# Prehospital Management of Ophthalmological Emergencies

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## Ophthalmological Emergencies

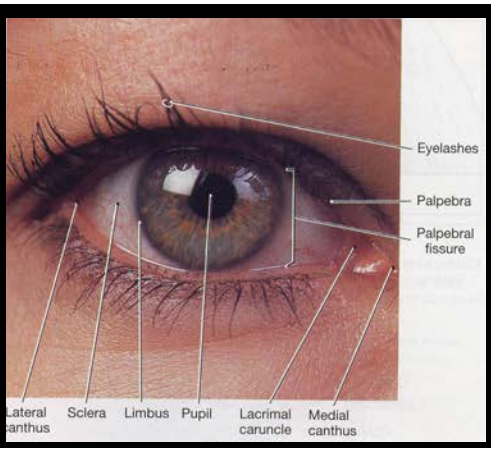
- The eyes are the windows to the soul.
- Eye-injuries can be life-changing events and EMS personnel should provide the best care possible to save a person's sight.

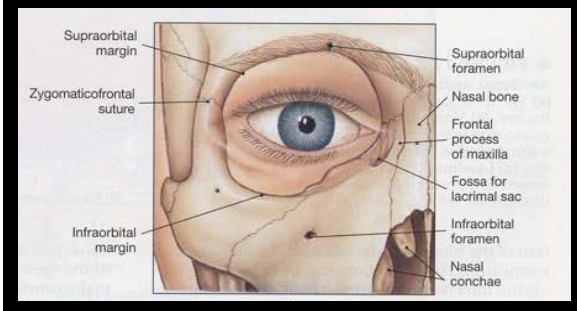
## Ophthalmological Emergencies

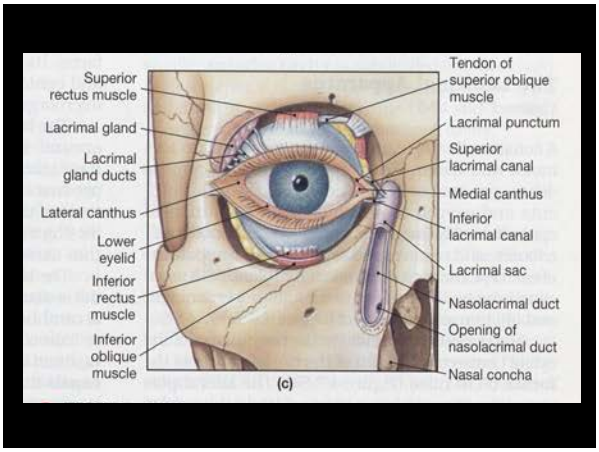
- Anatomy and Physiology
- Assessment
- Medical Conditions
- Traumatic Conditions
- Prehospital Management

