


# Pulmonary nocardiosis caused by *Nocardia exalbida* mimicking lung cancer

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## Keywords

Lymph node enlargement, *Nocardia exalbida*, nocardiosis.

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## Abstract

Nocardiosis is an uncommon infection caused by *Nocardia* species, but it can often occur in immunocompromised patients. As computed tomography (CT) findings of pulmonary nocardiosis, consolidation, masses, and nodules are often found, but lymph node enlargement is infrequent. *Nocardia exalbida* was first isolated in 2006, and there are still few reports on this microorganism. We report a case of pulmonary nocardiosis caused by *N. exalbida* presenting as a mass and lymph node enlargement that mimicked lung cancer. A 76-year-old man was referred and admitted to our hospital because of persistent cough, sputum production, and chest discomfort. Chest CT showed a mass in the superior segment of the left upper lobe and mediastinal lymph node enlargement. After we performed bronchoscopies, *Nocardia* species was isolated in a cultured specimen and identified as *N. exalbida*. This case required differentiation from lung cancer and was difficult to diagnose.

## Introduction

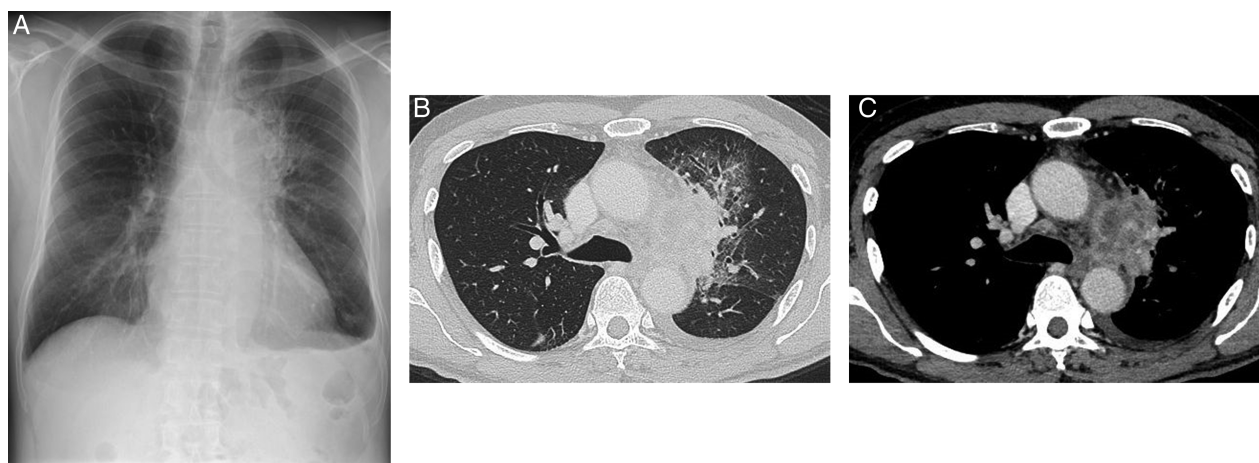
Nocardiosis is an uncommon infection caused by *Nocardia* species but can often occur in immunocompromised patients undergoing organ transplantation and those having cancer. Nocardiosis can occur in many organs, but pulmonary lesions are the most common. Computed tomography (CT) findings of pulmonary nocardiosis, consolidation, masses, and nodules are frequent, whereas lymph node enlargement is not. We report a case of pulmonary nocardiosis caused by *Nocardia exalbida* with CT findings of a mass and lymph node enlargement, requiring differentiation from lung cancer.

## Case Report

A 76-year-old man was referred and admitted to our hospital for persistent cough, sputum production, and chest discomfort. He had medical histories of overactive bladder and haemorrhoids, a 60-pack-year history of cigarette smoking, and enjoyed gardening. On examination, his vital signs were as follows: temperature 37.5° C, SpO<sub>2</sub> 97% on room air, blood pressure 129/73 mmHg, pulse rate 85/min, and respiratory rate 18/min. Coarse crackles were present

in the left upper lung. Chest-X-ray showed a mass in the superior left lung field and left pleural effusion (Fig. 1A). Chest CT also showed a 45-mm mass in the superior segment (S1 + 2) of the left upper lobe and mediastinal lymph node enlargement (Fig. 1B). These combined findings were suspicious for lung cancer. The mass showed contrast enhancement and suspected necrosis (Fig. 1C). Laboratory findings showed elevations of the white blood cell count (16,530/ $\mu$ L) and C-reactive protein (14.75 mg/dL) level and a reduced haemoglobin level (8.9 g/dL). However, tumour markers values of CEA, SCC, CYFRA, and ProGRP were normal.

We initially performed a bronchoscopy for suspected lung cancer but could detect no findings of malignancy in the transbronchial lung biopsy or cytology specimens, and no bacteria, including mycobacterial species, were isolated in the culture test. However, because his symptoms continued to exacerbate, we performed another bronchoscopy, adding endobronchial ultrasound-guided transbronchial needle aspiration to improve diagnostic accuracy. Because we considered the possibility of a rare bacterial infection, we had the specimen cultured for more than 1 week. *Nocardia* species was ultimately isolated in the culture and identified as *N. exalbida*.



**Figure 1.** Chest-X-ray showed a mass in the superior left lung field and left pleural effusion (A). Chest CT showed a mass of 45 mm in the superior segment (S1 + 2) of the left upper lobe and mediastinal lymph node enlargement (B). The mass also showed contrast enhancement and suspected necrosis (C).

