433 Teams

OPHTHALMOLOGY

1

Orientation, History Taking and Examination

Color index:

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

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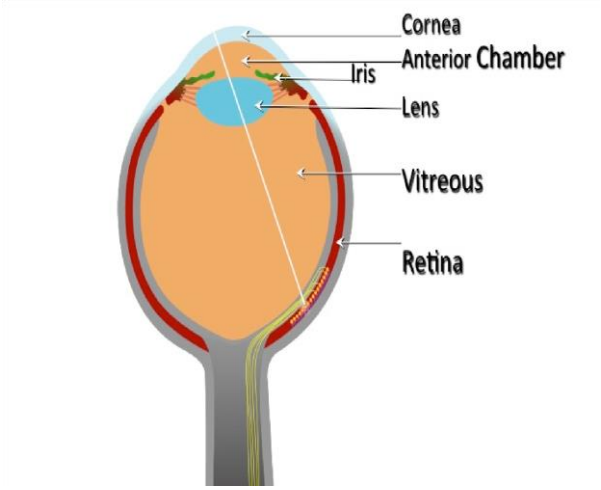
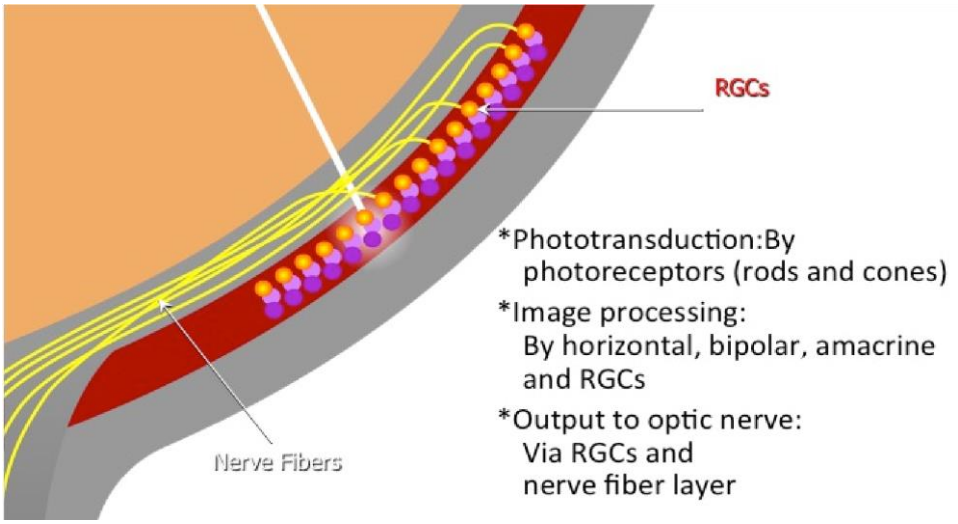
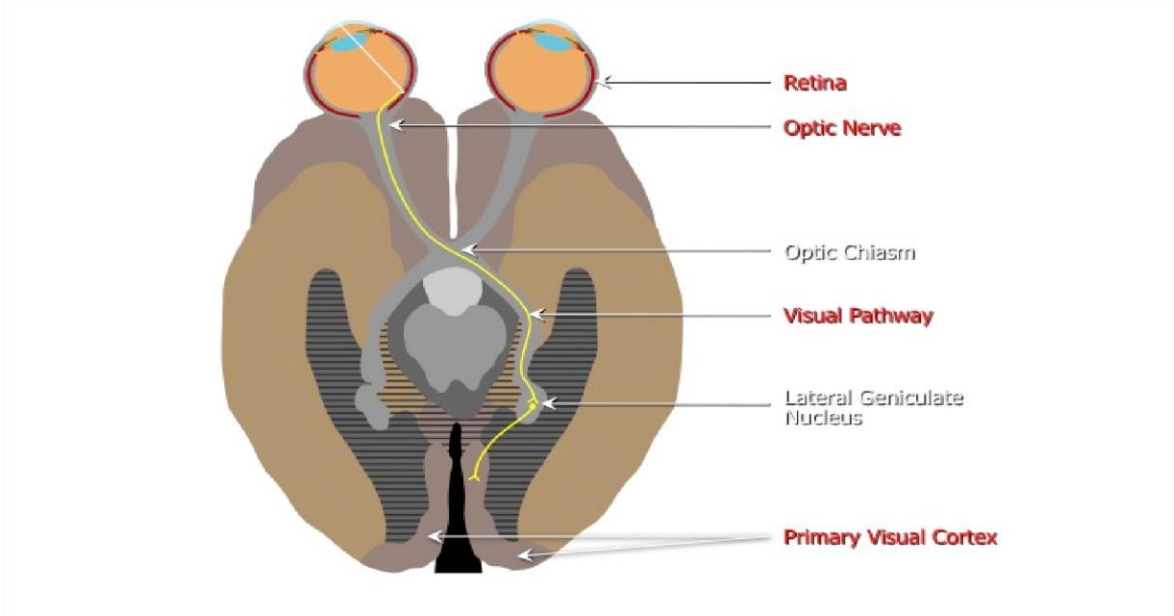
The Visual Pathway



Light enter the eye via the refractive media, namely the cornea, anterior chamber, lens and vitreous, and stimulates the retina posteriorly



Light stimulates the photoreceptors, ie , the rods and cones . Through a series of other retinal nerve cells, the end result is that the RGC 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, about half of the fibers cross over at the chiasm to the opposite optic tract, and the other half 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.

- Diagnostically and functionally, it is the most important square inch of the body surface.
- The eye is so intimately connected with the rest of the body that it reveals enormous amount of general information.
- Eye is the only part of the body where blood vessels and central nervous system tissues can be viewed directly.

