

Acute Hypoxic Respiratory Failure Secondary to Pulmonary Nocardiosis: An Unusual Presentation in the Emergency Department

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ABSTRACT

Keywords:

Pulmonary nocardiosis,
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Background: Nocardiosis, a rare but serious infection caused by Gram-positive, aerobic actinomycetes, primarily affects immunocompromised individuals. This report highlights an uncommon case of pulmonary nocardiosis in an immunocompetent patient leading to acute hypoxic respiratory failure.

Case Presentation: A 45-year-old male gardener with no significant past medical history presented with acute dyspnea, pleuritic chest pain, fever, night sweats, and weight loss. Physical examination revealed respiratory distress and hypoxia. Imaging showed bilateral alveolar infiltrates and cavitary lesions. Sputum analysis identified Gram-positive branching filamentous bacteria, and Nocardia species were cultured. HIV test was negative.

Management: The patient was admitted to the ICU and treated with high-flow oxygen therapy and empirical antibiotics (trimethoprim-sulfamethoxazole [TMP-SMX] and meropenem). Upon culture results, TMP-SMX was continued, and meropenem was discontinued. The patient showed significant improvement and was discharged on oral TMP-SMX for a six-month course.

Discussion: This case underscores the importance of considering pulmonary nocardiosis in acute respiratory failure, even in immunocompetent patients. Early diagnosis and appropriate treatment are crucial for favorable outcomes.

Conclusion: Pulmonary nocardiosis can cause severe respiratory symptoms in otherwise healthy individuals. Prompt recognition and treatment are essential to manage this potentially life-threatening condition effectively.

INTRODUCTION

Nocardia species are gram-positive, partially acid-fast bacteria that can cause a range of infections, including pulmonary, cutaneous, and disseminated nocardiosis.[1] Pulmonary nocardiosis is predominantly seen in immunocompromised individuals, such as those with HIV, organ transplants, or chronic corticosteroid use.[2] How-

ever, it can occasionally affect immunocompetent individuals.[3] This case report discusses a rare presentation of pulmonary nocardiosis leading to acute hypoxic respiratory failure in an immunocompetent patient.

Case Presentation:

A 45-year-old male with no significant past medical history presented to the emergency department of Regency

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hospital, Kanpur, Uttar Pradesh; with acute onset of dyspnea, pleuritic chest pain, and productive cough with purulent sputum for the past week. He also reported fever, night sweats, and unintentional weight loss of 5 kg over the past month. The patient denied any history of immunosuppressive therapy, chronic lung disease, or recent travel. He worked as a gardener.

Physical Examination:

During physical examination, the patient, a 45-year-old male, presented with a temperature of 38.5°C, a heart rate of 110 bpm, and a respiratory rate of 28 breaths per minute. His blood pressure was recorded at 130/80 mmHg, and his oxygen saturation was 85% on room air. The patient appeared to be in respiratory distress, showing signs of diaphoresis and tachypnea. Lung auscultation revealed diffuse crackles and rhonchi bilaterally. Cardiovascular examination indicated tachycardia but no murmurs or gallops. The abdominal exam showed a soft, non-tender abdomen with normal bowel sounds. The extremities revealed no edema or cyanosis.

