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First Case of *Nocardia pseudobrasiliensis* Causing Primary Cutaneous Nocardiosis in an Immunocompetent Patient

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Abstract

Nocardia brasiliensis is the most common cause of cutaneous nocardiosis. *Nocardia pseudobrasiliensis* is an emerging species responsible for invasive and disseminated disease in immunocompromised patients. We describe a case of a 67-year-old immunocompetent patient without significant past medical history diagnosed with primary cutaneous nocardiosis with *N pseudobrasiliensis* as the causative organism. In our opinion, we report the first case of primary cutaneous nocardiosis in an immunocompetent patient with *N pseudobrasiliensis* being the causative agent.

Keywords

primary cutaneous nocardiosis, *Nocardia pseudobrasiliensis*, immunocompetent

Introduction

In human infected with bacterial genus *Nocardia* there are more than 30 clinically relevant species that have been isolated.[1] *Nocardia asteroides* is the common cause of opportunistic infections in immunocompromised patients followed closely by *N brasiliensis*, which is the most common cause of cutaneous nocardiosis. *N pseudobrasiliensis* is an emerging species of *Nocardia* that was first identified in 1996.[2] Thus far, there have been 7 cases of *N pseudobrasiliensis* causing invasive and disseminated disease in immunocompromised patients.[3] We present a case of an immunocompetent 67-year-old female who presented with an ulceration of her right middle finger post rose thorn-related injury, diagnosed with *N pseudobrasiliensis*.

Case Presentation

A 67-year-old female presented with an ulceration on the right middle finger post rose thorn-related injury to the site. Patient reported a papular lesion on her right middle finger (Figure 1), which was progressively enlarging with swelling, and pain, ultimately ulcerating within a week of onset. In the emergency department, surgical drainage was carried out, and purulent samples were sent for culture. As patient was afebrile with no systemic symptoms, she was discharged home on oral cephalexin and fluconazole with outpatient follow-up. Few days later, the patient noticed a second ulceration on the right middle finger, with painful swelling of the right axillary region. During the second visit to the emergency department, 2 tender ulcers on the middle phalanx of right middle finger with tender nodular lymphangitis tract leading up her forearm were found on the patient (Figure 1) with right axillary lymphadenopathy. The patient was initially started on itraconazole for suspected diagnosis of sporotrichosis. However, wound culture revealed growth of filamentous acid fast organisms (Figure 2), and medications were changed to intravenous trimethoprim-sulfamethoxazole followed by oral formulation. Bacterial cultures were sent to a reference laboratory at LabCorp Burlington, North Carolina. Eventually species identification was done by matrix-assisted laser desorption ionization-time of flight mass spectroscopy and polymerase chain reaction sequencing, which showed *N pseudobrasiliensis*. Susceptibility testing was not performed. In subsequent outpatient visits the patient showed significant improvement on trimethoprim-sulfamethoxazole. Thus, antibiotics were continued for an additional 3 months after improvement in skin findings.

