



## CLINICAL CONSULTATION

# Symptoms: Ear Fullness and Pressure

By Hamid R. Djalilian, MD

**A** 75-year-old patient presents with a complaint of right ear fullness and pressure, which she has experienced for several years. She also has not been able to hear from her right ear for years, the patient said.

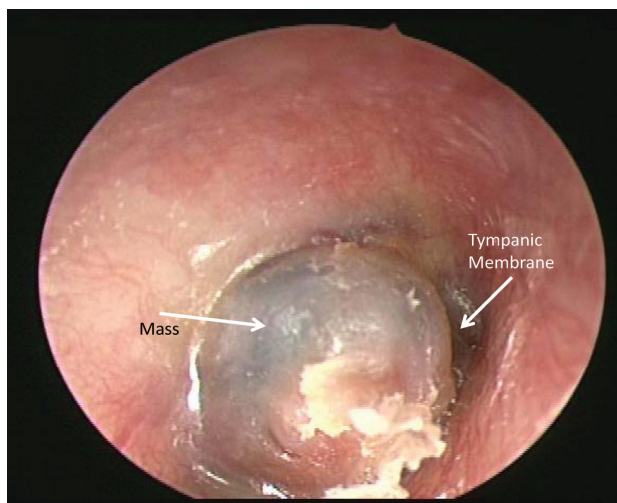
Her medical history is significant for surgery and radiation for a trigeminal nerve schwannoma 10 years ago. Otherwise, she is healthy.

The picture on the right shows the patient's ear exam.

**What is your diagnosis? See p. 12.**

**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.

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This otoscopic view shows the patient's right tympanic membrane.

# Diagnosis: Middle Ear Cholesterol Granuloma

By Hamid R. Djalilian, MD

Continued from p. 10

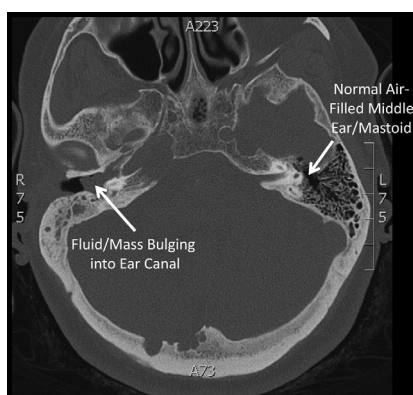
Our patient's examination showed a purple/blue mass behind the tympanic membrane that is bulging outward. A purple bulge from the tympanic membrane is most commonly caused by the jugular bulb.

In rare instances, the jugular bulb is high and dehiscant, meaning that there is no bony coverage and the top of the jugular bulb extends above the level of the inferior tympanic annulus. A high-riding jugular bulb usually is not of major consequence.

If the jugular bulb abuts the tympanic membrane or the ossicles, though, conductive hearing loss may result. When this happens, patients also report experiencing pulsatile tinnitus, especially when their heart rate is elevated. Surgery is beneficial in reducing the symptoms.

Previous attempts have been made, with varying degrees of success, to depress the jugular bulb using cartilage or other mechanisms. A newer technique described by our team involves anchoring the inferior aspect of the tympanic membrane more laterally so that it's displaced away from the jugular bulb, allowing for less manipulation of the jugular bulb and a lower chance of venous thrombosis.

In order to differentiate the true etiology of the blue tympanic membrane, imaging must be obtained. A CT of temporal



**Image 1.** The temporal bone CT shows the middle ear and mastoid filled with fluid (gray color) without bony destruction. Normal air-filled middle ear and mastoid appear black on CT.

bones demonstrates the anatomy of the jugular bulb and whether there is a high-riding bulb or bulb destruction from a tumor. An MRI of the internal auditory canals will differentiate the various masses within the middle ear.

In our patient, the CT shows fluid in the middle ear and mastoid without evidence of destruction, indicating that a tumor likely is not present (image 1).

The MRI shows hyperintensity (area brighter than the brain) of the fluid on both T1 and T2 sequences (image 2). This finding indicates that the blue mass in the middle ear is a cholesterol granuloma.

## ONE OF TWO WAYS

There are two theories for the development of a cholesterol granuloma. In

the obstruction–vacuum theory, Eustachian tube dysfunction is thought to cause mucosal edema, which can result in repeated episodes of bleeding and subsequent formation of cysts surrounding the blood. The cysts gradually expand.

