OPHTHALMOLOGY SUMMARY

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"Strabismus, glaucoma and uveitis are not included in this summary"

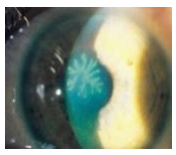
Optic and refraction

Hypermetropia (Long-sightedness)	• Rays of light focus behind the retina causing blurry vision of near objects ± distant objects (low optical power) • Causes: normal development of the eye (physiologic), short eyeball, ectopia lentis, post-operative aphakia, +ve family history. • Most them born with it, but it may not cause vision problems until they get older. • Complication: angle-closure glaucoma & strabismus or amblyopia (in children). • Corrected by convex lens (converging lens), contact lens or refractive surgery.
Myopia (Short-sightedness)	• Light focuses in front of retina causing blurry vision of distant objects (high optical power). • Usually presents in 1st or 2nd decades ,rarely begins after 25, except in DM or cataract. • Causes: Keratoconus, cataract, DM, long eyeball. • Complication: retinal tear or detachment, macular hole, open-angle glaucoma. • Corrected by concave lens (diverging lens), contact lens or refractive surgery.
Astigmatism	• The optical power in different plans is not equal due to non-spherical cornea or lens. • Non-spherical cornea or lens >> different points of focus on the retina >> difficult to see fine details, either close up or from a distance. • Corrected with a cylindrical lens (planoconvex or planoconcave) or refractive eye surgery.
Presbyopia	• A normal aging process (usually after age 45), due to reduced accommodation ability. • The focus behind the retina >> trouble seeing things up close (specifically reading). • Needing to hold reading materials farther away to focus on them. • Presbyopia gets worse over time, but it usually stops getting worse after age 65. • Occur earlier in hypermetropes than myopes.

- Emmetropia (normal vision): light from distant object focus on the retina with the eye at rest "not accommodating ".
- The visible part of the EM spectrum lies between the wavelengths 390nm & 760nm.
- Refractive component of the eye (focusing power): 2/3 cornea, 1/3 lens (increase with accommodation).
- The most common symptom in refractive errors is blurry vision.
- Aniseikonia: different image size between the 2 eyes as perceived by the patient.
- Anisometropia: different refractive power between the 2 eyes (usually > 2 Diopter).

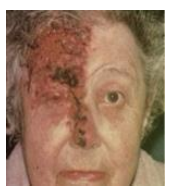
Cornea & sclera

Herpes simplex keratitis



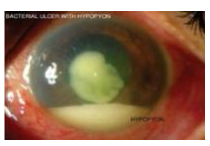
- HSV 1 is the most common cause.
- Primary infection usually acquired in childhood (may as conjunctivitis) >> resolution & latency of the virus in the trigeminal ganglion.
- Recurrent infection >> reactivation of latent virus (risk increases if the patient is debilitated (systemic illnesses, immunosuppression) and with stress.
- Pathognomonic: Dendritic ulcer, heals without scar (seen by fluorescein dye with blue light in slit lamp).
- May progress to stromal keratitis in severe cases (disciform keratitis) >> corneal edema & permanent scarring >> corneal graft may be needed.
- Treatment: Topical antiviral (Aciclovir), avoid topical steroid; it causes extensive ulceration.

Herpes zoster ophthalmicus



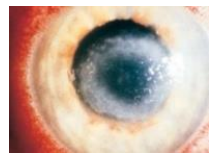
- Caused by HZV which is responsible for chickenpox.
- Ocular manifestation usually preceded by pain and vesicles in the distribution of ophthalmic decision of trig. nerve.
- Ocular problems (lid swelling, keratitis, iritis, secondary glaucoma) are more likely if the nasociliary branch is affected (signaled by vesicles at the root of the nose) >> Hutchinson's sign
- Treatment: Oral aciclovir is effective in reducing post-infected neuralgia if is given within 3 days of vesicles eruption, topical steroid for ocular disease and antibacterials to cover secondary infection.

Bacterial keratitis (90% of corneal infection)



- Prime pathogens: staph.epidermis, staph.aureus, strep.pneumoniae.
- S&S: severe pain, purulent discharge, ciliary injection, visual loss, **hypopyon** (WBC in anterior chamber), white corneal opacity.
- Risk factors: keratoconjunctivitis sicca, breach in the corneal epithelium, contact lens, prolonged use of topical steroids.
- Treatment: topical broad-spectrum antibiotics (Fluorquinolones), or combined antibiotics.

Acanthamoeba keratitis

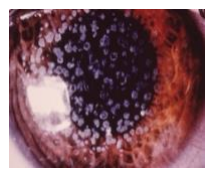


- Caused by protozoa.
- Risk factor: contact lens use (even in immuncomptenet).
- Cause extremely painful keratitis & ring-shaped infiltration or abscess.
- Treatment: Topical chlorhexidene and propamidine for months, may end with corneal graft.

Fungal keratitis

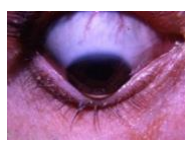
- More common in warmer climates.
- Should be considered in lack of response to antibacterial treatment, trauma by plants, prolonged steroid use.
- Cause corneal opacity that appear fluffy.
- Treatment: Topical and systemic anti-fungal drops (natamycin).

Corneal dystrophies



- Rare inherited disorder, but relatively common in Jordan due to high consanguinity rates.
- Various substances build up in the cornea affecting corneal transparency.
  - ✓ Anterior dystrophy: involves epithelium, cause recurrent corneal erosion.
  - ✓ Stromal dystrophy: cause visual loss due to corneal opacities.
  - ✓ Posterior dystrophy: involves endothelium, cause gradual visual loss due to corneal edema.
- Treatment: no treatment in asymptomatic, keratoplasty in symptomatic severe cases.

