

OVERVIEW OF TEMPORAL BONE

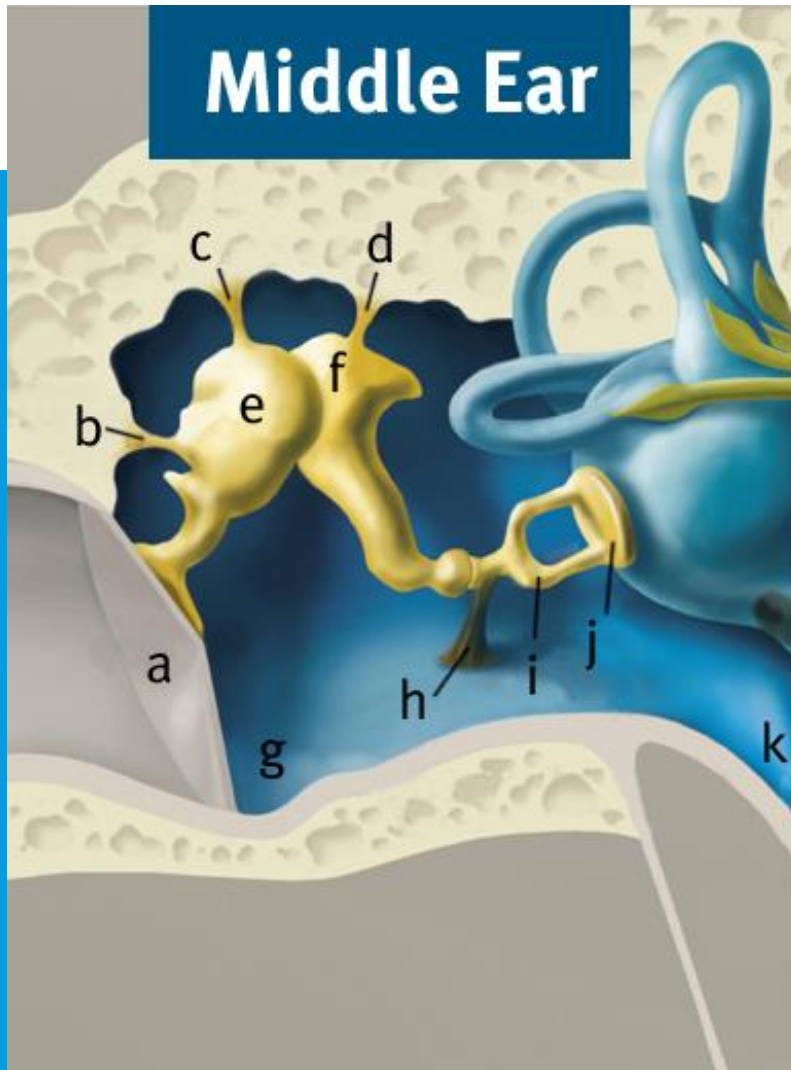
Siddhartha Gaddamanugu, M.D. Associate Professor
Department of Radiology | Neuroradiology Section
UAB | The University of Alabama at Birmingham

DISCLOSURES

- NONE

- Anatomy
- Common techniques
- Pathologies of middle ear with emphasis on cholesteatoma (will not cover inner ear)

Middle Ear



- a) Eardrum
- b) Lateral malleolar ligament
- c) Upper malleolar ligament
- d) Incudal ligament
- e) Malleus
- f) Incus
- g) Middle ear
- h) Stapedius muscle
- i) Stapes
- j) Stapes footplate and oval window
- k) Eustachian tube

Technical considerations

CT Temporal bone ;High resolution CT :0.6mm thin slices of skull base with coronal reformats. Can acquire Poschl's and Stenver's view.

Photon Counting CT –High spatial resolution(ossicle erosion)

MRI brain : high resolution DWI (Non echoplanar DWI)

CT angiography: Indicated in Pulsatile tinnitus.

