

# Neuro-Ophthalmic Grand Rounds

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Neuro-Ophthalmic Grand Rounds

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Disclosure Statement:

Dr. Carlo J. Pelino -  
Nothing to disclose

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Neuro-  
ophthalmic  
Grand Rounds



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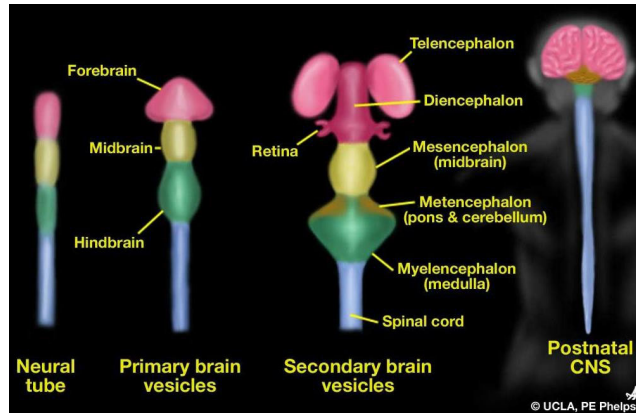
## Emergencies vs. Urgencies

Some of these are neuro related

- Differentiate “**E**mergency” vs. “**U**rgency”
- Proper Triage necessary ( Front desk, Doctor away, After hours )
- Understand the “ IOA Club ”
  - PapillaedemA
  - Central Retinal Artery Occlusion
  - Giant Cell Arteritis
  - Perforated Globe
  - Aneurysm
  - Acute Angle Closure Glaucoma
  - Pituitary Apoplexy
  - Acid / Alkaline Chemical Burn
  - Carotid Artery Dissection
  - HyphemA

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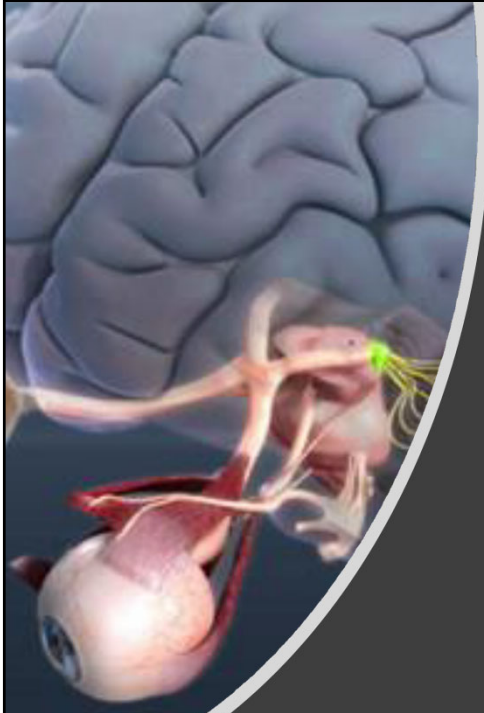
## The 5 vesicle brain – at five weeks gestation



- Telencephalon** – cerebral hemispheres
- Diencephalon** – thalamus, epithalamus, subthalamus, hypothalamus
- Mesencephalon** – midbrain
- Metencephalon** – pons and cerebellum
- Myelencephalon** = medulla oblongata

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## The visual pathway

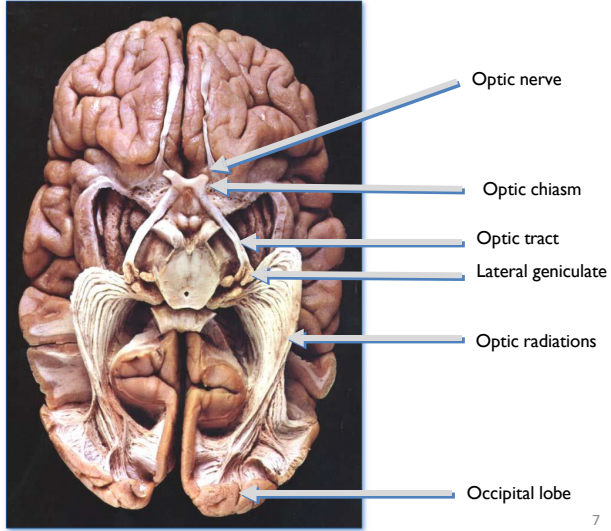
Retina has 10 layers:

- **Optic nerve**- intraocular, intraorbital, intracranial, intracranial
- **Optic Chiasm** – nasal fibers cross, temporal fibers do not
- **Optic tract** - contains retinal fibers from both eyes
- **Optic Radiations** - travel through the temporal, parietal and occipital lobes
- **Visual Cortex** - termination of all of the nerve fibers and found in the occipital lobe

- Visual field loss secondary to retina and optic nerve disease = usually occur **monocular**

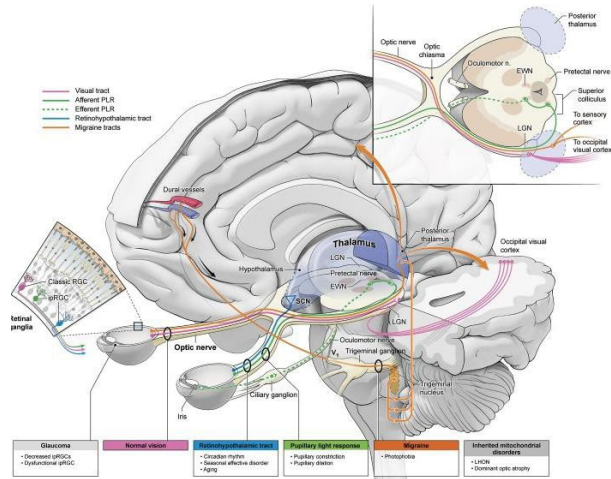
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# Anatomy of the visual pathway



