Supratentorial *Listeria monocytogenes* Brain Abscess in a Patient with Liver Cirrhosis

Romulo Omar Flores-Perez, Cesar Daniel Villarreal-Villarreal, Jesus Alberto Cardenas-de La Garza, Dionicio Angel Galarza-Delgado

Department of Internal Medicine, Autonomous University, Faculty of Medicine and University Hospital Dr. José Eleuterio González, Monterrey, México

Abstract

Meningitis and meningoencephalitis account for the majority of central nervous system infections by *Listeria monocytogenes* (*Lm*). Macroscopic listerial brain abscess is a rare infection. Early recognition of *Listeria* brain abscesses represents a major diagnostic challenge. Mortality from *Listeria* brain abscesses is high but can be reduced when appropriate treatment is timely started. Immunosuppressed patients are more often affected, and a high suspicion is needed for prompt identification. Treatment should be individualized taking into account the comorbidities, lesion size and location, bacterial resistance, and clinical and radiological response. We present a case of a supratentorial *Lm* brain abscess in a patient with liver cirrhosis whose family denied surgical management, and despite the large size, clinical and radiological success was achieved with 4 weeks of ampicillin.

Keywords: Brain abscess, central nervous system infections, *Listeria*, listeriosis

Introduction

*Listeria monocytogenes* (*Lm*) is an opportunistic, Gram-positive bacillus isolated from soil, vegetables, and wild or domestic animals. Listeriosis occurs sporadically or in outbreaks by contaminated food such as meat, feta cheese, and undercooked chicken.[1,2] Meningitis and meningoencephalitis account for the majority of *Lm* central nervous system (CNS) infections, of which abscesses represent only 10% with a mortality around 50%. Age >50 years, neonates, sinusitis, alcoholism, cirrhosis, or immunosuppression are the predisposing factors.[2-5]

In this case, success was achieved with 4 weeks of ampicillin (ABPC) in a supratentorial *Lm* brain abscess in a patient with liver cirrhosis whose family denied surgical management.

Case Report

A 48-year-old male from northeast Mexico presented to the emergency department of our hospital after a 40-s tonic-clonic seizure. He had chronic alcoholism consuming more than 160 g daily. His family referred a 5-day history of headache and gait disturbance. The patient had abruptly suspended alcohol consumption 48 h prior to admission and presented a 1-min tonic-clonic seizure with a postictal state of approximately 2 min.

On admission, he was unresponsive and afebrile with no focal neurological signs. Kernig’s sign, Brudzinski’s sign, and nuchal rigidity were negative. Initial laboratory workup showed leukocytosis with neutrophilia. Fourth-generation ELISA HIV and hepatitis B and C serology testing were nonreactive. Chest radiography on admission was normal. A nonenhanced brain computed tomography (CT) was performed which revealed a hypointense lesion in the right temporal lobe [Figure 1a]. Mucoperiosteal thickening of the left anterior ethmoidal cells and the maxillary sinus compatible with chronic sinusitis were additionally found. Abdominal ultrasound reported splenomegaly and suggestive findings of chronic liver disease. Chronic liver disease was classified as Child-Pugh B and its cause was attributed to alcohol abuse. The patient was transferred to the internal medicine ward where fever was documented and his neurological status worsened with physical examination showing neck stiffness. A lumbar puncture was performed, and cerebrospinal fluid (CSF) analysis showed a xanthochromic appearance with a cell count of 765 (75% neutrophils), glucose 16 mg/dL, proteins 466 mg/dL, and a Gram-negative stain. Acid-fast bacilli (AFB) staining and cytology analysis of CSF were assured. India ink preparation of CSF was negative. Blood and CSF cultures were obtained. Empirical antibiotic therapy with ceftriaxone 1 g intravenous (IV) bid, vancomycin 1 g IV tid, ABPC 2 g IV qid, and metronidazole 500 mg iv tid was started. A contrast-enhanced magnetic resonance imaging (MRI) of the brain reported a supratentorial, intra-axial mass in the right temporal lobe measuring 3.9 cm × 1.7 cm × 1 cm with a volume of 34 mL [Figure 1b-d]. The lesion had poorly defined borders and perilesional edema. It was centrally hypointense with irregular wall enhancement after gadolinium perfusion in

Address for correspondence: Dr. Romulo Omar Flores-Perez, Department of Internal Medicine, Autonomous University, Faculty of Medicine and University Hospital Dr. José Eleuterio González, Monterrey, México. Av. Madero Y Gonzalitos S/N, Colonia Mitras Centro, 64460 Monterrey Nl, México. E-mail: ro_flores89@hotmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

DOI: 10.4103/aiian.AIAN_233_18
Our patient had a history of alcohol abuse and chronic liver disease (attributed to chronic alcohol consumption) which was documented during evaluation; both are known risk factors for CNS meningitis. In patients with these characteristics, a complete neurological evaluation is crucial. A diagnostic workup and empirical antibacterial therapy must be started immediately to improve prognosis.

