




When Injured Eyes Knock

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Speaker Disclosure

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Course Objectives

- To discuss issues surrounding an optometric office availability and capabilities of managing ocular trauma cases
- To review the clinical findings of various ocular structures as it relates to a variety of injuries
- To review the proper management of each of the various findings

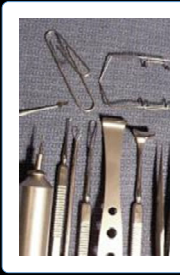
Introduction

- An estimated 2.4 million eye injuries occur in the U.S. annually. Nearly
- 35% of all eye injuries occur in people 18 to 45 years of age
- 40% of monocular blindness is related to trauma
 - The **leading cause** of monocular blindness
- 70-80% injured are male
- Average age 30y
 - Most common cause of visual loss in persons under age 25
- Using protective eyewear can prevent 90% of all eye injuries

Source: The scope of the problem, Prevent Blindness America

Introduction

- Importance of handling emergency and injury cases
 - Patients seeking care
 - Proper management will minimize or prevent further complications
- Handling phone call and office inquiries
 - Office protocol
 - Doctor's availability/liability, etc.
 - Training the office personnel
- Necessary Instrumentation

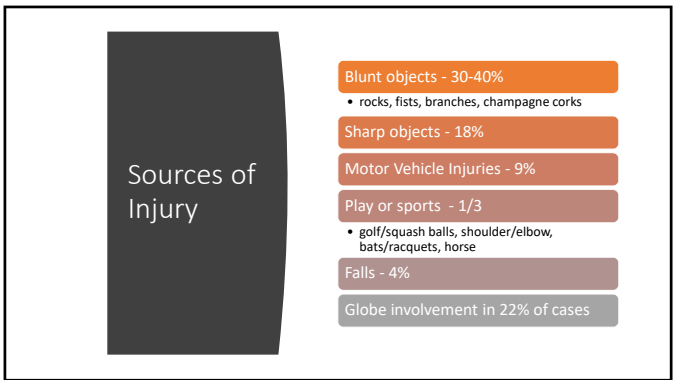
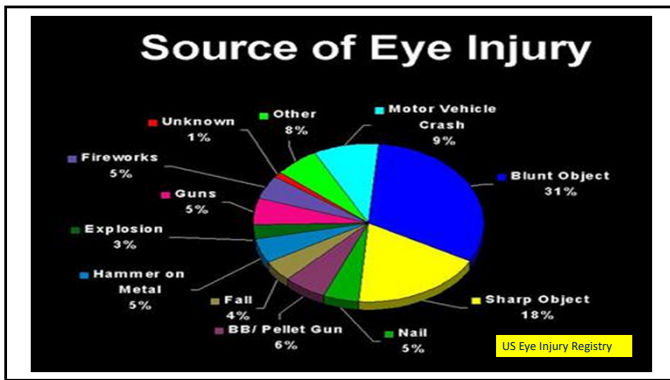
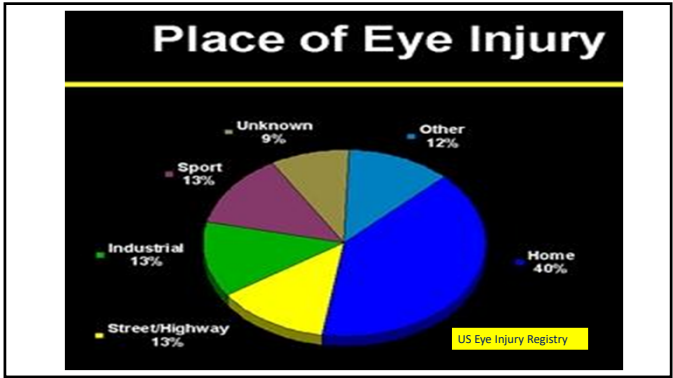
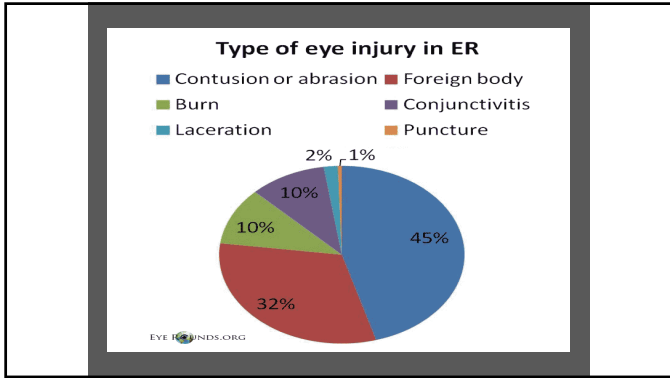


Epidemiology of Eye-Related Emergency Department Visits

From 2006 to 2011: 11,929,955 ED visits

- For ocular problems in the US were categorized as
 - Emergent (41.2%)
 - Nonemergent (44.3%)
 - Unable to determine (14.5%)
- Leading **diagnosis** in Emergent Category
 - Corneal abrasions (13.7%)
 - Foreign body in the external eye (7.5%)
 - Conjunctivitis (28.0%)
 - Subconjunctival hemorrhages (3.0%)
 - Styes (3.8%)

Source: Channa et. al, JAMA Ophthalmology, 2016 Mar;134(3):312-9



Ocular Trauma

- Assessment of Trauma
 - Nature of injury
 - Blunt (Penetrating or Lacerating)
 - Chemical
 - Location of injury
 - Peri-ocular
 - Anterior segment
 - Posterior segment

Criticality of Assessment and Management Period
Effecting the Outcome
Emergencies vs. Urgencies

- In **Emergencies** Minutes Matter
 - True Ocular Emergencies
 - Retinal artery occlusion (for visual outcome) and a Medically Urgent Condition
 - Chemical burns
- In **Urgencies** Hours Matters
 - Endophthalmitis
 - Penetrating Injuries
 - Orbital cellulitis (Medical Consequence)
 - Retinal Detachment

History

- Detailed History
- Where? When? What? How?
- Examination and Documentation
- Legal Issues
 - Ligation (MVA, Abuse Injuries, Assault)
 - Workman's Compensation vs. health insurance vs. auto insurance

History

- Mechanism of trauma
 - Blunt/penetrating/mixed Forces involved
- Previous injuries
- Past ocular history
- Past medical history

Assessment

- Pt review
 - Are there life threatening injuries which need to be treated first?
 - Brain injury?
- Facial Concerns
 - Lacerations/bruising, numbness, weakness
 - Orbital Associated Injuries and Findings
- Ocular Concerns
 - Globe Associated Injuries and Findings

Examination

- Beyond History
- VA and Pertinent Chair Skills
- Lids and lacrimal system, orbital rim/orbital bones, ocular motility, globe, optic nerve

Blunt Trauma


Eye protected by bony orbit, orbital rim and the eyelids

Anterior Segment

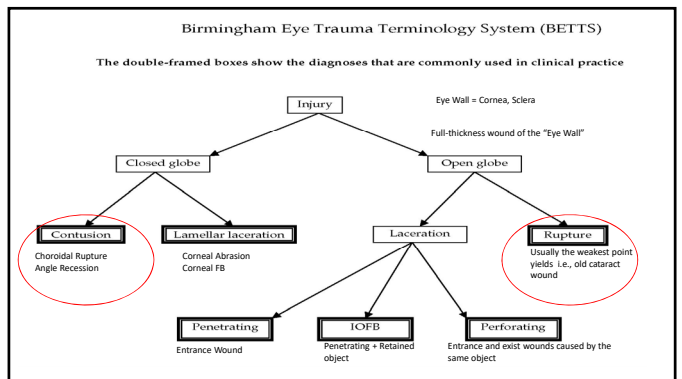
- Orbit
- Eyelids
- Conjunctiva/Sclera
- Cornea
- A/C
- Iris
- Lens

Posterior Segment

- Vitreous
- Retina/Optic Nerve
- Choroid



Bottle Rocket Injury





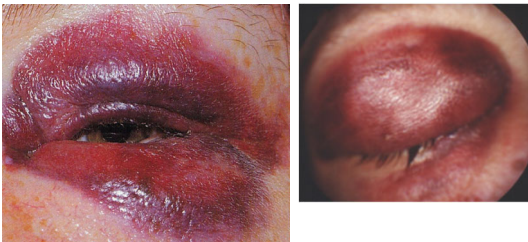
Orbital & Eyelid Emergencies

Orbital Trauma

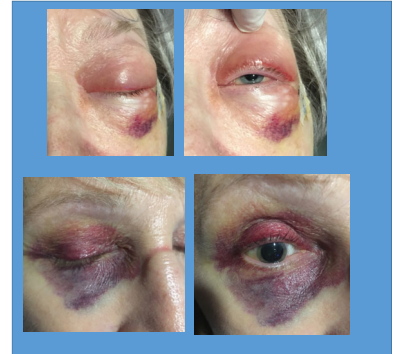
- Orbital hematoma
- Orbital fractures
- Orbital Foreign Body



