Necrotizing Otitis Externa due to Aspergillus in an Immunocompetent Patient

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An 85-year-old, nondiabetic man is described with necrotizing (malignant) otitis externa. The patient developed facial nerve paralysis in the presence of a progressive cellulitis and chondritis of the external auditory meatus. Destruction of the bony meatus and mastoid and obliteration of normal soft-tissue planes at the skull base were documented by computed tomographic scans. Aspergillus fumigatus was isolated from the external meatus and deep tissue specimens. Fungal invasion of bone and soft tissue was confirmed histopathologically. Pseudomonas aeruginosa was never isolated. This case is unusual from both the standpoint of etiology and host susceptibility in that the patient had no apparent underlying disease. Amphotericin B and rifampin therapy following radical mastoidectomy halted the progression of disease. Finally, this case illustrates the pitfalls of empiric antibacterial therapy for necrotizing otitis externa without cultural confirmation of the etiologic agent.


Necrotizing (malignant) otitis externa is an infection occurring in elderly diabetics caused by Pseudomonas aeruginosa. The disease is characterized by inflammation of the external auditory meatus with patchy necrosis of surrounding cartilage and bone and extension along subtemporal fat planes. The following report depicts a case of necrotizing otitis externa, unusual from both the standpoint of host susceptibility and etiologic agent.

REPORT OF A CASE

An 85-year-old man presented with a several-week history of right ear otalgia and otorrhea. He had complained of similar symptoms in years past and had been treated symptomatically with topical antibiotic-steroid drop preparations. He reported having suffered "broken ear drums" during his military service. Progressive hearing loss, without tinnitus or vertigo, had been ongoing over the past 15 years. His medical history included congestive heart failure, gouty arthritis, and urinary tract infection secondary to prostatic hypertrophy. He had no history of diabetes mellitus.

Otologic examination demonstrated a normal left external and middle ear with the exception of a small, dry, central perforation of the tympanic membrane. The right external auditory meatus, in contrast, was edematous and erythematous and a mucopurulent exudate was present. The right tympanic membrane appeared thickened and hyperemic with a large, central perforation. Granulation tissue extended from this perforation from the middle ear space. No periauricular tenderness was noted.

Oral penicillin V potassium, topical antibiotic-steroid drops, and a one-week course of oral methylprednisolone were administered. Despite four weeks of antibiotic therapy, his symptoms progressed. He began to experience headache in the right temporoparietal area. He became lethargic, anorexic, and lost weight. Right periauricular tenderness developed, especially in the area of the temporomandibular joint. Neurologic examination was normal.

Computed tomography (CT) of the head and temporal bones revealed abnormalities localized to the right external and middle ear (Fig 1). Soft-tissue density was present within the external ear canal and Prussak's space, and the margins of the osseous ear canal, particularly the anterior aspect adjacent to the temporomandibular joint, appeared irregular. A biopsy specimen of granulation tissue from the right middle ear revealed chronic inflammation. Culture of the exudate yielded small numbers of Staphylococcus epidermidis and Corynebacterium in addition to Aspergillus species. Results of laboratory studies were as follows: white blood cell count, 24.2 x 10^9/L (24,200/mm³), with 0.77 (77%) polymorphonuclear leukocytes and 0.06 (6%) band cell forms; erythrocyte sedimentation rate, 77 mm/h; serum urea nitrogen, 12.1 mmol/L (34 mg/dL); creatinine, 76.25 µmol/L (1.0 mg/dL); and calculated creatinine clearance, 0.660 mL/s (36 mL/min). Repeated fasting serum glucose determinations were normal. Urinalysis showed no glycosuria. Audiologic evaluation revealed a moderate sensorineural hearing loss on the left side and a severe mixed conductive and sensorineural hearing loss on the right side.

Given this presentation, consistent with necrotizing otitis externa, piperacillin sodium and gentamicin sulfate were administered empirically despite the failure to culture P aeruginosa. After four weeks of parenteral antibiotic therapy, minimal symptomatic improvement was noted. The erythrocyte sedimentation rate increased to 123 mm/h. Repeated CT of the temporal bones demonstrated persistent soft-tissue densities within the right external and middle ear; definite erosion of the anterior wall of the osseous external canal extending toward the temporomandibular joint was documented. Cultures of drainage from the right ear consistently yielded Aspergillus fumigatus. Antibiotic therapy was discontinued.

Five days later, the patient acutely developed a right facial palsy associated with slurring of speech and mild dysphagia. Neurologic examination confirmed paresis of the right facial nerve; there were no additional cranial nerve deficits. The white blood cell count was 13.6 x 10^9/L (13,600/mm³), with 0.87 (87%) segmented neutrophils and 0.06 (6%) band cell forms. The erythrocyte sedimentation rate was 77 mm/h. Barium swallow was normal. Computed tomographic scan of the temporal bones again demonstrated erosive irregularity of the right osseous external auditory meatus. Erosion of the vertical portion of the fallopian canal and obliteration of the subtemporal fat planes beneath the right external auditory meatus in the area of the stylo mastoid foramen were now evident (Fig 2). A gallium scan revealed increased uptake in the right temporal bone and temporomandibular joint consistent with osteomyelitis (Fig 3). Gentamicin sulfate and piperacillin sodium were reinstituted. Biopsy specimens of skin from the right external auditory meatus and granulation tissue from the middle ear again
revealed chronic inflammation. Smears of drainage from the right middle ear demonstrated numerous branching hyphae and inflammatory cells. Cultures yielded *A. fumigatus*. Aerobic, anaerobic, and mycobacterial cultures were otherwise unrevealing.

