Differential Diagnosis of Temporal Bone and Skull Base Lesions

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Introduction

- Wide spectrum of diseases
  - Primary tumors, inflammatory processes, metastases
- Diagnosis improved with HRCT/MRI
- Location
- Imaging characteristics
Lesions of the Middle Ear and Mastoid

- **Cholesteatoma**
  - Not a true neoplasm (accumulation of keratin debris)
  - May be congenital or acquired
  - Diagnosis is usually clinical
Lesions of the Middle Ear and Mastoid

- Cholesteatoma
  - HRCT is of value in preoperative assessment
  - Erosion of scutum, antrum expansion, ossicular destruction, erosion of otic capsule or tegmen
  - MRI of limited use
Lesions of the Middle Ear and Mastoid

- **Paragangliomas**
  - Benign, slow growing tumors from paraganglionic tissue (neural crest)
  - Histology with “Zellballen”
  - Malignancy rare
  - Catecholamine production rare
  - May be multicentric
Lesions of the Middle Ear and Mastoid

- Paragangliomas
  - Most common neoplasm of middle ear
  - Glomus tympanicum
    - Originate on promontory of cochlea
    - Fill ME space and ossicles involved
    - May extend to hypotympanum and expose jugular or petrous carotid
    - Present with HL and pulsatile tinnitus and ME mass
  - Glomus jugulare
    - Arise in jugular fossa
    - Become large before symptomatic (multiple CN)
Lesions of the Middle Ear and Mastoid

- Paragangliomas
  - Brown sign
  - Aquino sign
  - Vernet syndrome
  - Bruits
  - Cavernous sinus involvement
Lesions of the Middle Ear and Mastoid

- Paragangliomas
  - HRCT
    - Bony spine between petrous carotid and jugular bulb
    - Excludes other lesions
    - Extend to assess multicentricity
    - Important for surgical planning
Lesions of the Middle Ear and Mastoid

- Paragangliomas
  - MRI
    - Identify intracranial extent
    - Delineate deep tissue extent and neurovascular structures involved
    - Salt and pepper pattern on T1-C weighted images
  - Angiography
Lesions of the Middle Ear and Mastoid
Lesions of the Middle Ear and Mastoid

- Vascular Variants
  - Asymmetric Jugular Bulb
  - High-riding Jugular Bulb
  - Dehiscent Jugular Bulb
  - Jugular Bulb Diverticulum
Lesions of the Middle Ear and Mastoid
Lesions of the Middle Ear and Mastoid

- Vascular Variants
  - Aberrant ICA
  - Persistent stapedial artery
Lesions of the Middle Ear and Mastoid

- Adenomas
  - Nonaggressive neoplasms in young adults
  - Arise from glandular elements of ME mucosa
  - ME mass with CHL
  - HRCT useful
Lesions of the Middle Ear and Mastoid

- Endolymphatic Sac Tumors
  - Aggressive papillary tumor of ME/mastoid
  - Usually SNHL
  - Von Hippel-Lindau
  - HRCT
    - Erosive mass- expansile
    - Calcifications
  - MRI
    - Speckled pattern
    - Flow voids
Lesions of the Middle Ear and Mastoid
Lesions of the Middle Ear and Mastoid

- Sarcomas
  - Most common TB malignancy in children
  - Chronic otorrhea and otalgia
  - Facial nerve paresis
  - Distant metastases
Lesions of the Middle Ear and Mastoid

- Metastatic Disease
  - Infrequent
  - Breast, lung, kidney, prostate, GI
  - Hematogenously
  - Mastoid and petrous apex most common
  - Variable imaging findings (usually irregular bony destruction)
Lesions of the Middle Ear and Mastoid

- Langerhans cell histiocytoses
  - Letterer-Siwe disease
  - Hand-Schuller-Christian disease
  - Eosinophilic granuloma
Lesions of the Petrous Apex and Clivus

- Anatomy
  - Petrous apex divided by IAC
  - AM- clivus
  - AS- floor of middle cranial fossa
  - Lateral- cochlea/labyrinth
  - IAC- posterior
Lesions of the Petrous Apex and Clivus

- Asymmetric pneumatization
  - CT recognizable
  - T1- hyperintense
  - T2- hypointense

- Giant air cells
  - Seen on HRCT
Lesions of the Middle Ear and Mastoid
Lesions of the Petrous Apex and Clivus

- **Cholesterol granulomas**
  - Most common lesion of the petrous apex
  - Negative pressure in lumen causes hemorrhage
  - Expansile lesion
  - Hearing loss, tinnitus, vertigo, facial twitching
- **HRCT**
- **MRI diagnostic**
  - T1 and T2 hyperintense
Lesions of the Petrous Apex and Clivus
Lesions of the Petrous Apex and Clivus