Periorbital Hematoma



- Caused By Falling
- Common incident in patients, particularly nursing home population



Periorbital Hematoma

If mild, treat with cool compresses

If large amount of hemorrhage, especially behind the globe (Retrobulbar hemorrhage)

- – may require emergency surgery to reduce intraocular pressure and protect corneal surface

Retrobulbar Hemorrhage

- Pain
- Decreased vision
- Proptosis
- RAPD
- Decreased EOM
- Elevated IOP
- May see on CT

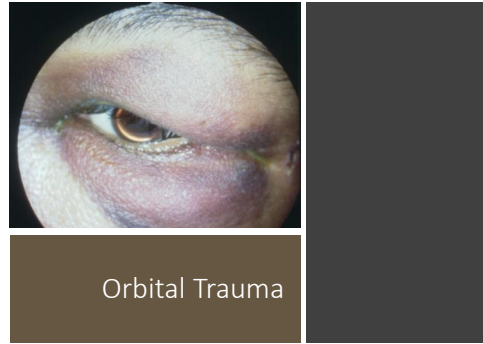


Courtesy: Salar Rafieetary, MD

Orbital Compartment Syndrome Lateral Canthotomy for Orbital Hemorrhage



Courtesy : Salar Rafieetary, MD



Orbital Trauma

Severe Traumatic Cases Managed at ERs and Hospital Inpatient



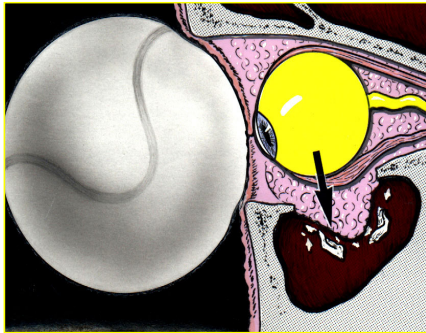
Courtesy: Salar Rafieetary, MD

Blunt
Ocular
Damage

The extent of ocular damage depends on:

- Size of the blunt object
- Hardness of the blunt object
- Velocity of the blunt object
- Force imparted directly to the eye

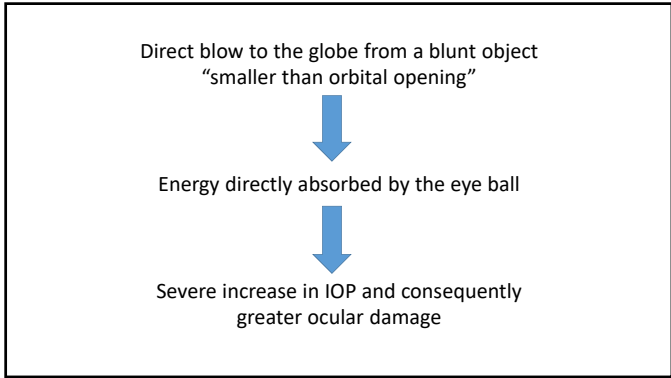
Pathogenesis of orbital floor blow-out fracture



Direct blow to the globe from a blunt object
"larger than the orbital opening"

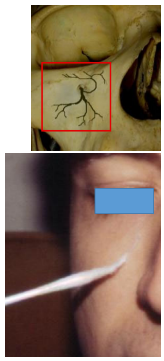
Energy absorbed by all of the orbital contents
leading to rise of intra-orbital pressure

Fractures of the thin bones of orbit
This "pressure-release valve" may prevent
serious ocular injury




Orbital Fractures

- Signs/Symptoms
 - Tenderness on palpation
 - Crepitation
 - Infraorbital nerve anesthesia or hyposthesia
 - Epistaxis (nose bleed)
 - EOM restriction/Diplopia (vertical)
 - Difficulty with jaw movement
 - Facial asymmetry
 - Enophthalmos



Signs of orbital floor blow-out fracture

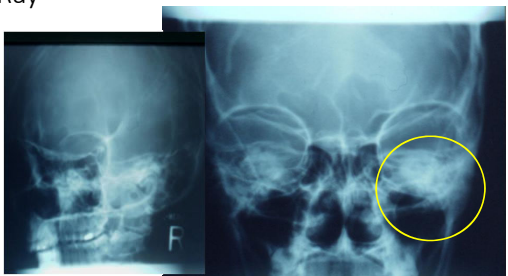


- Periorbital ecchymosis and edema
- Infraorbital nerve anesthesia
- Ophthalmoplegia - typically in up- and down-gaze (double diplopia)
- Enophthalmos - if severe

Imaging

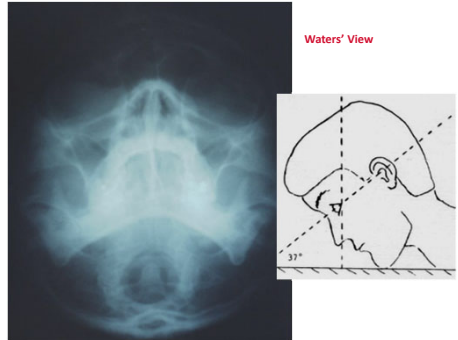
- X-ray
- CT
 - Axial and coronal
- MRI
 - No good - bone, metal FB
 - Subdural optic nerve haematoma

X-Ray



Lateral

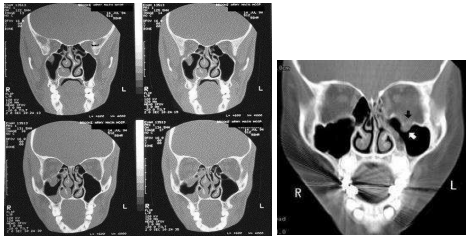
Caldwell View (A-P)



Waters' View

37°

CT Scans



Treatment

Surgery not required unless persistent diplopia or poor cosmesis

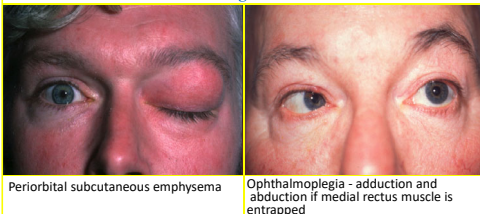
Surgery is usually delayed for 7-14 days to allow for resolution of swelling

Nasal decongestants, broad-spectrum oral antibiotics, ice packs

Instruct patient not to blow nose (1-2 days)

Medial Wall Fracture

Signs



Periorbital subcutaneous emphysema

Ophthalmoplegia - adduction and abduction if medial rectus muscle is entrapped

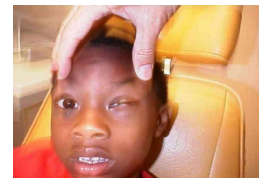
Treatment

- Release of entrapped tissue
- Repair of bony defect

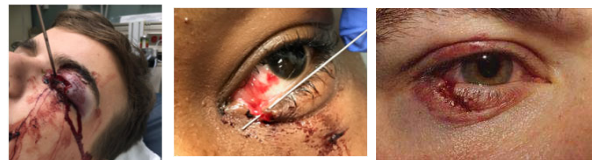
Eyelid-Super Glue



- Warm compress to loosen
- May need to trim lashes
- Gently rub to remove
- Remove glue from Cornea
- Treat Corneal Abrasion if present



Eyelid Lacerations



Courtesy: Salar Rafieetary, MD

Full-thickness Lid Laceration

Etiologies: Animal Bites, MVA, Sports Injuries (fishing hooks), Assault

by Daniel Miller, MD Exclusive to EyeWorld

One week after routine cataract surgery, a hostile patient called our office in severe pain. "Those eyedrops are killing me!" he said. I instructed him to come to our office right away and to bring all his medications with him.