Keratoconus



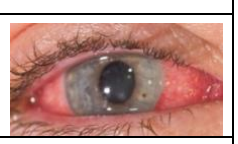
- Sporadic disorder, thinning of the center of cornea leading to ectasia and cone-shaped cornea (painless).
- Keratoconus causes visual loss secondary to progressive irregular myopia & astigmatism.
- Diagnosed by corneal topography.
- Munson's sign: V-shape lower eyelid.
- Modalities of treatment for KC:
  - ✓ Spectacles or contact lenses.
  - ✓ Corneal cross linking (linking of the stromal collagen by exposing UV radiation), stops KC progression.
  - ✓ Intra stromal corneal rings (reduce astigmatism).
  - ✓ Corneal graft
    - Avascular host cornea provides an immune-privileged site for grafting, success rate 80%
    - No need for HLA matching, extracted within 24h after death, can be grafted within 2 weeks from extraction.
    - Use non-absorbable sutures (16 sutures) for 1 year.
    - Topical steroids eye drops are used post-operation to prevent graft rejection.

Note: The conjunctiva & cornea are protected against infection by:

- Blinking.
- Washing away of debris by the flow of tears.
- The antibacterial properties of the tears.
- Entrapment of the foreign particles by mucus.
- The barrier function of the corneal epithelium. Neisseria gonorrhoeae is the only organism that can penetrate the **intact** epithelium

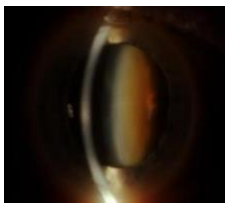
Indications of corneal graft (keratoplasty): keratoconus, cataract, traumatic scar, herpes infection, corneal dystrophy, decompensated cornea in old age.

Complication of corneal graft: rejection (most common, type IV hypersensitivity reaction), recurrence, cataract, astigmatism, endophthalmitis.

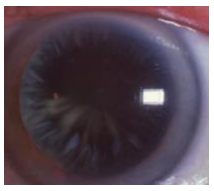
Episcleritis	Scleritis
Inflammation of superficial layer of the sclera causing mild discomfort with segmental redness of the eye 	Cause intense ocular pain with generalized redness and swelling of the sclera 
Rarely associated with systemic diseases	Usually associated with collagen vascular diseases, most commonly RA
	Complication: Scleral thinning (scleromalacia), sometime with perforation/ Keratitis/ Uveitis/ Cataract/ Glaucoma
Usually self- limiting Topical anti-inflammatory if symptom persist	Mild: Topical steroid & oral NSAID Moderate to severe: High doses of systemic steroids or cytotoxics

Lens

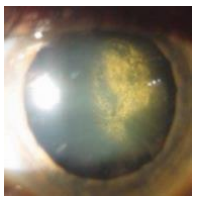
Cataract



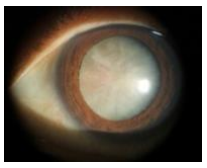
Nuclear cataract



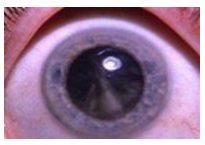
Cortical cataract



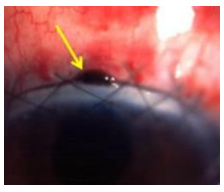
Post. subcapsular



Mature cataract



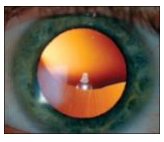
Immature cataract



Iris prolapse

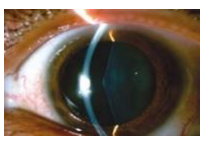
- It is the opacification of the lens of the eye (becomes cloudy causing hazy image).
- The commonest cause of treatable blindness worldwide.
- **Types:**
  - **Nuclear**: the most common type, cloudiness in the center of the lens.
  - **Cortical**: opacification of cortex of the lens, opaque cortical spokes (fissuring).
  - **Posterior subcapsular**: involve the back of the lens adjacent to the capsule, RF: prolonged topical steroid.
  - **Immature vs mature** cataract: Immature cataract has some transparent protein content.
  - **Congenital** cataract: lamellar, polar, sutural.
- **Causes:**
  - Age-related cataract: the most common cause (senile cataract); due to cumulative exposure to smoking, UV radiation, elevated blood sugar.
  - Ocular conditions: trauma, topical steroids, uveitis, high myopia, ocular surgery or tumor.
  - Systemic diseases: DM, galactocemia, hypocalcemia, fabry disease, atopic dermatitis, myotonic dystrophies, radiation, congenital cataract, TORCH infection, Down syndrome, Lowe syndrome, systemic drugs (steroids, chlorpromazine).
- **Symptoms & signs:**
  - Painless progressive loss of vision, change in refraction (myopia), glare, amblyopia in infant.
  - Decreased visual acuity & lens opacity seen on slit-lamp.
  - Cataract appears black against red reflex (especially if mature).
  - Leukocoria like in congenital cataract, may lead to amblyopia in children.
- **Type of surgery:**
  - Indication: cataract reducing the quality of life, no need to wait for cataract ripening
  - Phacoemulsification: preferable, 2 small incisions at the limbus, no sutures, emulsify the lens into liquid by the energy of ultrasound wave, early rehabilitation (recovery).
  - Extra-capsular cataract extraction (ECCE): extended incision at the limbus and must be sutured, useful when dealing with very hard cataract.
  - Intra-capsular cataract extraction (ICCE): larger incision, high rate of complications.
- **Post-operative care:**
  - Short course of steroid and antibiotic drop.
  - Spectacle or multifocal IOL for near vision since the patient cannot accommodate.
- **Complication of cataract surgery:**
  - **Posterior capsule opacification**: most common (20%), Tx: ndYAG laser.
  - **Vitreous loss** (risk of glaucoma and retinal traction), Tx: vitrectomy at operation time and delay of IOL placement.
  - **Iris prolapse**: due to inadequate suturing or inappropriate management of vitreous loss, Tx: excise prolapsed iris & resuture incision.
  - **Endophthalmitis**: rare (0.3%) but most serious, within few days, presents with painful red eye & reduced visual acuity & hypopyon, Tx: intravitreal broad-spectrum antibiotic.
    - Staph.epidermidis, staph.areus, pseudomonas.
  - **Astigmatism** by tight sutures.
  - **Macular edema**: Tx: topical NSAIDs & steroids
  - **Retinal detachment**

Ectopia lentis



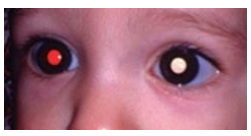
- Weakness of the zonules causes lens displacement.
- The lens become rounder and myopic.
- Etiology: trauma (most common), homocystinuria (displaced downward), Marfan syndrome (displaced upward).

