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.

Anatomy and Physiology

- External Anatomy
- Bony Anatomy
- Associated Structures
- Extra-ocular Muscles
- Eye Anatomy
- Chambers
- Retina
- Neurological Anatomy
Anatomy and Physiology

Anatomy of a Normal Eye

- Cornea
- Pupil
- Iris
- Lens
- Optic Nerve
- Macula
- Retina
Assessment

- History
- Physical Examination
  - Visual Acuity
  - External Eye
  - Confrontation/Visual Fields
  - Pupils
  - Ocular Mobility
  - 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
Medical Conditions
- Stye (External Hordeolum)
- Chalazion (Internal Hordeolum)

Stye (External Hordeolum)
- Staph infection of oil gland associated with an eyelash.
- Located at lash line and has appearance of small pustule.

Eye Emergencies

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”.

Allergic Conjunctivitis

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

Treatment:

- Topical antibiotics.
- Artifical 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.
- Sometimes it spontaneously resolves.
- Surgery necessary in other cases.

Corneal Disease
- HSV Keratitis
- Herpes Zoster Ophthalmicus
- Corneal Ulcers
- 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
  - 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.
- 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

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 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.

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.

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.
- 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?

This PowerPoint presentation available for free download at http://www.bryanbledsoe.com.