

Trauma for the OD: A Case Management Approach

COPE#31000-GO

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Virginia Eye Consultants

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Frequency of Traumatic Ocular Conditions

- Superficial injury of the eye and adnexa (41.6%)
- Foreign body on the external eye (25.4%)
- Contusion of the eye and adnexa (16.0%)
- Open ocular adnexa and eyeball wounds (10.1%)
- Orbital floor fracture (1.3%)
- Nerve injury (0.3%)

Rappon, J. Primary Care Ocular Trauma Management. Retrieved from <http://www.pacificu.edu/optometry/ce/courses/21042/primarycaretraumapg1.cfm>

Eye Trauma Statistics

- 75% of the injuries were to males
- 48% occurred at home
- 29% caused by play or sports
- 77% of injury victims were not wearing eyewear
- 55% thought that injuries could have been avoided with patient education

Source: American Academy of Ophthalmology, Eye Injury Snapshot 2009 Results Accessed from <http://www.patishomepage.com/forwards/work.htm> on 4/15/11

Triage Considerations

- Urgency vs. Emergency
- Acute vs. Chronic
- Mild vs. Severe
- Progressive vs. Stable
- Document all calls

<u>Emergency</u> <u>Immediately</u>	<u>Very Urgent</u> <u>Few Hours</u>	<u>Urgent</u> <u>Within a day</u>
Retinal Artery Occlusions	<u>Perforation</u>	Orbital Cellulitis
<u>Chemical Burns</u>	<u>Ruptured</u>	<u>Orbital Injury</u>
	Acute Glaucoma	Corneal Ulcer
	Sudden Proptosis	<u>Corneal Abrasion</u>
		<u>HypHEMA</u>
		<u>Intraocular Foreign Body</u>
		<u>Retinal Detachment</u>
		Macula Edema

Who's Your Phone a Friend??

General Trauma Considerations

- Take care of the obvious
 - ABCDE's
 - Radiology
 - Concussion evaluation
 - Mental status of patient

Importance of History

- Take your time with the history
- Inquire about angle of impact
- Nature of insulting object
 - Sharp, dull, big, small
- Prior treatments
- What was your vision before the injury?

Evaluation of Ocular Trauma

- Visual acuity – MUST CHECK VA
- Pupil testing – reactivity, equality, symmetry, APD?
- Confrontation visual fields – evaluate gross defects
- EOMs – Most critical in the evaluation of blunt trauma
- Gross examination – Lids take the brunt of the trauma
- Slit lamp examination
- Tonometry*
- Dilation*
- B-scan ultrasonography
- Color vision
- Imaging studies – CT / MRI

Computerized Tomography

- If you suspect any of the following, a CT scan is indicated
 - History of loss of consciousness for more than 10 minutes
 - Alcohol intoxication
 - History of seizures
 - Unreliable history of the accident
 - Age less than 2 years
 - History of persistent vomiting
 - Bleeding from the nose, mouth or ear
 - Patient has serious facial injury
 - Penetrating injury to the skull
- No MRI for fear of metallic foreign body

Axial vs. Coronal CT Scans

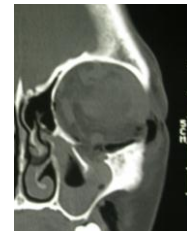
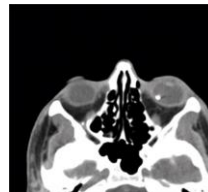


Photo Courtesy of Tom Joly, MD, PhD and Derek Cunningham, OD

Neuro-ophthalmologic Trauma

- Third, fourth and sixth nerve palsies can all happen
 - Third nerve palsies associated with worst outcome
 - Sixth nerve palsies associated with best outcomes

Start with the Most Serious

- Chemical burns
- Mechanical
 - Open globe
 - Closed globe
- Major orbital trauma
- Intraocular foreign body
- Head/Neck trauma

