



433 Teams

OPHTHALMOLOGY

1

Orientation, History Taking and Examination

Color index:

432 Team – **Important** – 433 Notes – Not important

ophthalmology433team@gmail.com



The Eye:

- It is the most important square inch of the body surface.
- Eye is the only part of the body where blood vessels and CNS tissues can be viewed directly.

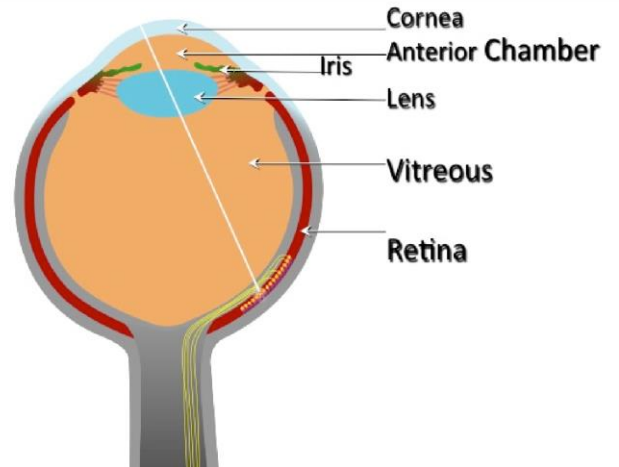
The Visual Pathway:

Light enter the eye via the refractive media

Which are:

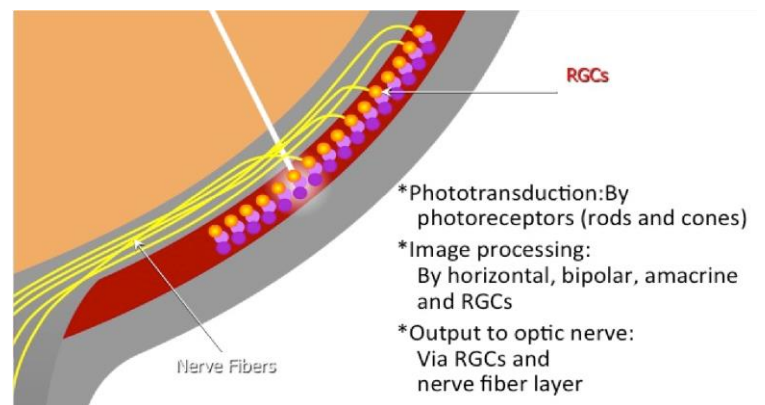
1. Cornea
2. Anterior chamber
3. Lens
4. Vitreous

And stimulates the **retina** posteriorly



Light stimulates the **1st order neurons** **Which are photoreceptors rods and cones.** Then **2nd order neurons Retinal-ganglion cells** is stimulated.

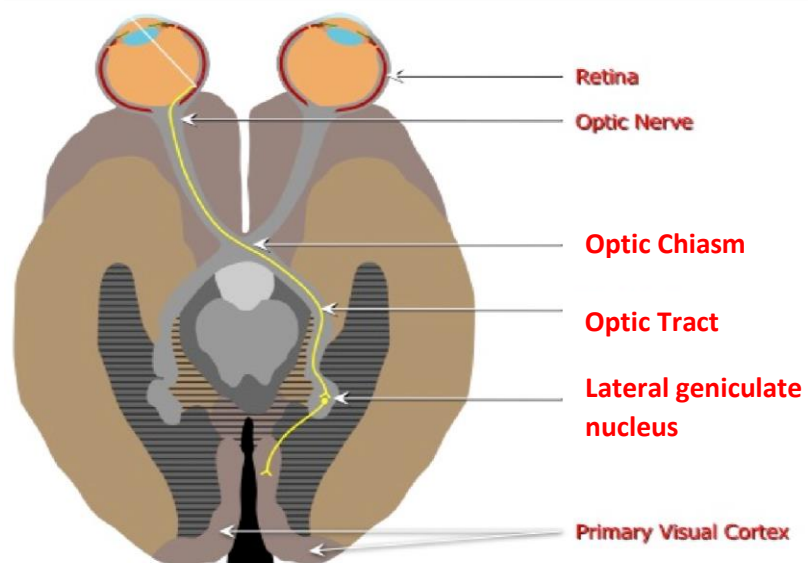
The RGC sends its axon, or fiber, in the nerve fiber layer to the **optic disc** and then down the **optic nerve**



