

Anisocoria

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Anisocoria

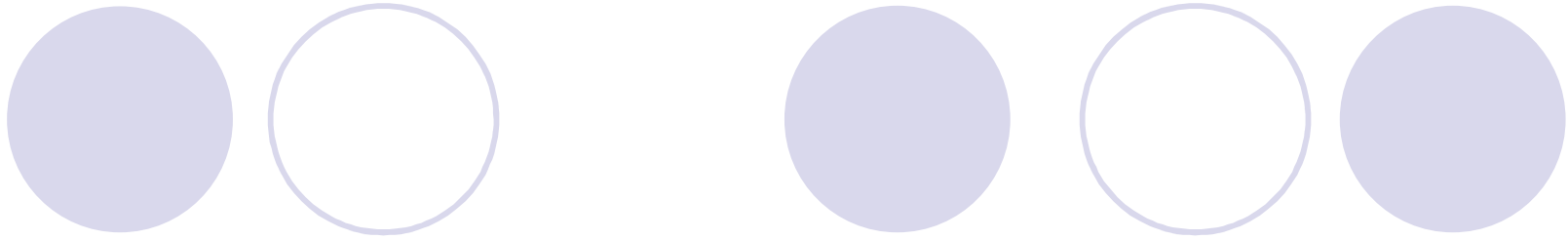
- | Disclosure

- | Most illustrations are from:

Biousse V, Newman NJ.

Neuro-Ophthalmology Illustrated.

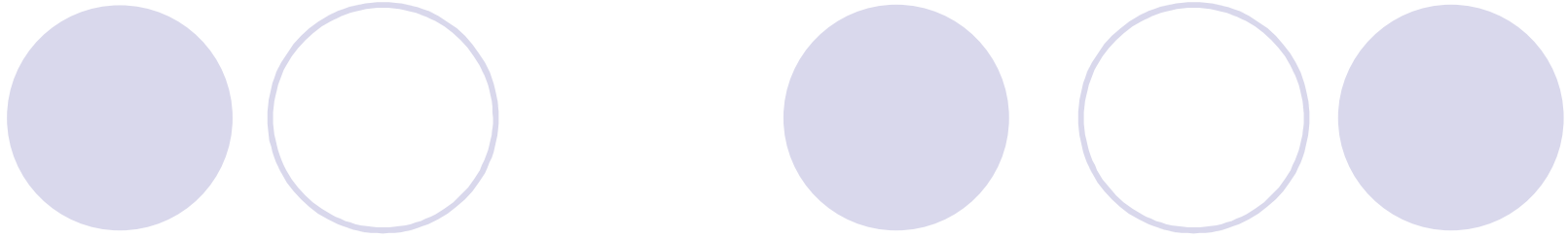
Thieme, NY. 2009



- | 17 y/o man with anisocoria

- | Myelodysplastic syndrome
- | S/p bone marrow transplant
- | Intubated for respiratory compromise

- | Two days after extubation:
 - | New onset seizures
 - | Anisocoria left pupil larger than right



| Neurologic consultation:

- | Dilated left pupil**
- | Normal visual acuity and EOMs**



- | **Ophthalmologic consultation:**
 - | Normal visual acuity, intraocular pressures, anterior segment, fundi
 - | Normal EOMs, lids
 - | OD pupil normal; OS 8mm and minimally reactive, no RAPD



| **Work-up:**

- | MRI/MRA and LP: all normal
- | Seizures secondary to metabolic derangement

And now what ?

| Pupil testing:

- | 0.1% pilocarpine: no constriction
- | 1.0% pilocarpine: constriction of OD only

Diagnosis

| Pharmacologic mydriasis

| Respiratory therapy X 3d:

- | Albuterol sulfate-
ipratropium bromide
- | Loose fitting mask –
mist escaping to left



Diagnosis

- | **Pharmacologic mydriasis OS**
 - | Ipratropium – anticholinergic agent
 - | Albuterol – beta-adrenergic agent



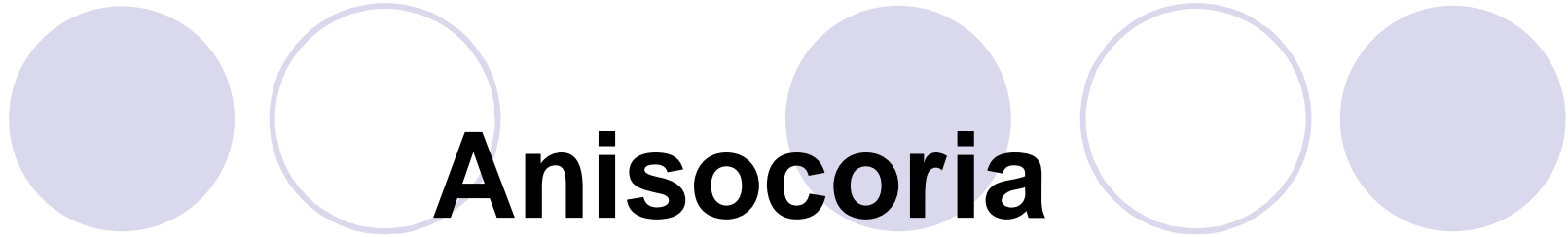


Follow-up

- | Respiratory treatments held overnight:
 - | Normal pupils next day



We all have
two eyes:
The Right eye
and the
The wrong eye.



Big Pupil Problem

vs.

