



Ocular emergencies and red eye

OBJECTIVES:

-

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REFERENCES: lecture, 436 (A) team, 435 teamwork, lecture notebook.

[Editing file](#)

Color index: [Important](#) | [Notes](#) | [Book](#) | Extra

Special thanks to 436 (A) teamwork.

Ocular Emergencies

- ◆ Usually the outcome in emergency cases depend on immediate intervention (how earlier do you manage the patient).

General Emergencies:	Orbital/Ocular trauma:
<ul style="list-style-type: none"> ◆ Corneal ulcer. ◆ Uveitis. ◆ Acute angle closure glaucoma. ◆ Orbital cellulitis. ◆ Endophthalmitis. ◆ Retinal detachment. 	<ul style="list-style-type: none"> ◆ Corneal abrasion. ◆ Corneal and conjunctival foreign bodies. ◆ Hyphema. ◆ Ruptured globe. ◆ Orbital wall fracture. ◆ Lid Laceration. ◆ Chemical injury.

- **Corneal Ulcer:** (Also Known as microbial keratitis, kera= Cornea). [extra from the book](#)

- ◆ Corneal ulcer occurs secondary to lid and conjunctival inflammation, but it is often secondary to trauma or contact lens wearer.
- ◆ Bacterial, viral, fungal or parasitic.
- ◆ **Signs & symptoms:**
 - Severe ocular pain, redness, ciliary injection, hypopyon, purulent discharge with decreased vision (severe if visual axis is involved) and a white corneal opacity.



Bacterial(pseudomonas) keratitis with opacity

- Normally, cornea is clear (glass-like).
- If there is opacity, then it may be due to corneal ulcer or scar.
- The difference between corneal ulcer & scar is that the corneal ulcer appears cream yellowish w/ redness and other symptoms, but corneal scar is a sequela of an ulcer ± hypopyon “pus” which is white yellowish collection in the anterior chamber (WBC in the anterior chamber).



Whitish collection in the anterior chamber (hypopyon)

- ◆ **Management:**

- Prompt diagnosis of the etiology by doing corneal scraping from the base of the ulcer (for culture & staining -Gram & Giemsa stains- to diagnose).
- Treatment with appropriate antimicrobial therapy is essential to minimize visual loss.
- Then treat the inflammatory process.
- Promote healing and treat the primary cause if present (e.g. lid deformity, dryness, rubbing eyelashes).
 - Start immediately with empirical fortified antibiotics (because culture will take 48 hours), why antibiotics? because the most common & the most dangerous is bacterial (pseudomonas causes perforation)



Corneal ulcer with Hypopyon

within hours), fungal infection will take a couple of days to cause perforation. Also, the response to antiviral\parasite is slow, thus we don't give antiviral/parasite empirically; it should be proven w/ culture or slide.

- Fortified antibiotics are given to cover gram -ve and +ve until the results come, then you can adjust the medications according to the results.
- But what if there is nothing on the culture? then you have 2 options:
 - o Either you see clinical improvement, so you continue on your medications; Or, there is no clinical improvement and here you should look for other causes such as fungal.
- Remember we treat patients not cultures.
- The drops are given hourly, day and night, for the first couple of days and are reduced in frequency as clinical improvement occurs, why? because there is no immune system (no blood vessels).



**2 abnormalities: corneal opacity & hypopyon.
Complication: corneal ulcer**

- Gram -ve:
 - o Mild to moderate: Ceftazidime (3rd generation cephalosporin).
 - o It covers (pseudomonas).
- Gram +ve:
 - o Mild to moderate: Cefazolin (1st generation cephalosporin).
 - o Severe case: **Vancomycin**

● Contact lens wearer

- ◆ Any redness occurs for patients who wear contact lens should be managed with extreme caution.
- ◆ Remove lens.
- ◆ Rule out corneal infection (i.e corneal ulcer).
- ◆ Antibiotics for gram negative organisms (pseudomonas aeruginosa is the most common), treat it empirically as bacteria give **Ceftazidime**, if no response → antifungal, because fungi and acanthembea are common causative organisms.
- ◆ Any pain, foreign body sensation or redness require visit to ophthalmologists.
- ◆ Do not patch. It will worsen the condition.
 - Sometimes corneal ulcer is misdiagnosed as corneal epithelial defect (corneal abrasion).
- ◆ Close Follow up with ophthalmologist in 24 hours.



**Contact lens wearer
2 findings: corneal infiltration & hypopyon.
Complication: corneal scarring & glaucoma.**

● Uveitis

- ◆ Inflammation of the uveal tissue (**iris, ciliary body, or choroid**), retina, blood vessels, optic disc, and vitreous can be involved "the patient may have retinitis or hypopyon secondary to uveitis".



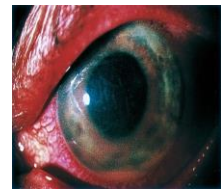
◆ It may be classified anatomically into:

- Inflammation of the iris, accompanied by increased vascular permeability, is termed iritis or anterior uveitis. White cells circulating in the aqueous humor of the anterior chamber can be seen with a slit lamp. Protein, which also leaks into the anterior chamber from the blood vessels, is picked out by its light-scattering properties in the beam of the slit lamp as a 'flare'.
- An inflammation of the ciliary body is termed cyclitis, it is termed intermediate uveitis.
- Inflammation of the posterior uvea is termed posterior uveitis and may involve the choroid (choroiditis), the retina (retinitis) or both (chorioretinitis). In posterior uveitis/retinitis visual loss may occur either from destructive processes caused by the retinitis itself (e.g. in toxoplasmosis or CMV infection) or from fluid accumulation in the layers of the macula (macular oedema).
- A panuveitis is present when inflammatory changes affect the anterior chamber, vitreous and retina and/or the choroid.

The patient is having hypopyon without infiltrate thus it is mostly uveitis or endophthalmitis.
WBC in the anterior chamber & redness.

◆ Etiology

- Idiopathic (50%).
- Inflammatory diseases:
HLA B27, Ankylosing spondylitis, IBD, Reiter's syndrome, Psoriatic arthritis, Sarcoidosis, (lung CT to diagnose) Behcet's, Vogt-Koyanagi-Harada Syndrome (panuveitis and ear involvement -blindness, deafness and vitiligo- are common in our region you have to read about it).
- Infectious:
 - Herpes virus.
 - Toxoplasmosis **transmitted through cats** (poor outcome).
 - **Secondary Tuberculosis** (granulomatous uveitis, common in KSA & India) – give anti-Tb and steroids Why? because you don't want the patient to have miliary TB.
 - Syphilis.
 - CMV (especially in AIDS pts).
 - Fungal infections in immune-compromised pts.

