

# Brain Abscess Caused by *Enterococcus avium*: A Case Report and Review of the Literature

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Brain abscesses can be highly lethal if appropriate treatment is not administered, and reports of such an abscess caused by *Enterococcus avium* are very rare. Here, we report a case of a 48-year-old man presenting with chronic otitis media. He initially presented with a headache and right otalgia. An otoscopic evaluation performed on the day of admission showed exudation of fresh pus from the right ear. Brain magnetic resonance imaging demonstrated a hypodense area in the right temporoparietal lobe, suggestive of a brain abscess. A culturing of the ear discharge and brain abscess aspirate proved of *E. avium* infection. Following stereotactic aspiration of the brain abscess and proper antimicrobial treatment, the patient recovered completely. In this report, we also review and discuss the available medical literature on previous cases of *E. avium* infection associated with brain abscess.

**Key Words:** Brain abscess, *Enterococcus avium*, Otitis media

## Introduction

Brain abscesses result from a focal suppurative process within the brain parenchyma, and brain abscesses account for 1–8% of all intracranial space-occupying lesions [1]. Brain abscesses remain a potentially fatal infection despite the availability of improved diagnostic imaging modalities and recent advancements in the management of brain abscess, with a 8–25% mortality rate [1, 2].

Enterococci are indigenous to the normal intestinal flora of humans, and most clinical infections are caused by either *En-*

*terococcus faecalis* or *E. faecium* [3]. *E. avium*, formerly known as “group Q streptococcus”, is one of the 23 known *Enterococcus* species and is pathogenic to humans [4, 5]. However, *E. avium* is rarely associated with brain abscess. Here, we report of a patient presenting with a brain abscess, from which *E. avium* was isolated as the only pathogen. Additionally, we identified and reviewed the English language articles on similar previous cases published between 1967 and 2012, using the following keywords: “brain abscess”, “group Q streptococcus”, and “*Enterococcus avium*”.

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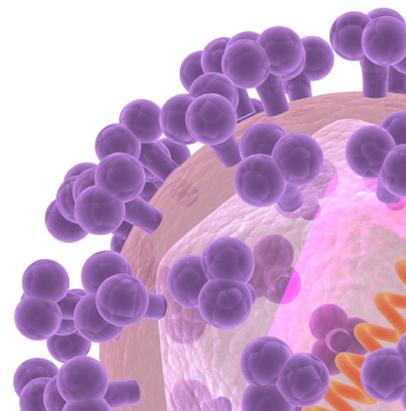
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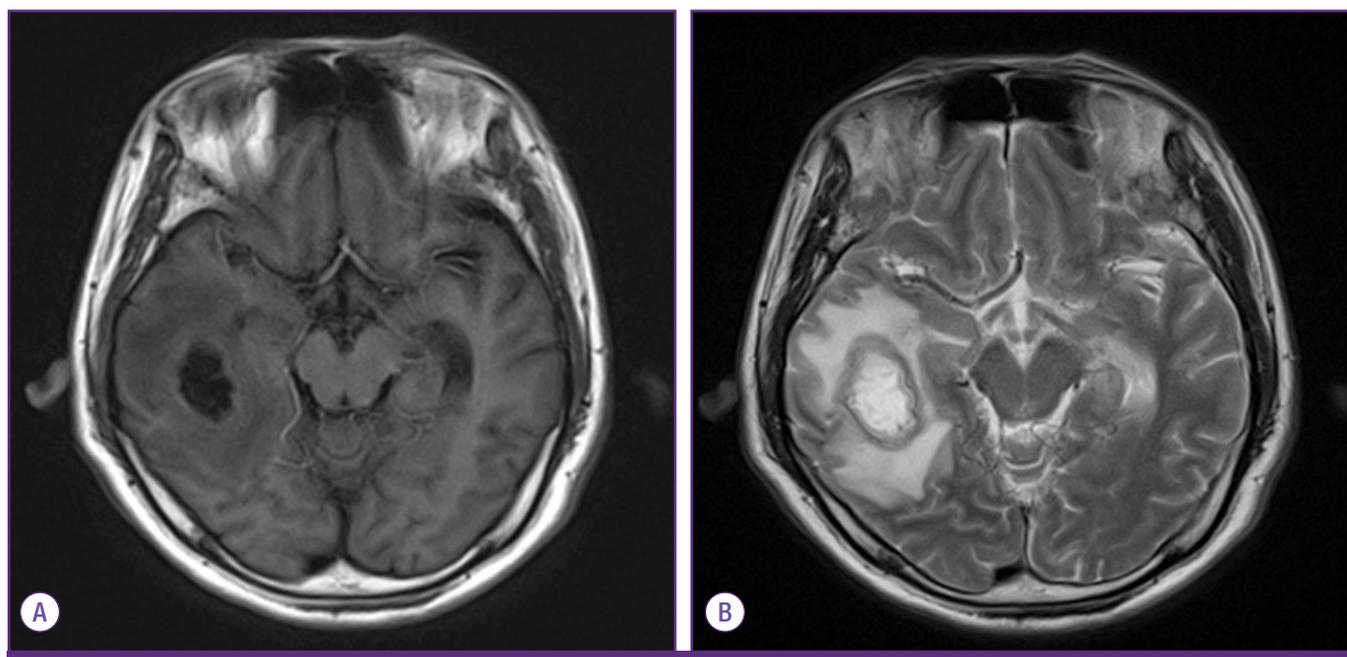


