CASE REPORT

Nocardia brasiliensis vertebral osteomyelitis and epidural abscess

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SUMMARY

Nocardia species exist in the environment as a saprophyte; it is found worldwide in soil and decaying plant matter. They often infect patients with underlying immune compromise, pulmonary disease or history of trauma or surgery. The diagnosis of nocardiosis can be easily missed as it mimics many other granulomatous and neoplastic disease. We report a 69-year-old man who presented with chronic back pain and paraparesis. He was found to have *Nocardial brasiliensis* vertebral osteomyelitis and epidural abscess. Laminectomy and epidural wash out was performed but with no neurological recovery. This is the second reported case of *N brasiliensis* vertebral osteomyelitis in the literature.

BACKGROUND

Nocardia species are ubiquitous soil organisms. It appears as branching, beaded, filamentous bacilli on Gram stain. Inhalation is the most common route of infection followed by direct skin inoculation. Lung is the most common organ involved. Nocardiosis is typically an opportunistic infection in immunocompromised patients. It can also affect immunocompetent patients in about a third of the cases.

We report the second case of *Nocardia brasiliensis* vertebral osteomyelitis and epidural abscess. We review the literature on *Nocardial* vertebral osteomyelitis and epidural abscess.

CASE PRESENTATION

A 69-year-old man was admitted for evaluation of paraparesis. He was treated for pulmonary tuberculosis in Mexico 12 years ago. The patient complained of recurrent superficial skin abscesses on his back and had multiple incision and drainage (I&D) over the years. Seven years ago, he was treated for *N brasiliensis* skin abscess of his back. Three months before admission he complained of back pain and stiffness of arms and legs. Prednisone 10 mg was started for presumptive diagnosis of polymyalgia rheumatica with poor response. Six weeks before admission he complained of progressive leg weakness. He became bedbound and was admitted to our hospital. Physical examination revealed a cachectic man who weighed 38 kg, his blood pressure was 100/60, pulse rate 90/min and temperature 98.1°F.

He was kyphotic with multiple skin scars on his back. A paraspinal sinus tract draining yellowish discharge was also noted (figure 1). The muscle strength was 3/5 in the hip flexors and 2/5 in the distal leg muscles. Deep tendon reflexes were hyperactive in knees and ankles. There was a sensory level

Figure 1 Multiple old healed sinus tracts on the back of the patient and a new sinus tract which was discharging pus.

at T4 and bilateral upgoing toes. The chest x-ray (CXR) revealed bilateral upper lobes fibrosis and nodular opacities which was unchanged from a prior CXR. The haemoglobin was 10.3 gm/dl, the white blood cell count was 21 000 with 92% neutrophils, the albumin was 1.9 gm/dl and the erythrocyte sedimentation rate was 129 mm/h. A three sputum specimens were negative for acid-fast bacilli. The MRI of the spine revealed an infiltrative process involving the thoracic spine vertebrae and diffuse paraspinal soft tissue and epidural thickening and enhancement from T1 through T9 causing cord compression. The picture was suggestive of osteomyelitis and epidural phlegmon. Vancomycin and cefepime was started empirically. Blood cultures were negative and the initial Gram stains and the acid-fast bacilli stains on the skin sinus discharge were negative. An urgent T3–T8 laminectomy and epidural wash out was performed. The post-operative course was uneventful. A filamentous branching Gram-positive bacilli was reported growing from the spinous culture 5 days after admission. We suspected nocardia infection; linezolid and bactrim therapy was started. The vancomycin and cefepime were discontinued. The sensitivities were reported few days later and the antibiotics were switched to minocycline and bactrim. The patient was discharged to the rehabilitation unit. He remains wheel chair bound with some improvement of the back pain. *N brasiliensis* was identified and we planned to continue treatment with minocycline and bactrim for 1 year.

