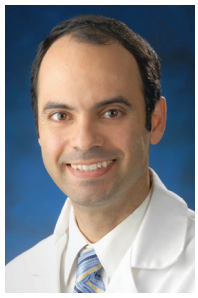


Symptom: Asymmetric Hearing Loss

By Hamid R. Djalilian, MD

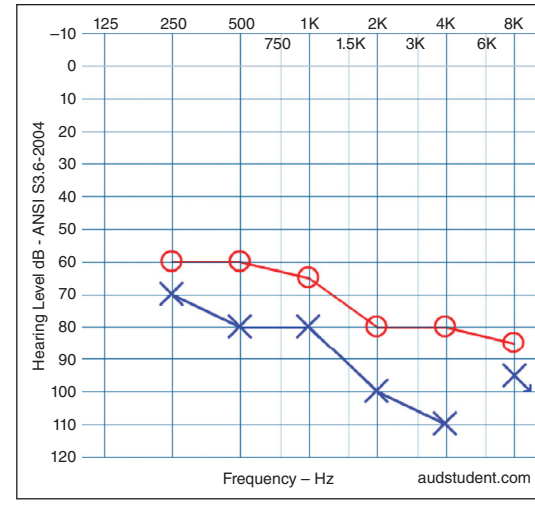
A 75-year-old man comes in for a hearing evaluation. In the last five years, his hearing has declined, he says. Subjectively, he feels that his hearing is better in his right ear, and he has difficulty understanding his children and grandchildren.

He does not have vertigo or tinnitus, he says. He occasionally feels dizzy when he gets up quickly or tries to make a quick turn, and he nearly fell once.

The patient worked as an accountant and has never shot a gun nor attended a concert. He neither takes medication nor has ever had surgery. His audiogram is shown on the right.

What is your next step? See p. 10.

Dr. Djalilian is the director of neurotology and skull base surgery and associate professor of otolaryngology and biomedical engineering at the University of California, Irvine.



The patient reported hearing loss, with better hearing in the right ear. His audiogram is shown here.

Diagnosis: Meningioma

By Hamid R. Djalilian, MD

Continued from p. 8

The patient's audiogram shows a moderately severe to severe sensorineural hearing loss on the right. Even though the hearing loss is significant on that side, there is asymmetry, with even worse hearing loss on the left. Asymmetric hearing loss has been defined as a difference of 15 dB between the right and left ears at three contiguous frequencies.

No matter the degree of loss, asymmetric hearing loss requires further evaluation. Generally, this workup includes auditory brainstem response (ABR) testing or MRI. While ABR testing has the advantage of a much lower cost compared with MRI, its sensitivity also is a lot lower for small tumors.

The patient's MRI, which is shown in figure 1, reveals a large cerebellopontine angle tumor on the side of the asymmetric loss. The most common tumor in the cerebellopontine angle is a vestibular schwannoma.

A vestibular schwannoma, also known as an acoustic neuroma, is a tumor of the vestibular nerve that gradually grows and compresses the cochlear nerve, leading to asymmetric hearing loss.

MENINGIOMA OR ACOUSTIC NEUROMA

While vestibular schwannomas are the most common tumor in the cerebellopontine angle, meningiomas also can occur in that area.

Given their tendency to spread along the dura and ability to invade bone, meningiomas have a higher likelihood of recurrence after resection.

Meningiomas are tumors that originate from the dura, which is the tough layer that covers the brain. The seventh and eighth cranial nerves pierce the dura and enter the internal auditory canal to reach the inner ear.

The dura adheres to the temporal bone and is inside the internal auditory canal. When the dura of the internal auditory canal is the source of a meningioma, the tumor has a very similar appearance on imaging to an acoustic neuroma starting in the internal auditory canal.

However, a few signs set apart meningiomas from acoustic neuromas on imaging. For example, since a meningioma originates on the dura, it tends to spread along that thick membrane. This pattern results in the appearance of the tumor's leading margin along the dura, creating a dural tail.

In addition, meningiomas tend to cause calcification and sometimes invade surrounding bone. On the other hand, acoustic neuromas tend to grow slowly and expand the internal auditory canal without invading the bone or causing calcification.