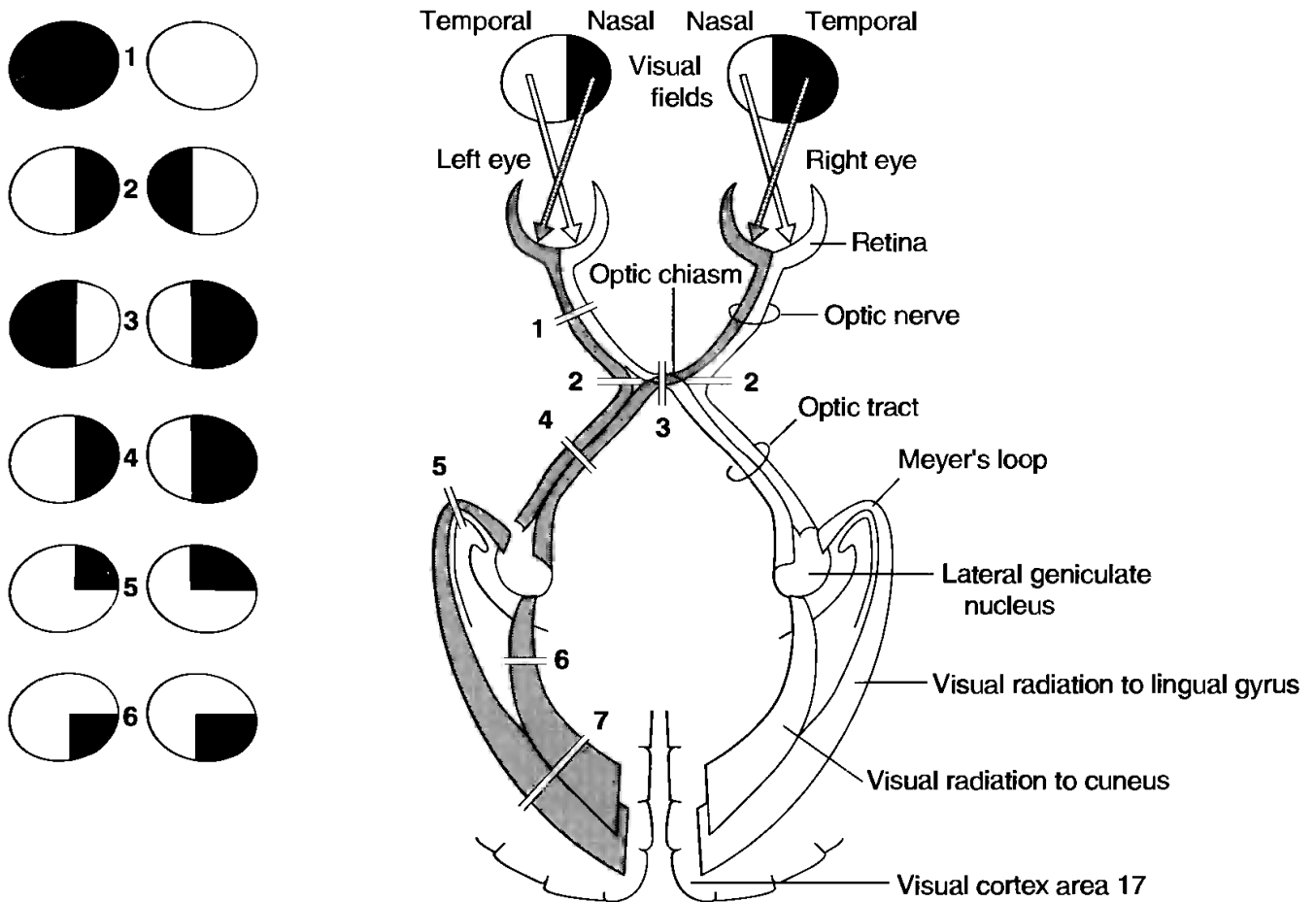
From the **optic nerve**, nasal fibers cross over at the **optic chiasm** to the opposite **optic tract** and temporal fibers remains on the same side.

The fibers in the **optic tract** synapse in **the lateral geniculate nucleus** of the thalamus. Neurons in the lateral geniculate nucleus then project to the **occipital lobe**, to the **primary visual cortex**.

From there, there is further processing with projections to other cells in the visual cortex and elsewhere. Resulting in **conscious visual perception**.