He had accidentally switched his Pred Forte (prednisolone acetate, Allergan) with Typewrite White-Out and, not surprisingly, had obvious irritation on slitlamp examina-



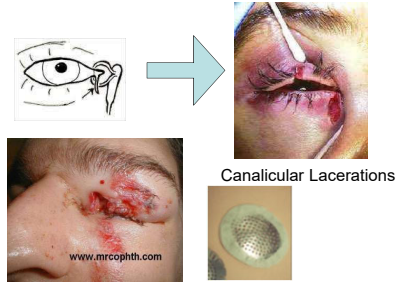
tion. Kindness, reassurance, and genuine Pred Forte helped his post-operative course back to a normal healing period. 🙏

Combined Eyelid and Facial Lacerations



Courtesy: Salar Rafieetary, MD

Eyelid Laceration Assessment



Canalicular Lacerations

www.mrcophth.com



Protection during Transfer

Eyelid Lacerations

Should always be concerned about underlying open globe

- Refer to oculoplastics for
 - Full-thickness laceration
 - Laceration involving medial 1/3 of lid
 - Deep lacerations with or without fat prolapse
 - Lacerations with significant tissue loss

Laceration Repaired



Courtesy: Salar Rafieetary, MD

Complications Secondary to Eyelid Lacerations

Lid margin notching

Lagophthalmos
• Due to scarring or tissue loss or septum into wound

Hypertrophic scars

Infection

Tearing

• Canalicular damage, lid malposition, pump failure

Traumatic ptosis

• Myogenic or neurogenic

Anterior Segment Trauma

Chemical Burns

- A vision-threatening emergency
- Immediate irrigation essential



Chemical Burns

Acid vs. alkali

- Alkali more severe than acid burns

Self-Induced

Treatment

- Immediate copious irrigation
- Severe cases refer to appropriate ER
- Do not use chemical antidotes
- Monitor pH



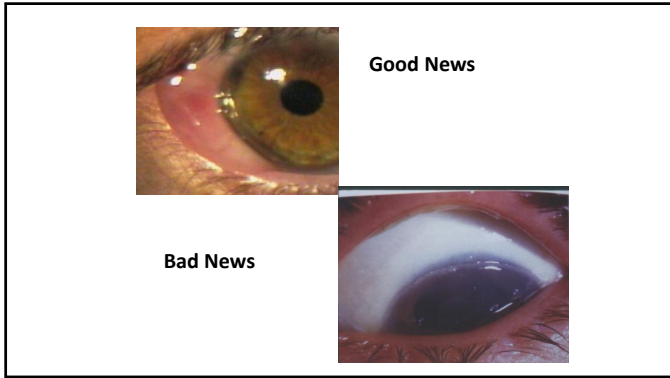
Irrigate immediately before anything else

Alkaline (bases)

- Fertilizers
- Cleaning products (ammonia)
- Drain cleaners (lye)
- Oven cleaners
- Bleach (sodium hydroxide)
- Fireworks (magnesium hydroxide)
- Cement (lime)
- High pH
- Especially damaging – will denature proteins and lyse cell membranes which enhances penetration

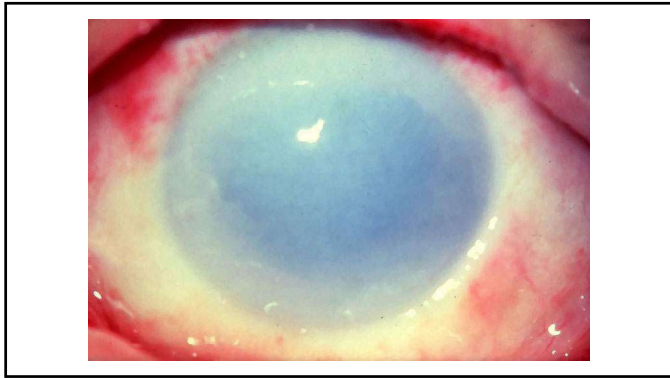
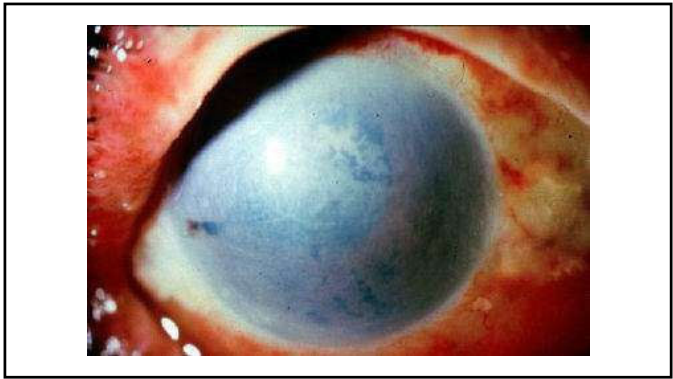
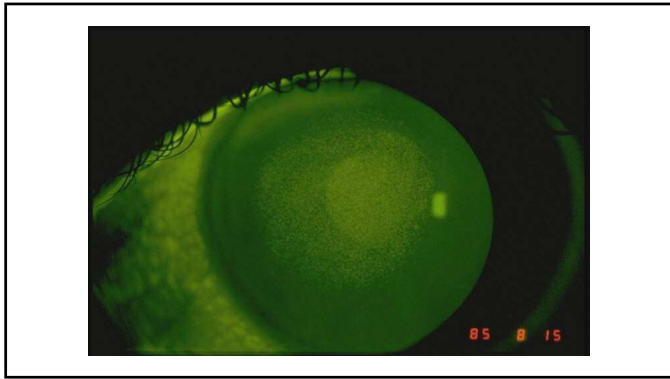
Acids

- Battery acid (sulfuric acid)
- Glass polish/etching (hydrofluoric acid)
- Vinegar
- Nail polish remover (acetic acid)
- Low pH
- Depth of penetration usually less due to precipitation of proteins



Grading of Severity of Chemical Injuries

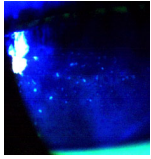
- Grade I (excellent prognosis)**
 - Clear cornea
 - Limbal ischaemia - nil
- Grade II (good prognosis)**
 - Cornea hazy but visible iris details
 - Limbal ischaemia <1/3
- Grade III (guarded prognosis)**
 - Hazy cornea with no iris details
 - Limbal ischaemia 1/3 to 1/2
- Grade IV (very poor prognosis)**
 - Opaque cornea
 - Limbal ischaemia >1/2



Chemical Burns

Treatment

- Immediate copious irrigation
 - Lid speculum may be helpful
- Severe cases refer to appropriate ER
- Do not use chemical antidotes
- Monitor pH
- Corneal defect should be followed up daily until healed



Welding top cause of consumer product-related eye injuries

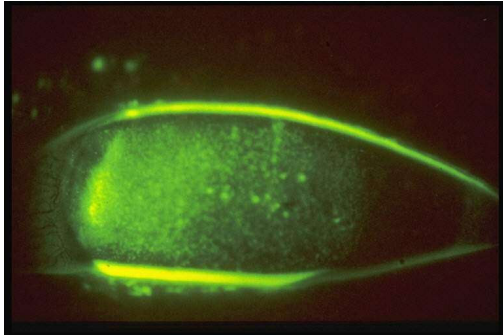
Burns

- Radiation
 - U.V.
- Thermal

Ultraviolet Burn

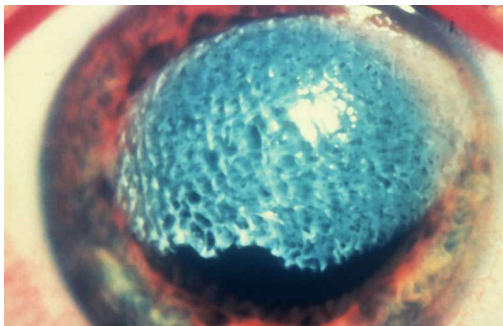


- Welding or sun lamps without eye protection
- Produces small, diffuse epithelial defects which stain with fluorescein
- Becomes severely painful several hours after exposure
- Treat with Cyclogyl, antibiotic ointment, and pressure patching

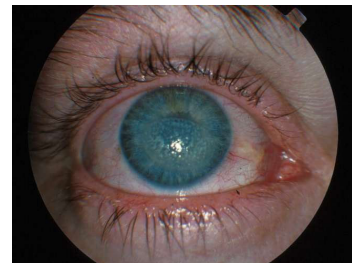


Thermal Burn

- Most common – cigarettes and curling iron
- Usually superficial burns
- Treat like chemical burn except no irrigation needed
- May need debridement of burned tissue



Thermal Corneal Burn







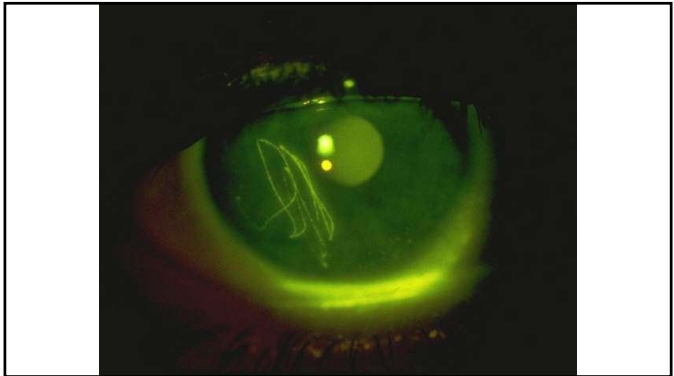
Foreign Bodies

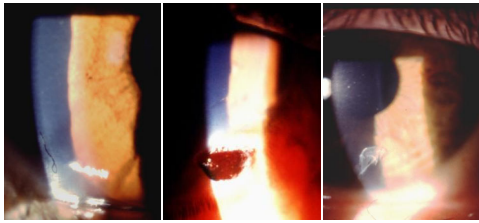
- Superficial and Corneal FB most common injury seen in optometric practice
 - Superficial (Eyelid, Conj. Cornea)
 - Penetrating (retained) or Perforating