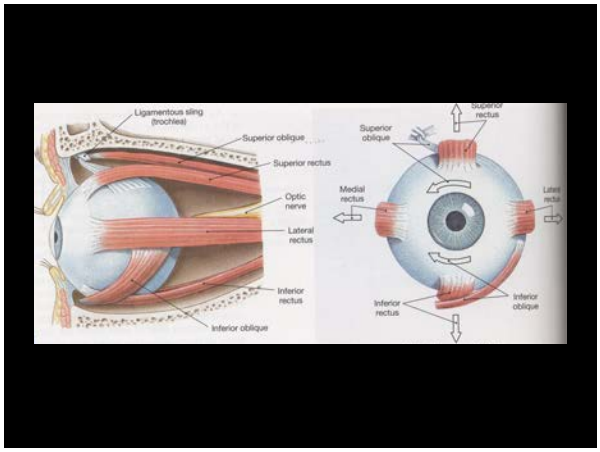
## Anatomy and Physiology

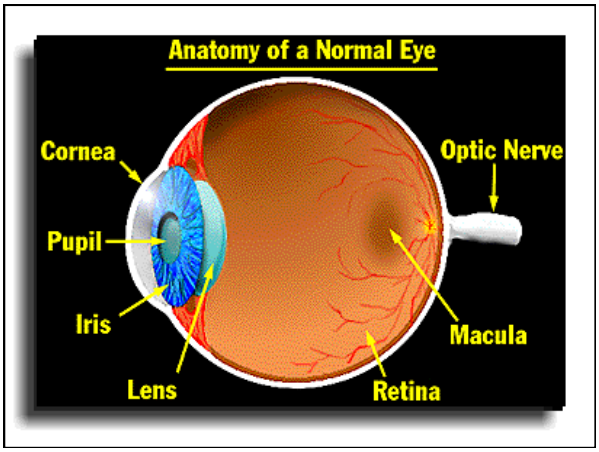
- External Anatomy
- Boney Anatomy
- Associated Structures
- Extra-ocular Muscles
- Eye Anatomy
- Chambers
- Retina
- Neurological Anatomy

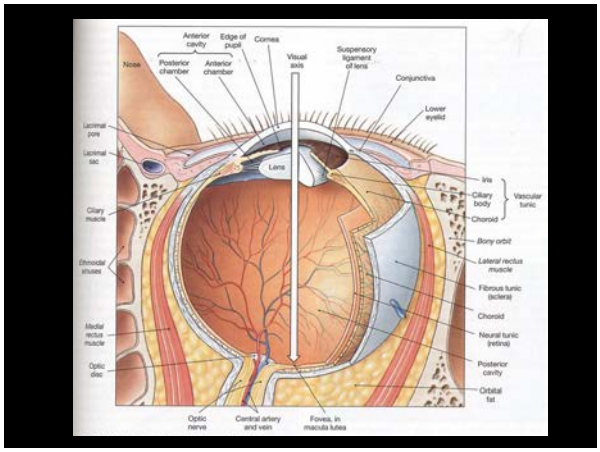


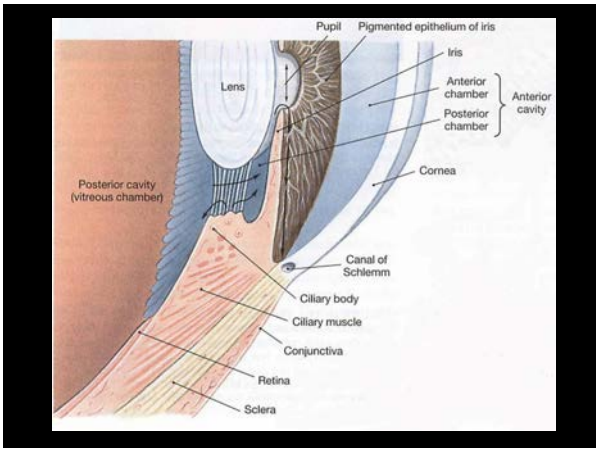



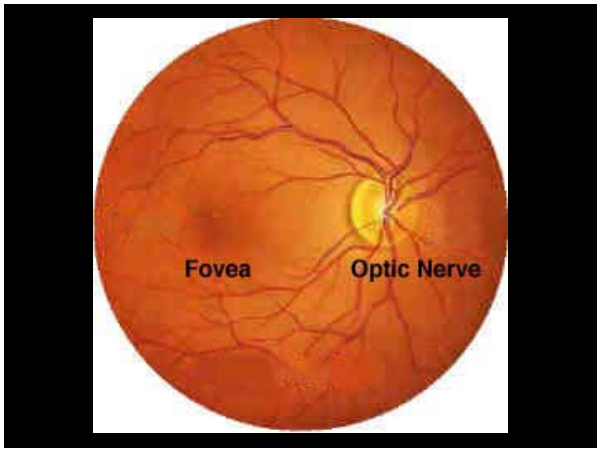

Superior rectus muscle
Lacrimal gland
Lacrimal gland ducts
Lateral canthus
Lower eyelid
Inferior rectus muscle
Inferior oblique muscle
Tendon of superior oblique muscle
Lacrimal punctum
Superior lacrimal canal
Medial canthus
Inferior lacrimal canal
Lacrimal sac
Nasolacrimal duct
Opening of nasolacrimal duct
Nasal concha
(c)

