

Approach to diplopia

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A 42-year-old female presents to with diplopia. She was seen 2 weeks ago for an episode of headache with elevated blood pressures to 197 mmHg. The diplopia has been present for 2 days. On exam the patient's visual acuity was 20/20 in the right eye and 20/40 in the left. There is left ptosis. Extraocular movements reveal moderate limitation of adduction of the left eye. Slit lamp examination is normal, except for a mid-dilated pupil in the left eye. Fundoscopic examination and visual field examination were normal.

Wang AG. (2018) Pcom Aneurysm with Oculomotor Nerve Palsy (ONP). In: Emergency Neuro-ophthalmology. Springer, Singapore

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Ways to remember

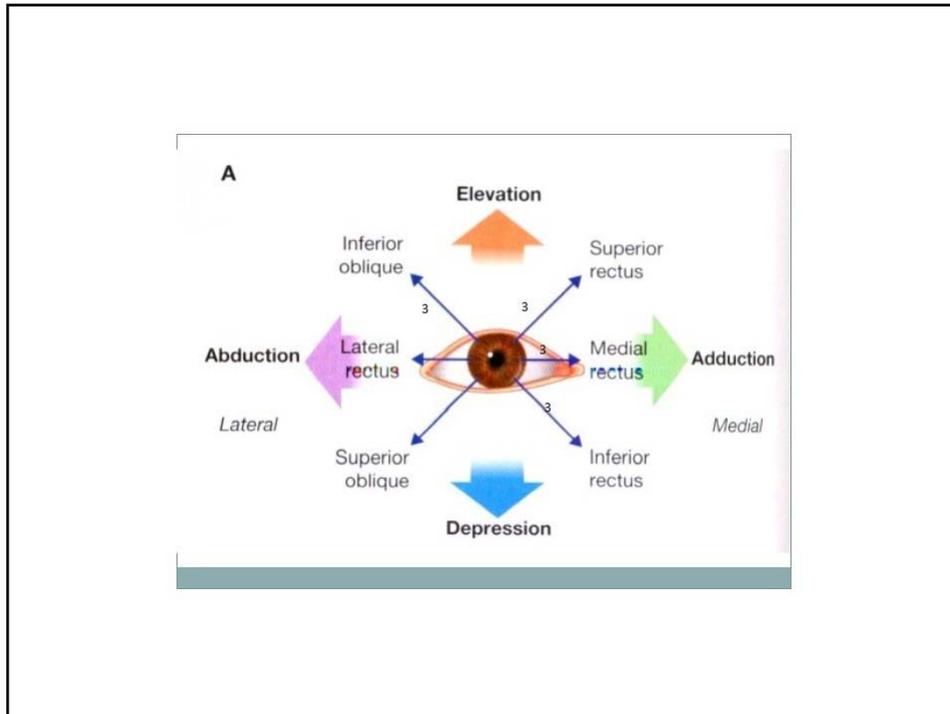
- Isolated Diplopia vs diplopia and ...
 - Ataxia
 - Aphasia
 - Dysphagia
 - Vertigo
- Ipsilateral CN findings and contralateral hemisensory-motor
- Think Stroke

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Other ways to think of this

- Monocular
 - Persists when either eye is closed
 - Refractive problem or dry eye
- Binocular
 - Resolves when either eye is closed
 - Imbalance of **CNs 3, 4 or 6**