- **Primary cholesteatoma**
  - Arise from aberrant embryonic rests
  - HRCT
    - Expansile lesion, smoothly marginated
    - No enhancement
  - MRI – diagnostic
    - T1- hypointense
    - T2- hyperintense
Lesions of the Petrous Apex and Clivus
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Lesions of the Petrous Apex and Clivus

- **Effusions**
  - Can develop in petrous apex due to ETD, URI, barotrauma
  - **HRCT**
    - Soft tissue without bony destruction
  - **MRI**
    - T1- hypointense
    - T2- hyperintense
Lesions of the Petrous Apex and Clivus
Lesions of the Petrous Apex and Clivus

- **Petrinous apicitis**
  - Acute form is usually rapid and may progress to Gradenigo’s syndrome
- **MRI**
  - T1- low intensity
  - T2- high intensity
  - Marked enhancement
- **HRCT**
  - Expansile lesion with irregular margins
  - Bony destruction
Lesions of the Petrous Apex and Clivus
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Lesions of the Petrous Apex and Clivus

- **Skull Base Osteomyelitis**
  - Usually after chronic OE in diabetics or immunocompromised
  - HRCT
    - Soft tissue density
    - Demineralization
    - Irregular lytic lesions
  - MRI
    - Increased signal on T2
    - Enhancement
  - Technetium/Gallium
Lesions of the Petrous Apex and Clivus

- Aneurysms
  - Congenital weakness of the petrous portion of carotid
    - Trauma/infection
  - MRI
    - Complex with flow voids
    - May require angiography
- HRCT
  - Smoothly marginated bone eroding lesion
  - Contrast possibilities
Lesions of the Petrous Apex and Clivus

- Chondrosarcoma
  - Arises from embryonic rests of cartilage at foramen lacerum and petrous apex
  - Headaches and multiple cranial neuropathies
  - HRCT
    - Irregular bone destruction
    - Enhances
    - Calcifications (popcorn)
  - MRI
    - Enhances markedly with gadolinium (chordomas)
Lesions of the Petrous Apex and Clivus
Lesions of the Petrous Apex and Clivus

- **Chordomas**
  - Low grade malignancy
  - Remnant of notocord
  - Headache, diplopia, and visual deficits
  - Physaliphorus cells ("soap bubble")
- **HRCT**
  - Erosive soft tissue mass at clivus and occiput
- **MRI**
  - Enhances markedly with gadolinium
  - Resembles chondrosarcoma
Lesions of the IAC, CPA, and Skull Base

- Epidermoids
  - Ectodermal rests usually in CPA
  - Enlarge insidiously
  - SHNL, dysequilibrium, tinnitus, facial paresis
  - HRCT
    - Well-defined homogenous mass
    - Possible calcifications
  - MRI- diagnostic
    - T1- hypointense
    - T2- hyperintense
    - No enhancement
Lesions of the IAC, CPA, and Skull Base

- Schwannomas
  - Arise from sheaths of cranial nerves
  - Vestibular, facial, trigeminal, jugular
  - Varied presentation
- HRCT
  - Inhomogeneous enhancement
  - Smooth mass effect
- MRI – definitive diagnosis
  - T1- low intensity
  - Marked enhancement with gadolinium on T1
Lesions of the IAC, CPA, and Skull Base
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Lesions of the IAC, CPA, and Skull Base

- **Meningiomas**
  - Arise from arachnoid layer of meninges
  - Variable presentation
  - **MRI**
    - T1- low intensity
    - Marked enhancement with gadolinium on T1
    - Signal voids (calcium)
    - Dural tail or flare
  - **HRCT**
    - Isodense to hyperdense
    - Homogeneous enhancement
    - Calcifications
Lesions of the IAC, CPA, and Skull Base

- Lipomas
  - Similar presentation to acoustic schwannomas
  - MRI – diagnostic
    - T1- high intensity
    - T2- low intensity
    - No further enhancement with gadolinium on T1 because nearly saturated
Case Study

- 21 yo bf present s to clinic with complaint of “drainage from left ear”
Case Study

- 21 yo bf presents to clinic with complaint of “drainage from left ear”
- Pain in left ear, behind left eye and forehead, developed double vision
- Experienced fevers, chills, N/V
- Swelling in left face
- Similar episode one month prior- no money for Abx
Case Study

- PMH: ear infections “all life”, no hospitalizations
- PSH: none
- Meds: castor oil left ear, Tylenol
- SH/FH: N/C
- ROS: N/C
Case Study

- Temp = 102, VSS
- Gen - toxic appearing
- Eye - left eye with chemosis/injection, lateral rectus palsy
- Ear - left TM with large perf with green discharge, Weber to left, AC=BC
- Neck - small lad in posterior triangle
- Neuro - nuchal rigidity
- Remainder unremarkable
Case Study

- Labs: WBC = 19.3 with left shift
Case Study
Case Study
Case Study
Case Study