



Nocardia cyriacigeorgica: A Case of Disseminated Infection in an Immunocompromised Patient

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Abstract

Introduction: *Nocardia cyriacigeorgica* is a common environmental organism isolated from different clinical samples in Europe, Asia, and North America, predominantly from respiratory samples, but also from samples from several other sites.

Case Presentation: In the current paper a disseminated *Nocardia cyriacigeorgica* infection in an immunocompromised patient was reported. The patient was admitted to the under study hospital with multiple cutaneous abscess such as lesion and paraspinal abscess developed to brain abscess.

Conclusions: *Nocardia cyriacigeorgica* was isolated from a sample of skin lesion based on phenotypic properties and sequencing method. Limited cases of *Nocardia cyriacigeorgica* in Iran are reported.

Keywords: Immunocompromised Patient, Brain Abscess, Linezolid, *Nocardia* Infection

1. Introduction

Nocardiosis is a severe opportunistic infection in the last 2 decades due to the recent increase in the number of immunocompromised patients that occurred from advances in transplantation, cancer, chemotherapy, acquired immune deficiency syndrome (AIDS), and immunosuppression therapy in rheumatologic diseases (1). The causative organism of nocardiosis is *Nocardia* species; they are aerobic, catalase positive, Gram-variable to Gram-positive and partially acid fast bacteria and are generally slow growing, non-motile bacilli with branching filaments. These soil-born ubiquitous actinomycetes often cause localized or disseminated infection. Despite the relative variety of *Nocardia* spp., as a cause of cerebral infection, the brain is the most frequent non-pulmonary site involved in disseminated nocardiosis (2). Disseminated nocardiosis is defined as a *Nocardia* infection in 2 or more non-contiguous sites.

Nocardia cyriacigeorgica is a recently identified species. It is isolated from clinical samples in Europe, Asia, and North America, predominantly from respiratory samples, but also from several other sites (3). The current report describes a disseminated nocardiosis caused by *Nocardia cyriacigeorgica* in an immunosuppressed patient. The current case is the 3rd report of *N. cyriacigeorgica* infection in Iran

(4).

2. Case Report

A 61-year-old male with the history of diabetes mellitus and rheumatoid arteritis was admitted in May 2015 to Khatam Al-Anbia Hospital, Tehran, Iran, with complaints of multiple cutaneous abscess lesions and right side weakness with lumbar pain.

He had been diagnosed with rheumatoid arteritis and vacuities 5 months earlier and was receiving immunosuppression therapy consisted of azathioprine (50 mg daily), oral prednisolone (75 mg daily), and methotrexate (7.5 mg weekly). On physical examination, he was lethargic and decreased force of right sided extremity muscles than the left side was observed. Also, lumbosacral spinal tenderness and multiple cutaneous abscess lesions 0.5-1.5 cm in diameter in thorax, abdomen, and upper and lower limbs were observed (Figure 1). Under examination, the vital signs were unremarkable at the time of admission:

His body temperature was 38.3°C, pulse 93 beat/minute, blood pressure 115/75 mmHg, and respiratory rate 18 breath/minute. Laboratory testing revealed hemoglobin (Hb) 13.4 g/dL, total white blood cell count (WBC) $10.93 \times 10^3/L$, and platelet count $255 \times 10^3/L$. The

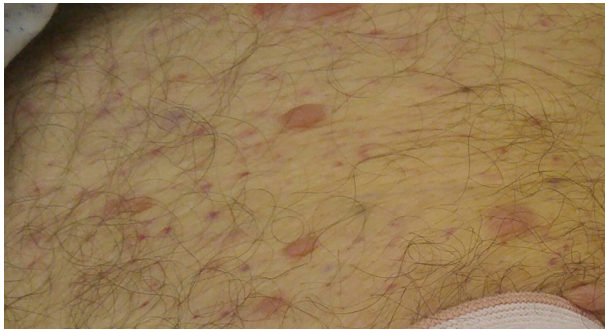


Figure 1. Nodule Presentation

erythrocyte sedimentation rate (ESR) was noted to be elevated at 76 mm/1st hour.

Due to the lethargic condition with right sided weakness, brain computed tomography (CT) scan with intravenous (IV) contrast was done that revealed a mass lesion with cerebral abscess. The lumbosacral magnetic resonance imaging (MRI) was performed because of spinal tenderness, and paraspinal abscess in lumbosacral area was observed (Figures 2 and 3).