Chemical Burns

- **Emergency!!!** - Every minute counts
- Do not waste time on Hx and PE
- Alkali burns more common and worse than acid
 - Alkali
 - Household cleaners, fertilizers, drain cleaners
 - Acid
 - Industrial cleaners, batteries, vegetable preservatives

Chemical Burns

- Check VA????
- Check pH if possible
- Immediate irrigation
 - Do not wait until they are at your office
- Absolute Emergency – 1 day consult at most for minor cases

Hughes Classifications of Ocular Burns

- Grade 1 (Very good prognosis)
 - No corneal opacity or limbal ischemia
- Grade 2 (Good prognosis)
 - Corneal haze but iris details are clear. Less than 1/3 cornea limbus ischemia
- Grade 3 (Guarded prognosis)
 - Sufficient corneal haze to obscure iris details. 1/3 to 1/2 of cornea limbus ischemia
- Grade 4 (Poor prognosis)
 - Opaque cornea without view of iris or pupil. More than 1/2 of cornea limbus ischemia

Management of Chemical Burns

- Debride necrotic tissue
- **Frequent ATS**
- Bandage contact lens
- **Quinolone: 1 gtt 4-6x/day (prevents infection)**
- Prednisolone phosphate: 1 gtt q 1-2 hr while awake (reduces inflammation)
- Vitamin C: 1-2 gm po QD (reduces corneal thinning/ulceration)
- 10% sodium citrate: 1 gtt q 2 hr while awake (chelates Ca++ and impairs PMN chemotaxis)
- **Scopolamine 0.25%: 1 gtt TID (reduces pain/scarring with AC inflammation)**
- 10% Mucomyst (n-acetyl-cysteine): 1 gtt 6x/day (mucolytic agent and collagenase inhibitor)
- **Oral pain meds**
- Doxycycline 100 mg po bid (collagenase inhibitor)
- **Glaucoma gtts/oral diamox if IOP elevated**
- Significant injury may require admission

Pearls - Prevention is KEY!!!

- Know the potential eye safety dangers
- All chemical injuries should be lavaged immediately
- Extent of damage is dependent on concentration and pH of acid or base
- Eliminate hazards before starting work
- Use protective measures

Case #2: Pencil Fighting

- 13 year old AA male
- Stuck in the eye with a pencil
- Couldn't open his eye

Open-Globe Injuries

- Full-thickness wound of the eyewall
- Rupture – Caused by blunt object increasing IOP, wound is an inside-out mechanism and not necessarily at the impact site
- Laceration – Usually caused by a sharp object, wound is an outside-in mechanism at impact site
- Penetrating – single entrance laceration
- Perforating – Two wounds caused by the same object

Open Globe

- Check VA - reduced
- Seidel's sign
 - NaFl stain
- Displaced pupil
 - Expelled contents
- Non-reactive pupil
- Low IOP
- Poor reflex
- Hyphema

Case #3: Weekend Call

- 64 yowm c/o decreased VA OS, watery eye, no pain
- Hit head on corner of the bed last night
- Went to sleep hoping it gets better
- Used ATs for relief
- Ocular Hx: Cataract surgery OU, PKP OS 2005

Ruptured Globe

Photo Courtesy of Tom Joly, MD, PhD

Treatment for Open Globe Injuries

- Protect the eye with fox shield
- Oral antiemetics to prevent Valsalva maneuvers
- Administer sedation and analgesics PRN
- Avoid topical eye solutions

Closed-Globe Injuries

- Closed-globe injuries
 - No full-thickness wound of the eyewall
- Contusion
- Laceration
- Superficial foreign body

Contusion

- Need to get eye open
 - Will dictate urgency of consult
- Check VA
- Assess lids and globe for debris or lacerations
- Check pupil response (round pupil)
- Red Reflex?
- Do eyes move well together?
- Instill FI to check for abrasions
- Check IOP if all else is clear
- Palpate bony orbital rim checking for tightness or crepitus (orbital emphysema)