Any damage throughout pathway of optic nerve may cause a specific type of visual field defect:
(we will explain that in details in neuro-ophthalmology lecture)

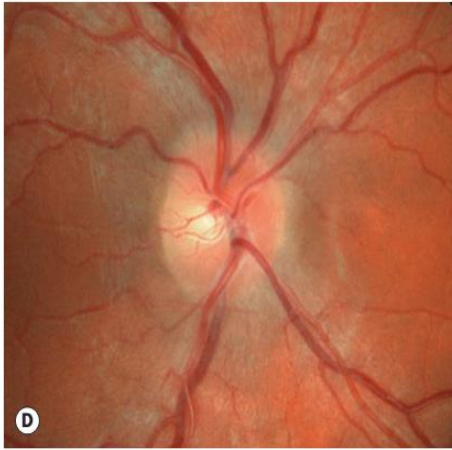


- 1- Left eye blindness due to **Left optic nerve damage**
- 2- Binasal hemianopia due to **bilateral carotid artery aneurysm compressed optic chiasm**
- 3- Bitemporal hemianopia due to **pituitary tumor compressed optic chiasm**
- 4- Right Homonymous hemianopia due to **Left optic tract damage**
- 5- Right superior quadrantic hemianopia due to **Left temporal lobe lesion (Pie in the floor)**
- 6- Right inferior quadrantic hemianopia due to **Left parietal lesion (Pie in the sky)**

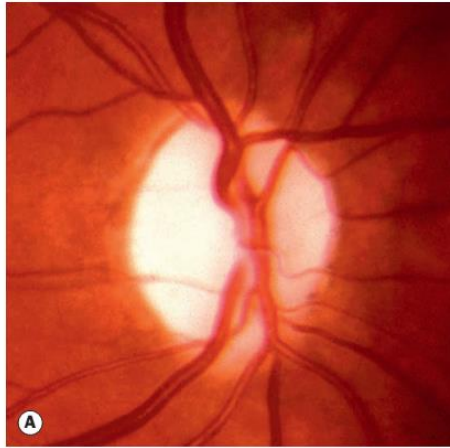
Neurological connections:

- The eye examination evaluates CN II, III, IV, V, VI, VII, VIII (7 cranial nerves).
- The study of CN III, IV, V, VI evaluate the **brain stem, cavernous sinus, and apex of orbit.**

1- Optic nerve (CN II): is the best-known connection between the brain and the eye.



Normal Optic disc



Pale disc (optic atrophy)



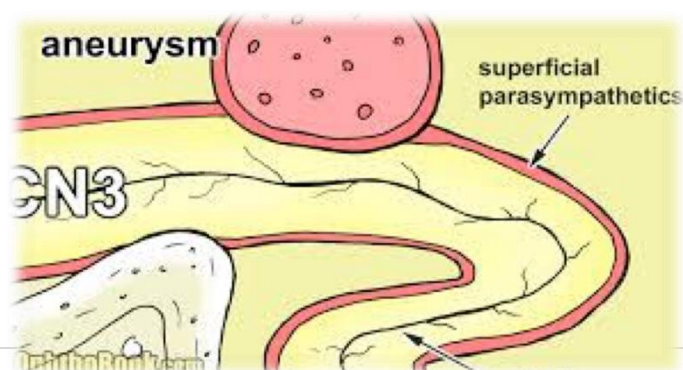
Disc edema

- If patient has **bilateral symmetrical disk edema** due to **increase of intracranial pressure** this called **papilledema**
- If the patient has an **edema in one eye and optic atrophy in the other eye** due to **frontal lobe tumor** this called **Foster–Kennedy syndrome**

2- Oculomotor nerve (CN III)

It has two parts:

1. **Deep Motor fibers:** Supply all eye muscles except **superior oblique** (by CN IV) and **Lateral rectus** (By CN VI)
 - **Medical 3rd nerve palsy:** Isolate motor part damaged due to **Vascular diseases** such as diabetic and hypertension.
2. **Superficial Parasympathetic fibers:**
 - **Surgical 3rd nerve palsy:** pressure on **pupil constrictor fibers of CN III** after head injury or **Posterior communicating artery aneurysm (most common cause)** lead to **Unilateral dilated pupil.**

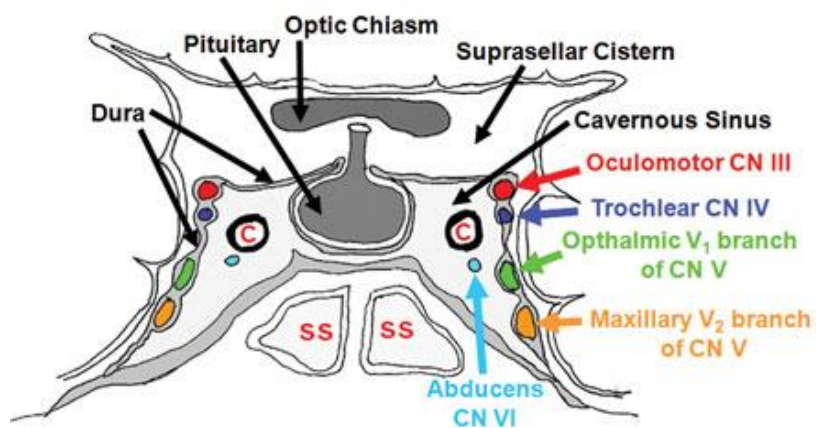


2- Other related nerves to the eye:

- **Abducent nerve (CN VI):** is the longest and **most common nerve damaged by trauma**. It may involve in **mastoid infection (petrous ridge)**.
- **Trochlear nerve (CN IV):** to know if trochlear nerve is preserved when CN III we will ask patient to look down. If eye of patient intorted it means CN IV is intact.
- **Trigeminal nerve (CN V):** **Do corneal sensitivity test to check the nerve**
- **Facial nerve (CN VII):** Supply Orbicularis oculi muscle which allow closure of eyelid. **it may affected in Parotid gland and Inner ear diseases.**
- **Vestibulocochlear nerve (CN VIII):** is related to **nystagmus**

Vascular connections:

Venous flow disorder:



- **Carotid – cavernous fistula:** Patient will present with Proptosis (bulging of eye) **and eye pulsating**
- **Cavernous sinus thrombosis:** Patient will present with Proptosis (bulging of eye) **without pulsating**



Central artery occlusion:

Arterial emboli can reach the retina from carotid artery, heart valves, sub-acute endocarditis, and or traumatic bone fracture.

Temporal Arteritis (Giant cell Arteritis):

- Best initial investigation is **ESR**, followed by **C-reactive protein**, then **Biopsy**(a negative biopsy does not rule out the dx due to the focal and segmental nature of the infiltrates)

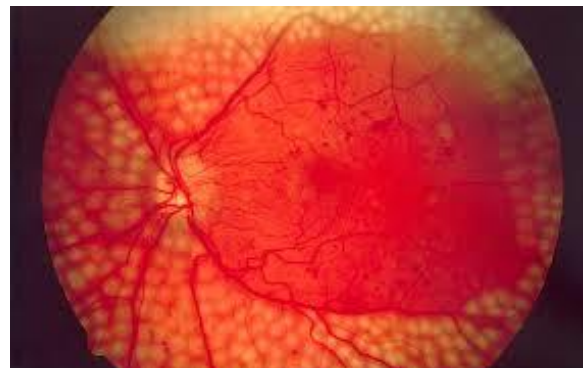
Metabolic disorders:

Diabetes Mellitus:

- Diabetic Retinopathy, cataract, Refractive errors, Ophthalmoplegia.
- Diabetic Retinopathy:
 1. Non-proliferative diabetic retinopathy: does not need laser treatment
 2. Proliferative diabetic retinopathy: **need laser treatment**
- Refractive is affected by level of blood sugar. **So, don't do refraction unless the blood sugar is controlled.**



Proliferative diabetic retinopathy (PDR) with microaneurysms and tortured vessels



Proliferative diabetic retinopathy (PDR) treated with pan-retinal laser photocoagulation

Hypoparathyroidism:

Associated with **cataract**

Wilson's disease:

- alpha1-antitrypsin (α 1-AT) deficiency
- Kayser-Fleischer corneal ring (a brownish-yellow ring around the cornea of the eye)

Thyroid eye disease:

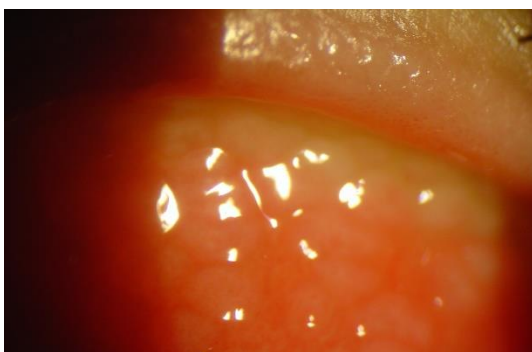
- Commonest cause of unilateral and bilateral proptosis
- Also known as **infiltrative ophthalmopathy** "Graves ophthalmopathy" or thyroid eye disease
- Patient may have normal or abnormal thyroid hormone levels because eye manifestations related to **autoimmune infiltration to eye muscles** not due to thyroid hormones.
- Since they have increased IOP we perform visual field exam



- 1- Exophthalmos (proptosis)
- 2- Lid retraction

Allergy:

- Vernal keratoconjunctivitis (VKC)
- known by Spring catarrh (رمد الربيع)
- Eye sign: **Cobblestone papillae**
- Commonest eye allergy in KSA "الرمد الربيعي"
- Treat with antihistamines and topical steroids
- Topical steroid side effect: **1-Posterior supcapsular cataract 2- Steroid induced glaucoma**



