

# Neuro-Ophthalmology

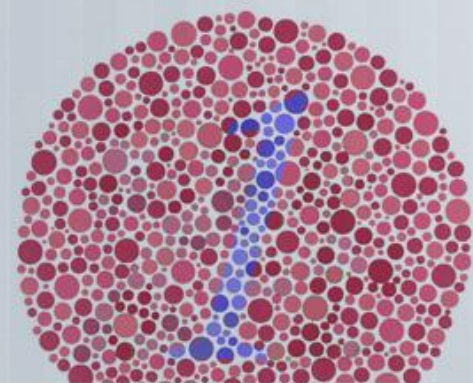
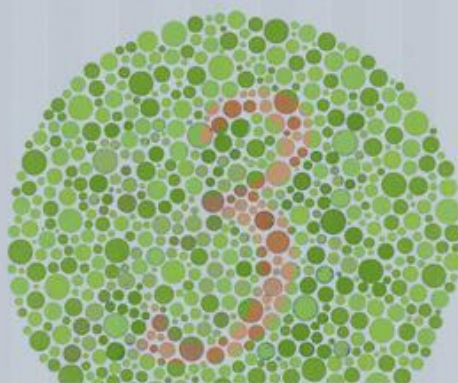
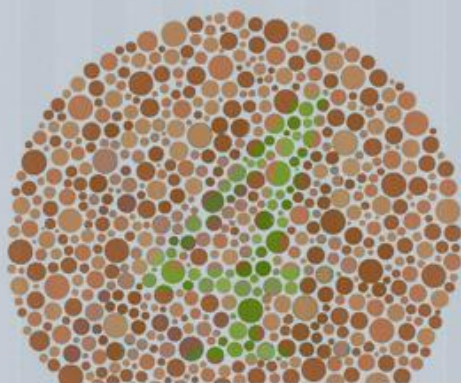


**431**  
**Teams**  
medical students

## *Ophthalmology Team*

**Done by: Bader Alghamdi**

**Thanks to 430 team**

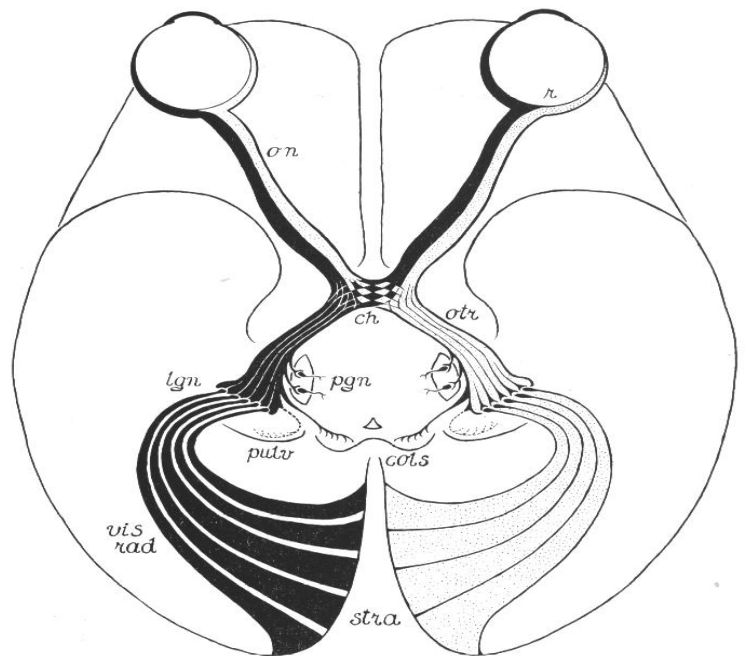
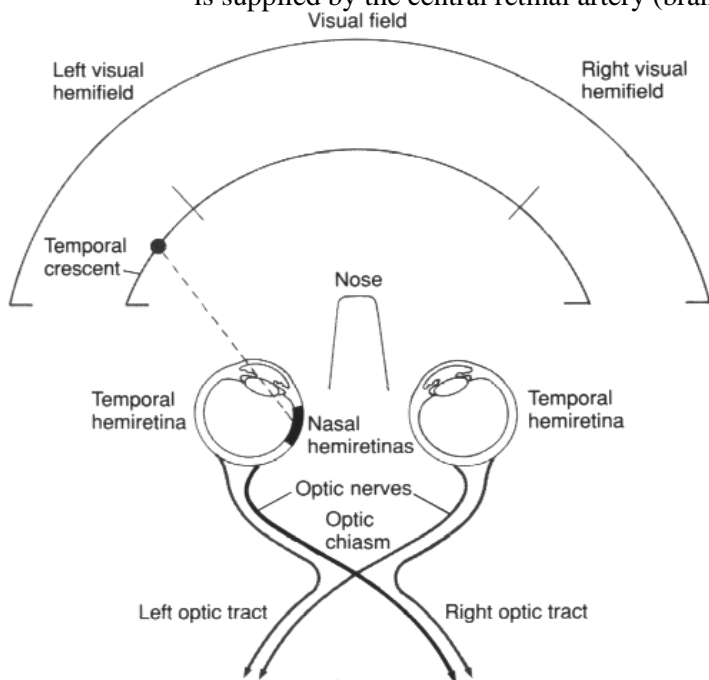