Anterior lenticonus



- Abnormal lens shape, the anterior curvature of the anterior part is increased centrally.
- Seen in Alport's syndrome (AR, deafness & nephropathy)

Leukocori

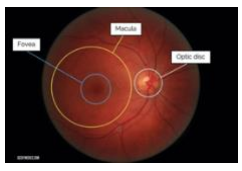


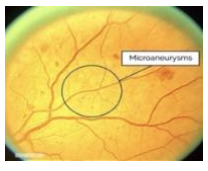
- Abnormal white reflection from the pupil (instead of red).
- Seen in retinoblastomas, congenital cataracts, retinal detachment, glaucoma & corneal dystrophy.

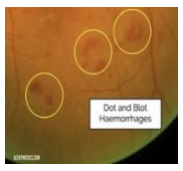
Retina

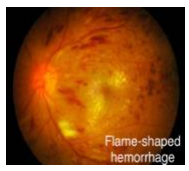
Diabetic retinopathy

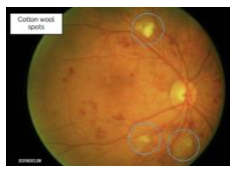
- It is a progressive microangiopathy of the retinal blood vessels caused by chronic hyperglycemia.
- The most common cause of moderate to severe vision loss between ages 25 and 74 years.
- Retinal blood supply: central retinal artery and choroidal circulation.
- Risk factors: duration of dm, poor control of dm, HTN, hyperlipidemia, nephropathy, obesity, pregnancy, smoking.
- 2 stages/types:
  - **Nonproliferative diabetic retinopathy NPDR** (microvascular leakage):
    Hyperglycemia >> loss of pericytes >> weak retinal vessels leading to:
    1. Microaneurysms this is the first sign.
    2. Increase vascular permeability >> lipid & protein leakage >> hard exudate & retinal edema.
    3. Other signs: dot & blot hemorrhage (microaneurysms rupture in deep layers), flame-shaped hemorrhage (retinal capillaries rupture in superficial layers), cotton-wool spots (accumulation of dead nerve cells, fluorescein angio shows no capillary perfusion), venous changes (heading and looping), Intraretinal microvascular abnormalities IRMAs (like abnormal branching adjacent to the areas with non perfusion).
  - **Proliferative diabetic retinopathy PDR** (microvascular occlusion):
    Basement membrane thickening, endothelial cell damage, deformed RBCs, platelet stickiness & aggregation >> vessels occlusion >> retinal hypoxia >> **VEGF** release >> new vessel formation (neovascularization) "hallmark"
    1. These new vessels form at or near the optic disc (NVDs), anywhere in the retina (NVEs) or at iris (NVIs)
    2. Other signs: Vitreous hemorrhages, per-retinal & subhyloid hemorrhages (breaking of the new vessels), traction retinal detachment (due to contraction of the fibrous component of the new vessels), Neovacular glaucoma.
- Classification based on severity:
  - **Mild NPDR**: microaneurysms only.
  - **Moderate NPDR**: Microaneurysms and/or dot and blot hemorrhages in more than 1 quadrant, soft exudate, Cotton wool spots or venous beading in one quadrant.
  - **Severe NPDR**: microaneurysms in 4 quadrants or venous changes in 2 quadrants or IRMA in one quadrant.
  - **PDR**: neovascularization or Vitrous or pre-retinal hemorrhage.
  - **Macular edema:** intraretinal fluid (edema) and retinal thickening involving the macula, diagnosed by OCT.
- **Treatment**:
  - Mild & moderately NPDR: Good diabetic control & control associated diseases & regular follow-up (9 months for mild and 6 months for moderate).
  - Significant macular edema: anti-VEGF & localized laser photocoagulation at the point of leakage.
  - Sever NPDR: pan-retinal photocoagulation & anti-VEGF & close follow-up every 4 months.
  - PDR: pan-retinal laser photocoagulation & anti-VEGF.
- **Complications**:
  - Vitreous hemorrhage.
  - Tractional retinal detachment.
  - Rubeosis iridis: Neovascularization of the **iris** and drainage angle leading to increased IOP and progressive glaucoma (angle-closure).
  - Sudden visual loss (due to macular edema [mcc] or ischemia, vitreous hemorrhage, retinal detachment).

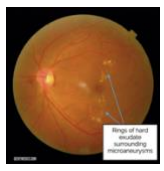


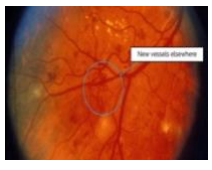
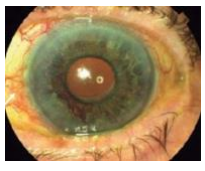






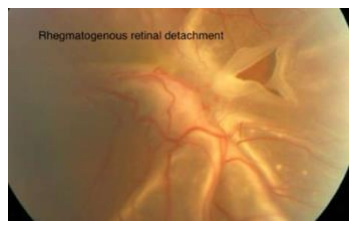




Retinal detachment

- Detachment of the neurosensory retina from the retinal pigment epithelium, types:



✓ **Rhegmatogenous retinal detachment** is the most common:
- Due to retinal tear > retinal fluid seeps into subretinal space > detachment.
- RF: trauma, intraocular surgery, myopia, increased age.

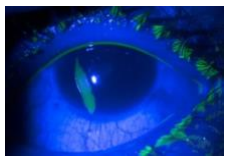
✓ **Traction retinal detachment:**
- By contracting fibrous tissue on retinal surface like in proliferative diabetic retinopathy.

