

# Eye Injuries: A Selection of Injuries and Treatment Protocols

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**abstract:** *As the profession of chiropractic evolves and becomes more involved in the world of sports, doctors of chiropractic are finding themselves held to the same knowledge and training base as medical physicians and athletic trainers. Doctors of chiropractic must be able to deal with a variety of injuries, including those to the eye. Although eye injuries are not common, sports chiropractors must know about the most common types of injuries and how to assess and treat them. Corneal defects and foreign bodies are just two of the many eye-related injuries that may occur in sporting events, and the well-informed doctor of chiropractic should have a firm grasp on these as well as the many other eye injuries or conditions that may occur in a sporting environment.*

**key words:** Chiropractic; Eye Injury; Sports Medicine

## INTRODUCTION

As the profession of chiropractic evolves and becomes more involved in the world of sports, doctors of chiropractic are finding themselves held to the same knowledge and training base as medical physicians and athletic trainers. Chiropractic sports physicians are expected to understand how and when to treat the variety of injuries that occur in a sporting environment.

With the advent of chiropractic sports physician certification programs, as well as courses leading to diplomate status, chiropractors are becoming more involved in sports settings. Youth, interscholastic, scholastic, amateur, and professional athletes in all sports use chiropractors, either on staff or as an adjunct to the health care team. Because of this, the chiropractic sports physician must be well trained and have a vast knowledge of the complexities involved in sports injuries. On-field as well as in-office management of injuries often entails quick decisions and the ability to know when and how to treat an injured athlete.

The injuries most often assessed and treated by chiropractors tend to be musculoskeletal. Chiropractic training in this area is vast and represents what most consider to be the profession's "bread and butter." However, this is not the only type of injury seen when working with athletes. Eye injuries are not common in sports and are not routinely encountered by chiro-

practores working at sporting events or in their offices. However, because of the increasing number of people participating in sports, and the increasing number of chiropractors rendering services to athletes on the field or in the office, the chance of seeing eye injuries increases. The National Electronic Injury Surveillance System estimated that 42,000 sports-related eye injuries occur each year in the United States, representing 1.7% of all sports-related injuries.<sup>1</sup> In this survey, 9200 eye injuries resulted from baseball (22%), 7500 from basketball (18%), 3200 from bicycling (8%), 4000 from racquet sports (9%), 2400 from football (6%), 1700 from soccer (4%) and 900 from hockey (2%).<sup>2</sup>

When looking at this breakdown of sports, it is apparent that team sports such as baseball, basketball, football, soccer, and hockey are ones that are quite popular and have a moderate to high risk for eye injuries; such athletes also often have a team medical physician and trainer available. Often, a chiropractor is part of the medical staff, or sometimes the only one on the sidelines. This again stresses the importance of having a good knowledge and training base concerning eye injuries.

In the United States, baseball is the leading causes of eye trauma in children younger than 15. In the 15-to-24-yr-old age range, basketball and football are the leading causes; racquet sports are responsible for most eye injuries in the group older than 24.<sup>3</sup> Children and adolescents are particularly susceptible to injuries because of their fearless manner of play and their athletic immaturity. Because of these and other factors, team doctors, trainers, coaches, players, and parents must be aware of the possibility of eye trauma, the preventive measures to take, and the proper care needed when an injury occurs.

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The following is an outline of common sports and the types of injuries seen, followed by selected eye injuries and recommended treatment protocols.

## **DISCUSSION**

### **Individual Sports**

#### *Baseball*

Baseball injuries are numerous in younger children because of their lower skill levels, slower reaction times, wide variations in skill levels, and differences in physical maturity.<sup>4</sup> Young children lack the quick responses needed to duck from a pitch and do not have the eye-hand coordination needed to help ease the ball into the glove while fielding. Injuries in this sport are usually caused by the ball (62%) or bat (16%). In terms of severe eye injuries alone, baseball is the leading sport, responsible for nearly 30% of such injuries.<sup>5</sup> The most common injuries are lid or periorbital contusions, corneal abrasions, soil foreign bodies, lid lacerations, traumatic iritis, and subconjunctival hemorrhage.<sup>6</sup> However, severe injuries such as ruptured globes and orbital fractures can occur.<sup>7</sup>

#### *Basketball*

Play in the National Basketball Association is becoming more aggressive, and this trickles down to the college, high-school, and adolescent levels, causing younger athletes to emulate the style of the professional players. Given this aggressive style of play, the close contact between players, and the fact that the sport involves extremities moving in all directions, it is not surprising that eye injuries are becoming more common. Basketball is second only to baseball in the number of eye injuries reported in the United States. Most injuries are caused by an opponent's fingers or elbow rather than the ball itself,<sup>5</sup> and a 1993 study by Zigelbaum<sup>6</sup> found that players on offense are at highest risk. Lid lacerations, traumatic iritis, lid and periorbital contusions, and corneal abrasions<sup>6</sup> are the most common eye injuries found in basketball players.

