Bruch's membrane: innermost layer of choroid; clubbed pigmented epithelial cells which are responsible for transport between retina and choroid
Acute Visual Loss

Retinal Detachment

Retinal Vascular Occlusion
amaurosis fugax, arterial occlusion, venous occlusion

Other: optic neuritis, papillitis, ischemic neuropathy, giant cell arteritis

Retinal Detachment features

- Spontaneous or traumatic separation from epithelial layer
- High risk: post-cataract surgery, myopia, inflammatory disorders
- Most common site: superior temporal

Signs and symptoms

- Flashers, floaters, “curtain” closing, shadows, bubbles, wavy distortions
- Progressive, central vision spared till macula detaches
- Relative afferent pupillary response defect
- Asymmetric red reflex: detached area appears lighter
- Retinal hydration lines (rugae)

Treatment

- Refer all detachments
- Position head, allow gravity to slow the progression
- Cryotherapy, laser photocoagulation, pneumatic retinopathy, surgery

Prognosis

- 80% single occurrence; 15% require repeat treatment;
- 5% never re-attach
- Worse prognosis: macula detachment

**Amaurosis fugax**

- **transient** acute loss of vision
- “curtain” descends, then returns to normal
- unilateral visual loss, lasts several minutes
- meets criteria for a TIA

- usually patients >50 yo, hx or risk of atherosclerosis
- cause: ipsilateral carotid circulation atheroma
- emboli interrupts retinal blood flow, then passes
- check for carotid plaques; endarterectomy

**Retinal Artery Occlusion**

- **embolic, thrombotic**

<table>
<thead>
<tr>
<th>Carotid atherosclerotic disease</th>
<th>Cardiac valvular disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>lipid emboli (cholesterol emboli)</td>
<td>DIC</td>
</tr>
<tr>
<td>cardiac cell anemia</td>
<td>polyarteritis nodosa</td>
</tr>
<tr>
<td>giant cell arteritis</td>
<td>retinal migraine</td>
</tr>
<tr>
<td>thrombosis</td>
<td>syphilis</td>
</tr>
<tr>
<td>hypercoagulative states</td>
<td>cat-scratch disease</td>
</tr>
<tr>
<td>cardiac myxoma</td>
<td></td>
</tr>
<tr>
<td>IDU, talc emboli</td>
<td></td>
</tr>
<tr>
<td>trauma</td>
<td></td>
</tr>
</tbody>
</table>

**Central Retinal Artery Occlusion**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Signs</th>
<th>Treatment</th>
</tr>
</thead>
</table>
| sudden, painless, often complete unilateral visual loss | early: narrowing of arterioles, “hoe-carrying”
hours later: opalescent retina (edema); cherry red spot (perifoveal pallor)
later: ganglion cell death, optic atrophy, pale disc, blind eye | true ophthalmic emergency
intermittent firm pressure/release massage (central indicated if recent surgery or trauma)
immediate referral, vessel dilation, paracentesis |
Central Retinal Vein Occlusion

**Risk Factors:**
- elderly, hypertension, glaucoma, diabetes
- increased blood viscosity: polycythemia vera, sickle cell anemia, lymphoma, leukemia

**Symptoms:**
- *subacute unilateral blurriness* to loss of vision

**Signs:**
- relative afferent pupillary defect
- *blood and thunder* fundus
- dilated veins, flame-shaped hemorrhages, edema, exudates, optic disk swelling
- later: neovascularization

**Treatment:**
- typically resolves somewhat with time (20/200)
- laser treatments, prevent neo-vascular glaucoma
- work up for underlying cause

---

**Optic Neuritis:**

**Sudden inflammation of nerve; destruction of myelin at risk**

**Causes:**
- autoimmune dz
  - SLE, sarcoid
- infection
  - TB, syphilis, Lyme, meningitis, encephalitis, others
- multiple sclerosis
- toxicity
  - methanol, ethambutol
- vitamin B₁₂ def

**Symptoms/Signs:**
- loss of vision, *unilateral*
- loss of pupillary reaction to light
- loss of color vision
- pain with EOMs

**Treatment:**
- may resolve spontaneously, 2-3 weeks
- corticosteroids, IV
- prognosis good unless MS or SLE

---

**Chronic Visual Loss**

**Glaucoma**

**Cataract**

**Macular Degeneration**

**Retinopathy**
Glaucoma

Increased intraocular pressure (IOP)