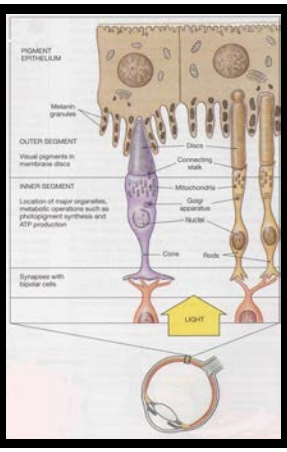

Ligamentous sling (trochlea)
Superior oblique
Superior rectus
Optic nerve
Lateral rectus
Inferior rectus
Inferior oblique
Superior rectus
Superior oblique
Medial rectus
Lateral rectus
Inferior rectus
Inferior oblique

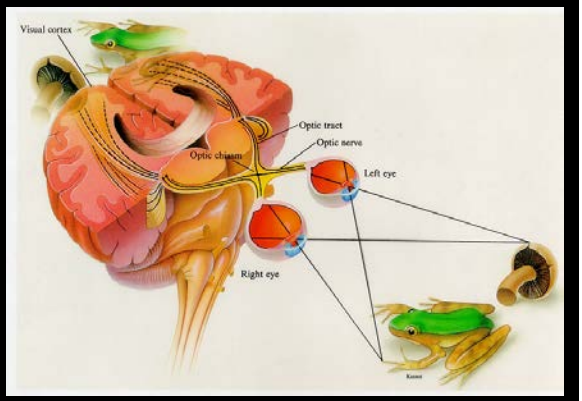

Anatomy of a Normal Eye
Cornea
Optic Nerve
Pupil
Iris
Macula
Lens
Retina


Nose
Anterior cavity
Edge of pupil
Cornea
Visual axis
Suspensory ligament of lens
Conjunctiva
Lower eyelid
Posterior chamber
Anterior chamber
Lacrimal pore
Lacrimal sac
Lens
Iris
Ciliary body
Choroid
Vascular tunic
Ciliary muscle
Bony orbit
Extraocular muscles
Lateral rectus muscle
Fibrous tunic (sclera)
Choroid
Medial rectus muscle
Neural tunic (retina)
Optic disc
Posterior cavity
Orbital fat
Optic nerve
Central artery and vein
Fovea, in macula lutea


Pupil
Pigmented epithelium of iris
Iris
Lens
Anterior chamber
Posterior chamber
Anterior cavity
Cornea
Posterior cavity (vitreous chamber)
Canal of Schlemm
Ciliary body
Ciliary muscle
Conjunctiva
Retina
Sclera


Fovea
Optic Nerve




## Assessment

- History
- Physical Examination
  - Visual Acuity
  - External Eye
  - Confrontation/Visual Fields
  - Pupils
  - Ocular Motility
  - Anterior Segment
  - Fundus*
  - IOP*

  * May not be appropriate for EMS except in special circumstances

## History

- Onset (Slow versus rapid)
- Monocular versus Binocular
- Antecedent activities (hammering)
- Past visual acuity (need for glasses)
- Unusual signs/symptoms
- Other medical conditions

## Test Visual Acuity

## Test Peripheral Vision

## Inspect the External Eye

## Test the Pupillary Response

## Test for Accommodation

## Check Extra-ocular Muscles

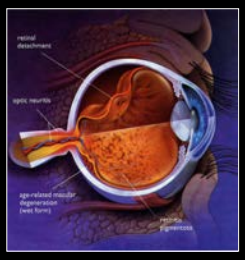

## Check the Corneal Reflex

## Visualize the Anterior Segment

## Medical Conditions

- Stye (External Hordeolum)
- Chalazion (Internal Hordeolum)

## Eye Emergenncies



## Stye (External Hordeolum)

- *Staph* infection of oil gland associated with an eyelash.
- Located at lash line and has appearance of small pustule.

## Stye (External Hordeolum)

- Treated with warm soaks and topical ophthalmic antibiotics.

