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Orbital Calcifications & Imaging of Optic Nerve Head Drusen

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Outline

- Ms. GB's head CT
- Differential diagnosis of orbital calcifications
- Orbital anatomy
- Images of the most common entities
- Techniques for visualizing optic nerve head drusen

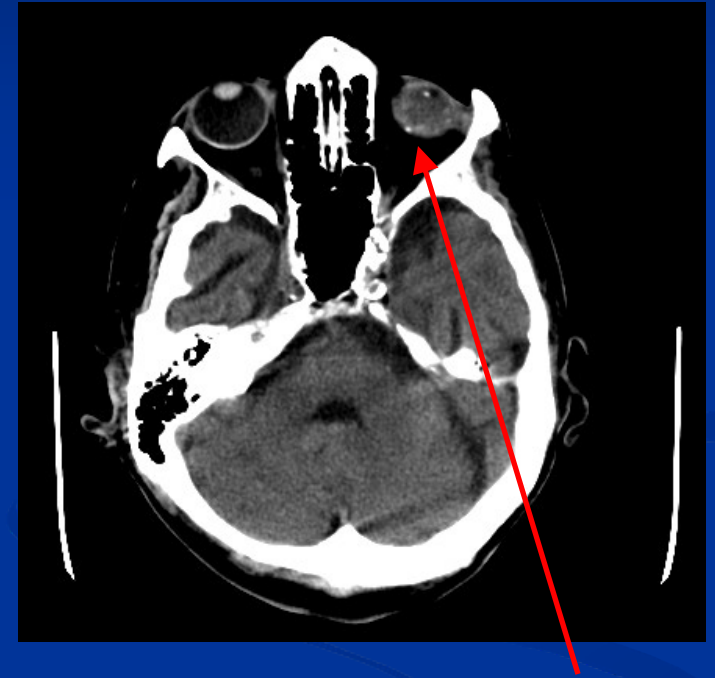
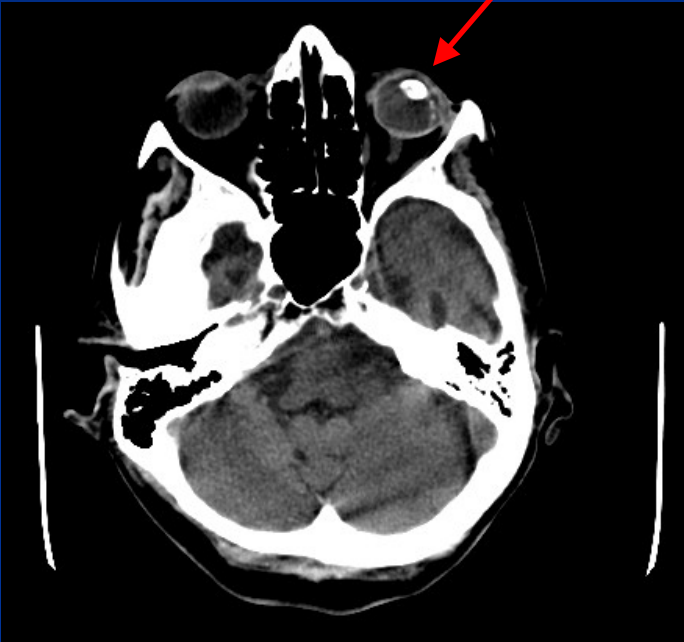


Ms. GB's Fall

- 94 year-old female lives alone in assisted living
- Found lying on her kitchen floor at 3AM complaining of severe L hip pain
- At presentation:
 - Unable to ambulate
 - Unable to give a history due to known dementia
 - PMH significant for CVA, HTN & CAD
- Upon admission → evaluated for a L hip fracture & intracranial hemorrhage



Ms. GB's Head CT



No evidence of acute intracranial hemorrhage or edema.
BUT, **two calcified lesions** were noted in the left globe.



What now?

- What could the ocular densities be?
- What should be done about them?



Asymptomatic Orbital Calcifications

- 100 random orbital CTs
 - No Hx eye trauma or eye Sx
 - Normal fundoscopic exam
 - Mean age: 35y (range 3-85y)
- 8% found to have calcifications



DDx of Orbital Calcifications

■ Common:

- Scleral Plaque
- Cataract
- Trochlear Apparatus
- Phthisis Bulbi
- Drusen
- Foreign Bodies