Small Pupil Problem



Physiologic Anisocoria

- | 10-20% of population has 0.4mm of anisocoria
- | Normal light, near and dark reactions

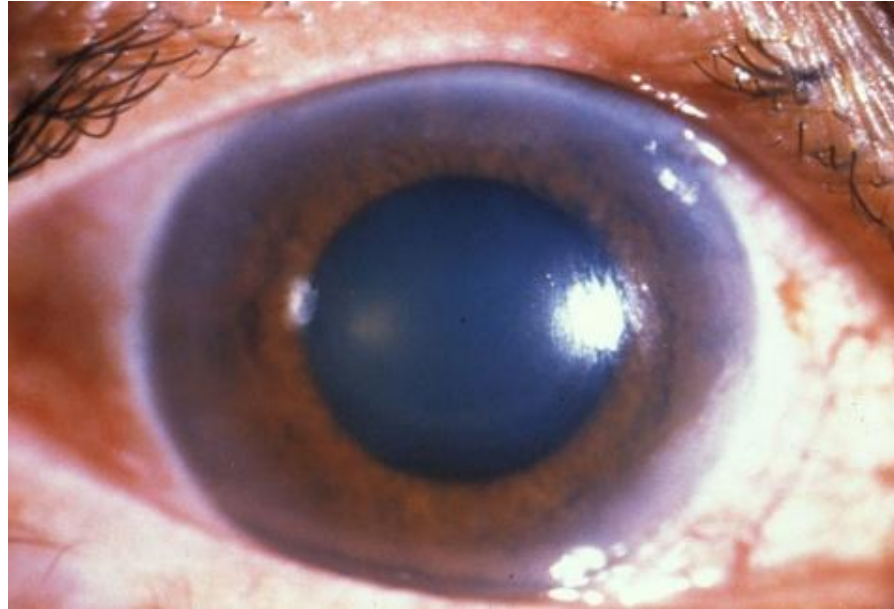
Light

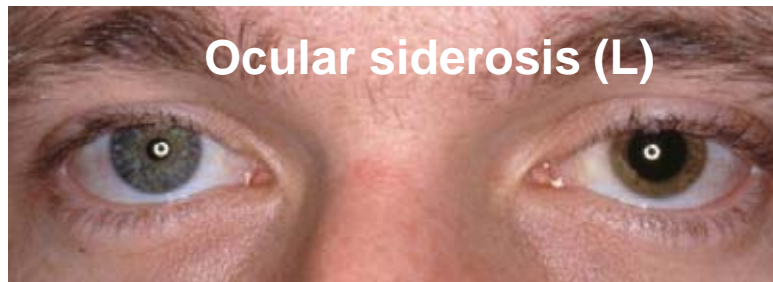
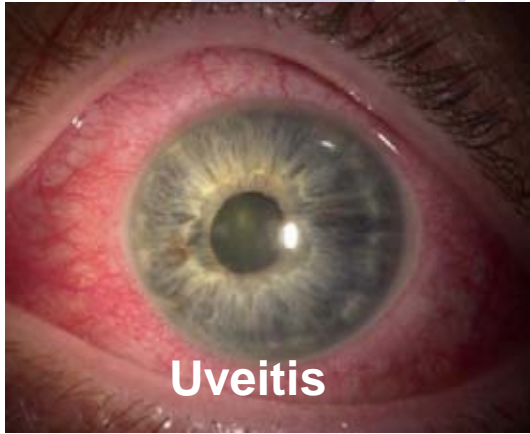


Dark



Anisocoria. Ocular causes

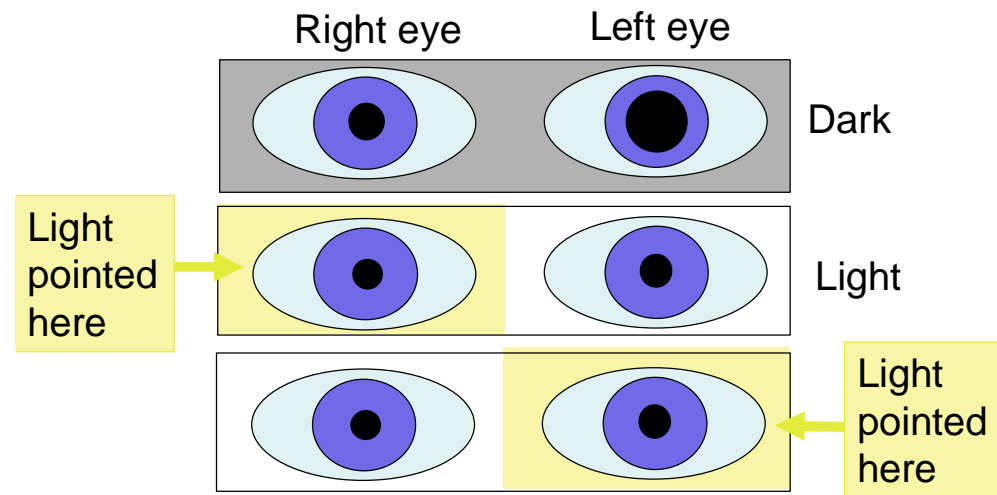




The small pupil is abnormal

The anisocoria is greater in the dark than in the light

- Poor pupillary dilation on the abnormal side
- Abnormality of the sympathetic system.



Horner Syndrome

| Abnormality of the sympathetic system

Dark



Light



Congenital Horner Syndrome



Pharmacologic Diagnosis of Horner

Cocaine (4 or 10%)

- Normal pupil dilates
- Horner pupil dilates poorly
- Anisocoria increases*



-Cocaine blocks the reuptake of norepinephrine at the sympathetic nerve synapse with the iris dilator:

=> pupillary dilation in eyes with intact sympathetic innervation

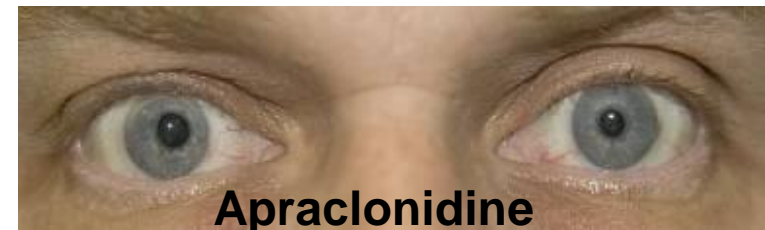
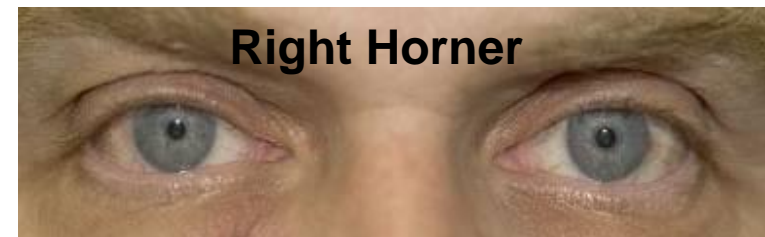
=> no effect in eyes with impaired sympathetic innervation, regardless of the lesion location

Pharmacologic Diagnosis of Horner

Apraclonidine (0.5 or 1%)