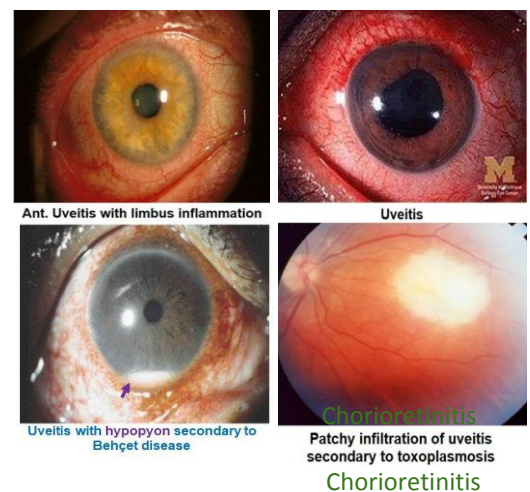


◆ Investigations:

- We do tests based on the suspected cause. E.g.
 - Toxoplasmosis = blood test.
 - Secondary TB = skin tuberculin test and chest X-ray or CT scan (more accurate).

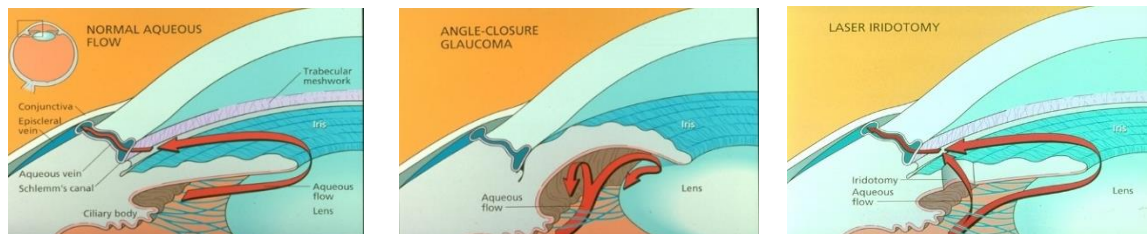
◆ Management

- The treatment is aimed at:
 - Suppressing inflammation in the eye, and relieving pain in anterior uveitis;
 - Preventing damage to ocular structures, particularly to the macula and the optic nerve, which may lead to permanent visual loss.
- Identify possible cause.
- **Topical steroid.**



- Steroid therapy is the main stay of treatment.
 - In anterior uveitis, the steroids are given topically (by eye drops);
 - However, topical steroids do not effectively penetrate to the posterior segment. Posterior uveitis is therefore treated with systemic steroids, or with steroids injected onto the orbital floor or into the sub-Tenon's space.
 - **Topical cycloplegic** (atropine + cyclopentolate) to relax the ciliary body muscles and dilate pupils → important to relieve the pain, to reduce photophobia & to prevent iris adhesion to the lens (posterior synechia).
 - Systemic immunosuppressive medication:
 - Steroid.
 - Cyclosporine.
 - Methotrexate.
 - Azathioprine.
 - Cyclophosphamide.
 - Immunomodulating agents
 - Infliximab (Anti-TNF) (mostly for Behcet's Disease).
- **Acute Angle Closure Glaucoma** (موية زرقاء). [extra from the book](#)

- ◆ Is caused by a rapid or sudden increase in intraocular pressure (IOP). Raised Intraocular pressure is caused by an imbalance between the production and the drainage of aqueous humor.



- ◆ Result from peripheral iris blocking the outflow of fluid
- ◆ **Risk factors:**
 - More in hyperopic pts since they have smaller eyes and thus their angle is more crowded (they have shallow anterior chambers & the structures in anterior chamber are more crowded). A triggering factor is dimming the light cause the pupil gets dilated and it goes back to the angle and close it.
 - Myope pts will be prone to develop open angle glaucoma.
- ◆ **Signs & symptoms:**
 - Present with severe pain, redness, mid-dilated pupil with decreased vision and colored haloes around lights, severe headache or nausea and vomiting and intraocular pressure is elevated (normal IOP is 10-21 mmHg *imp), photophobia.
- ◆ Can cause severe visual loss due to optic nerve damage.
- ◆ Typical history: the symptoms increase while dimming the light. *Glaucoma increases at night more than morning because of pupil dilation at night. For example, patient came to the doctor complaining that he had eye pain whenever he is watching a film and turning off the lights.

◆ **Management:**

▪ **Medical Tx:**

○ It is necessary to stabilize the eye and reduce the pressure by both topical and oral medications.

- Topical → pilocarpine and beta-blockers.

▪ Pilocarpine constricts the pupil and draws the peripheral iris out of the angle.

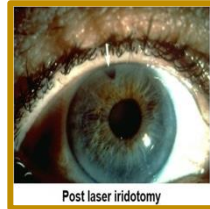
- Oral → Acetazolamide

▪ Both beta-blockers (topical) & acetazolamide (oral or I.V) reduce aqueous secretion & the pressure gradient across the iris.

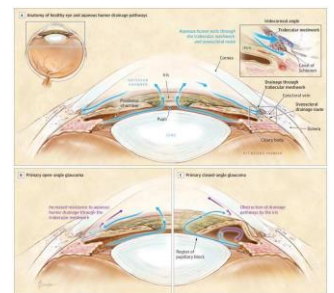
▪ After reducing IOP, peripheral laser iridotomy will be curative in most cases (definitive treatment); This provides an alternative pathway for fluid to flow from the posterior to the anterior chamber, bypassing the pupil and thus reducing the pressure gradient across the iris. This can be done with a YAG laser or surgically.



Halos around lights



Post laser iridotomy



● **Pre-septal cellulitis** (you need to rule out orbital cellulitis).

◆ Also known as periorbital cellulitis which is an inflammation and infection of the eyelid and portions of skin around the eye.

◆ Any inflammation **anterior** to the septum we call it preseptal cellulitis; If it crosses the septum, we call it orbital cellulitis (the differentiation is important because orbital cellulitis is worse).

◆ **Symptoms:**

- Lid swelling and erythema.
- Visual acuity, motility, pupil reaction, the globe & the optic nerve are normal; Unlike orbital cellulitis.

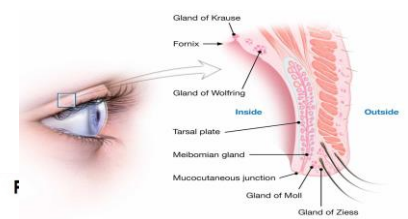
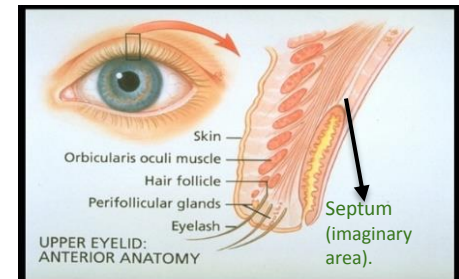
◆ **Etiology:**

- Skin wound.
- Laceration.
- Retained foreign body from trauma.
- Vascular extension, extension from sinuses (sinusitis) or another infectious site (e.g., dacryocystitis, chalazion).
- Organisms: (mostly bacterial infection)
 - Staph aureus, Streptococci, H.influenzae (<5yrs).

