Received: 24 November 2022 | Revised: 21 March 2023 | Accepted: 3 April 2023

DOI: 10.1002/ccr3.7265

CASE REPORT

Clinical Case Reports Open Access WILEY

A case report of cutaneous infection with *Mycobacterium neoaurum*

Alireza Mohebbipour-Loren[1] | **Mehrnaz Soghrati**[2] | **Sajjad Barin**[3] | **Mitra Rezaei**[4]

[1]Department of Dermatology, Islamic Azad University, Ardabil Branch, Ardabil, Iran

[2]Private Office, Isfahan, Iran

[3]Pathology Department, School of Medicine, Ardabil University of Medical Sciences, Ardabil, Iran

[4]Pathology Department, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Correspondence
Mehrnaz Soghrati, Private Office, No. 11, Shariati Building, Shariati Street, Isfahan, Iran.
Email: mehrnaz.soghrati@gmail.com

Key Clinical Message

Cutaneous infection due to *Mycobacterium neoaurum* in immune-competent individuals had only been reported in limited cases. The point that makes our case very impressive was its cutaneous infection, and presentation in the immune-competent patient.

Abstract

Cutaneous infections caused by nontuberculous mycobacteria usually occur in immunocompromised hosts. We report a rare case of cutaneous infection caused by *Mycobacterium neoaurum* in an immune-competent patient.

KEYWORDS

case report, cutaneous, nontuberculous mycobacteria, *Mycobacterium neoaurum*

1 | INTRODUCTION

Nontuberculous mycobacteria (NTM) are a diverse group of mycobacteria that are not categorized in the *Mycobacterium tuberculosis* complex and cause various diseases.[1–3] Although NTM infections mostly occur in immunocompromised patients, or in patients with underlying morbidities needing chronic use of indwelling catheters or intravascular material, immune-competent subjects can be infected rarely.[1]

In recent years, there has been an increase in reports of NTM infection, probably due to changes in environmental and individual risk factors such as global warming, increasing humidity, use of immunomodulatory drugs, and a rise in the survival of immunocompromised population with improvement in diagnostic and therapeutic methods worldwide.[3–5]

Mycobacterium neoaurum is a member of the NTM group which belongs to the *Mycobacterium parafortuitum* complex.[1,3] It was first isolated from soil and seawater by Tsukamura and Mizuno in 1972.[1,3] Despite its rarity, *M. neoaurum* has been reported as a cause of a wide range of infections such as catheter-related bloodstream infections, pulmonary infections, and skin/soft tissue infections.[1,3,6,7]

The gold standard method for identification of NTM species is the molecular-based method, especially gene sequencing, although polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) is another reliable technique with well-proven and well-established efficacy.[3,8,9]

Until now, limited cases of human infection by *M. neoaurum* have been reported in the literature. Here, we report a case of cutaneous infection due to *M. neoaurum* in an immune-competent patient as the first from Iran and the third from the world.

2 | CASE PRESENTATION

A 44-year-old man presented to the outpatient dermatology clinic with two erythematous ulcerative nodules on the dorsum of his left hand and index finger. The patient had no history of fever, weight loss, or cough, and was an otherwise healthy farmer and rancher. The patient

had no underlying diseases and no history of use of any medications.

His skin lesion started 6 months earlier, with a slowly growing erythematous nodule on the back of his left hand. A second lesion then appeared on the index finger. One month later, three papular lesions started to grow on the upper medial part of his left arm.

On cutaneous examination, there were 2.5- to 3-cm erythematous nodules with central ulceration on the dorsal aspect of the left hand and a 1.5-cm ulcerated erythematous nodule on the dorsal of his left index finger. Three erythematous papulonodular lesions approximately measuring 1 cm were noted on the upper medial left arm (Figure 1).

With clinical suspicion of cutaneous non-tuberculous mycobacterial (NTM) infection, deep cutaneous fungal infection, leishmaniasis, cutaneous tuberculous infection, chronic bacterial osteomyelitis, pyoderma gangrenosum, cutaneous malignancy, and nodular vasculitis, a biopsy was taken from the hand lesion.

On histological examination, there was acanthosis and parakeratosis of the epidermis, the keratocytes showed reactive atypia. There was dense lymphoplasma cell infiltration and vague granuloma formation in the upper, mid, and deep dermis. The infiltration was extended to perifollicular, periadnexal, and hypodermis as well (Figure 2). Periodic acid Schiff (PAS), Giemsa staining, Ziehl–Neelsen, and acid-fast staining were negative.

