

CASE REPORT

A Case of Mycobacterium Marinum Infection in the Middle Finger of the Left Hand

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SUMMARY

Background: In April 2024, our hospital confirmed a case of Mycobacterium marinum infection in the middle finger of the left hand. The patient sought medical attention at our hospital due to swelling of the left middle finger with tendon contracture for one and a half years and subcutaneous induration of the left palm for one month. In September 2022, the patient's left middle finger was pricked by raw fish bones, resulting in punctate erythema and pain. Self-application of erythromycin ointment did not improve. In November 2022, the left middle finger showed redness and swelling. The local hospital diagnosed it with tenosynovitis, but the effect of anti-inflammatory treatment was not significant. Later, the left middle finger gradually developed tendon contracture and mobility disorders. In May 2023, the patient underwent multiple "short needle knife" treatments in an external hospital for "tenosynovitis". The swelling and redness of the fingers slightly subsided, and the treatment effect was not ideal. In March 2024, the patient developed subcutaneous induration in the left palm. For additional diagnosis and treatment, the patient went to our hospital for treatment. Clinically admitted with "1. Hand skin infection (Mycobacterium), 2. Tendon contracture (with infection)".

Methods: Clinically, ultrasound-guided puncture and aspiration of subcutaneous abscess in the middle finger of the left hand were performed. The extracted pus was subjected to bacterial culture and identification, acid fast staining, Gram staining, NGS (Next-Generation Sequencing) detection of pus and additional related auxiliary examinations such as blood routine, urine routine, liver function, kidney function, and electrocardiogram.

Results: Hand magnetic resonance imaging: 1. Abnormal signals around the third proximal phalanx of the left hand and around the flexor tendon of the third metacarpal finger, suspected of abscess. 2. Increased signal in the left wrist canal, suspected of inflammatory disease. Blood routine + CRP (venous blood): The percentage of neutrophils is 28.9%, the total number of neutrophils is $1.30 \times 10^9/L$, and the percentage of lymphocytes is 60.2%. Liver function: Total protein 58.0 g/L, albumin 33.6 g/L, no significant abnormalities observed in the rest. Acid fast staining of pus: positive, culture and identification of pus bacteria (MALDI-TOF MS, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry): Mycobacterium marinum. NGS detection of pus: Mycobacterium marinum. Clinical treatment plan: Rifampicin 0.6 g po qd, clarithromycin 0.5 g po bid for anti-infection treatment, local hot compress. After 5 days of treatment, the patient's flexor digitorum tendon extended towards the proximal end, with a soft texture and mild tenderness. The flexion activity was slightly restricted, and no additional special discomfort was reported. The patient improved and was discharged.

Conclusions: This article reports a case of Mycobacterium marinum infection in the middle finger of the left hand. Mycobacterium infection was quickly and accurately identified by MALDI-TOF MS and NGS, reasonable treatment measures were adopted clinically. The patient improved and was discharged. I hope that in the future, this study can provide assistance for the clinical diagnosis and treatment of Mycobacterium infection.