- Normal pupil does not dilate
- Horner pupil dilates

Anisocoria reverses and palpebral fissure enlarges (apraclonidine reverses the Horner syndrome)



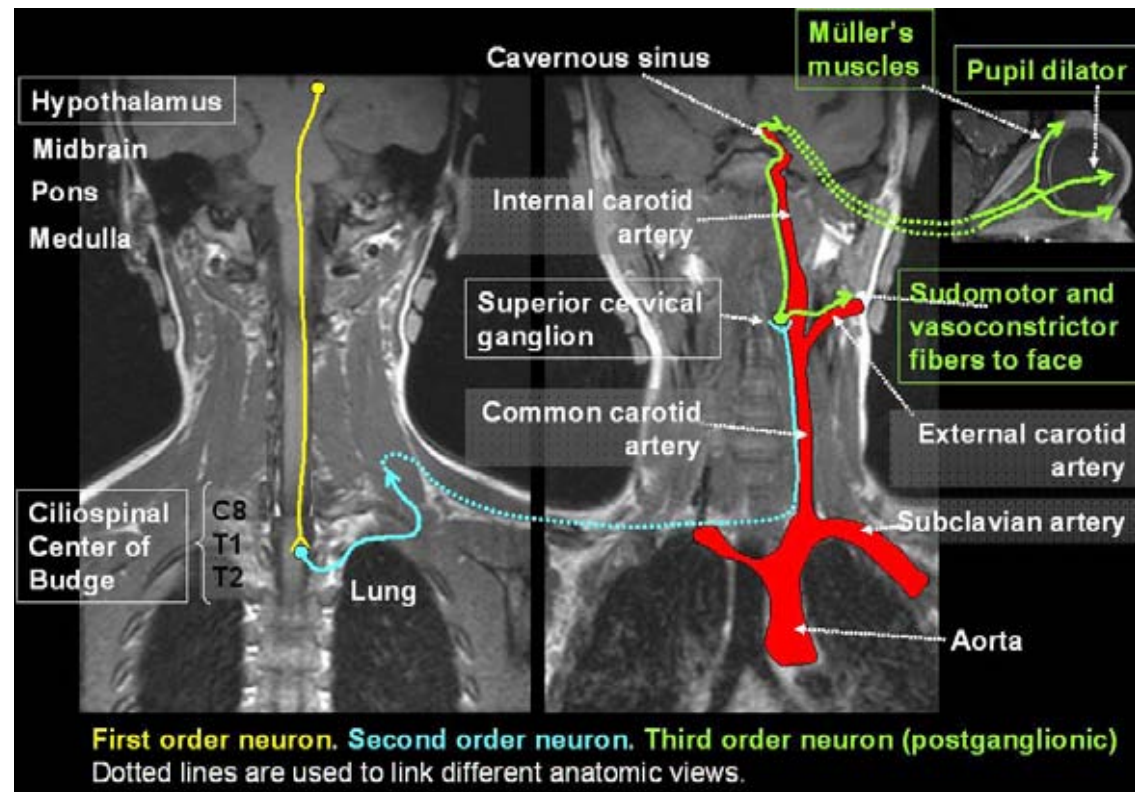
*Apraclonidine is a direct α_1 receptor agonist (strong α_1 and weak α_2)
=>No effect in eyes with intact sympathetic innervation
=>Mild pupillary dilation in eyes with sympathetic denervation,
regardless of the lesion location (with denervation hypersensitivity, α_1
effect dilates the Horner pupil)*

Horner's Syndrome: Localization

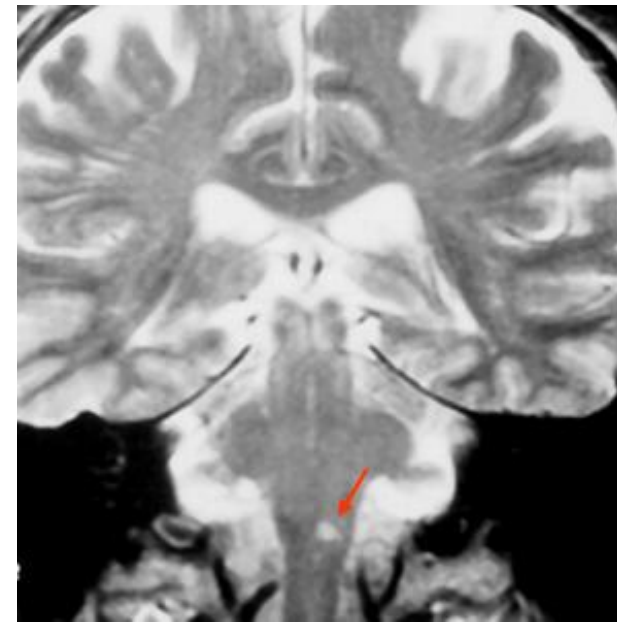
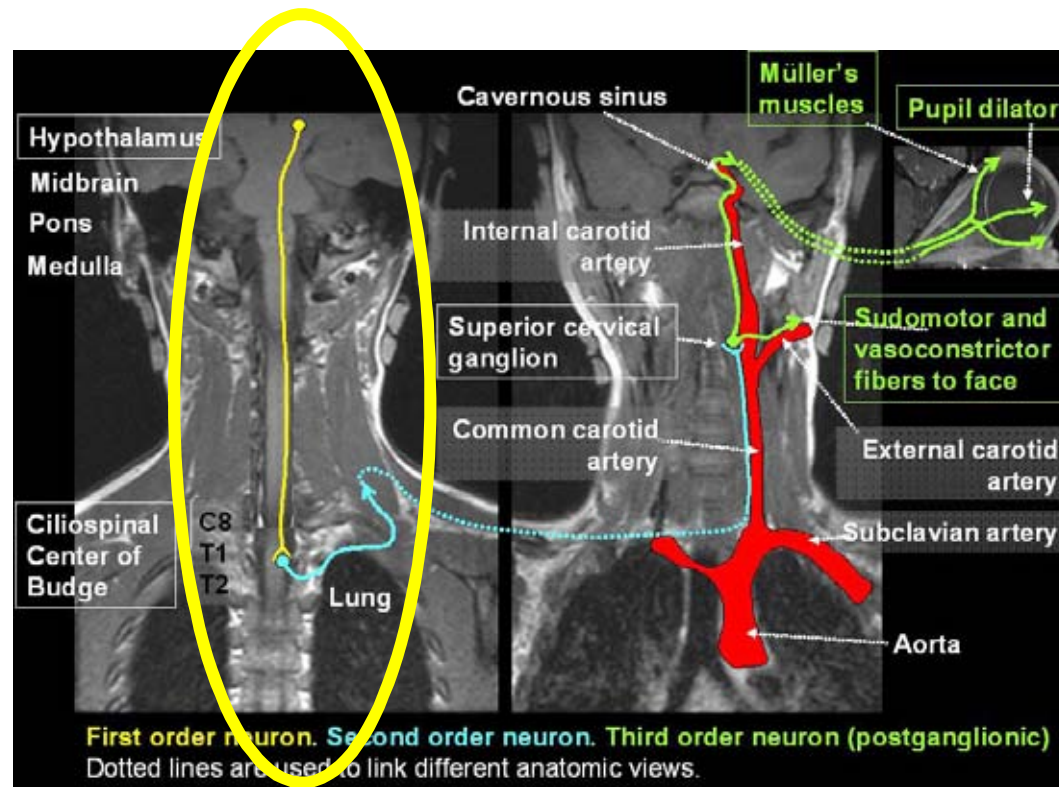
1: 1st order neuron:
brainstem/ spine

