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Nocardia farcinica brain abscess in an immunocompromised patient: a case report

Tiziana Laurano, Maria Teresa Della Rocca, Adriana Durante, Vittorio Panetta, Mariassunta Claudia D'Amato, Giusy Natale, Stefano Labella, Giuseppina Tucci, Rosalba Di Virgilio, Rita Greco

UOC Microbiology and Virology, AORN Sant'Anna and San Sebastiano, Caserta, Italy

Summary

Nocardia is a Gram-positive, weakly acid-fast bacterium that can cause nocardiosis, a serious infection that can lead to abscess formation in the central nervous system. In this report, we present a case of a primary brain abscess caused by *Nocardia farcinica* in an immunocompromised patient.

Key words: *Nocardia*, brain abscess, immunocompromised patient, antimicrobial susceptibility, MALDI TOF-MS.

Correspondence to: Rita Greco, UOC Microbiology and Virology, AORN Sant'Anna and San Sebastiano, Caserta, Italy.
E-mail: rita.greco@aorncaserta.it

Introduction

The genus *Nocardia* (*Actinomycetales*) are thin, branched filamentous obligate aerobes [2]. These bacteria are ubiquitous and are usually found in soil, dust, decaying vegetation, and other organic matter [4]. They are usually Gram-positive, meaning they absorb little Gram stain due to the presence of branched-chain fatty acids in their cell wall. However, they also appear Gram-negative with Gram-positive intracellular granules and are weakly acid-fast [7,8]. Nocardia species are catalase-positive. They utilize carbohydrates for oxidative metabolism and can grow on most nonselective laboratory media. Growth can be slow, with an incubation time of 3 to 5 days before colonies can be observed in culture media. Colonies are initially white, but can vary greatly in appearance (e.g., dry to waxy, white to orange). These Gram-positive bacteria cause nocardiosis, an exogenous infection that can be localized or disseminated (multiple abscesses), resulting in bronchopulmonary disease following colonization of the airways, skin and lymphocutaneous infections following trauma [3] Patients who can most commonly contract a *Nocardia* infection have a compromised immune system, with T cell translocation, undergo Solid Organ Transplantation (SOT), Hematopoietic Stem Cell Transplantation (HSCT) or suffer from malignant haematological malignancies and Solid Organ Neoplasms (SOM). Other risk factors could be long-term therapies with corticosteroids or other drugs that suppress cell-mediated immunity. In addition to previous conditions like diabetes, bronchitis, or asthma [1]. A percentage of 1-2% of patients with Nocardiosis infection also have brain abscesses [6].

Case Report

The patient, a 77-year old woman, was admitted to the Emergency department of AORN Sant' Anna and San Sebastiano, Caserta, Italy, with asthma attacks and mobility problems but she had no neurological deficits. On admission, laboratory evaluation revealed hemoglobin 13.4 g/dL, hematocrit 40.1%, white blood cell count 23,300/mm^3, and platelets 435,000/mm^3. Pertinent chemistry findings were blood urea nitrogen 74 mg/dL, creatinine 2.6 mg/dL, and glucose 151 mg/dL. The patient had a history of breast cancer, relapsed gastrointestinal resection and Hodgkin's lymphoma. Cancer treatment was interrupted because of a Cytomegalovirus (CMV) lung infection complicated by hypoxemic respiratory failure. Computed Tomography (CT) scan revealed a small capsular abscess in the right temporal lobe. The patient underwent an osteoplastic craniotomy for drainage and excision of an abscess from the right temporal lobe. The intraoperative samples were purulent and characterized by yellow color, microscopic examination revealed Gram-negative, branching, granular, and partially acid-fast bacteria (Figure 1). The specimen was inoculated into Brain-Heart Infusion (BHI) and incubated aerobically at 37°C; after 24 hours, it was inoculated onto agar plates following laboratory procedure. Microbiological culture showed growth on blood, chocolate and also MacConkey agar plates after 48 hours. The plates were incubated at 37°C for 72 hours. The organism was identified by Matrix-Assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry (MALDI-TOF MS) as *Nocardia Farcinica* with 99.9% accuracy as a "claimed" organism (Figure 2). *Nocardia* identification can