## Case Report

A 48-year-old man with a 13-day history of headache and right otalgia was admitted to our tertiary medical center. He was diagnosed with type 2 diabetes mellitus 3 years earlier and was thereafter treated with oral hypoglycemic agents up until the current presentation. **The patient had chronic suppurative otitis media** for several years. Physical examination showed that his verbal output was reduced and his neurologic status was 11 on the Glasgow Coma Scale. The patient's temperature was 36.8°C, blood pressure was 140/100 mmHg, and pulse was 80 beats/min. Otoloscopic evaluation revealed the exudation of fresh pus from the right ear. Laboratory studies revealed an elevated leukocyte count of 18,500/mm<sup>3</sup> and an elevated C-reactive protein level of 18.9 mg/dL. Serological tests were negative for human immunodeficiency virus (HIV), hepatitis B, and hepatitis C. Brain magnetic resonance imaging (MRI) showed the presence of a 3.5-cm, rim-like enhancing lesion in the right temporoparietal lobe with perilesional edema (Fig. 1). Obliteration of the right mastoid air cells with sclerotic changes was noted, and its communication to the right mastoid was suspected. The patient underwent stereotactic aspiration of the brain abscess and **treated with parenteral antibiotics**, including ceftriaxone (2 g every 12 hours) and metronidazole (500 mg every 6 hours). Elective surgery

was scheduled, but a follow-up computed tomography (CT) scan showed significant decreases in the extent of brain abscess due to abscess drainage through the communication site of the right ear. Therefore, the scheduled surgery was cancelled.

On day 6 of hospitalization, *E. avium* was isolate from ear discharge and aspirates of brain abscess culture. **Species identification and antimicrobial susceptibilities of *E. avium*** were determined using the MicroScan Pos Breakpoint Combo Panel Type 28 (Siemens, CA, USA). Ampicillin (2 g every 4 hours) was subsequently administered to the patient. Antibiotic susceptibility testing of the isolates showed that the pathogen was susceptible to penicillin, ampicillin, imipenem, glycopeptides, fluoroquinolones, and high level of aminoglycosides. Parenteral antibiotic therapy consisting of ceftriaxone, metronidazole, and ampicillin was continued for 4 weeks. After parenteral antibiotic therapy, the patient's neurologic deficits improved, and he was discharged in a stable condition with oral antibiotics. Oral antibiotic therapy comprising amoxicillin (500 mg every 8 hour) and levofloxacin (750 mg every 24 hours) was continued for 8 weeks. Compared the images of the initial MRI and the follow-up CT performed 1 month later, the abscess seemed to be completely resolved. Three months after diagnosis, the patient was **full recovered without any residual neurologic deficits**.



**Figure 1.** MRI scan of the brain shows a 3.5-cm, round, rim-like enhancing lesion in the right temporoparietal lobe with perilesional edema. (A) Axial T1-weighted MRI shows a thin, ring-like, hyperintense lesion in the right temporoparietal region, which was presumed to be due to the paramagnetic effects of the abscess capsule. (B) T2-weighted axial MRI shows the hypointense rim of the abscess with a large area of high signal intensity, which is consistent with edema.