Rare vascular anomalies: Aberrant internal carotid artery

PATHOLOGY

Inflammation/Infection- Cholesteatoma, Otitis

Neoplasm – Glomus tympanicum, Squamous cell

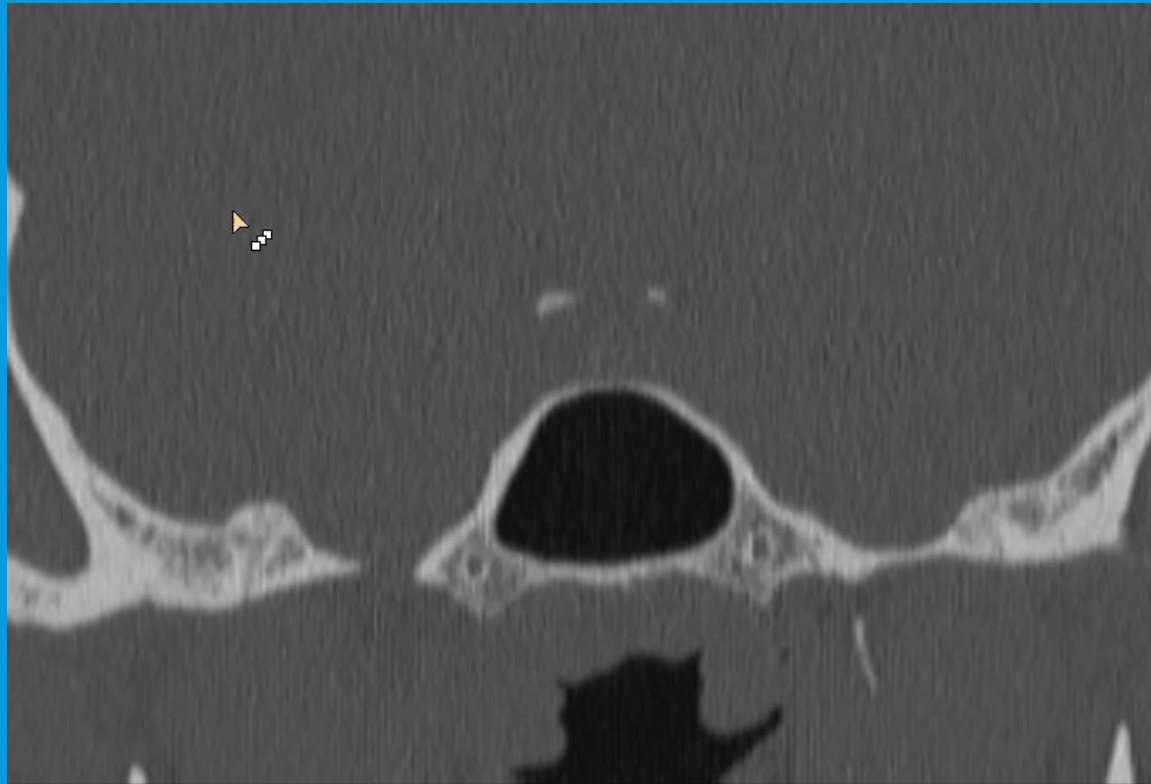
Developmental- Middle ear CSF leak

Vascular abnormalities- Aberrant ICA, dehiscent jugular

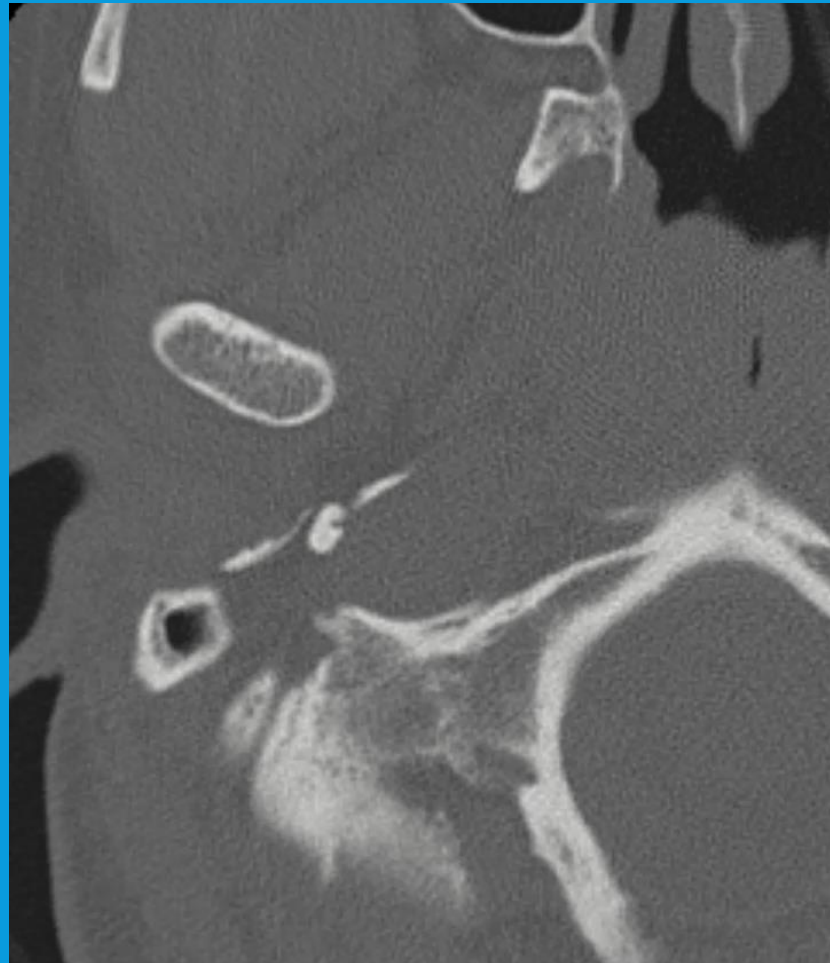
Unclear etiology- Otospongiosis

Trauma

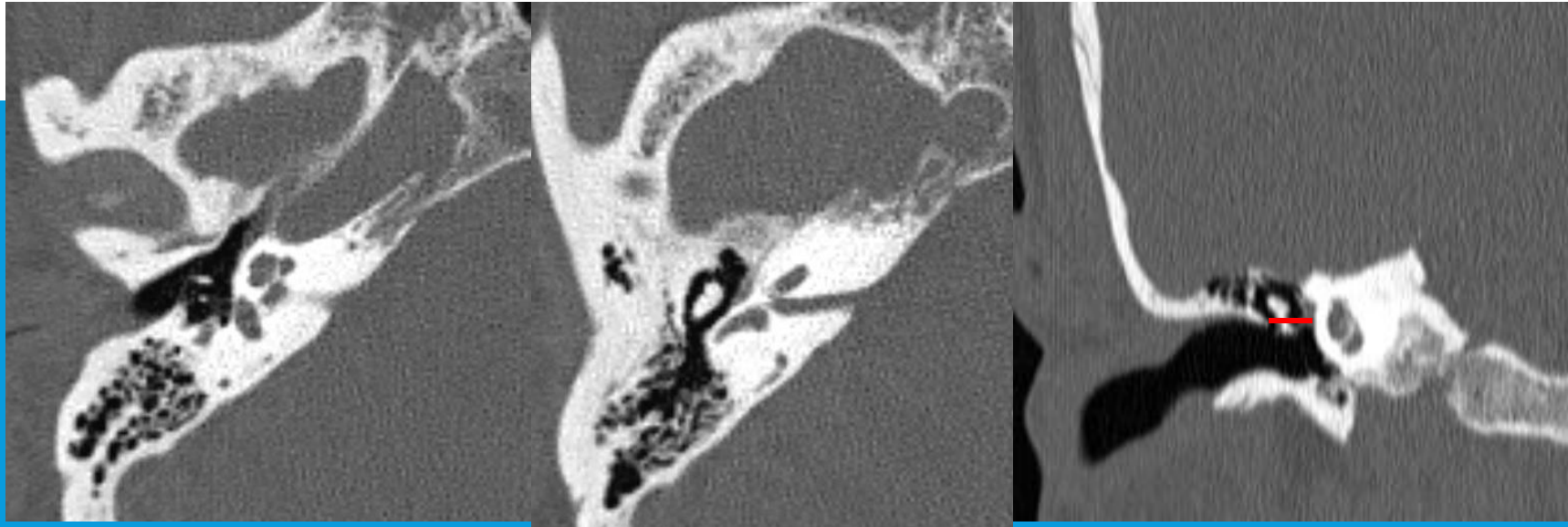
ANATOMY



ANATOMY



ANATOMY

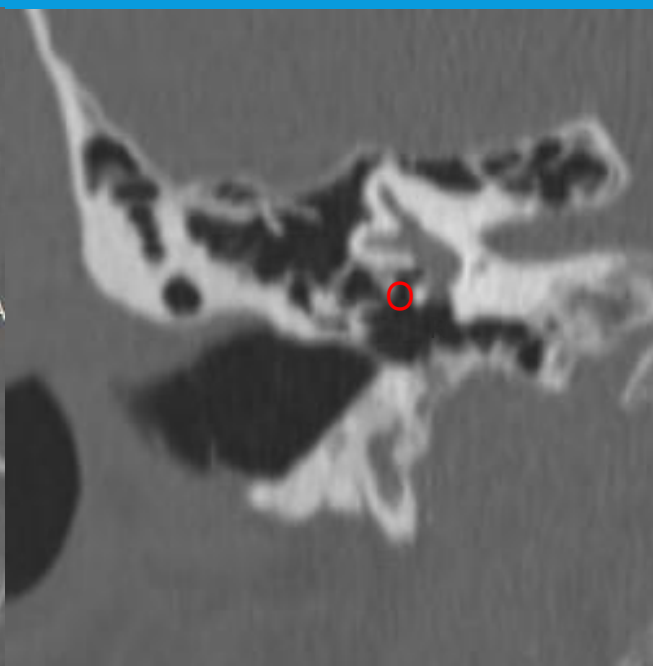
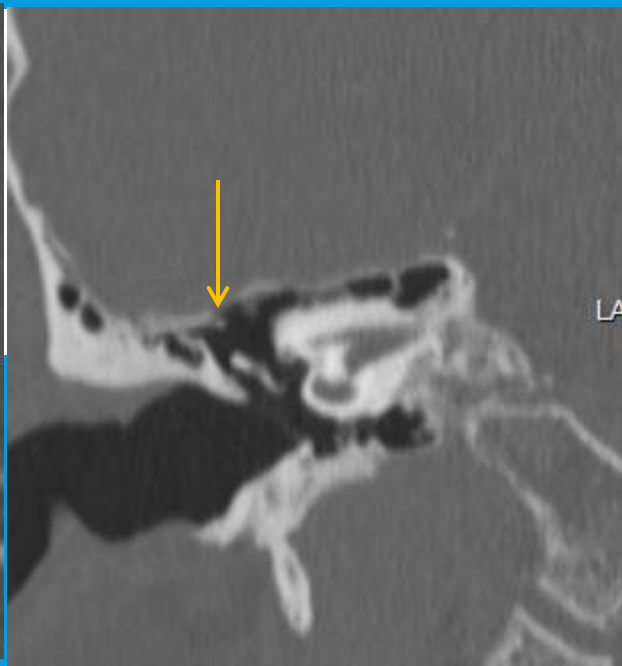