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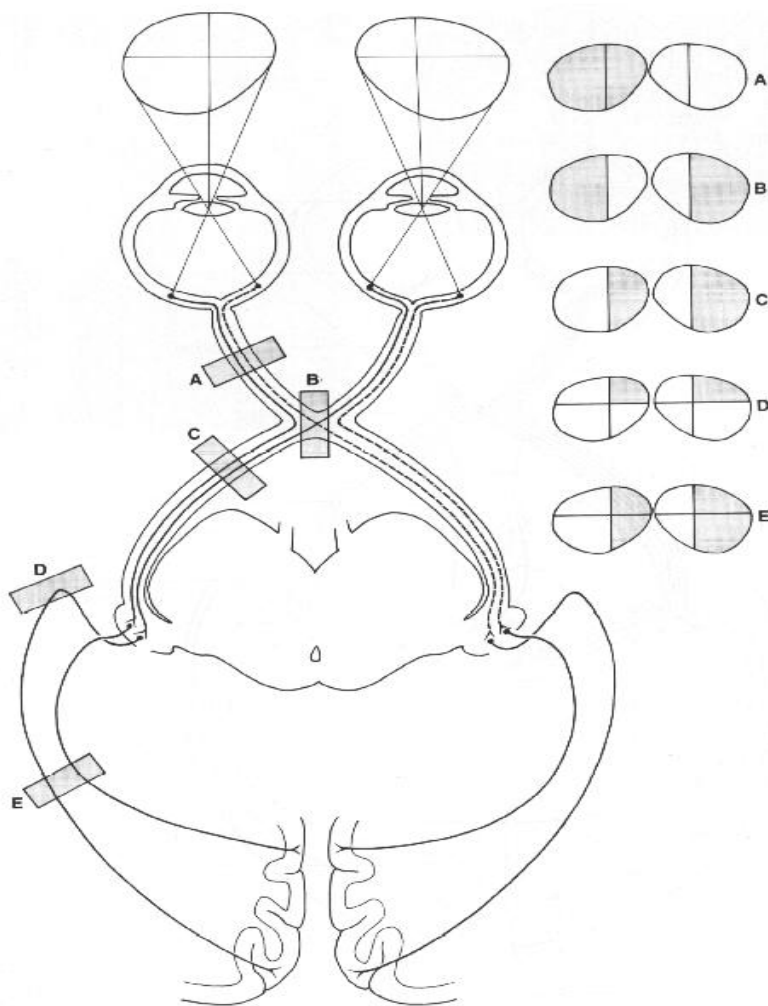
- Afferent ( vision sense )
- Efferent ( ocular motility and abnormality in pupil size )
- Other

