Eye Trauma: Incidence
- 2.4 million eye injuries per year in the U.S.
- 40,000 lead to vision loss
- 20% of adults report ocular trauma
The History

- Vision
  - One or both eyes affected?
  - Vision at time of exam?
  - Vision prior to trauma?
- Symptoms
  - Pain, Foreign Body sensation, redness, discharge, swelling?
  - Duration of symptoms?
  - Surgery prior to trauma?
- Gradual or Sudden onset
- Contact lens wearer
- Systemic disease
- Pain

Complete Eye Exam

- Vision
- External Exam – eyelids and anterior segment
  - Eversion of lid
  - Fluorescein
- Pupils
- Motility
- Globe
- Pressure
- Visual fields
- Retina exam - ophthalmoscopy
  - Red Reflex

Equipment

- SNELLEN CHART
- TOPICAL ANESTHESIA
- SLIT LAMP OR OTHER MAGNIFIER
- BLUE LIGHT FOR FLUORESCEIN
- OPTHALMOSCOPE
Chemical Burns

- A true ocular emergency
- Alkali more serious than acid
- Immediate irrigation is essential
- Cornea stains with fluorescein
- If greater than 50% of the epithelium is gone, healing will be prolonged and needs urgent ophthalmology referral

Chemical Burn

![Chemical Burn Images]

Initial Management

- Irrigation of chemical burn should be initiated before arrival to ER or Dr. office
- Can irrigate with tap water
- Best to put eye in a direct stream of water and irrigate for at least 5 minutes
- In office or ER
  - Topical anesthesia
  - Check pH if possible
  - Copious irrigation
  - Place fluorescein and evaluate epithelial damage then check for foreign bodies
Copious Irrigation

Chemical Burn: Treatment
- Topical cycloplegic
  - Cyclogyl 1%, Homatropine, Atropine 1% eyedrops tid
- Topical Antibiotic
- Patch eye for pain control
- Daily followup to assess healing and infection
- Prompt referral to ophthalmologist
- Pain meds and sleep meds are helpful but will still need to warn patient that this will be painful

Pressure Patch
Ruptured Globe

Mechanism of injury

Ruptured Globe: evaluation & treatment

- Nature of injury
- 360 degrees of subconjunctival hemorrhage
- Irregular pupil
- Hyphema
- Obtain CAT scan of orbit to rule out foreign body and confirm ruptured globe
- Do not patch!! Place shield if possible
- Emergent ophtho consult
- Nothing to eat or drink
Grade 1 Hyphema

Microhyphema

- May not see layered blood in the anterior chamber
- Presents with mildly hazy vision, redness, photophobia, tearing and discomfort
- Same risk of increased IOP
- Same treatment as hyphema

Hyphema management

- If nature of injury is possible for rupture – assume ruptured globe
- Place shield over eye and refer immediately to ophthalmologist
- 25% of patients will have other ocular injuries
  - Assess eye pressure and treat if pressure is high
  - Cycloplegics,
  - Strict bedrest and sleep with head elevated
  - Follow daily through day 5 for re-bleed and IOP
Blow out fracture

- Ecchymosis
- Swelling
- Pain on palpation of inferior orbital rim
- Numbness of cheek
- Diplopia
- Enophthalmos

Blowout fracture: Mechanism of injury

Orbital blowout fracture

- Inferior rectus entrapment
- Upgaze limitation
Orbital trauma: Isolated blow out fracture

- Surgery indicated for persistent diplopia and/or entrapment of inferior rectus muscle
- Surgery indicated for poor cosmesis or enophthalmos
- Diplopia can resolve as swelling resolves

Orbital fracture treatment

- Oral antibiotics for 10 days
- Ice compresses to reduce swelling
- Afrin pm nasal stuffiness
- Oral or IM steroid if significant swelling
- No blowing nose
- Ophthalmology consult