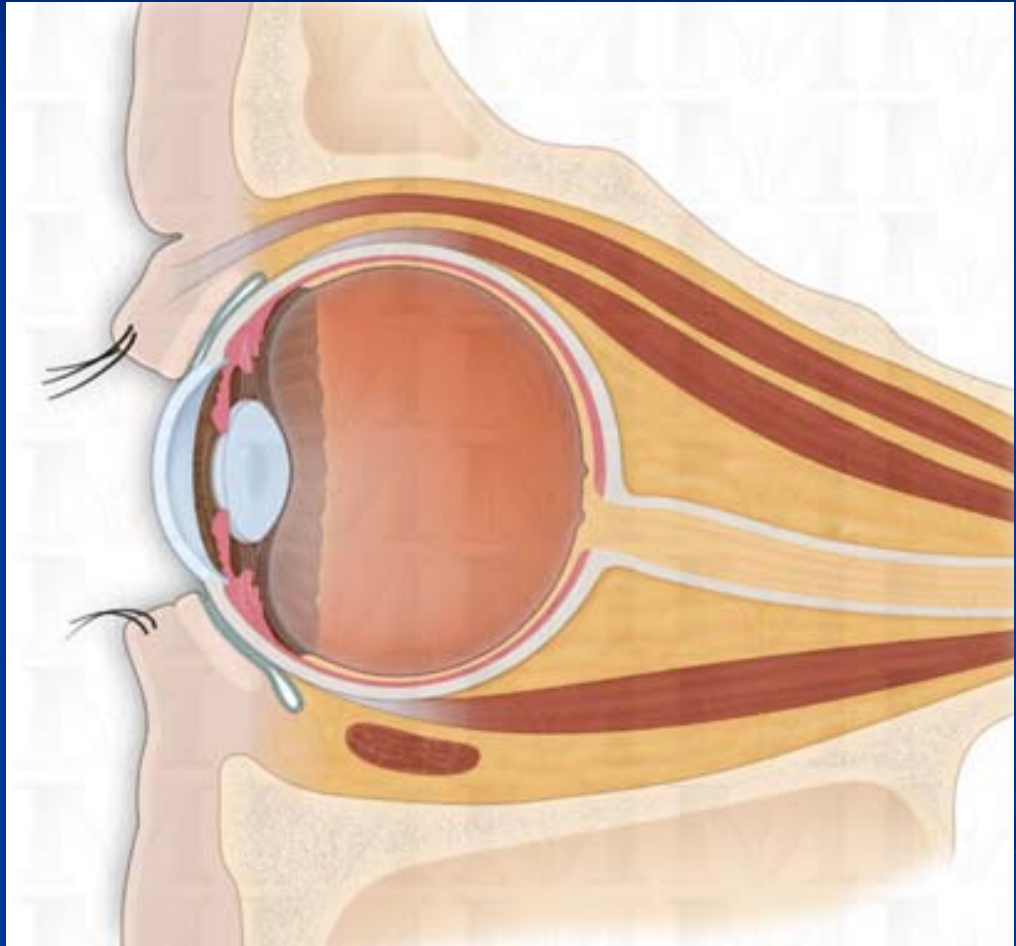
■ Uncommon:

- **Infectious:** Toxoplasmosis, CMV, Herpes. TB, syphilis
- **Vascular:** Atherosclerosis, Phlebolith
- **Neoplastic:** Retinoblastoma, Choroidal osteoma, Meningioma
- **Hypercalcemia:** Hyperparathyroidism, Metastases, Vit D intox.



Relevant Orbital Anatomy 1

- The orbit is a pyramid-shaped cavity of the skull formed by 7 bones (frontal, maxilla, sphenoid, zygoma, ethmoid, lacrimal and palatine). It protects the globe and its associated structures.
- There are 6 striated extraocular muscles that move the globe: the 4 rectus muscles (SR, IR, MR, LR), the superior oblique (SO) & the inferior oblique (IO). Each rectus muscle's tendon inserts into the sclera just posterior to the fornix and adjacent to the ciliary body

