

Mastoiditis, Brain Abscess and Sinus Thrombosis As Complications of Chronic Otitis Media: A Case Report

Salih Macin,^{1*} Ahmet Cagkan Inkaya,² Ozlem Dogan,³ Gokhan Bozkurt,⁴ Rahsan Gocmen,⁵ Yesim

Cetinkaya Sardan,⁶ and Yakut Akyon⁷

¹Sırnak State Hospital, Microbiology Laboratory, Sırnak, Turkey

²Hacettepe University Faculty of Medicine, Department of Infections Diseases and Clinical Microbiology, Ankara, Turkey

³Haydarpaşa Numune Training and Research Hospital, Microbiology Laboratory, İstanbul, Turkey

⁴Hacettepe University Faculty of Medicine, Department of Neurosurgery, Ankara, Turkey

⁵Hacettepe University Faculty of Medicine, Department of Radiology, Ankara, Turkey

⁶Ankara Guven Hospital, Infections Diseases Unit, Ankara, Turkey

⁷Hacettepe University Faculty of Medicine, Department of Medical Microbiology, Ankara, Turkey

*Corresponding author: Salih Macin, MD, Sırnak State Hospital, Sırnak, Turkey. Tel: +90-5066904590, Fax: +90-4862161225, E-mail: salihmacin@hotmail.com

Received 2016 September 06; Revised 2016 November 24; Accepted 2016 November 26.

Abstract

Introduction: Brain abscess is a rare life-threatening focal intracerebral infection. The etiology of brain abscess depends on trauma, surgical intervention, and infection type. In this report, we present a case with brain abscess caused by *Prevotella denticola* after chronic otitis media infection.

Case Presentation: A 27-year-old male patient presented a history of yellowish green ear drainage coloring his pillow for 10 years. One month before admission, he began to suffer from increased headache. He was first admitted to another hospital and treated with ceftriaxone for otitis media. He was referred to our hospital when a brain abscess was detected in cerebral magnetic resonance imaging (MRI). Meropenem and vancomycin treatment was stated empirically because of failure of the previous antibiotic therapy. The abscess was drained through a burr hole on the second day of admission. The aerobic culture of the pus resulted negative; however, black pigmented colonies were detected on anaerobic culture plates. The organism was identified as *P. denticola* via molecular typing targeting the 16S RNA gene. The postoperative period was complicated by left temporal hematoma that required surgical intervention; left transverse and sigmoid sinuses thrombosis were treated with enoxaparine. Because of the critical condition of the patient, de-escalation was not considered, and the patient received meropenem plus vancomycin for 6 weeks until discharge with complete cure.

Conclusions: In conclusion, in spite of usually benign features, chronic otitis media may lead to serious complications such as brain abscess. Every effort should be made for microbiological diagnosis of the causative pathogen(s) for appropriate antibiotic treatment.

Keywords: Brain Abscess, *Prevotella denticola*, Chronic Otitis Media

1. Introduction

Brain abscess is a rare but life-threatening complication, described as focal suppurative infections (1). It begins with colonization of microorganisms into the brain parenchyma and develops to a well-vascularized, ring-enhancing capsule form surrounded with collection of pus (2). In developed countries, the incidence rate among all cranial lesions is about 1% - 2%, whereas in developing countries it increases up to 8%. The mortality rate associated with brain abscess have had a significant decrease in last years (0% - 24%) due to improved surgical techniques, effective antimicrobial treatments, and contemporary diagnosis methods (3). It is usually observed that the spread of the infection causes brain abscess complications, e.g. maxillary sinusitis and tooth inflammations, middle ear infec-

tions and meningitis, which appear after trauma and surgical interventions (4, 5).

Prevotella is an obligate anaerobic pigmented and non-pigmented bacterium (6). *Prevotella denticola* is a pigmented bacterium of oral microbiota. As many anaerobic bacteria, *P. denticola* are natural members of the flora under appropriate conditions. Otherwise, they might cause periodontal diseases, severe septicemia, osteomyelitis, and deep tissue abscess.

