Ophthalmologic Emergencies

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Objectives

- Assess the severity of ocular and orbital emergencies
- Provide the acute necessary care
- Determine need for patient transfer to specialized center
Topics

- Assessing the patient with a red eye
- Eyelid and lacrimal lacerations
- Orbital fractures
- Blunt, penetrating and perforating globe injuries
- Chemical injuries
- Sudden vision loss
• 2.4 million eye injuries in USA annually

• 1 million Americans
  – Permanent visual loss due to an injury
  – 75% of those who are blind in one eye

• 20-33% of injuries are job related
Eye Injuries Occur at …

- Home: 40%
- Street/Highway: 13%
- Industrial: 13%
- Sport: 13%
- Other: 12%
- Unknown: 9%

Modified from - http://www.useironline.org
Demographics

• Average: 5 Males : 1 Female

• Mean age: 29 years

• 57% under age 30
New Terminology (BETTS)
Birmingham Eye Trauma Terminology System

• “All terms relate to the whole eyeball as the tissue of reference.”

http://www.asotonline.org/bett.html
Anatomy of the Eye

Right Eye (viewed from above)
Definitions

• Eye Wall
  – Sclera and cornea

• Closed Globe injury
  – No penetration or perforation of the eye wall

• Open globe injury
  – Full thickness wound of the eye wall

• Contusion
  – No full-thickness wound
  – Injury due to either direct energy delivery by the object or due to changes in the shape of the globe

• Lamellar laceration
  – Partial-thickness wound of the eye wall
Definitions

• Rupture
  – Full-thickness wound of the eye wall
  – Caused by a blunt object

• Laceration
  – Full-thickness wound of the eye wall
  – Caused by a sharp object

• Penetrating injury
  – Entrance wound only

• Perforating injury
  – Entrance and exit wounds
  – Both caused by the same agent
So… You Have a Patient

• Follow the same protocol that you would for any patient with any problem
  – History, Physical Exam, Assessment, Plan . . .

• Universal Precautions
  – Avoid direct contact with bodily fluids

• Document visual acuity in both eyes
  – Prior to initiating examination or treatment

• Consult ophthalmologist
History

• Vision prior to the injury
  – Contact lens wear

• Previous eye surgery
  – Cataract
    – Intraocular lens
  – Lasik
  – Corneal transplant
  – Other
Circumstances of Injury

• Projectile
  – Size and shape
  – Velocity
  – Material: Metal, Vegetable Matter

• Blunt objects
  – Size and shape
  – Velocity

• Sharp objects
Primary Management

• Protect the eye from outside forces
  – No pressure on suspected open globes
  – Place shield or cup over the eye

• Preserve tissue

• Get as much of an examination as possible

• Remember tetanus prophylaxis

• Contact ophthalmologist immediately
  – Ophthalmologist should obtain a dilated retinal examination
Differential Diagnosis of the Pink or Red Eye
A “Red Eye” May Be A Sign Of …

• Adnexal disease
  – Lid disorders
  – Lacrimal system inflammatory conditions
  – Orbital disease

• Ocular disease
  – Conjunctival / scleral disorders
  – Corneal disease
  – Uveitis
  – Glaucoma
Objectives

• Use the history, your exam and your knowledge base to localize the abnormality and determine its likely etiology

• Manage the patient to minimize disease sequelae and to
  – Prescribe the appropriate therapy or
  – Make the appropriate referral if needed
History - Characterize the Symptoms

- Duration – hours, days, weeks
- Unilateral or bilateral
- Onset of symptoms – acute vs. chronic
- Precipitating event – trauma, contact lens usage
- Previous episodes of a similar problem
- Treatment to date
Beware of…

• Decreased vision

• Severe pain

• Halos

• History of recent eye surgery
## Associated Symptoms - Clues to Diagnosis

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Itching, seasonal exacerbation, associated rhinitis</td>
<td>Allergy, atopy</td>
</tr>
<tr>
<td>Burning, foreign body sensation, tearing</td>
<td>Blepharitis, dry eye, foreign body, trichiasis</td>
</tr>
<tr>
<td>Localized lid tenderness</td>
<td>Hordeolum, chalazion</td>
</tr>
<tr>
<td>Mucopurulent discharge, crusting</td>
<td>Bacterial conjunctivitis</td>
</tr>
<tr>
<td>Watery discharge, URTI, unilateral then bilateral</td>
<td>Viral conjunctivitis</td>
</tr>
<tr>
<td>Intense pain Nausea, vomiting, intense ocular pain, halo</td>
<td>Abrasion, ulcer, scleritis, iritis, acute glaucoma</td>
</tr>
<tr>
<td>Intense photophobia</td>
<td>Uveitis, keratitis, ulcer</td>
</tr>
</tbody>
</table>
Examination