Superficial Foreign Body

- Multiple linear epithelial defects suggests foreign body beneath the eyelid
- Be sure to flip upper eyelid with cotton-tip
- Can be removed if superficial with moist cotton-tip
- If embedded -- can be removed with cotton-tip or 25-gauge needle

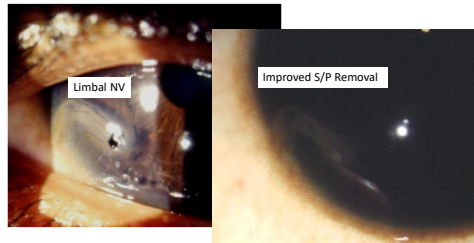
Evert the Eyelids



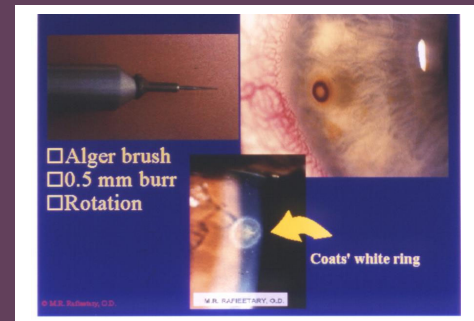
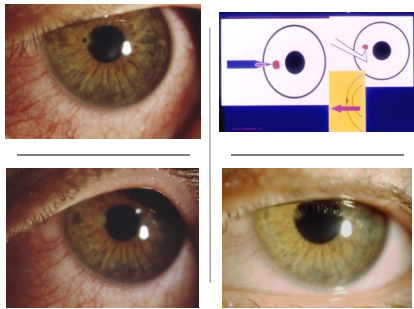


Corneal FB- Types

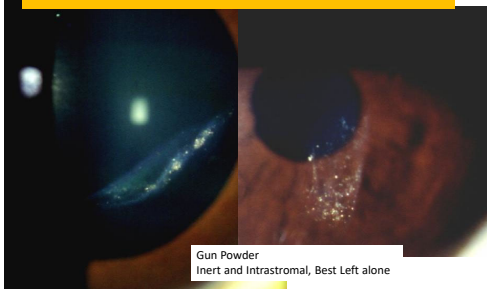
Vegetative (Non-inert) Object



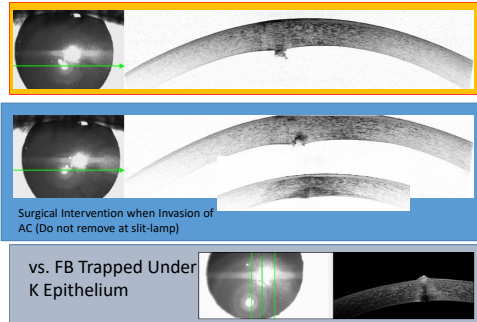
Inflammatory Response

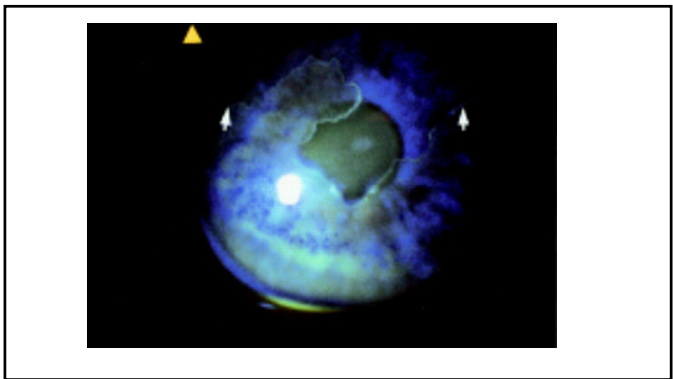
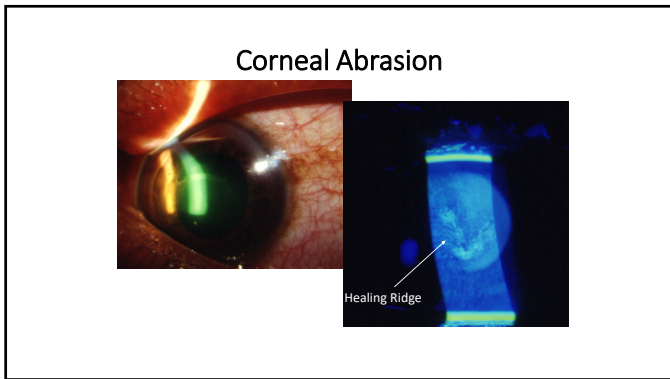
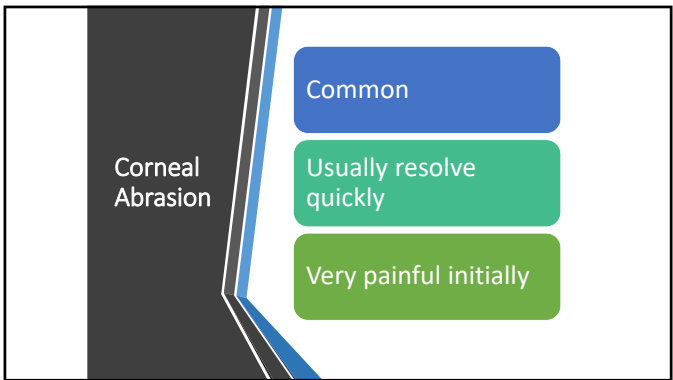
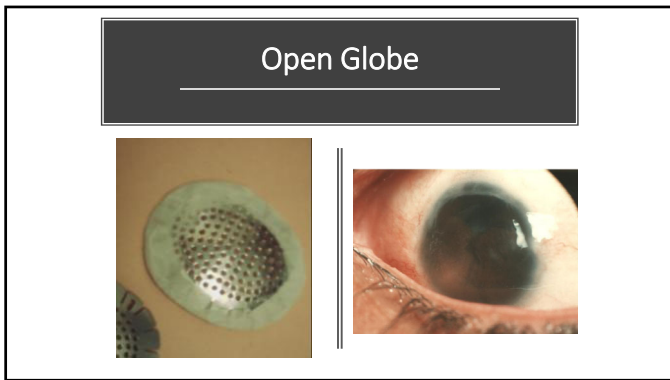
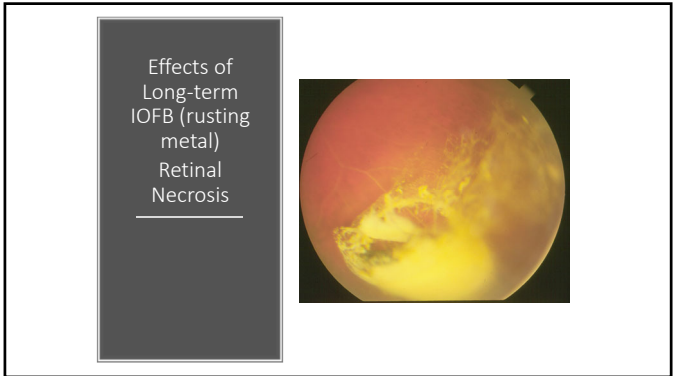
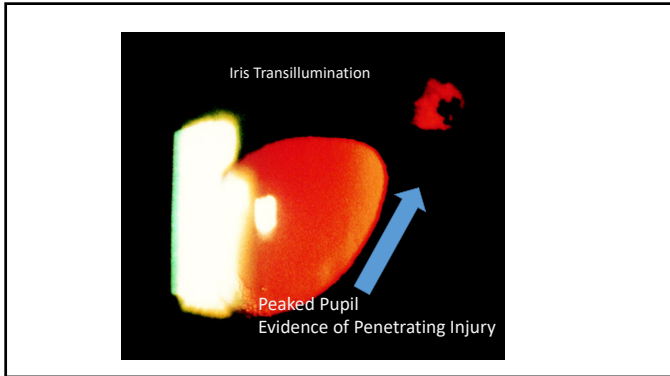


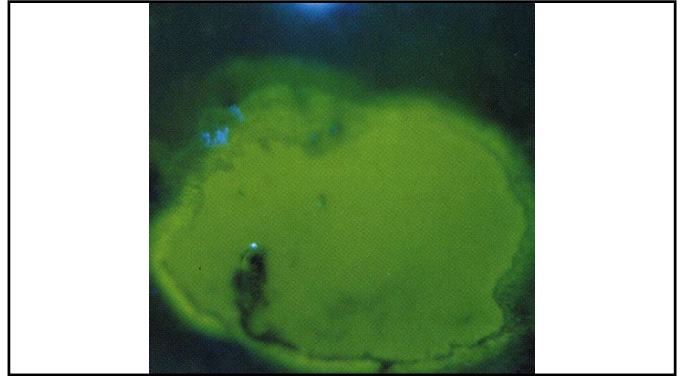
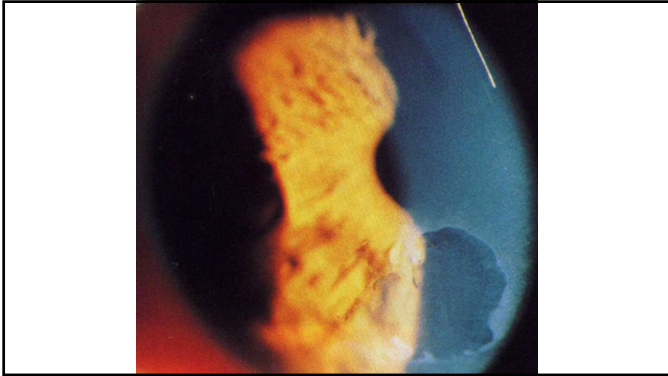
FB Depth and Material