Cobblestone papillae

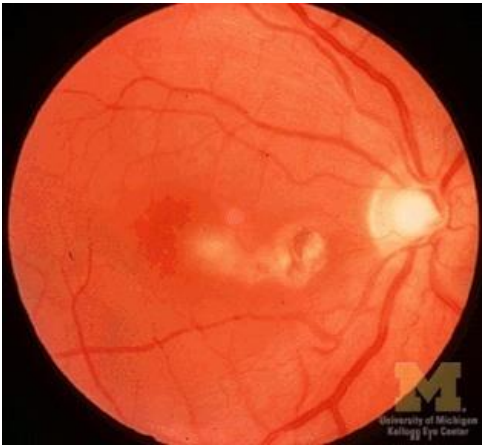


Vernal keratoconjunctivitis

Other eye diseases:

Infections:

(Syphilis, Toxoplasmosis, Rubella)



Chorioretinal scar due to old infection

Mucocutaneous disorders:

Steven-Johnson Syndrome , pemphigus



Elastic tissue:

(pseudoxanthoma elasticum)

Chromosomal abnormalities:

Trisomy:13,15,21.

Eye poisoning

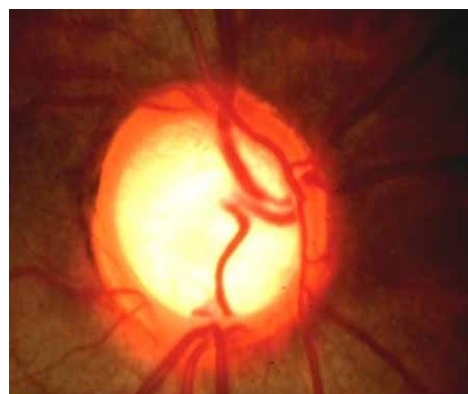
- Morphine addict lead to meiotic pupil
- Lead poisoning, vitamin A intoxication lead to papilledema
- **Coma + pinpoint pupil can be due to Morphine overdose or Pontine hemorrhage. How to differentiate between them? by hyperpyrexia with Pontine hemorrhage**

Glaucoma

- Optic neuropathy manifested by optic nerve disease, affection of visual field and with or without increase IOP.
- If you see disc cupping, confirm glaucoma diagnosis by **examination the visual field**



Normal Disc



Disc cupping (Ratio > 0.3)

History and physical examination:

History:

Patient comes with gradual visual loss. What would you ask the patient?

DDx of Chronic Visual Loss: (Always remember these 4)

- 1- Cataract (most common cause of CVL)
- 2- Diabetic retinopathy
- 3- Age related macular degeneration
- 4- Chronic open angle glaucoma

- **Age** (to rule out Age-related macular degenerations)
- **History of diabetes** (to rule out Diabetic retinopathy)
- **History of eye medications** (to rule out glaucoma and cataract)

Patient comes with sudden visual loss. What would you ask the patient?

DDx of Acute Visual Loss: (Always remember these 4)

- 1- Acute angle closure glaucoma
- 2- Vascular occlusion (central retinal artery or central retinal vein)
- 3- Acute retinal detachment
- 4- Optic neuritis

- **Male or female** (female more prone to get optic neuritis)
- **Flashes, floaters and curtain-like appearance** (to rule out retinal detachment)
- **Transient visual loss, heart diseases, Hypertension and DM** (to rule out vascular occlusion)

Important terms: (Very important)

- **Anisocoria:** different size of the pupil
- **Anisometropia:** different refractive error
- **Anisoconia:** different size of cornea



Anisocoria

Ophthalmic Examination:

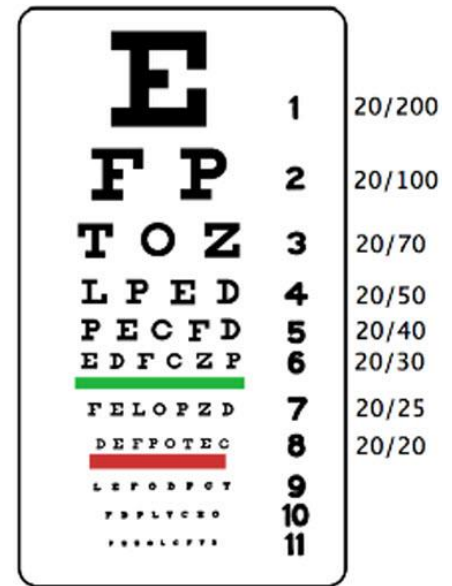
▪ **Visual acuity**

E. Visual Acuity *(The sharpness of near and distance vision)*

- 1- Place Snellen letter chart or the E chart 20 feet away from the patient
- 2- Occlude one eye completely using the palm of their hand or an eye occlude, to allow vision testing in the opposite eye
- 3- Have patient read the letters from the eye chart
- 4- Record visual acuity as a fraction
- 5- Use the pinhole acuity test If the patient cannot discern the symbols on the eye chart

