



SKULL BASE LESIONS THAT MAY MIMICK DISEASE

AUTHORS: MYERS, TANDBERG, LORENZO

UNIVERSITY OF NEW MEXICO
DIAGNOSTIC RADIOLOGY

Learning Objectives

- The participant will identify normal anatomic variants that may mimic lytic lesions in the skull base.
- The participant will distinguish skull base vascular variants that can mimic skull base masses.
- The participant will differentiate skull base vascular variants by MRI that can mimic vascular pathology.

Background

Imaging of the skull base can be a daunting task even for experienced radiologists. A thorough understanding of normal skull base anatomy and anatomic variants is imperative in preventing unnecessary workup by further imaging or biopsy.

This educational exhibit will illustrate common skull base variants that can mimic

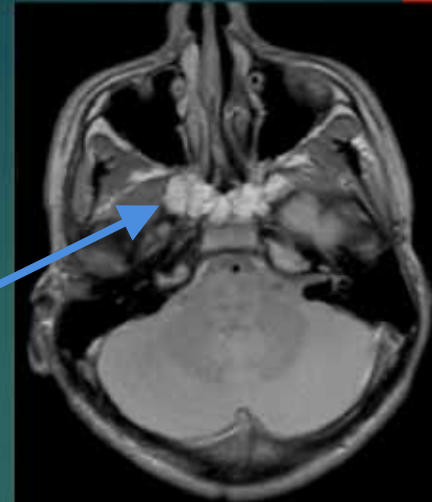
1. Lytic lesions in the skull base
2. Masses of the middle ear and skull base
3. Vascular pathology on MRI.

Incomplete pneumatization of the sphenoid

Arrested pneumatization most commonly occurs in the association with the sphenoid sinuses.

No specific clinical findings are attributed to this entity.

- Pneumatization begins at 4 months.
- The process of pneumatization progresses from red marrow to fatty marrow to epithelialization
- Typically occurs in the basisphenoid, pterygoid process and clivus.
- Commonly involves multiple sites



Incomplete Pneumatization of the Sphenoid – Imaging

CT

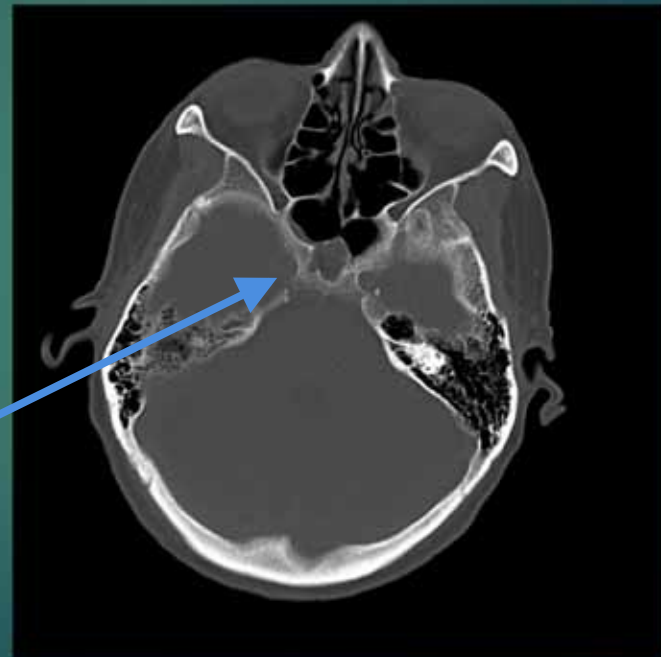
- Non-expansile lesion in the sphenoid with sclerotic margins.

MRI

- Internal fat and microcystic component without mass effect.
- No enhancing components