◆ **Management:** Need to be treated properly to avoid extension of the infection to the orbit which cause orbital cellulitis (inside).

▪ Warm compresses. (always warm for infections- we need vasodilation and subsequent increase in WBCs and chemotaxis)

▪ Systemic antibiotics usually oral, especially if they are older than 6 yrs, if they are less than 6 yrs we need to admit them because we are afraid of orbital cellulitis "Augmentin".



Periorbital cellulitis

- if not better or +ve history of trauma: CT or X-ray of the sinuses (to rule out sinusitis) and orbit

Eye is normal (white sclera) & only slight redness on the skin.



Diagnosis: pre-septal cellulitis.
Treatment: systemic oral antibiotics & warm compressors.

• Orbital Cellulitis

- ◆ It most commonly refers to an acute spread of infection into the eye socket from either the adjacent sinuses or through the blood.
- ◆ More serious than preseptal cellulitis because it may go to the brain and lead to death.
- ◆ Mostly orbital cellulitis is a complication of preseptal cellulitis. But, if someone has bad sinusitis, it may cross & cause orbital cellulitis without going through the skin.
- ◆ It may be caused by gram +ve (the commonest causative organisms are *Staphylococcus* and *Streptococcus*) or anaerobes (thus should be covered by antibiotics).

◆ Symptoms:

- Pain.
- Decreased vision.
- **Impaired ocular motility**/double vision.
- Afferent pupillary defect (response of pupil to shining a light).
- Conjunctival chemosis and injection Chemosis of the conjunctiva is a type of eye inflammation that occurs when the inner lining of the eyelids swells.
- **Proptosis** (bulging of the eye anteriorly out of the orbit).
- Optic nerve swelling.
 - Motility, pupil reaction, fundal exam & color vision need to be tested to check optic nerve function."
- **Periorbital inflammation and swelling.**



Orbital cellulitis
Hx of sinusitis
I.V antibiotics

◆ Investigations:

- An MRI or CT scan is helpful in diagnosis and in planning treatment.

◆ Management:

- **Admission.**
- **Intravenous antibiotics.**
- Nasopharynx and blood cultures.
- Surgery may be necessary.
- In case of subperiosteal abscess, **first** give IV antibiotics for couple of days, then evacuate this surgically if the abscess doesn't resolve spontaneously.



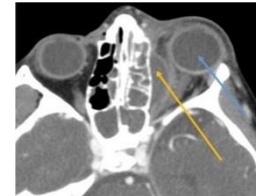
Orbital cellulitis

◆ Complication:

- The risk is on the brain: the meninges have a direct connection with the orbital cavity, thus when the organism crosses the septum it reaches the meninges causing meningitis or encephalitis which are fatal.



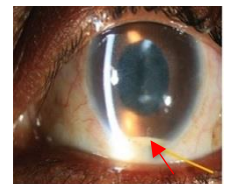
Here the eye is inflamed & closed completely.



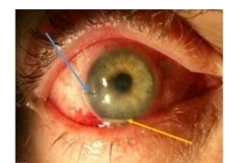
Orbital cellulitis
Collection of pus pushing the eye

• Endophthalmitis

- ◆ Endophthalmitis is the inflammation of the vitreous cavity, it's an EXTREME EMERGENCY as it's a blinding disease that needs intervention within hours.
- ◆ It is a potentially devastating **complication of any intraocular surgery**.
- ◆ Inflammation inside the eye. The organism is inside the vitreous cavity. It may go inside via a surgical wound or trauma (channel from outside to inside which cause bacterial entry and it finds a good environment to live in as there are no direct blood vessels in the vitreous to provide strong immunity).
- ◆ **It may be endogenous endophthalmitis (secondary to septicemia or endocarditis, for example), but the majority is exogenous endophthalmitis.**
- ◆ Sometimes the destruction is due to the inflammation not the infection itself.
- ◆ **Symptoms:**
 - Any patient in the **early postoperative period (within 6 weeks of surgery)** c/o pain or decreased vision should be evaluated immediately.
 - **It causes a marked generalized conjunctival inflammation.**
 - On physical examination, there will be redness, lid edema & hypopyon; And on fundal exam you will see **vitritis** (vitreous cells) & red reflex will be diminished.
 - By looking at the eye it's sometimes difficult to differentiate between uveitis & endophthalmitis. What should we do??! **HISTORY!!!** Post-surgery →endophthalmitis (e.g. a patient presents 2-3 days post-op with severe redness, lid edema and hypopyon on exam you find vitritis).
- ◆ **Management**
 - **Vitreous sample** for culture.
 - **Intravitreal antibiotics** injection plus topical antibiotics.
 - The commonest is bacterial, but it can be fungal.
 - Broad spectrum antibiotics mostly vancomycin (covering gram +ve) and ceftazidime (covering gram -ve) are given.
 - The intervention needs to be as soon as possible (within mins). Any delay for one day or more may lead to destruction of the retina.



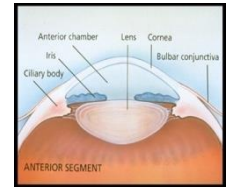
Endophthalmitis with hypopyon



Endophthalmitis (Note the sutured corneal wound and hypopyon)

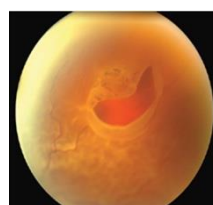
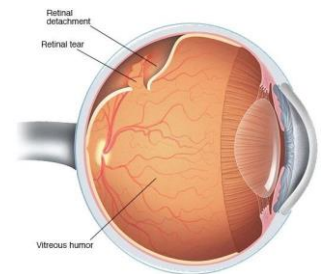


- In severe infection the vitreous will be like an abscess; In this case surgery is needed to drain it (vitrectomy).
- If visualization of vitreous is not possible in case of severe infection, do B scan (ultrasound).
- Visual acuity will decide the treatment either intravitreal antibiotics or surgery.
- In decreased visual acuity (hand motion or less) surgery is needed; if better give, intravitreal antibiotics only.
- Do surgery – if no response to antibiotics and endophthalmitis secondary to blebitis.

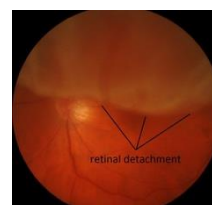


- **Retinal Detachment** (go back to acute visual loss for full understating).

