AMSER Case of the Month June 2025

22 Y.O. female nursing student presenting with headaches and left eye ptosis and double vision

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Patient Presentation

- 22 year old female patient presents to the ED for evaluation of headache, blurred vision, and abnormal eye movements. She reports that she has had intermittent migraines for the last year, though they appear to increasing in frequency and severity. Currently she reports getting migraines every other day. They tend to occur at night and are localizable to the left periorbital area. She denies any nausea, vomiting, muscle weakness, or parasthesias with these migraines. She was started on migraine medication, which she reports does not help.
- She a reports abnormal movements of her left eye. Specifically, she feels her left eye gets stuck in left lateral gaze before spontaneously correcting. This reportedly occurs several times per day and it happens most days of the week. She reports blurred vision during these episodes.

Patient Presentation

- pMHx: Hypothyroid(unknown etiology)
- Surgical History: Frequent ear tubes as child
- Medications: Levothyroxine, prednisone, alprazolam
- Physical Exam:
  - CN II: Subtle aniscoria(R>L), reactive to light bilaterally without rAPD, visual fields full to finger counting, 20/20 visual acuity bilaterally without corrective lenses
  - CN III/IV/V: Ductions are full. Left intermittent exotropia(>15PD), only brought out with cross cover testing in left gaze. Subtle left ptosis at baseline.

Pertinent Labs

- TSH: wnl
- BMP: wnl
- HCG: negative

What Imaging Should We Order?

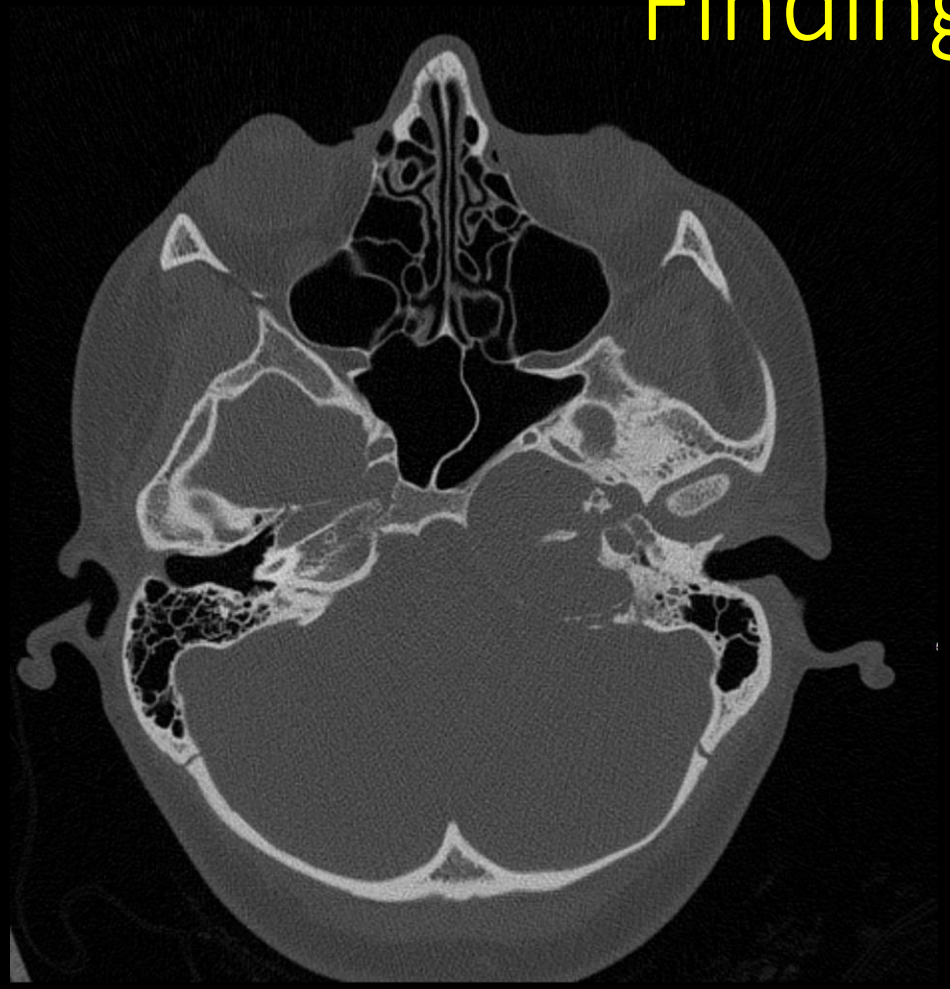
Select the applicable ACR Appropriateness Criteria

Variant 7: **Headache with one or more of the following "red flags": increasing frequency or severity, fever or neurologic deficit, history of cancer or immunocompromise, older age (>50 years) of onset, or posttraumatic onset. Initial imaging.**

