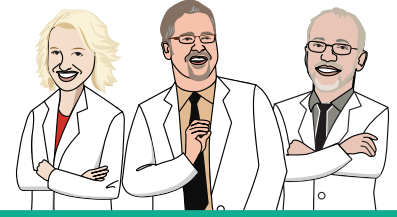




## Continuous Core Content



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Editor-in-Chief: Mel Herbert, MD  
 Managing Editor: Jessica Mason, MD  
 Executive Editor: Stuart Swadron, MD

### C3 – EYE TRAUMA

Jessica Mason MD, Stuart Swadron MD, Mel Herbert MD  
 Peer Reviewer Nicholas Testa, MD

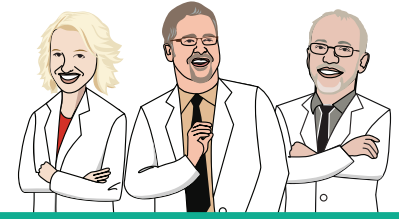
*\* Drug doses are a guide only, always check a second source and follow local practice guidelines*

#### Take Home Points:

- Assess threats to life first with a primary trauma survey.
- Patients with eye trauma should be carefully evaluated for signs of globe rupture; if suspected, protection with a shield and emergent ophthalmology consult are indicated.
- Retrobulbar hematomas present with vision loss (in conscious patients), proptosis and elevated intraocular pressure; this requires an emergent lateral canthotomy to preserve vision.
- Corneal burns need immediate irrigation which should be continued until the pH of the eye is 7.0; intraocular pressure (IOP) should also be checked.
- Metallic foreign bodies can leave a “rust ring” in the cornea which should be removed either in the emergency department or by ophthalmology in follow up.
- Eyelid lacerations should be carefully examined and often need specialist repair.
- A hyphema is an accumulation of blood in the anterior chamber and is at risk for corneal staining, rebleeding, and glaucoma.
- Traumatic iritis can occur after eye trauma and is characterized by a painful red eye with both direct and consensual photophobia, and signs of inflammation in the anterior chamber.
- Corneal abrasions are very painful but tend to heal very quickly. Patients need to be reevaluated to ensure resolution without complications.

### Background

In a recent episode of C3, we covered the painful red eye. In this episode, we discuss the patient with eye trauma. There are many different eye injuries to be aware of, and knowing when to consult a specialist is key. We will discuss the most common injuries as well as those that present the greatest risk to the patient's vision.

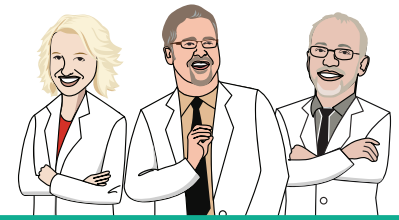


## History, Examination & Imaging

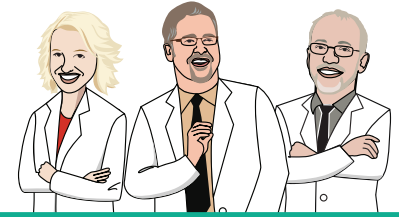
- Eye trauma can be frightening and dramatic, capturing our immediate attention
- It is important to remember that patients with eye trauma are trauma patients first
- Once the primary trauma survey is complete and the patient is stabilized, we can return to an evaluation of the eye injuries
- Key elements of the history include
  - Description of the mechanism of injury
    - A history of “metal on metal” (e.g., a hammer on a nail that results in a fleck of metal in the eye) should prompt consideration of globe rupture)
  - Onset and character of pain
  - Vision changes
  - Past medical history and medications, especially anticoagulation/antiplatelet agents
  - Tetanus status
- Key elements of the physical exam include
  - Visual acuity - the “vital sign” of the eye
  - A standardized approach to the exam working from the exterior structures to the interior using a slit lamp for patients well enough to be mobile and upright
  - Direct and consensual photophobia
  - Swinging flashlight test to assess for an afferent pupillary defect
  - Extraocular movements
- Imaging studies of the eye may include
  - Ultrasound to assess for retinal detachment and other injuries
  - CT (head and/or orbits) for retrobulbar hematoma, fractures, foreign bodies, or ruptured globe
    - CT can rule in but not rule out foreign bodies and ruptured globe

## Corneal Abrasions & Burns

- History
  - Painful red eye with tearing and decreased visual acuity
- Examination
  - Invert the eyelids to check for retained foreign bodies
  - The “ice rink” sign consists of vertically oriented corneal abrasions from a retained foreign body under the eyelid and repeated blinking
  - Fluorescein staining will show uptake when examined under the cobalt blue light



