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CASE REPORT

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Disseminated Nocardia infection—A rare presentation

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Abstract

Nocardia infection is rare and requires early diagnosis, extended use of sulfonamides for good prognosis, and prevention of recurrence. It is crucial to suspect nocardiosis in cases of atypical pneumonias or unexplained visceral organ dysfunction.

KEYWORDS

atypical, disseminated, immunocompromised, immunosuppression, Nocardia, nocardiosis

1 | INTRODUCTION

Nocardia infection is uncommon and requires early diagnosis and intervention. Extended use of sulfonamide, periodic surveillance, and the reduction in immunosuppression appear to be key factors for good prognosis and prevention of recurrence. It is crucial to suspect nocardiosis in cases of atypical pneumonias or unexplained visceral organ dysfunction.

Genus Nocardia is a gram-positive, aerobic, filamentous rod-shaped bacteria that are partially acid-fast. It is found globally in soil and decaying plant material and is often associated with rare opportunistic infections seen in immunocompromised hosts such as glucocorticoid therapy, malignancy, organ transplantation, HIV, diabetes mellitus, lung disease, chronic granulomatous disease, and autoimmune disease.[1] It can also be seen in immunocompetent individuals.[2] The modes of transmission include inhalation or ingestion of particles or cutaneous infection. Cutaneous infection can occur because of direct inoculation resulting from trauma, surgery, intralesional infection, or even an insect bite and can disseminate to virtually any organ, particularly the central nervous system. It tends to relapse or progress despite appropriate therapy.[3] Disseminated Nocardia typically presents as a primary pulmonary disease but can presents with cutaneous and hematogenous dissemination, resulting in subcutaneous nodules, cellulitis, and abscess formation.

2 | CASE HISTORY

A 59-year-old nonsmoker man with a past medical history of hypertension developed chest pain and acute pulmonary edema. He underwent cardiac catheterization and was noted to have coronary artery disease requiring a stent, reduced ejection fraction (EF) of 30% and wall motion abnormality, and severe mitral regurgitation. Despite optimal medical therapy, he developed severe global left ventricular dysfunction with EF 15% and nonsustained ventricular tachycardia. These events led to defibrillator implantation and a home milrinone drip. Because of severe ischemic cardiomyopathy, the patient underwent heart transplantation 8 months after the initial presentations. The pretransplant evaluation was completed and included the patient's weight—71 kilogram,

height—180 cm, and BMI—21.9. Laboratories at the time of initial admission include white blood count of 10.5 K/microL, hemoglobin 17.6 g/dl, platelets 308 K/microL, neutrophil 8.6 K/microL, albumin 3.0 g/dl, alkaline phosphatase 212 U/L, alanine aminotransferase 51 U/L, aspartate aminotransferase 33 U/L, creatinine 1.72 mg/dl, and GFR 43 ML per minute for 1.73 m^2. Additionally, infectious disease workup showed toxoplasma IgG <3 IU/ml, HSV 1 IgG 0.20 index value (normal <0.90 index value), quantiferon TB gold negative, RPR nonreactive, varicella Zoster IgG 2449 index value, HBV core IgM negative, Hep B S Ab negative, Hep B surface Ag negative, HIV Ag/Ab nonreactive, Hep C Ab negative, EBV IGG Ab positive, and CMV IgG positive.

Post-transplantation medications included as follows—fluconazole 200 mg daily, trimethoprim-sulfamethoxazole 80–400 daily, and valganciclovir 900 mg daily. The patient's immunosuppression regimen consisted of mycophenolate 1000 mg twice daily, prednisone 15 mg per day, and tacrolimus 2 mg twice daily.