Headache is thought to be the most common symptom in patients with brain abscess. Other signs of increased intracranial pressure, such as nausea, confusion, and lethargy, are commonly documented. Although our patient was unresponsive at the moment of admission, he had no other signs of CNS infection such as fever, focal neurologic deficits, Kernig’s sign, Brudzinski’s sign, or nuchal rigidity. Lm has a special tropism for CNS, and different theories have been proposed for its dissemination. Lm makes its way through the human host via the intestines after ingestion of contaminated food, spreading to distant tissues via the lymph and blood, and using mononuclear phagocytes to disseminate from its site of entry. Identification of Lm infection can be challenging, as the onset of symptoms can be as late as 1 month after pathogen exposure. Our patient and his family denied any gastrointestinal symptoms before or during onset.

Most of the patients with Listeria abscess have concomitant bacteremia documented as positive blood cultures in 85% of cases. Other causes of bacterial brain abscesses have positive blood cultures in around 11%. Distinctively, our patient had a positive CSF culture and a negative blood culture. The high rate of concomitant bacteremia and deep locations of abscesses such as the thalamus, basal ganglia, pons, and medulla oblongata support the theory that the development of listerial brain abscess is secondary to hematogenous spread. Access to the CNS occurs by circulating leukocytes crossing the blood–brain or blood–choroid barriers by a phagocyte-facilitated mechanism described as the “Trojan horse” mechanism, direct invasion of the blood–brain or blood–choroid endothelial cells by extracellular blood-borne bacteria, or retrograde migration into the brain from within the axons of cranial nerves. Direct extension from infected adjacent sources such as sinuses, middle ear, or teeth is another possibility for CNS spread. The CT of our case reported maxillary and ethmoidal mucoperiosteal thickening suggestive of chronic sinusitis, which may have played a role in the CNS involvement.

Suspicion of meningitis prompts early antibiotic treatment, so damage is limited and prognosis is improved. The clinical practice guidelines of the Infectious Diseases Society of America recommend the use of ABPC with gentamicin as the first-line treatment for Lm CNS infections. Insufficient and conflicting data exist to recommend this adjunctive therapy, with some reports suggesting a worse outcome. The choice of antibiotics for empirical treatment should be based on the suspicion of the brain abscess etiology. In general, a combination of a third-generation cephalosporin (cefotaxime or ceftriaxone), metronidazole, and vancomycin (pending organism identification) is recommended. Once anaerobic infection has been ruled out, metronidazole may be administered.

**Case Reports**

**Figure 1:** (a) Nonenhanced computed tomography of the right temporal lobe with hypointense lesion (b) Contrast-enhanced magnetic resonance imaging – T1 centrally hypointense lesion with irregular wall and vasogenic edema (c) Magnetic resonance imaging – T2 hyperintense lesion (d) Magnetic resonance imaging – diffusion weighted with restriction
discontinued. We decided to start ceftriaxone, vancomycin, ABPC, and metronidazole empirically after blood/CSF samples were retrieved (ABPC for Listeria suspicion due to the risk factors of our patient, metronidazole and ceftriaxone for possible paranasal sinuses spread, and vancomycin for potential Staphylococcus aureus infection). After the culture from CSF revealed Lm as the responsible pathogen, we narrowed treatment to ABPC.

Patients with meningitis should be treated for at least 3 weeks, while brain abscesses should receive antibiotic therapy for a minimum of 6–8 weeks followed by serial MRI. Appropriate antibiotic treatment must be continued until the clinical situation has improved and brain imaging documents either resolution or a small, stable lesion. Our patient had a total of 4 weeks of ABPC therapy with complete clinical and radiological resolution.