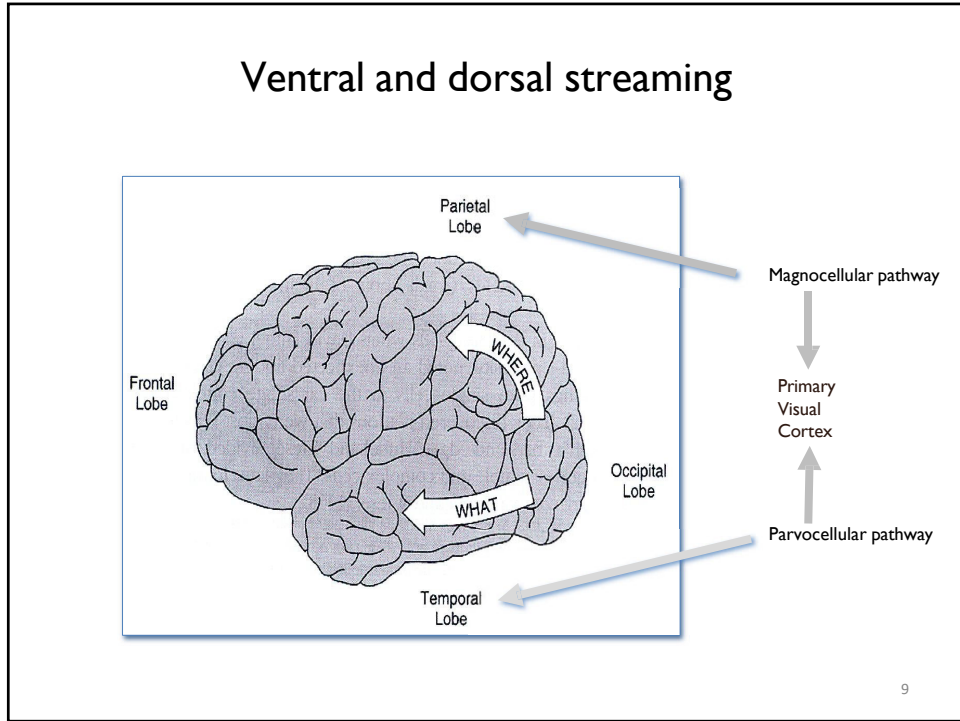
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# Important visual system pathways



<https://europemc.org/article/med/28251921> 8

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## Anatomy of the brain

- medulla oblongata (M.O.)
- pons
- midbrain –
  - cerebral peduncle
  - cerebral aqueduct of midbrain
  - corpora quadrigemina
    - superior colliculi
    - inferior colliculi

(c)

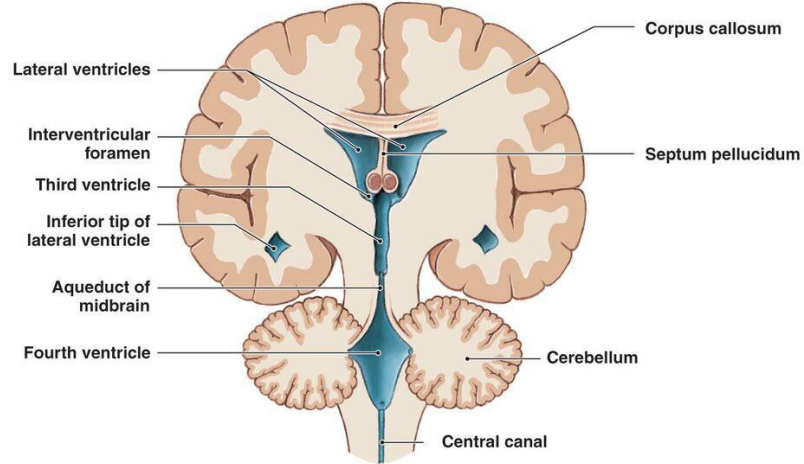
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## Ventricular system

Two views of the ventricles, which are filled with cerebrospinal fluid

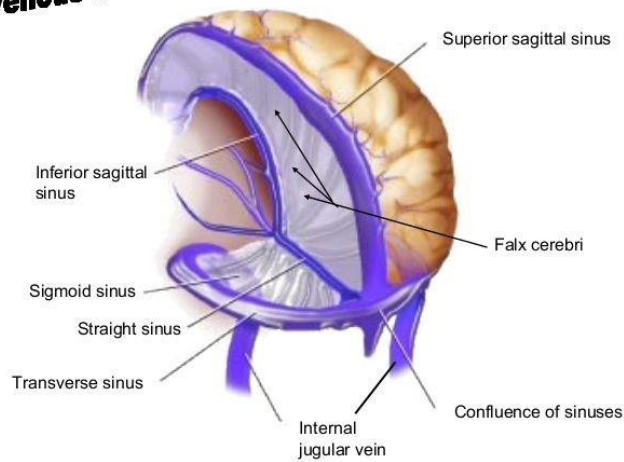


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## Venous sinuses

### venous sinuses



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Case: 77 year old man

- Reports 3 week history of blurred vision right eye
  - Notices especially when reading
  - Right-sided weakness
  
- Visual acuities 20/20 (Right) 20/20 (Left)
  
- PERRL (trace +) RAPD right eye
  
- Confrontation fields: right homonymous hemianopia denser superiorly
  
- Medical history: Hypertension / pipe smoker

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## Visual Field Results

**SINGLE FIELD ANALYSIS**  
**EYE: RIGHT**  
 ID# 12345  
 DATE: 05/23/2023  
 REFRACTIVE STATUS: REF: -0.50 DS  
 VISUAL ACUITY: 20/20  
 FIELD TEST: H-H  
 TEST DATE: 05/23/2023  
 TEST TIME: 10:00 AM  
 TEST ROOM: 100

