

## Case Report

# Catheter-related bacteremia caused by *Mycobacterium abscessus*: a case report and literature review

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Received January 16, 2020; Accepted May 7, 2020; Epub July 15, 2020; Published July 30, 2020

**Abstract:** *Mycobacterium abscessus* is a rapidly growing bacterium commonly present in soil and water contaminants, whose infection in humans is difficult to treat because of its resistance to drugs. Therefore, the aim of this work was to examine the clinical characteristics of catheter-related bacteremia caused by *Mycobacterium abscessus* in order to improve the rate of successful diagnosis and the understanding of the disease. Previous reports have shown that lung, skin and soft tissue invasion by *M. abscessus* are common, but bacteremia caused by this bacterium is rarely observed. In this study, one case of bacterial isolation and identification of catheter-related bacteremia caused by fast-growing *M. abscessus* was reported. *M. abscessus* was identified in the blood culture of the patient using an automatic microbial mass spectrometer. The patient was treated with moxifloxacin + etimicin combined with linezolid + clarithromycin + rifentine, and the infection was effectively under control. Although microbiological examination is the primary diagnostic measure for this type of disease, the rate of positive detection is low. Mass spectrometry is a useful technique for early accurate diagnosis of nontuberculous mycobacteria and has greatly improved the level of clinical microbial identification.

**Keywords:** Nontuberculous mycobacteria, *Mycobacteria abscessus*, bacteremia, catheter-related infections

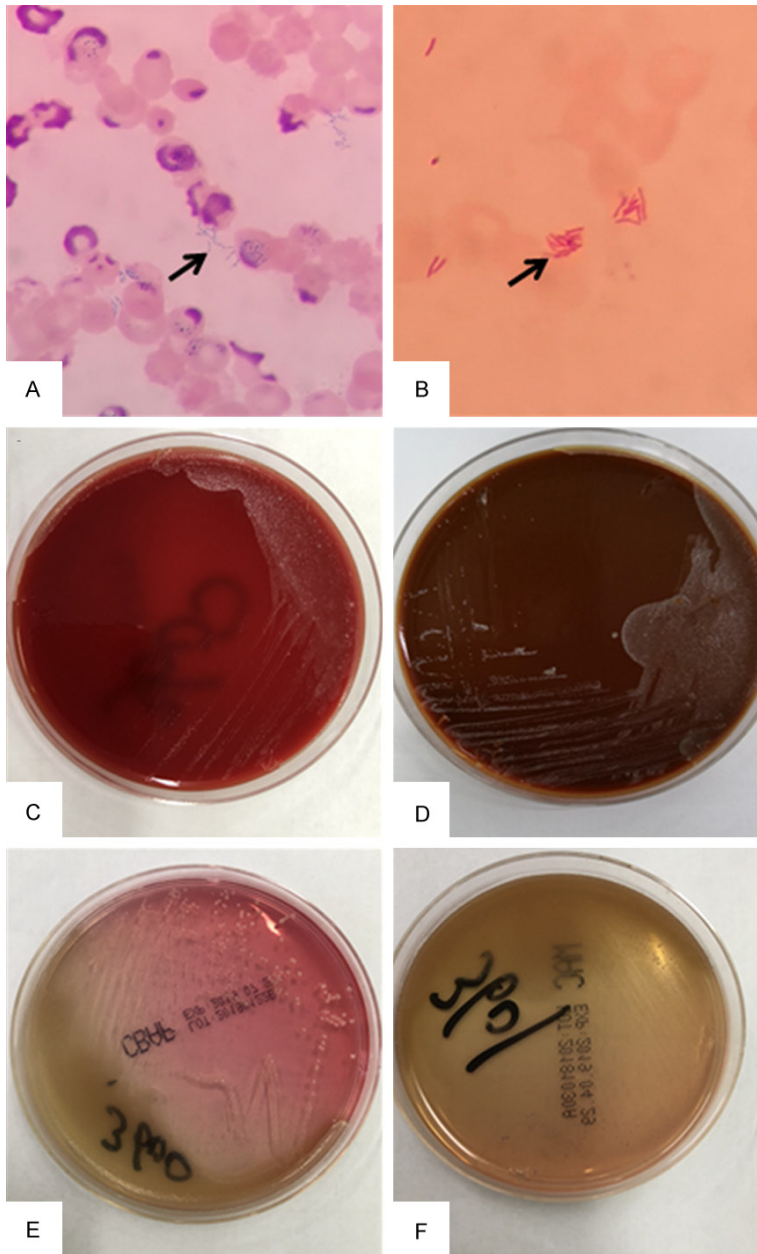
## Introduction

Nontuberculous mycobacteria (NTM) are opportunistic pathogens that can be widely found in the environment. NTM were first reported and isolated from human pathogenic secretions in 1884 and they can cause various infections in humans, such as lung, skin, and soft tissue infections [1]. The most common primary NTM infections are caused by fast-growing NTM species including *M. amurensis*, *M. abscessus*, and *M. fortuitum*. These species often cause skin soft tissue infections and are resistant to common anti-tuberculosis (TB) drugs. However, NTM infections are rarely reported due to limitations in etiological test methods. Nevertheless, the improvement and advancement in diagnostic techniques in recent years significantly increased the detection rate of NTM infections. The wide application of a combination antiviral therapy reduced the incidence of *Mycobacterium avium* complex infection in individuals infected with human immunodeficiency