- Seidel's sign is the appearance of aqueous humor draining out of a full thickness laceration of the cornea
    - It is classically described as a waterfall of clear fluid on a background of fluorescein, and is a sign of globe rupture
  - Treatment
    - Although corneal abrasions heal rapidly they are very painful and can sometimes lead to a secondary infection
    - Antibiotic ointment
      - Ointment is preferred over drops when available
      - Antibiotic ointment helps prevent infection and fills in the defect on the cornea surface
      - Contact lens wearers need coverage for Pseudomonas, typically with a fluoroquinolone antibiotic
    - Pain management
      - Topical NSAIDs
        - Topical ketorolac can be an effective analgesic when used in prescribed doses, but be aware that prices vary
        - [EMA 1995 May Abstract 14 - Treatment Of Corneal Abrasions With Soft Contact Lenses And Topical Diclofenac](#)
      - Systemic opioids
        - Some providers prescribe a very short course of oral opioids
      - Topical anesthetics
        - The idea that topical tetracaine impairs corneal healing is being challenged and it may be safe in dilute doses for a brief duration
        - [EM:RAP 2017 December Paper Chase 4 - Topical Tetracaine For Corneal](#)
        - [EM:RAP 2014 September Paper Chase 2 - Topical Analgesia for Corneal Abrasion](#)
        - [EMA Links: EMA 2015 December Abstract 19 - The Safety Of Topical Anesthetics In The Treatment Of Corneal Abrasions](#)
        - [EM:RAP 2014 January Mythbusting 1 - Corneal Abrasions and Topical Anesthetics](#)
        - [EMA 2013 March Abstract 11 - Dilute Proparacaine For The Management Of Acute Corneal Injuries](#)
      - Cycloplegics and eye patching have questionable benefit
        - [EMA 2002 January Abstract 21 - Mydriatics in Corneal Abrasion](#)
        - [EMA 1993 November Abstract 13 - No Eye Pad For Corneal Abrasion](#)
- Follow up
  - Repeat exam in 1-2 days is recommended to assess for corneal ulceration and iritis
- Corneal burns
  - Chemical burns to the cornea should be immediately irrigated and should be continued until the pH reaches 7.0
    - Remember to irrigate first and then measure the pH of the eye
    - Be careful to measure the pH of the cornea itself, not the irrigation fluid that is being instilled

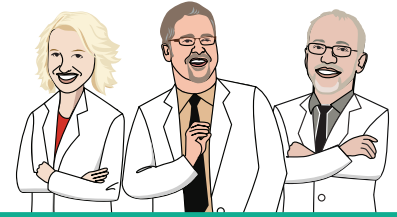


- As with elsewhere in the body, alkaline substances cause liquefactive necrosis whereas acids cause coagulation necrosis of the cornea
- Once the pH has normalized, perform a complete eye examination, including a measurement of IOP
- Treat with topical antibiotics, and consult an ophthalmologist for further recommendations and follow up
- Foreign bodies
  - Removal of foreign bodies embedded in the cornea can first be attempted using irrigation and a cotton tipped applicator
  - If these techniques fail, foreign body can be removal can be attempted using topical anesthetic and a small gauge needle (27 or 30 gauge) with the bevel pointed towards the operator
- Rust rings
  - Metallic foreign bodies embedded in the cornea for several hours can leave a rust deposit in the cornea
  - If the emergency provider is comfortable and has the appropriate tools, removal can be cautiously attempted using a corneal burr
  - Rust ring removal may be very difficult in the first 24 hours, alternatively, it can be done in follow-up 1-2 days later when it softens and becomes easier to remove

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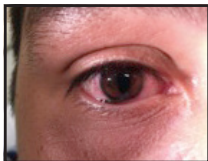
## Eyelid Lacerations

- Simple superficial lacerations of the eyelid can be repaired in the emergency department if the ED provider is comfortable with the repair
- Consider specialist consultation for
  - Lacerations involving the lid margin
  - Full thickness eyelid lacerations
    - These require careful examination for globe rupture and a multi-layered closure
  - Lacerations through the tarsal plate
    - These will require multi-layered closure
  - Signs of fat extrusion or ptosis
  - Lacerations near the medial lacrimal puncta
    - These may involve the canaliculus
    - Fluorescein stain applied to the cornea leaking out of the the laceration suggests lacrimal involvement

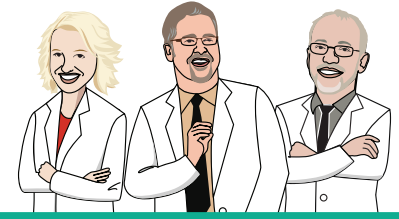


## Globe Rupture

- Globe rupture can occur with lacerations, penetrating eye trauma, or blunt eye trauma
- Signs of globe rupture
  - Peaked pupil
  - Scleral smudge (uveal prolapse)
  - Bloody chemosis
  - Subconjunctival hemorrhage
  - Seidel's sign
- If the suspicion is low you can consider checking an IOP
  - A low pressure suggests globe rupture
- CT can rule in globe rupture but is not sensitive enough to rule it out
  - [EM:RAP 2017 December - Paper Chase 5 - Open Globe Dx By CT Scan](#)
- Treatment
  - Eye shield (not patch)
  - It is critical to shield the eye from any contact or external pressure that may further damage (including extrusion of the eye humors)
  - Emergent ophthalmology consultation
  - Elevate the head of bed
  - Antiemetics
  - Tetanus prophylaxis
  - Pain medication and sedation as needed



