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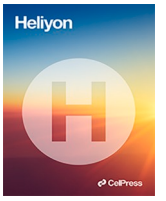

Case report

Mycobacterium marinum cutanous infection misdiagnosed as sporotrichosis in a patient with systemic lupus erythematosus: A case report

Bo-quan Long, Qi Long, Mei-yan Lai, Lan Yang, Fu-rong You, Hong-wei Guo *

Dermatology Department of The Second Affiliated Hospital of Guangdong Medical University, Zhanjiang, 524003, China

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ABSTRACT

Mycobacterium marinum(*M. marinum*), a slow-growing bacterium in freshwater and seawater, can cause cutanous and extracutaneous infections. A fisher-woman with systemic lupus erythematosus (SLE) presented with chronic polymorphic rashes in a lymphangitic pattern was initially misdiagnosed as sporotrichosis. The final diagnosis of *M. marinum* and *Candida dubliniensis* co-infection was confirmed based on the skin histopathology, pustule culture, MetaCAP sequencing and effective antibiotic combination treatments.

1. Introduction

Mycobacterium marinum (*M. marinum*), a non-tuberculous mycobacterium (NTM) infects fish and humans through direct contact. Bacterial incubation lasts 2–3 weeks, resulting in skin lesions such as papules, pustules, nodules, ulcers, and scabs. Here, we reported a case of *M. marinum* infection in a woman with systemic lupus erythematosus (SLE) in a long-term corticosteroid usage, who was initially misdiagnosed as sporotrichosis and eventually achieved a successful antibiotic combination treatment.

2. Case

A 38 years old female accidently got skin abrasion in her both lower legs and left upper limb when she was organizing fishing gear one and a half years ago. The wounds led to erythema, plaques, pustules, nodules, ulcers, and scars. Six months ago prior to the first clinic, the patient was diagnosed with sporotrichosis and failed in oral itraconazole treatment as the rashes spread along lymphatic vessels.

The woman was diagnosed with SLE more than 20 years ago and was on prednisone since. Three years ago, she was diagnosed with type 2 diabetes and started taking metformin irregularly.

Physical examination: a moon-shaped face with scarlet dilated facial capillaries significantly appeared; scattered skin ulcers on the calves and bean-sized nodules on the left elbow were observed along the lymphatic vessels, the erythema, plaques, pustules, abscesses, necrosis, and scarring were seen as well (Fig. 1a and b).

Skin histopathology revealed hyperkeratosis, neutrophilic aggregates, granulomatous structures with multinucleated giant cells, and lymphocytic infiltration (Fig. 1c and d). *Candida dubliniensis* was identified from the pustule secretion culture though the blood

* Corresponding author.
E-mail address: hongweiava@126.com (H.-w. Guo).

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cultures were negative. Special stains were inconclusive, yet MetaCAP sequencing confirmed *M. marinum* infection (sequence number 477, Supplementary meterial).

According to the medical history, skin histopathology, and lab findings, a mixed infection of *M. marinum* and *Candida dubliniensis* was diagnosed. A triple combination of antibiotics was administered orally for 3 months: rifampicin (0.45 g/d), ethambutol (0.75 g/d), and clarithromycin (0.25 g/d), along with 2 weeks of consecutive antifungal therapy: fluconazole capsules (0.2 g/d). The rashes subsided gradually afterwords.

3. Discussion

M. marinum, found in water and seafood, causes infections via contaminated sources [1]. Its skin lesions manifest with painless papulonodules, often leading to delayed diagnosis. Deep infection can cause tenosynovitis or osteomyelitis, particularly in immunocompromised individuals.

The patient, a fisherwoman, likely encountered *M. marinum* in contaminated seawater through broken skin. Her history of SLE with prolonged immunosuppressive therapy indicated an immunocompromised condition which might underlie the opportunistic infections [2]. The skin lesions followed a lymphangitic pattern, suggesting type II *M. marinum* infection [3]. Clinically, it is difficult to distinguish cutaneous *M. marinum* infection from sporotrichosis, as reported in the past [4]. In this case, the misdiagnosis of sporotrichosis was made at first, but the indistinct string of noduloulcerative lesions and the failed anti-fungi treatment pointed to different diagnosis such as *M. marinum* infection.

The gold standard for *M. marinum* infection diagnosis involves isolation of the bacteria from skin or lesion tissues [5]. *M. marinum*, catalase-positive and slow-growing, are typically cultured on Lowenstein-Jensen medium at 30 °C for 2–4 weeks to become detectable. However, in this case, we identified *M. marinum* infection by MetaCAP technology.