1- Afferent System:

- **Anatomy:** vision is generated by photoreceptors in the retina, signals leave the eye by the optic nerve. In the chiasm partial axon crossing occurs. After the chiasm the axons are called optic tract. The optic tract wraps around the midbrain to get to the lateral geniculate nucleus LGN where all axons synapse. From the LGN axons get out through the deep white matter of the brain as the optic radiation, which will travel to the primary visual cortex in the occipital lobe. **Blood supply:** inner surface of the retina is supplied by the central retinal artery (branch of ophthalmic), the outer retina by choroid arteries.



- 1- Temporal fibers are responsible for nasal fields, and nasal fibers are responsible for temporal fields.
- 2- If one eye is damaged the patient will lose one fifth of his field.
- 3- Any injury before LGN will make the optic disc pale. If after LGN (like MCA stroke), the disc will appear normal.



- A- Damage to optic nerve or retina or orbit > complete blindness in left eye (anopsia)
- B- Damage to chiasm like pituitary adenoma > bilateral temporal hemianopsia
- C- Lesions in LEFT optic tract > RIGHT homonymous congruous hemianopsia
- D- Lesion in LEFT temporal lobe > RIGHT homonymous congruous superior quadrant-anopsia (pie in the sky)... Lesion in LEFT parietal lobe > RIGHT homonymous congruous inferior quadrant-anopsia (pie in the floor).
- E- Lesion in the LEFT occipital cortex > RIGHT homonymous hemianopsia with macular sparing. (why sparing? **Because macular fibers receive blood supply from MCA and PCA**)

**IMPORTANT!!!**

- **Examination:**

- a- Visual acuity (distance, near)
- b- Color vision (ishihara, AOC) ishihara can't determine which color.
- c- Visual field (confrontation, goldmann perimetry, Humphrey perimetry)
- d- Pupil exam (in light and dark), swinging flashlight test (marcs gun) is an afferent papillary defect APD. **Anisocoria means unequal size of pupils.**
- e- Fundoscopy ( direct and indirect ophthalmoscope, slit lamp and lens)

- **Diagnosis**

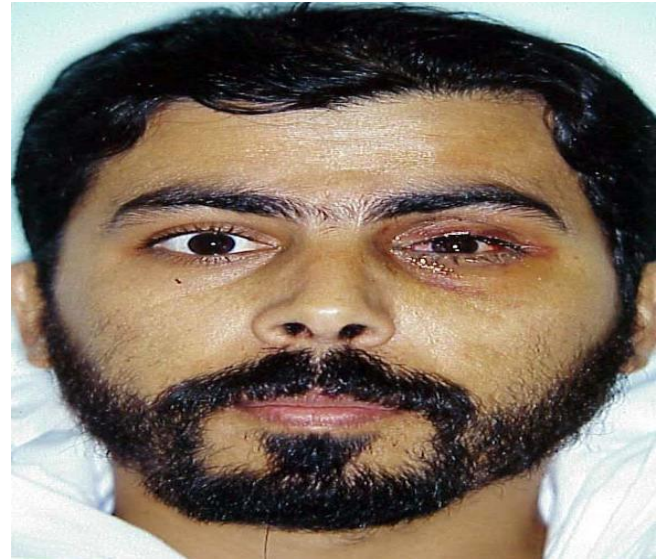
ischemic	compression	Congenital and genetic	trauma	Inflammation
-Non-arteritic ischemia -Optic neuropathy -Central retinal artery occlusion -Retinal emboli -Giant cell arteritis with ION (ischemic optic neuritis )	-intraorbital ON -intracranial ON -optic chiasm -optic tract -posterior afferent system	-congenital retinal dystrophies -optic nerve hypoplasia Leber hereditary optic neuropathy -dominant and recessive optic atrophy -glaucoma	-globe -intraorbital optic nerve -optic canal -optic chiasm -occipital lobe	-optic neuritis -orbital pseudotumor -other



case 1

25 year old man who was exposed to firecracker that exploded near his left eye . NLP OS (no light perception in the left eye)