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KEYWORDS

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CASE PRESENTATION

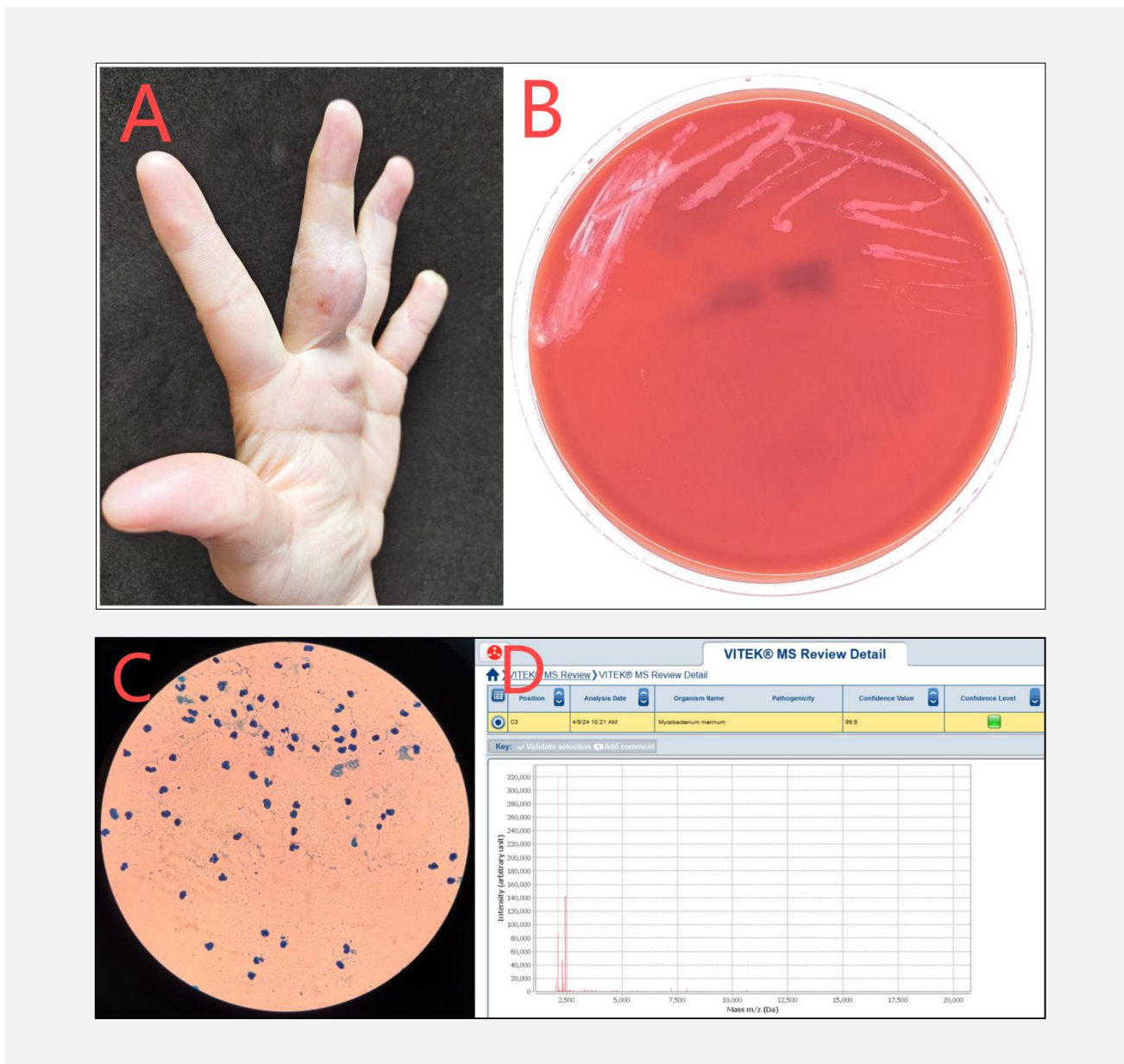
The patient, a 41-year-old female, presented to our hospital with swelling of the left middle finger accompanied by tendon contracture for one and a half years and subcutaneous induration of the left palm for one month. In September 2022, the patient's left middle finger was pricked by raw fish bones, resulting in punctate erythema and pain. Self application of erythromycin ointment did not improve. In November 2022, the left middle finger showed redness and swelling. The local hospital diagnosed it with tenosynovitis, but the effect of anti-inflammatory treatment was not significant. Later, the left middle finger gradually developed tendon contracture and mobility disorders; in May 2023, the patient underwent multiple "little needle knife" treatments in an external hospital for "tenosynovitis", but the swelling and redness of the fingers slightly subsided, and the treatment effect was not ideal; In March 2024, the patient developed subcutaneous induration in the left palm. For additional diagnosis and treatment, the patient went to our hospital for treatment. Clinically admitted with "1. Hand skin infection (Mycobacterium), 2. Tendon contracture (with infection)". Physical examination: A 3 cm x 4 cm sized granulation mass is seen in the middle section of the right middle finger (Figure A), with the flexor tendon extending towards the proximal end. The mass is soft, with mild tenderness and limited flexion activity. Clinically, ultrasound-guided puncture and aspiration of subcutaneous abscess in the middle finger of the left hand were performed. The extracted pus was subjected to bacterial culture and identification, acid fast staining, Gram staining, NGS detection of pus and additional related auxiliary examinations such as blood routine, urine routine, liver function, kidney function, and electrocardiogram. Examination results: Magnetic resonance imaging of the hand: 1. Abnormal signals around the third proximal phalanx of the left hand and the flexor tendon of the third metacarpophalangeal finger, suspected of abscess. 2. Increased signal in the left wrist canal, suspected of inflammatory disease. Blood routine + CRP (venous blood): The percentage of neutrophils is 28.9%, the total number of neutrophils is $1.30 \times 10^9/L$, the average volume of red blood cells is 100.8 fL, and the percentage of lymphocytes is 60.2%. Liver function: Total protein 58.0 g/L, albumin 33.6 g/L, aspartate aminotransferase 12.1 U/L, lactate dehydrogenase 103.8 U/L, no significant abnormalities observed in the rest. Acid fast staining of pus: positive (Figure C), culture and identification of pus bacteria (MALDI-TOF MS): *Mycobacterium marinum* (Figure B, D). NGS detection of pus: *Mycobacterium marinum*. Clinical treatment plan: Rifampicin 0.6 g po qd, clarithromycin 0.5 g po bid for anti-infection treatment, local hot compress.

