**ABSTRACT**

We describe a case of *Nocardia nova* septic arthritis following a total knee replacement. A 55-year-old obese woman was admitted to hospital 5 months after knee surgery with a 3-week history of pain, swelling, and restricted mobility in her left knee but no preceding trauma/injury. 30 ml of cloudy joint fluid was aspirated and an arthroscopic examination showed extensive fibrin formation and synovitis. An arthroscopic washout was carried out using 16 litres of saline, followed by total synovectomy and intensive antibiotic therapy (clarithromycin 500 mg twice daily and co-trimoxazole [sulphamethoxazole 400 mg and trimethoprim 80 mg] once daily and augmentin duo forte 875 mg twice daily). At 2.5 years, the patient had recovered completely with no prosthetic loosening.

**Key words:** arthritis, infectious; arthroplasty, replacement, knee; Nocardia

**INTRODUCTION**

The Nocardia species belong to the actinomycetaceae family, which are saprophytes found in soil. They are environmentally ubiquitous, and have been found in soil, water (fresh and salt), decaying vegetation, animal faecal deposits, and dust. They are gram positive and strictly aerobic and seen as variably acid-fast, filamentous, branching rods (Fig.) They were first described by Nocard in 1888 in a case of bovine lymphadenitis. Approximately half of the nocardial species are recognised human and/or animal pathogens able to cause a wide range of diseases from cutaneous infections through inoculation/trauma to infections of the central nervous system, myocardium, joints, ocular (retina) system, renal system, bones and lungs. They can also infect debilitated or immunocompromised individuals. Few cases of Nocardia joint infections have been reported. One case was reported in the hip prosthesis of a patient with severe systemic lupus erythematosus. We report a case of sepsis in a total knee replacement caused by cutaneous nocardiosis.
CASE REPORT

A 55-year-old obese woman (body mass index, 45.2) presented with bilateral, severe knee osteoarthritis causing pain, restriction in mobility and range of movement, and bilateral 15° valgus deformities. She had a history of well-controlled hypertension and non-symptomatic gout. Her right knee was successfully managed with a cemented total knee replacement in March 2001. Nine months later she underwent arthroplasty to her left knee.

A midline incision and subvastus approach was used. The femoral and tibial surfaces were prepared and an uncemented Natural porous femoral component (Zimmer, Warsaw [IN], US) and an uncemented tibial component were inserted with screws and a cemented patella button. No drains were used. She was given a cocktail of local anaesthetic agents and a pain catheter was left in situ for 24 hours, then removed before discharge.

She made an uneventful recovery and at the 5-week follow-up had a well-healed surgical scar with no signs of infection, was mobilising fully weight bearing, independently and unaided with a range of movement of 3° to 110° (which improved to 0°–125° 6 weeks later). The knee was stable with good patellar tracking. The postoperative radiographs were satisfactory, showing the prosthesis well seated.

Five months after the left knee surgery, she was admitted to hospital with a 3-week history of pain, swelling and restricted mobility in her left knee, but no preceding trauma or injury. She had a temperature of 38°C, and the knee was swollen and reddened by a local effusion and in fixed flexion of 15° with a maximum flexion of 40°. Her white cell count (WCC) was 12.3x10⁹/l, C-reactive protein (CRP) was 95 mg/l, and the erythrocyte sedimentation rate (ESR) was 92 mm/hr. Plain radiographs showed no evidence of loosening. Needle aspiration of the left knee under sterile conditions yielded 30 ml of cloudy joint fluid, which was sent for microbiological analysis. A diagnosis of septic arthritis was made and the knee was aspirated again. An arthroscopic examination through standard anteromedial and anterolateral portals showed extensive fibrin formation and synovitis. An arthroscopic washout using 16 litres of saline was carried out, followed by a total synovectomy.

A staphylococcal infection was suspected and the patient was given high dose intravenous vancomycin until the results of the aspirate culture became available. She continued to receive oral rifampicin 300 mg twice daily and sodium fucidate 250 mg 3 times daily.