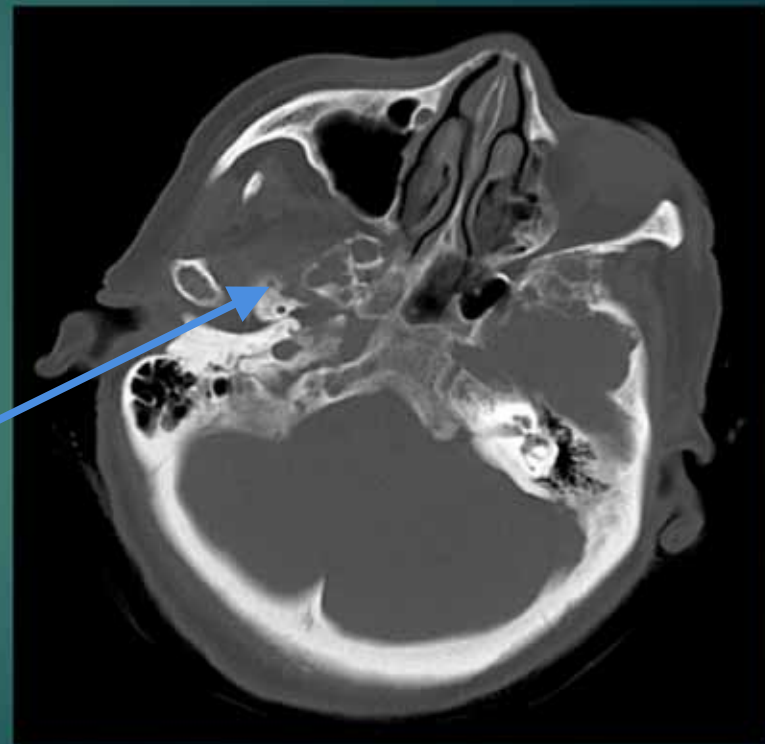
Differential Diagnosis

- Fibrous dysplasia
- Osteomyelitis
- Chondrosarcoma



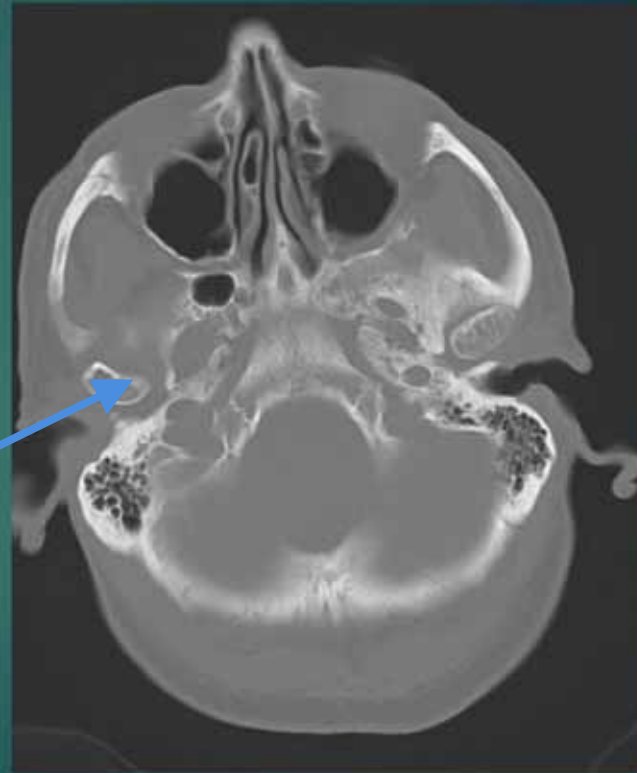
Sphenoid Wing Arachnoid Pits

- Arachnoid pits are a descriptor for arachnoid granulations.
- These lytic appearing lesions can occur in the sphenoid wing and can be confused for a more sinister lytic process.
- These lesions will follow fluid signal characteristics.



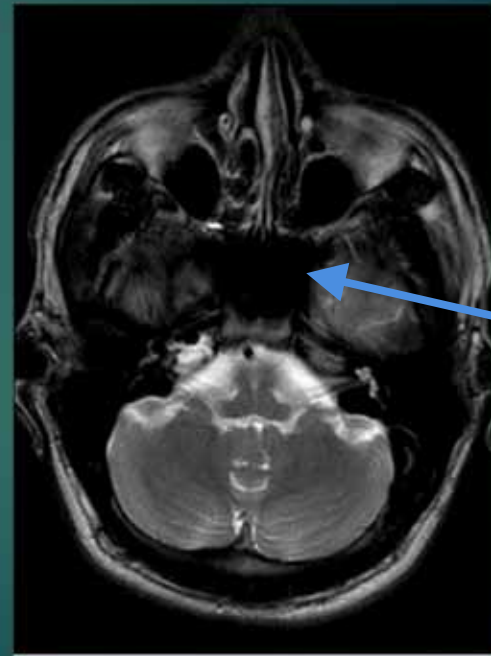
Asymmetric Pneumatization of the Petrous Apex

- Asymmetric Pneumatization occurs in up to 10 percent of individuals
- Care must be taken to not confuse the contralateral petrous apex for a mass.
- Signal characteristics in the contralateral petrous apex should mimic marrow signal
- In children red marrow can be present.
- In adults fatty marrow is expected.
- Normal trabecula can also be seen in the contralateral petrous apex.