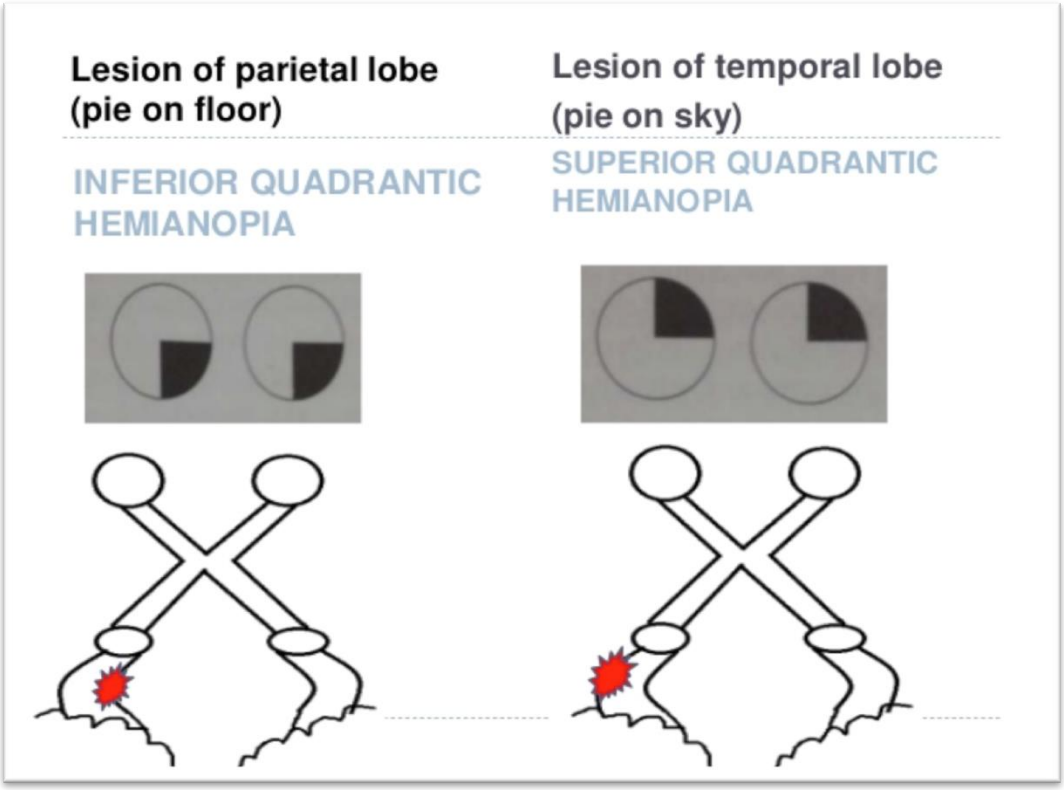
1.Neurological connections

- The 12 cranial nerves provide us with a large part of our information about the brain. Of these, the eye examination evaluates CN II, III, IV, V, VI, VII, VIII (7 cranial nerves).

- In addition, it provides information about the autonomic pathways.(sympathetic/parasympathetic)

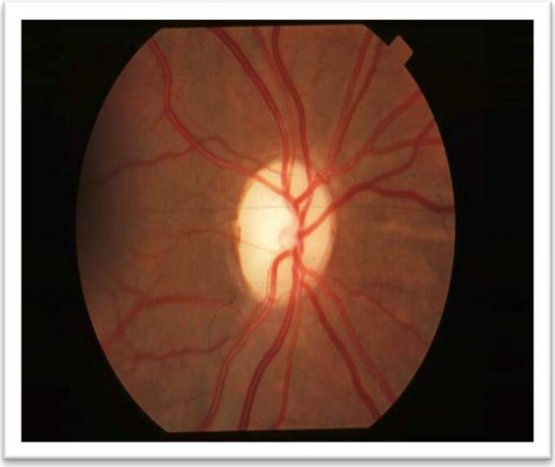
- The best known connection between the brain and the eye is the optic nerve (ON)

- The visual pathway, which extends from front to back across the brain can be studied easily and safely using **perimetry**. It can differentiate accurately between lesions of the temporal, parietal and occipital lobes.



- In addition, the ON has important clinical relationships to the pituitary gland, the middle ventricles, the venous sinuses, the meningeal and bony structures of base of the skull