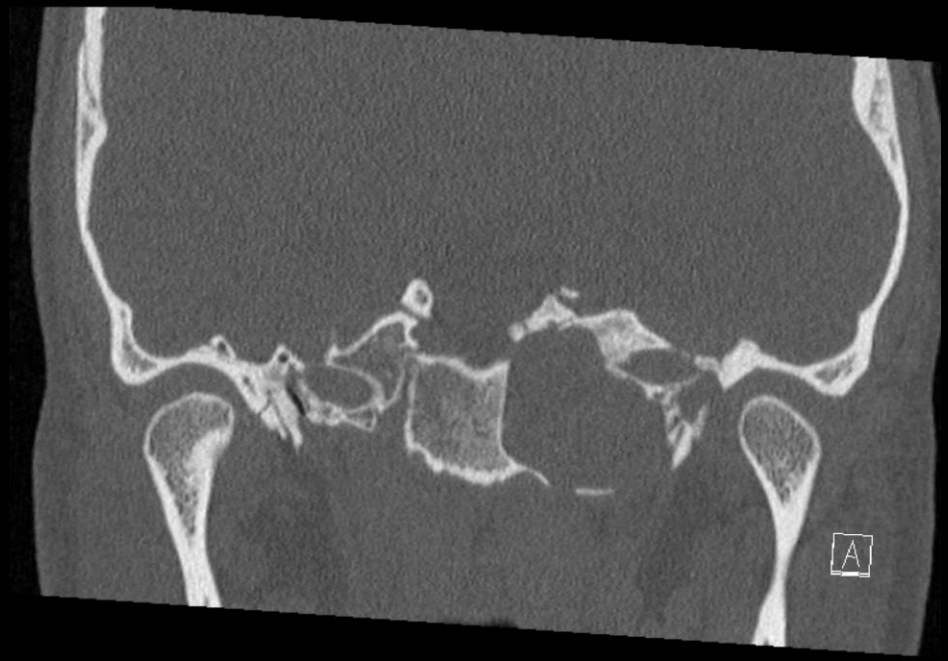
Procedure	Appropriateness Category	Relative Radiation Level
MRI head without and with IV contrast	Usually Appropriate	O
MRI head without IV contrast	Usually Appropriate	O
CT head without IV contrast	Usually Appropriate	☢☢☢
Arteriography cervicocerebral	Usually Not Appropriate	☢☢☢
MRA head with IV contrast	Usually Not Appropriate	O
MRA head without and with IV contrast	Usually Not Appropriate	O
MRA head without IV contrast	Usually Not Appropriate	O
MRI head with IV contrast	Usually Not Appropriate	O
MRV head with IV contrast	Usually Not Appropriate	O
MRV head without and with IV contrast	Usually Not Appropriate	O
MRV head without IV contrast	Usually Not Appropriate	O
CT head with IV contrast	Usually Not Appropriate	☢☢☢
CT head without and with IV contrast	Usually Not Appropriate	☢☢☢
CTA head with IV contrast	Usually Not Appropriate	☢☢☢
CTV head with IV contrast	Usually Not Appropriate	☢☢☢

This imaging modality was ordered by the ER physician. MRI was recommended after initial CT scan

Findings (unlabeled)

