Imaging of the Cerebellopontine Angle

Ted Mau, Harvard Medical School Year IV
Gillian Lieberman, MD
Introduction

The cerebellopontine angle (CPA) is an area of the basal cistern found at the junction of the pons, medulla, and cerebellum. Radiological assessment of the CPA is often requested by otolaryngologists in the setting of sensorineural hearing loss (SNHL). By the time the radiologist receives the consult, the otolaryngologist has most likely already narrowed the differential for SNHL to retrocochlear, or neural etiologies based on the history and physical exam. The task of the radiologist is then to assess for the presence of anatomical retrocochlear lesions and to identify them based on their radiologic appearance. This presentation examines two cases of SNHL with different radiologic findings.
Patient 1

69 yo female presents with hearing loss in the left ear. Clinical otoneurologic evaluation localizes the defect to the retrocochlear portion of the acoustic pathway. Radiologic evaluation is requested.

What is the appropriate imaging modality?
SNHL suspected of sensory, or cochlear etiology should be first evaluated with CT because the cochlea is encased in a bony structure. CT can often provide the definitive diagnosis for anatomical defects of the cochlea (e.g. Mondini deformity).

SNHL suspected of neural, or retrocochlear etiology should be evaluated with MR. MR is the method of choice for evaluating tumors in the CPA, the most common cause of retrocochlear SNHL. MR also provides superior definition of the cranial nerves that pass through the CPA.
Patient 1- MR Study

Pre- and post-contrast T1- and T2- weighted MR images of the head were obtained.

(Note: Gadolinium is routinely used in CPA imaging because it allows the identification of small tumors that may not be otherwise easily identified with non-enhanced images.)

Post-gadolinium T1-weighted axial and sagittal images are shown on the next slide.
Post-gadolinium T1-weighted images
There is a 1.5 cm mass with low to intermediate signal on T2 (not shown), decreased signal on T1 (not shown), and strongly enhancing on this post-contrast T1-weighted image.
The mass is partly within the left porus acusticus (internal auditory canal) as evidenced by the tail extending into the canal. However, most of the mass is extracanalicular in the CPA cistern and pressing upon the brain stem.
Note that 1. the extracanalaricular portion of the mass is roughly spherical (rather than hemispherical), roughly centered over the porus, and 2. the overall mass has an ice cream cone appearance, with the intracanalaricular portion as the cone.
10

Patient 1: Radiologic Diagnosis

This appearance of the tumor is most consistent with an **acoustic schwannoma**.

An acoustic schwannoma arises from the Schwann cells of usually the vestibular division of CN VIII within the internal auditory canal (IAC).
Patient 1: Acoustic Schwannoma

- accounts for 60-90% of all CPA tumors
- majority of lesions occur in patients 40-60 years of age
- causes clinical symptoms by pressure effect on the cochlear and vestibular divisions of CN VIII (SNHL, tinnitus, disequilibrium)
- DDx: vestibular neuritis, meningioma, cholesteatoma
- this is a benign, slow growing tumor that is usually followed with MRI at 6-12 months in patients with stable clinical symptoms before surgical intervention is instituted
Patient 1: Teaching Point

Note that the acoustic schwannoma arises from within the IAC and extends into the CPA cistern, giving rise to the ice cream cone appearance. A smaller tumor would appear as a cylindrical mass totally contained within the IAC.

Patient 2 will illustrate a similar appearing tumor with a different identity.
Patient 2

61 yo male who initially presented with hearing loss in the right ear. Clinical neurotologic evaluation localized the defect to the retrocochlear portion of the acoustic pathway.

Post-gadolinium T1-weighted axial and sagittal images are shown on the next slide.
Post-gadolinium T1-weighted images
There is a 1.6 cm enhancing mass within the right CPA with a fairly broad base and extending into the IAC.
Compare this mass with the acoustic schwannoma seen in Case 1. This mass is more hemispheric than spheric. It is also eccentric to the porus (IAC).
Patient 2: Radiologic Diagnosis

This is a recurrent CPA meningioma. The patient had an operation to partially remove the tumor 15 years prior. This is a follow-up study.

A meningioma arises from the endothelial cells within the arachnoid villi. It therefore more often initiates in the CPA cistern and may grow into the IAC (as opposed to the acoustic schwannoma, which starts within the IAC and grows into the CPA).
Patient 2: CPA Meningioma

• accounts for 7-15% of all CPA tumors, a distant second to the acoustic schwannoma
• clinical symptoms tend to be more related to increased pressure on the posterior fossa, i.e. headaches. Hearing tends to be normal.
• DDx: Acoustic schwannoma, cholesteatoma
• this is also a benign, slow growing tumor that can be treated with a combination of surgical excision and radiotherapy
Characteristic Radiologic Appearance of CPA Tumors

Acoustic Schwannoma
- spherical mass centered to porus
- acute bone-tumor angle

CPA Meningioma
- hemispheric mass eccentric to porus
- obtuse bone-tumor angle
- broad dural base

*For diagrammatic depiction see the Temporal Bone chapter in Head and Neck Imaging, 2nd Ed. by Som and Bergeron.
Unknown Case: What’s your diagnosis?
The ice cream cone appearance is consistent with an acoustic schwannoma.
References

*The authoritative comprehensive text on head and neck imaging.*

- **Head and Neck Imaging**, Harnsberger, H.R., in the Handbooks in Radiology series. 1990  
*Excellent pocket introductory text in outline format.*

*100 cases of common problems encountered in head and neck MRI.*