

Case Report

First report of solitary cavitation nodules in the lungs with *Mycobacterium canariasense*

Jing Liu¹, Meiyong Wu¹, Jianping Zhang¹, Cuilin Shi¹

¹ The Affiliated Infectious Diseases Hospital of Soochow University, The Fifth People's Hospital of Suzhou, Suzhou 215000, Jiangsu, China

Abstract

Introduction: *Mycobacterium canariasense* is a relatively rare and rapidly growing nontuberculous mycobacterium (NTM) infection.

Case report: This case report describes a 36-year-old man with a *Canariasense* infection in the lung with solitary cavitation nodules located subpleural on CT scan, for which the final diagnosis was made by metagenomic next-generation sequencing (mNGS) of bronchoalveolar lavage fluid (BALF-mNGS). It was successfully treated with levofloxacin and amikacin.

Conclusions: This experience is instructive because clinical diagnostic and CT imaging characteristics and treatment strategy guidelines for pulmonary infections caused by *M. canariasense* have not yet been established.

Key words: *Canariasense*; solitary cavitation nodules; mNGS.

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Introduction

Nontuberculous mycobacterium (NTM) lung disease previously appeared to be uncommon with low physician awareness, mainly due to limitations in diagnostic techniques. The exact cause of the increase in NTM disease is unclear. Currently, reports of NTM are on the rise globally [1] due to population aging and comorbidities, doctor attention, and advances in laboratory techniques for diagnosing this disease. NTM are mycobacteria other than tuberculous (MOTT) [2], with more than 200 species identified to date. *M. canariasense* is considered to be an environmental pathogen and may act as an opportunistic pathogen. According to the literature, it was first isolated from clinical specimens in Spain in 2004 and has since been isolated from Iran hospital water in 2011 [3]. It was also detected in the Spanish water supply in 2016 [4].

Case presentation

A 36-year-old man was admitted to our institution with a physical examination. His temperature was 36.7°C, pulse 90 beats per minute, blood pressure 132/77 mmHg, and respiratory rate 19 breaths per minute. The patient had no cough, no phlegm, no fever, no chest tightness, no shortness of breath, no chest pain, no hemoptysis, and no notable recent weight loss. He denied a history of hypertension and diabetes. He

denied hepatitis, tuberculosis, and other infectious history. He denied surgical history, denied history of other trauma, and denied history of blood transfusions. He denied any history of drug or food allergies. He had a smoking history of approximately 3 years, 6-7 cigarettes/day. He denied a history of alcohol abuse. Male tumor indicators were negative, all inflammatory indicators in routine blood tests were negative, and CD4+ T cells, CD8+ T cells, and NK cells were normal. Cryptococcus clip membrane antigen, Aspergillus IgG, DNA of *Bacillus tuberculosis* sputum, X-pert of sputum, and sputum culture of common bacteria were negative. The COVID-19 nucleic acid test was negative. The patient underwent sputum mycobacterium culture, common bacterial culture testing, and drug sensitivity testing before hospitalization, and the results were negative. The initial diagnosis was pulmonary infection, anti-infective treatment with cefixime, and there was further diagnosis by bronchoscopy on the third day of hospitalization. BALF-Xpert was negative, BALF-TBDNA was negative, BALF-GM was negative, and the tracheoscopy brush and BALF smear for acid-fast bacilli were negative. BALF culture of mycobacteria, common bacteria, and drug sensitivity were also negative. Tracheoscopy brush and BALF smears for shedding cells did not reveal heterotropic cells.

However, the BALF-NGS report was *M. canariae*, sequence number 27. The CT scans before and after treatment are shown in Figure 1.

Discussion

A review of the patient history showed that the patient had normal immunity, no special epidemic history, and negative NTM sputum culture. However, BALF-mNGS was positive. NTMs are ubiquitous in the environment.