- ◆ The retina has 10 layers, RD is a separation of retinal pigment epithelium (RPE) from the neurosensory retina.
- ◆ It is **not** a separation between retina and choroid.
- ◆ **Types:**
 - Rhegmatogenous retinal detachment secondary to break (tear) in the retina (acute & emergency).
 - Both exudative RD & tractional RD are usually chronic.
- ◆ **Risk factors:**
 - People with high myopia -6 and above.
- ◆ **Symptoms**
 - **Flashes, floaters**, a curtain or shadow moving over the field of vision.
 - Peripheral and/ or central visual loss.
 - History of scratching the eye.
 - Painless
- ◆ **Management:** Surgery, Laser and vitrectomy.
 - The aim of the treatment is to close the causative break in the retina and to increase strength of the attachment between the surrounding retina and the RPE 'Retinal pigment epithelium' by inducing inflammation in that region.
 - If involving the macula (macula off) ⇒poor prognosis and surgical intervention needed.
 - In the periphery (macula on) ⇒better prognosis and can be treated by laser.

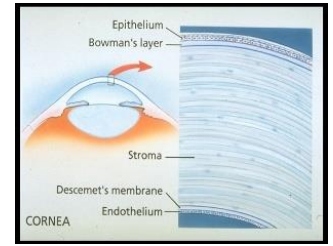


Retinal detachment with horseshoe retinal tear

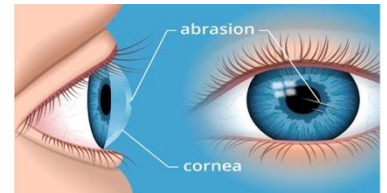


- **Corneal Abrasion**

- ◆ Corneal abrasion, also known as corneal epithelial defect, is sloughing of the corneal epithelium.
- ◆ History of scratching the eye (by fingernails, papers or during contact lens removal).
- ◆ Symptoms:
 - Foreign body sensation.
 - Severe **pain**.
 - Tearing.
 - **Photophobia** (experience of discomfort or pain to the eyes due to light exposure).

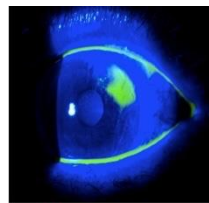
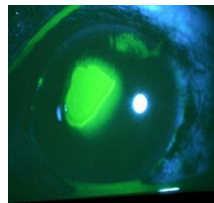


Corneal abrasion with NO opacities
القرنية صافية موزي الالسر



- ◆ **Diagnosis:**

- Slit lamp to see the irregularity of the cornea.
- Fluorescein dye in drops or strips & blue light. It will show the affected area in green.
 - The instillation of fluorescein will identify the extent of an abrasion and use of concentrated fluorescein, will identify a leak of aqueous through a penetrating wound.



SAQ: Fluorescein dye uptake
المنطقة التي تأخذ الصبغة هي المتآثرة



What is the finding? Corneal abrasion.

Treatment:

Topical antibiotic & eyepatch

- ◆ **Treatment:**

- It heals spontaneously.
 - Stem cells in the periphery of the cornea will come and cover that defect. But before covering the defect, the eye is prone to bacterial infection, so give prophylactic antibiotics. Sometimes we **patch the eye if we rule out infection**.
 - Sometimes pts who are contact lens wearer think they had scratched the eye while removing the lens, but actually it is a corneal ulcer not abrasion. So be careful.
 - **If you have any suspicion of infection or injury from lenses, DO NOT PATCH THE EYE.**
 - Corneal abrasion = patch.
 - Corneal ulcer = no patch.
- Topical prophylactic antibiotic (fluoroquinolone -ofloxacin-; In general, broad spectrum antibiotics).
- Pressure patch over the eye.
- Refer to ophthalmologist.



- ◆ **Complication:**

- Corneal ulcer can be a complication of corneal abrasion.

• Chemical Injuries

- ◆ A vision-threatening emergency with a poor outcome.
- ◆ The offending chemical may be in the form of a solid, liquid, powder, mist, or vapor.
- ◆ Can occur in the home, most commonly from detergents, disinfectants, solvents, cosmetics, drain cleaners.
- ◆ Alkaline chemical injury is worse than acid, because alkali causes deep penetration.
- ◆ It may be aggressive and destroy eye surface “epithelium” causing stem cell deficiency which end up with blindness.
- ◆ Destruction of optic nerve common in case of glaucoma resulting from alkaline injury.
- ◆ Can range in severity from mild irritation to complete destruction of the ocular surface



What is the immediate management? irrigation with water for at least 30 mins.
Complications: Infection & corneal perforation.

◆ Management:

- Irrigate with clean water.
- **Immediate irrigation is essential**, preferably with saline or Ringer’s lactate solution, for **at least 30 minutes**.
- Irrigation should be continued until neutral pH is reached (i.e.,7.0).
 - **Measuring tear pH with litmus paper.**
- Instill topical anesthetic.
- Check for and remove foreign bodies in case of fireworks/cement.
- Instill topical antibiotic.
- Frequent lubrications.
- Oral pain medication.
- Enhance healing.



▪ Then you deal with the sequelae; and the extent of the chemical injury depends on:

- First action that has been done.
- Extent of injury to the stem cells.

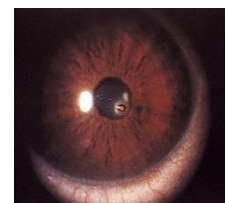
- If a chemical injury has occurred, the conjunctiva may appear white and ischemic. If such changes are extensive, corneal healing will be grossly impaired because of damage to the epithelial stem cells of the cornea, which are located at the limbus.



Alkali chemical burn

• Corneal or Conjunctival Foreign Bodies

- ◆ History of trauma
- ◆ Foreign body sensation-tearing
- ◆ **Management**
 - Instill topical anesthetic.
 - **Removal of the foreign body.**



- The foreign body could be hidden under the lid.

- Topical antibiotic.
- Treat corneal abrasion.
- Pts may develop corneal ulcer as well.
- A radiograph of the orbits, with the eyes looking up and then down, or a CT scan, may also be indicated if an intraocular foreign body is suspected.



Diagnosis: conjunctival foreign body.
2 managements: local anesthesia & removal of foreign body.



Diagnosis: corneal foreign body.
2 lines of treatment: Topical anesthesia, topical antibiotics. Removal of antibody.

• Hyphema

- ◆ Blood in the anterior chamber, mostly secondary to trauma.
- ◆ Can occur with blunt or penetrating injury.
- ◆ The blunt trauma can cause rupture of the root of the iris blood vessels, or the iris may be torn away from its insertion into the ciliary body (iris dialysis) to produce a D-shaped pupil.
- ◆ Can lead to high intraocular pressure & corneal pigmentation.
- ◆ Detailed history (Sickle cell) to help in the treatment.

◆ Management

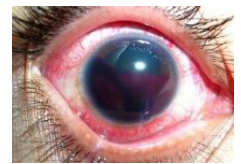
- Spontaneous absorption & resolution.
- Bed rest 2-3 days to prevent re-bleeding.
- Topical steroid to reduce inflammation & risk of rebleed.
- Topical cycloplegic to dilate the pupil, why? to stabilize it to prevent re-bleeding.
- The only thing that you need to monitor the patient for is IOP.