✓ **Exudative retinal detachment:**
- Subretinal fluid exudate accumulation without retinal tears

- Symptoms: Prodromal symptoms (light flashes, floaters, no pain or red eye, scotoma, then sudden painless loss of vision).
- Management: surgical repair of the retina, vitrectomy, photocoagulation may be used.

Eye injuries

Corneal abrasions



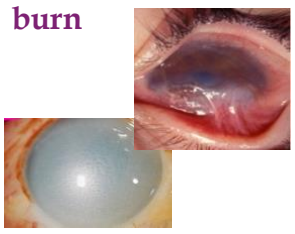
- Loss of epithelial layer of the cornea.
- Etiology: direct injury, prolonged contact lens wear, foreign body under the eyelid, …
- Symptoms: severe eye pain, photophobia, foreign body sensation, epiphora, normal visual acuity, normal pupillary reflex.
- Diagnosis: green staining defect on fluorescein examination.

Vision-threatening conditions:

■ Ocular chemical burns ■ Orbital compartment syndrome ■ Open globe injury ■ Traumatic hyphema

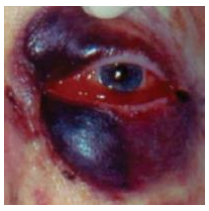
■ Vitreous hemorrhage ■ Retinal trauma ■ Optic nerve injury ■ Periocular injuries that threaten vision

Ocular chemical burn



- Eye contact with acid or alkali (alkali cause more severe damage than acid).
- Symptoms: decreased vision, moderate to severe eye pain, photophobia, conjunctival redness, blepharospasm (inability to open the eye), symblepharon (lid attached to the globe).
- In severe cases of alkali exposure, opacification of the cornea happens with white conjunctiva due to ischemia.
- Management: continuous irrigation (30-60 min) with water or saline, morgan lens can be used, steroids & cyclopentolate.

Orbital compartment syndrome

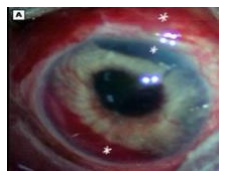


- Orbital compartment pressure increased causing compressive optic neuropathy and ischemia.
- Symptoms: proptosis, afferent pupillary defect, peri-orbital swelling/hemorrhage, eye pain, acute onset of decreased vision, decrease retropulsion, chemosis, subconjunctical hemorrhage.
- Most commonly due to retrobulbar hemorrhage caused by trauma.
- May cause irreversible vision loss within 1-2 hours.
- Tonometry shows increase in IOP, fundoscopy shows papilloedema.
- Management:
  - Lateral canthotomy and inferior cantholysis (do not delay the decompression).
  - Elevation of the head of the bed to at least 45 degrees & pain control.
  - Correction of any coagulopathy and/or cessation of anticoagulant therapy.
  - Prevent sudden increased IOP by cough suppression, Antiemetics therapy, stool softeners.
  - Hospitalization for definitive management of the underlying cause.

Penetrating injury to the eye

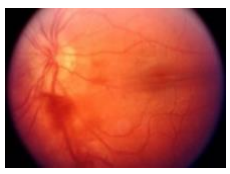
- Decrease visual acuity & afferent pupillary defect.
- Teardrop pupil, Seidel sign, decreased IOP.
- Uveal tissue and aqueous prolapse through the wound.
- Give prophylaxis antibiotic and tetanus prophylaxis, keep NPO.
- Rapid primary closure within 24 hours.

Blunt trauma to the eye



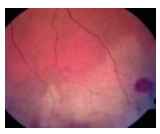
- Subconjunctival hemorrhage superiorly.
- Conjunctival laceration.
- Hyphema
- Iridodialysis superiorly (separation of the iris from the ciliary body due to blunt trauma).

Vitreous hemorrhage



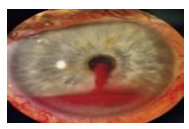
- It is extravasation of blood within or around vitreous body.
- Causes: PDR, retinal vein occlusion, retinal tear or detachment.
- Management: vitrectomy.

Commotio retinae



- Retinal edema after blunt closed globe injury.
- Asymptomatic or decrease visual acuity.
- Ophthalmoscopy shows retinal whitening with normal vessel +/- retinal hemorrhage.
- Exclude the presence of retinal break or detachment.
- Typically resolve without intervention (observation).

Hyphema



- Blood in anterior chamber results from a tears in the vessels of the ciliary body or iris.
- Pain, decreased visual acuity, photophobia, and anisocoria, increase IOP.
- MCC is traumatic, Rubuosis iridis is the mcc of non-traumatic.
- Management: monitoring of IOP, eye shield, limitation of activity, cycloplegia to manage pain, glucocorticoid eye drops to lower the risk of rebleeding. Or Surgical clot evacuation if it was: large & persistent or any complication happens.
- Complication: rebleeding, uncontrolled IOP, glaucoma, corneal staining blood.

Optic nerve injury (traumatic optic neuropathy)

- Causes decrease vision, red color desaturation, decrease color vision, afferent pupillary defect.
- Direct injury vs indirect injury (most common).

Periocular injuries that threaten vision

Head trauma can cause a carotid cavernous sinus fistula.

- Retinal vessel distention and high intraocular pressure.
- Mild proptosis and engorgement of the episcleral vessels.
- Chemosis.

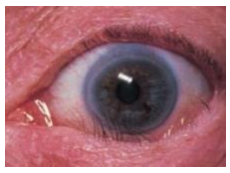
Serious condition associated with red eye: scleritis, angel- closure glaucoma, bacterial/viral keratitis, hyphema, hypopyon.