Gram staining is crucial for the *Prevotella* spp. identification. The presence of polymorphonuclear leucocytes mixed with the bacteria in morphotype suggests anaerobic infection. Aerotolerance tests can reveal anaerobic nature of the bacteria and subsequently, different advanced diagnostic procedures might be performed, including automated systems based on biochemical tests, and matrix-

assisted laser desorption ionization-time of flight (MALDI-TOF). DNA sequencing method is the gold-standard. The treatment of *Prevotella* spp. varies from β -lactamase to a combination of β -lactam- β -lactamase inhibitors, and carbapenems for more severe infections (7). The present study reports a brain abscess after chronic otitis media infection due to *P. denticola*, which is a rare cause of brain abscess.

2. Case Presentation

A 27-year-old male diagnosed with otitis media presenting purulent drainage from the left external ear tract underwent treatment with IV antibiotics at an external medical center. The brain imaging was done for otitis media and since abscess in the temporal lobe appeared, the patient was dispatched to our hospital and hospitalized for examination and follow-up. The patient history showed a yellow-green ear drainage that was intense enough to create stains on the pillow; the drainage stopped after a few days and restarted again. He had headache for 1 month and its severity had increased over time. Ten days before admission to our hospital, he had been hospitalized with the diagnosis of otitis media and took IV antibiotic treatment (ceftriaxone). Following the identification of temporal abscess at the external center, the patient rejected the treatment and came to our hospital.

At the time of admission, he was 37.4°C with stable vital parameters, presenting purulent drainage in his left external auditory canal, and granulation tissue in the external auditory canal. The evaluation of the left ear membrane was not possible due to the polypoid tissue covering it. He had facial paralysis in left and neck rigidity. Kernig's and Brudzinski's symptoms were negative. Treatment with vancomycin and meropenem was applied empirically. In the brain imaging, at the time of emergency admission, some findings which were concordant with abscess were identified.

Magnetic resonance imaging of brain, sagittal T1W, and axial T2W images showed T1-hypointense and T2-hyperintense cystic lesions with peripheral vasogenic edema in the left temporal lobe. Postcontrast sagittal T1W image revealed ring-like thick contrast enhancement in the lesions, as well as, demonstrated the epidural abscess adjacent to parenchymal lesions. The lesions had high DWI signal and low signal intensity on ADC map representing diffusion restriction. Axial FLAIR image showed luminal hyperintensity within the left sigmoid sinus suggesting sinus thrombosis (Figure 1). On day 2 of hospitalization, mastoidectomy and temporal abscess drainage were performed.

Gram-negative coccobacillus were observed at the microbial investigation of abscess material. The abscess ma-

terial was inoculated to the "eosin methylene blue" (EMB) agar and chocolate agar and incubated at 37°C for 48 hours to identify aerobic and anaerobic bacteria. Aerobic incubation resulted negative but the anaerobic incubation to the Schaedler Agar and thioglycollate broth at 37°C for 48 hours resulted dark pigmented colonies on Schaedler agar, representing small and faintly stained gram-negative coccobacillus. In the analysis using half-automated system BBL crystal (Becton, Dickinson and company U.S.A) *Prevotella* spp. were identified. Thereupon 16S analysis revealed *P. denticola* causing the brain abscess. At the control MRG after drainage, two intact abscesses were observed but one of them was already drained. During the second week of the treatment, the patient got better in terms of neurological symptoms. Since monoplegia had been developed in the patient's right lower extremity, brain imaging was repeated; however, no acute pathology was observed.