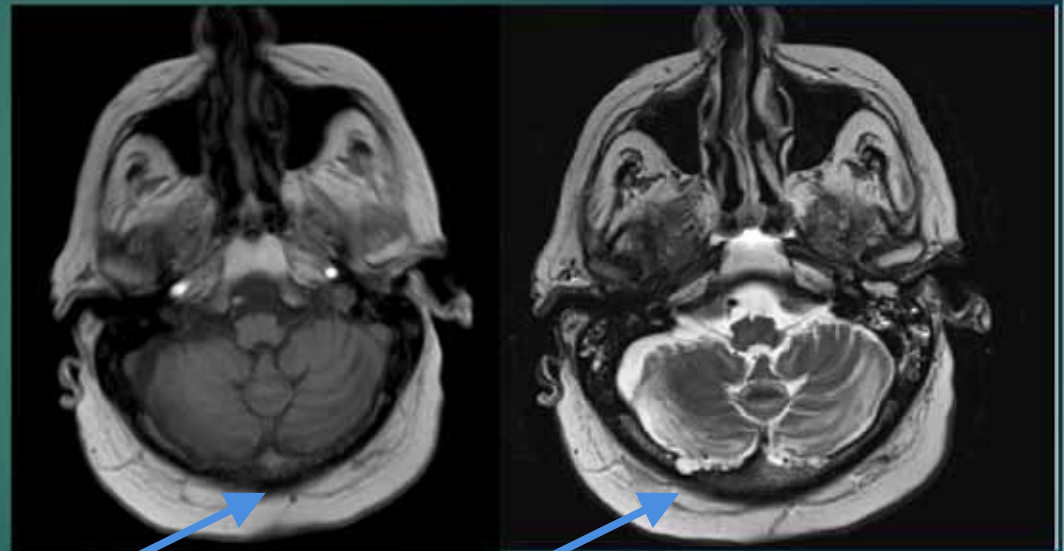
Asymmetric Pneumatization of the Petrous Apex

- The contralateral petrous apex can often be confused for a cholesterol granuloma in these cases.
- In the absence of a CT demonstrating trabeculae it can be useful to evaluate a fat saturated sequence.
- Cholesterol Granulomas will continue to demonstrate increased T1 signal on fat saturated images.
- Normal marrow should demonstrate loss of signal.
- Pneumatized petrous apices can sometime contain fluid (i.e. effusions)
- Imperative that these lesions lack bony remodeling.
- An effusion will have low T1 signal as opposed to a Cholesterol Granuloma.



Giant Arachnoid Granulations

- Giant Arachnoid Granulations are classified as greater than 1 cm
- These can often demonstrate unreliable signal characteristics on MRI.
- Nearly 80% are incongruent with fluid signal characteristics on MRI.
- CSF incongruent signal is seen on nearly 100% of FLAIR sequences in some studies.
- Most often there is incomplete FLAIR suppression.
- Giant Arachnoid Granulations often demonstrate higher T1 and T2 signal than CSF.



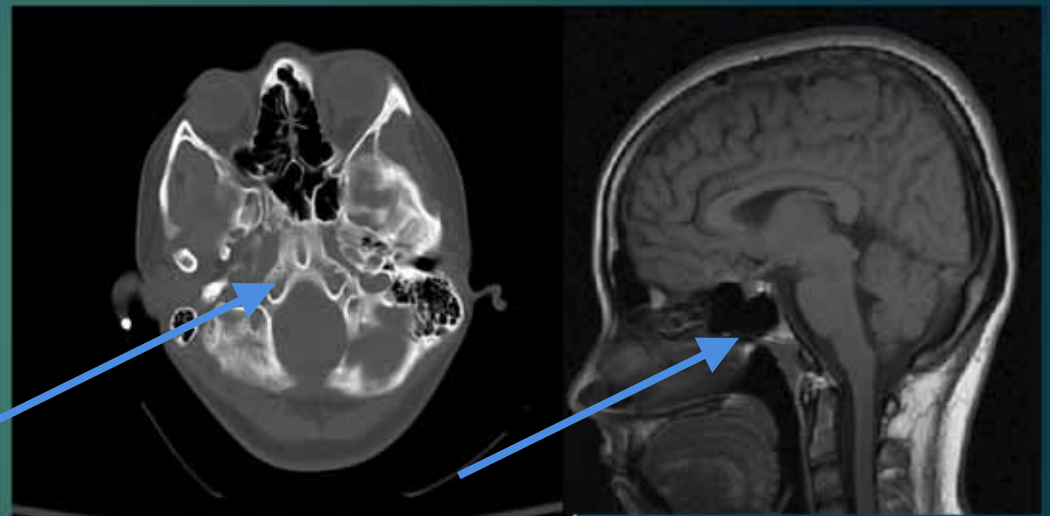
Giant Arachnoid Granulations

- Investigator have reported that the most reliable method for diagnosis is CT demonstrating CSF attenuation.
- Often found adjacent to dural venous sinuses, similar to Arachnoid Granulations.
- Often have an ellipsoid appearance.