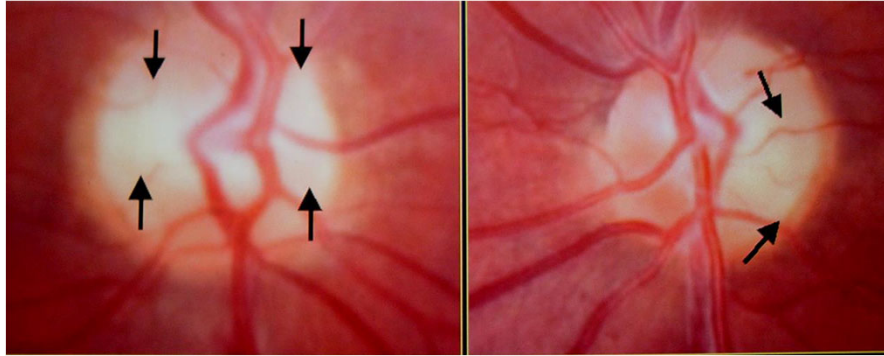
Visual field plot for the right eye showing a large area of blindness in the right hemifield (nasal side).

**SINGLE FIELD ANALYSIS**  
**EYE: LEFT**  
 ID# 12345  
 DATE: 05/23/2023  
 REFRACTIVE STATUS: REF: -0.50 DS  
 VISUAL ACUITY: 20/20  
 FIELD TEST: H-H  
 TEST DATE: 05/23/2023  
 TEST TIME: 10:00 AM  
 TEST ROOM: 100

Visual field plot for the left eye showing a large area of blindness in the left hemifield (temporal side).

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Note the specific type of pallor in each optic nerve !!!!



Bowtie Optic atrophy  
Right Eye

Temporal optic Atrophy  
Left Eye

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### Bow-tie (band) optic atrophy

Optic tract lesion

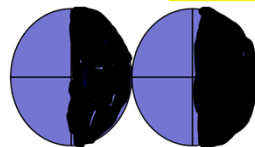
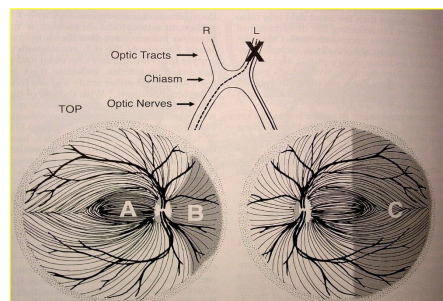
Ipsilateral ST/IT pallor

Contralateral band pallor (temporal VF defect)  
From nasal macular fibers (papillomacular bundle)

May have small RAPD in contralateral eye

Incongruous homonymous hemianopia

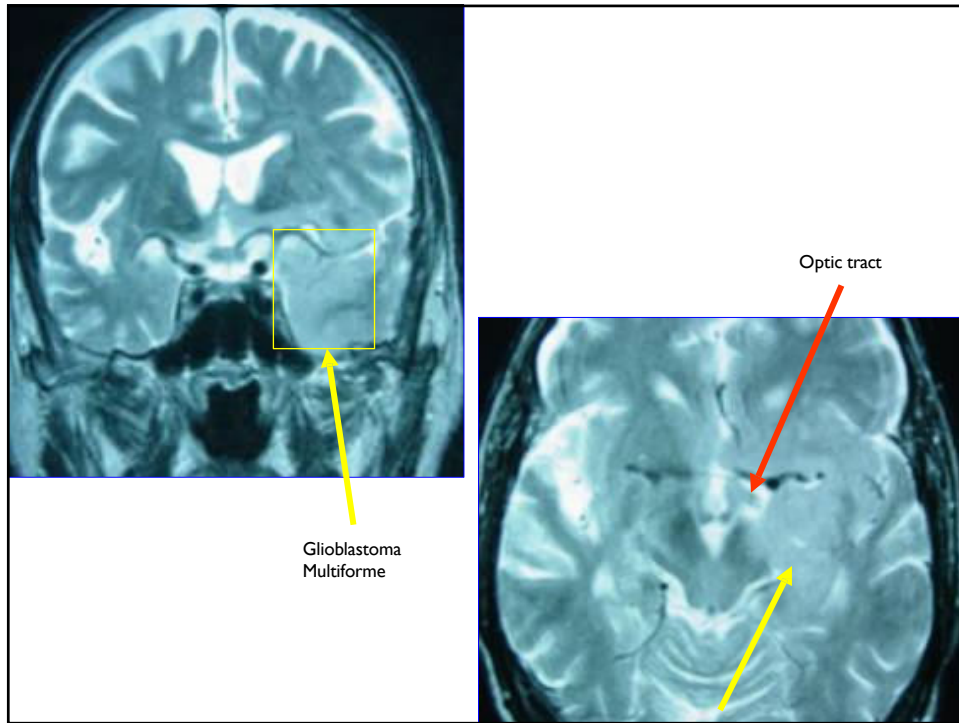
Nasal and papillomacular fibers cross in the chiasm



