Joint Trauma System

Defense Health Agency

Eye Trauma

Joint Trauma System Battlefield Trauma Educational Program

Scenario 1

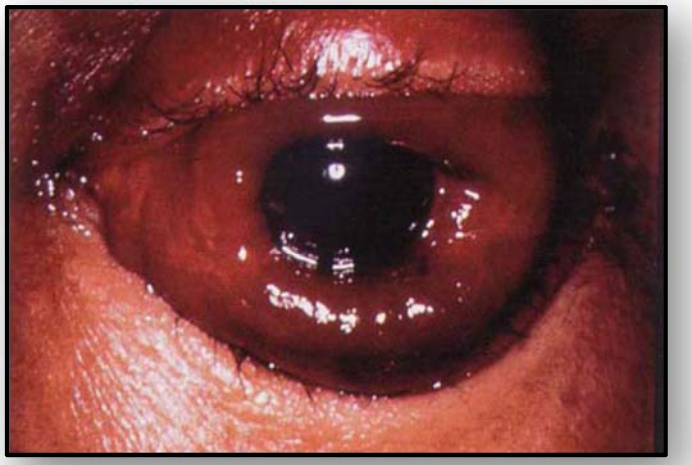
A 34-year-old female was hit in the left eye by a projectile flung up by a helicopter. She describes significant pain in the region and blurry vision.

1. What are your priorities?
2. How would you proceed with treatment?

Scenario 2

A 28-year-old female was in mine-resistant ambush protected (MRAP) vehicle that was struck by an rocket-propelled grenade (RPG). A piece of shrapnel struck her in the left eye with significant swelling and tightness of the left orbit and grossly visible penetrating of the eye. She reports ability to recognize light only from the eye.

1. What are your priorities?
2. How would you proceed with treatment?

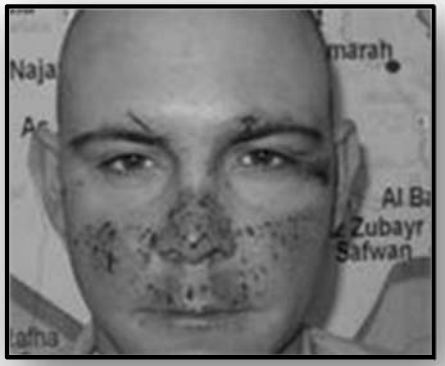


Objectives

- Prevent ocular injuries by wearing military combat eye protection (MCEP), ballistic protective eyewear (BPE), EyePro or Eye Armor
- "Keep an eye out" for ocular trauma: Maintain high index of suspicion
- Do NOT put pressure on eye with suspected open globe injury
- Teleophthalmology can improve and extend ophthalmic trauma care
- SHIELD AND SHIP
- Recognize and treat the 2 ocular emergencies
  - Chemical injury → irrigate immediately
  - Orbital compartment syndrome → lateral canthotomy and cantholysis

Background

- 10-15% combat-related trauma involved the eye during Operation Iraqi Freedom and Operation Enduring Freedom.
- Eye injuries can be prevented.
  - MCEP, BPE - EyePro or Eye Armor
  - Authorized Protective Eyewear List (APEL)



Do Not's

Do No Harm (DO NOT'S)

- DO NOT put pressure on eye with suspected open globe injury.
- DO NOT check intraocular pressure, ophthalmologist will check at Role 3.
- DO NOT patch → puts pressure on eye (DO shield but DO NOT patch).
- DO NOT wrap → puts pressure on eye.
- DO NOT place anything under an shield including gauze.
- DO NOT remove impaled or resistant foreign bodies.
- DO NOT attempt repair eye.
- DO NOT enucleate or debride tissue, even if eye is severely traumatized.