- Visual acuity
  - If decreased, refer

- Examine pupils
  - Symmetry (uveitis, acute glaucoma, orbital cellulitis)
  - Reactivity
  - Relative afferent pupil defect (RAPD)

- Motility

- External Examination

- Location of redness
  - Localized lid erythema = chalazion, hordeolum
  - Localized periorbital inflammation = dacryoadenitis, dacryocystitis
  - Diffuse periorbital inflammation = orbital cellulitis

- Proptosis

- Pre-auricular nodes

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Penlight Examination

- Lid margin – blepharitis?
- Conjunctiva
  - Diffuse or sectoral redness?
  - Limbal injection (corneal or iris involvement)?
  - Type of discharge
  - Conjunctival follicles (viral conjunctivitis)
- Cornea
  - Clear or opaque?
  - Epithelial defect with fluorescein?
    - Abrasion vs. ulcer?
Hordeolum

• “Stye”
  – Internal vs. external
  – s. aureus

• Warm soaks

• Lid soaks

• Topical antibiotic ointment

• +/- systemic antibiotics for recurrences
Chalazion

• Blockage of meibomian gland

• Granulomatous inflammation

• Treatment as above
  — residual swelling may require incision and drainage

http://rgm22.nig.ac.jp/mediawiki-ogareport/index.php/The_Accessory_Organs_of_the_Eye
Blepharitis

• Eyelid inflammation

• Relationship to normal ocular flora, especially Staphylococcus

• Can be associated with Rosacea

• Symptoms
  – Eyelash crusting, madarosis (loss of lashes)
  – Inflamed lid margins, telangiectasia, saponification

• Treatment:
  – Warm compresses, lid hygiene
  – Mild antibiotic ointment to margin (erythromycin is best)
  – Systemic Tetracycline, Erythromycin
Dry Eye

- Common cause of irritated eyes
- Especially in postmenopausal women
- Patients with Sjogren syndrome
- Can cause corneal epithelial erosions
- Treatment: lubricants
Dacryocystitis

• Nasolacrimal duct obstruction

• Swollen, inflamed lacrimal sac

• Treatment
  – Newborn
    – Massage over lacrimal sac
    – Probing may be needed
  – Adult
    – Systemic antibiotics, +/- DCR
Dacryoadenitis

- Pain, redness and swelling of outer third of upper lid

- Bacterial or viral etiology

- Treatment
  - +/- systemic antibiotics
  - Incision and drainage if abscess develops
Preseptal Cellulitis

• Diffuse edema and erythema of lids
  – Anterior to the orbital septum

• May be secondary to lid or lacrimal system inflammation

• Normal vision, pupils, motility

• No proptosis

• Treatment
  – Systemic antibiotics
Orbital Cellulitis

• Potentially vision and life-threatening

• Inflammation of the orbital contents
  – Posterior to the orbital septum

• Often originates from paranasal sinuses disease

• Exam
  – Decreased vision
  – Impaired ocular motility with pain
  – Proptosis
  – Afferent pupillary defect, optic disc edema
Orbital Cellulitis

- Treatment
  - Hospitalization, blood cultures
  - Emergency orbital CT scan
  - Surgical drainage of subperiosteal abscess
  - Complications cavernous sinus thrombosis, meningitis
Subconjunctival Hemorrhage

• Blood in sub-conjunctival space
• No pain, normal vision
• Resolves in 1-3 weeks
• Causes
  – Idiopathic
  – Valsalva
  – Traumatic
  – Bleeding disorder
Allergic Conjunctivitis

• Signs
  – Hyperemia
  – Chemosis
  – Lid edema
  – Mucous discharge
  – Tearing

• Symptom
  – Itching

• Treatment
  – Cold compresses
  – Topical vasoconstrictor/antihistamines
  – Mast cell stabilizers
  – Topical steroid in severe cases
Viral Conjunctivitis

- Usually affects older children
- Usually unilateral
  - Then affects fellow eye
- May be associated with pharyngitis
- Associated with preauricular or submandibular adenopathy
  - Adenovirus
- Will resolve spontaneously
  - In 10-14 days without treatment
- Highly contagious
Bacterial Conjunctivitis

• Usually occurs in preschool-aged children
• Bilateral but can be unilateral
• Mucopurulent discharge with matting
• May be associated with otitis media
• Will resolve spontaneously in 10-14 days without treatment
Causes of Pediatric Acute Conjunctivitis

- Most commonly cultured pathogenic organisms
  - *Haemophilus influenzae*
  - *Streptococcus pneumoniae*
  - *Moraxella catarrhalis*

Why Treat Bacterial Conjunctivitis?