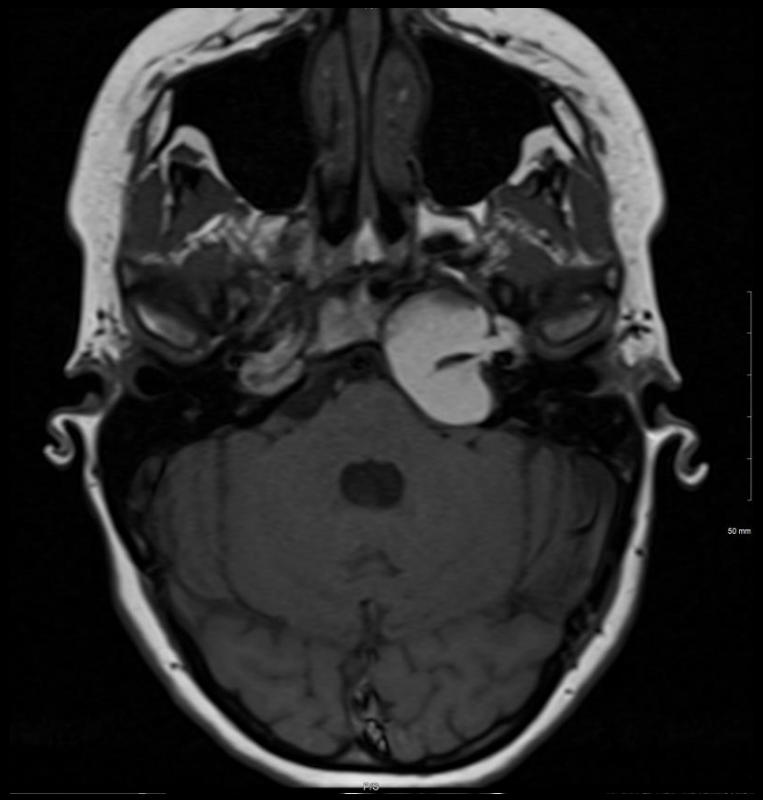


Axial noncontrast CT

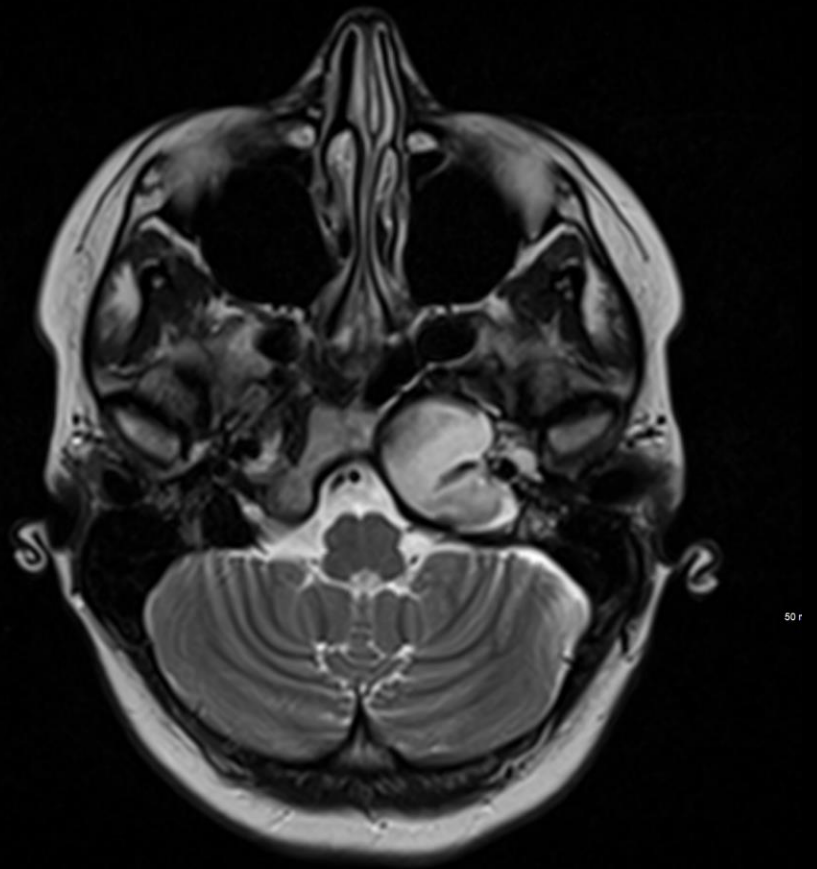


Coronal noncontrast CT

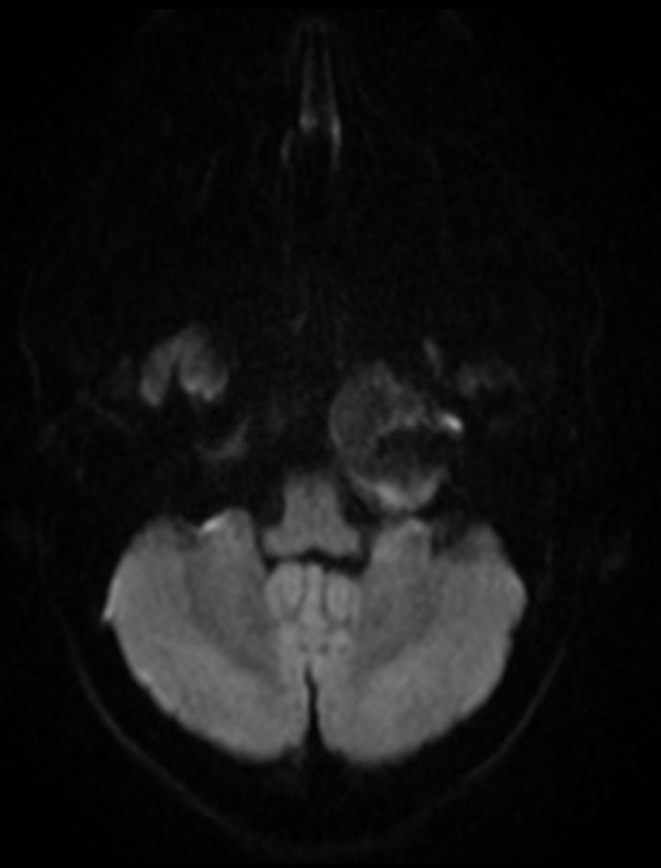
Findings (unlabeled)