DISCUSSION

Nocardia is a genus of aerobic Gram-positive bacteria. Unlike other Gram-positive bacteria,

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Table 1 Cases of nocardial spinal, epidural abscess and vertebral osteomyelitis reported in the literature

Cases	<i>Nocardia</i> species	Age/comorbidities	Presentation	Treatment and outcome
Ataly <i>et al</i> ⁷	<i>Asteroides</i>	51 years renal transplant, renal failure on haemodialysis, chronic obstructive lung disease (COPD), diabetes mellitus (DM)	Back pain and leg weakness. MRI: paravertebral and epidural abscess from C2–C8 compressing the cord.	Percutaneous drainage of the abscess. Intravenous mipenem and intravenous trimethoprim/sulfamethoxazole for 3 months then oral trimethoprim/sulfamethoxazole for 3 months. Complete neurological recovery.
Lakshmi <i>et al</i> ⁸	<i>Brasiliensis</i>	20 years, no underlying comorbidities	Leg weakness, urine retention and fever. History of multiple subcutaneous back abscesses s/p I and D. She has multiple healed and discharging sinuses on her back. MRI: cord compression and paravertebral abscess.	Patient was started on trimethoprim/sulfamethoxazole. The follow-up and outcome was not reported.
Graat <i>et al</i> 2002 ⁹	<i>Fracinicia</i>	54 years, Alcohol abuse, chronic liver disease, depression and hypertension	Back pain and leg weakness. Methicillin sensitive staphylococcus aureus bacteremia, remained ill in spite of intravenous dicloxacillin and gentamycin. CXR: lung infiltrates and pleural effusion. MRI: L1–L2 spondylodiscitis, psoas abscesses and epidural abscesses from T11–L3.	Multiple procedulres: laminectomy, drainage of abscesses, bone grafts, intercostal tubes. All the abscesses and surgical specimens grew <i>Nocardia</i> . Combinations of trimethoprim, ciprofloxacin, sulfadiazine and amikacin were administered then imipenem and minocycline were prescribed. Patient developed candida wound infection which required percutaneous drainage and fluconazole therapy. After 10 months of hospitalisation he was walking with a cane. He remained on cipro, sulfadiazine for 2 years.
Durmaz <i>et al</i> 2001 ¹⁰	<i>Asteroides</i>	59 years, DM	Neck pain, left arm and leg weakness. MRI: multiple contrast-enhancing brain and cervical cord lesions.	Craniotomy and laminectomy with drainage and excision of abscesses were performed. Intravenous amikacin, ceftriaxone and trimethoprim/sulfamethoxazole was initiated. Patient died after 12 days postoperatively.
Mehta <i>et al</i> ¹¹	Not reported	30 years, no comorbidities	Productive cough, fever, leg weakness, mastoid and knee skin abscess. CXR: bilateral lung infiltrates. MRI: lumbar intramedullary abscess like lesion.	Patient was treated with antituberculous medications and steroids with no response. Mastoid skin abscess grew nocardia. She was treated with cotrimoxazole and amikacin, clarithromycin and augmentin were added from time to time. Duration of treatment is unknown. She was able to walk without assistance.
Mukunda <i>et al</i> ¹²	<i>Asteroides</i>	52 years, no comorbidities	Legs weakness, urine and stool incontinence. MRI: 1×1.8 cm intramedullary lesion at level of L1.	Lumbar laminectomy, intramedullary abscess was drained. Initial treatment with intravenous imipenem and intravenous trimethoprim/sulfamethoxazole then oral trimethoprim/sulfamethoxazole and minocycline treatment was continued for 1 year. Complete recovery.
Harvey. <i>et al</i> ¹³	<i>Asteroides</i>	39 years. Remote history of alcoholism	Low back pain, urine incontinence and fever. MRI: destructive lesion at L4 and epidural abscess causing cord compression.	Lumbar laminectomy and evacuation of the epidural abscess. Intravenous amikacin for 8 weeks and intravenous ceftriaxone for 6 months and oral sulfisoxazole for one year. Ambulating without a brace and minimum pain.
Guiral <i>et al</i> ¹⁴	<i>Asteroides</i>	37 years, no comorbidities	Back pain and fever. Bone scan showed increased uptake in a sacroiliac joint. An aspirate grew nocardia. Poor response after 10 days treatment with trimethoprim/sulfamethoxazole. CT showed a lytic lesion in the sacrum.	Excision of large sacroiliac abscess and debridement of bones. Cultures grew nocardia and treatment with trimethoprim/sulfamethoxazole was continued for 2 months. Patient had complete neurological recovery.
Siao <i>et al</i> ¹⁵	<i>Asteroides</i>	57 years, intravenous heroin user	Neck pain and quadriplegia. A myelogram showed complete blockage at C2–C3 space to C4–C5 space, CT revealed an epidural abscess.	Laminectomy and decompression of the abscess were performed. Culture grew <i>N. asteroides</i> . Treatment was started with trimethoprim/sulfamethoxazole which was switched to minocycline because of allergic reaction. No neurological recovery.
Peterson <i>et al</i> ¹⁶	<i>Asteroides</i>	53 years, 70 pack year smoker, alcohol dependency	Productive cough, weight loss and leg weakness. CXR: right upper lobe infiltrate. Myelogram complete blockage of contrast at T4. CT: destruction of T2 and T3.	Thoracic Laminectomy and multiple decompression and drainage procedures were performed. The lung biopsy grew <i>Nocardia</i> . Patient was treated with intravenous ampicillin and sulfadiazine. Patient survived with some neurological recovery.
Epstein <i>et al</i> ¹⁷	<i>Asteroides</i>	50 years, no comorbidities	Back pain, leg weakness productive cough and right supraclavicular mass with sinus formation. CXR: bilateral upper lobe infiltrate. Spine x-ray: mottled appearance of C7–T3 vertebrae.	Laminectomy was performed with partial excision of tumor mass. Pathology revealed granuloma with sulfur granules seen on periodic acid shiff stain. Blood, urine and stool cultures grew <i>Nocardia</i> . Patient was treated with tetracycline and sulfisoxazole. He made a partial recovery and is able to walk with crutches.

