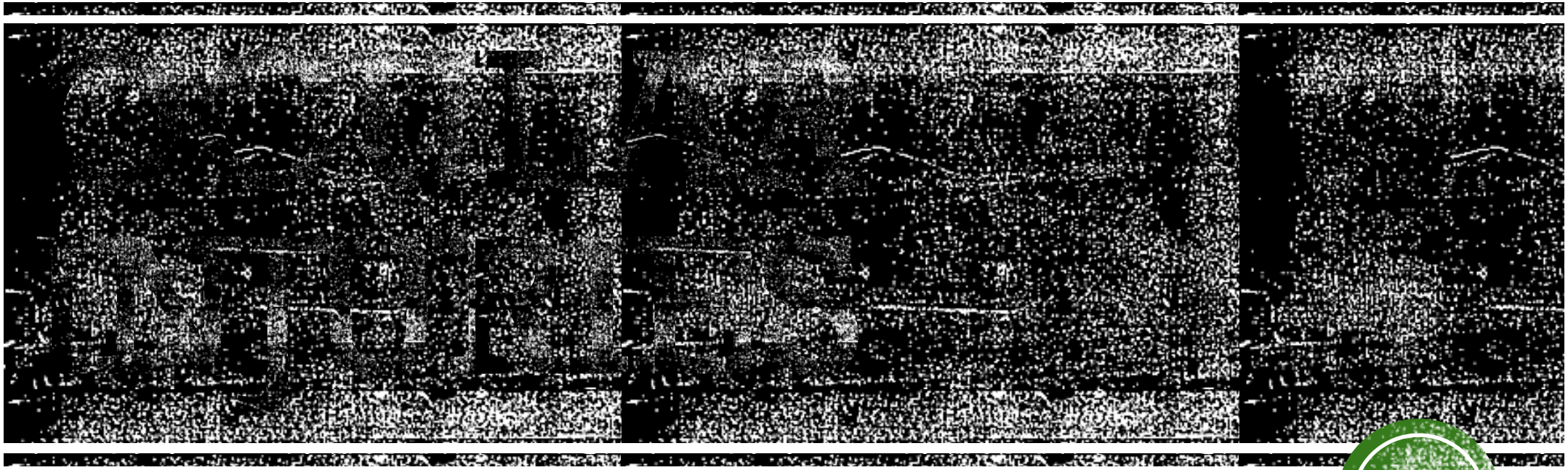


Kasey Stickler, MD, CAQSM

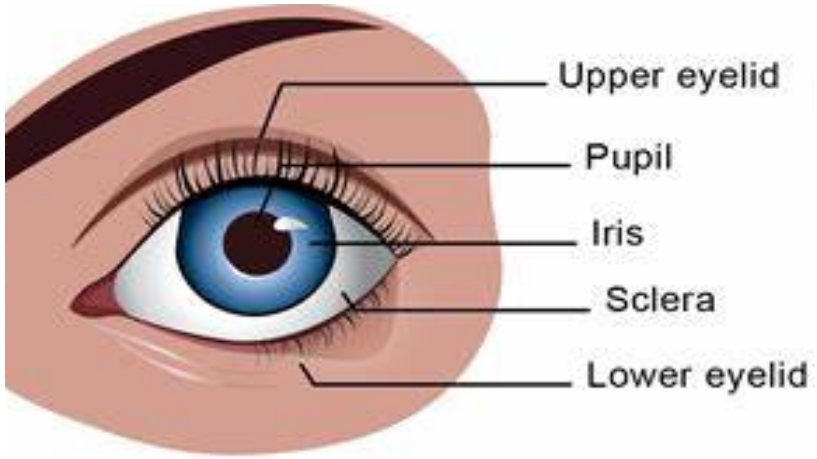
DISCLOSURES

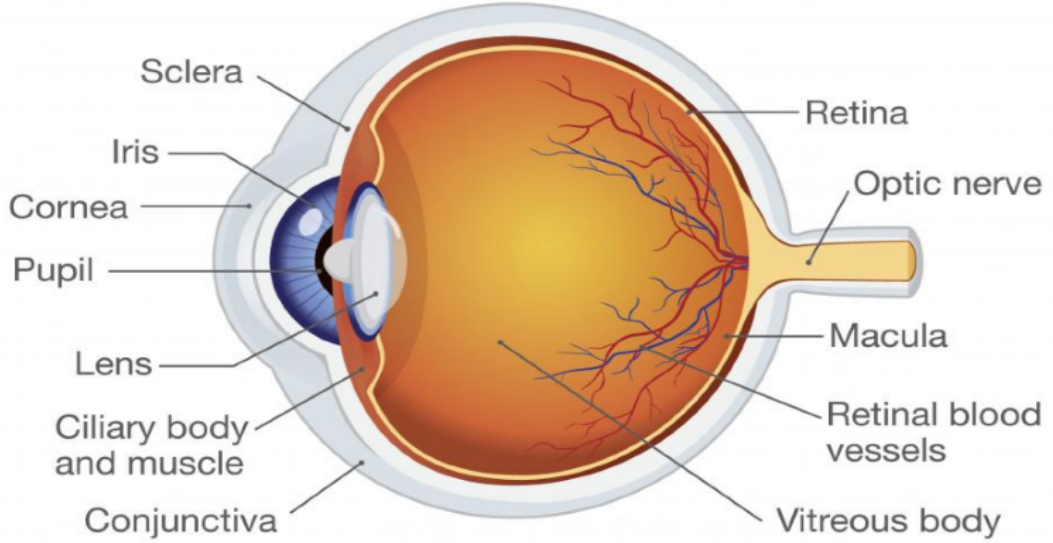
- I have no financial disclosures.

OBJECTIVES

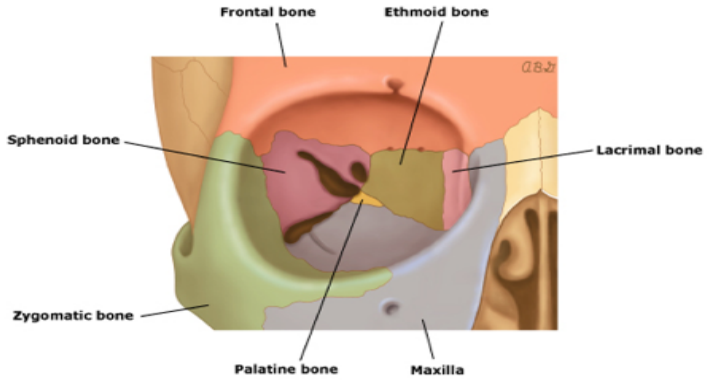
- Overview ocular anatomy
- Discuss incidence of ocular injuries in sports
- Identify important history and physical findings
- Discuss common ocular injuries with their appropriate management
- Understand when to refer to Ophthalmology
- Discuss return to play following an injury
- Identify methods to prevent eye injury
- Understand importance of having an appropriately stocked sideline bag


PARENTS STRONGLY
CAUTIONED
PG-13
SOME MATERIAL MAY BE INAPPROPRIATE FOR CHILDREN UNDER 13
®


Upper eyelid
Pupil
Iris
Sclera
Lower eyelid

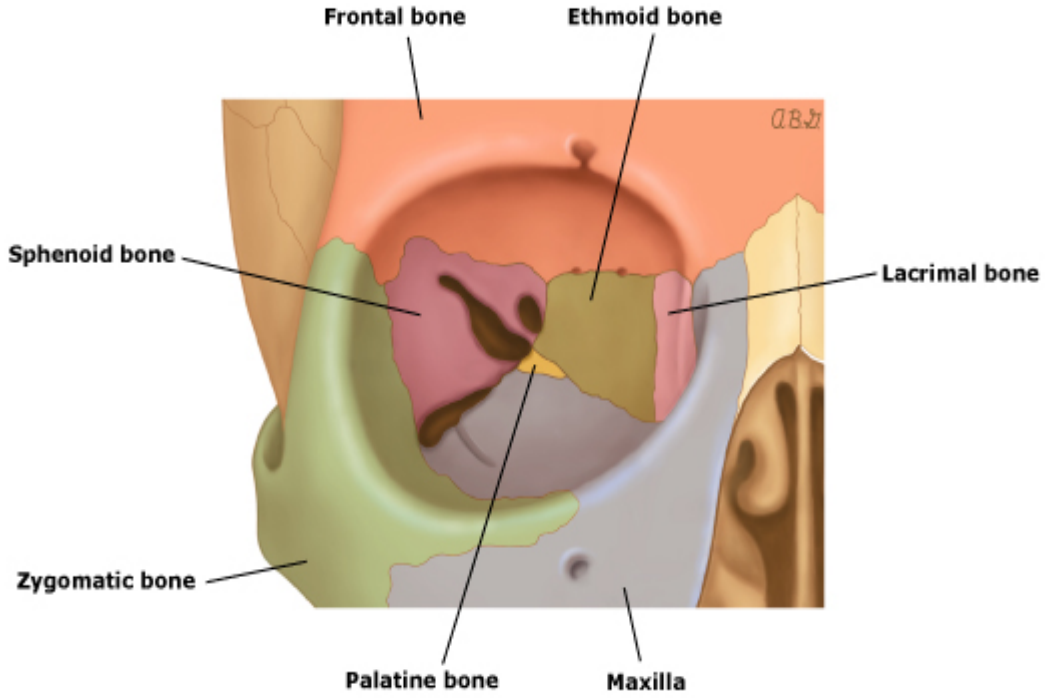

Sclera
Iris
Cornea
Pupil
Lens
Ciliary body and muscle
Conjunctiva
Retina
Optic nerve
Macula
Retinal blood vessels
Vitreous body

