ASSOCIATION OF RINGSIDE PHYSICIANS

EYE CONDITIONS: POSITION STATEMENT OF THE ASSOCIATION OF RINGSIDE PHYSICIANS

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ABSTRACT AND POSITION STATEMENT

Key Concepts and Recommendations

An annual dilated eye exam should be mandatory for combat sport athletes in sports involving strikes to the head. Absolute monocular vision should be a contraindication to participation in striking sports. Conditions that should prompt a discussion and shared decision making about possible disqualification from combat sports that involve strikes to the head include functional monocular vision (corrected vision worse than 20/60 in either eye, uncorrected vision worse than 20/200 in either eye, or

myopia of 3.50 diopters or worse in either eye), history of open globe injury, history of retinal detachment, history of lens dislocation, and uncontrolled major ocular disease that has not been cleared by an ophthalmologist (uncontrolled glaucoma, macular abnormalities, etc.). Signed informed consent and acknowledgment of risk of visual loss should be done if clearance is granted despite the presence of the above conditions.

Immediate pre-competition ocular exam should include a brief penlight exam assessing for anisocoria and any visible ocular or periocular injury. Recommended equipment at ringside should include, at a minimum, a direct ophthalmoscope, penlight, eye shield, and cotton-tipped swabs. Optional items to consider for post-fight evaluation and treatment include suture supplies, cobalt blue light, fluorescein dye, anesthetic eye drops, Rosenbaum pocket visual acuity card, sterile saline or balanced salt solution, loupes or magnifying glass(es), diagnostic ultrasound, and tonopen.

Signs and symptoms noted on post-fight examination that require further evaluation and clearance from an ophthalmologist prior to returning to combat sport participation include hyphema, suspected retrobulbar hematoma, suspected retinal injury, 360 degree subconjunctival hemorrhage, proptosis or enophthalmos, irregularly shaped pupil, severe corneal abrasion resulting in diminished visual acuity or severe pain, traumatic iritis causing miosis or mydriasis that does not resolve within one hour, diminished visual acuity, halos around lights, deep eye pain with eye movement, photophobia, diplopia, light flashes or new floaters. Lacerations that involve lid margins, tarsal plates, levator palpebrae, lacrimal duct or sac, the conjunctival surface of the lid, those within 6-8mm of the medial canthus, and those with associated ptosis or orbital fat prolapse should also be referred to an ophthalmologist for specialized repair.

The ringside physician should be prepared to do basic first aid measures for a suspected globe rupture including application of an eye shield without applying any external pressure to the globe.

Eye injury prevention measures should include curved-finger MMA glove design to reduce eye pokes; use of headgear while sparring to prevent lacerations; and avoiding hard contact lens wear during any sparring or competition.

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PREAMBLE: DEVELOPMENT OF THIS STATEMENT

The Association of Ringside Physicians (ARP) is an international, non-profit organization dedicated to the health and safety of the combat sport athlete. This Position Statement represents a collaborative effort among the ARP board of directors, emeritus board, and subject matter experts from the membership. It seeks to highlight issues in eye conditions unique to combat sports athletes.

An extensive literature search including, but not restricted to, Pubmed, Cochrane Reviews and non-indexed peer-reviewed articles published in online medical journals was performed to determine the epidemiology, diagnosis, and ringside management of sport-related ocular trauma (OT) and associated eye conditions, as well as ways to reduce risk of injury. After review, discussion, and revision, the manuscript was formally approved by the authors and the entire board of directors as the official Position Statement of the ARP.

INTRODUCTION

Referees and ringside physicians are responsible for mitigating and managing the considerable injury burden that exists in combat sports. It's unclear whether continued participation in combat sports increases the risk of vision loss in athletes, however, eye injuries pose a significant risk of chronic morbidity.

Management of eye injuries within combat sports varies as there are no established guidelines governing referrals and activity restrictions after sustaining injuries [1]. In addition, medical suspension times can vary between sports, with boxers having longer suspension times than MMA competitors in a Canadian study [2].