AND optic nerve damage

- visual field loss → blindness
- PREVENTABLE!
- prevalence 0.5%; 3-4 female:1 male
- ocular htn (IOP without optic nerve damage) 1.5%
- highest risk
  - African Americans
  - diabetes mellitus, htn, hypothyroidism
  - family history
  - hx eye tumors, retinal detachment, refractive errors

Glaucoma, pathophysiology

- aqueous humor—produced by epithelium of ciliary body
- flows past lens, around iris, through pupil
- anterior chamber drains through trabecular meshwork to canal of Schlemm
- any resistance to drainage leads to increased pressure

Open Angle
- insidious, asymptomatic rise in IOP
- chamber remains open
- bowing of iris on exam
- arcuate scotomata
- contraction of peripheral field
- central vision spared

Angle-Closure
- sudden complete occlusion
- typically IOP >60 mmHg
- pain, blurred vision, photophobia
- colored halos or rainbows
- vasovagal: nausea, vomiting, diaphoresis
- red, teary; hazy cornea; fixed mid-dilated pupil
- conjunctival injection, lid and corneal edema, firm globe

Open Angle

- chamber remains open
- bowing of iris on exam
- arcuate scotomata
- contraction of peripheral field
- central vision spared

Angle-Closure
- sudden complete occlusion
- typically IOP >60 mmHg
- pain, blurred vision, photophobia
- colored halos or rainbows
- vasovagal: nausea, vomiting, diaphoresis
- red, teary; hazy cornea; fixed mid-dilated pupil
- conjunctival injection, lid and corneal edema, firm globe
Glaucoma, screening → all 3 steps!

- Check anterior chamber angle risk of closure, avoid anticholinergics
- Optic Nerve Exam
temporal palor cup:disc ratio >0.5 angulated narrow arteries edema
- IOP: >21 mmHG

http://www.icoph.org/med/glaucoma/glaucoma55.html

normal pressure glaucoma: highest in Japanese ancestry, look for changes in optic disc, risk loss of vision

---

Glaucoma, treatment

Angle Closure

- **True Ocular Emergency**
- lower IOP: multiple medications
  - beta blocker: timolol topical
carbonic anhydrase inhibitor: intravenous acetazolamide
  - osmotic agent: mannitol
- Laser iridectomy


---

Glaucoma, medical treatment

<table>
<thead>
<tr>
<th>promote drainage</th>
<th>prostaglandin-like</th>
<th>latanoprost (KalaT) latanoprost (Lumigan)</th>
<th>redness, stinging, change in eyelid pigment, retinal edema</th>
</tr>
</thead>
<tbody>
<tr>
<td>cholinergic agents</td>
<td>procarbazine</td>
<td>carbachol</td>
<td>pain, blurred vision, stuffy nose, diaphoresis, salivation, GI upset</td>
</tr>
<tr>
<td>epinephrine components</td>
<td>epinefrin (Propine)</td>
<td></td>
<td>redness, allergy, palpitations, elevated BP, h/a, anxiety</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>decrease production</th>
<th>beta blockers</th>
<th>timolol (Timoptic) bimatoprost (Betoptic)</th>
<th>dizziness, bradycardia, hypotension, impotence, fatigue, depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbonic anhydrase inhibitors</td>
<td>dorzolamide (Trusopt) brinzolamide (Azopt) acetazolamide (Diamox) po methazolamide (Desoximer) po</td>
<td></td>
<td>frequent urination, paresthesias, rash, depression, fatigue, impotence, metallic taste</td>
</tr>
<tr>
<td>both alpha agonists</td>
<td>brimonidine (Alphagan)</td>
<td></td>
<td>fatigue, dizziness, red/itchy eyes, dry mouth</td>
</tr>
</tbody>
</table>

---
**Glucoma, surgical treatment**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>laser trabeculoplasty</td>
<td>open clogged canals</td>
</tr>
<tr>
<td>filtering trabeculopathy</td>
<td>remove small piece of trabecular meshwork</td>
</tr>
<tr>
<td>electrocautery</td>
<td>remove strip of trabecular meshwork</td>
</tr>
<tr>
<td>drainage implants</td>
<td>silicone tube placement</td>
</tr>
</tbody>
</table>