The patient did very well for 10 months. He was cutting branches of a tree when he lost his balance and injured his chest when a 100-pound tree branch fell over his chest wall. He developed progressively worsening shortness of breath and difficulty breathing and was admitted to the hospital. CT scan of the chest showed multiple pulmonary nodules, one of which was large and cavitary (Figures 1 and 2). CT-guided needle biopsy revealed bacterial elements of *Nocardia transvalensis*. Antimicrobial susceptibility testing was performed in this case to guide therapy. He was treated with combination therapy of meropenem 1 gram iv every 8 hours and trimethoprim-sulfamethoxazole 15 mg/kg/day in 3 divided doses. Extrapulmonary foci screening MRI of the brain revealed lesions in the corpus callosum.

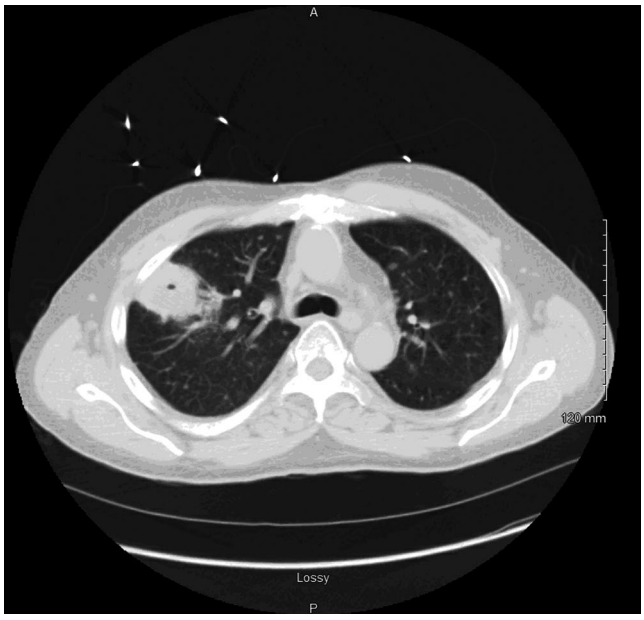

FIGURE 1 CT scan image showing multiple pulmonary nodules one of which is large and cavitary

In the next one month, follow-up imaging reported significant improvement and resolution of pulmonary nodules (Figure 3). However, an MRI of the brain revealed a new enlarging area involving the right posterior temporal lobe consistent with progressive worsening of brain abscesses (Figure 4). Intracranial biopsy pathology revealed Nocardia. The patient was treated with iv amikacin and iv trimethoprim-sulfamethoxazole 15 mg/kg/day in 3 divided doses. He was transitioned to oral ciprofloxacin and linezolid once repeat MRI revealed improvement and based on bacterial sensitivity pattern.[4]

He developed extreme debility, generalized weakness, right eye tenderness and induration, watering, headaches, and blurred vision. MRI revealed paranasal sinus mucosal thickening, dependent right maxillary sinus fluid levels significant for maxillary sinusitis, and new and worsening soft tissue swelling and enhancements significant for periorbital cellulitis and orbital wall osteomyelitis (Figure 5). Nocardia treatment was continued using moxifloxacin. He continued to deteriorate clinically and chose hospice care at this point. Antibiotic treatment was not escalated based on the patient's wishes.

3 | DISCUSSION

The most common spread site is the central nervous system (CNS), which accounts for about 44% of systemic infections.[5] It is essential to assess for Nocardia infection, and CNS presentation symptoms could include headaches, seizures, altered mental status, or focal neurological deficits.[6] Infection can present as meningitis or subacute abscess, which is often mistaken for malignancy. Because it can present insidiously, it can take months to years for CNS infection to progress before the emergence of clinical symptoms. By this time, the primary pulmonary site of infection may have been resolved. Therefore, consider nocardiosis in patients with CNS manifestations in conjunction with a recent or current pulmonary disease. Since systemic infection can result in rapid patient deterioration, it is vital to aggressively work up atypical pneumonia and distinguish between brain tumors and Nocardia abscess.[7]

The standard first-line treatment is sulfonamides. The treatment of severe disseminated infection with CNS involvement includes intravenous (IV) trimethoprim-sulfamethoxazole, amikacin, linezolid, third-generation cephalosporins, and carbapenems.[4,8] A treatment regimen for 6–12 months is indicated for a disease that does not