Preventing eye and periocular injuries in combat sports is difficult due to rules that preclude the use of eye protection. Because of the prevalence of these injuries among combat sport athletes, as well as the nature of the sports themselves, identifying and appropriately managing at-risk fighters is crucial to preventing long-term ocular morbidity. Although there are eye conditions that the ringside physician can manage before, during or after the bout, many of these ocular conditions require clearance and definitive treatment from an eye specialist. The goal of this ARP position statement is to help guide the ringside physician and combat sports commissions in the absence of existing guidelines regarding the identification and management of eye injuries in combat sports athletes.

INJURY EPIDEMIOLOGY

The literature on the epidemiology of eye injuries among MMA participants is limited, likely due to relatively recent widespread acceptance of MMA within the last 15 years. However, there are multiple studies within the boxing literature that have analyzed the epidemiology of ocular pathology. According to data from the Nevada Athletic Commission, injuries occur at a rate of 36 per 100 boxing competitions and

53 per 100 mixed martial arts (MMA) competitions. Of the 1539 total injuries noted in boxing matches in Nevada between Jan 2000-May 2020, 47.6% were eye injuries and 25.6% of MMA injuries involved the eyes and periocular structures. Orbital wall fractures constituted 17.6% of all ocular injuries among MMA contestants, compared to 3.1% of boxers, a statistically significant difference. Boxers had 27% higher odds of sustaining eye injuries compared to MMA participants, with eyelid and eyebrow lacerations constituting 82% of eye trauma suffered [3].

In a study assessing ophthalmologic examinations of all boxers registered with the Italian Boxing Federation, there was a 41% prevalence of any ocular pathology [4]. Around 6% of boxers had a "vision threatening injury", defined by the authors as lesions impacting the lens, macula, peripheral retina, and angle [4]. The authors included lattice degeneration in this category, a particular type of peripheral retinal degeneration that is associated with retinal detachment [5]. Overall, peripheral retinal degeneration was found in 60% of boxers in a small Italian study [6]. Glaucoma was also suspected at a higher rate among boxers (3.3% vs. 0.3%), and more ophthalmology referrals were placed for boxing compared to MMA [3].

Anterior Segment Injuries

The anterior segment of the eyeball extends from the cornea to the anterior surface of the lens and includes the cornea, conjunctiva, iris, ciliary body and lens. The traumatic conditions of the anterior segment include corneal abrasion, corneal laceration, conjunctival laceration, subconjunctival hemorrhage (SCH), hyphema, traumatic iritis, iridodialysis, cyclodialysis, angle recession, glaucoma, traumatic cataracts and lens dislocation.

Corneal Injuries

One of the most frequent injuries of the anterior segment of the eye is corneal abrasion with loss of corneal epithelium. Around 5% of boxers examined in a small Italian study were found to have prior or active corneal abrasions [6]. Leukomas, or fibrotic changes of the cornea, were found in almost 10 percent of boxers and noted to be more prevalent among ex-professional boxers [6].

Symptoms of corneal abrasions include pain, foreign body sensation, tearing, blurred vision, and photophobia. Diagnosis can be made with the use of a cobalt blue light source and fluorescein staining. Anesthetic eye drops such as tetracaine and proparacaine can be administered for both diagnostic and therapeutic reasons. One double-blind RCT in 2014 demonstrated no delayed healing when using tetracaine for the first 24 hours after developing a corneal abrasion [7]. The American College of Emergency Physicians states that it is generally safe to prescribe topical anesthetics in small quantities (1.5-2.0mL) for up to 24 hours of acute treatment of simple abrasions [8]. The abrasion can be treated with antibiotic ointment in order to prevent secondary bacterial infection and provide a lubricating barrier, although research supporting this common practice is limited [9]. Contact lens wearers should refrain from using them and instead use

eyeglasses until the abrasion has healed. Indications for a slit lamp examination with an eye specialist include worsening symptoms after injury, persistent symptoms greater than 4 days later, visual acuity worse than 20/40, presence of a hyphema, corneal infiltrate or ulceration, or the abrasion grows in size after injury [10].