During follow-up, except left facial paralysis, neurological symptoms recovered within three days. The recovery of facial paralysis was determined on 5th day of follow-up. New MRG results showed temporal epidural hematoma and therefore, the patient was submitted to a new surgery for hematoma drainage. No growth was detected in the drainage culture of 10cc necrotic material. Thrombosis was detected on MRG images at left transverse and sigmoidal sinuses on the following days after hematoma drainage. Enoxaparin was used for anticoagulation and continued as empirical treatment for six weeks. At the time of discharge, the patient was healthy.

3. Discussion

Prevotella spp. are considered as normal flora of the oral cavity; but in case of low oxygen concentration, trauma, pyogenic infections, etc., they can cause severe inflammation especially when accompanied by predisposing factors such as pulmonary abscess, bronchiectasis, empyema, otitis media, or mastoiditis. *Prevotella* spp. may also cause brain abscess (8). Bacteria in oral cavity have more tolerance to oxygen in nature compared to other bacteria; this is a virulence factor for them.

The determinants of brain abscess differ with the time, geographical distribution, drug usage, surgical intervention, and infection type. Different bacteria, fungi, and parasites may cause brain abscess. *Streptococcus* spp. and *Staphylococcus aureus* have been frequently isolated from bacterial communities. Enteric gram negative bacillus (*Proteus* spp., *Escherichia coli*, *Klebsiella* spp., *Morganella Morganii*, *Pseudomonas* spp.) are generally isolated as a part of mixed cultures in the case of otitis media infection or suppressed immune system in the ratio of 23% - 33% (9).