virus. However, the risk of infection is increased by the wide application of stem cell transplantation, organ transplantation and the use of pharmaceutical drugs such as anti-tumor necrosis factor [2, 3]. NTM are becoming an important opportunistic pathogen, especially in immunocompromised patients. *M. abscessus*-induced infections have been rarely reported in previous literature. Here, a case of catheter-related bacteremia caused by fast-growing *Mycobacterium abscessus* is reported.

## Case presentation

A 66-year-old woman was admitted to the hospital on October 22, 2018 for right breast cancer. Postoperative pathology report was as follows: breast cancer, surgical margin (-), nipple (-), and 0/7 sentinel lymph node metastasis. After discharge, the patient underwent 2 cycles of chemotherapy through the intravenous (IV) port of the local hospital (erobicin hydrochloride 70 mg d1, 60 mg d2, and cyclophosphamide 1 g d1). On January 27, 2019, the patient had a



**Figure 1.** Bacterial identification results. Direct smear of blood enriched culture revealed uneven gram-positive staining (A) (1000 $\times$ , olympus cx21) and acid-fast positive staining (B) (1000 $\times$ , olympus cx21). Transfer of the blood enriched culture onto blood agar plate (C) and chocolate agar plate (D) resulting in the formation of small white colonies after 48 hr of culture. The bacterium appears as small white pink colonies on China blue agar plate (E) and MacConkey agar plate (F).

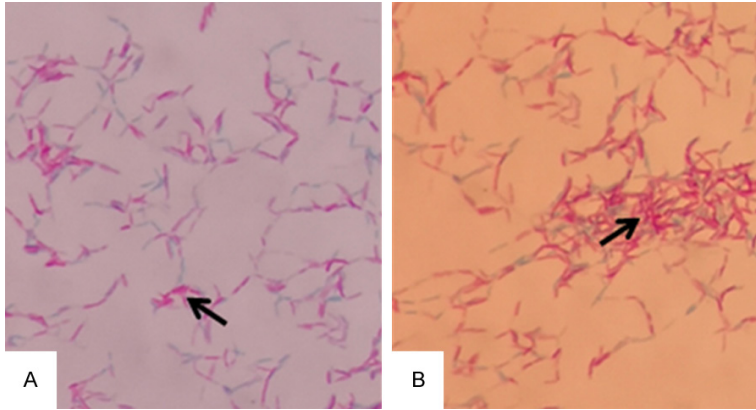
fever for unknown reason, and the second-generation cephalosporin anti-infective treatment was not effective. The patient was transferred to our hospital on February 11, 2019. Post-admission examination revealed rough sounds in both lungs, with diffused audible fine moist

rales and absence of redness and exudation at the IV incision. Blood examination showed  $5.42 \times 10^9/L$  white blood cells,  $4.12 \times 10^9/L$  neutrophils, 0.206 ng/ml procalcitonin, and 79.40 mg/L C-reactive protein. Chest CT results were as follows: postoperative changes in the right breast were absent, and cord-like shadows were visible in the middle lobe of the right lung, suggesting a catheter-related infection. On February 13, 2019, the IV port was removed under local anesthesia, and central venous blood and peripheral blood were collected and cultured under aerobic and anaerobic conditions. The patient was subjected to meropenem anti-infective therapy. The blood cultures revealed the presence of *M. abscessus*. The patient was transferred to the Infectious Diseases Department of other hospital.

The blood was cultured in the Bact/Alert 3D automated blood culture instrument (Biomerieux). Positive alarms were detected from the instrument on day 2.5 (central venous blood aerobic bottle) and day 4.47 (peripheral blood aerobic bottle). The blood was directly examined by gram staining and acid-fast staining (**Figure 1A** and **1B**). The blood enrichment culture showed that small white colonies were visible on the blood agar and chocolate agar at 48 hours (**Figure 1C** and **1D**). Gram and acid-fast staining of these colonies indicated the presence

of gram-positive and acid-fast positive bacilli (**Figure 2A** and **2B**). The bacterial colonies appeared greyish white without pigmentation and grew on China blue agar plate and MacConkey agar plate (**Figure 1E** and **1F**). Using an automatic microbial mass spectrometry

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**Figure 2.** After culture 48 h, gram and acid-fast staining of these colonies indicated the presence of gram-positive (A) (1000 $\times$ , olympus cx21) and acid-fast positive bacilli (B) (1000 $\times$ , olympus cx21).

**Table 1.** The Result of microbial identification by automatic microbial MS system

Antomatic microbial MS system	bacterial name	confidence
VITEK MS	mycobacterium	99%

(MS) system (VITEK MS, Biomerieux), it was possible to confirm that the NTM species isolated from our patient was *M. abscessus* (**Table 1**). The result of interferon-gamma release assay for *mycobacterium tuberculosis* (TB-IGRA) test was negative (**Table 2**), indicating that it was not tuberculous mycobacteria.

