Ophthalmology:

* Lectures included here	Page
1. Anatomy	2
2. Optics + Refraction	12
3. Lens + Cataract	22
4. Glaucoma	32
5. Diabetic Retinopathy	46
6. Cornea + Sclera	57
7. Strabismus	71
8. Lids + Lacrimal Glands	83
9. Eye injuries	108

Good luck ....

Rama Aldaqqa

☆ ANATOMY of EYE

• Orbital Cavity

→ 7 bones

Frontal | Zygomatic | Sphenoid | Maxillary | palatine | lacrimal | Ethmoid

Orbit

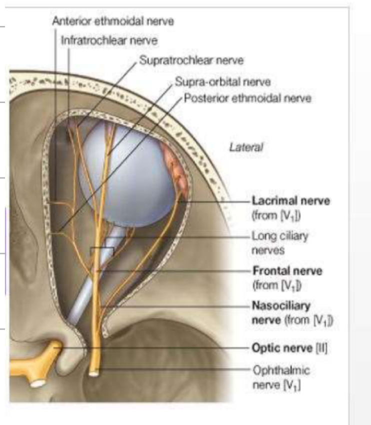
→ Orbital Structures

Eyeball | Nerves | Blood vessels | Muscles | Lacrimal Gland | Fat

→ Nerves

Optic N. (CN-2) | Oculomotor N. (CN-3) | Trochlear N. (CN-4) | Trigeminal N. (CN-5) | Abducent N. (CN-6)

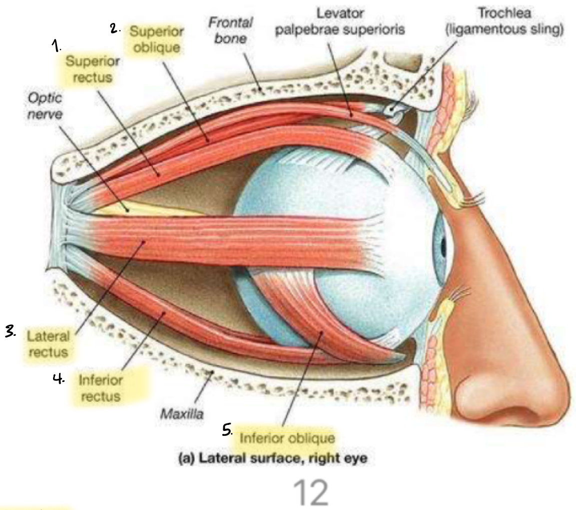
Trigeminal N. (CN-5) → Ophthalmic (V1) | Maxillary (V2)



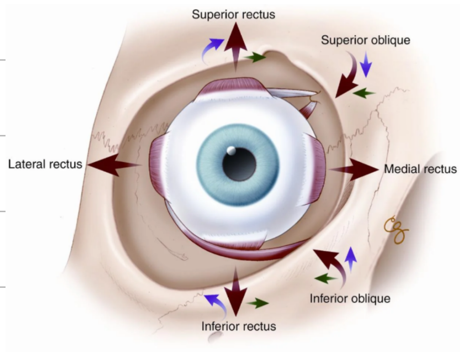
→ Muscles

Extra-ocular muscles

7. Levator Palpebral Superioris
(inserted into Eyelid)



6. + medial rectus



Muscle	Primary	Secondary	Tertiary
Medial rectus	Adduction		
Lateral rectus	Abduction		
Inferior rectus	Depression	Excyclotorsion	Adduction
Superior rectus	Elevation	Incyclotorsion	Adduction
Inferior oblique	Excyclotorsion	Elevation	Abduction
Superior oblique	Incyclotorsion	Depression	Abduction

→ Blood Vessels :

Internal Carotid Artery
↓
Ophthalmic artery (main arterial supply)
through optic canal Along optic n.

Branches

- Central Retinal A. → inner Retina
- Lacrimal A. → ✓ Lacrimal gland ✓ Eyelids ✓ Conjunctiva
- Ciliary arteries
- Ethmoidal A. → Ethmoidal sinuses + Nasal Cavity
- Supra-orbital + Supratrochlear → forehead + Scalp

post. Ciliary A.

Short
- Choroid
- Optic n. head

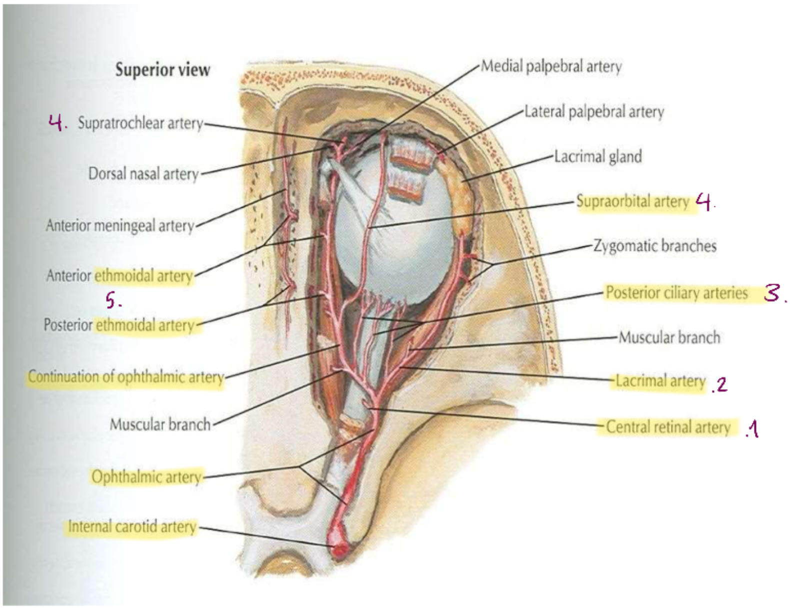
Long
- Ant. uvea

Ant. Ciliary A.
- Rectus muscles
- Ant segment (From Cornea to lens)

Vinous Drainage

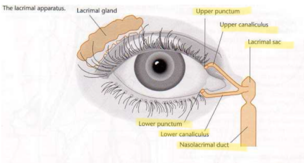
* Sup. ophthalmic V. → Cavernous Sinuses
* Inf. ophthalmic V. → pterygoid venous plexus.

- **Clinical Significance**: Infection from the face (danger triangle) can spread via these veins → **Cavernous sinus thrombosis**



→ Lacrimal Gland

Location:
Sup. Lat.
Divided by Orbital Septum
~ into ~
palpebral Orbital



Function
tears production
Drains
↓
Lacrimal puncta
↓
Canaliculi
↓
Lacrimal Sac (in lacrimal bone)
↓
Nasolacrimal duct
↓
inferior meatus of Nose.

Blood Supply
↓
* Lacrimal A. (from ophthalmic A.)
* Venous drainage → into Cavernous Sinus.

Innervation
↳ para-Sym (CN-VII via ptyregoid ganglion)
↓
↑ tears
↳ Symp (sup. cervical ganglion)
↓
Controls Blood flow
↳ Sensory (lacrimal nerve CN-V1)

pathologies

Dry Eye Syndrome
↓
Tear Deficiency

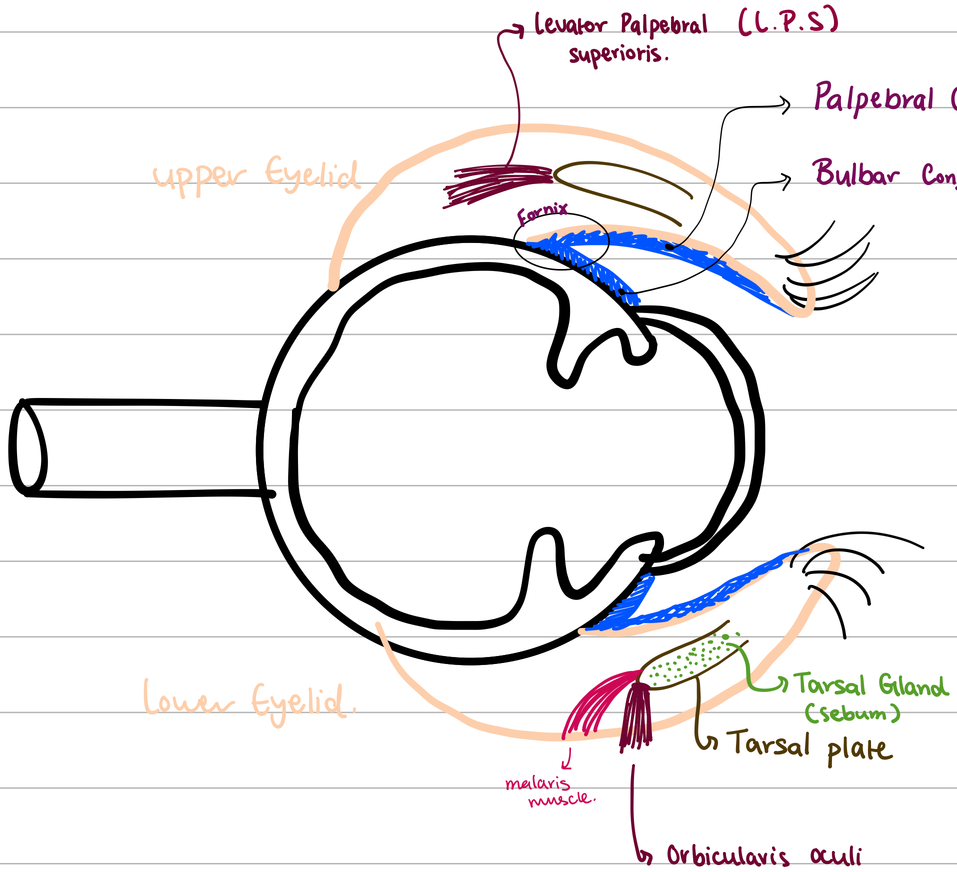
Dacryoadenitis
↓
inflammation infection (viral / bacterial)

Lacrimal tumors
↓
may cause
↓ ↓
proptosis globe displacement

→ Fat

↳ behind Orbital Septum.

→ Eyelids



Conjunctiva

↳ Epithelial layer
- thin
- transparent

(Non-Keratinized stratified squamous epithelium)

↳ covering
- Ant. Sclera
- inner Eyelid

↳ functions
- Lubrication
- protection
- immune defense.

Eyelids muscles

- Orbicularis Oculi (by facial n.)
- malaris muscle (Smooth m. ↓ Sympathetic Supply) it's insertion ↳ tarsal plate
- Levator Palpebral Superioris (has multiple insertion)

→ Eye ball :

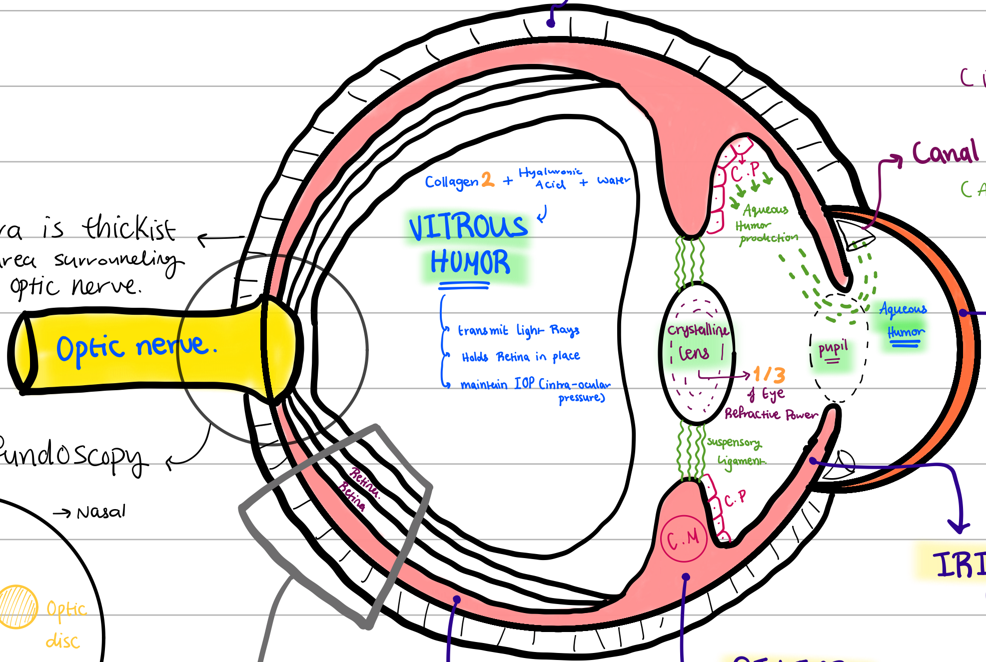
SCLERA
- Episclera
- Sclera proper
- Lamina fusca

(whitish Area)

(irido-corneal Angle)

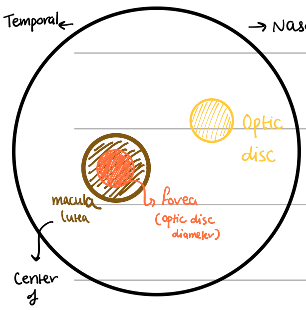
Canal of Schlemm (Sclera vinous sinus)
(Aqueous Draining System)

Sclera is thickist in area surrounding optic nerve.

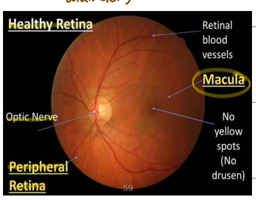


CORNEA
- Epithelium
  - Avascular
  - Sensitive
  - (5 layers)
  - transparent.
  - 2/3 of Eye Refractive power.

with fundoscopy



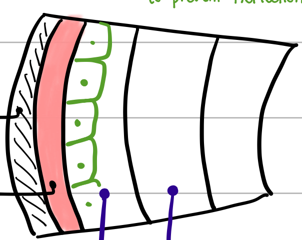
Center of Retina
(↑ Resolving power of Eye)
↓
Center vision
(3x optic disc diameter)



IRIS - pigmented.
- contains melanin pigment with variable density.
- 2 muscles
  - Dilator pupillae (Sympathetic) - longitudinal -
  - Sphincter pupillae (para-sympathetic) - circular -

CILIARY BODY
- Ciliary muscle (C.M) → Change Lens Shape (Accomodation)
- Ciliary process (C.P) → production of Aqueous humor

CHOROID
-pigmented-
- Absorbs light to prevent Reflections
- Blood Supply to Retina (↑ vascular)



inner Neural layer of RETINA (10 layers)
multiple Cells
- Photo Receptors (Rod, Cone)
- Bipolar
- Ganglion → Collects + forms optic nerve.
- Amacrin
- Horizontal

outer pigmented layer of RETINA - epithelial Cells rich in melanin - (Basal layer)

mainly 3 Layers

outer	mid	inner
* fibrous Coat	* Vascular Coat (uvea)	* Neural Coat (Sensory)
Sclera, Cornea	Iris, Ciliary Body, Choroid	Retina (light sensitive tissue): outer pigmented, inner Neural

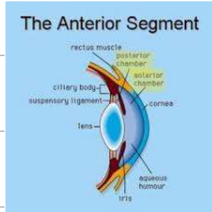
- Cornea → lens ⇝ Anterior Segment

filled with Aqueous humor

Ant. Segment

Ant. Chamber

Cornea → iris + Lens



Post. Chamber

between Ciliary body

iris   lens

(triangular in shape)

- Lens → Retina ⇝ Posterior Segment

1. Cornea

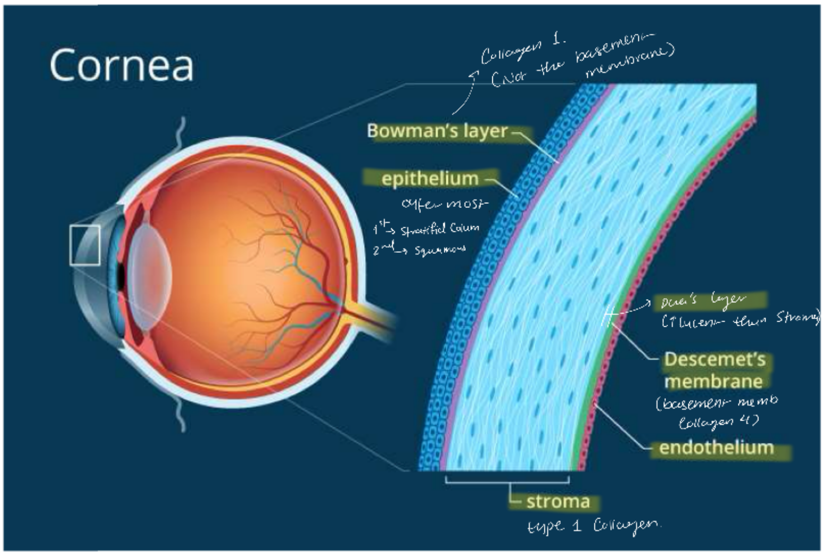
↳ 6 Layers

Epithelium >> Bowman's Layer >> Stroma >> Dua's layer

- Epithelium: Stratified Squamous ↓ Stratified Columnar.
- Bowman's Layer: - Collagen 1; - Not basement membrane
- Stroma: - Collagen 1
- Dua's layer: (↑ Lucent than Stroma)

>> Descemet's membrane >> Endothelium

- Descemet's membrane: (Basement membrane) - Collagen 4



2. Sclera

Obaque — fibrous — protective

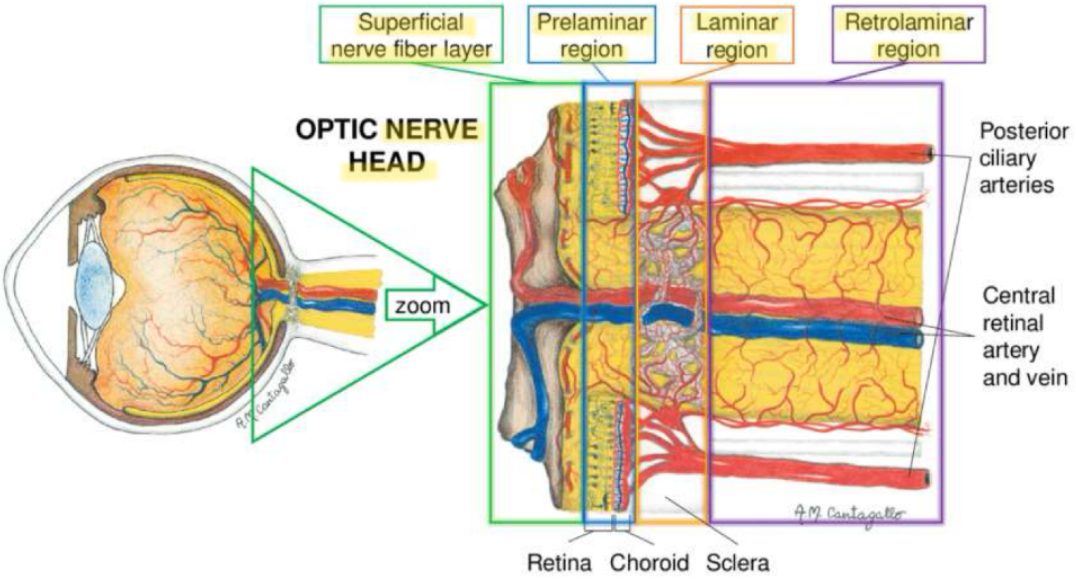
* mainly Collagen Content

functions :
- ↳ Attachment of EOM
- ↳ protection

• between Cornea + Sclera → Limbus
(contains Stem Cells of Epithelium)

Limbus → Common site of surgical incisions [illegible] sclera.

orbit.