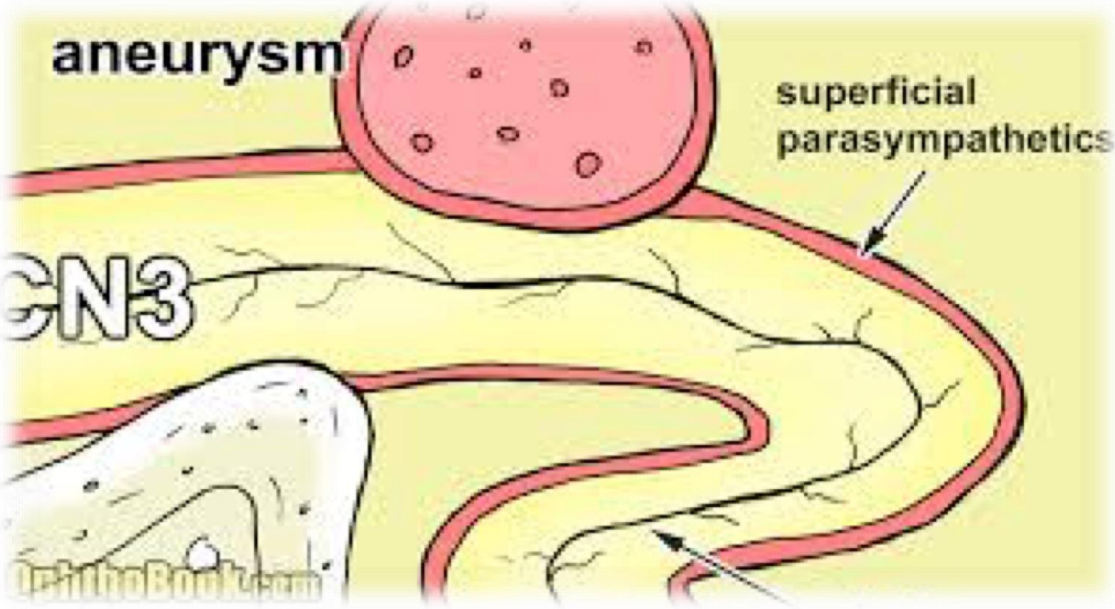
Pituitary Gland and Visual Field



Visibly pale (optic atrophy) when its nerve fibers damaged at any point from retina → LGB

ON has the diagnostically useful capability of swelling with ↑ICP (papilledema)

- In SAQ (short answer question)"Disc edema" is a better answer than "Papilledema "which is more specific to ↑IO
- The study of CN III, VI, V, VI evaluate the **brain stem, cavernous sinus, and apex of orbit .**
- Unilateral dilated pupil after head injury can occur due <u>to pressure on pupil constrictor fibers of CN III</u>.
- **CN VI** involved in **mastoid infection**. (petrous ridge)
- Parotid gland. Inner ear disease → CN VII.
- Nystagmus → CN VIII
- Bilateral carotid artery aneurysm → Binasal Hemianopia.
- A fistula between carotid artery and cavernous sinus → ↑IOP → Thrill+pulsating eyes



- CN III is composed of 2 parts:
  1. Superficial parasympathetic pupillomotor Usually affected by compression. (aka dilated surgical 3rd nerve palsy)
  2. Deep motor Usually affected by medial causes like DM\HtN (aka surgical 3rd nerve palsy)
- How do we know if CN IV is involved in addition to CN III ?

1. Patient will not be able to look down (damaged CN III)
2. Eyes will not intort (damaged CN IV)

Focal brain lesion like:

- Vascular occlusions
- Hemrrhage
- Neoplasm

Diffuse brain lesions like:

- Infections
- Demyelinating disorders " nerve damage"

2.Vascular connections

Venous flow disorder:

- Arterial emboli can reach the retina from carotid artery, heart valves, sub-acute endocarditis, and\or traumatic bone fracture.
- Specific disease of the vessels like: PAN, temporal arteritis and HTN.

- 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)

- When a patient complain of any changes in vision, rule out DM first!

- Hematological disorders of all types can manifest in the fundus

Cavernous sinus thrombosis

- Almost all metabolic disorders can affect the eye :

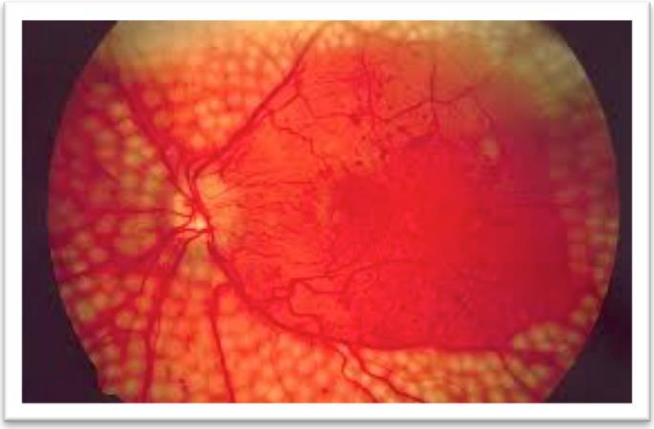
DM : diabetic Retinopathy, cataract, Refractive errors, Ophthalmoplegia.

Carotid-cavernous fistula (orbital)

Hypoparathyroidism: cataract

Wilsons disease: Kayser-Fleischer corneal ring (a brownish-yellow ring around the cornea of the eye)

Dilated tortous retinal vessels



Chorioretinal scar (a result of an old infection or injury) we can not diagnose it by picture but by investigation

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

Common SAQ question

3.Throid eye disease:

Also known as infiltrative ophthamopathy "Graves ophthalmopathy" or thyroid eye disease

Since they have increased IOP we perform visual field exam

4.Infections:

(Syphilis, Toxoplasmosis, Rubella)

5.Allergy:

Vernal keratoconjunctivitis (VKC)

known by Spring catarrh

Commonest eye allergy in KSA" الرمد الربيعي

Treat with steroids and antihistamines

Can cause blindness. Why? Chronic use of topical steroids lead to increase IOP (steroid induced glaucoma)

6.Mucocutaneous disorders:

SJS, pemphigus

7.Elastic tissue:

(pseudoxanthoma elasticum)

8.Chromosomal abnormalities:

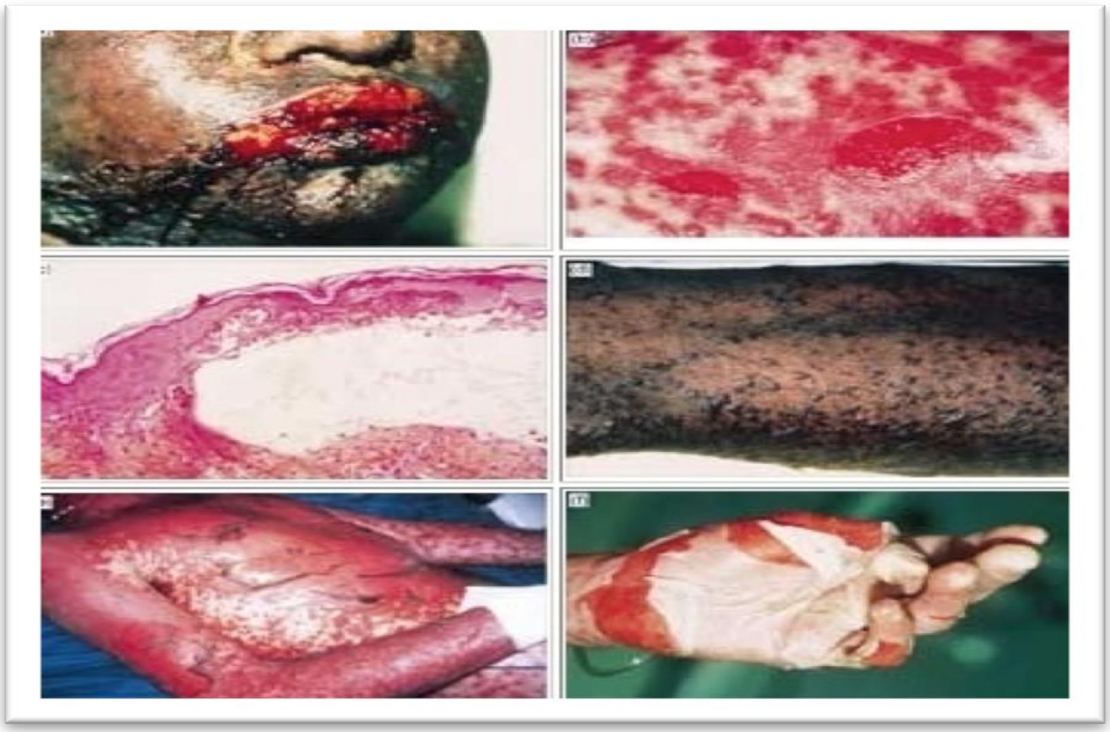
Trisomy:13,15,21.

9.Eye poisoning

-Morphine addict lead to meiotic pupil

-Lead poisoning, vitamin A intoxication lead to papilledema

Coma+pinpoint pupil = Morphine overdose or Pontine hemorrhage (Differentiate between them by hyperpyrexia with Pontine hemorrhage)



90% of our information reaches our brain via sight

Unfortunately, of all the parts of the body, the eye is the most vulnerable to minor injury

History Taking & Physical Examination

History:

- It is gathering information process from the patient guided by an educated and active mind
- It is a selective guided and progressive elicitation and recognition of significant information
- History by skilled person can arrive at the proper diagnosis in 90% of patient
- It gives vital guidance for
  -physical examination
  -laboratory work
  -therapy
- Failure to take history can lead to missing vision or life threatening conditions

"chief complaint"

(The patient own words)
(She can not see with right eye)

- You should not come to conclusion that he problem is nearsightedness and write down(Myopia of RE)
- The patient needs will not be satisfied until he\she has received an acceptable explanation of the meaning of the chief complaint and its proper management

"History of the present illness"

- Detailed description of the chief complaint to understand the symptoms and course of the disorder
- Listen and question and then write down in orderly sequence that make sense to you
- The time sequence (when, how fast, what order event occur?)
- Frequency and intermittency
- Location and laterality
- Severity
- Associated symptoms

- Documentation (old record and photo indicate ptosis, proptosis and VII N palsy.
  Examples:
  Gradual painless decrease vision both eyes for 1y
  Sudden painless decrease vision RE for 10 min

Cannot see with right eye(RE)!!

- Only distance vision blurred?
- Blind spot is present in the center of visual field (VF)?
- Right side of visual field of the RE lost?
- Right VF of both eye lost?
- A diffuse haze obscures the entire field of RE?
  Each of these has different diagnostic implication
  Most patient has difficulty providing precise and concise description

Disturbance of vision:

- Blurred or decrease central vision
- Decreased peripheral vision (glaucoma)
- Altered image size(micropsia, macropsia and metamorphopsia)
- Diplopia(monocular and binocular)
- Floaters
- Photopsia(flash of light)
- Color vision abnormalities
- Dark adaptation problems
- Blindness(ocular and cortical)
- Oscillopsia(shaking of images)

DDx of Acute Visual Loss: (Always remember these 4)
1-Age related macular degeneration(AMD)
2-Vascular occlusion(DM,HTN)
3-Retinal detachment
4-Acute glaucoma

- Morning visual disturbances > Eye dryness
- Blurring of vision for 20 min > Migraine aura
- Patient still complains of problems with his\her vision although all his exams and investigation are normal > Do visual field exam (could be stroke!)
- There are two types of color blindness. complete and partial (most common), both are diagnosed by ishihara's test.