T1 axial MRI



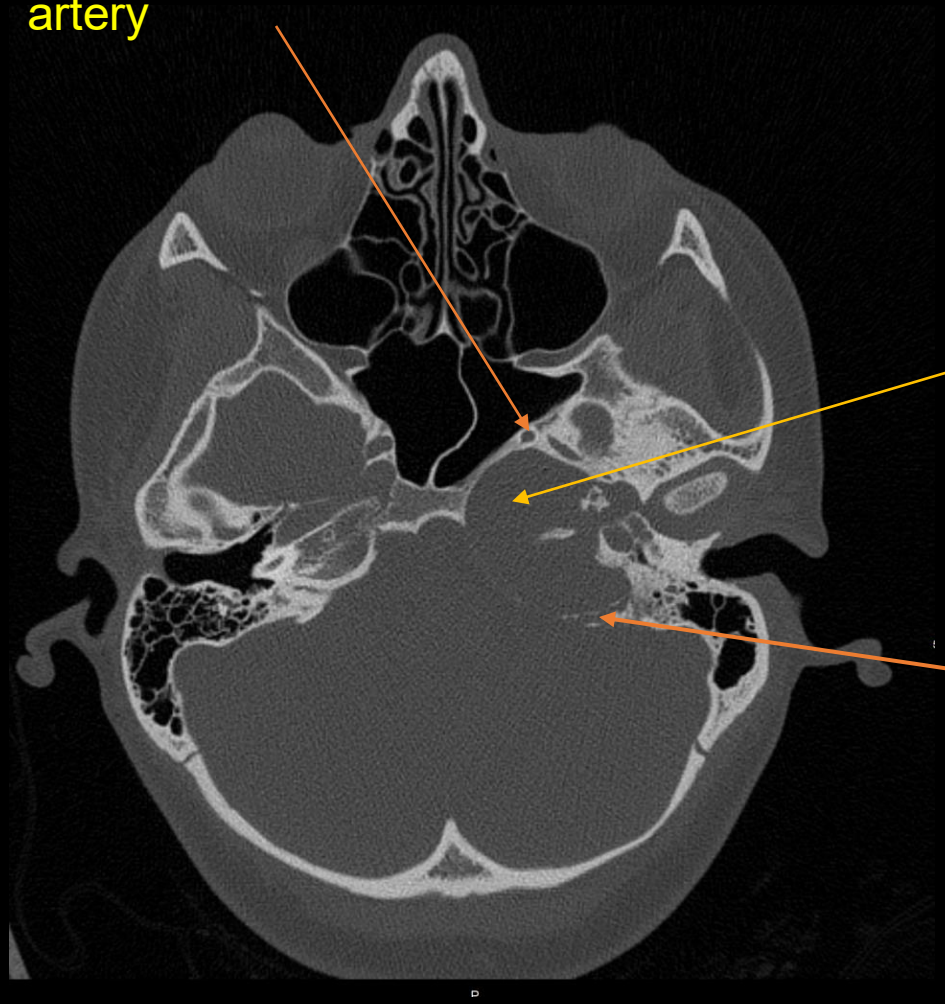
T2 MRI



Diffusion weighted Imaging

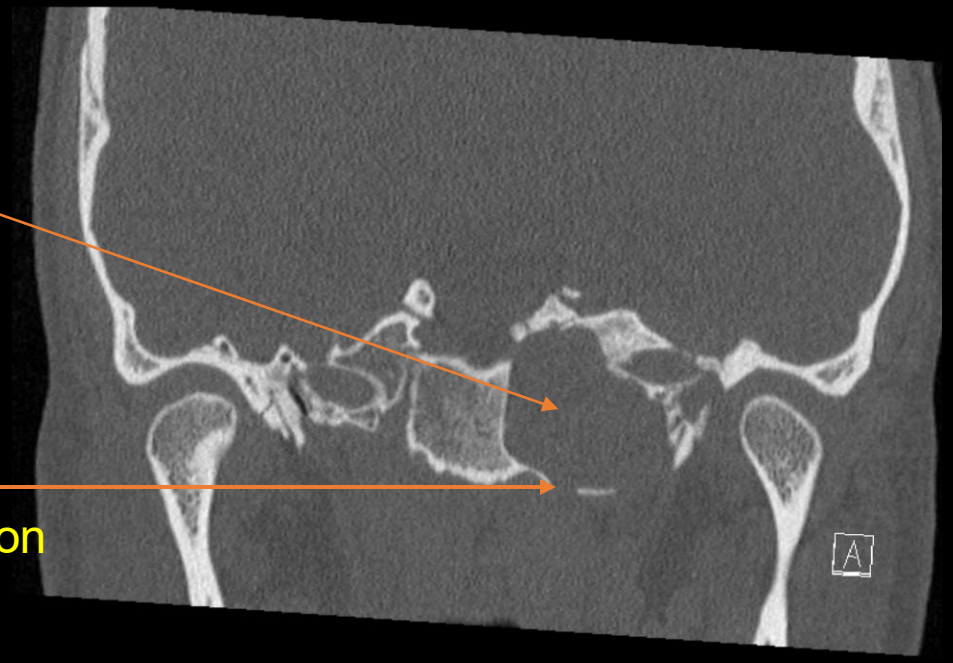
Findings: (labeled)