Embedded Corneal FB







Corneal Abrasions

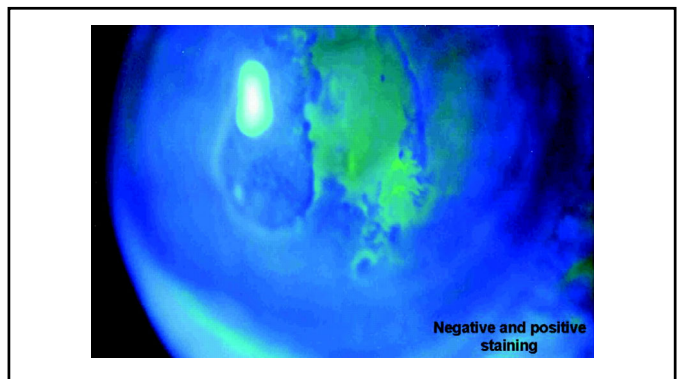
- Non-CTL Wearer: Antibiotic ointment/drop (e.g. Emycin/polytrim)**
 - Cycloplegic (cyclogyl bid)
 - May consider bandage CL, amniotic membrane
- CTL Wearer (Requires anti-pseudomonal coverage)**
 - Cycloplegic
 - DO NOT PATCH**
 - No contact lens wear

Corneal Abrasions

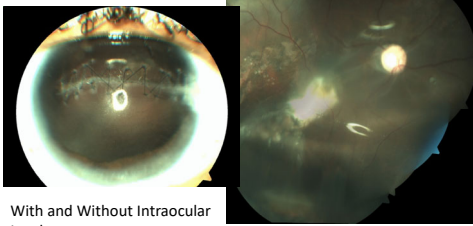
- Follow-up**
 - Large/central abrasion – Daily
 - Peripheral/small abrasion – 2-3d
 - CTL wearer—daily (once healed, no CTL wear for 1 week)

Recurrent Epithelial Erosion

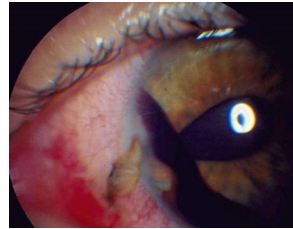
- History gives clue
- Often triggered by minor trauma
- Treatment**
 - Lubricants
 - Bandage contact lens
 - Amniotic membrane
 - Epithelial debridement
 - Tetracyclines
 - Laser Phototherapeutic Keratectomy (PTK)
 - Anterior Stromal Puncture



Corneal Laceration



With and Without Intraocular Involvement

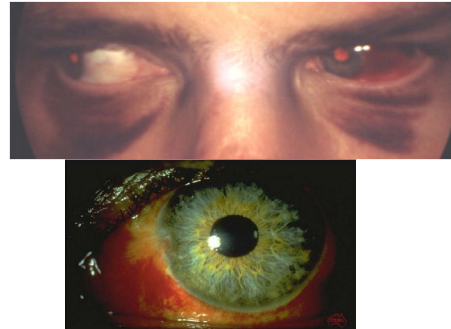


- Irregular Pupil
- Due to iris prolapse through laceration

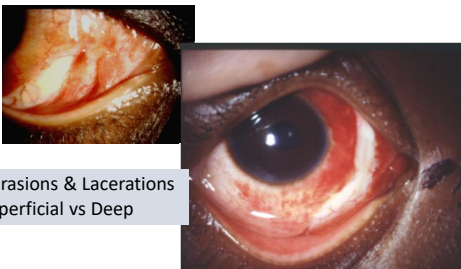
Corneal Laceration

Subconjunctival Hemorrhage

- Very common after blunt trauma
- Superficial blood vessels broken
- May occur spontaneously (Coumadin, aspirin, valsalva)
- Usually self-limited
- Treat with artificial tears and reassurance
- May be suggestive of ruptured globe



Conjunctival Injuries



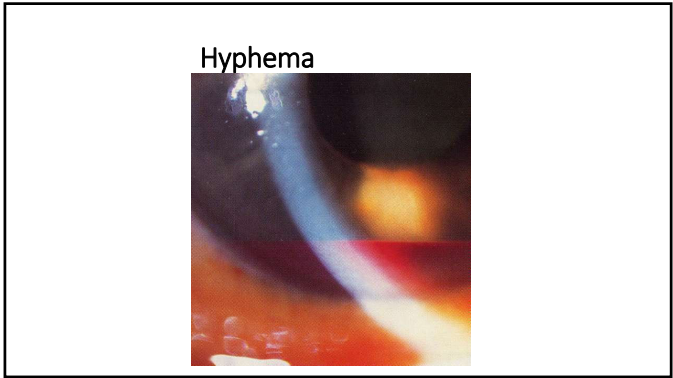
Abrasions & Lacerations
Superficial vs Deep

Bloody Chemosis



Hyphema

- Blood in the anterior chamber
- Can be diffuse or layered
- Source of bleeding is the iris or ciliary body



Hyphema

Blunt injury

↓

Complications:

Raised IOP	Angle recession	Corneal staining	Rebleed
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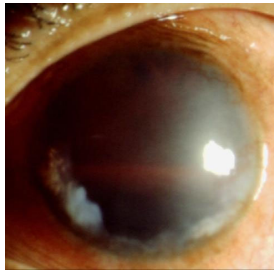
Hyphema

- Management
 - Hospitalize/bed-rest (head elevated at 30-45 degrees)
 - Protective shield
 - Cycloplegic-mydriatic, topical steroids
 - IOP monitor & control
 - Mild analgesics (avoid aspirin)
 - Rule out sickle cell
 - Surgical aspiration

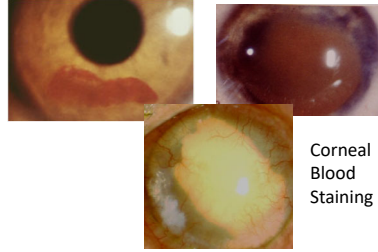


Hyphema

Presentation
of
Rebreeding

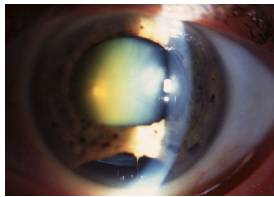


Hyphema, Chronic or Recurrent

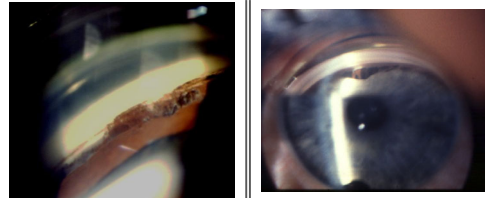


Corneal
Blood
Staining

Iris Dialysis



Angle recession



Traumatic
Iritis

Ranges from Mild to Severe

Usually other injuries as well

Treat as for non-traumatic Iritis
but may not require long taper and
will not require systemic work-up



Iritis

Post Traumatic Endophthalmitis

7% of cases

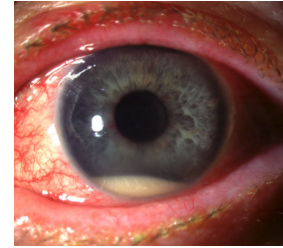
Skin flora most likely cause

- S aureus
- Consider Bacillus cereus if any soil
- 8-25%

Prophylactic antibiotics

- Consider intravitreal if heavily contaminated
- IV for 3-5d post-op
- Topical also

Endophthalmitis



Sympathetic Ophthalmia

<0.5% of penetrating injury

Bilateral granulomatous uveitis

AC inflammation, multiple yellow spots in peripheral fundus

Complications

- Cataract, glaucoma, optic atrophy, exudative detachments, subretinal fibrosis

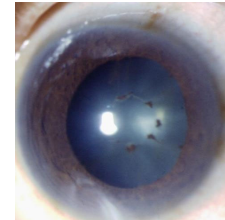
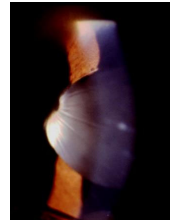
80% within 3 months, 90% within 1 year