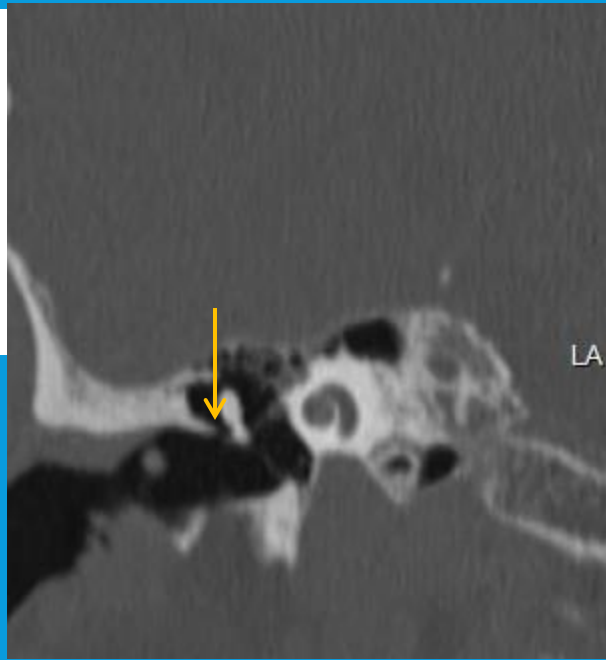


Middle ear cavity or
mesotympanum

Epitympanum

Mesotympanum contains all 3 ossicles

Epitympanum contains only incus and malleus



Check list on the coronal view

1. Prussak's space

2. Tegmen or roof of middle ear.

The oval window is superior to round window

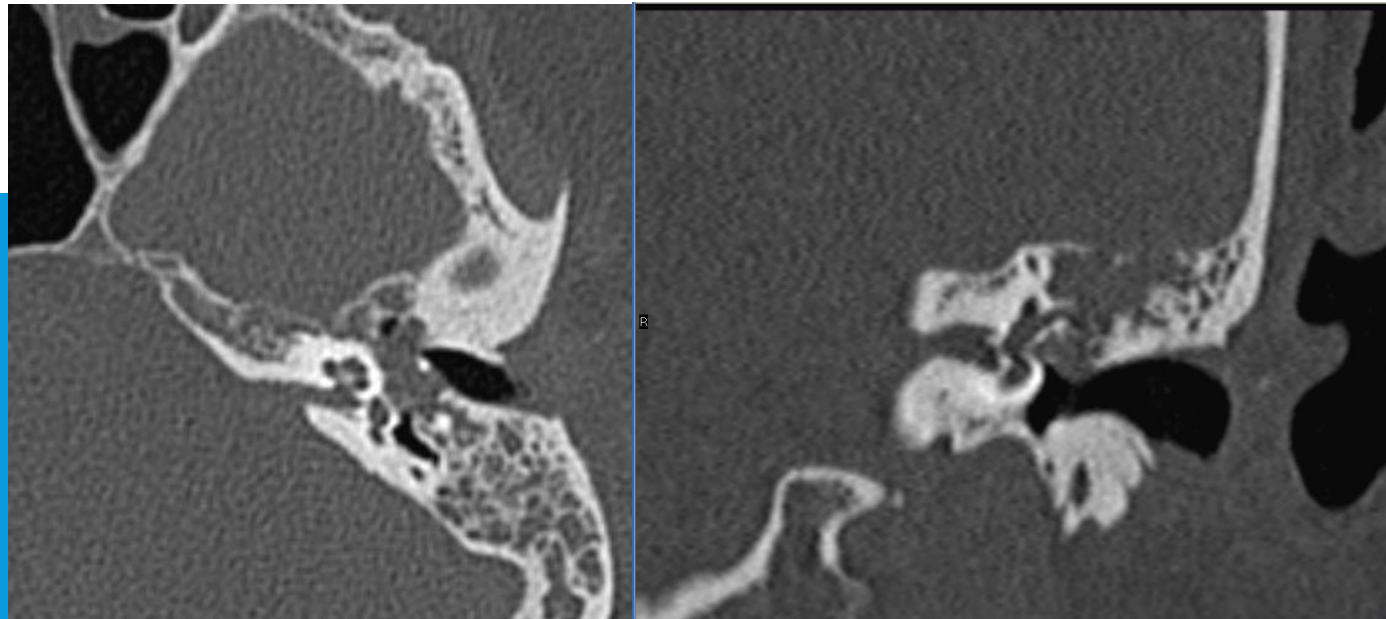


1. Where is the soft tissue in the right middle ear located?

2. Is there bony erosion ?

Diagnosis: Cholesteatoma

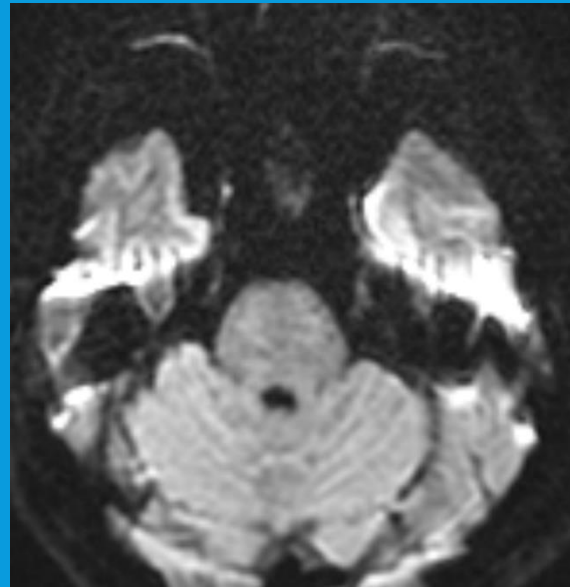
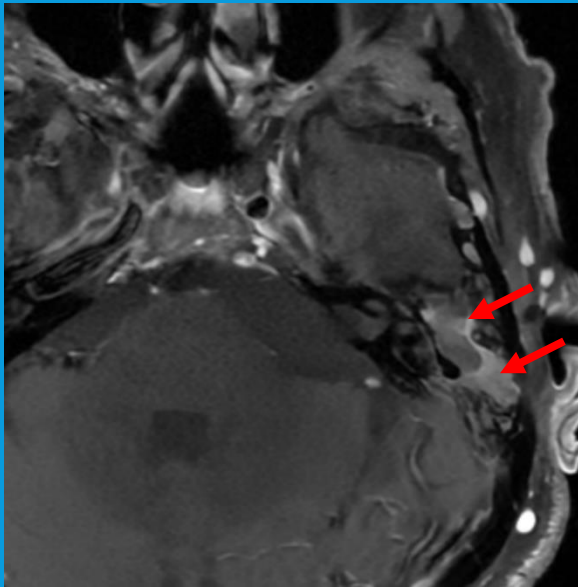
Cholesteatoma