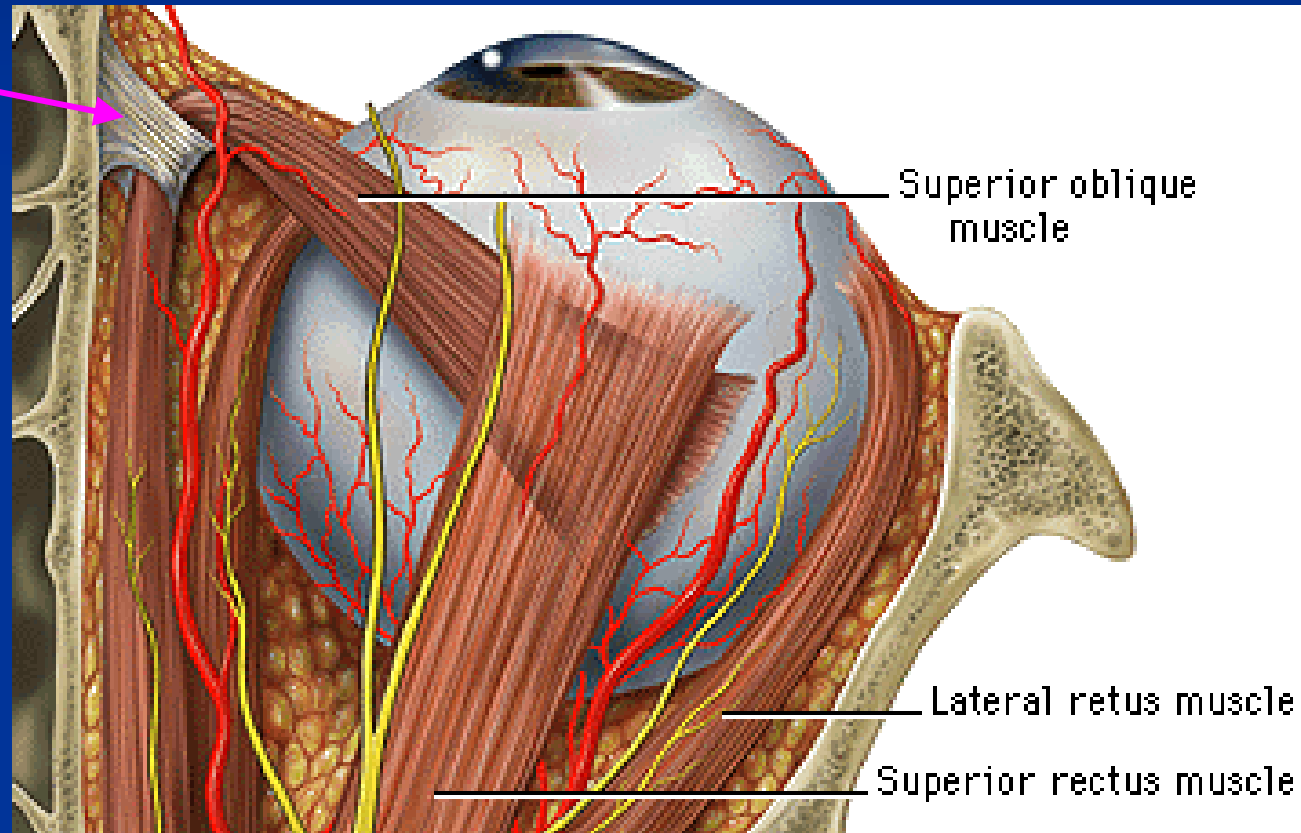


http://www.millermedart.com/pages/s_opht16.html



Relevant Orbital Anatomy 2

Trochlear Apparatus

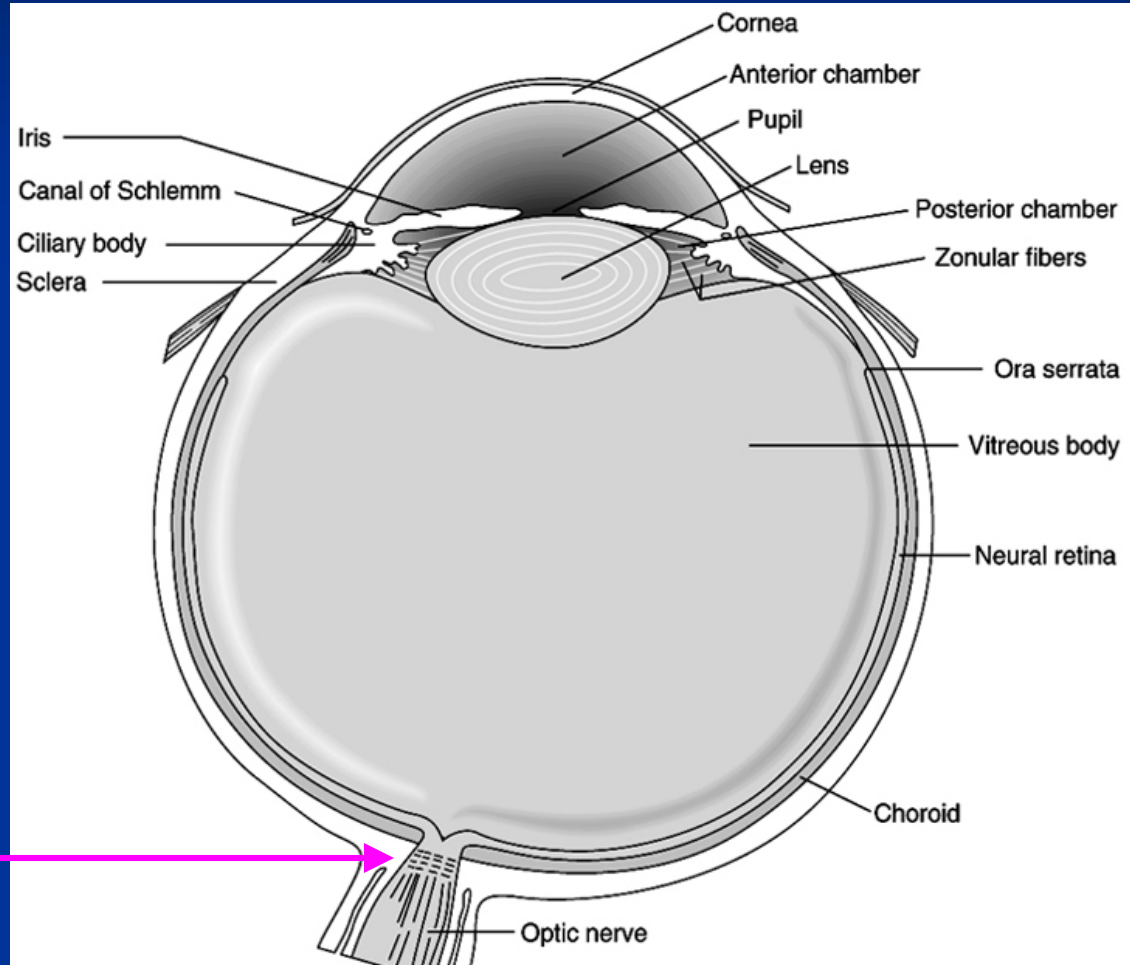


<http://info.med.yale.edu/caim/manual2/graphics/illustrations.html>



Relevant Orbital Anatomy 3

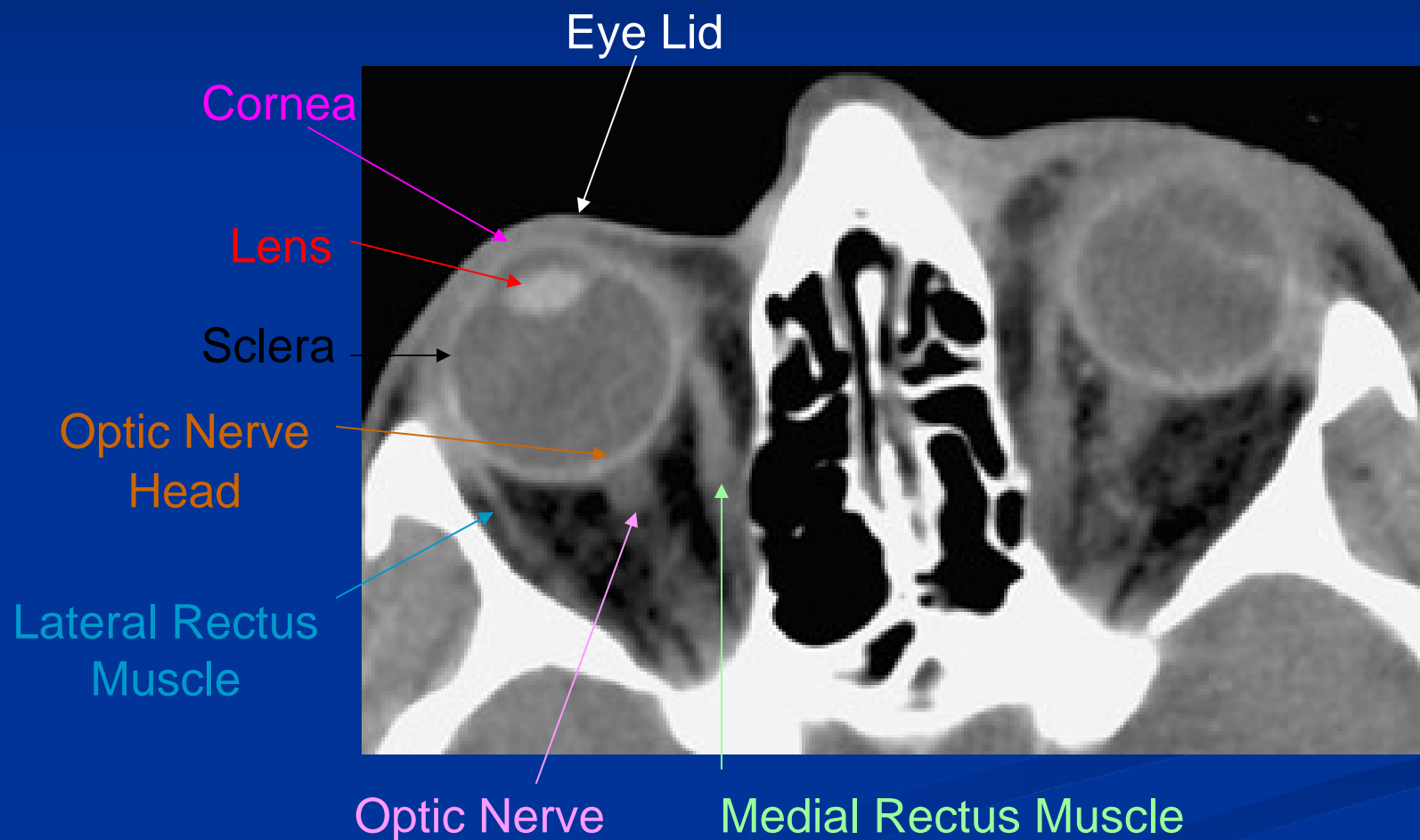
- The lens is a biconvex disk composed of 35% protein, the highest protein content of any tissue in the body; therefore it is relatively dense on CT. It is suspended just posterior to the iris by the zonular fibers extending from the ciliary body.
- The scleral lamina cribrosa is a sieve-like plate through which the optic nerve fibers pass on their way to lateral geniculate nucleus (LGN)



Lamina Cribrosa



Relevant Orbital Anatomy 4





Orbital Anatomy: Quiz

What is misplaced and where is it?

