First report of *Nocardia veterana* soft tissue abscess

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Abstract:

Background: Members of the genus *Nocardia* are filamentous, gram-positive, aerobic bacteria and exist ubiquitously in most environments. In 2001, the species *Nocardia veterana* was first isolated, and it predominantly causes pulmonary infections in immunocompromised hosts. **Methods:** We present the first report of a soft tissue abscess caused by *N. veterana* in a 59-year-old woman being treated for chronic cutaneous graft-versus-host disease. **Results:** After failing to improve with empiric treatment, two incision and drainage procedures were required. She subsequently completed a one-year course of oral antibiotic therapy consisting of trimethoprim-sulfamethoxazole then azithromycin. No relapse occurred. To better characterize *N. veterana* infections, we performed a systematic literature review and summarized all previously reported cases. **Conclusion:** The rising prevalence of immunocompromising conditions warrants increased vigilance for *N. veterana* infections and other atypical or opportunistic pathogens.

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Introduction

Members of the genus *Nocardia* are filamentous, gram-positive, aerobic bacteria and exist ubiquitously in most natural environments.[1, 2] They classically lead to infections in immunocompromised hosts,[1] but 15% of patients in a large series had no predisposing conditions.[3] In 2001, the species *Nocardia veterana* was first isolated.[4] It has been demonstrated to predominantly cause pulmonary infections in immunocompromised hosts,[5-7] and only two reports have identified *N. veterana* as the cause of abscesses.[8, 9] We present the first report of a soft tissue abscess caused by *N. veterana* in a 59-year-old woman being treated for chronic cutaneous graft-versus-host disease (GVHD).

Methods

Review of medical records was approved by our institution's institutional review board. To better characterize *N. veterana* infections, we performed a systematic literature search of PubMed with the following operators: ("Nocardia veterana" OR "N. veterana") AND (infection OR infections). Articles' citation lists were also reviewed to identify cases. We excluded one abridged report of a mycetoma[10] whose full details are published in a later manuscript.[11]

Case Presentation

- A 59-year-old woman with a history of acute lymphoblastic leukemia s/p hematopoietic stem cell transplantation (HSCT) presented to the emergency department for evaluation of a right shoulder cutaneous abscess.
- Relevant medications: prednisone (30 mg daily), tacrolimus, acyclovir, fluconazole, and monthly pentamidine.
- Two weeks prior to presentation, she had been evaluated for a 5 x 7 cm erythematous, indurated region on her right shoulder, and empiric treatment with PO minocycline (100 mg BID) was initiated.
- I&D were performed in the emergency department and purulent drainage was sent for culture. Antibiotic therapy was empirically switched to PO clindamycin (600 mg TID). She was afebrile and discharged.
- Two days later, she was admitted after a wound check showed increasing erythema around I&D site. Leukocytosis noted (15,200/μL; ref. range 4,000-10,000/μL), but she remained afebrile.
- MRI of her right upper extremity demonstrated a 2 cm soft tissue abscess involving superficial fascia of the lateral deltoid and focal myositis (**Figure 1**). Antibiotic therapy was broadened to intravenous vancomycin and piperacillin-tazobactam.
- On hospital day 2, repeat I&D of abscess. The following day, culture from her initial presentation grew 4+ Gram-positive rods, prompting *Nocardia* spp. to be suspected.
- Antibiotic therapy was switched to PO trimethoprim-sulfamethoxazole (TMP-SMX) (800 mg-160 mg BID).
- Brain MRI and chest CT showed no evidence of involvement, and she was discharged on hospital day four.
- Four days after discharge, 16S rRNA gene sequencing identified the isolate as *N. veterana*, and susceptibility testing was sent out to the University of Texas Health Center's Department of Microbiology Research in Tyler, Texas.
- Seventy-three days after discharge, elevated creatinine (3.1 mg/dL, baseline 1.9 mg/dL; ref. range 0.6-1.2 mg/dL) was attributed to the use of TMP-SMX in combination with tacrolimus, and antibiotic therapy was switched to PO azithromycin (500 mg daily).
- 1.5 months later, her creatinine returned to baseline (1.7 mg/dL), and she had been tolerating azithromycin without adverse events.
- In absence of symptoms attributable to her *N. veterana* infection, azithromycin therapy was discontinued 289 days after its initiation. She continued to receive phototherapy for GVHD and remained on prednisone (20 mg daily), acyclovir, fluconazole, and monthly pentamidine.
- She continued to be followed after completing >1 year of anti-nocardial therapy and has remained relapse-free for over 5 years