Lid Laceration

- Give tetanus prophylaxis
- Remove superficial foreign bodies
- Rule out deep foreign bodies
- Margin involvement repair by ophthalmologist in 24 – 48 hours
- Cannalicular involvement needs immediate repair
- If etiology is dog bite, must copiously irrigate and start broad spectrum antibiotic
Red Eye

- Benign
  - Subconjunctival hemorrhage
  - Conjunctivitis
  - Corneal abrasion
  - Foreign body

- Pathologic
  - Corneal ulcer
  - Acute Glaucoma
  - Iritis/anterior uveitis
  - Scleritis

Subconjunctival Hemorrhage

- Spontaneous - may follow coughing, sneezing or straining
- Resolves in 2-4 weeks
  - check CBC, INR / PTT & BP if recurrent episodes
- No pain, normal vision
- Resolves in 1-3 weeks
Conjunctivitis

- Acute Conjunctivitis
  - Bacterial
  - Viral
  - Allergic

- Chronic Conjunctivitis
  - Blepharitis, Meibomitis
  - Allergic Conjunctivitis
  - Rosacea
  - Adult Inclusion Chlamydial Conjunctivitis

Bacterial Conjunctivitis

- Common causes:
  - Staphylococcus
  - Streptococcus
  - H. Influenza

Bacterial conjunctivitis

- Burning
- Tearing
- Mucopurulent discharge
- Eyes matted shut in morning
- More common in children
- Contagious

Treatment:
- Antibiotic Eye Drops 3-4 times a day
- Usually self-limited but treatment is justified because decreases time course of disease and transmission to others
Viral Conjunctivitis

HSV and HZV are common causes of a red eye and conjunctivitis.

HSV Treatment

- Be suspicious if painful conjunctivitis and not resolving with topical eyedrops
- Use Fluorescein when evaluating conjunctivitis to rule out HSV dendrite
- No steroids
- Ophthalmology referral
- Viroptic eyedrops 5 x day
- Oral Acyclovir
HZV Treatment

- Refer to ophthalmology
- Oral Acyclovir
- Neurontin – may increase as needed for pain control
- Artificial tears 5 x day
- Cold Compresses
- Bacitracin ointment for forehead lesions
- Erythromycin ophthalmic ointment for lid lesions

Cornea Abrasion

- Symptoms
  - Foreign body sensation
  - Pain
  - Tearing
  - Photophobia
Flourescein staining

Corneal Abrasion

Must Flip lid

Ask patient to look down
Flip upper lid

- Topical anesthetic eyedrop
- Try to remove foreign body with cotton tip, if unsuccessful may use 18 gauge needle to remove foreign body
- If rust ring and FB sensation persists – refer to ophthalmology

<table>
<thead>
<tr>
<th>Treatment</th>
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<tbody>
<tr>
<td>• patch</td>
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<tr>
<td>• topical antibiotic and cycloplegic eyedrops</td>
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<tr>
<td>• occlusive patch will splint eyelid movement and allow epithelium to heal over defect</td>
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<tr>
<td>• NO PATCH IF RELATED TO CONTACT LENS USE</td>
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<tr>
<td>• as CL wearers at greater risk of secondary infection and corneal ulcer formation</td>
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</table>

Case study

- 34yr old man
- Landscaper
- Mowing lawn without safety glasses and felt something hit the eye.
- Mild pain on presentation to ER
- Mild visual acuity complaints
- Initial examination reveal no FB
- Treated for conjunctival abrasion and sent home
Always look under the eyelid!

Small conjunctival abrasion and heme but no foreign body

Case study

- Initial examination revealed no FB under lid
- No corneal abrasion
- Treated for conjunctival abrasion and sent home
- Followup 2 days later revealed significant decrease in vision to 20/200. Eye mildly red with significant photophobia.