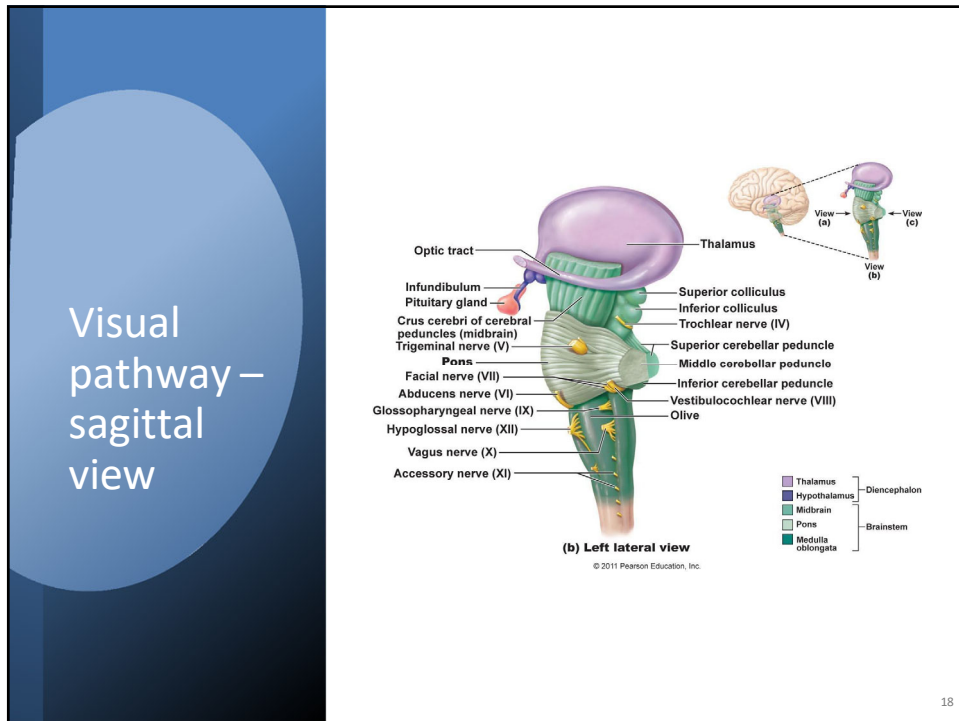
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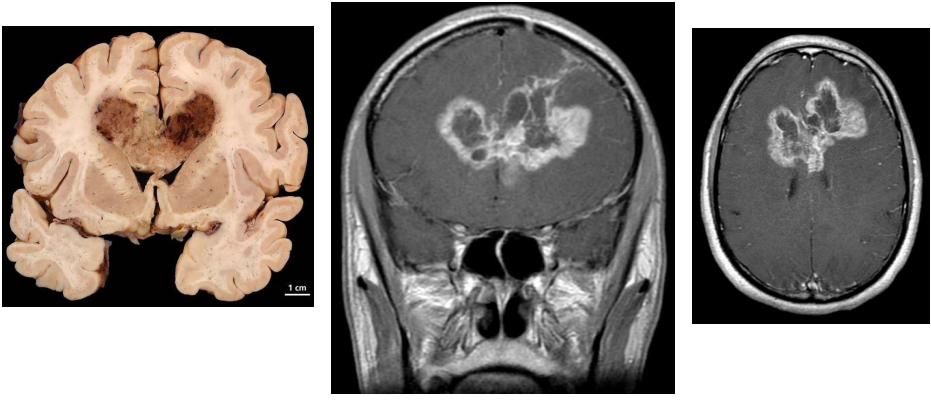
# Treatment

- The standard of treatment for a GBM is surgery, followed by daily radiation and oral chemotherapy for six and a half weeks, then a six-month regimen of oral chemotherapy given five days a month.
- The neurosurgeon will remove as much of the tumor as possible and may implant medicated wafers right into the brain. These wafers dissolve naturally and gradually release chemotherapy drugs into the tumor area over time.
- Another chemotherapy drug called **temozolomide** was approved by the FDA in 2013 and is commonly used to treat GBMs and other advanced brain cancers. The drug is taken in pill form and works by slowing tumor growth.
- Radiation may be used to destroy additional tumor cells and treat tumors in patients who are not well enough for surgery.

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## GBM = butterfly glioma

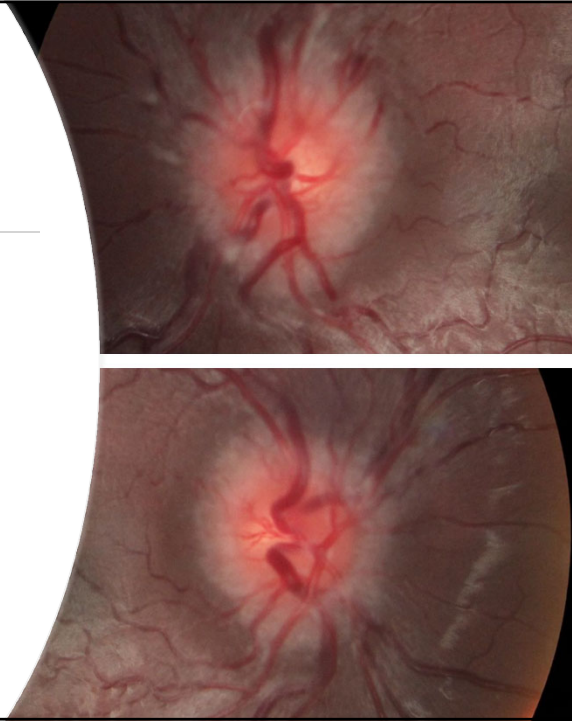


<https://radiopaedia.org> 20

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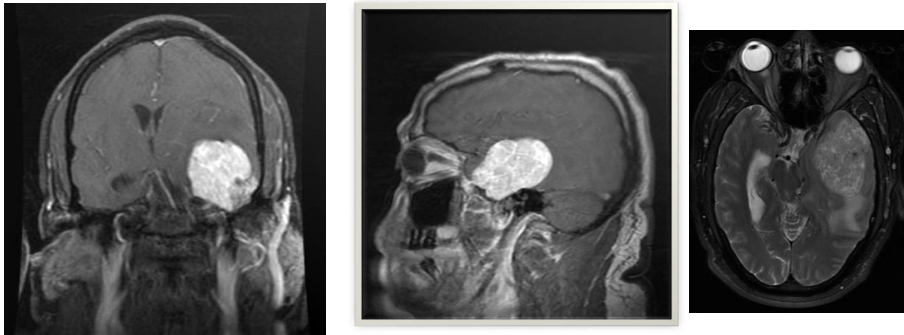
## Bilateral optic nerve swelling

- 16 year old male
- Left Temporal Lobe
- Astrocytoma



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## Swelling of the optic nerves



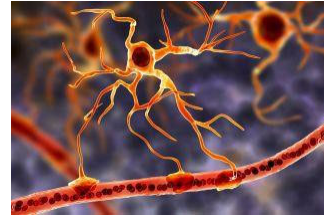
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## Adult and childhood brain tumors