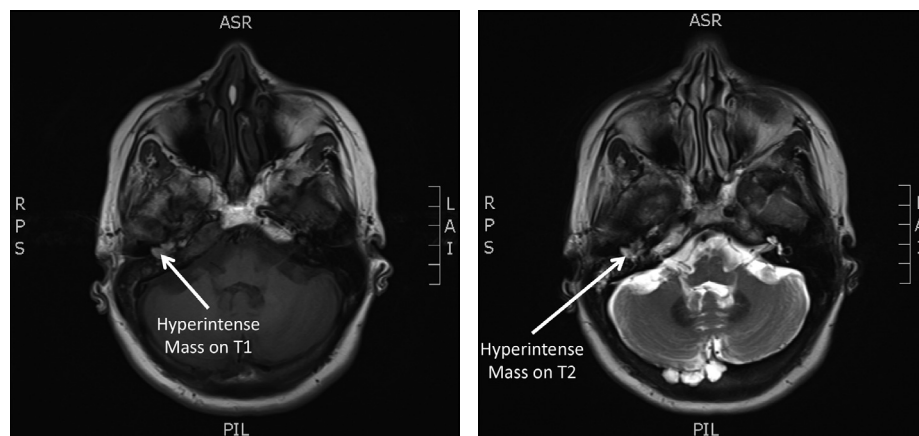
In the exposed marrow theory, on the other hand, hyperplastic mucosa is thought to invade underlying bone and expose the bone marrow, which, in turn, bleeds.

Either way, a combination of trapped blood and a surrounding chronic inflammatory response lead to the formation of a cholesterol granuloma. In our patient, the etiology is most likely related to Eustachian tube obstruction caused by previous surgery and radiation for a trigeminal schwannoma.

Histologically, cholesterol granulomas contain yellow-brown fluid consisting of cholesterol crystals, red blood cells, and blood break-down products.

Cholesterol granulomas are surrounded by a fibrous tissue capsule and can be located in any part of the aerated portion of the temporal bone. These lesions can grow insidiously for a very long time in the petrous apex.

Once the lesion expands enough, it extends into the inner ear or structures around the



**Image 2.** Left: The axial T1-weighted image of the temporal bone shows hyperintense (bright) fluid in the middle ear. Right: The T2 image at the same level demonstrates hyperintensity as well, indicating the presence of a cholesterol granuloma.

# iPad Exclusive!

## CLINICAL CONSULTATION VIDEO: VISUAL DIAGNOSIS

Read this month's Clinical Consultation column by Hamid R. Djalilian, MD, and then watch the bonus video to see images from the patient's CT, which demonstrate the middle ear cholesterol granuloma on multiple slices.

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temporal bone, causing hearing loss, dizziness, facial paralysis, or other cranial neuropathies, such as abducens nerve palsy. Most commonly, these lesions are diagnosed incidentally on imaging performed for headaches or other unrelated issues.

On CT imaging, a smooth-walled, expansile, well-circumscribed lesion is seen with thinned overlying bone. There may be dehiscence of the bone when the lesion is large, and inner ear structures can be exposed.

**These lesions can grow insidiously for a very long time in the petrous apex.**

When a cholesterol granuloma is present in the petrous apex, it tends to be more aggressive, with bony erosions and extension to the inner ear, carotid canal, or internal auditory canal. However, when a cholesterol granuloma is located in the middle ear or mastoid, erosion is rarely seen.

MRI scanning in our patient shows high signal intensity on T1- and T2-weighted images. Usually, signal intensity is lower due to the presence of hemosiderin. With gadolinium, no central enhancement is seen, and peripheral enhancement is not appreciated, given the high signal intensity on T1.

### OPTIONS FOR TREATMENT


Cholesterol granulomas are treated with surgical drainage. Since the cholesterol granuloma technically is a cyst containing

mucous and blood, its surgical drainage will prevent further expansion.

When the cyst is located in the petrous apex, treatment is made more challenging by the presence of the structures of the inner ear, carotid artery, jugular vein, and brain.

The most common approach for surgical treatment of a petrous apex cholesterol granuloma is an infracochlear approach, which dissects below the cochlea between the jugular vein and carotid artery. The infralabyrinthine approach uses the small corridor between the jugular bulb and the posterior semicircular canal to reach the petrous apex.

Other approaches include the retrolabyrinthine, zygomatic root, transarcuate, transcochlear, and middle cranial fossa. When the cyst is located in the mastoid, a mastoidectomy suffices in treating the problem.

In a middle ear cholesterol granuloma, like our patient had, a myringotomy and tube placement in the office treat the problem. The patient underwent a tube placement in the office, and copious mucous was suctioned from the middle ear, relieving pressure and the tympanic membrane bulging. 

### REFERENCES:

1. Lee A, Hamidi S, Djalilian HR. Anatomy of the transarcuate approach to the petrous apex. *Otolaryngol Head Neck Surg* 2009;140(6):880-883.
2. Shaikh MF, Mahboubi H, German M, Djalilian HR. A novel approach for surgical repair of dehiscence of high jugular bulb. *Laryngoscope* 2013;123(7):1803-1805.