Initial Evaluation

Patient History and Initial Evaluation

- "Keep an eye out" for ocular trauma during the initial evaluation
  - Maintain high index of suspicion based upon mechanism of injury
  - Direct facial and ocular trauma
  - Blast injury/shrapnel/metal on metal
    - Metallic fragments can penetrate without obvious signs on exam
  - Blunt trauma
    - Compressive forces can cause ruptured globe

Initial Evaluation

Patient History and Initial Evaluation (*continued*)

- "Keep an eye out" for ocular trauma during the initial evaluation
  - Multitrauma, easy to overlook ocular trauma
  - Unconscious patient, cannot report change vision
  - Thermal burns
- Wear of MCEP/BPE/"EyePro"/"Eye Armor" at time of injury
- Glasses or contact lens use
- Past ocular history
- Tetanus status

Eye Exam

- ***Do NOT*** put pressure on eye with suspected open globe injury
- Vision
  - ❑ Assess and document for each eye if possible
- Pupils and extraocular motility
  - ❑ Assess and document if possible
- Survey eye "outside to inside"
  - ❑ External Exam – face, bony orbit, eyelids
  - ❑ Eye – conjunctiva, cornea, anterior chamber, iris, lens
  - ❑ Do not attempt fundus / posterior segment examination at Role 1 or 2.

Vision Acuity Testing

- Some patients may require drop of topical anesthetic to cooperate
- Record for each eye

1. Testing method
   - ❑ Snellen eye chart
   - ❑ Printed letters. Example: uniform name tape
   - ❑ Combat optotypes (figures of different sizes). Example: Stars or stripes on U.S. Flag patch
   - ❑ Count fingers
   - ❑ Hand motion
   - ❑ Light perception/No light perception
2. Distance tested (e.g., 5 feet)
3. With or without correction (glasses or contact lenses)

Vision Acuity Testing

- Example # 1
  - Right eye: uniform name tape 5 feet without correction
  - Left eye: count fingers 2 feet without correction
- Example # 2
  - Right eye: hand motion 2 feet with glasses correction
  - Left eye: stripes US Flag patch 10 feet with glasses correction

Teleophthalmology

- Improve and extend ophthalmic care to remote deployed locations
- Initiate consultation with ophthalmologist if possible
  - Phone (DSN, satellite, Nett Warrior)
  - Encrypted email
  - PATH/HELP
  - Video teleconference
  - Teleophthalmology app (If available)
- Information to provide in consult
  - Focal history: mechanism of injury, wear of EyePro, use of glasses or contact lenses
  - Exam: visual acuity, exam findings
  - Picture(s)

Shield and Ship Do's

- DO place rigid eye shield immediately.
- DO evacuate patient within 24 hours for evaluation by eye surgeon at Role 3 if possible.
  - ❑ No altitude flight restrictions for open globe
    There is no air in closed space with this injury.
- DO maintain patient comfort.
  - ❑ Pain control
- DO avoid maneuvers that increase intraocular pressure.
  - ❑ Valsalva, vomiting, strenuous movements
  - ❑ Give antiemetic pro re nata (PRN)

Shield and Ship Do's

Continued

- DO record vision and history.
- DO initiate teleophthalmology consultation.
  - Photographs, call, video
- DO give tetanus booster PRN.
  - Give at first available opportunity if needed.

Shield Do's

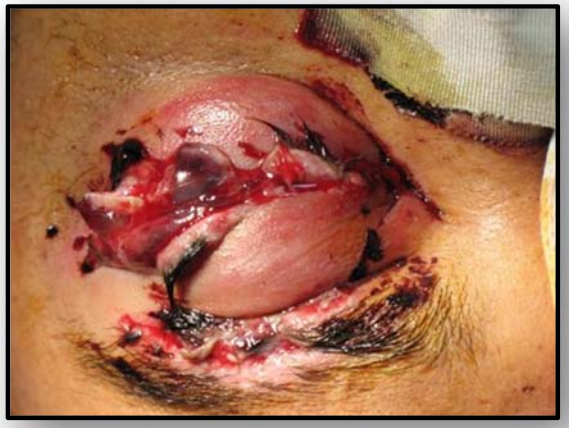
- DO use rigid eye shield (Fox shield if available).
  - ❑ Can use member's own eye protection (if intact or minor damage).
- DO position shield so rim of the orbit supports it when taped.
- DO secure shield with tape.
  - ❑ Recommend 3 strips or enough to secure.
- DO shield ONLY injured eye
  - ❑ Shielding both eyes increases patient anxiety.

