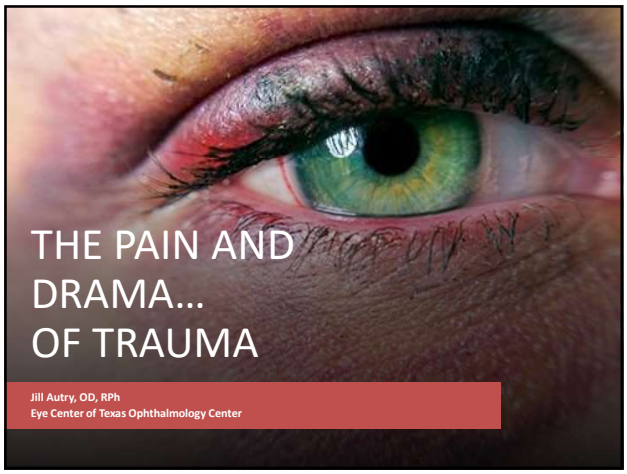

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Ocular Examination

- Ensure globe is intact
  - Signs of open globe
    - Peaked pupil
    - Low IOP
    - Shallow anterior chamber
    - Positive Seidel sign
- Vision
- APD
- Check for diplopia/EOM restriction/IOP
- Slit lamp exam and DFE
- Check for infraorbital numbness
  - Includes lower lid, cheek, side of the nose, and upper lip

2

Periorbital Trauma

- Falls, fights, car accidents, ball injuries
- Mechanism of injury can help discern likelihood of serious sequelae—Start with good history
- Check globe first
- Hematoma at location of impact with surrounding and sometimes creeping areas of ecchymosis
- May have associated subconjunctival hemorrhage, periorbital lacerations

3

4

Periorbital Examination

- Check for bone fractures by palpating upper and lower orbital rims and cheekbones
- May feel break in bone (step-off)
- May feel crepitus (“Rice Krispie” air pockets)
- Edema/pain/hemorrhage can cause minimal diplopia. Conservative observation allowed if remaining presentation WNL.

5

Treatment

- Reassure patient
- Ice packs x 24-48 hours for swelling
- Discoloration can take 2-3 weeks to resolve
- OTC analgesia (acetaminophen preferred)
- CT of face and orbits if fracture suspected
  - 3mm axial and coronal cuts
- Follow up in 3-4 days to check for traumatic iritis, retinal involvement, etc.
- Emergent follow-up if patient notices diplopia, decreased VA, ocular pain, etc.

6

Orbital Fracture

- Orbital fractures are secondary to ocular involvement. Do eye exam first.
- More common if eye is struck with object larger than the diameter of the orbital rim
- Most common is inferior wall, second most common is medial wall
- EOM restriction and/or pain, diplopia, orbital emphysema, CSF rhinorrhea
- Enophthalmos more common with blowout fractures

7

Inferior Wall Fractures

- aka Orbital floor fracture
- Most likely area of orbital fracture/"blowout" with trauma
- Adjacent to inferior rectus where entrapment can result in diplopia, worse on upgaze
- May feel "step-off" bone fracture
- Area of distribution of infraorbital nerve. May result in infraorbital numbness

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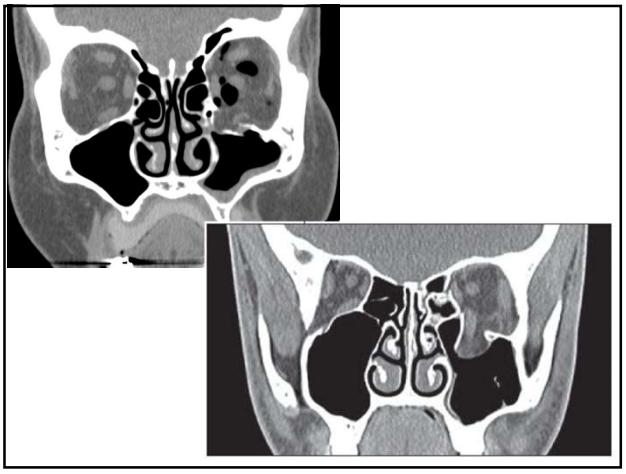

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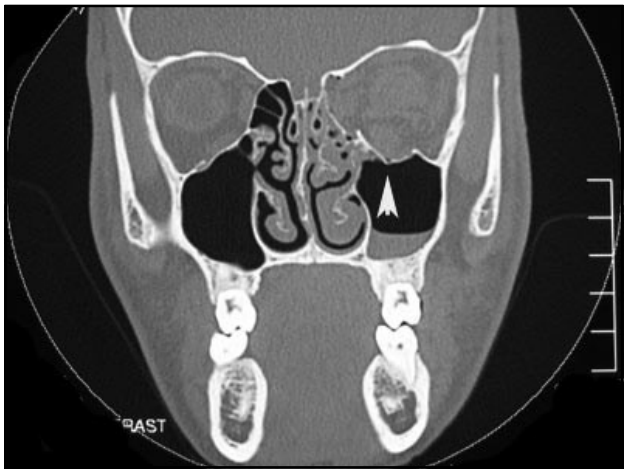

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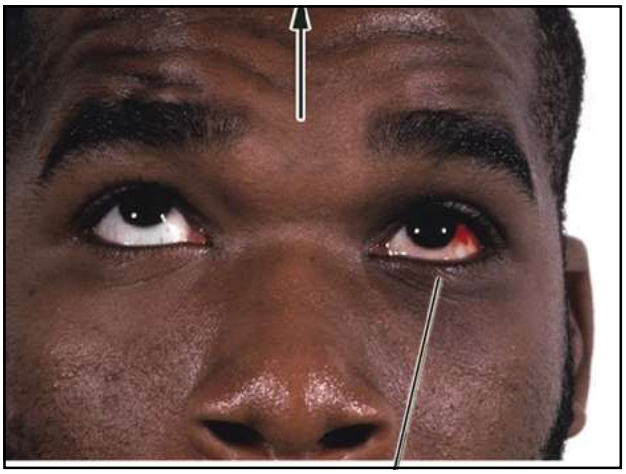

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Medial Wall Fractures

- Most common with fist blow directly to medial wall area
- Medial rectus can be damaged
  - Look for EOM restriction on add/abduction
  - Ptosis, narrowing of palpebral fissure with abduction
- Easily damaged, thin lamina papyracea separates orbit from ethmoidal sinus
  - Look for subcutaneous emphysema, nosebleed, CSF rhinorrhea, feel for crepitus
  - Tell patient not to blow nose or bend over