“Atropine” to fix the iris (pupil dilation) to prevent clotting & dislodging of the clot

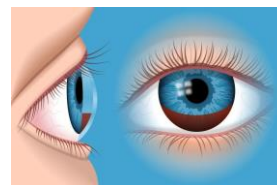
- Anti-fibrinolysis agents (tranexamic acid).
- Surgical evacuation.
 - People with sickle cell anemia may need blood evacuation surgically because of deformed RBCs which have difficulty going through trabecular meshwork, do not wait.



Hyphema along w/ sub-conjunctival hemorrhage.



Eight ball hyphema



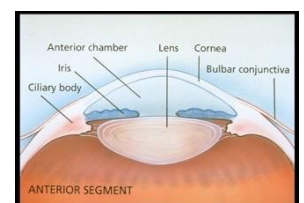
Diagnosis: hyphema.
Complications: posterior synechia & glaucoma.

• Ruptured Globe

◆ Etiology:

- suspect a ruptured globe if:
 - Severe blunt trauma hit by a thumb or a tense ball; the rupture will happen in the weak parts of the eye, which are around the insertion of the muscles, at the limbus and at the optic nerve.
 - Sharp object: there will be an entrance and an exit if there is perforation or only an entrance if it is penetrating.

◆ Suspect a ruptured globe if: (signs)



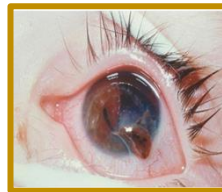
- Bullous subconjunctival hemorrhage Take him to OR explore the area and suture. if you leave it, you'll have infection, e.g. Endophthalmitis.
- Uveal prolapse (Iris or ciliary body)
- Irregular pupil
- Hyphema
- Vitreous hemorrhage
- Lens opacity
- **Lowered intraocular pressure** (look for a defect, there must be a leak).
- Intraocular foreign body
- Any leaking point should be closed immediately to prevent infection inside the eye (endophthalmitis).
- **If you have an intraocular foreign body (in the retina), the first thing to do is to take the patient to the OR to suture the eye,** then you plan the subsequent surgery to remove the foreign body after 5-6 days.



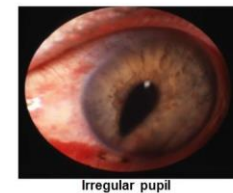
The diagnosis:
ruptured globe.
Complication:
endophthalmitis.

◆ **If globe ruptured or laceration is suspected:**

- Stop examination
- **Shield the eye**
- Give tetanus prophylaxis
- Refer immediately to ophthalmologist
- We can't do MRI maybe it's metal!!

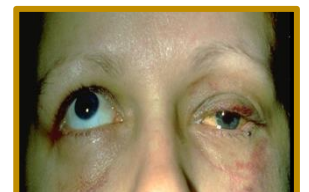


Finding: Ruptured globe.
Investigations: X-ray to rule out foreign body.
Complication: endophthalmitis.



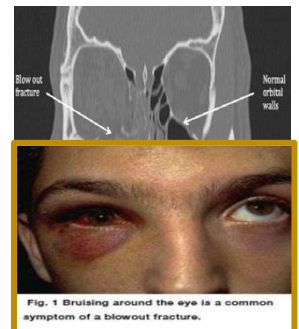
● **Orbital Fractures**

- ◆ An orbital fracture is a traumatic injury to the bone of the eye socket. These injuries are usually the result of blunt force trauma to the eye (**Blowout fracture**).
- ◆ Assess ocular motility muscle entrapment (eye is entrapped thus pt can NOT look upward).
- ◆ **Assess sensation over cheek and lip.**
 - **A patch of paresthesia below the orbital rim suggesting infraorbital nerve damage. The infraorbital nerve is commonly injured in orbital blow-out injury involving the floor of the orbit.**
 - Palpate for bony abnormality (Enophthalmos; eye sinking inside) In this case, you need to fix the floor. Put an implant.



Diagnosis: blowout fracture.
Important modality for investigation:
CT scan

- Enophthalmos is a backward displacement of the globe. It is a feature of an orbital 'blowout fracture'.
- ◆ Damage to the orbit itself (a blow-out fracture) is suspected if the following signs are present:
 - Emphysema (air in the skin which crackles when pressed) derived from a fractured sinus.
 - Limitation of eye movements, particularly on up-gaze and downgaze, due to trapping of the inferior rectus muscle by connective tissue septa caught in the fracture site in the inferior orbital floor, the wall most commonly fractured.
 - Subsequently the eye may become recessed into the orbit (enophthalmos).
 - If the lid margin is cut at the medial canthus it is important to determine if either of the lacrimal canaliculi is severed. This will cause epiphora if untreated.
- If a blow-out fracture is suspected, a CT scan will delineate the bony and soft- tissue injury. If this is not possible then plain orbital radiographs are performed.
- When evaluating orbital fractures, focus on the following exam findings (Ophtho-book) from team 435:
 - Vision, color: Make sure the optic nerve isn't involved.
 - Extraocular movements: Usually decreased from swelling or muscle contusion, but make sure there isn't any gross muscle entrapment. If concerned, you can perform forced ductions. This involves pulling on the eye with forceps to see if the eye is mobile.
 - Proptosis: Measure the degree of proptosis or enophthalmos using the Hertel ophthalmometer (a fancy ruler).
 - Palpate: Feel along the orbital rim for step-off fractures and subcutaneous emphysema (air crepitus).
 - Sensation: Check sensation of the V1 and V2 sensation on the forehead and cheek. V2 runs along the orbital floor and can be damaged with floor fractures



Diagnosis: blowout fracture.
Complains: decreased vision & decreased movement.

• Lid Laceration

- ◆ Can result from sharp or blunt trauma.
- ◆ Rule out associated ocular injury.
- ◆ Treatment:
 - Surgery (approximate the lids and close them following normal anatomy), If approximation is not following the normal anatomy: patient will have problems (the lids will be deformed, tearing won't be appropriate, and the eye will be prone to infections).
 - This requires careful apposition and suturing, particularly if the lid margin is involved, to retain the lid contour. If one of the lacrimal canaliculi is damaged an attempt can be made to repair it, but if repair is unsuccessful, usually the remaining tear duct is capable of draining all the tears. If both canaliculi are involved, an attempt at repair should always be made.



Eye is relatively intact. The injury is in the lid.

- You need to know the anatomy so you can close it well. If you do not close it well, the patient will have subsequent dryness and corneal infection.