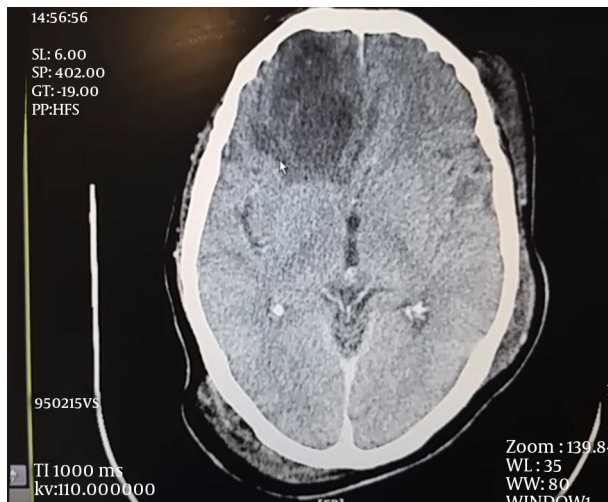


Figure 2. CT Scan at Presentation

The patient was treated with trimethoprim/sulfamethoxazole (TMP/SMX) (160/800 mg), and ceftriaxone and imipenem (1 g IV) due to cerebral abscess and multiple cutaneous abscess lesions and the history of immunosuppression therapy.

Due to suspicion of *Nocardia* infection, cutaneous abscess culture was sent to laboratory and vital signs and red flags were precisely controlled; 5 days later, culture anal-

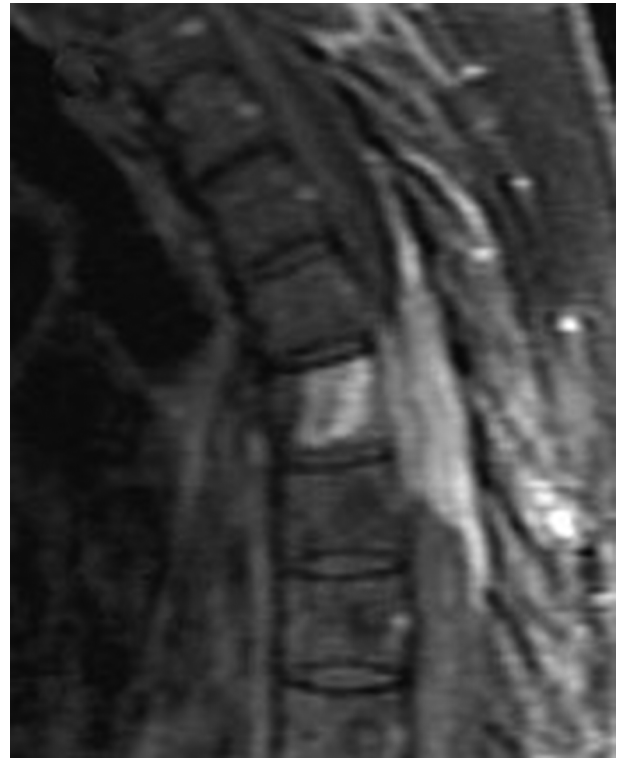


Figure 3. Paraspinal Abscess

ysis of cutaneous yielded Gram-positive filament bacilli identified as *Nocardia* sp.

Despite combination therapy of this disseminated *Nocardia* sp. with imipenem, ceftriaxone, and TMP/SMX, the patient deteriorated while on antibiotic therapy and his level of consciousness dropped. There was no change in the new brain CT scan (Figure 4). Chest X-ray showed infiltration in the lung base and bilateral pleural effusion (Figure 5). For this reason, linezolid (600 mg IV twice a day) was added to the previous treatment regimen.