2: 2nd order neuron:
brachial plexus/ lung
apex

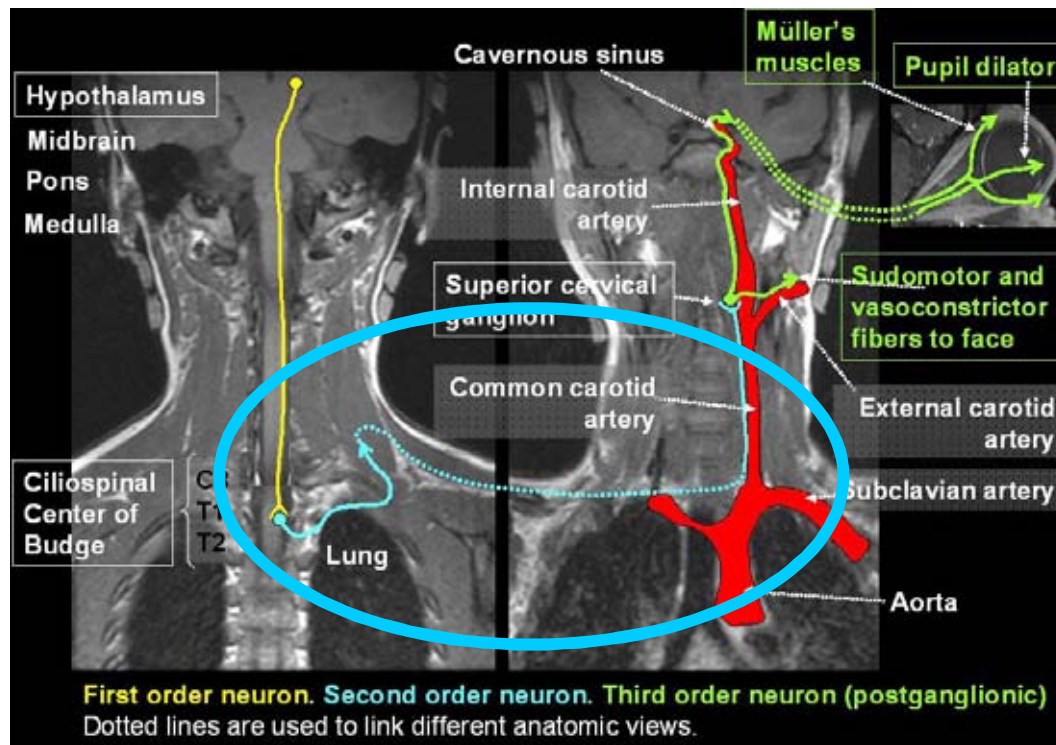
3: 3rd order neuron:
carotid dissection



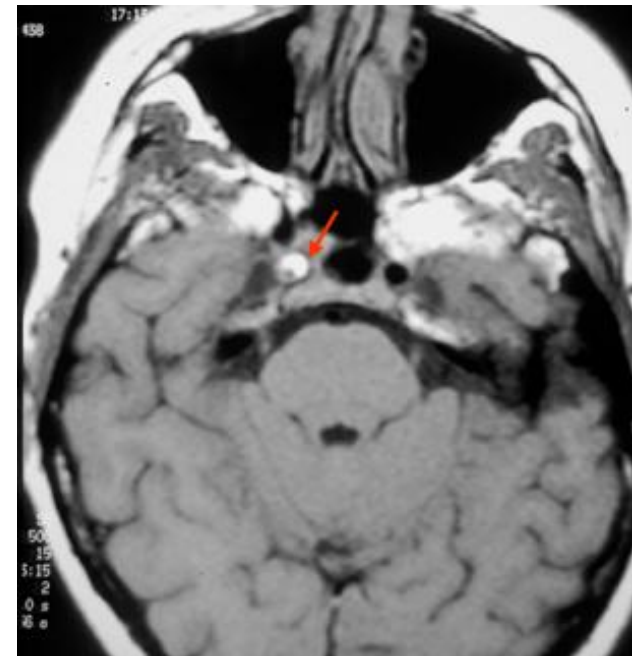
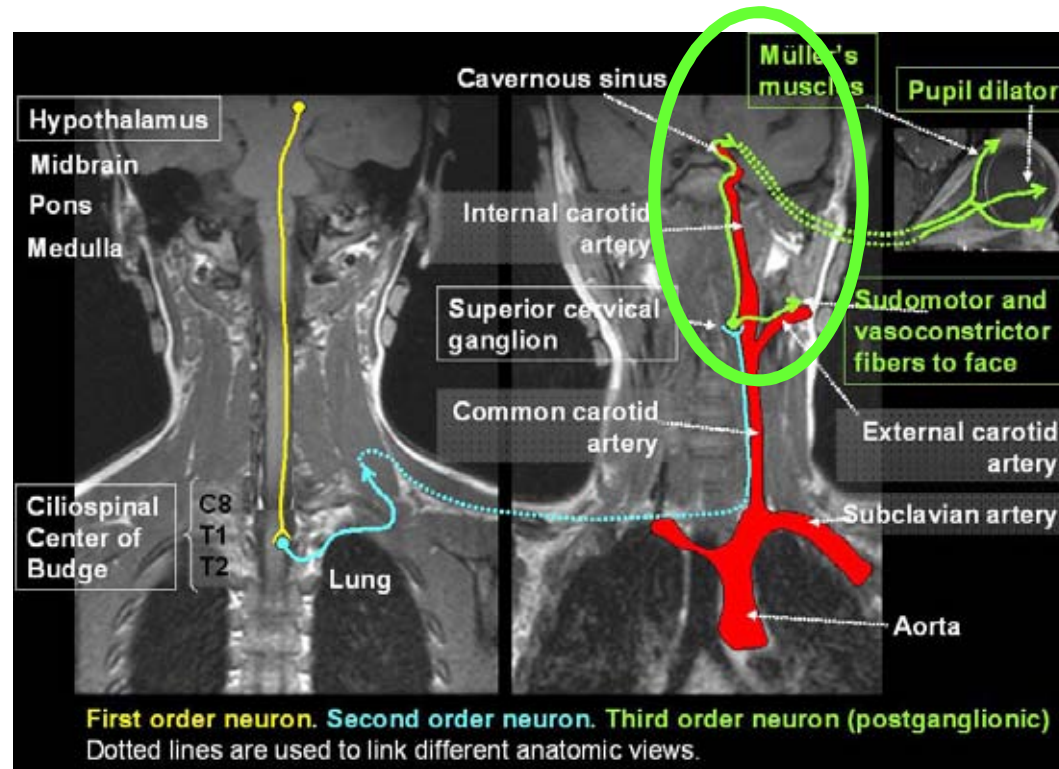
1st Order Horner: Brainstem