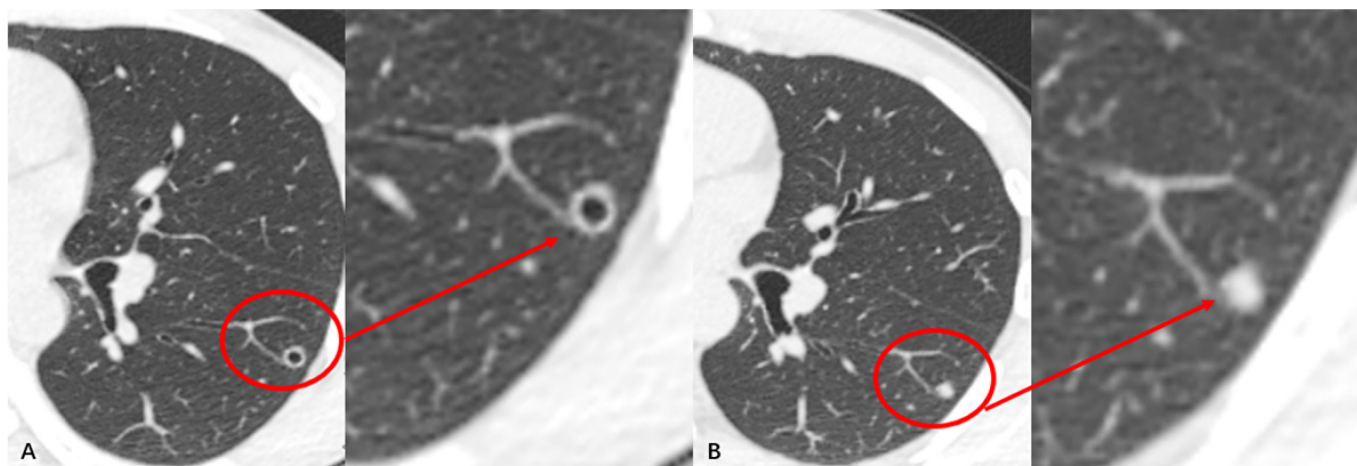
The increasing incidence and mortality of NTM worldwide over the past few decades is both a new clinical challenge and a public health issue [1]. In some special circumstances, NTM can invade the human body through the respiratory tract, gastrointestinal tract, skin, and other pathways. Its pathogenic process is similar to that of tuberculosis, but the molecular mechanism of the body's anti-NTM immune response has not been fully clarified [5,6]. In recent years, due to the increasing incidence of NTM in immunocompromised and immunonormal patients, attention to infections caused by NTM has become quite important [7]. The case we encountered is relatively rare. In China, CT examination of small pulmonary nodules is quite popular and most patients are anxious, which needs to be addressed by clinicians. We found strong diagnostic evidence for the infectious disease that was considered first, and it was treated successfully. Although few reports have demonstrated the efficacy of levofloxacin and amikacin [8-10] against *M. canariasense*, diagnostic and treatment methods for this pathogen have yet to be fully elucidated. The successful treatment of this case can be used as a reference experience.

M. canariasense is a rapidly growing nontuberculous mycobacteria (RGM) [11]. RGMs are environmental organisms that can behave as contaminants as well as pathogens [8]. According to the literature [10], the 2019 Iranian medical records provide published reports on the treatment of *M. canariasense* pulmonary disease. The phenotypic and genotypic characteristics of isolates of this strain were determined in accordance with guidelines from the American Thoracic Society and the Infectious Diseases Society of America. However, it is essential to accumulate further evidence for diagnosis and treatment. The diagnosis of NTM itself is difficult, and rare NTM is not easy to diagnose. While we appreciate CT imaging as a direct indication of lung infection, we also appreciate that mNGS has been a helpful tool in the final diagnosis and can be viewed as the reference standard.

Based on the mNGS and the final treatment results, the diagnosis of *M. canariae* in this case is considered reliable. There was no evidence of other diseases or pathogens. At present, the clinical features, diagnostic methods, and treatment strategies for *M. canariasense* respiratory infection are not yet fully elucidated. Awareness of the possibility of this condition is important, and further collection and analysis of suspected cases are mandatory.

Due to earlier bacterial culture techniques, these infections are frequently misdiagnosed and undertreated, and their true prevalence suffers from gross underestimation. With the continuous application of gene testing technology, especially in the central and eastern regions of China with better economic conditions, this technology can be rapidly developed and applied in difficult clinical problems, thus rapidly

Figure 1. The CT scan before and after treatment.



A. A small nodule isolated subpleurally in the upper lobe of the left lung, approximately 8 mm in diameter, exhibiting a thin-walled cavity containing tension, with smooth inner and outer walls and no liquid plane in the cavity; **B.** Two months after medication, chest CT scan review revealed a reduced nodule and a closed cavity in the left upper lobe.

increasing the diagnosis rate of NTM and carrying out effective antibiotic therapy.

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Authors' contributions

(I) conception and design: JL, MW, JZ, and CS. (II) Administrative support: WM and JZ. (III) Collection and assembly of data: JL and CS. (IV) Data analysis and interpretation: JL and CS. (V) Manuscript writing: all authors. (VI) Final approval of the manuscript: all authors.