Intraocular FB
Remember mechanism of injury!
- Remember orbital x-ray or CT if high velocity mechanism
- Always remember tetanus prophylaxis

Corneal ulcer

- Often associated with CL wearers esp. with poor lens hygiene
- Severe pain NOT relieved with topical anesthetic, tearing, photophobia, reduced vision, purulent discharge
- CANNOT see iris detail through necrotic stroma
- Corneal stroma thins as bacterial enzymes “eat through” stroma
- Can lead to perforation of cornea and permanent loss of vision
Corneal Ulcer

- White on cornea that is not able to be blinked away
- Will turn green with Flourescein stain
- Hypopyon
- Very red eye
- Very painful
- Very photophobic
- Decreasing vision
- Usually contact lens wearer
- Staph, Strep, Pseudomonas

Treatment:
- EMERGENCY referral to ophthalmology
- Requires immediate cultures (corneal scrapings), intensive (q1h) broad spectrum high-dose topical antibiotics, may require admission, subsequent corneal graft
- Do not patch, even temporarily

Acute Glaucoma

- Blurred Vision
- Headache
- Halos around lights
- Nausea
- Vomiting
- Abdominal pain
- Ocular pain
- Blurred vision
Acute Angle Closure Glaucoma

- Another ocular emergency
- Pupil mid-dilated and oval
- Eye complaints may be minimal compared to GI symptoms and sickness
- Treatment: emergency referral to ophthalmologist
- Pilocarpine 2% eyedrops 4 x a day
- Pressure lowering eyedrops
- Oral Diamox
- Hyperosmotic agents - glycerol, mannitol

Uveitis

- HLA-B27 + Arthritides
  - Ankylosing Spondylitis
  - Reiter's Syndrome
  - Psoriatic Arthritis
  - Inflammatory Bowel Disease
    - Usually rheumatoid factor negative but HLA B27 +
  - Patients may develop a recurrent, non-granulomatous iritis. Topical steroids and dilating drops are the mainstay of ocular therapy.
Granulomatous Iritis

**Complications**
If diagnosis & treatment is delayed, the iris may adhere to the lens causing cataract and a small irregular pupil.
- Glaucoma can be present.

Scleritis

- Inflammation of sclera and deep episcleral vessels
- associated with extreme ocular discomfort
- red eye, tearing, photophobia
- may have visual loss

Preseptal vs. Orbital cellulitis

- Preseptal cellulitis improves quickly with oral antibiotics
- This is a clinical diagnosis
- Do not hesitate to image especially to rule out orbital cellulitis and subperiosteal abscess
  - If abscess present consult oculoplastics or ENT for drainage
- Orbital cellulitis can go to the brain
  - Needs immediate hospitalization and IV antibiotics

BE ALERT! A red eye with pain, photophobia, decreased vision OR limbal redness should be referred to an ophthalmologist.
Preseptal cellulitis

- Palpate lids for chalazion
- Obtain CT to rule out orbital abscess and sinus disease
- Warm compresses
- Systemic antibiotics
- Follow closely

Preseptal cellulitis

- Hordeolum – acute
- Chalazion – chronic

Blockage of eyelid gland
- External = hair follicle
- Internal = meibomian gland
- May be sterile or infected

Treatment:
- Warm compresses
- Topical antibiotics
- Lid care
- +/- systemic antibiotics
- Incision and drainage

Preseptal Cellulitis

- Diffuse edema and erythema of lids anterior to the orbital septum
- May be secondary to lid or lacrimal system inflammation
- On examination: normal vision, pupils, motility, no proptosis
- Treatment: rule out orbital cellulitis and systemic antibiotics
- Must get ortho consult
Orbital Cellulitis

- Pain
- Decreased vision
- Impaired ocular motility
- Proptosis
- Usually swollen shut
- No discharge

- optic disc edema signals optic nerve involvement
- Potentially vision and life-threatening inflammation of the orbital contents posterior to the orbital septum
- Often originates from paranasal sinuses disease
Orbital cellulitis: management

- Admit to hospital immediately
- Ophtho and ID consult
- Obtain MRI orbits, sinus and brain
- Surgery to drain abscess if necessary
- IV antibiotics
  - IV Unasyn
  - IV Ceftriaxone or Vancomycin
- Rule out phycomycosis in immunocompromised patients and diabetics

