Prosthetic knee septic arthritis due to *Pseudomonas stutzeri*

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Prosthetic joint infection is usually caused by *Staphylococcus aureus*, coagulase-negative staphylococci and, less commonly, by Gram-negative bacilli and anaerobes. A case of prosthetic joint infection due to *Pseudomonas stutzeri* in a 73-year-old female with acute promyelocytic leukemia is presented, and the pertinent literature is reviewed. Although the patient had prolonged neutropenia, the infection was successfully treated with antibiotics and without artificial joint replacement.

Key Words: Arthritis; *Pseudomonas stutzeri*; Sepsis

Arthrite septique à *Pseudomonas stutzeri* au niveau d'une prothèse de genou

L'infection d'une prothèse articulaire est habituellement causée par le staphylocoque doré, le staphylocoque à coagulase négative et, moins fréquemment, par des bacilles Gram négatif et des anaérobies. Un cas d'infection de prothèse articulaire à *Pseudomonas stutzeri*, chez une femme de 73 ans, atteinte de leucémie promyélocytaire aiguë est présenté ici et on passe en revue la littérature qui s'y rattache. Bien que la patiente ait présenté une neutropénie prolongée, l'infection a pu être traitée avec succès au moyen d'antibiotiques et sans que l'on ait à remplacer la prothèse articulaire.

Pseudomonas stutzeri is a Gram-negative, nonfermenting rod. It is a saprophyte found in soil and water, and is rarely involved in human infections such as bacteremia, community-acquired pneumonia, osteomyelitis, endocarditis, meningitis, otitis media, septic arthritis or wound and eye infections (1-4). This organism has been isolated from the hospital environment (5-7). We report a case of septic arthritis of a prosthetic knee in a 73-year-old woman. To our knowledge, this is only the third reported case of septic arthritis and the first of a prosthetic joint infection due to this organism (3,4).

CASE REPORT

A 73-year-old woman with a recent history of acute promyelocytic leukemia, which had been treated orally with *all-trans* retinoic acid 15mg/m², was admitted to the Department of Internal Medicine at Rabin Medical Center

due to fever and pancytopenia. Medical history revealed cholecystectomy for cholelithiasis and pancreatitis, and a total right knee replacement for severe osteoarthritis several years previous.

On admission, the patient was moderately ill, with pallor and widespread ecchymoses covering her entire body. Temperature was 38.6°C; blood pressure was 170/85 mmHg; pulse 110 beats/min and respiration rate 28 breaths/min. The rest of the physical examination was normal. Laboratory tests revealed the following values: hemoglobin 92 g/L, hematocrit 26%, white blood cell count 1200×10⁹/L (40% neutrophils); platelet count 34×10⁹/L, prothrombin time (international normalized ratio) 1.20; serum glucose 9.8 mmol/L; and lactate dehydrogenase level 12.8 µkat/L. Serum creatinine, blood urea-nitrogen, electrolytes, calcium, phosphorous and liver enzyme levels, and urinalysis tests were within normal limits. A chest x-ray appeared normal.

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Intravenous ceftazidime (2 g tid) was started. After two days, two admission blood cultures yielded a Gram-negative, nonfermentative rod, which was later identified as *P stutzeri*, sensitive to ampicillin, ampicillin/clavulanic acid, fluoroquinolones, piperacillin, imipenem, aminoglycosides, aztreonam and third-generation cephalosporins including ceftazidime.

Three days after therapy with ceftazidime began, the patient was afebrile but still neutropenic (400 neutrophils/mm³). Blood cultures taken two and four days later were sterile. Ceftazidime was switched to oral ciprofloxacin 500 mg bid. However, on hospital day 12, the patient developed fever (39.5°C), chills and right knee pain. Erythema, swelling and tenderness with fluctuation of the affected knee were noticed. Arthrocentesis of the prosthetic knee was performed by an orthopedic surgeon, and 20 mL of muddy synovial fluid were drained. Laboratory tests of the synovial fluid revealed the following: white blood cell count $48,900 \times 10^9/L$ (granulocytes 48%); glucose level 5.7 mmol/L, protein level 35 g/L and lactate dehydrogenase level 43.2 $\mu\text{kat/L}$. A Gram stain of the synovial fluid showed Gram-negative rods and positive culture for *P stutzeri*. Antibiotic susceptibility of the synovial fluid isolate was the same as for the blood isolate.

Intravenous ceftazidime was administered for an additional two weeks. The patient's condition significantly improved. She became afebrile, signs of knee arthritis disappeared and her neutrophil count was within normal limits. The patient was discharged on oral ciprofloxacin 500 mg bid for an additional six weeks. At one and six months follow-up, a bone marrow biopsy showed signs of remission. There were no signs of arthritis; the patient felt well and had a well functioning joint.