Inferior Median Clival Canal

- Rare anatomic Variant
- Thought to represent a remnant of notochord which passes from the intracranial surface of the clivus to the retropharyngeal space.
- Usually 2mm in diameter.
- A coexisting cystic structure presumed to be a tornwaldt cyst had been described at the nasopharyngeal aspect of an inferior median clival canal.



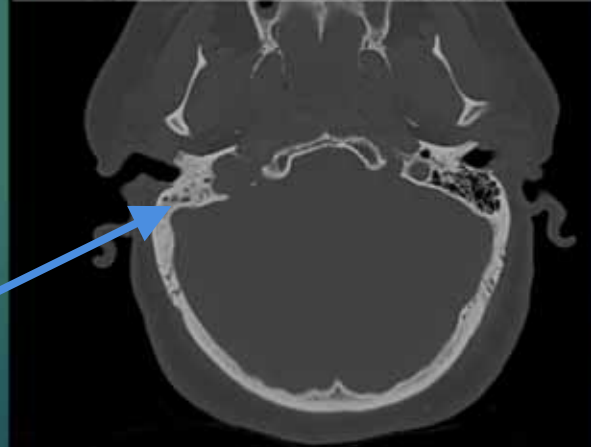
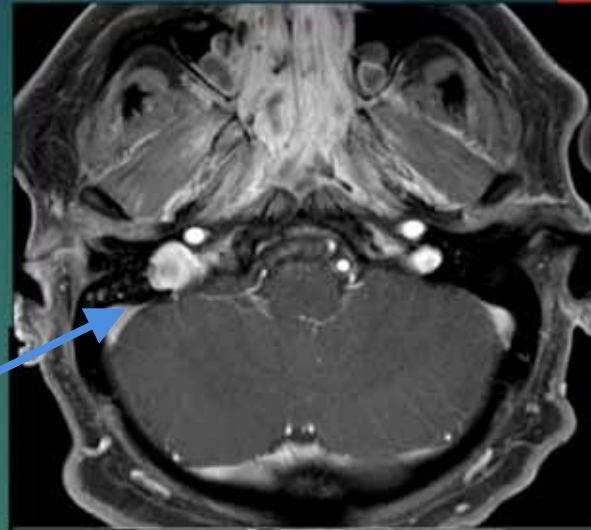
Asymmetric Enhancement of the Dural Venous Sinuses

- Asymmetric Anatomy - The right transverse sinus is larger than the left in most patients.
- Arachnoid Granulations - Can give the appearance of small filling defects in the dural venous sinuses . These can be characterized by their CSF signal characteristics
- Asymmetric flow - Can mimic thrombosis



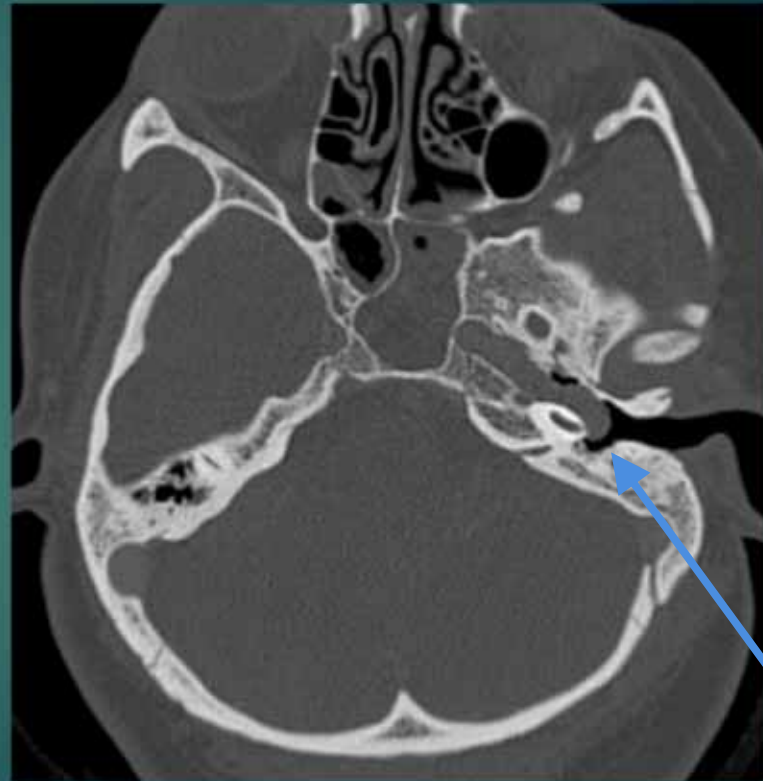
Dehiscent Jugular Bulb

- Defined as absence of the sigmoid plate between a high riding jugular bulb and the middle ear.
- Common cause of pulsatile tinnitus.
- Not to be confused with a glomus jugulare which should exhibit adjacent destructive bony changes.



