

## Mini Review

# Investigation of Eye Injuries in Athletes

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Nowadays, due to the dimensions of life, unfortunately, the possibility of vision damage has increased [1]. Eye injuries are divided into mild, moderate and severe types [2]. Dangerous sports in terms of eye damage include baseball, hockey, football, basketball, lacrosse, tennis, golf and water polo, very dangerous sports in terms of eyes include boxing and wrestling [3]. The possibility of eye damage, as mentioned, in sports where athletes fight directly and face to face. Like wrestling, combat sports, boxing, football is far more than sports such as athletics or swimming, where athletes fight against time and distance. They are subject to eye injuries. The extent of the damage depends on the hardness and flexibility and force of the impacting object [4]. The mechanism of eye damage is closed (without tearing), with tearing or due to the effect of radiation [4]. Scratches and wounds of the eyelids and conjunctiva and bleeding in these areas are the most common injuries, followed by injuries to the bones of the eye socket, which are the most common causes of double vision or sunken eyes. But fortunately, the damage to the eyeball itself is the least and the worst type in terms of vision threat, eyelid and conjunctival bleeding are absorbed between two to four weeks, and in some cases, the rupture of these areas must be surgically repaired [1]. Eyeball fractures If there are no symptoms, they do not need surgery, but in cases where they lead to changes in the facial condition of double vision or drooping eyes, they need surgery, but eyeball injuries in any case need treatment (surgical and non-surgical) and need special care [5]. Most of the injuries to football players are the result of hitting the opponent's head, and in a few cases, the result of the collision of their hands and feet, and in most cases, scratches and tearing of the eyelids and bleeding in these areas (Figure 1,2). But in combat sports, eye damage is mostly caused by foot impact and there is a risk of breaking the eyeball in addition to eyelid and conjunctival injuries. Contrary to expectations, eye injuries caused by boxing in Iran are not very common, and one of the reasons for this is the presence of fewer athletes in this field compared to football and martial arts. Injuries with tears are usually rare, broken glasses can cause damage to the eye, which can range from a small scratch to a tear of the eyeball [6]. Rupture of the lacrimal duct is usually caused by the impact of the opposite player's finger in the inner area of the eye [7]. Even the fishing hook has damaged the eyeball. Radiation injuries occur in sports where the eyes are exposed to sunlight without protective glasses (snow skiing

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Submitted: 13 February 2023

Accepted: 28 March 2023

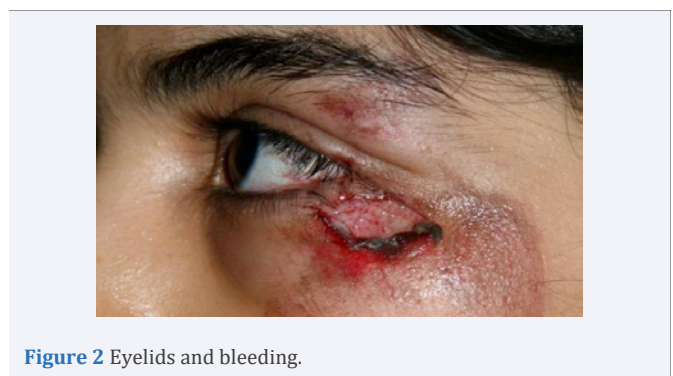
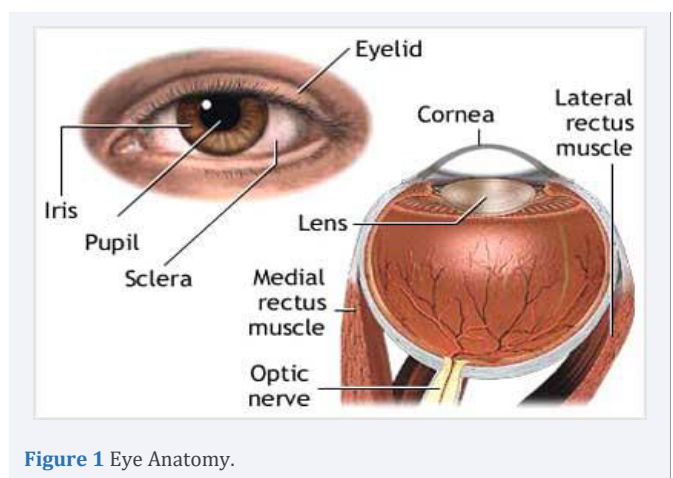
Published: 29 March 2023