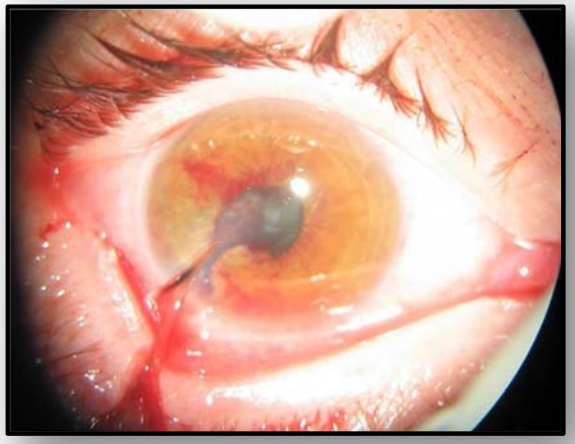
Shield Do Not's

- DO NOT let a suspected eye injury leave your level without rigid eye protection.
- DO NOT patch ➔ puts pressure on eye (DO shield but DO NOT patch).
- DO NOT wrap ➔ puts pressure on eye.
- DO NOT place anything under an eye shield including gauze.
- DO NOT shield both eyes if only one eye is injured.

Open Globe

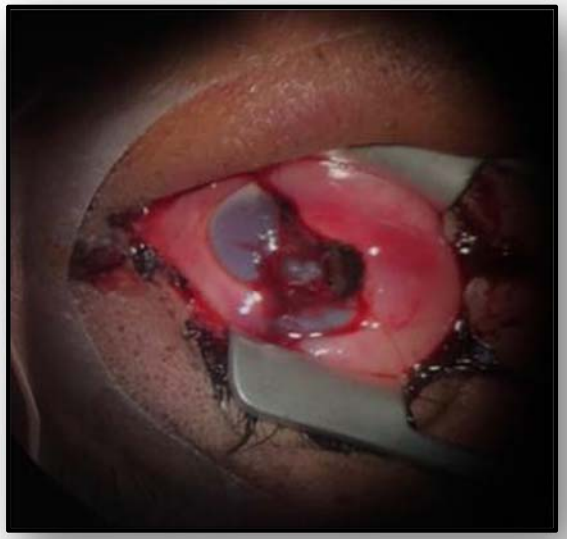
- Mechanism
  - Penetrating or perforating trauma
  - Ruptured globe from blunt trauma
- Exam
  - Subconjunctival hemorrhage (SCH), especially if 360 degrees
  - Full-thickness corneal or scleral laceration
  - Shallow anterior chamber
  - Peaked or irregular pupil
  - Prolapse of intraocular contents outside the eye. Dark tissue is iris or uveal tissue





Open Globe

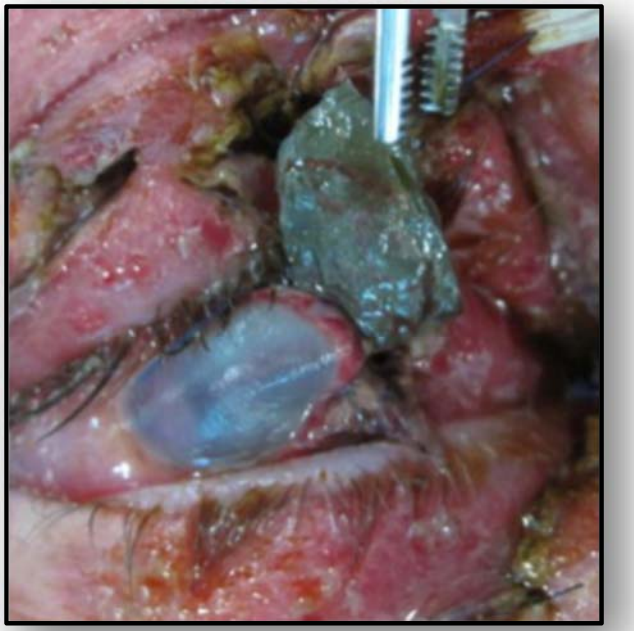
Management



- SHIELD AND SHIP
  - ❑ Rigid eye shield immediately
  - ❑ Evacuation within 24 hours if possible
- Record vision and history
- Teleophthalmology
- Antibiotics, Antiemetic, Tetanus booster PRN
- Avoid maneuvers that increase intraocular pressure.
- Do NOT attempt to repair.
- Do NOT attempt to enucleate eye.
- Do NOT attempt to debride tissue, even if eye is severely traumatized.