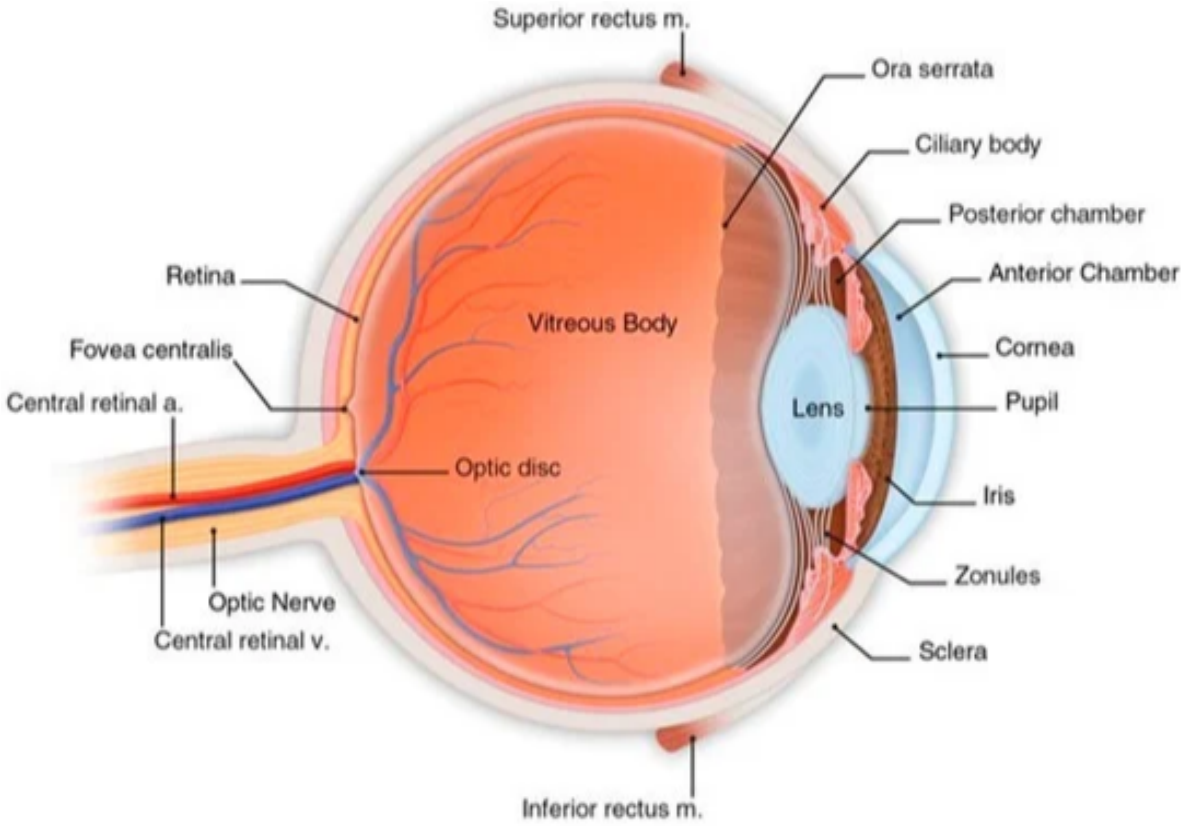
OCULAR ANATO



Orbital Structure	Bones	Associated Structures
Superior orbital rim, roof of orbit	Frontal Bone	Frontal sinus, supraorbital nerve
Lateral wall of orbit	Sphenoid bone, zygoma	Lateral canthal ligament
Infraorbital rim and floor of orbit	Zygoma, maxillary bone	Inferior oblique and inferior rectus muscles, maxillary sinus, infraorbital nerve
Medial wall of orbit	Maxillary and ethmoid bones	Medial rectus muscle, ethmoid sinus, medial canthal ligament, lacrimal duct system

OCULAR ANATOMY: BONES OF ORBIT




Superior rectus m.
Ora serrata
Ciliary body
Posterior chamber
Retina
Anterior Chamber
Vitreous Body
Fovea centralis
Cornea
Central retinal a.
Lens
Pupil
Optic disc
Iris
Zonules
Optic Nerve
Central retinal v.
Sclera
Inferior rectus m.

- Annual rate of [illegible] presenting to ED
  - 37.6 per 10,000

CDC study from 2007-2010

INCIDENCE

Moderate risk:	High risk:	Very high risk:
• Football • Soccer • Tennis • Volleyball • Fishing • Golf	• Baseball/ softball • Basketball • Racquetball • Lacrosse • Hockey	• Boxing • Wrestling • Contact Martial Arts • Usually do not use eye protection

Sports utilizing ball, puck, bat, stick, racquet, and/or body contact

INCIDENCE

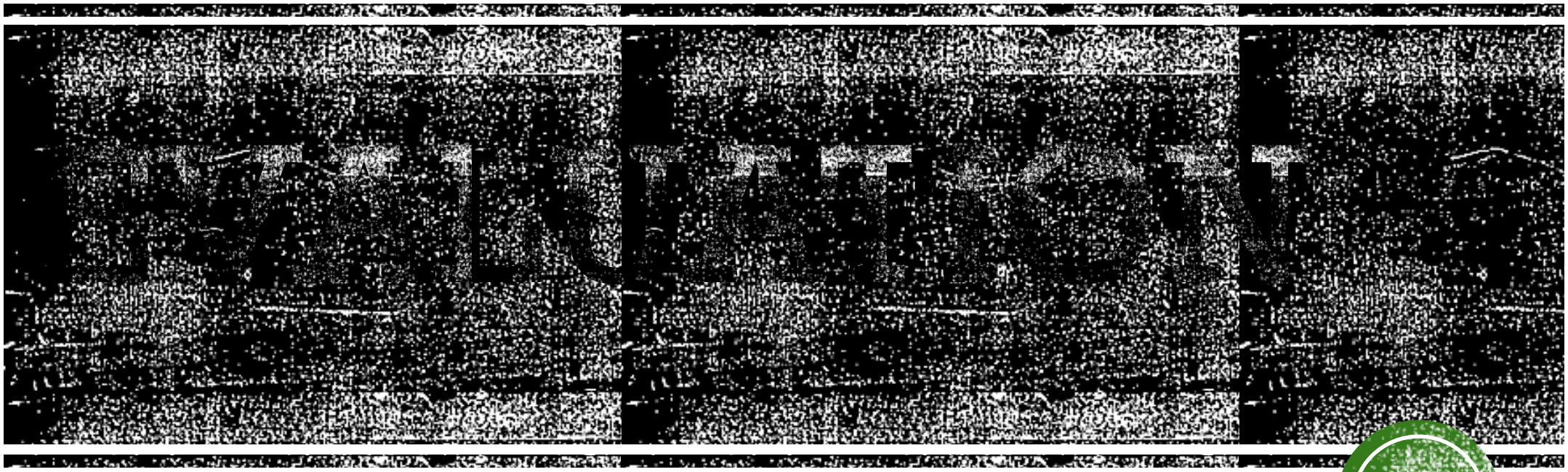
- What sport is the leading cause of sports-related eye injuries in the US based on AAO (American Academy of Ophthalmology) study?
  - A. Football
  - B. Basketball
  - C. Softball
  - D. Racquetball
  - E. Hockey

INCIDENCE

- What sport is the leading cause of sports-related eye injuries in the US based on AAO (American Academy of Ophthalmology) study?
  - A. Football
  - B. Basketball
  - C. Softball
  - D. Racquetball
  - E. Hockey

- According to AAO (American Academy of Ophthalmology):
  - Basketball is the leading cause of sports-related eye injuries in United States
  - Followed by:
    - Baseball
    - Softball
    - Airsoft rifles
    - Pellet guns
    - Racquetball
    - Hockey

https://www.aao.org/eye-health/tips-prevention/injuries-sports



IMPORTANCE OF PREPARTICIPATION EXAM

- Ocular history:
  Past Medical History:
  - High degree myopia (nearsightedness)
  - Surgical Aphakia (absence of lens of the eye)
  - Retinal Detachment
  - Eye surgery
  - Infection/injury to eye(s) previously

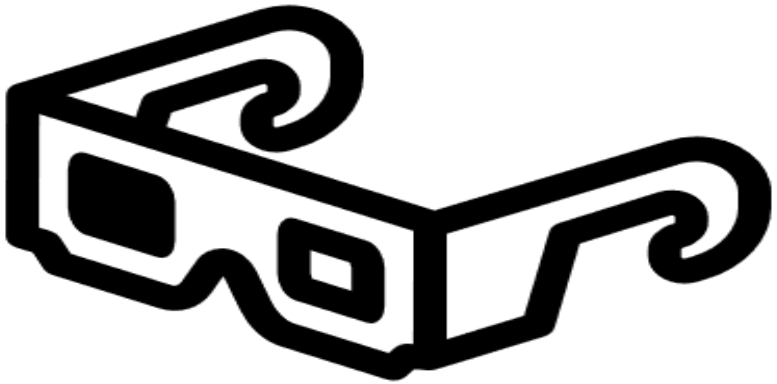
- Family History:
  - Retinal Detachment
  - Retinal Tears
  - Diabetic Retinopathy

- Exam:
  - functionally one-eyed athletes

  - If have risk factors should have eye care professional evaluate before participating in any high or very high risk sport

Christensen GR. Eye injuries in sports: evaluation, management, and prevention. In: Mellion MB, Walsh WM, Shelton GL, eds. The team physician's handbook. 2d ed. Philadelphia: Hanley && Belfus, 1997:407–25.