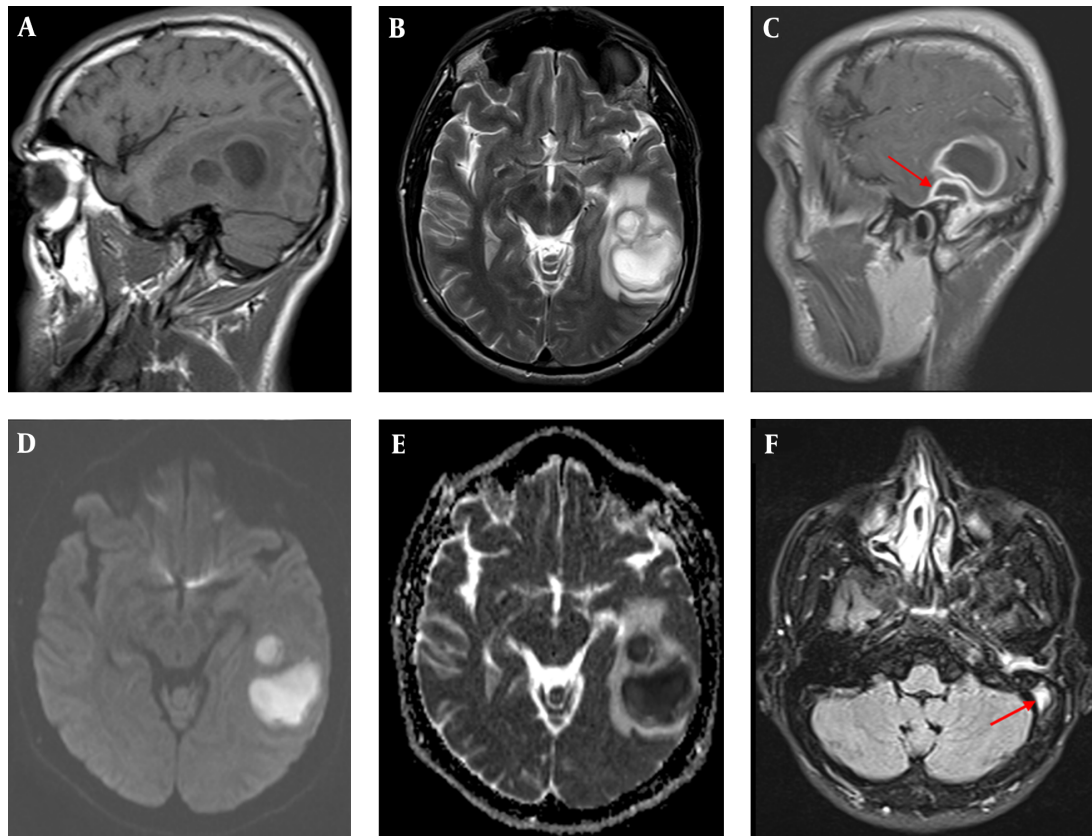


Figure 1. Contrast-Enhanced Cranial Magnetic Resonance Imaging. (A) the Sagittal T1-Weighted Image Showing Two Adjacent Circular Hypo-Intense Lesions and Their Mild T1 Hyper-Intense Walls At Left Temporal Lobe; (B) the Axial T2A Image Indicating the Walls of the Lesions Are Mildly Hypotensive and Surrounded by Vasogenic Edema; (C) Contrast-Enhanced Sagittal T1A Image Showing Smooth Thick Contrast at the Walls of the Lesions Which Is Accompanied By Epidural Abscess (Arrow) in the Floor of the Left Temporal Lobe, Adjacent to Intra-Parenchymal Lesions; (D,E) Diffusion-Weight Imaging Demonstrating Limitation of Homogenous Diffusion, Typical for Abscess, at the Central to the Left Temporal Lesions; (F) the Axial FLAIR Image Monitoring the Intraluminal Hyper Intensity of the Left Sigmoidal Sinuses, on Behalf of Thrombosis.

Several studies have reported that the growth ratio of anaerobic bacteria is nearly 25-30% in the case of brain abscess, and *Bacteroides* and *Prevotella* species were the most frequently isolated bacteria (10, 11). The cases in which anaerobic bacteria are accounted for the development of brain abscess generally occur after middle ear and mastoid infection (12, 13). In a study by Menon et al., 75 brain abscess cases were reviewed in a 5-year period, and it was determined that chronic otitis media is the most frequent risk factor. In two of these cases, *P. denticola* was detected (14). In the present report, a long-term ear infection was present as well. In a study, two cases of brain abscess were reported from our country that one of them was associated with anaerobic agents and presented with middle ear and mastoid infections, whereas the other one was attributed to head trauma followed by meningitis (15).

The recognized treatment method of brain abscess is ponction and aspiration of abscess followed by medical treatment towards the active microorganism agent (16).

After surgical intervention, patient should be treated for 6 - 8 weeks, according to the agent determined in microbial investigations. Thrombosis of septic transverse sinus is always observed as a suppurative complication of otitis media and mastoiditis. As shown, *Proteus* spp., *E.coli*, *S. aureus*, and anaerobes are agents that cause transverse sinus thrombosis (17, 18). Most of the patients may develop facial paralysis and intracranial pressure symptoms (19). In case of sagittal sinus thrombosis, fluctuation in mental level, motor changes, papillary stasis, and neck stiffness may be observed and they can become severe enough to threaten the life. Some coagulation defects such as lack of clotting factors might be observed, although they are general complications in the course of bacterial meningitis (20). Anticoagulant treatment for the septic sinus thrombosis is contradictive. In this study, the patient developed sinus thrombosis despite of active antibiotic treatment application. Even though it was not possible to detect any underlying coagulation defect, anticoagulant treatment was ini-

tiated due to the development of thrombosis during the antimicrobial treatment process.

In this way, considering irresponsiveness to the previous antibiotic treatment before admission to our hospital, a broad-spectrum antibiotic treatment was applied and even though the patient underwent surgical drainage in a short span of time, intracranial septic thrombophlebitis was developed during the follow-up. Consequently, development of severe complications such as brain abscess and septic intracranial thrombophlebitis should be considered after long-term otitis media infection. The main way to manage the chronic otitis media is early diagnosis and surgical intervention. Microbial pathogens facilitate the invasion and consequently complications. In addition, given the fact that anaerobic bacteria are responsible for etiology of brain abscess, appropriate diagnosis and treatment planning are required. For the prompt diagnosis of the brain abscess due to anaerobic agents, a multi-disciplinary approach including neurosurgery, neurology, and microbiology disciplines is necessary.

