Surgical Neurology International

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Case Report

Four cases of nocardial brain abscess

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Received: 07 June 12 Accepted: 30 June 12 Published: 21 August 12

This article may be cited as:
Tamarit M, Poveda P, Barón M, Del Pozo JM. Four cases of nocardial brain abscess. Surg Neurol Int 2012;3:88.
Available FREE in open access from: http://www.surgicalneurologyint.com/text.asp?2012/3/1/88/99927

Abstract

Background: Nocardial brain abscesses are a rare central nervous system infection with high morbidity and mortality. Infection is acquired through inhalation or direct innoculation and then spreads hematogenously. They are usually associated with immunocompromised patients but may appear in otherwise healthy individuals. Treatment is based on surgical aspiration and antibiotics for several months.

Case Description: We present four cases of nocardial brain abscesses treated at our institution and review the literature regarding these lesions. Ages ranged from 22 to 71 years. One patient was a healthy individual without any predisposing condition. Patients were treated with surgical evacuation and long term parenteral antibiotics. Two patients made a full recovery; one patient died and one recovered with significant morbidity. In one case malignancy was suspected, probably delaying diagnosis.

Conclusions: Nocardial brain abscesses are a rare condition that needs to be considered in the differential diagnosis of brain lesions. They are not necessarily associated with predisposing factors such as immunosupresion. Treatment must be started as soon as possible with surgical evacuation and long term parenteral antibiotics in order to avoid significant morbidity.

Key Words: Nocardia, cerebral, brain abscess, treatment

Access this article online

Website: www.surgicalneurologyint.com

DOI: 10.4103/2152-7806.99927

Quick Response Code:

INTRODUCTION

Nocardial brain abscesses are a rare central nervous system infection, associated with high morbidity and mortality. They usually appear as opportunistic infections in immunocompromised patients but also occur in otherwise healthy individuals. Infection usually occurs through inhalation or direct innoculation, with central nervous system involvement developing as a result of hematogenous dissemination. We present four cases of nocardial brain abscesses that have been treated at our institution during a fifteen year period.

CASE REPORTS

Case 1

A 41-year-old male, HIV positive in C3 stage, complaining of headache, nausea, and vomiting, progressive left hemiparesis. Computed Tomography (CT)/Magnetic Resonance Imaging (MRI) studies showed a right temporal lesion with peripheral ring enhancement after contrast administration, and smaller satellite lesions. Under suspected diagnosis of toxoplasmosis, treatment with sulfadiazine/pyrimethamine was started

with no clinical or radiological improvement. Burr hole aspiration of abscess was done, with bacteriological cultures positive for *Nocardia asteroides*. Treatment with trimethoprim/sulfamethoxazole and amikacin was started, but the patient suffered neurological deterioration and worsening of the lesion in subsequent CT scans. He underwent craniotomy and evacuation, and since then has made a good recovery with left hemianopia as the only neurological symptom. Treatment with intravenous antibiotics was administered for six weeks, and subsequent treatment with oral cotrimoxazole was maintained for one year.

Case 2

A 22-year-old male with no relevant previous history except for an episode of culture-negative pneumonia two months beforehand. He was admitted to our hospital with symptoms of headache, nausea, and vomiting. CT/MRI studies showed a right temporoccipital lesion suggestive of brain abscess. Craniotomy with abscess evacuation was performed, and empirical antibiotic treatment was started. Cultures were positive for *Nocardia farcinica* and treatment with intravenous trimethoprim/sulfamethoxazole was started. Initially the patient made a good recovery, but in the course of weeks his neurological status worsened and CT scans showed hydrocephalus. He required external ventricular drainage. Cefalo-spinal fluid (CSF) cultures were also positive for nocardia, and treatment was changed to meropenem plus amikacine for 6 weeks and then meropenem (using a port-a-cath) and oral levofloxacine for one year. The patient made a full recovery, and hydrocephalus resolved without the need of shunting.