Uveal prolapse inferior to iris in a globe rupture



## Hyphema

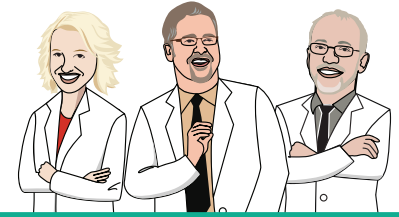
- Hyphema is blood in the anterior chamber
- It can occur spontaneously or as a result of trauma
- IOP should be measured in all patients with hyphema because of the risk for glaucoma
- Evaluate the extent of the hyphema and any associated injuries (e.g. ruptured globe or retinal detachment)
- Treatment
  - Emergent consultation is indicated in
    - Patients with sickle cell disease, who are at very high risk for rebleeding and acute glaucoma secondary to hyphema
    - A hyphema that fills the entire anterior chamber (an 8-ball hyphema)
  - Keep the patient upright to avoid corneal staining
  - Treat pain if painful
  - Treat glaucoma if present
  - Eye shield for comfort and protection from further injury
  - Consult with ophthalmology regarding cycloplegics
  - [EMA 2013 March Abstract 12 - Do Medical Interventions for Traumatic Hyphema](#)
- Disposition
  - Small hyphemas (<30% of the anterior chamber) in healthy patients who are not anticoagulated can be considered for discharge with close outpatient ophthalmology follow-up



8-ball hyphema (filling the entire anterior chamber) with bloody chemosis in a patient with a ruptured globe from blunt eye trauma

## Traumatic Iritis

- Iritis can occur after eye trauma as well as spontaneously in various medical conditions
- Key findings include
  - Painful red eye
  - Consensual photophobia
    - This is the finding of pain when light is shined into the unaffected eye
    - Inflammation of the ciliary body causes pain with pupillary constriction, regardless of the presence of light

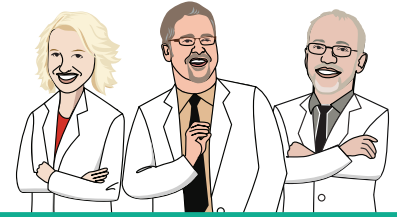


- The findings of “cell and flare” on slit lamp examination, which may layer into hypopyon (collection of pus) in the anterior chamber
- Management
  - Ophthalmology consultation
  - Homatropine
  - Topical steroids if recommended by ophthalmology

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## Retrobulbar Hematoma

- A retrobulbar hematoma is an accumulation of blood behind the orbit which can increase the intraocular pressure, decrease blood flow to the optic nerve, and cause permanent vision loss
- Often occurs in conjunction with a severe multisystem trauma
- Signs and symptoms
  - Awake patients may complain of pain and decreased visual acuity
  - Exophthalmos
  - Elevated IOP
    - If the pressure is >40 mm Hg lateral canthotomy should be performed to preserve vision
    - EMRAP-HD - Lateral Canthotomy
    - EMRAP-HD Smart Card is available that describes and shows the procedure step by step
    - If a retrobulbar hematoma is present but the IOP is <40 mm Hg, serial pressures should be checked and a canthotomy performed for rising pressures or worsening visual acuity
- Steps of a lateral canthotomy
  - Anesthetize - inject anesthetic into the lateral canthus
  - Clamp - clamp the lateral canthus with a hemostat to devascularize
  - Canthotomy - cude the lateral canthus laterally about 1-2 cm
  - Identify the canthal ligament - with iris scissors pointed perpendicular to the patient just inside the orbital rim, identify the inferior crus of the canthal ligament
  - Cantholysis - cut the inferior crus
  - Recheck pressure - if still elevated, cut the superior crus
  - Confirm that the IOP has dropped (and that vision is improving in awake patient)

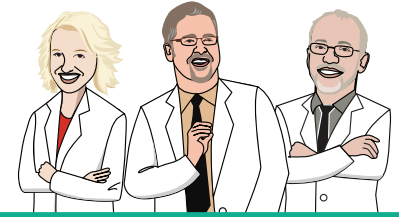


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## Traumatic Retinal Detachment & Traumatic Optic Neuropathy

- Retinal detachment can occur after eye trauma as well as spontaneously
- Traumatic retinal detachment
  - Eye trauma can lead to retinal detachment
  - Preceded by flashes, floaters, and then a visual field deficit
  - Ocular ultrasound can make the diagnosis
  - Consult ophthalmology for definitive diagnosis and management
- Traumatic optic neuropathy
  - Rare condition following trauma that damages the optic nerve and can cause permanent blindness
- Lens dislocation
  - Can result in monocular diplopia





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[REBELEM - Topical Anesthetic Use on Corneal Abrasions](#)

[LIFE IN THE FASTLANE - Eye Trauma](#)