Footnotes

Authors' Contribution: Salih Macin, Ozlem Dogan and Yakut Akyon contributed to the conception and design of the work and wrote the manuscript. Ahmet Cagkan Inkaya, Rahsan Gocmen, Gokhan Bozkurt and Yesim Cetinkaya Sardan examined the patient, conducted the clinical follow-up, developed the original idea, collected data, and wrote the manuscript.

Financial Disclosure: The authors report no conflicts of interest.

Funding/Support: No funding was secured for this study.

References

- Carpenter J, Stapleton S, Holliman R. Retrospective analysis of 49 cases of brain abscess and review of the literature. *Eur J Clin Microbiol Infect Dis.* 2007;**26**(1):1-11. doi: [10.1007/s10096-006-0236-6](https://doi.org/10.1007/s10096-006-0236-6). [PubMed: [17180609](https://pubmed.ncbi.nlm.nih.gov/17180609/)].
- Garg M, Gupta RK, Husain M, Chawla S, Chawla J, Kumar R, et al. Brain abscesses: etiologic categorization with in vivo proton MR spectroscopy. *Radiology.* 2004;**230**(2):519-27. doi: [10.1148/radiol.2302021317](https://doi.org/10.1148/radiol.2302021317). [PubMed: [14699181](https://pubmed.ncbi.nlm.nih.gov/14699181/)].
- Mathisen GE, Johnson JP. Brain abscess. *Clin Infect Dis.* 1997;**25**(4):763-79. [PubMed: [9356788](https://pubmed.ncbi.nlm.nih.gov/9356788/)].
- Sakamoto H, Karakida K, Otsuru M, Arai M, Shimoda M. A case of brain abscess extended from deep fascial space infection. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2009;**108**(3):21-5. doi: [10.1016/j.tripleo.2009.05.002](https://doi.org/10.1016/j.tripleo.2009.05.002). [PubMed: [19716487](https://pubmed.ncbi.nlm.nih.gov/19716487/)].
- Mylonas AI, Tzerbos FH, Mihalaki M, Rologis D, Boutsikakis I. Cerebral abscess of odontogenic origin. *J Craniomaxillofac Surg.* 2007;**35**(1):63-7. doi: [10.1016/j.jcms.2006.10.004](https://doi.org/10.1016/j.jcms.2006.10.004). [PubMed: [17296309](https://pubmed.ncbi.nlm.nih.gov/17296309/)].
- Finegold SM. Overview of clinically important anaerobes. *Clin Infect Dis.* 1995;**20** Suppl 2:205-7. doi: [10.1093/clinids/20.Supplement_2.S205](https://doi.org/10.1093/clinids/20.Supplement_2.S205). [PubMed: [7548607](https://pubmed.ncbi.nlm.nih.gov/7548607/)].
- Bahar H, Torun MM, Demirci M, Kocazeybek B. Antimicrobial resistance and beta-lactamase production of clinical isolates of prevotella and porphyromonas species. *Chemotherapy.* 2005;**51**(1):9-14. doi: [10.1159/000084017](https://doi.org/10.1159/000084017). [PubMed: [15722627](https://pubmed.ncbi.nlm.nih.gov/15722627/)].
- Brouwer MC, Tunkel AR, McKhann G2, van de Beek D. Brain abscess. *N Engl J Med.* 2014;**371**(5):447-56. doi: [10.1056/NEJMr1301635](https://doi.org/10.1056/NEJMr1301635). [PubMed: [25075836](https://pubmed.ncbi.nlm.nih.gov/25075836/)].
- Akcam FZ, Karaaslan T, Akcam M, Avsar K. Orta kulak iltihabı sonrası gelişen Morganella morgani. ye bağlı beyin absesi olgusu. *SDU Tıp Fak Derg.* 2006;**13**(4):27-30.