Conjunctiva Injuries

The conjunctiva is commonly injured with ocular trauma. Pain, redness, SCH, and foreign body sensation are common in patients with conjunctival lacerations or abrasions. Surgical treatment is rarely needed, but patients should be monitored until healing is complete. [11, 12]. SCH's commonly occur in isolation and will typically heal within 7-14 days. Assuming no changes in visual acuity or significant ocular pain, athletes can continue to fight with this injury. While circumferential SCH's have been associated with underlying open globe injuries, all SCH should be carefully evaluated to ensure there are no other signs of an open globe injury prior to clearing the athlete for sport participation, as even a small SCH can cause more serious underlying pathology.

Hyphema

Hyphema is a collection of blood in the anterior chamber secondary to a tear of the iris, ciliary body or trabecular meshwork and their associated vasculature. Signs and symptoms include increased intraocular pressure (IOP), anisocoria, headache, pain, blurred vision, and photophobia. Although a large hyphema can be seen with pen-light examination alone, a small collection of blood (microhyphema) may require a slit lamp exam to be seen. A complete ocular assessment by an ophthalmologist is recommended for all hyphemas. Sickle cell status, use of blood thinners and bleeding disorders should be documented. The height of the hyphema in millimeters from the inferior corneal limbus and the IOP should be measured as up to a third of patients will have elevated intraocular pressure. Advanced imaging such as ultrasonography, CT scan of the orbits, or optical coherence tomography (OCT) may be considered. Topical ophthalmic steroids may be used to reduce associated inflammation and cycloplegic agents can decrease photophobia, pain, and promote healing by minimizing the movement of damaged iris vessels. If the IOP is elevated, topical aqueous suppressants such as beta-blockers and alpha-agonists may be used. If topical medications fail to control the IOP, systemic drugs such as carbonic anhydrase inhibitors (e.g. acetazolamide) and hyperosmotic agents (e.g. mannitol) may be required. Surgical evacuation may be required when medical treatment has been unsuccessful. The patient should be evaluated daily until resolution [11, 12, 13].

Cataracts and Len Dislocation

Blunt ocular trauma can lead to the development of traumatic cataracts immediately after the trauma or years later. Cataracts were observed in almost 2% of 956 examined boxers, compared to none of the age-matched controls [4]. A traumatic cataract typically requires surgical management, which may be

more complex than surgery for age-related cataracts [14]. When a traumatic cataract is identified, it is important to perform a thorough eye exam as other intraocular structures may also be damaged.

Among boxers, lens dislocation and/or disinsertion was identified in 7% of ocular examinations performed and was the most common lesion affecting this portion of the eye [4]. Lens dislocations may be tolerated for years; however, the presence of coexisting conditions or symptoms may warrant surgical exploration [15]. If a lens dislocation is identified by history or exam, this should prompt restriction from participation in combat sports until cleared by an eye expert since this condition typically requires surgical correction.

Iris and Ciliary Body Injuries

Blunt trauma may produce anterior uveitis (aka traumatic iritis) or iridocyclitis if the ciliary body is also involved. Symptoms usually develop within 1-3 days after the trauma and can include photophobia, tearing, decreased visual acuity, floaters and pain. An ocular exam including visual acuity, IOP measurement, dilated fundus examination, and slit lamp exam confirm the diagnosis. Anterior chamber cell and flare (white blood cells and proteinaceous fluid) may be present on slit lamp exam. Treatment is typically with topical medications including cycloplegics, steroids and medications to control the IOP. The patient should follow up within one week for reassessment [11, 12, 16].

Injuries to the iris and ciliary body include tears of the iris sphincter muscle, iridodialysis (detachment of the iris root from its insertion site at the ciliary body) and cyclodialysis (detachment of the ciliary muscle from the scleral spur). Signs and symptoms can include monocular diplopia, glare, photophobia, hyphema, angle recession, mydriasis, corectopia, increased or decreased IOP, peripheral anterior synechiae or rarely aniridia. Patients with iris trauma should be evaluated by an ophthalmologist. [11, 12, 13].

