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SNI: Infection

Case Report

Nocardia paucivorans cerebellar abscess: Surgical and pharmacotherapy

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Abstract

Background: Nocardia species are ubiquitous in nature and mainly cause pulmonary disease in humans; however, they can also infect the central nervous system and skin. The management of cerebellar nocardiosis is troublesome and requires multiple considerations of the severity of the underlying systemic disease, difficulties in identifying the bacterium, and frequent delay in initiating adequate therapy.

Case Description: We report a 52-year-old diabetic female patient with *Nocardia paucivorans* cerebellar abscesses. Brain magnetic resonance imaging (MRI) revealed innumerable small ring-enhancing lesions of posterior fossa. In this report, we present a case of primary single cerebellar abscesses due to N. paucivorans. Early diagnosis and surgical interventions were significant for the patient. The diagnosis was confirmed by DNA sequencing and the organism was susceptible to trimethoprim–sulfamethoxazole (TMP/SMX). The patient was successfully treated with drugs and surgical excision.

Conclusion: According to the literature, surgical excision or aspiration of cerebellar abscess seems to provide favorable outcomes. In our experience, a successful outcome was achieved with subtotal resection and prolonged adequate antibiotic therapy.

Key Words: Cerebellar abscess, brain abscess, Grocott stain, Nocardia infection, *Nocardia paucivorans*, surgery

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INTRODUCTION

Nocardia is a gram-positive, branching, filamentous bacteria, ubiquitous in soil, and is distributed worldwide.[10] Infection commonly occurs after inhalation of the pathogen, resulting in nocardial pneumonia and hematogenous spread following nocardial pneumonia, which results in disseminated nocardiosis. However, in this case, primary occurred as a central nervous system infection.[12] We present the case of a nocardial cerebellar abscess diagnosed in a patient with predisposing conditions that were successfully cured. The patient underwent craniotomy, evacuation of the purulent collection, and partial resection of the abscess walls.[5]

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The patient completed 6 months of antibiotic therapy, after which she had no neurological symptoms and complete resolution of all brain abscesses, as observed on magnetic resonance imaging (MRI).

CASE PRESENTATION

A 52-year-old female patient was admitted to our hospital. The patient presented with ongoing (3 days) ataxia in the right lower limbs, in addition to dizziness and a progressive headache. No fever was noted in the past month before admission. Her medical history was unremarkable; she was immunocompetent, her diabetes was well controlled, and she did not have a history of surgery or steroid abuse. Her social history included intermittent alcohol consumption without smoking. She was alert and responsive on admission. Physical examination revealed clear lung sounds without rales or wheezing. Her heartbeat was regular without any murmurs. There was no tenderness or rebound tenderness in the abdomen. Neurological examination revealed right-sided ataxia and dysarthria. There were no other symptoms, for example, fever, neck stiffness, photophobia, papilledema, or other abnormalities. Laboratory testing revealed a C-reactive protein level of 0.7 mg/dL and a white blood cell count of 8500 μL. The patient had a normal neutrophil function test result, lymphocyte count, and normal immunoglobulin levels. She was tested negative for human immunodeficiency virus (HIV), HIV antibodies, hepatitis B surface antigens, and hepatitis C antibodies. Cerebrospinal fluid revealed a white blood cell count of 18 cells/mm^3, 70% lymphocytes (normal: <5% lymphocytes, no neutrophils, no monocytes), a red blood cell count of 1 cells/mm^3, and protein level of 92.9 mg/dL (reference range: <45 mg/dL). Cultures were negative for bacterial and fungal infection. A computed tomography (CT) scan of the head showed a right cerebellar low-density lesion without hydrocephalus. A CT scan of the chest, abdomen, and pelvis did not show any abnormalities. Cerebral MRI disclosed multiple necrotic cystic ring-enhancing lesions in the right cerebellar juxtaventricular region with surrounding edema.

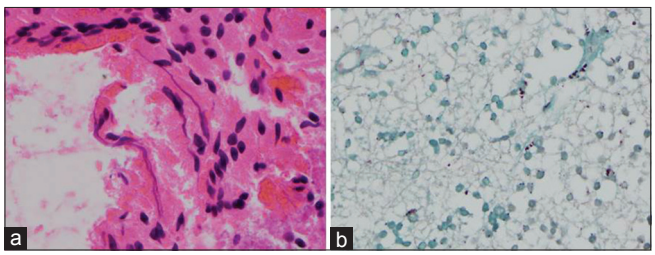

Figure 1: (a) The patient underwent resection of the lesion for microbiological and histopathological examination. Histopathological examination of the brain specimen demonstrated thin, branching organisms of about 1-micron thickness, consistent with Nocardia species on hematoxylin and eosin staining (original magnification, ×40). (b) Grocott staining revealed thin, filamentous, and ramifying argyrophilic bacteria (original magnification, ×40)

