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Case Report

Left knee prosthesis-related *Mycobacterium goodii* infection

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SUMMARY

Non-tuberculous mycobacteria are increasingly being recognized as important human pathogens. We present the case of a 44-year-old non-diabetic male who underwent left total knee arthroplasty for degenerative arthritis after trauma. He developed left knee swelling and progressively worsening pain over the next 4 weeks. He was referred for treatment using whirlpool baths and developed a blister at the surgical incision site. Repeated aspirations of the left knee failed to show any growth of organism on routine cultures. He finally underwent explantation of the left knee prosthesis with antimicrobial spacer placement 4 months later. Cultures of three different intra-operative specimens turned positive for *Mycobacterium goodii*. This infection was successfully treated with combination oral antimicrobials for 6 months. The patient underwent revision left knee arthroplasty subsequently and was symptom-free until his last follow-up visit 1 year later. This patient highlights the importance of testing for mycobacteria in prosthesis-related infections with previously negative routine bacterial cultures.

1. Introduction

Non-tuberculous mycobacteria, including *Mycobacterium goodii*, are increasingly recognized as important human pathogens. We report a patient with an *M. goodii* prosthesis-related knee infection, the third reported case to our knowledge.

2. Case report

A 44-year-old non-diabetic male underwent left total knee arthroplasty for degenerative arthritis following trauma secondary to a motor vehicle accident. The accident, 19 years ago, had caused a left femoral fracture, which at that time had required open reduction/internal fixation and nail placement. Post-knee surgery, he developed left knee swelling and pain, which progressively worsened over the next 4 weeks. Subsequently he underwent osteopathic/chiropractic maneuvering, providing no relief of symptoms. He was then referred for physical therapy, requiring treatment in whirlpool baths. Soon after exposure to the whirlpool bath (6–8 weeks after surgery), he developed a blister on the anterior aspect of the left knee at the surgical incision site, for which he used Epsom salts with no relief. Repeated aspirations of the left knee failed to show any growth of organism on routine cultures. He continued to have worsening pain and left knee swelling and finally underwent explantation of the left knee prosthesis, with antimicrobial spacer placement 4 months later. Prior to the procedure, the patient had been off antimicrobials for almost 2 weeks.

The patient's past medical history was significant for nicotine dependence, poor dental hygiene, and significant ethanol use. On examination he was a well appearing, afebrile male. The vital signs were within normal limits. Musculoskeletal examination showed left knee swelling with no erythema, drainage of fluid, or tenderness at the surgical incision site. The rest of the examination was within normal limits.

The initial investigations showed an erythrocyte sedimentation rate (ESR) of 88 mm/h and C-reactive protein (CRP) of 1.64 mg/dl. An X-ray of the left knee showed surgical changes of the left knee arthroplasty and patellar resurfacing, asymmetric narrowing of the medial joint space, and left knee joint effusion. Histopathology of the synovium demonstrated fibrous connective tissue with patchy chronic inflammation, but no granulomas.

The patient was empirically started on intravenous vancomycin 1250 mg every 12 h along with ceftriaxone 2 g every 24 h. Intra-operative tissue Gram stain and acid-fast stain were negative. Cultures of three different intra-operative specimens turned positive for acid-fast bacilli (AFB) within 3 days of surgery. DNA sequence testing performed by a reference laboratory (Arup Laboratories, Salt Lake City, Utah, USA) identified the organism as *M. goodii/smegmatis*. Susceptibility testing using broth microdilution technique showed the organism to be susceptible to amikacin, cefoxitin, ciprofloxacin, gatifloxacin, linezolid, minocycline, trimethoprim/sulfamethoxazole (TMP/SMX), and tobramycin, and resistant to clindamycin.

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Empiric antimicrobial treatment was then discontinued. The patient was started on TMP/SMX 160/800 mg one tablet twice daily, minocycline 100 mg one tablet twice daily, ciprofloxacin 500 mg one tablet twice daily. He stopped TMP/SMX 160/800 mg one tablet twice daily on his own after 1 week. He continued with minocycline and ciprofloxacin for 6 months. ESR and CRP normalized with resolving left knee swelling and pain. He underwent revision left total knee arthroplasty 6 months after completing the antimicrobial course. The intra-operative AFB stain and cultures were negative for mycobacteria. He was symptom-free at follow-up after 1 year.

3. Discussion

Mycobacterium smegmatis group was first isolated by Lustgarten in 1885. The first well-described case of human disease caused by the *M. smegmatis* group, involving the lungs and pleura of a patient with underlying exogenous lipoid pneumonia, was reported in 1986. The first series of patients with *M. smegmatis* infection was reported by Wallace[1] in 1988, who characterized 22 clinical isolates that were heterogeneous and fell into three groups. In 1999, the three groups were studied in greater detail,[2] including DNA homologies, and were found to be three distinct species: *M. smegmatis* sensu stricto, *Mycobacterium wolinskyi*, and *M. goodii*. The most accurate differentiation of these species is accomplished through molecular techniques.[3]

M. goodii has been implicated in localized post-traumatic wound infections, surgical site infections, osteomyelitis following open fractures, and pulmonary infections complicating lipoid pneumonia or achalasia.[1,4–6] Other reported cases include olecranon bursitis in a patient with diabetes and multiple myeloma[7], bacteremia and pacemaker lead infection,[8] and post-cataract endophthalmitis.[9] The organism is found in the environment and is able to survive inside free living fresh water amoeba.[10] It is relatively resistant to disinfectants.

Antimicrobial susceptibility data are sparse. The original study by Brown et al.[2] showed all isolates susceptible to amikacin, doxycycline, ciprofloxacin, and sulfamethoxazole, and variably susceptible to cefoxitin and clarithromycin. These organisms are usually susceptible to ethambutol and exhibit good in vitro susceptibility to gatifloxacin and ciprofloxacin.[11] Monotherapy with TMP/SMX or doxycycline has been used, but often associated with treatment failure, resulting in prolongation of course. Most authors recommend 4 months of two-drug therapy for skin/soft tissue infections and therapy of 6 months duration for underlying bone disease, with removal of foreign body. Commonly used antimicrobials include TMP/SMX, doxycycline, and ciprofloxacin. Intravenous amikacin and imipenem have been used for severe cases.[12] The most recent case report of such an infection involving a knee prosthesis was treated with moxifloxacin and doxycycline for 9 months, followed by monotherapy with doxycycline for life of the retained prosthesis.[13] In our patient, the prosthesis was removed, which probably was the most important intervention resulting in an eventually satisfactory outcome.

In conclusion, *M. goodii* is a rapidly growing mycobacterium increasingly recognized as an important human pathogen. It is most commonly implicated in post-trauma and surgical site infections. It is also associated with respiratory infections in patients with lipoid pneumonia. Identification of the organism is best accomplished by molecular techniques. Infection with this organism may not produce granulomas. This patient highlights the importance of testing for mycobacteria in prosthesis-related infections with previously negative routine bacterial cultures.

Conflict of interest: No competing interests declared.

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