Anteriorly displaced carotid artery



Expansile lesion in left petrous apex

Note bone thinning/demineralization



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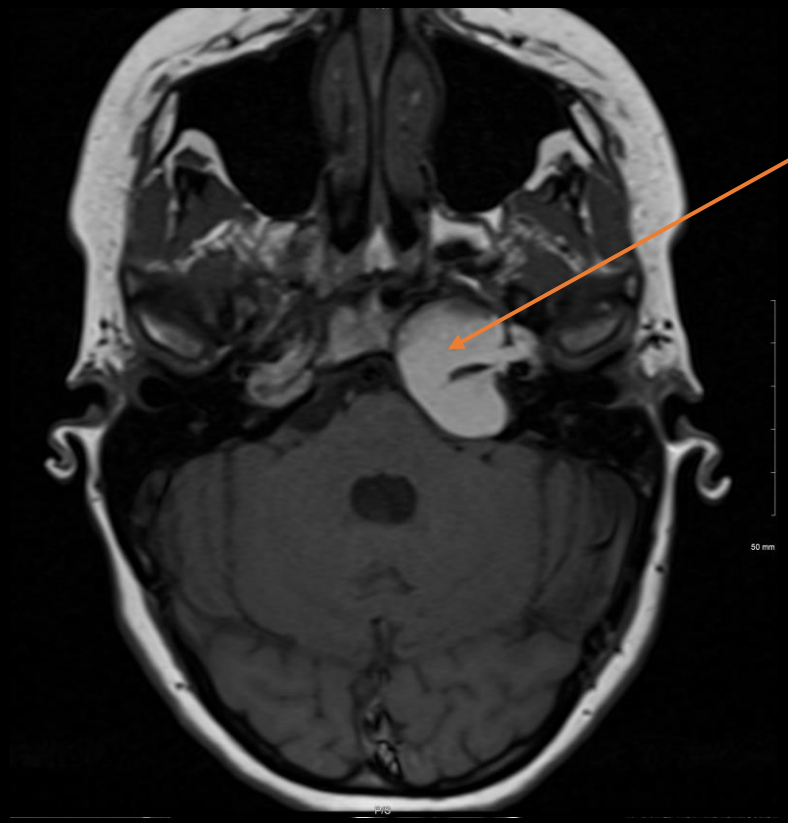
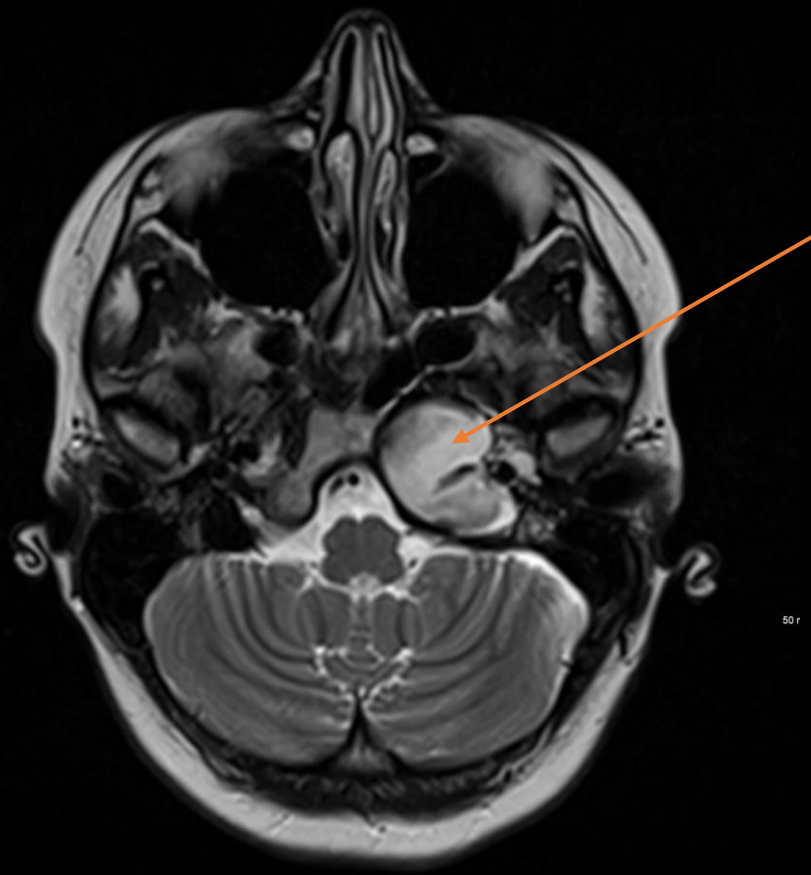
Findings(Labeled) – T1 Axial MRI

