Le Infezioni in Medicina, n. 3, 267-269, 2017

Disseminated *Mycobacterium chimaera* infection after open heart surgery in an Italian woman: a case report and a review of the literature

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SUMMARY

We report the first Italian case of *Mycobacterium chimaera* disseminated infection in a patient *with* a history of cardiac surgery.
The patient was initially diagnosed with sarcoidosis and started on immunosuppressive therapy. Ten months later she developed a vertebral osteomyelitis: *M. chimaera* was isolated from bone specimen. A review of the literature shows that *M. chimaera* infection occurs specifically in this population of patients, due to contamination of heater-cooler units used during cardiosurgery. Devices responsible for the transmission were produced by Sorin Group Deutschland. *Mycobacterium chimaera* infection should be included in the differential diagnosis for patients undergoing cardiac surgery.

Keywords: *Mycobacterium chimaera*, cardiac surgery, sarcoidosis, immunosuppressive therapy.

INTRODUCTION

Mycobacterium chimaera infections have recently been described in Europe and the United States, particularly in patients who underwent cardiac surgery [1]. This slow-growing, non-tuberculous mycobacterium belongs to the *Mycobacterium Avium Complex* (MAC) species and has generally been thought to have relatively low virulence, at least as a pulmonary pathogen in immunocompromised patients.
This report outlines the clinical case of a *M. chimaera* osteomyelitis and disseminated infection in a patient with a history of cardiac surgery. To the best of our knowledge this is the first case reported in Italy.

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CASE REPORT

A 70-year-old woman was admitted in December 2016 from another hospital to our department with the diagnosis of vertebral osteomyelitis caused by *M. chimaera.*
Her story starts in October 2014, when she underwent bioprosthetic mitral valve replacement for severe steno-regurgitation. She was successfully discharged without any major complication and no clinical problems were reported in the following 14 months.
On February 2016, the patient was again admit-

ted to another hospital after two months of fever (37.5°C), cough and fatigue. Symptoms were not responsive to a ten-days course of empiric antibiotic therapy with ceftriaxone. Infectious diseases work-up was negative and, after further investigations, a diagnosis of disseminated sarcoidosis was made (non-caseating granulomas on pulmonary and bone marrow biopsies). An oral therapy with prednisone (50 mg/die) and idroxichloroquine was started and progressive resolution of the symptoms commenced.

Few months later, however, the patient started suffering from fever and low back pain. She was therefore admitted to hospital in November 2016. On November 16th a PET-CT scan was performed and showed increased metabolic activity on L2-L3 vertebral bodies and endocardium. An echocardiogram was performed showing no signs of endocarditis, while a vertebral biopsy confirmed the diagnosis of osteomyelitis. *Acinetobacter* spp. was initially isolated from blood cultures and the patient was treated with meropenem and amikacin for 14 days.

M. chimaera later grew on cultures from blood and from the bone specimen (L3 vertebral biopsy). Species identification of the mycobacterium was made with molecular genetic test and the strain was found to be susceptible to macrolides and aminoglycosides (GenoType NTM-DR ver. 1.0).

In order to start a targeted therapy, the patient was transferred to our department on December 21st 2016.

On admission, the patient was afebrile but complained of low back pain and movement impairment. Blood count revealed anaemia (Hb 9,8 g/dL) and lymphocytopenia (7.800/mm^3). C-reactive protein, lactate dehydrogenase and creatinine levels were slightly increased.

She was started on a 4-antibiotic empiric regimen of rifampin, ethambutol, azithromycin and amikacin. Corticosteroid therapy was tapered to 5 mg/die. After one month of therapy, however, a Magnetic Resonance Imaging (MRI) highlighted the worsening of the vertebral osteomyelitis on L2-L3. A small paravertebral abscess was also reported (Figure 1).

The patient underwent a neuroradiologic evaluation, after which surgical treatment was decided.

A percutaneous vertebroplasty was therefore performed with vertebral injection of a mixture of rifampin and an injectable synthetic bone graft substitute (Cerament TM - Biotis; the composition includes 40% hydroxyapatite, 60% calcium sulphate, and liquid radiopacity enhancing component containing Iohexol). The procedure was well tolerated.