IS6110 PCR for *M. tuberculosis* was negative. Nested PCR-RFLP pattern of mycobacterial 65-kDa heat shock protein (hsp65) gene showed *M. neoaurum*.

The patient received clarithromycin 250 mg, rifampin 300 mg, and ciprofloxacin 500 mg, twice daily, for 4 months. Then, rifampin was discontinued and clarithromycin and ciprofloxacin were continued for an additional month. The central lesion on the medial upper part of the arm was treated with cryotherapy using liquid nitrogen once at the beginning of the treatment course.

Our endpoint for treatment was the absence of swelling, induration, cellulitis, and ulcer. The patient has been visited monthly for the first 5 months of treatment then every 3 months thereafter for 1 year and then every 6 months. There has not been any evidence of recurrence since then (Figure 3).

3 | DISCUSSION

Cutaneous infection due to *M. neoaurum* in immune-competent individuals had only been reported in limited cases. The point that makes our case very impressive was its cutaneous infection, and presentation in the immune-competent patient.

The first case of human infection *M. neoaurum* was reported in 1987 in an immunocompromised patient with cystadenocarcinoma of the ovary who had a Hickman catheter for total parenteral nutrition.[10] In 2000, the 16S rRNA sequencing method was used for the identification of *M. neoaurum* for the first time.[9]

Several conditions including malignancy, immunosuppression, diabetes mellitus, IV drug abuse, recurrent bacterial infection, recent antibiotic therapy, prosthetic valves, foreign body, and multiple comorbidities have been reported as risk factors for *M. neoaurum* infections in humans.[1,3]

Previous studies have reported that about 75% of *M. neoaurum* infections are catheter or line-related sepsis.[7] Although Hickman catheters are the most common reported lines for infection with *M. neoaurum*, this pathogen can involve any foreign body.[1,3,5,11]

Infections of NTM are insidious and their signs and symptoms can mimic other diseases, which leads to delay in diagnosis and treatment.[1]

NTM cutaneous infections usually present as red to violaceous nodules that can drain serosanguinous discharge, ulcerate, or spread to deeper tissues and form fistulas with an indolent course that is nonresponsive to antimicrobial therapy.[5]

Among these cases, three cases were reported in immune-competent patients. Two of them were cutaneous infections and one was pulmonary infection.[12–14]

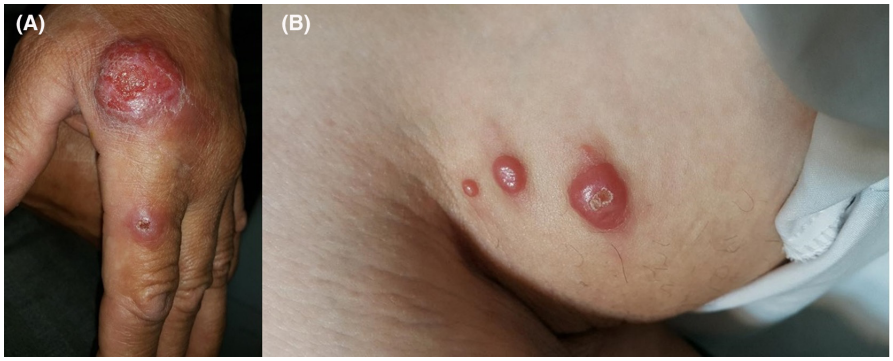


FIGURE 1 Cutaneous lesions. (A) Erythematous ulcerative nodules on the dorsal aspect of the left hand and index finger. (B) Erythematous papulonodular lesions on the upper medial left arm.