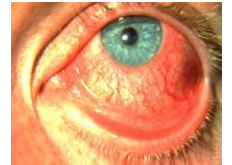
Red eye

- **Relevance:**

- ◆ Frequent presentation to GP.
- ◆ Must be able to differentiate between serious vision threatening conditions and simple benign conditions.

- **Red eye:**

- ◆ Refers to hyperemia of the superficially visible vessels of the conjunctiva, episclera, or the sclera.
- ◆ Caused by disorders of these structures themselves, or of adjacent structures like the eyelids, cornea, iris, and ciliary body.



- **Differential diagnosis of red eye**

- ◆ Conjunctival:
 - Blepharo-conjunctivitis.
 - Bacterial conjunctivitis.
 - Viral conjunctivitis.
 - Chlamydial conjunctivitis.
 - Allergic conjunctivitis.
 - Toxic/chemical reaction.
 - Dry eye.
 - Pinguecula/pterygium.
- ◆ Lid diseases:
 - Chalazion.
 - Sty.
 - Abnormal lid function.
- ◆ Corneal disease:
 - Abrasion.
 - Ulcer.
- ◆ Foreign body.
- ◆ Dacryoadenitis.
- ◆ Dacryocystitis.
- ◆ Masquerade syndrome.
- ◆ Carotid and dural fistula.
- ◆ Acute angle glaucoma.
- ◆ Anterior uveitis.
- ◆ Episcleritis/scleritis.
- ◆ Subconjunctival hemorrhage.
- ◆ Factitious.

• **Blepharitis** [extra from the book](#)

- ◆ Adults > children.
- ◆ Inflammation of the lid margin and eye lashes.
- ◆ Frequently associated with styes (is an exquisitely painful abscess of an eyelash follicle. Treatment requires the removal of the associated eyelash and application of hot compresses).
- ◆ Meibomian gland dysfunction
- ◆ Chalazion is secondary to blepharitis that results when meibomian gland is obstructed and the gland swollen (inflamed/causing granuloma).
- ◆ Lid hygiene, topical antibiotics, and lubricants are the mainstays of treatment:
 - Lid hygiene (cleaning the eye after mascara and eyeliner is important).
 - Topical antibiotics to treat the blepharitis and prevent the recurrent chalazion.
 - Lubricants.



Scales around the eye lashes.



Swelling of the upper eyelid.

Diagnosis: chalazion
Treatment: hot compressors;
If no response within 6
months, incision & drainage
should be done.



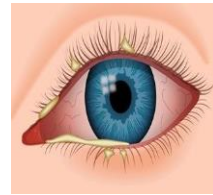
Diagnosis: Stye
Treatment: topical antibiotics,
incision & drainage.

• **Bacterial Conjunctivitis** [extra from the book](#)

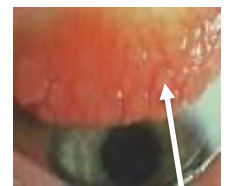
- ◆ Signs & symptoms:
 - Redness.
 - Tearing.
 - Foreign body sensation.
 - Burning.
 - Stinging.
 - Photophobia.
 - Mucopurulent or purulent discharge.
 - Lid and conjunctiva maybe edematous.
 - Papillary reaction.
- ◆ It affects both adults and children.
 - Ophthalmia Neonatorum (bacterial conjunctivitis in newborns).
- ◆ Organisms:
 - Streptococcus pneumoniae, Hemophilus influenzae, and staphylococcus aureus and epidermidis.
- ◆ Management:
 - Conjunctival swab for culture, especially in newborns.
 - Topical broad-spectrum antibiotics “Fluoroquinolones:(ofloxacin, levofloxacin)”.



Redness with copious secretions.



Diagnosis: bacterial
conjunctivitis or blepharitis
Treatment: topical antibiotics,
warm compressors & lid hygiene.



Papillae

• **Viral Conjunctivitis**

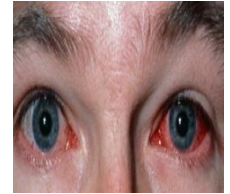
- ◆ Signs & symptoms:
 - Acute, watery red eye with soreness, foreign body sensation and photophobia.



- Conjunctiva is often intensely hyperemic; Also, there may be **follicles**, hemorrhages, inflammatory membranes and **an enlarged pre-auricular lymph node**.

◆ **Etiology:**

- The most common cause is **an adenoviral infection** (it is highly contagious and frequently occurs in epidemics).
- In history, they will tell you they have URTI or have contacted with someone with red eye.



◆ **Treatment:**

- No specific therapy but **cold compresses** are helpful & lubricating drops.
- Antihistamine drops if itching is present. If there is a severe inflammation, we will give topical steroids.

Papillae	Follicles
Bacterial & allergic	Viral, chlamydial & toxic
Red dots of varying size (red due to central vessel).	Avascular, white nodules filled with lymphocytes.

● **Allergic Conjunctivitis** [extra from the book](#)

- ◆ Encompasses a spectrum of clinical condition.
- ◆ All associated with the hallmark symptom of **itching**.
- ◆ There is often a history of rhinitis, asthma and family history of **atopy** (Atopy refers to the genetic tendency to develop allergic diseases such as allergic rhinitis, asthma and atopic dermatitis (eczema)).
- ◆ Signs & symptoms:
 - It may include mildly red eyes, **watery discharge, itching**, chemosis, **papillary hypertrophy** and giant papillae.
- ◆ Treatment:
 - It consists of **cold compresses**, antihistamines, non-steroidal, mast cell stabilizers, topical corticosteroids (should be given in severe allergy under supervision to avoid developing the steroid side effects, most importantly glaucoma and cataract) and cyclosporine.



Papillae

● **Chlamydial Conjunctivitis**

- ◆ Usually occurs in sexually active individuals with or without an associated genital infection.
- ◆ **Signs and symptoms:**
 - Conjunctivitis usually unilateral with tearing, foreign body sensation, lid crusting, conjunctival (**profuse**) discharge and follicles (**a mucopurulent follicular conjunctivitis**).
- ◆ There is often non-tender preauricular node.
- ◆ Treatments requires **oral** tetracycline or azithromycin.



Now let's recap the difference between the types of conjunctivitis:

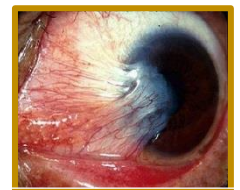
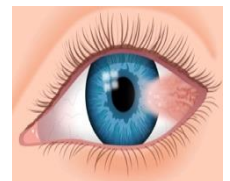
Bacterial conjunctivitis	Viral conjunctivitis	Allergic conjunctivitis	Chlamydial conjunctivitis
Mucopurulent discharge + Papillae	Watery discharge + Follicles + tender palpable Preauricular LN +history of URTI	Watery discharge + Papillae + nasal congestion + sneezing	Unilateral + Mucopurulent discharge + Follicles + Non tender palpable Preauricular

- **Dry Eye** [extra from the book](#)

- ◆ Common in our area.
- ◆ There are primary and secondary causes.
- ◆ Symptoms
 - Burning or foreign body sensation.
 - Tearing.
 - Usually bilateral.
- ◆ Etiology
 - Idiopathic.
 - Collagen vascular diseases (the commonest is rheumatoid arthritis).
 - Conjunctival scarring.
 - Infiltration of the lacrimal gland.
 - Vitamin A deficiency.
 - Drugs: Isotretinoin (Roaccutane).
- ◆ Treatment
 - Artificial tears or ointments (it requires long-term treatment).
 - In severe cases it may be necessary to occlude the puncta with plugs, or more permanently with surgery, to conserve the tears.