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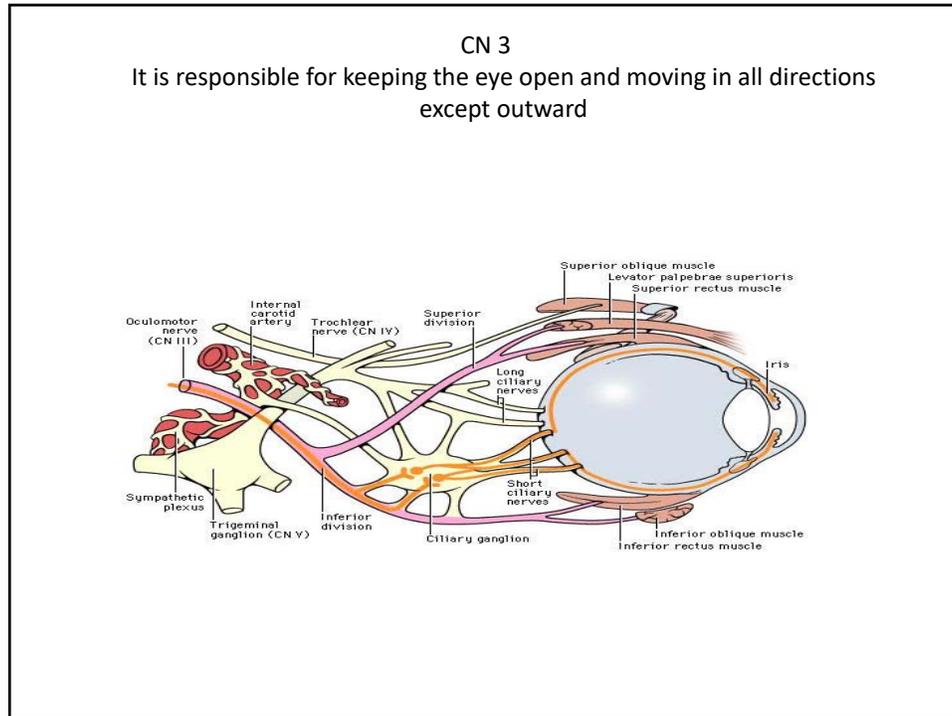


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3rd Nerve Palsies can't be missed

- The third nerve innervates:
 - superior rectus muscle,
 - inferior rectus muscle,
 - medial rectus muscle
 - Inferior Oblique muscle
 - levator palpebrae superioris.
- It is responsible for keeping the eye open and moving in all directions except outward

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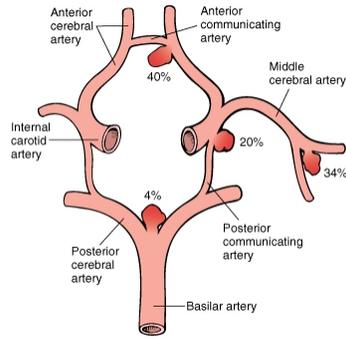


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- A complete CN 3 palsy is easy
 - Eye is down, out, pupil is dilated, lid drooped
- A partial CN 3 palsy is more subtle
 - Mild eye lid droop
 - Mild pupil dilation

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Pcomm aneurysm is the 3rd CN palsy you can't miss



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This anatomical illustration shows a cross-section of the posterior communicating artery (Pcom) aneurysm. The aneurysm is shown as a bulge on the Pcom artery, which is located near the optic chiasm and the third cranial nerve (III nerve). The internal carotid artery is also visible. Labels include:

- Posterior communicating artery
- Optic chiasm
- Internal carotid artery
- Posterior cerebral artery
- III nerve

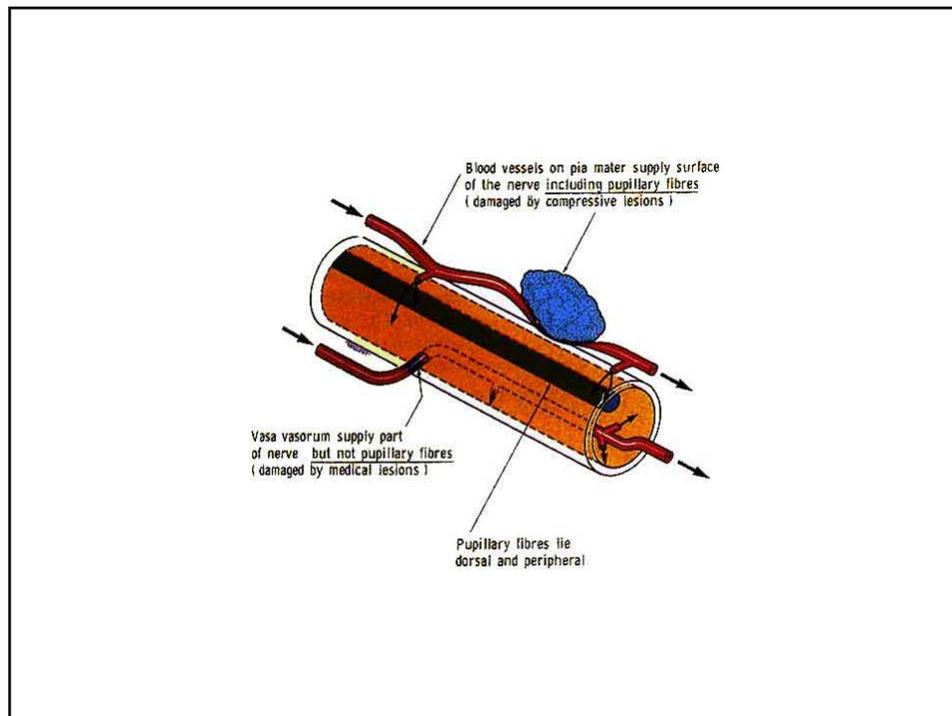
- Wang AG. (2018) Pcom Aneurysm with Oculomotor Nerve Palsy (ONP). In: Emergency Neuro-ophthalmology. Springer, Singapore