## Chalazion (Internal Hordeolum)

- Acute or chronic inflammation secondary to blockage of one of the meibomian oil glands in the tarsal plate.
- Red, tender lump in the lid or at the lid margin

## Chalazion (Internal Hordeolum)

- Approximately 50 glands on the upper lid and 25 on the lower lid.
- Glands serve to keep the eye moist by spreading sheet of oil across the eye with blinking.

## Chalazion (Internal Hordeolum)

- Treatment:
  - Warm compresses 3-4 times a day.
  - Topical ophthalmic antibiotics.
  - Oral antibiotics.
  - Ophthalmology referral.

## Conjunctiva

- Bacterial Conjunctivitis
- Viral Conjunctivitis
- Allergic Conjunctivitis
- Neonatal Conjunctivitis
- Pterygium

## Bacterial Conjunctivitis

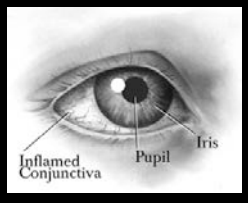
- Irritation of the conjunctiva and purulent drainage.
- Cornea is clear.
- Commonly referred to as “pink eye”.

## Bacterial Conjunctivitis

- Treatment:
  - Topical antibiotics.
  - Analgesia

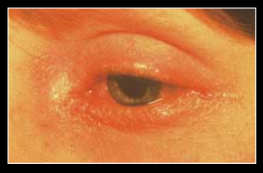
## Allergic Conjunctivitis

- Inflammation of the conjunctiva due to allergens in the environment.
- Prominent redness and itching.
- Cornea clear.




## Allergic Conjunctivitis

- Treatment:
  - Artificial tears.
  - Topical antihistamines/ decongestants.



## Allergic Conjunctivitis

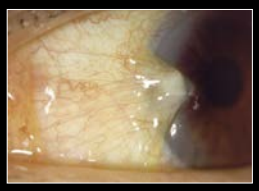
- Treatment:
  - Severe cases may require ophthalmic steroids.

## Neonatal Conjunctivitis

- Conjunctivitis (Neonatal)
- Caused by *Neisseria gonorrhoeae, Chlamydia*, or Herpes virus.
- Infant must be evaluated to exclude systematic infection.

## Pterygium

- Raised web-shaped growth of the conjunctiva.
- More common in sunny and tropical climates.
- Can invade the cornea.



## Pterygium

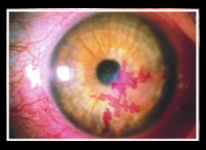
- Sometimes it spontaneously resolves.
- Surgery necessary in other cases.

## Corneal Disease

- HSV Keratitis
- Herpes Zoster Ophthalmicus
- Corneal Ulcers

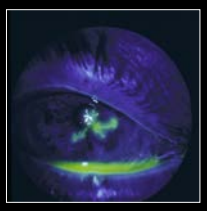
## HSV Keratitis

- Can affect eyelids, conjunctiva and cornea.
- Typical dendritic appearance can be seen in the cornea.



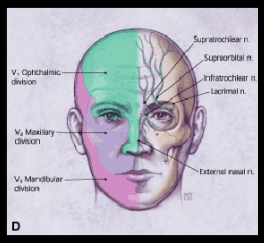
## HSV Keratitis

- Caused by Herpes Simplex Virus.
- Can cause permanent corneal scarring.



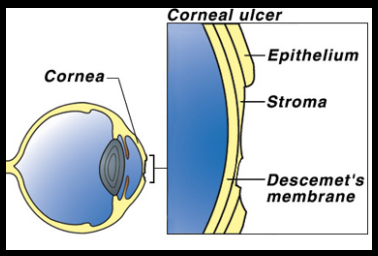
## Herpes Zoster Ophthalmicus

- Shingles in the distribution of the trigeminal nerve.
- Caused by reactivation of the Herpes zoster virus.



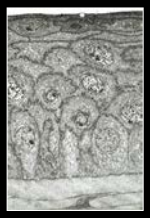

## Herpes Zoster Ophthalmicus

## Corneal Ulcers




## Corneal Ulcers

- Serious infection involving multiple layers of the cornea.
- Caused by entry of infectious agents through breaks in the epithelial border.