• Early cure of bacterial conjunctivitis has important implications for:
  – Reducing contagion
  – Improving patients’ quality of life
  – Early return to school and work
  – Early identification of masquerade disease
Chlamydial Conjunctivits

• Sexually transmitted
• Birth canal in newborns
• Signs
  – Inferior tarsal follicles
  – Corneal pannus
  – Preauricular node often unilateral
• Treatment
  – Systemic tetracycline or azithromycin 2g po x 1
  – Topical erythromycin
  – Inform and treat partner
  – Workup for associated stds
Pingueculum and Pterygium

- Wind, actinic exposure

- Treatment
  - Lubrication
  - Steroids for inflammatory flares
  - Surgical excision
Episcleritis

- Episceral redness with localized tenderness
- Usually sectoral, may be nodular
- Blanches with topical epinephrine 2.5%
- Benign and self-limited

Etiology
- Idiopathic
- Collagen vascular disease - RA, SLE
- Gout
Scleritis

- Inflammation
  - Scleral collagen
  - Deep episcleral vessels
- Extreme ocular discomfort
- Symptoms
  - Red eye
  - Tearing
  - Photophobia
- May have visual loss
- Sectoral, diffuse, nodular, or necrotizing
- Anterior or posterior
Scleritis

• Etiology
  – Collagen vascular disease RA, SLE
  – Gout
  – Syphilis
  – Vasculitis (workup is essential)

• Complications
  – Peripheral ulcerative keratitis with corneal perforation
  – Secondary glaucoma
  – Scleral melting and perforation
  – Exudative retinal detachment
Corneal Abrasion

- **Hx:** ACUTE corneal trauma
  - eg foreign body, fingernail
- Severe ocular pain due to nasociliary nerve irritation
- Tearing, photophobia
- Poor vision if abrasion central

**Diagnosis**
- FB sensation relieved with topical anesthetic
  - stain with fluorescein

**Treatment**
- ATB ointment or drops
  - rarely patch, T#3, topical NSAIDS
Infectious Keratitis, Corneal Ulcers

• Epithelial defect on fluorescein PLUS:
  – Corneal necrosis and opacification

• Thinning of corneal stroma
  – Bacterial enzymes "eat through" stroma
  – Potential perforation

• Hypopyon
  – Secondary endophthalmitis rare
Infectious Keratitis, Corneal Ulcers

• Etiology
  – Staph
  – Strep
  – Pseudomonas (esp contact lens wearers)
  – Fungal
  – Amoebic

• Rx
  – Immediate cultures and sensitivities
  – Intensive (q1h) broad spectrum, high-dose, topical antibiotics
  – Subsequent corneal graft if scar
HSV Keratitis

- Pain
- Photophobia
- Decreased visual acuity
- Signs
  - Dendritic lesions, central more common than peripheral
  - Stromal keratitis
  - Kerato-uveitis
  - Red eye involving limbus,
  - Dendrite with terminal bulbs
Herpetic Keratitis

• Treatment
  – Topical antivirals (Viroptic 9/day)
  – Minimal wiping debridement,
  – Culture / DFA

• NO TOPICAL STEROIDS
Anterior Uveitis

- Severe pain NOT relieved with topical anesthetic
- Brow ache
- Tender to palpation through lid
- Severe photophobia
  - Wears sunglasses even indoors
- Tearing but no discharge
- Reduced vision
Anterior Uveitis

- **CIRCUMLIMBAL REDNESS**
- "ciliary flush"
- Smaller pupil on affected side due to spasm of iris sphincter from inflammation
Anterior Uveitis

- Cells and flare in anterior chamber
- Keratic precipitates
- +/- hypopyon (esp. HLA-B27)
- Irregular pupil with dilation due to posterior synechiae
Anterior Uveitis

• Treatment
  – Mydriasis and cycloplegia to relieve pain & prevent posterior synechiae
  – Topical steroids

• If recurrent / bilateral, full medical work-up to identify associated systemic disorders
  – e.g. sarcoid, Ankylosing Spondylitis

• Late sequelae
  – Secondary cataracts
  – Macular edema from chronic inflammation
  – Acute glaucoma with pupillary block will prevent aqueous flow into anterior chamber, producing secondary ACG
The Red Eye

• Make the Correct Diagnosis
• Treat it properly
• Identify a Masquerade Syndrome
• Know when to refer
Of the following causes of a red eye, which is the most likely to be associated with systemic disease?