ISSN: 2379-0571

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and water sports). Minor eye injuries may be treated on the spot, and the medical officer must be fully aware of which injuries should be referred to an ophthalmologist [8]. First, the cause of eye damage must be identified. Then the visual acuity and the estimation of the visual field (by moving the fingers in front of the injured person from the side to the center) are determined (the limitation of the visual field is a sign of damage to the retina, optic nerve and damage to the central nervous system) then the pupil opening is estimated (compared with the condition of the pupil of a healthy eye) and then the reaction of the pupil to light is evaluated [9]. The characteristic abnormal reactions are serious damage to the eyeball and the central visual system. The presence of blood in the anterior chamber of the eye should

be evaluated. In case of rupture of the globe, manipulation for examination can increase the amount of damage and this should be done in a specialized center [10]. If the diameter of the object that caused the injury is greater than the diameter of the opening of the eyeball, then the possibility of damage to the bones of the eyeball and the optic nerve increases [11]. Examples of damage to the eye can be seen in bone fractures of the eyeball, crushing of the eyelids. Injury to the iris, sub conjunctival hemorrhage, retinal hemorrhage, vitreous hemorrhage, choroidal tear, retinal tear, retinal detachment. You should also pay attention to double vision and checking eye movements, eye prominence, swelling around the eye socket, roughness of the edges of the eye socket and when opening the mouth and chewing [12].

Additional examination by ophthalmoscope and retinal examination is necessary in cases of reduced vision. If there is a tear of the conjunctiva, there is a possibility of tearing the eyeball. Also, the presence of a black spot on the sclera (protrusion of the choroid) and the drop formation of the pupil and an increase in the depth of the anterior chamber are signs of eyeball rupture, in which case a protective shield is placed (on the bony edges of the eyeball) and the patient is taken to the center. Ophthalmology equipment is sent [13].

In case of the following injuries, the athlete will be prohibited from continuing the competition and an eye examination will be performed.

- Sudden loss of vision, visual field damage
- Pain when moving the eyes, fear of light
- Double vision
- Eye protrusion
- Presence of flies
- Irregular and drop-shaped pupils
- Sensation of a foreign body in the eye
- Red and inflamed eyes
- The presence of blood in the anterior chamber, the presence of a halo around the light source
- Eyelid ulcer in the inner area
- Sub conjunctival bleeding
- Broken contact lenses or glasses
- Suspicion of tear in the eyeball

If an athlete's vision is less than 20/40 (about 5/10), it is mandatory to use a special protective device in the form of a mask in sports such as hockey, football, and polo.

Classification of eye injuries based on sports fields Eye injuries are common in racket sports, tennis, squash, badminton, racket sports and all of them have very high speed, squash is the fastest sport. The speed of the badminton ball can reach 135 mph. Balls and rackets can cause injuries. The possibility of injury increases in doubles when two players are on the same court. Approximately one-half of eye injuries from racquet sports are caused by the racquet itself. This type of injury often leads to

eye bleeding at the site of impact. In most patients, trauma to the cornea or limbus causes damage to important vascular tissues. This can lead to bleeding in the anterior eye cavity and is called hyphema. Before the initial pain associated with the impact, the dull pain lasts for several hours. Vision may be significantly reduced but will improve as the hyphema (blood clot) subsides. Occasionally, the sclera may bleed a little. This is quite alarming but indicates external bleeding which is not nearly as important as internal bleeding. Both badminton and squash balls can hit the eye, causing serious eye damage. (Figure 3) In a study on eye injuries in sports, squash was considered the most dangerous in terms of eye injury risk. Most eye injuries are caused by balls. The danger position is when a player gets stuck in front of the court and turns to see the flow of his shot; he is hit by the opponent's next shot. In racquet sports, injuries can be prevented by using eye protection. These eye protectors not only provide protection against injury, but can also be worn over time. Even if you need a small vision correction, it will help you see the ball a second sooner or help your aim by a fraction of an inch [14].