## Corneal Ulcers

- Patient usually has:
  - Painful red eye
  - Tearing
  - Photophobia
- Treatment:
  - Topical antibiotics
  - Cyloplegics

## Cellulitis

- Preseptal (Periorbital) Cellulitis
- Postseptal (Orbital) Cellulitis

## Periorbital Cellulitis

- Cellulitis that has not breached the orbital septum.
- Eyelids edematous, warm and red.
- Eye not involved.
- *Staph.*, *Strep.*, and viruses common cause.

## Periorbital Cellulitis

- Poses particular risk to children under 5 years of age.
- Can expand to postseptal cellulitis.

## Orbital Cellulitis

- True orbital infection.
- Eye- and life-threatening.
- *Staph. aureus* most common cause.
- Admission, IV antibiotics and surgical care required.

## Trauma

- Superficial Trauma
  - Subconjunctival hemorrhages
  - Conjunctival abrasions
  - Corneal abrasions
  - Corneal foreign bodies
- Lid Lacerations
- Blunt Trauma
- Penetrating Trauma
- Chemical Trauma

## Subconjunctival Hemorrhage

- Fragile vessels rupture from trauma, Valsalva pressure spikes (sneezing, coughing, retching), hypertension, or without obvious cause.

## Subconjunctival Hemorrhage

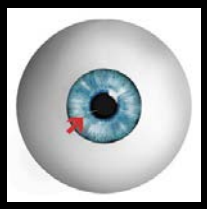
- Cornea not involved.
- Resolves within 2 weeks.

## Conjunctival Abrasion

- Abrasion of conjunctiva.
- Heals spontaneously.
- Patching and topical antibiotics helpful.

## Corneal Abrasion

- Abrasions cause:
  - Pain
  - Photophobia
  - Tearing
- Topical anesthetic drops usually provide immediate relief.

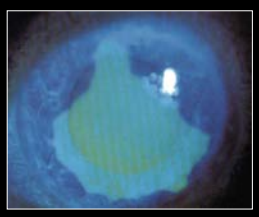


## Corneal Abrasion

- Always inspect for foreign bodies that might have caused the abrasion.

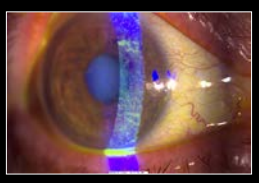
## Corneal Abrasion

- Corneal abrasions often worsened by rubbing and scratching.
- Foreign body sensation common.



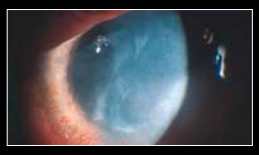
## Corneal Abrasion

- Sometimes abrasions are difficult to see without fluorescein staining.



## Corneal Abrasion

- Magnification sometimes necessary.
- Treatment:
  - Topical antibiotics
  - Cycloplegics
  - NEVER give or leave topical ophthalmic anesthetic drops with patient!

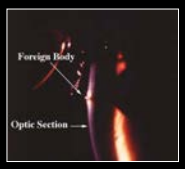


## Corneal Foreign Bodies

- Corneal foreign bodies should be removed under the best magnification possible.
- Prehospital skill in certain settings (particularly industrial)

## Corneal Foreign Bodies

- Most corneal foreign bodies are superficial and can be easily removed.




## Corneal Foreign Bodies

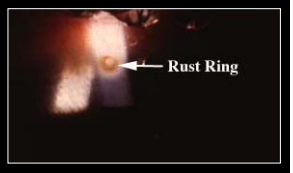
- Metallic foreign bodies are common in industrial setting.

## Corneal Foreign Bodies

- If they remain in the cornea more than 24 hours a rust ring will develop around each metallic foreign body.

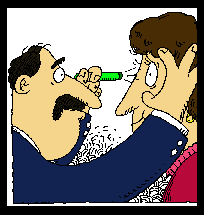

## Corneal Foreign Bodies

- Rust ring must be removed to prevent permanent corneal scarring and/or discoloration.