Iridectomy
(Univ of Iowa, EyeRounds.org)

**Cataract**

**Epidemiology**
- 50% of 65-74 yo
- 70% of > 75 yo
- 1.4 million extractions/year in US

**Causes**
- Congenital/genetic (0.4% of births)
- Acquired: trauma, inflammation, radiation/UV light, metabolic/nutritional defects (diabetes)

**Pathophysiology**
- Normal lens is 35% protein
- Lens continues to grow in size, weight, density
- Increased proportion of insoluble protein
- Brown to yellow discoloration

**Symptoms**
- Slowly progressive loss of vision; blurriness, glare, fixed spots, reduced color perception
- "Second sight" less reliance on reading glasses

**Signs**
- Cataract appears dark against red reflex
- Use +5 diopters to view
- Prohibits exam of fundus

**Treatment**
- Early: magnifying glasses, dilation
- Later: surgical removal (improve ADLS, permit fundus exam, prevent secondary glaucoma or uveitis)
- Surgical risk: bleed (<0.1%), retinal detachment, secondary glaucoma, after-cataract
Age-related Macular Degeneration

| drusen       | - yellowish hyaline nodules (colloid bodies)  
|             | - deposit in Bruch’s membrane  
|             | - small, discrete bumps OR large, irregular indistinct deposits  
|             | - limit the nutritional and metabolic support  

| degenerative changes  
| “dry AMD” (most common)  
| - can occur without drusen  
| - clumps of hyperpigmented or depigmented atrophic areas  
| - degeneration of supporting structures  

| subretinal neovascularization  
| “wet AMD” (most advanced)  
| - subretinal hemorrhagic fibrosis  
| - pigment epithelium degeneration  
| - photoreceptor atrophy  
| - further breakdown of Bruch’s membrane  
| - hemorrhage—acute visual loss  

ARMD

| symptoms       | - blurry vision, gradual  
|               | - wavy or distorted vision (metamorphopsia)  
|               | - central blind spot (scotoma)  

| signs          | - decreased acuity  
|               | - Amsler grid distortion  
|               | - drusen mottling  
|               | - atrophy, loss of pigment, macular scarring  
|               | - subretinal or intra-retinal bleed or serous leak  

| treatment      | - laser photocoagulation, subretinal surgery  
|               | - intravitreous injections (wet AMD):  
|               | - Lucentis (recombinant antibody fragment)  
|               | - Macugen (selective vascular endothelial growth factor antagonist)  
|               | - antioxidants, carotenoids, omega 3 fatty acids, zinc  

Intermediate ARMD


Retinopathy

<table>
<thead>
<tr>
<th>diabetic</th>
<th>hypertensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>type 1: screen 3-5 yrs after diagnosis, annually</td>
<td></td>
</tr>
<tr>
<td>type 2: screen at diagnosis, annually</td>
<td></td>
</tr>
<tr>
<td>ischemic injury to retinal vasculature</td>
<td></td>
</tr>
<tr>
<td>-background “simple” (microneurysms, hemorrhages, exudates)</td>
<td></td>
</tr>
<tr>
<td>-preproliferative (arteriolar ischemia, cotton wool spots)</td>
<td></td>
</tr>
<tr>
<td>-proliferative “malignant” (neovascularization, macular edema)</td>
<td></td>
</tr>
<tr>
<td>acute or accelerated hypertension more likely</td>
<td></td>
</tr>
<tr>
<td>-diffuse arteriolar narrowing</td>
<td></td>
</tr>
<tr>
<td>-“copper wire” narrowing</td>
<td></td>
</tr>
<tr>
<td>-“silver wire” sclerosis</td>
<td></td>
</tr>
</tbody>
</table>

Treatment:
- refer all!
- laser photocoagulation
- treat underlying disease

Adnexal Diseases

Blepharitis
Dacryocystitis
Hordeolum
Chalazion
Ectropion, Entropion
Xanthelasma
Epithelial Inclusion Cysts
Orbital Cellulitis
Blepharitis