DISCUSSION

A wide spectrum of microbial agents is capable of causing prosthetic joint infection. Staphylococci (coagulase-negative staphylococci and *Staphylococcus aureus*) are the most common causative agents of prosthetic joint infection, accounting for 53% of cases. Aerobic streptococci and Gram-negative bacilli are each responsible for approximately 20% of cases, with anaerobes causing 5% to 10% of these infections. Less common causative agents are environmental organisms ordinarily considered to be 'contaminants' of cultures such as *Corynebacterium* species, *Propionibacterium* species and *Bacillus* species. Rarely have cases of prosthetic septic arthritis due to fungi and mycobacteria been described (8). Twenty per cent to 40% of prosthetic joint infections occur secondary to hematogenous spread. Potentially, any microorganism can induce infection of a prosthetic joint by this route.

To our knowledge, the present case is the third reported case of septic arthritis and the first case of prosthetic joint infection due to *P stutzeri*. In our case, *P stutzeri* was undoubtedly the etiological agent because it was the sole isolated organism from two blood cultures and synovial fluid. The infection process of the prosthetic knee was secondary to

hematogenous spread of the microorganism. Despite the patient being on appropriate antibiotic therapy for 12 days and having recovered from her initial bacteremia, she developed microbiologically proven prosthetic septic arthritis, probably contributed to by persistent granulocytopenia.

In the two previously reported cases of *P stutzeri* arthritis, it is logical to assume that the microorganism was introduced into the joint during an invasive procedure (3,4).

In the first reported case (3), a patient with psoriasis and pulmonary emphysema had *Escherichia coli* isolated from synovial fluid after three months of intra-articular injections of corticosteroids to the knee. *P stutzeri* was cultured only from the second aspiration. The patient underwent arthroscopy and synovectomy. His postoperative antibiotic therapy was intravenous carbenicillin for two weeks (3). In the second reported case, a patient with diabetes mellitus who had abused alcohol had *P stutzeri* recovered only from the synovial membrane of the hip at a second exploratory operation. Cultures from the first surgical intervention were negative (4). In addition to intra-articular gentamicin, this patient was treated with intravenous ceftazidime 2 g tid for two weeks and subsequently underwent a total hip replacement (4). The outcome was favourable in the two cases (3-4).

Successful treatment of prosthetic joint infection depends on extensive surgical débridement, usually a two-stage surgical procedure, and effective antimicrobial therapy. Removal of the prosthesis and cement is followed by a six-week course of bactericidal antibiotic therapy chosen on the basis of in vitro susceptibility tests, and reimplantation is performed at the conclusion of the antibiotic therapy (8). Although the removal of the prosthesis is usually necessary to eradicate the infectious process associated with a foreign body, this therapeutic approach is not always feasible. Indeed, our patient was successfully treated with a conservative approach. The decision for this approach was based on the relative contraindication of surgery due to her medical condition, the high in vitro sensitivity of the pathogen to an oral, well absorbed antibiotic and the patient's rapid response to antibiotic treatment alone, without signs of the prosthesis loosening.

P stutzeri is usually susceptible in vitro to third-generation cephalosporins, aminoglycosides, antipseudomonal penicillins, fluoroquinolones, monobactams, carbapenems and trimethoprim/sulphamethoxazole, and is occasionally sensitive to ampicillin (2). The most common reported infection of *P stutzeri* is primary bacteremia. Goetz et al (9) reported six hemodialysis patients with bacteremia. All patients in this series recovered, including four who did not receive specific antibiotic therapy. The remaining two patients were treated with gentamicin in combination with carbenicillin or cephapirin (9). The second common reported infection due to this microorganism is pneumonia. At present, five cases of community-acquired pneumonia caused by *P stutzeri* have been reported, with only one case associated with emphysema (10). In these series, pneumonia occurred in patients older than 40 years, and in those with coexisting diseases such as chronic pulmonary or liver disease, renal failure, hemo-

peritoneal dialysis, or alcoholism. Four patients had a satisfactory outcome, but one patient with alcoholism, malnutrition and chronic liver disease died (10). Three cases of osteomyelitis have been described in the literature. One case involved the calcaneus (11) and the other two the tibia (1,12), occurring either after trauma or as a postoperative infection. Soft tissue infection due to *P stutzeri* was reported in five cases. Less commonly reported infections are otitis media (1), prosthetic valve endocarditis (15), synthetic vas-

cular graft infection (16), meningitis (17) and endophthalmitis (18). All of these cases were treated with third-generation cephalosporins, ampicillin, aminoglycosides or antipseudomonal penicillins. The outcome was favourable in all of the reported cases (1,11-18).

Although *P stutzeri* is a rare cause of septic arthritis, it should be added to the list of pathogenic microorganisms that can cause this infection, mainly in patients with significant underlying conditions.

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