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2 types of 3rd nerve palsies

- Pupil affected (Must diagnose on that visit)
 - Surgical causes.
 - Parasympathetic fibers run on the 3rd nerve surface affected by external compression
- Pupil not affected
 - Medical causes
 - Atheroma/DM
- Pain is not a discriminating feature: you can have pain with both

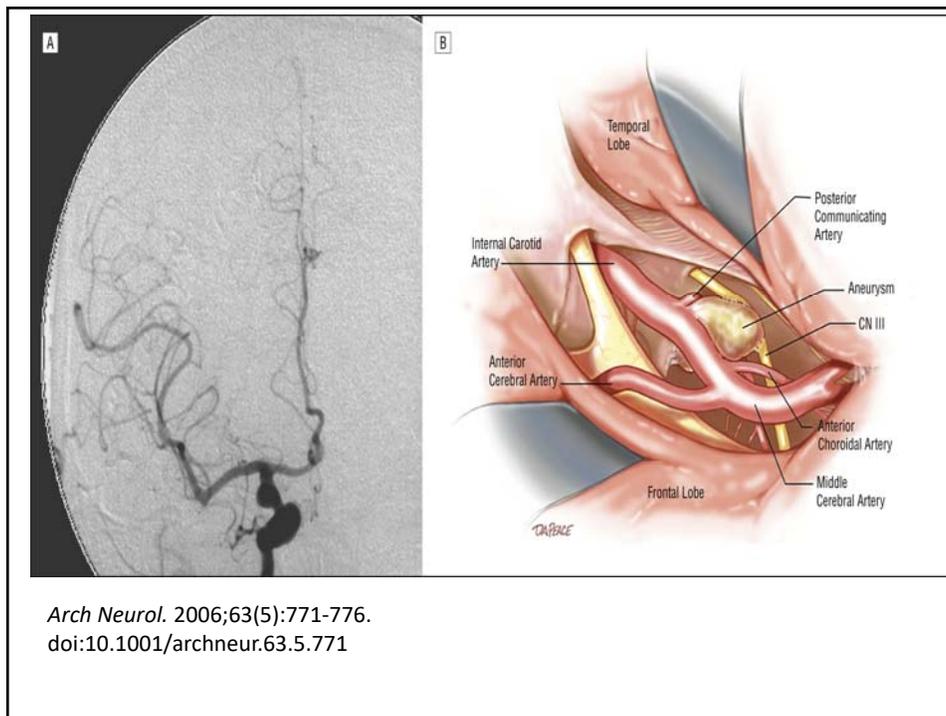
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- It is possible to have external compression and the pupil spared
- Remember:
 - 3rd CN palsy = CT + CTA
 - To rule out external compression

