Nontuberculous Mycobacterial Skull Base Osteomyelitis: Case Report and Literature Review

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Background

This case report details the presentation and treatment course of an 82-year-old woman with a history of hypogammaglobinemia treated with intravenous immunoglobulin and chronic rhinosinusitis (CRS) who developed left-sided otitis media found to be caused by nontuberculous mycobacteria (NTM) that progressed to anterior and lateral skull base osteomyelitis.

Methods

A retrospective chart review was performed from patient's first presentation with CRS in October 2016 through most recent follow-up in September 2023. A review of literature on nontuberculosis mycobacterial osteomyelitis was performed.

Case History

The patient presented in 2016 at age 75 with CRS despite maximal medical management. She underwent revision functional endoscopic sinus surgery in 2016. Medical evaluation revealed hypogammaglobulinemia, and intravenous immunoglobulin (IVIG) was initiated with good control of her symptoms and improvement in her endoscopic examination. In 2019, she developed a chronic left serous effusion, and myringotomy with tube placement was performed. The tube extruded, and she developed chronic suppurative otitis media unresponsive to medical therapy.

Left intact canal wall tympanomastoidectomy was performed in October 2019. Her sinus disease also worsened, and culture of her left middle meatus demonstrated *Mycobacetrium chelonae/abscessus* in December 2019. Though her left ear initially healed well, she then demonstrated graft loss and necrotic changes to the left ear canal suspicious for osteomyelitis. Therapy for *M. abscessus* was initiated per infectious disease recommendations with IV amikacin and PO linezolid. Gallium-67 single-photon emission computerized tomography (SPECT) scan in February 2021 revealed persistent uptake in the left temporal bone and anterior skull base and was treated with IV piperacillin-tazobactam and hyperbaric oxygen for empiric treatment of bacterial osteomyelitis. Despite initial clinical improvement, repeat gallium scan in July 2021 was consistent with persistent active osteomyelitis.

In August 2021, she was taken for left modified radical tympanomastoidectomy for removal of necrotic tissue and culture. Cultures were negative for her left ear, but she developed otitis media with effusion on the right, and cultures were consistent with *M. abscessus.*

A

	Mycobacterium chelonae/abscessus group	
Drug	TBINT	TBMDIL
Amikacin	S	8
Cefoxitin	I	32
Ceftazidime		
Ciprofloxacin	R	>4
Clarithromycin	R	>16
Doxycycline	R	>16
Imipenem	I	8
Linezolid	S	2
Minocycline	R	>8
Moxifloxacin	R	8
Tigecycline		0.06
Trimethoprim/Sulfa	R	4

B

	Mycobacterium abscessus	
Drug	TBINT	TBMDIL
Amikacin	S	16
Cefoxitin	I	32
Ciprofloxacin	R	>4
Clarithromycin	R	>16
Doxycycline	R	>16
Imipenem	R	32
Linezolid	S	<1
Minocycline	R	>8
Moxifloxacin	R	4
Tigecycline		0.25
Trimethoprim/Sulfa	R	4

Figure 1. Pertinent culture results and respective sensitivities. A. Culture obtained from the left middle meatus in December, 2019 positive for *M. chelonae/abscessus* group sensitive to amikacin and linezolid. B. Culture obtained from the right middle ear positive for *M. abscessus* sensitive to amikacin and linezolid.

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Case History cont.

A three drug regimen of IV amikacin, PO omadacycline, and PO linezolid was recommended for NTM. The three-drug regimen was poorly tolerated due to ototoxicity and anemia. She ultimately completed approximately four months of omadacycline 300 mg daily and linezolid 600 mg twice daily stopped due to anemia. Repeat gallium scan demonstrated reduced uptake, suggestive of response to therapy. She is currently being managed off systemic antibiotics with ear and sinus debridements and close clinical monitoring.

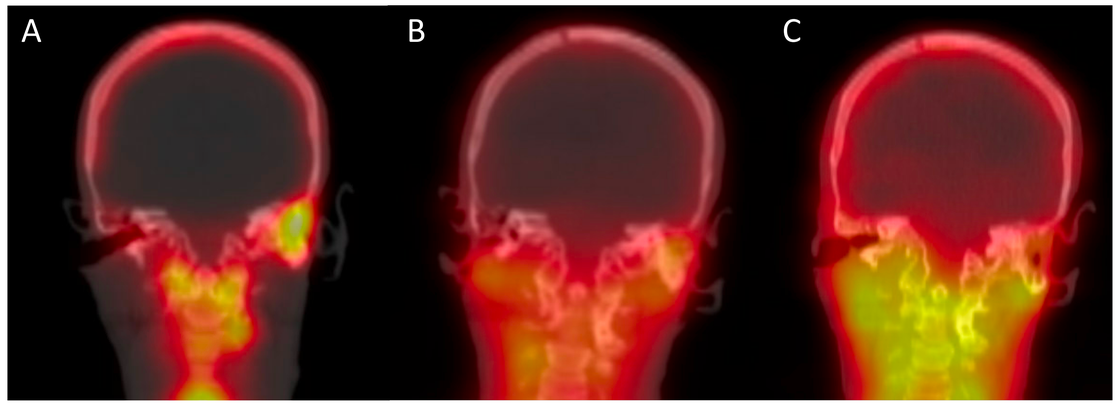

Figure 2. SPECT gallium-67 coronal imaging. A. February, 2021 scan demonstrating asymmetric increased uptake in the left mastoid and along the left skull base. B. July, 2021 scan demonstrating persistent increased activity in the left mastoid after completing a six-week course of IV piperacillin-tazobactam and HBO. C. January, 2023 scan demonstrating no definitive increased uptake in the left or right mastoid or skull base after repeat systemic antibiotic treatment including linezolid and omadacycline.

Literature Review

Descriptions of NTM-mediated ear disease are rare in the literature, and most articles are retrospective case series. Moreover, otologic disease progressing to involve the skull base is even more rare. From a eleven-year review out of the Netherlands of national lab samples taken from ear cultures, only 10 cultures grew NTM, specifically *M. abscessus.* All patients were children with a history of otitis media requiring tympanostomy[1]. A small case series published in 1999 described four children who had wound breakdown or persistent purulent otorrhea after otologic surgery, and cultures grew either *M. chelonae* (n=3) or *M. avium* (n=1)[2]. A slightly larger case series of eight pediatric patients described a mean 81-day delay between presentation and diagnosis. Of these, most grew *M. abscessus* (n=7) from ear cultures. All patients were cured with systemic antibiotics including amikacin, clarithromycin and linezolid plus topical boric acid with a period of 21 weeks[3].

A 2016 respective case series of 22 adult patients with NTM-mediated mastoiditis describes a majority presenting with external auditory canal granulation tissue (90.0%) and a similar proportion with a history of surgical intervention (90.3%). Eighteen patients grew *M. abscessus* in culture. Eight of these patients developed skull base osteomyelitis, and treatment consisted of two to forty-one months of clarithromycin and various other antibiotics[4]. Best practices for treatment of NTM osteomyelitis have not clearly been established.

Conclusions

NTM-mediated otomastoiditis and skull base osteomyelitis is a rare entity that represents a diagnostic challenge. This case report emphasizes the importance of considering NTM-mediated otologic disease in patients with chronic symptoms that fail to respond to both antibiotic and surgical therapy and introduces the use of omadacycline as a treatment consideration for such patients.

Disclosures

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