CONTACT LENS



- Best corrected vision in weaker eye is < 20/40
- Must wear sports eye protectors that meet ASTM (American Society for Testing and Materials) racquet sports standards in all sports that carry risk of eye injury
- If sports requires facial mask, still have to wear eye protector beneath
- Contraindicated sports:
  - Boxing, wrestling, full contact martial arts

INJURY EVALUATION

Remember your early years of medical training

Start with a history and physical exam

INJURY EVALUATION

- History:
  - How'd it happen? (mechanism of injury)
    - Low or High velocity injury
    - Direction of impact
    - High velocity injuries more concerning for penetrating eye injury
  - Symptoms?
    - Describes sensation of something in the eye
    - Difficulty seeing or blind spots
    - Double vision
    - Tearing up
    - Sensitivity to light
    - Flashing lights or halos (aura)
    - Curtain coming down over the eye

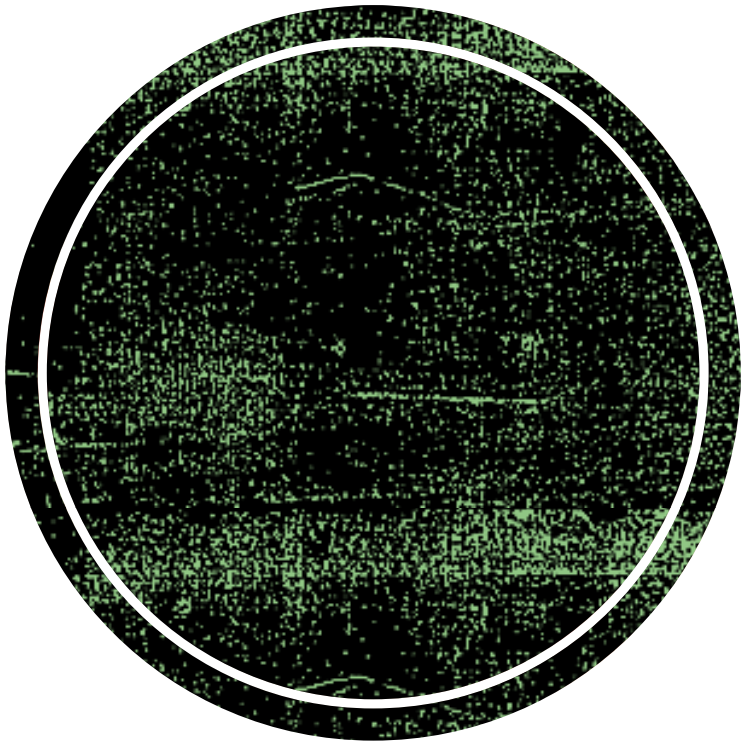
HISTORY

MOST COMMON MECHANISMS

Blunt trauma

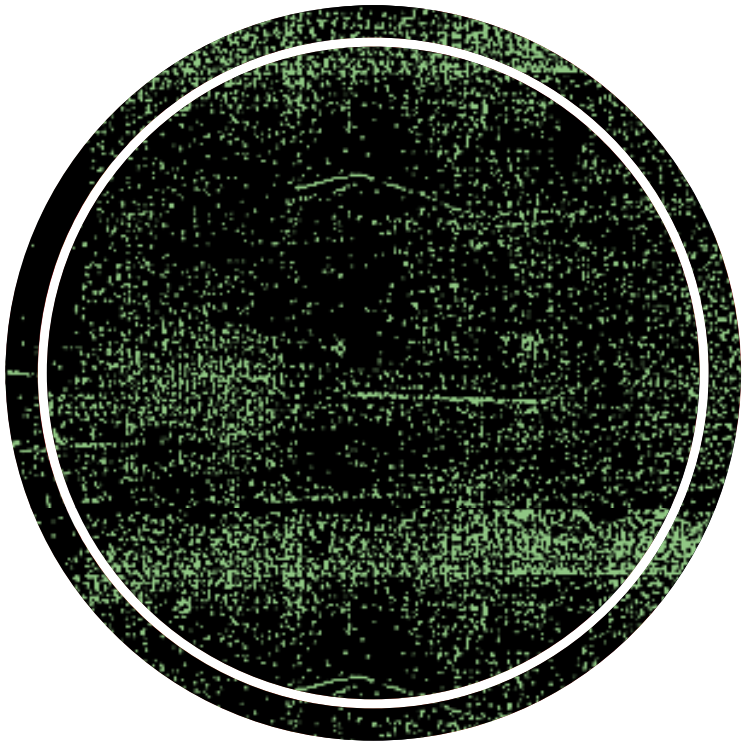
Penetrating trauma

Radiation injuries



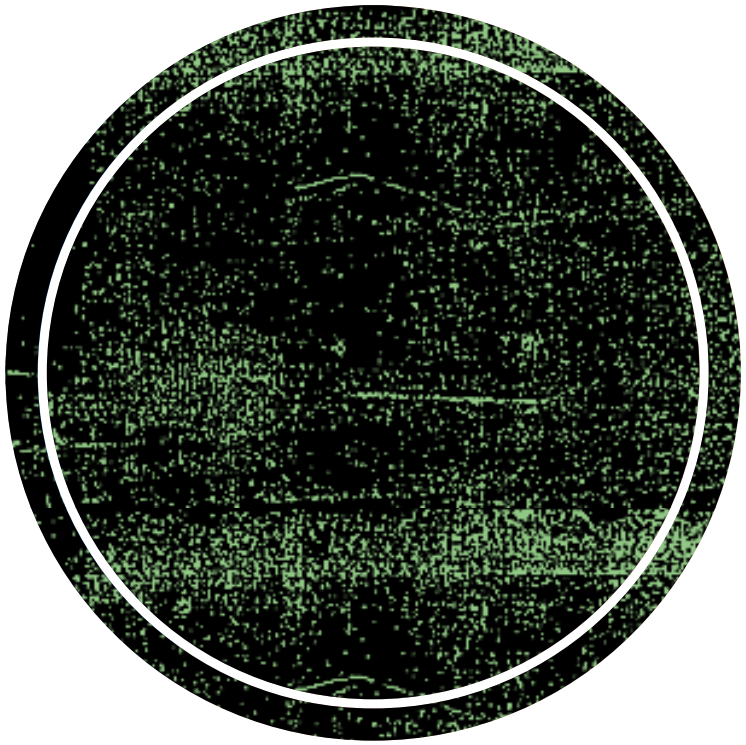
MECHANISMS: BLUNT TRAUMA

- Most common mechanism
  - Object smaller than eye
    - More force on internal structures
  - Object larger than eye
    - More force of floor of orbit and medial wall
- “Pressure-release valve”
  - Attempt to prevent globe rupture



MECHANISMS: PENETRATING TRAUMA

- Relatively uncommon overall
- Eyeglass breakage is common cause



MECHANISMS: RADIATION

- Exposure to UV light in snow/water sports, long distance runners/bikers

Filipe JA, Barros H, Castro-Correia J. Sports-related ocular injuries. A three-year follow-up study. Ophthalmology. 1997;104:313-8.

INJURY EVALUATION

- Physical Exam:
  - Obvious deformities, erythema, hematoma
  - Visual acuity (Snellen Chart if available)
  - Visual fields
  - Extra-ocular movements
  - Pupil response
  - Use pen light to assess for blood in anterior chamber
  - Crepitus of orbit
  - Fluorescein dye

PHYSICAL EXAM

When to urgently refer!

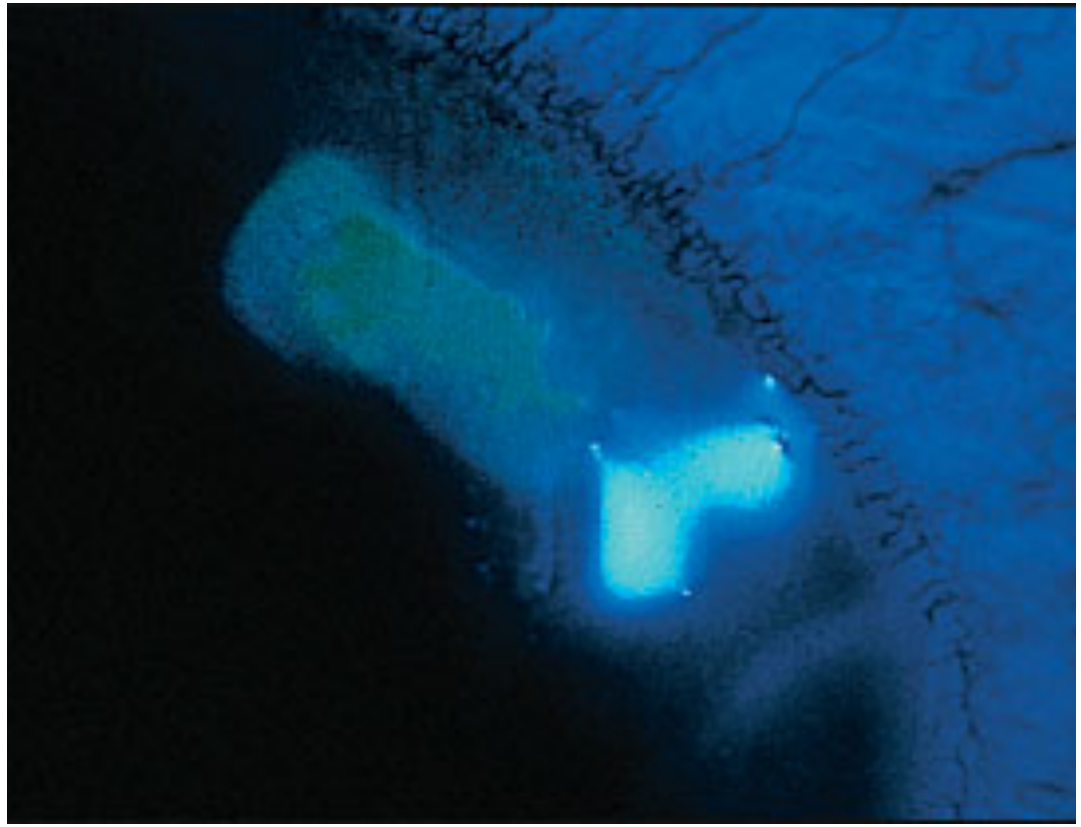
REASONS FOR URGENT REFERRAL BASED ON EXAM