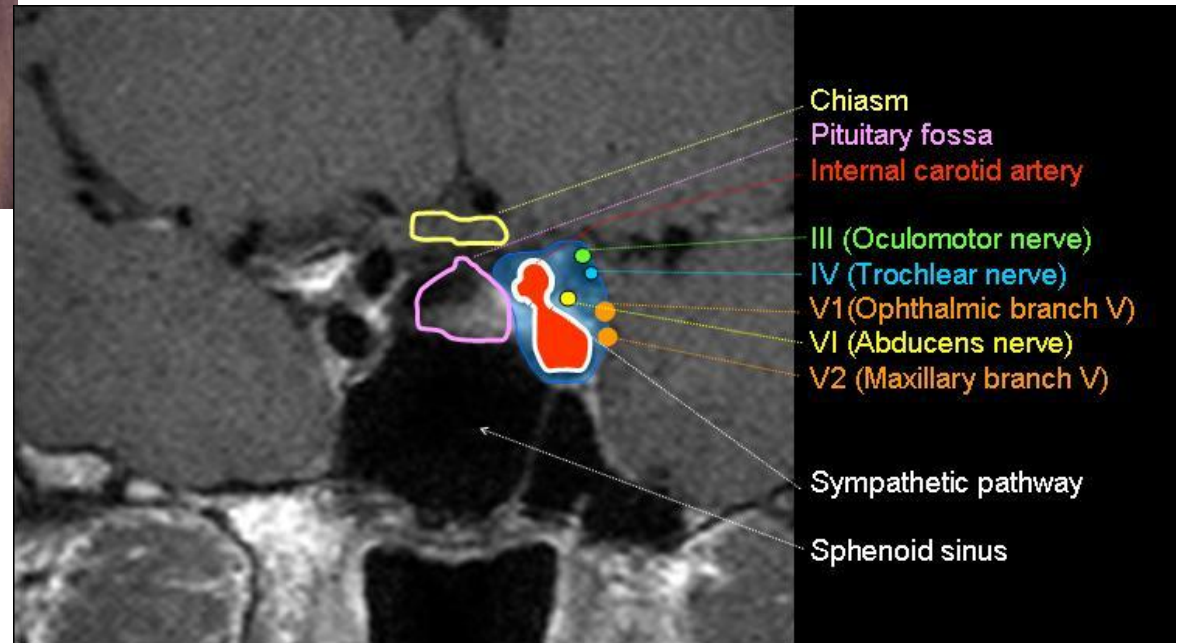
2nd Order Horner: Pancoast Tumor



3rd Order Horner: ICA Dissection



Horner + VIth = Cavernous Sinus



Pharmacologic Localization of Horner Hydroxyamphetamine Test

Normal pupil dilates

1st or 2nd order dilate

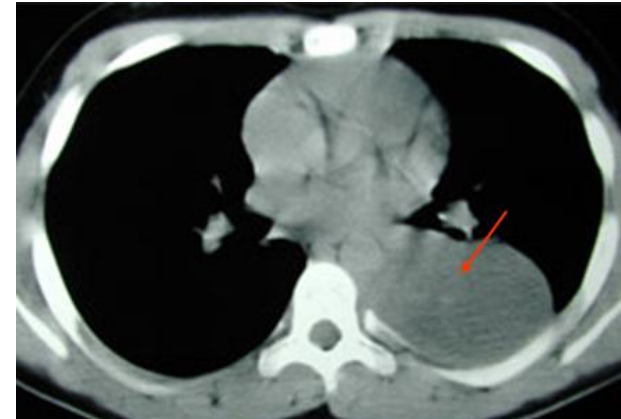


3rd order dilates poorly

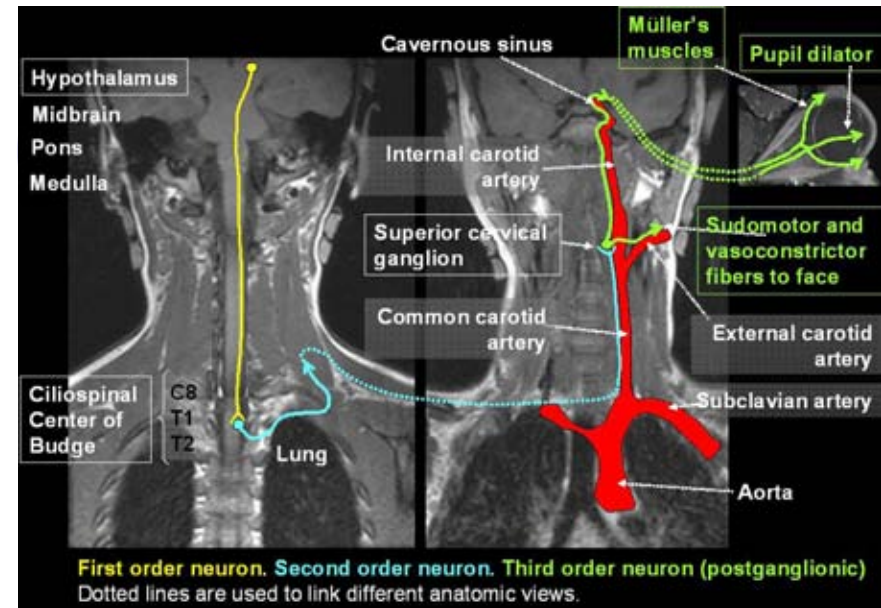


Hydroxyamphetamine releases stored norepinephrine from the postganglionic adrenergic nerve endings. Causes pupillary dilation in eyes with intact sympathetic innervation or intact post ganglionic fibers; has no or partial effect in eyes with impaired sympathetic innervation from lesions involving the post ganglionic fibers

Congenital Horner: Neuroblastoma



Imaging Horner syndrome

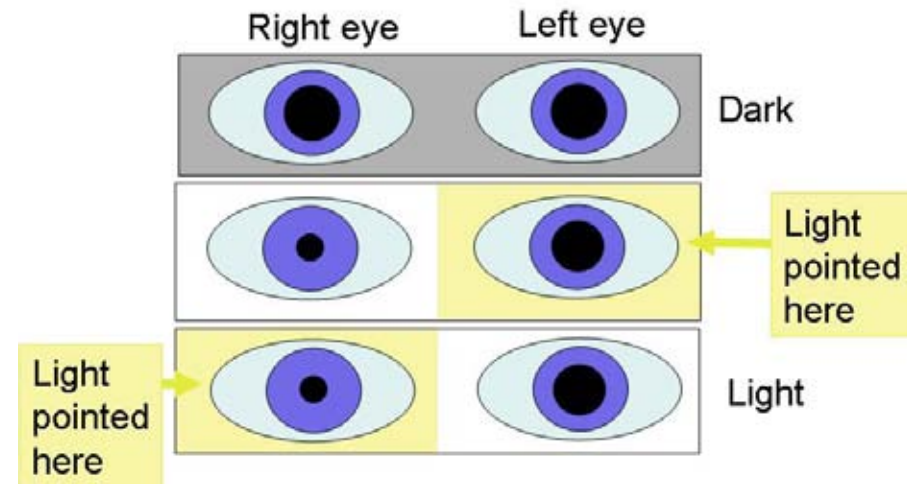