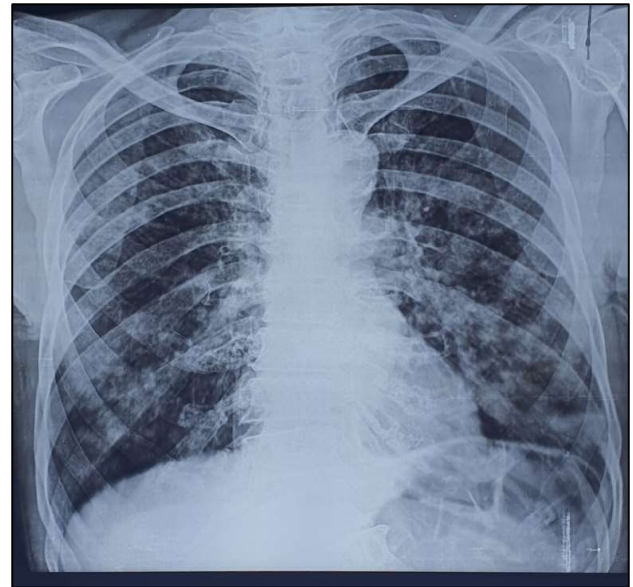
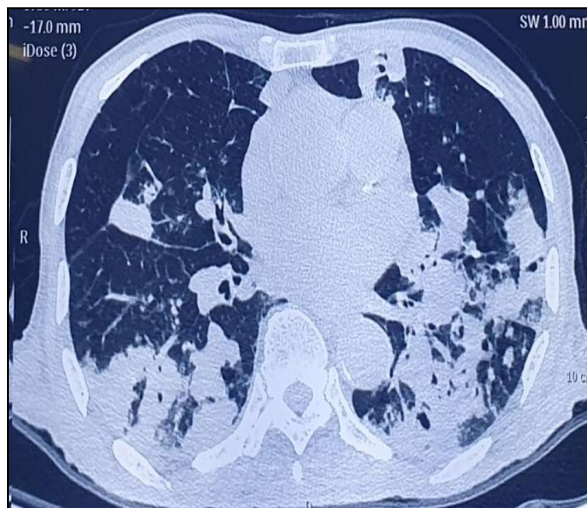
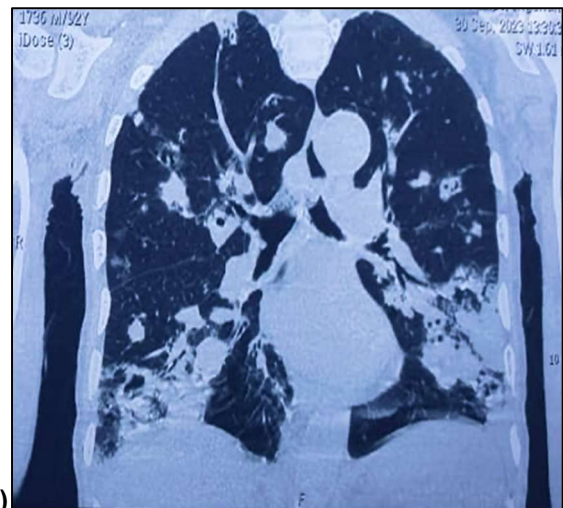


Figure 1: Chest X-ray-diffuse bilateral alveolar infiltrates



(A)



(B)

Figure 2 (A) & (B): CT Chest- Multiple cavitary lesions with surrounding consolidation and ground-glass opacities

Investigations:

Investigations revealed a complete blood count with a white blood cell count of 18,000/ μ L, indicating neutrophilia, hemoglobin at 13 g/dL, and platelets at 250,000/ μ L. Arterial blood gas analysis showed a pH of 7.35, a PaCO₂ of 45 mmHg, and a PaO₂ of 55 mmHg, despite the patient being on 15 liters per minute of oxygen through a non-rebreather mask. The chest X-ray demonstrated diffuse bilateral alveolar infiltrates. A CT scan of the chest revealed multiple cavitary lesions with surrounding consolidation and ground-glass opacities. Sputum gram stain identified Gram-positive branching filamentous bacteria, and sputum culture confirmed *Nocardia* species. Blood cultures also grew *Nocardia* colonies on blood agar. The HIV test was negative.

Management:

The patient was admitted to the intensive care unit for

acute hypoxic respiratory failure and started on high-flow nasal cannula oxygen therapy. Empirical antibiotic therapy with trimethoprim-sulfamethoxazole (TMP-SMX) and meropenem was initiated pending culture results. Upon identification of *Nocardia* species, TMP-SMX was continued, and meropenem was discontinued.

Outcome:

The patient showed significant clinical improvement with resolution of hypoxia and reduction in respiratory distress over the next week. Repeat chest CT after two weeks of antibiotic therapy demonstrated partial resolution of cavitary lesions and consolidations.

The patient was discharged on oral TMP-SMX with a plan for a prolonged treatment course of six months, with regular follow-up to monitor for recurrence or complications.