Injuries in boxing can result from direct contact or shockwaves. Depending on the force of the injury, trauma may lead to retinal injury, retinal detachment, retinal hemorrhage, etc. Bleeding of the eyelids, which is usually the result of a blow to the orbital rim or eyelids, is very common in boxing. Armed martial arts require body protection. Occasionally, weapons or shields may break. In 1982, penetration into the eye socket due to a broken sword blade entering the mask of an international fencer was reported [12].

## EYE INJURIES IN SPORTS USING WOODEN EQUIPMENT

Cricket, hockey, baseball, and golf are some of the stick and ball sports, but they share certain common characteristics. The ball is small and hard, and when hit with a bat or stick, they move at a high speed. Except in golf, where the ball is struck with the club while stationary, the ball is struck while in motion. The study shows that in hockey, most injuries are caused by hockey sticks. Hyphema and fracture of the orbital cavity are the most commonly reported eye injuries that can be caused by an opponent's stick. Cricket bowlers are more at risk than batsmen. Retinal detachment, orbital fracture, hyphema and eyelid tear are



Figure 3 Serious eye damage.

common eye injuries [11].

However, many cricket bowlers now have protective caps to prevent the ball from hitting the eyes. Although golf injuries are rare, golf balls can cause serious injuries. Golf balls and clubs can be lodged in the orbital cavity and lead to eyeball damage after breaking and dislocating the eyeball. Due to the severity of golf-related eye injuries, eye protection should always be emphasized by golfers.

### EYE INJURIES IN BALL SPORTS

Big ball sports are usually sports with fast movements and involve moving the ball. Football, basketball, volleyball, rugby, handball are the most common sports. Although, the ball is always in motion, it is not the main cause of eye injuries. A heavy shot to the head may have a slight penetration into the eye socket, but such injuries are rare. Physical collisions with the opponent's hands, knees or feet or sometimes wrists can accidentally hit the eyes and cause damage to the eyes. Such injuries are commonly seen in basketball and rugby. Deliberate tackles are quite common in rugby. For this reason, the widespread use of hats is quite common [9].

### EYE INJURIES IN WATER SPORTS

Swimming, sailing, fishing and diving are the most common water sports. Prolonged exposure to chlorine in swimming pools can destroy the surface of the cornea. Defective glasses or glasses that are placed in a bad shape may cause damage to the eyes. Glasses that are too tight may cause swelling of the eyelids. Diminished vision has been reported after pulling rubber goggles off the face, slipping from the hand, and returning to the original position on the face with great force. Fishing injuries, especially from hooking, are serious and can lead to dislodgement. During diving (diving) with equipment, changes related to the pressure of the environment are transmitted to the eyes and barotraumas - eye tissue occurs when the pressure balance is lost. Diving may be dangerous for patients who have undergone eye surgery. There is a theory about corneal tear in refractive surgery of divers [12].

### EYE INJURIES IN SNOW SPORTS

Snow sports are fast and dynamic sports. Skiing and ice hockey are the most common. Being at a very high altitude can cause a lack of oxygen, which leads to an increase in blood flow to the retina and prepares for intra-retinal bleeding. Loss of an eye due to a stick coming between the face and face shield has been reported in ice hockey. It is also possible for the ball to cause eye damage [15].

The result is that eye injuries in sports are not rare, and in the current situation and due to the expansion of sports, whether in the form of championships or otherwise, unfortunately, there is a possibility of it, and with a few recommendations, the risk can be reduced or, if it happens, the damage can be increased. Prevented Eye examinations in sports should be a part of a full body examination and the examiner should know the previous history such as myopia, surgery, cataract, retinal detachment and surgery, previous injury due to trauma and history of eye infection, because these records increase the risk of new injury. Family history of retinal detachment and diabetes are also important. Athletes with such conditions should be protected