* Optics + Refraction

Straight light Rays → medium → bend + Converge

Refraction

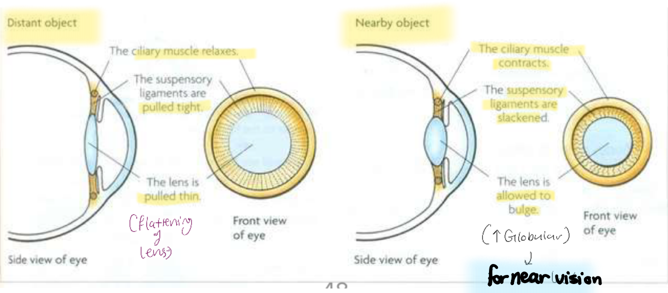
(Refractive power of the Eye)

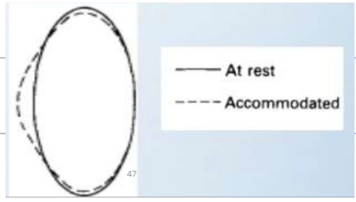
2/3 → Cornea (Fixed power)

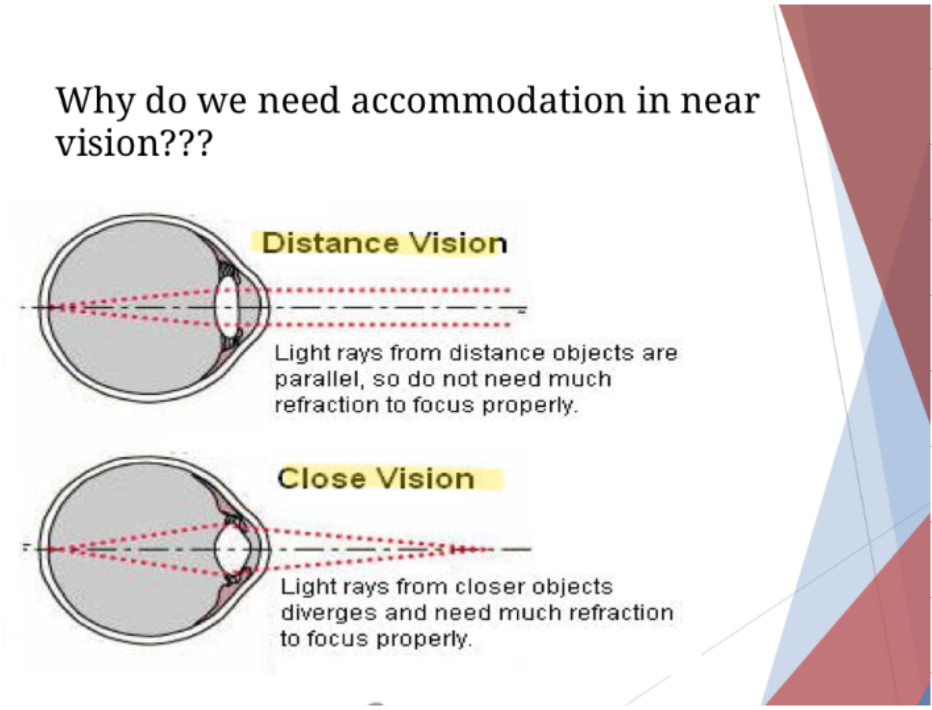
1/3 → Lens (↑/↓ power with Accomodation)

Accomodation

↳ Change in lens shape to focus objects at variable distance







Accomodation (for near vision)

↓ Spherical lens

↓ Constricted Pupils.

Normal Vision without Accomodetion

For Far vision

Emmetropia

(when parallel rays of light from distant object are brought to Focus on retina)

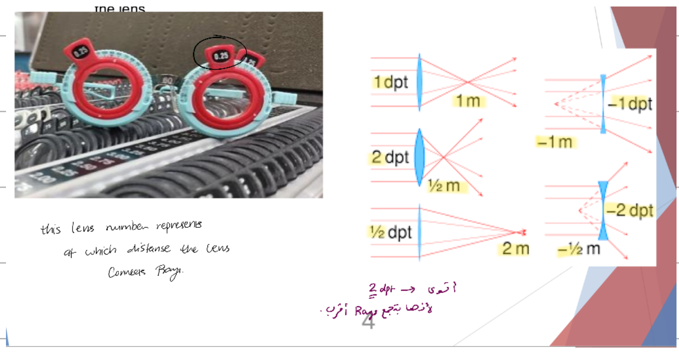
Lenses

↳ Lenses power is measured by Diopter. (dpt)

↑dpt → lens converge light rays ↓distence

2dpt → converge light at 1/2 m

$(1/dpt) = m.$



lenses

positive lens → Converging lens, Convex

For Hypermetropia

negative lens → Diverging lens, Concave

For Myopia

Refractive errors

Myopia	Hypermetropia	Presbyopia	Astigmatism
(Nearsightedness)	(Farsightedness)	Loss of accomodative Ability of the Lens	a problem of Cornea / Lens curvature
sees near far blurry	sees far near blurry	(Normal Aging process) → > 45 y/o Similar to Hypermetropia sees far.	→ Not spherical Far / near object could look blurry

- Aniseikonia: a difference of image size between the 2 eyes as perceived by the patient.
- Anisometropia: a refractive power difference between the 2 eyes (usually > 2D)
- Aphakia: (Phakos=lens), aphakia is no lens.
- Pseudophakia: artificial lens in the eye.

10

Causes of Refractive errors

- Eyeball length (↑ / ↓)
- Shape of Cornea
- Aging of the lens.

Symptoms of Refractive errors

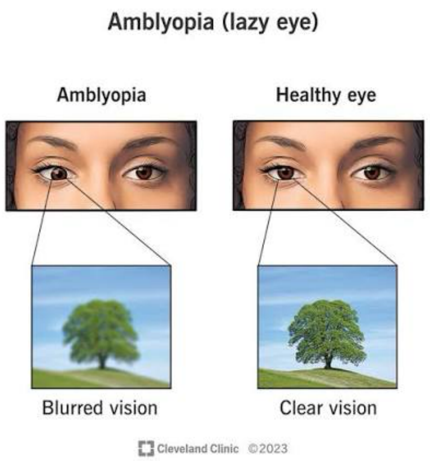
1 Hypermetropia (Hyperopia - farsightedness)

- blurry near objects
- light focus behind Retina
  - due to
    - physiologic Causes
      - Small weak eyes at birth (Hypermyop Eyes at birth)
      - *part of Normal Development (if persist)
        - Abnormal (imperfectly developed eye)
    - pathologic Causes
      - too short Eyeball
      - Cornea Shape Abnormalities
      - Lens Abnormalities
        - Ectopia lentis (displacement)
        - Post-Sx Aphakia (No lens)
- most pt are born with it (but it doesn't causes vision problems until old)
- ↑Risk with other family member has it
- m/c Symptoms
  - Trouble seeing Close
  - Eye Strain - Ciliary muscles are straining to maintain Accomodation
  - Headaches (↑reading)

* Children with Severe Hyperopia → ↑Risk of other eye problems
  - Strabismus (crossed eye)
  - Amblyopia (lazy eye)

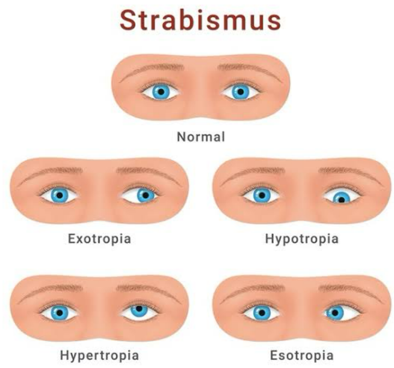
* Equal Bilat. Hyperopia
  - development of → Convergent Squint

due to ↑ Accomodative effort



Convergent squint

Divergent squint



(if Bilat. → Convergent Squint)

Complication of Hyperopia

↳ Angle Closure glucoma

Management

↳ By Converging lens (convex)

② Myopia (near sightedness)

- Blurry far Objects
- Light focus in front of Retina
  - Caused by
    - Changes in Cornea
    - Kerato-conus
- usually starts between 6 - 14 y/o + worsen until early 20s
  - Rarely after 25 - unless → DM → cataract.
- Complications (Rare)
  - RD
  - macular Hole
  - open angle glaucoma
- Mx
  ↳ Diverging lens (concave) / Refractive Eye Sx.

Severe Myopia → ↑Risk of RD (Retinal Detachment)

③ Astigmatism (الانحراف / اللا بؤرية)

Light Rays have different points of focus.

due to → non - Spherical Shape of Cornea.

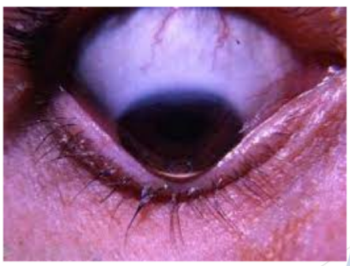
Cause? → unknown

usually at birth + occurs with myopia / Hyperopia.

difficult to see details either → near → far (Blurry vision)

Mx
- → Clyindrical lens
  - plano - convex
  - plano - concave
- → Refractive Eye Sx

* m/c Ex. of Astigmatism → Kerato conus



✱ Management of Refractive error

1st → Glasses

- Convex lens
- Concave lens

other Alternatives

Contact lenses

types

↳ Daily vs Monthly

↳ type

- **Soft**
  - ✓ takes Cornea shape
- **Hard**
  - ✓ Cornea takes it shape

↳ m/c cause to use Contact lens → Cosmetic

↳ Don't want Glasses

↳ m/c cause to use Hard lens

↓

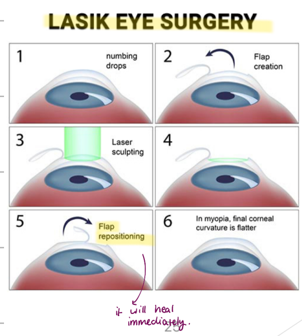
Keratoconus

↳ problems of lens

↳ lens is impermiable

Corneal Refractive Sx

- **Lasir (PRK)** photorefractive keratectomy
  - ↳ without flab.
- **LasiK**
  - ↳ painless
  - ↳ ↓ visual limitation post Sx



Lens refractive Sx

(lenticular)

↑ Complications

if

Sleep > 6h

with it

→ Dryness → ischemia

So Complications

giant papillary Conjunctivitis

Corneal Hypoxia

neovascularization

Corneal Abrasion

Corneal ulcer

Keratitis

* Prerequisites for Corneal Refractive Sx

Age

>18

Stability

for at least 6 month

(ideally 1 year)

* Contraindications

Collagen tissue disease

Pregnancy

Lactation

Keratoconus

Active Corneal disease

Dryness

complications

(↓↓ propability)

- Incomplete flap
- Free flap
- Flap subluxation
- Corneal opacification
- Corneal perforation
- Under/overcorrection
- Recurrence
- Corneal ectasia
- etc

Sx

↳ if myope

Cornea بناكل من نصها

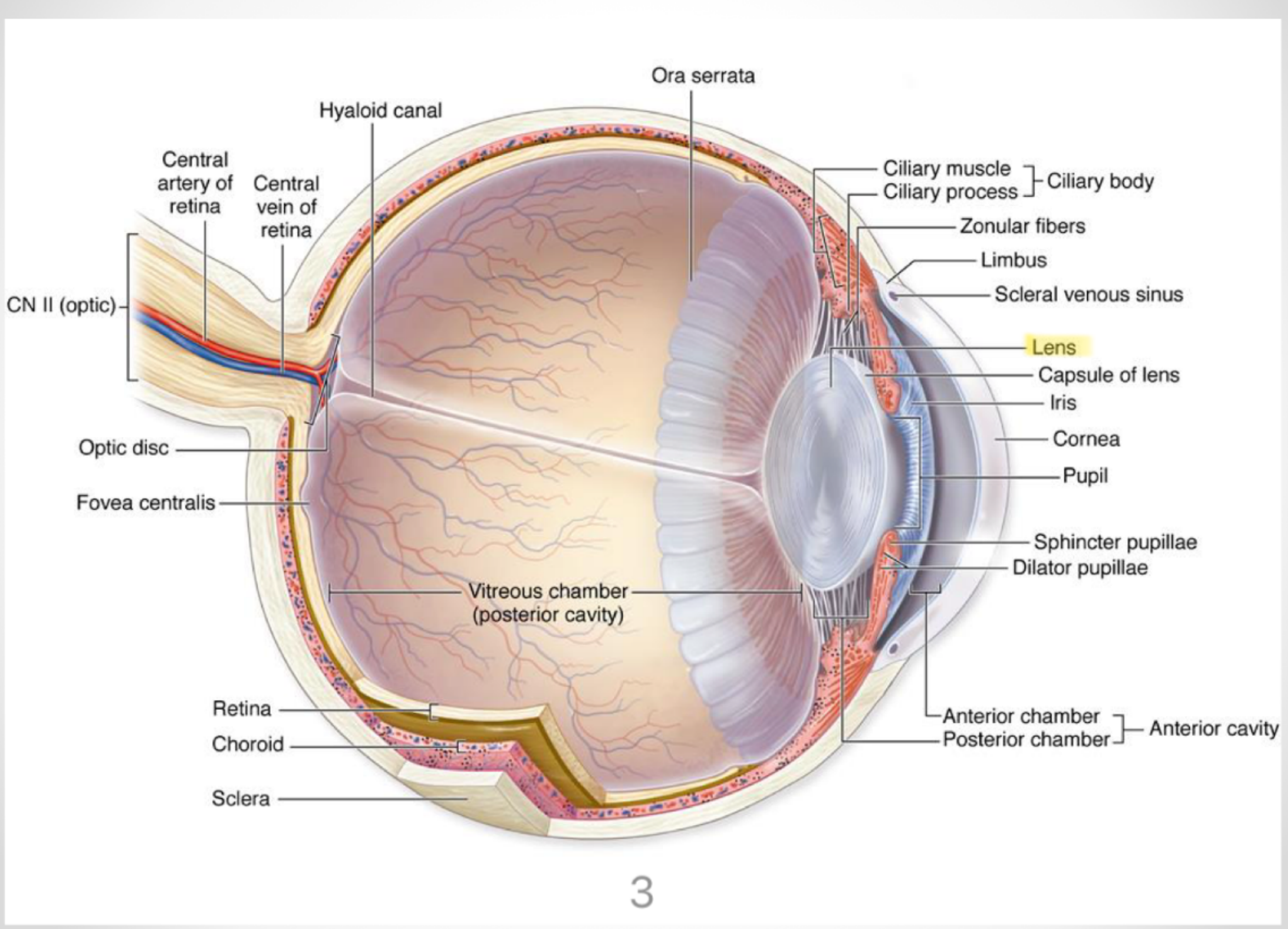
↳ if Hypevope

بناكل من الأطراف .

Lens

+

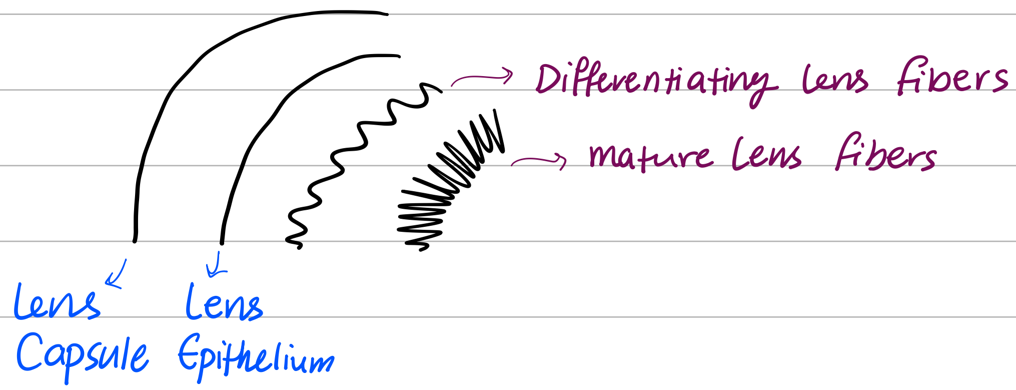
Cataract

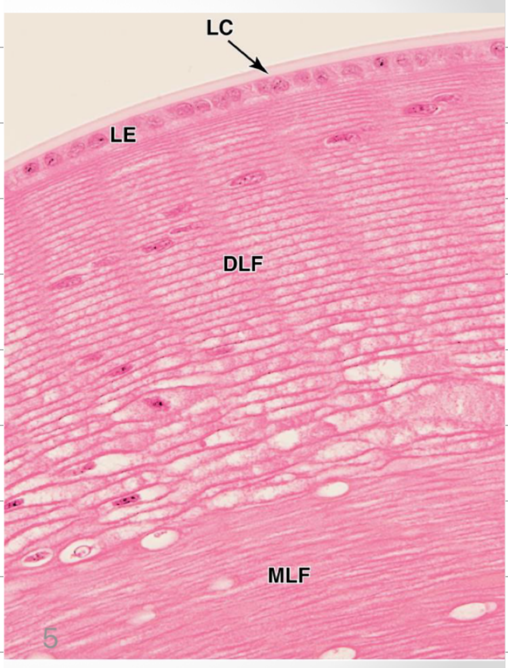


Lens

- Transparent
- Biconvex
- behind iris
- Focuses light on Retina
- Avascular
- highly Elastic - Hardens with Age -

Histology of lens





LC : thick

proteoglycans + Collagen IV

LE : Simple Cuboidal Cells

Just Ant. of lens

LF : Parallel to Epithelium

DLF

- Still have nuclei
- Elongated
- Cytoplasm is filled with crystallins (proteins)

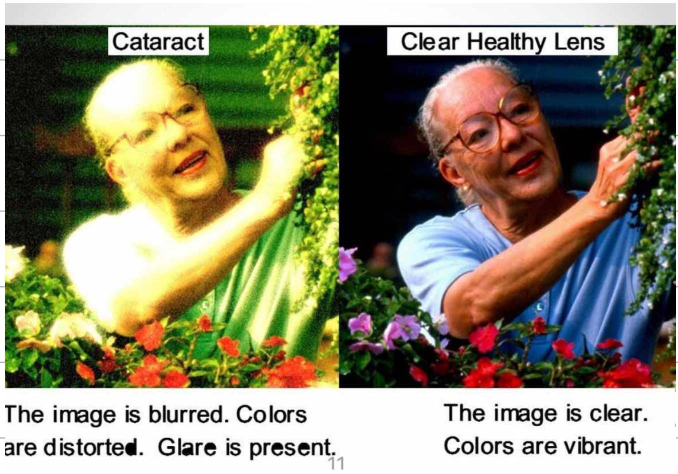
MLF

- No nuclei
- Densly packed

Cataract (m/c Reversable / Tx blindness)

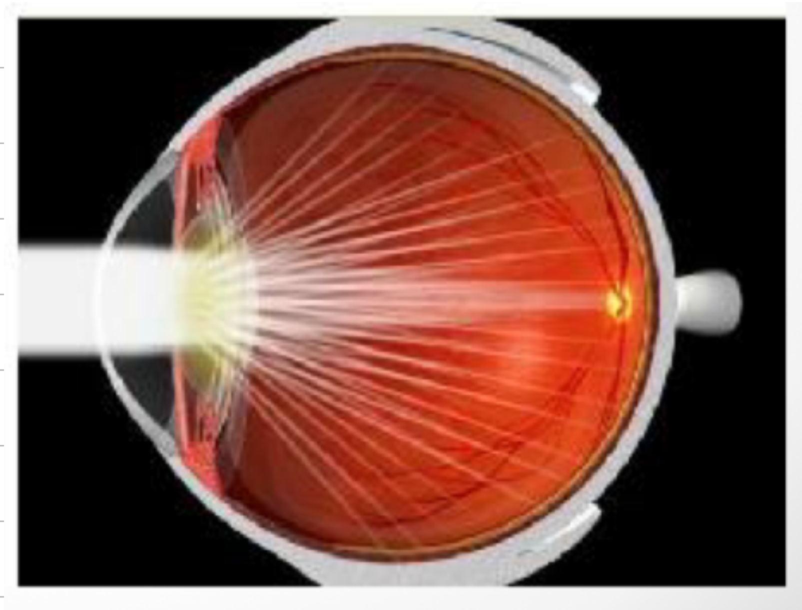
→ opacification of the lens.

