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Case report

Prostate abscess caused by *Nocardia farcina*

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ABSTRACT

Nocardia farcinica usually infects the respiratory tract and can sometimes cause central nervous system infections; however, it rarely infects the prostate. Here we report the first case of *N. farcinica* detected in the purulence specimen drained from a prostate abscess. A 70-year-old Japanese male receiving steroid and cyclosporine treatment came to our department with chief complaint of turbid urine. Computed tomography revealed a low-density lesion in his prostate. Antibiotic administration and prostatic drainage were effective. *N. farcinica* was detected in the cultures of urine and prostatic drainage purulence specimens. Nocardiosis should be included in the differential diagnosis in immunosuppressive patients with prostate abscess.

Introduction

Nocardiosis is an infection caused by the opportunistic *Nocardia* species that usually develops in immunocompromised patients. *Nocardia farcinica* is a gram-positive and aerobic actinomycete that can cause human infection. *Nocardia farcinica* infection can sometimes be lethal. Nocardiosis usually begins as a subacute lung infection, similar to actinomycosis, but *Nocardia* tends to disseminate.

N. farcinica often infects the lungs, brain, and skin but rarely infects the prostate. Prostate abscesses are rare in clinical practice because early antibiotic therapy has reduced this common complication of prostatitis. Prostate abscesses develop mainly in diabetic and immunocompromized patients and are frequently caused by gram-negative or gram-positive bacteria, such as *Escherichia coli* and *Staphylococcus aureus*.

Herein, we report the first case of a prostate abscess caused by *N. farcinica*, which was detected in the purulence specimen drained from the prostate abscess, in a 70-year-old Japanese male.

Case report

A 70-year-old Japanese male with interstitial lung disease (ILD), diabetes mellitus, atrial fibrillation, and ischemic heart disease was hospitalized due to bacterial pneumonia. At the time of admission, he was taking prednisolone 13 mg/day and cyclosporine 50 mg/day for ILD and had been previously taking cyclophosphamide. The other medications were repaglinide 1.5 mg/day and teneligliptin 20 mg/day for diabetes mellitus, apixaban 5.0 mg/day for atrial fibrillation, and aspirin 100 mg/day and prasugrel 3.75 mg/day for ischemic heart disease. He was initiated on levofloxacin (LVFX) as empiric therapy for the newly diagnosed bacterial pneumonia. We judged that LVFX was effective for his pneumonia, because inflammatory findings on laboratory data had decreased and consolidation on chest X-ray and CT had improved. Although the antimicrobial agent was effective for the pneumonia, he still had dyspnea and hypotension. Then he was diagnosed with congestive heart failure. His chronic heart failure might be exacerbated by bacterial pneumonia. Therefore, he was initiated on treatment with furosemide, dopamine, and dobutamine. His general condition had been stable. After improvement of heart failure, cloudy urine was reported.

On physical examination, his vital signs were as follows: blood pressure, 118/68 mmHg; pulse, 80/min; respiratory rate, 20/min; oxygen saturation, 99% on room air; body temperature, 36.8 °C; and Glasgow Coma Scale (GCS), 15. His head, neck, cardiovascular, and abdominal examinations were normal. The examination of the

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lungs revealed bilateral fine crackles. There was no evidence of costovertebral angle tenderness.

Laboratory evaluation revealed leukocytosis and anemia (white blood cell count, 13,700/μL; hemoglobin, 8.8 g/dL). Peripheral blood smear showed neutrophilia. C-reactive protein was elevated at 5.51 mg/dL. Serum creatinine and blood urea nitrogen levels were 1.08 mg/dL and 27 mg/dL, respectively. Liver function tests were normal except for an elevated alkaline phosphatase level of 436 IU/L.

Urine microscopy showed 100 white blood cells/high-power field and bacteria. Computed tomography of the pelvis revealed a prostatic mass measuring 4.0 × 5.0 × 5.0 cm (Fig. 1). Gram staining of the urine showed gram-positive, filamentous, branching rods (Fig. 2a). Kinyoun staining of the urine showed filamentous, branching rods (Fig. 2b). Urine culture was positive for *N. farcinica*, the presence of which was confirmed by mass spectrometric analysis. The drug susceptibility analysis of the isolated organism is shown in Table 1.