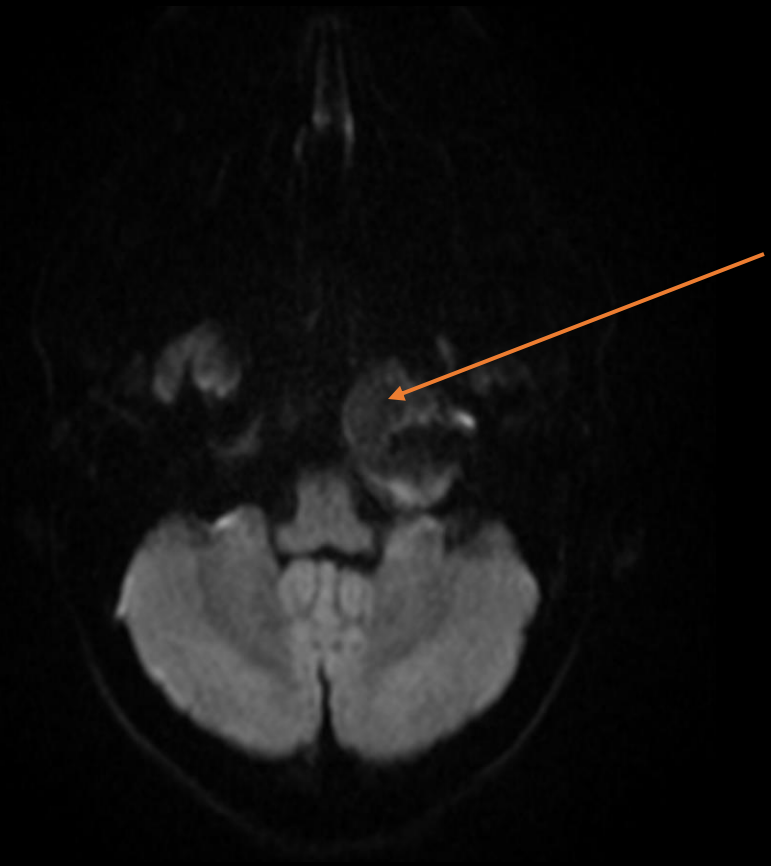


Intrinsically hyperintense T1 signal throughout

Findings(Labeled) – T2 Axial MRI



Findings(Labeled) – Diffusion Weighted Imaging



Note lack of diffusion restriction on Diffusion weighted imaging

Final Dx:

Based on a discussion with a multidisciplinary tumor board the likely diagnosis was

Cholesterol Granuloma

Case Discussion: Pathophysiology

- Cholesterol granuloma is a special type of middle ear granulation[2]
- Occurs most often in individuals with history of chronic otitis media[2]
  - Note our patient reported having multiple ear tubes as a child
- Occur most often at the petrous apex[2]
  - Represent the most common cystic lesion of the petrous apex
- The exact etiology is unknown, but ultimately comes down to trapped blood, which leads to a chronic inflammatory response.[2]
- Symptoms depend on the location of the lesion[2]
  - At the petrous apex may lead to CN dysfunction, hearing loss, tinnitus, or be asymptomatic

Case Discussion: Imaging Findings

- Appears hyperintense on T1 and T2 MRI[2]
  - Hyperintensity on T1 is due to cholesterol/methemoglobin
    - Low signal on rim due to hemosiderin and thinning of adjacent bone
  - Also high central signal with low peripheral signal on T2
    - No attenuation on FLAIR
  - Typically no diffusion restriction on DWI
- On CT an expansile lesion with a well marginated lesion is typically seen[2]
  - Thinned overlying bone can be seen
  - Appearance can vary with location
    - May appear with bony erosions in the petrous apex
    - When in middle ear, associated erosion is rare

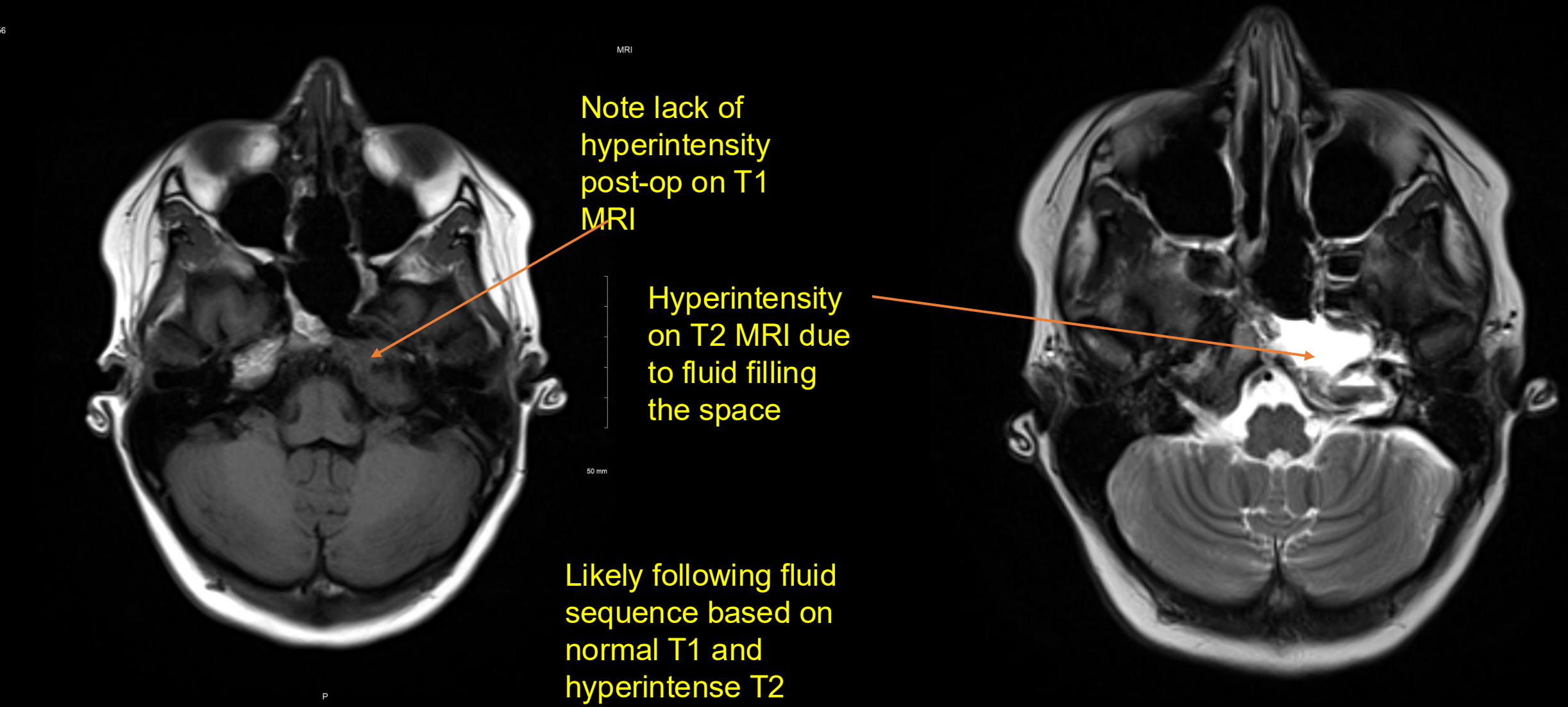
Case Discussion: Treatment and Prognosis