#### *Racquet sports*

Racquet sports include racquetball, tennis, squash, paddleball, badminton, and handball. Ball speeds in racquetball have been measured at 78 to 127 m.p.h., with racquet speeds measured at 108 to 125 m.p.h.<sup>8</sup> The force associated with such speeds can cause injuries to the orbit of the eye and its fragile contents, ranging in severity from a bruise to blindness.<sup>9</sup>

Tennis, with its high-velocity volleys and serves, has seen its fair share of eye injuries. The tennis ball, at 6.25 cm in

diameter, cannot enter the orbit as readily as a squash ball but can still cause severe injury, typically vitreous hemorrhage and retinal breaks, including retinal detachment requiring surgery.<sup>5</sup> Playing doubles is also risky, not only because of the extra racquet on each side of the court but also because players turn around to watch their partner serve or return.

Squash has become more popular and has a high potential for eye injuries. It is estimated that squash is the most dangerous sport in the United Kingdom, generating an eye injury rate of 5.2 per 100,000 playing sessions.<sup>5</sup> Injury by the ball itself is most common and occurs when the player turns to watch his or her opponent play a stroke. Injury by the racquet is often more serious, however.<sup>5</sup> Many of the injuries involve hyphemas and rupture to the globe.

Badminton is also becoming more popular, thus increasing its propensity to cause severe eye injuries. Doubles has been found to be more dangerous than singles, and the closer one is to the net, the higher the risk for injury. Badminton is dangerous enough that all players should wear polycarbonate spectacles or goggles.<sup>5</sup>

Because of the ever-increasing popularity of many racquet sports, sports practitioners should advise players to use protective eyewear to reduce the risk of eye injuries.

#### *Football*

Despite the vast amount of protection a football player wears, the helmet with its protective face guard does not afford as much protection to the eye as one might assume. However, although the protection to the eye and face is incomplete, face guards have resulted in an 80% to 90% reduction in facial injury.<sup>10</sup> The most common cause of eye injuries in football tends to be the entry of fingers through the face guard.

#### *Soccer*

Soccer is another sport whose popularity has increased tremendously in the past few years in the United States. Once seen as a relatively safe sport, soccer is responsible for approximately 1700 eye injuries per year.<sup>2</sup> Although the soccer ball is relatively loose and transmits most of its force to the bones surrounding the orbit, eye injuries still result.<sup>6</sup> However, many injuries are caused by either teammates or opponents rather than the ball. Soccer ball impact can result in hyphemas, vitreous hemorrhage, corneal abrasions, and even blowout fractures. Severe injuries are not that common; however, they can occur, and some physicians are concerned about possible brain injury from repeatedly "heading" the ball because of the high-impact energy the ball holds.<sup>10</sup>

## *Hockey*

Before the mid-1970s, eye injuries were so common that they were considered an inherent risk of the game.<sup>11</sup> Sticks caused 75% of the eye injuries, with the puck and opposing players making up the remainder. Severe injuries such as ruptured globes and orbital fractures were seen, and of all players who suffered eye injuries, 15% were rendered legally blind.<sup>5</sup> However, since the advent of full-face protectors, eye and face injuries in North America have been almost totally eliminated. Face protectors are worn by more than 1.2 million North American hockey players, resulting in 70,000 fewer eye and face injuries.<sup>10</sup>

## *Swimming*

Swimming and pool sports ranked third as the most likely to produce eye injuries in the 15-to-24-yr-old age group. Swimming actually has a low incidence of eye traumas, but eye irritation has been attributed to the chemicals in swimming pools, the most common being chlorine.<sup>5</sup> A passing knee has been blamed for orbital blowout fractures, but this is rare. Most pool-related eye injuries result from pool sports and children clowning around in the pool.<sup>12</sup>

## **Injuries and Treatment**

The following are the eye injuries that a sports physician would be most likely to encounter while working at a sporting event. This is by no means a complete listing. A chiropractor working with sports teams should have knowledge of not only the following eye injuries but also of the less common eye injuries that may be encountered.

### *Corneal abrasions*

Corneal abrasions are defects in the corneal epithelium that produce pain, photophobia, and tearing.<sup>6</sup> There may be a history of scratching the eye, a foreign body in the eye, contact lens use, or trauma.<sup>13</sup> Abrasions can be so painful that a player may sit out of action. In the typical athlete, protective reflexes tend to prevent extensive corneal abrasions, but even minor lesions are quite painful. It is important to ensure there is no foreign body left in the eye and to find out if the athlete was wearing contact lenses. Foreign bodies in the eye and abrasion injuries of the conjunctiva and cornea produce almost identical symptoms,<sup>14</sup> so history is very important.