Systemic immunosuppression

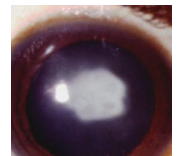
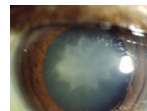
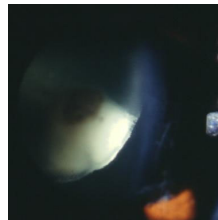
Mostly good prognosis >6/18

However, enucleate only if no visual potential

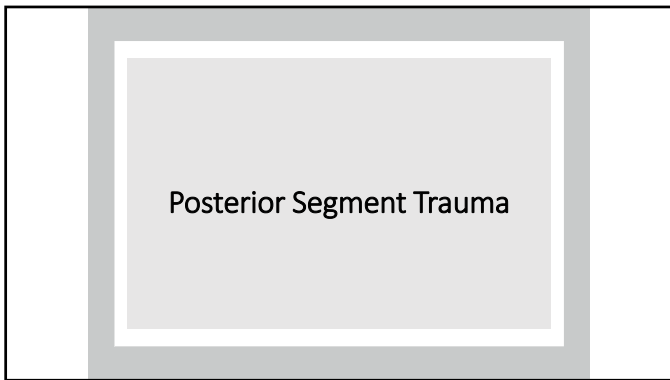
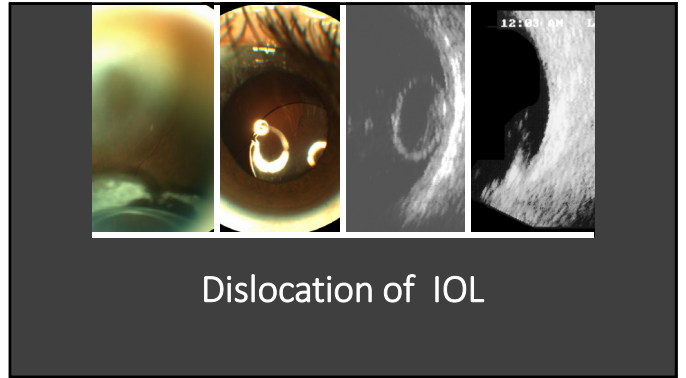
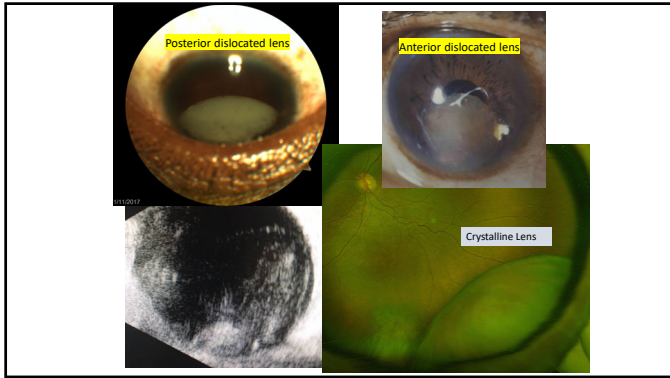
Lens-Capsular Findings



Zonular Dehiscence



Traumatic Cataract



Intraorbital/Intraocular Foreign Body

- High-speed projectile foreign body to eye or orbit
- Clinical Scenarios:
 - Weedeating or mowing
 - Grinding metal
 - Hammering or pounding metal
 - Motor vehicle accident

The illustration shows a person mowing a lawn. Safety warnings include: 'Eye protection', 'At least 10 years old', 'Long pants', 'Sturdy shoes', 'Watch your hands', and 'Watch your feet'.

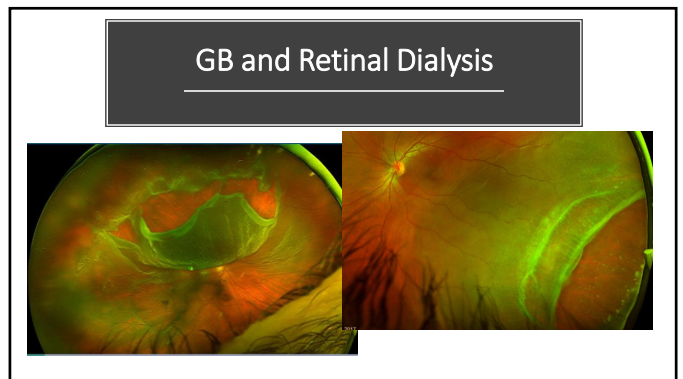
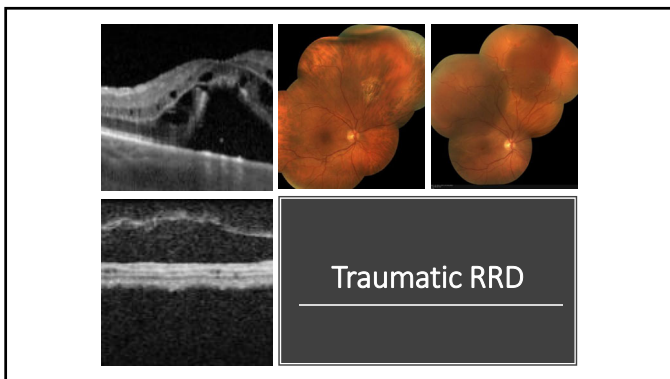
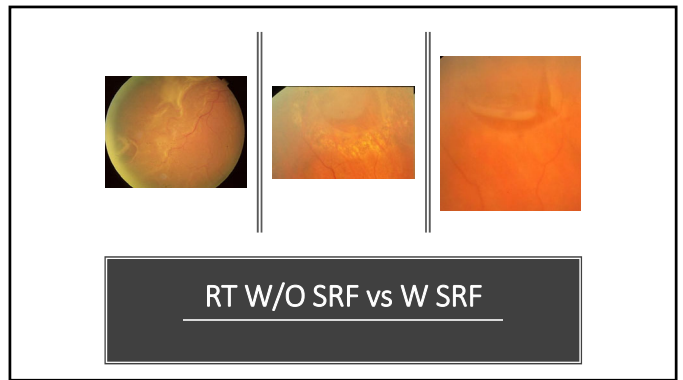
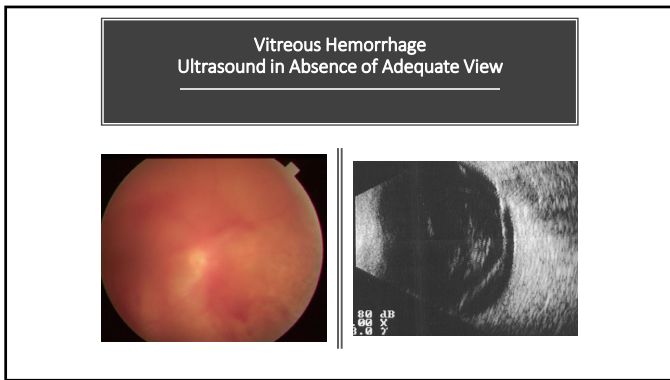
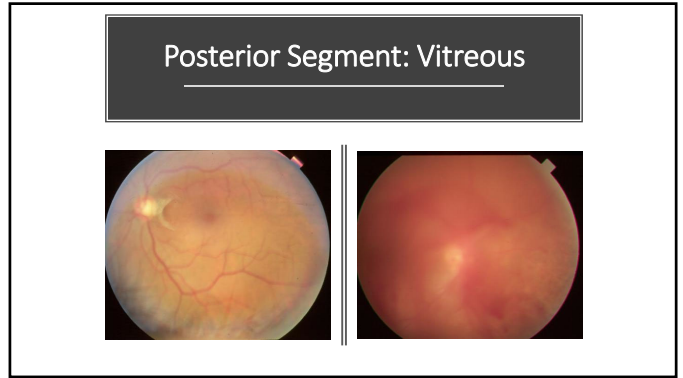
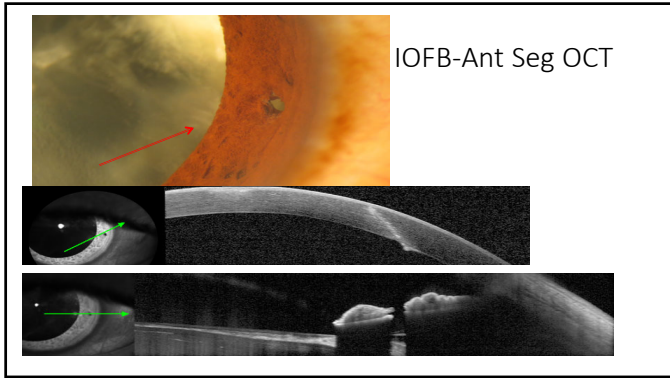
Intraorbital/Intraocular Foreign Body