- Mamelak AN, Mampalam TJ, Obana WG, Rosenblum ML. Improved management of multiple brain abscesses: a combined surgical and medical approach. *Neurosurgery.* 1995;**36**(1):76-85. doi: [10.1227/00006123-199501000-00010](https://doi.org/10.1227/00006123-199501000-00010). [PubMed: [7708172](https://pubmed.ncbi.nlm.nih.gov/7708172/)].
- Theophilo F, Markakis E, Theophilo L, Dietz H. Brain abscess in childhood. *Childs Nerv Syst.* 1985;**1**(6):324-8. doi: [10.1007/BF00270817](https://doi.org/10.1007/BF00270817). [PubMed: [3833334](https://pubmed.ncbi.nlm.nih.gov/3833334/)].
- Abdullah J. Clinical presentation and outcome of brain abscess over the last 6 years in community based neurological service. *J Clin Neurosci.* 2001;**8**(1):18-22. doi: [10.1054/jocn.2000.0746](https://doi.org/10.1054/jocn.2000.0746). [PubMed: [11322120](https://pubmed.ncbi.nlm.nih.gov/11322120/)].
- Aebi C, Kaufmann F, Schaad UB. Brain abscess in childhood-long-term experiences. *Eur J Pediatr.* 1991;**150**(4):282-6. doi: [10.1007/BF01955533](https://doi.org/10.1007/BF01955533). [PubMed: [2029923](https://pubmed.ncbi.nlm.nih.gov/2029923/)].
- Menon S, Bharadwaj R, Chowdhary A, Kaundinya DV, Palande DA. Current epidemiology of intracranial abscesses: a prospective 5 year study. *J Med Microbiol.* 2008;**57**(Pt 10):1259-68. doi: [10.1099/jmm.0.47814-0](https://doi.org/10.1099/jmm.0.47814-0). [PubMed: [18809555](https://pubmed.ncbi.nlm.nih.gov/18809555/)].
- Yuceer N, Yucesoy M, Mertol T, Arda MN. Anaerob brain abscess in two cases. *Türk Nöroşir Derg.* 2002;**12**:156-62.
- Takeshita M, Kawamata T, Izawa M, Hori T. Prodromal signs and clinical factors influencing outcome in patients with intraventricular rupture of purulent brain abscess. *Neurosurgery.* 2001;**48**(2):310-6. doi: [10.1227/00006123-200102000-00012](https://doi.org/10.1227/00006123-200102000-00012). [PubMed: [11220373](https://pubmed.ncbi.nlm.nih.gov/11220373/)].
- Southwick FS, Richardson EJ, Swartz MN. Septic thrombosis of the dural venous sinuses. *Medicine (Baltimore).* 1986;**65**(2):82-106. [PubMed: [3512953](https://pubmed.ncbi.nlm.nih.gov/3512953/)].
- Seven H, Ozbal AE, Turgut S. Management of otogenic lateral sinus thrombosis. *Am J Otolaryngol.* 2004;**25**(5):329-33. [PubMed: [15334397](https://pubmed.ncbi.nlm.nih.gov/15334397/)].
- Sitton MS, Chun R. Pediatric otogenic lateral sinus thrombosis: role of anticoagulation and surgery. *Int J Pediatr Otorhinolaryngol.* 2012;**76**(3):428-32. doi: [10.1016/j.ijporl.2011.12.025](https://doi.org/10.1016/j.ijporl.2011.12.025). [PubMed: [22277267](https://pubmed.ncbi.nlm.nih.gov/22277267/)].
- Tunkel RA. In: Subdural Emphyema, Epidural abscess and suppurative intracranial thrombophlebitis. Bennet JE, Dolin R, Blaser MJ, editors. Philadelphia: Churchill Livingstone; 2015. pp. 1177-85.