- | 1st order-brain and cervical MRI
- | 2nd order-MRI spine and neck/ Chest
- | 3rd order-MRI brain/MRA head and neck
- | Don't know localization- MR brain, neck and Chest X-Ray.
- | Congenital- MRI neck, chest, abdomen

The big pupil is abnormal

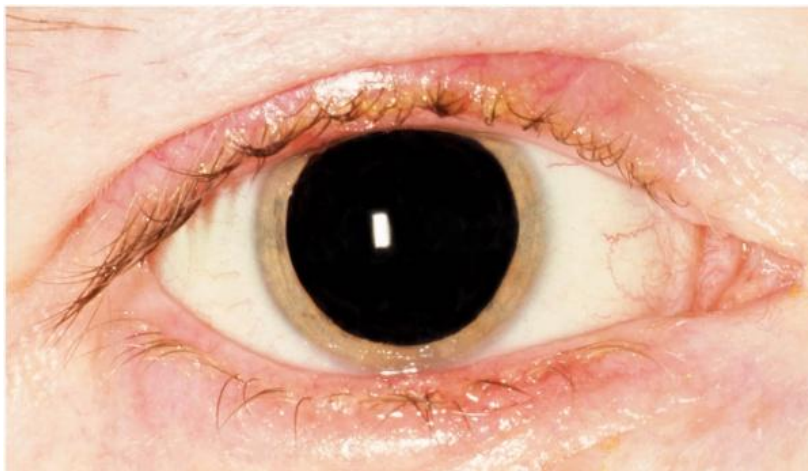
The anisocoria is greater in the light than in the dark

- Poor pupillary constriction on the abnormal side
- Abnormality of the parasympathetic system.



Pharmacologic Mydriasis

- | Very large pupil
- | Does not react to light or near
- | Poor constriction with Pilocarpine 1%



Pharmacologic Mydriasis

Sphincter blockers

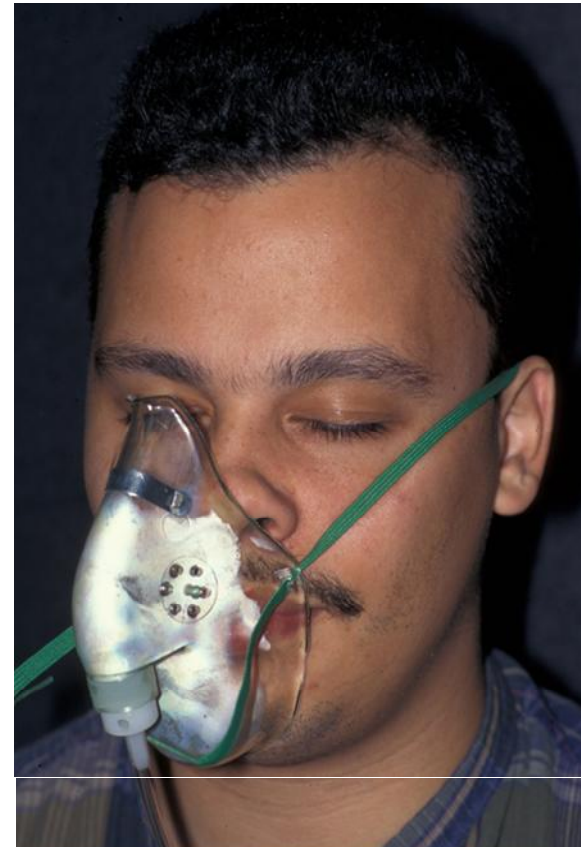
- Belladonna alkaloids
- Atropine
- Scopolamine
- Tropicamide
- Cyclopentolate
- Anticholinergic inhalants
- Gentamycin
- Lidocaine