↳ Cloudy / opaque



How Cataract causes Abnormal vision?

Cloudy lens scatters light
↓
Hazy image will be seen

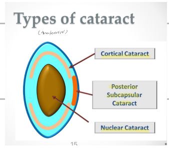


* Healthy lens allows sharp image to fall on every part of Retina → Clear image is seen.

* Cataract is not a disease it's an Aging problem.

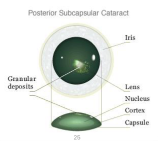
→ Types

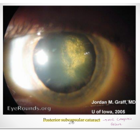
Anatomical



Cortical
- lens Cortex (Outer)
- – spokes –
- fissuring
  ↓
  due to change in Water Content
- Causes
  - Glare (الوهج)
  - light Scattering

Post. SubCapsular
- Back of lens adjacent to Capsule



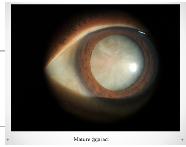


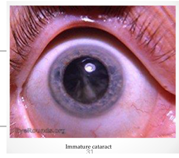
Posterior subcapsular cataract

Posterior subcapsular cataract

Nuclear (m/c)
- Central / nuclear part
- nucleus is Hard / Sclerotic
  ↓
  Condensation of brown pigment within the lens
- Shift to Nearsightedness
  → problem of distance vision

mature / immature
- mature: All lens protein is opaque
- immature: Lens has some transparent Content

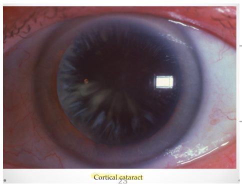

Mature cataract

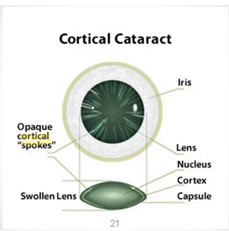

Immature cataract

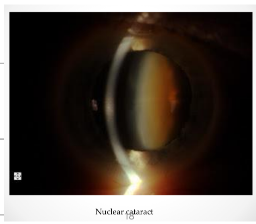
Congenital
- Lamellar
- polar
- sutural

Congenital Cataract → Autosomal Dominant (AD)

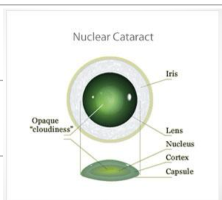
Cortical cataract

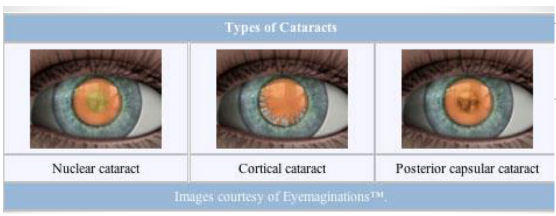

Cortical cataract




Nuclear cataract

Nuclear cataract





→ Causes of Cataract

Age (m/c)

• Senile Cataract

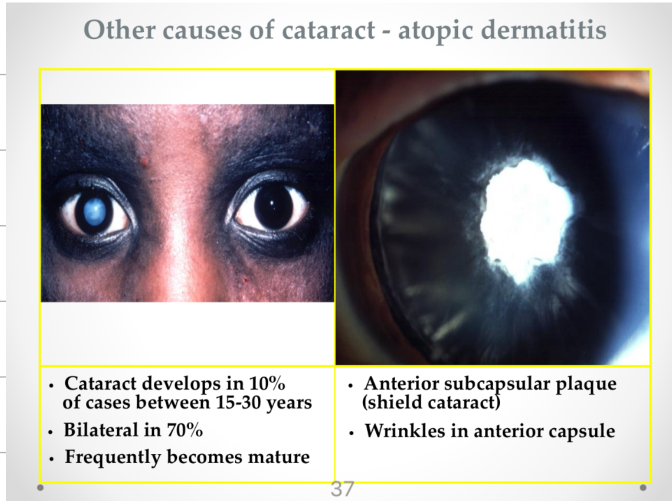
• Cumulative exposure to
- Smoking
- UV-B light
- Blood sugar level

Associated with other Ocular Conditions

- Trauma
- Topical steroids
- Uveitis
- Intraocular tumors
- ↑Myopia

Associated with Systemic diseases

- DM
- Metabolic diseases (Galactosemia, Hypocalcemia, fabry disease) ↳ Rare X linked lysosomal storage disease
- Systemic drugs (steroids , chlorpromazine)
- Infection (Cong. Rubella)
- Myotonic dystrophy
- Atopic dermatitis
- Systemic syndromes (Down's, Lowe's) → Rare. X linked. AR → Characterize by
  characterized by congenital cataracts, hypotonia and areflexia , mental retardation, proximal tubular acidosis, aminoaciduria, phosphaturia, and low-molecular-weight proteinuria. Glaucoma is present in about 50% of cases.
- Congenital Cataract (inherited) - AD
- External radiation

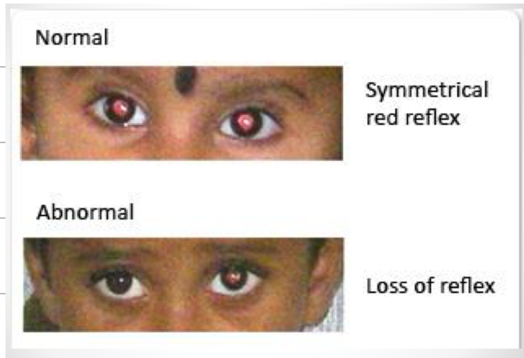


→ Symptoms

- Loss of vision
- Glare
- Chang in Refractive error
- Amblyopia (Lazy eye - الكسل البصري) (↑ in Ped Age group Cataract) < 10y (Reversable)

→ Signs.

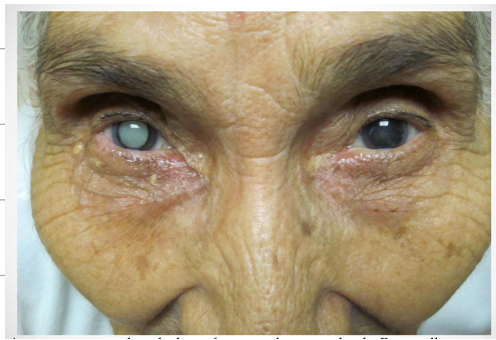
- ↓ Visual Aquity
- Lens opacity (with Slit lamp exam)
- Black spot against Red Reflex of fundus
- Leukocoria (white pupillary reflex)
  - caused by many conditions including congenital cataract



Leukocoria → (very wide DDx) but some serious condition → Retinoblastoma (quick fast lethal tumor)

41

Advanced Cataract

↳ 

→ Tx

→ No proven prevention

→ only Tx

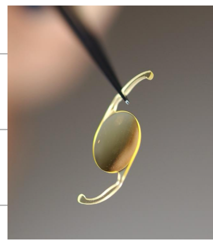
↓

Sx (removal of affected lens)

indication of Sx → Cataract ↓↓ Quality of life.

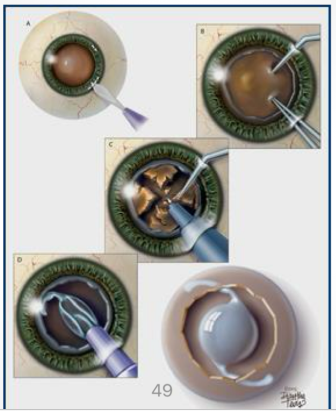
Cataract Sx

- Day Case
- Topical Anesthesia / LA / GA (if pt not fit for local.)
- ↑ Success Rate (95%)
- removal of affected lens. → Insertion of plastic lens implant



Cataract Sx

- Phacoemulsification
  - * No need for post-op Suturing
- External Capsular Cataract Extraction (ECCE)
- Internal Capsular Cataract Extraction (ICCE)

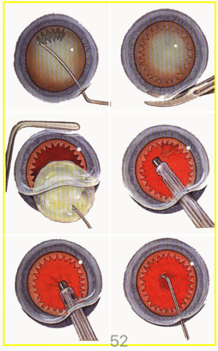


- Consists of removing the lens manually, but leaving the majority of the capsule intact. The lens is expressed through a 10–12 mm incision which is closed with sutures at the end of surgery.
- Extracapsular extraction is less frequently performed than phacoemulsification but can be useful when dealing with very hard cataracts or other situations where emulsification is problematic.
- Manual small incision cataract surgery (MSICS) has evolved from extracapsular cataract extraction. In MSICS, the lens is removed through a self-sealing scleral tunnel wound in the sclera which, ideally, is watertight and does not require suturing.

- The lens and surrounding capsule are removed in one piece through a large incision while pressure is applied to the vitreous membrane.
- It is rarely performed as the surgery has a high rate of complications.

1. *Anaesthetic* - The eye is numbed with either a subtenon injection around the eye or using simple eye drops.
2. *Corneal Incision* - Two cuts are made through the clear cornea to allow insertion of instruments into the eye.
3. *Capsulorhexis* - A needle or small pair of forceps is used to create a circular hole in the capsule (or bag) in which the lens sits.
4. *Phacoemulsification* - A handheld probe is used to break up and emulsify the lens into liquid using the energy of ultrasound waves. The resulting 'emulsion' is sucked away.
5. *Irrigation and Aspiration* - The cortex which is the soft outer layer of the cataract is aspirated or sucked away. Fluid removed is continually replaced with a salt solution to prevent collapse of the structure of the anterior chamber (the front part of the eye).
6. *Lens insertion* - A plastic foldable lens is inserted to the capsular bag that is used to contain the natural lens. Some surgeons will also inject an antibiotic in to the eye to reduce the risk of infection. The final step is to inject salt water in to the corneal wounds to cause the area to swell and seal the incision.

1. Anterior capsulotomy
2. Completion of incision
3. Expression of nucleus
4. Cortical cleanup
5. Care not to aspirate posterior capsule accidentally
6. Polishing of posterior capsule, if appropriate



7. Injection of viscoelastic substance
8. Grasping of IOL and coating with viscoelastic substance
9. Insertion of inferior haptic and optic
10. Insertion of superior haptic
11. Placement of haptics into capsular bag and not into ciliary sulcus
12. Dialling of IOL into horizontal position

→ Post-op Care

↳ Short Course of Steroids + ABx

Spectacle (glasses) / multifocal Intra-ocular lenses

↓

For near vision

(pt will be unable to Accomodate)

→ Complications of Sx

Vitrous Loss
- Risk of ↑ Glucoma, Retinal traction
- Tx → Vitrectomy + Delay of IOL placement

Iris Prolapse
- immediately post-op
- Caused by
  - ↳ Inadequate suturing
  - ↳ Inappropriat Mx of vitrous loss

Endophthalamitis

Post.op Corneal Astigmatism
- due to tight sutures

Macular Edema
- Tx ↓ topical Steroids / NSAIDs

RD

Post. Capsule Opacification
- Scarring of Residual Epithelium
- Tx → Laser

- Tx → Sx
Repair.

✓ Serious Emergency
(↑ Growth Rate of bacteria)
→ infect Retina (Neural tissue)
that Do not Regenerate if lost.

✓ within few days of Sx
(2 - 3 d)

✓ presentation

Painful Red Eye

↓ visual Aquity

Hypopyon
(collection of pus in Ant. Chamber)

✓ Tx
↳ Intravitreal Broad Spectrum ABx

✓ Common Causative organism

Staph. Epidermidis

Staph. Aureus

Pseudomonas sp.

Glucoma

Abnormal Drainage System → ↑ Intraocular P (> 20 mmHg) → Optic Neuropathy

↓ Ocular HTN

↓ Glucoma

Normally IOP
↓
10 - 20 mmHg

Glucoma → Optic Neuropathy + ↑ IOP

الماء الأسود
الزَّرَق

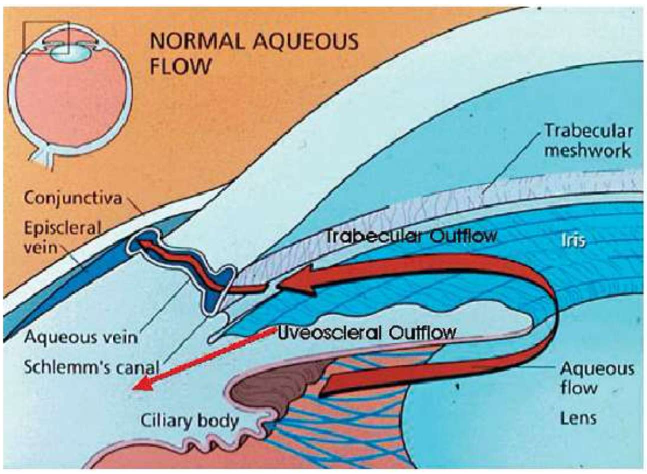
(damage to Optic n. Head (cupping)
+ visual field)

→ Aqueous Humor

Normal volume
0.25 cc
/ 250 μL

produced by
Ciliary processes

pathway
↳ post chamber
between iris + lens
↓ through pupil
Ant. Chamber



Aqueous humor drainage System

85 %

↓

Irido - Corneal Angle

- Classic pathway -

Trabecular meshwork → Canal of Schlemm → Aqueous veins → Episcleral veins.

15 %

↓

Uveolo - Scleral pathway

PG - E2 Analog → Activates this pathway

mean of 15.5 mmHg

→ Normal Ocular P : 10 - 21 mm Hg

- with Diurnal variations
- ways to measure IOP → Goldmann Applanation Tonometry (GAT)

Risk factors

Age | Ethnicity | FHx | ↑IOP | Trauma | Eye Sx | Drugs | Refractive Errors

↑IOP → most importent

Non-IOP dependent Risk factors

- Systemic Vascular Dysregulation
  - Raynaud's
  - prinzmetal Angina
  - Migraine
- Nocturnal Hypotension
- Sleep Apnea

→ ↑IOP is not enough to Dx Glucoma

must be combined → + Optic Neuropathy

Also we have

↳ Normal tension Glucoma

where IOP is Normal

but IOP level

↳ main Risk factor

↳ importent for monitoring of Tx

→ Classification of Glucoma

↳ Gonioscopy (look at the drainage angle)

→ Stage of Glucoma

↳ determined by

Extent of Damage to

Optic N. + visual fields

→ pathology of ↑IOP → mainly due ↓ Drainage

(Not ↑ production)

Glucoma

Open Angle Glaucoma

POAG
1° (m/c)
- idiopathic ↑↑ outflow Resistence
- little F>M
- > 50y
- Screenable disease (preventable)
- presentation
  - Asymptomatic (insidious finding)
  - Visual field Abnormality
- ↑ common in myopes
- IOP : 20 - 40 mmHg
- primary Tx
  - Eye drops
    - β. Blocker (Tenolol) — Relative Contrained for Asthmatic pt.
    - PGE2 Analog — Contraindicated for pregnant women.

SOAG
2°
- Angle is open but something is blocking the trabecular meshwork
  - Ex. Hyphema

Closed Angle Glaucoma

Acute
- Ocular Emergency -
- F > M
- presentation
  - Acute + dramatic
    - severe pain + Redness
    - ↓ visual feild
    - Severe Headache
    - dilated pupil
    - N+V
    - photophobia + excessive tearing
    - sudden loss of vision
- Tx (↓IOP)
  - β. Blockers Eyedrops to ↓IOP or any other Eyedrop
    - α Agonist
    - CA inh
  - IV / oral Acetazolamide (Carbonic Anhydrase inhibitor)
    - ↓ Aqueous humor production
    - Side effects → Hypokalemia
    - So Contraindications to give to pt with
      - Sulfonamide Allergy
      - pt taking ↓K⁺ diuretics
  - IV Mannitol
    - Contraindicated to pt with
      - uncontrolled Diabetes

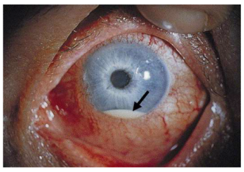
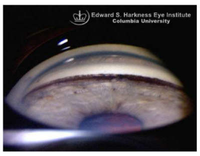
Chronic

★ Yag laser iridotomy / surgical iridectomy

SOAG

Causes

- Clogging of TM
  - RBCs → Hyphema
  - WBCs → uveitis
  - Pigment → melanoma
  - Proteins → pseudoexfoliation syndrome / Lens protein.
- ↑ Episcleral venous P
  - Carotid Cavernous fistula
  - Sturg weber syndrome
  - SVC Obstruction
- Scarring of TM
  - Angle Recession (Trauma)
- ↑ TM Resistence due to medication (Steroids)


Closed Angle Glucoma

- Anatomic predisposing features
  - Shallow Ant. Chamber
    - Hyperopia
    - Short Eye
- Risk factors
  - Eye injury
    - Scarring
    - adhesions
  - Rubiosis iridis (NVIs)
  - Mydriasis
    - by Drugs (Mydriatics)
    - by Darkness
    - by Stress / fear
  - Drugs

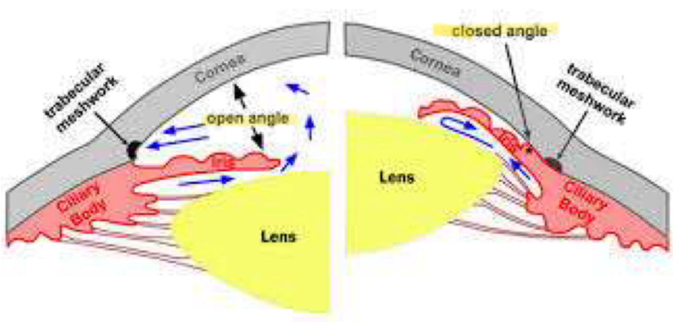
↳ pathophysiology

↳ Blockage of TM → ↓ Drainage → sudden ↑IOP

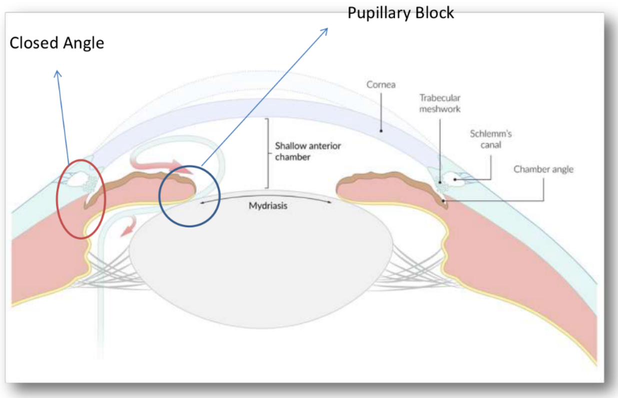
Causes

- Primary
  - peripheral iris obstruct angle
- Secondary
  - Scarring
    - PAS
    - PS
  - Lens luxation / large cataract
  - Rubeosis iridis (NVI)

Open vs Closed Angle

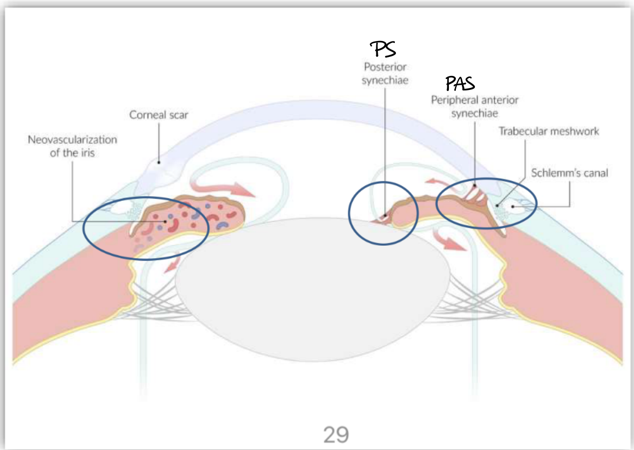


Acute Angle Closure with pupillary Block



28

Chronic Angle Closure-NVG/ Uveitis



Complications → Irreversible damage of optic N.

