



## CLINICAL CONSULTATION

# Symptoms: Ear Fluid and Plugged Feeling

By Hamid R. Djalilian, MD

**A** 69-year-old woman presented to her ear, nose, and throat physician (ENT) three months ago with fluid and a constant blocked sensation in her left ear. She did not have an upper respiratory infection before these symptoms started, she said.

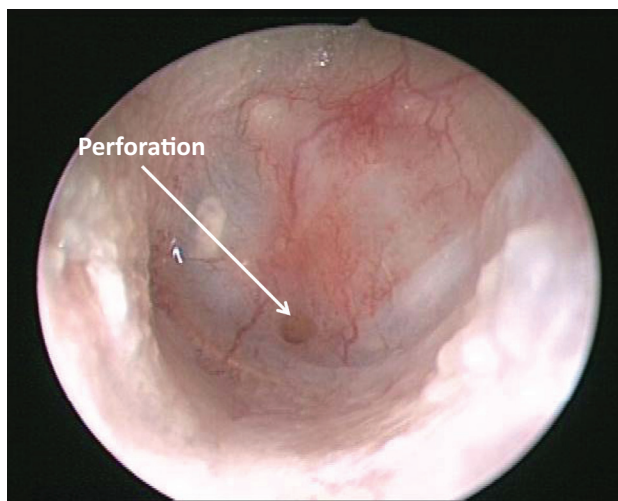
The ENT placed a tube in the patient's tympanic membrane. Although the patient felt immediate relief, she continued to have fluid draining from her left ear. Upon waking up in the morning, her pillowcase would be soaked, she said.

Her ENT removed the tube, with the consideration that it might have been causing an inflammatory reaction.

The drainage continued, however, and the patient presents here today. The image on the right shows her ear exam.

**What is your diagnosis? See p. 30.**

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



**On otoscopy, the patient's tympanic membrane shows perforation and clear drainage filling the medial canal.**

# Diagnosis: Spontaneous CSF Leak and Encephalocele

By Hamid R. Djalilian, MD

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**C**hronic drainage from the ear is nothing unusual; it often happens in patients who have chronic otitis media with perforation.

However, a few factors make this particular case different. First, the patient didn't develop any problems with her ear until she was 69 years old, meaning that she does not have a long history of Eustachian tube dysfunction. Second, she developed fluid in her ear without previously having an upper respiratory infection, allergic rhinitis, or a related issue. Patients without a history of these conditions are very unlikely to develop fluid in the ear.

Given this absence of past problems, the greatest concern for the patient is that cerebrospinal fluid (CSF) is leaking into the middle ear because of a possible defect in the bone that separates the brain from the ear, called the tegmen tympani.

Another dangerous possibility is a nasopharyngeal carcinoma blocking the Eustachian tube, leading to the collection of middle ear fluid. Other skull base malignancies could do the same, resulting in Eustachian tube destruction or obstruction.

Finally, systemic conditions affecting the ear, most commonly Wegener's granulomatosis or sarcoidosis, also could cause fluid collection in the middle ear.

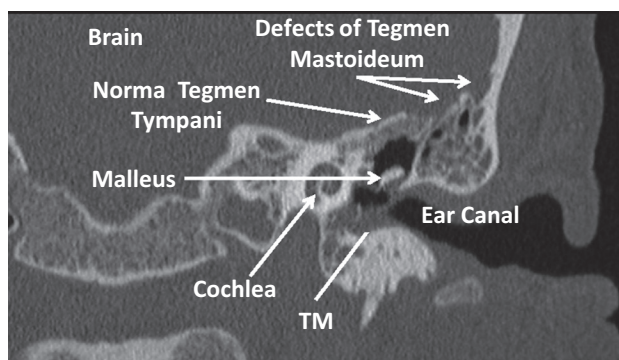
Despite this long list of potentially life-threatening problems, the most common causes of noninfected fluid in the ear are Eustachian tube dysfunction because of inflammatory disease or irritative problems, such as allergic rhinitis, laryngopharyngeal reflux, or smoking.

In older adults, it has been found histologically that atrophy of the tensor veli palatini muscle, which helps in Eustachian tube opening, can be a likely cause of Eustachian tube dysfunction.

## COMPREHENSIVE WORKUP

The common problems notwithstanding, an adult who presents with unilateral middle ear fluid and no precedent Eustachian tube dysfunction, allergic rhinitis, or upper respiratory infection requires a more detailed examination and possible further workup.

All these patients will require a nasopharyngoscopy in order to visualize the opening of the Eustachian tube and, specifically, the area behind the Eustachian tube where nasopharyngeal carcinomas most commonly grow—the fossa of Rosenmüller. Nasopharyngeal carcinomas are much more common in patients who are of Asian descent and those who smoke, but they can occur in other patients as well.