The right facial nerve paresis progressed to frank paralysis over the next week, despite antibiotic therapy. The erythrocyte sedimentation rate rose to 101 mm/h. Nerve conduction studies performed 72 hours after complete paralysis revealed no response to stimulation of the right facial nerve. Electromyography revealed fibrillations in all three right facial muscles tested; no motor units were observed.

A right radical mastoidectomy was performed for debridement, biopsy, and facial nerve exploration. The mastoid approach also improved the interpretation of the cultures by bypassing the auditory meatus; this minimized the possibility of contamination from organisms, including *Aspergillus*, which might be colonizing the external meatus. Necrotic bone was removed from the bony external auditory meatus and mastoid, including the entire length of the vertical facial canal from the second genu to the stylomastoid foramen. The right facial nerve appeared atrophic and did not respond to intraoperative direct stimulation. Multiple bone biopsy specimens revealed granulation tissue with necrosis and calcification. Branching, septated fungal hyphae were present within bone (Fig 4). Cultures yielded heavy growth of *A. fumigatus*.

Amphotericin B treatment (1 mg/kg/d) was begun. Despite bouts of azotemia treated with hydration and interruptions of therapy, 1500 g of amphotericin B was administered over a five-week period. The patient's otorrhea and facial paralysis per-
Necrotizing otitis externa is characterized by progressive cellulitis, chondritis, and osteomyelitis of the ear canal and skull base. Presenting features include severe otalgia, otorrhea, and an inflamed auditory meatus. Progression through bone as osteomyelitis and extension along the subtemporal skull base as fasciitis may result in unilateral paresis or paralysis of the seventh nerve. This was seen in our patient with facial nerve involvement both in the fallopian canal and at the stylomastoid foramen. There is a notable morbidity and mortality from intraosseous inflammatory and vascular complications.

The pathogen in virtually all cases of necrotizing otitis externa is \textit{P. aeruginosa}. In a literature review of cases of necrotizing otitis externa totaling 262 patients, 99.2% were due to \textit{P. aeruginosa}. In this patient, since the clinical and radiologic findings were so typical of necrotizing otitis externa, prolonged antimicrobial antibiotic agent therapy was administered by the attending physician despite the failure to culture \textit{P. aeruginosa}.

Although \textit{Aspergillus} has been implicated in acute and chronic otitis externa, it is also known to be an occasional commensal of the external ear. As a result, the isolation of the \textit{Aspergillus} from the ear of this patient was initially unappreciated by the attending physician and antifungal therapy was delayed. Given the patient’s deterioration on parenteral antipseudomonal antibiotic agents and the questioned significance of the isolation of \textit{Aspergillus}, a mastoid approach for biopsy and culture was deliberately undertaken so as to avoid contamination by commensal organisms in the external auditory meatus. Histopathologic examination of bone from the meatus and mastoid revealed the presence of invasive branching, septate, hyphae, and culture confirmed the presence of \textit{A. fumigatus}.

Only one case of necrotizing otitis externa due to \textit{A. fumigatus} has previously been reported, this in a 68-year-old leukemic man with granulocytopenia who survived with amphotericin B therapy and recovery of his bone marrow. Our case is thus unique not only in terms of the etiology, but also in our patient’s lack of apparent predisposition to necrotizing otitis externa. Most patients with necrotizing otitis externa have been elderly individuals with insulin-dependent diabetes mellitus. This patient was 85 years old, but had no evidence of diabetes mellitus or immunosuppressive illness.

Amphotericin B therapy resulted in symptomatic improvement, eradication of fungus from the external auditory meatus and mastoid cultures, and a decline in the erythrocyte sedimentation rate from 101 to 46 mm/h. No further cranial nerve paralyses or intracranial complications developed. Rifampin was administered concomitantly based on previously published in vitro findings and an anecdotal case report of sino-otobital aspergillosis responding to combined amphotericin B and rifampin therapy. Although a clear-cut cure was not achieved as evidenced by his recurrence of headache and reelevation of erythrocyte sedimentation rate following discontinuation of antifungal therapy, the patient’s long-term survival is noteworthy.

A case of necrotizing otitis externa due to \textit{A. fumigatus} is reported in an elderly gentleman with neither diabetes mellitus nor immunosuppression. The progression of disease was halted by the administration of intravenous amphotericin B and oral rifampin following radical mastoidectomy. Given the apparent increasing frequency of invasive aspergillosis in the immunosuppressed host, otorlaryngologists should be aware that this fungus can also cause necrotizing otitis externa in addition to sino-orbital disease. Management principles developed in the treatment of invasive \textit{Aspergillus} of the paranasal sinuses appear applicable to necrotizing otitis externa.

Finally, given this experience, empiric antipseudomonal therapy for necrotizing otitis externa is clearly inappropriate; cultural confirmation of the etiologic agent must be made before long-term antimicrobial therapy is initiated.

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References