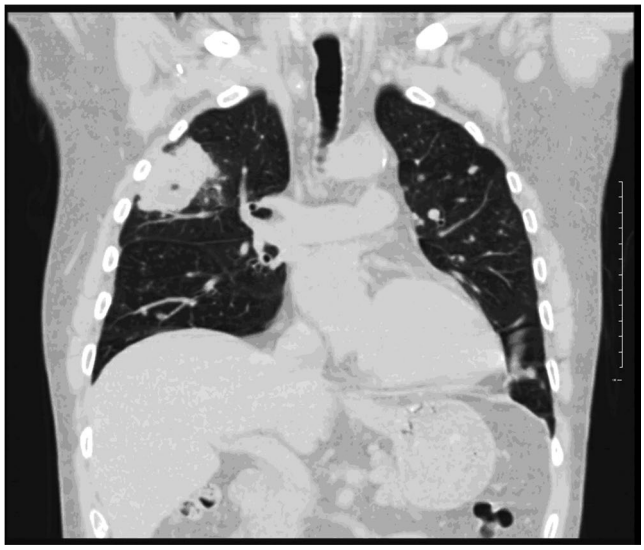

FIGURE 2 CT scan image showing multiple pulmonary nodules one of which is large and cavitary

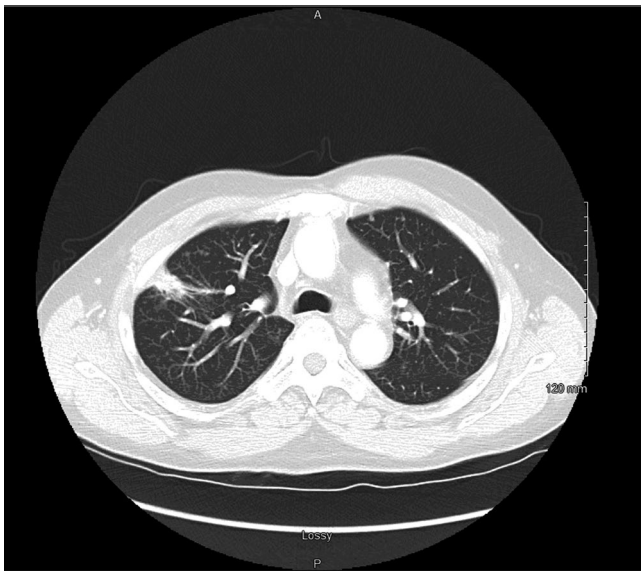

FIGURE 3 CT scan image showing resolution of nodules and improvement at 1-month follow-up scan

