OCULAR DISORDERS IN SPORT

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DISCLOSURES

- None
OBJECTIVES

- Epidemiology
- Eye tray
- Physical Exam
- When to refer
- Review common presentations and treatments of ocular injuries and conditions in sport
- Prevention and the functional one-eyed athlete
- Vision rehabilitation in concussion
Epidemiology of eye injuries in sport

- 1/3 of eye injuries leading to blindness are sport-related
- 100,000 physician visits costing $175 million per year
- 13% of penetrating globe injuries
- 82% from sports without eye protection

## INJURY RISK BY SPORT

### Table 1.
Selected sports by risk category.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Sport</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>BB and paintball</td>
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<tr>
<td></td>
<td>Basketball</td>
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<tr>
<td></td>
<td>Baseball</td>
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<tr>
<td></td>
<td>Softball</td>
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<td></td>
<td>Ice hockey</td>
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<tr>
<td>Moderate</td>
<td>Tennis</td>
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<td></td>
<td>Soccer</td>
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<td></td>
<td>Volleyball</td>
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<tr>
<td></td>
<td>Football</td>
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<tr>
<td></td>
<td>Fishing</td>
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<tr>
<td></td>
<td>Golf</td>
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<tr>
<td>Low</td>
<td>Swimming</td>
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<tr>
<td></td>
<td>Snow skiing</td>
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<tr>
<td></td>
<td>Water skiing</td>
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<tr>
<td></td>
<td>Bicycle</td>
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<tr>
<td></td>
<td>Snowboarding</td>
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<tr>
<td>Eye-safe</td>
<td>Exercise (jogging, running, walking, aerobics)</td>
</tr>
</tbody>
</table>

SIDELINE “EYE TRAY”

- ophthalmoscope
- local anesthetic drops
- fluorescein strips
- cotton swabs
- eye wash
- vision chart
- penlight with cobalt blue filter
- magnifying glass
- antibiotic drops/ointment
- eye shield
PHYSICAL EXAM

- Visual acuity (portable chart or smartphone app) and visual fields
- Pupil size, reactivity, shape, and extra-ocular muscles
- Swinging flashlight test
  - Afferent pupillary defect is present when the eye with the deficit paradoxically dilates when exposed to the light source (Marcus Gunn)
  - Could indicate an optic nerve or retinal injury
PHYSICAL EXAM

- efferent defect loses both direct and consensual constrictions, with both present in the unaffected eye
  - seen with anisocoria (unequal pupils) and could indicate a third nerve palsy, Horner syndrome, or pupillary muscle
- penlight exam to evaluate the anterior chamber for relative depth and the eyelids for lacerations
- Conjunctiva, cornea, and facial and maxillary bones
- funduscopic examination to evaluate the red reflex
WHEN TO REFER

- sudden vision loss or visual field loss
- marked pain with movement
- marked photophobia
- flashes of light
- irregular pupil or pupillary response
- diplopia
- hyphema
- proptosis
- suspected globe perforation
  - extensive subconjunctival hemorrhage
- Halos around lights (corneal edema)
COMMON CONDITIONS
CORNEAL ABRASION

▸ usually traumatic but can occur spontaneously, as in the athlete with dry eyes

▸ traumatic insult to the eye with associated:
  ▸ irritation or a sharp pain, tearing, photophobia, or foreign body sensation

▸ will stain with fluorescein dye

Am Fam Physician 2003;67:1481-8,1494-6
TREATMENT

- systematic reviews and Cochrane meta-analysis have shown that treatment with a combination of drops is most effective

- topical antibiotic and cycloplegics (cyclopentalate) leads to improved healing

- Conversely, eye patching does not improve healing rates or pain 1 d after injury and can lead to a loss of binocular vision
FOREIGN BODY

- similar feeling to corneal abrasion
  - high index of suspicion
- Commonly missed under the upper lid
  - thorough exam including inversion of the upper and lower lid
- Foreign bodies should be irrigated
- moistened cotton swab or tip of an 18-gauge needle can be used with caution, taking care to not damage the cornea
ORBITAL FLOOR FRACTURES