Intraocular Foreign Body (IOFB)

- History
  - High index of suspicion if blast injury/shrapnel/metal on metal injury
- Exam
  - Perforation site sclera or cornea
  - Hole in iris
  - Findings may be subtle



Intraocular Foreign Body (IOFB)

- Management
  - SHIELD AND SHIP
    - Rigid eye shield immediately
    - Evacuation within 24 hours if possible
  - Record vision and history
  - Teleophthalmology
  - Do NOT attempt to remove IOFB
  - Antibiotics, Antiemetic, and Tetanus booster PRN
  - Avoid maneuvers that increase intraocular pressure

Chemical Injury

- Exam
  - Blanching of conjunctiva
  - Corneal opacification
- Management
  - Begin irrigation immediately UNLESS open globe is suspected.
    - Normal saline or lactated ringers if available
    - Can use water or any neutral solution
    - Can use nasal cannula hooked to IV tubing for continuous irrigation
  - Minimum 2 liters irrigation if unable to check PH
    - Some chemical injuries require up to 10 liters

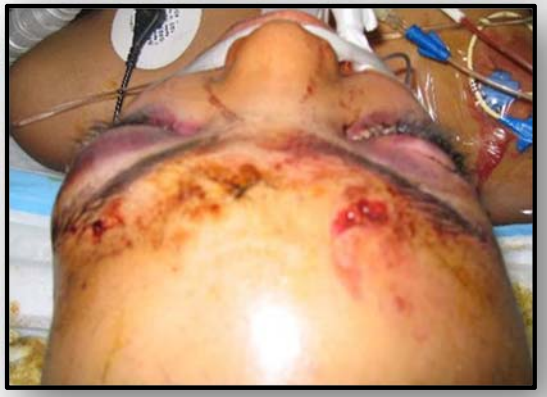
Chemical Injury

- Management *(continued)*
  - Topical anesthesia with available “caine” – tetracaine, proparacaine, lidocaine
  - Do NOT try neutralize acid with base or base with acid.
  - Remove visible acidic or basic foreign bodies with cotton tip applicator (CTA).
  - Teleophthalmology
  - SHIELD AND SHIP