Diffusion-weighted imaging (DWI) showed restricted diffusion [Figure 1].[2] With the diagnosis of a suspected primary brain tumor, the patient underwent craniotomy and partial resection of the mass. A soft, brown, purulent mass was observed, and resected without opening the forth ventricle using a microdissector, under high magnification. The preliminary histopathological study of the resected lesion indicated a brain abscess. A microbiological investigation of the diagnosis was made using the Gram and Grocott stains of the surgical specimens [Figure 2]. A gram-stained smear of the fluid showed branching, filamentous gram-positive bacilli, which were identified following culture as *N. paucivorans*, by means of 16S rRNA sequence analysis.

This preliminary *in vitro* resistance to TMP/SMX informed the choice of ceftriaxone sodium as initial empiric treatment. A subsequent susceptibility E-test confirmed that the pathogen was actually susceptible to TMP/SMX (minimum inhibitory concentration: 0.01 μg/mL); therefore, antimicrobial therapy was modified accordingly. Medical treatment included ceftriaxone sodium (2 g/12 h) for 1 month and TMP-SMX [1600 mg/320 mg intravenous (IV), daily] for 1 month, followed by transition to oral therapy levofloxacin (500 mg daily) and TMP-SMX (1600 mg/320 mg also oral daily) for an additional 11 months. The patient's clinical condition improved over the following 5 weeks, and she was discharged on Day 35 with no neurological deficit. After 1 year of treatment, MRI revealed no brain abscesses [Figure 3].

DISCUSSION

Nocardia accounts for as little as 1–2% of all brain abscesses, and it is a rare cause of brain abscess,

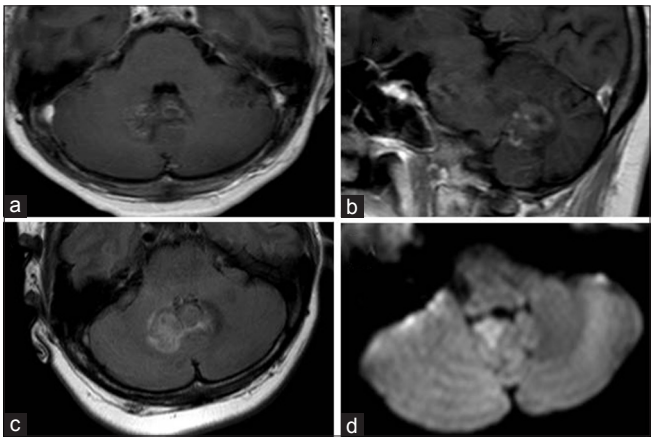

Figure 2: (a and b) T1-enhanced axial, sagittal magnetic resonance image showing infratentorial lesion affecting deep structures, including the cerebellar vermis. The lesion is juxtaventricular (fourth ventricle), but not cause obstructive hydrocephalus. (c) Fluid-attenuated inversion recovery demonstrated brain edema around the lesion. (d) Diffusion-weighted image showing a restricted lesion of abscess

particularly in an immunocompetent host.[13] Nocardia species are gram-positive, aerobic, branching, filamentous bacteria belonging to Actinomycetales, which can be found in the soil and dust worldwide.[9] Three main species cause infection in humans: *Nocardia asteroides*, *Nocardia brasiliensis*, and *N ocardia caviae*. *N. asteroides* is the most commonly isolated Nocardia species.[7] *N. paucivorans* is rare species.