Although rare, another phenomenon to consider in fighters with an eye poke or blunt eye injury includes traumatic miosis with or without ptosis/Horner's syndrome and traumatic mydriasis. There are limited case reports detailing trauma-induced miosis and mydriasis in rugby and football respectively. Both cases occurred in the absence of head trauma and spontaneously resolved with time [17, 18]. In the absence of head trauma, athletes with traumatic miosis and mydriasis should be monitored for 45-60 minutes and if symptoms do not resolve, consider referring the athlete to the hospital for further evaluation of potentially serious underlying pathology.

Glaucoma

Glaucoma is a group of eye conditions that damages the optic nerve. This damage is often caused by an abnormally high intraocular pressure but can also be seen with normal or even low pressure. Glaucoma is the most common complication of blunt ocular trauma, especially in those patients with iris and ciliary

body injuries such as angle recession. Ringside assessment is limited, but traumatic glaucoma should be considered in the differential diagnosis when a fighter presents with photophobia, hyphema, blurry vision, ocular pain, increased IOP, and ocular swelling. The management of traumatic glaucoma requires prompt evaluation and intervention by an ophthalmologist and highlights the importance of annual eye exams among combat athletes. [12]. Glaucoma is currently considered a disqualifying eye condition in various boxing and MMA governing bodies; however, the ARP recommends that athletes with well-controlled glaucoma be allowed to participate in combat sports [19, 20].

Posterior Segment Injuries

The posterior segment of the eye is composed of the tissue from just behind the lens to the posterior sclera and includes the vitreous, the retina, the choroid, and the optic nerve head [21]. Traumatic conditions of the posterior segment include posterior vitreous detachment, vitreous base avulsion, vitreous hemorrhage, commotio retinae, retinal tears, retinal detachment, macular hole, retinal hemorrhage, choroidal rupture, sclopetaria, scleral rupture, and optic nerve avulsion [22, 23, 24].

Vitreous Injuries

Under normal conditions, the vitreous membrane is adherent to the retina and has a gel-like consistency. In blunt ocular trauma (OT), the globe suffers an anteroposterior compression and rapid expansion. This can damage the retina, choroidal vessels, vitreous membrane or lead to a disconnection between the retina and the vitreous.

Vitreous base avulsion typically occurs after blunt OT and can lead to retinal tear or vitreous hemorrhage, thereby increasing the risk of a retinal detachment [25, 26]. Posterior vitreous detachment (PVD) is a common condition that occurs in the aging eye but can also occur after trauma. PVD is asymptomatic in most cases, but it can produce floaters. A PVD can be associated with retinal tears and even detachments, especially when accompanied by vitreous hemorrhage. Symptoms include floaters, flashes of lights, and loss of visual field. Diagnosis is made by a dilated fundoscopic exam.

Athletes should be urgently examined by an eye doctor when floaters are combined with flashing lights (photopsias) and decreased visual field. Surgery is typically unnecessary for isolated PVD; however, the patient should undergo a fundoscopic exam and be reassessed in 2-4 weeks [27]. For isolated vitreous hemorrhage, treatment is typically conservative with follow-up exams every 3-4 weeks. Vitrectomy is reserved for non-clearing vitreous hemorrhage. [26, 28].

Retinal Injuries

The primary retinal injuries of concern in combat sports are commotio retinae, retinal tears, retinal detachments, macular holes, and associated hemorrhages. The most common retinal injuries among boxers

are retinal detachment and dialysis, which were found in 13 of 1912 eyes examined [4]. Macular changes were noted in a third of boxers, however, the significance of such changes and their relation to boxing participation is unknown [6].

Commotio retinae is a retinal condition resulting from blunt OT, characterized by retinal whitening and temporary vision loss. The trauma causes a shockwave through the eye that disrupts the outer segments of the photoreceptors and leads to swelling of the retinal layers. The whitening seen in commotio retinae is due to the extracellular edema and possibly intracellular swelling of the retinal cells. Patients often complain of reduced vision, visual field defects and photopsias. Diagnosis is typically made based on the history of trauma and the characteristic appearance of the retina on fundus exam. Optical coherence tomography can show the extent of retinal edema and disruption of the retinal layers and fluorescein angiography (FA) may be used to assess the integrity of the retinal blood vessels and the retinal pigment epithelium. In many cases, commotio retinae resolves spontaneously within weeks to months, with gradual improvement in vision; however, in some cases there can be permanent damage to the photoreceptors leading to persistent visual deficits [26].

