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Case Report

Disseminated *Mycobacterium chimaera* Presenting as Vertebral Osteomyelitis

Daphne M. Moutsoglou, Frank Merritt, and Ethan Cumbler

Department of Medicine, Hospital Medicine Group, University of Colorado School of Medicine, Aurora, CO, USA

Correspondence should be addressed to Daphne M. Moutsoglou; daphne.moutsoglou@ucdenver.edu

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Mycobacterium chimaera, a member of the *Mycobacterium avium* complex, is a slow-growing, nontuberculous mycobacterium associated with outbreaks in cardiac-surgery patients supported on heart-lung machines. We report a case of an elderly woman on chronic prednisone who presented with a six-month history of worsening chronic back pain, recurrent low-grade fevers, and weight loss. Imaging identified multilevel vertebral osteomyelitis and lumbar soft-tissue abscess. Abscess culture identified *M. chimaera*.

1. Introduction

Mycobacterium chimaera is a slow-growing, nontuberculous mycobacterium (NTM) sequevar belonging to the *Mycobacterium avium* complex (MAC) [1]. *M. chimaera* has been reported in patients undergoing cardiac surgery, who later develop cardiac and disseminated infection [2–4]. *M. chimaera* can contaminate tap water and has been identified growing in water tanks within heater-cooler units of heart-lung machines [5–7].

Prior reports show that, despite antibiotic and surgical treatment, disseminated *M. chimaera* has a high mortality rate. Even with antibiotic therapy targeted to *in vitro* sensitivities, medical therapy often fails to result in clearance. The identification of *M. chimaera* may be missed in the absence of molecular sequencing diagnostics. While this case represents a description of proven *M. chimaera* osteomyelitis, it is likely that other cases have occurred and been attributed to other MAC species.

2. Case

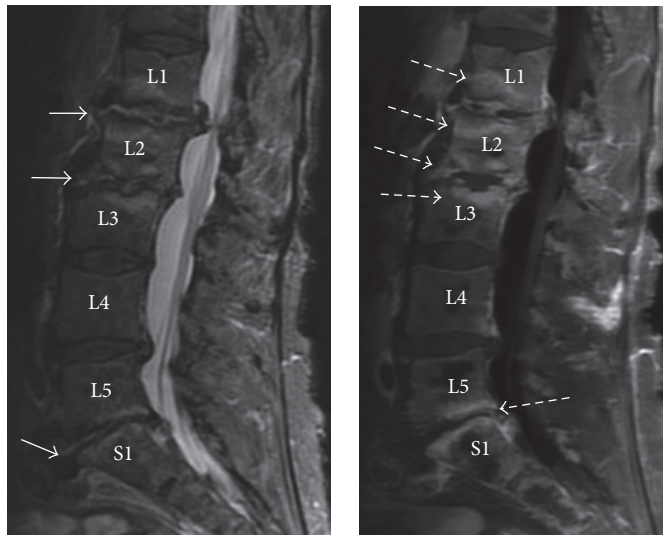
A 75-year-old woman with systemic lupus erythematosus was evaluated for two months of chronic, low back pain. She also reported subjective fevers, weight loss, and an initially necrotic, one-centimeter wound on her right calf that developed five months earlier. She had no history of trauma, paraspinal steroid injections, or past cardiac or spine surgery. Medications are significant for prednisone and hydroxychloroquine.

On exam she was afebrile, with normal vitals, mild lumbar tenderness, normal strength, and intact reflexes in the lower extremities and without saddle anesthesia.

Laboratory analysis showed normocytic anemia (hemoglobin 11.6 g/dL), normal white blood cells (5.4×10^9/L), normal platelets (175×10^9/L), hyponatremia (124 mmol/L), and elevated erythrocyte sedimentation rate (106 mm/hr) and C-reactive protein (117 mg/L). She had normal serum complement levels, a negative HIV, and an indeterminate QuantiFERON test.

MRI with and without contrast of the thoracic and lumbar spine revealed multilevel discitis and prevertebral osteomyelitis at L1-2, L2-3, and L5-S1 (Figure 1). An abscess located in L5-S1 (Figure 1(a), white arrow) was aspirated. Culture of the abscess revealed polymorphonuclear cells without organisms on conventional and acid-fast bacilli staining. Bacterial and fungal microscopy of the abscess and blood cultures were obtained. Cryptococcal PCR, *Coccidioides* antibody, and *Mycobacterium tuberculosis* polymerase chain reaction were negative.