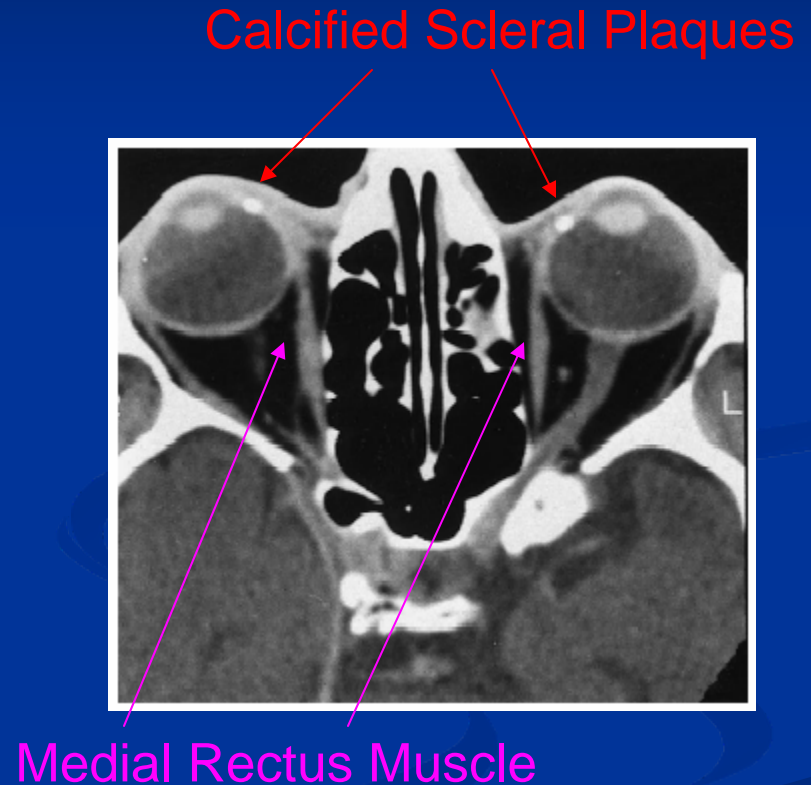


L lens dislocated posteriorly, against retina



Calcified Scleral Plaque

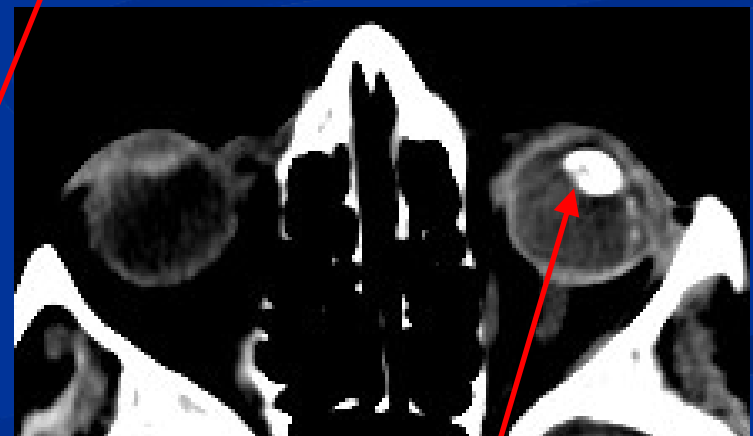
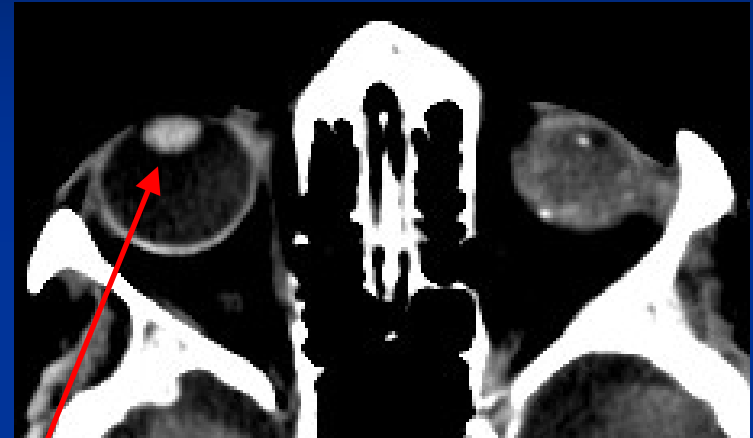
- **Appearance:** Focal, anterior to rectus muscle insertion
 - 2/3 = MR
 - 1/3 = LR
 - Uncommonly = SR or IR
- **Cause:** Degenerative changes
2° mechanical stress
- **Clinical:**
 - Associated with age:
 - Uncommon < 70
 - 23% at 80y
 - > 50% are bilateral





Calcified Cataract Latin = “waterfall”

- **Appearance:** Well defined, biconvex disk posterior to the cornea
- **Cause:**
 - Trauma (unilateral) → cortex
 - Longstanding inflammation: uveitis (unilateral) → cortex + nucleus
 - Mature cataract