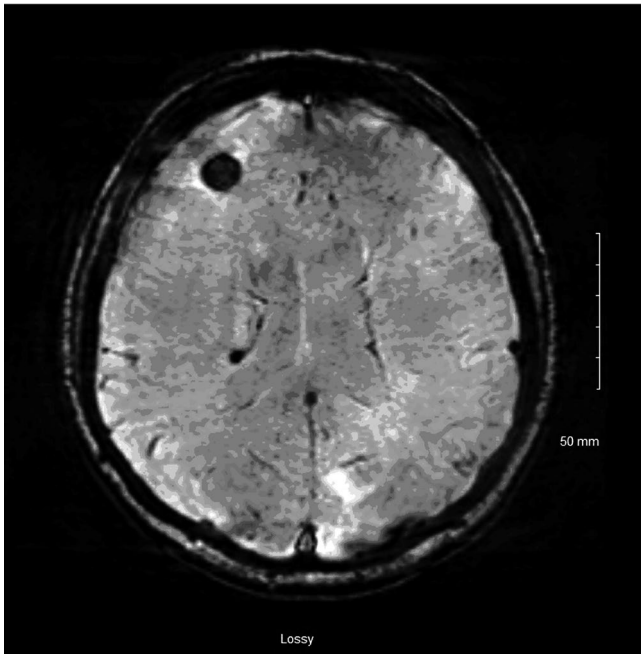

FIGURE 4 MRI Brain image showing right posterior temporal lobe abscess

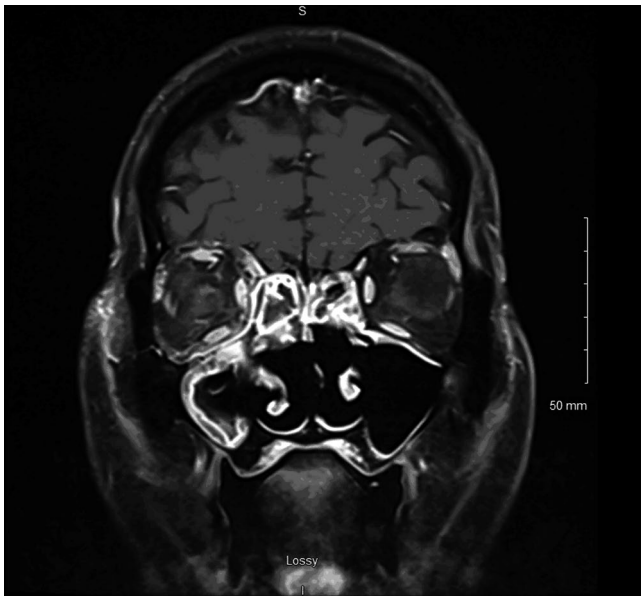

FIGURE 5 MRI of brain showing periorbital cellulitis and periosteal elevation significant for orbital wall osteomyelitis

involve the CNS, whereas immunosuppression or CNS involvement requires at least 12 months of treatment.[6] Periodic imaging is essential to follow up for the resolution of lesions during the treatment course. Disseminated nocardiosis is associated with a mortality rate ranging from 7% to 85% in immunocompromised hosts.

Our case was unique because of the disseminated involvement of sinus cavities. Through a review of the literature, this is very uncommon. Our patient's clinical picture continued to deteriorate despite standard IV antibiotic treatment. In addition, there are no studies that have been shown to determine the most effective therapy for nocardiosis. This is partly due to the rare occurrence of Nocardia infections and the even rarer occurrence of sinus involvement. In vitro studies have shown susceptibility in animal models to various antibiotics such as amikacin, imipenem, meropenem, linezolid, and dapsone.[9] Some of these other antibiotic processes could have been employed, but there is no evidence that this could have improved the patient's outcome.

4 | CONCLUSION AND LEARNING POINTS FOR CLINICIANS

The present report describes an uncommon *Nocardia transvalensis* infection in an immunocompromised patient. This case exemplifies the need for early diagnosis of Nocardia and the need for early intervention. Sulfonamide extended use and the reduction in immunosuppression appear to be key factors for a good prognosis.[10] However, as our case displays, the recurrence of infection can present within several months after initial presentation, and numerous variables determine the treatment effectiveness for Nocardia infections. It is crucial to suspect nocardiosis in immunocompromised patients, patients on immunosuppressive medications with severe pneumonia symptoms, or any other unexplained visceral organ dysfunction. In immunocompromised patients whose immunosuppression cannot be reversed, such as AIDS patients and transplant recipients, prophylactic treatment for nocardiosis with trimethoprim-sulfamethoxazole should be considered.

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AUTHOR CONTRIBUTIONS

Harkesh Arora involve in conceptualization, original case writing, multiple revisions, and editing. Sathishkumar Ramalingam involved in funding, writing, review, and editing. Rajvee Sanghavi involved in resources, writing, and review. Adedayo Balogun involved in resources, writing, and review. Maheshwari Muruganandam involved in resources, writing, and review.

ETHICS STATEMENT AND STATEMENT OF PATIENT CONSENT

I confirm that the patient consent has been signed and collected in accordance with the journal's patient consent policy. I will retain the consent form and will provide it if requested.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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