↳ Dx of Closed Angle Glucoma

Hx

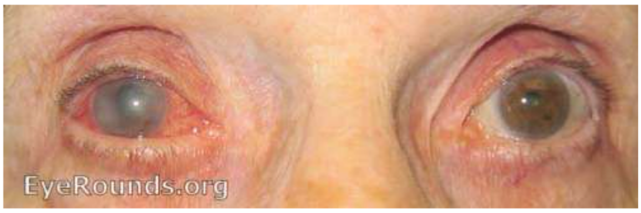
(Symptoms)

Above.

PEx

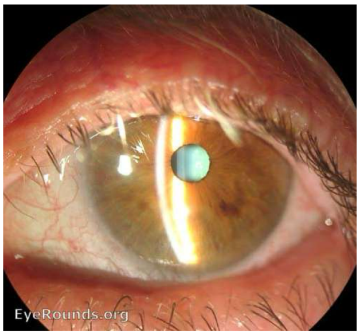
- ↓ Visual Acuity
- Non Reactive fixed oval pupil
- Cloudy Edematous Cornea
- Shallow Ant. Chamber
- Closed Angle on gonioscopy
- IOP > 40 mmHg

Injected, Cloudy cornea, oval pupil



Shallow A/C

Ant. chamber.



* Glucoma in General Dx

Hx
- Age
- Race
- fam Hx
- Refractive Error
- Ocular Hx
  - Trauma
  - Sx
  - Laser
- Medical Hx
  - DM
  - HTN
  - Asthma
  - Known Drug Allergy

PEx
- BSCVA
  - to detect Refractive Errors
- RAPD
- IOP
  - by Goldmann / tonopen
- Slit Lamp Exam
  - Signs of Secondary Glucoma
- Optic N. Head Examination
  - Stage.

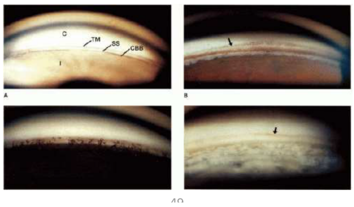
Visual Field Exam
- Stage.

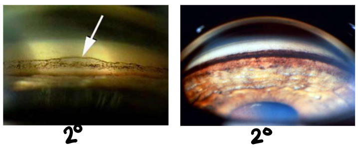
Special tests

5 tools

5 Tools

1. **Gonioscopy** (to See irido Corneal Angle) + look for 2°





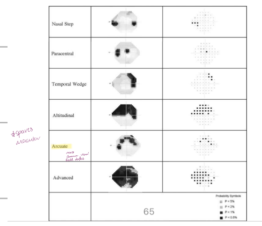
2° 2°

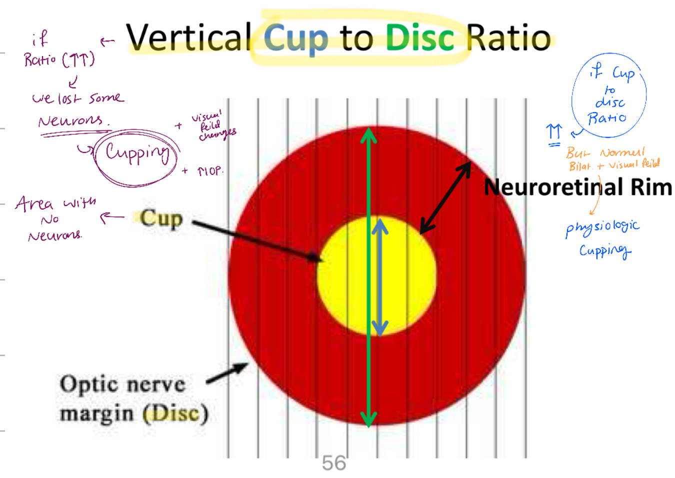
2. **Corneal thickness**
   - thin Cornea can give → Falsely low IOP
   - thick Cornea can give → Falsely High IOP

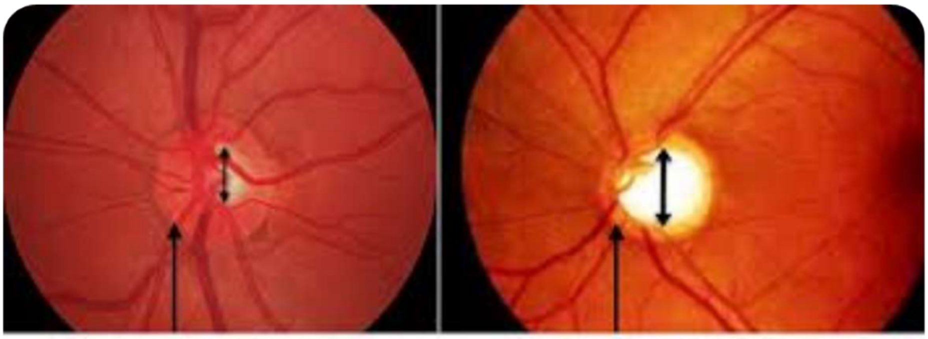
3. **Stereoscopic view of Retina on Slitlamp** + Dilated pupils → Optic N. Examination
   - Cup to Disc Ratio. (if ↑ → we lost some nerves)
   - Other findings
     - thin Rim
     - Notch
     - Drance Hemorrhage
     - peripapillary atrophy

4. **Optic n. Head imaging**

5. **Visual Field Examination** → m/c visual field defect with Glucoma → Arcuate (Spares macula)

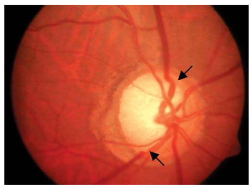






Normal optic nerve head Glaucomatous cupping

myonet sign.



myonet Sign.

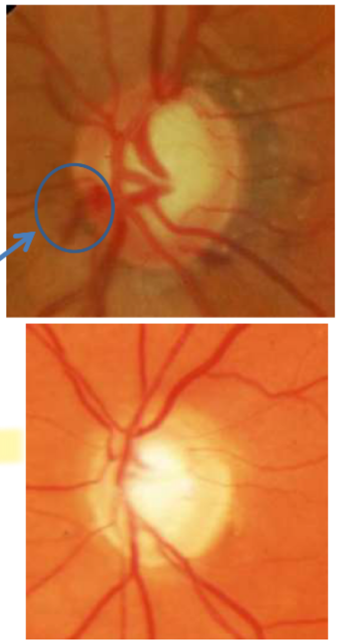
61

Optic Nerve Head Examination

- Look for:
  - –Cupping
  - –Asymmetry
  - –Notching
  - –Hemorrhages
  - –ISNT rule

Drance Hemorrhage (typical for Glucoma)

60



3 Tips

1. Every pt Has Glucoma until proven otherwise

2. IOP is neither necessary nor sufficient for glucoma Dx
But
most importent Risk factor.

3. Mx of Glucoma depends on Subtype of Glucoma.

Tx of Glucoma

Medical | Laser | Surgical

Medical

- PG analogs
  - ↑ uveoscleral outflow
  - SE:
    - pro inflam
      - Hyperemia

Ocular
- Conjunctival hyperaemia
- Eyelash lengthening, thickening hyperpigmentation
- Irreversible iris hyperpigmentation
- Periorbital fat loss
- deepening of the upper lid sulcus
- Hyperpigmentation of periocular skin – Common but reversible

- β. Blockers
  - ↓ Aqueous production
  - Contraindicated
    - Asthma
    - bradycar
    - Heart block

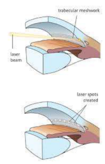
- α2 Agonist
  - Aqueous suppression
  - Neuroprotective
  - SE:
    - Severe Allergic Rxns
    - Contact dermatitis

- CA inhibitors
  - Systemic
    - Acetazolamide
  - Topical

Laser

- ↑ Outflow facility
  - Trabeculoplasty

• Series of laser burns at the TM to increase outflow facility



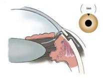
76

  - yag laser peripheral iridotomy
- ↓ Aqueous production
  - Cyclodiode
    - Ciliary body ablation

Surgical

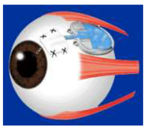
- Trabeculectomy

• A fistula between the anterior chamber and the subtenon space



- Glaucoma Drainage devices.

Glaucoma Drainage Devices



- Sulfonamide derivative
  - watch out for Allergy
- Aqueos suppressant.

- parasympathomimetic / cholinergic agonist (pilocarpine)
  - ↑ conventional pathway outflow (iridocorneal)
  - miosis
  - SE: ↑ RD Risk.

Diabetic

Retinopathy

Diabetic Retinopathy

→ 1 of m/c + Serious microangiopathy of DM.

↳ other
- diabetic nephropathy
- peripheral neuropathy

macroangiopathies
- IHD
- CVA

→ 1 of m/c diabetic eye disease

All Can Cause variable degree of visual Symptoms.

→ Diabetic eye disease (from Ant → Post)
- Corneal Abnormalities
- iris + Angle Neovascularization
- Neovascular Glaucoma
- Snow flake Cataract (Spc for DM)
- Occular nerve function
- Retinopathy

Diabetic cataract, or "snowflake" cataract.

(Rare)

→ Diabetic Retinopathy

progressive microangiopathy caused by Chronic Hyperglycemia

- m/c cause of mod-severe vision loss in the working Age Group 25-74 y

→ Retina Anatomy:

→ Risk Factors

primary

- Duration of Diabetes (most important)
- Metabolic Control

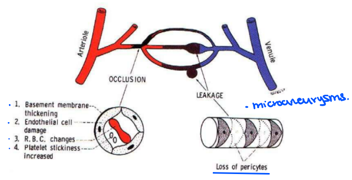
secondary

- HTN
- Nephropathy
- Hyperlipidemia
- Smoking
- Obesity
- pregnancy
- Anemia

→ pathogenesis

↳ Microangiopathies

Microangiopathy which has features of both microvascular leakage and occlusion.



microvascular leakage → Clinical Signs

- Intra Retinal hemmorrhages
  - dots
  - blots
- macular Edema → leading cause of vision loss in DR.
- Accumulation of Lipid Exudates within macula

microvascular occlusion → Clinical Signs

- ischemia → ↑VEGF → Neovascularization
  - within disc → NVDs
  - within Retina → NVEs
  - iris (Rubiosis iridis) → NVIs.
- Cotton wool Spots
- venous Changes (Bleeding)
- Intraretinal shunt vessels

Leakage is due to → Loss of pericytes

↓ distention of walls → microaneurysms (1st Clinical Sign of DR)

↓ disruption of Blood - Retinal barrier

↓ Leakage of plasma

↓ Retinal Edema

↓ Hard Exudates

occlusion is due to

↓ ↑ thickness of Basement membrane.

↓ Endothelial cell damage

↓ deformed RBCs (due to sustained Hyperglycemia)

↓ platelet stickness + aggregation.

All lead to → ischemia + Hypoxia

↓ induce ↑ VEGF

↓ Shunt + growth of new vessels.

(Hallmark of proliferative diabetic retinopathies)

New vessels

↳ Fragile + Easy to Rapture + Assotiated with fibrous Component

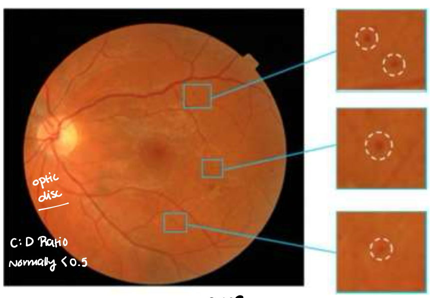
- vitrious hemorrhage + subhyaline Hemorrhage.
- (fibrous Component) with time it will contract → Traction force on Retina (Tractional Retinal detachement)

* Retinal Detachement
  - Seperation of Neurosensory Retina from underlying pigmented layer

Clinical Signs

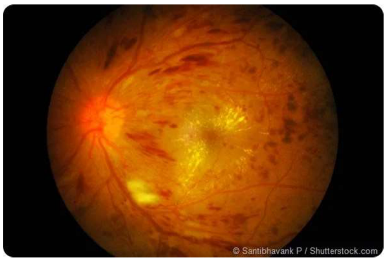
↳ **Early (NPDR)** (Non proliferative)

- **microaneurysm**
  - ✓ (Earliest Sign)
  - ✓ Small Red dots
  - ✓ Rapture of these



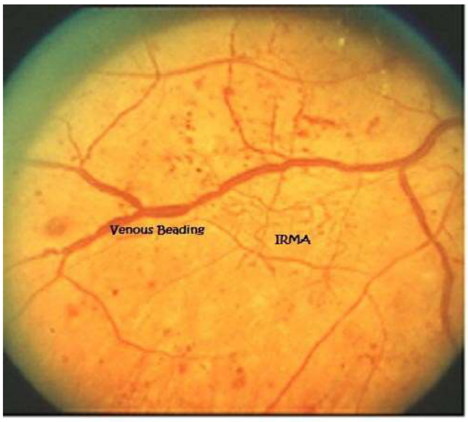
•microaneurysms.

- **dot + blot hemorrhages**
  - ✓ deeper Layer of Retina
  - ✓ if flame / splinter shaped → Superficial Layers.
- **macular edema**
- **Intraretinal microvascular abnormalities (IRMA)**
  - → Shunt vessels within Retina
  - Not As neovascularization
  - Sign of Severe NPDR Not PDR
- **Hard Exudates**
  - ✓ leakage of Serum proteins + lipids.
  - ✓ usually around macula.
- **Cotton Wool Spots**
  - ✓ Infarctions within superfacial nerve layer of Retina.
  - ✓ usually around optic disc. (↑ thickness of Retinal n. layer)
- **venous changes**
  - ↳ vinous beeding



- Flame hemorrhages.
- dot hemorrhage + microaneurysms
- macular Exudation (Hard Exudates)
- Cotton Wool Spots.

Hard Exudate	vs	Cotton Wool Spots
• Serum protein / lipids		• infarctions
• Around macula / Fovea.		• around optic disc
• Deep yellow		• pale / white
• Well defined with distinct borders		• ill defined fluffy borders



- IRMA

→ Leading Cause of Vision Loss in DR
↓
Macular Edema (DME)

Classification

DME Absent
- No Retinal thickning in the post pole
- No Hard Exudates.

DME present
- Retinal thickning in post pole
- Hard Exudates

if DME present

Mild DME

Retinal thickness + Hard Exudates

* distant from macula center.

Moderate DME

Retinal thickness + Hard Exudates

* Approaching center of macula but not involving it.

Severe DME

Retinal thickness + Hard Exudates

* involving center of macula.

Clinically significant macular edema

the Early Treatment Diabetic Retinopathy Study classification protocol as the presence of :

one of the following:

* مش مطلوب

- Retina thickening at or within 500 um from the center of the macula
- Retinal hard exudate at or within 500 um of the center of the macula if associated with edema.
- Zone of thickening one disc diameter, at least part of which is within one disc from the center of the macula.

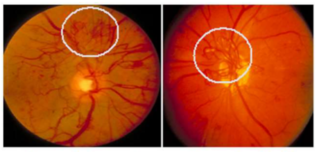
if DME → Clinically insignificant → we Don't need Tx.

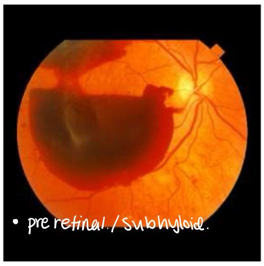
if Significant
→ Tx with Intravitreal injections Anti-VEGF / Steroids / Laser Tx.

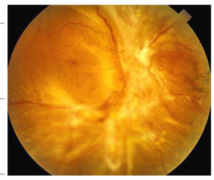
↳ Late Signs (proliferative)

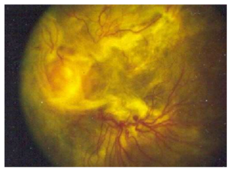
Neovasculaization — Vitrous Hemmorrhage — pri Retinal Hemorrhage (Subhyloid) — Traction RD — Neovacular glaucoma

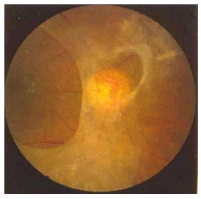
NVDs — NVEs — NVIs


(a) New vessels elsewhere (NVE) (b) New vessels on disc (NVD)



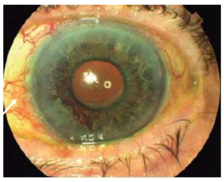






Rubeosis Iridis
Neovascularization of the iris.
(NVIs)

starts to appear at pupil margin.



Diabetic Retinopathy

non-proliferative (NPDR)

mild
- microaneurysm
- Signs just to 1Q

moderate
- Signs in 2 - 3 Q

Severe
- Signs in 4Q

* 4-2-1 Rule.
- > 20 dot hemorrhages in 4Q
- ≥1 venous changes in at least 2Q
- IRMA in 1Q

proliferative (PDR)

(Neovasculariztation + it's Complications)

Classification of the American Academy of Ophthalmologists

Dilated Ophthalmoscopy Findings	Proposed Disease Severity Level
No abnormalities	No apparent DR
Microaneurysms only	Mild NPDR
More than "mild" but less than "severe"	Moderate NPDR
Any of the following: 20 or more microaneurysims in 4 quadrants Definite venous beading in 2 or more quadrants Prominent IRMA in 1 or more quadrants and no neovascularization	Severe NPDR
1 or more of the following: Definite neovascularization Preretinal or vitreous hemorrhage	PDR

Table 7. International Clinical Diabetic Retinopathy Disease Severity Scale.