MetaCAP [6] (Metagenomics Capture) is a high-throughput sequencing method for detecting microbiomes in different sample types without relying on clinical cultures. Based on the million probe capture technology on top of the conventional mNGS (metagenomic next generation sequencing), the surperiorities of MetaCAP is using targeted metagenomics as a cost-effective and rapid alternative to whole metagenome sequencing. The principle is to hybridize microbial nucleic acids with customized multi-million specific probes to capture and enrich the sequences in the target region, and then achieve high sensitivity detection by second generation sequencing. Therefore, MetaCAP sequencing facilitates probe-based target enrichment and timely diagnosis as an easy and efficient second generation sequencing. Additionally, *Candida dubliniensis* was detected in pus cultures sampled from other site of the lesions, showing a higher susceptibility of immunocompromised patients to opportunistic infections [7].

The exclusion of SLE flare should be considered since the development of the lesions accompanied with an overall malaise. However, the asymetrically distribution of the lesions, the identifications of the pathogens and the effective anti-infection treatments proved *M. marinum* infection would be the causes for the rashes and malaise.

Treatment options for *M. marinum* infections are diverse, encompassing antibiotics, surgical debridement, and photodynamic therapy. Rifampicin stands out as the most effective among ethambutol, macrolides, tetracyclines, sulphonamides, and quinolones. According to American Thoracic Society and the Infectious Diseases Society of America (ATS/IDSA) guidelines [8], clarithromycin monotherapy may suffice for mild cases, whereas combination therapy (rifampicin, ethambutol, clarithromycin,e.g.) is recommended for extensive or deep tissue involvement. In deed, dual or triple therapy has shown efficacy in long-term immunosuppressed patients [8], so that a combination antibiotic treatment was employed for the case.

4. Conclusion

For patients under long-term hormone and immunosuppressive treatments, the rare opportunity infections should keep in mind after excluding the immunocompromised conditions flare. Prompt histopathology, pathogen culture, and molecular biotechnologies would be crucial for an accurate diagnosis. Individualized treatments, based on immune status and response, optimize patient

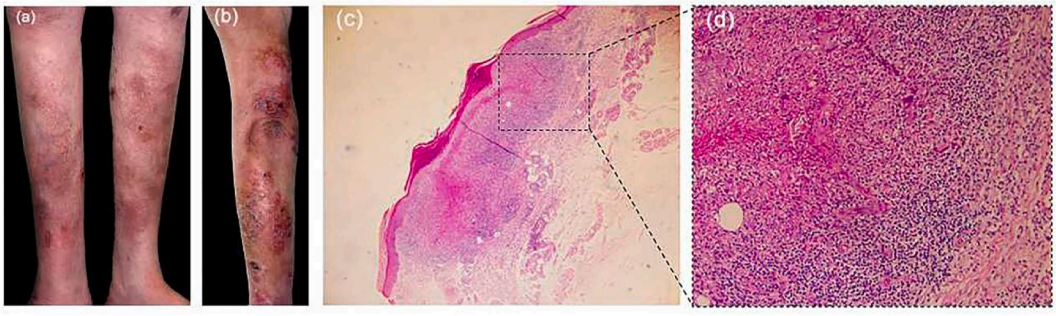

Fig. 1. (a) Scattered skin ulcers on both calves.(b) Infiltrative plaques, nodules and abscesses were observed around the left elbow at the first clinic. (c) Hematoxylin and eosin (H&E)staining of the patient's left elbow biopsy. Notable findings include hyperkeratosis, neutrophilic aggregates, granulomatous structures, multinucleated giant cells, and lymphocytic infiltration (× 40).(d) A magnified view of the black square in (c) (× 100).

outcomes.

Consent

Written informed consent was obtained from the individuals for the publication of any potentially identifiable images or data included in this article.

Ethical statement

Since the data were anonymized and presented no threat to patients' rights, the Ethics Committee of The second Affiliated Hospital of Guangdong Medical University exempted the need for ethical approval.

Data availability statement

No data was used for the research described in the article.

CRediT authorship contribution statement

Bo-quan Long: Writing – original draft, Methodology. **Qi Long:** Resources. **Mei-yan Lai:** Resources. **Lan Yang:** Data curation. **Furong You:** Data curation. **Hong-wei Guo:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e34444.

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