Near Vision :

- 1- If distance visual acuity test is not practical, check for near vision using a reading card, if available, or a Snellen chart .
- 2- Ask patient to wear reading glasses if owned
- 3- Patient holds the near test chart at about 40 cm
- 4- Test each eye separately
- 5- If visual acuity is not recordable with usual tests, check for
 - o "counts fingers"
 - o "hand motion" *(which direction?)*
 - o "light perception" *(from center+4quadrants)*



Snellen chart

▪ **External examination:** Evaluate by gross inspection and palpation.



Orbital Cellulitis



Ptosis



Retinoblastoma



Proptosis



Enophthalmos



enlarged preauricular lymph

▪ Ocular Motility and alignment

Squint: misalignment of the eye

B. Ocular Motility and alignment

Motility

- 1- Inspect the primary gaze (No deviation) and head tilt or turn
- 2- Ask patient to follow a target (finger, pencil, or penlight) held at a comfortable distance from the patient ('Look at the tip of my pen, follow it with your eyes, keeping your head still and letting me know if any time you see double or feel pain.')
- 3- Move the target in (+ and x) way (cardinal directions)
- 4- Pause during each gaze position to detect nystagmus (Note : Direction of nystagmus is it vertical or horizontal)
- 5- Inspect for:
 - normal and abnormal movements in each direction
 - relation of upper lid to globe as patient moves eye vertically from above downward
- 6- Ask patient about presence of diplopia (double vision)

Alignment

1- Corneal light reflex

- Ask patient to fixate on far object
- Shine the light and look for the reflex (should be central)
 - if it is nasal>exotropia, Temporal>esotropia, inferior>hypertropia...

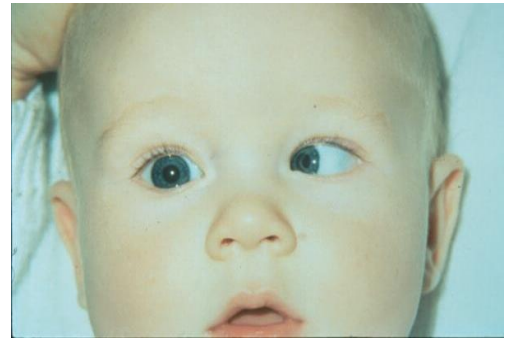
2- Cover-uncover test (for -tropia)

- Ask patient to fixate his eye on a far target
- Do cover-uncover test on one eye. (Note any movement of uncovered eye).
 - If eye turns **outward** > it was inward so it is **esotropia**.. etc)
- Repeat for the other eye
- Repeat fixating on near object?

3- Do alternate cover test (for -phoria)

- Ask patient to fixate on a far target (15 or so inches)
- Move the cover rapidly from one eye to another (Note any movement of uncovered eye).
 - If eye turns **outward** > it was inward so it is **esotropia**.. etc)

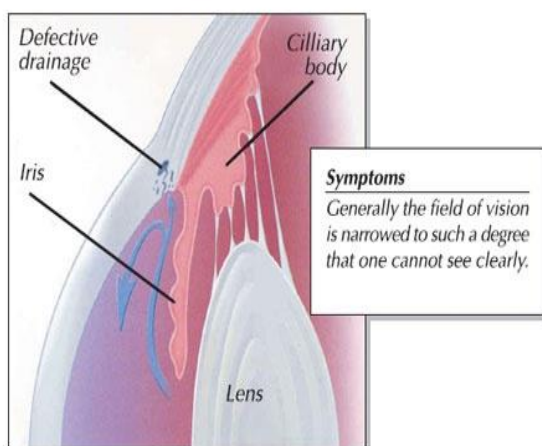
4- Repeat all 3 fixating on near object (just mention it)



▪ Gonioscopy:

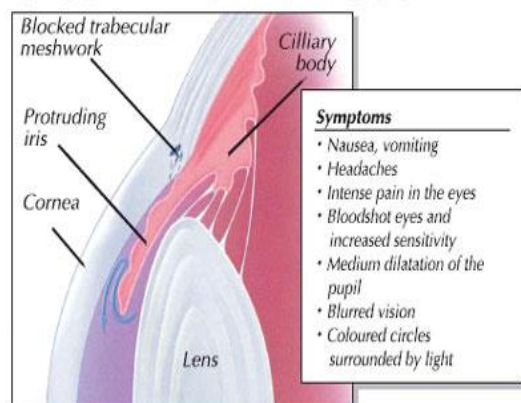
- examination of angle of anterior chamber to differentiate between angle and closed glaucoma

OPEN ANGLE GLAUCOMA



The angle is open but drainage is defective.