→ management

1. Control Risk Factors

HTN, Anemia, KF ↲ ↳ espacially metabolic Control.

2. indications of Specific Tx.

- proliferative DR (↑Risk of RD + vision loss)
- Clinically Significant macular edema
- Complications of PDR
  - vitrious hemorrhagy
  - RD
  - Neovascular Glaucoma

3. Tx options

- Laser Tx
  - Laser photo-coagulation → PDR
  - central Laser Tx. → Some cases of clinically significant DME
- Intravitreal injections
  - Anti-VEGF → DME
  - Steroids → DME if Not Response to Anti VEGF
- Surgery → pars plana vitrectomy
  - indications
    - persistent vitrious hemorrhagy / subhyloid hemorrhage.
    - traction RD

Laser photocoagulation

↳ Laser to All Retina

Laser Central Tx

↳ laser to macula but Outside fovea.

Sx → vitrectomy + removal of neovascularization + Endolaser + Anti VEGF injections

+ Tamponading agents.

Asymptomatic / mild NPDR → Observe + Control Risk Factors (↓ HbA1c)

Clinical significant DME → Anti VEGF mainly
involving fovea or Central laser Tx

Severe NPDR → Anti VEGF

PDR → laser photocoagulation.
+ anti VEGF

* Anti-VEGF
  ↳ Ranibusilmab ?
  ↳ Athlepercibt ?
  ↳ Biobyo ?
  ↳ parecimab ?

Cornea

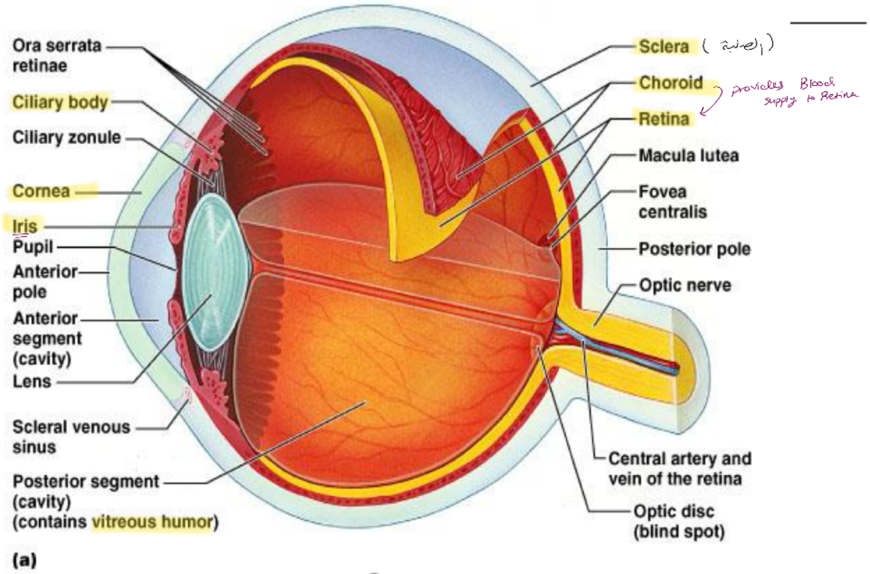
+

Sclera

Cornea + Sclera

→ Anatomy

uvea
↳ vascular



3

→ Cornea

Anatomically

↳ 5 layers

Epithelium – stratified Squamous, Regenerates (Stem cells in limbus)

↓

Bowman's Layer

↓

Stroma – 90% of Corneal thickness

↓

Dua's layer

↓

Descemet's membrane → Endothelium
– basement memb –

mono layer
of Non-Regenerating
Cells

function: pump water
from stroma to control
Hydration of Cornea

disease: loss of barrier
+ pumping functions

Corneal Edema + Cloudiness

Cornea is Avascular

nutrition for

Endothelium
+ post. stroma

Aqueos
humor

Ant. stroma
+ Epithelium

Air + tear
film

innervation → Highly Sensory
(↑ sens n. endings)
from
Nasociliary n. (branch of ophthalmic, branch
of trigeminal)

functions

protection

Refraction
(2/3 of Eye refractive power)
- fixed power -

Pathologies

Infective

viral — HSV, HZV
Bacterial
protozoal — Acanthameba
fungul

non-infective

Dystrophies
Shape disorders

* Infective

Cornea protective factors against infections

- Blinking
- flow of tears → washing of debris
- Entrapment of foriegn particles by mucus
- Tears Antimicrobial prop
- barrier function of Corneal Epithelium (tight junction)

loss of protection balance → infection.

1. Viral

↳ Latency of virus in trigeminal ganglion
Reactivation → Recurrent infection

↳ Characterized
↳ Dendritic ulcers on the cornea

usually Epithelium
Heals without Scar

if ↳ Stroma involved
Healing with Scar

↳ viruses

↓ m/c

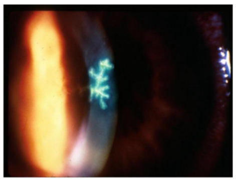
HSV

↳ Symptoms + Signs

- ↑painful
- watery discharge
- photophobia
- swelling of the eyelid

pathognomic appearance ↓

Dendritic ulcer



HZV

↳ Symptoms + Signs

- pain
- Headache
- Skin lesions
- dendritic ulcer

Skin lesion

↳ At ophthalmic division of Trigeminal

- Ocular problems are more likely if the nasociliary branch is involved Hutchinson's sign

Tx

- Topical Antiviral for Dendritic ulcer
- Oral Antiviral in HZV with Skin involvement (↓ post Herpetic neuralgia)

Avoid Topical Steroids in pt. with Dendritic ulcer

(it may cause ↑ulceration)

ulcer

↳ epi → Heal without Scar

↳ stroma → Disciform Keratitis (immunogenic Rxn) ↗

permenent scarring ← Corneal edema

↓

may Require Corneal Graft.

*if Epithelium Healed → we could give Topical Steroid (↓ Scarring)

2. Bacterial (Does not occur unless ↓ protective factors)

↳ pathogens

- Staph
- Strep
  - *unable to penetrate the Cornea if intact epithelium
- Neisseria gonorrhoeae
  - ↳ the only that Can penetrate the intact epi

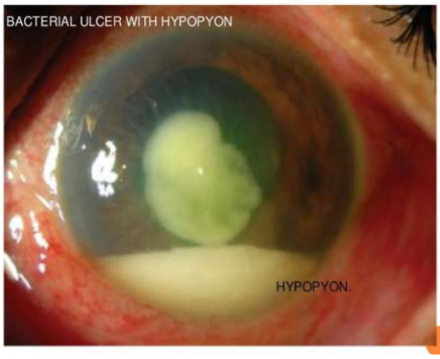
↳ predisposing factors

- Keratoconjunctivitis Sicca (Dry eye)
- use of Contact lens
- a breach into Epithelium
- Long term use of topical Steroid

↳ Symptoms

- Pain
- Purulent Discharge
- Ciliary injection
  - Conjestion around cornea
- Visual Loss
- Hypopyon
  - WBCs Collection in AC.

will end by Scar formation



DDx of Hypopyon

uveitis

bacterial Keratitis

Tx

Combined Topical ABx

Cover both gram (+) (−)

Fluoroquinolones can be used as monotherapy

3. protozoal (Acanthameba Keratitis)

↑ Common in contact lenses users

Symptoms

painful Keratitis

Ring Shaped Abscess

↳ Tx → chlorhexidene, propamidine

for months

may end up by → due to Scar formation

4. Fungal Keratitis

↳ ↑ common in warmer areas

↳ Consider in
- X No Response to ABx
- Cases with prolonged use of steroids
- Hx of Trauma by plants

↳ Signs

↳ Corneal opacity that appear fluffy

↳ Tx → Topical + Systemic Antifungul.

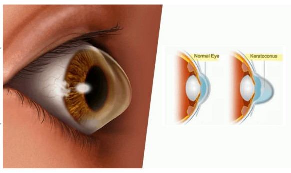
* Non infective

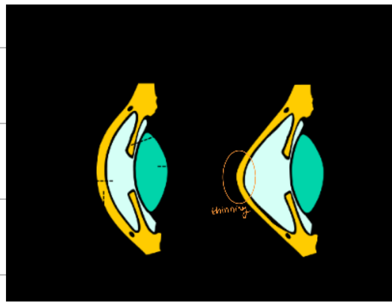
1. Dystrophies

- Rare inherited disorder
  (Common in Jordan due to Consanguinity)
- Affects Corneal Transparency (Abnormal material builds up in Cornea)
  - The only Tx → Corneal Graft (penetrating keratoplasty PKP)
- Types
  - Ant Dystrophies → Recurrent Corneal Erosions
  - Stromal Dystrophies → visual loss
  - Post. Dystrophies → gradual visual loss

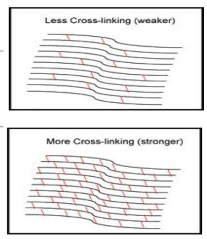
2. Shape disorders (Keratoconus)

- Sporadic disorder → thinning of corneal center
  leads to → ectasia + cone shaped

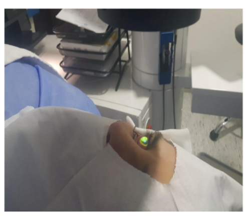




- Vision affected
  - without pain -
  - myopia, Astigmatism
  - + Sometimes → mild, subclinical (Asymptomatic)
- DX → Corneal topography
- Tx (multiple ways)
  - Spectacle -Glasses-
  - Contact Lenses
  - Corneal Cross linking → Stops progression of Keratoconus
  - Corneal Graft. -in severe Keratoconus-
  - * Combination



under topical. Anesthesia.



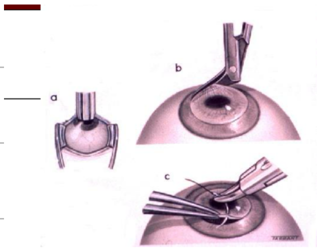
Corneal Graft Sx

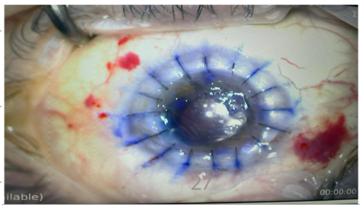
- Donor corneal tissue can be grafted into a host cornea to restore corneal clarity or repair a perforation
- Avascular host cornea provides an immune-privileged site for grafting, with high success rate (80%)
- No need for HLA matching
- Extracted within 24 hours of death (After death)
- Topical steroids eye drops are used after operation to prevent graft rejection (No need for systemic steroids)
- In Jordan, 50% of need is covered by local donation. JEB is based at JUH since1979

24

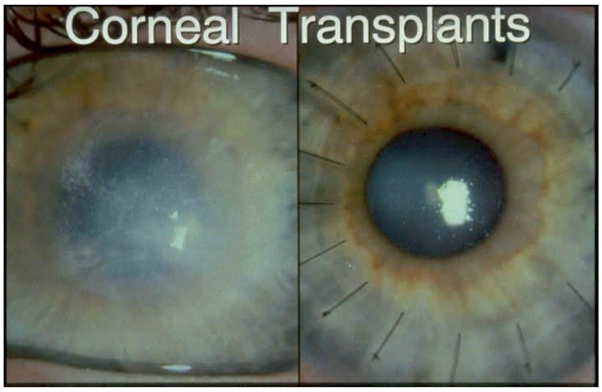
Cornea can be grafted within 2 weeks from extraction

25





Non absorbable sutures for 1year



Refractive Surgery (Any Sx to improve refractive power)

Corneal Surgeries (90% – laser)

- **PRK (laser)** photorefractive keratectomy
  - taking part of stroma after debridement of part of epithelium.
- **LASIK** – putting flabs
- **LASEK** – putting flabs
- **TransPRK** – transepithelial – No debridement of epithelium.
- **Cross linking**
- **Rings**
- **Grafts**

Lens Surgeries

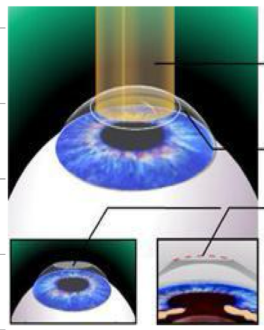
principle → using laser to alter Cornea shape

myopic → ↑Flattening of cornea

Hypermetropic → ↑steepening of cornea

Astigmatism → Flattens the steepest meridian.

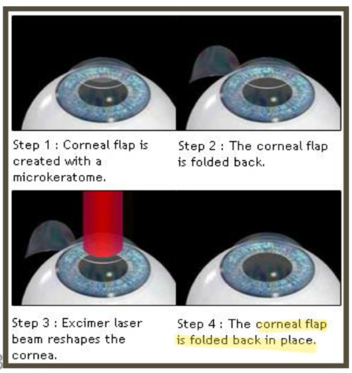
PRK



32

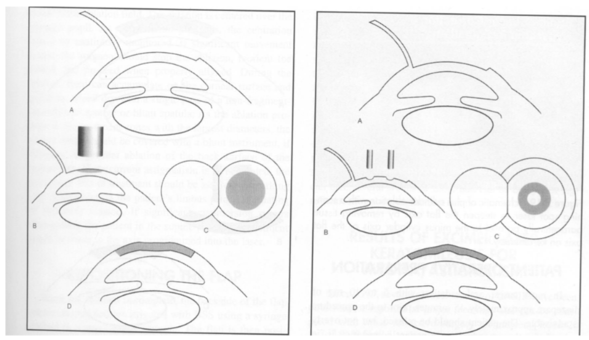
LASIK

laser assisted in situ keratomileusis
* corneal flap (in situ)
* reshape the cornea (keratomileusis)



33

Lasik


Flattening for Myopia

pulging of Hypermetropia

34

Contraindication (of laser + lasik)

- Age < 19
- unstable Refractive error
- Poor vision due to other causes
- unhealthy cornea
- Severe dryness / inflamm
- Keratitis
- Kerato-conus → must Do Corneal Topography beforehead.

Sclera

Anatomically
- whitish of the eye
- interwoven collagen fibrils of different widths

function
- site of EOM insertion

pathologies

Episcleritis

- inflamm of superficial layer of sclera
- Signs + Symp
  - mild discomfort
  - segmental redness
- Tx → Self limiting
  - if persist → topical antiinflammatory
- Rarely associated with

Scleritis

usually associated with Collagen vascular disease (connective tissue disease)

m/c → RA

Symptoms
- Severe ocular pain
- generalised eye redness
- Scleral swelling

Complications
- Sclermalacia
  - scleral thinning
  - ± Rapture
- Keratitis
- Uveitis
- Cataract

Tx
- mild →
  - Topical
    - Steroids
    - NSAIDs
- moderate-severe

Systemic disease

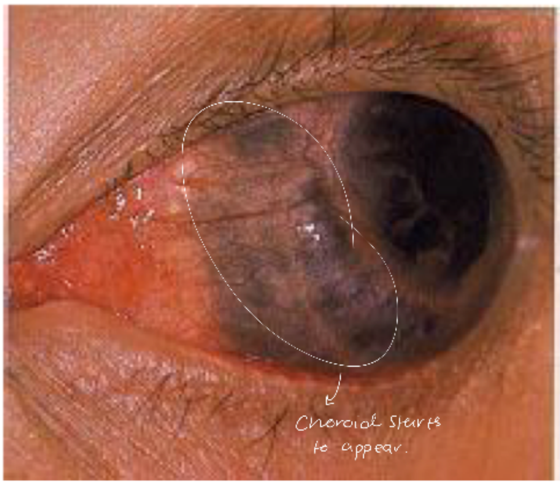
Formation

Glaucoma

↑↑ Doses of Systemic

Steroids

Cytotoxics



Sclermalacia.

Scleritis

Medical condition that requires investigations for underlying cause

Strabismus

→ Normal Eye Movements
↳ by EOM

by CN III oculomotor → MR, IR, SR, IO

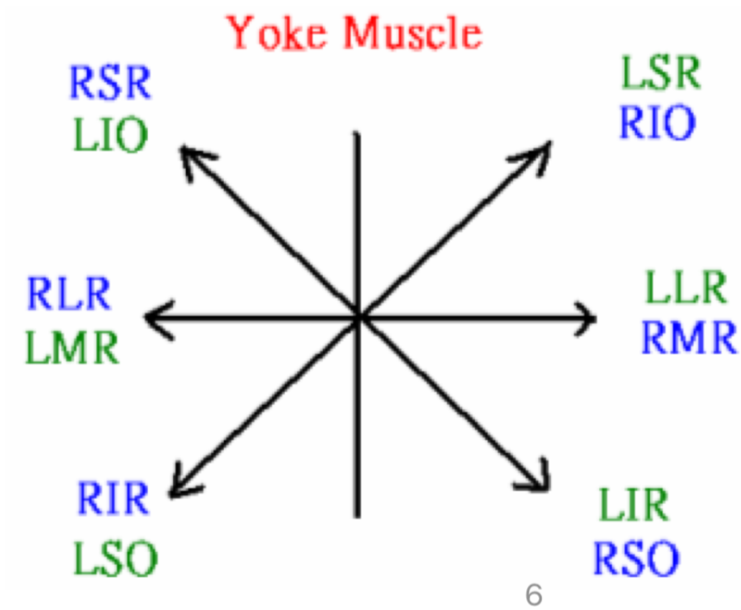
by CN IV trochlear → SO

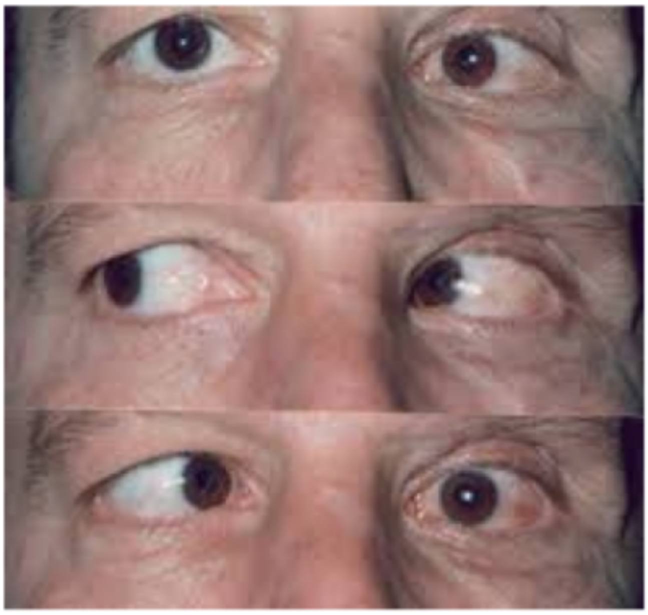
by CN VI Abducent → LR

Obliques
↙ Sup → Depressor
↘ inf. → Elevator

→ positions of gaze
↳ 9 positions
6 - Cardinal
3 - Additional

Yoke muscles are pair of muscles (one muscle in each eye) moving the eye into the same direction of gaze





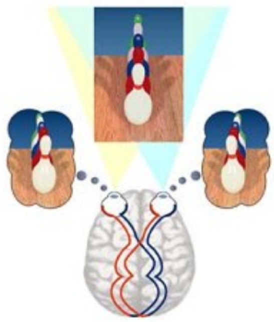
Lt. Abducent n. palsy (n. 6)
- Lt. LR is affected -

could be due to
HTN crisis
uncontrolled DM
Stroke
trauma

Strabismus
Could be
intermittent
in certain positions.

