

Mycobacterium thermoresistibile Infection following Knee-Replacement Surgery

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We report a case of *Mycobacterium thermoresistibile* as a cause of infection following total knee replacement. This infection was masked by the prior isolation of a vancomycin-resistant enterococcus. The infection was resolved with long-term therapy using moxifloxacin and doxycycline.

CASE REPORT

A 73-year-old female patient who underwent a bilateral total knee replacement developed pain and swelling in the left knee and fevers 2 months after surgery. She was seen 1 week prior to admission at another facility, where material draining from the incision site was cultured. These cultures grew a vancomycin-resistant *Enterococcus faecium* isolate (VRE). The patient was placed on linezolid and transferred to our hospital for removal of the infected prosthetic joint.

On admission the patient appeared well, with a tender left knee with a decreased range of motion and drainage from the incision site. The patient has a history of diabetes mellitus. Her laboratory values were significant only for a white blood cell count of 11.1/ μ l, a platelet count of 619/ μ l, an erythrocyte sedimentation rate of 90 mm/h, and a C-reactive protein level of 16.3 mg/liter. The patient was taken to the operating room for removal of the prosthetic joint. A washout of the left knee was also performed at this time. Linezolid therapy was withheld prior to surgery but restarted immediately after the procedure was performed. Tissue sections obtained perioperatively were sent for pathological examination and for bacteriological, mycological, and mycobacterial culture. Pathological examination of synovial tissue revealed chronically inflamed granulomatous tissue with fibrinous exudates, tissue necrosis, and acute inflammation. Special stains for acid-fast bacilli were negative. Gram and acid-fast stains prepared from the specimens sent for microbiological culture were negative. Routine bacteriology and mycology cultures were negative. The patient was discharged on a 6-week course of linezolid for a presumed VRE infection. After 3 weeks of incubation at 35°C, the Lowenstein-Jensen agar slant showed scant growth of a chromogenic acid-fast bacillus. This was followed by the detection of growth in the VersaTREK Myco bottle (Trek Diagnostic Systems, Cleveland, OH) a short time later. The resulting growth from the Myco bottle was identified using the Sherlock MIDI high-performance liquid chromatography system (MIDI, Newark, DE) as *Mycobacterium thermoresistibile*.

The identification was confirmed using biochemical tests and the ability of the isolate to grow at 52°C. This isolate was positive for nitrate reduction and negative for both tellurite reduction and iron uptake.

Susceptibility tests were performed utilizing Sensititre microtiter plates (Trek Diagnostic Systems) with Middlebrook 7H9 broth incubated at 42°C. For this method, a 0.5 McFarland standard suspension of the isolate is made and the manufacturer's instructions are followed depending on the panel type utilized, with 7H9 broth used in place of Mueller-Hinton broth. The resulting MICs were as follows: moxifloxacin, ≤ 0.25 μ g/ml; trimethoprim-sulfamethoxazole, ≤ 0.5 μ g/ml; tetracycline, ≤ 2 μ g/ml; clarithromycin, ≤ 1 μ g/ml; and linezolid, ≤ 0.5 μ g/ml.

Moxifloxacin was given in conjunction with linezolid for 6 weeks as some improvement was noted with the initial therapy. Linezolid was subsequently replaced with doxycycline, and therapy was continued for 32 weeks.

The patient was seen to improve on antimicrobial therapy. Seven months after surgery, the patient's erythrocyte sedimentation rate decreased to 12 mm/h, while the C-reactive protein level decreased to 3.5 mg/liter. At this time the patient underwent a debridement of the area, and repeat cultures were taken. All bacterial, mycobacterial, and mycological cultures were negative. No new antimicrobial therapy was administered. The patient has been scheduled to undergo another total knee replacement.

Mycobacterium thermoresistibile is only rarely implicated as a cause of infection. It was first reported as the cause of a respiratory tract infection in 1981 (5). Subsequently it has been reported to cause a second pulmonary infection (3), two cutaneous infections following surgery (4, 6), and a third cutaneous infection due to accidental trauma (1). It has also been found associated with respiratory infections in domestic cats (2).

Although *M. thermoresistibile* is a rapidly growing scotochromogen, isolation from this specimen was somewhat delayed owing to the suboptimal growth temperature. This organism has been isolated previously from primary cultures incubated at 35 to 37°C, but it may not appear initially to be a rapidly growing mycobacterium.

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The prior isolation of a VRE from the draining incision tended to mask the significance of the mycobacterial isolate. Prior to identification, this isolate was postulated to be a contaminant. Performing high-performance liquid chromatography directly from a sample obtained from the positive Myco bottle alerted all involved of the potential significance of this isolate. The identification was subsequently confirmed by incubating subcultures at 52°C and by the performance of biochemical testing. This resulted in the initiation of appropriate long-term antimicrobial therapy and the postponement of a second prosthetic joint insertion. Failure to have rapidly identified this isolate would have had negative consequences for the patient. Wounds and other specimens obtained from skin and skin structures are routinely incubated at 30°C on a medium capable of growing *Mycobacterium haemophilum* as well as other pathogens typically associated with skin and skin structure infections. This is in addition to the standard media and incubation conditions used to culture noncutaneous spec-

imens. Although this isolate of *M. thermoresistibile* did grow, incubation of a primary medium at 42°C would have decreased the time required to detect this pathogen. It may be appropriate to incubate one plate at 42°C when specimens from skin, skin structures, and draining wounds are sent for mycobacterial culture.

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