Black Eyes

- Severe
- Palpate orbital rim
- Treatment
 - Ice packs
 - Pain meds
 - Rest

Photo Courtesy of Tom Joly, MD, PhD

Sub-Conjunctival Hemorrhage

- No sx other than redness
- Cause:
 - Valsalva: cough? Heavy lifting?
 - Trauma: rubbing?
 - Hypertension: check BP
 - Bleeding disorder/meds: warfarin? ASA?
 - Idiopathic
 - Orbital mass: check EOM, retropulsion, IOP

Photo Courtesy of Esther Chang, MD

Lid Lacerations

- Check VA
- Difficult to suture because of tarsal plate and margin function
- Refer to ophthalmology
- Tetanus prophylaxis
- Upper lid skin has no subcutaneous fat

Photo Courtesy of Tom Joly, MD, PhD

Upper Lid Defects

- Must consider levator/aponeurosis
- NO subcutaneous fat

Excursion of upper eyelid from maximum downgaze to maximum upgaze (12-17 mm)

Lower Lid

- Lacerated canthus
- Lacrimal drainage system
- Quality reconstruction necessary
- Wound closure can be delayed for up to 3 days with satisfactory surgical outcomes in adults and 12-36 hours in children
 - Can be beneficial to allow swelling to go down, leading to better visualization of tissue re-approximation

Photo Courtesy of Tom Joly, MD, PhD

Blunt Trauma

- Proptosis from retrobulbar hemorrhage
- Contusion/sub-conj hemorrhage
- Retinal detachment
- Commotio Retinae
- Traumatic uveitis or hyphema
- Traumatic cataract
- Blow out fracture

Blowout Fracture

- Check VA
- Base and medial walls of orbit are very thin
- Does not need to be a major trauma
- Look for trapped extra-ocular muscles (reduced versions) - strabismus
- Sunken eye - hypo-ophthalmos
- Infraorbital hypoesthesia
- Diplopia
- Pain on eye movement or nausea

Repair?

- Within 2 weeks
 - Symptomatic diplopia within 30° of primary gaze
 - Muscle entrapment (prevent ischemia and necrosis)
 - Fracture greater than 50% of orbit floor
 - Displaced orbital rim fracture
 - > 3mm of enophthalmos, significant hypo-ophthalmos
- Monitor
 - Diplopia outside central 30°
 - Modest isolated fractures
 - Improvement over first 2 weeks

Orbital Trauma in Children

- Trap door orbital floor fractures are very common
 - More elastic orbits
 - More common to get muscle entrapment
- Evaluation for repair typically in 5-7 days vs 2 weeks for adults

<http://www.opt.indiana.edu/ce/big10/02.htm>
<http://emedicine.medscape.com/article/867985-overview#a0112>

Pearls

- Initial restriction in ocular motility is often secondary to orbital edema
- If no entrapment on CT, re-evaluate after edema resolves

Corneal Foreign Body

- Remove if visible and not completely penetrating
- Always document depth of FB
- Stain cornea with NaFl
- Anesthetize eye for patient comfort and to allow a better view.

Case Example

- 26 year old White Male
- Prisoner in Alabama
- Chipping cell bars with file while prison guard is blowing himself up
- Occurred 2 weeks ago
- Feels something hit his eye

Initial Presentation

- Va: OD = 20/30 OS=20/25
- Right eye ciliary flush
- Scattered subconjunctival hemorrhage
- Mild traumatic iritis
- Counselor vision should return
- Rx with Atropine and Pred Forte drops

Two Weeks Post Injury

- Persistent foreign body sensation and redness
- Va: OD = 20/30 OS=20/20
- Stable iritis
- Dilated exam

IOFB Diagnosis

- Beware of metal on metal
- Careful SLE
- Look at lens closely
- Look at corneal endothelium
- Siderosis
- Dilate
- Gonioscopy
- Transillumination
- B-scan, Plain Film, and/or CT scan

IOFB Treatment

- Prompt Referral
- Traumatic Endophthalmitis
- Bacillus Cereus: kissin' cousin to Anthrax
- High risk of NLP and loss of eye
- Immediate Vitrectomy
- Immediate Intravitreal Antibiotics and Vitrectomy within several days
- Chronic IOFB also requires prompt contact with specialist