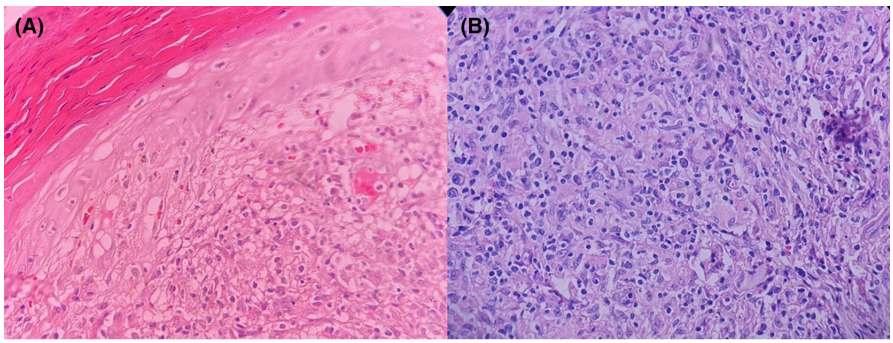
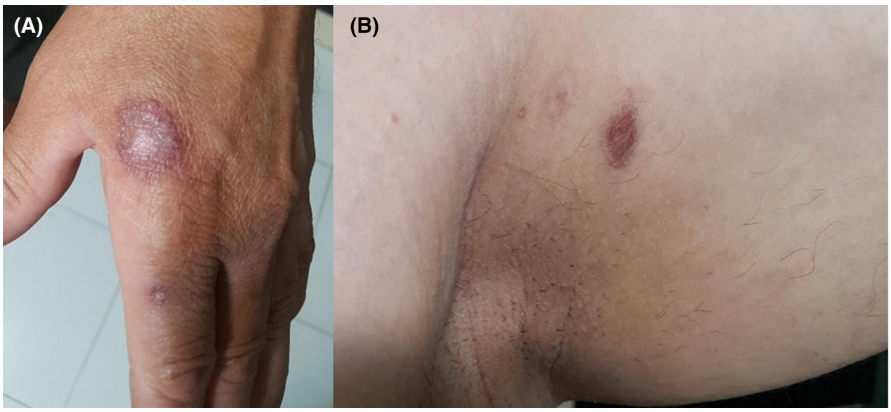


FIGURE 2 H&E image. In high power examination (A) the epidermis shows parakeratosis with marked spongiosis and few lymphocytic exocytosis. (B) The upper, mid, and hypodermis show intense infiltration of lymphoplasma cells as well as many areas of vague granuloma formation with periadnexal and perifollicular area involvement.

FIGURE 3 After 4 months of treatment. The lesions healed with scar on the dorsal of the left hand (A) and upper medial of the left arm (B).



The first cutaneous infection by *M. neoaurum* was reported in an Australian woman who developed scarring alopecia. After the final diagnosis via PCR, she partially responded to a 4-month course of combination antibiotic therapy with moxifloxacin and roxithromycin. This case was also the first reported *M. neoaurum* infection in an immune-competent person.[14]

The second cutaneous infection with *M. neoaurum* was reported in Hong Kong in 2012 in an immune-competent man in the hand. The infection was diagnosed for him using the PCR-restriction fragment length polymorphism of the hsp65 gene and the sequence of the 16s rRNA.[13] Our patient is the third case of cutaneous infection with *M. neoaurum* in an immunocompetent host. He was an immunocompetent host without any underlying diseases or comorbidity. Our patient was a farmer and rancher with recurrent exposure to water, soil, and animals as a potential source of contamination with *M. neoaurum*.

No standard guidelines are available for the treatment of *M. neoaurum* infections, but dual antimicrobial therapy has been recommended to minimize the risk of antibiotic resistance.[3]

There are no optimal treatment regimes for skin and soft tissue NTM infections because of the absence of large-scale clinical trials comparing different treatment regimes and length of treatment. In most studies, at least two antibiotics have been used to minimize the potential for the development of resistance. We decided to use three antibiotics that have shown efficacy in similar cases.

The patient with scarring alopecia was treated with moxifloxacin and roxithromycin and the patient with hand infection was treated with oral ciprofloxacin and doxycycline.[13,14]

Although there are no optimal treatment regimes and length of treatment for cutaneous NTM infection, it is suggested that at least 4–8 weeks of treatment can be useful, and deeper infections might require 6 months or more of treatment.

In our case the treatment continued for 5 months. The patient has been followed up every 3 months in the first year after cessation of treatment and every 6 months thereafter. There is no evidence of recurrence.

4 | CONCLUSION

In any immune-competent individual, especially those exposed to soil, sand, and water with localized skin and soft tissue infection with poor or no response to common

empiric antimicrobial treatment especially negative cultures for bacterial and fungal infection and even negative acid-fast staining, more evaluation using molecular-based methods, especially PCR-RLF analysis for the possibility of NTM infection, should be considered.

