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CASE REPORT

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Pneumonia due to *Mycobacterium cosmeticum* in a patient with systemic sclerosis: A case report

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Key Clinical Message

Pulmonary infection due to *Mycobacterium cosmeticum* was reported in only two patients previously. More studies are warranted to define its characteristics and treatments. We report a systemic sclerosis patient who had a pulmonary infection due to *M. cosmeticum* and then successfully recovered after treatment with combination antibiotic regimen.

KEYWORDS

Mycobacterium cosmeticum, pneumonia, systemic sclerosis

1 | BACKGROUND

There are more than 190 species and subspecies of nontuberculous mycobacteria (NTM) identified in the natural environment. They can cause a variety of infections in humans, with the lung being the most commonly affected organ, accounting for up to 90%.[1,2] According to the growth rate, NTM species can be categorized into two types: rapidly growing and slowly growing.[3] *Mycobacterium cosmeticum* belongs to the rapidly growing type of NTM. The first case of *M. cosmeticum* infection was reported in a female patient at a Venezuelan nail salon who presented with a subcutaneous granuloma.[4] Only two cases of pulmonary infection due to *M. cosmeticum* have been reported previously, including a kidney transplant recipient and a patient with acquired immunodeficiency syndrome.[5] Here, we report a case of pulmonary infection due to *M. cosmeticum* in a patient with systemic sclerosis, adding to our understanding of this rare pathogen.

2 | CASE PRESENTATION

On November 27, 2021, a 31-year-old woman was admitted to the Department of Pulmonary Medicine because of an elevated serum creatinine level for 1 month and exacerbation of chest discomforts for 1 week. She also reported chills, fever (temperature 38°C–39°C), cough, and blood-tinged sputum. The patient had a history of systemic sclerosis, interstitial pneumonia, stage 5 chronic kidney disease, uremic cardiomyopathy, anemia of chronic renal disease, renal hypertension, and acute left-sided heart failure.

Her medications included prednisone 20 mg once daily, tripterygium glycosides 20 mg three times a day, asiaticoside 12 mg three times a day, glucuronolactone 100 mg three times a day, nifedipine 100 mg twice a day, and bisoprolol 5 mg once daily.

On admission, the patient had dyspnea with a respiratory rate of 33 breaths/min. She was provided with

Yueqin Hu, Chao Zhang, and Liangliang Jia contributed equally to this work.

continuous high-flow humidified oxygen (oxygen concentration 38%, oxygen flow 35 L/min). The initial laboratory tests showed leukocytosis with a white blood cell count of 3.31×10^9/L, neutrophils 86.3%, hemoglobin 95 g/L, and procalcitonin 5.95 ng/mL. Chest X-ray and computed tomography examinations revealed bilateral increased infiltrations, reticular and ground-glass opacities, and multiple cord-like and patchy high-density shadows (Figure 1). She was treated with piperacillin–tazobactam, cefoperazone–sulbactam, and moxifloxacin. Her fever subsided, but she still had persistent dyspnea and cough.

The patient underwent bronchoalveolar lavage (BAL) and microbiological examinations. The BAL sample gram staining, bacterial and fungal cultures, *Mycobacterium tuberculosis* polymerase chain reaction, and *Aspergillus* immunological test were all negative. Metagenomic next-generation sequencing (mNGS) of the BAL sample indicated *M. cosmeticum* (sequence number 7440). The patient was provided with rifampicin 0.45 g once daily, ethambutol 0.75 g once daily, clarithromycin 0.5 g twice a day, and moxifloxacin 0.4 g intravenous administration once daily for 21 days. Then, rifampicin, ethambutol, and clarithromycin were continued for additional 14 days. The patient developed a rash. Hence, ethambutol was discontinued. Rifampicin and clarithromycin were continued for additional 4.5 months. Repeat chest computed tomography examination indicated greatly improved bilateral infiltrations and opacities (Figure 2). The patient also reported significantly improved dyspnea and cough.