- Orbital floor fractures were 17% of all maxillofacial injuries in sports
  - Sports accounting for 21% of all the fractures surveyed
- Signs include periorbital edema, ecchymosis, and painful extraocular movements
- Step off can be seen if the orbital rim is fractured
- Infraorbital nerve injury can cause hypesthesia or dysthesia
- Proptosis or enophthalmos (abnormal protrusion of eyeball) also can be seen
- Limitation of vertical gaze is suggestive of an inferior rectus entrapment

CASE STUDY

- Player came to sideline stating that he was having pain around his right eyebrow, right eye, and blurry vision after getting tackled on punt return
CASE

GAME MANAGEMENT

- Sideline assessment
  - Mild right scleral redness
  - Tenderness along superior orbital rim
  - EOM and VA grossly intact, though patient states that he is having subjective diplopia in the right lower field gaze only
  - Mild blurry vision
CASE

HALFTIME EXAM WITH OPHTHALMOLOGY

- Visual acuity
  - OS: 20/20
  - OD: 20/20
- Cobalt blue penlight with fluorescein stain negative
- EOM grossly in tact on examination, but patient again endorses subjective diplopia in the right lower field gaze only
- Mild superior orbital wall tenderness, but no ecchymosis or swelling
- Minimal swelling, no enophthalmos

So… Go or No Go?
CASE

2ND HALF

- since diplopia only at the end of downward gaze and essentially no other symptoms, player allowed to play in 2nd half
  - he is to report any worsening symptoms
  - taken off punt return duty
- 2nd Half 4 catches, over 70 yards
- no worsening symptoms, blurriness resolved
- Post-game re-check with minimal swelling, still with downward gaze diplopia
- So CT of the orbits obtained that evening
FOLLOW-UP MANAGEMENT

- evaluated by peri-orbital ophthalmology and plastics ENT
- diplopia resolved within 2 days, asymptomatic
  - oral steroid taper
  - fitted with shield that fits outside of mask
  - adjust air compression in helmet
- re-check CT post-season or if increased symptoms
ORBITAL FLOOR FRACTURES

- avoid blowing nose for weeks after injury
- surgery is controversial
  - consider for continued diplopia
  - enophthalmos (2 mm or more)
  - entrapped muscle or tissue
- fracture greater than 50% of the floor
GLOBE RUPTURE

- high velocity trauma
- Lack of appropriate recognition can lead to endophthalmitis
  - intraocular infection that can lead to blindness
- Pain, visual loss, hyphema, anterior chamber depth loss, pupil irregularity, and subconjunctival hemorrhage involving 360 degrees around the cornea are very suspicious for globe rupture
GLOBE RUPTURE

Fig. 4. Scleral rupture: 360-degree subconjunctival hemorrhage with peaked pupil and occult scleral laceration.

Source: Comp Ophthalmol Update © 2007 Comprehensive Ophthalmology Update, LLC
GLOBE RUPTURE

- prompt referral to an ophthalmologist
- eye shield
- manipulation of the eye is deferred to avoid direct pressure and further damage
- Scheduled analgesics and antiemetics should be provided to avoid Valsalva
SYMPATHETIC OPHTHALMIA

- bilateral eye inflammation that threatens blindness in both eyes after an initial penetrating injury to one eye
- seen in globe ruptures and orbital fractures
- typically follows a latent period after initial injury to the eye
- 70% to 80% occur in the first 3 months after injury
  - changes in accommodation strength, photophobia, and tearing
  - Prompt referral is critical
HYPHEMA

- blunt trauma
- acute management
  - shielding the eye
  - bed rest with head of the bed elevated
  - cycloplegic drops, and avoidance of any aspirin-containing products
- prompt ophthalmic referral as re-bleeds may occur
RETROBULBAR HEMORRHAGE

- direct trauma that can lead to compartment syndrome
  - decreased perfusion and ischemia
  - increased pressures for longer than 60 min can lead to permanent visual loss
- clinical diagnosis
  - high index of suspicion should be held for patients with periorbital bruising, visual impairment, proptosis, and pupillary defects in the setting of blunt trauma
RETINAL INJURY