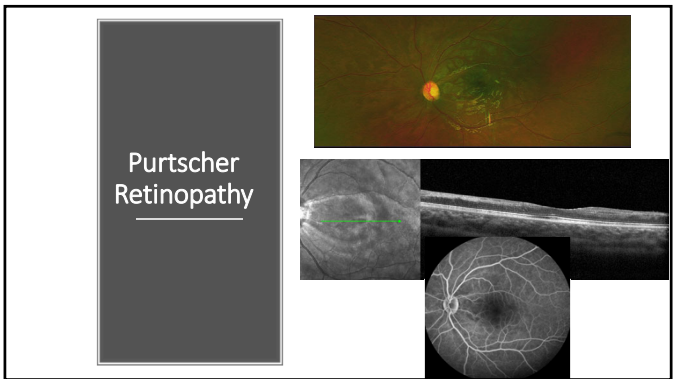
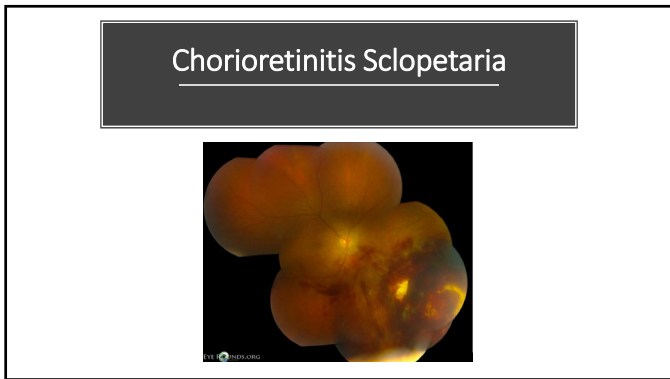
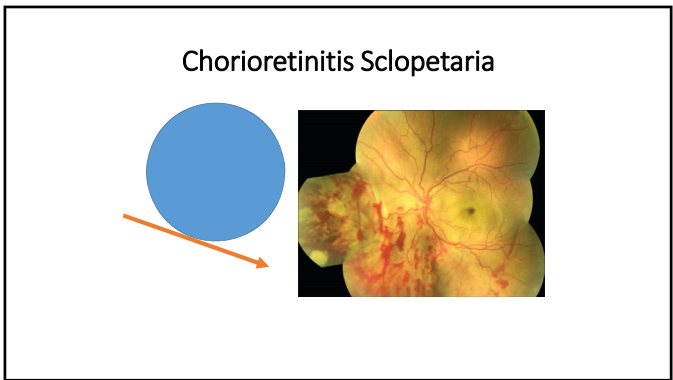
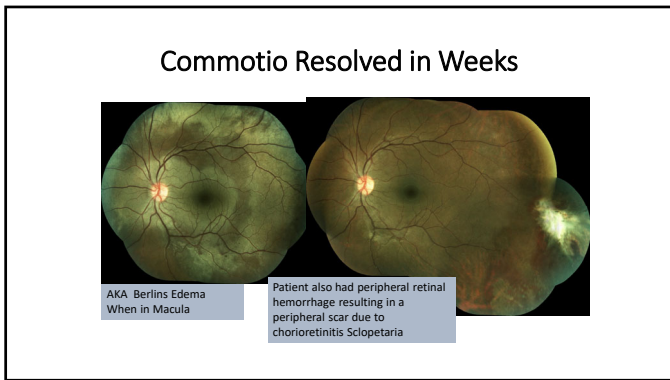
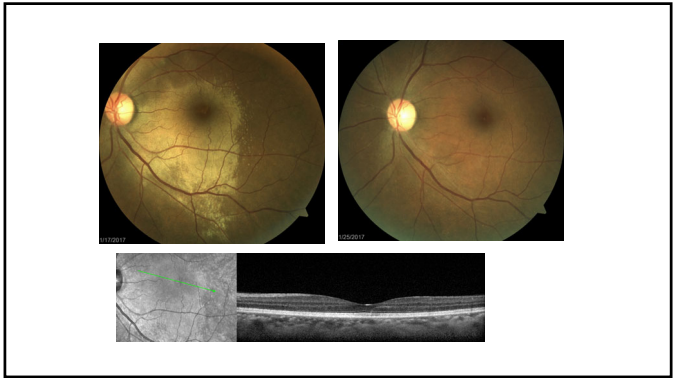
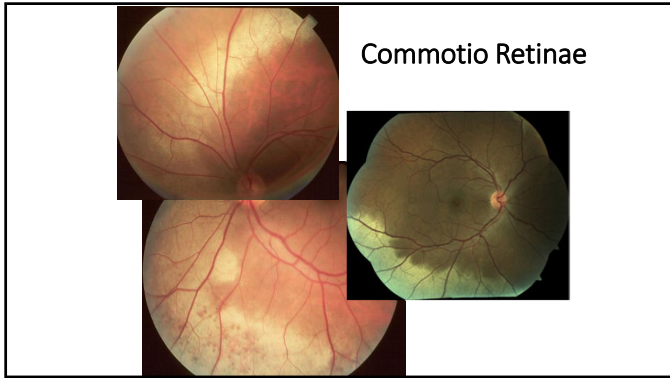
- Need to rule out injury to globe or intraocular FB -- requires surgery
- CT scan orbits (1mm cuts, Axial & Coronal)

Radiology for FB

NO MRI
Magnetic Material

The radiographic images include a CT scan of the orbits, a lateral skull radiograph, and a frontal skull radiograph. A red box highlights a specific area in the lateral view.