**Symptoms**
- irritation, burning, FB sensation
- tearing, photophobia, intermittent blurry vision

**Signs**
- Anterior blepharitis: red-rimmed lid margins, lash loss, scurf: dandruff-like deposits, collarettes: fibrous scales
- Posterior blepharitis: thick, cloudy meibomian glands, may lead to stye, chalazion, decreased tear production

**Treatment**
- scrub daily with dilute baby shampoo, avoid makeup
- remove scurf, collarettes, colonies
- massage to express sections if blocked
- topical antibiotics if recalcitrant (erythromycin, polymixin/bacitracin)
- oral antibiotics: resistant or recurrent events, corneal or conjunctival involvement (doxycycline)

---

Dacryocystitis, Dacryoadenitis

**Symptoms**
- pain, swelling, tearing, drainage

**Signs**
- swelling, tenderness, erythema

**Treatment**
- warm to cool compresses
- oral antibiotics if infectious cause
- I&D if abscess forms
- recalcitrant: surgery
- dacryocystorhinostomy or dacryocystectomy
**Hordeolum (stye)**
Infection of sebaceous gland (Staph)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Subacute onset</td>
<td></td>
</tr>
<tr>
<td>Mildly painful</td>
<td></td>
</tr>
<tr>
<td>Nodule or pustule on lid</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Often pointed, red, tender</td>
<td></td>
</tr>
<tr>
<td>External: skin surface</td>
<td></td>
</tr>
<tr>
<td>Internal: conjunctival surface</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm compresses [often all needed]</td>
<td></td>
</tr>
<tr>
<td>Topical antibiotics (fluoroquinolones, polymixin/trimethoprim)</td>
<td></td>
</tr>
<tr>
<td>I&amp;D if fail to heal</td>
<td></td>
</tr>
</tbody>
</table>

---

**Chalazion**
Chronic granulomatous inflammation of Meibomian gland may arise post-hordeolum

<table>
<thead>
<tr>
<th>Symptoms</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Painless or minimally tender</td>
<td></td>
</tr>
<tr>
<td>May be associated with chronic blepharitis, conjunctivitis, recurrent stye</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Grayish discoloration on conjunctival surface</td>
<td></td>
</tr>
<tr>
<td>Local conjunctival erythema</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm compresses</td>
<td></td>
</tr>
<tr>
<td>Triamcinolone injections (may depigment skin)</td>
<td></td>
</tr>
<tr>
<td>Marsupialization if unresolved after 1 month</td>
<td></td>
</tr>
</tbody>
</table>
chalazion

http://commons.wikimedia.org/wiki/File:Gradowka.jpg

Ectropion (lids turn outward)
Entropion (lids turn inward)

| causes   | - involutional (laxity with age)  
|          | - cicatricial (scarring of lid)  
|          | - paralytic (7th nerve palsy)  
|          | - mechanical (mass on lower lid or cheek)  
|          | - congenital (rare)  
| symptoms | - irritation, burning, FB sensation  
|          | - visible space between globe and lid (ectropion)  
|          | - trichiasis (abrading) (entropion)  
| treatment| - surgical correction  

Xanthelasma

- bilateral plaque-like yellow lesions
- medial upper and/or lower lids
- idiopathic >> hyperlipidemia, diabetes
- middle aged to elderly females
- cosmetic concern
- surgical excision for cosmetic wishes

http://commons.wikimedia.org/wiki/File:Xanthelasma_palpebrarum.jpg
Epithelial Inclusion Cyst

- traumatic implantation of epidermis into dermis or plugged follicle
- rarely—associated with Gardner’s syndrome
- slow-growing, white, round, firm
- usually < 1cm
- dx: neoplasm
- tx: excision, marsupialization

Orbital Cellulitis

- secondary to: URI, sinusitis (especially children), lid trauma, stye, impetigo, conjunctivitis, dacrocystitis
- symptoms: erythema, low grade fever, decreased vision
- signs: sluggish pupillary reflex, proptosis, restricted motility, edema, erythema of lids and surrounding skin, retinal hemorrhage, venous congestion, disc edema
- diagnostic studies: increased WBC, CT: broad infiltration of orbital fat
- treatment: broad spectrum antibiotics, IV then po, 2-3 weeks (ampicillin-sulbactam, cephalosporin, chloramphenicol), monitor for local spread, optic nerve damage, meningeal/cerebral infection, surgical drainage if large or recalcitrant, sinus drainage as indicated