Continued

Table 1 Continued

Cases	<i>Nocardia</i> species	Age/comorbidities	Presentation	Treatment and outcome
Welsh <i>et al</i> ¹⁸	<i>Asteroides</i>	38 years, no comorbidities	Cough and fever with right upper lobe infiltrates. She was treated empirically for tuberculosis in spite of negative smear. She developed weakness and numbness of both legs. There were two subcutaneous tender nodules.	The skin lesions and sputum grew <i>Nocardia</i> . Streptomycin and sulfadiazine treatment was started. Patient developed headache, nuchal rigidity, respiratory failure and died. Autopsy revealed disseminated Nocardiosis.

Nocardia appears as branching, beaded, filamentous bacilli on Gram stain.^{1–6} Actinomyces can resemble *Nocardia* on Gram-stained sample. However, *Nocardia* exhibits weak acid fastness and grows only under aerobic condition.^{1–6} *Nocardia* is a slowly growing organism; routine cultures usually require 5–21 days to exhibit growth. It is important not to discard the cultures early if you are suspecting nocardiosis.⁴ *Nocardia* exists in the environment as a saprophyte; it is found worldwide in soil and decaying plant matter. It has been recovered from water, garden soil, house dust and beach sand.^{2–3} Inhalation is the most common route of infection, and the lung is the most frequently involved organ.^{3–4} Direct inoculation in the skin is the second route of infection.^{3–4}

Nocardia can disseminate from pulmonary or cutaneous focus directly to virtually any organ. There is no evidence of respiratory spread from infected animals to humans.² There is also no evidence of person-to-person transmission although rare clusters suggest this possibility.² The exact prevalence of nocardiosis is unknown, old reports estimated 500–1000 cases every year in the USA.¹ Although immunocompetent hosts can develop nocardiosis (10–50% of cases), nocardiosis is typically regarded as opportunistic infection. Cell-mediated immunity is crucial to contain the infection. Organ transplantation, cancer, diabetes mellitus, alcoholism, AIDS and long-term use of corticosteroids were all reported to increase the risk of nocardiosis.^{2–4} Since Edmond Nocard first described aerobic actinomycetes as the causal agent of bovine farcy in 1888, the taxonomy of genus *Nocardia* continues to evolve; more than 50 species have been described.^{1–3} *N. asteroides* is the most common species associated with human disease. *N. brasiliensis* is the second most frequently aerobic actinomycete isolate in the laboratory. It is responsible for mycetoma in Mexico and South America and is usually associated with localised and cutaneous infection.² We searched MEDLINE for reports of nocardiosis causing spinal epidural abscess, spinal cord and vertebral body infection and we found 12 cases in the literature.^{7–18} We included only cases with positive cultures (table 1). Five patients (41%) had underlying known comorbidities that increase the risk of nocardiosis.