Listeria abscesses are monobacterial, which favors antibiotic treatment as proper therapy. Surgical drainage or surgical removal is reserved for patients that do not respond, relapse, have large abscesses, or are infected with resistant microorganisms. Evidence of the indications and effectiveness of surgical intervention in Lm abscesses are limited by the few case reports and case series available. Surgical aspiration is suggested for large abscesses (>2.5 cm) located in deep brain matter (e.g. cerebellum and diencephalon) and for identification of the infective agent. In our case, despite a large abscess measuring 3.9 cm × 1.7 cm × 1 cm, the patient’s family refused surgical drainage or removal.

Despite antibiotic treatment, this infection has a high mortality. In patients with Lm bacteremia complicating a malignancy, Goulet et al. reported up to 40% mortality, with the highest incidence of infection occurring in patients with chronic lymphocytic leukemia and liver cancer and the highest mortality in lung and pancreatic cancers.

A pyogenic abscess is usually seen as a ring enhancement and central hypointense lesion in T1 MRI after gadolinium perfusion, and it typically shows restricted diffusion images. Our patient’s images were consistent with the description of a pyogenic abscess by MRI.

**Conclusions**

Listeria brain abscesses are a rare complication and carry a high morbidity and mortality. Immunocompromised patients are more often affected, and a high suspicion is needed to identify cases early. Treatment should be individualized taking into account the comorbidities, lesion size and location, bacterial resistance, and clinical and radiological response. Certain scenarios may warrant shorter antibiotic schemes to diminish hospital stay, costs, and complications with close follow-up to identify recurrence.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Antal EA, Dietrichs E, Lobert EM, Melby KK, Maehlen J. Brain stem encephalitis in listeriosis. Scand J Infect Dis 2005;37:190-4.
2. Mylonakis E, Hohmann EL, Calderwood SB. Central nervous system infection with Listeria monocytogenes 33 years’ experience at a general hospital and review of 776 episodes from the literature. Medicine (Baltimore) 1998;77:313-36.
3. Bartt R. Listeria and atypical presentations of Listeria in the central nervous system. Semin Neurol 2000;20:361-73.
4. Lorber B. Listeria monocytogenes. In: Bennett J, Dolin R, Blaser M, editors. Mandell, Douglas, and Bennett’s Principles and Practice of Infectious Diseases. 8th ed. Philadelphia, PA: Elsevier/Saunders; 2015.
5. Brouwer MC, van de Beek D, Heckenberg SG, Spanjaard L, de Gans J. Community-acquired Listeria monocytogenes meningitis in adults. Clin Infect Dis 2006;43:1233-8.
6. Milgrim LM, Rubin JS, Rosenreich DL, Small CB. Sinusitis in human immunodeficiency virus infection: Typical and atypical organisms. J Otolaryngol 1994;24:450-3.
7. Brouwer MC, Tunkel AR, McKhann GM 2nd, van de Beek D. Brain abscesses. N Engl J Med 2014;371:447-56.
8. Drevets DA. Dissemination of Listeria Monocytogenes by infected phagocytes. Infect Immun 1999;67:3512-7.
9. Drevets DA, Bronze MS. Listeria monocytogenes: Epidemiology, human disease, and mechanisms of brain invasion. FEMS Immunol Med Microbiol 2008;53:151-65.
10. Amaya-Villar R, Garcia-Cabrera E, Sulleiro-Igual E, Fernández-Viladrich P, Fontanals-Aymerich D, Catalán-Alonso P, et al. Three-year multicenter surveillance of community-acquired Listeria monocytogenes meningitis in adults. BMC Infect Dis 2010;10:324.
11. Tunkel AR, Glaser CA, Bloch KC, Sejvar JJ, Marra CM, Roos KL, et al. The management of encephalitis: Clinical Practice Guidelines by the Infectious Diseases Society of America. Clin Infect Dis 2008;47:303-27.
12. Sonnevile R, Ruimy R, Benzonana N, Rifflaud L, Carsin A, Tadié JM, et al. An update on bacterial brain abscess in immunocompetent patients. Clin Microbiol Infect 2017;23:614-20.
13. Goulet V, Hebert M, Hedberg C, Laurent E, Vaillant V, De Valk H, et al. Incidence of listeriosis and related mortality among groups at risk of acquiring listeriosis. Clin Infect Dis 2012;54:652-60.
14. Chang SC, Lai PH, Chen WL, Weng HH, Ho JT, Wang JS, et al. Diffusion-weighted MRI features of brain abscess and cystic or necrotic brain tumors: Comparison with conventional MRI. Clin Imaging 2002;26:227-36.