A – Conjunctivitis
B – Corneal Ulcer
C – Uveitis
D – Subconjunctival hemorrhage
Answer

C-Uveitis
Eyelid Injuries
Eyelid Contusion

• Consider……..

• Associated eye injury

• Orbital fracture

• Bilateral
  – Basilar skull fx

• Bigger picture
  – Child Abuse
Eyelid Laceration

• Tarsus involved?

• Lid margin involved?

• Lacrimal system involved?

• Status of the globe and orbit?
Canalicular Laceration

- Must re-establish patency of the lacrimal drainage system
- May require placement of a stent at the time of repair
- Need ophthalmologist to perform these surgeries
Orbital Injuries
Types of Orbital Injuries

- Rim fractures
- “Blow-out” fractures
- Foreign body
- Associated injury to the eye globe
Blow - Out Fracture

• Blunt trauma from an object equal or larger in size than the orbital aperture

• Globe does not rupture

• Force is transmitted through the orbit and “blows out” an orbital wall
  — Floor
  — Nasal wall
Blow - Out Fractures

• Diplopia due to…
  – Muscle entrapment
  – Limited eye movements

• Enophthalmos
  – Sunken appearance to the eye

• Infraorbital nerve hypoesthesia

• Orbital emphysema or air in the orbit
Imaging – CT scan

- Fracture
  - Floor
  - other
- Muscle entrapment
- Fluid/blood in sinuses
- Evidence of disruption of the globe
Blow-out Fracture - Management

• Surgery indications
  – Diplopia in primary position or downgaze
  – Enophthalmos
  – Large fracture >1/3 of orbital floor

• Operate within or at 2 weeks - Controversy

• Antibiotics

• Don’t blow nose
Closed Globe Injuries
Hyphema

• Blood in the anterior chamber
  – Diffuse
  – Layered

• Associated injuries
  – Iris dialysis
  – Angle recession
  – Lens subluxation
  – Vitreous hemorrhage
  – Retinal detachment
Hyphema

• Look for anterior segment injuries
• 50% have associated posterior segment injury
• Secondary hemorrhage
  – Rebleed up to a few days later
• Elevated IOP
Corneal Blood Staining

- Risk factors
  - Elevated IOP
  - Total hyphema
  - Endothelial injury or dysfunction
- Can develop without elevated IOP
- Takes several months to clear
- Amblyopia risk in children
Hyphema Management

• Keep head elevated
• No strenuous activity
• Aminocaproic Acid (Amicar)
  – Given P.O. for 5 days
• Steroids
  – Topical
  – Systemic
• Long-acting cycloplegics (Atropine)
• Surgery – rare to evacuate total hyphema
  – In the setting of elevated pressure
  – To prevent corneal staining
Corneal Abrasion

• Best diagnosed at the slit-lamp using fluorescein staining

• Differentiate from infectious ulcers
  – Especially in contact lens wearers

• Treatment
  – Patch
  – Topical antibiotic
Corneal Foreign Body

- Can be metallic or other substance

- Can be stuck to the cornea or lacerate or penetrate the cornea

- Treatment
  - Removal at slit-lamp
  - Antibiotic ointment
  - +/- patch
  - Best done by ophthalmologist
  - Some ER physicians comfortable with managing them
Conjunctival Foreign Body

- History dictates likelihood
- Associated vertical linear scratches
  - Indicate a foreign body under the upper lid
- Remember to evert the lid
  - Check on superior tarsal conjunctiva
Retinal Effects of Contusion

• Retinal hemorrhages

• Commotio retinae
  – Potential shearing of the photoreceptors
  – Gray-white opacification of the retina – transient
  – Leaves a scar
  – Visual loss can be permanent

• Retinal tears

• Retinal detachment
Choroidal Rupture

- Breaks in the choroid, Bruch’s membrane and the RPE
- Mechanical compression and sudden hyperextension
- Differential diagnosis
  - ARMD, Exudative
  - Angioid Streaks
  - CNV
  - Presumed Ocular Histoplasmosis Syndrome
  - Pseudoxanthoma Elasticum
- Good vision if macula spared
Lamellar Laceration – Conjunctival Laceration

• Rule out open globe
  – View sclera directly
  – Manipulate conjunctivae under topical anesthetic

• Treatment
  – Primary closure?