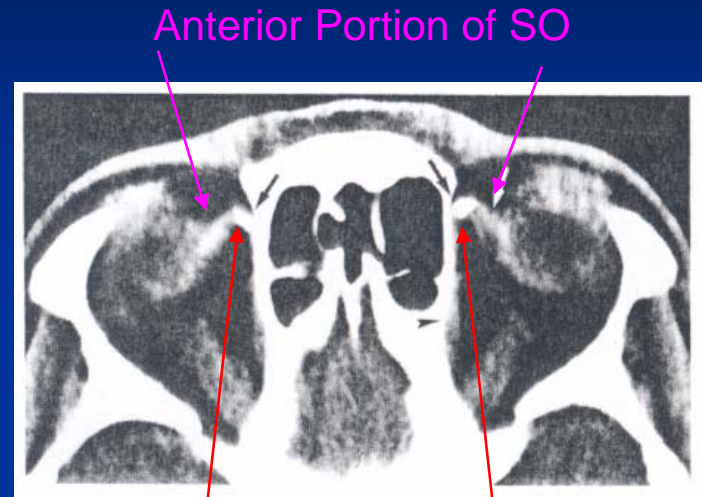
Non-calcified Lens

Calcified Cataract



Calcified Trochlear Apparatus

- **Appearance:** Focal, at point of SO angulation, adjacent to the medial orbital wall
- **Cause:** Degenerative changes
- **Clinical:**
 - Associated with age:
 - 25-30% > 50y
 - If <40, consider diabetes mellitus
 - odds ratio for detecting trochlear calcification in diabetic v nondiabetic = 4.3

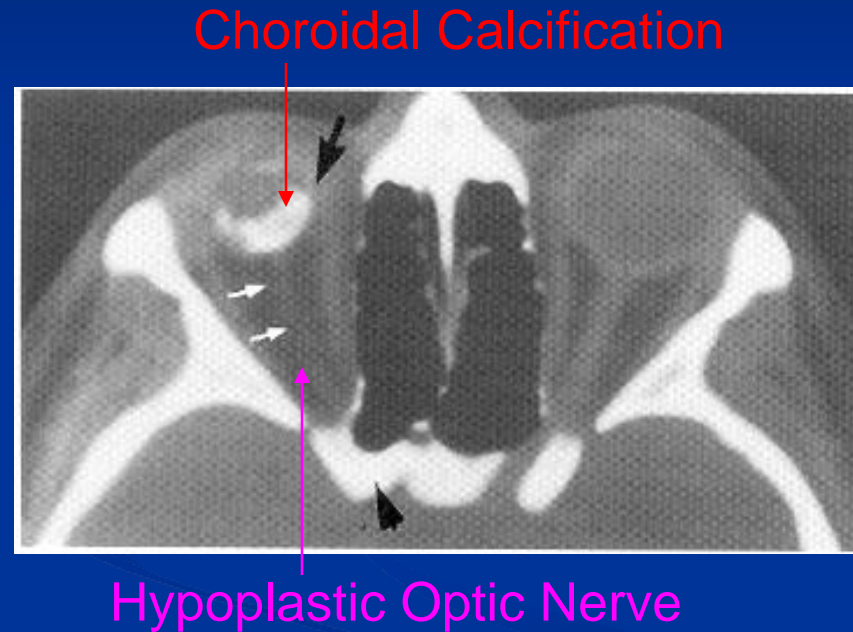




Phthisis Bulbi

Greek = “wasting”

- **Appearance:** Ocular structures → atrophic, disorganized & shrunken:
 - Terminal process = calcification, most commonly forming a crescent along the choroid
- **Cause:** Ocular degeneration
 - Trauma
 - Longstanding inflammation

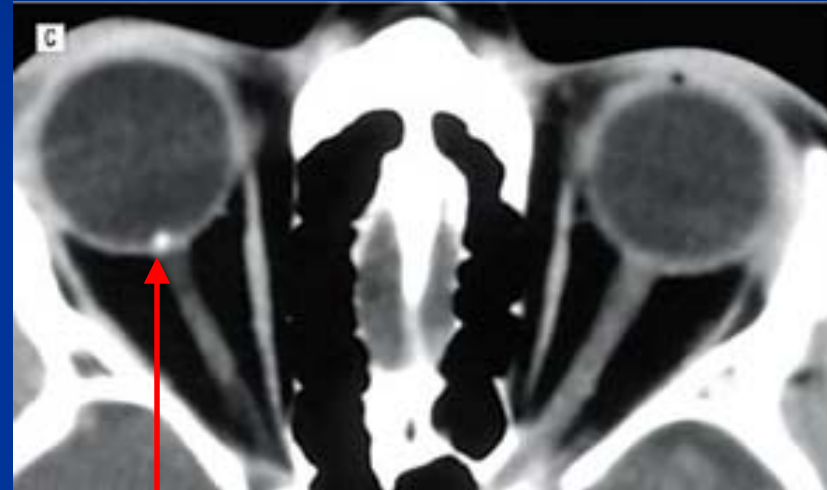




Optic Nerve Head Drusen (ONHD)

German = "Stone"

- **Appearance:** Well defined, punctate, located in the optic disc, anterior to the lamina cribrosa
- **Cause:** Acellular deposits of degenerated nerve fibers
- **Clinical:**
 - 1-3% pop; 70-90% bilateral
 - Caucasians
 - Autosomal dominant w/ variable penetrance
 - Present from early childhood
 - Usually aSx
 - 64-87% = visual field defects