There are different types of retinal tears (i.e. retinal dialysis or giant retinal tears), and they can be associated with retinal detachment. A retinal tear is a hole in the retinal layer, whereas a retinal detachment is a disconnection between the retina and the underlying retinal pigment epithelium. Retinal dialysis is a specific type of retinal tear that is oriented circumferentially and located either anterior to the ora serrata within the ciliary epithelium or posterior to the ora serrata within the retina. The symptoms of a retinal tear include photopsias, floaters and loss of visual field, although in some cases the patient may be asymptomatic. Signs and symptoms of retinal tears might appear immediately, but can appear weeks, months or even years after the initial injury [26, 29]. Retinal tears can be treated with laser retinopexy, cryopexy or pneumatic retinopexy [30]. Retinal detachments have similar symptoms to retinal tears and may result in permanent vision loss if not properly managed. Treatment of a retinal detachment often requires surgery; thus, prompt recognition and referral is critical. [31].

A macular hole occurs through direct mechanical disruption, vitreous traction, retinal edema and hemorrhage, choroidal rupture, and secondary complications such as retinal detachment and epiretinal membrane formation. The most common symptoms are metamorphopsia (distortion of straight lines) and decreased central visual acuity (20/30-20/400). Diagnosis is made by a fundoscopic exam and OCT. Macular holes without any other injuries can spontaneously resolve in up to 50% in children and 40% of young adults in the first two months. In many cases, surgery is required [32].

Posterior Segment Hemorrhage

Vitreous and retinal hemorrhages should be promptly assessed, and concomitant injuries should be ruled out. Posterior segment bleeding due to blunt trauma can often be conservatively managed only with observation while the blood resorbs [33]. Clearance for combat sport participation should be determined on a case-by-case basis with the athlete's treating eye specialist.

Choroidal Injuries

Choroidal rupture is a serious eye condition usually caused by blunt trauma, leading to a break in the choroidal layer underneath the retina. Symptoms include decreased vision, visual field defects, and distorted vision. Diagnosis is made through clinical examination, OCT, and fluorescein angiography. Treatment is focused on managing complications such as choroidal neovascularization with anti-VEGF injections, laser therapy, or surgery. The prognosis varies depending on the extent and location of the rupture and the timely management of complications. [29, 34]. Clearance for combat sport participation should be determined on a case-by-case basis with the athlete's treating eye specialist.

Scleral Injuries

Scleral rupture (scleral tear) is a severe eye injury caused by blunt or penetrating trauma. Symptoms may include severe pain, decreased vision, and visible deformity of the eye. Diagnosis is made by ophthalmic examination and imaging. Athletes with a suspected scleral rupture should be disqualified from competition immediately, treated on site with a protective eye shield, and referred emergently to an ophthalmologist. Treatment requires immediate surgical repair. The prognosis varies based on the injury's severity and the timeliness of treatment. [26, 29].

Optic Nerve Injuries

Optic nerve injuries following blunt trauma can result in significant visual impairment. Diagnosis is made by clinical examination and imaging, and treatment options include observation, corticosteroids, and (rarely) surgical decompression. The prognosis varies based on the severity of the injury and the timeliness of intervention [26]. Clearance for combat sport participation should be determined on a case-by-case basis with the athlete's treating eye specialist.

