

# Bilateral Middle Fossa Floor Meningiomas Invading the Middle Ear

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## Abstract

This case is a 49-year-old female patient who presented with suspected eustachian tube dysfunction symptoms that were refractory to medical treatment. She presented with conductive hearing loss and aural fullness on the left. A physical exam revealed an epitympanic fleshy mass in the middle ear with effusion. Imaging with MRI and CT showed opacification of the epitympanum with surrounding bony demineralization bilaterally left greater than right and significant thinning versus dehiscence of the tegmen mastoideum and tympani on the left with only thinning of the tegmen on the right. An MR temporal bone with and without contrast, demonstrated enhancement of the left middle ear extending to the tegmen and corresponding enhancement of the dura along the floor of the left middle cranial fossa as well as extending along foramen ovale into the infratemporal fossa. There was to a lesser degree similar appearance on the right. A biopsy of the middle ear mass on the left revealed meningioma. This case highlights the need to widen your differential with common symptoms when they are refractory to treatment.

## Keywords

Conductive Hearing Loss, Multifocal Meningioma, Middle Ear Meningioma

## 1. Introduction

Meningiomas are the second most common intracranial tumors and make up 15% - 20% of all primary brain tumors [1]. However, meningiomas of the middle fossa floor that extend into the middle ear are exceedingly rare [1]. These are extracranial meningiomas and make up about 1% - 2% of all meningiomas [2]. They often have extension secondary to the primary intracranial tumors and accompany osteolytic change of the skull [3]-[5]. Meningioma en plaque (MEP) is an infiltration

of the dura that sometimes leads to invasion of the bone with the intrasosseous tumor growth leading to significant hyperostosis [2] [4] [5]. A subset of meningioma patients also bear two or more spatially separated tumors and these are reported to occur only in 1% - 10% of patients [6]. These cases of bilateral middle ear meningiomas are so rare that they are often misdiagnosed as some other more common middle ear pathology [1]. For example, such as eustachian tube dysfunction, middle ear effusion or chronic otitis media. We share our experience of a patient referred for left eustachian tube dysfunction, conductive hearing loss and aural pressure. The patient was discovered on imaging and pathology to have bilateral meningioma of the middle fossa plate invading the epitympanum of the left greater than the right middle ear (**Figure 1(A)**). To our knowledge, this is the first description of extracranial meningiomas invading bilateral middle ears. This case highlights that extracranial extension of common intracranial pathology can present as the cause of some common ear symptoms that are typically diagnosed as eustachian tube dysfunction or chronic otitis media.

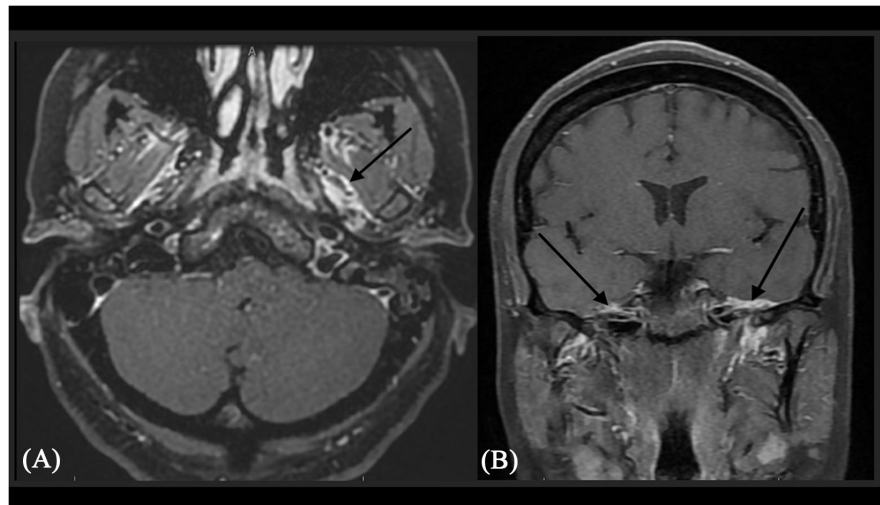


**Figure 1.** (A) demonstrates an axial view of the bilateral middle ears at the level of the ossicles. This demonstrates some opacification present in bilateral middle ear spaces. (B) demonstrates the right middle ear and soft tissue present abutting the ossicles. (C) demonstrates the left middle ear and soft tissue present in the middle ear.