Unfortunately, the patient rapidly died. Post mortem examinations of isolated *Nocardia* sp. based phenotypic properties and sequencing method indicated *Nocardia cyriacigeorgica* as the cause of disease. The initial isolation of the current study sample was identified by the phenotypic properties such as modified acid fast growth in lysozyme, and hydrolyzing tyrosine, xanthine, hypoxanthine and uric acid. To identify more precisely, polymerase chain reaction (PCR) was performed on 16s-rRNA of the isolated bacteria. The 16s-rRNA sequences were recorded in GenBank of NCBI. The 16s-rRNA sequences of *Nocardia cyriacigeorgica* in the current case were submitted to GenBank, and closely compared with those of the NCBI regis-

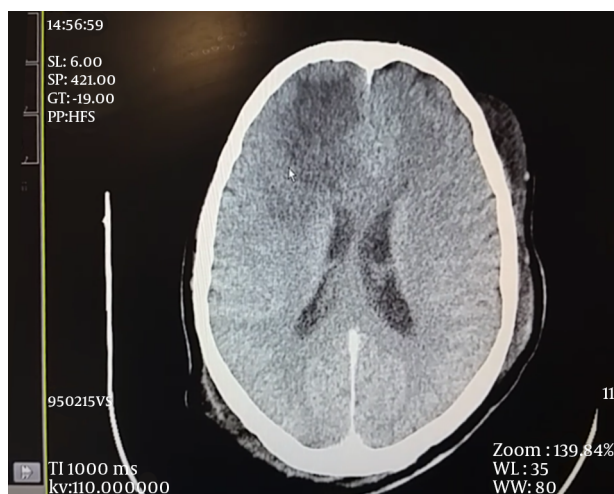


Figure 4. CT Scan After Treatment Demonstrated Improvements.

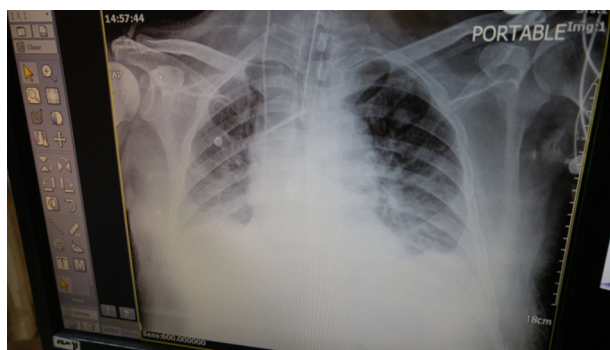


Figure 5. Chest X-Ray Showed Infiltration in the Lung Base and Bilateral Pleural Effusion.

tered type (*N. cyriageorgica* DSM44434T); and 100% similarity with this strain and 0% gap in this isolate was found.

3. Discussion

Nocardia cyriageorgica was first identified in 2001 by Yassin et al. (5) as a novel species differing from the previously described members of genus *Nocardia* in terms of molecular and biomedical characteristics. A study by Convill et al. based on DNA-DNA homology, indicated that *N. cyriageorgica* was indeed a member of *N. asteroides* drug pattern VI. In the Southern USA *N. asteroides* drug type VI is the most frequent reported *Nocardia* sp. This species of *Nocardia* is found primarily in soil, but can also inhabit humans and is sometimes found in water habitats (6). *Neocardiacyriageorgica*, similar to other species of *Nocardia*,

is considered an opportunistic pathogen that affects immunosuppressed patients who are particularly susceptible to *Nocardia cyriageorgica* (7). *Nocardia cyriageorgica* could be an etiologic agent of Parkinson disease due to its ability to spread to the brain via the blood stream (8). Dry and windy areas are the primary location for the infection, since the winds enhance the relocation of the microbe (8). *Nocardia cyriageorgica* and type VI strains of *Nocardia* spp. have a same antibiogram susceptibility pattern and are typically susceptible to sulfonamide, amikacin, linezolid, imipenem, and broad spectrum cephalosporins (9), while remaining resistant to clarithromycin and penicillin, with the exception of a few strains of *N. cyriageorgica* that are reported susceptible to ciprofloxacin (10).

The current case results may help to better identify *N. cyriageorgica* and its ability to cause disseminated *Nocardia* infection. The lungs are the primary site of *Nocardia cyriageorgica* infection (11). *Neocardia cyriageorgica* was originally thought to belong to NAC, due to differences in antibiotic susceptibility patterns; now it is considered a separate entity with the advent of newer molecular diagnostic techniques such as 16S-rRNA gene (12) or matrix-assisted laser desorption. It is reported that ionization time to combat invasive infection caused by *N. cyriageorgica* is increasing.