## Corneal Foreign Bodies

- Treatment:
  - Topical anesthetic drops in both eyes.
  - Test visual acuity
  - Try and determine if full thickness or superficial.
  - Evert lids to look for foreign bodies.



## Lid Lacerations

- Full thickness lacerations should be repaired by an ophthalmologist.

## Lid Lacerations

- Patch or sterile eye dressing should be applied in prehospital setting.
- Simple pressure usually adequate for hemorrhage control.

## Chemical and Burn Injuries

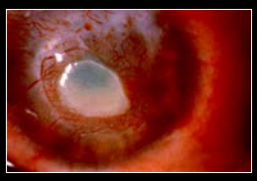
- Chemical Injuries
- Burn Injuries
- Cyanoacrylate injuries

## Chemical Injuries

- Chemicals cause injuries through direct chemical effects or through heat produced as chemicals react with chemicals and substances found in the eye.

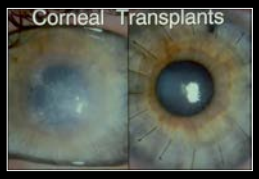
## Chemical Injuries

- Goal is to neutralize (dilute) the chemicals with copious quantities of water.
- Eye should be irrigated until pH of eye is normal (7.0-7.4).



## Chemical Injuries

- Chemical injuries can cloud and injure the cornea to the point where a corneal transplant may be required.




## Cyanoacrylate

- Cyanoacrylate ("Super Glue") is common eye problem.
- No treatment.
- Oily ophthalmic ointments may help to breakdown acrylate.

## Chemical Burns

- Remove from danger
- Instill topical ophthalmic analgesic.
- Irrigate with running water for 10-15 minutes.
- Re-instill topical ophthalmic analgesic as needed.
- If possible, make sure pH of eye is normal.

## Chemical Burns

- Consider Morgan lens for irrigation.
- Can be used bilaterally.
- Well-tolerated by most patients.

## Burn Injuries

- Treat injuries as to the injury type rather than the mechanism of injury.

## Burn Injuries

- Fireworks can cause blunt, penetrating and pressure trauma.

## Ultraviolet Keratitis

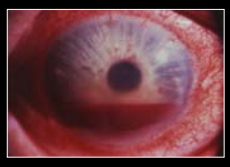
- Symptoms:
  - Pain
  - Tearing
  - Photophobia
  - Foreign body sensation
- Usually develops 6-12 hours after unprotected exposure to welding or sun-tanning lamps.
- Topical anesthetic, cycloplegic, pressure patch.

## Blunt Trauma

- Hyphema
- Blowout Fractures

## Hyphema

- Hyphema
- Blood in the anterior chamber.
- Results from bleeding of ruptured iris root vessel.
- Atraumatic hyphema most commonly from sickle cell disease.



## Hyphema

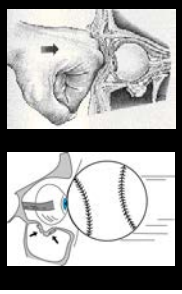

## Hyphema

## Hyphema

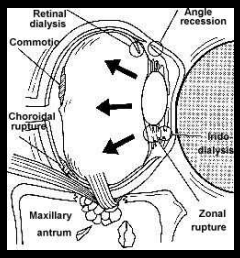
- Grade 4 (“eight-ball”) hyphema
- Treatment:
  - Elevate HOB
  - Treat Pain
  - Consider diuretics if ordered by medical control

## Blowout Fractures

- Result from blunt trauma from object bigger than globe.
- Usually involves inferior wall into the maxillary sinus or medial wall into the ethmoid sinus.

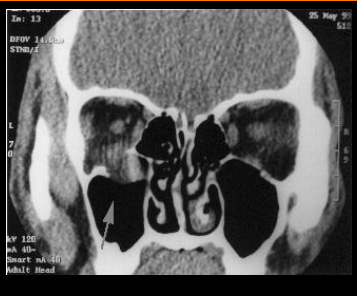


## Blowout Fracture




## Blowout Fracture

## Blowout Fracture



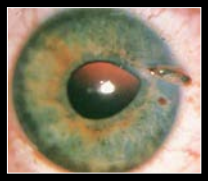
## Blowout Fracture

## Blowout Fracture

- Blowout fractures should be treated symptomatically.
- 32% of blowout fractures are associated with ocular trauma.