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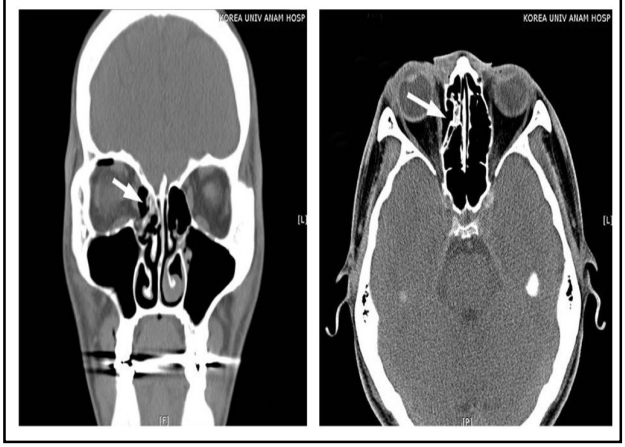

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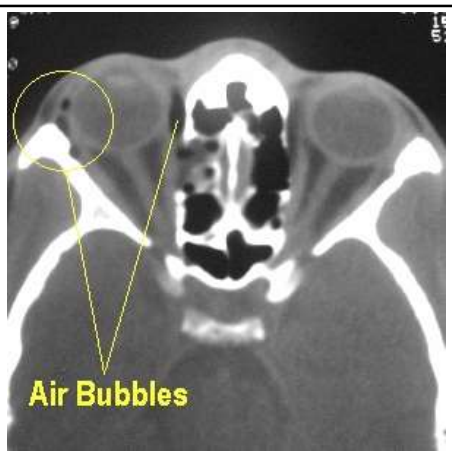

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Testing and Management

- CT of orbits without contrast
  - With axial and coronal views
  - With special attention to orbital floor and canal
- No blowing nose
- Consider broad spectrum oral antibiotics
- Consider oral steroids for severe orbital edema

16

Orbital Surgery

- Consult with oculoplastic surgeon if CT positive for fracture
- Surgery is controversial unless
  - Non-resolving diplopia with positive forced duction testing
  - Enophthalmos
  - Fracture involving one-half or more of inferior orbital floor
- Best performed within 2 weeks of trauma
  - Allows for some of the swelling to subside

17

Eyelid Lacerations

- Can be caused by blunt force or penetrating injuries
  - If penetrating injury, concern for foreign object to be embedded
- Inspect globe
- Palpate for broken bones

18

Treatment and Follow-up

- Large complicated lacerations require referral
  - Jagged cuts
  - Fat prolapse signals deeper wound
  - Medial canthal injuries prone to canalicular damage
  - Concern for foreign body material inside area
  - Animal bites
- Small, uncomplicated lacerations can be closed with sutureless glue such as Dermabond™ or SurgiSeal™

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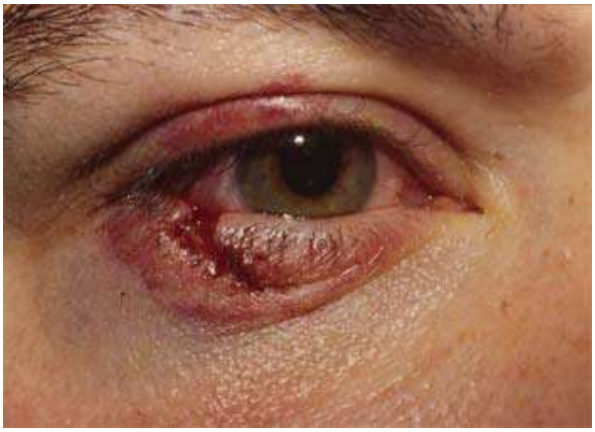

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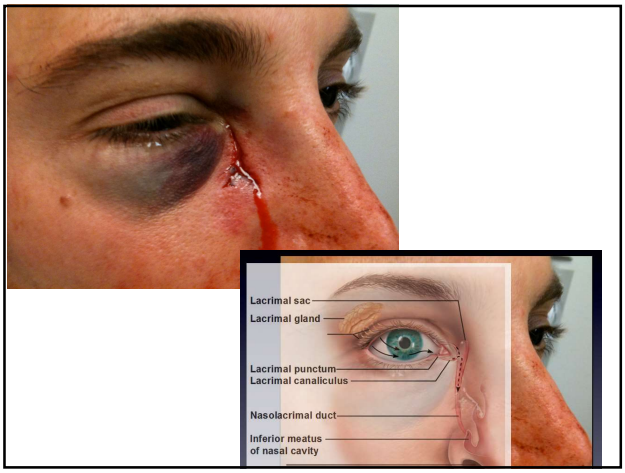

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Surgical Glue

- Maximum bonding strength at two and one-half minutes
  - Faster repair time
- Water-resistant covering
- Flexible
- Has own antimicrobial protection
  - Do not prescribe ointment which can loosen the glue
- Equivalent in strength to healed tissue at seven days post repair
- Better acceptance by patients
  - Can be applied using only a topical anesthetic, no needles
  - Does not require removal of sutures
  - Does not require follow up in situations where follow up suture removal is difficult

23

24

Laceration Management

- Cover with prophylactic antibiotic
  - Amoxicillin 875mg bid
- If caused by human or animal bite, cover with Augmentin instead 875mg bid
  - Make sure animal has up-to-date vaccinations against rabies
- May need tetanus immunization booster
  - Send to local health clinic

25

Subconjunctival Hemorrhage

- Inspect globe for signs of penetrating injury
  - Bullous subconjunctival heme or heme 360 degrees more common
- Inspect for foreign material at hemorrhage site
- Inspect for conjunctival laceration with addition of fluorescein
  - Any associated conjunctival lacerations of 5mm or less do not need repair

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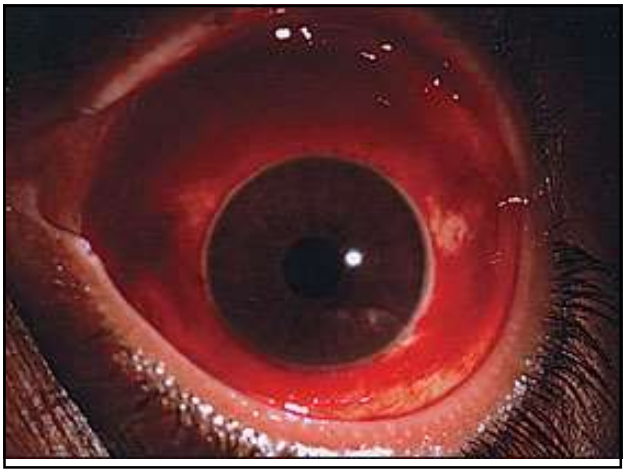