CLOSED ANGLE GLAUCOMA



The angle between the iris and the cornea narrows or closes, blocking the drainage of the aqueous humor.

- **Pupil examination:**

C. Pupillary Reflex

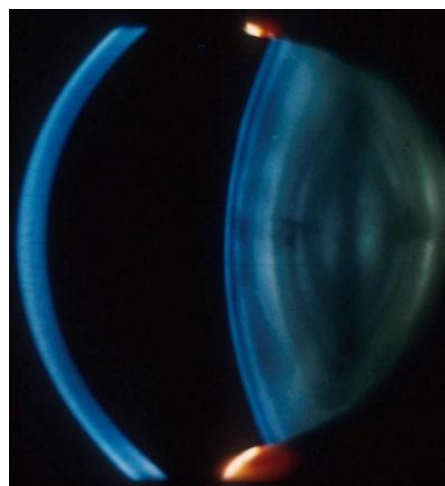
- 1- Ask patient to concentrate on distant target.
- 2- Inspect the size and symmetry of the pupil in open light.
- 3- Near reflex (In open light)
 - a. Ask patient to look into distance and then at your finger
 - b. Comment on Accommodation, convergence and miosis
- 4- Dim room light, check torch light (BRIGHTEST)
 - 5- Direct pupillary reflex:
 - a. Come from temporal region
 - b. Comment on reactivity
 - 6- Indirect pupillary reflex:
 - a. Shine light on the same eye
 - b. Observe other eye
 - 7- **Repeat for the other eye!**
 - 8- Swinging flashlight test:
 - a. Shine the light 2-3 seconds on each pupil
 - b. Comment if the patient have relative afferent pupillary defect (Equal constriction or not)



Leukocoria in the right eye

- If swinging flashlight test is positive patient have Afferent pupillary defect (**Marcus Gunn pupil**)
- Afferent pupillary defect can be due to **Optic neuritis – Optic tumor – traumatic optic neuropathy**
- Most important causes of Leukocoria are **Retinoblastoma & Congenital cataract**

- **Slit lamp biomicroscopy**

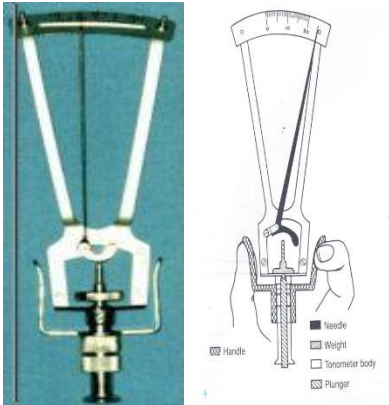


- **Tonometry:**
- to measure intraocular pressure

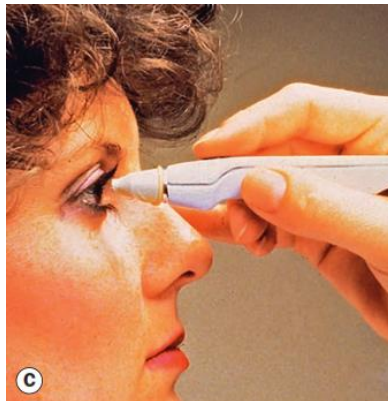
F. Tonometry

- a. Uses of tonometry (to measure intra-ocular pressure)
- b. Types (Goldmann applanation– tonopen – non contact tonometry “air puff”)
- c. Requirements
 - i. Goldmann applanation: required topical anesthesia (propacaine), fluorescein dye and tension drops
 - ii. Tono-pen: required topical anesthesia (propacaine)
- d. Normal intra-ocular pressure (10-21)

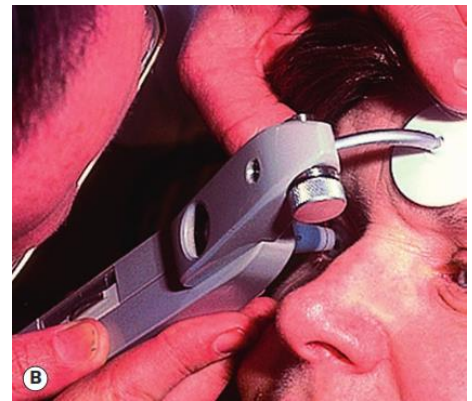
Dim light: only when doing pupillary reflex or direct ophthalmoscope!