Retrobulbar hematoma

Retrobulbar hematomas are a rare, but serious condition characterized by the accumulation of blood behind the eyeball, leading to increased intraocular pressure with potential optic nerve compression, resulting in permanent blindness if not promptly treated within 90 minutes. Fortunately, there are no case reports of this condition occurring in sports at the time of this publication, although the mechanism makes

it entirely possible. Symptoms may include pain, proptosis, decreased vision, and restricted eye movements. Decompression is achieved by canthotomy and cantholysis, which is considered a generally safe procedure to perform, if trained to do it, as there are no major neurovascular structures in the lateral canthus that cannot be easily fixed by an ophthalmologist later. The hardest part of this procedure is making the decision to perform it. Supplies needed to perform this procedure include Stevens tenotomy scissors, toothed forceps, a 3cc syringe with a 27G needle, lidocaine with epinephrine, and gauze. Close monitoring and follow-up are crucial to ensure recovery and prevent complications. physicians covering events in rural areas greater than 90 minutes from a hospital can consider seeking additional training in how to perform a lateral canthotomy and cantholysis. Overall, the procedure has a low risk of procedural complications and retrobulbar hematomas, while rare, have an extremely high risk of permanent blindness if no interventions are done.

Referral to an ophthalmologist

In summary, traumatic eye injuries lead to a variety of ophthalmic pathologies based upon where the injury occurs, but the symptoms are often similar. The most severe complications may require surgery to avoid permanent vision loss. Table 2 summarizes the conditions that require referral to an ophthalmologist for definitive assessment and management.

MEDICAL AND ADMINISTRATIVE RECOMMENDATIONS FOR EYE CONDITIONS

Pre-Fight Examination and Clearance Recommendations

Pre-participation eye exam

The eye exam component of the pre-participation evaluation is essential to ensuring athlete safety and reducing risk of potential injury. A comprehensive eye exam by an optometrist or ophthalmologist should be mandatory for all athletes in sports involving head strikes to screen for the conditions outlined in Table 1. This exam should be conducted annually and include a dilated eye exam.

Critical components of the pre-fight exam performed by the ringside physician just prior to the fight include a penlight exam assessing for anisocoria and visible signs of ocular or periocular injury. Periorbital palpation for orbital rim step-off and subcutaneous crepitus should be done to detect inadequately treated injuries [35]. Formal testing of visual acuity on the day of the fight is not required, but it is recommended that the ringside physician asks the athlete if there has been any change in their visual acuity since their last comprehensive eye examination. If visual acuity is deemed necessary, it should be done prior to a penlight examination because the latter can alter the visual acuity [35, 36].

Ringside Eye Kit

At a minimum, the ringside eye kit should include a direct ophthalmoscope, a penlight, an eye shield, and cotton-tipped swabs. Additional items to consider include a cobalt blue light, fluorescein dye, anesthetic eye drops, a Rosenbaum pocket visual acuity card, loupes or magnifying glass(es), sterile saline or balanced salt solution, a portable ultrasound, tonopen, suture supplies, and supplies to perform a lateral canthotomy and cantholysis if the ringside physician is trained to diagnose a retrobulbar hematoma and perform the procedure. and the venue is over 60 minutes from an emergency department. Supplies needed for this procedure include 2% lidocaine with epinephrine, 30G needle, syringe, Adson forceps, and Stephens tenotomy scissors [36].

Disqualifying Conditions Recommendations

Athletes with eye conditions outlined in Table 1 should be counseled on the risk of participation in striking sports, in which the risk of catastrophic eye injury is elevated. Disqualifications for these conditions is not mandatory but should be discussed and considered. Given the rarity of catastrophic eye injuries in striking sports, shared decision making for clearance is warranted. This should involve a discussion with the athletes, their coaches (or parents), licensing/sanctioning organization physicians and administrators, and ophthalmologist.