- "Convergence insufficiency" is a condition that can cause pain especially in pediatric patients.
- Refractive errors never cause pain

Ciliary injection (red eye) is mainly cause by 4 things:

- Acute conjunctivitis
- Acute iritis
- Acute glaucoma
- Acute keratitis *(corneal ulcer; a combination of conjunctivitis and iritis)*

Ocular pain or discomfort:

- Foreign body sensation
- Ciliary pain *(aching, severe pain in or around the eye, often radiating to the ipsilateral forehead, molar area)*
- Photophobia
- Headache
- Burning
- Dryness
- Itching: *patient rub the eye vigorously (allergy)*
- Asthenopia *(eye strain)*
- Abnormal ocular secretions
- Lacrimation, epiphora
- Dryness
- Discharge (purulent, mucopurulent, mucoid, watery)

Abnormal ocular secretions:

- Lacrimation, epiphora
- Dryness
- Discharge (purulent, mucopurulent, mucoid, watery)
- Redness, opacities, masses
- Anisocoria

Anisocoria

"Family history"

- Many eye conditions are inherited .Examples: RE, glaucoma, strabismus, retinoblastoma, neoplastic, vascular disorders
- Familial systemic disease can be helpful in ophthalmic evaluation and diagnosis. Examples: Atopy, thyroid diseases, DM, certain malignancies
- Ask about any eye problem in the family background?
- Ask specifically about corneal diseases, glaucoma, cataract, retinal diseases or other heritable ocular conditions.

"Systemic review"

- Ask questions designed to confirm or exclude your tentative diagnosis
  -significant positive
  -significant negative
  -''Significant is equal to expected''
- Predict the physical and lab findings likely to be present
- Any discrepancy between the history and physical examination requires explanation

Summary of Hx Taking

History of Present Illness: Explore every complaint with the "basic questions" -- when did it start, what's it like, is there anything that makes it better or worse, are you taking any medications for relief, etc..

Specific HPI review of systems:

1. **Floaters and flashing lights**
   - These are the classic symptoms of a retinal detachment and retinal tears!
   - Ask EVERY patient about these symptoms.
   - Ask if they're new or have worsened recently.

2. **Transient vision loss**
   - Migraine vessel spasm in the young / micro-emboli in the elderly.
   - Curtains of darkness might indicate an ischemic event or a retinal detachment, so explore these symptoms in detail.

3. **Blurry vision**
   - Is the vision always blurry?
   - Does it worsen when reading or watching TV? *People blink less when watching TV and develop dry eyes.*
   - Is this a glare problem at night that might indicate cataracts?
   - Is this a patient with poor glycemic control with resulting hyperosmotic swelling of their lens?

4. **Red, painful eyes**
   - Ask about the nature of the pain (is this a scratchy pain, aching pain, or only pain with bright light).
   - Is there discharge that might indicate an infection?

5. **Chronic itching and tearing**
   - Is it in both eyes?
   - Think about allergies or blepharitis.

6. **Headaches and scalp tenderness**
   - Think of temporal (giant cell) arteritis and ask about other collaborating symptoms like jaw claudication, polymyalgias, weight loss, and night sweats.

PMH:

- Diabetes, hypertension, and coronary artery disease.
- Thyroid problems and asthma *(you might need to prescribe a beta-blocker and you don't want to set off bronchospasm).*

POH (past ocular history):

- Past clinic visits and surgeries.
- Specifically: cataract surgeries, eye trauma, and glaucoma.

Family History:

Focus on history of glaucoma and blindness. *Patients will often confuse glaucoma with cataracts, so be sure to ask.*

Allergies:

We sometimes give Diamox to control eye pressure so make sure your glaucoma patient isn't allergic to sulfa drugs.

Medications:

- Current eyedrops taken, and why.
- Are they using a regular eyedrop? How about vasoconstricting Visine
- Check if your patient is taking an oral beta- blocker already, *in case you want to start a beta-blocking eyedrop.*

This was quoted and reorganized from OphthoBook.

Ophthalmic Examination:

"The purpose is to evaluate"

- Function

Visual x nonvisual (eye movement and alignment)

- Anatomy of the globe

Adnexia (lids+periocular tissue)

Orbit

"vision"

1-How to test it?

- Display of different –sized targets shown at a standard distance from the eye
- Snellen chart
- 20/20, 6/6
- Uncorrected,corrected

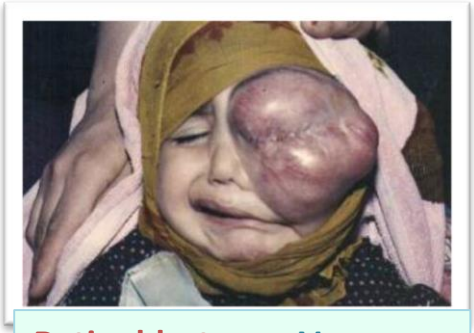
2- Testing poor vision

- If the patient is unable to read the largest letter<(20/200)
- Move the patient closer e.g.5/200
- If patient cannot read:
  Count fingers (CF)
  Hand motion (HM)
  Light perception (LP)
  No light perception (NLP)

"Ophthalmic Examination"

- Visual acuity
- External examination
- Motility and alignment
- Pupil examination

- Slit lamp biomicroscopy
- Tonometry
- Ophthalmoscopy
- Gonioscopy
  (To observe the anterior chamber angle if the angle is open or narrow or if the eye can be dilated safely. Its most important function is in determining whether a patient's ↑IOP is due to a "open angle" or "closed angle" mechanism)
- Retinoscopes



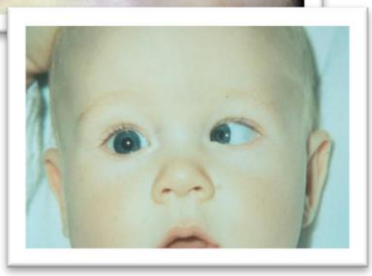
Retinoblastoma. Very Please read about

" External Examination"

- Evaluate by gross inspection and palpation
- Ocular adnexa. (lid, periocular area)
- Skin lesions, growths, inflammatory lesions
- Ptosis
- Proptosis, exophthalmos, enophthalmos
- Palpation of bony rim, periocular soft tissue
- General facial examination e.g. enlarged preauricular lymph node, temporal artery prominence.