The most common primary central nervous system neoplasm in adults:

**Astrocytomas** = comprise **80%** of all CNS tumors

1. Pilocytic Astrocytomas – childhood / cerebellar
2. Fibrillary Astrocytomas – (25 years old)
3. Anaplastic Astrocytoma
4. Glioblastoma Multiforme – most aggressive



<https://www.livescience.com/depression-brain-astrocytes.html>

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## Brain tumor suspicion

The greatest concern for most chronic headache patients is that they have a brain tumor

Patients with primary or metastatic brain tumors have a headache at the time of diagnosis (~30%)

Brain tumor headache have pain worse in the morning, nausea and vomiting = seen in **20%** of patients

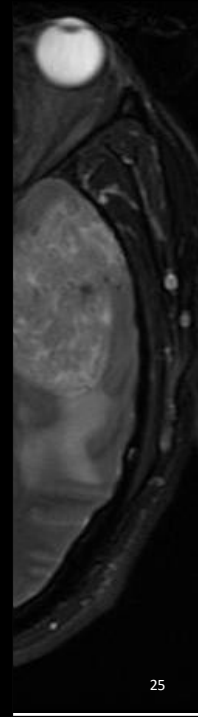
Most often the headaches are intermittent, dull ache, unilateral and mild initially but usually occur daily

Headache occurs in **70%** of brain tumor patients

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## Tumors of the central nervous system

- Incidence is 15 per 100,000 for intracranial tumors
- In Adults 50% are primary brain tumors
- In Adults 50% are metastatic brain tumors
  - Breast cancer
  - Lung cancer
- In children, nearly all brain tumors are primary



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## Case - 25 year old woman

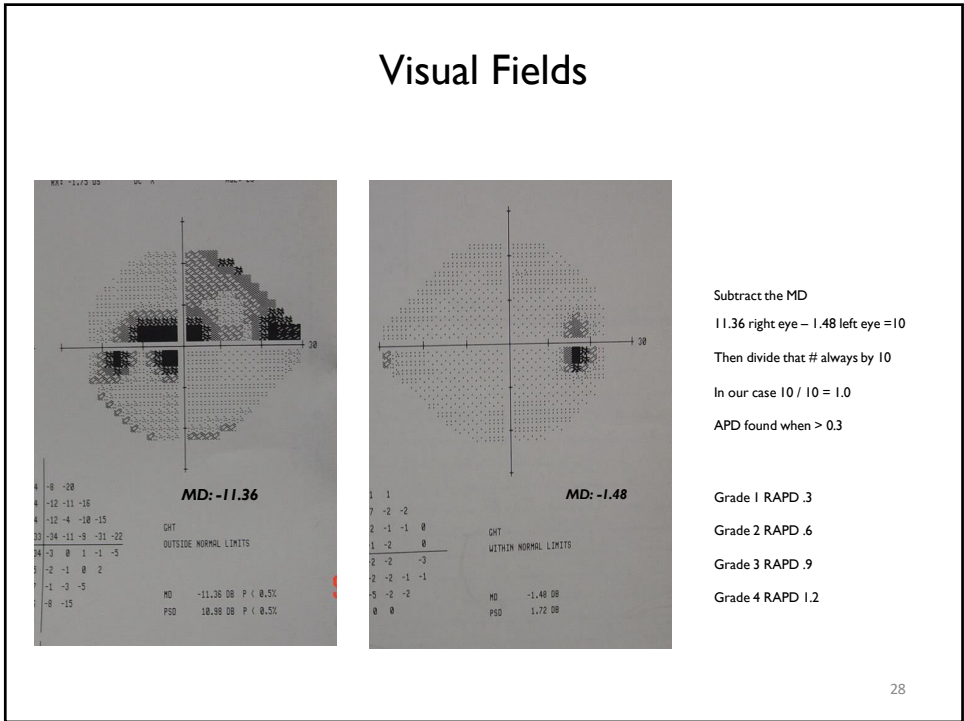
- 5 yrs ago, C/D was 0.3 x 0.3 both eyes with no pallor in either eye
- 3 years ago C/D ratio increased with normal IOP
- Due to findings, optometrist spoke with PCP, and PCP ordered MRI of brain and orbits - with and without contrast
- MRI reported to be normal

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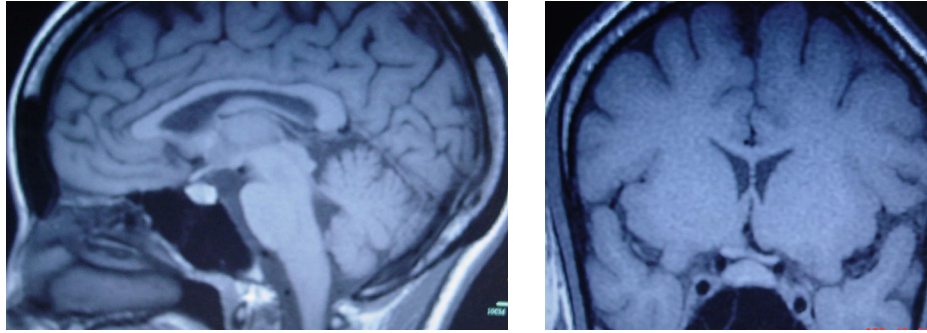
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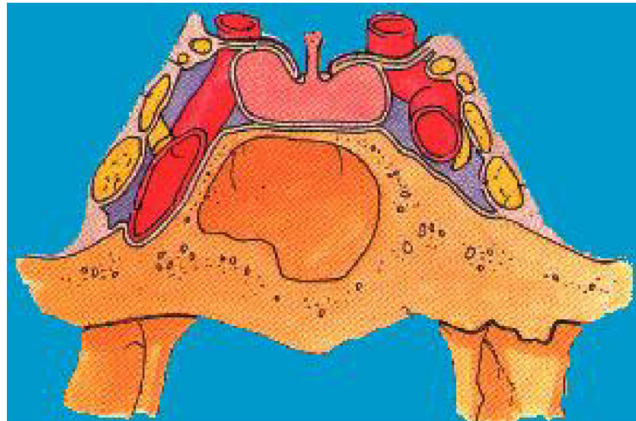
## Important Notes: MRI



