Traumatic Eye Injuries

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Traumatic Eye Injuries

Today we will review…

1. Variety of ocular injuries
2. Basic anatomy
3. Visual recognition of injuries
4. Sight-saving procedures
Traumatic Eye Injuries

Why pay attention today?

A. We see a lot of eye injuries
B. The number of really serious injuries is increasing
C. We need to be on top of our game to diagnose and treat the worst ones properly
D. All of the above
Epidemiology

• 2.4 million eye injuries in the US annually
• 15% occur in the workplace
• 80% males
• Young population
• 50,000 new cases of trauma related monocular blindness each year
Where do most eye injuries occur?

A. Home
B. Work
C. Sports
D. Highway
E. Other

Make your selection please…
<table>
<thead>
<tr>
<th>Setting</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>40%</td>
</tr>
<tr>
<td>Work</td>
<td>15%</td>
</tr>
<tr>
<td>Highway</td>
<td>15%</td>
</tr>
<tr>
<td>Sports</td>
<td>15%</td>
</tr>
<tr>
<td>Other/Unknown</td>
<td>15%</td>
</tr>
</tbody>
</table>
# Epidemiology

## Sports

<table>
<thead>
<tr>
<th>Sport</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseball / Softball</td>
<td>33%</td>
</tr>
<tr>
<td>Fishing</td>
<td>28%</td>
</tr>
<tr>
<td>Basketball</td>
<td>10%</td>
</tr>
<tr>
<td>Golf</td>
<td>8%</td>
</tr>
<tr>
<td>Racquetball</td>
<td>6%</td>
</tr>
<tr>
<td>Tennis</td>
<td>5%</td>
</tr>
<tr>
<td>Soccer</td>
<td>5%</td>
</tr>
<tr>
<td>Football</td>
<td>4%</td>
</tr>
</tbody>
</table>

Witherspoon et al, Opth Clin N Am Vol 12 1999
Anatomy

- Relatively thick bones superiorly and laterally
- Thin medial wall and orbital floor
- Closed space
- Proximity to brain and sinuses
SR elevates, adducts, rot. medially
SO depresses, abducts, rot. Medially
MR adduction
Obliques protrude the eye

IR depresses, adducts, rotates lat
IO elevates, abducts, rot. Laterally
LR abduction
recti retract it
Levator Palpebrae

Superior Rectus

Space within cone of muscles

Orbicularis Oculi

Sup. tarsal muscle

Tarsus (upper)

Bulbus oculi

Optic nerve

Subarachnoid space

Inferior Rectus

Fascia bulbi (Tenon’s capsule)

Inferior Oblique

Conjunctival sac

Orbital septum

Inf. tarsal muscle

Ciliary gland

Ciliary glands

Tarsus

Skin

Conjunctiva

Ciliary

Tarsal

CILIARY

TARSAL
How Thick is the Cornea?

A. 0.5 mm
B. 1 mm
C. 2 mm
D. 2.5 mm
E. 3 mm

Make your selection, please.
Priorities

- Stabilize the patient
- Assess visual pathways
- Assess global integrity
- Provide sight saving procedures
- Consult early
Sight-saving Procedures

- Irrigation
- Globe protection
- Lateral canthotomy
History

- Proceed after assessment of ABC’s and addressing life threats
- Obtain detailed history of what happened to the eye
- Obtain past ocular history, including contact wear, and medical problems affecting the eye
- Describe visual symptoms
External Eye Exam

• Look for
  – Trauma
  – Infection
  – Dysfunction
  – Deformity
  – Proptosis
  – Subcutaneous emphysema

• Palpate the orbital rim
Visual Acuity

- Distance chart, handheld chart
- Count fingers
- Hand motion
- Light perception
- Use glasses or pinhole to document best acuity as possible
- Use topical anesthetic if required
Visual Fields

• Test gross confrontational fields
Pupillary Exam

- Look for relative afferent pupillary defect to identify an optic nerve injury
- Assess size and roundness, regularity
- Anisocoria may be caused by trauma, cycloplegics, PCA aneurysm, prior trauma or surgery
Ocular Motility