The aspirate revealed pus cells, but no organisms were seen on microscopy. A mycobacterium-like organism grew on broth cultures. Direct cultures grew an organism branching on gram and acid fast bacilli staining at 24 and 48 hours, with white central aerial hyphae. *Nocardia nova* was eventually isolated.

Ten days after the knee washout, while sensitivities were still pending, the patient was commenced on clarithromycin 500 mg twice daily and co-trimoxazole (sulphamethoxazole 400 mg and trimethoprim 80 mg) once daily. The knee swelling reduced and the range of movement increased so the patient was discharged after 10 days. On discharge her WCC was 11.95 x10⁹/l, CRP 45.3 mg/l, and ESR 108 mm/hr. She was closely monitored post-discharge by both the operating surgeon and microbiologist.

Ten weeks after the knee washout, she developed a discharging sinus over her lower medial left thigh. The sinus communicated with the knee joint and swabs failed to yield any organisms. Her CRP at this time was 11.6 mg/l and ESR 89 mm/hr. She was continued on clarithromycin 500 mg twice daily and co-trimoxazole one tablet daily with the addition of augmentin duo forte 875 mg twice daily.

The sinus gradually subsided over 6 months. 12 months after the knee washout, she had fully recovered with her inflammatory markers down to normal levels. The antimicrobials were gradually reduced but not discontinued. The regimen consisted of clarithromycin 500 mg once daily, co-trimoxazole (sulphamethoxazole 400 mg and trimethoprim 80 mg) once daily. She was mobilising,

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**Figure** Photomicrograph showing filamentous, branching rods of *Nocardia nova* (Courtesy of Research Center for Pathogenic Fungi and Microbial Toxicoses, Chiba University, Japan).
pain free, with a good range of movement of 0° to 110°. Two years later, radiographs of the knee showed no evidence of prosthetic loosening. Two years after the episode of septic arthritis, this patient presented for a right total hip replacement. An indented scar was present over the site of the sinus. She was still on antibiotics and showed no signs of infection. The total hip replacement was uneventful and she was doing well 12 months later.

**DISCUSSION**

Nocardiosis is an uncommon bacterial infection; its diagnosis is often delayed or missed due to its non-specific clinical manifestations. Cutaneous manifestations of nocardial infections may be difficult to distinguish from staphylococcal or streptococcal infections. Nocardial species may be difficult to identify because of delay in growth on culture following isolation from tissue samples. The culture may be discarded before visualisation of the nocardial species.²⁹

Cutaneous nocardiosis has been reported with cellulitis, abscess or pustule formation, nodular lymphangitis and mycetoma in the form of a granulomatous mass with a discharging sinus.¹⁰,¹¹

Some of these patients were immunocompromised; the use of corticosteroids is a predisposing factor. The incidence of prosthetic infection following joint replacement surgery is between 0.3 and 2.2%.¹²,¹³

Infection imposes a major clinical and financial burden in both its diagnosis and treatment. Its diagnosis relies on the clinical history and examination, serological and microbiological analysis, and radiographic imaging. Early identification of symptoms such as atypical swelling, inflammation/redness, increased pain, restriction of joint mobility and increased temperature are important when making the diagnosis. Radiological features of chronic infection include osteopaenia, periprosthetic loosening, periostitis and endosteal reaction. Radionuclide bone scans are not specific and unreliable during the early period of infection. Cultures of aspirated joint fluid and an arthroscopic biopsy provided the diagnostic key. The rise in inflammatory blood marker levels such as WCC and CRP were also important, as was early involvement of the microbiologist. *Staphylococcus aureus* and *Streptococcus* are the most common pathogens in prosthetic infections; inappropriate antibiotics may have been used had that assumption been made. A positive culture for Nocardia may take time as growth is slow, and the colonies have to be differentiated from other gram-positive bacteria. Both the aspirate and tissue samples produced branching filaments of *Nocardia nova*, allowing the appropriate antibiotic regimen to be started immediately.

The successful outcome in this case was attributed to aggressive initial treatment, isolation of the causal organism, and prompt commencement of appropriate antibiotics. This enabled retention of the total knee prosthesis. We emphasise the difficulty of identifying the causal agent and the need for vigorous early treatment and close liaison with the microbiologist.

**REFERENCES**