References

1. Uttamchandani RB, Daikos GL, Reyes RR, Fischl MA, Dickinson GM, Yamaguchi E, et al. Nocardiosis in 30 patients with advanced human immunodeficiency virus infection: clinical features and outcome. *Clin Infect Dis.* 1994;**18**(3):348–53. [PubMed: 8011814].
2. Hooper DC, Pruitt AA, Rubin RH. Central nervous system infection in the chronically immunosuppressed. *Medicine (Baltimore).* 1982;**61**(3):166–88. [PubMed: 7043156].
3. Cargill JS, Boyd GJ, Weightman NC. *Nocardia cyriageorgica*: a case of endocarditis with disseminated soft-tissue infection. *J Med Microbiol.* 2010;**59**(Pt 2):224–30. doi: 10.1099/jmm.0.011593-0. [PubMed: 19797466].
4. Shojaei H, Hashemi A, Heidarieh P, Eshraghi S, Khosravi AR, Daei Naser A. Clinical isolation of *Nocardia cyriageorgica* from patients with various clinical manifestations, the first report from Iran. *Med Mycol J.* 2011;**52**(1):39–43. [PubMed: 21441712].
5. Yassin AF, Rainey FA, Steiner U. *Nocardia cyriageorgica* sp. nov. *Int J Syst Evol Microbiol.* 2001;**51**(Pt 4):1419–23. doi: 10.1099/00207713-51-4-1419. [PubMed: 11491341].
6. Beaman BL, Beaman L. *Nocardia* species: host-parasite relationships. *Clin Microbiol Rev.* 1994;**7**(2):213–64. [PubMed: 8055469].
7. Brown-Elliott BA, Brown JM, Conville PS, Wallace RJ. Clinical and laboratory features of the *Nocardia* spp. based on current molecular taxonomy. *Clin Microbiol Rev.* 2006;**19**(2):259–82. doi: 10.1128/CMR.19.2.259-282.2006. [PubMed: 16614249].
8. Hubble JP, Cao T, Kjelstrom JA, Koller WC, Beaman BL. *Nocardia* species as an etiologic agent in Parkinson's disease: serological testing in a case-control study. *J Clin Microbiol.* 1995;**33**(10):2768–9. [PubMed: 8567923].
9. Conville PS, Witebsky FG. Organisms designated as *Nocardia asteroides* drug pattern type VI are members of the species *Nocardia cyriageorgica*.

- iacigeorgica. *J Clin Microbiol.* 2007;**45**(7):2257-9. doi: [10.1128/JCM.00133-07](https://doi.org/10.1128/JCM.00133-07). [PubMed: [17475753](https://pubmed.ncbi.nlm.nih.gov/17475753/)].
10. Barnaud G, Deschamps C, Manceron V, Mortier E, Laurent F, Bert F, et al. Brain abscess caused by *Nocardia cyriacigeorgica* in a patient with human immunodeficiency virus infection. *J Clin Microbiol.* 2005;**43**(9):4895-7. doi: [10.1128/JCM.43.9.4895-4897.2005](https://doi.org/10.1128/JCM.43.9.4895-4897.2005). [PubMed: [16145170](https://pubmed.ncbi.nlm.nih.gov/16145170/)].
 11. Hirayama T, Takazono T, Horai Y, Tashiro M, Saijo T, Kosai K, et al. Pulmonary Nocardiosis Caused by *Nocardia concava* with a Literature Review. *Intern Med.* 2016;**55**(9):1213-7. doi: [10.2169/internalmedicine.55.6228](https://doi.org/10.2169/internalmedicine.55.6228). [PubMed: [27150883](https://pubmed.ncbi.nlm.nih.gov/27150883/)].
 12. Fatahi-Bafghi M, Heidarieh P, Rasouli-Nasab M, Habibnia S, Hashemi-Shahraki A, Eshraghi SS. Comparison of restriction enzyme pattern analysis and full gene sequencing of 16S rRNA gene for *Nocardia* species identification, the first report of *Nocardia transvalensis* isolated of sputum from Iran, and review of the literature. *Antonie Van Leeuwenhoek.* 2016;**109**(10):1285-98. doi: [10.1007/s10482-016-0746-x](https://doi.org/10.1007/s10482-016-0746-x). [PubMed: [27613736](https://pubmed.ncbi.nlm.nih.gov/27613736/)].