Clinical manifestations of brain nocardiosis are commonly insidious and non-specific. Patients are typically diagnosed because of neurologic defects due to mass effect or even incidentally when performing craniotomy for a presumed brain tumor. The mortality rates estimated for a nocardial brain abscess are 55 and 20% in immune-compromised and immune-competent patients, respectively.[16,17] Abscesses are typically multiloculated and poorly encapsulated, and approximately 40% are multifocal.[8] Abscess localization is primarily in the brain stem, basal ganglia, and cerebral cortex of the frontal, parietal, and occipital lobes. Two aspects, however, make our case rather exceptional: The fact that the immunologic study did not reveal any type of immunosuppression and the abscess' location in the cerebellum. In our review [Table 1], only one patient displayed cerebellar nocardiosis, while six of seven patients had predisposing factors. Nocardial cerebellar abscess is a severe disease associated with brain stem disorders and hydrocephalus. Our case was high risk due to the abscess being located in the cerebellar juxtaventricular region. The most frequent symptom reported here was headache, which is consistent with our review. Focal neurological deficits were also observed in three patients—two patients exhibited hemiparesis and one patient showed ataxia and aphasia. Two patients presented with seizures. In nocardial cerebellar abscess, headache was the most frequent symptom as reported in patients with another abscess location. For diagnosis of a nocardial brain abscess, it is important to perform brain imaging and surgical interventions. It has been reported that nocardial brain abscesses typically exhibit multiple concentric rims in T2-weighted MRI.[6] Brain CT, demonstrating a hypodense, enhancing lesion with surrounding edema, is sensitive to discovery and localization of the lesion. DWI and apparent diffusion coefficient (ADC) maps could be very helpful in the differential diagnosis, particularly in brain abscesses showing the characteristic homogeneously

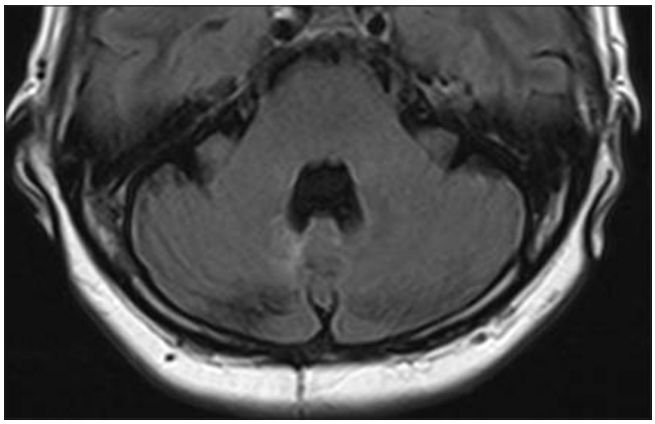

Figure 3: Brain magnetic resonance imaging performed 1 year after the surgery shows disappearance of the inflammatory tissue and purulent collection

Table 1: Summary of clinical characteristics, management, and outcome of nocardial brain abscess

Case [references]	Age/sex	Predisposing factors	Clinical symptoms	Characteristic of abscess	Treatment	Outcome
Galacho-Harriero *et al*.[5]	51 years/M	Diabetes	Headache	Right temporal-parietal multiple ring-enhancing lesion	Surgical resection TMP/SMX 800 mg/160 mg/12 h, 10 months	No neurological sign
Galacho-Harriero *et al*.[5]	68 years/F	Wegenerdisease Cyclophosphamide	Ataxia Aphasia	Supratentorial and infratentorial multiple ring-enhancing lesion	Surgical resection amikacin 500 mg/12 h (for 2 months) Rifampin 600 mg/12 h (10 months)	No neurological sign
Galacho-Harriero *et al*.[5]	84 years/M	Steroid	Apathy	Right temporal-parietal single lesion	Surgical resection TMP/SMX 800 mg/160 mg/12 h (10 months)	No neurological sign
Aliaga *et al*.[2]	63 years/M	Steroid	Headache Hemiparesis	Left frontal lobe multiple ring-enhancing lesion	Surgical resection TMP/SMX 15 mg/kg/day Ceftriaxson 2 g/12 h (10 months)	Recovered with minimal sequelae
Abel *et al*.[1]	67 years/M	Steroid	Seizure Hemiparesis	Left frontal lobe single ring-enhancing lesion	Aspiration of abscess TMP/SMX, meropenem (5 months)	Right-sided weakness and dizziness
Monticelli *et al*.[15]	70 years/M	Multiple myeloma	Seizure	Right parietal lobe multiple ring-enhancing lesion	TMP/SMX, meropenem	No neurological sign
Delaware *et al*.[4]	50 years/M	N/A	Headache	Bilateral cerebral hemispheres multiple lesion	Imipenem 1 g/8 h (3 months), Moxiis), ho 400 mg/24 h (3 months) TMP-SMX 1600 mg/320 mg/day (12 months)	No neurological sign

hyperintense lesions on DWI and hypointense lesion on ADC. In addition, to prevent treatment delay, early surgical intervention is required.[3,14] To treat a nocardial brain abscess, craniotomy with evacuation of the abscess, as well as collection of a specimen for culture to further assess drug sensitivity, is essential for successful treatment. In our review, surgery was undertaken in five patients (surgical resection in four patients; aspiration in one patient). Surgical resection was very effective in our case. A 12-month course of therapy is recommended for the treatment of nocardial brain abscesses. TMP/SMX, ceftriaxone, amikacin, and minocycline are used to treat nocardiosis. TMP/SMX is currently accepted as the first-line treatment for nocardiosis.[11] Of the seven patients in our review, six received treatment with regimens including TMP–SMX, in combination with other antibiotics. Therapeutic regimens lasted between 5 and 14 months. Complete clinical resolution was achieved in five patients. In the case presented here, we administered TMP/SMX for 12 months, according to a drug sensitivity test. Like in our rare case, early identification and treatment of the bacteria is necessary to achieve good outcome in immunocompetent patients.