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Corneal Abrasions

- Common, superficial trauma to the corneal epithelium
- Always check the globe for penetrating injury
- Get history of trauma
  - Cause of injury, activity being performed
  - Especially concerned if pt was hammering metal, using a lawnmower or weedeater, or welding
  - Watch out for the "I Musta" scenario

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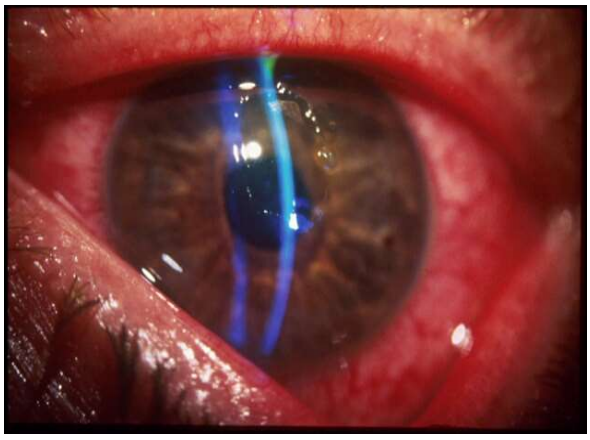

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"I Musta" Scenario

- Unsure of when and how abrasion was received
  - "I musta"…….
- Assume infectious keratitis in contact lens wearers
  - CL should protect patient from abrasion
  - Early bacterial keratitis will look like abrasion only
  - Treat with aggressive 4th generation fluoro, NO BCL, NO PAIN MEDS (only cycloplegia)

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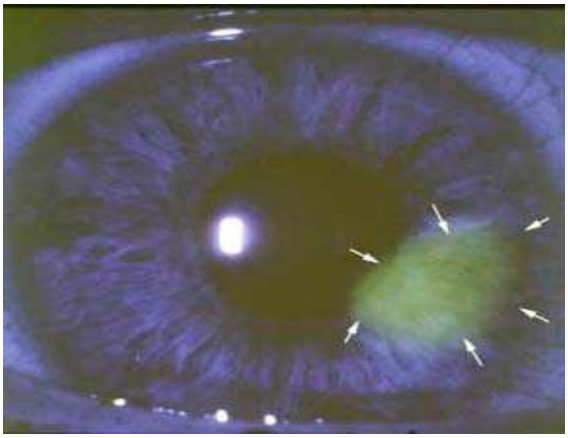

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Pearls for Treating Abrasions

- Have technician place drop in waiting room if patient cannot be brought back immediately
- Look at the eye before instillation of fluorescein
- Bandage CL
  - Can leave on 2-3 days then return for follow-up
    - Remove by sliding over to sclera and pinching off or use forceps
    - Do not remove BCL too early
  - Or pressure patch if unable to place BCL
    - Pressure patch patient needs to return next day
- Healing epithelium can appear dendritic as it heals—it is not herpetic!

33

Pharma for Abrasions

- Prophylactic antibiotic
  - Use at least a 3rd generation fluoroquinolone or tobramycin; Polytrim™ in kids
- Vegetative matter etiologies in most cases do not result in fungal infections
  - Can use Vigamox for prophylaxis considering its inherent antifungal properties if concerned
- Consider "comfort drops" for non-CL wearers who present with abrasion of known etiology
  - Remove top from Optive™ sample bottle and place 10-20 drops of anesthetic inside—label as "Comfort Drops"
- Put drop of atropine in eye in office for pain
- Need for more than OTC pain control is rare

34

History of Lasik

- Corneal abrasions even years after Lasik can result in Diffuse Lamellar Keratitis (DLK)
  - aka Sands of the Sahara (SOS)
- Treat as usual but also add topical steroid to prevent/treat DLK
  - Pred qid
- Injury can also displace flap
  - Will need to get refractive surgeon to replace

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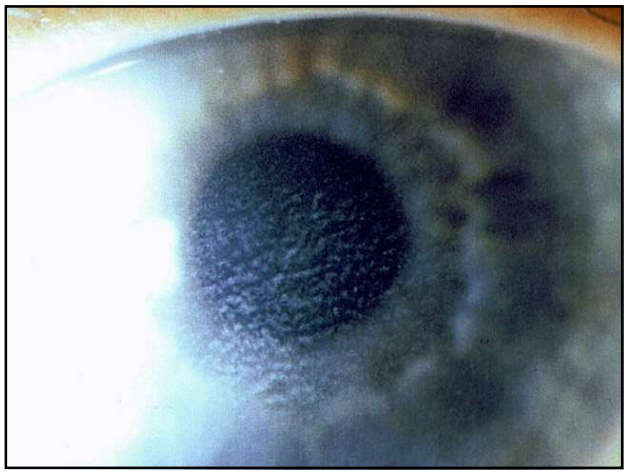

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Recurrent Corneal Erosion

- More common with jagged etiologies and with pre-existing anterior corneal dystrophies
  - Fingernail injuries
  - Tree branches
  - Co-morbid EBMD pathology
- Keep BCL on longer if higher risk of RCE
  - at least 2 weeks with prophylactic antibiotic
  - Start Muro-128 ung qhs for 4-6 weeks after BCL removed
- Multiple recurrences may need surgical treatment
  - We do Epi-peel most commonly with amniotic lens placement afterwards

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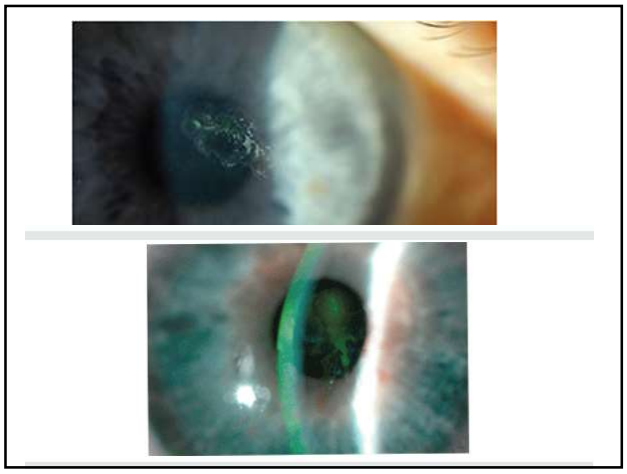