Periocular Infection

- Any antibiotic regimen should have adequate central nervous system penetration to minimize the risk of meningitis and cavernous sinus thrombosis
- Systemic steroid use is controversial and should only be used after sufficient antibiotic loading and on immunocompetent patients

IOFB Treatment

- Vitrectomy +/- Lensectomy
- IOFB Removal
- Magnet vs. Forceps
- Where to take out
- Retinal Impact Site
- Laser
- Partial Gas-Fluid Exchange
- Posterior Hyaloid Separation
- Not a Simple Procedure

Clinical Pearls

- Beware of metal on metal
- Prompt referral to retinal specialists
- Potential severe complications
 - Retinal Tear
 - Retinal Detachment
 - Traumatic Endophthalmitis
 - Siderosis

Corneal Lacerations

- Seidel test
- Observation versus surgical repair
 - Size
 - Depth
- Severe trauma
 - Iris prolapse
 - Scleral laceration
 - Cataracts
 - Hyphema

Corneal Abrasions

- Check VA
- Important to know what abraded the cornea – Organic vs Inorganic
- Did the patient put anything into their eye afterwards?
- Grade the level of pain/light sensitivity

NEVER PATCH !!!

- Patching creates a great anaerobic environment
- Patient can not tell if things are getting worse
- Oxygen speeds healing
- If a patch is needed let an eye doc make the decision
 - Patch for pain until they get into your office?

Fluorescein

- Always instill FI for a suspected corneal abrasion
- Need to use a cobalt blue light to excite the FI
- Be careful with the use of topical anesthetics

Abrasion Treatment

- Minor abrasion require only prophylactic antibiotic and ocular lubricants (topical NSAIDS?)
- Moderate to severe – cycloplegic, oral analgesic, bandage contact lens, 4th Gen Fluoroquinolone
 - Clean up margins?
 - Doxy?

Pearls

- Never prescribe topical anesthetics
- Avoid patching CL wearers and pts who sustained injury from vegetative matter or fingernails
- Consider infectious process in presence of purulent discharge
- Corneal infiltrate is suggestive of infection
- AC reaction is suggestive of infection
- May lead to RCE

RCE Treatment

- Treat abrasion first
- Lotemax with taper X 2 mos
- Muro 128 ung X 2 mos
- Freshkote TID X 2 mos
- Doxy BID X 2 mos
- Restasis???
- Superficial Keratectomy

Karpecki, P. Pearls: Management of Recurrent Corneal Erosion. Accessed from http://www.eyecareeducators.com/site/pearls_management_of_recurrent_corneal_erosion.ht

LASIK

- Any corneal abrasion on a flap is serious.
- Microkeratome flaps can easily come off years after surgery
- Femtosecond flaps incredibly stable, but can still have issues

My Eye Hurts?

- 38 year old male
- Was welding and felt like something was in his eye

UV Keratitis Treatment

- Artificial tears
- Oral analgesics
- Antibiotic if infection is suspected
- No topical anesthetics

<http://emedicine.medscape.com/article/799025-workup>

Photokeratitis/Snow blindness

- Check VA
- Caused by UVB(C) exposure to the cornea – 320-290nm
- Painful !!!!!
- Superficial punctate keratopathy about 6 hours after exposure (corneal sun burn)
- Typically self limiting
- Welders flash, tanning beds, skiing, desert, sailing

Travel Troubles

- 46 YOWF, hit OD with a bungee cord from baggage
- Half of her vision blacked out on nasal side, pain, tenderness, swelling
- VA came back in 15 minutes
- Happened at 8:30am