The patient was treated with oral trimethoprim/sulfamethoxazole (TMP/SMX) 320/1600 mg/day (6.4/32 mg/kg/day). On day 6 after treatment initiation, his serum creatinine level was elevated to 1.53 mg/dL. Because of the acute kidney injury, the antimicrobial agent was switched to imipenem/cilastatin (IPM/CS) 1.5 g/day (30 mg/kg/day). On day11 from starting TMP/SMX, trans-perineal prostatic drainage with percutaneous vesicostomy was performed. The culture of the drained purulence was positive for *N. farcinica*. On day 18, the patient was restarted on oral TMP/SMX 80/400 mg/day (1.6/8 mg/kg/day) which was increased gradually to 320/1600 mg/day after discontinuation of the intravenous IPM/CS administration. However, his serum creatinine level was found to be elevated again. The TMP/SMX dose was reduced to 160/800 mg/day (3.2/16 mg/kg/day), and clavulanate/amoxicillin (CVA/AMPC) 1500 mg/day (30 mg/kg/day) was added. After 60 days from starting treatment against nocardiosis, the patient was eventually getting discharged with TMX/SMX 160/800 mg/day and CVA/AMPC 2250 mg/day (45 mg/kg/day). He continued to take the pills for about 12 months in outpatient setting.

Discussion

Nocardia species are environmental, gram-positive, acid-fast, filamentous, branching rods. The ports of entry of *Nocardia*, which has more than 50 species such as *N. asteroides*, *N. nova*, and *N. brasiliensis* [1], are the airways and skin at sites of surgery and trauma; once in the body, they lead to nocardiosis, an opportunistic infection that manifests in immunocompromized patients in 60% of the cases [2]. For example, inhalation of soil particles causes pulmonary infections, whereas direct invasion causes skin infections. The most common infection site is the lungs (43%), followed by the central nervous system (30%) [3].

Risk factors are treatment with steroids, immunosuppressive therapy, previous surgery, neoplasm, transplantation, acquired immune deficiency syndrome, chronic pulmonary disease, diabetes mellitus, chronic kidney disease, and alcoholism [3,4]. Our patient was receiving prednisolone and cyclosporine for interstitial pneumonia. In the current case, the isolated pathogen was identified as *N. farcinica*, the causative microorganism in 29.8% of all *Nocardia* infections [5].

Microscopic investigation is useful for diagnosis. In the current case, gram staining revealed the presence of gram-positive, filamentous, branching rods. Kinyoun staining, an acid-fast procedure, was useful for distinguish *Nocardia* from *Actinomyces*. Cultures should usually grow for at least 48–72 h to allow colonies to appear, which can often take more than 5 days. Currently, 16S rRNA sequencing is the most frequently used method for identification of *Nocardia* species [1,2]. In the current case, we used matrix-assisted laser desorption/ionization-time of flight mass spectrometry (Microflex LT/SH®) for the identification of the pathogen. The score for *N. farcinica* was over 2, which allowed for its early identification.

The empiric therapy for nocardiosis is TMP/SMX, and *N. farcinica* is usually resistant to cephalosporin antibiotics and aminoglycosides except amikacin [2]. The usual duration of therapy is 6 months, although immunosuppressive patients need 12 months of treatment [4].