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Corneal Foreign Body

- Most often metal, wood, or glass in the superficial layers of the cornea
- Rule out penetrating injury
  - More common with metal on metal history
- Use sterile cotton swab for superficial foreign bodies
- Use forceps and/or large gauge needle for deeper foreign bodies
- Use Algier brush for removal of rust rings

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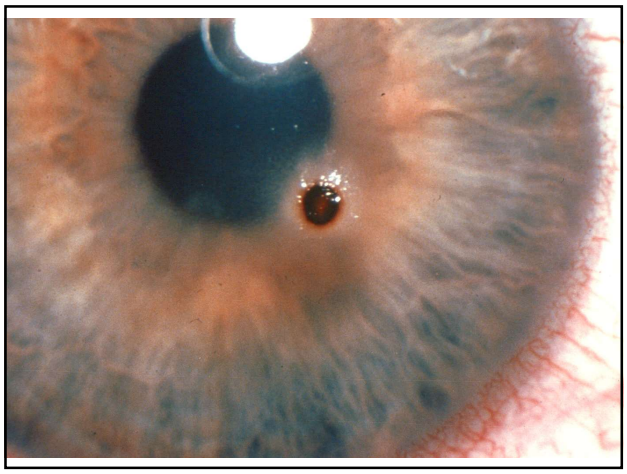

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Penetrating Injuries

- More common with history of hammering metal, welding, weedeating, breaking glass, sticks, knives, scissors, nails
- Male gender more common
- Look for ocular signs of penetrating trauma
- Intraocular foreign body
  - CT scan of globe and orbit for suspected IOFB

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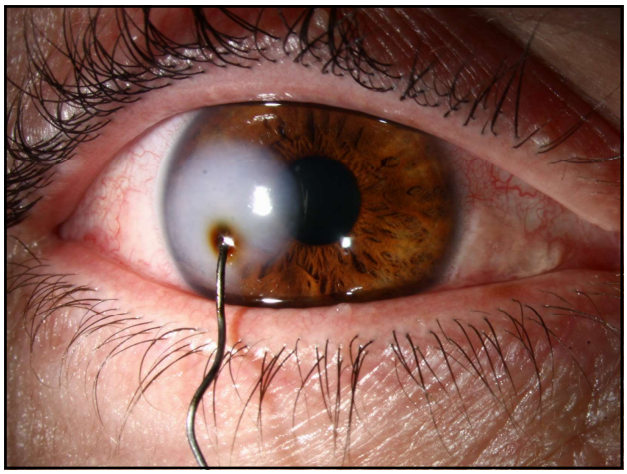

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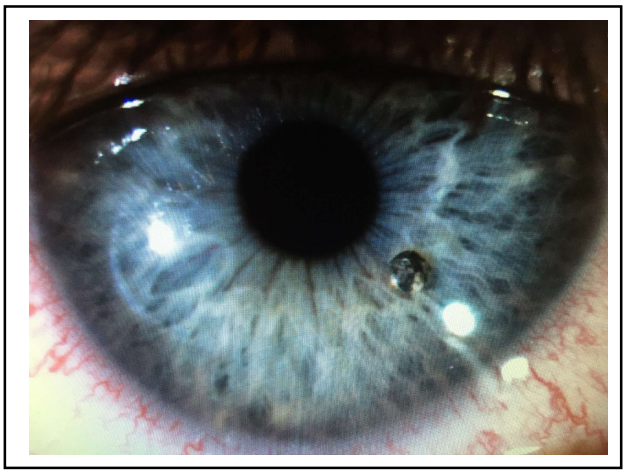

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Signs of Penetrating Injury

- Poor vision
- Full-thickness corneal injury
- Bullous subconjuctival hemorrhage or 360 degree hemorrhage
- Seidel sign
- Shallow anterior chamber
- Constant epiphora
- Lens displacement/cataract formation
- Iris damage
  - Hole through iris
  - Peaked pupil
  - Iris prolapse
  - Iridodialysis
- Vitreous hemorrhage
- Low IOP-check IOP last

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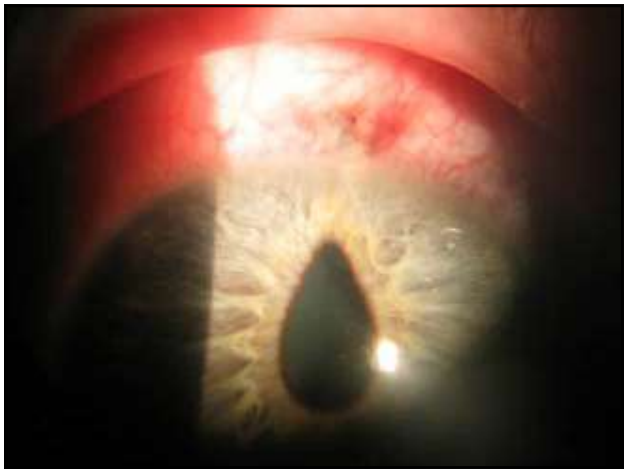

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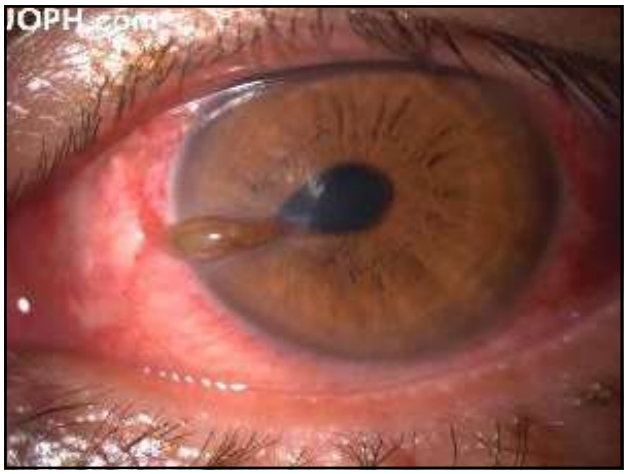