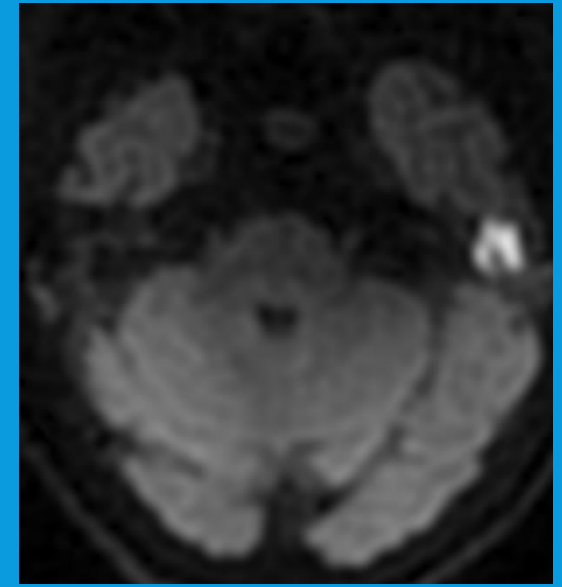
1. Ossicles: Incus common, cannot comment on Stapes erosion.
2. Tegmen: Remember the tegmen can be developmentally defective.

Consider : A secondary encephalocele

MR APPEARANCE OF CHOLESTEATOMAS -72 YR OLD WITH PRIOR LEFT MIDDLE EAR SURGERY



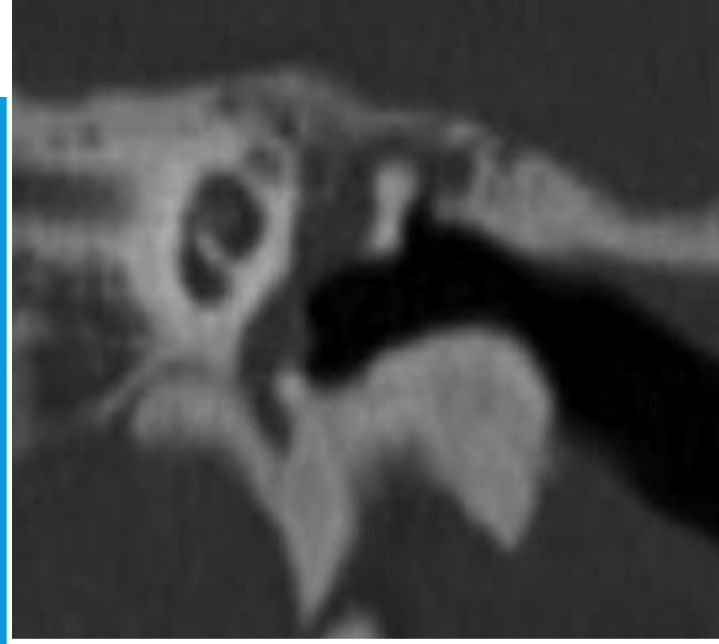
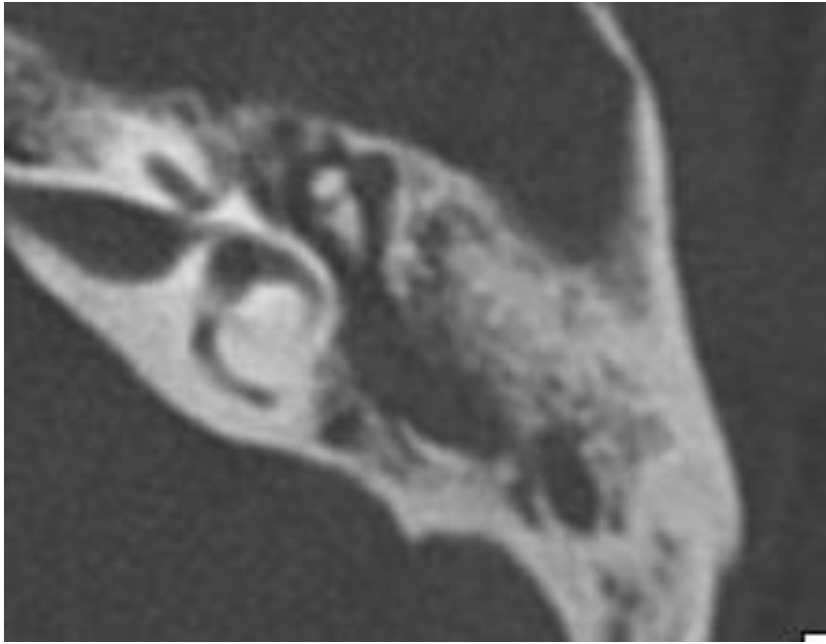
EPI DWI



NonEPI-Propellar DWI

ESR Essentials: imaging of middle ear cholesteatoma—practice recommendations by the European Society of Head and Neck Radiology Touska and Connor European Radiology (2025) 35:2053–2064

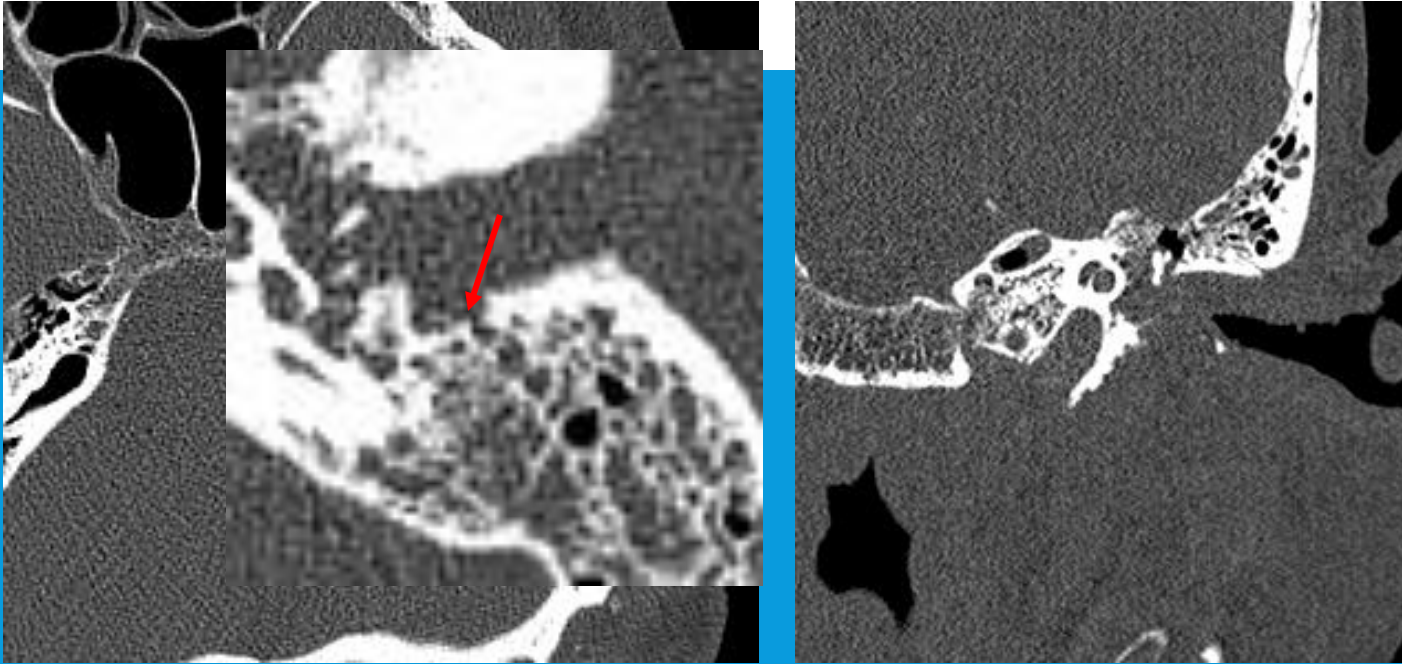
IS THIS CHOLESTEATOMA?