Conjunctival Conditions

Conjunctivitis
- viral, bacterial, chlamydial, allergic

Pinguecula

Pterygium
### Viral Conjunctivitis

**Basic Science**
- adenovirus (epidemic keratoconjunctivitis)
- rapidly bilateral

**Clinical**
- acute onset
- redness, mild discomfort
- watery discharge, diffuse injection, lid edema
- +/- follicular response, inner lid usually (photosensitivity)
- tender preauricular adenopathy

**Treatment**
- usually self-limiting
- cold to warm compresses
- artificial tears, vasoconstrictor/antihistamine drops

### Bacterial Conjunctivitis

**Basic Science**
- *Staph aureus, Haemophilus, Moraxella, Pseudomonas*
- *Neisseria*: rare but serious, risk corneal perforation

**Clinical**
- red, irritated, discomfort; often bilateral
- mucopurulent exudate, adhesions
- erythema, edema of lids
- *Neisseria*: copious, purulent, often unilateral

**Treatment**
- broad spectrum antibiotic (drops preferred over ointment)
- fluorquinolone, polymixin, sulfa
- *Neisseria*: frequent irrigation, topical and systemic Abs, prompt referral

### Chlamydial Conjunctivitis

**Basic Science**
- serotypes D-K
- sexually transmitted

**Clinical**
- typically unilateral
- scant mucopurulent discharge
- nontender preauricular adenopathy
- marked follicular response, marked keratitis
- Giemsa stain: inclusion bodies

**Treatment**
- systemic tetracycline or erythromycin, 3 weeks
- topical Abx as well, ointment preferred
**Allergic Conjunctivitis**

**Basic Science**
- Atopic individuals at highest risk
- Typically seasonal

**Clinical**
- Mild conjunctival injection, edema
- Stringy mucoid discharge
- Severe edema: photophobia, vision impaired

**Treatment**
- Removal of allergen, desensitization
- Systemic antihistamines
- Topical: vasoconstrictor/antihistamine
  - Antihistamines (levocabastine)
  - Mast cell stabilizers (lodoxamide)
  - Nonsteroidal (ketorolac)
- Systemic steroids: control acute, recurrent exacerbations

---

**Pinguecula**
- Elevated, fleshy, yellow to brown conjunctival mass
- Nasal side, on sclera toward cornea
- Causes: chronic sun, repeated trauma, dry or windy conditions
- Usually no symptoms, no treatment
- May become inflamed (pingueculitis)

**Pterygium**
- Triangular or wedge-shaped fleshy growth
- Vascularized, folds over and onto cornea
- Interferes with vision
- Localized inflammatory process
- Most often in tropical climates
- Surgical excision, artificial tears, topical NSAIDs or steroids
### Corneal Conditions

<table>
<thead>
<tr>
<th>Dry Eye Syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herpes Simplex Keratitis</td>
</tr>
<tr>
<td>Herpes Zoster Ophthalmicus</td>
</tr>
<tr>
<td>Corneal Ulcer</td>
</tr>
<tr>
<td>Corneal Abrasions</td>
</tr>
</tbody>
</table>

### Dry Eye Syndrome

**causes**
- idiopathic, aging, contact wearers
- lid palsy, ectropion, blepharitis, graft vs host, collagen vascular diseases (Sjogren's, RA), sarcoidosis, medication side effect (anticholinergics)

**clinical**
- irritation, dryness, redness, foreign body sensation
- worsens as day progresses
- exacerbated by smoke, cold, low humidity, wind
- mild conjunctival injection, if anything
- punctate staining of cornea (fluoroscein)

**diagnosis and treatment**
- Schirmer's test
- artificial tears, ointments
- punctal plug to prevent tear outflow
- cyclosporine drops (Restasis)

### Herpes Simplex Keratitis

**basic science**
- 98% are unilateral
- HSV-1 >> HSV-2
- direct contact

**clinical**
- irritation, **light sensitivity**, redness
- pain mild or absent
- mild conjunctival injection
- **dendritic lesion** (fluorescein)
- advanced: scarring, vascularization

**treatment**
- REFER!
- topical antiviral
- NO steroids—will cause tissue loss, ocular perforation
Herpes Zoster Ophthalmicus