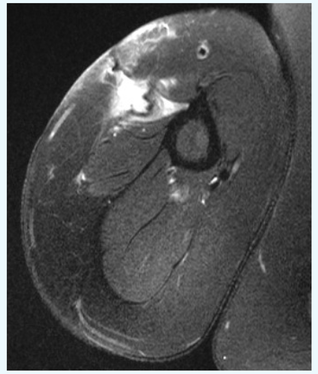

Figure 1. *Nocardia veterana* abscess. T2-weighted magnetic resonance imaging demonstrates 2 cm abscess involving the superficial fascia of the right lateral deltoid muscle

Literature Review

Table 1 summarizes our case and all reported cases of *N. veterana* infections. The mean age was 55 years, and 29% were female. Pulmonary infections accounted for 17 of 24 infections, with abscesses being the second most common (3 of 24). In total, 25% of patients had prior solid organ transplantations, 17% of patients had prior HSCT and were undergoing treatment for GVHD, and 13% of patients were people living with HIV. The duration of treatment ranged from 3 weeks to >6 years. TMP-SMX monotherapy was used as initial anti-nocardial therapy for 11 of 24 cases. Successful outcomes occurred in 58% of cases.

Table 1. *Nocardia veterana* infections

Age/Sex	Clinical Syndrome	Immunocompromising Comorbidities	Initial Anti-nocardial Regimen	Length of Treatment	Outcome	Reference
83/F	bowel abscess	malignancy	TMP-SMX	>3 months	success	8
73/M	brain abscess	diabetes mellitus	meropenem	1 year	success	9
66/M	endophthalmitis	heart transplant, diabetes mellitus	meropenem, linezolid	planned length of 12 months	success	12
42/F	mycetoma	SLE	amoxicillin	>6 years	success	11
72/M	nodular lymphangitis	immunosuppressive therapy for interstitial pneumonitis	TMP-SMX	planned length of 3 months	stable at time of report	13
40/M	peritoneal infection	AIDS, chronic hepatitis B, malignancy	died before treatment initiation	Not applicable	died before treatment initiation	14
24/M	pulmonary infection	chronic granulomatous disease	amikacin, ceftriaxone, trimethoprim	>3 months	stable at time of report	15
40/F	pulmonary infection	HIV	cotrimoxazole	6 months	success	16
43/F	pulmonary infection	immunosuppressive therapy for SLE	TMP-SMX	6 months	success	17
47/M	pulmonary infection	liver transplant	TMP-SMX	6 months	success	17
52/M	pulmonary infection	not specified	not reported	not reported	not reported	18
52/M	pulmonary infection	HSCT recipient treated for GVHD	TMP-SMX	397 days	success	19
52/F	pulmonary infection	HSCT recipient treated for GVHD	TMP-SMX	154 days	success	19
54/M	pulmonary infection	heart transplant	cotrimoxazole	15 days	success	16
59/M	pulmonary infection	liver transplant	imipenem	>6 months	success	16
63/M	pulmonary infection	lung transplant, immunosuppressive therapy for bronchiolitis obliterans	TMP-SMX	16 weeks	died after discontinuing immunosuppression	15
65/M	pulmonary infection	HSCT recipient treated for GVHD	imipenem/cilastatin, amikacin	722 days	died from encephalitis of unknown etiology	6
67/F	pulmonary infection	recurrent pneumonias and bronchiectasis	minocycline	>7 weeks	symptomatic improvement at time of report	17
78/M	pulmonary infection	history of tuberculosis	not reported	not reported	not reported	4
not reported	pulmonary infection	lung transplant	TMP-SMX	30 days	success	7
58/M	pulmonary infection with bacteremia	malignancy, recent prednisone course for autoimmune hemolytic anemia	TMP-SMX, azithromycin, piperacillin-tazobactam	3 weeks	success	20
30/M	pulmonary infection with bacteremia	HIV, chronic hepatitis B, history of tuberculosis	TMP-SMX	<1 month	died from multi-organ failure	5
51/M	pulmonary and urinary tract infections with bacteremia	malignancy, peritoneal dialysis	TMP-SMX	<2 months	died from underlying malignancy	21
59/F	soft tissue abscess	HSCT recipient treated for GVHD	TMP-SMX	1 year	success	our case

Conclusion

Overall, *N. veterana* has a predilection for causing pulmonary infections in patients with immunocompromising conditions,[4-7, 15-20] and TMP-SMX is commonly used to treat infections caused by *Nocardia* spp.[1] When planning management for an immunocompromised host, a prolonged treatment duration is recommended. The rising prevalence of immunocompromising conditions warrants increased vigilance for *N. veterana* infections and other atypical or opportunistic pathogens.

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