- Loss of vision
- Pain with eye movement
- Diplopia
  - vertical
- Light flashes/floaters
  - retinal detachment
- Hyphema
  - Blood in anterior chamber
- Halos
  - Corneal edema
- Suspected globe perforation
- Loss of visual fields
- Photophobia
  - can be in benign or serious conditions
- Proptosis/enopthalmos
- Irregularly shaped pupil
  - globe rupture concern
- Embedded foreign object
- Laceration at lid margin or near medial canthis
- 360 degree subconjunctival hemorrhage
  - globe rupture concern

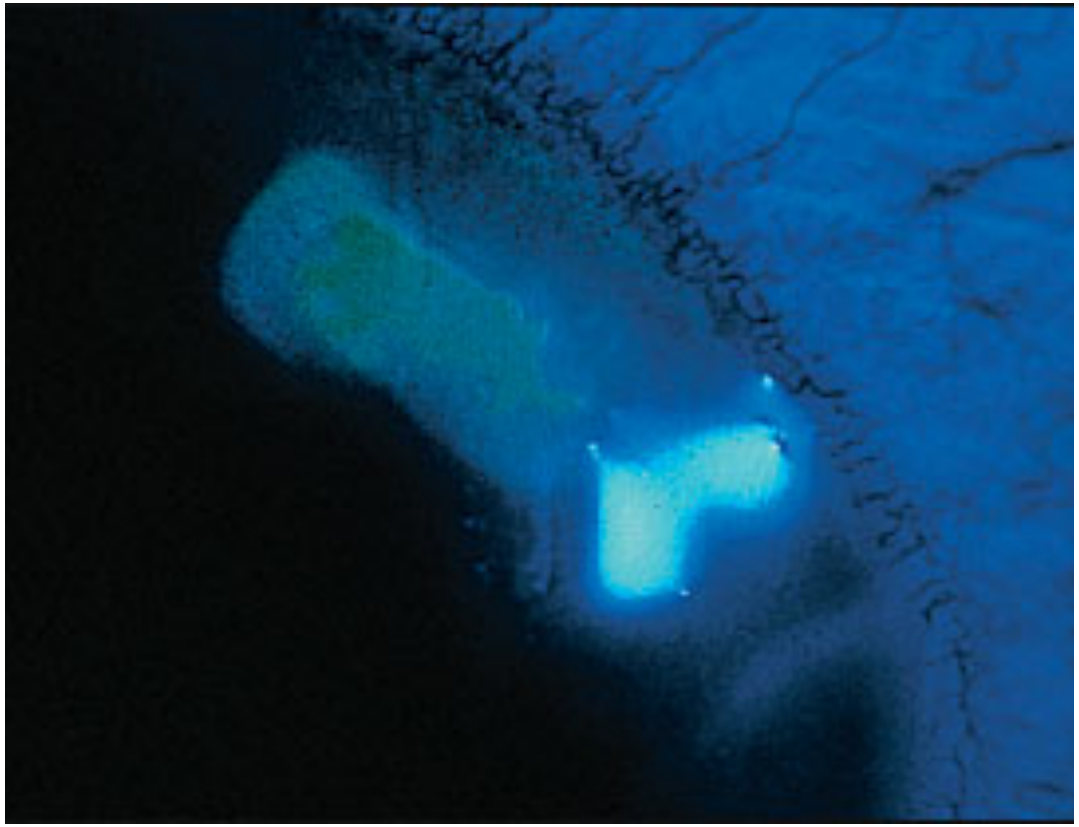
OCULAR INJURIES

Corneal Abrasions	Corneal Foreign Body	Peri-orbital Hematoma	Retrobulbar Hemorrhage
Subconjunctival Hemorrhage	Traumatic Iritis	Hyphema	Retinal Detachment or Hemorrhage
Globe Rupture	Eyelid Injury/ Laceration	Orbital Fracture	Burns

CORNEAL ABRASION

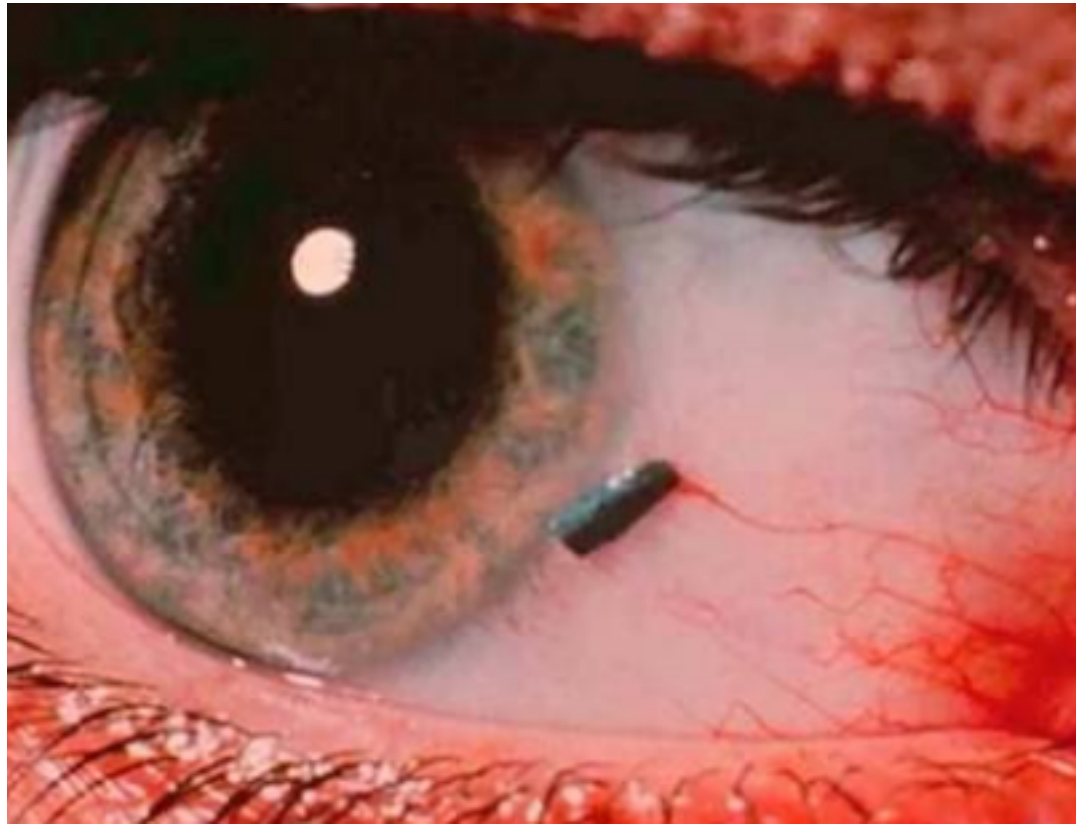


- Incidence:
  - Extremely common
- Cause:
  - Defect in cornea surface
- History/Symptoms:
  - Traumatic (example: finger to eye)
  - Spontaneous (example: contacts, dry eye)
  - Feel as though they have something in eye, photophobia, tearing
- Physical Exam:
  - Erythema of conjunctiva
  - Evaluate for foreign body
  - Often need anesthetic
  - Fluorescein stain exam with blue light filter