(use of protective equipment) in dangerous or very dangerous sports for the eyes (Figure 4). In fact, the best way to prevent eye injuries in athletes is to use protective equipment. Studies show that 90% of eye injuries caused by sports can be prevented [7]. However, most people do not take protective measures. They protect their head with a hat and their body with a pad, but few use eye protections for their eyes. The sad part about eye injuries is that they often result in permanent damage. It is recommended that the training of the athletes be done under the full supervision of the coaches and by using the safety precautions, although it is not possible to replace the athlete in individual sports when there is an eye injury, and in group sports, due to the "possibility of changing the result", it is not possible to replace the athlete. Injured athlete coaches are not very happy to move. Certainly A person who has reduced vision due to trauma, severe tears and pain in the eyeball, or "double vision" or swelling of the eyelids to the extent that led to the closure of the eyelids and lack of vision due to it, cannot be in the field. It is necessary to maintain sports (whether training or competition) and immediate examination by an ophthalmologist. Also, people with pre-existing poor eye conditions are at greater risk. For example, if an athlete is playing with someone with low vision in one eye and good vision in the other, care must be taken to protect the good eye, as its injury can result in the athlete losing or reducing overall vision. It is also recommended for the return of an eye-injured athlete, the medical team and doctors overseeing the competitions, although there is no specific guide in this case, but in athletes who do not have an eyeball tear, on the condition of full vision (visual acuity and field of vision) and no double vision. And the feeling of comfort in the eye is mandatory and the athlete should not use local anesthetic drops to reduce pain, and the medical officer should make sure that there is no danger to the vision by a complete examination of the vision system. It was said that today the sport has moved out of the state of competition and into battle. Although there are rules in this battle and referees or supervisors have been appointed to enforce them, none of them are a guarantee to prevent "injury" and the athlete's alertness is the main obstacle to eye damage, and unfortunately, most of these injuries occur during "training". Coming and not the "competition" time, which may be the cause of not using protective equipment or the simplistic athletes during training. In the end, I should mention



Figure 4 Protective equipment for the eyes.

that blows to the head, especially the temporal area, can lead to blindness or reduced vision, which emphasizes the importance of using these helmets in sports where it is mandatory

## REFERENCES

1. Sabel BA, Wang J, Cárdenas-Morales L, Faiq M, Heim C. Mental stress as consequence and cause of vision loss: the dawn of psychosomatic ophthalmology for preventive and personalized medicine. *EPMA J* 2018; 9: 133-60.
2. de Juan Jr E, Sternberg Jr P, Michels RG. Penetrating ocular injuries: types of injuries and visual results. *Ophthalmology*. 1983; 90: 1318-22.
3. Medicine CoS, Fitness. Medical conditions affecting sports participation. *Pediatrics*. 2001; 107: 1205-9.
4. Drolsum L. Eye injuries in sports. *Scandinavian Journal of Medicine & Science In Sports*. 1999; 9: 53-6.
5. Sabel BA, Wang J, Cárdenas-Morales L, Faiq M, Heim C. Mental stress as consequence and cause of vision loss: the dawn of psychosomatic ophthalmology for preventive and personalized medicine. *EPMA J*. 2018; 9: 133-60.
6. Mishra A, Verma AK. Sports related ocular injuries. *Med J Armed Forces India*. 2012; 68: 260-6.
7. Cass SP. Ocular injuries in sports. *Current Sports Medicine Reports*. 2012; 11: 11-5.
8. Toldi JP, Thomas JL. Evaluation and management of sports-related eye injuries. *Curr Sports Med Rep*. 2020; 19: 29-34.
9. Philip SS, Dutton GN. Identifying and characterising cerebral visual impairment in children: a review. *Clin Exp Optom*. 2014; 97: 196-208.
10. Onugwu AL, Nwagwu CS, Onugwu OS, Echezona AC, Agbo CP, Ihim SA, et al. Nanotechnology based drug delivery systems for the treatment of anterior segment eye diseases. *J Control Release*. 2023; 354: 465-88.
11. Liu X, Chen D, Geng X, Fan Y. Biomechanical Study on the Mechanism of Eye Injuries. *Biomechanics of Injury and Prevention*: Springer. 2022; 97-128.
12. Moran S, O'Keefe M. Ophthalmic Trauma. *Pediatric Surgery: General Pediatric Surgery, Tumors, Trauma and Transplantation*: Springer. 2021; 535-54.
13. Kocabayoglu S, Erdener U, McDonagh D. Eye Injuries and Other Ocular Emergencies. *The IOC Manual of Emergency Sports Medicine*. 2015:125-36.
14. Johnson GL. Contributions to the comparative anatomy of the mammalian eye, chiefly based on ophthalmoscopic examination. *Philosophical Transactions of the Royal Society of London Series B, Containing Papers of a Biological Character*. 1901; 194: 1-82.
15. Bhootra AK. *Elite sports and vision*: Jaypee Brothers Publishers. 2008.