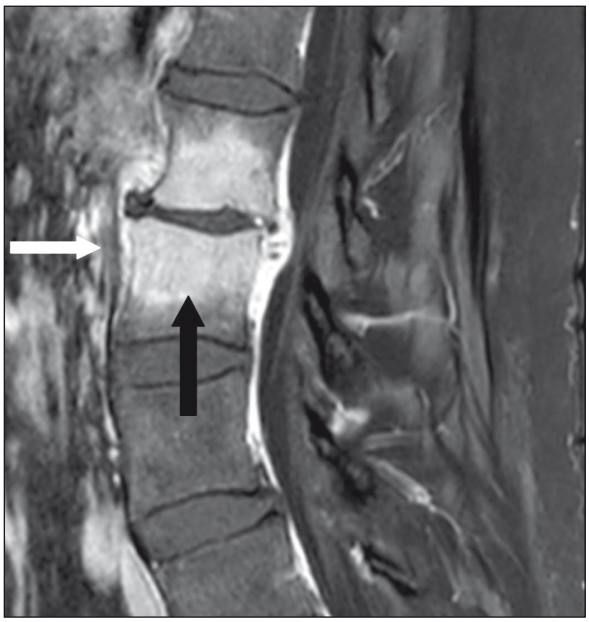

Figure 1 - MRI image of L2-L3 vertebral osteomyelitis (black arrow) with paravertebral abscess (white arrow), performed after one month of therapy.

On February 2017, after receiving a complete antibiogram, linezolid was added to the ongoing therapy. The patient was discharged on March 1st and since then she has been followed by the dedicated service of our outpatient clinic. At the time of this report she is still on therapy, showing significant clinical improvement.

DISCUSSION

Diagnoses of *M. chimaera* in patients with previous cardiac surgery have recently been described in other clinical reports. Outbreaks have been reported in Europe (Germany, Switzerland, UK, Netherlands) and in the United States [2,3]. Subsequent clusters have also been reported elsewhere [4,5].

These infections are presumed to be acquired through airborne transmission of aerosolized bacteria, deriving from the contamination of heater-cooler units' water tanks. These devices used

to regulate the patient's body temperature during cardiosurgical procedures, have already been demonstrated to be colonized by mycobacteria, as described by other authors [4,6,7].
In particular, the heater-cooler unit that was used in our case was produced by Sorin Group Deutschland (Stockert 3T), which is the same unit described in all the other clinical reports [4-6].
To our knowledge, only one case of *M. chimaera* infection in a patient without a history of cardiac surgery has been published [8]. In this particular case the source of infection was unclear, but the patient had a history of prolonged immunosuppressive therapy with prednisone and hydroxychloroquine.
Studies reveal that patients with documented infection by *M. chimaera* presented with different sites of infection. Prosthetic valve endocarditis was the most common presentation (21 cases) accompanied by other signs of disseminated disease including ocular involvement (panuveitis, multifocal chorioretinitis), bone involvement (*e.g.*, osteoarthritis, vertebral osteomyelitis), splenomegaly, pancytopenia, hepatitis, and renal impairment [2,3,5]. One case of surgical site infection is reported. The disease usually presented months to years after the surgical procedure.
Furthermore, in many cases aspecific symptoms led to a misdiagnosis of sarcoidosis (or amyloidosis) as it happened to our patient. Immunosuppressive therapy started before the correct diagnosis played a central role in the pathogenesis and dissemination of this mycobacterium [1,7,8].
For patients with macrolide-susceptible disease, a multidrug regimen similar to that used for pulmonary MAC disease (a macrolide plus ethambutol plus a rifamycin) is generally used. Patients with an extensive, severe, or life-threatening disease have also been treated with a parenteral aminoglycoside, such as amikacin. On the other hand, if the isolate is macrolide-resistant, therapy consists of ethambutol plus a rifamycin plus a parenteral aminoglycoside. The addition of another antimycobacterial agent such as linezolid or clofazimine may also be of some value, although there is limited data to support their use.
The optimal duration of treatment has not yet been established, but the treatment is usually administered for at least six months.
This clinical report underlines the importance of a correct differential diagnosis, since the misinterpretation of these difficult cases as sarcoidosis (or other immuno-mediated diseases) may lead to a worse outcome for these patients. It also highlights the importance of controlling, by molecular analysis, the potentially contaminated medical devices used in cardiac surgery.

Conflict of interest
The authors declare that they have no competing interests.

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