Eyelid & lacrimal system

Ptosis

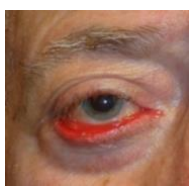
- Abnormally low position of upper eyelid, normally upper lid covers 1-2mm of upper limbus.
- Causes:
  - Mechanical; lid edema, lid scarring, lid lumps (hemangioma, tumor, infection, hematoma)
  - Disinsertion of lavetor muscle aponeurosis from its insertion on tarsus (mcc of acquired ptosis).
  - Neurological; 3rd nerve palsy, Horner syndrome.
  - Myogenic; myasthenia gravis, muscular dystrophy.
  - Congenital; mc is malformation of the levator palpebrae superioris muscle.
- Signs:
  - Palpebral aperture size reduction.
  - Lid creases are absent or in abnormal position.
  - Horner's (miosis, anhidrosis), 3rd nerve palsy (mydriasis, diplopia), myasthenia gravis (fatigue after repeated movement).
- Management: manage the underlying cause, otherwise do surgery.
- In children if visual axis is covered >> **amblyopia (lazy eye).**

Entropion



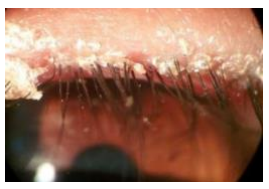
- Inturning of the lid margin and lashes into the globe, usually lower lid.
- Spasmodic Entropion: tightly closing the eye.
- Involutional Entropion: in elderly due to weakening of the lower lid retractors, so the preseptal part of the orbicularis muscle override the pretarsal muscle.
- Cicatricial Entropion: due to conjunctival scarring.
- Management:
  - Taping of lower lid and lubrication (short-term treatment).
  - Botulinum toxin into the palpebral part of orbicularis muscle.
  - Surgery.

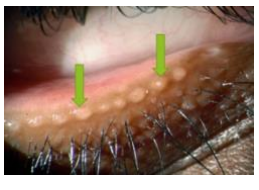
Ectropion



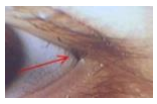
- Eversion of the lid away from the globe.
- Causes:
  - Age-related orbicularis muscle laxity.
  - 7th nerve palsy.
  - Scarring of the periorbital skin.
- Symptoms: epiphora due to decreased tear drainage, dehydration, irritable eye.
- Surgical management is an effective treatment & lubrication.

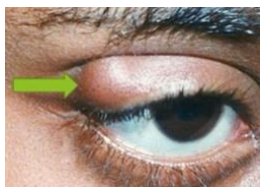
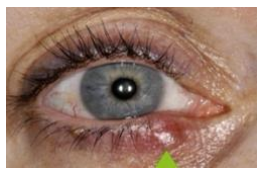
Blepharitis



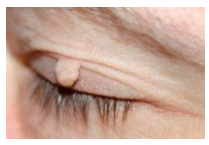


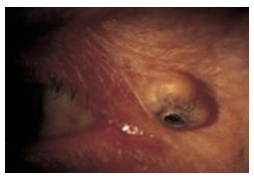
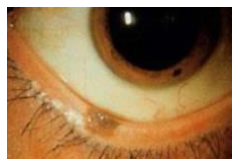
- Chronic inflammation of the lid margins, need long-term treatment.
- Associated with atopic eczema, seborrheic dermatitis & rosacea.
- Cause red, sore & itchy eye, worse in morning.
- **Anterior blepharitis:**
  - Inflammation concentrated along the eyelashes.
  - Associated with Staphylococcus overgrowth which can cause marginal keratitis (ulceration of the peripheral cornea).
  - Signs:
    - Scaling and redness of the lid margin.
    - Ulceration (Staph infection).
    - Collarettes formation (cylindrical dandruff)
    - Reduction in the eyelashes number.
  - Management:
    - Lid toilet with bicarbonate solution or baby shampoo; to remove the squamous debris.
    - Topical steroid.
    - Topical antibiotic (fusidic acid gel) in case of staph. infection.
- **Posterior blepharitis:**
  - Caused by meibomian gland dysfunction due to obstruction by squamous debris.
  - Signs:
    - Plugging of meibomian orifices.
    - Thickened, cloudy meibomian secretion.
    - Injection of the lid margin and conjunctiva.
  - Management:
    - Lid massage after hot bathing & artificial tear in case of dry eye.
    - Topical azithromycin drops.
    - Oral doxycycline or tetracycline.

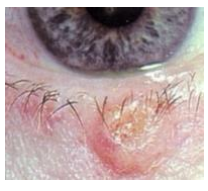
Trichiasis 	• Eyelashes are directed towards the globe with normal lid margin >> irritation and abrasion. • Associated with trachoma (chlamydia trachomatis) in developing world. • Treatment: epilation of the offending lashes, cryotherapy or electrolysis for recurrent cases.

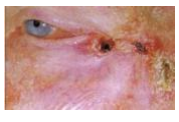
Chalazion 	• Lipo-granuloma within the tarsal plate due to meibomian gland obstruction. • Painless lid swelling usually resolves within 6 months. • If persistent >> incised and drainage.	**Hordeolum** 	• Internal hordeolum (abscess): painful abscess within meibomion gland. - Managed by drainage and topical antibiotics. • External hordeolum (stye): very painful abscess of eyelash follicle. - Managed by eyelash removal, hot compressor and topical antibiotic.

Molluscum contagiosum 	• Umbilicated lesion found at the lid margin caused by DNA pox virus. • Most common in childhood (<5 years) & early adolescence, male > female. • It causes irritation of the eye and small elevation of lymphoid tissue (follicular conjunctivitis). • Transmission: Direct skin contact, auto-inoculation, fomites. • Risk factors: immunosuppression, active atopic dermatitis, warm & humid climates. • Treatment: excision the lesion.

Squamous cell papilloma (skin tags) 	• Caused by HPV. • Fibrovascular core and thickened squamous epithelium. • Excised for cosmetic reasons.	**Xanthelasmas** 	• Lipid-containing lesion. • Usually bilateral. • Hypercholesterolemia. • Check blood cholesterol. • Excised for cosmetic reasons.

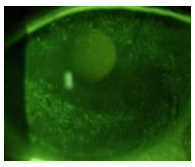
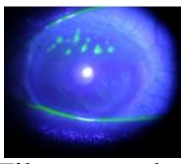
Keratocanthoma 	• Brownish fast-growing (3-6 weeks) lesion with a central crater, filled with keratin. • Do histology; may have a malignant feature. • Excision; spontaneous regression led to scar.	**Nevus (mole)** 	• Derived from naevus cell (altered melanocytes) • Can be pigmented or not. • No treatment is necessary.