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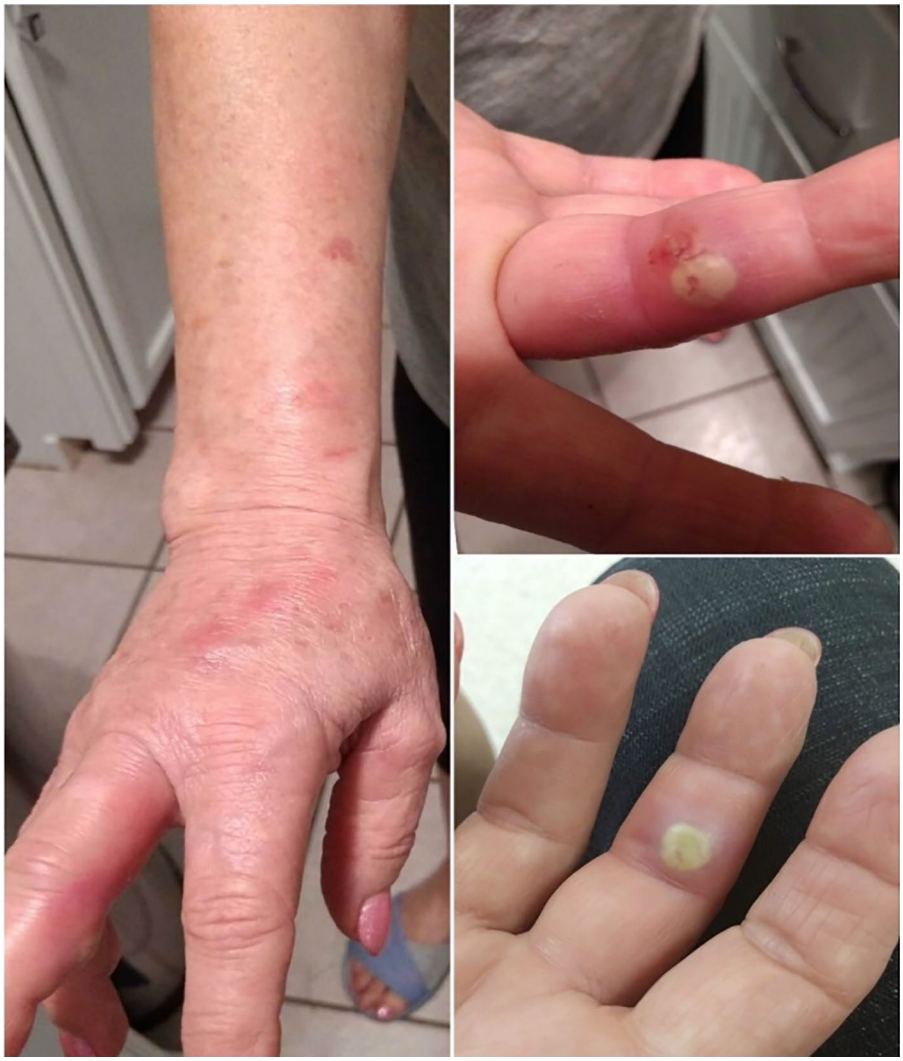

Figure 1. Right middle finger papule, with lymphangitis tracking up patient's forearm.

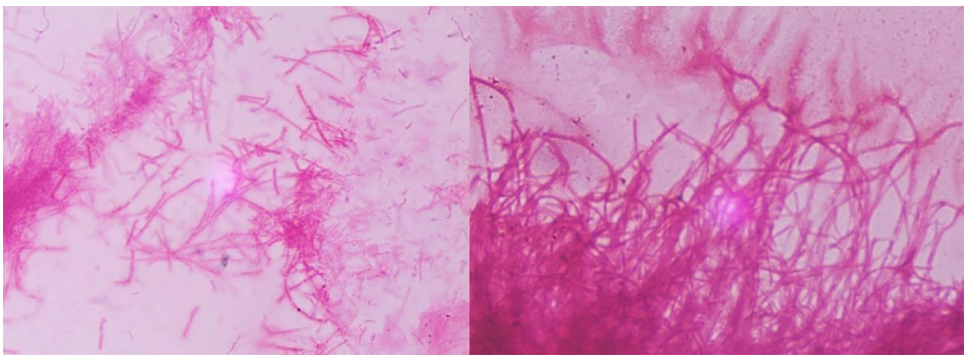

Figure 2. Positive acid fast filaments of *Nocardia pseudobrasiliensis*.