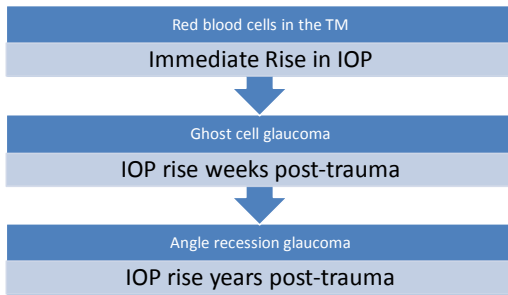
Traumatic Hyphema

- Sports Injuries account for 60% of hyphemas
- Complications
 - Elevated IOP
 - Posterior Synechiae
 - Peripheral anterior synechiae
 - Corneal blood staining
 - Optic atrophy
 - Angle recession glaucoma (usually >180°)

Traumatic Hyphema

- Draw the level of the clot and record the level of free cells
- Tear usually occurs at the anterior aspect of the ciliary body in the angle
- Uncomplicated hyphemas usually last 5-6 days

Traumatic Hyphema



Purpose of Hyphema Treatments

- Prevent IOP increase
- Prevent secondary hemorrhage
- Prevent corneal blood staining
- Sickle cell anemia complicates things

Traumatic Hyphema Treatments

Elevate head and shield the eye

- Bed rest
- Pain – acetaminophen (no Aspirin)
- Cycloplegics – decrease risk of posterior synechiae
- Miotics – increase surface area for iris reabsorption
- Steroids – immediate use is debatable
 - Use after 4-5 days likely helpful to reduce risk of scarring
- Treat IOP >30 mm Hg

Traumatic Hyphema Treatments

- Aminocaproic (antifibrinolytic) acid may be used for larger hyphemas or with increased risk of re-bleeds
 - May require inpatient care due to side effects
- Oral osmotic agents can be used to control IOP
 - Debatable whether any topical medications have a therapeutic advantage in the acute phase
- Consider referral for hyphemas greater than 75%

Pearls

- Rebleeding is a common complication of hyphema as the blood clot stabilizes and retracts
- Elevated IOP can occur in hyphema patients
- Sickle cell patients are at special risk for IOP elevation
 - Avoid CAI which can cause metabolic acidosis and worsen sickling

Angle Recession

- Important late complication of ocular trauma
- IOPs may remain normal for years to decades before becoming severely elevated
- Patient education to the importance of future care
- Fellow eye increased risk of POAG

Iridodialysis/Cyclodialysis

- Iridodialysis: iris torn from scleral spur
- Cyclodialysis: ciliary body torn from SS

iridodialysis

cyclodialysis

Dislocated IOL

- Consider in High Risk Patients
 - Pseudoexfoliation
 - Marfans
 - Trauma
- Unrecognized zonular dehiscence
- Unrecognized tear in posterior capsule
- Treatment
 - Refer to surgeon if patient symptomatic
 - Repositioning or IOL exchange

Traumatic Uveitis

- Check VA
- Light sensitive
- Ciliary flush
- Decreased VA
- Decreased pupil response
- Sub-conj hemorrhage

Traumatic Cataract

Retrobulbar Hemorrhage

- Symptoms
 - Eye pain
 - Diplopia
 - Vision loss
 - Reduced ocular motility
 - Proptosis

Retrieved from www.pacificu.edu/~primarycaretrauma_fig38.jpg on 4/12/11

Retrobulbar Hemorrhage

- Signs
 - Proptosis
 - Increases IOP
 - Ecchymosis
 - Ophthalmoplegia
 - APD
 - Disc swelling due to compressive optic neuropathy
 - Central retinal artery pulsation

Retrieved from <http://webeye.ophth.uiowa.edu/eyeforum/atlas/pages/retrobulbar-hemorrhage.html>

Orbital Compartment Syndrome

- Diffuse accumulation of blood throughout the intraorbital tissues due to surgery or trauma
- Pain and decreased VA
- Proptosis, distortion of globe, optic nerve stretching
- Build up of volume is only held back by medial and lateral canthal tendons

Traumatic Optic Neuropathy

- Visual outcome is poor
 - Regardless of treatment (high dose corticosteroids, optic nerve sheath fenestration, or optic canal decompression), outcome is poor
- RAPD presence is the most useful diagnostic test