## Penetrating Injuries

- Foreign body penetrates globe (usually sharp, high-velocity injury).



## Penetrating Injuries

- Hyphema
- Irregular pupils
- Significant reduction in visual acuity

## Penetrating Injuries

- Eye-threatening emergency requiring emergency ophthalmologic surgical intervention.

## Penetrating Injuries

- Prehospital treatment:
  - Elevate HOB.
  - Calm patient.
  - Consider RSI in children.
  - Cup (non-contact) dressing over the affected eye.
  - Transport to eye center.

## Enucleated Eyes

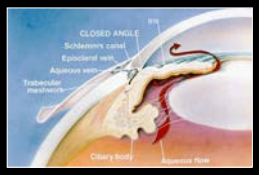
- Cover with sterile dressings moisten in normal saline.
- Cover enucleated eye with cup or similar non-pressure device.
- Transport.

## Painful Visual Reduction/Loss

- Acute angle closure glaucoma
- Optic Neuritis

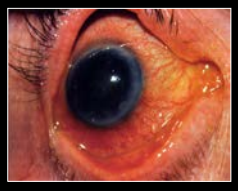
## Acute Angle-Closure Glaucoma

- Symptoms:
  - Cloudy vision
  - Eye ache
  - Headache
  - Increased IOP
  - Nausea and vomiting.
- Symptoms often occur in patient without history of glaucoma.



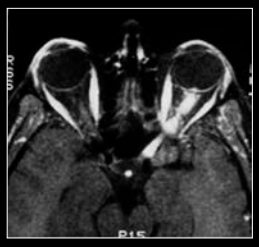

## Acute Angle-Closure Glaucoma

- Fluid movement between anterior and posterior chamber is blocked resulting in increased fluid pressure in the posterior chamber.
- Pupil dilated and non-reactive.



## Optic Neuritis

- Most common cause of optic nerve vision reduction in patients 20-40.
- Women more commonly affected.
- Color vision more affected than visual acuity.



## Optic Neuritis

- Inflammation of the optic nerve.
- Initial treatment does *not* involve steroids.

## Painless Visual Reduction/Loss

- Central Retinal Artery Occlusion
- Central Retinal Vein Occlusion
- Giant Cell Arteritis
- Retinal Detachment

## Central Retinal Artery Occlusion

- Sudden, profound, painless, monocular loss of vision.
- First branch of internal carotid provides blood to retina.
- Loss of blood supply will cause the retina to infarct and become pale.

## Central Retinal Artery Occlusion

- Amaurosis fugax often precedes CRAO.
- Amaurosis fugax is a painless, monocular loss of vision, which may be total or sectorial.
- Atrial fibrillation a common precursor.
- Digital massage sometimes used to attempt to dislodge embolic clot.

## Central Retinal Vein Occlusion

- Central Retinal Vein Occlusion is usually associated with hypertension.
- Symptoms include painless, variable loss of vision that is monocular and rapid.
- Optic disk is edematous and retina hemorrhagic.

## Giant Cell Arteritis

- Inflammation of medium-sized arteries in the carotid circulation (also called Temporal Arteritis).
- Patients usually > 50
- Associated with devastating visual consequences.

## Retinal Detachment

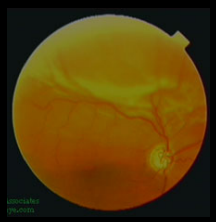
- One of the most common eye emergencies.
- Causes include trauma, previous eye surgery, and eye diseases.

## Retinal Detachment

- Patients will usually have sensation of flashing lights and then a shower of floaters.
- Patients may note wavy distortion of objects.

## Retinal Detachment

- Protect the globe at all costs.
- Place goggles or protective cup to avoid any contact with the eye.
- Avoid any rough handling.



## Systemic Disease

- Thyroid disease.
- Wilson's Disease

## Looking for Love in the Wrong Places


## Questions?

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