After 5 days of treatment, the patient's flexor digitorum tendon extended towards the proximal end, with a soft texture and mild tenderness. The flexion activity was slightly restricted, and no additional special discomfort was reported. The patient improved and was discharged. After discharge, anti-infection treatment continued. Medical advice: Regularly monitor liver function, blood routine, and electrocardiogram during medication, evaluate efficacy 2 - 4 weeks later, and evaluate whether to adjust the anti infection plan based on clinical symptoms.

DISCUSSION

In 1954, *Mycobacterium marinum* was first isolated from human skin tissue, and was named *Mycobacterium marinum* due to infection caused by contact with bacteria during swimming [1]. With the development of marine fisheries, the risk of infection among personnel engaged in fisheries work has increased. In 1997, China reported the first case of *Mycobacterium marinum* infection [2]. Subsequently, the incidence rate of skin and soft tissue infections caused by *Mycobacterium marinum* is gradually increasing. *Mycobacterium marinum* is considered to be one of the most common pathogens causing skin NTM infection in China [3]. This article reports a case of *Mycobacterium marinum* infection misdiagnosed as tenosynovitis. After more than a year of seeking medical attention, the patient was diagnosed and confirmed by *Mycobacterium* culture in live skin tissue. This reminds dermatologists to pay attention to this atypical *Mycobacterium* infection.

The common clinical manifestations of *Mycobacterium* infection are isolated papules and nodules on the fingers or hands, which can also be manifested as sporotrichosis like distribution [4]. According to different clinical symptoms, *Mycobacterium* infection can be classified into four types (I - IV) to guide treatment [5]: Type I is isolated or localized 1 - 3 lesions; type II has three or more lesions, which may be accompanied by inflammatory nodules; type III is a skin lesion with deep infection (such as arthritis, tenosynovitis, and bursitis); type IV is a disseminated infection that may present with pulmonary infections and other systemic manifestations. A typical manifestation of *Mycobacterium* infection is isolated or scattered papules and nodules on the hands, wrists, or upper limbs. In a few patients, ulcers, pustules, plaques, or sporotrichosis like skin lesions may appear. The affected area is more common in the upper limbs, especially in the hands, and sometimes involving other parts such as the lower limbs, trunk, and face [6]. The incidence of close contact with seafood in coastal areas, living by the seaside or water bodies, has significantly increased, which is related to increased exposure [7]. Although the number of skin infections caused by *Mycobacterium marinum* is continually increasing, due to insufficient understanding of the bacterial infection, non-specific clinical manifestations, and atypical histo-



Clinical and bacteriological images:

Figure A: Lesion image of the patient's middle finger.

Figure B: Growth of *Mycobacterium marinum* in Blood agar medium at 35°C, 5% CO₂, 96 hours, aerobic cultivation.

Figure C: Acid fast staining of bacteria x 1,000.

Figure D: Identification results of *Mycobacterium marinum* MALDI-TOF MS.

pathological features, it is easy to misdiagnose it as a fungal infection in clinical practice. According to recent research statistics, less than 60% of patients seek medical attention and receive correct diagnosis and treatment within three months [8].