- **Pterygium**

- ◆ Extension of conjunctiva, invading the cornea (Pterygia are wing-shaped and located nasally, with the apex towards the cornea, onto which they progressively extend).
- ◆ The exact cause is unknown but may be secondary to sun exposure and dryness. prevention with sunglasses and lubricating with eye drops.
- ◆ Treatment is mostly surgery, but if it is small, we usually don't interfere because of the high recurrence.
 - Indications for surgery (cutting & removal):
 - If it obstructs the vision by involving the visual axis.
 - Suspicion of malignancy (squamous cell carcinoma).
 - If it causes astigmatism.
 - Cosmetic (if large)



Conjunctiva & fibrovascular membrane are growing toward the cornea.

Indications for surgery:

- Affecting the vision by going to the visual axis.
- For cosmetics.

- **Ectropion**

- ◆ Ectropion is an eversion of the eyelid away from the globe (sagging of the eyelid).

- ◆ Causes:

- Age - related orbicularis muscle laxity.
- Scarring of the periorbital skin.
- Seventh nerve palsy.



from the

- ◆ Symptoms:

- Dryness which increases the risk of corneal defect.
- Redness.
- Excessive tearing.

- ◆ Treatment:

- **Surgery** by suturing the eyelid (Blepharoplasty).

- **Trichiasis**

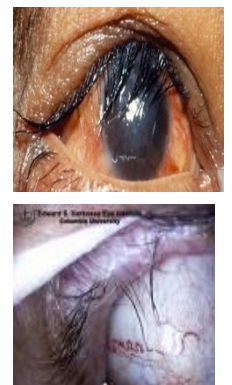
- ◆ Eyelashes are inverted toward the eye (globe) & rubbing against the cornea which causes irritation & abrasion.

- ◆ If it is 1 or 2 lashes, we call it trichiasis. If the whole lid edge is inverted, we call it entropion.

- ◆ Most of the time it is secondary to old trachoma in our area, which is a parasitic infection.

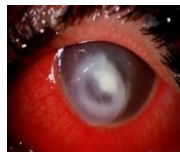
- ◆ Treatment:

- In trichiasis, we do ablation; while in entropion we correct it by surgery.



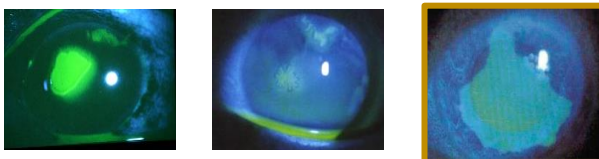
- **Infectious keratitis**

- ◆ Also known as corneal ulcer.



Corneal opacity

- **Corneal abrasion**



- **HSV dendrites** [extra from the book](#)

- ◆ Primary infection by HSV1 is usually acquired early in life by close contact such as kissing.

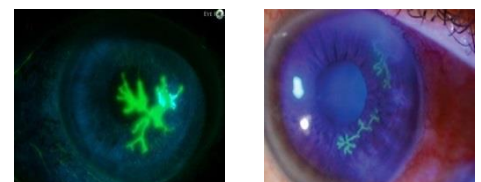
- ◆ The pathognomonic appearance is of a dendritic ulcer.

- ◆ Symptoms:

- Fever.
- Vesicular lid lesions.
- Follicular conjunctivitis.
- Pre-auricular lymphadenopathy.
- Very red, swollen & painful eye.

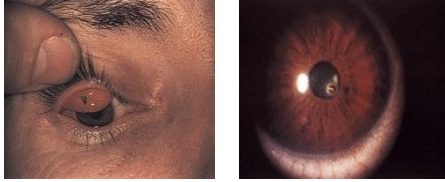
- ◆ Management:

- **Fluorescein staining** to confirm (dendritic ulcer seen on exam) HSV type 1 (always with the eye HSV-1).



- Topical antiviral “Acyclovir”.
- Topical steroids **must not** be given to patients with a dendritic ulcer, since they may exacerbate the disease and cause extensive corneal ulceration.

- **Foreign Body**



- **Nasolacrimal Obstruction**

- ◆ It leads to **dacryocystitis** (inflammation and swelling of lacrimal sac), mostly due to secondary to nasolacrimal obstruction.
- ◆ If the lacrimal **gland** gets affected, we call it: dacryoadenitis.
- ◆ **Symptoms:**
 - **Pain.**
 - **Redness.**
 - **Swelling over the innermost aspect of the lower eyelid** (medial side of the orbit).
 - Tearing.
 - **Discharge.**
- ◆ **Organisms:**
 - Staph aureus, streptococcus, and diphtheroids.
- ◆ **Treatment:**
 - Systemic antibiotic until the redness subsides, then surgical drainage to open the lacrimal duct (DCR surgery) “dacryorhinostomy”.
 - It should not be done immediately while the eye is injected & inflamed because it will cause bleeding & subsequent obstruction.



- **Conjunctival tumor (melanoma)**

- ◆ It is lethal & can metastasize to the liver.
- ◆ Biopsy, to achieve a definitive diagnosis, may be required.



- **Iritis**

- ◆ Subtype of uveitis.
- ◆ It is associated with TB.
- ◆ Inflammation of the iris, accompanied by increased vascular permeability, is termed iritis or anterior uveitis. White cells circulating in the aqueous humor of the anterior chamber can be seen with a slit lamp. Protein, which also leaks into the anterior chamber from the blood vessels, is picked out by its light-scattering properties in the beam of the slit lamp as a ‘flare’.

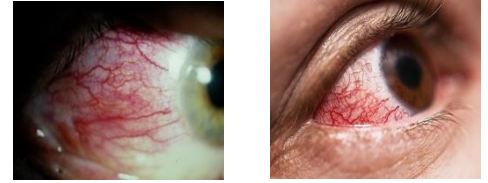


Hypopyon

White deposits in the cornea (keratic precipitates) which are WBC and macrophages attached to the back of the cornea.