"ocular motility"

Evaluate:
1-Alignment
2-movement

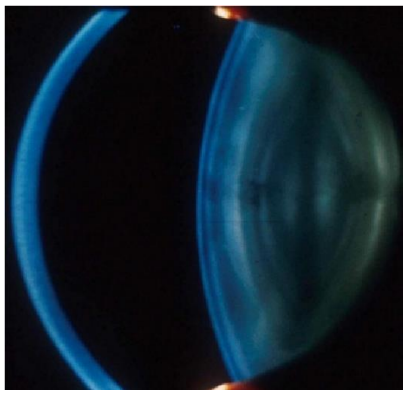


Misalignment of the eye

Not necessarily proptosis, it could be enophthalmos in the other eye. So, we evaluate the patient from below.

- Follow a target with both eyes in each of the four cardinal directions ofgaze.
- Note
  -speed /smoothness
  -range
  -symmetry
  -unsteadiness of fixation (e.g nystagmus)
- Examine for size, shape, reactivity to both light and accommodation.
- Direct response and consensual response
- Afferent pupillary defect (APD/Marcus Gunn pupil) you should know exactly how to do it for OSCE!
- Efferent pupillary defect
- Pupillary abnormalities:
  -neurologic disease
  -previous inflammation–adhesion
  -acuteintraocular inflammation--- spasm
  -atony
  -prior surgical trauma
  -effect of systemic or eye medication
  -benign variation of normal

- Is a table---mounted binocular microscope with special illumination source.
- A linear slit beam of light is projected onto the globe – optic cross section of the eye

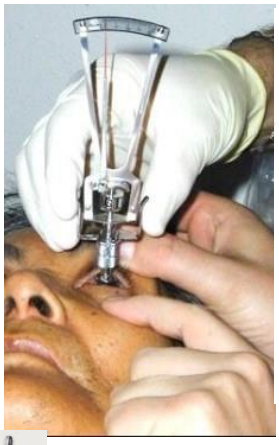


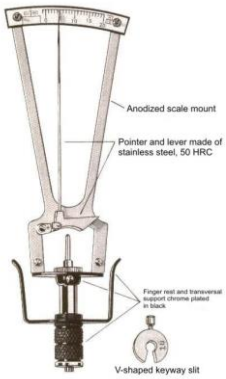
Slit lamp alone, the anterior half of the global (anterior segment) can be visualized.

"Tonometry"

- Tonometry is a procedure performed to determine the intraocular pressure(IOP). It is an important test in the evaluation of patients at risk from glaucoma. Most tonometers are calibrated to measure pressure in millimeters of mercury(mmHg).
- The globe is a closed compartment with constant circulation of aqueous humor.
- This maintains the shape, and relatively uniform pressure within the globe
- Normal pressure 10–21 mmHg.

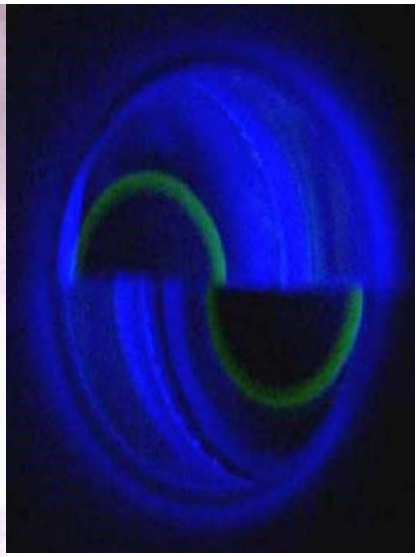
Types of tonometry





Schiotz tonometer. Very important for SAQ!
Please make sure you spell the full nameright.