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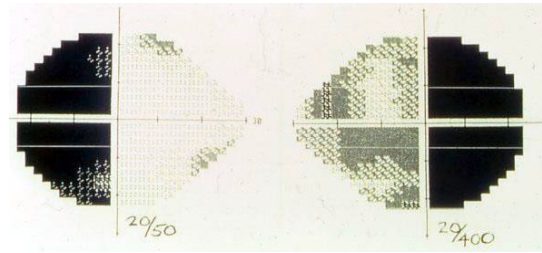
## Cavernous sinus and pituitary gland



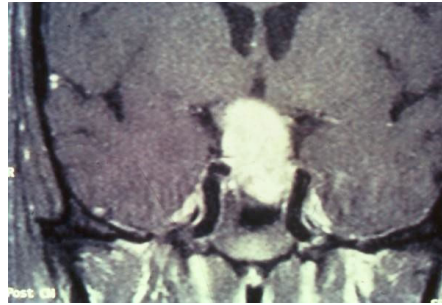
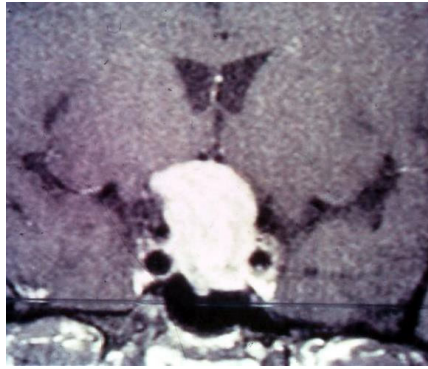
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## Pituitary gland adenoma

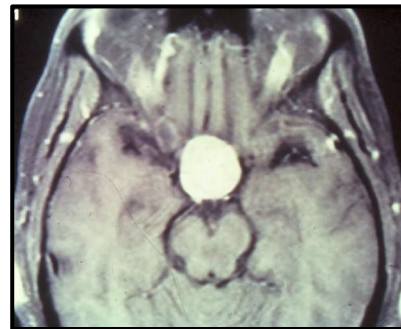
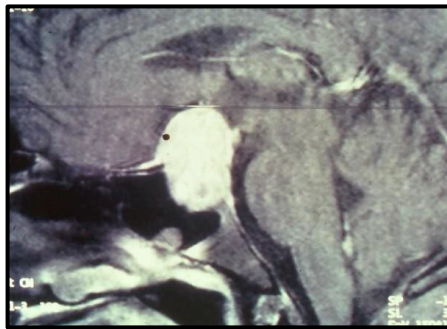


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## Types of pituitary adenomas



**Growth hormone:** Acromegaly - This condition often requires surgery as the first line of treatment.

**Cushing's syndrome/ACTH (Adrenocorticotropic hormone):** Surgery is most commonly the first line of treatment.

**Prolactinoma:** is the most common secretory pituitary tumor. It can be treated with a medication bromocriptine.

**Non-secreting tumors:** do not secrete hormones but can cause health problems because of their size and location. Treated surgically.

<https://www.pennmedicine.org>

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## Etiology of bitemporal VF loss


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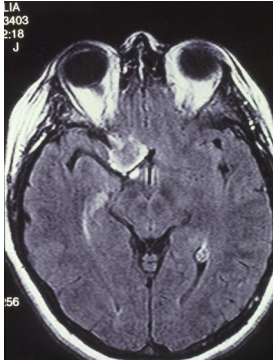
- Pituitary Adenoma            55%
- Craniopharyngioma        25%
- Meningioma                10%
- Glioma                      7%
- Arachnoid Cyst



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## Case - Meningioma

Pale right optic nerve

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## Meningioma

Tumor comprised from the cell of the arachnoid layer of the meninges

These neoplastic proliferations grow slowly in the subarachnoid

## Epidemiology

Females are affected by a 3:1 ratio

Most commonly present in patients from 30-50 years of age

Meningiomas are rare in patients less than 20 years old

## Meningioma

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## Meningioma

### Facts

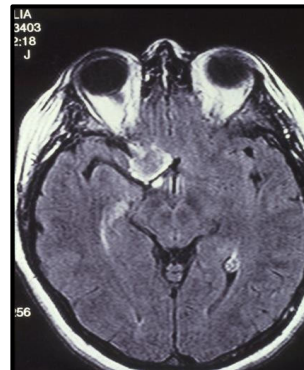
- Meningiomas compress the optic nerve by extrinsic factors
- Most meningiomas are unilateral