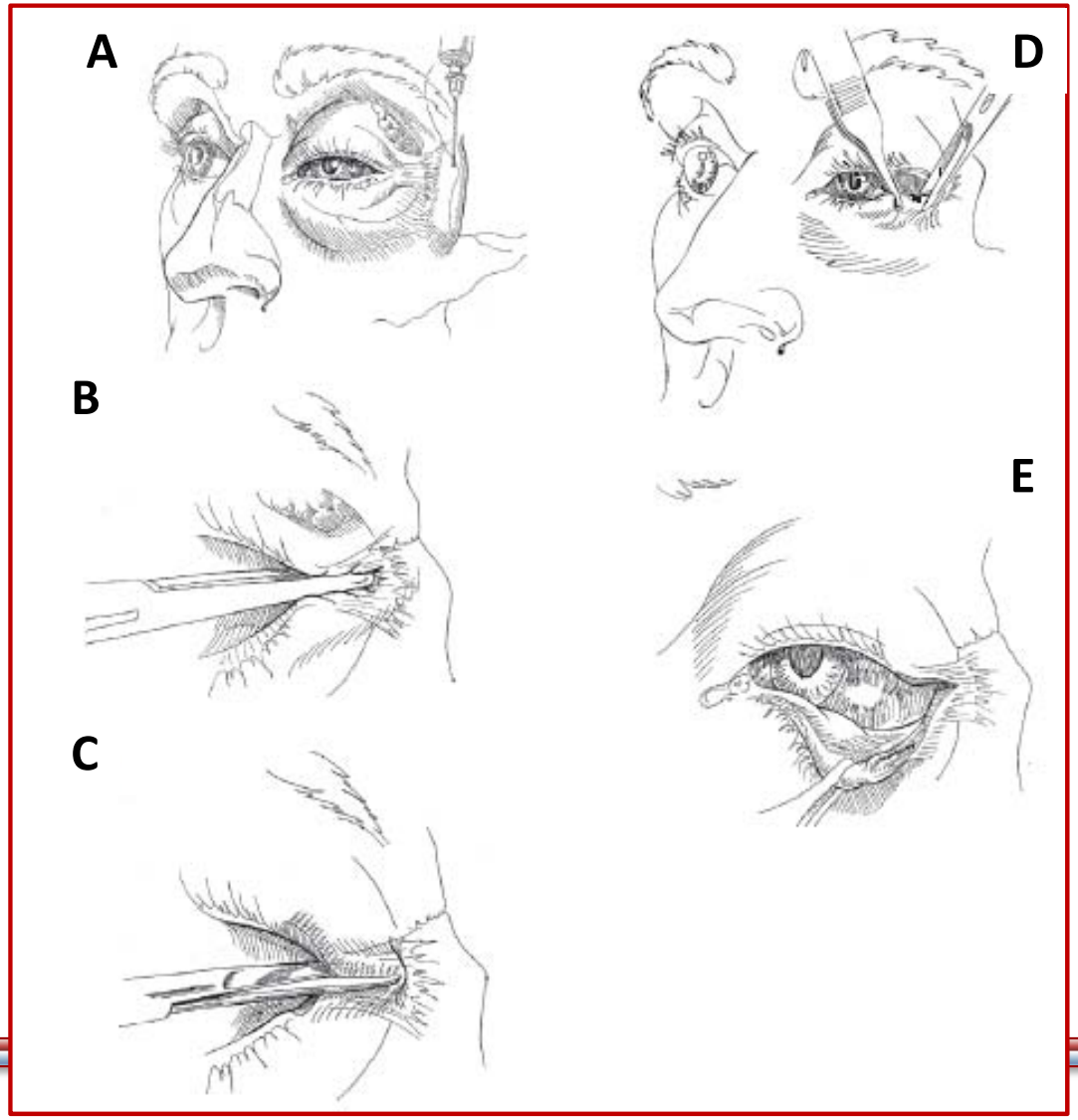
Orbital Compartment Syndrome

Most common cause is retrobulbar hemorrhage/orbital hemorrhage

- History: If conscious, pain, decreased vision, vision loss
- Exam: “Rock Hard” eyelids
- Management
  - Emergent Lateral Canthotomy and Cantholysis
  - Teleophthalmology
  - SHIELD AND SHIP



Lateral Canthotomy



Closed Globe Injury

- Hyphema is bleeding into anterior chamber
- Exam
  - Rule out open globe!
  - Blood or clot in anterior chamber
  - “8-ball” or “black ball” hyphema
- Management
  - Teleophthalmology
  - SHIELD AND SHIP

Orbital Fracture

Exam

- Step-off orbital rim
- Restricted eye movements
- Enophthalmos, hypoglobus
- Subcutaneous or conjunctival emphysema
- Numbness below eye