Pharmacologic Mydriasis

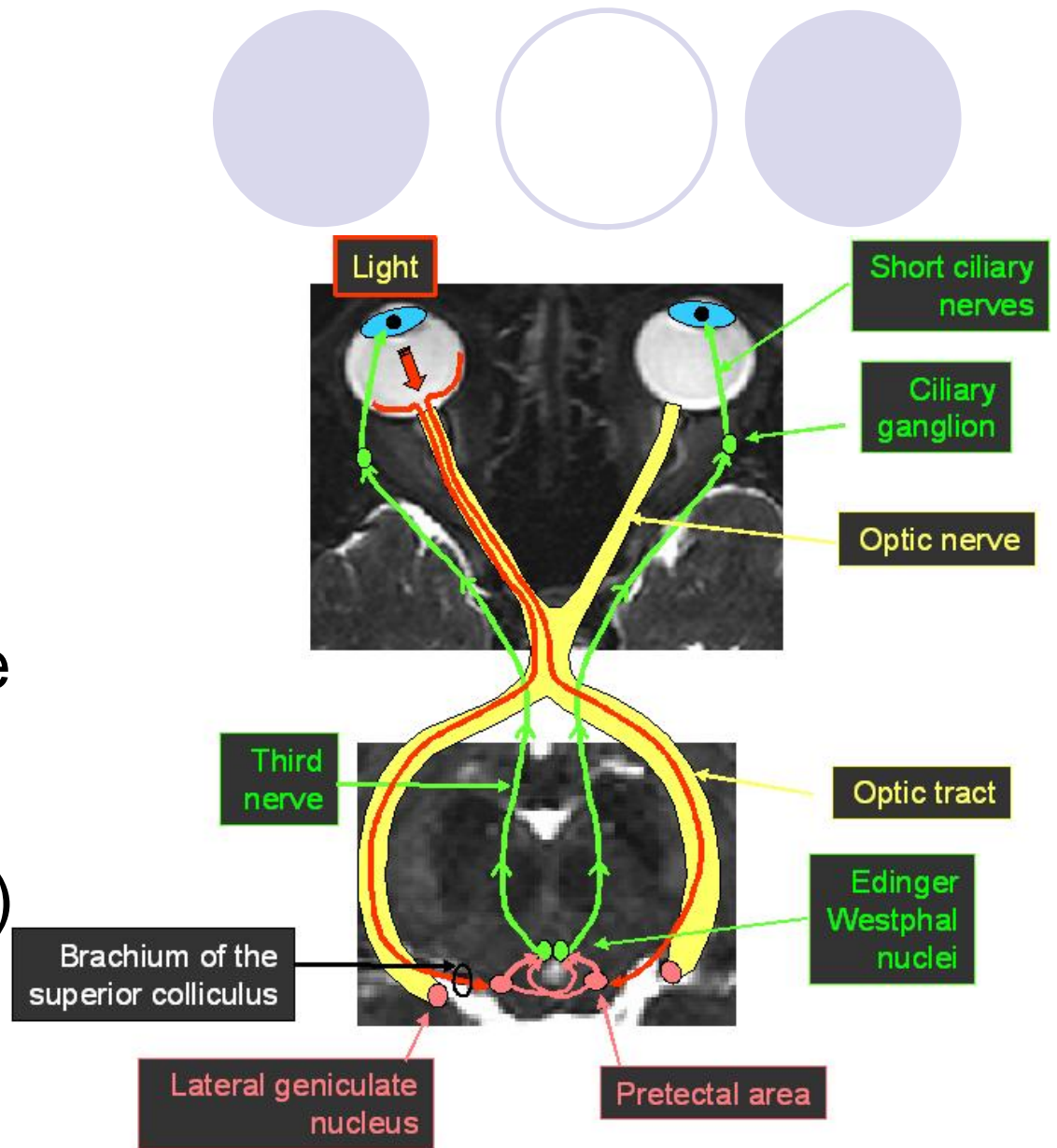
Dilator Stimulators

- Epinephrine
- Phenylephrine
- Ephedrine
- Hydroxyamphetamine
- Cocaine
- Ocular decongestants
- Adrenergic inhalants

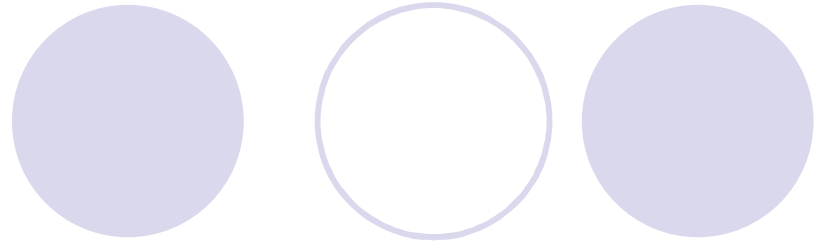


Tonic Pupil

- | Initially large, irregular, tonic redilation
- | Good near response
- | Sensitivity to dilute pilocarpine (0.125%)