Examine the eye for foreign bodies and abrasions; a penlight for illumination, a magnifying glass, cotton-tipped applicators or lid evertors, and an appropriate irrigating solution should be available.<sup>15</sup> If no foreign body can be located, the presence of an abrasion should be suspected. If symptoms continue, refer the athlete to a medical physician for continued diagnostic studies.

A topical anesthetic and fluorescein sodium dye is applied; a bright-green stain of the abrasion site confirms the diagnosis. Treatment consists of a topical broad-spectrum antibiotic and a pressure patch.<sup>6</sup> If the abrasion was caused by a contact lens, a patch should not be used, to prevent infectious keratitis from developing.

Uncomplicated cases often heal in about 4 days with the use of an antibiotic and a firm patch. Do not let the athlete participate until he or she is symptom-free or has had the approval of the referring physician.

### *Corneal laceration*

Lacerations of the eyeball may also produce extreme pain and visual impairment. On examination, the cornea appears cut and an irregular corneal reflex is present, or a tear-shaped pupil with a small ebony tip at the apex of the tear is present; alternatively, the iris may exhibit a hole from perforation.<sup>16</sup> If a laceration of the eyeball is noted, further examination in this area should stop. Reassure the athlete and refer him or her immediately to an ophthalmologist after placing a protective pad or shield over the eye. Often, it is helpful to cover both eyes at the same time to reduce eye movement and lower the likelihood of further irritation. Do not exert any pressure on the eye.<sup>15</sup>

### *Subconjunctival hemorrhage*

Subconjunctival hemorrhage is an injury that looks worse than it is; however, proper assessment is essential. Damage to the conjunctival vessels, by trauma or spontaneously, results in a blood locus beneath the conjunctiva. Subconjunctival hemorrhage usually resolves within 10 to 14 days and does not require treatment. However, careful examination is required. The hemorrhage should be tracked to its posterior border and, as with all cases of trauma, a ruptured globe should be ruled out.<sup>13</sup>

### *Foreign bodies*

Foreign bodies are quite common. Foreign bodies and abrasions usually go hand in hand, although not always. Athletes often describe the feeling of having something in the eye.<sup>15</sup> Superficial foreign bodies can usually be brushed off the cornea with a cotton swab or irrigated off with sterile saline.<sup>17</sup> If the foreign material is difficult to visualize, the lid may be everted.<sup>17</sup> Everting the upper lid helps ensure that no residual foreign body exists. A moistened, sterile cotton-tipped applicator may be used to swab away the foreign body gently, especially if it is in the conjunctival fornix.<sup>6</sup>

Symptoms of foreign bodies include a foreign body sensation, pain, photophobia, and tearing. Close examination is important because a corneal abrasion may be involved.<sup>6</sup> Foreign bodies in the eye and abrasion injuries of the conjunctiva and

cornea produce almost identical symptoms of pain, tearing, and a sensation of something in the eye. Foreign bodies are often worked free from the cornea by the profuse tearing that occurs as a result of the initial irritation. Although a foreign body may not be present, the athlete who has suffered a corneal abrasion will continue to insist that something is in the eye. In these cases, the abrasion, and not the foreign body, is responsible for the symptom.<sup>15</sup>

If the foreign body cannot be removed and appears to be embedded, refer the athlete to an ophthalmologist or medical facility.<sup>13</sup> If no foreign body can be located, the presence of an abrasion should be suspected; if symptoms continue, refer the athlete to a medical physician.

#### *Eyelid laceration*

Lid lacerations are relatively uncommon. They should not be taken lightly because they may be accompanied by other injuries; if no other structure is involved, the seriousness of the injury decreases. Minor horizontal lacerations to the skin of the eyelid that do not involve the lid margin are generally not a serious problem. The lacerated edges are easy to approximate, and after repair and healing the residual scar is minimal.<sup>15</sup> After cleaning the lacerated area,<sup>11</sup> sterile skin-closure strips can be used to close minor lacerations away from the lid margin if the athlete cannot be sent to a hospital.