- Traumatic retinal tears are usually caused by blunt trauma.
- Symptoms specific to retinal tears are flashes of lights and floaters, which may not always be present.
- Symptoms of severe pain and dulled vision, in the setting of decreased acuity and trauma, should prompt ophthalmology referral.
- Non-traumatic cases have been reported in endurance athletes.
  - Individuals who are more prone to clotting and thrombosis.
- Risk for retinal detachment is much higher in athletes with severe myopia and with age.
PREVENTION
Epidemiology

- more than 90% of these injuries are preventable
- Getting players to wear eye protection that is not mandated is a challenge
- In 2002, a National Health Interview Survey showed that only 15% of children in organized sports wore appropriate protective eyewear
- Survey of 1,163 squash players in Australia demonstrated that 1,072 of them did not wear eye protection.
  - 51% reported this was due to the eyewear being uncomfortable or restricting their vision.
- Of all those surveyed, 71.7% of them agreed that protective eyewear would significantly reduce their risk of sustaining injury
NCAA

- 2005: mandated women’s lacrosse wear eye protection
  - few small studies show decreased eye injury rates
    - some increase in head/concussion injuries
      - reporting?
- NCAA does not mandate eye protection for any other collegiate sport
THE FUNCTIONAL “ONE-EYED” ATHLETE

- corrected visual acuity of less than 20/40 in the eye with the defect
- all functional one-eyed athletes should wear protection
- should not participate in wrestling, boxing, or full-contact martial arts
  - no available eye protection available
- eye protector must be worn beneath a face mask in sports that require facial protection
  - hockey, football, and lacrosse
- basketball and baseball should wear polycarbonate sports goggles
- Also consider signing informed risk waiver
### Table 2. Return-to-play guidelines.

<table>
<thead>
<tr>
<th>Eye Injury</th>
<th>Return to Play</th>
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<tbody>
<tr>
<td>Corneal abrasion</td>
<td>May return to play if no functional or binocular loss of vision.</td>
</tr>
<tr>
<td>Corneal foreign body</td>
<td>Same guidelines as for corneal abrasion</td>
</tr>
<tr>
<td>Blow-out fracture</td>
<td>Should not return to competition. Should be cleared by an ophthalmologist and ENT prior to return.</td>
</tr>
<tr>
<td>Globe rupture</td>
<td>Should not return to competition. Should be cleared by an ophthalmologist prior to return.</td>
</tr>
<tr>
<td>Hyphema</td>
<td>Should not return to competition. Should be cleared by an ophthalmologist prior to return.</td>
</tr>
<tr>
<td>Retrobulbar hemorrhage</td>
<td>Should not return to competition. Should be cleared by an ophthalmologist prior to return.</td>
</tr>
<tr>
<td>Retinal tear or detachment</td>
<td>Should not return to competition. Should be cleared by an ophthalmologist prior to return.</td>
</tr>
<tr>
<td>Eyelid laceration</td>
<td>May return to play if bleeding controlled and no functional or binocular loss of vision.</td>
</tr>
<tr>
<td>Penetrating eye trauma</td>
<td>Should not return to competition. Should be cleared by an ophthalmologist prior to return.</td>
</tr>
<tr>
<td>Burns and radiation exposure</td>
<td>May return to play if no functional or binocular loss of vision.</td>
</tr>
</tbody>
</table>
VISION FOR CONCUSSION
SPORTS VISION CLINIC

VISION REHAB

- Visual Clarity
- Contrast Sensitivity
- Depth Perception
- Near Far Quickness
- Perception Span
- Reaction Time
- Multiple Object Tracking
- Target Capture
- Eye Hand Coordination
- Go/No Go
SPORTS VISION CLINIC

VISION ASSESSMENT TOOLS

- Right Eye assesses eye movement with:
  - Circular smooth pursuit
  - Horizontal smooth pursuit
  - Vertical smooth pursuit
  - Horizontal saccades
  - Vertical saccades
- Also can perform comprehensive vision screening
THANK YOU