball (2.1%) and golf (2.1%), among others. 81.2%

of the total of injuries were caused by a ball which contacted the eye. The prevalence change from one study to others, but these are the sports which normally cause greater eye trauma. Table 1 shows the variability of prevalence for each sport according to different authors.

### Common injuries in sport practice

Generally, the common mechanisms of eye trauma involve blunt, and rarely penetrating and radiation injuries. Blunt trauma can cause from simple alterations to severe affections, including: subconjunctival hemorrhage, orbital and lid contusions, orbital fracture, iris injury, choroidal rupture, ruptured globe, hyphema, retinal hemorrhage, vitreous hemorrhage, retinal tears, and retinal detachment, among others [5,6]. Penetrating injuries can occur with large projectiles or eyeglass breakage. Regarding to radiation injuries, they occur as a result of exposure to ultraviolet light in sports which involve great exposure to sun such as snow or water skiing, and other water sports [5].

Eye injuries caused by football and basketball are closely associated with collision with another player, which can result in an orbital fracture causing a secondary contusion, typically affecting retina. The ball impact can result in a hyphema [8,9]. Vitreous hemorrhage, commotio retinae, retinal tear and retinal detachment, choroidal rupture, macular hole, maculopathy and epiretinal membrane are posterior segment alterations found after traumas in sports which involve a medium or small ball such as tennis, paintball or golf ball [10]. There are also alterations related to anterior segment such as hyphema, cataract, corneal abrasion, edema, subluxated lens, glaucoma, iridodialysis and angle recession [10]. Alterations related to each sport are shown in Table 2.

### Recommendations for prevention

Use of protective eyewear while practicing sports is associated with a reduction in the rate of eye and orbital injuries [7,11-14]. This preventive measure could prevent secondary complications

to the rest of the eye. Sports goggles with polycarbonate lenses are suitable for sports such as basketball, football, tennis, baseball or softball [4,5]. However, in other sports like, field or ice hockey, and paintball the most appropriate option is to use full face protection [3]. In case of outdoor activities which imply high sun

exposure it is recommended to use high impact resistant eye protection or sports goggles with polycarbonate lenses as well as an ultraviolet filter [6,15-17]. Protection equipment for different sports is shown in Table 2 [18].

**Table 1:** Prevalence of sport eye injury from different authors.

Sport	Bro <sup>12</sup>	Hoskin <sup>8</sup>	Leivo <sup>9</sup>	Ong <sup>7</sup>	Alfaro <sup>18</sup>	Capão <sup>16</sup>	Mean	Sport	Bro <sup>12</sup>	Hoskin <sup>8</sup>	Leivo <sup>9</sup>	Ong <sup>7</sup>	Alfaro <sup>18</sup>	Capão <sup>16</sup>	Mean
1. Floorball	56%		32%				44%	15. Racquetball					5,9%		6%
2. Football		11%	13%	62,5%	4,2%		23%	16. Cricket		5%		6,3%			6%
3. Paintball						21%	21%	17. Hockey	3%	4%	8%				5%
4. Squash				10,4%		29%	20%	18. Scooter		5%					5%
5. Cycling		22%	5%				14%	19. Badminton			5%	4,2%			5%
6. Fishing		7%			19,6%		13%	20. Rugby				4,2%			4%
7. Softball					10,3%		10%	21. Golf		4%		2,1%	5,9%		4%
8. Motocross		3%				17%	10%	22. Combat sports			4%				4%
9. Trampoline		8%					8%	23. Bungee jumping						4%	4%
10. Baseball		3%	4%	2,1%	22,3%		8%	24. Gymnastics			3%				3%
11. Soccer	14%	3%			5%		7%	25. Lacrosse				2,1%			2%
12. Swimming		7%					7%	26. Rounders				2,1%			2%
13. Basketball			4%		9,8%		7%	27. Rink bandy			2%				2%
14. Tennis	4%	8%	10%	4,2%	5%		6%	28. Skiing			2%				2%

### Conclusion

The eye is an irreplaceable organ and sports practice poses a risk to this precious body part that allows us to see the world. Therefore, we recommend using the most appropriate protection in any sport practice for preventing injuries, especially in sports with medium or high risk. Although, high-risk sports involve contact activities for which a ball is usually used such as football, tennis, etc. it is also important to note that eye injuries are not always related to an impact and in some other time an unconscious

risk may be present like in those practiced in environments with high radiation such as skiing, climbing, etc. In conclusion, due to the diversity of injuries related to the eye, it is important to investigate those patients who arrive to our offices with a trauma caused while practicing sports, paying attention to the ocular surface, orbital structure and retinal status. Furthermore, it should be recommended that the use of specific eye equipment for each sport in order to avoid traumas as much as possible.

**Table 2:** Mechanisms which cause ocular trauma, common alterations derived from them and protection equipment and strategies to prevent them [5,6,14,19].

Risk	Sport	Mechanism	Common alterations	Protection equipment
Low	Swimming or Diving	Noncontact	Brow or lid laceration	Swim goggles
	Skiing (snow and water)		Radiation injuries	Ultraviolet filter
	Bicycling	Falls and insects, rain, wind or foreign bodies impacting the eye	Minor injuries	Goggles with polycarbonate lenses
	Running			Goggles with polycarbonate lenses
Medium	Badminton	Contact and ball, puck, bat, stick, or racquet impact	Orbital fracture, orbital and lid contusions, iris injury, ruptured globe subconjunctival hemorrhage, hyphema, vitreous and retina hemorrhage, choroidal rupture, retinal tears, and retinal detachment,	Sports goggles with polycarbonate lenses
	Tennis			
	Volleyball			
	Water polo			
	Football			
	Fishing			
	Golf			
High	Air rifle and Paintball	Small and fast projectiles	Orbital fracture, orbital and lid contusions, iris injury, ruptured globe subconjunctival hemorrhage, hyphema, vitreous and retina hemorrhage, choroidal rupture, retinal tears, and retinal detachment,	Full face protection
	Squash	Hard projectiles or sticks and collision		Sports goggles with polycarbonate lenses
	Cricket			Full face protection
	Racquetball			Full face mask and sports goggles with polycarbonate lenses
	Baseball			Not available, not permitted in sport
	Lacrosse			
	Hockey			
	Full contact martial arts and boxing	Close contact and intentional injury		

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