• Episcleritis

- ◆ The outer coats covering the eye: conjunctiva then the sclera, between them is episclera, a fine membrane containing blood vessels. Sometimes it gets inflamed.
- ◆ **Symptoms:**
 - It can be localized (sectorial) or diffused redness.
 - Often asymptomatic (it may or may not be painful. There is no discharge, and the vision is not reduced).
 - Usually self-limited.
- ◆ **Etiology:**
 - Sometimes it is associated with RA or gout. Thus, they need to be investigated.
- ◆ **Treatment:**
 - Topical or systemic NSAIDs.



• Scleritis

- ◆ This is a more severe condition than episcleritis, and may be associated with the collagen vascular diseases, most commonly rheumatoid arthritis, also SLE.
- ◆ **Symptoms:**
 - Pain may be severe with tenderness (unlike episcleritis).
 - Tearing.
 - Photophobia.
 - Maybe localized, diffuse or associated with nodules.
 - Redness.
 - Characteristically the affected sclera is swollen.
- ◆ **Etiology:**
 - 30 to 60% associated with systemic disease e.g. RA.
- ◆ **Complications:**
 - It can result in scleral necrosis (scleromalacia perforans). scleral thinning, sometimes with perforation, keratitis, uveitis, cataract formation and glaucoma.
- ◆ **Treatment:**
 - May need systemic steroids (methotrexate or mycophenolate).
- ◆ Test: phenylephrine > cause vasoconstriction: bleached > conjunctivitis. not > scleritis.
- ◆ You need to know the difference between scleritis & episcleritis (there is a more severe pain along with tenderness in scleritis as well as slight bluish discoloration of the sclera indicating deep inflammation).

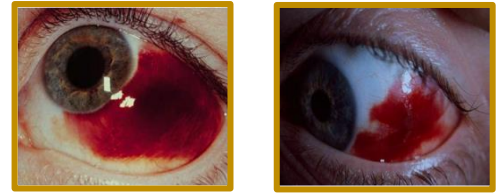


• Subconjunctival Hemorrhage

- ◆ Subconjunctival hemorrhage is bright red due to exposure to ambient oxygen levels and obscures the white of the sclera.
- ◆ Usually asymptomatic.
- ◆ Blood underneath the conjunctiva, often in a sector of the eye.



- ◆ Etiology:
 - Valsalva (strong coughing or straining).
 - Traumatic (mostly).
 - Hypertension.
 - Bleeding disorder (serious, sometimes leukemia or lymphoma cases present with subconjunctival hemorrhage).
 - Idiopathic.
- ◆ If spontaneous & recurrent, it needs to be investigated.
- ◆ Treatment:
 - Mostly it's self-limiting, but most importantly is to identify the cause, it could be the earliest sign of leukemia.



Diagnosis: subconjunctival hemorrhage.
Causes: Trauma & bleeding disorders.

● Red Eye Treatment Algorithm

- ◆ **History:**
 - Trauma.
 - Contact lens wearer.
 - Severe pain/photophobia.
 - Significant vision changes.
 - History of prior ocular disease.
- ◆ **Exam**
 - Visual acuity.
 - Ocular motility.
 - Abnormal pupil.
 - Ocular tenderness.
 - White corneal opacity.
 - Increased intraocular pressure.



YES??! ⇒ refer **urgently** to ophthalmologist

Is it conjunctivitis?

- ◆ **History:**
 - Itching? → allergy, viral.
 - Exposure to person with red eye → viral
 - URTI → viral.
 - Past history of conjunctivitis → allergy.
 - Discharge with morning crust → allergy, chlamydial.
 - Exposure to drug → allergy.
- ◆ **Signs:**
 - Discharge → bacterial, chlamydia (depends on the nature of discharge).
 - Lid and conjunctival edema → bacterial.
 - Conjunctival redness.
 - Preauricular lymph node → viral.
 - Facial or eye lid vesicles → HS.

Questions:

1. A 7-year-old child with nasal congestion and sore throat he came complaining of tearing and red eye with follicular conjunctiva, preauricular lymph node was swollen also, what is the most likely organism?
 - A. Chlamydia trachomatis.
 - B. Staphylococcus aureus.
 - C. Adenovirus.
2. A 60 years-old male who has a history of inferior orbital trauma. What is the most common presentation?
 - A. Decrease corneal sensitivity.
 - B. Decrease sensation in the cheek.
 - C. Inability to adduct the eye.
 - D. Inability to look down in adduction eye.
3. A female patient came to ER after a splash of chemical detergent into her eyes. She opens her eyes with difficulty and is complaining of severe pain. What is the main initial treatment?
 - A. Topical antibiotic.
 - B. Systemic antibiotic.
 - C. Eye irrigation.
 - D. Topical steroid.
4. An 18-year-old patient presented with vertical diplopia after tennis ball trauma on his left eye. The Ex reveals enophthalmos with hypotropia and limited upward movements on the left eye. Which one of the following is the initial recommended investigation?
 - A. SCAN ultrasound.
 - B. SCAN ultrasound.
 - C. MRI.
 - D. CT scan orbit.
5. 14 years old child presented with red right eye after trauma that happened 3 days ago. On examination there was cells in anterior chamber and keratic precipitates, what is the management?
 - A. Topical corticosteroid and cycloplegic.
 - B. Topical antibiotic and cycloplegic.
 - C. Systemic corticosteroid and cycloplegic.
 - D. Systemic antibiotic and cycloplegic.
6. A 20- -year- -old male with history of runny nose over last few days presented with acute eyelid swelling, proptosis, and limitation of extraocular motility. What is the initial treatment of choice?
 - A. Antibiotic eye drops.
 - B. Oral systemic antibiotic.
 - C. Surgical intervention.
 - D. Intravenous antibiotic.

7. A 65-year-old male admitted to ICU with septicemia. after 3 days of IV antibiotics. He complains of acute loss of vision in his left eye. Which of the following is the most likely diagnosis?
- A. Retinal vein occlusion.
 - B. Retinal detachment.
 - C. Endophthalmitis.
 - D. Acute glaucoma.

Answers: 1:C 2:B 3:C 4:D 5:A 6:D 7:C

Good luck!

High yield summary from Master the boards

Viral conjunctivitis	Bacterial conjunctivitis
Bilateral	Unilateral
Watery discharge	Purulent, thick discharge
Easily transmissible	Poorly transmissible
Normal vision	Normal vision
Itchy	Not itchy
Preauricular adenopathy	No adenopathy
No specific treatment	Topical antibiotic

	Conjunctivitis	Uveitis	Glaucoma	Abrasion
Presentation	Itchy eye, discharge	Autoimmune disease	Pain	Trauma
Eye finding	Normal pupils	Photophobia	Fixed midpoint pupil	Feels like sand in my eye
Most accurate test	Clinical diagnosis	Slit lamp examination	Tonometry	Fluorescein stain
Best initial therapy	Topical antibiotics	Topical steroids	Acetazolamide, mannitol, pilocarpine, laser trabeculectomy	No specific therapy; patch not clearly beneficial