Basal cell carcinoma 	• The most common malignancy of the eyelid (90%). • Slowly growing, locally invasive, non-metastasizing. • Painless nodule may be nodular, scaly or ulcerative (rodent ulcer). • RF: fair-skinned individuals, Hx of prolonged sun exposure, UV radiation. • Treatment: excision with safe margins, Mohs surgery, cryotherapy or radiotherapy. • Good prognosis.

Squamous cell carcinoma 	• More malignant & faster growing, metastasize to regional lymph nodes. • Hard nodule or scaly patch. • It can arise *de novo* or from actinic keratosis (premalignant lesion). • UV exposure is important risk factor. • Treatment: excision with safety margins.

Lacrimal system

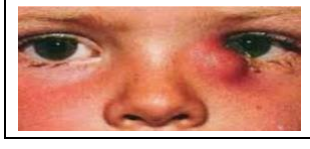
Lacrimal diseases	***Abnormalities of the lacrimal gland and system:** 1. Tear flow and evaporation. ▪ Aqueous deficient – dry eye (deficient lacrimal gland secretions), Causes: 1. Normal with age. 2. Sjögren's syndrome. ▪ Evaporative dry eye, causes: 1. Inadequate meibomian oil delivery. 2. Malposition of the globe or lid margin ▪ Inadequate mucous production, causes: 1. loss of goblet cells. 2. Drainage of tears. 2. Disorders of the tear drainage ▪ Obstruction of tear drainage (most common site is nasolacrimal duct) ▪ Infection - Dacrocystitis

Aqueous deficient – dry eye  **Punctate staining**  **Filamentary keratitis**	• Symptoms: - Grittiness, burning, photophobia, heaviness in the lids and ocular fatigue. - Symptoms worse in the evening - In severe cases: reduced visual acuity due to corneal damage. • Signs with fluorescein stain: - Early break up of the tear film after 5 seconds of blink suppression - Punctate staining of the eye with fluorescence will show small dots of fluorescein over the exposed corneal or conjunctival surface - Filamentary keratitis (tags of abnormal mucus). • Treatment: - Artificial tears, but if was severe: - Shielded spectacles to create humid environment around the eye. - Surgery: to occlude the puncta either temporarily or permanently, or to correct the position of the eye lids.

Sjogren's syndrome	• Chronic autoimmune diseases lead to deficient lacrimal gland secretions. • More common in older women. - Primary >> idiopathic - Secondary >> associated with other autoimmune disease like RA, SLE, scleroderma. • Diagnosis: - Decreased salivary and lacrimal functions. - T-cell infiltrates in minor salivary gland. - Anti-Rho and anti-La titers. • Management: artificial tears, shielded spectacles, puncta plugs or surgical occlusion, topical anti-inflammatory (cyclosporine).

Evaporative dry eye	**A. Inadequate Meibomian oil delivery (MGD):** - Extensive Meibomian gland obstruction > deficient tear film lipid layer > water loss from eyes. - Treatment as in posterior blepharitis. **B. Malposition of the globe or lid Margin:** - Ectropion - Lagophthalmos: Incomplete lid closure as in 7th CN palsy. - Proptosis - Infrequent blinking (Parkinson's) **Management:** - Correction of lid deformity - Artificial tears and lubricants - Local Botulinum toxin injection into the levator muscle in case of incomplete closure - Lateral Tarsorrhaphy

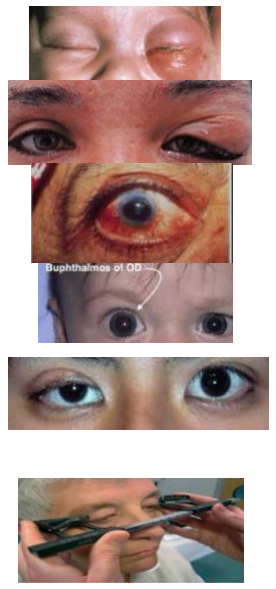
Infantile Drainage Obstruction	• The nasolacrimal system canalizes and become patent near term period. • Watery eyes will result from failure of the distal end of the nasolacrimal duct to canalize. • Obstructed canaliculi may result in mucocele or dacryocystitis. • The conjunctiva is not inflamed. • Dx: pressure over lacrimal sac >> discharge from puncta • Treatment: mostly resolves spontaneously in the 1st year of life, If not > probing to perforate the occluded membrane through the lacrimal duct
Adult Drainage Obstruction	• Most common site of obstruction is the nasolacrimal duct. • Causes: infections, direct trauma, fractures, topical drugs. • Present with watery eyes, stickiness and white eyes, worse in cold or windy weather. • Stenosed punctum can be seen on slit lamp. • Patency of the Nasolacrimal system can be assessed by: - Syringing normal saline into the canaliculi. - Fluorescein dye disapperance after 5 minutes. - Dacryocystogram: radio-opaque dye followed by X-ray. - Dacroyscintogram: Radioactiveisotope followed by gamma camera • Management: Dacryocystorhinostomy.

Dacrocystitis 	• Infection of the lacrimal sac, secondary to obstruction of the nasolacrimal duct at the junction of the lacrimal sac. • Presentation: pain, redness, swelling over the inner aspect of the lower eyelid and epiphora • Mostly due to staph (step.areus) or strep • Management: admission, systemic antibiotic, incision and drainage, dacrocystorhinostomy.