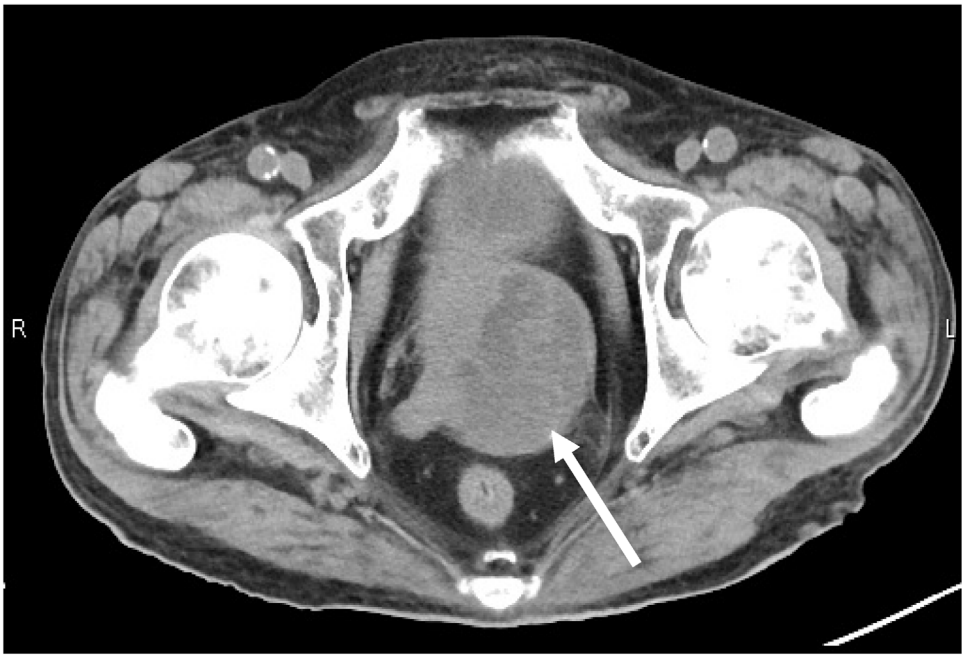

Fig. 1. CT scan: A pelvis CT revealed a 4.0 × 5.0 × 5.0 cm low density lesion indicate abscess at left side of prostate.

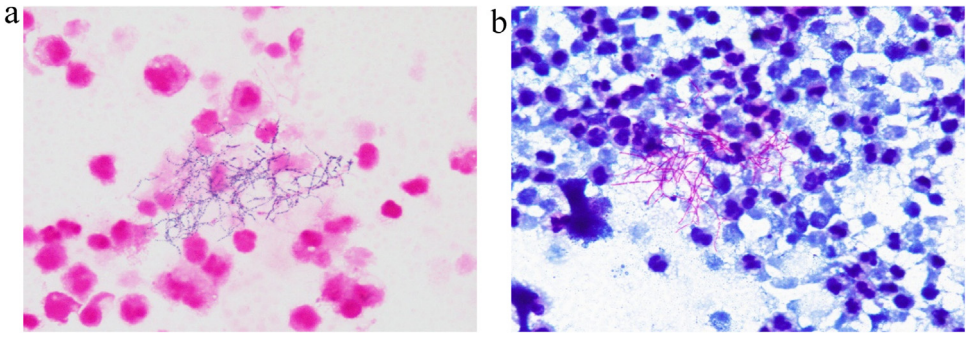

Fig. 2. a. Gram stain: Urine Gram stain showed filamentous branching Gram-positive rods and white blood cell (×1000). b. Kinyoun stain: Urine Kinyoun stain showed filamentous branching rods (×1000).

Table 1
Drug susceptibility of *N. farcinica* identified our patient.

Antibiotics	MIC (μg/mL)	Interpretation
CVA/AMPC	4.0	S
CTRX	16.0	I
IPM/CS	2.0	S
CAM	8.0	I
MINO	4.0	I
CPFX	8.0	R
TOB	8.0	I
AMK	0.5	S
TMP/SMX	0.25	S

S: Susceptible, I: Intermediate, R: Resistant.
CVA/AMPC: Amoxicillin/Clavulanate, CTRX: Ceftriaxone, IPM/CS: Imipenem/Cilastatin.
CAM: Clarithromycin, Minocycline, CPFX: Ciprofloxacin, TOB: Tobramycin.
AMK: Amikacin, TMP/SMX: Trimethoprim/Sulfamethoxazole.

Conversely, risk factors for prostate abscess are prostate biopsy, surgery, instrumentation of the urinary tract, urinary tract disorders, intravenous drug use, diabetes mellitus, chronic kidney disease, cirrhosis, and immunosuppression. The causative pathogens are usually gram-negative rods that cause urinary tract infections, such as *E. coli*. Drainage of the abscess is important for its management because the pathogen isolated from the pus culture is often different than that isolated from the urine culture.