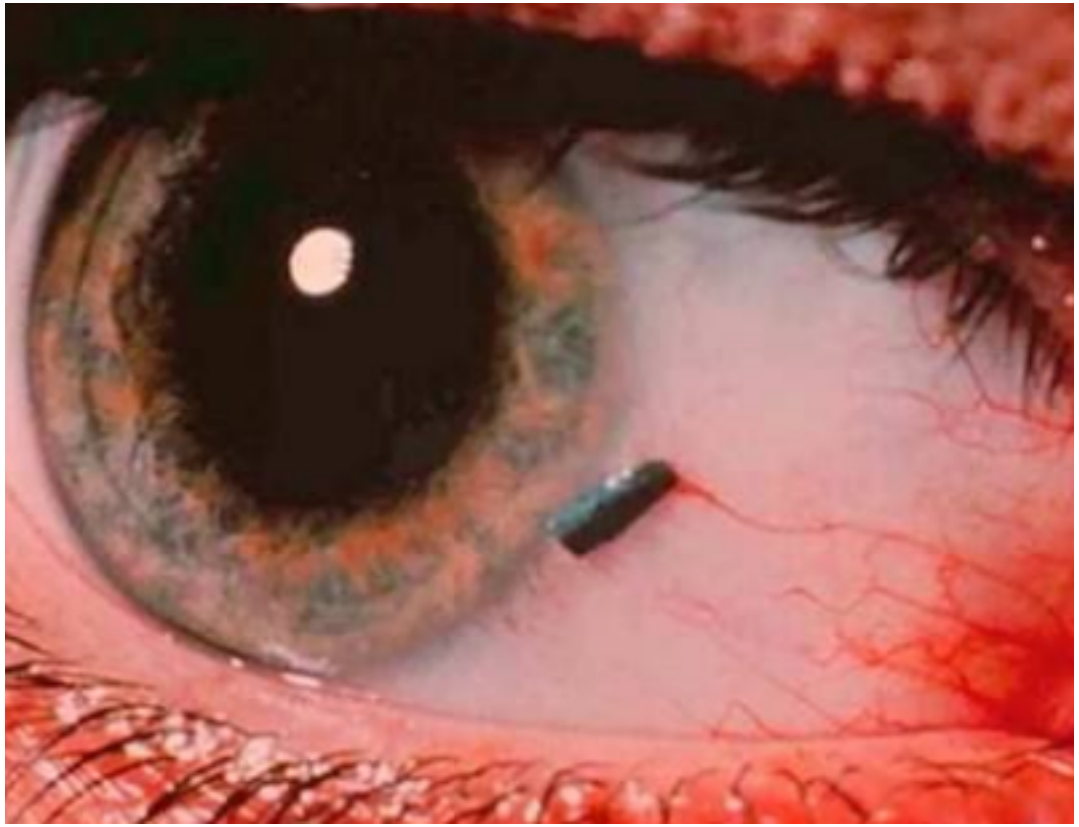


- Treatment:
  - Topical antibiotics 3-5 days
  - Erythromycin ointment
  - Flouroquinolones if history of contacts
  - Topical NSAIDs occasionally (1-2 days)
  - Cycloplegics for pain control (atropine)
  - Topical anesthetics can slow healing
  - No need for eyepatch
  - Discontinue contacts
- Prognosis:
  - Typically improved in 24-48 hours
- When to get to ophtho:
  - Large lesions
  - Not improving or worsening following 48 hours
  - Signs of infection
- RTP:
  - Once healed

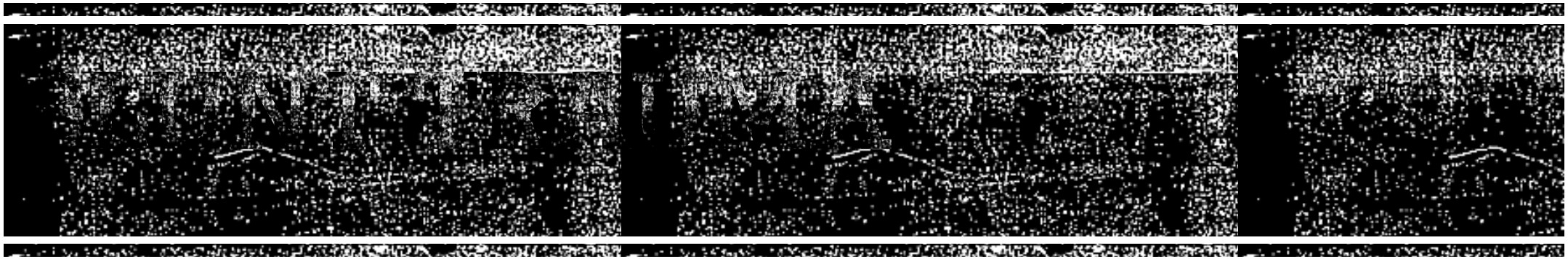
FOREIGN BODY



- Incidence:
  - common
- History/Symptoms:
  - Feel as though they have something in eye, photophobia, tearing
  - Often occurs in conjunction with corneal abrasion
  - May also cause globe rupture, conjunctivitis, iritis
- Physical Exam:
  - Use topical anesthetic
  - Inversion of lids for evaluation (cotton swab)

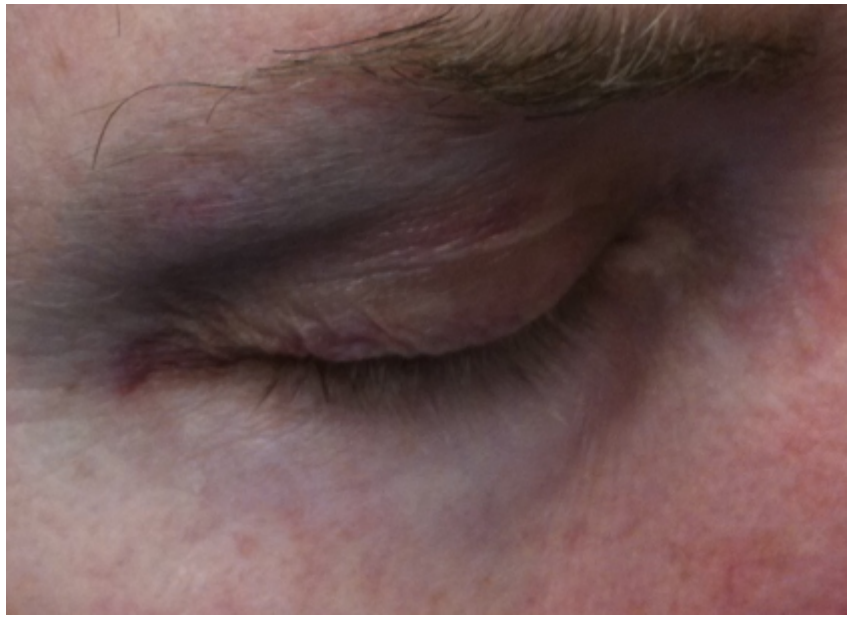


- Treatment:
  - Irrigation
  - Moistened cotton swab
  - 18 gauge needle?
  - Topical antibiotic
- When to get to ophtho:
  - If foreign body cannot be removed
- RTP:
  - If removed without issue and no corneal abrasion or vision loss, RTP
  - If cannot be removed, then no RTP



- Incidence:
  - Majority of sports-related eye injuries
- History/Symptoms:
  - Object strikes eye (important to know speed, size, and soft/hard)
  - Pain, swelling, edema, ecchymosis (black eye)
- Physical Exam:
  - Pain to palpation, swelling, bruising
  - Rule out concerns features
- Treatment:
  - Ice, rest, analgesics

[illegible]



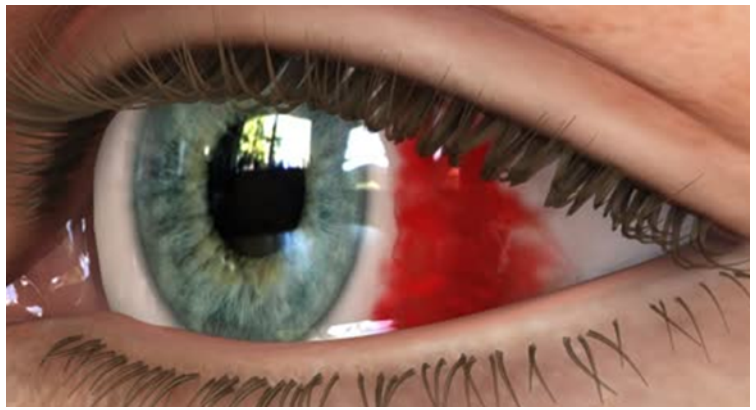
- History/Symptoms:
  - Struck in eye with blunt object
  - More than just black eye
- Physical Exam:
  - Blood collection in or behind globe
- Treatment:
  - Usually self limited
- When to get to ophtho:
  - Larger hematoma
    - Displace globe, increase ocular pressure
- RTP:
  - Cannot return if globe fracture and/or meet criteria for referral

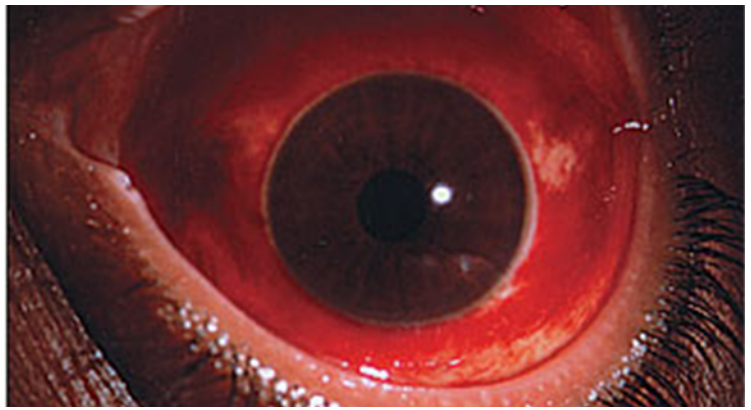
ORBITAL FRACTURE

- History:
  - Blunt trauma
- Symptoms:
  - Acute pain, periorbital bruising, proptosis, resistance to retropulsion, and relative afferent pupillary defect
  - Compartment syndrome in orbital space
- Concerns:
  - Raised pressure for longer then 60 mins can lead to permanent vision loss
  - More common in athletes with:
    - Clotting disorders, sickle cell anemia, on anticoagulant therapy
- EMERGENT REFERRAL: Often requires emergent lateral canthotomy and high dose IV steroids

Journal of Emergency Medicine.