- Typically for symptomatic patients, surgical excision is needed[1]
  - Excision MUST include the cyst wall
- Many different surgical approaches can be used[1]
  - Depends on cyst location, and degree of hearing loss
  - Approaches include transtemporal, middle fossa, or endonasal approach
- Surgical management involves drainage procedures to establish an outflow pathway which is maintained[3]
  - So that expansion of the cholesterol granuloma does not lead to symptom recurrence
- Recurrence rate is known to be high[1]

Patient Outcome

- Based on patients presenting symptoms and scans, an endonasal approach was used to drain and diagnose the condition
  - Joint case with ENT and neurosurgery
- Left ICA superiorly displaced by granuloma
  - More space for surgeons to work with
- Mucosal graft in middle turbinate placed
- Propel mini stent placed to aid in drainage along left petroclival junction
- Post-operative MRI showed no residual

Post-Op MRI Imaging

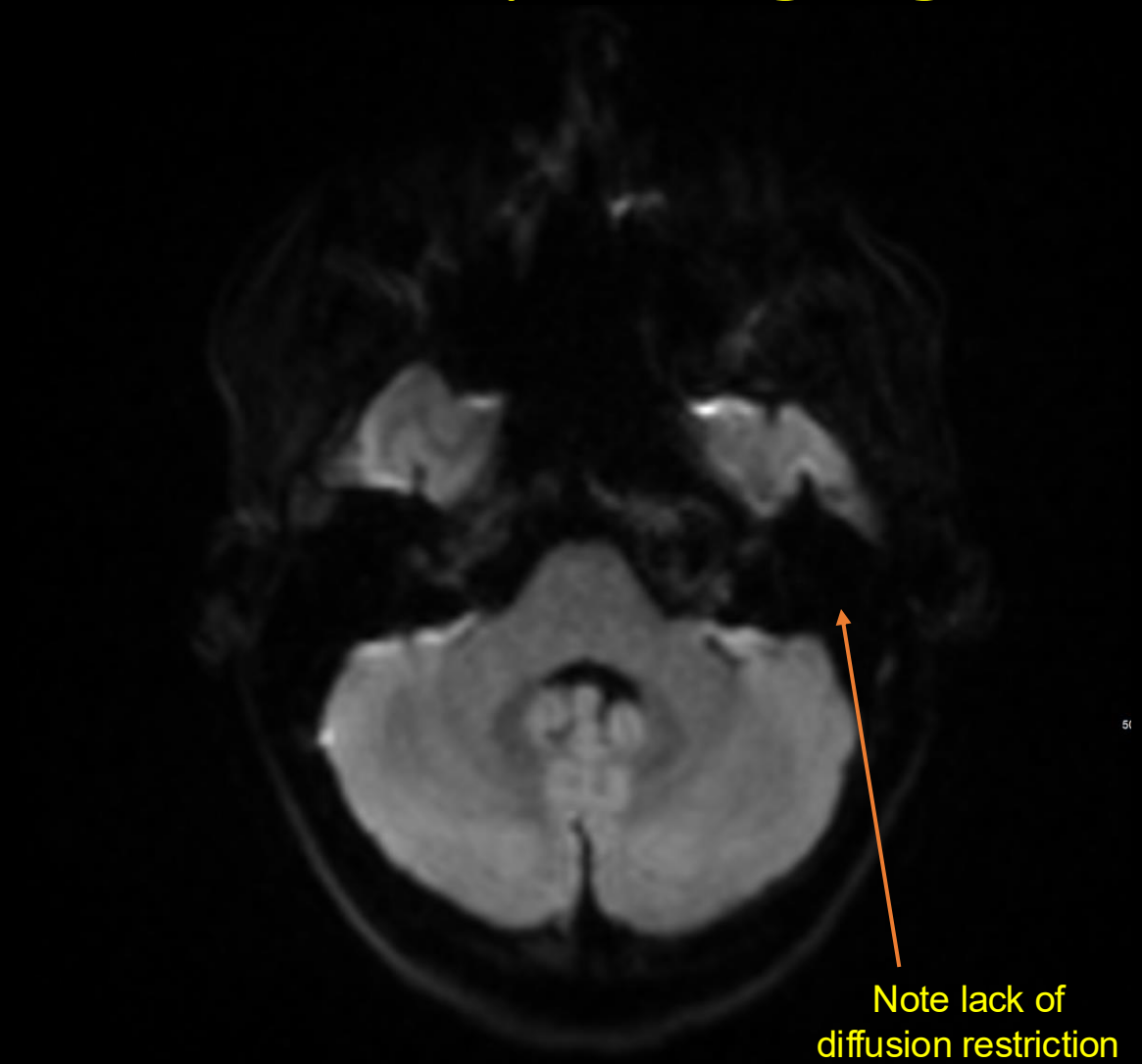


Note lack of hyperintensity post-op on T1 MRI

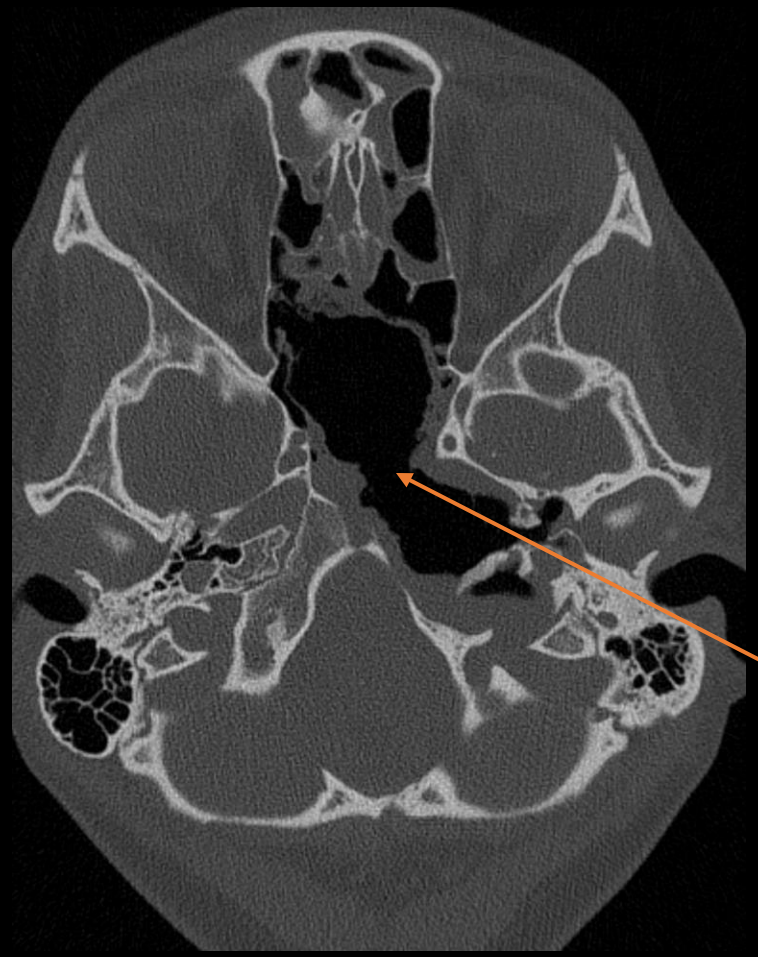
Hyperintensity on T2 MRI due to fluid filling the space

Likely following fluid sequence based on normal T1 and hyperintense T2

Post-Op Imaging



Note lack of diffusion restriction post-op on Diffusion weighted MRI



Note the space left behind postop to allow for persistent drainage on axial noncontrast CT

References:

1. Azevedo SR, Mendes G, Coutinho MB, Almeida C. Nasopharyngeal Approach to a Cholesterol Granuloma of the Petrous Apex. *Ear Nose & Throat Journal*. 2021;102(12):NP596-NP598. doi:https://doi.org/10.1177/0145561321102807 4
2. Bahman Rasuli, Gaillard F. Cholesterol granuloma. Radiopaediaorg. Published online May 2, 2008. doi:https://doi.org/10.53347/rid-1117
3. Hoa M, House JW, Linthicum FH. Petrous Apex Cholesterol Granuloma. Otology & Neurotology. 2012;33(6):1059-1065. doi:https://doi.org/10.1097/mao.0b013e31825d63ea