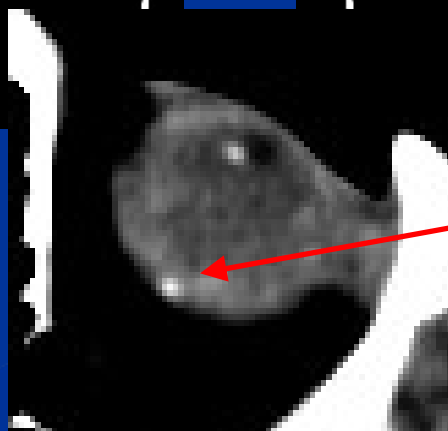
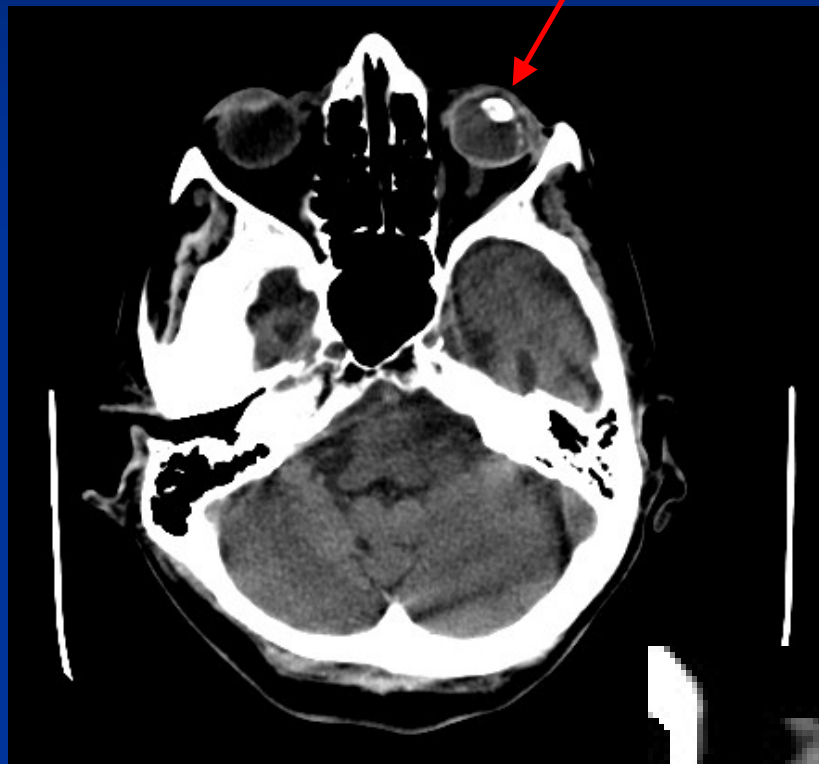


ONHD



What did Ms. GB have?

Calcified Cataract



ONHD



Imaging of ONHD

- MRI
 - Plain film
 - CT
 - Fluorescence Angiography
 - Ultrasonography
- Unreliable for detection

Kurz-Levin MM, *et al.* A comparison of imaging techniques for diagnosing drusen of the optic nerve head. *Arch of Ophthalmology* 1999; Aug;117(8):1045-9.

Bec P, *et al.* Optic nerve head drusen, high resolution computed tomographic approach. *Arch Ophthalmol* 1984 May;102(5):680-2.



ONHD – CT

■ Advantages:

- Commonly preformed test, therefore if suspect, check records
- Detects deep & superficial drusen
- Useful for Dx ocular pathology that other imaging modalities might miss, for example retro-orbital lesions

■ Disadvantage

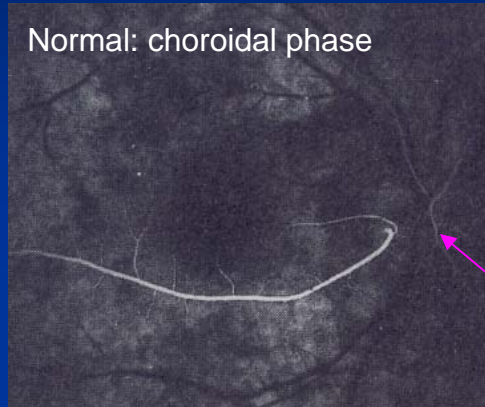
- Drusen: 0.05 – 3mm in size; therefore, even high-resolution, thin slice scans may not detect