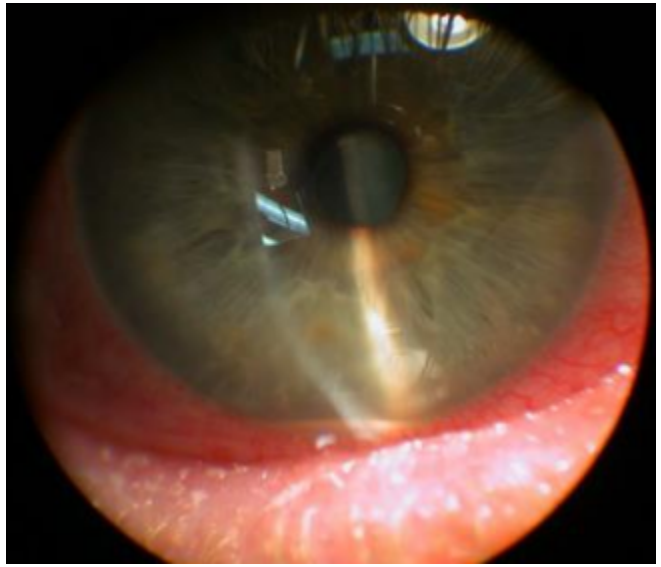
Anterior Eye



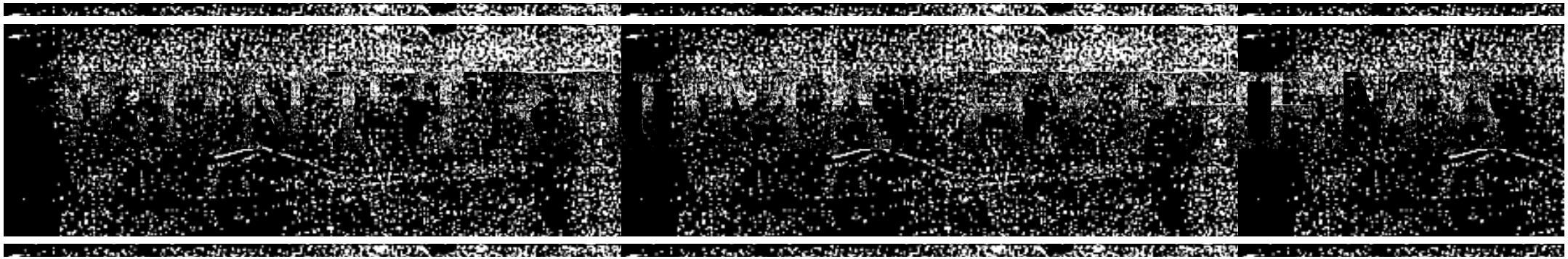


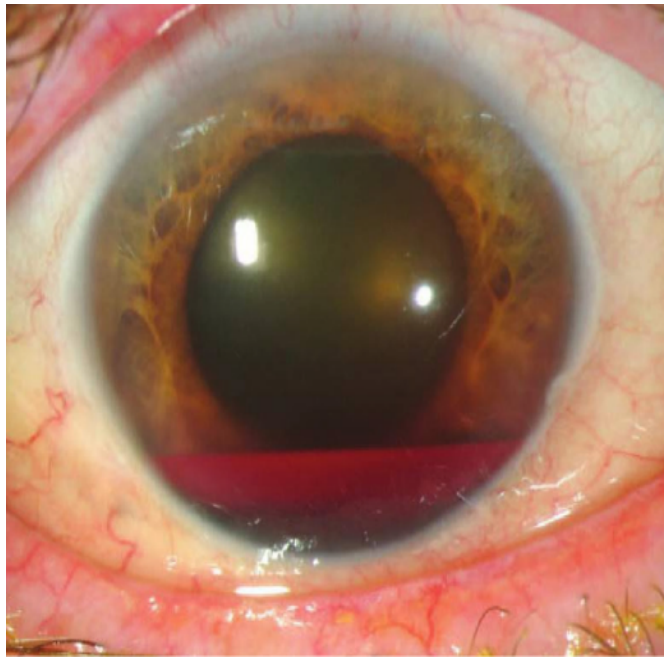
- Incidence:
  - Extremely common
- History/Symptoms:
  - Trauma or spontaneous (sneeze, cough)
  - Asymptomatic
- Physical Exam:
  - Assess visual acuity
  - Collection of blood in conjunctiva
- Treatment:
  - Resolved on own in 2-3 weeks
- When to get to ophtho:
  - Entire sclera involved, concern for globe rupture
- RTP:
  - Yes, if no concerning signs as mentioned above

HYPHEMA



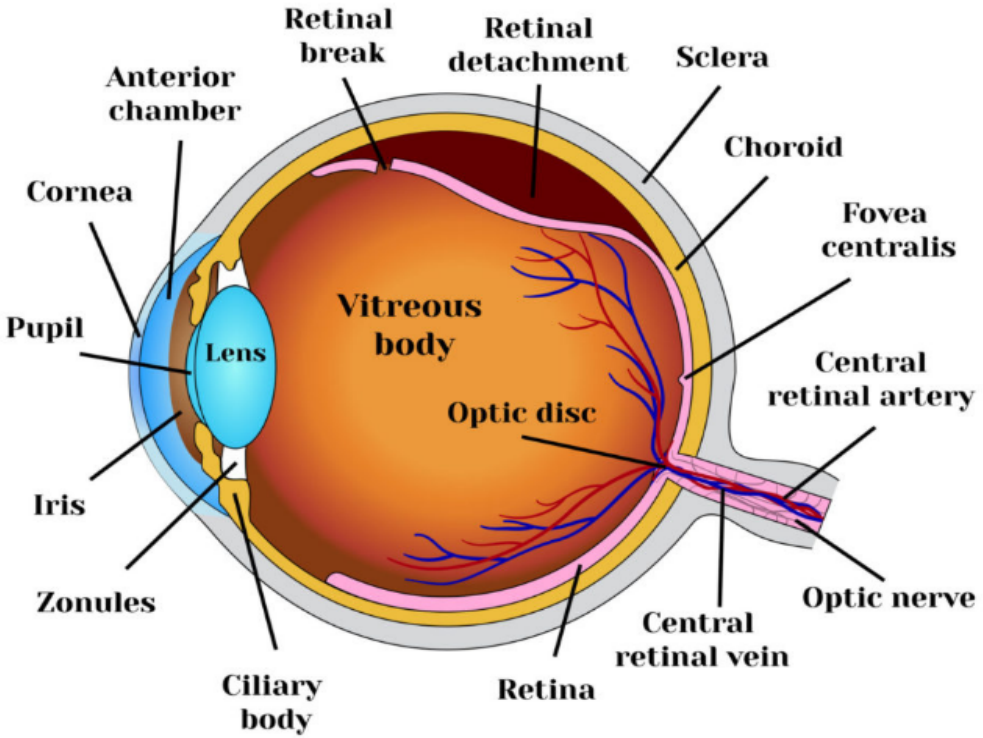
- Incidence:
  - 20% of iritis
- History/Symptoms:
  - Blunt trauma
  - Eye pain, blurry vision, photophobia, floater, tearing
- Physical Exam:
  - Tearing, decreased visual acuity, sluggish pupil
  - Slit lamp: cell and flare (floating around in anterior chamber)
- Treatment:
  - Cycloplegics
  - Topical corticosteroids if no infection
- When to get to ophtho:
  - Upon presentation
- RTP:
  - No





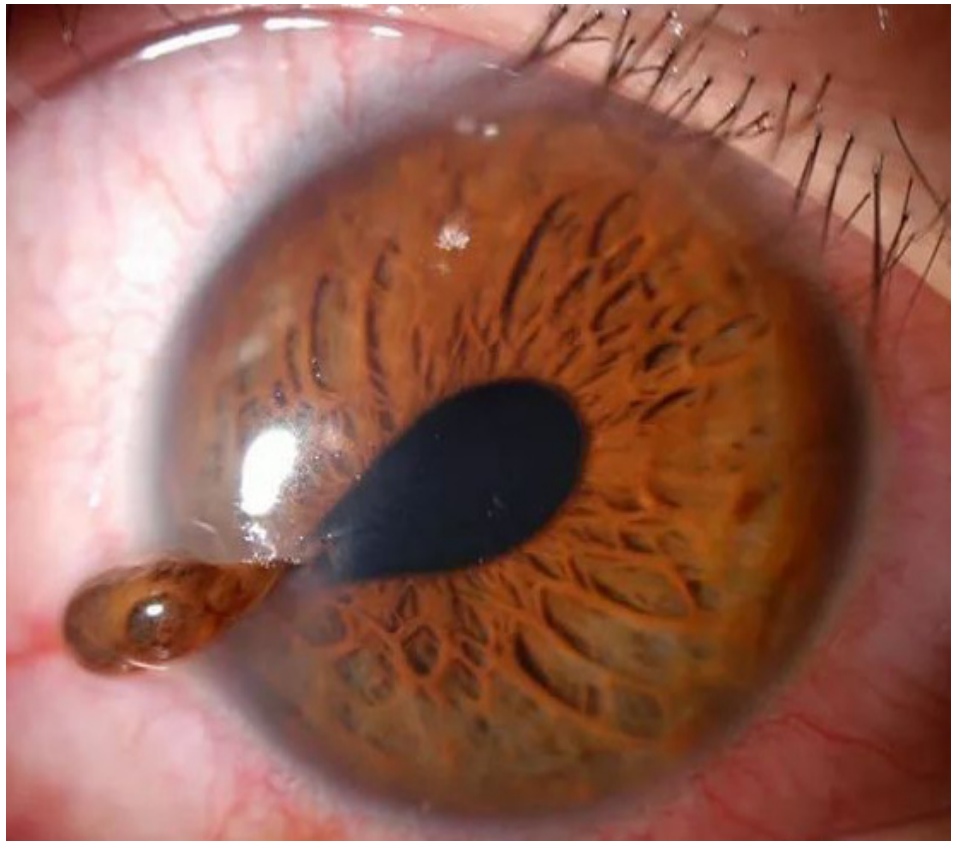
- History/Symptoms:
  - Trauma
  - Pain, swelling, pupil dilation or constriction
- Physical Exam:
  - Blood in anterior chamber of eye
  - Can cause increased ocular pressure
- Treatment:
  - Shield eye, refer immediately
  - Bed rest with head elevation
  - Stop any NSAIDs and ASA
  - Concern for rebleeding within 5 days
    - Carries worse prognosis than primary bleed
- When to get to ophtho:
  - Upon presentation
- RTP:
  - No