✰ Binocular Single Vision + Stereopsis

Normally both eyes are directed toward the same object and an image of that object is created on each retina, these images are fused centrally and interpreted by the brain as a single image.



8

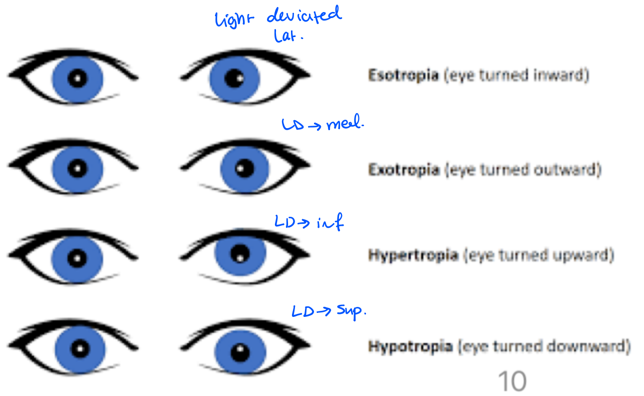
Importance of Stereopsis

- Visual field
- Eliminate Blind Spot
- ↑ Acuity
- Estimation of distance
- Depth perception

→ **Strabismus** (حول)

↳ is a sign not a disease

↳ misallignment of the eye.



10

if Both Light Reflexes

↓

Orthophoria.

Approach to Strabismus

Hx
- Frequency - constant / intermittent
- Onset
- FHx
- PMx, SHx

PEx
* most important
- Do not Rely on the appearance.

* Normally 5 factors must be present for Single binocular vision

لازم يشتغلو مع بعض

Normal Eye — Normal muscles — Normal nerves — Normal orbit — Normal Brain

Any problem of these due to

- Congenital
- Aquired
  - vascular
  - inflam
  - traumatic
  - neoplastic

will lead to → Strabismus.

Strabismus

Non-paralytic

- Not a muscle /nerve problem-
- Coordination problem
- ↑↑ children
- No Diplopia

But Amblyopia → must < 10y

if > 10y → No Amblyopia But Diplopia

- Causes
  - Hypermetrope → Tx → Glasses → Sx
  - Amblyobia → patching the better seeing eye (Tx must < 10y)

- to Examine Exact amount of Refractive Error → we give Cyclopentolate (Anti cholinergic) ↳ to Paralyze Ciliary muscle

Paralytic

(paralytic squint)

- Aquired, Diplopia present
- Causes
  - nerve palsy
    - Causes
      - ↳ Orbital disease / Neoplasia → meningioma → acoustic neuroma → glioma
      - ↳ Vascular disease → HTN, DM, Aneurysm → 3rd n. palsy (post. Communicating A. aneurysm)
      - ↳ Trauma
      - ↳ ↑ICP → 3rd ↳ 6th
      - ↳ inflamm
  - mechanical
    - Restriction / EOM disease
    - Causes
      - ↳ Dysthyroid Eye disease
      - ↳ Myasthenia gravis
      - ↳ Brown Syndrome

Nerve palsies

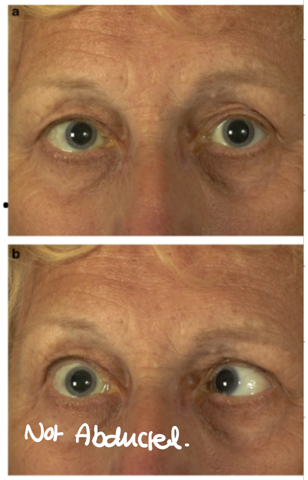
3rd N. palsy	4th n. palsy	6th n. palsy
Loss of oculomotor	Loss of Trochlear	Loss of Abducent
- ↑Abducent + Trochlear	- X SO	- X LR
Abd + depression	Elevated + Add	No Abduction

3rd N. palsy

- X levator of eyelid
  ptosis
- X of parasymp
  mydriasis.

4th n. palsy

6th n. palsy



Dysthyroid Eye disease

↳ Deposition of materials in the orbit / muscles

↳ proptosis / Exophthalmus.

Myasthenia gravis

↳ Neuromuscular disease

Tests for Strabismus

Corneal Light Reflex (Hirshberg's test)

Cover - uncover test

Alternating Cover test

* Strabismus types:

→ Esotropia

Concomitant

(non paralytic)

Congenital

* 1st 6months
* No Hypermetropia
* Tx ↓

Recession of Both MR

Accomodative

* pt with moderate amount of **Hypermetropia**

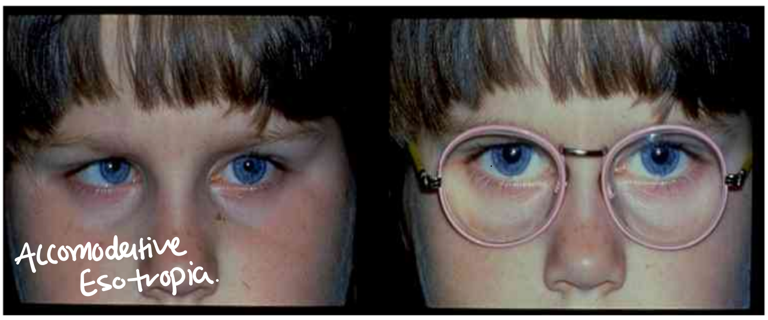
Normal near reflex

Accomodation / pupil constrict / Convergence squint

with Hypermetropia they have weak Accomodative power

↓

So they try to compensate with ↑↑ Convergence Squint



Non-Accomodative

→ Emotional / Physical Stress

→ Sensory Deprivation

↓ Cataract un Tx

↓ optic atrophy

→ **Retinoblastoma.**

→ Exotropia

Intermittent

- onset < 5y
- manifest during times of
  - visual inattention
  - Fatigue
  - Stress

Non Accomodative Exotropia

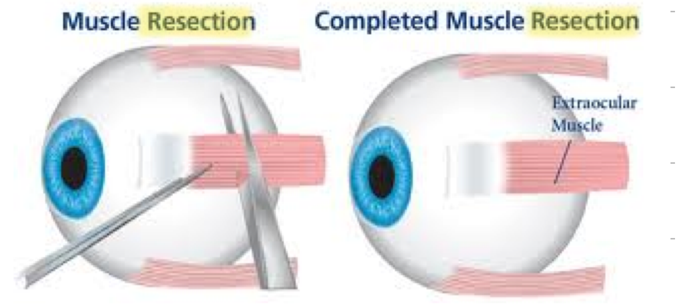
Crouzon's Syndrome

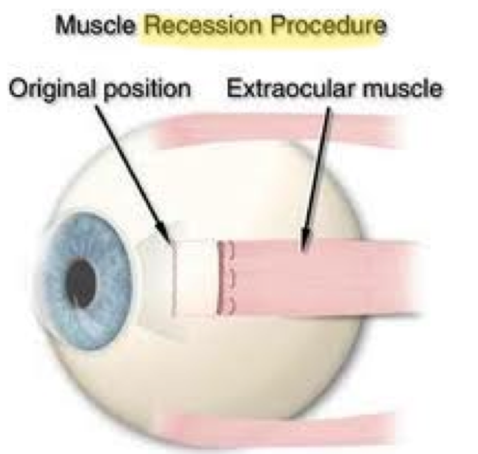
Abnormal Orbit → Strabismus

→ Mx of Strabismus

- Early detection
- Glasses
- Sx
  - بضعف عضلة أو بقوي عضلة.

Resection / Recession
(↑power) (↓power)





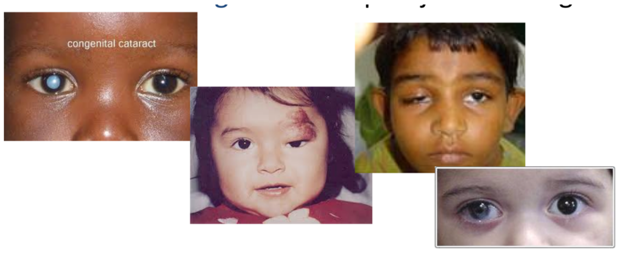
* Amblyopia

just in pt < 10 years
(No proper development of vision within 1st 10 years of life)

الكسل البصري

~> Causes

- Strabismic
- Anisometropia
  (unequal Refractive error)
- Form Deprivation
  - unTx Cataract
  - ptosis
  - Lid Capillary hemangioma
  - Corneal opacity



Take home messages

- Strabismus is a symptom/sign (similar to fever) which might be the presenting sign of life threatening conditions.
- Parents are always true about their complaint of presence of squint.
- There is nothing called Pseudo strabismus.
- Never patch the eye of a child. → be careful of Amblyopia.

Lids

+

Lacrimal

gland.

Anatomy of the Eyelid (Tursus)

Eyelid Structures

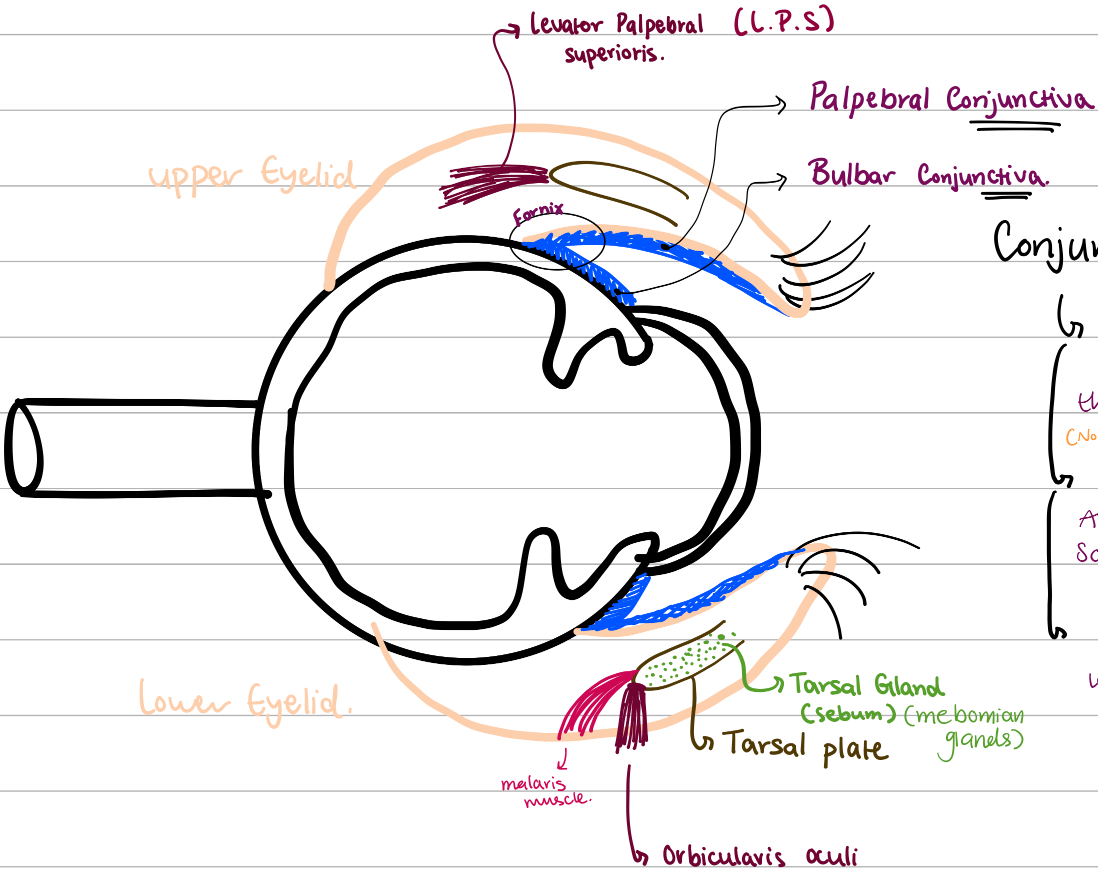
- Skin
- Orbital septum
- Orbital Fat
- muscles
- tarsal plates + meibomian glands
  - ↳ produce oily secretions to stabilize tear film + prevent Evaporation
- Conjunctiva
- Eyelashes

Eyelids muscles

- Orbicularis Oculi (by facial n.)
- muller's muscle (weaker elevator) (smooth m. → sympathetic supply) it's insertion ↳ tarsal plate
- Levator Palpebral Superioris (main elevator) (has multiple insertion) (by oculomotor n.)

Eyelid functions

- Eyelid protection
- tear production + Drainage
- maintaining normal tear film



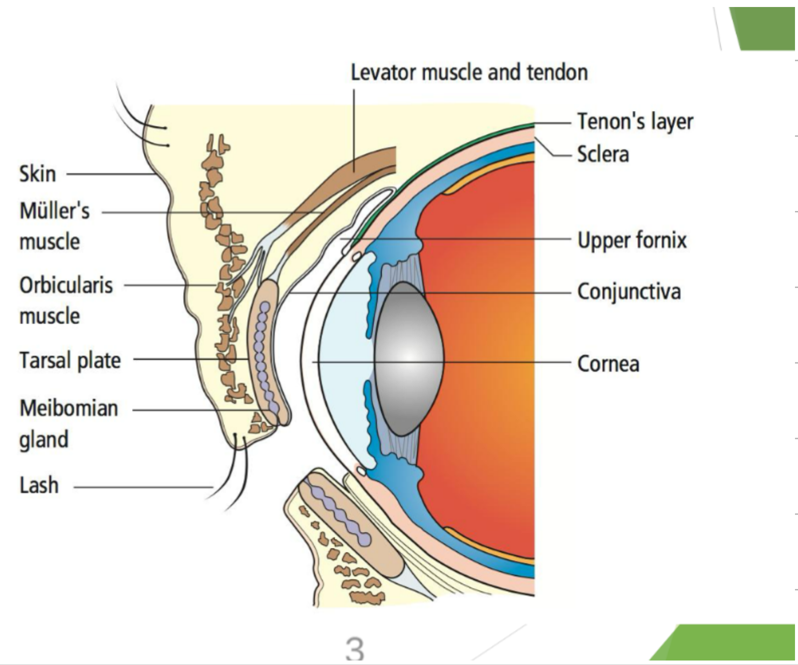
Conjunctiva

↳ Epithelial layer
- thin
- transparent

(Non-Keratinized stratified squamous epithelium)

↳ covering
- Ant. Sclera
- inner Eyelid

↳ functions
- Lubrication
- protection
- immune defense.



Pathologies

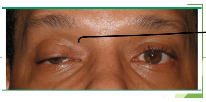
- Abnormal lid Position
  - ptosis
  - Entropion
  - Ectropion
- inflamm
  - Blepharitis
    - Ant.
    - Post.
- Benign lumps
  - 7 types
- Malignant Lumps
  - BCC
  - SCC
- Lash Abnormalities
  - Trichiasis
- Lacrimal System Abnormality
  - problem of tear production + Evaporation
  - problem of Drainage

1. Abnormal lid position

ptosis

- Abnormal low position of upper eyelid

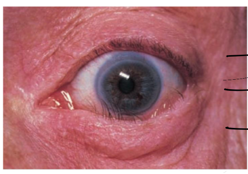
normally it only covers 1 - 2 mm of upper Limbus



- presentation
  - cosmetic
  - vision impairment
  - underlying cause

Entropion

- (↑ lower lid) inward eyelids toward eyeglobe
- problem
  - continuous irritation by lashes / lids



- Causes
  - spastic (tightly closing the eye)
  - Involutional - Elderly - weakening of Lower lid Retractors
  - cicatritial - Conjunctival Scarring -

Ectropion

- Eversion outward turn of lower eyelid

- Causes
  - Age orbicularis laxity
  - 7^{th} n. palsy
  - periorbital skin scarring
- Mx
  - Tx Cause
  - Sx

↳ Mx → Tx cause.

Taping of LL + Lubrication

spastic → botulinum toxin to orbicularis oculi

Sx

↳ Causes

↳ mechanical

- Lid lumps
  - (↑Wg on upper eyelid)
    - hemangioma
    - hematoma
    - infections
    - tumors
- Lid edema
- Lid Scarring

↳ Disinsertion

↳ of Aponeurosis of Levator muscle from it's insertion on tarsus

↳ ↑ Elderly

↳ m/c cause of Acuired ptosis

↳ Neurologic

- 3^{rd} n. palsy
- Horner's syndrome

↳ Myogenic

- malformation of LPS muscle
- myesthenia gravis
- muscular dystrophy
- botulism

* m/c cause of Congenital ptosis

↳ Signs

- ↓ palpebral aperture size
- No lid creases
- if Cause
  - Horner's Syndrom → Triad
    - ptosis
    - miosis (↓pupil)
    - Anhidrosis
  - 3^{rd} n. palsy
    - mydriasis (↑pupil)
    - Diplopia
  - Myasthenia Gravis → + fatigue after repeated Exercise.

↳ Mx

↳ Tx underlying Cause

↳ medically for medical disease (Myasthenia Gravis)

↳ Sx

↳ Complication

↳ in Children → if ptosis covers visual Axis → Amblyopia.

2. Blepharitis

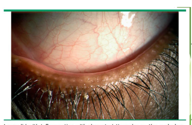
- inflammation of Eyelid margins (Chronic) → Long term Tx
  - Eyelid → Eyelashes
  - margins → mucocutaneous junction

- presentation
  - Red
  - itchy
  - Sore eyes
  - worse in morning * → no blinking during sleep → No clearence of Staph exotoxin
    - Different than Dryness
      - worse at night.

- Associated with
  - atopic eczema
  - seborrhic dermatitis
  - Rosacea

  because it affects Sabaceous glands

- types
  - Ant. Blepharitis (Eyelashes)
    - Signs



Lower lid with inflammation with characteristic scales on the eyelashes.

  - Post. Blepharitis (meibomian glands)

Scaling + Redness of Lid margin (Squamous Debris)

Ulceration

Collarette formation → Dilated Blood vessels

↓ #n of Lashes

↳ if + Corneal involvement
↓
Blepharo Keratitis.

↳ Associated with
↳ Staph overgrowth (Exotoxin)
↓
marginal Keratitis
- ulceration of peripheral Cornea -

↳ Mx
- Lid hygiene
  - Bicarbonate Solution
  - Baby Shampoo
- Topical Steroids
- Topical ABx
  ↓
  fusidic acid ointment

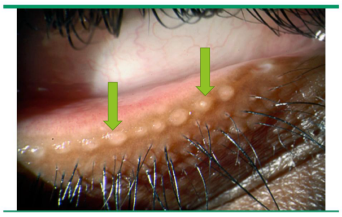
if very severe
↓
Systemic Doxycyclin

↳ Caused by
↳ Meibomian Gland Dysfunction (MGD)
due to Obstruction by Squamous Debris

↳ Results in ↓
viscous Cloudy lipid Secretions

↳ involves
- Lid margin
- Conjunctiva

Posterior Blepharitis



Lower eyelid with characteristic posterior lid inflammation and oily white plugs visible at the meibomian gland openings.