The patient was started on empiric intravenous vancomycin and ertapenem. On day 12, *M. chimaera* was identified in the abscess aspirate by culture and sequencing. She was then transitioned to clarithromycin, rifampin, and



(a) (b)

Figure 1: *Prevertebral osteomyelitis, discitis, and soft-tissue abscess seen on sagittal MRI imaging with and without contrast*. (a) Sagittal T2 STIR showing high signal consistent with fluid in the L1-2, L2-3, and L5-S1 disc spaces with endplate edema (white arrows). (b) Sagittal T1 fat saturation obtained after contrast shows extensive enhancement centered around the L1–3 and L5-S1 disc spaces consistent with discitis and osteomyelitis (dashed arrows).

ethambutol. A new biopsy of the calf wound was positive for *M. chimaera.* Surgical discectomy, debridement, and fusion were recommended; however, she deferred surgery and was discharged with a prolonged course of antimycobacterials.

3. Discussion

Disseminated infection with *M. chimaera* has been previously described following cardiac surgery (range of 5 to 40 months to diagnosis after surgery) as vascular graft infection, prosthetic valve endocarditis, or myocarditis [2, 3]. Outbreaks of *M. chimaera* in patients supported by heart-lung machines have prompted recent investigations identifying water tanks supporting heater-cooler systems as the likely source of infection in these outbreaks [6, 7]. *M. chimaera* can also cause pulmonary infection, similar to *M. avium* and *M. intracellulare* [8–11]. Initial reports suggested that *M. chimaera* is more virulent than the other MAC species [1]. This has since been called into question by a larger case series in which *M. chimaera* was more likely to be a colonizer of the respiratory tract and less likely to cause true infection, compared to the other MAC species [11]. In this series, patients with true respiratory infection due to *M. chimaera* were more likely to be immunosuppressed (53%), suggesting a more opportunistic pattern of infection [11].

Similar to other MAC species, *M. chimaera* is typically treated with a prolonged course of clarithromycin, ethambutol, and rifampin. Vertebral osteomyelitis caused by MAC or other NTM often requires surgery, due to either neurologic deficits, spinal instability, or failure of medical treatment [12].

Identification of *M. chimaera* requires sequencing; therefore, nonsequencing methods may fail to identify the correct *Mycobacterium* species [3, 11, 13]. A study that retrospectively sequenced samples from patients with diagnosed MAC found that 28% of infections were due to *M. chimaera*, while 54% and 18% of previously diagnosed MAC infections were due to *M. avium* and *M. intracellulare*, respectively [11]. In another retrospective study of patients with prior diagnosis of *M. intracellulare*, sequencing determined that 143 of the 166 samples attributed to *M. intracellulare* infection could be reclassified as *M. chimaera* [13]. Similar to other MAC infections, *M. chimaera* often presents with fever of unknown origin and weight loss.

Disseminated *M. chimaera* infection after cardiac surgery may manifest as granulomatous nephritis, granulomatous hepatitis, chorioretinitis, multifocal choroiditis, and pulmonary infection, as well as spondylodiscitis, osteoarthritis, and poststernotomy wound infection [1–4]. Laboratory characteristics of disseminated *M. chimaera* include an elevated C-reactive protein, pan-negative conventional blood cultures, with anemia, lymphopenia, and thrombocytopenia, and elevated lactate dehydrogenase, creatinine, and transaminases [2–4].

The patient in this case presented with a history of chronic nonhealing leg wound months prior to the clinical signs of her vertebral osteomyelitis. Given that the leg wound later grew acid-fast bacilli identified as *M. chimaera*, her ulcer was likely the first manifestation of the disease, months before diagnosis of spinal involvement. This emphasizes the importance of considering slow-growing NTM species in the evaluation of nonhealing wounds in patients on immune-compromising medications, since conventional pathology and bacterial cultures will fail to make the diagnosis.

Unlike many prior descriptions of patients with *M. chimaera*, our patient did not have a history of recent surgery or heart-lung bypass. Her chronic immunosuppression with

prednisone and hydroxychloroquine was a likely predisposing factor to this infection. She had an elevated CRP and anemia similar to other reports, but she did not have pancytopenia or liver and kidney involvement, as described in other patients with disseminated disease after heart surgery [2–4]. To our knowledge, this is the first report in the literature of *M. chimaera* causing vertebral osteomyelitis in a patient without history of cardiac surgery.

Abbreviations

MAC: *Mycobacterium avium* complex
NTM: Nontuberculous mycobacteria.

Disclosure

All authors had access to data and had a role in writing this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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