RETINAL DETACHMENT



- Incidence:
  - More common in endurance athletes if spontaneous
- History/Symptoms:
  - Trauma or spontaneous
  - Family history
  - More common in myopia
- Physical Exam:
  - Flashes of lights, floaters, curtain in visual field, decreased peripheral or central visual acuity
- Treatment:
  - Emergent evaluation by Ophthalmology
- RTP:
  - No

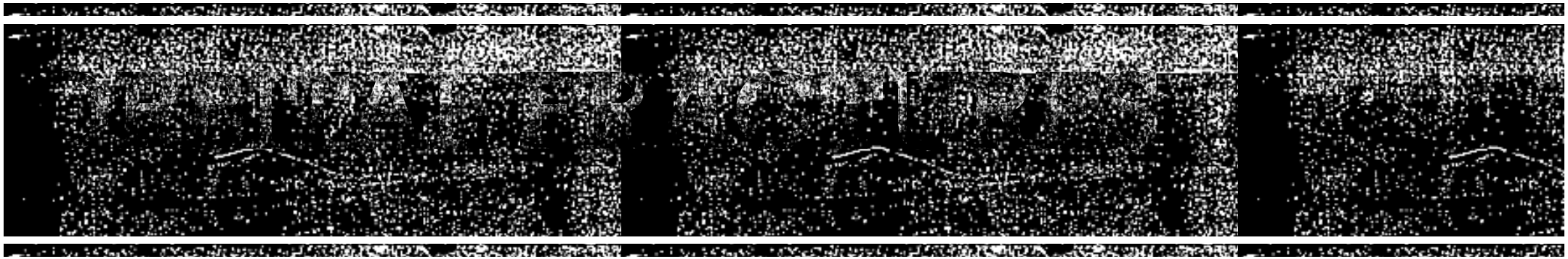
Retina Vitreous Consultants, Inc Pittsburgh



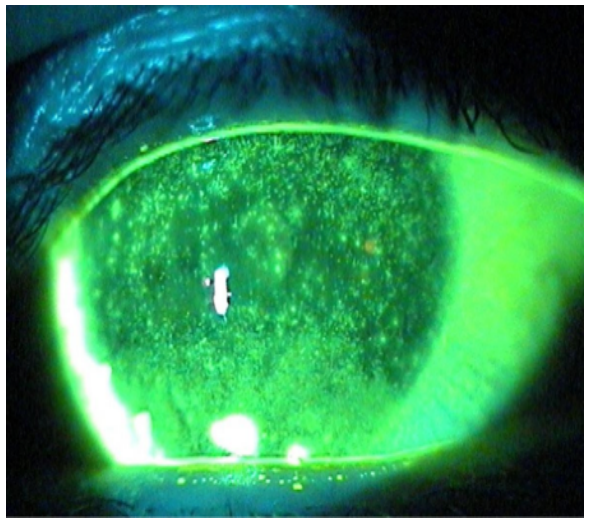
- History/Symptoms:
  - Blunt or penetrating trauma
- Physical Exam:
  - Circumferential subconjunctival hemorrhage, hyphema, pain with EOM, lose anterior chamber depth, decreased visual acuity, irregular or tear drop pupil, afferent pupillary defect
- Treatment:
  - DO NOT TOUCH
  - Immediate eyeshield
  - Avoid Valsalva
  - Avoid topical anesthetic or fluoroscein
  - Emergent evaluation by Ophthalmology
- RTP:
  - No

[redacted]

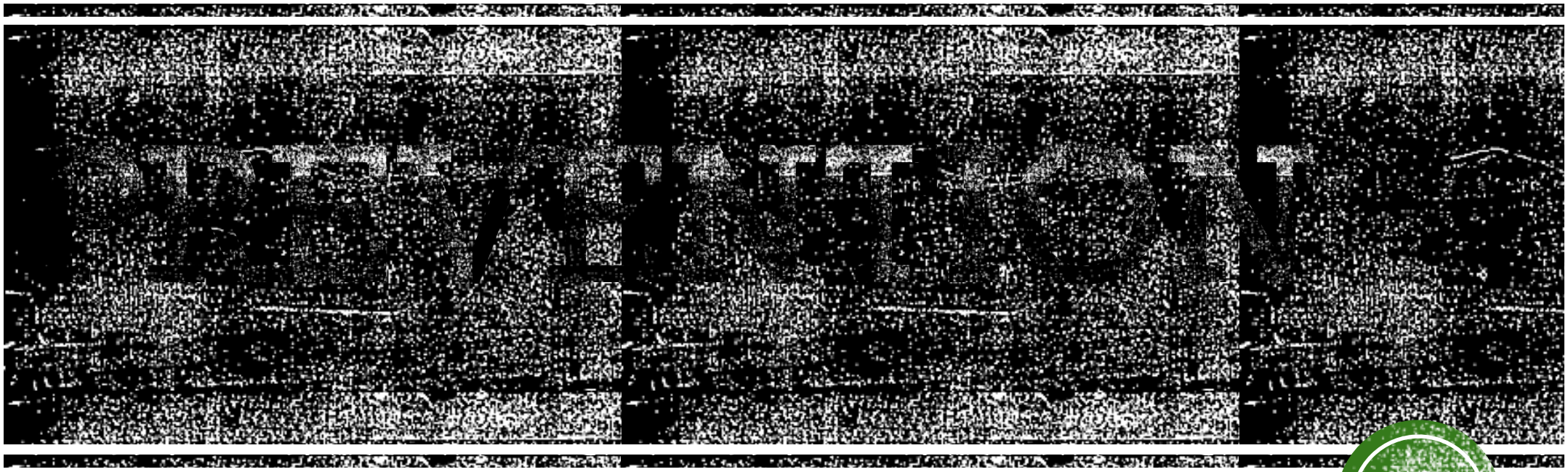
- History/Symptoms:
  - Blunt or penetrating trauma
    - Eyeglasses
  - Evaluate for globe injuries and foreign bodies
- Physical Exam:
  - Laceration present
- Treatment:
  - Superficial <25%
    - Secondary intention
    - Topical antibiotics
  - Time to closure 12-36 hours
- Referral:
  - Involve lid margin, lacrimal duct, through, 6-8 mm of medial canthis
  - Fat exposure/ptosis: could be levator palpebrae
- RTP:
  - if minor and no functional or binocular vision loss



- Incidence:
  - Common
  - More commonly involves inferior orbital wall
  - Less commonly medial wall
  - About a third are associated with other ocular injury
- History/Symptoms:
  - Blunt trauma with object (example ball)
- Physical Exam:
  - Pain to palpation, enopthalmos, periorbital ecchymosis, painful EOM, upward gaze restriction (inferior rectus trapped), diplopia, decreased sensation below eyelid
- Treatment:
  - Avoid blowing nose (avoid further displacement)
  - Refer immediately to ED for xray/CT
- When to get to ophtho:
  - Upon presentation
- RTP:
  - No



- Incidence:
  - More often in snow/water sports, long distance running/biking
- History/Symptoms:
  - Acute burns: photophobia
- Physical Exam:
  - Acute burns:
    - Fluorescein stain: punctate lesions
- Treatment:
  - Topical antibiotics
- Long term effects:
  - Cataracts, skin cancer, corneal degenerative change, photokeratitis
- Prevention is key!
- RTP:
  - If no vision loss



PREVENTION

30,000 sport-related eye injuries treated in U. S. Emergency Rooms each year

90% could be prevented by wearing appropriate protective eyewear

Do you know which collegiate sports have regulated use of protective eyewear?

- Women's collegiate lacrosse
- Collegiate hockey

PREVENTION

Recommendations for Protective Eyewear

2-mm polycarbonate lenses in normal streetwear frames (for athletes who need corrective lenses and are involved in low-risk sports).