• When to explore surgically
Burns

Chemical

Thermal

Radiation
Chemical Burn Treatment

• **Immediate** copious irrigation
  – Check pH
  – irrigate until pH≈7.0

• Acid vs Alkali
  – Alkali much worse - detergents

• Topical steroid
  – Initial treatment only

• Topical antibiotic

• Long-term outcome is guarded
  – Blanched perilimbal vessels
Thermal/Radiation Burn

• Thermal injuries - variety
• UV Keratitis
  – Welders
• Mild and moderate ones will heal with no sequelae
• May be associated with iritis
• Topical antibiotic and steroid
• Cycloplegic drops
Open Globe
Corneal Laceration

- Obtain best non-traumatic examination
- Plan immediate surgical exploration and repair
  - NPO
  - ? Antibiotics
  - Tetanus prophylaxis
  - General anesthetic
    - Depolarizing blockers ?
Uveal Prolapse

- Preserve and reposit viable uvea at the time of primary surgical repair
- Excise only non-viable tissue
Lens Injury

• Disruption of the lens capsule
  – Cause rapid lens opacification.

• Dilate

• Get early view of posterior segment

• Primary lens extraction
  – Depends upon the clinical situation
Scleral Laceration

• Surgical exploration and repair
• Rule out foreign body

• Most common rupture sites
  – Limbus
  – Posterior to rectus muscle insertions
  – Around optic nerve
Occult Ruptured Globe

- Decreased vision
- Conjunctival hemorrhage
- Shallow anterior chamber
- Change in pupil size or shape
- Low intraocular pressure
- Extraocular muscle dysfunction
- Vitreous hemorrhage
Intraocular Foreign Body

- Stabilize
- Do not remove foreign body
- NPO
- Antibiotics
- Immediate surgical repair
Intraocular Foreign Body
Intraocular Foreign Bodies

**Toxic**
- Lead
- Zinc
- Nickel
- Aluminum
- Copper
- Iron
- Vegetable matter

**Non-toxic**
- Gold
- Silver
- Platinum
- Plastic
- Glass
Intraocular Foreign Body

• Surgical intervention depends upon
  – Location
  – Material
  – Magnetic or not
Intraocular Foreign Body

- Imaging
  - Ultrasound
  - CT
  - MRI
  - Beware that magnetic foreign bodies may move causing more extensive injuries to ocular structures
Prognosis

• Depends on extent of injury and the tissues involved

• Ocular Trauma Score
  – United States Eye Injury Registry
  – Provides a probability estimate of a patient’s visual acuity range at six months after the injury
Prevention of Eye Injuries

• 90% of all eye injuries are preventable
• In glasses – use polycarbonate lenses
• In the workplace
  – Safety goggles
  – UV filters
• In sports
  – Face guards
  – Sports goggles
• 1.5% were wearing safety glasses at time of injury
• 2.9% were wearing non-safety glasses

Parver L, et.al. Characteristics and causes of penetrating eye injuries reported to the National Eye Trauma System Registry, 1985-91.
Sudden Vision Loss
Vascular Causes of Sudden Vision Loss

• Artery Occlusion
  – Central
  – Branch

• Vein Occlusion
  – Central
  – Branch

• Ischemic Optic Neuropathy
Neurologic Causes of Sudden Vision Loss

• Optic Neuritis
  – Anterior
  – Retrobulbar

• Symptoms
  – Central loss
  – Loss of normal color perception

• Stroke - CNS

• Migraine
Structural Causes of Sudden Vision Loss

• Retinal detachment
  – Trauma
  – Spontaneous
    – Myopia
  – Following posterior vitreous separation

• Symptoms
  – Flashes of light
  – Curtain-like loss in part of field of vision
Angle Closure Glaucoma

• Complete obstruction to fluid drainage from the eye

• Normal amount of fluid production

• No fluid drainage

• Severe, sudden increase in pressure

• Pain, blurred vision, halos around lights
Sudden Vision Loss: Work-up

- Characteristic History
- Visual acuity
- Visual Field
- Pupillary Function
- Penlight examination
- Ophthalmologist’s findings
Question

A patient comes in with a history of hammering a nail when he felt something hitting his eye and his vision decreased.

What test should **NOT** be performed after he arrives to the ED and is being worked up?

A – Ultrasonography of the eye
B – X-ray of the orbits
C – MRI of the orbits
D – CT-scan of the orbits
Answer

C – MRI of the orbits

(may have a magnetic intraocular foreign body)
Remember to encourage your patients and friends to wear protective eye gear …
Cleveland Clinic
Every life deserves world class care.