Pearls

- In absence of severe retinal pathology, APD is highly suggestive of optic nerve pathology
- With head trauma, concussive forces can be directed to the optic canal
 - Damage secondary to compression from hemorrhage or edema or lacerated by fractured bone
- Patients with traumatic optic neuropathy often have other head or neck injuries

Traumatic Retinal Damage

Finding the tear

- If superior RD not crossing vertical midline
 - Tear will be within 1-2 clock hours of most superior point of the RD
- If superior RD crossing vertical midline, or total RD
 - Tear will likely be near 12:00
- If Inferior RD
 - tear usually around 6:00, lying more to the side of the higher detached side



Comotio Retinae

- Energy is transferred to the opposite side of the globe.
- Inflammation will usually be on posterior nasal retina

Choroidal Rupture

- Caused by trauma which compresses the eye on its anteroposterior axis and expands it on its horizontal axis
- Rupture in Bruch's membrane, RPE and choriocapillaris
- Found temporal to and concentric to optic disc
- Accompanied by subretinal hemorrhage
- No nerve fiber bundle VF defects seen
- CNV uncommon complication

<http://www.aafp.org/afp/2003/0401/p1481.html?ref=Guzels.TV>

Valsalva Retinopathy

Purtscher's Retinopathy

- Due to severe compression injury to the head or chest
- Complement-activated coagulation of leukocytes and other microemboli that occlude retinal capillaries
- Unilateral or Bilateral
- Poor vision from macular infarction and/or optic nerve dysfunction

Accessed from <http://webeye.ophth.uiowa.edu/eyeforum/cases/39-PurtschersRetinopathyAngiopathiaRetinaTraumatica.htm>

An Officer and a Fireman

- 34 year old White Male
- Prison Guard who makes custom knife sheaths as hobby
- Requires heating of plastic polymer to bond with knife base
- Decides one Saturday that this may work well for a lighter

Initial Presentation

- Va: OD = 20/300 OS=20/30
- First degree burns right periorbital region
- Scattered subconjunctival hemorrhage OD
- Mild Traumatic iritis
- Counselor vision should return

Two Months Post Injury

- Has new hobby
- Avoiding firearms and other things that can go boom at work
- Still blurred OD
- Va: OD = 20/300 OS=20/30
- Counselor vision should return
- Presents for second opinion

Differentials

- Trauma
 - Hemorrhage
 - Commotio
 - Hole
- Solar
- Vascular
 - BVO
 - JFT
 - Coat's
 - CNVM
 - CRAO
- Inflammatory
 - MFC, POHS
 - PIC
 - CNVM
- Genetic
 - Pattern Dystrophy
 - Neuronal Storage
 - Angioid Streaks
 - Early Stargardt's

Macular Hole Diagnosis

- Physical Exam
- OCT
- Watske-Allen
- HVF's 10-2
- IVFA not indicated

Macular Hole Treatment

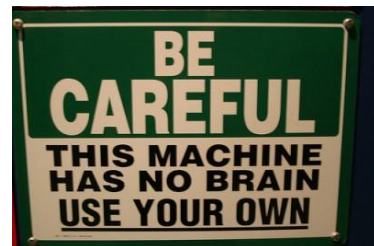
- Spontaneous hole closure rate 1%
- Vitrectomy hole closure rate 80-85%
- Post vitrectomy cataract 70% at 1 year
- Post vitrectomy RD 3% at 1 year
- Post vitrectomy VF defect in 10-15%
- Risk of fellow eye hole 10% without PVD
- Risk of fellow eye hole 2% with PVD

Clinical Pearls

- Macular Pathology may be difficult to detect
- Compare to fellow eye
- OCT is helpful
- Watske-Allen is helpful

Pearls

- Consider retinal tears or detachment in presence of pigment or RBC in vitreous
- Traumatic macular holes have been known to spontaneously close with restoration of good vision



Retrieved from <http://www.micromango.com/four-ways-to-reduce-work-related-injuries-during-a-slow-economy/>