Schiotz tonometer



Tonopen tonometer



Perkins tonometer



Goldmann applanation tonometer



Air-puff tonometer



- Goldmann applanation tonometer is the **most accurate test**
- Perkins tonometer is used if patient is **infant or laying in supine position**

▪ Ophthalmoscopy

Start with WIPE!

A. Direct Ophthalmoscope

- 1- Dim the room's light, check function of ophthalmoscope.
- 2- Ask patient to fix his vision on a specific point in the distance
- 3- Use ophthalmoscope in your right hand & right eye to examine the patient's right eye (left hand for left eye)
- 4- Assess red reflex (From 1m – arm length)

Comment on anything that interferes with the passage of light that will diminish the red reflex (e.g. large vitreous hemorrhage, cataract)

- 5- Shine light beam from ophthalmoscope into pupil:
 - From position approximately 12 inches from the patient and about 15 degrees lateral to patient's line of vision (Follow red reflex approaching from superiotemporal area) (*Don't cover patient visual field*)
 - Move in toward patient's eye on the 15 degree line up to the point where your own fingers holding the ophthalmoscope contacts patient's cheek
- 6- Place your left hand on the patient head to fix it
- 7- Examine the posterior segment of the eye
 - a. Optic disc for:
 - i. Clarity of disc outline
 - ii. Color (yellowish-orange)
 - iii. Cup:disc ratio
 - iv. Sharpness of disc margin
 - v. Presence of abnormalities surrounding the disc
 - vi. The blood vessels of the disc
 - b. Vessels
 - c. Macula
 - d. Fovea (foveal light reflex) (ask patient to look at the light)
 - e. Retinal background
- 8- Repeat the test on the left eye



Direct Ophthalmoscope



Indirect Ophthalmoscope

▪ How to differentiate between direct and indirect ophthalmoscope?

1. **Direct we use one eye** but **indirect we use both eyes**
2. The image of **direct is erect** while **indirect is inverted**
3. Magnification of **direct is 15 times** while **indirect is 3 times**
4. Retinal field of **direct is small** while **indirect is large**

Important notes mentioned by Dr.Essam

1- Lid, Lacrimal, and Orbit Disorders:

- **How to differentiate between Preseptal and orbital cellulitis?**
When patient can move his eye this is preseptal cellulitis if he can't this is orbital cellulitis

2- Strabismus, Amblyopia and Leukocoria

- **What is amblyopia?**
The affected eye differ from normal eye by more than 2 lines
- **Who affected by amblyopia?**
Children only and usually before age of 6
- **What are the causes of amblyopia?**
Unilateral cataract - Sequent - Eye patches after treatment
- **What is Leukocoria?**
White pupil
- **What are the causes of Leukocoria?**
Retinoblastoma (most important and dangerous) - Cataract

3- Acute Visual Loss

- **Patient complain will be Sudden decrease or loss of vision**
- **What are the most important causes?**
Acute angle closure glaucoma - Vascular occlusion (central retinal artery or central retinal vein) - Acute retinal detachment - Optic neuritis

4- Chronic Visual loss

- **Patient complain will be Gradual decrease or loss of vision**
- **What are the most important causes?**
Cataract (**most common cause**) - Diabetic retinopathy - Age related macular degeneration - Chronic open angle glaucoma
- **You may be asked about risk factor of ARMD**

5- Refractive Errors

- **Refractive is affected by level of blood sugar. So, don't do refraction unless the blood sugar is controlled.**

6- Ocular manifestations of systemic diseases

- **What are the most important diseases?**
Sarcoidosis - Tuberculosis - Bechet diseases - IBD - Vogt-Koyanagi-Harada Syndrome - Ankylosing spondylitis
- **Tuberculosis cause Chronic granulomatous uveitis**
- **Ankylosing Spondylitis cause Chronic non-granulomatous uveitis**
- **Uveitis associated with anterior chamber reaction**
- **Uveitis lead to inflammation of iris which affect the round shape of pupil**

7- Neuro-ophthalmology

- **3rd, 4th and 6th nerve palsy is the most important**
- **Optic neuritis is very important**

8- Ocular Pharmacology and Toxicology

- **Anti-glaucoma medications is the most important**
- **Alpha-2 agonists does not given to children**

Scenarios mentioned by Dr.Essam:

- Patient had sinusitis and then come with immobility of eye => Orbital Cellulitis
- Patient has ruptured orbital globe. How to treat it? => Eye shield
- Patient comes with Chemical substance enter to the eye, How to treat it? => Irrigation by water at least for 20 minutes until chemical washed out

Done By:

Mojahed Otayf