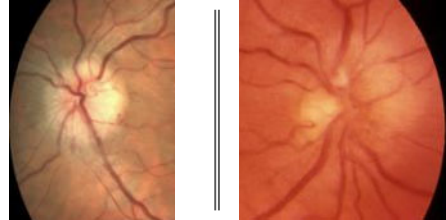




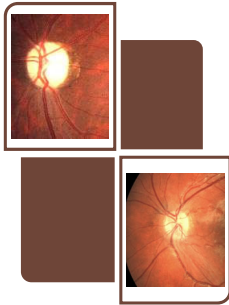
Purtscher Retinopathy



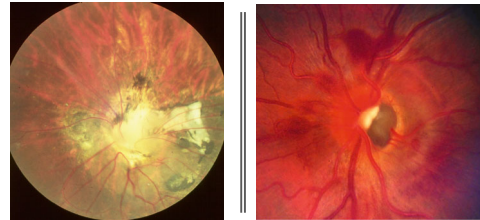
Traumatic Optic Neuropathy



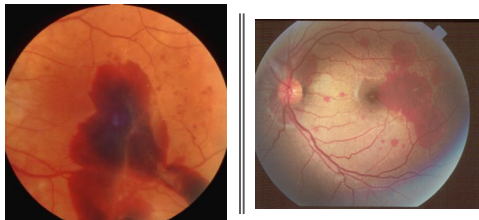
Traumatic Optic Neuropathy



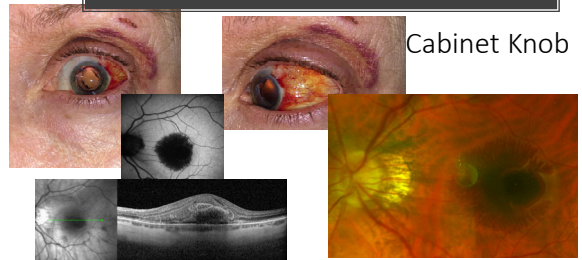
Optic Nerve Avulsion

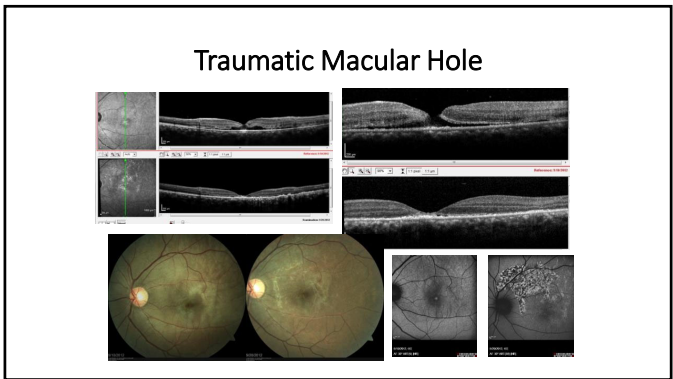
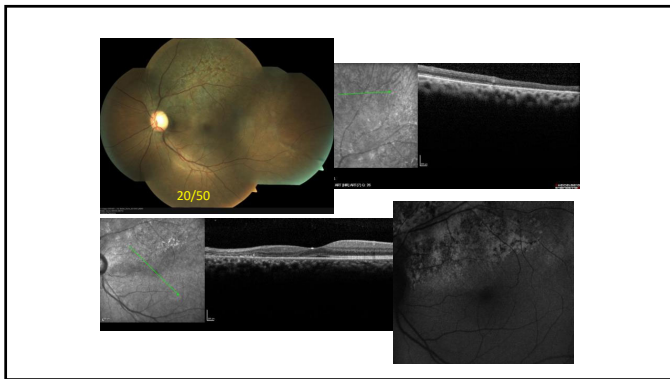
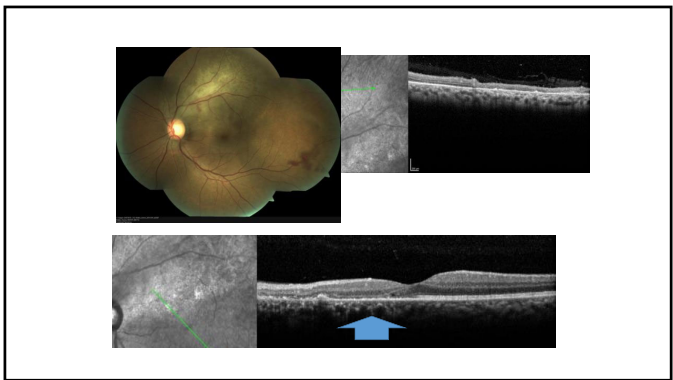
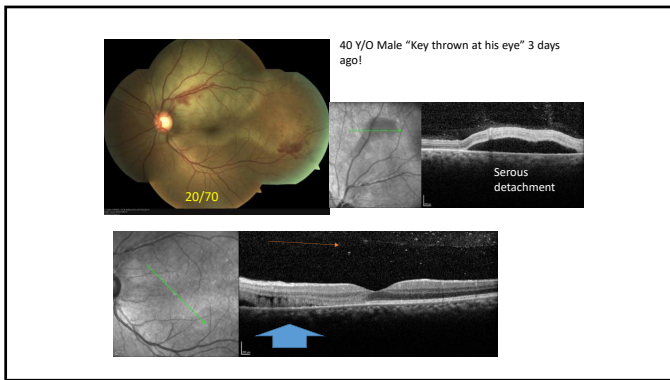
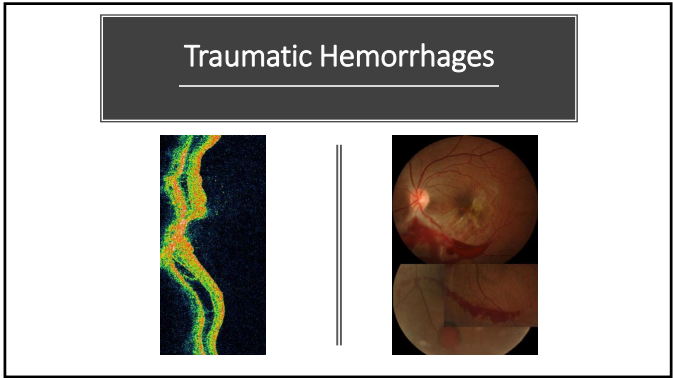
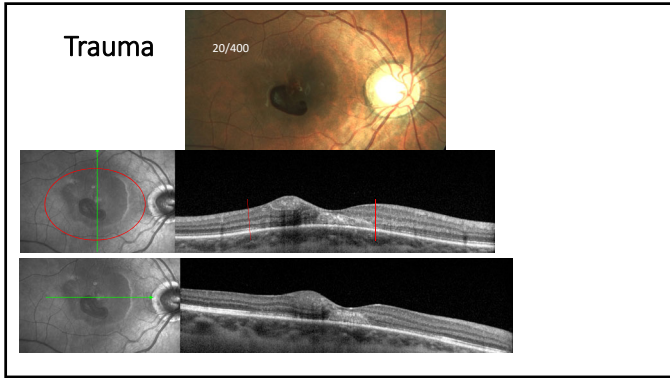


Traumatic Hemorrhages

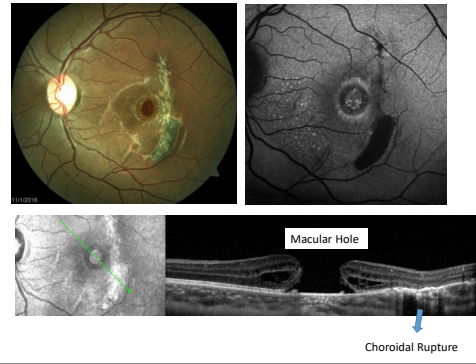
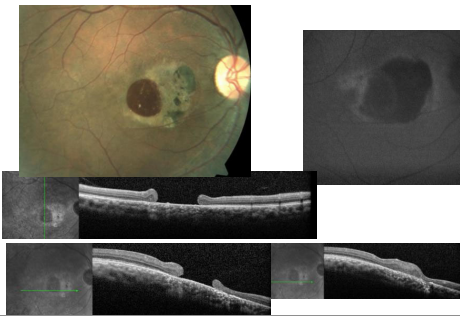


Traumatic Hemorrhages

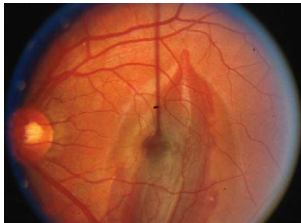




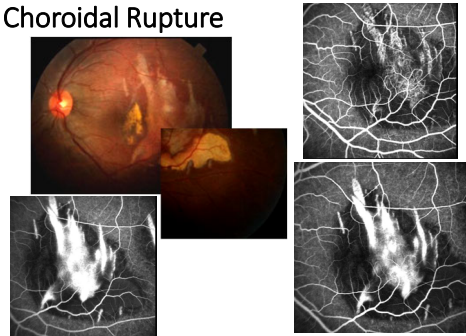
Traumatic Macular Hole



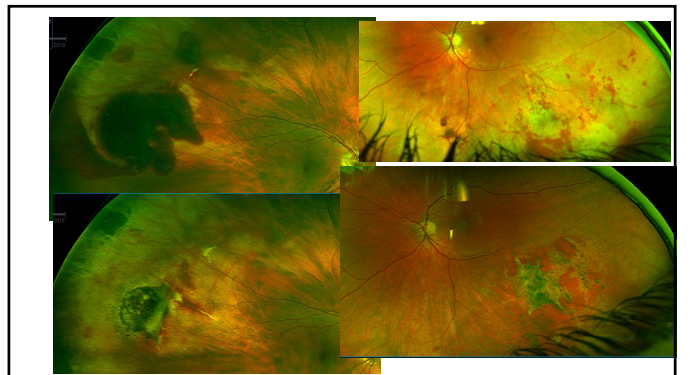
Choroidal Rupture & Retinal Hemorrhage



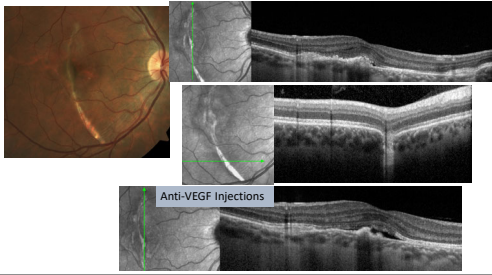
Choroidal Rupture



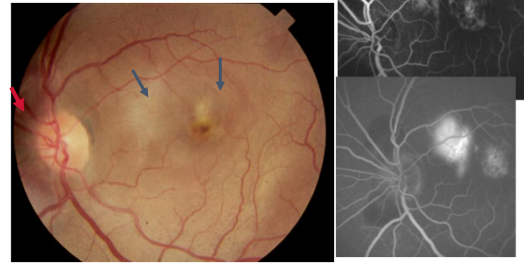
Choroidal Rupture



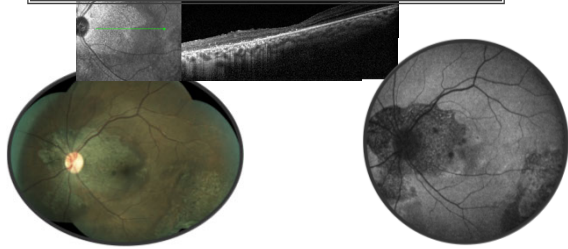
Choroidal Rupture (Secondary CNV)



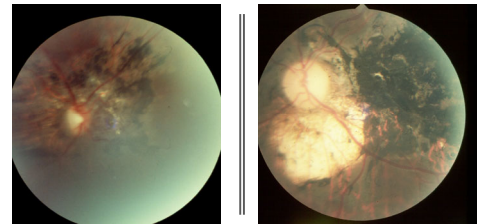
CNV



Traumatic Chorioretinal Scar



Traumatic Chorioretinal Scar

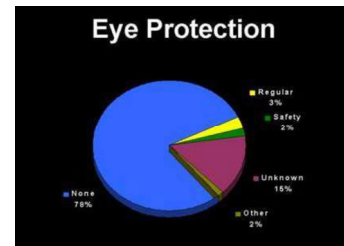


Eye Injuries

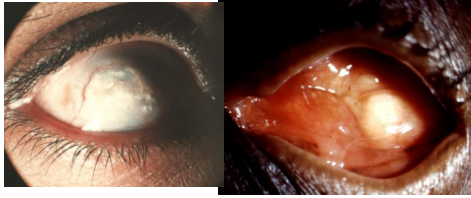
PREVENTION

Prevention

Eye Protection



End-Stage Disease!



Don't Let This Happen!



References

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