CONCLUSION

Nocardia seems to have a special tropism for the neural tissue. Solitary abscess represents the most common manifestation in the central nervous system, accounting for 1–2% of all cerebral abscesses. Early identification of the specific nocardial species is important to initiate long-term effective antibiotic therapy. In our experience, successful outcome was achieved performing subtotal resection and administering antibiotic therapy.

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Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Abel S, Hasan S, Kujawski B, Talwar A, Betler J, Wegner R, *et al.* Cryptic Nocardia nova brain abscess postradiation treatment and neurosurgery in a patient with small cell lung cancer: A case report and review of the literature. Adv Radiat Oncol 2016;18:290-3.
2. Aliaga L, Fatoul G, Guirao E, Peña A, Rodríguez-Granger J, Cobo F. Nocardia paucivorans brain abscess. Clinical and microbiological characteristics. ID Cases 2018;13:e00422.
3. Chaudhari DM, Renjen PN, Sardana R, Nocardia Farcinica brain abscess in an immunocompetent old patient: A case report and review of literature. Ann Indian Acad Neurol 2017;20:399-402.
4. Delaware N, Than KD, Chen KS, McKeever PE, Wang AC, Pandey AS. Resolution of innumerable cerebral Nocardia paucivorans abscesses after medical management. J Clin Neurosci 2016;27:175-7.
5. Galacho-Harriero A, Delgado-López PD, Ortega-Lafont MP, Martín-Alonso J, Castilla-Díez JM, Sánchez-Borge B. Nocardia farcinica brain abscess: Report of 3 cases. World Neurosurg 2017;106:1053.e15-1053.e24.
6. Haines AB, Zimmerman RD, Morgello S. MR imaging of brain abscesses. AJR Am J Roentgenol 1989;152:1073-85.
7. Kim S, Lee KL, Lee DM, Jeong JH. Nocardia brain abscess in an immunocompetent patient. Infect Chemother 2014;46:45-9.
8. Kumar VA, Augustine D, Panikar D. Nocardia farcinica brain abscess: Epidemiology, pathophysiology, and literature review. Surg Infect (Larchmt) 2014;15:640-6.
9. Lai CC, Lee LN, Teng LJ. Disseminated Nocardia farcinica infection in a uraemia patient with idiopathic thrombocytopenia purpura receiving steroid therapy. J Med Microbiol 2005;54:1107-10.
10. Laurent FJ, Provost F, Boiron P. Rapid identification of clinically relevant Nocardia species to genus level by 16S rRNA gene PCR. J Clin Microbiol 1999;37:99-102.
11. Lee GY, Daniel RT, Brophy BP. Surgical treatment of nocardial brain abscesses. Neurosurgery 2002;51:668-71.
12. Lerner PI. Nocardiosis. Clin Infect Dis 199;22:891-903.
13. Lin YJ, Yang KY, Ho JT. Nocardial brain abscess. J Clin Neurosci 2010;17:250-3.
14. Menkü A, Kurtsoy A, Tucer B. Nocardia brain abscess mimicking brain tumour in immunocompetent patients: Report of two cases and review of the literature. Acta Neurochir (Wien) 2004;146:411-4.
15. Monticelli J, Luzzati R, Maurel C, Rosin C, Valentinotti R, Farina C. Brain abscesses caused by Nocardia paucivorans in a multiple myeloma patient treated with lenalidomide and dexamethasone: A case report and review of literature. Mediterr J Hematol Infect Dis 2015;7:e2015011.
16. Rafiei N, Peri AM, Righi E, Harris P, Paterson DL. Central nervous system nocardiosis in Queensland: A report of 20 cases and review of the literature, Medicine (Baltimore) 2016;95:e5255.
17. Sorrell TC, Mitchell DH, Iredell JR, Chen SC-A. Nocardia species. In: Bennett JE, Dolin R, Blaser MJ, editor. 8th ed, Vol 2. Philadelphia: Elsevier; 2015. p. 2853-63.