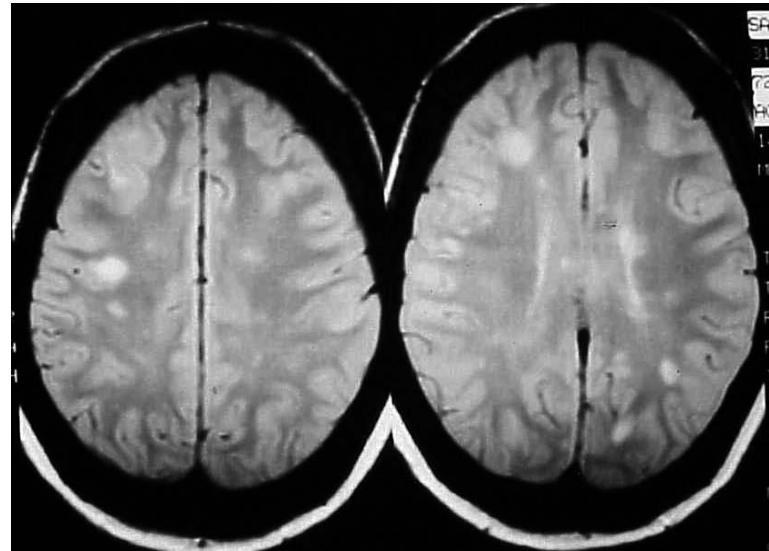
Diagnosis: optic nerve avulsion



Case 2

27 y/o women developed blurred vision in Right eye OD and mild right periorbital pain  
VA 20/50, MRI abnormal

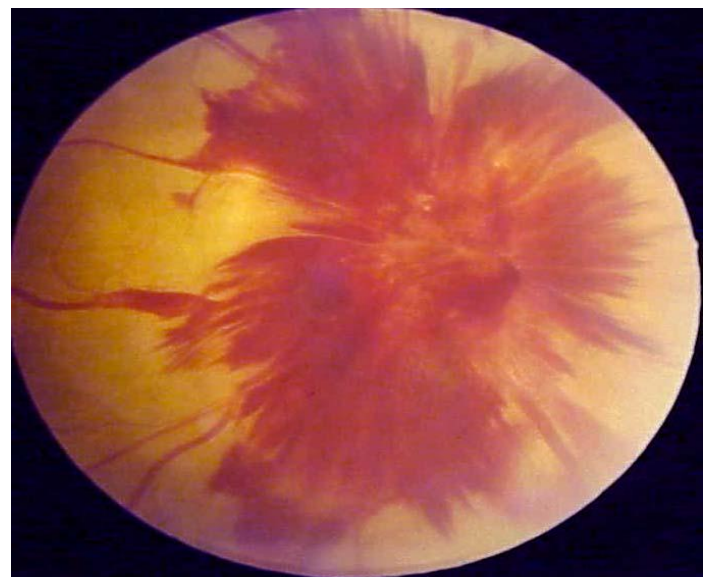
Diagnosis: multiple sclerosis ( optic neuritis)



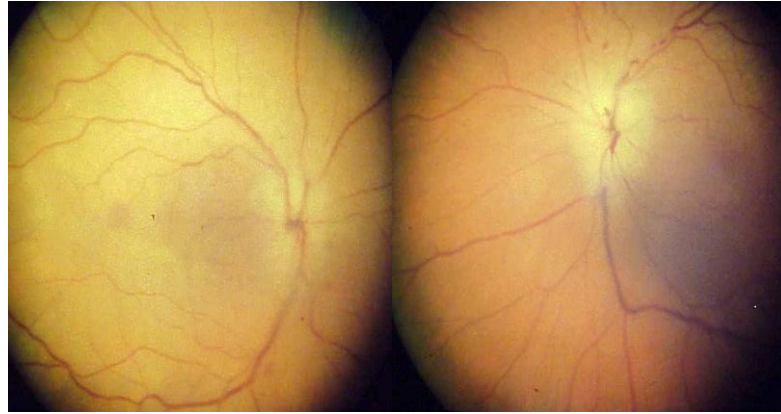
Case 3

28 y/o women had modest left periorbital pain  
3 weeks ago, she has some blurring of vision

