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Pulmonary Nocardiosis and Tuberculosis Co-infection: A Case Report of a Silent Invader in an Immunocompromised Patient

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Abstract: ***Background: Pulmonary nocardiosis is an uncommon but life-threatening infection caused by aerobic actinomycetes of the genus Nocardia. It is frequently misdiagnosed as tuberculosis (TB) or fungal infection due to overlapping clinical and radiological features. Early microbiological identification is critical for appropriate management. Case Presentation: A 40-year-old female with a history of childhood pulmonary TB presented with a one-month history of cough, expectoration, generalized weakness, and progressive dyspnoea. Chest X-ray revealed bilateral fluffy opacities. Endotracheal tube aspirate showed thin, branching, filamentous gram-positive bacilli and weakly acid-fast filaments on modified Ziehl–Neelsen (ZN) stain (1% sulfuric acid). Culture on blood agar and Lowenstein–Jensen medium yielded dry, chalky-white colonies, identified by MALDI-TOF-MS as Nocardia cyriacigeorgica. Notably, sputum CBNAAT was also positive, indicating pulmonary TB reactivation. Conclusion: This case highlights the necessity of thorough microbiological evaluation- including modified acid-fast staining- to diagnose mixed pulmonary infections. Coordination between clinicians and microbiologists is essential for early detection and targeted therapy.***

Keywords: Pulmonary nocardiosis, *Nocardia Cyriacigeorgica*, Tuberculosis reactivation, Microbiological diagnosis

1. Introduction

Nocardia species are aerobic, Gram-positive, branched filamentous bacteria that are saprophytic and ubiquitous in the environment. Nocardiosis is primarily an opportunistic infection, with 60–90% of cases occurring in immunocompromised hosts, such as those with chronic steroid use, HIV, or malignancy. However, it can also affect immunocompetent individuals.(1) Pulmonary involvement is the most common presentation, occurring in 73%–77% of cases. Diagnosis is notoriously difficult because clinical symptoms and radiological findings often mimic other respiratory pathogens, particularly *Mycobacterium tuberculosis*. Mixed infections involving both *Nocardia* and TB are rare and present a significant diagnostic and therapeutic challenge.(3)

2. Case Presentation

A 40-year-old female presented to the emergency department with complaints of cough with expectoration and generalized weakness persisting for over a month, alongside progressive dyspnoea for 15 days. Her medical history was significant for pulmonary TB during childhood.

Upon admission, laboratory findings demonstrated leukocytosis and deranged renal, hepatic, and coagulation parameters. Viral markers, including HIV, were non-reactive. Radiological assessment via chest X-ray revealed bilateral fluffy opacities suggestive of an infective etiology.

Microbiological investigation of an endotracheal tube aspirate was initiated. Direct microscopy via Gram stain revealed thin, branching, filamentous gram-positive bacilli. Modified ZN staining using 1% sulfuric acid as a decolorizing agent demonstrated weakly acid-fast filaments, a hallmark of *Nocardia* species. The sample was subsequently cultured on blood agar and Lowenstein–Jensen (LJ) medium. After 24–28 hours of incubation, dry, chalky-white colonies were observed. Identification was confirmed as *Nocardia cyriacigeorgica* using matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF-MS).

In addition to the nocardiosis diagnosis, the patient's sputum was tested via Cartridge-Based Nucleic Acid Amplification Test (CBNAAT), which returned a positive result, highlighting a likely reactivation of pulmonary TB. Antimicrobial susceptibility testing for the *Nocardia* isolate showed sensitivity to **trimethoprim–sulfamethoxazole (TMP-SMX)**, **linezolid**, and **amikacin**.

Figure 1: Dry white chalky colonies on Blood agar

3. Discussion

This case illustrates the "silent" nature of *Nocardia* in regions where TB is endemic. In countries with high TB incidence, many nocardiosis cases are initially misdiagnosed as TB. [1] The clinical presentation of pulmonary nocardiosis—including fever, cough, and malaise- is non-specific and overlaps significantly with TB and fungal pneumonia. Radiographically, while our patient showed fluffy opacities, *Nocardia* can present with varied patterns, including nodules, cavitation (seen in 30% of cases), and reticulonodular infiltrates.[2]

The identification of *N. cyriacigeorgica* is particularly relevant as it is an emerging pathogen. Historically, species identification relied on biochemical tests, but modern techniques like MALDI-TOF-MS and 16S rRNA gene sequencing have revolutionized accuracy.[1]

Mixed infections with *Nocardia* and TB, as seen here, are associated with higher mortality rates. Studies suggest that approximately 5% of proven TB cases may have a *Nocardia* co-infection. [3] The presence of one pathogen often leads clinicians to stop searching for others, emphasizing the need for a high index of suspicion when a patient fails to respond to standard anti-tubercular treatment.[4]

Standard TB drugs have no effect on *Nocardia*. TMP-SMX remains the cornerstone of nocardiosis treatment, though multi-drug regimens including amikacin, linezolid, or carbapenems are often required for severe or disseminated disease.[2]

4. Conclusion

Accurate diagnosis of pulmonary nocardiosis requires close collaboration between clinicians and microbiology laboratories. The routine use of **modified ZN staining** for respiratory samples is highly recommended to ensure *Nocardia* is not overlooked. Early microbiological identification and the recognition of potential mixed infections are vital to initiating prompt, targeted therapy and improving outcomes in vulnerable patients.

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