Orbital Fracture

Management

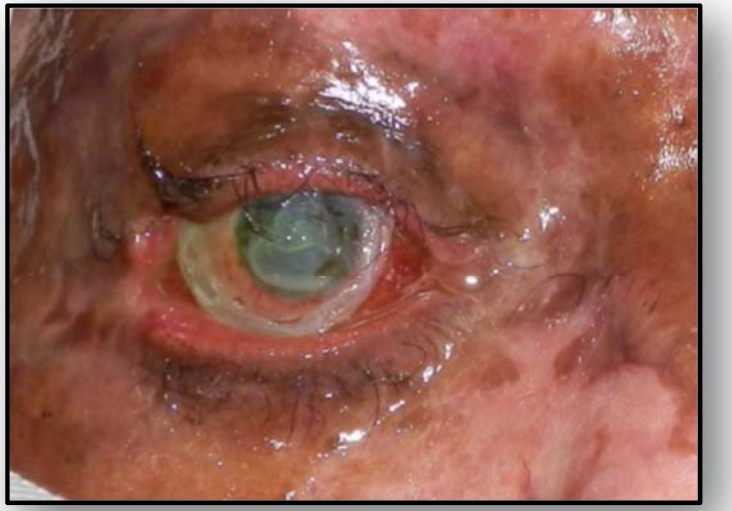
- Clinical evidence of entrapment with nonresolving brachycardia, heart block, nausea, vomiting, or syncope requires immediate repair, goal within 24 hours
- Teleophthalmology
- SHIELD AND SHIP
- No nose blowing
- Maintain high suspicion for open globe!

Eyelid Laceration

- Exam
  - Note if injury involves eyelid margin or nasolacrimal system
- Management
  - SHIELD AND SHIP
  - Maintain high suspicion for open globe!
  - Teleophthalmology
  - Unless experienced, delay definitive repair for laceration involving eyelid margin for surgery by ophthalmologist

Thermal Burn

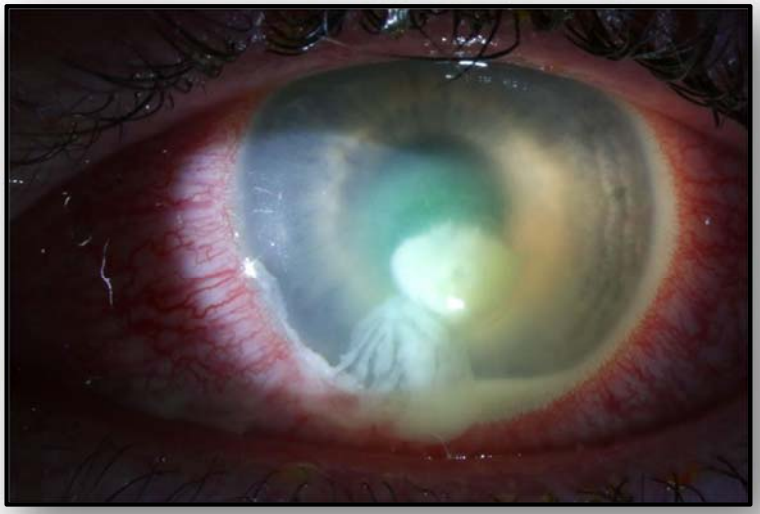
- Exam
  - Facial burn
  - Eyelash loss
- Management
  - SHIELD AND SHIP
  - Teleophthalmology
  - Eye ointment if unable to close eyelids and no open globe



Infectious Keratisis

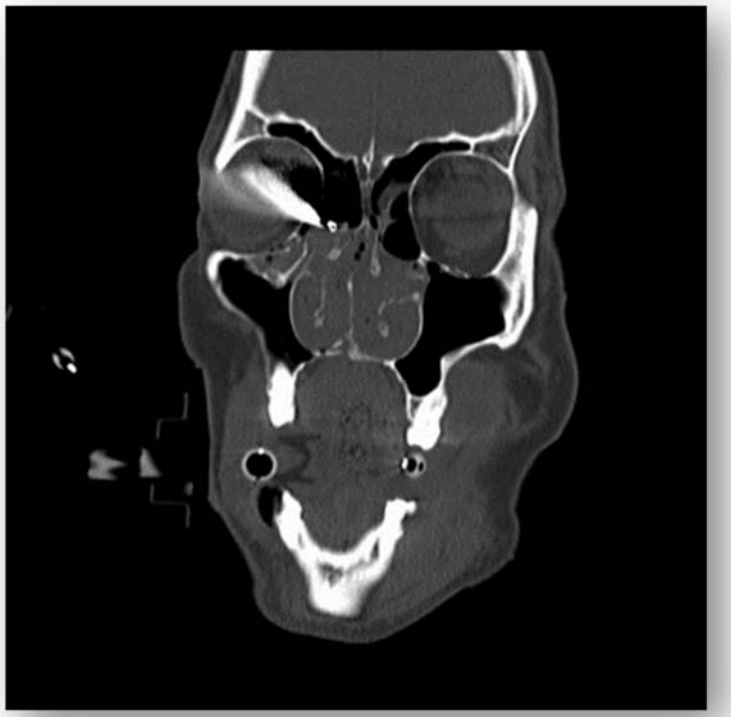
- Infectious keratitis/corneal ulcer
  - Commonly associated contact lens wear/overuse