Acute Vision Loss

- Sudden, non-traumatic vision loss in one eye is usually caused by retinal or optic nerve lesions

Central Retinal Artery Occlusion

- The central retinal artery or one of the arteries that branch off of it becomes blocked by a tiny embolus (clot) in the blood stream.
- Look for white retina and cherry red spot in macula

Figure 1
Central Retinal Artery Occlusion: Management

- Re-breathe CO2
- IOP lowering eyedrops
- Diamox 500 mg po x 1
- Massage globe with lids closed
- Older person – rule out temporal arteritis, check carotid arteries
- Evaluate embolic risk factors
- Young person – hypercoaguable work up

CRAO

- Unilateral, painless, severe, acute vision loss
- May have history of amaurosis fugax
- Usually associated with carotid or cardiac embolus
- **Risk Factors** – Atherosclerosis of the carotid arteries, atrial fibrillation, aortic or mitral valve disease or prosthesis, endocarditis, polyarteritis, syphilis, lupus, giant cell arteritis, Takayasu aortitis, Hypercoagulation disorders

CRAO

- Workup:
  - Immediate referral to Ophthalmologist
  - Sed rate asap
  - Check blood pressure
  - Carotid Doppler
  - ECG and Echocardiogram
  - Blood tests – FBS, HgbA1c, CBC w/ diff, PT/PTT, lipid profile, ANA, RF, FTA-ABS, antiphospholipid antibodies

Central Retinal Artery Occlusion: Management

- Re-breathe CO2
- IOP lowering eyedrops
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- Massage globe with lids closed
- Older person – rule out temporal arteritis, check carotid arteries
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**Amaurosis Fugax**

- Monocular vision loss that usually lasts seconds to minutes, but may last up to one hour and then vision returns to normal.

- Etiology
  - Carotid artery disease
  - Cardiac Disease
  - Giant Cell Arteritis
  - Hypercoaguable/ Hyperviscosity states - workup in young
  - Ocular Migraine – diagnosis of exclusion
  - Intra-orbital tumors

- Patients with recurrent episodes, TIA like symptoms or have vascular risk factors need referral to neurologist for a stroke workup.

**Giant Cell Arteritis**

- Variety of presentations
- Ophthalmic emergency because may lead to bilateral vision loss which is irreversible
- Patients older than 50
- Symptoms – temporal headache, scalp tenderness, jaw claudication, anorexia, weight loss, fever, joint aches, vision loss, double vision.

**Temporal arthritis: clinical signs**

- Unilateral decrease in vision
- Afferent pupil defect
- Optic nerve swelling (may be normal)
- Scalp forehead tenderness
- Headache
- Jaw claudication
- Loss of weight
Giant cell Arteritis

GCA Management

- Immediate SED Rate, C-Reactive Protein and CBC with platelets
  - Men: Age / 2
  - Women: Age + 10 / 2

- Systemic steroids
  - IV Methylprednisolone 250 mg q 6 hours for 12 doses in hospital
  - Then oral prednisone 80 – 100 mg p.o. daily. The dose is tapered according to symptom resolution and sed rate normalization. Treatment may last up to a year or more.

- Temporal artery biopsy within one week of starting steroids

Case Studies
30 year old female

Complaint:
Pt complains of flashes of light in left eye x 2 weeks
Constant flashes x 1 day
Woke up with cloud in vision inf. nasally and no vision

Medical and Ocular History

- No medical history
- Taking Minocycline for Acne
- Amblyopia Left Eye
- Muscle surgery 1 year ago
- No family history of eye problems, Father deceased from stroke

Exam

- Va cc 20/20 right 20/40 left
- Pupils 4-2 reactive and equal ou, quicker release left eye
- APD difficult to tell
- CVF:
  - Right eye - Normal
  - Left eye - Inferonasal defect
Fundus Exam Right Eye

Swollen optic nerve, severe arteriolar attenuation, splinter hemorrhages

Fundus Exam left eye

Optic nerve swelling, retinal opacification, splinter hemorrhages, cotton wool spots

- Patient has Papilledema
  - Differential diagnosis
    - Pseudopapilledema
    - Idiopathic Intracranial Hypertension
    - Malignant hypertension
    - Graves Disease

Differential diagnosis

- Pseudopapilledema
- Idiopathic Intracranial Hypertension
- Malignant hypertension
- Graves Disease
Now What?