Tonic Pupil



| Light response



| Near response

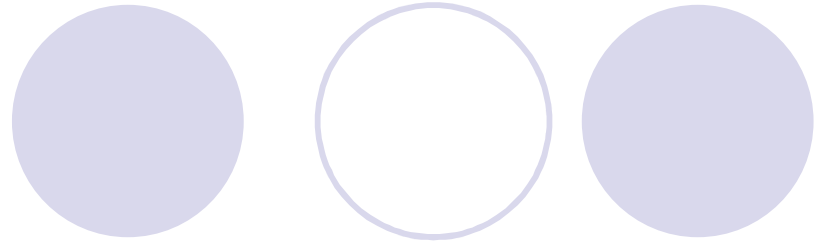


Tonic Pupil

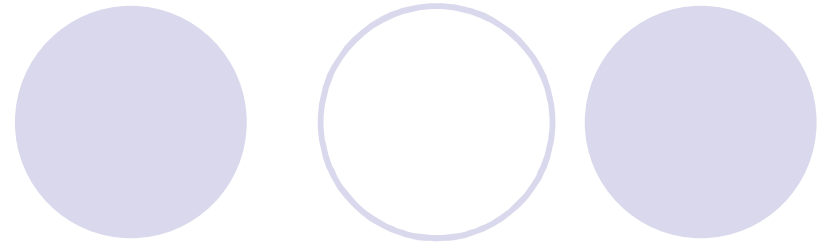
| Light response



| Dilute pupil



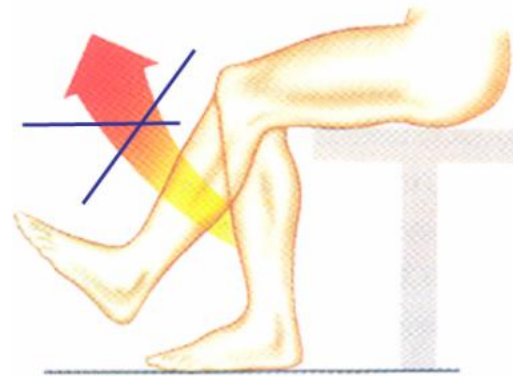
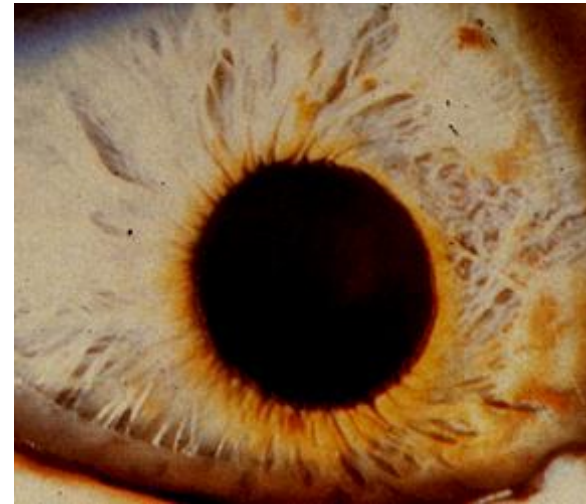
Tonic Pupil



- | Sectoral paralysis, segmental contraction

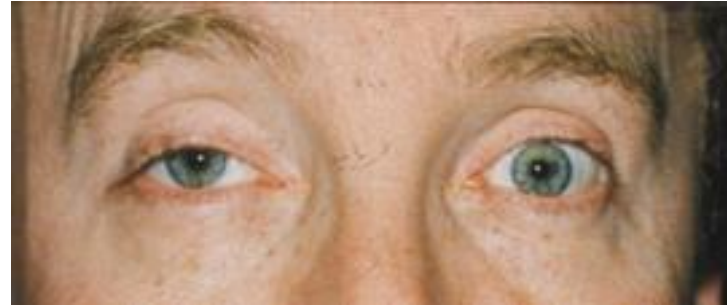
- | Loss of pupillary ruff

- | Vermiform movements of iris

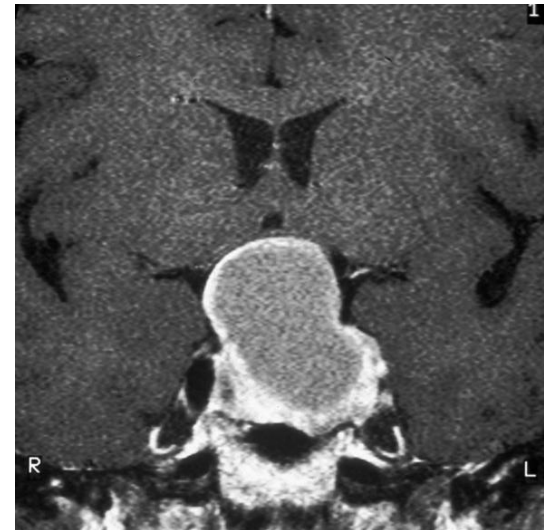
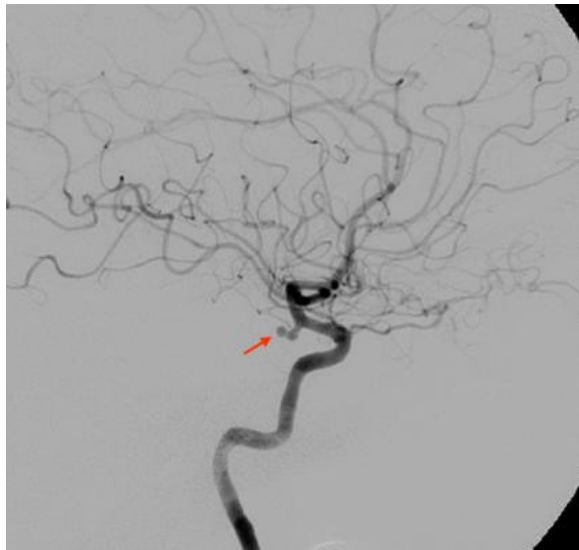
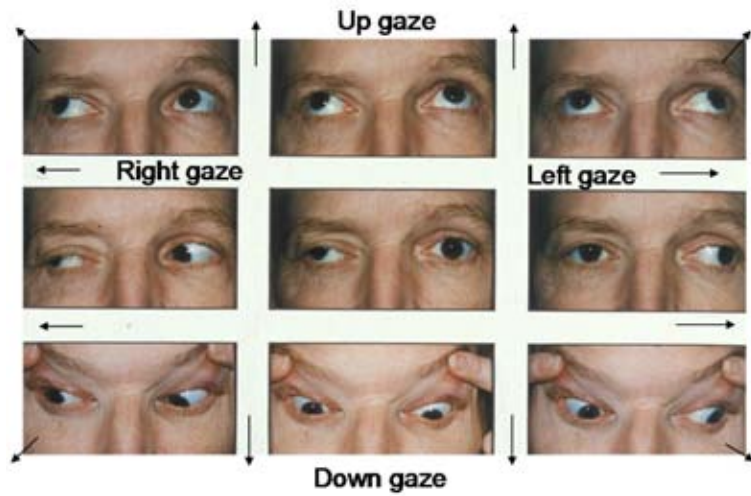


Third Nerve Palsy

- | Dilated pupil
- | Poorly reactive to light
- | Always with ptosis/diplopia



PCOM Aneurysm / Pituitary Apoplexy



Anisocoria : Remember

- | **No anisocoria w/ afferent defect**
- | **Carotid dissection (Horner)**
- | **Posterior communicating artery aneurysm and pituitary apoplexy (IIIrd n. palsy)**