## Discussion

Enterococci are generally regarded as the normal intestinal flora [6]. Over the past 2 decades, however, enterococci have been identified as one group of pathogens responsible for several nosocomial infections; *E. faecalis* and *E. faecium* account for up to 90% of the responsible clinical isolates [6, 7]. In a previous study, streptococci were identified as the most common bacteria identified in cultures in patients with brain abscesses, with *E. faecalis* and *E. faecium* accounting for only 5% of all isolates [1, 8]. *E. avium* is rarely reported as a pathogen in humans. Thus far, only 6 cases of brain abscesses caused *E. avium* have been reported, including those reported in the present study [9–13]. The main characteristics of these cases are summarized in Table 1. To the best of our knowledge, this case report is the first to report a brain abscess caused by *E. avium* in Korea.

The pathogenic mechanism of brain abscess formation involves either contiguous spread from the focus of infection, hematogenous dissemination to the brain from a distant focus, or head trauma. In most cases, the brain abscess was occurred due to contiguous spread from the middle ear, mastoid cells, or paranasal sinuses. Carpenter et al. reported that more than 40% of brain abscesses in adult patients are otogenic in origin [14]. In their study, abscesses were located in the temporal lobe (54% of patients), cerebellum (44%), or both locations (2%). In our case review of brain abscess due to *E. avium* (Table 1), we found that 5 of 6 patients presented with chronic otitis media, and **only 1 patient, who was previously diagnosed with astrocytoma, did not present with otitis media** [10]. These findings suggest that brain abscesses caused

by *E. avium* infection are predominantly otogenic in origin. Treatment of brain abscess is done by a team approach; adequate abscess drainage and appropriate antimicrobial therapy are most important for proper treatment. In patients with bacterial brain abscess, intravenous antimicrobials have traditionally been administered for 6–8 weeks [15]. Shorter courses (3–4 weeks) of parenteral therapy may be adequate for patients who have undergone surgical excision of the abscess. In the present case, follow-up CT showed a significant decrease in the extent of brain abscess, owing to abscess drainage through the communication site. Thus, parenteral antibiotic therapy was continued for 4 weeks. **Attending physicians need to consider *E. avium* infection in such cases, so that effective therapy can be initiated as soon as possible.**

In 1984, Collins et al. successfully proposed the renaming of “*Streptococcus avium*” to “*Enterococcus avium*” due to the findings of various DNA-DNA and DNA-ribosomal RNA studies [5]. Although *E. faecalis* and *E. faecium* are the 2 most common species responsible for enterococcal infections, our findings and other reports demonstrate an emerging trend of *E. avium* infection in humans. Only a few clinical manifestations caused by *E. avium* have been reported thus far, including bacteremia, endocarditis, osteomyelitis, and splenic abscess [4, 16–18]. Majority of these patients additionally presented with immunocompromising conditions or serious systemic disease. However, only 1 patient with *E. avium* brain abscess was in an immunocompromised state at diagnosis (Table 1, Case 2). Virulence traits are believed to permeate *Enterococcus* species to various degrees, thereby enhancing their disease-causing abilities [19]. However, factors that influence the virulence potential of *E. avium* are not well understood.

**Table 1.** Reported cases of brain abscess caused by *Enterococcus avium*

Case	Author	Age	Sex	Predisposing factor	Culture	Abscess location on CT	Antimicrobial therapy	Outcome
1	Mohanty [9]	19	M	Chronic OM	Abscess	Temporal lobe	Ceftriaxone + metronidazole + amikacin	Death
2	Osoba [10]	19	F	Astrocytoma	Abscess	Parietal lobe	Vancomycin + metronidazole + ceftazidime	Survival
3	Mohanty [11]	5	M	Chronic OM	Abscess	Cerebellum	Cefoperazone/sulbactam + metronidazole	Survival
4	Pehlivan [12]	27	M	Chronic OM	Abscess	Temporal lobe	Vancomycin + ceftriaxone	Survival
5	Escribano [18]	45	F	Chronic OM	Abscess	Cerebellum	Linezolid + meropenem	Survival
6	Present study	48	M	Chronic OM	Abscess + ear discharge	Temporal lobe	Ceftriaxone + metronidazole + ampicillin	Survival

M, male; F, female; OM, otitis media; CT, computed tomography.

Recently, Na et al. [4] suggested that *E. avium* seems to be more virulent than *E. gallinarum* and *E. casseliflavus*, but less virulent than *E. faecium*. Further studies are needed to define the pathogenesis and virulence of *E. avium*.

Although *E. avium* is not commonly associated with brain abscesses, it should be considered as an etiological agent in the future, especially in patients diagnosed with chronic otitis media.

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