The patient was subjected to a combination of anti-infective therapy composed of etimicin, linezolid, clarithromycin, moxifloxacin and rifapentine. After over 10 days of treatment, the patient's body temperature was reduced and stabilized at 37°C and the infection was temporarily under control. The patient continued its therapy of oral clarithromycin, moxifloxacin and rifapentine after discharge.

### Discussion

*M. abscessus* is a fast-growing NTM that is widely found in nature and can cause diseases in humans and some animals. However, no direct evidence of animal to human or human to human infections is available [2]. In recent years, an increasing number of reports are available regarding *M. abscessus* infections in the lungs, skin and soft tissues of humans, but bacteremia was rarely observed. *M. abscessus* is the most common respiratory pathogen in

lung infections caused by fast-growing mycobacteria, and it can cause 60-80% of all chronic lung diseases [4]. *M. fortuitum*, *M. mucogenicum* and *M. chelonae-abscessus* are common pathogens of bloodstream infections [5, 6]. Previous studies showed that bloodstream infections caused by fast-growing mycobacteria are common in patients with malignancies and are often associated with the presence of catheters. These infections are primarily caused by *M. fortuitum* (30.3%), *M. mucogenicum* (27.2%), and *M. chelonae-abscessus* (18.2%) [7-9]. In this case, *M. abscessus* was identified from the patient's central venous blood culture and peripheral blood culture. The positive alarm time

of the patient's central venous and peripheral blood cultures was 2.5 days and 4.47 days, respectively. The positive alarm time of the central venous blood was more than 2 hours earlier than that of the peripheral blood, suggesting that the infection was a catheter-related bloodstream infection. However, we did not take any sample from the catheter tip to culture and further confirm this speculation.

In this case, inoculation of *M. abscessus* onto a blood agar plate resulted in the formation of pin-sized colonies on day 2 after culture. These colonies gradually became greyish white after continuous culture and were composed of a large number of gram-positive and acid-fast positive bacilli, which was consistent with previous findings [10-12]. The emergence of molecular biology-based bacterial identification methods in recent years has greatly improved the identification of this bacterial species. In addition to traditional bacterial culture and biochemical identification, MS was also used to identify the species in our bacterial sample. MS has a unique advantage in NTM identification, as it can identify NTM species in a rapid, sensitive and specific manner. Therefore, MS can be an crucial technique for a rapid NTM identification [13, 14].



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**Table 2.** The Result of microbial identification by TB-IGRA test

	N (Negative control)	T (TB Antigen)	P (Positive control)
The result of TB-IGRA (IU/mL)	0.189	0.246	6.218
The result	Negative (T-N <0.35 IU/ml)		

*M. abscessus* is a fast-growing NTM that is resistant to most antibiotics and hence, clinical treatment for *M. abscessus* infection is rather difficult. Macrolides are currently the only oral drugs effective against *M. abscessus*, while amikacin is the most effective IV drug against *M. abscessus*. The conventional combination regimen for *M. abscessus* treatment involves 0.5 g of oral clarithromycin twice a day plus 0.4-0.6 g of amikacin via IV drip (two administrations). Previous studies reported that 4-9 months of treatment using this regimen completely cured the postoperative wound infection with *M. abscessus* in 139 adults without any recurrence after 4.5 years [15, 16]. The patient was treated with etimicin, linezolid, clarithromycin, moxifloxacin, and rifapentin. After receiving this combination of anti-infective treatment, the patient no longer had a fever. After discharge, the patient continued to use clarithromycin, moxifloxacin, and rifapentin. Fever was detected again after approximately a month, and the patient was subjected to moxifloxacin, amikacin sulfate, clarithromycin, linezolid, imipenem and cilastatin treatment upon admission. This anti-infective regimen was effective in reducing and maintaining the patient's body temperature, but longer treatment time was required for a complete recovery since the patient was immunocompromised after the mastectomy.

As the number of immunocompromised patients increased in recent years, the rate of NTM infection has also increased but has not yet been acknowledged by most clinicians. It is difficult to discriminate some lung infections due to TB from the ones caused by NTM, and NTM bacteria are resistant to most anti-TB drugs and antibiotics. Therefore, further study of NTM effective therapy is urgently required. The development and progress of molecular biology techniques have led to an early accurate diagnosis of NTM. NTM treatment should include the selection of drugs to which bacteria are susceptible and a rational use of antibiotics recommended by a recognized regimen, along with a sufficient therapy time length to ensure efficacy. Medical staff should be more mindful of NTM infections and should stringently imple-

ment aseptic procedures to reduce and avoid the risk of nosocomial infections.

### Acknowledgements

This work was partially funded by the research and development of the Hebei Provincial Health and Wellness Committee. The authors are thankful for the participation of the patients, their families, clinicians in this study.

### Disclosure of conflict of interest

None.

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