No bony erosion and the soft tissue is present throughout the middle ear cavity

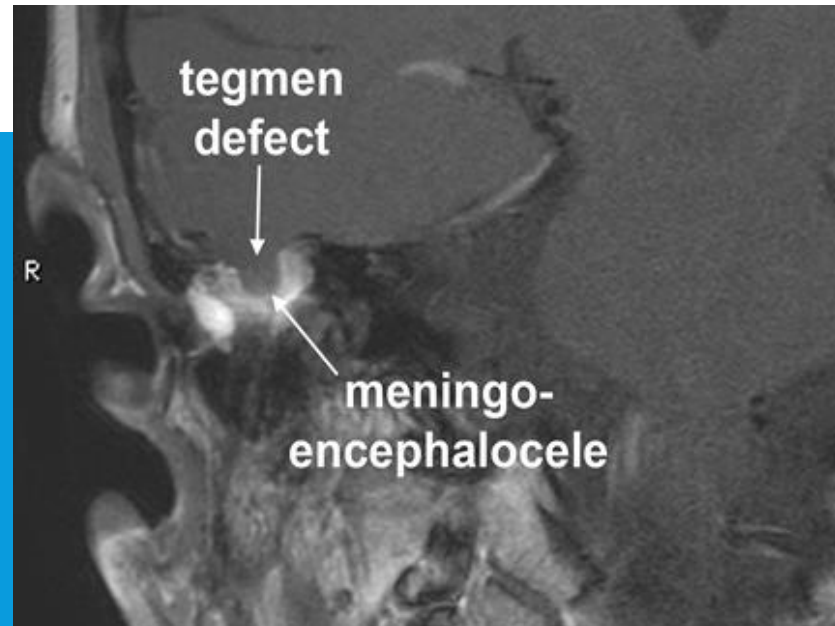
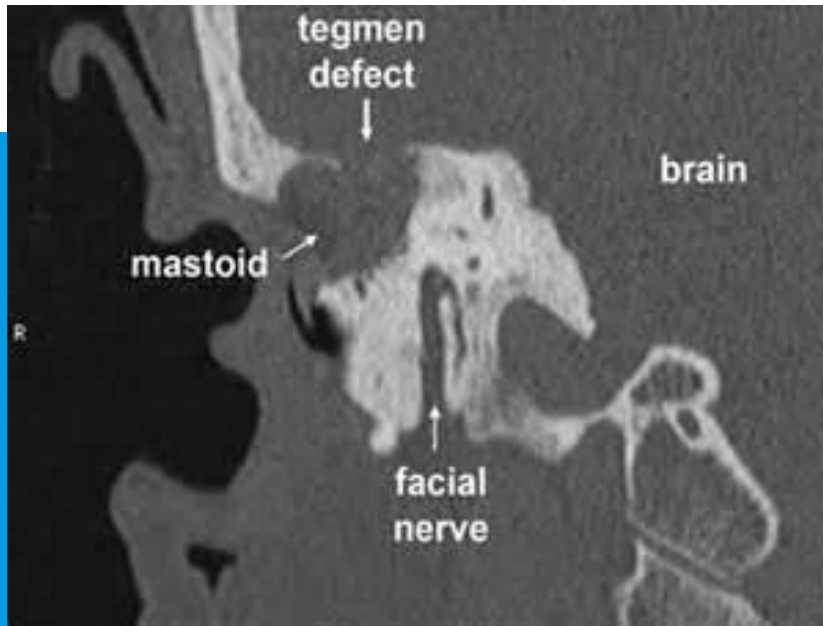
Otomastoiditis versus simple retained fluid

63-YEAR-OLD MALE WITH EAR DISCHARGE



Diagnosis: Malignant Otitis externa/ Skull base osteomyelitis

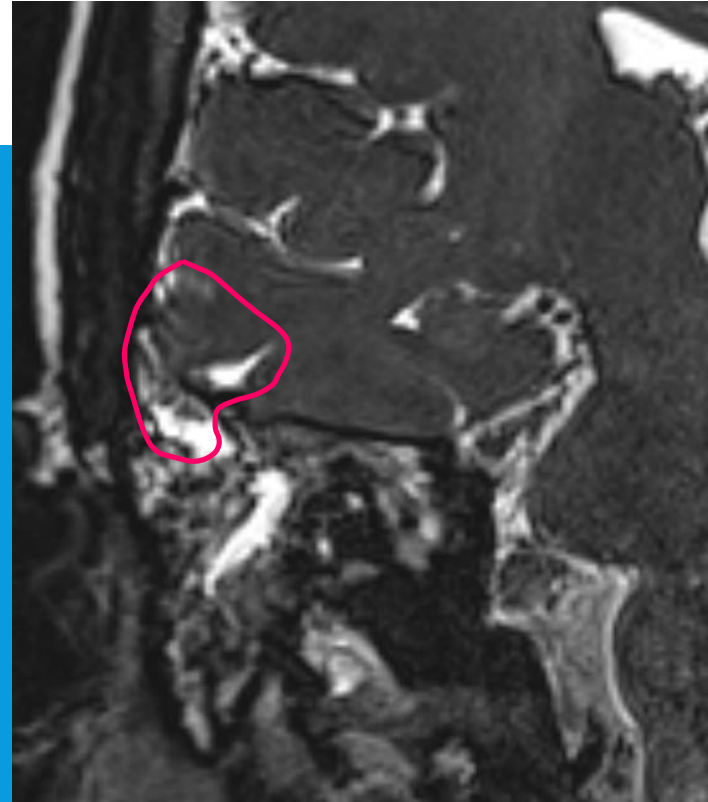
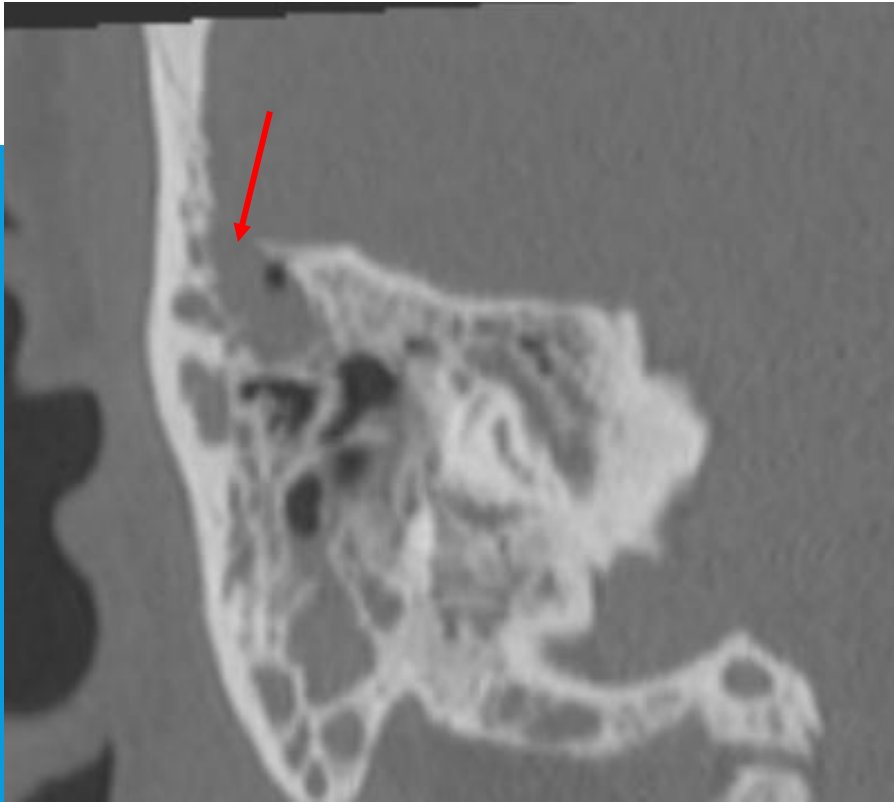
Temporal lobe encephalocele