Ocular Injury Prevention Recommendations

It has been estimated that there are roughly 30,000 annual ED visits in the US for sports-related eye injuries [37]. Sports-related ocular trauma affects the young at a disproportionately higher rate and can have lifelong consequences. The American Academy of Pediatricians and the American Academy of Ophthalmology published a joint policy statement recommending the use of eye protection in sport noting that the majority of ocular trauma in sport occurs in those younger than 25 years of age. [38]. Of note, boxing was considered to be one of the high-risk sports for eye injury in “unprotected” athletes. The AAP/AAO policy, along with the New York Athletic Commission, recommends that all functional one-eyed athletes (visual acuity worse than 20/40) not participate in boxing or full-contact martial arts since protective eyewear is not possible or permitted. [20, 38]. The ARP, along with most professional and amateur combat sport governing bodies, have adopted a less restrictive threshold than the 20/40 definition of a functionally monocular athlete and recommend a minimum of 20/60 best corrected vision [19]. This is due to the nature of combat sports and the increased risk tolerance that is commonplace. When considering exceptions to the recommendations, it is important to consider the discipline of combat sport the athlete is participating in. For example, a 20/70 acuity in a grappling sport athlete potentially has a lower risk of eye injury than it would in a striking sport athlete. There are, however, a few other safety measures to be considered to reduce risk of ocular injury.

A UFC Vegas 21 MMA main event ended in a no contest when one fighter sustained an eye poke injury that left him unable to continue fighting. Afterwards there was increased attention to the types of

gloves used in MMA. Preliminary data presented at the Association of Ringside Physicians' annual conference in 2022 looked at eye poke incidence rate between the 3 most common glove types (UFC, Bellator, and PFL) and found eye poke incidence with Bellator gloves was statistically significantly lower than both UFC and PFL gloves at the time ($p=0.3$ and $p=0.2$ respectively) [39]. In April 2024, the UFC announced new fight gloves that are designed to mitigate eye pokes. Due to limited available data, it is safe to assume that eye pokes will continue to occur if fingers are exposed, and further research should be done on glove types that will further reduce the risk of injury.

With regards to defense, it is recommended that athletes maximize the use of headguards while sparring to reduce the incidence of periocular lacerations [40]. One 2017 study compared the laceration rate in elite male amateur boxers and found a 430% increase in lacerations without headguards compared to wearing headguards in competition [41]. Due to the absence of research comparing male and female combat sport athletes in the use of headguards, the ARP does recommend that headguard rules in different sport governing bodies be equalized between men and women [40].

USA Boxing does not allow athletes, judges, or referees to wear glasses, but does authorize referees to wear polycarbonate sport goggles in the ring [19]. We found no research concerning the safety of soft contact lens use during sport, therefore no recommendations can be made. However, a 2022 study by Hou, et al. evaluated the force needed to induce a corneal abrasion using a porcine eye model. This study found that soft contact lens use increases the average force needed to create a corneal abrasion by more than 5-fold. Although the authors do not recommend wearing soft contact lenses as a preventative safety measure, the study does suggest that those who already wear soft contact lenses may have increased corneal protection [42]. More studies are needed to make a definitive recommendation.

Ringside Ocular Injury Treatment Recommendations

When an athlete sustains an eye injury during competition, it is recommended to give the athlete a few minutes to recover prior to deciding if the contest should be stopped. According to the unified rules of MMA, a fighter is allowed up to five minutes after an eye poke injury to recover and potentially continue the contest if symptoms resolve [43]. The athlete should be provided a wet compress if desired and advised to only apply gentle pressure. The ringside physician should avoid use of a penlight immediately since it can cause pain and more blepharospasm. Once symptoms abate, a more thorough exam can be done. If a penlight exam is necessary, use of low-intensity tangential illumination is recommended. Table 2 lists conditions requiring urgent referral to an ophthalmologist for evaluation, treatment, and clearance for return to striking sports. Although some ocular injuries may be within the scope of a ringside physician to manage, most fight-related ocular injuries will require further evaluation and management by an ophthalmologist and/or optometrist.