3 | DISCUSSION

Systemic sclerosis is a multisystem disease, affecting multiple organs and systems, including the skin, gastrointestinal tract, lung, heart, kidney, and peripheral blood vessels. Pulmonary involvement commonly presents as interstitial pneumonia and pulmonary hypertension.[6] In addition, secondary bacterial infections were reported occasionally in the literature. Iwata et al. reported a case of pulmonary infection due to *Mycobacterium kansasii* in a patient with systemic sclerosis–rheumatoid arthritis overlap syndrome, which improved after rifampicin, isoniazid, and ethambutol treatments.[7]

Of the more than 190 NTM species and subspecies, *Mycobacterium avium*, *M. kansasii*, and *Mycobacterium xenopi* belong to the slowly growing type, and *Mycobacterium abscessus* belongs to the rapidly growing type. Rapidly growing mycobacteria cause various human infections. Pulmonary infection caused by NTM is difficult to diagnose. Its infection should also be distinguished from colonization and contamination. The guidelines from the Infectious Diseases Society of America recommended that in pulmonary infection caused by NTM, all the evidence from the clinical, imaging, and microbiological evaluations should be considered.[2] The imaging results are mainly nodules, cavities, or bronchiectasis with multiple nodules. Microbiological diagnostic criteria include a positive culture of at least two independent sputum specimens, at least one positive culture of BAL fluid, histological features of mycobacteria in the endobronchial or lung biopsy, or one or more sputum or bronchial lavage cultures positive for NTM.

M. cosmeticum was first reported in 2004.[4] The first batch of bacterial strain was from drains and sinks at a nail salon in Atlanta, Georgia, USA, and a subcutaneous granuloma in a woman in Venezuela undergoing mesotherapy. Subsequently, there were more cases of *M. cosmeticum* infections reported,[8–14] including infections in the lung, joint, catheters, ascites, skin, and colon, as well as systemic infection. *M. cosmeticum* was also detected in the environment.[15–17] Organ involvement and widespread environmental distribution of *M. cosmeticum* confirm its pathogenicity.

Here, we report a case of *M. cosmeticum* pneumonia in a patient with systemic sclerosis. The patient had clinical symptoms and signs of pulmonary infection, with pulmonary imaging indicating increased infiltrations, reticular

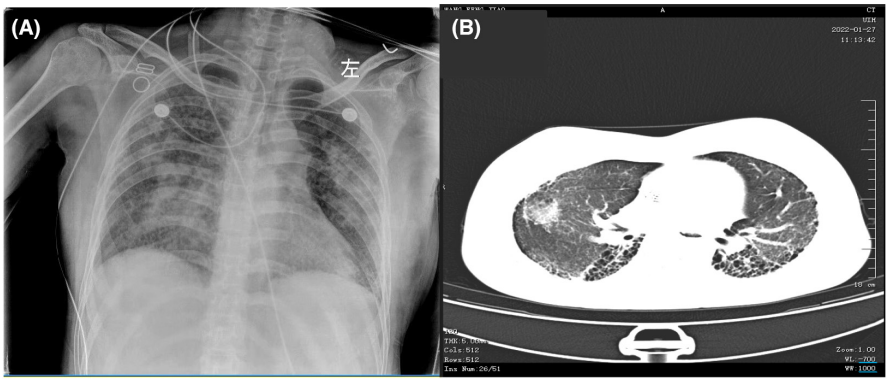

FIGURE 1 Chest X-ray (A) and computed tomography (B) examinations revealed increased infiltrations, reticular and ground-glass opacities, and multiple cord-like and patchy high-density shadows.