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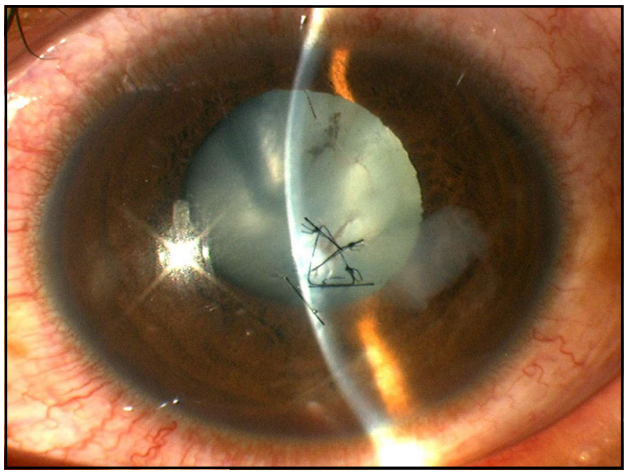

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Seidel's Sign

- Fluorescein test to check for open globe
- Best results with fluorescein strips
- Suspect open globe if
  - Low IOP
  - Shallow AC
  - History of penetrating injury
  - Patient complains of constant tearing

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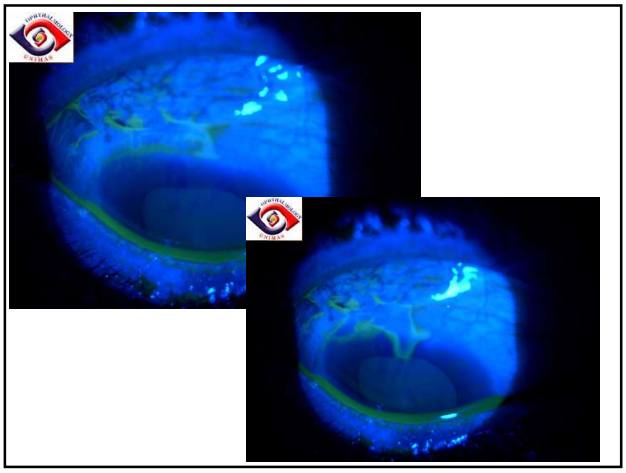

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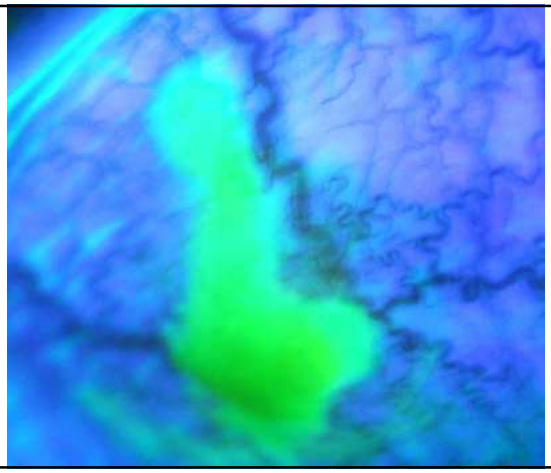

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Management of Penetrating Injury

- Do not further touch the eye
- Instill in office antibiotic
- Place a hard, vaulted shield over the eye
  - Do not pressure patch
- Send to ER with note "Penetrating ocular injury needing immediate ophthalmology consult"
  - Call 911 if you are unsure patient will go to ER

52

Hyphema

- Common result of blunt trauma to globe
- Microhyphema may look like cell and flare
  - But it takes a few days for C/F to form
- Check for periorbital area and globe for other injuries
  - Vision, IOP, Seidel's sign, anterior chamber depth, broken facial bones, EOMs, APD, lens, iris, retina, etc.
- If hyphema covering pupil, will need Bscan to rule out fundus pathology

53

54

Hyphema Treatment

- Watch daily until resolved
- Start steroid q2h
- Atropine qd or cyclopentolate tid
- Control IOP if elevated to avoid corneal blood staining
  - brimonidine, beta-blockers, CAIs
  - Avoid prostaglandins if possible
  - Refer for persistent elevated IOP despite treatment
- Counseling
  - Limit activities
  - Keep head of bed elevated
  - No ASA or IB products
  - Long-term glaucoma risk (75% will have angle recession)

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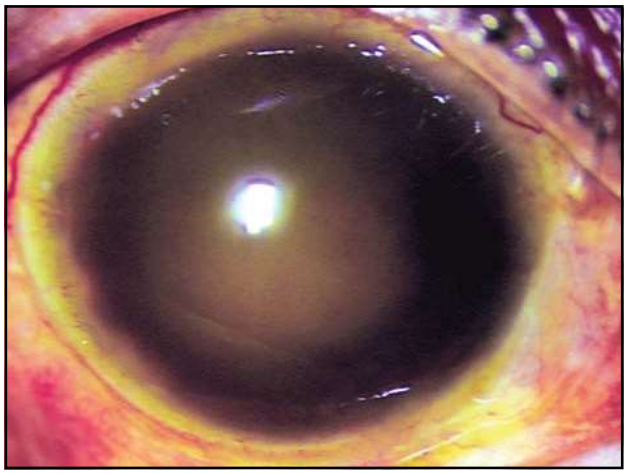

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Iris Damage

- Traumatic iritis
- Iridodialysis
  - Separation of iris from the ciliary body attachment
  - Often see associated angle recession on gonioscopy
- Torn iris sphincter
  - Resulting in permanent mydriasis
- Hole through iris or iris prolapse
  - Concern for penetrating injury

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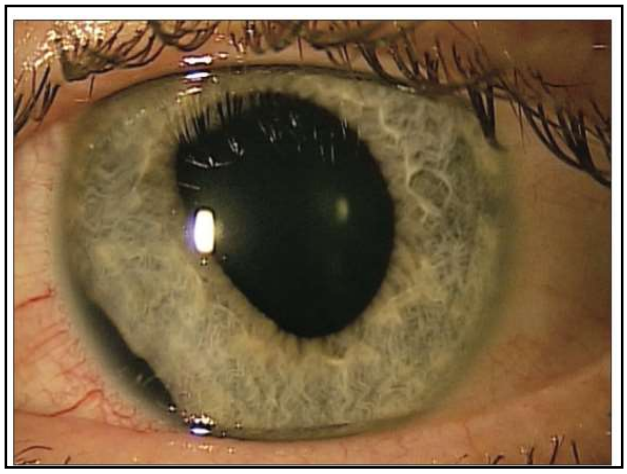