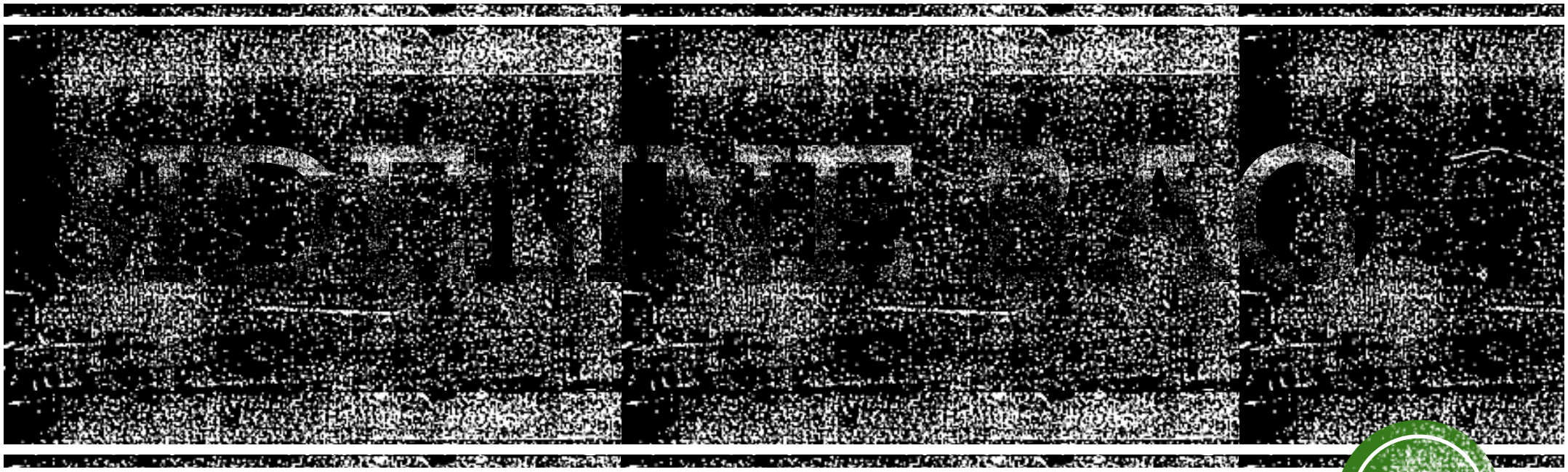
Sports frames with a 3-mm polycarbonate lens (for athletes participating in moderate- to high-risk sports). Eye protection should be used by athletes who wear contact lenses and by those who do not need corrective lenses. The athlete with refractive errors should wear prescription polycarbonate lenses.

A sturdy sports frame meeting impact-resistance standards (i.e., ASTM F803-01) is required. Eyeguards without lenses do not pass ASTM racquet sports eye safety standards.

Face masks attached to a helmet should be used in sports such as hockey, football, baseball, and lacrosse.[2,3]

ASTM = American Society for Testing and Materials.

Jeffers JB. An ongoing tragedy: pediatric sports-related eye injuries. *Semin Ophthalmol.* 1990;5:216-23.
Napier SM, Baker RS, Sanford DG, Easterbrook M. Eye injuries in athletics and recreation. *Surv Ophthalmol.* 1996;41:229-44.

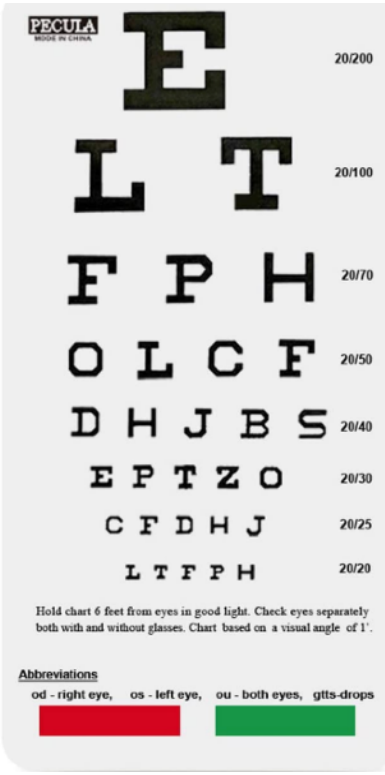


SIDELINE BAG

- Snellen Chart
- Ophthalmoscope
- Penlight
- Fluorescein dye
- Cotton swabs
- Needle
- Sterile saline
- Topical anesthetic

SIDELINE BAG

Snellen Chart



SIDELINE BAG

Ophthalmoscope

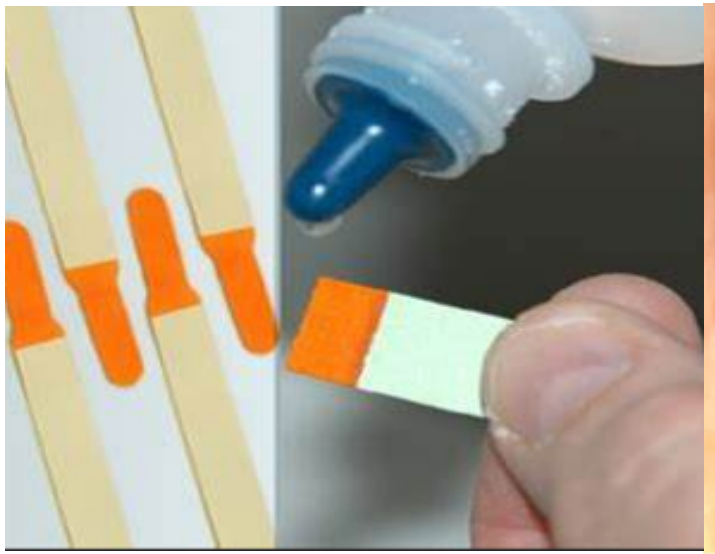
SIDELINE BAG

Penlight

Blue light mimics slit lamp.

SIDELINE BAG

Fluorescein Dye



SIDELINE BAG

Cotton Swab/Needle

SIDELINE BAG

Topical Anesthetic

SUMMARY

- An understanding of anatomy will help you best identify involved structures based on injury.
- Larger objects typically cause orbital wall injury, while smaller objects cause internal structure injury.
- Three general types of traumatic injury: blunt, penetrating, and burns
- Preparticipation evaluation is valuable in determining which athletes are at highest risk, especially functionally one eyed athletes.
- Visual acuity is the vital signs of the eyes and knowing when to urgently refer to ophthalmology.

SUMMARY

- Corneal abrasions and subconjunctival hemorrhages are two of the most common injuries seen in sport.
- Emergent referrals include: retrobulbar hemorrhage, globe rupture, and possibly orbital fracture.
- Return to play is important in the sports world, so understanding what injuries can immediately return vs. not.
- Prevention is important, recognizing which sports are higher risk resulting in need for ASTM protective eyewear.
- Stocking your sideline bag: Snellen chart, ophthalmoscope, penlight, cotton swabs, sterile saline, fluorescein dye, topical anesthetic.

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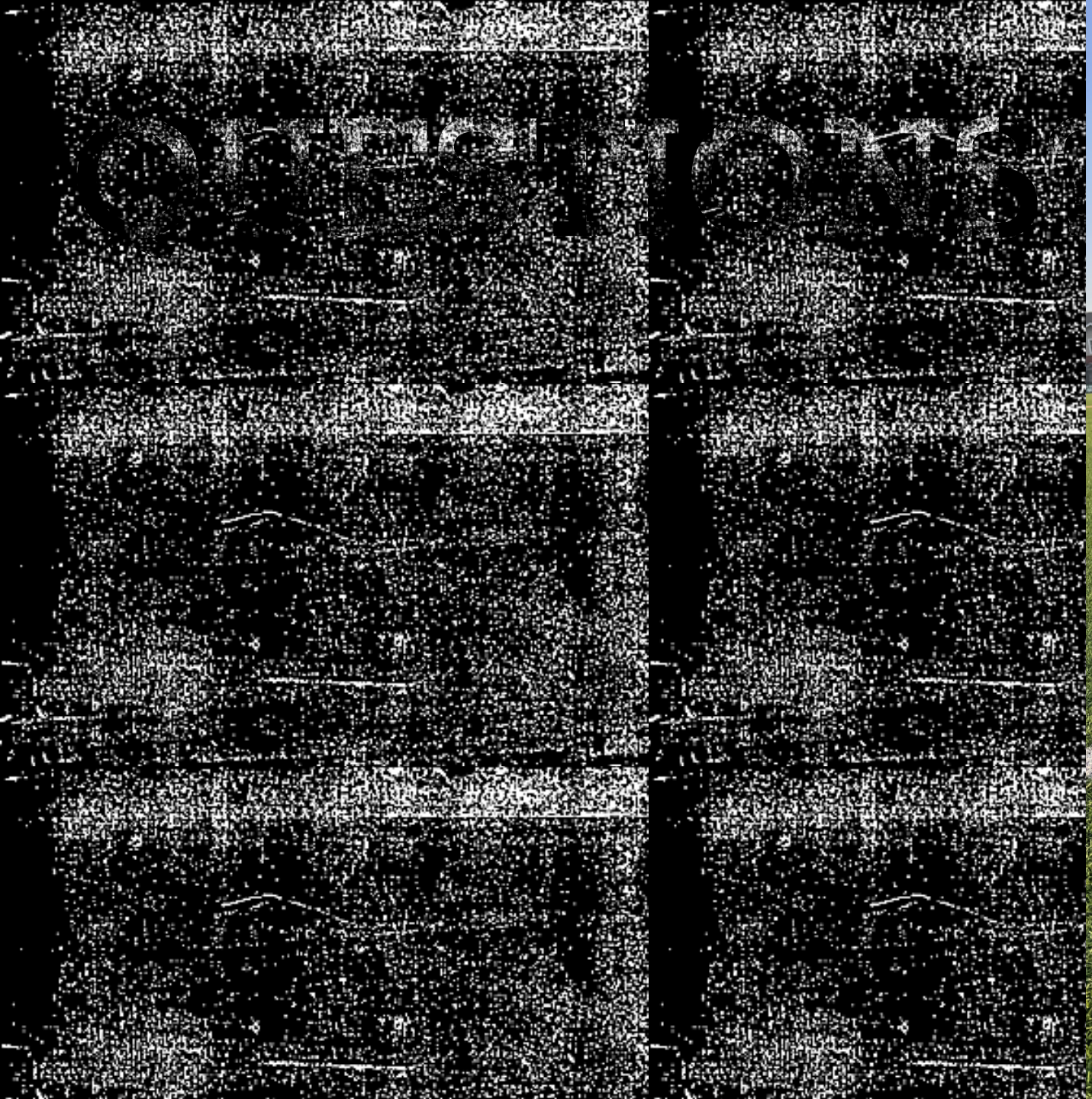


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