**Figure 1.** This coronal CT image of the patient's left temporal bone shows two defects in the tegmen mastoideum—the bone separating the mastoid air cells from the brain. Medially, the intact tegmen tympani—the bone (white) separating the brain from the middle ear—can be seen. The mastoid is filled with fluid (gray). “TM” stands for “tympanic membrane.”

Next, the larynx should be evaluated to ensure that the patient does not have significant acid reflux, which can contribute to Eustachian tube dysfunction. The problem tends to occur on the same side that the patient sleeps, as more of the refluxate will pool by the opening of that Eustachian tube at night.

If the examination is normal, a high-resolution CT of the temporal bones should be performed to assess the bone that separates the ear from the intracranial contents. High-resolution coronal and axial images should be obtained. These images are best read by an experienced neuroradiologist.

The clinician should evaluate the bone separating the brain from the mastoid, the middle ear, and the petrous apex cells on every cut of the coronal images. Next, the axial cuts should be studied to look at the bone separating the posterior cranial fossa from the mastoid air cells medial to the sigmoid sinus.

If a disruption in the bone is seen, an MRI must be obtained to evaluate the relationship of the dura and brain with the corresponding defect on the CT scan.

In addition, attention must be given to the course of the Eustachian tube to ensure that it is not interrupted or obstructed by a mass at the skull base.

If imaging is unremarkable, a workup for possible systemic conditions, such as Wegener's granulomatosis and sarcoidosis, should be considered, depending on the circumstances. A blood test checking the erythrocyte sedimentation rate, cytoplasmic antineutrophil cytoplasmic autoantibody (cANCA)

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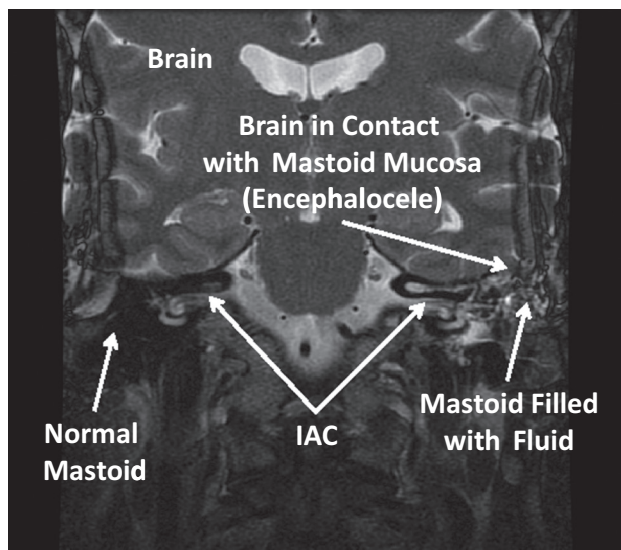
Read this month's Clinical Consultation case, and then watch the accompanying videos from Hamid R. Djalilian, MD, to see three perspectives of the patient's symptoms, and a treatment example:

- Video 1 depicts the patient's otoscopy, which showed pulsatile, clear fluid.
- Video 2 shows coronal CT images demonstrating the mastoid tegmen defects.
- Video 3 includes the coronal T2-weighted MRI images highlighting the encephalocele.
- Video 4 depicts a different patient with a spontaneous cerebrospinal fluid leak undergoing surgical repair.

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**Figure 2.** This coronal T2-weighted MRI shows herniation of the brain into the mastoid, which is called an encephalocele. There is no bone (black on MRI) separating the brain from the mastoid filled with fluid (bright areas in the mastoid). The right mastoid shows no fluid (dark). "IAC" stands for "internal auditory canal."

presence, and angiotensin converting enzyme level generally will suffice. Sometimes, serum calcium is checked as well. Sarcoidosis is far more common in African-Americans than Caucasians, with a 10-to-1 ratio.

## SURGICAL TREATMENT

Our patient has a spontaneous CSF leak and encephalocele. CT imaging shows two defects in the bone that separates the mastoid from the brain, which is called the tegmen mastoideum (see figure 1). MRI demonstrates herniation of the brain into the mastoid through the larger of those defects (see figure 2).

This condition occurs more often in obese patients because heavy weight around the chest and abdomen causes an increase in central venous pressure, which in turn leads to a rise in intracranial pressure.

The treatment for encephalocele is surgery. If the defects are limited to the mastoid, a postauricular mastoid approach generally suffices.

Fascia, in combination with other materials such as cartilage or bone, may be used to reconstruct the defect and the dura. An abdominal fat graft generally is placed to obliterate the mastoid, and fascia is used to separate the middle ear from the mastoid in the unlikely case of a failure.

As long as CSF is not communicating with the middle ear and Eustachian tube or ear canal, the risk of meningitis is minimal. However, if there is communication of CSF with the middle ear, the chance of meningitis increases substantially.

Patients with a spontaneous CSF leak often have an increase in intracranial pressure after the leak has been closed, and they need to be observed for signs of this condition. If the problem is left untreated, these patients are at risk of developing leaks in other areas, such as the opposite ear or nasal sinuses. 