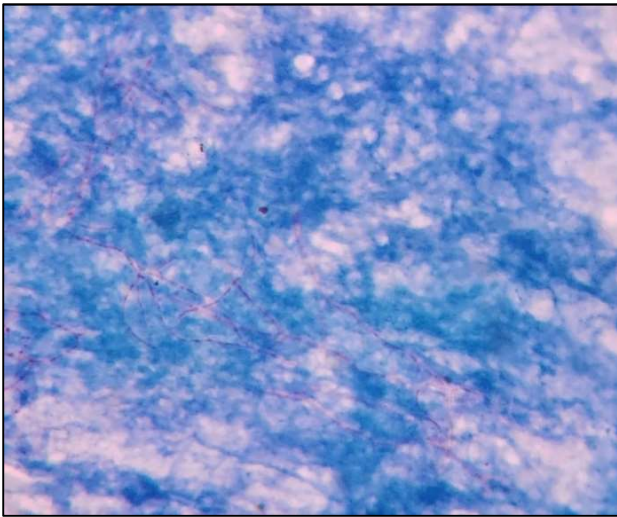


Figure 3: Sputum gram stain- Gram-positive branching filamentous bacteria



Figure 4: Blood cultures- Nocardia colonies on blood agar

DISCUSSION

This case underscores the importance of considering pulmonary nocardiosis in the differential diagnosis of acute hypoxic respiratory failure, even in immunocompetent patients. Early identification and appropriate antimicrobial therapy are crucial for favorable outcomes. The patient's occupational exposure as a gardener may have contributed to the development of nocardiosis, emphasizing the need for awareness of environmental risk factors.

Nocardiosis, caused by Gram-positive, aerobic actinomycetes, is a rare and serious infection predominantly affecting immunocompromised patients, with approximately 65% of cases occurring in individuals with compromised host defense systems.[1,4] The most common pathogen in human disease is *Nocardia asteroides*.[5,6]

Nocardiosis typically manifests as pulmonary (75%–80%), cutaneous, or neurological (44%) disease, but it can involve virtually any organ system.[7] The risk of pulmonary and disseminated disease is higher among individuals with deficient cell-mediated immunity, especially those with lymphoma, transplantation, systemic steroid use, or AIDS.[8]

Clinical features are relatively nonspecific, with a chronic course in 70% of cases before diagnosis. Pulmonary nocardiosis typically presents as subacute pneumonia, with symptoms developing over several days or weeks.[9] Acute presentations, such as dyspnea, pleuritic pain, and hemoptysis, are less common. Radiological presentations can vary and include consolidation, well-circumscribed nodules, large multiloculated abscesses, or cavities.[10,11] Major differential diagnoses include pneumonia, tuberculosis, bronchogenic carcinoma, or lung abscess. Pulmonary nodules with multiple cavitations can mimic conditions like actinomycosis, septic emboli, metastasis, sarcoidosis, Wegener's granulomatosis, or other fungal infections.[12]

Diagnosis should be based on the isolation of the organism in respiratory secretions, such as sputum or bronchial washings. Management involves antimicrobial therapy in all cases, with surgical drainage as needed. Cotrimoxazole is the drug of choice and can be administered alone or in combination with other drugs such as imipenem, amikacin, third-generation cephalosporins, or minocycline in severe cases.[13] Disseminated nocardiosis has a poor prognosis, with a mortality rate of over 85% in immunocompromised hosts, but in healthy patients, the mortality rate is about 15%–20%.[14,15]

CONCLUSION

Pulmonary nocardiosis is a rare but significant cause of acute hypoxic respiratory failure. Clinicians should maintain a high index of suspicion for this infection, particularly in patients presenting with respiratory symptoms and cavitary lung lesions, regardless of their immune status. Early diagnosis and treatment are paramount in managing this potentially life-threatening condition.

Declaration of Patient Consent

The authors confirm that they have obtained all necessary patient consent forms. In these forms, the patient(s) have provided their consent for their images and clinical information to be included in the journal report. The patients understand that their names and initials will not be published and that efforts will be made to protect their identity, although complete anonymity cannot be guaranteed.

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None

CONFLICTS OF INTEREST

There are no conflicts of interest.

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