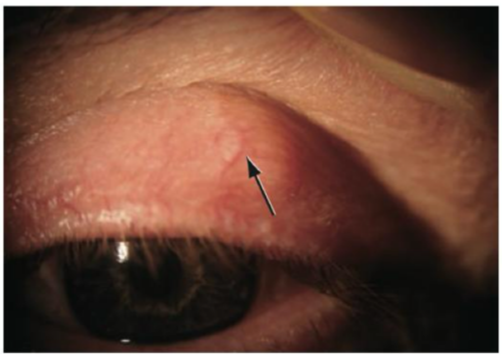
↳ Mx
- Lid hygiene
  After hot bathing
- Systemic Azithro
  - for Short term -
- Oral
  ↓ Doxy
  ↓ tetra
- Artificial tears
  ↓
  Eye dryness due to ↓ oil Secretions

3. Benign lumps

- Chalazion
- Hordeolum (Abscess)
- Molluscum Contagiosum
- Cysts
- Squamous Cell papilloma
- Xanthelasma
- Keratocanthoma
- Neavus

1. Chalazion

- Lipo-Granuloma within tarsal plate
- Causes
  ↓
  meibomian Gland Obstruction
- painless
- Resolve within 6 months
  if persist
  ↳ incised + curetted through conjunctiva.

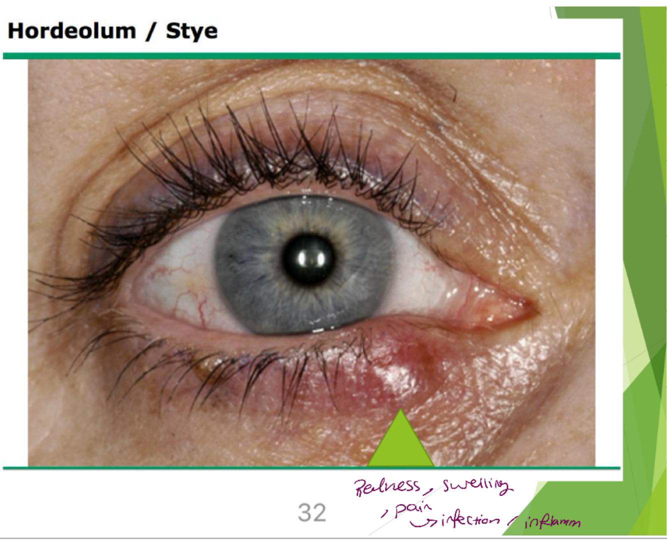


2. Hordeolum (Abscess)

→ with inflammation ≠ unlike chalazion

Internal Hordeolum (Abscess)
- painful Abscess
- meibomian gland
- Mx → Drainage + ABx

External Hordeolum (Stye) – الشحاد
- very painful
- Eyelash follicle
- Mx
  - removal of Eyelash
  - Hot Compressors
  - Topical ABx



Redness, swelling, pain → infection / inflamm

3. Molluscum Contagiosum

lesion of Lid margin

By
Pox virus
(molluscum contagiosum virus)

Transmission
- Direct Skin Contact
- Autoinoculation
- Fomites

Risk Factors
- immunosuppression / Active atopic dermatitis
- Hot + humid Climate + crowded areas

if + lymphoid tissue on tarsal Conjunctiva
Follicular Conjunctivitis

presentation
irritated Red eye

Mx
Lesion Excision

M > F / ↑ childhood (↑ < 5 y) + Early Adolscence

20% of HIV pt has symptomatic infection

4. Cysts

Sabaceous Cyst
- opaque cyst
- Excision for cosmetic reasons

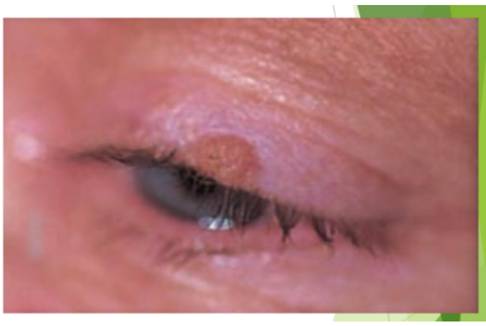
Cyst of moll
- Translucent cyst
- Obstruction of Sweat Glands

Cyst of Zeis
- Opaque cyst
- Eyelashes Accessory Sabaceus gland Obstruction

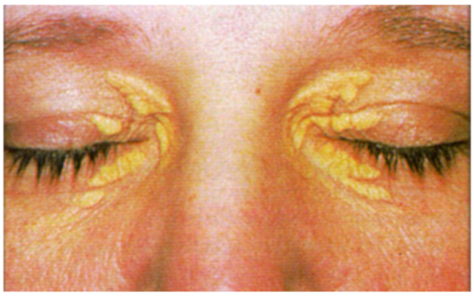
5. Squamous Cell papilloma (Skin tags)

الثواليل.

- Frond like lesions
- HPV
- Fibrovascular Core + thickened Squamous Epithelium
- Excision for Cosmetic Reasons



6. Xanthelasma



Lipid containing / Assotiated with Hyper Cholesterolemia

Check Blood Cholesterol

Excision for Cosmetic Reasons

7. Keratoacanthoma (must differentiate than BCC)

Brownish

, Fast growing → over 3 - 6 weeks ↓ different than malignancies ↓ months - years

+

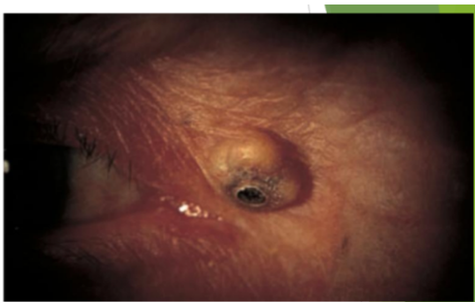
Central Crater (حفرة) filled with Keratin.

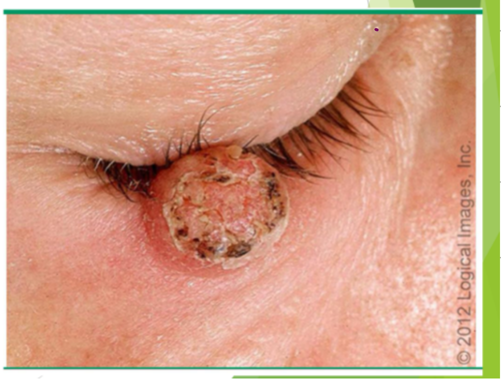
Mx ↳ Excision

why?

For Histology ↓ to Exclude malignant feature

Spontaneous regression will lead to ↓ ugly Scarring



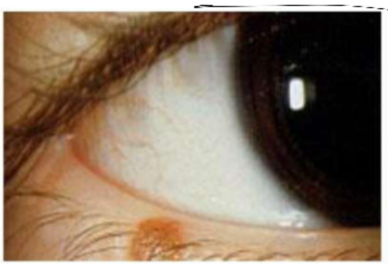


8. Nevus (mole)

lesion from Altered melanocytes (Naevus cells)

pigmented / non pigmented

No Tx needed unless suspicious → removal



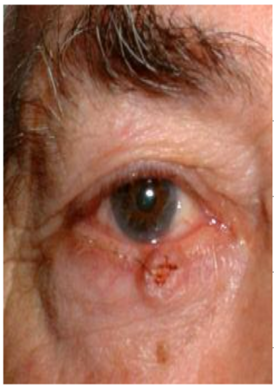
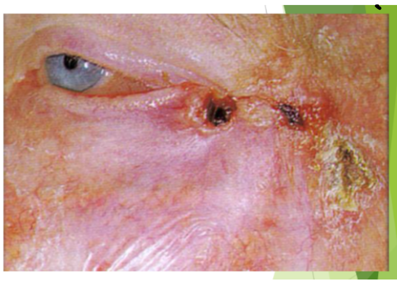
4. Malignant Lumps

Basal Cell Carcinoma (BCC)

- m/c eyelid tumors
  - 90% of eyelid tumors are BCC
  - 10% of All BCC in the body are in eyelids
- Characteristics
  - Slowly growing
  - Locally invasive
  - non-metastatic
  - painless
  - lesion
    - nodular
    - ulcerative
    - Scaly
- Tx
  - Excision biopsy + safty margins
  - Mohs Sx
  - Cryotherapy
  - Radiotherapy
- Good prognosis
- Risk factors:
  - Fair Skinned
  - Blue eyes
  - Hx of prolonged Sun Exposure.

Squamous Cell Carcinoma

- ↓ common
- Characteristics
  - Fast growing
  - ↑ malignant
  - mets to Reigonal Lymph nodes
  - lesion
    - Hard nodule
    - Scaly patch
- MX
  - Excisional biopsy with Safety margins
- Cause / Risk factors
  - De novo
  - pre-existing actinic Keratitis

5. Lash Abnormality

↳ Trichiasis

- Eyelashes directed foward globe
  - * Normal lid margin (unlike Entropion)
- Causes
  - ↓ irritation, Abrasion, tearing of Cornea
- Associated with
  - ↓ Trachoma (contagious eye bacterial infection
  - ↓ by Chlamydia trachomatis
  - ↓ that leads to scarring of eyelids inner surface.
- Tx
  - ↳ Epilation + local Sx Resection
  - ↳ if Recurrent
    - ↓ Electrolysis
    - ↓ cryotherapy

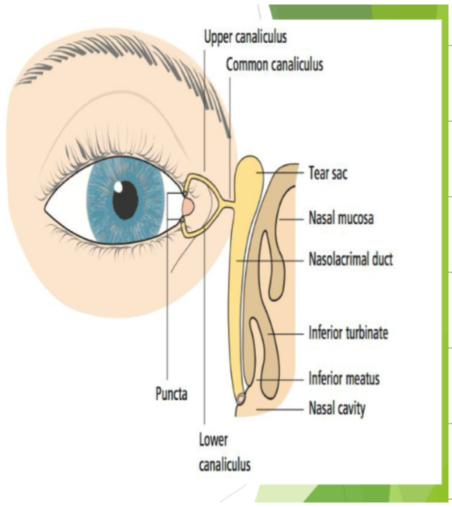
6. Lacrimal System Abnormalities

conjunctival tear film
+
Lacrimal glands
+
meibomian gland

→ Tear film → Drainage through

Tear film → Evaporation

Drainage through → upper / lower puncta → upper / lower canaliculi → Common Canaliculus → Lacrimal Sac → Nasolacrimal duct → Nose



Tear film

- inner
  - mucin Layer
  - by Conjunctival Goblet cells
  - for
    - Adhere tears to the eyes
- middle
  - Aqueous Layer
  - by Lacrimal glands
  - for
    - nourish
    - protection of cornea
- Outer
  - Oil Layer
  - by meibomian glands
  - for
    - Lubrication
    - prevent Evaporation

functions of tear film

- Moistens eye, prevent Dehydration
- provides smooth air /tear interface for distortion free refraction
- Transmit O_2 to Avascular Cornea
- Remove Debris + foreign bodies
- Antibacterial
  - IgA
  - Lysozyme
  - Lactoferin

Abnormalities of Lacrimal System

↓ Tear production
↑ Evaporation
(Dry Eye)

1. Aqueous deficient dry eye
2. Evaporation dry eye
   - Inadequate meibomian delivery
   - malposition of globe, lid margins (Ectropion / proptosis)
3. Cicatricial Conjunctival disorder

Drainage of tears

4. Obstruction of tear drainage
5. Infection of nasolacrimal duct.

Dry Eye

↳ ↓ tear Flow / ↑ Evap → tear def + ocular surface Hyperosmolarity

- ocular surface damage
- inflamm
- discomfort
- visual loss

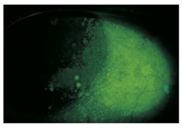
Called Keratoconjunctivitis Sicca

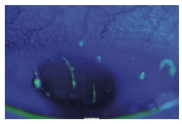
1. Aqueous deficient dry eye

- ↓ lacrimal gland secretions
- ↑ older women
- cause mainly
  - Sjogren's Syndrome
    - primary
      - Autoimmune
        - inflamm + destruction of glands.
      - Associated with Dry mouth
    - Secondary
      - ↳ Accompined with other Autoimmune diseases
        - RA
        - SLE
        - Scleroderma

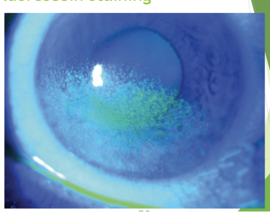
Signs with Fluorescein Stain

- Early break up of tear film
- Punctate staining
- Filamentary Keratitis
  - tags of Abnormal mucus





Fluorescein staining



DX → ↓ salivary + lacrimal functions

↳ Bx → T-cell infiltrates

Labs → Anti-Rho , Anti-La

management

- Artificial tears
- Shielded glasses
- puncta plugs / Sx occlusion of puncta
- Topical Anti-inflamm
  - Steroids
  - Cyclosporin

Symptoms (Non-specific)

- Burning eyes
- photophobia
- Lid Heaviness
- Ocular fatigue
- Grittiness
  - (Sand Sens)
- Worse at night
- ↓ visual Aquity

2. Evaporation Dry eye

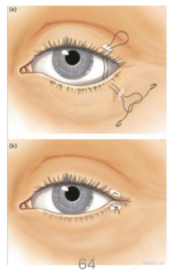
Inadequate Oil
↓
Extensive Meibomian gland dysfunction
↓
↓ tear film Lipid layer
↓
↑ water loss

Malposition of Globe / Lid
↓
Ectropion
↓
Lagophthalmos
↓
Incomplete Lid Closure (7th CN. palsy)

Proptosis
↓
Infrequent blinking
↓
(Parkinson's)

Tx →
As post. Blepharitis

Tx
- Correction of Lid deformity
- Artificial tears + Lubricants
- Local botulinum toxin into levator muscle
- Lateral Tarsorrhaphy



3. Cicatricial Conjunctival disorder

(scarring)

- Loss of goblet cells due to Conjunctival shrinkage + Adhesion forming between globe + Conjunctive → Symblepharon

- cicatricial Conjunctival disorders
  - ↓ Erythema multiforme (SJS)
  - target lesions on Skin, mouth, vulva

- Sign + Symptoms
  - ↓ similar to Aqueous deficiency
  - ↓ scarred Abnormal Conjunctiva
  - ↓ area of fluorescein staining

- Tx
  - Artificial lubricants

other causes of Loss of goblet cells

- ↓ Chemical Eye burn
- ↓ Trachoma
- ↓ Vit A deficiency (xerophthalmia)

4. Obstruction of Tear Drainage

Infants: Congenital Drainage Obstruction.

- Normally
  - Nasolacrimal System Canalizes + become patent near term period
- Failure of canalization of
  - Distal end of Nasolacrimal duct. → Watery eyes
    - * the Conjunctiva is not inflamed.
  - obstruction of Canaliculi → mucocele, Dacrocystitis
- DX → discharge from puncta due to ↑P on lacrimal Sac

Clinical picture

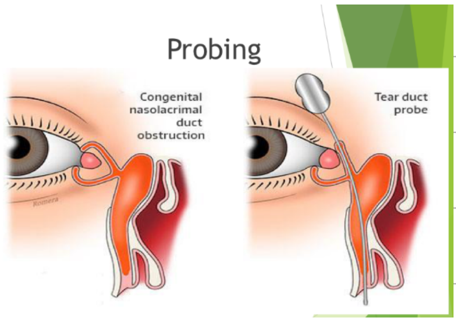
Adult drainage Obstruction

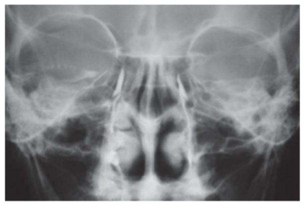
- m/c site → lacrimal duct but can be anywhere else
- Causes
  - Infections
  - Direct trauma / Fractures
  - Topically applied drugs
- presentation
  - watery Eyes
  - white eyes
  - Stickiness
  - worse in Cold / windy weather
  - on Slit lamp → Stenosed punctum
- patency can be assessed by
  1. Syringing normal saline or water into the canaliculi.
  2. Fluorescein dye disappearance test after 5 minutes.
  3. Dacryocystogram: radio-opaque dye followed by X-ray
  4. Dacroyscintillogram: Radioactiveisotope followed by gamma camera

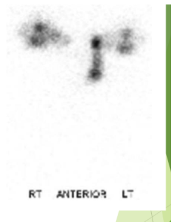
↳ Tx

↳ Resolve Spontaneously in 1st year of life

↳ Probing to perforate occluded duct







↳ Tx

↓ Exclude other causes causing watery eyes

↓ Dacryocysto-rhinostomy (DCR)

5. Nasolacrimal System infections

Dacryocystitis

↳ mostly due to Obstruction

↳ infection

↓ Steph. infection

↓ Strep.

↳ presentation

↳ Painful swelling on medial side of Orbit.

Mucocele

↓ Collection of mucus in an obstructed sac

usually painless. (Not infected)

↳ Tx → ABx Systemic

DCR is Done
in both cases.

Acute Dacryocystitis

Eye

injuries

→ Eyes are located near vital regions

Intracranial space

Cervical spine

Airway

→ Consider Life threatening injuries then identify Vision threatening injuries

→ Eye injury

ocular trauma

orbit (periocular trauma)

or Both

→ Eye injuries

Common Eye injuries

Eyelid Lacerations

Corneal Abrasions / Corneal FB

Conjunctival injuries

Orbital fractures

Vision threatening Conditions

Ocular Chemical burn

Orbital Compartment Syndrone

Open globe injury

Traumatic Hyphema

Hyphema: RBCs in AC.

Vitreous hemorrhage

Retinal trauma

periocular injuries

optic n. injury

1. Lid lacerations

Full thickness Laceration

Laceration + Orbital Fat prolapse

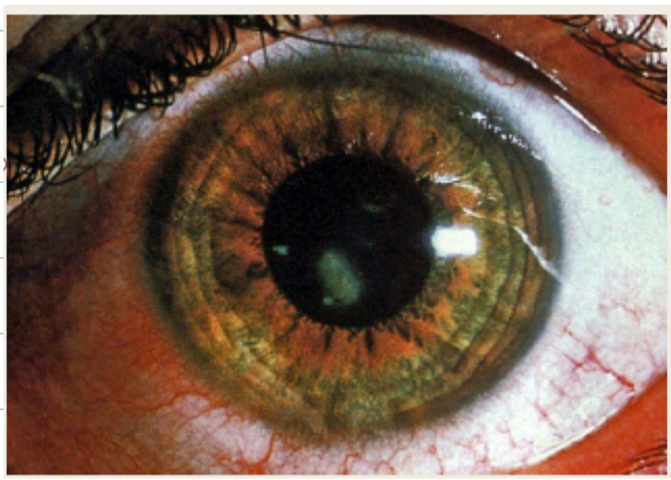
Laceration through lid margins

Laceration involving Lacrimal System (puncta + canaliculi)

Laceration + poor alignment /Avulsion

2. Corneal Abrasion + Corneal FB

- Loss of Epithelial layer
  - (if involving Stroma → Laceration)
- presentation
  - Severe pain
  - photophobia – Reluctance to open the eye –
  - FB Sens
- findings
  - Normal visual Aquity
  - Normal pupillary reflex
  - Staining defect on fluoresciene



Corneal FB
- m/c → برادة الحديد

1. Ocular Chemical burns

Eye Contact

- Acids
  - Coagulative necrosis - (أسود)
- Alkali
  - Liquifactive necrosis -

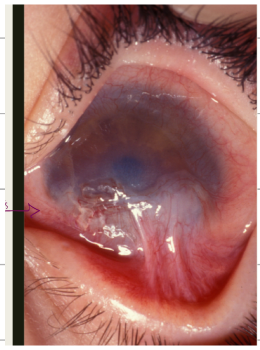
↳ management

- Continuous irrigation — water / saline
- 30-60 min
- Morgan lens can be used

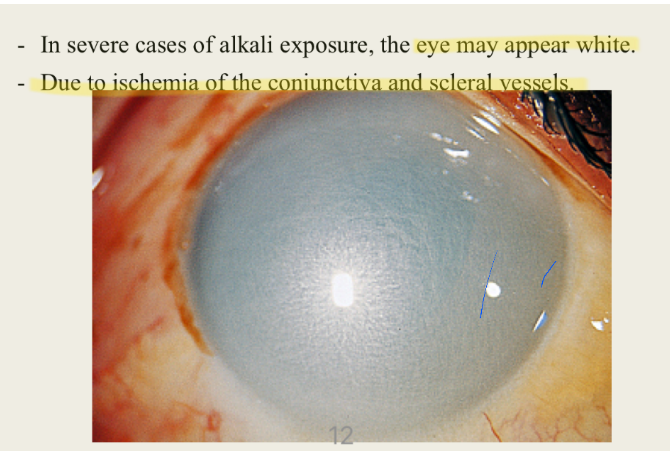
↓ forceful irrigation if open globe injury is suspected.

presentation

- ↓ vision
- Mod-Sev pain
- Blepharospasm
- photophobia
- Conjunctival redness
- Symblepharon



lid attached to globe due to fibrosis



2. Orbital Compartment Syndrome.

→ True ophthalmic Emergency

→ due to Trauma + Intra-orbital hemorrhage

↓

Rapid ↑ Intra Orbital P

↓

↑P on optic n.