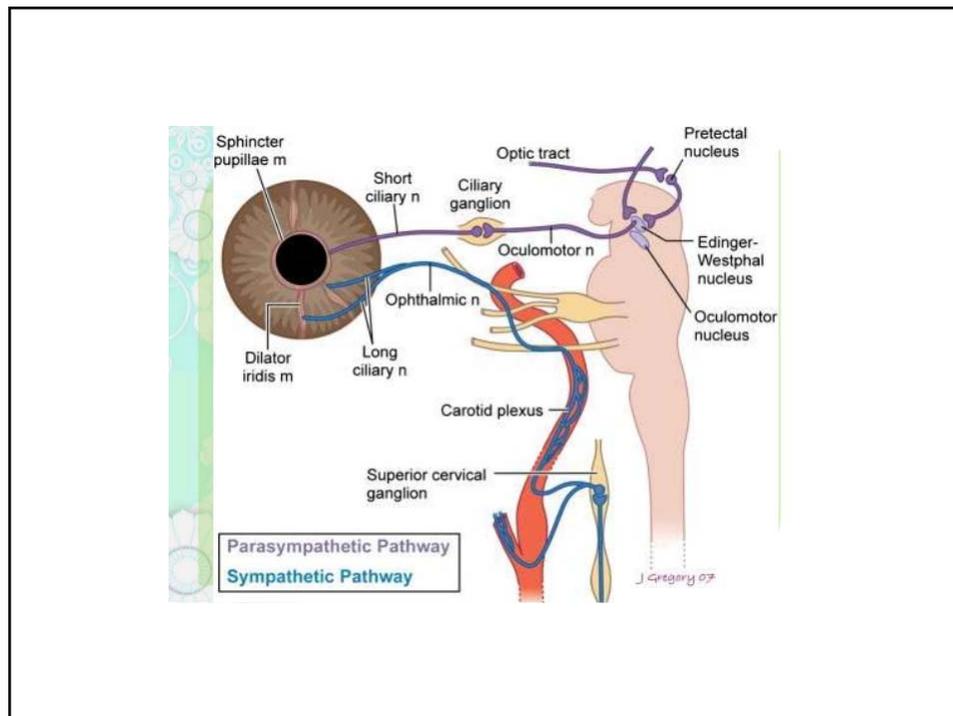
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- Pcomm aneurysm vs Horner's Syndrome

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4th CN palsies

- Identifying fourth cranial nerve palsies is difficult, even for a trained neurologist or ophthalmologist.
 - Even if you miss it, they are not usually due to anything bad.
 - Diplopia is usually vertical or oblique
 - If you do identify it and **if it's an isolated palsy**, the patient may be referred for follow-up as an outpatient.
 - The yield of CT is incredibly low
 - Most patients with a fourth nerve palsy either have traumatic, congenital or microischemic

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6th CN palsies

- This is the most common isolated cranial nerve palsy causing diplopia
- These patients usually complain of horizontal diplopia,
- If pt >50 with vasc RF and it's isolated 6 CN and no papilledema: its very likely microangiopathic.
 - MRI and optho consult as out pt: how good are you
- CT will miss most pathologies that can produce sixth nerve palsies: trauma is the exception to this
 - Trauma=CT

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6th CN lesions in children

- Any patient under the age of 18 with an acute sixth nerve palsy should have imaging. Compressive tumors are responsible for 25% of all peds sixth nerve palsies. MRI is preferred.

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A 6th CN palsy is the non-localizing focal finding in neurology. Why?

- Increased intracranial pressure can cause a sixth nerve palsy.
- look at their fundi to make sure they do not have papilledema.
- If your patient has a headache suspicious for increased ICP consider: SDH, ICH, IIH, Dural DVT, brain stem stroke

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- **Patients with giant cell arteritis may present with transient diplopia 25% of the time.**
 - If the patient is older than 50 with diplopia in the last month, send a CBC, CRP and ESR. You do not want to miss this diagnosis.

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Mixed CN Causes of Diplopia

- **Brainstem strokes: almost never will affect just one cranial nerve.** Patients will likely have other accompanying signs such as vertigo, dizziness, aphasia, unsteadiness, ataxia
- **orbital apex syndrome**
 - orbital apex is the most posterior part of the orbit
 - thoroughfare for multiple cranial nerves such as 3, 4, 6, **optic nerve** and the V1 and V2 branches of the 5th cranial nerve.
 - Orbital apex syndrome:
 - infection, thyroid eye disease, tumors or trauma.
 - CT of the orbits with contrast would be an appropriate first step.

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- **Cavernous sinus**

- Optic nerve does not go through here
- So, any change in visual acuity would be more concerning for orbital apex syndrome.
- Cavernous sinus w/u needs imaging via MRI.
- If MRI is not available, CT or CT venogram is acceptable