The orbit

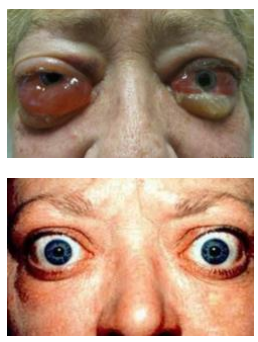
Proptosis

- Some causes:
  - **Orbital cellulitis**: mcc of unilateral proptosis in children.
  - Thyroidopathy: mcc for proptosis in adults is **Graves' disease** [exophthalmos].
  - **Neoplasm**:
    - Intra-conal lesion: eye is displaced forward, like **meningioma**.
    - Extra-canal lesions: eye is displaced to one side, like **lacrimal gland tumor** (to nasal side).
    - In children, rapidly developing Proptosis; **rhabdomyosarcoma**.
  - **Orbital venous varix:** <u>transient</u> proptosis induced when increasing cephalic venous pressure (valsalva maneuver).
  - **Pseudoproptosis** (buphthalmos, contralateral enophthalmos, contralateral blepharoptosis, ipsilateral lid retraction, axial myopia).
  - **Traumatic**, orbital/facial fracture.
- How to measure proptosis? By **hertel exopthalometer (distant from the lateral orbital rim to the apex of the cornea),** normal range 10-21 mm.
  - Mild: 21-23 mm, moderate: 24-27 mm, severe: 28 mm or more.
  - A difference of more than 2 mm between the two eyes is significant.



Thyroid eye disease

- MCC of unilateral or bilateral proptosis in adults (mainly hyperthyrodism, may be hypo).
- Inflammation >> extra-ocular muscles and soft tissue swelling.
- Signs & symptoms of Graves opthalmopathy:
  - Painful eye, peri-orbital edema, proptosis, chemosis, diplopia.
  - Reduced visual acuity, conjunctivitis, lid lag, lid retraction, restricted eye movement.
- Complication: corneal ulcer and perforation, compressive optic neuropathy (vision loss).
- Tx of urgent complications: systemic steroids, radiotherapy, surgical orbital decompression.
- Assessment of severity by Werner's classification (**NO SPECS**)
  - 0: **N**o signs or symptoms 1: **O**nly signs 2: **S**oft tissue involvement 3: **P**roptosis
  - 4: **E**xtra-ocular muscle involvement 5: **C**orneal involvement 6: **S**ight loss (optic nerve inv.)



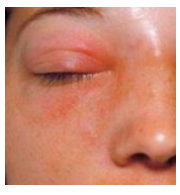
Enophthalmos

Seen in:

1. Orbital fractures (blowout fracture).
2. Horner's syndrome (pseudoenophthalmos).
3. Orbital fat atrophy.
4. Congenital abnormality.
5. Metastatic disease.

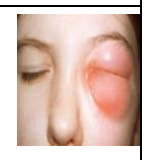
Preseptal cellulitis

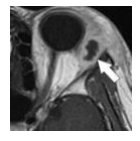
- Inflammation of soft tissue anterior to orbital septum.
- Etiology: periorbital trauma or dermal infection
- Unilateral painful, erythematous, swollen lid, no proptosis, normal extra-ocular muscle & visual acuity.
- The globe is not affected.
- Clinical diagnosis.
- Tx: oral antibiotics
- If severe or child <1 year give IV antibiotics.



Orbital cellulitis

- Inflammation of soft tissue posterior to orbital septum.
- Etiology: bacterial rhinosinusitis, preseptal cellulitis.
- Unilateral painful, erythematous, swollen eye, fever, proptosis, ophthalmoplegia, decreased visual acuity.
- Dx: MRI/ CT
- Tx: Admission, IV antibiotics, drainage of abscess if present, optic nerve decompression if it's compromised.
- Complication: optic nerve inflammation, cavernous sinus thrombosis, meningitis, brain abscess, vision loss.

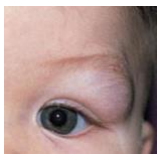




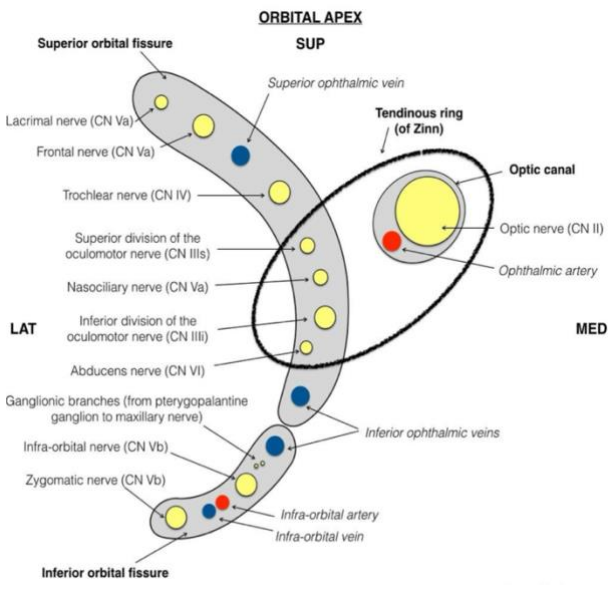
Orbital tumor

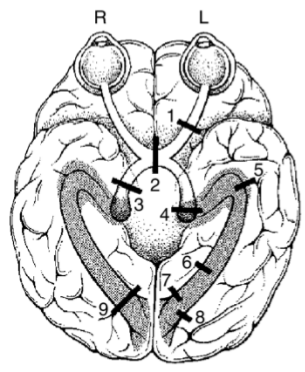
- **Lacrimal gland tumors**: malignant tumor has poor prognosis, benign tumor has risk of malignant transformation.
- **Optic nerve gliomas**: may be associated with neurofibromatosis
- **Meningioma**: arising from the middle cranial fossa, difficult to excise, may spread by optic canal to the orbit.
- **Lymphoma**
- **Rhabdomyosarcoma**: It's the **commonest malignant primary** orbital tumor in **children**, rapidly growing, chemotherapy is effective if it is localized.
  Capillary hemangiomas as the **most common benign** orbital tumors affecting **children**
- **Metastasis**:
  - **Children**: Most commonly from **Neuroblastomas**, Ewing sarcoma, Wilms tumor, and leukemias.
  - Adults: Breast, lung, prostate, or GI tract

Dermoid cyst	• Congenital lesions are caused by the continued growth of ectodermal tissue beneath the surface, which may present in the medial or lateral aspect of the superior orbit. • Excision is usually performed for cosmetic reasons and to avoid traumatic rupture, which may cause scarring. • Some may be attached deeply by a stalk, and a before surgery to identify this deeper CT scan may be necessary.