AUTHOR CONTRIBUTIONS

Alireza Mohebbipour-Loren: Conceptualization; project administration; writing – review and editing. **Mehrnaz Soghrati:** Conceptualization; investigation; methodology; writing – original draft. **Sajjad Barin:** Conceptualization; investigation; methodology; writing – review and editing. **Mitrasadat Rezaei:** Conceptualization; methodology; supervision; writing – review and editing.

ACKNOWLEDGMENTS

Nil.

FUNDING INFORMATION

None of the authors has any financial disclosures.

CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interests regarding the publication of this paper.

DATA AVAILABILITY STATEMENT

Data are available on request.

ETHICS STATEMENT

Ethics approval for this report was obtained from the Ethics Committee of Islamic Azad University Ardabil Branch, Ardebil, Iran.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

ORCID

Mehrnaz Soghrati https://orcid.org/0000-0001-7299-1112

REFERENCES

1. Hannah CE, Ford BA, Chung J, Ince D, Wanat KA. Characteristics of nontuberculous mycobacterial infections at a midwestern tertiary hospital: a retrospective study of 365 patients. *Open Forum Infect Dis*. 2020;7(6):ofaa173.
2. Behra PRK, Pettersson BMF, Ramesh M, Dasgupta S, Kirsebom LA. Insight into the biology of *Mycobacterium mucogenicum* and *Mycobacterium neoaurum* clade members. *Sci Rep*. 2019;9(1):19259.
3. Walayat S, Awwal T, Roy M, Ahmad S. *Mycobacterium neoaurum* line-related bacteremia with pulmonary involvement: case report and review of literature. *IDCases*. 2018;11:88-90.
4. Alhusseini M, Miceli MH, Chandrasekar P, Revankar S. Catheter-related bloodstream infection due to *Mycobacterium neoaurum* in a patient with acute leukemia. *Leuk Lymphoma*. 2014;55(8):1933-1934.
5. De Groote MA, Huitt G. Infections due to rapidly growing mycobacteria. *Clin Infect Dis*. 2006;42(12):1756-1763.
6. Awadh H, Mansour M, Shorman M. Bacteremia with an unusual pathogen: *Mycobacterium neoaurum*. *Case Rep Infect Dis*. 2016;2016:5167874.
7. Brown-Elliott BA, Wallace RJ Jr, Petti CA, et al. *Mycobacterium neoaurum* and *Mycobacterium bacteremicum* sp. nov. as causes of mycobacteremia. *J Clin Microbiol*. 2010;48(12):4377-4385.
8. Becker ML, Suchak AA, Wolfe JN, Zarychanski R, Kabani A, Nicolle LE. *Mycobacterium neoaurum* bacteremia in a hemodialysis patient. *Can J Infect Dis*. 2003;14(1):45-48.
9. Woo PC, Tsoi HW, Leung KW, et al. Identification of *Mycobacterium neoaurum* isolated from a neutropenic patient with catheter-related bacteremia by 16S rRNA sequencing. *J Clin Microbiol*. 2000;38(9):3515-3517.
10. Davison MB, McCormack JG, Blacklock ZM, Dawson DJ, Tilse MH, Crimmins FB. Bacteremia caused by *Mycobacterium neoaurum*. *J Clin Microbiol*. 1988;26(4):762-764.
11. Kusano T, Fukasawa C, Yamamoto S, et al. Pin tract infection caused by *Mycobacterium neoaurum* in a 14-year-old child: a case report. *J Infect Chemother*. 2021;27(8):1244-1247.
12. Kim CK, Choi SI, Jeon BR, Lee YW, Lee YK, Shin HB. Pulmonary infection caused by *Mycobacterium neoaurum*: the first case in Korea. *Ann Lab Med*. 2014;34(3):243-246.
13. Omoruyi OJ, Ip WY, To KK. Hand infection due to *Mycobacterium neoaurum*. *J Hand Surg (Eur Vol)*. 2012;37(6):574-575.
14. Martin LK, Lawrence R, Kossard S, Murrell DF. Cutaneous *Mycobacterium neoaurum* infection causing scarring alopecia in an immunocompetent host. *Br J Dermatol*. 2007;157(1):204-206.

How to cite this article: Mohebbipour-Loren A, Soghrati M, Barin S, Rezaei M. A case report of cutaneous infection with *Mycobacterium neoaurum*. *Clin Case Rep*. 2023;11:e7265. doi:10.1002/ccr3.7265