**Basic Science**
- Latent varicella virus
- Trigeminal (5th) ganglion, 1st division

**Clinical**
- Pain, headache, photophobia
- Vesicular rash
- Hutchinson’s sign: lesions on tip of nose; indicates ocular involvement (cornea, conjunctiva)
- Complications: uveitis, glaucoma, scleritis, optic neuritis

**Treatment**
- Refer!
- Oral (or IV) acyclovir, famcyclovir, valacyclovir
- +/- topical steroids

**Prevention**
- Zostavax, > 60 year old; 3/11/11: > 50 years old
- Reduce risk of zoster and post herpetic neuralgia
- Adverse effects: redness, pain, headache

Corneal Ulcer

**Basic Science**
- Infection or inflammation
- History of trauma, poor lid apposition or contact lens use

**Clinical**
- Pain, photophobia, tearing, reduced vision
- Dense corneal infiltrate with overlying epithelial defect (fluorescein)
- Hypopyon (layering of WBC in anterior chamber)
- Ciliary flush is common
- Severe: rapid corneal destruction
- Fungal: feathery border

**Treatment**
- Refer!
- Scraping, Gram stain
- Treat per causative agent
- Avoid contact use
## Corneal Abrasion

<table>
<thead>
<tr>
<th><strong>basic science</strong></th>
<th>- history of mild trauma</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>clinical</strong></td>
<td>- conjunctival injection, hyperemia</td>
</tr>
<tr>
<td></td>
<td>- photophobia, blepharospasm</td>
</tr>
<tr>
<td></td>
<td>- swollen lids, tearing</td>
</tr>
<tr>
<td></td>
<td>- pain, foreign body sensation</td>
</tr>
<tr>
<td></td>
<td>- epithelial defect (fluorescein)</td>
</tr>
<tr>
<td></td>
<td>- search for foreign bodies</td>
</tr>
<tr>
<td><strong>treatment</strong></td>
<td>- topical anesthetic—immediate relief—DO NOT DISPENSE — may retard healing</td>
</tr>
<tr>
<td></td>
<td>- cycloplegic, systemic analgesic</td>
</tr>
<tr>
<td></td>
<td>- antibiotic ointment, pressure patch (max 24 hours)</td>
</tr>
<tr>
<td></td>
<td>- follow up daily till resolved</td>
</tr>
</tbody>
</table>

## Trauma

**Foreign Bodies**

- Subconjunctival Hemorrhage
- Orbital Fracture (Blow Out)
- Hyphema
- Radiant Energy Burns
- Lacerations, Penetrating Injuries
- Chemical Burns

## Foreign Bodies

- conjunctiva or cornea (more dangerous)
- tearing, red, irritated, painful
- hyperemia, laceration, obvious FB
- hemorrhage or abrasion may occur
- **evert lids for exploration**
- remove under topical anesthesia
- irrigate with saline; use forceps or Q-tip
- apply antibiotic ointment after removal
- refer if suspect laceration, globe penetration
Subconjunctival Hemorrhage

<table>
<thead>
<tr>
<th>causes</th>
<th>clinical</th>
<th>treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>spontaneous</td>
<td>acute, dense blood in subconjunctival space</td>
<td>-reassurance, 2-3 wks to clear</td>
</tr>
<tr>
<td>after Valsalva</td>
<td>flat, red spot to massive hemorrhage with edema</td>
<td>-artificial tears, relieve discomfort</td>
</tr>
<tr>
<td>associated with conjunctivitis, hypertension, bleeding diathesis, trauma</td>
<td></td>
<td>-refer if suspect clotting disorder, trauma, ruptured globe</td>
</tr>
</tbody>
</table>

Orbital Fracture

orbital floor = maxillary, zygomatic, palatine
Orbital Fracture

**cause**
- blunt impact to the orbit; fist, tennis ball, etc.

**clinical**
- “blow out” into maxillary sinus
- trapped inferior rectus, inferior oblique → restricted, painful vertical eye movement
- double vision, edema, subcutaneous emphysema
- posteriorly displaced globe, proptosis

**treatment**
- REFER
- CT: delineate extent of disease
- risk: increased IOP, retinal detachment, vitreous hemorrhage, lens subluxation, local damage
- nasal decongestants, antibiotics
- cold compresses, ice packs, avoid sneezing
- surgical repair