Spontaneous or after trauma/surgery

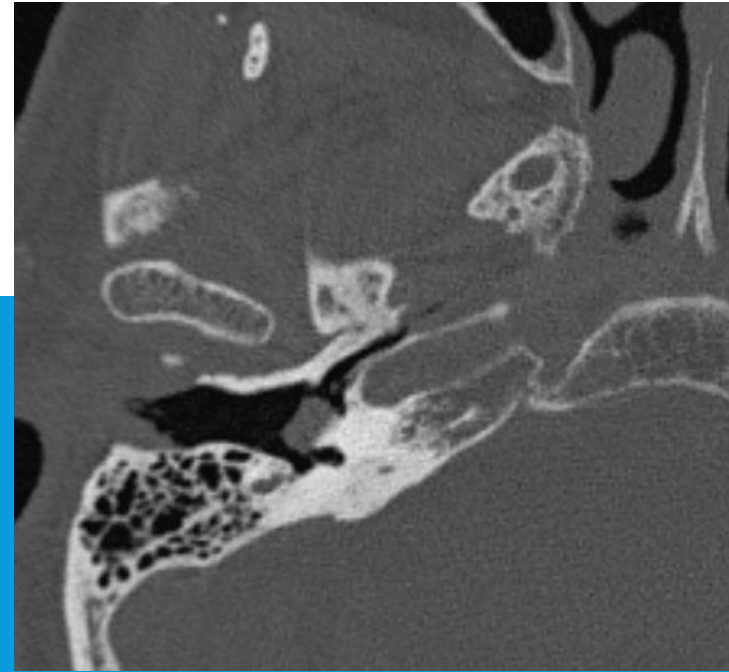
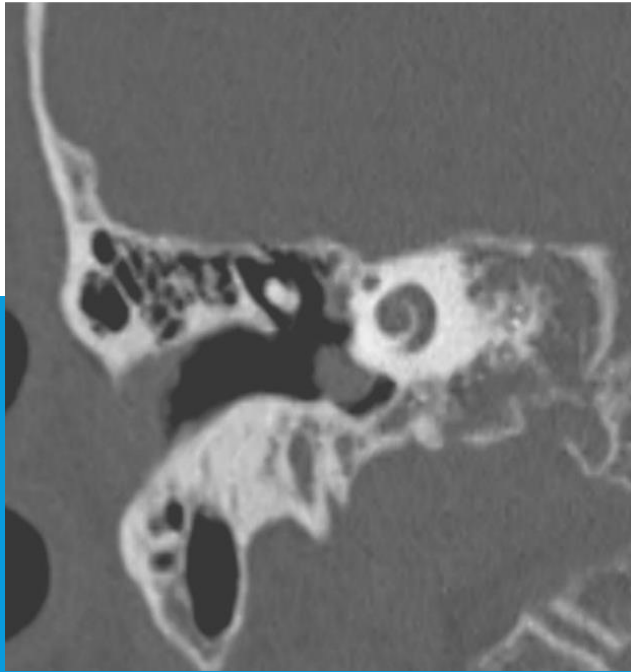
Causes CSF rhinorrhea or otorrhea ,and rarely meningitis and seizures

46-year-old with otorrhea- B transferrin positive



3D T2 Weighted images

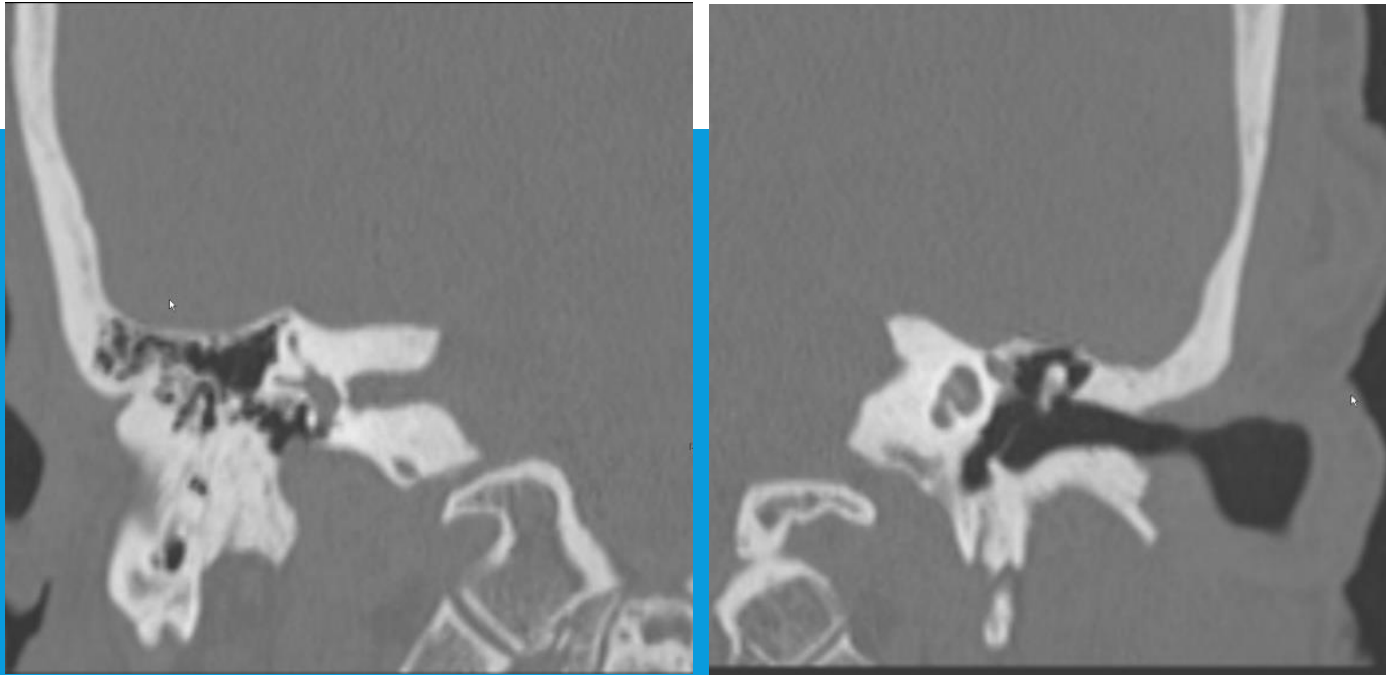
MRI features to aid the identification of lateral temporal bone cephaloceles British Journal of Radiology, Volume 96, Issue 1150, 1 October 2023, 20230014