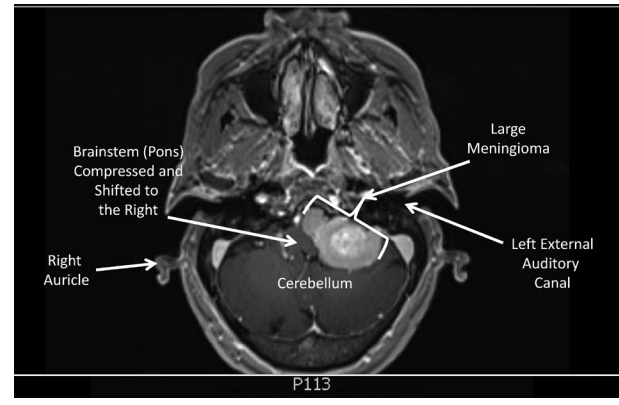


Figure 1. This axial T1-weighted post-gadolinium enhanced image shows a large meningioma of the left cerebellopontine angle that is compressing the brainstem, shifting it to the right.

The World Health Organization classifies meningiomas based on their histology. Grade I is considered low grade, and grades II and III are considered more aggressive. People with a history of head trauma or radiation to the head have a higher risk for meningioma development.

Heavy cell phone use (896 hours or more) has been associated with increased incidence of meningioma (odds ratio of 2.57). Regular cell phone use was not associated with a higher risk of tumor development.

Meningiomas of the cerebellopontine angle are treated the same way as vestibular schwannomas. Patients are given the options of observation, stereotactic radiosurgery, and surgical resection.

Given their tendency to spread along the dura and ability to invade bone, meningiomas have a higher likelihood of recurrence after resection. Patients need long-term surveillance in order to ensure a recurrence has not occurred.

PRESERVING HEARING AND FACIAL FUNCTION

Our patient had a meningioma. He was experiencing headaches and had developed mass effect on the brainstem.

The large size of the tumor—4 c.m.—meant that it was not amenable to stereotactic radiosurgery. Usually, tumors larger than 3 c.m. in the cerebellopontine angle are not radiated because of the edema that occurs in the tumor after radiation.

That additional edema may cause a blockage of the fourth ventricle, which is part of the communication system between the cerebrospinal fluid in the brain and the spine. Fourth ventricle

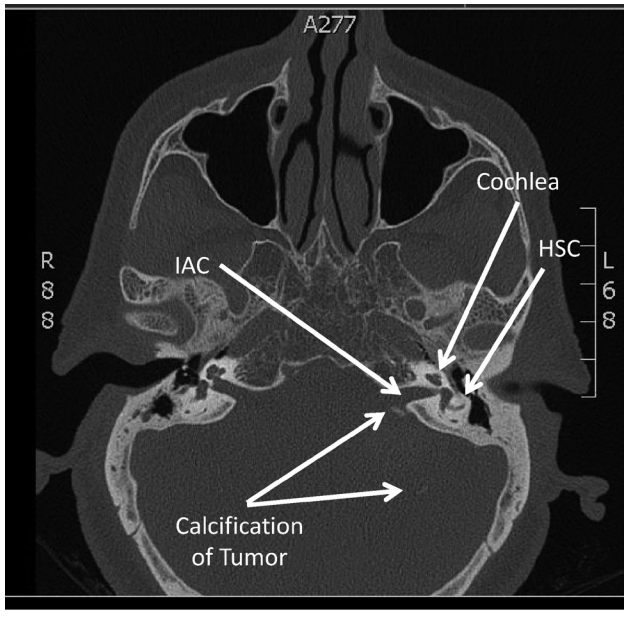


Figure 2. This axial CT of temporal bones demonstrates small foci of calcification in the area of the tumor. IAC stands for internal auditory canal, and HSC for horizontal semicircular canal.

blockage can acutely cause increased fluid pressure in the head (hydrocephalus) and can lead to death.

In rare instances, when patients are unable to undergo surgery, hypofractionated radiation is performed, with the radiation given over the course of six-weeks in 30 fractions. This mode of radiation generally is less effective, but it causes less edema, and it is used in a very select group of patients.

This patient had a resection of the tumor, which was found to be adherent to the fifth, seventh, eighth, ninth, tenth, and eleventh nerves. The tumor was invading the temporal bone and had to be removed with some bone in order to ensure the tumor was removed in its entirety.

Generally, recovery of hearing is not expected in these cases. Preservation of hearing function is often very difficult with large tumors.

Generally, recovery of hearing is not expected in these cases; preservation of hearing function is often very difficult with large tumors. Hearing preservation in an acoustic neuroma of this size would be nearly impossible because of the amount of adherence to the eighth nerve and the degree of dissection required to separate the tumor from the cochlear nerve.

Intraoperative neurophysiological monitoring was performed in our patient for cranial nerves VII, VIII, IX, and X. In this case, the tumor was not very adherent to the eighth nerve, allowing for resection of the tumor without sacrifice of function. The patient's hearing and facial function were preserved.