- Test all six EOM’s, CN 3,4,6
  - SO4
  - LR6
  - R3
- Motility is impaired by constriction, nerve injury, trauma
- Diplopia present
Anterior Segment

- Best done with slit lamp
- Examine all portions of anterior chamber for injury
- Evert lids
- Use fluorescein dye
Fundus

- Dilate pupils for best results
- Document full pupillary exam first
- Look for foreign body, blood, detachment, other
Before dilating...
IOP

- Don’t measure if globe rupture suspected
- Increased with hyphema
Injuries
Is this just a Subconjunctival Hemorrhage?
No...
Corneal Abrasion

- Pain, photophobia, tearing
- Topical anesthetic relieves pain
- Identify source when possible
- Evert lids
- Use slit lamp
Corneal Abrasion
Corneal Abrasion

- Evaluate for foreign body
- Dilate (homatropine)
- Antibiotic ointment
- Tetanus
- Follow up
- Contacts?
Which mechanism is most worrisome for an IOFB?

A. Working under a car removing a rusted muffler
B. Welding
C. Sanding wood with an orbital sander
D. Striking a nail with a hammer
E. Forgetting your anniversary

Make your selection, please.
Corneal Foreign Bodies

- If metal on metal, rule out intraocular foreign body
- Don’t assume there is only one...
- Remove foreign body and rust ring
- Refer
Foreign Bodies
Corneal Foreign Bodies

- Topical Anesthetic in ED
- Pain meds at home
- Topical antibiotics
- Cycloplegia
Clues to Perforation

- Hemorrhagic chemosis
- Shallow anterior chamber
- Hyphema
- Irregular pupil
- Significant reduction in visual acuity
- Poor view of fundus
- Positive Seidel’s
Scleral Laceration
Scleral Laceration
Lacerations: Yes or No?
Should you try to repair this laceration in your office?

A. Yes
B. No
C. Maybe
Yes or No?
• Refer for wound closure, unless you have no choice
• Canalicular system injuries must be referred
Blunt Trauma

• Visualization of eye may be difficult. Use speculum
• Assess visual acuity and globe integrity
• If the anterior chamber is flat, make no further attempt to assess the eye.
• Sight Saving Procedure:
Sight Saving Procedure

• Place a metal protective shield over the eye and don’t let anyone touch it!
• Use a styrofoam cup if you can’t find a shield
Globe rupture

- Administer antibiotics
- NPO
- Consult
Globe Rupture
Blunt Trauma

- If globe appears intact, proceed with exam
- Look for hyphema grossly
- Assess EOM for entrapment
- Palpate orbital rims
- Assess for sensory loss
Blunt Trauma

- Perform a slit lamp exam
- Use fluorescein
- Look for evidence of pupillary irregularity
- Dilate and do a fundoscopic exam
- Refer even if no injuries found
Mechanism for Blunt Injury

- Eye is struck
- Cornea pushed inward, compressing globe
- Rupture may occur at weakest points (recti insertion, corneal-scleral limbus)
- Pupillary sphincter may rupture
Mechanism for Blunt Trauma

- Iris may be avulsed from ciliary body
- Anterior chamber recessed, tears ciliary body, hyphema forms
- Blood cells clog meshwork, >IOP
- Zonular ring may be torn, dislocating lens
- Bleeds and detachment posteriorly
Mechanism for Blunt Trauma
Mechanism for Blunt Trauma

Suspect traumatic optic neuropathy when other cause of acute significant visual loss cannot be found

Check for RAPD
Orbital Compartment Syndrome

- History of trauma
- Pain, Proptosis
- Resistance to retropulsion of the globe
- Markedly decreased or absent vision/RAPD
- Consult immediately for treatment options
- Medical management?
  - Topical beta blocker, diamox, mannitol
Sight Saving Procedure: Canthotomy and Cantholysis