At present, the reported cases of *Mycobacterium* infection both domestically and internationally are mainly unilateral upper limb infections, most likely due to increased exposure to seafood in the upper limb, with symptoms mainly characterized by erythema, papules,

and nodules [9]. Infection caused by *Mycobacterium marinum* should be distinguished from infections caused by *Vibrio vulnificus* and Sporotrichosis. *Vibrio vulnificus* infection commonly leads to characteristic bullous skin damage, manifested as redness and swelling of the skin, with the appearance of bullae or blood blisters. Skin swelling can rapidly spread within 24 hours, and the lesion can progress to necrotizing fasciitis. *Vibrio vulnificus* infection has a rapid onset and severe progression. Within 2 days of admission, over 50% of pa-

tients experience multiple organ dysfunction syndrome, septic shock, and even death [10]. Sporotrichosis is relatively common in the northeast region of China, with the main pathogen being *Sporotrichosis Schenck*, which mostly originates from the soil. Farmers and gardeners are the main susceptible population. Skin lesions are common in exposed areas such as limbs, forming nodules, plaques, and inflammatory papules. In some patients, the skin lesions are arranged in a bead like pattern along the lymphatic vessels, but generally do not show obvious symptoms [11].

The typical pathological manifestation of *Mycobacterium marinum* is infectious granuloma, with infiltration of epithelioid cells, multinucleated giant cells, lymphocytes, and tissue cells in the dermis [12]. Unfortunately, the patients in this study did not undergo histopathological examination, making it impossible to determine whether they have typical infection characteristics. The low positive rate of *Mycobacterium marinum* culture may be related to the low bacterial load at the infected site, elevated culture temperature, and lengthy culture cycle [13]. Therefore, when the culture results of patients with highly suspected *Mycobacterium* infection in clinical practice are negative. They can be cultured and extended at 28 - 32°C, and if necessary, consider combining with NGS. In this case report, the original samples were simultaneously subjected to NGS detection, and the final results were consistent with the mass spectrometry method. This case confirms that NGS detection can significantly shorten the detection time compared to traditional methods.

Mycobacterium marinum is more sensitive to clarithromycin, azithromycin, ethambutol, rifampicin, levofloxacin, and moxifloxacin, but resistant to isoniazid, aminosalicylic acid, and streptomycin [14]. In clinical practice, 2 - 3 sensitive drugs are commonly used in combination therapy. It is recommended to use clarithromycin or azithromycin in combination with rifampicin, moxifloxacin, or ethambutol, and continue treatment for 1 - 2 months after the skin lesion subsides, with a total course of 4 - 6 months [15]. The patient in this case received anti-infection treatment with 0.6 g po qd of rifampicin and 0.5 g po bid of clarithromycin. During the medication period, liver function, blood routine, and electrocardiogram were regularly monitored. The efficacy was evaluated 2 - 4 weeks later, and the anti-infection regimen was adjusted based on clinical symptoms. During medication, side effects may occur, including secondary infections, vestibular dysfunction, hearing loss, gastrointestinal symptoms (diarrhea, nausea, vomiting), liver and kidney damage, etc. Based on the treatment experience of multiple cases of atypical mycobacterial infections in our department, while using antibiotics for anti-infection treatment, surgical incision drainage combined with Ella photodynamic therapy has a good effect. However, the patient currently has swelling, mobility disorders, and tendon contracture in the left middle finger. We have repeatedly communicated with the patient that there is a high possibility of con-

tracture after hand incision drainage, which may cause mobility disorders and a poor prognosis. After communicating with the patient about the advantages and disadvantages of surgical incision drainage and conservative treatment, the patient chose conservative treatment. In summary, this article reports a case of *Mycobacterium* infection in the left finger, which was quickly and accurately identified by MALDI-TOF MS and NGS. Reasonable treatment measures were adopted clinically, and the patient improved and was discharged. I hope that in the future, this study can provide assistance for the clinical diagnosis and treatment of *Mycobacterium* infection.

Ethics Approval and Consent to Participate:

Ethical review and approval were not required for this study. The patient provided written informed consent to participate in this study.

Consent for Publication:

The patient provided written informed consent for study publication.

Availability of Data and Materials:

The original data and materials presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

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Declaration of Interest:

The authors declare no competing interests.