We empirically treated the patient with meropenem before identifying the bacterial species. After identification, we additionally administered trimethoprim/sulfamethoxazole (TMP-SMX), which improved his symptoms and the abnormal shadow on chest X-ray. After the patient was switched to TMP-SMX and levofloxacin, he was discharged from hospital. Thereafter, we performed a precise whole-body examination on him and discovered colon cancer. After about 3 months of treatment, chest X-ray and CT findings improved (Fig. 2A–C), and he has been recurrence-free for 1 year.

## Discussion

*Nocardia* species are Gram-positive bacteria found within the environment in soil and water [1]. They cause rare opportunistic infections in immunocompromised patients, such as those with organ transplantation, cancer, corticosteroid use, or alcohol abuse. *Nocardia* can affect various organs. In 1994, Beaman and Beaman reported on 1050 patients with nocardiosis and found that lesions were frequently present in the pulmonary system (412 patients; 39.2%), systemically (more than two sites involved) (334 patients; 31.8%), in the central nervous system (91 patients; 8.7%), and in cutaneous or lymphocutaneous sites (82 patients; 7.8%). Fortunately, as our detailed examination demonstrated, in the present patient, only one lung was infected.

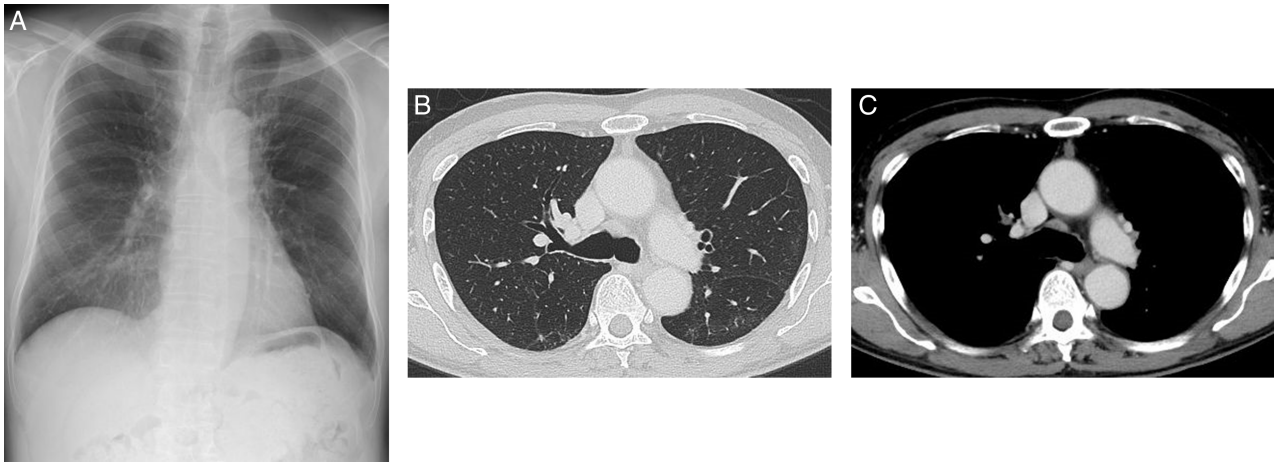
Initially, we suspected lung cancer, not pulmonary nocardiosis, because of the chest CT findings. Tsujimoto et al. reported the high-resolution CT findings of 40 patients with pulmonary nocardiosis [2]. They found nodules ( $n = 13$ , 32.5%), cavitation ( $n = 12$ , 30.0%), consolidation ( $n = 9$ , 22.5%), and masses ( $n = 5$ , 12.5%) but no lymph node enlargement. Liu et al. also reported nine

cases of pulmonary nocardiosis, with consolidation ( $n = 8$ , 88.9%) and mass or nodule ( $n = 6$ , 66.7%) being the most common CT findings [3], but only two patients had lymph node enlargement. As both mediastinal lymph node enlargement and a mass were present on CT, it took time to determine an accurate diagnosis.

Currently, numerous species of *Nocardia* have been reported. In an article from Spain published in 2017, among 1119 species, the following were accurately identified: *Nocardia cyriacigeorgica* (25.3%), *Nocardia nova* (15.0%), *N. abscessus* (12.7%), and *N. farcinica* (11.4%). However, *N. exalbida*, as identified in our patient, was a relatively unusual species [4]. It was first isolated in 2006 in two immunocompromised patients, one with lung abscess and one with pemphigus vulgaris [5]. The present patient had a risk factor of colon cancer, and his gardening hobby may have been the source of his infection. There are few published reports on this species, so further reporting of cases is necessary.

When treating nocardiosis, antibiotics such as TMP-SMX, amikacin, imipenem,  $\beta$ -lactams, ciprofloxacin, or linezolid are often used, and in patients with severe infection, combination therapy should be considered [4]. We empirically administered meropenem in our patient before identifying the bacterial species, and thereafter, we additionally administered TMP-SMX, which proved to be successful. The patient continued treatment even after discharge and has shown no signs of recurrence.

Pulmonary nocardiosis is often misdiagnosed as another pulmonary infection. Moreover, some cases are correctly diagnosed on culture only at autopsy [1]. Therefore, to accurately diagnose diseases caused by a rare species, it is important to collect samples repeatedly and change the culture method. In this case, CT findings and the bacterial species were atypical. However, by retrieving multiple



**Figure 2.** After treatment, chest X-ray and CT findings improved (A–C).

specimens and allowing adequate time to culture and identify the causative species, we could appropriately diagnose and treat this patient.

In conclusion, we reported a case of pulmonary nocardiosis caused by *N. exalbida* in which CT findings showed atypical images requiring differentiation from lung cancer.

#### Disclosure Statement

Appropriate written informed consent was obtained for publication of this case report and accompanying images.

#### Acknowledgment

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