B-scan showed posterior scleritis



Day2



Case 4

Giant cell arteritis, it can cause cell blindness in 2 days

Day4



Pappiledema is bilateral disc swelling due to increased ICP (intra cranial pressure).

Case 5

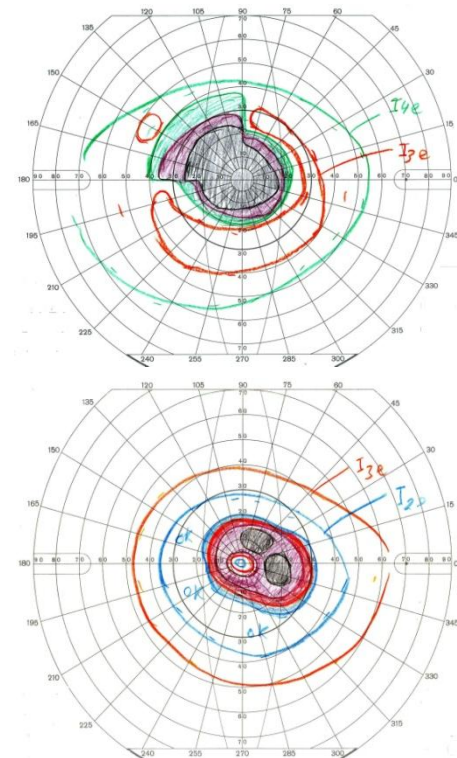
14 y/o girl, vision OS ( left eye) began to decline gradually without pain. First visit with VA OD 20/40 and OS CF at 3'.

Pale, flat optic disc OU ( both eyes)

VA 1 month later CF at 3' OU

VA 10 months later 20/20 OU

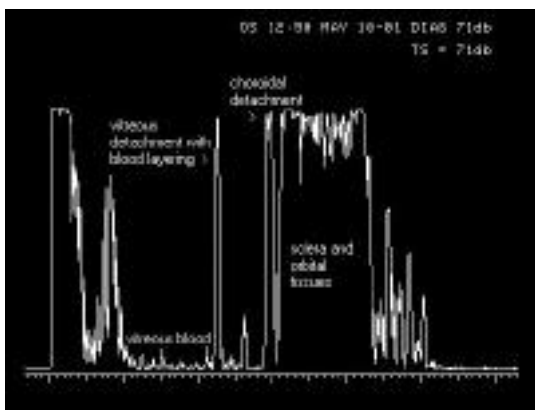
Diagnosis LHON- like optic neuropathy



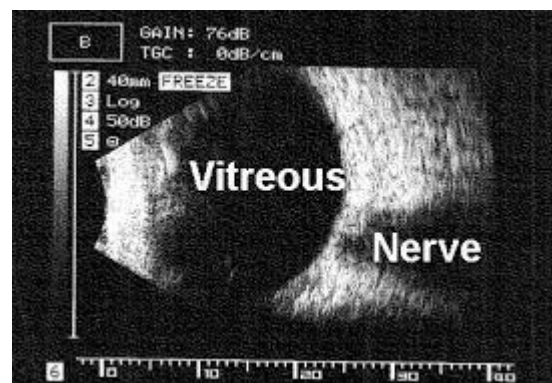
- **Tests**

- a- During exam (visual field, A scan, b scan, OCT, ERG/VEP)
- b- Neuro-imaging (CT scan, MRI)
- c- Ultrasound (orbital color Doppler, carotid Doppler ultrasound)
- d- Blood tests
  - a. Vasculitis (ESR, CBC, ANA, VDRL)
  - b. Uremia (BUN, creatinine, U/A)
  - c. Liver function (SGOT, SGPT, Alkaline phosphatase)
  - d. Electrolytes
  - e. Genetic evaluation