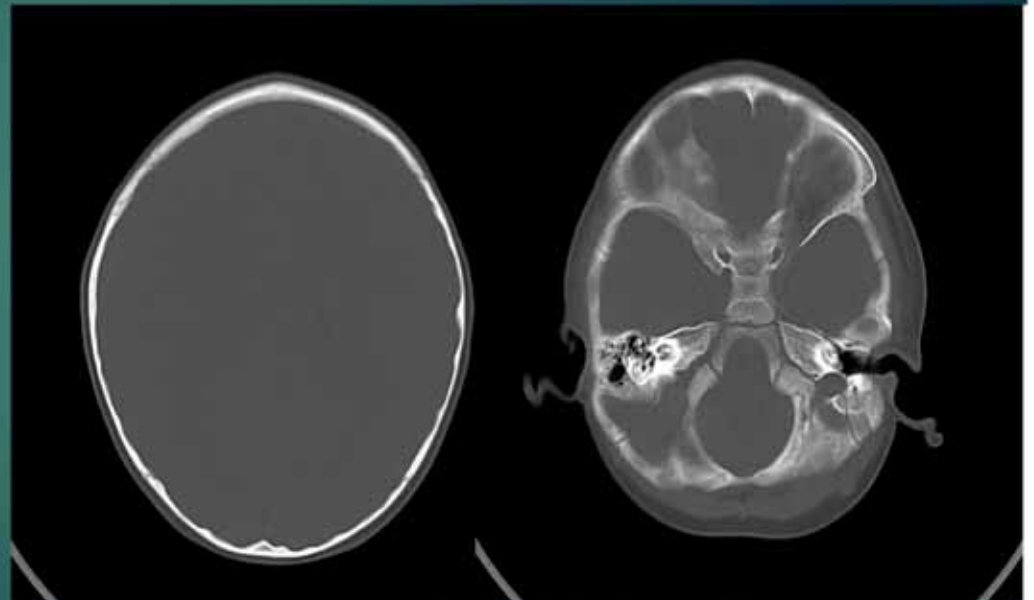
Aberrant Internal Carotid Artery

- Results from involution of the normal first cervical segment of the carotid artery.
- Results in enlargement of an artery that passes lateral to the cochlear promontory.
- Patients often have tinnitus
- Vascular mass on otoscopic examination
- Characterized by absent or hypoplastic or absent vertical segment of the ICA canal on CT
- More lateral and posterior course of the petrous portion on Angiography



Sutures in Children

- Calvarial sutures are sclerotic and interdigitate imparting increased strength.
- It is imperative to identify normal sutural and variant sutural anatomy (i.e. not confuse these for fractures.)
- Metopic suture: midline division of the frontal bones can persist into adulthood.
- Wormian bones: accessory sutures associated with lambdoid sutures
- Associated with a variety of systemic illnesses including:
 - Downs syndrome
 - Osteogenesis Imperfecta
 - Hypothyroidism
 - Rickets



Refereces

- Arrested Pneumatization of the Skull Base: Imaging Characteristics Kirk M. Welker, David R. DeLone, John I. Lane, and Julie R. Gilbertson American Journal of Roentgenology 2008 190:6, 1691-1696
- Lesions of the Petrous Apex: Classification and Findings at CT and MR Imaging Ahmed Abdel Razek and Benjamin Y. Huang RadioGraphics 2012 32:1, 151-173
- “Giant” Arachnoid Granulations Just Like CSF?: NOT!! C.R. Trimblea, H.R. Harsbergerb, M. Castilloc, M. Brant-Zawadzki, A.G. Osborn AJNR 2010 31: 1724-1728
- Alper F, Kantarci M, Dane S et-al. Importance of anatomical asymmetries of transverse sinuses: an MR venographic study. Cerebrovasc. Dis. 2004;18 (3): 236-9.
- Lohman BD, Sarikaya B, McKinney AM et-al. Not the typical Tornwaldt's cyst this time? A nasopharyngeal cyst associated with canalis basilaris medianus. Br J Radiol. 2011;84 (1005): e169-71. Br J Radiol (full text) - doi:10.1259/bjr/95083086