- Must be done aggressively
- Local anesthesia
- Grasp lateral canthus with hemostat, crushing tissue
- Incise with scissors
- Grasp lower lid with forceps and pull outward until you can feel the attachments to the lid on the orbital rim. Cut the insertions, and the lateral canthal tendon.
- Repeat on upper lid if needed
- Eye will push forward, relieving pressure
• Appearance post canthotomy:
• Needle decompression if this fails
• Localize blood first
Carotid Cavernous Fistula

- 2-3 days post trauma
- Diplopia, noises in head, engorged vessels, elevated IOP, pulsatile tinnitus
- Visual loss
- Management by Neurosurgery and interventional neuroradiology
- Findings more subtle if dural based
Grading Hyphemmas

O: no layered blood
1: less than 1/3
2: 1/3 to ½
3: >1/2
4: Total (8 ball)
Treatment of Hyphemas

- Assess for rupture / penetrated globe
- Elevate head to allow cells to settle
- Dilate the pupil
  (normal iris constriction and dilation will stretch vessels, causing rebleed)
- Treat elevated IOP
- Amicar (antifibrinolytic) per ophtho
- Generally admitted
Blow Out Fractures
Blowout Fracture

- Paralysis of Upward Gaze
- Diplopia on upward gaze
- Enophthalmos (rare)
- Infraorbital anesthesia
What injury is present here?
Make your selection, please:

A. Retro-orbital bleed, right eye  
B. Medial rectus entrapment, left eye  
C. Superior orbital fracture, right eye  
D. Prosthetic eye, left side  
E. No injury, he has multiple sclerosis
Blowout Fracture

- 33% involve eye: consult ophtho even if asymptomatic
- If no entrapment, eye injury, conservative treatment
- Oral antibiotics
- Specialty follow up
- Avoid blowing nose
Traumatic Iritis

- Occurs 2-3 days after the event
- Pain, photophobia, redness, blurring
- Not relieved by topical anesthetic
- Cells and flare
- Consensual pain
Traumatic Iritis

- Rule out other injury
- Cycloplegia
- Consult ophtho
- Topical steroids
Commotio Retinae

- Follows blunt trauma
- Uncommon
- Retinal whitening, edema
- Contracoup type injury
- Occurs within hours, resolves within days
- Visual acuity decreased, (esp. at macular involvement) scotoma
- Refer to retina specialist
- Visual loss may persist
Airbag Injuries

- Velocity of inflation 200 mph
- Classic sequelae of blunt trauma for eye
- Safety glasses for driving?
Airbag Injuries
Penetrating Injury

- More likely to have long term impairment
- Globe rupture--
  Prognosis better with:
  - Visual acuity 20/200 or better
  - Penetrating injury
  - Injury anterior to rectus muscle
  - Injury length less than 1 cm
Sight Saving Procedure

• A true emergency!
• First priority copious irrigation
• Wait on visual acuities
• Assess pH intermittently
• Ensure lids and corners irrigated
Grading Chemical Injuries

I: loss of corneal epithelium

II: stromal haze and small amount limbic ischemia

III: widespread stromal haze and obscurcation of iris, larger ischemia

IV: opaque cornea, >50% limbic ischemia

“Good” prognosis for I and II
Which exposure has a better prognosis?

A. Acid burn to the eye
B. Alkali burn to the eye
Chemical Injuries

- Acid coagulates protein, limiting depth of injury
- Alkali may have severe penetration, causing damage to deep structures within minutes
- Both can be blinding
Chemical Injuries
Superglue

- Remove clumps from eyelids
- Erythromycin ointment to moisten, lubricate, and dissolve
- Refer to ophtho
- Usually not permanently harmful
Thermal Injuries

- History of exposure
- Pain, tearing, decreased vision, redness, FB sensation
- Differentiate from welder’s flash
- Corneal epithelial defect
- Corneal whitening = stromal burn
Thermal Injuries

- Rule out ruptured globe
- Consider chemicals
- Topical antibiotics
- Cycloplegia
- Pain meds
- Patch
- Ophtho
Remember...

- Protect a ruptured globe
- Irrigate copiously
- Canthotomy and cantholysis as an emergency sight saving procedure
- Keep your eyes out for potential injuries...
…but not to this extent.