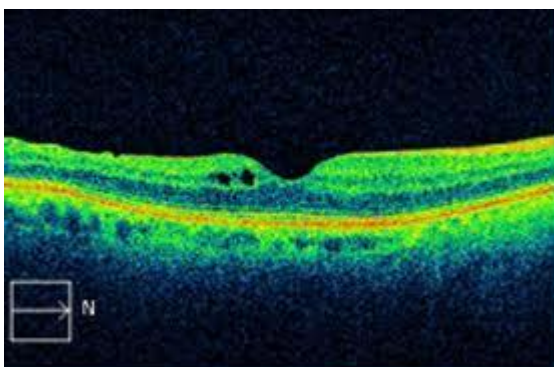
A scan



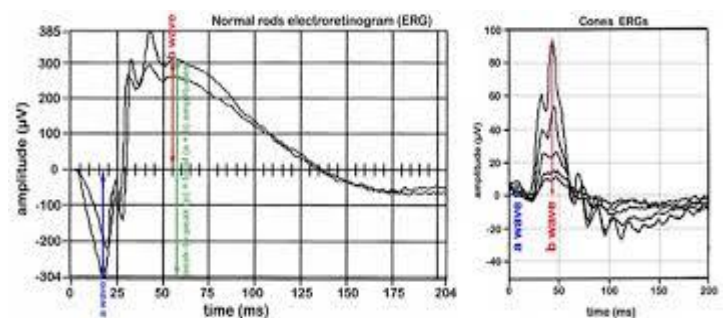
b scan



OCT



ERG/VEP



Near reflex consists of:

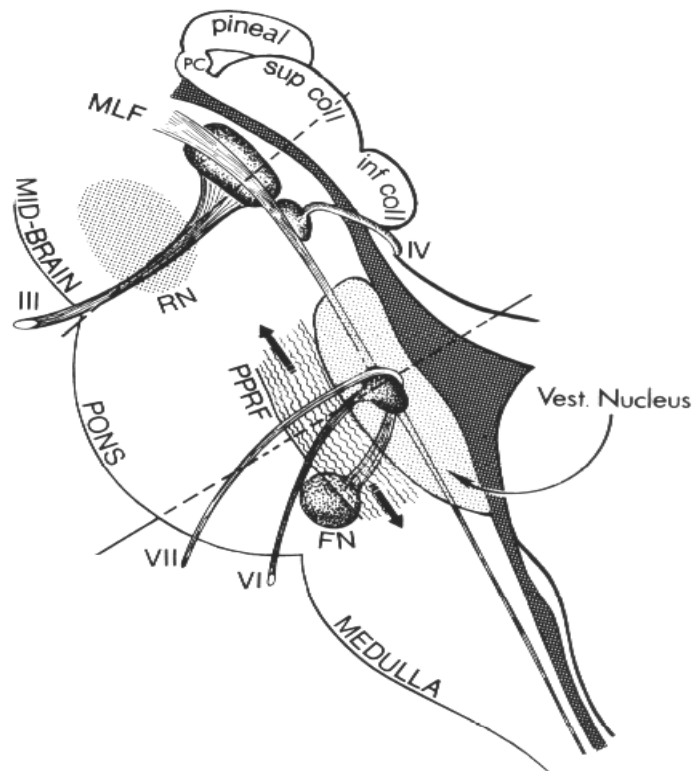
- 1- Convergence
- 2- Meiosis
- 3- Lens accommodation



2- Efferent system:

- **Anatomy:**

- a- The 3<sup>rd</sup> nerve runs across the top of the cavernous sinus and has an important clinical implication. PCA is located above the cavernous sinus so 3<sup>rd</sup> nerve is commonly affected if a PCA aneurysm ruptures.
- b- The 4<sup>th</sup> cranial nerve is the only nerve located posteriorly and immediately decussating and runs in a horizontal course.
- c- The 6<sup>th</sup> cranial nerve has the longest intracranial course of cranial nerves and can be damaged in the brain stem or more often in it's intracranial course.
- d- The facial nerve 7<sup>th</sup> loops around the nucleus of the 6<sup>th</sup> cranial nerve. A single brain mass affecting both of them together is common.
- e- Cavernous sinus wall is formed of the tough dura matter. If the internal carotid artery ruptures here, the high blood pressure of the artery will be obtained within the sinus giving rise to C-C fistula (carotid-cavernous). Patients usually present with sudden or insidious onset of redness in one eye associated with progressive bulging or proptosis.



Neurofibromatosis type 1 affects the development of the skull and the globe. The picture shows a big orbit and the superior orbital fissure is 5 times bigger.

- **Examination:**

A- Just look at the patient

- a. Are eyes straight
- b. What are the lid positions?
- c. Are the eyes proptotic?
- d. Are there any spontaneous eye movements?

a



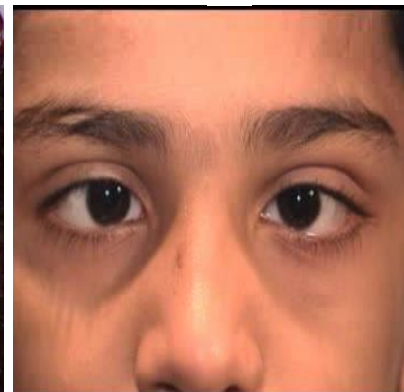
b



c



d



B- Movements of both eyes in all directions

- a. Have the patient move eyes in all directions, not just the direction where you think there is a problem.
- b. Hold lids if necessary (only after looking first without holding lids)
- c. Examine each eye separately if necessary ( like in kids with esotropia + crossed fixation)

a



b



C- Smooth pursuit:

The reflex that helps to maintain fixation on an object in motion in the visual world while the head is stable. Also the reflex that inhibits the vestibulo-ocular reflex

D- Saccades:

The reflex that permits a rapid re-fixation from one point in the visual field to another. There is Saccadic dysmetria in cerebellar disease.



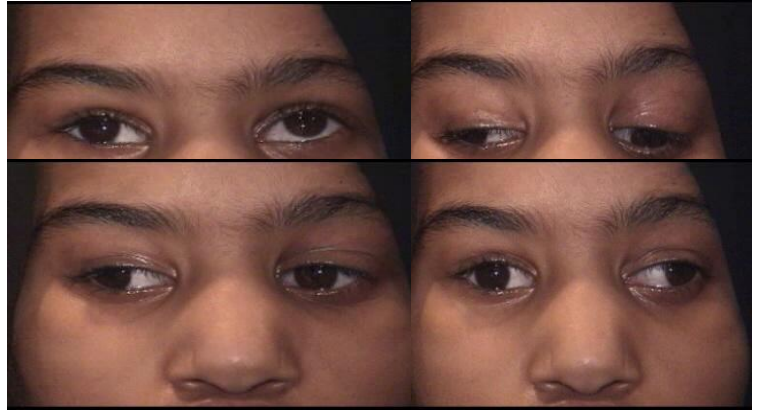
- **Diagnosis:**

- a- In orbit ( like extra ocular muscles, trauma, mass )
- b- Neuromuscular junction ( like myasthenia gravis)
- c- Single cranial nerve ( 3<sup>rd</sup>, 4<sup>th</sup>, 6<sup>th</sup> )
- d- Multiple cranial nerves
- e- Intra parenchymal ( intra-nuclear ophthalmoplagia INO , gaze palsy )

10 y/o girl born with weakness of the face.