References:

1. Hu DD, Weaver SD, Collars OA, Champion PA, Champion MM. N-terminal proteomics of *Mycobacterium marinum* using bottom-up label-free quantitative analysis in data-dependent acquisition mode on a timsTOF Pro mass spectrometer. *Microbiol Resour Announc* 2024 Apr 11;13(4):e0126323. (PMID: 38477461)
2. Wen D, Meng C, Feng Y, et al. Syringaldehyde Exhibits Antibacterial and Antioxidant Activities against *Mycobacterium marinum* Infection. *Microorganisms* 2024 Feb 7;12(2):348. (PMID: 38399751)
3. Barrantes Murillo DF, Negrao Watanabe TT, Sasaki E, Pirie GJ, Wakamatsu N. Coinfection by *Mycobacterium marinum* and *Mycobacterium fortuitum* in a captive adult diamondback water snake causing disseminated mycobacteriosis with acute cutaneous ulceration. *J Vet Diagn Invest* 2024 Mar;36(2):269-73. (PMID: 38205524)

4. Liu X, Liu Z, Chen Z, et al. Successful diagnosis of Mycobacterium marinum infection by mNGS in a patient with Human Immunodeficiency Virus: a case report. *J Infect Dev Ctries* 2024 Apr 30;18(4):651-4. (PMID: 38728638)
5. Tooulia M, Mellos A, Vougiadiotis I, Vrakas S. Mycobacterium marinum infection in a patient with Crohn's disease on anti-tumor necrosis factor treatment. *Indian J Gastroenterol* 2024 Apr 23. (PMID: 38652376)
6. Xing F, Lo SKF, Ma Y, et al. Rapid Diagnosis of Mycobacterium marinum Infection by Next-Generation Sequencing: A Case Report. *Front Med (Lausanne)* 2022 Feb 4;9:824122. (PMID: 35187006)
7. Uijtendaal W, Yohanna R, Visser FW, Ossenkoppele PM, Hess DL, Boumans D. A Case of Hypercalcemia in an Immunocompetent Patient with Disseminated Mycobacterium marinum Infection with a Rain Barrel as the Most Likely Primary Source. *Eur J Case Rep Intern Med* 2021 Nov 18;8(11):002864. (PMID: 34912737)
8. Jeon CH, Kim SH, Cheong HS, et al. Clinical characteristics and the diagnostic role of molecular tests in musculoskeletal infections caused by nontuberculous Mycobacterium: a single-center experience. *Infection* 2022 Aug;50(4):981-7. (PMID: 35320503)
9. Hendriks L, van Hees CLM, de Steenwinkel JEM, et al. Treatment and Outcome of Culture-Confirmed Mycobacterium marinum Disease. *Open Forum Infect Dis* 2022 Mar 16;9(4):ofac077. (PMID: 35308482)
10. Guo L, Chen JS, Deng PW, et al. Finger necrosis and Vibrio vulnificus bloodstream infection caused by a scratch from the dorsal fin of a freshwater fish. *Asian J Surg* 2024 Jun 4. (PMID: 38839495)
11. Tan L, Ariffin N, Vendargon FMM, Mohd Khialdin S. Ocular Adnexal Manifestations of Sporotrichosis: A Report of Two Cases. *Cureus* 2024 May 8;16(5):e59939. (PMID: 38854294)
12. Patel PM, Camps N, Rivera CI, Tuda C, VanOstran G. Mycobacterium marinum Infection and Interferon-Gamma Release Assays Cross-Reactivity: A Case Report. *Cureus* 2022 Jan 19;14(1):e21420. (PMID: 35198325)
13. Strobel K, Sickenberger C, Schoen C, Kneitz H, Kolb-Maurer A, Goebeler M. Diagnosis and therapy of Mycobacterium marinum: a single-center 21-year retrospective analysis. *J Dtsch Dermatol Ges* 2022 Sep;20(9):1211-8. (PMID: 36000770)
14. Zhao Q, Bao F, Mi Z, et al. An outbreak of Mycobacterium marinum infection associated with handling seabass in China. *Chin Med J (Engl)* 2022 Nov 5;135(21):2617-9. (PMID: 36228158)
15. Liao X, Liu Y, Liu H, Zhang F. Combination treatment with antibiotics and photodynamic therapy in refractory mycobacterium marinum infection: A case report. *Photodiagnosis Photodyn Ther* 2023 Jun;42:103516. (PMID: 36924978)