## 2. Case Report

A 49-year-old female with a history of allergies including nasal polyposis and idiopathic intracranial hypertension was referred for left ear aural fullness and popping, mild left middle ear effusion and moderate low frequency conductive hearing loss left greater than right over the course of three months. She had a history of idiopathic intracranial hypertension (IIH), and a surgical history of septoplasty and fiberoptic endoscopic sinus surgery. She was seeing an allergist who was administering allergy shots to alleviate her allergy symptoms. Her general Otolaryngology thought her ear symptoms were due to her allergies and eustachian tube dysfunction and when medical management did not work, he referred to a Neurotologist. The presumed diagnosis was eustachian tube dysfunction. On initially presentation on August 23, 2022, she reported only mild intermittent otalgia in the left ear. She denied any recent otologic infections. On exam, there was a mild serous effusion on the left with a flesh-colored mass in the epitympanum and an immobile tympanic membrane. The right tympanic membrane and middle ear appeared normal. Audiogram demonstrated a left moderate to mild low frequency conductive hearing loss from 250 - 750 Hz rising to normal and a Type As tympanogram. The right side only showed a mild low frequency conductive hearing loss at 250 - 500 Hz but within the normal range and a Type A tympanogram. CT temporal bone done contrast done in September 2022 showed no significant hyperostosis as commonly associated with meningioma but opacification of the epitympanum with surrounding bony demineralization bilaterally left greater than right (**Figures 1(B)** and **1(C)**). There was no evidence of ossicular erosion or blunting of scutum bilaterally. There was significant thinning versus small areas of dehiscence of the tegmen mastoideum and tympani on the left with only thinning of the tegmen on the right.

Due to these findings, further characterization was obtained with an MR temporal bone in October 2022 with and without contrast which demonstrated enhancement of the left middle ear extending to the tegmen and corresponding enhancement of the dura along the floor of the left middle cranial fossa as well as extending along foramen ovale into the infratemporal fossa (**Figures 2(A)** and **2(B)**). There was to a lesser degree mild enhancement of the right middle fossa floor with minimal extension to the middle ear space. There was no communication visible between the two middle fossa floor enhancements. There was concern for pachymeningitis on the MRI read from the neuroradiologist though this did not fit the clinical presentation. The sella was partially empty which was related to her prior diagnosis of IIH. The working differential diagnosis was possible rheumatological etiology, or bilateral middle fossa floor meningioma after discussing the case in detail with neuroradiology. Labs were drawn in October 2022 to try to rule out rheumatological causes. These labs included Antineutrophil Cyto Ab, Rheumatoid Factor, Antinuclear Antibodies, Syphilis Serology (RPR), Calcium, CRP Non-cardiac, Sedimentation Rate (ESR) and Lyme Disease Serology with Reflex. Next, a middle ear exploration was planned with biopsy to characterize the middle ear mass more confidently.



**Figure 2.** (A) on the left demonstrates an axial T1 MRI post contrast which demonstrates the left soft tissue attenuation present in the middle ear. The dural origins of this mass can also be demonstrated in these images. (B) is another frame of the coronal T1 MRI post contrast on the left. This image demonstrates bilateral soft tissue attenuation in both middle ear spaces designated by the arrows. Dural enhancement can be seen in both images along the floor of the left and right floors of the middle fossae.

Operative findings from a left exploratory tympanotomy with biopsy and left middle ear exploration on October 26, 2022 showed a flesh colored mass visible just lateral to incus and located at the epitympanic which was biopsied. The permanent pathology report indicated meningeal cells positive for epithelial membrane antigen (EMA) and progesterone receptor (PR) with negative stains for synaptophysin and cytokeratin AE1/AE3. The findings raise suspicion of meningioma; however, the specimen was too small for a definitive diagnosis, but no other possible pathology was raised when discussed with pathologist in detail. Informed consent was obtained from the patient to report this case.

The patient was monitored with a repeat MRI in June 2023 that showed a slightly increased burden of enhancing tissue along the floor of the middle cranial fossa and a slight thickening of the right middle cranial fossa. She elected to be referred to Neurosurgery and Radiation Oncology for possible surgical removal versus gamma knife. She chose to continue to observe after these consultations since there was a very small increase in the size of the en plaque meningioma. She also decided to get a hearing aid for the left middle ear after deciding against further surgical debridement of the middle ear mass. In January 2024 she called reporting increased left otalgia. Repeat MRI showed very mild growth of the en plaque meningioma only on the left side of 1 - 2 mm. She was found to have a bulging left TM with significant middle ear fluid and a myringotomy and tube revealed cloudy middle ear effusion which was cultured. This grew Beta Lactamase Positive *M. Catarrhalis* and was treated with Augmentin 875 mg BID for 10 days and her symptoms completely resolved after treatment. She is scheduled to have a repeat MRI temporal bone. She is scheduled to follow up with a repeat MRI in

January 2025. She has deferred genetic testing for Neurofibromatosis to see if she has a genetic predisposition toward this presentation. Her father had a solitary intracranial meningioma which was treated with stereotactic gamma knife radiation.

### 3. Discussion

This case demonstrates a unique and rare case of bilateral en plaque meningioma from the middle fossa invading the middle ear space. It highlights the importance of a wide differential for common ear symptoms such as aural fullness and conductive hearing loss which can be assumed to be from eustachian tube dysfunction. The patient underwent multiple imaging modalities, leading to a differential diagnosis that included less common middle ear etiologies such as rheumatological diseases, pachymeningitis and bilateral en plaque meningiomas. She ultimately had a biopsy that led to the correct diagnosis.

### 4. Conclusion

Common ear symptoms such as aural fullness and conductive hearing loss are not always due to common middle ear pathologies like eustachian tube dysfunction and allergies. A wide differential must be the initial approach so that rare etiologies will not be missed.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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