The parents noticed unusual eye movements at early age.

Diagnosis: bilateral mobius syndrome, or possible congenital injury to 3<sup>rd</sup> cranial nerve OD ( right eye)



Inflamed or enlarged Extra ocular muscles

Damage the optic nerve (like in grave's

Disease)



Trauma with blowout fracture to the floor of the orbit

Causing ocular dystopia ( eyes are different in position)



Mass: left optic sheath meningioma resected.



Neuromuscular junction: patient with myasthenia gravis with bilateral ptosis. He is trying to overcome the ptosis by elevating the eyebrows, absent wrinkles because muscle tone is weak.



Single cranial nerve: 3<sup>rd</sup> oculomotor

Complete oculomotor nerve palsy will result in a characteristic down and out position in the affected eye. The eye will be displaced downward because the superior oblique (supplied by 4<sup>th</sup>) is still working. It will be displaced outward because the lateral rectus (supplied by 6<sup>th</sup>) is still working also. The patient will have ptosis of the eyelid and pupil dilatation.



congenital 4<sup>th</sup> cranial nerve palsy:

note that the right eye is slightly higher.  
The patient may complain of vertical  
diplopia which gets worse when the  
affected eye looks toward the nose.



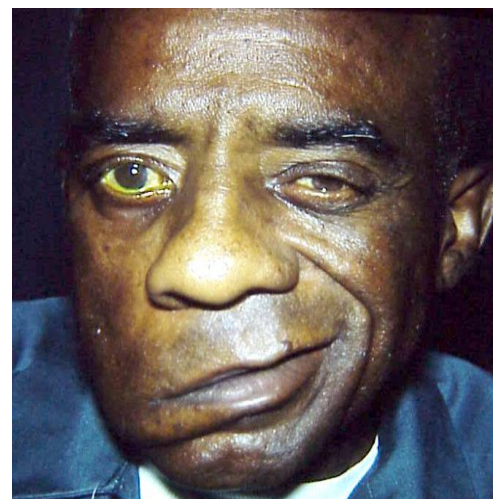
Abducent nerve 6<sup>th</sup> cranial: note the  
right eye doesn't abduct.



Intra-parenchymal: INO (intranuclear  
ophthalmoplagia)



Gaze palsy (facial nerve injury)





### 3- Others

Neurofibromatosis

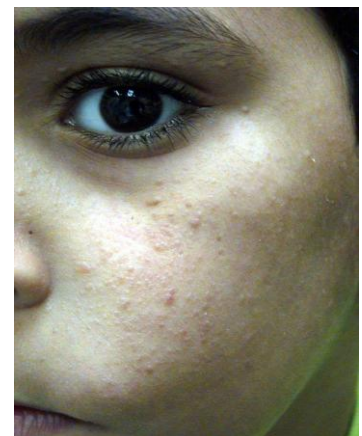


dysmorphism

Unusual teeth



Tuberous sclerosis ( usually comes with astrocytoma 'brain tumor' ). In the pic you can see adenoma sebaceum which is rash of reddish spots or bumps that appears on the nose or cheeks in a butterfly pattern ... **NO need to remember !!!**



Unusual posture:

Dx is congenital fibrosis of the ocular muscle type 1, the hallmark is that patients tilt their head back because the eyes can't be elevated to primary gaze... **NO need to remember !!!**



4- Summary:

- 1- Afferent system is the vision sensation, and efferent system is ocular motility and pupils size.
- 2- If one eye is damaged you will lose one fifth of your field ONLY.
- 3- Macular fibers receive blood supply from MCA and PCA.
- 4- To describe eye lesion you should mention the side, hemianopsia or quadrantanopsia, congruous or incongruous, superior or inferior, with or without macular sparing.
- 5- **You MUST know visual field defects with their lesions' site.**
- 6- Superior oblique by 4<sup>th</sup> cranial nerve (trochlear), lateral rectus by 6<sup>th</sup> cranial nerve (abducent).