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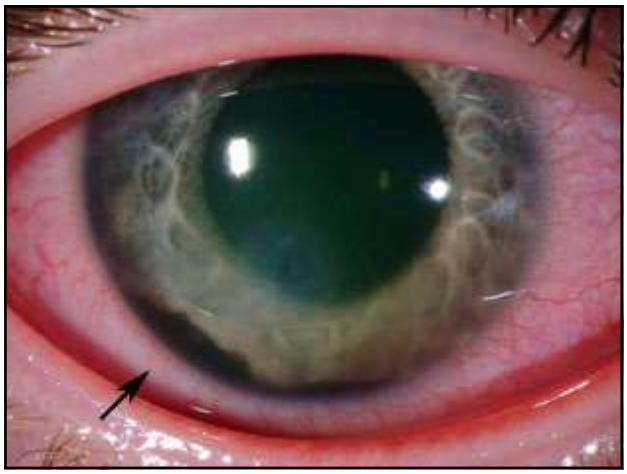

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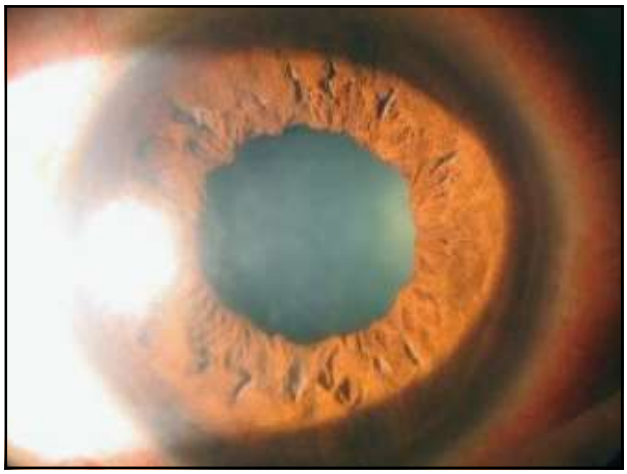

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Traumatic Iritis

- Usually caused by blunt force injuries
- Trauma induced necrotic products promote inflammation
- Increased permeability of ocular vessels allow inflammatory mediators and cells to appear
- Generally starts two to three days after trauma
- Signs
  - Cell/flare/fibrin/KP/hypopyon/decreased IOP/posterior and/or anterior synechiae
- Symptoms
  - Decreased VA, pain, sensitivity to light, redness

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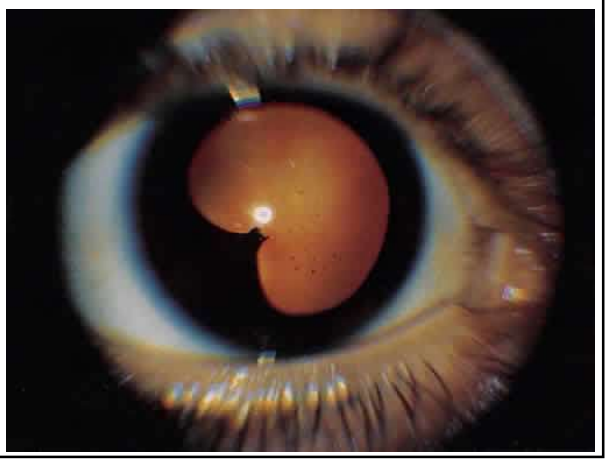

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Traumatic Iritis Treatment

- Cycloplegia
- Pred acetate 1%, Lotemax, or Durezol
  - Start qid to q2h depending on presentation
  - Taper over one to two weeks depending on response
  - Add topical NSAID at end of taper if desired
- Watch for change to increased IOP
  - Use timolol, brimonidine, or CAI to control IOP
  - Avoid prostaglandins if possible

63

Angle Recession Glaucoma

- Secondary open-angle glaucoma
- Onset is often delayed decades from injury
- Look for signs of previous trauma-generally blunt force trauma
- Treat accordingly
  - Gonioscopy-do not necessarily see angle recession
  - Medication to start
  - Brimonidine, Beta-blockers, CAIs first choice only bc of unilateral cosmetic concerns with prostaglandins
  - SLT rarely effective
  - Often will reach maximum medical therapy and need trabeculectomy

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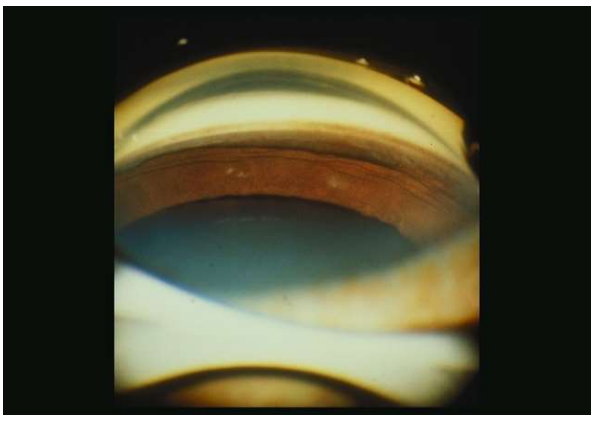

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Cataract

- If immediate formation, look for penetrating foreign body
- Can form years after initial injury or be more advanced than other cataract later in life
- Look for lens subluxation, weak or torn zonules, phacodonesis

67

Other Lens Damage

- Dislocated/subluxated lens
  - May report monocular diplopia
- Zonular dehiscence
  - Phacodonesis
- Compromised capsular integrity
- Dislocated IOL

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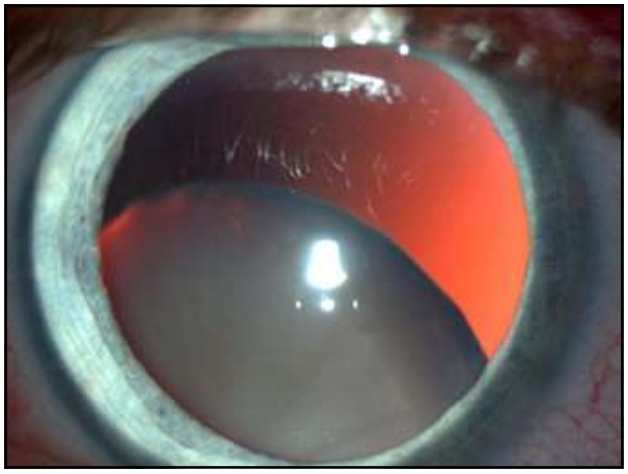