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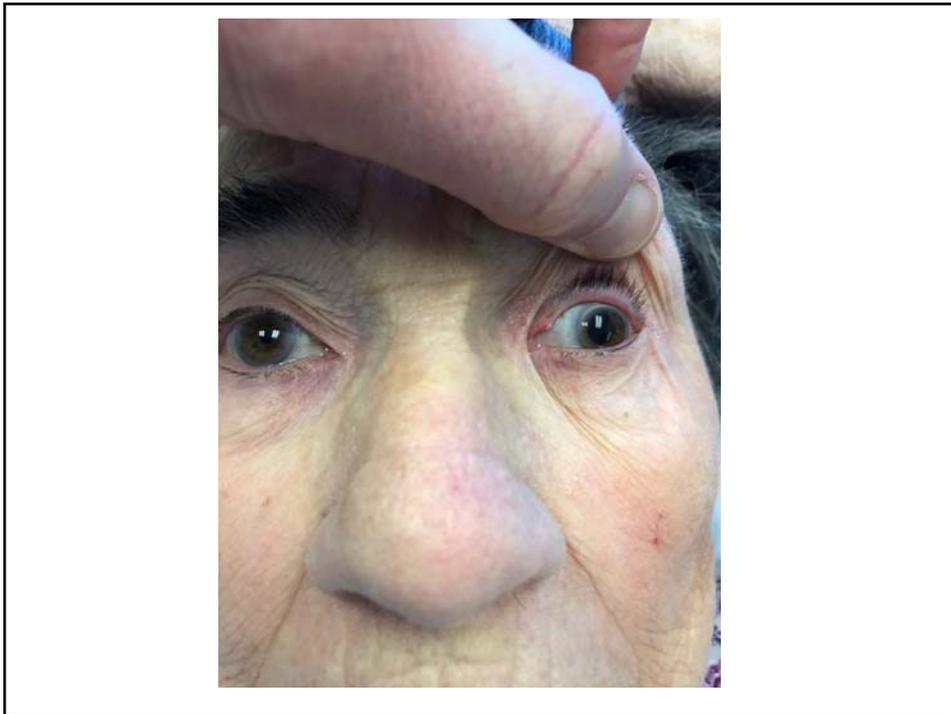
- **myasthenia gravis and multiple sclerosis.**

These should be referred to a neurologist and CT will not be helpful.

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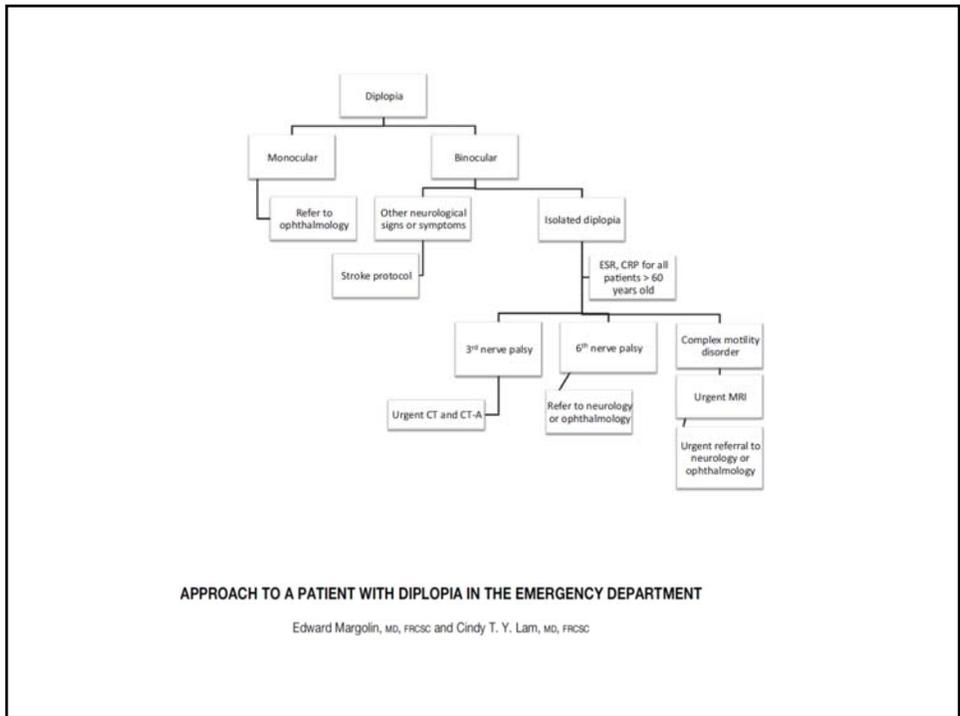
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Literature Citations

- Wang AG. (2018) Pcom Aneurysm with Oculomotor Nerve Palsy (ONP). In: Emergency Neuro-ophthalmology. Springer, Singapore
- Margolin, E et al. Approach to a patient with diplopia in the emergency department. *J Emerg Med.* 2018 Jun;54(6):799-806.
- EM:RAP Dec 2018 vol 18 issue 12, Diplopia Ilene Claudius MD, Jan Shoenberger MD and Edward Margolin MD