also be confirmed using 16s RNA sequencing, Next Generation Sequencing or other technologies. Antimicrobial susceptibility was tested with *in vitro* gradient test (E-test method) according to literature and European Committee on Antimicrobial Susceptibility Testing (EUCAST, 2024) guideline for *Staphylococcus spp.* gram positive. The antimicrobial susceptibilities pattern is reported in Table 1. *Nocardia* was susceptibility to Imipenem (IMP), Meropenem (MEM), Amikacin (AK), Linezolid (LNZ) and Trimethoprim-Sulfamethoxazole (SXT) than resistance for Cefepime (PM) and Ceftriaxone (CFX) was reported. The antibiotic treatment was set to linezolid (600 mg, twice a day) and trimethoprim-sulfamethoxazole (160 mg/800 mg/day) for seven days. Subsequently, the patient had microbiological eradication and was discharged. Of the patients affected by Nocardia, 71.4% had a good prognosis, indicating that nocardial bacteremia is curable. However, some patients died from the disease. One possible cause of death was old age combined with serious underlying diseases and a prolonged history of taking oral glucocorticoids or immunosuppressants. Secondly, an unclear initial diagnosis and delayed treatment are among the factors that lead to a poor prognosis for nocardial bacteremia [5]. Sulfonamides are the first choice of treatment drug, but there has been a gradual increase in drug resistance. If necessary, a combination of drugs should be used, and timely drainage should be performed when the abscess spreads to other sites, in order to achieve a good prognosis [7].

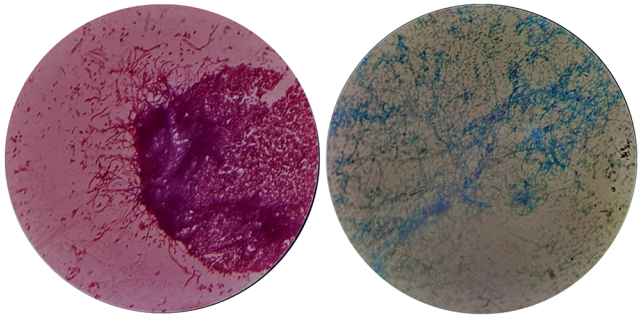

Figure 1. Gram and Zhiel Nielsen strain of *Nocardia farcinica*.

Table 1. Antimicrobial susceptibility of *Nocardia farcinica*.

Antimicrobics	MIC (mg/L)
Imipenem (IMP)	0.75
Meropenem (MEM)	4
Linezolid (LNZ)	1.5
Amikacin (AK)	1
Trimetroprim-sulphamethoxazole (SXT)	4
Cefepime (PM)	>256
Ceftriaxone (CFX)	>32

MIC, Minimum Inhibitory Concentration.

Conclusions

The *Nocardia* species causing human infections are *N. asteroides*, the most common, *N. brasiliensis*, and *N. caviae*. *Nocardia farcinica* infection commonly occurs in immunocompromised states and can lead to the formation of abscesses in various districts. *Nocardia* infections arise in immunocompromised states, including those with leukemia, those taking steroids, and those with autoimmune diseases. Bacteremia is rare, and its clinical manifestations lack specificity. For this reason, a rapid microbiological approach was fundamental to successfully managing the infection.

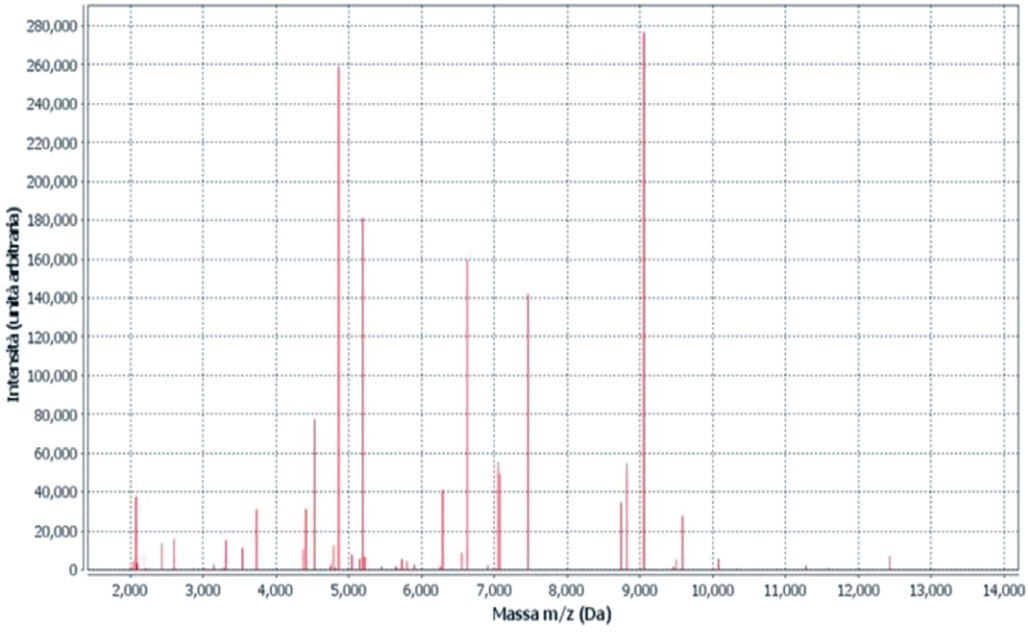

Figure 2. *Nocardia farcinica* spectra.

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