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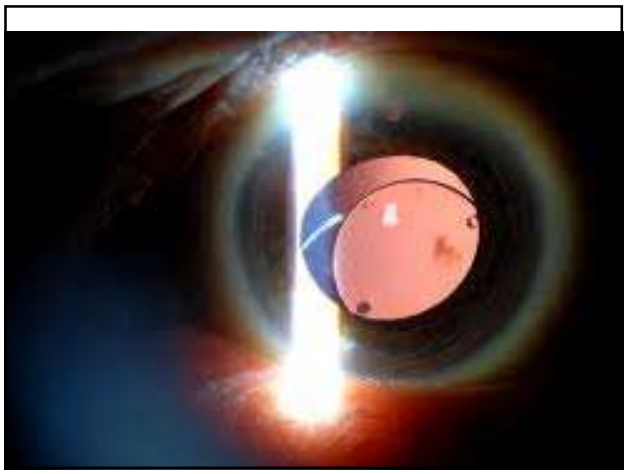

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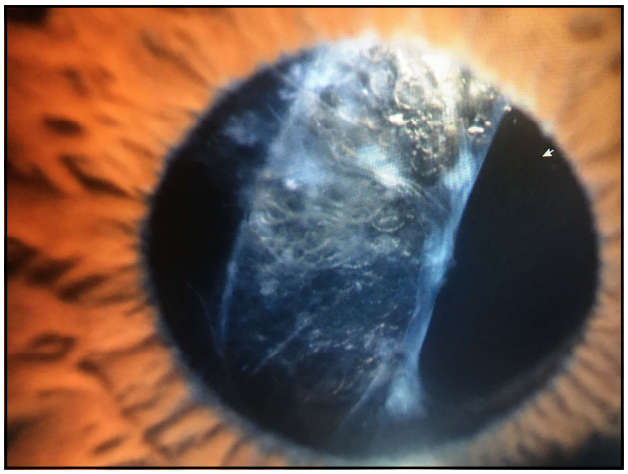

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Unilateral Cataract Surgery

- If pre-presbyopic, warn of loss of near VA--consider multifocal unilaterally
- If presbyopic and multifocal candidate--recommend clear lensectomy in alternate eye with multifocal
- Note multifocals may be contraindicated considering other traumatic damage to the eye
- If moderate to severe refractive error…
  - CL patient can shoot for plano goal in phaco eye but will be resigned to CL wear not specs
  - Spec only patient--balance phaco eye with Rx of other eye

74

Trauma Induced PVD

- Trauma alters the vitreoretinal interface
- More likely to evoke retinal break or vitreous hemorrhage due to stronger adhesions
- DFE with scleral depression recommended
- Signs/symptoms of RD
- Monitor more closely than age related PVD
- Limit activities

75

Vitreous Hemorrhage

- From blunt force or penetrating injury
- RBCs noted in anterior vitreous at slit lamp
- Hemorrhage noted with BIO
  - Can obscure view of the retina
  - May need Bscan
- 70% of patients with vitreous hemorrhage have associated retinal break, usually superior
- Watch daily with retinal exam, head of bed elevated, no ASA/Ib products, limit activities

76

Commotio Retinae

- Sheenlike retinal whitening in posterior pole or periphery of retina
- Most common retinal damage from blunt trauma
- Shock waves from trauma damage outer layers of retina with extracellular edema and photoreceptor disruption
- Most often opposite to direction of injury
- Can leave permanent visual field defect but most often is self-limiting
- No acute treatment although oral steroids are sometimes advocated for posterior pole involvement
- Generally subsides 3-4 weeks with observation only

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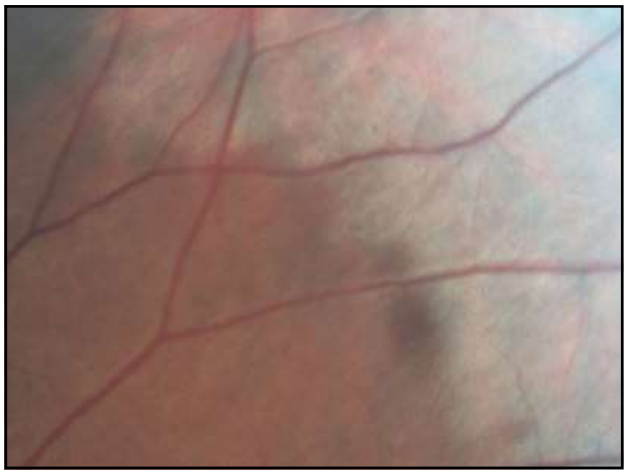

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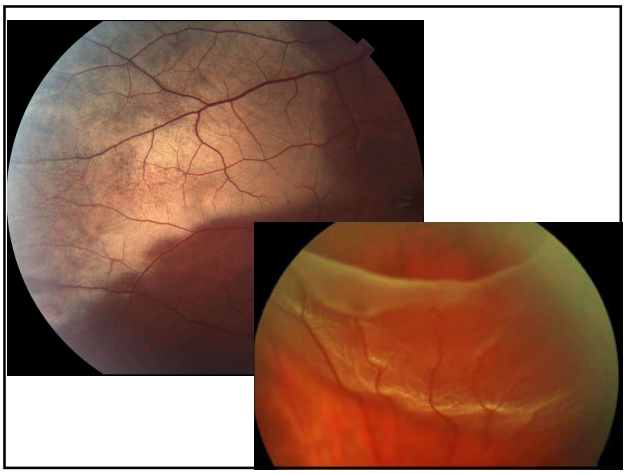

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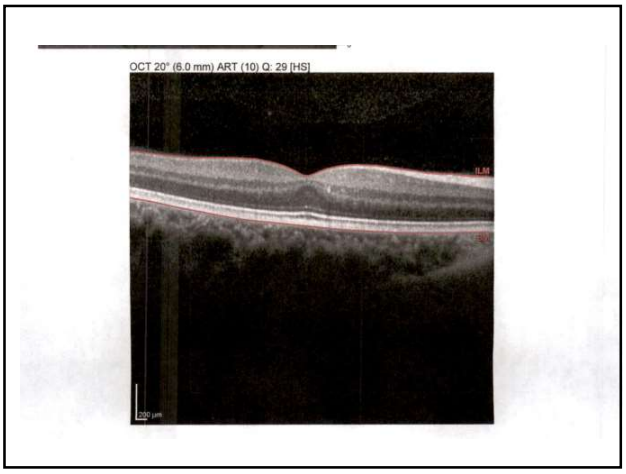
Other Retinal Involvement