Location at cochlear promontory ; characteristic of **glomus tympanicum**

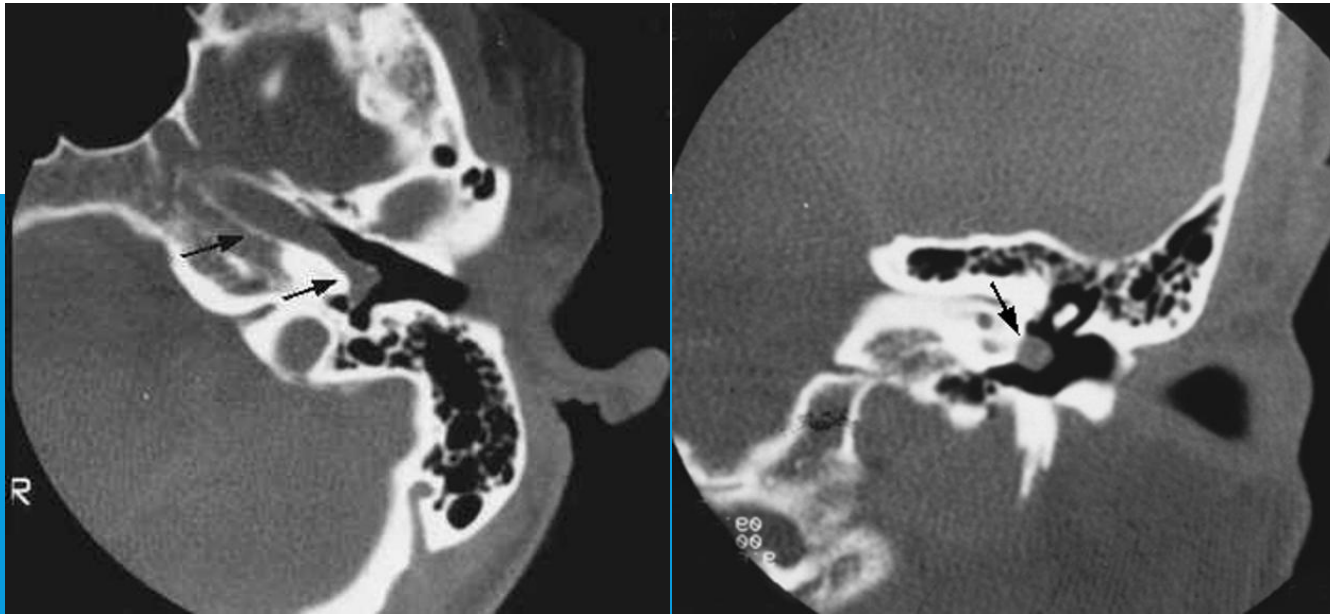
Other rare middle ear tumors; Facial nerve schwannoma, lipoma and middle ear adenoma

PULSATILE TINNITUS



Dehiscent sigmoid plate/jugular plate.