### Diagnosis

- MRI (Magnetic Resonance Imaging)
- CT scan

### Treatment

- Observation
- Surgical removal
- Radiation



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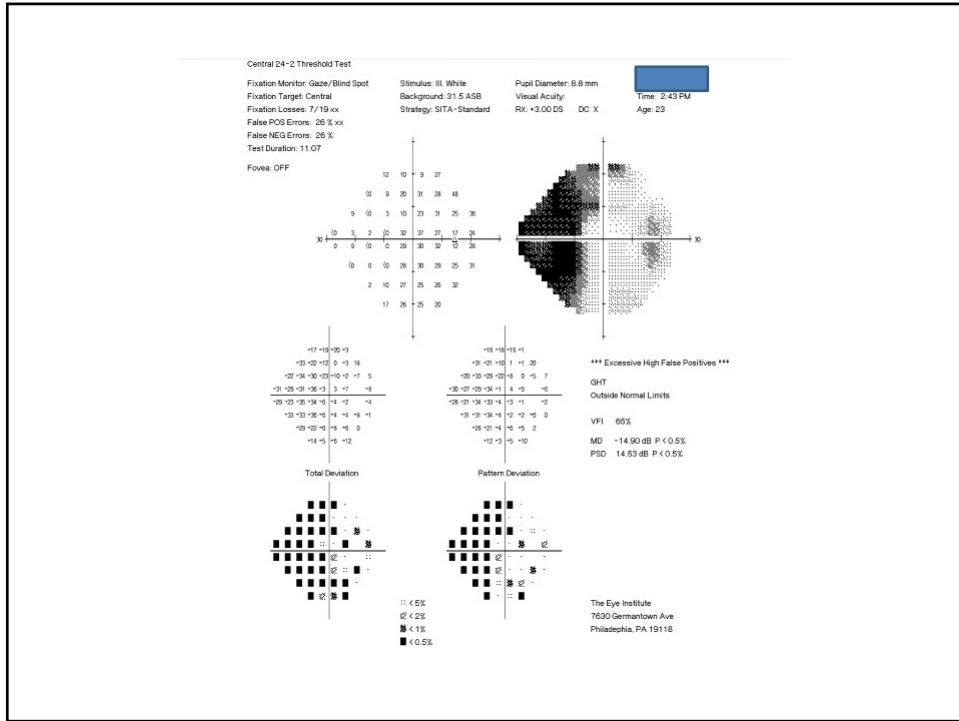
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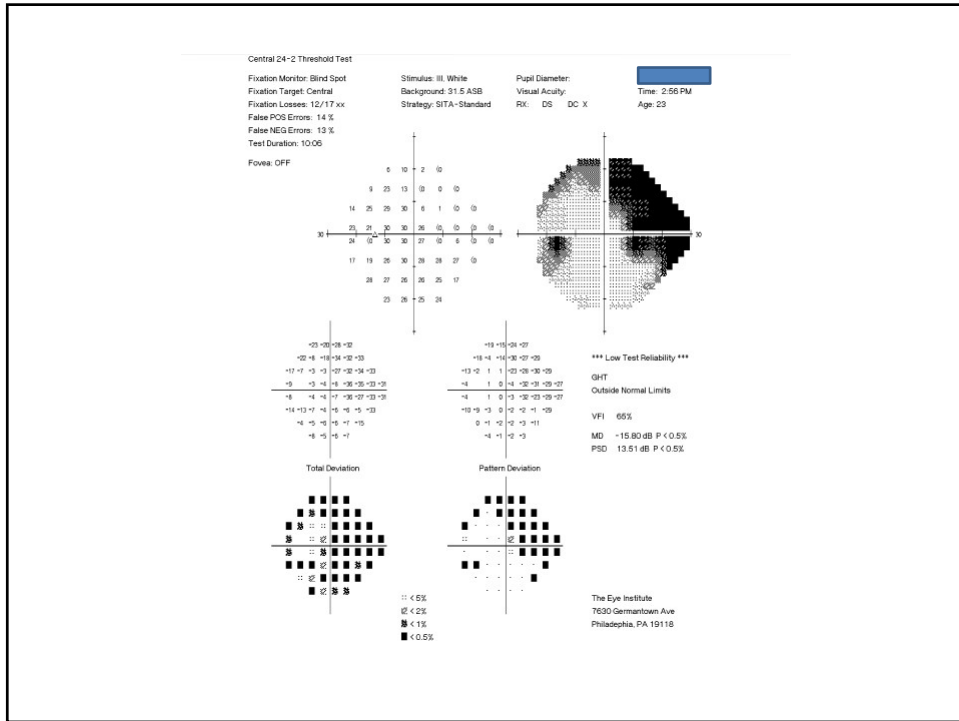
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## Venous sinus thrombosis

MRV – performed to image dural venous sinuses



Blood clot in veins = headache, stroke symptoms

Prevalence 5 per million / year

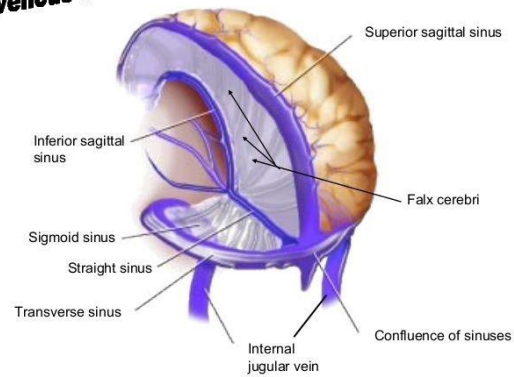
Inherited blood disorders (factor V leiden), lupus, cancers, medications (chemo drugs), infections (staph)

Intravenous heparin, subcutaneous heparin then coumadin for extended period of time

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## Venous sinuses

### venous sinuses



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## Things that must be considered with ONH swelling

Immediately order a **CT** or **MRI** – to rule out mass lesion

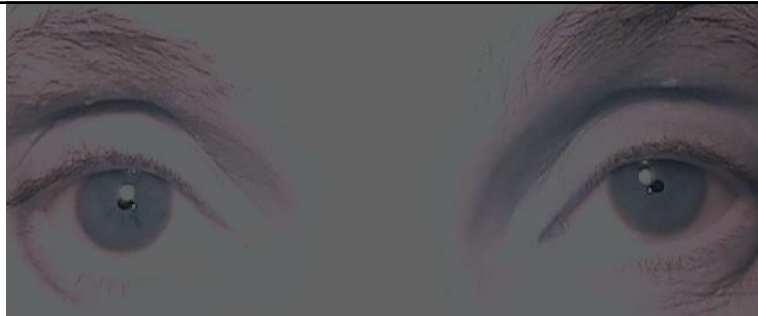
If no lesion is found – **lumbar puncture** will be performed to rule out infection and to measure ICP