- Retinal Detachment
  - Associated with trauma induced vitreal shift anteriorly
  - Flashes/floaters/curtain of field loss
  - Shaefer's sign, break or detachment seen
- Macular RPE damage
  - Due to blunt trauma
  - RPE and subsequent photoreceptor loss
  - Severe, permanent vision loss
  - Can see on OCT mac

80



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Choroidal Rupture

- Breaks in the choroid, Bruch's membrane, and the RPE due to blunt, non-penetrating trauma
- Usually posterior pole, often macula
- Crescent shaped cracks concentric to the disk
- CNV formation is common with subretinal bleeding and can occur even years later
- No treatment unless CNV develops then consider anti-VEGF

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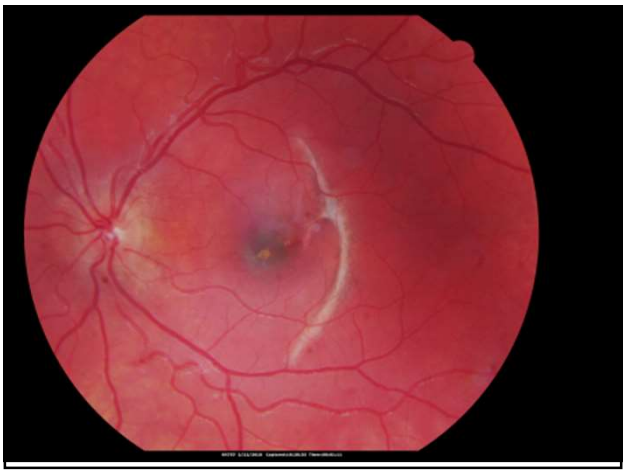

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Traumatic Optic Neuropathy

- Generally associated with closed head trauma (generally brow/frontal blow) or penetrating orbital trauma
- Variable amounts of decreased VA, VF defects, and loss of color vision
- Positive APD
- Do CT of orbits with MRI of brain
- Optic nerve may appear normal at onset but atrophy usually may develop over weeks to months
- IV steroids controversial

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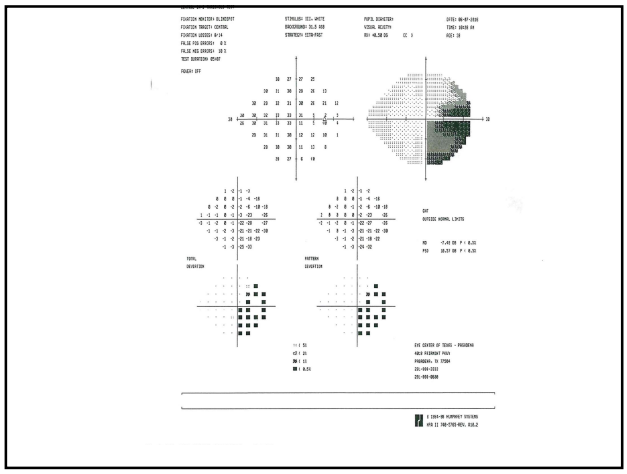

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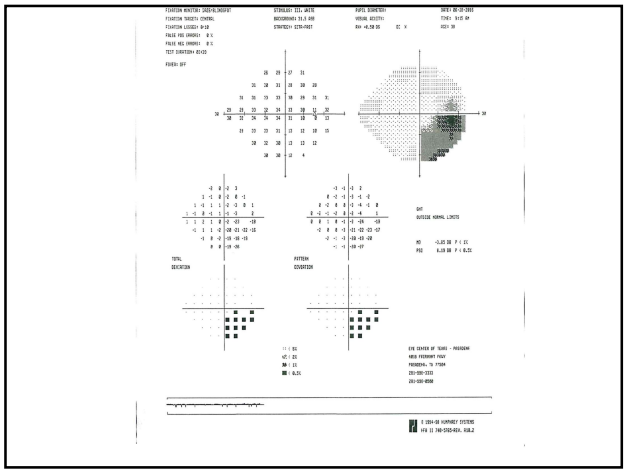

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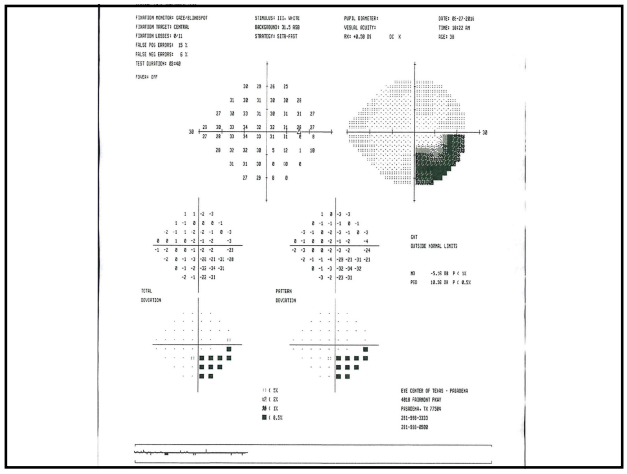

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Retrobulbar Orbital Involvement

- Retrobulbar hemorrhage/hematoma
  - EOM restriction/diplopia
  - Proptosis
  - APD
  - IOP elevation
  - Lateral canthotomy may be needed emergently
  - To ER and surgery STAT

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Long-term Trauma Signs

- Corneal scar
- Unilateral mydriasis
  - Poor pupillary constriction secondary to sphincter tear
- Iridodialysis
- APD
- Angle recession on gonioscopy
  - Compare with gonio of unaffected eye
- Unilateral increased IOP
- Weak or torn zonules
- Unilateral cataract
- Optic atrophy
- Choroidal rupture scarring

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Warnings To Patient

- Glaucoma
  - At increased risk for glaucoma over your lifetime which may not present for decades. Need 6 month FU then yearly exams.
  - Do baseline VF and OCT NFL
  - STRESS ASYMPTOMATIC
- Cataract
  - At increased risk for earlier cataract formation over your lifetime. Need 6 month FU then yearly exams.
- Retina/Vitreous
  - Signs/Symptoms of retinal break/detachment
  - Amsler grid for choroidal ruptures

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THANK YOU!

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