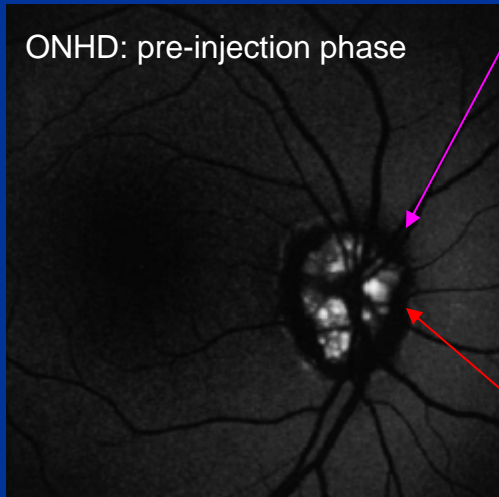
ONHD



ONHD – Fluorescein Angiography



Optic Nerve Head

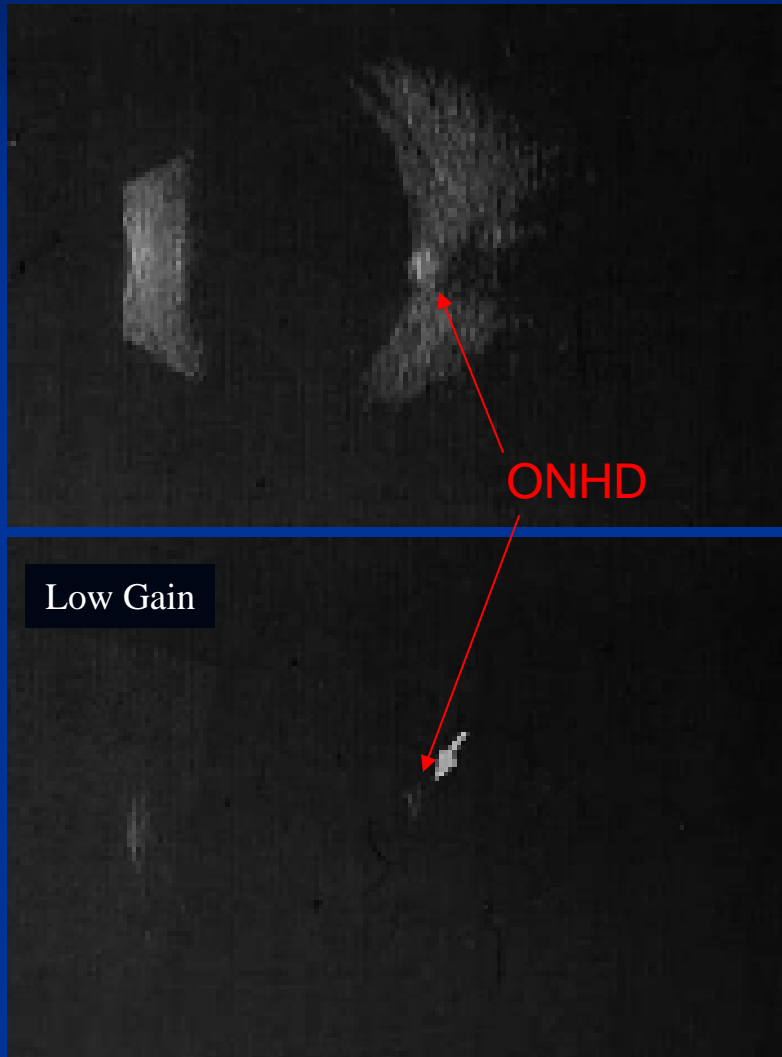


Autofluorescence

- **ONHD is autofluorescent**
- **Advantage:**
 - No ionizing radiation
- **Disadvantage:**
 - Unreliable detection of deep drusen



ONHD – Ultrasonography / B-scan



■ Appearance:

- Highly echogenic lesion persists with low-gain scanning (<60 dB)
- Posterior cone of shadow

■ Advantages:

- No ionizing radiation
- Cheap
- Portable
- Detects both deep & superficial drusen
- Entire disk area visualized

■ Disadvantage:

- Operator dependent



Imaging of ONHD: B-scan v CT v FA

36 eyes with suspected drusen imaged with 3 techniques:

	<u>Drusen detected</u>
B-scan:	21
CT:	9
FA:	10

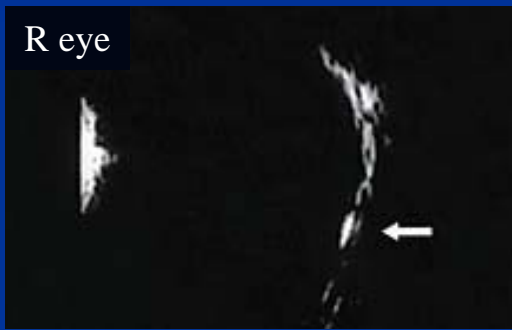
Summary: B-scan = imaging method of choice



Imaging of ONHD: B-scan is best



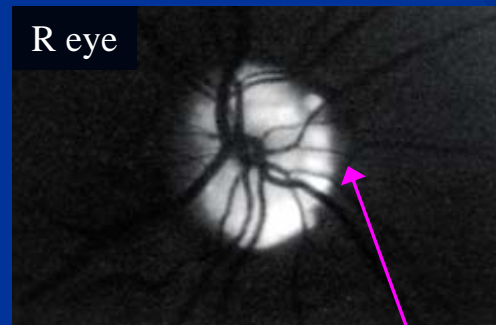
Example: 41yo M w/
bilateral ONHD



B-scan detected both
R & L ONHD



ONHD



Autofluorescence

CT and FA detected
only R ONHD



Summary

- Asymptomatic orbital calcifications are common
- Most entities are innocuous & readily identifiable given characteristic location and appearance
- If ONHD is suspected clinically, B-scan is the imaging modality of choice



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