    Numerous regulations prohibit or limit wear during deployment, but contact lens use during deployment is common
- Exam: Corneal infiltrate
- Management
  - SHIELD AND SHIP
  - Stop contact lens wear
  - Teleophthalmology



Other Trauma Ocular Injuries

- Laser Exposures
  - Document vision, report, ophthalmology consultation.
- LASIK flap dislocation
  - Do NOT amputate.
- Intraorbital foreign body
  - Do NOT remove impaled or resistant foreign bodies.



Other Trauma Ocular Injuries

- Corneal abrasion
  - Use topical antibiotic drops or ointments.
- Corneal and conjunctival foreign bodies
  - Superficial may be irrigated away or removed with a moistened cotton tipped applicator under topical anesthesia.
  - Start topical antibiotic drops or ointments.
- Traumatic optic neuropathy
  - Document vision, afferent pupillary defect.

Exercise 1

A 34-year-old female was hit in the left eye by a projectile flung up by a helicopter. She describes significant pain in the region and blurry vision.

1. What are your priorities?
2. How would you proceed with treatment?

Exercise 2

A 28-year-old female was in MRAP that was struck by an RPG. A piece of shrapnel struck her in the left eye with significant swelling and tightness of the left orbit and grossly visible penetrating of the eye. She reports ability to recognize light only from the eye.

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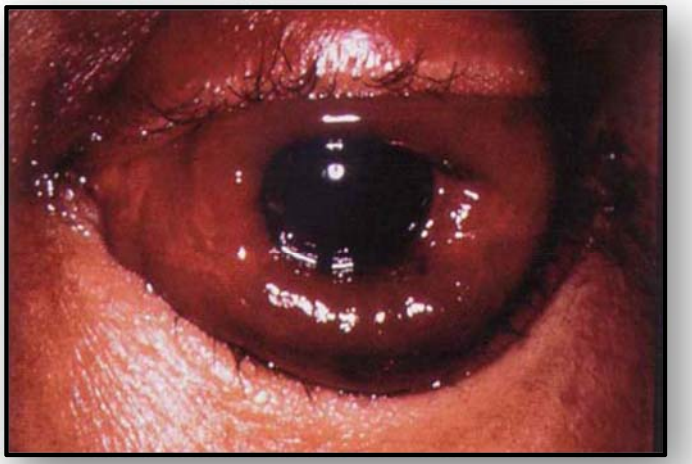

References

- Joint Trauma System, Eye Trauma: Initial Care Clinical Practice Guidelines, 28 Aug 2019, https://jts.amedd.army.mil/assets/docs/cpgs/JTS_Clinical_Practice_Guidelines_(CPGs)/Eye_Trauma_Initial_Care_28_Aug_2019_ID03.pdf
- Borden Institute, Emergency War Surgery, 5th U.S. edition, Chap 14, 2018.
- Allen RC and Harper RA (Eds.). (2017) Basic Ophthalmology: Essentials for Medical Students (10th ed.). San Francisco, CA: American Academy of Ophthalmology.
- Godbole NJ, Seefeldt ES, Raymond WR et al. Simplified Method for Rapid Field Assessment of Visual Acuity by First Responders After Ocular Injury. Military Medicine. 2018;183:219-223.
- Mines MJ, Bower KS, Lappan CM, et al. The United States Army Ocular Teleconsultation program 2004 through 2009. Am J Ophthalmol. 2011;152:126-132.e2.
- The Wills Eye Manual: Office and Emergency Room Diagnosis and Treatment of Eye Disease. Philadelphia: Lippincott, 1994. Print.

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