Case 3

A 71-year-old male with significant history for silicosis that was admitted to the emergency department with progressive motor afasia. CT/MRI brain studies showed three intra-axial lesions, two left frontal, and one in the left temporal lobe [Figure 1]. A total body CT scan was done, showing a pulmonary lesion. Biopsy of this lesion was performed, with no conclusive result. He was referred to our department with suspected diagnosis of pulmonary neoplasm with multiple brain metastases. Biopsy of the frontal lesions was performed, with evacuation of pus. Cultures were positive for *Nocardia arthritidis*. Treatment with trimethoprim/sulfamethoxazole and meropenem was administered for six weeks, and oral cotrimoxazole was taken for one year. He made a full recovery with resolution of neurological symptoms.

Case 4

A 58-year-old male with significant history for alcohol abuse with chronic hepatopathy, portal hypertension, and esophageal varices, hypothyroidism, glandular and pulmonary sarcoidosis treated with long-term steroids. He suffered a traumatic brain injury after a casual fall with subsequent agitation and a CT scan was obtained, showing a right intra-axial parietal lesion. MRI studies showed a heterogeneous lesion with peripheral contrast enhancement and diffusion restriction, suggestive of intracranial abscess. He underwent craniotomy and evacuation of the lesion. Cultures were possitive for *Nocardia cerradoensis*, and treatment with trimethoprim/sulfamethoxazole and meropenem was initiated. After initial improvement the patient suffered progressive clinical deterioration with respiratory insufficiency needing prolonged assisted ventilation. A pulmonary biopsy was obtained, showing extensive pulmonary fibrosis. After several weeks without the patient showing any signs of improvement, he was withdrawn from ventilation and eventually died.

DISCUSSION

Nocardia is a gram positive aerobic filamentous bacteria found in soil and water.[4,8] Nocardial infections occur more frequently in immunocompromised hosts, mainly with cell-mediated immunity defects such as HIV-positive patients, transplant organ recipients, patients with malignancies or long-term steroid use. They are also associated with localized pulmonary disease or

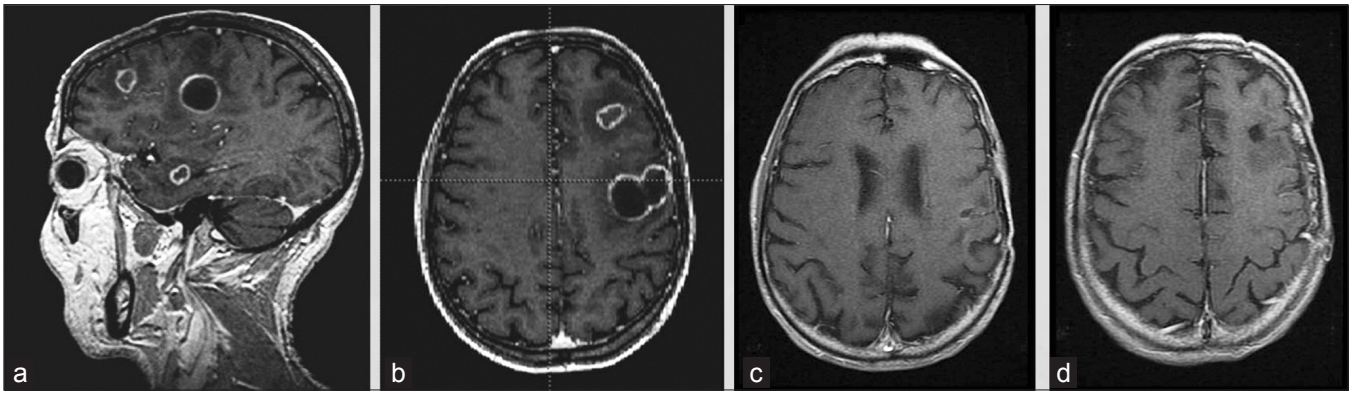

Figure 1: Images for Case 3. (a, b) The presurgical magnetic resonance imaging scan with multiple contrast-enhancing lesions. (c, d) The post-treatment MRI showing resolution of lesions, with areas of encephalomalacia

structural abnormalities, such as bronchiectasis.[2,8-10] Notwithstanding, in some series up to two 60% of nocardial infections occur in immunocompetent hosts, and up to two thirds of the patients with central nervous system infections do not have any of these predisposing factors.[3,5,9] Incidence of nocardial infections seems to be growing according to the published literature, which could be caused by an increase in the number of patients receiving immunosupresive treatment, improved diagnostic methods, or a higher proportion of old patients.[2,10]