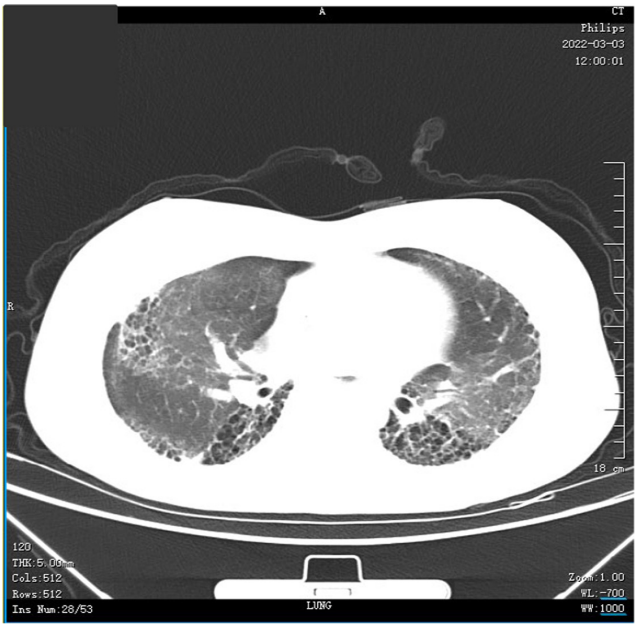

FIGURE 2 Repeat chest computed tomography examination displaying greatly improved bilateral pulmonary infiltrations and opacities.

and ground-glass opacities, and multiple cord-like and patchy high-density shadows. The mNGS of the BAL sample reported *M. cosmeticum*. The mNGS technology has high sensitivity and specificity for strain identification and can help diagnose NTM disease. To the best of our knowledge, this is the first case of systemic sclerosis co-occurring with pulmonary infection due to *M. cosmeticum*. There is no specific guideline recommendation for the treatment of pulmonary infection due to *M. cosmeticum*. Macrolides, quinolones, imipenem, cefoxitin, minocycline, linezolid, rifampicin, and sulfamethoxazole have been used to treat the rapidly growing *M. abscessus*.[18,19] Macrolides are the basis of combination therapy. In vitro, *M. cosmeticum* is sensitive to moxifloxacin, clarithromycin, amikacin, sulfamethoxazole, and linezolid.[9,15] A patient with ascites infection due to *M. cosmeticum* successfully recovered after treatments with rifampicin, isoniazid, ethambutol, and pyrazinamide for 2 months and rifampicin and isoniazid for months.[11] Our patient was immunocompromised because of her chronic illnesses and long-term prednisone treatment. The treatments with tripterygium and asiaticoside also have immunomodulatory and immunosuppressive effects,[20,21] which may have increased her susceptibility to rare infections. We detected *M. cosmeticum* in the BAL sample through the mNGS method but not the bacterial culture. Therefore, we could not perform a drug sensitivity analysis. We selected rifampicin, ethambutol, clarithromycin, and moxifloxacin as her treatment regimen. Rifampicin and ethambutol are classic antimycobacterial medications. Rifampicin binds strongly to the DNA-dependent RNA polymerase β subunit, thereby inhibiting bacterial RNA synthesis.[22] Ethambutol blocks the synthesis of *M. tuberculosis* cell wall and has certain antibacterial activities against *M. tuberculosis* and some NTM species.[23] Clarithromycin inhibits bacterial protein synthesis by binding to the nuclear protein 50S subunit. Most NTM species are sensitive to clarithromycin.[24] Moxifloxacin kills *M. tuberculosis* by inhibiting the DNA topoisomerase II and preventing DNA replication and transcription.[25] In our patient, after the combination therapy, the lung infection resolved.

4 | CONCLUSION

We report a case of pulmonary infection due to *M. cosmeticum* in a patient with systemic sclerosis. *M. cosmeticum* was detected through the mNGS method. She had clinical presentations of cough and fever, with imaging results indicating bilateral pulmonary involvement. After the treatment with combination antibiotic regimen, her pulmonary symptoms resolved, which supported the diagnosis of *M. cosmeticum* infection.

AUTHOR CONTRIBUTIONS

Yueqin Hu: Conceptualization; data curation; methodology; writing – review and editing. **Chao Zhang:** Project administration; resources; supervision; validation. **Liangliang Jia:** Data curation; writing – original draft.

FUNDING INFORMATION

None.

CONFLICT OF INTEREST STATEMENT

The authors have no relevant financial or nonfinancial interests to disclose.

DATA AVAILABILITY STATEMENT

The data are available upon reasonable request to the corresponding author.

ETHICS STATEMENT

The study was approved by the ethics committee at the Yichang Central People's Hospital, Yichang, Hubei, China.

CONSENT

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

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