**MRV** to rule out “venous sinus thrombosis”

Get **visual fields** to make sure no progressive field loss

Always, Always, Always .... check **blood pressure**

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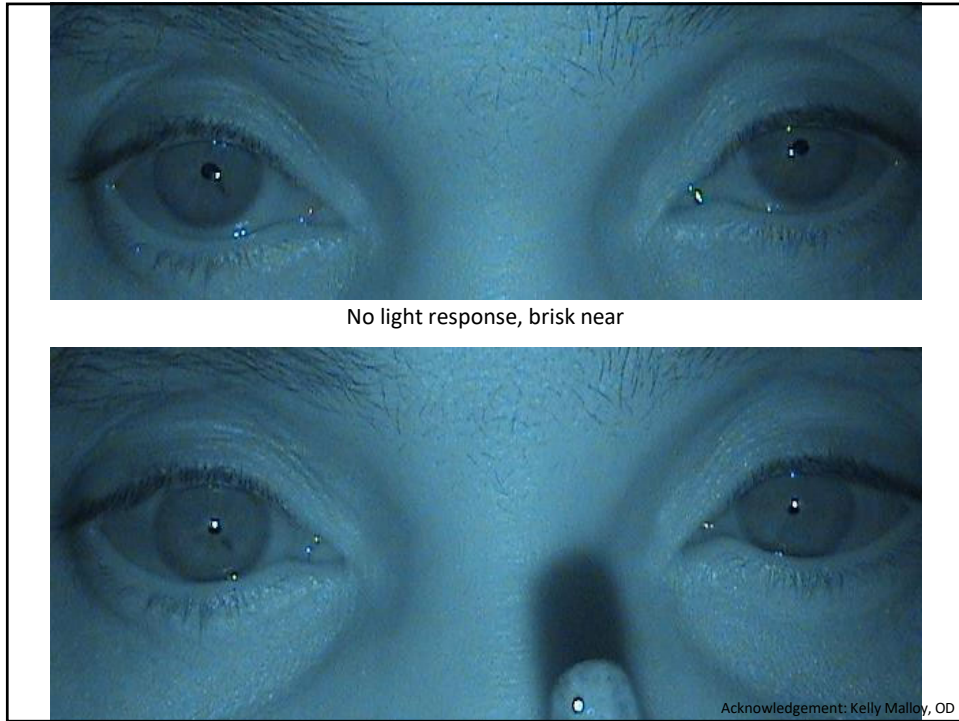


Resting Miosis



Acknowledgement: Kelly Malloy, OD

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### Argyll-Robertson Pupil

- Resting Miosis ( 2.5 mm ) in darkness
- No direct pupil response
- Brisk near response (LND)
- Preserved vision ?
- Dilates poorly

Causes:

- Syphilis, Multiple Sclerosis, Lyme, Sarcoidosis

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Stages: Ocular Syphilis

- Primary – Chancre on eyelid or conjunctiva
- Secondary – Uveitis, optic neuritis, retinitis, episcleritis, scleritis, conjunctivitis, dacryoadenitis, dacryocystitis
  - Ocular findings found in 10% with secondary syphilis
- Latent stage – may remain so for months or even a lifetime
- Tertiary – Interstitial keratitis, optic atrophy, Argyll Robertson

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- Syphilis Work-up and Management
  - FTA-ABS, RPR
  - Lyme titer
  - Neuroimaging (r/o MS)
  - Rule out Sarcoid: Chest X-ray, ACE, serum lysozyme
- Treatments
  - IV or IM Penicillin G
  - Oral Tetracycline/Doxycycline or Azithromycin

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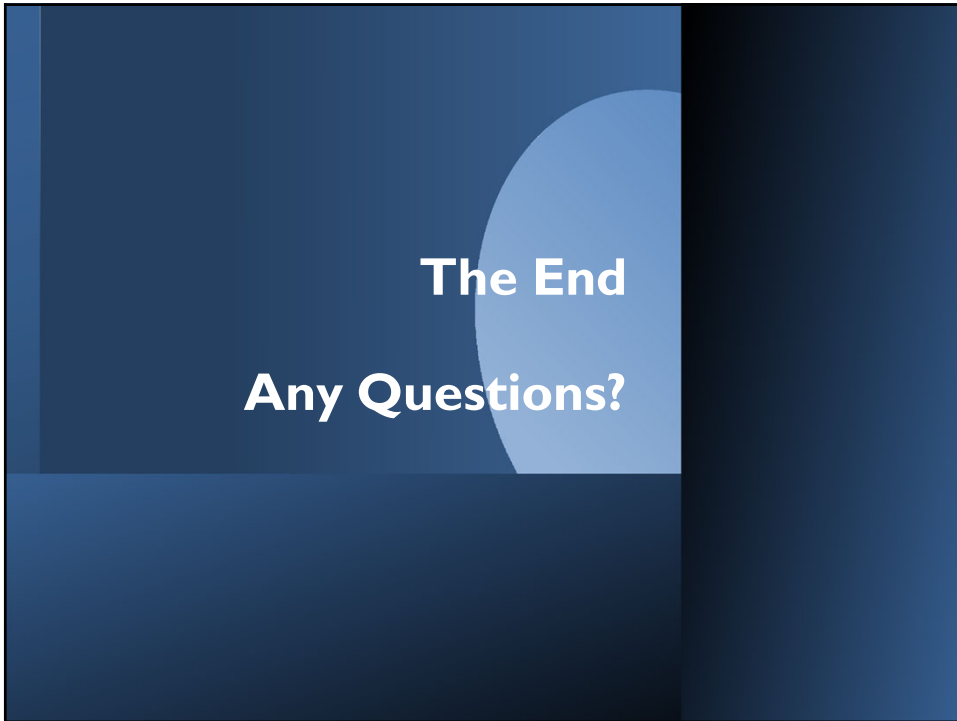




**Thank you for your attention  
Stay Safe !**

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