References

1. Nqwata L, Ouédraogo AR (2022) Non-tuberculous mycobacteria pulmonary disease: a review of trends, risk factors, diagnosis and management. *Afr J Thorac Crit Care Med* 28. doi: 10.7196/AJTCCM.2022.v28i2.157.
2. Tortoli E, Fedrizzi T, Meehan CJ, Trovato A, Grottola A, Giacobazzi E, Serpini GF, Tagliazucchi S, Fabio A, Bettua C, Bertorelli R, Frascaro F, De Sanctis V, Pecorari M, Jousson O, Segata N, Cirillo DM (2017) The new phylogeny of the genus *Mycobacterium*: the old and the news. *Infect Genet Evol* 56: 19-25. doi: 10.1016/j.meegid.2017.10.013.
3. Hassan KS, P PK, Al Owaisi R, Al Kindi AH, Al Azri S, Adikaram C, Al Balushi Z, Khamis F, Al Busaidi I (2022) First case report of *Mycobacterium canariasisense* native mitral valve endocarditis. *Int J Infect Dis* 121: 66-68. doi: 10.1016/j.ijid.2022.04.025.
4. Mormeneo Bayo S, Núñez Medina R, López Gómez C, López-Calleja AI (2021) First isolation of *Mycobacterium canariasisense* in a child. *Enferm Infecc Microbiol Clin (Engl Ed)* 39: 213-214. doi: 10.1016/j.eimc.2020.06.016.
5. Daley CL, Iaccarino JM, Lange C, Cambau E, Wallace RJ Jr, Andrejak C, Böttger EC, Brozek J, Griffith DE, Guglielmetti

- L, Huitt GA, Knight SL, Leitman P, Marras TK, Olivier KN, Santin M, Stout JE, Tortoli E, van Ingen J, Wagner D, Winthrop KL (2020) Treatment of nontuberculous mycobacterial pulmonary disease: an official ATS/ERS/ESCMID/IDSA clinical practice guideline. *Clin Infect Dis* 71: e1-e36. doi: 10.1093/cid/ciaa241.
6. Haworth CS, Banks J, Capstick T, Fisher AJ, Gorsuch T, Laurenson IF, Leitch A, Loebinger MR, Milburn HJ, Nightingale M, Ormerod P, Shingadia D, Smith D, Whitehead N, Wilson R, Floto RA (2017) British thoracic society guidelines for the management of non-tuberculous mycobacterial pulmonary disease (NTM-PD). *Thorax* 72: ii1-ii64. doi: 10.1136/thoraxjnl-2017-210927.
7. Azadi D, Shojaei H, Pourchangiz M, Dibaj R, Davarpanah M, Naser AD (2016) Species diversity and molecular characterization of nontuberculous mycobacteria in hospital water system of a developing country, Iran. *Microb Pathog* 100: 62-69. doi: 10.1016/j.micpath.2016.09.004.
8. Campos-Herrero MI, García D, Figuerola A, Suárez P, Campo C, García MJ (2006) Bacteremia caused by the novel species *Mycobacterium canariasisense*. *Eur J Clin Microbiol Infect Dis* 25: 58-60. doi: 10.1007/s10096-005-0079-6.
9. Grossman R, Adler A, Rubinstein M, Nissan I, Kaidar-Shwartz H, Dveyrin Z, Leshem E, Maor Y, Tau L, Rorman E (2022) Emergence of *Mycobacterium canariasisense* infections in central Israel. *Eur J Clin Microbiol Infect Dis* 41: 501-504. doi: 10.1007/s10096-021-04356-6.
10. Sakhaee F, Vaziri F, Bahramali G, Taremiyan K, Siadat SD, Fateh A (2019) Pulmonary infection associated with *Mycobacterium canariasisense* in suspected tuberculosis patient, Iran. *Emerg Infect Dis* 25: 1984-1986. doi: 10.3201/eid2510.190156.
11. Tagashira Y, Kozai Y, Yamasa H, Sakurada M, Kashiyaama T, Honda H (2015) A cluster of central line-associated bloodstream infections due to rapidly growing nontuberculous mycobacteria in patients with hematologic disorders at a Japanese tertiary care center: an outbreak investigation and review of the literature. *Infect Control Hosp Epidemiol* 36: 76-80. doi: 10.1017/ice.2014.14.

Corresponding author

Jianping Zhang and Cuilin Shi
The Affiliated Infectious Diseases Hospital of Soochow University, The Fifth People's Hospital of Suzhou, 10 Guangqian Road, Xiangcheng District, Suzhou 215000, Jiangsu, P.R. China.
Tel: + 86-0512-87806067
E-mail: zhangjianping_yb@suda.edu.cn; 18168725548@163.com

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