---

**Hyphema**

**basic science**
- blood in anterior chamber
- microhyphema (suspended RBCs) to massive hemorrhage
- history of blunt trauma common

**clinical**
- pain, blurry vision, red eye
- examine for further injury, neoplasm, abuse
- injection, sluggish pupil, iris tears, active bleeding

**treatment**
- REFER!
- admit, monitor closely
- bed rest, eye shield, cyclopegia

---

**hyphema**
Radiant Energy Burn

**causes**
- sunbathing, sunlamps, welding, no protection

**clinical**
- moderate to severe pain
- 6-12 hours after the event
- red, tearing, blurry vision, photophobia, blepharospasm
- dense punctate staining of cornea (fluorescein)
- injection, lid edema, corneal edema

**treatment**
- cycloplegic, antibiotic ointment
- pressure patch (max 24 hours)
- systemic analgesic
- very good prognosis
- risk: cataract

Lid Laceration/Penetrating Injuries

- **URGENT REFERRAL**
- Surrounding structures at risk

- Keep patient still; avoid pressure
- DO NOT remove embedded objects
- no pressure, no drops or ointments
- start systemic antibiotics

- Surgery will be required

Chemical Burns

- **IRRIGATE! Immediately and Profusely**
  - Eyewash or Tap Water
  - Continue until pH normalizes
  - and Then Irrigate Some More!
- Severe pain, redness, visual loss, spasm
- Cycloplegics, antibiotic ointment
- Corneal epithelial loss, edema, hemorrhage
- Corneal scarring, blindness

**Radiant Energy Burn**

**causes**
- sunbathing, sunlamps, welding, no protection

**clinical**
- moderate to severe pain
- 6-12 hours after the event
- red, tearing, blurry vision, photophobia, blepharospasm
- dense punctate staining of cornea (fluorescein)
- injection, lid edema, corneal edema

**treatment**
- cycloplegic, antibiotic ointment
- pressure patch (max 24 hours)
- systemic analgesic
- very good prognosis
- risk: cataract

**Lid Laceration/Penetrating Injuries**

- **URGENT REFERRAL**
- Surrounding structures at risk

- Keep patient still; avoid pressure
- DO NOT remove embedded objects
- no pressure, no drops or ointments
- start systemic antibiotics

- Surgery will be required

**Chemical Burns**

- **IRRIGATE! Immediately and Profusely**
  - Eyewash or Tap Water
  - Continue until pH normalizes
  - and Then Irrigate Some More!
- Severe pain, redness, visual loss, spasm
- Cycloplegics, antibiotic ointment
- Corneal epithelial loss, edema, hemorrhage
- Corneal scarring, blindness
Visual Disorders
Refractive Errors

Correction: concave lenses
Correction: convex lenses

National Eye Institute: www.nei.nih.gov

Color Blindness

- usually hereditary (x-linked, others)
- acquired: aging, Parkinson, Alzheimers, glaucoma, mac degeneration, alcoholism, leukemia
- males (8%) > females (1%)
- red-green deficiency most common
- blue-yellow deficiency 1/100,000
- test using Ishihara plates

Amblyopia

- Loss of visual acuity not correctable by glasses in an otherwise healthy eye
- Normal eye that is prohibited from developing
- 2% of adult population US affected
- 50% due to strabismus
- others: refractive error, form-deprivation syndrome, occlusion
Strabismus

• concomitant (nonparalytic)
  * angle/degree of misalignment is equal in all directions of gaze
  * more common, congenital/genetic
• incomitant (paralytic)
  * degree of misalignment differs with direction of gaze
  * more likely due to neurologic disorder or trauma
• heterophoria (latent, intermittently apparent)
• heterotropia (manifest)

Strabismus

• Misalignment of eye axes
• Hypotropia – downward
• Hypertropia – upward
• Exotropia – outward
• Esotropia – inward

Amblyopia and Strabismus

• Cover/uncover test
  heterotropia (manifest): cover normal eye; affected will move in place
  heterophoria (latent) cover suspected eye; uncover and misalignment may become apparent

• Treatment basics:
  amblyopia: patch good eye; start young
  strabismus: glasses, surgical correction
Thank you!