If the margin of the eyelid is cut, the injury is much more serious. All patients suffering lacerations that involve the upper or lower lid margin should be referred to an ophthalmologist. These lacerations may cut through the tarsal plate and lead to a notched lid, which can be disfiguring.<sup>15</sup> An ophthalmologist should be consulted if the laceration involves the lid margin, the medial aspect of the lid (canalicular damage may be present), the upper eyelid (damage to underlying structures such as the levator palpebrae superioris muscle), and the upper and lower eyelids, or when the injury involves excessive tissue loss or the full lid thickness.<sup>6</sup>

If the laceration involves the lid margin and globe, do not use sterile skin-closure strips and do not patch the eye. Tape a hard, protective shield over the eye and transport the patient to an ophthalmologist immediately.<sup>11</sup>

#### *Orbital wall fractures*

Blunt trauma often causes orbital wall fractures as a result of the transmission of compressive force.<sup>18</sup> Fractures usually involve the thinnest bones of the orbit—the medial wall and floor.<sup>6</sup> The floor of the orbit is pushed into the maxillary sinus, and as a result mobility of the eye is restricted. Pain at the impact site, double vision, and eyelid swelling after nose blowing are typical symptoms. Clinical signs other than restricted eye

movement include subcutaneous empyema, enophthalmos, and hypesthesia.<sup>6</sup> Fractures may also be detected by a difference in the gap between the limbus and lower lid on the affected side with upward gazing.<sup>17</sup>

If an orbital fracture is suspected, immediate referral to an ophthalmologist is essential.

#### *Traumatic iritis*

An inflammation of the iris or ciliary body with pain, photophobia, and tearing is classic iritis. Although trauma is the most common cause, other causes include herpes simplex or zoster, Reiter's syndrome, arthritic psoriasis, and ankylosing spondylitis.<sup>13</sup>

The pupil can become miotic and may react poorly to light. Usually a topical agent such as a cycloplegic is used.<sup>6</sup> This, of course, is done by a medical physician, so referral is necessary when either traumatic or nontraumatic iritis is suspected.

#### *Conjunctivitis*

"Pink eye" and "red eye" are terms used to describe conjunctivitis. Because of the proximity of athletes and the fact that they can be exposed to many different irritants, conjunctivitis is a common eye condition encountered by a health care practitioner who is working with athletic teams. Conjunctivitis is an inflammation in which conjunctival blood vessels become congested. Three varieties exist: viral, bacterial, and allergic. Most cases are self-limiting, but recognizing the problem and taking a history are of utmost importance.

Viral conjunctivitis presents with preauricular lymph node swelling; noticed on the palpebral conjunctiva is mucous debris, a watery discharge, or both. The athlete normally complains of burning, itching, and tearing. Transmission is usually from direct contact. Therapy involves the treatment of symptoms while the virus runs its course. Cold compresses may be applied to the periocular area, and artificial tears may be used. Have the athlete avoid close physical contact with others.<sup>13</sup>

Bacterial conjunctivitis is similar to viral conjunctivitis, except that the discharge is purulent instead of watery and mucoid.<sup>13</sup> Cultures are traditionally taken, and broad-spectrum topical antibiotics should be used.<sup>13</sup> Cold compresses are also useful.

Allergic conjunctivitis is usually identified by the seasonal nature and a history of bilateral itching. A watery discharge is usually apparent, and the conjunctiva and lids may become edematous.<sup>13</sup> Treatment includes avoidance of the allergen and the use of cold compresses and artificial tears. A medical physician may prescribe topical antihistamines.

#### **Recommendations for Referrals**

Referrals may be made to either an ophthalmologist or a hos-

pital setting when eye injuries are encountered. Most patients with eye injuries should be referred to an ophthalmologist, either on an urgent basis or follow-up.<sup>14</sup> I recommend making a referral to an ophthalmologist in the following situations: if there is blurred vision that persists or persistent blinking; if retinal detachment is suspected, with symptoms such as partial or complete loss of the visual field in conjunction with flashing lights or floaters; and if there is sharp stabbing or throbbing pain and swelling of an eye.<sup>14</sup> A referral should be made if there are signs and symptoms of possible structural damage to the orbit or eye muscle entrapment, such as double vision or one eye moving less than the other. A visible foreign body or the sensation of a foreign body should also prompt a referral.

Other recommendations for an ophthalmologic referral include damage to the eyelid, such as a cut or tear, or a lid with abnormal function, as well as cuts, scratches, or punctures. An abnormally shaped pupil or pupils of unequal size also warrants referral. Finally, if hyphema or subconjunctival hemorrhage is seen, refer because of the possibility of more severe trauma.<sup>14</sup>

## CONCLUSION

When the doctor of chiropractic is working with athletes, whether as a sideline doctor or an adjunct to the health care team, he or she must be aware of the many aspects of sports-related injuries. This includes a broad understanding of the different types of eye problems that may be encountered. The information presented here is not all-encompassing. It is important to gather as much information as possible on recognizing and treating eye injuries. Doctors of chiropractic must understand their role as a team physician or consulting member and be able to bridge the gaps between our profession and that of other allied health care professionals. Meeting an ophthalmologist is important if one is going to work with athletes and athletic teams. The doctor of chiropractic has a responsibility to assess and treat an injured athlete properly, and if needed refer the patient to other qualified professionals.

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