- Any other problems?
  - Headache, Nausea / vomiting, neurological symptoms, tinnitus
  - “Yes, I have had a really bad headache for the last two weeks”
  - “oh yeah, I may have high blood pressure. I used to take medication but I don’t anymore because no insurance”
- Blood pressure evaluation in office
  - 174/115 mm Hg
- Patient sent to Hospital ER for immediate Blood pressure control, needs to be admitted for Malignant Hypertension

77 year old female

**Complaint:** “**Double vision for 2 weeks**”

Sudden onset of diplopia and headaches, went to ER and admitted to hospital for 2 weeks

- MRI/MRA done in ER - normal
- Blood pressure normal in hospital
- All blood tests are normal
  - Myasthenia panel – wnl
  - Sed rate – 38
  - Blood sugars and lipid panel are normal
- Ophthalmology, Neurology consulted – no evidence of eye disease or brain disease

Medical and Ocular History

- Lesion removal Right Upper Lid- Cancerous
- Always had perfect vision – no glasses
- Headaches - frontal gets them often due to sinus but this one feels different. No headache since leaving hospital.
- Must close one eye to get rid of double vision
- Medications – Fosamax, Synthroid
- PMH – osteoporosis and hypothyroid
- Family history of macular degeneration
Exam

- Vision 20/30 right 20/40 left
- Slight right head tilt
- Pupils - left pupil 1 mm larger than right pupil and equally reactive
- APD - negative
- Motility exam reveals eye turns out and CN III palsy
- Visual Field is normal
- Eyelid – slight ptosis of left upper lid, scar on left upper lid
- Normal refraction, fundus exam

Work-up

- Called Radiologist – “Brain MRI / MRA normal but do not see posterior communicating artery
- Obtain Angiogram to rule out brain aneurysm – angiogram is negative and radiologist is called to confirm
- Repeat labs – sed rate and CRP – normal
- Call internist, speak to PA – PA will follow for headaches. Called neurologist – he will follow too.
- Return in 1 month

Return History and Exam

- Patient says “Doing much better, my eye is back in, now.”
  - only have slight horizontal diplopia.
  - Wearing her sisters glasses because “my vision has changed some”
- Headaches are back but “I have a cold and my internist thinks they are due to sinus disease”
- “I have a burning sensation in my scalp”
- I’ve lost 4 pounds
- No pain in jaw but I can’t open my mouth very wide
- CN III palsy completely resolved but now the eye turns in and there is a CN VI palsy
What is going on?

- Repeat Sed Rate and CRP
  - Sed rate elevated
  - CRP elevated
  - Patient admitted to hospital for IV steroids and temporal artery biopsy
  - Diagnosis – Giant Cell Arteritis

43 year old female

- Bent over this morning and left eye went totally gray with a tiny sliver of vision in the periphery of the eye.
- Slight improvement since then
- No headache, nausea, flashes of light, floaters

Medical and Ocular History

- Ocular migraines
- No medical history
- Meds: none
- Family history
  - Grandmother – cataracts
  - Brother and Father – heart disease
Exam

- Vision – Right eye 20/20; Left eye CF in periphery
- Pupils - + afferent pupil defect in left eye
- Visual Field – Right eye normal; left eye decreased
- Motility - normal

Fundus exam left eye

![Cherry Red Spot](image)

Diagnosis

- Central Retinal Artery Occlusion in a healthy 43 year old female?
- Workup
  - CT normal
  - Echo normal
  - Preliminary blood tests all normal
  - Sent to hematologist – work up revealed Factor V Leiden hypercoaguable state
  - Genetic disease runs in family – unknown in family prior to this diagnosis