Diabetes mellitus was present in two patients,^{7–10} alcoholism was present in two patients,^{9–16} intravenous drug use in one patient,¹⁵ renal failure and history of renal transplant was present in one patient.⁷ Chronic obstructive pulmonary disease (COPD) was reported a risk factor for pulmonary nocardiosis and was present in one patient who had pulmonary nocardiosis that spread to his spine.¹⁶

Disseminated nocardiosis is the involvement of two or more organs. Six patients (50%) had vertebral osteomyelitis and epidural abscesses as part of disseminated nocardia infection.^{9–11 16–18} Pulmonary involvement was present in five of these patients

(41%). The current infection in our case is likely secondary to activation of latent infection since he was treated for *N. brasiliensis* abscesses on his back. Prednisone use probably activated an old dormant infection. *N. asteroides* was reported in nine cases.^{7–10 12–18} *Nocardia fracinicia* was reported in one case.⁹ There was only one report of *Nocardia brasiliensis*; the patient in this report had multiple subcutaneous back abscesses and sinuses similar to our case.⁸ Optimal antimicrobial treatment regimens have not been firmly established for nocardiosis.² Sulfonamides have been used in nocardiosis treatment since the 1940s.^{2–16} Synergy against *Nocardia* has been demonstrated between trimethoprim and sulfamethoxazole (TMP-SMX) which became the first line of treatment for *Nocardia* infection.^{3–6 16} For adults with normal renal function, the recommended daily dose is 5–10 mg/kg TMP and 25–50 mg/kg SMX, divided over two to four doses.

For the treatment of cerebral abscesses, disseminated disease, a higher daily dose can be considered; 15 mg/kg TMP and 75 mg/kg SMX. After 3–6 weeks, dosage can be reduced and treatment can be resumed orally.⁶ Not all *Nocardia* species are sensitive to sulfa drugs. Alternative antimicrobial agents, belonging to carbapenems, cephalosporins, aminoglycosides, quinolones, macrolides or tetracyclines can be used for patients who cannot tolerate sulfa drugs. Combination antibiotic therapy is usually used as the initial therapy in the very ill patients.^{2–3 6} Optimum duration of antibiotic therapy is uncertain but long-term suppressive therapy is the rule.² Non-immunocompromised patients with pulmonary or systemic nocardiosis should be treated for a minimum of 6–12 months, those with CNS infection should be treated for 12 months.² All immunocompromised patients should be treated for at least 1 year.² Limited cutaneous infection can be treated for 1–3 months.^{2–6} Sulfa antibiotics were used in all the 12 patients in our review. They were used as the solo antibiotic in only three patients (25%).^{8–14} Laminectomy was required in six patients (50%).^{3–10 12 15–17} Drainage and debridement was performed in two patients.^{7–14} Case series and reviews reported a death rate of 18%–33% for patients with chronic nocardiosis and 66–72% for acute infections.^{1–4} The death rate of CNS disease is 40–87%.^{1–4} Two of the patients in this review died from disseminated infection (18%).^{10 18} Five patients (45%) had complete recovery,^{7–12–14} two patients (18%) required assistance with walking,^{16–17} one patient did not have neurological recovery like our patient and one patient's outcome was not reported.^{8–15}

Nocardiosis is a disease with a high mortality. The diagnosis can be difficult as it mimics many other common granulomatous and neoplastic diseases. It usually presents in immunocompromised patients with other coexisting illnesses and it can be a slow grower on the culture media. Nocardiosis should be considered as a potential cause of cavitary lung lesions, brain, bone, epidural and skin abscesses that does not respond appropriately to antibiotics especially with negative Gram stains and cultures.

Learning points

- ▶ Although nocardiosis is typically regarded as an opportunistic infection in immunocompromised patients, one-third of the patients are immunocompetent.
- ▶ *Nocardia* is a slowly growing organism which takes 5–21 days to exhibit growth. It is important not to discard the cultures early if you are suspecting nocardiosis.
- ▶ Treatment duration has to be at least months.
- ▶ Nocardiosis is a great imitator, it is frequently misdiagnosed as it mimics many other common granulomatous and neoplastic diseases.

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