Sudden loss of vision	Gradual loss of vision
Sudden transient (<24 h) Vascular: o Carotid pathology o Cardioembolic emboli o GCA o Vasospam Neurogenic: o Retinal migraine Ophthalmic: o Papilledema o Optic disc drusen o Subacute (intermittent) angle-closure glaucoma **Sudden persistent (>24 h)** o Ischemic optic neuropathy o Angle-closure glaucoma (painful) o Microbial keratitis o Acute anterior uveitis o Endohthalmitis o Hyphema o Vitreous hemorrhage o Rhegmatogenous retinal detachment (painless) o Central & branch retinal artery occlusion (painless) o Central & branch retinal vein occlusion (painless) o Anterior ischemic optic neuropathy o Optic neuritis (painful) o Hydrops Keratoconus (painful)	o Refractive errosm o Keratoconus o Corneal edema o Corneal scar o Corneal infection (Keratitis) o Corneal dystrophies o Corneal degeneration o Cataract o Ectoia lentis o Change in shape (Anterior & posterior lenticonus) o Vitritis (Infection: Toxoplasmosis, endophthalmitis. Autoimmune: Behçet disease , Sarcoidosis) o Diabetic retinopathy o Retinal vein occlusion (central and branch) o Age related macular degeneration (AMD) o Aquired maculopathies : macular hole, epiretinal membrane o Posterior & anterior uveitis (painful) o Retinal dystrophies (Retinitis pigmentosa) o Macular dystrophies (Stargardt's disease) o Open-angle glaucoma





Location	Field Defect		
	Left Eye	Right Eye	Comment
1 Left Optic Nerve	●	○	No light perception left eye
2 Chiasm	◐	◑	Bitemporal hemianopsia
3 Right Optic Tract	◐	◔	Incongruous left homonymous hemianopia
4 Left Lateral Geniculate Nucleus	◔	◔	Right homonymous sectoranopia (lateral choroidal artery) - or -
	◑	◑	Incongruous right homonymous hemianopia
5 Left Temporal Lobe	◔	◔	Right homonymous upper quadrant defect ("pie in the sky")
6 Left Parietal Lobe	◕	◕	Right homonymous defect, denser inferiorly
7 Left Occipital Lobe (upper bank)	◕	◕	Right homonymous lower quadrananopsia (macular sparing)
8 Left Occipital Lobe (lower bank)	◔	◔	Right homonymous upper quadrananopsia (macular sparing)
9 Right Occipital Lobe	◕	◕	Left homonymous hemianopia (macular sparing)

Notes:

- **Contraindications for LASIK surgery:**
  Keratoconus, unstable refractive error, pregnancy, severe dry eye syndrome, autoimmune diseases.
- **Side effects of Acetazolamide:**
  Hypokalemia, renal tubular acidosis causing hyperchloremic non-anion gap metabolic acidosis.
- **Side effects cyclopentolate:**
  Elevation of IOP, burning, irritation, photophobia, blurred vision, superficial punctate keratitis.
- **Side effects of topical prednisolone:**
  Blurry vision, increased IOP, burning sensation, eye irritation.
- **Causes of anisocoria:**
  Anterior uveitis, acute angle closure glaucoma, eye trauma, Horner syndrome.
- **Causes of vision loss in graves patient:**
  Optic compressive neuropathy, corneal ulceration or infection.
- **Causes of abducens nerve palsy (CN VI):**
  Trauma, Psudotumor cerebri, cavernous sinus thrombosis, diabetic retinopathy, giant cell arteritis, vasculitis.
- **Steps of phacoemulsification:**
  Anesthesia > corneal incision > Capsulorhexis > phacoemulsification > irrigation & aspiration > lens insertion at posterior chamber.
  The final step is to inject salt water in to the corneal wounds to cause the area to swell and seal the incision.
  Advantages: no sutures, 2 small incisions.
- **Causes of amblyopia:**
  A vision impairment of one eye (also called "lazy eye"), due to abnormal communication between the eye and the brain. May develop as a result of uncorrected strabismus, cataract, or refractive errors.
- **Test to confirm glaucoma:**
  Gonioscopy, Tonometry, visual field examination, optic nerve head examination.

- **Normal characteristics of the cornea:**
  - Diameter: 11-12mm, thickness: 0.5 mm.
  - 5 layers: epithelium (stratified squamous non-keratinized, regenerates from the stem cells in the limbus), bowman membrane (acellular layere of collagen) , stroma (90% of corneal thickness), descemet membrane (tough), endothelium (monolayer of non-regenerating cells, actively pump water from the stroma to control hydration of the cornea).
  - Avascular, epithelium and ant.stroma derives its nutrition from ambient air and tear film, post.stroma and endothelium from aqueous humour.
  - Rich in sensory nerve endings originating from the nasociliary branch of trigeminal nerve
- **Normal characteristics of the lens:**
  - Avascular, derived from ectoderm, highly elastic, harden with age.
  - The lens capsule is a thick, homogenous external lamina formed by proteoglycans & collagen IV.
  - The lens epithelium is a single layer of cuboid cells, present only on the anterior surface of the lens.
  - Differentiating lens fibers: elongated nucleated cells filled with crystalline.
  - Mature lens fibers: no nuclei, densely packed to produce a unique transparent structure.
- **The orbit consists of 7 bones:**

Frontal bone, Ethmoid bone, Lacrimal bone, Sphenoid bone, Maxillary bone, Palatine bone, Zygomatic bone.

- **Structure passes through optic canal:**

Optic nerve, Ophthalmic artery, Central retinal vein

- **The lacrimal gland:** Lies anteriorly in the superolateral aspect of the orbit. lacrimal sac lies On the anterior part of the medial wall.
- The 6 ocular muscles originate at the apex around the optic nerve and insert into the globe.

Final past papers: https://doctor2020.jumedicine.com/wp-content/uploads/sites/12/2024/07/Ophthalmology-final-past-papersedited.pdf

Best of luck