Infection is acquired through inhalation or direct inoculation, causing primary pulmonary or cutaneous disease. Involvement of other sites occurs through hematogenous dissemination.[3,4,8] Nocardia seems to have a special tropism for the brain, with central nervous system (CNS) involvement in up to 45% of the patients with systemic infections; primary pulmonary infection might be subclinical, and up to 40% of CNS infections appear isolated without evidence of infection elsewhere.[3] CNS involvement most frequently presents as brain abscesses, although meningitis, diffuse cerebral infiltration or spinal cord infections have been described.[3] Symptoms and signs of CNS infections are very variable, generally insidious, without fever or signs of septicemia, unlike other bacterial abscesses. The most common signs are focal neurological deficits, non-focal findings, and seizures.[9] CT/MRI findings usually consist of one or multiple contrast-enhancing lesions. Symptoms and radiological findings might mimic other conditions such as neoplasms, vasculitis or stroke, delaying diagnosis.[3,6,8,9]

CNS nocardial infection is associated with high morbidity and mortality. Mortality rates are around 30%, compared to 10% for other bacterial abscesses. Immunocompromised patients and those with multiple lesions have a poorer prognosis, with mortality rates around 60%.[9]

Diagnosis is based on bacteriological cultures, serological tests being not useful. Gram stains show thin gram positive, weakly acid-fast branching filaments. Selective media are usually needed to isolate nocardia from other bacteria, therefore if nocardia is suspected it should be communicated to the microbiology laboratory.[4,8] Characterization of the different nocardia species is based on biochemical reactions or molecular techniques.[2]

Treatment of nocardial brain abscesses is based on surgery and antibiotherapy. According to a large series, if an extraneural nocardial infecton is identified, the patient is stable, and the diameter of the brain abscess is less than 2 cm, empirical treatment can be started without the need of surgical aspiration. For lesions larger than 2.5 cm in diameter, surgical aspiration is recommended. Craniotomy and excision is reserved for lesions that enlarge after two weeks or fail to shrink after four weeks of antibiotic treatment.[9]

For nocardial brain abscesses, treatment with high dose intravenous antibiotics for 3 to 6 weeks and then oral treatment for 12 months is recommended.[8,9] Cotrimoxazole (trimethoprim/sulfamethoxazole) is the most widely used antibiotic, but it can cause serious adverse reactions such as neutropenia or skin rash that might require cessation of treatment. Furthermore, nocardia resistance to cotrimoxazole has been described.[10] Alternative drugs that have been succesfully used are minocycline, amikacin, imipenem, third generation cephalosporines, tetracyclines, amoxicillin/clavulanic, linezolid.[1,2,4,6-10]

We report four cases of nocardial brain abscesses treated at our institution. Cases 1 and 4 were immunocompromised. Cases 3 and 4 had localized pulmonary disease, silicosis, and sarcoidosis respectively, which could have favoured the development of primary pulmonary nocardiosis. The other patient was previously healthy without any predisposing condition. Cases 2 and 3 had signs or symptoms of a lung infection, although we have no proof it was also caused by nocardia. In the other cases, primary infection seems to have been subclinical. In the third case, malignancy was suspected, probably delaying diagnosis and subsequent treatment. The previously healthy patient developed meningitis with secondary hydrocephalus despite surgical evacuation and antibiotic treatment, and therefore a more aggressive treatment was decided, with parenteral antibiotics given for one year using a port-a-cath. Case 1 needed a second neurosurgical procedure after burr hole aspiration. Two patients made a full recovery, one patient recovered with significant morbidity (hemianopia), and one patient died because of systemic complications. Our case series shows the need of early diagnosis and aggressive treatment of these lesions in order to start treatment as soon as possible and avoid significant morbidity or mortality. Nocardial brain abscesses must be taken in consideration in the differential diagnosis of intra-axial brain lesions in both healthy and immunocompromised patients.

CONCLUSION

Our case series shows the importance of early diagnosis and aggressive treatment of these lesions. Despite their low incidence, we need to consider nocardial infection in the differential diagnosis of a cerebral lesion in order to obtain an early diagnosis and start treatment as soon as possible.

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