Legionella micdadei, a New Cause of Prosthetic Joint Infection

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Extrapulmonary infections caused by Legionella spp. other than Legionella pneumophila are rare. We report what is, to our knowledge, the first description of a prosthetic joint infection due to Legionella spp. Systematic testing of samples with suspected prosthetic infection by molecular biology techniques was essential. Legionella micdadei should be added to the list of microorganisms causing prosthetic joint infection.

CASE REPORT

An 83-year-old woman underwent total arthroplasty of the right knee in 1990 due to rheumatoid arthritis (RA). She had a 20-year history of RA and had been receiving low-dose methotrexate (4 mg/day) and deflazacort (6 mg/day) since 1993 with no recent exacerbation of her underlying disease. Consequently, she had never received anti-tumor necrosis factor medication. Although she presented bronchiectasis, she had never been a smoker. Her medical history contained no other significant findings. In January 2007, the old prosthesis was replaced with an Legacy constrained condylar knee (LCCK) prosthesis, as a result of aseptic loosening. One year later, the patient began to experience progressive pain followed by swelling in her right knee. In December 2008, the patient had a respiratory infection with fever and pleuritic chest pain. She was treated with an antibiotic that she could not recall. She was admitted to the hospital in September 2009 with a swollen erythematous right knee and a fistulized fluctuating mass in the patellar bursa.

Two purulent synovial fluid samples obtained by arthrocentesis and a fistula exudate obtained before starting any antimicrobial therapy revealed no microorganisms on a Gram-stained smear (performed by a standard technique using safranin as counterstain), nor did they show growth in conventional culture media (blood, chocolate, and brucella agar) or in enriched brain heart infusion broth (BHI), even though the biochemical characteristics of synovial fluid were suggestive of infection (glucose, 0 mg/dl; protein, 4.3 g/dl; white blood cell [WBC] count not available). However, universal 16S rRNA PCR was positive, and sequence analysis of the amplicon revealed Legionella micdadei in both synovial fluid samples. The second synovial fluid sample was cultured in selective buffered charcoal-yeast extract agar (BCYE) (BMPA; Oxoid, Cambridge, United Kingdom), which was incubated in 5% CO2 at 35°C. After 7 days of incubation, colonies of a Gram-negative bacterium measuring 2 to 3 mm were seen. The bacterium was identified as L. micdadei by universal 16S rRNA PCR followed by sequencing and PCR and sequencing of the mip gene. A sputum culture did not reveal Legionella spp., and a test for Legionella pneumophila serogroup 1 urinary antigen (BinaxNow Legionella; Binax Inc., Scarborough, ME) was negative.

Nine different periprosthetic samples were taken when the prosthesis was removed. Histopathology revealed chronic inflammation. Silver staining was not performed. Mycobacterial cultures were sterile. Universal 16S rRNA PCR and specific mip gene PCR (14) were positive for L. micdadei in 6 of the 7 samples on which it was performed. Alignment of sequences was interpreted in accordance with previously published criteria (5). The sequences obtained had 100% similarity with sequence AF227162.1 of the 16S rRNA gene of L. micdadei and sequence S62141.1 of the mip gene of L. micdadei and L. micdadei grew in 4 of the 9 samples in BCYE. High-dose levofloxacin (500 mg twice a day [b.i.d.]) and rifampin at 600 mg/day were started immediately after surgery for a period of 5 months, after which time the inflammatory symptoms resolved. Culture and PCR of surgical samples taken during arthrodesis (March 2010) did not reveal Legionella.

We were unable to demonstrate the origin of the Legionella infection in this case, and no large air-conditioning units were found near the patient’s residence. However, the patient had received aerosolized water therapy at a spa in 2009. At the onset of symptoms, she had undergone 2 arthrocenteses (both unremarkable) and had received an injection of corticosteroids in her right knee; however, her condition did not improve.

To our knowledge, this is the first report of prosthetic joint infection caused by L. micdadei.

Legionella spp. cause mainly respiratory tract infections, and the vast majority of episodes are caused by L. pneumophila. L. micdadei is one of the most frequent non-L. pneumophila species. Extrarespiratory disease caused by Legionella spp. is distinctly uncommon but has been reported to include Pontiac fever, soft tissue abscesses, cellulitis, endocarditis, and other conditions (10).

Extrapulmonary infections by Legionella spp. have been de-
scribed as primary infections in the absence of concurrent pneumonia. Nevertheless, the true frequency may be underestimated because specimens from nonpulmonary locations are not usually cultured on media enriched for Legionella spp. In such cases, the microorganism could have entered through the lung and spread hematogenously with minimal or no respiratory symptoms. These cases contrast with those of surgical wound infection, in which the microorganism is inoculated directly (3, 7). Legionella has already been reported to be responsible for infection of prosthetic material other than joints (4, 8, 9, 12, 13, 15). Most patients were immunosuppressed, and the portal of entry remained unknown.

After a thorough search of the literature, we were able to identify only 2 cases of septic arthritis (2, 6) and 2 other cases of reactive arthritis attributed to Legionella spp. (1, 11). All 4 cases were caused by L. pneumophila, and 3 had previous or concomitant pneumonia (6). Only 1 patient was immunocompromised. The course was indolent in all 4 cases, with more than 2 weeks of progression and involvement of several small joints. None of them occurred in patients with prosthetic joints.

We present the first report of prosthetic joint infection caused by L. micdadei. The patient was immunosuppressed due to long-term therapy for rheumatoid arthritis but had never received anti-tumor necrosis factor medication.

We were unable to identify the source of Legionella. No other cases of legionellosis were detected during this period to support a possible environmental source. The patient had undergone hydrotherapy, although no temporal association existed between exposure and symptoms. Legionella could have entered the joint during corticosteroid infiltration in March 2009; however, this could not be demonstrated.

L. micdadei should be added to the list of potential causal agents of prosthetic joint infection. Systematic use of universal 16S rRNA PCR and sequencing with culture may help in the diagnosis of infections caused by unusual microorganisms not detected by conventional culture.

Note that the subject of the case report was informed that data concerning the case would be submitted for publication and signed an informed consent document.

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