Asymptomatic and it requires appropriate recognition; DON'T TOUCH

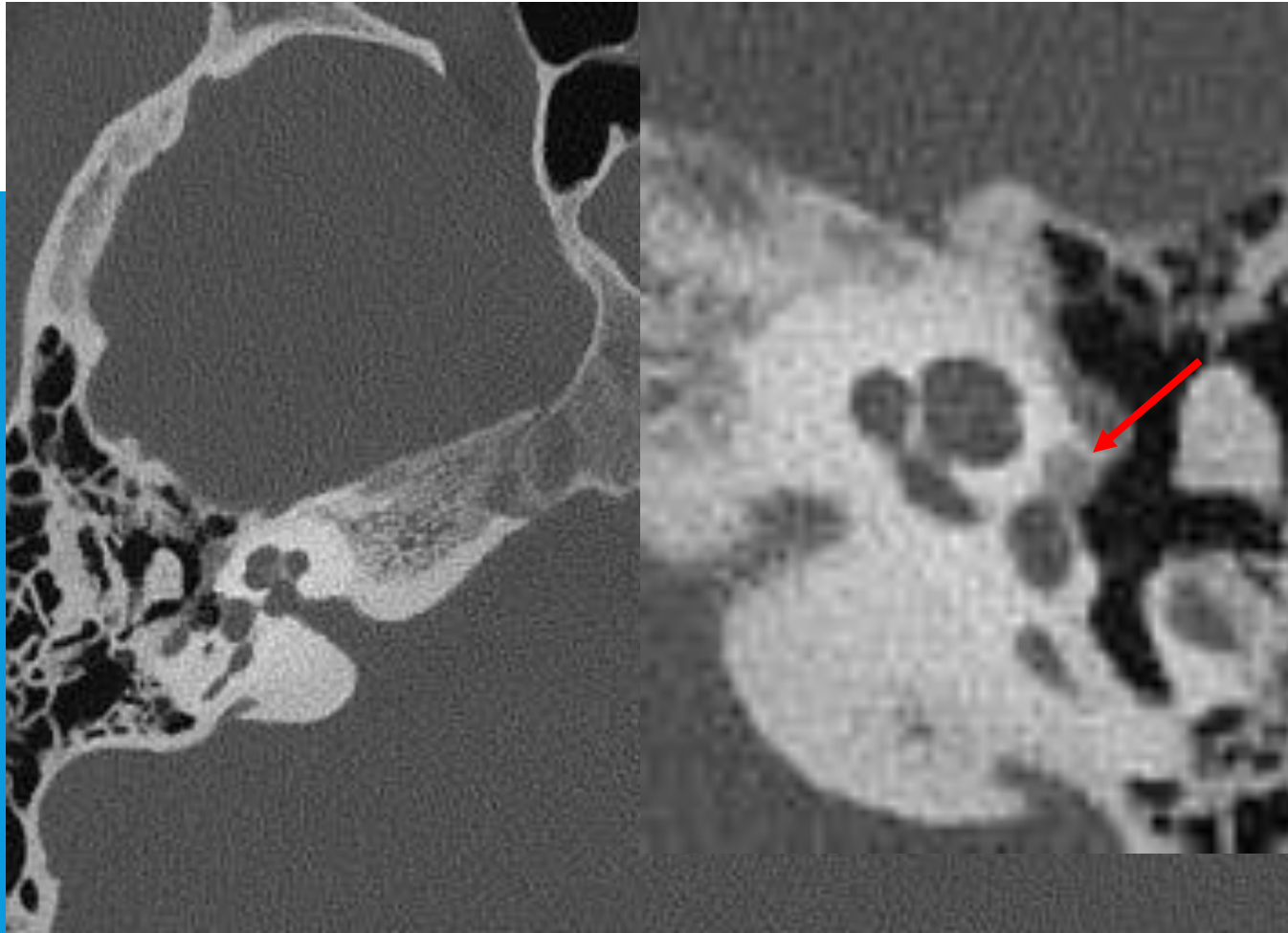


What is this vascular anomaly?

Aberrant internal carotid artery; can cause tinnitus.

Pathology: the cervical segment of the ICA fails to develop, and the middle ear course represent collaterals which reform the petrous ICA

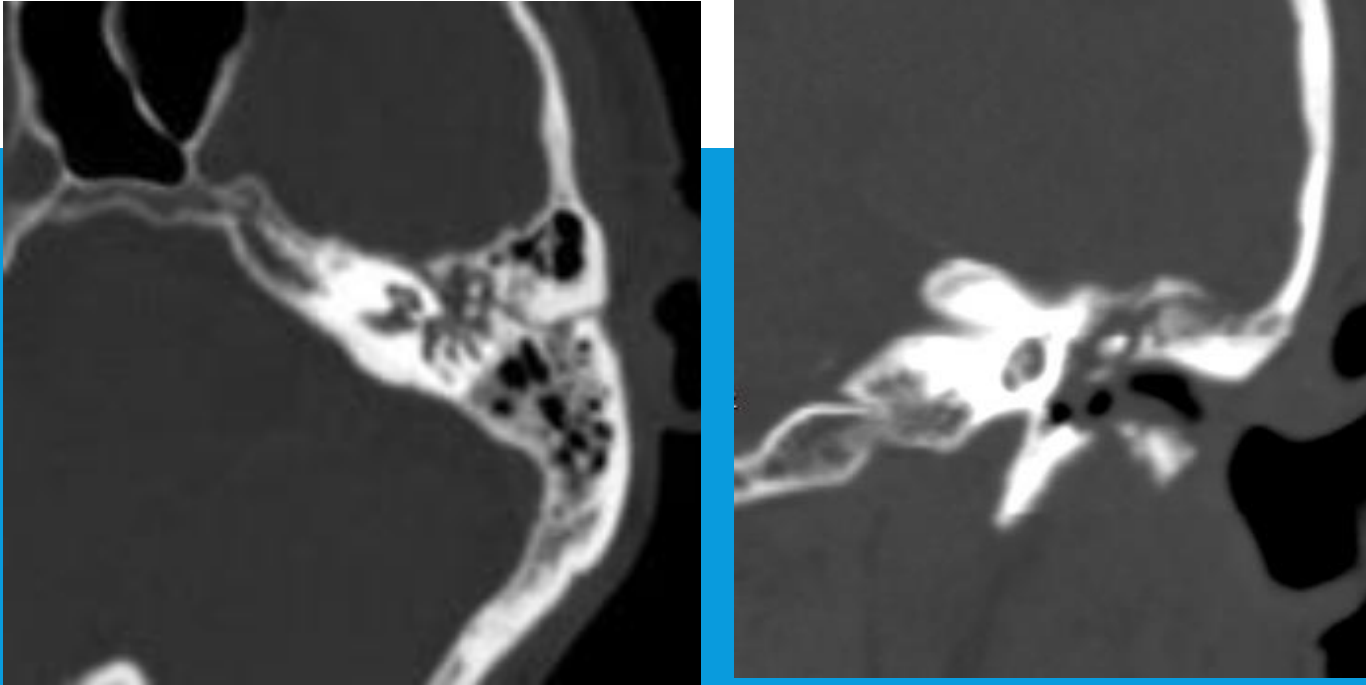
39-year-old woman with left sided conductive hearing loss



Diagnosis-Otospongiosis

Imaging of Conductive Hearing Loss With a Normal Tympanic Membrane AJR 2016; 206:49–56

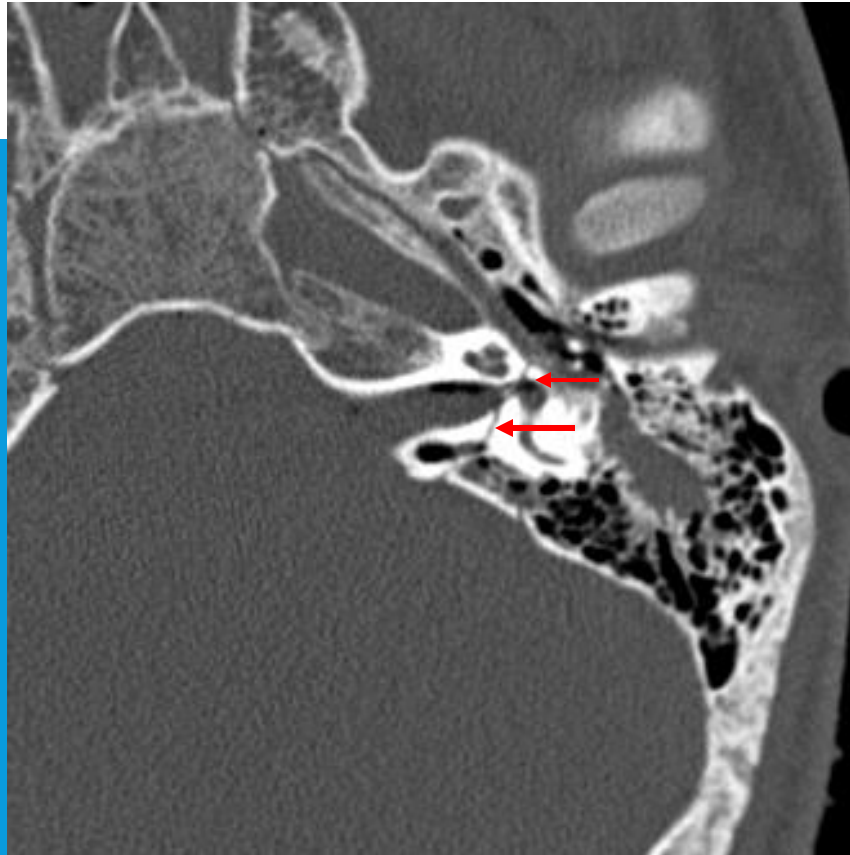
TRAUMA



Otic capsule sparing

Fluid in temporal bone trauma is usually blood or **CSF** especially if there is tegmen fracture.

TRAUMA



Fracture involving the inner ear; otic capsule violating.

THANKS FOR YOUR ATTENTION