Goldman tonometer



Tonopen

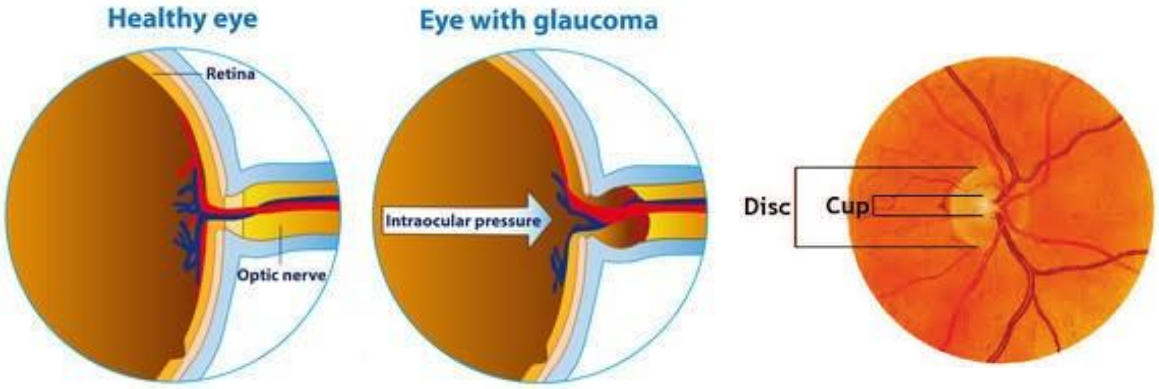
Perkin tonometer

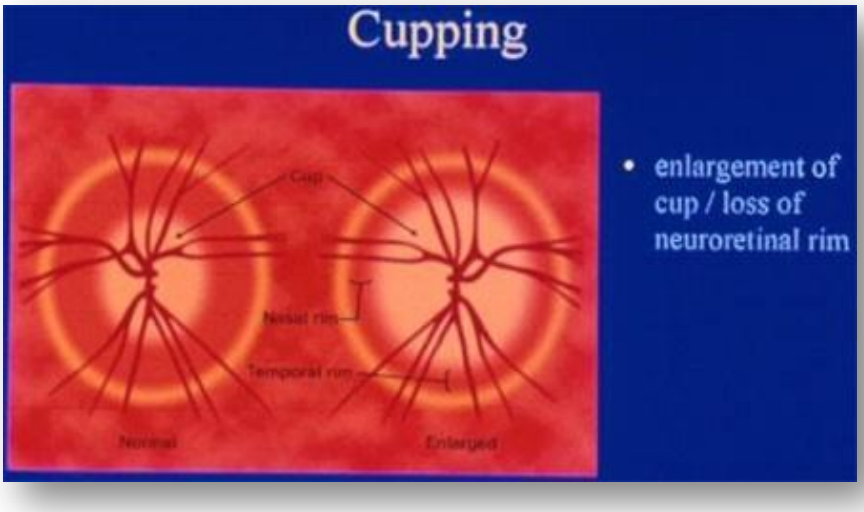
Glodmann applanation

"Glaucoma"

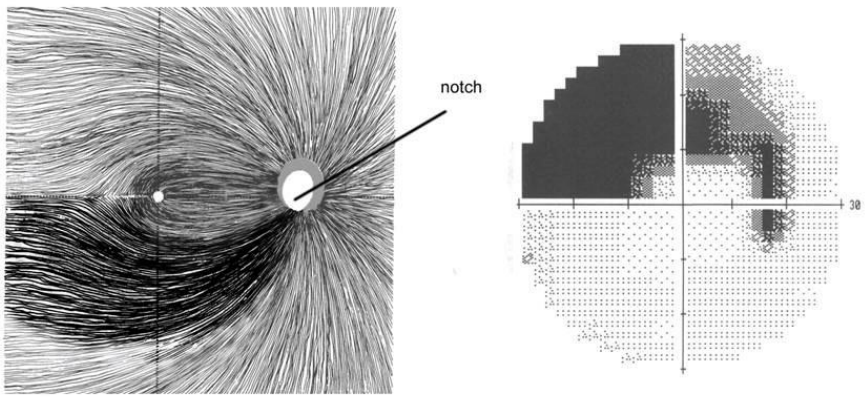
Diagnosis made by checking:

1- IOP
2- Disc cupping
3- Visual field defect





Retinal nerve fiber layer



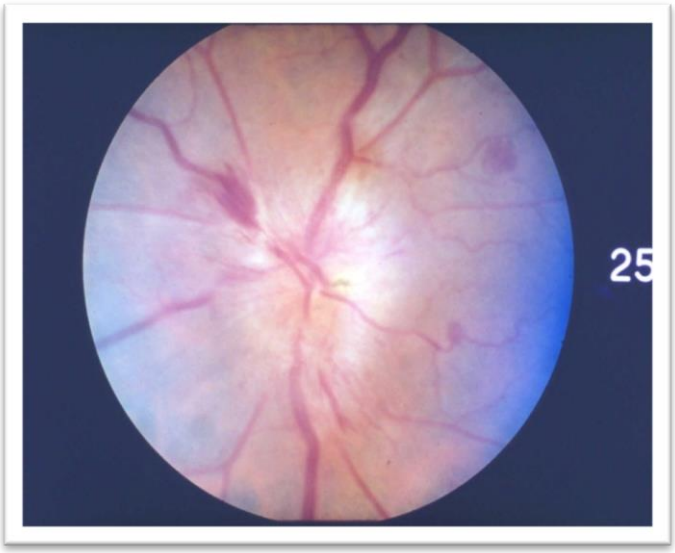
Neurological defects don't respect horizontal/vertical lines of visual field

-Ophthalmoscopy

Both are used for fundoscopic

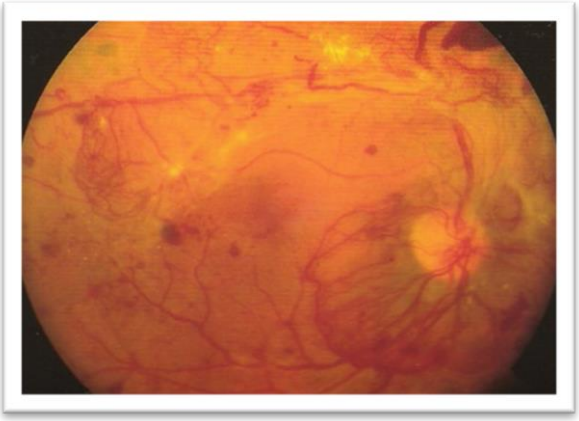
	Direct ophthalmoscopy	Indirect ophthalmoscope
Advantages	1. Handheld instrument. 2. Standard part of the general medical examination. 3. Portable.	1. provide much wider field of view 2. less magnification (3.5X with 20D lens) 3. brighter light source – better view. 4. Binocular – steroscopic view. 5. Allow entire retina examination till the periphery.
Disadvantages	-	1. Inverted retinal image. 2. Brighter light is uncomfortable to the patient.
Shape		