Corneal abrasions

Corneal abrasions are the most common ocular injury in combat sports. Most are easily diagnosed and managed by the ringside physician. Treatment typically includes topical NSAIDS and ophthalmic ointment for pain management. A 2021 systematic literature review and meta-analysis looked at 33 studies (31 randomized controlled trials [RCTs], two cohort studies) and found that topical NSAIDS reduced corneal pain in the first 48 hours. The authors concluded, however, that "the existing evidence was insufficient to support or refute the use of topical anesthetics, cycloplegics, steroids, or BCL (bandage contact lens) for pain control in corneal abrasions" [44]. While not contraindicated, the literature remains unclear as to whether topical antibiotics prevent secondary bacterial infections in corneal abrasions [45]. In addition, a 2016 Cochrane Review of trials placing an eye patch for corneal abrasions suggests that treating simple corneal abrasions with a patch may not improve healing or reduce pain. [46]. Also, contact lens users should be counseled to not wear contact lens while recovering from a corneal abrasion in order to prevent secondary infections. High risk corneal abrasions that should be referred to an ophthalmologist urgently include those with worsening symptoms after injury, persistent symptoms greater than 4 days later, visual acuity worse than 20/40, presence of a hyphema, corneal infiltrate or ulceration, or the abrasion grows in size after injury [10].

Lacerations around the eye

Repair of lacerations around the eye will largely be dependent on the skillset of the ringside physician. Specialty referral to an oculoplastic surgeon is recommended for lacerations involving the lid margin and the lacrimal drainage system as well as lacerations that are associated with ptosis, orbital fat prolapse, the tarsal plate, or levator palpebrae. The time to primary closure is easiest within 12-36 hours. However, lacerations >36 hours are not difficult to manage so urgent transport to the Emergency Department is usually not necessary. In elite amateur boxing tournaments, subcuticular sutures, glue, strips, or a combination of these are required if a boxer is to continue fighting in the tournament according to the AIBA, World Boxing, and USA Boxing [47, 48].

Suspected globe rupture

If a globe rupture is suspected, it is critical that no additional pressure is applied externally to the eye. Physical findings suggestive of a potential globe rupture include, but are not limited to, a deflated appearance of the eye, a 360-degree subconjunctival hemorrhage, irregularly shaped pupil, acutely decreased visual acuity, deep ocular pain, and prolapse of intraocular contents. The ringside physician should carefully cover the affected eye with a vaulted eye shield or other vaulted hard barrier and transport the patient to the Emergency Department immediately. Do not remove any foreign bodies, if present. Avoid any analgesics or fluorescein in the eye since these medications can be toxic to the retina and other intraocular contents [35]. The ARP recommends that any athlete with a history of an open globe rupture should be disqualified from participation in combat sports.

Retrobulbar hematoma

If trained, the ringside physician may perform a lateral canthotomy and cantholysis if a retrobulbar hematoma is suspected to prevent permanent loss of vision. This should be done as soon as reasonably possible and immediately followed by transport to the local Emergency Department [49]. Permanent visual loss can occur 90 minutes of injury, so urgent treatment is paramount. If transport time to a hospital with a physician trained to perform lateral canthotomy is greater than 90 minutes, consideration should be given to perform the procedure on-site if the ringside physician is trained and has the appropriate equipment. For any athlete with a history of retrobulbar hematoma, clearance from an ophthalmologist is recommended prior to participation in striking combat sports.

QUALIFYING STATEMENT

These guidelines are recommendations to assist ringside physicians, combat sports athletes, trainers, promoters, sanctioning bodies, governmental bodies, and others in making decisions and setting policy. These recommendations may be adopted, modified, or rejected according to clinical needs and constraints and are not intended to replace local commission laws, regulations, or policies already in place. In addition, the guidelines developed by the ARP are not intended as standards or absolute requirements, and their use cannot guarantee any specific outcome. Guidelines are subject to revision as warranted by the evolution of medical knowledge, technology, and practice. They provide the basic recommendations that are supported by synthesis and analysis of the current literature, expert and practitioner opinion, commentary, and clinical feasibility.

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DISCLOSURE STATEMENT

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Table 1: Potentially Disqualifying Eye Conditions
Absolute monocular vision (disqualifying)
Use of hard contact lenses (remove prior to fight or use soft lenses)
Uncorrected vision worse than 20/200 in either eye
Corrected vision worse than 20/60 in either eye
Myopia of 3.50 diopters or worse in either eye
History of globe rupture
History of retinal detachment
History of lens dislocation
Presence of any major uncontrolled ocular disease (i.e. uncontrolled glaucoma, major lens abnormalities, macular abnormalities, dangerous peripheral retinal lesions, commotio retinae, etc.)

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