Discussion

According to the Centers for Disease Control and Prevention, 500 to 1000 cases of nocardiosis occur in the United States every year, and are grouped into systemic versus cutaneous group. Approximately 60% of the cases are seen in immunocompromised patients.[4] Systemic nocardiosis is most often seen in immunocompromised patients following inhalation of *N asteroides* and progression to pulmonary infection.[5] Out of all cases of nocardiosis, 7.8% to 10% of cases are cutaneous in nature, but exact prevalence of primary cutaneous nocardiosis is unknown. Traumatic inoculation of skin progresses to cellulitis and/or lymphangitis in immunocompetent patients.[6,7] *N brasiliensisis* is the causative agent in almost 80% of the cases of cutaneous nocardiosis.[6] In 1996, Ruimy et al[2] confirmed that *N pseudobrasiliensis*, which was thought to belong to *N brasiliensis* phenotypically, is actually genotypically a new taxon constituting a new species of *Nocardia*. In 2015, Kandasamy et al[3] reported a total of 7 published case reports on *N pseudobrasiliensis* to date. Among all those 7 cases, all except 2 cases had predisposing condition causing immunosuppression and none was reported to cause cutaneous infection. To the best of our knowledge, this is the first reported case of primary cutaneous infection caused by *N pseudobrasiliensis* in an immunocompetent patient.

Manifestation of primary cutaneous nocardiosis can be varied. Mostly seen clinical presentation include localized superficial, lymphocutaneous, mycetoma-like, or cutaneous involvement in disseminated infection.[7] Similar to our patient's presentation, lymphocutaneous nocardiosis usually starts from the site of inoculation and spreads proximally along lymphatic vessels giving rise to inflammatory nodules like picture.[1] Clinical presentation of lymphocutaneous nocardiosis is clinically similar to sporotrichosis, staphylococcal, or streptococcal soft tissue infections, as well as ulceroglandular tularemia.[8] *Coccidioides immitis* along with *Histoplasma capsulatum*, *Cryptococcus neoformans*, *Pseudoallescheria boydii*, *Blastomyces dermatitidis*, and viruses like cowpox or herpes simplex are few of the less common causes of lymphangitis.[9]

Diagnosing nocardiosis is challenging as clinical presentation is similar to other diseases mentioned above. Commercial availability as well as reliability of serological test is not good.[7] Therefore, gram stain and culture is used for the diagnosis of *Nocardia*.[7] *Nocardia* species are gram-positive, rod-shaped bacteria, which are partially acid-fast beaded branching filaments that grow under aerobic conditions.[10] *N brasiliensis* and *N pseudobrasiliensis* can be distinguished from the other species by adenine hydrolysis and nitrate reductases, but these tests are not commonly available in most microbiology laboratories. Therefore, matrix-assisted laser desorption ionization-time of flight mass spectroscopy and gene sequence analysis are used for species identification as was seen in our case.[11] *N pseudobrasiliensis* is thought to be associated with more invasive and disseminated disease, as well as less favorable antibiotic susceptibility patterns.[2]

Due to lack of prospective controlled trials, optimal treatment for nocardiosis has been debated. Appropriate surgical drainage followed by susceptible antibiotics is the preferred treatment for cutaneous nocardiosis. Various factors like infection site, disease extension, and host factors influence clinical outcome and duration of the therapy.[9] Trimethoprim-sulfamethoxazole is the first-line antibiotic therapy for nocardiosis. Immunocompetent patient with cutaneous nocardiosis should be ideally treated with trimethoprim-sulfamethoxazole for 2 to 4 months, which may need to be extended further for some immunocompromised patients to prevent recurrence.[10]

Conclusion

This is the first case of culture proven primary cutaneous infection due to *N pseudobrasiliensis*. Primary cutaneous nocardiosis is a rare infection, but presents similarly to other bacterial skin infections. Due to the potential for this infection to rapidly disseminate early recognition and prompt treatment ensures better prognosis.

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Author Contribution

Shraddhadevi Makadia and Ishan Patel wrote the original draft of the article. Shraddhadevi Makadia participated in gathering the data for the case. All authors read and approved the final manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethics Approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed Consent

Verbal informed consent was obtained from the patient for their anonymized information to be published in this article

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