To date, only one case of prostate abscess caused by *N. farcinica* has been reported [6]. The authors detected *Nocardia* only by a blood culture and not directly from the culture of purulence drained from the prostate abscess. Therefore, the current patient was the first case of *N. farcinica* that was detected using the culture of pus drained directly from a prostate abscess. In both cases, the patients had been on long-term immunosuppressive therapy.

Genitourinary nocardiosis is rare. To date, there were 17 reports of genitourinary nocardiosis (Table 2) [3,6–20], and 94.6% of the patients harbored risk factors. Testes and kidneys were more likely to be infected, and *N. asteroides* was the most common causative pathogen. Patients with prostatic involvement of *N. farcinica* were rare.

In the current patient, there was no evidence of other sites of *Nocardia* involvement except for the prostate. The patient had interstitial pneumonia but did not have any nodules suggestive of pulmonary nocardiosis. However, he did not have any wounds or nodules in the extremities or the trunk. Thus, we postulated that *N. farcinica* might have entered through the airways and disseminate to the prostate.

In conclusion, nocardiosis is a rare disease and should not be overlooked in the differential diagnosis of infections in immunosuppressed patients. Percutaneous trans-perineal or transrectal drainage is very useful for diagnosis and therapy. Microbiological surveillance including aggressive procedures is needed for early diagnosis and appropriate treatment.

Table 2
Case reports of genitourinary nocardiosis.

Year	Autor	Case	Organs	Other Sites	Species	Underlying disease
1971	Young et al. [7]	53 M	Renal abscess	Lung, Brain	*N. asteroides*	Hodgkin disease
1971	Young et al. [7]	26 F	Renal abscess	Lung, Brain	*N. asteroides*	Hodgkin disease
1971	Young et al. [7]	41 F	Renal abscess	Lung, Brain	*N. asteroides*	Lymphosarcoma
1974	Geelhoed et al. [8]	70 M	Testis	Lung	*N. asteroides*	Lung Cancer
1976	Strong et al. [9]	61 M	Testis, Prostate	Lung, Liver	*N. asteroides*	MDS
1986	Wheeler et al. [10]	44 M	Testis	Retina	Unknown	Heart Transplantation
1991	Yenrudi et al. [11]	19 F	Renal abscess	Lung	*N. asteroides*	SLE
1994	Miralles [12]	22 M	Kidney	Lung, Brain	*N. farcinica*	AIDS
1994	Lopez et al. [13]	52 M	Testis	Subcutaneous abscess	*N. asteroides*	Liver Transplantation
1996	Salahuddin et al. [14]	47 M	Pyelonephritis	Unknown	*N. asteroides*	Type 1 Diabetes
2000	Torres et al. [3]	85 M	Pyelonephritis	Lung, Bacteremia	*N. farcinica*	non-Hodgkin Lymphoma
2003	Qu et al. [15]	37 M	Prostatitis	Bacteremia	*N. asteroides*	Intestine Transplantation
2005	Routh et al. [16]	78 M	Testis, Epididymis	Bacteremia	Unknown	Granulomatous Polyarteritis
2009	Dehghani et al. [17]	22 M	Epididymis	Brain	Unknown	T-cell Leukemia
2012	de Montmollin et al. [18]	68 F	Renal abscess	Lung	*N. farcinica*	Malnurtrition
2013	Yamaguchi et al. [19]	77 M	Testis	Subcutaneous abscess	*N. brasiliensis*	Nothing
2014	Poisnel et al. [20]	51 M	Prostatitis	Bacteremia	*N. veterana*	Glioblastoma
2016	Scorey et al. [6]	68 M	Prostate abscess	Lung, Bacteremia	*N. farcinica*	Psoriatic arthritis

MDS: Myelodysplastic Syndrome, SLE: Systemic Lupus Erythematosus, AIDS: Acquired Immune Deficiency Syndrome.

Author statement

Corresponding author, Ippei Sakamaki is responsible for this manuscript and responsible for communicating with the other authors about progress, revisions and final approval of the proof.

Author contributions

All authors took care of the patients. YY made conception of this work. IS and AU wrote the draft. The manuscript was revised and approved by all authors.

Duplicate submission publication

Authors declare that this submission is not duplicate submission.

Consent

Authors obtained written informed consent from the patient for publication of this case report.

Declaration of Competing Interest

All authors have no conflicts of interest to declare.

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