Disc Edema



Retinal hemorrhages

Vitreous Hemorrhage



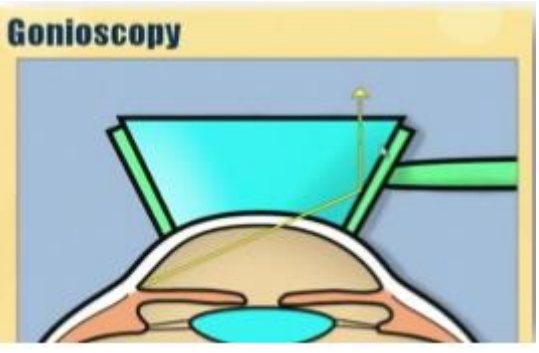
Proliferative Retinopathy

"**special lenses:**

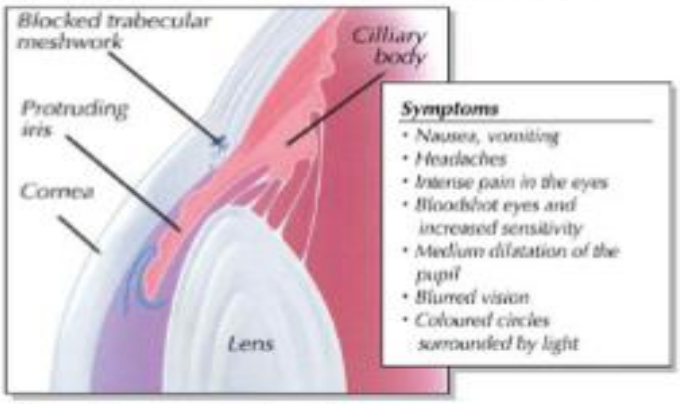
- Goniolens

- Other lenses allow evaluation of the posterior segment

Importance of Genioscopy

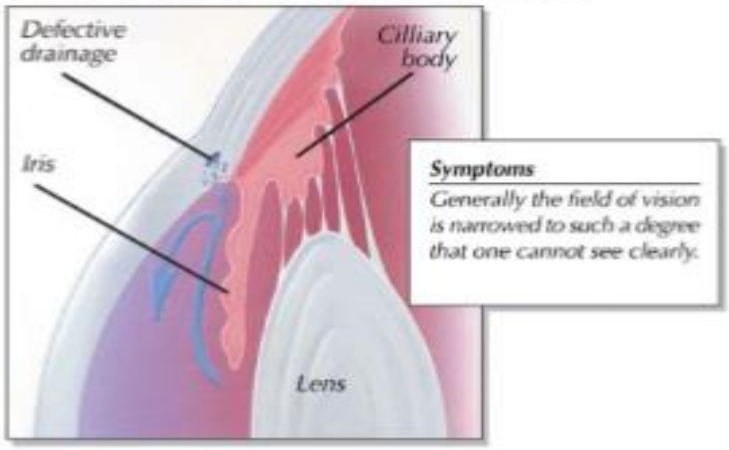


CLOSED ANGLE GLAUCOMA



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

OPEN ANGLE GLAUCOMA



The angle is open but drainage is defective.

Gonioscope can tell if it's open or closed angle glaucoma

Retinoscope

Summary of Ophthalmology Examinations

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

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>hyepertropia…*

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)

Watch: https://www.youtube.com/watch?v=TxEQWtlXtrI

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)

D. Visual fields

1- At the level of patient's head, arm length apart.

2- If you examine the right eye of the patient, ask the patient to look to your left eye and cover his left one (*and don't move his eye)*

3- Hand positioned halfway between you and your patient.

4- Ask the patient to identify how many fingers are displayed or when he can see the fingers *(don't let the patient look directly at fingers)*

5- Compare patient's field of vision against yours

6- Test each of the four quadrants

7- Repeat for the other eye!

Comment on:

1- Common visual field defect *(Central scotoma - Bitemporal hemianopia - binasal hemianopsia - Homonymous hemianopia - Altitudinal field defects)*

2- Localize field defects *(Central scotoma – Enlarged blind spot – Arcuate nasal field defect – Wedge shaped temporal field defect)*

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

1- Place Snellen letter chart or the E chart 20 feets 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

- "counts fingers"
- "hand motion" *(which direction?)*
- "light perception" *(from center+4quadrants)*

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!

Summary

- The eye examination evaluates CN II, III, IV, V, VI, VII, VIII. **(7 cranial nerves)**
- The study of CN III, IV, V, VI evaluates the **brain stem, cavernous sinus, and apex of orbit.**
- Unilateral dilated pupil after head injury can occur due to pressure on pupil constrictor fibers of CN III.
- **Bilateral carotid artery aneurysm → Binasal Hemianopia.**
- **A fistula between carotid artery and cavernous sinus → ↑IOP → Thrill + pulsating eyes.**
- **CN III is composed of 2 parts:**
  1. Superficial parasympathetic pupillomotor → Usually affected by compression. *(aka dilated surgical 3rd nerve palsy)*
  2. Deep motor → Usually affected by medical causes like DM/HTN. *(aka surgical 3rd nerve palsy)*

- **When a patient complains of any changes in vision, rule out DM first!**
- **Hypoparathyroidism → Cataract**
- **DDx of Acute Visual Loss: (Always remember these 4)**
  1. Age-related Macular Degeneration (AMD)
  2. Vascular Occlusion (DM, HTN)
  3. Retinal Detachment
  4. Acute Glaucoma

- **Ciliary injection (red eye) is mainly caused by 4 things:**
  1. Acute conjunctivitis
  2. Acute iritis
  3. Acute glaucoma
  4. Acute keratitis *(corneal ulcer; a combination of conjunctivitis and iritis)*
- **Retinoscope** → used to determine Refractive error *(can tell if your vision is 20/20)*
- **Ophthalmoscope** → used for Fundoscopic exam

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