↓

ischemia + Compartment Syndrome (OCS)

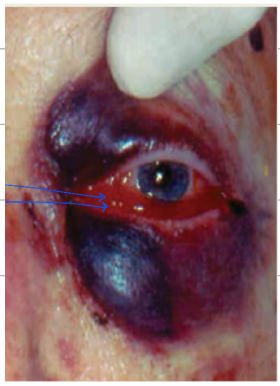
→ DX : Clinically

2° to trauma

iatrogenic

→ presentation

- Acute ↓ vision
- Ophthalmoplegia
- Diplopia
- Eye pain
- periorbital swelling /hemorrhage
- RAPD
- Subconjunctival hemorrhage
- Eyelids tightness
- Chemosis (conjunctival Swelling)
- ↓retropulsion
- proptosis



→ MX

↳ Decompression ASAP

↳ lateral Canthotomy + inferior Canthdysis

- Evaluation for and management of coagulopathy and orbital imaging (CT or MRI)

- MRI is contraindicated if a metallic intra-orbital or intraocular foreign body is suspected.

Additional management:

- Elevation of the head of the bed to at least 45 degrees
- Management of increased intraocular pressure
- Pain control
- Correction of any coagulopathy and/or cessation of anticoagulant therapy
- Prevention of sudden increased intraorbital pressure by:
  - Cough suppression
  - Antiemetic therapy (eg, ondansetron)
  - Stool softeners to prevent excess straining with bowel movements

- Hospitalization and definitive management of the underlying cause of OCS

3. Open Globe injuries

→ following blunt injury

→ open globe laceration

- penetrating (entry no exit)
- perforating (entry + exit)
- Corneal laceration
- Corneal scleral laceration
- Scleral laceration

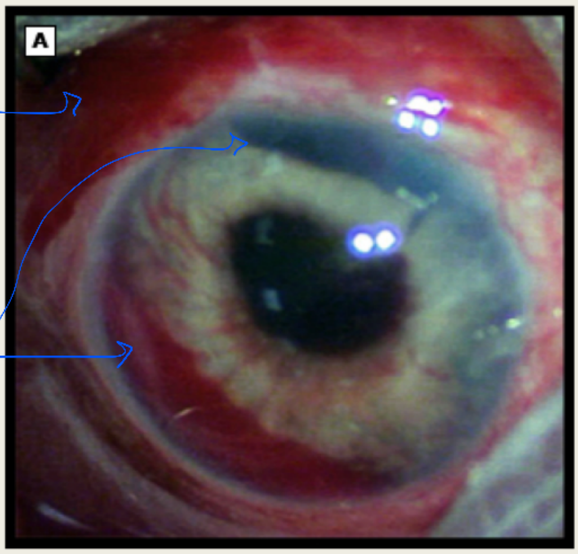
Signs & Symptoms:

- Markedly decreased visual acuity
- Relative afferent pupillary defect
- Eccentric or teardrop pupil.
- Extrusion of vitreous
- External prolapse of the uvea (iris, ciliary body, or choroid) or other internal ocular structures
- Tenting of the cornea or sclera at the site of globe puncture
- Low intraocular pressure (checked by an ophthalmologist only)
- Seidel sign زي الشلال
  vitrous : بطلع

19

Blunt injury to the eye with:

- Subconjunctival hemorrhage superiorly
- Conjunctival laceration
- Hyphema (blood in the anterior chamber)
- Iridodialysis (separation of the iris from its insertion at the ciliary body) superiorly.

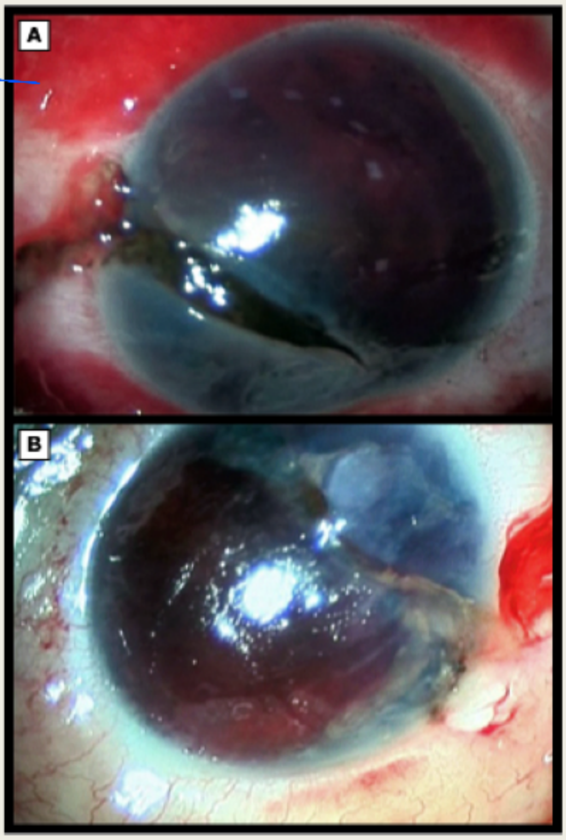


Penetrating Injury with:

Subconju hemorrhage

- Full thickness corneal laceration from a fragment of glass.

- Uveal tissue and aqueous are seen prolapsing through the wound.



Open globe laceration with a teardrop pupil

→ Mx

↳ Definitive → Sx

1. urgent Evaluation

2. NPO

3. ABx (prophylactic) - Avoid endophthalmitis.

4. Tetanus prophylacxis

5. Rapid primary Closure (best with 24 h)

↳ promotes best visual outcome

4. Traumatic Hyphema

→ Grossly visible blood in AC
 if Not visible ↳ microhyphema
 ↳ Cornea → lens

→ Cause
 ↳ Tear in the vessels of ciliary body / iris

Signs & Symptoms:

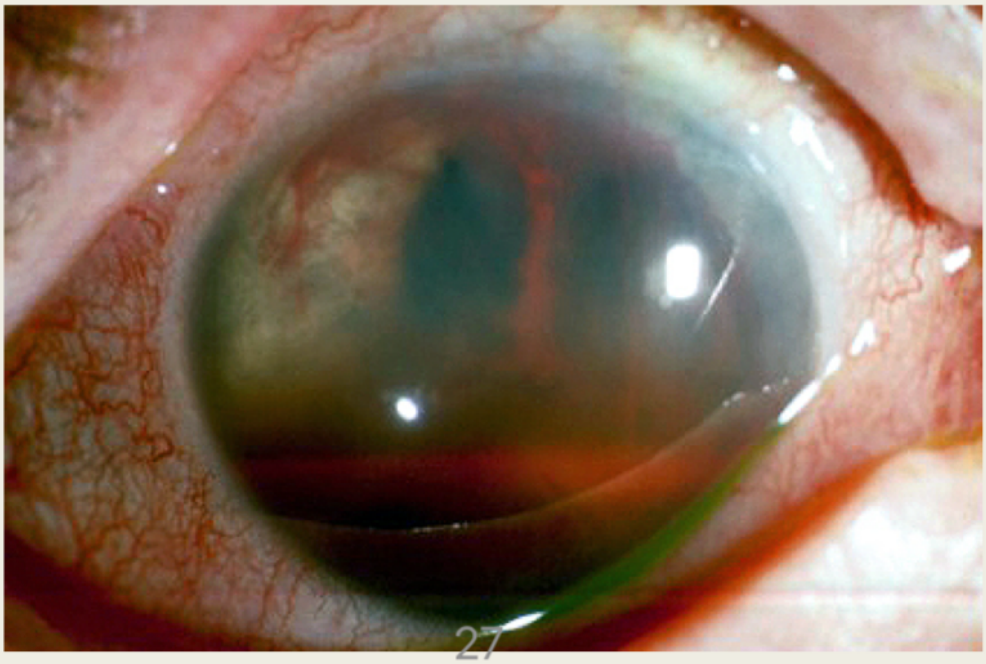
- Grossly apparent layer of blood using a penlight.
- Microhyphema, detected by split lamp.
- Photophobia
- Decreased visual acuity
- Anisocoria
- Iridodialysis (tearing of the iris away from its insertion
- Increased intraocular pressure

Complication

↑IOP

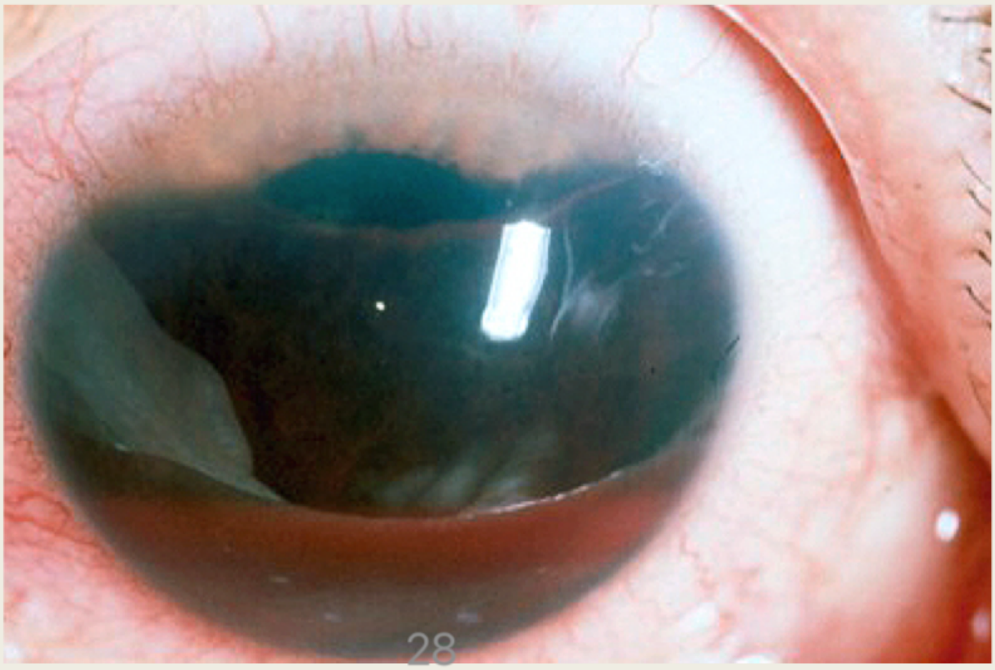
Corneal Staining.

- Grade I to II hyphema inferiorly
- Active bleeding from the superior iris.



27

- Grade IV hyphema following blunt trauma.



→ MX

↳ prevent Rebleeding, ↑IOP, corneal staining

monitor IOP

Eye Sheild

Activity limitation

Cycloplegia for pain

Glucocorticoids Eye drop (↓ rebleeding)

if

Large persistent (>10 day >III grade)

Early Corneal staining

uncontrolled IOP (> 50mmHg >5 days)

→ Surgical Clot Evacuation.

5. Vitrous hemorrhage

Vitreous hemorrhage

- It is extravasation of blood into one of the several potential spaces formed within and around the vitreous body.
- May indicate a retinal tear or detachment.
- May be associated with abusive head trauma in infants and young children.
- Subarachnoid or subdural hemorrhage in patients with significant head trauma.

32

* usually resolve by itself. → Mx → Conservative

↳ if not

↳ Laser photocoagulation

↓ Intravitrious Anti VEGF

6. Retinal trauma

confined to a visual field, or complete.

- **Retinal detachment:**

Hx → pt says he see something like certain

- May cause light flashes, floaters, visual disruption.
- Patients require bed rest pending urgent surgical repair.
- The timing of the repair is determined by the location of the detachment.
- Detachments that threaten the macula and central vision warrant urgent repair.

Tx → Surgery.

33

- **Commotio retinae:**
- Refers to retinal edema after blunt closed globe injury.
- May be asymptomatic or cause decreased vision in affected patients.
- Ophthalmoscopy shows retinal whitening with normal vessels.
- Retinal hemorrhage may also be seen.
- It typically resolves without intervention.
- Exclusion of associated retinal break or detachment is important

35

Commotio retinae

36

7. Optic n. injury

Optic nerve injury

- Known as traumatic optic neuropathy
- Causes decreased vision, including desaturation of red color or decreased color vision in the affected eye
- Afferent pupillary defect.

- Mechanisms of injury are as follows:

- **Direct nerve injury:** uncommon, due to a lacerating injury
- **Indirect nerve injury:** more common, results from contusion of the nerve within the optic canal. The usual cause is a forceful blow to the temple or the brow.

37

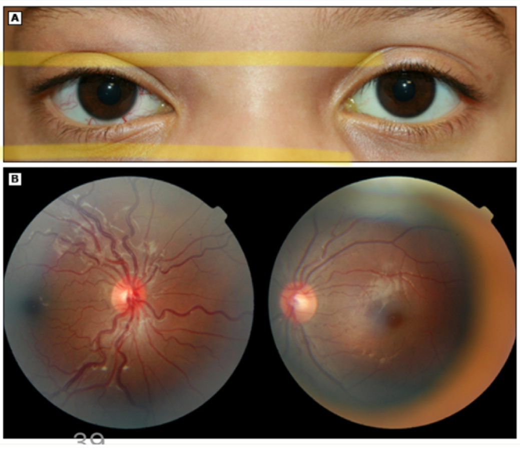
8. periocular injury

Periocular injuries that threaten vision

- Head trauma can cause a carotid cavernous sinus fistula.
- Ocular surface vessels appear tortuous (termed "corkscrew") and dilated with concomitant chemosis (edema of the conjunctiva).
- Retinal vessel distension and high intraocular pressure.

38

- Mild proptosis and engorgement of the episcleral vessels.
- Dilatation of the retinal vasculature



* Red Eye

DDX

Benign

- Lid
  - hordeolum (Stye)
  - Chalazion
  - Blephavitis.
- Conjunctiva
  - Conjunctival hemorrhage
  - Conjunctivitis
    - Bacterial
    - Viral
    - Allergic
- Cornea
  - Corneal Abrasion
  - FB
  - Contact lens overwear
- Dry Eye Syndrome
- Sclera → Episcleritis.

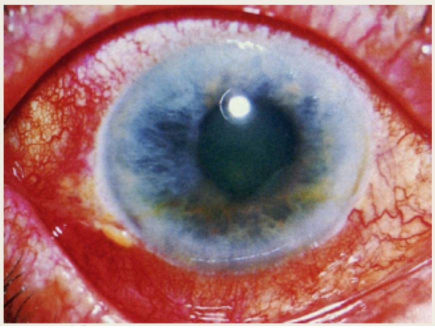
Serious

- Closed Angle glaucoma
- Cornea
  - Hyphema
  - Keratitis
    - Bacterial
    - Viral
  - Hypopyon
- Sclera
  - Scleritis
- iritis (uveitis)

Acute angle-closure glaucoma

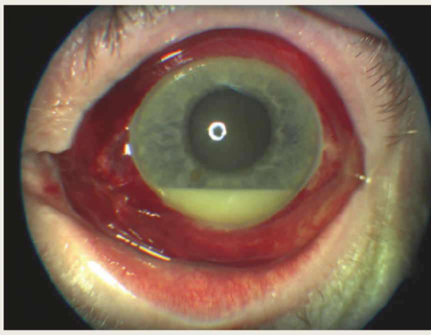
- The conjunctival vessels are dilated, especially near the cornea (ciliary flush).

- The cornea is slightly hazy (edematous).

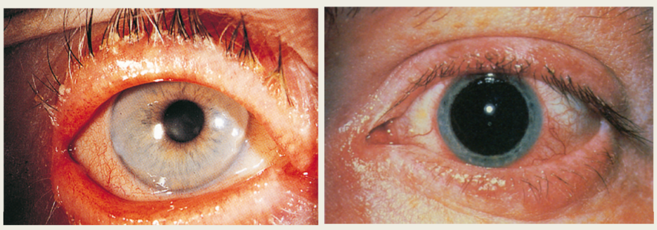


Hypopyon

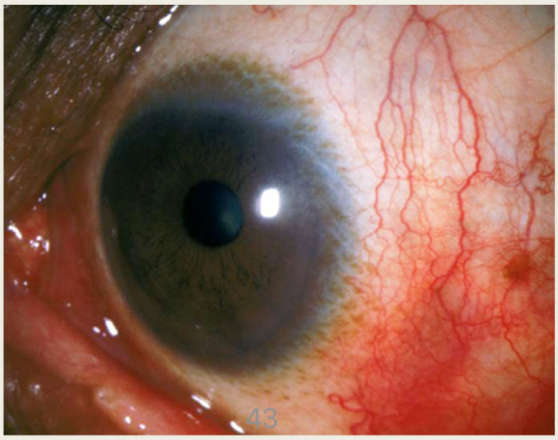
- Leukocytic exudate seen in the anterior chamber.



Blepharitis

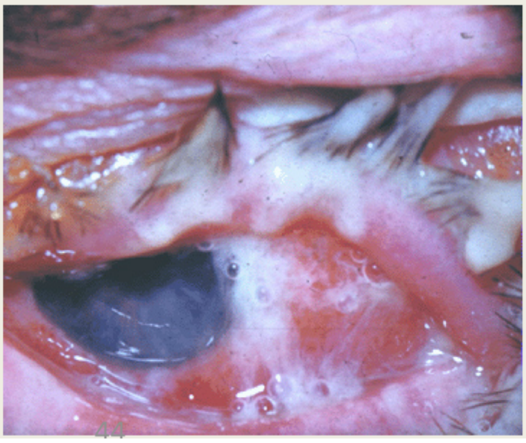


Episcleritis



43

Bacterial conjunctivitis



44