



Short Research Communication

Pseudomonas oryzihabitans Infected Total Hip Arthroplasty

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Abstract

Pseudomonas oryzihabitans is a saprophytic gram-negative microorganism usually found in damp environments, only occasionally responsible for human pathology. Infection mainly occurs in malnourished, immunocompromised individuals with indwelling catheters. There is no previous published record of infection after joint arthroplasty. To enhance the literature, in this article we report a patient with a *Pseudomonas oryzihabitans* infected total hip arthroplasty, and discuss the diagnosis and management of this unusual infection.

Key words: Total hip arthroplasty; Periprosthetic joint infection; *Pseudomonas oryzihabitans*.

Introduction

Pseudomonas oryzihabitans is a gram-negative, non-fermenting, oxidase-negative, rod-shaped bacterium. It typically produces transparent or yellow-stained, rough, wrinkled colonies after 48 hours' incubation in agar media [1, 2]. It is commonly isolated in moist environment such as soil and rice paddles [3]. In the hospital setting, it has been recovered from sink drains and respiratory equipment [4]. *Pseudomonas oryzihabitans* is only a rare cause of human infection. It has been reported to cause sepsis in children, bacteremia in critically ill or immunocompromised patients, peritonitis in patients undergoing ambulatory peritoneal dialysis, endophthalmitis, as well as central-venous-catheter-related infections, with the latter being the most frequently reported [5-9]. The literature on this infection is scarce, represented mainly by infrequent case reports. To our knowledge, there is no documented case of periprosthetic joint infection (PJI) associated with *Pseudomonas oryzihabitans* in related literature. Therefore, to enhance the literature and

increase the awareness of the treating physicians on this bacterial isolate infection, we report a patient with a *Pseudomonas oryzihabitans* infected total hip arthroplasty (THA) and discuss the diagnosis and management of this unusual infection.

Case report

A 72-year-old man presented with left hip pain and intermittent low grade fever, as well as occasional yellowish drainage from a sinus tract at the surgical incision of a cementless THA performed 4 years before at another hospital. Patient's past medical history was also significant for a 2-vessel coronary artery bypass graft (CABG), performed one year prior to the current presentation. Prior use of steroids, a previous state of immunosuppression, or recent travel was not reported. The patient reported multiple prior hospital admissions due to drainage, allegedly attributed to a superficial infection and suppressed multiple times with multiple courses of per os and/or intravenous antibiotics including vancomycin,

clindamycin, ciprofloxacin and cotrimoxazole, only to recur a few months after each episode and antibiotics regimen. Anteroposterior (AP) pelvis, AP and lateral hip radiographs as well as laboratory findings were consistent with PJI, as well as heterotopic ossification adjacent to the left hip joint (Fig. 1). Preoperative cultures collected with wound swabs showed *Staphylococcus hominis* and *Staphylococcus capitis* isolates of debatable clinical significance; cultures of synovial fluid aspiration were negative. With the assumptive diagnosis of PJI and septic loosening of the implants a joint decision was obtained for a staged THA revision.



Figure 1: Preoperative anteroposterior radiograph of the left hip shows the infected THA and the adjacent heterotopic ossification.

The patient was scheduled for the first stage THA revision 4 weeks after cessation of any antibiotics. Through a posterior hip approach, the femoral component was removed via a Paprosky-style extended proximal femoral osteotomy [10]. Next, the acetabular cup and supporting screw were removed (Fig. 2). Eight tissue samples were obtained from the bone, joint capsule and femoral canal for cultures, and the implants were sent for sonication. We routinely use sonication to identify bacteria in the biofilm on explanted implants, as this method has been found to be significantly more

sensitive than tissue biopsy, while maintaining almost identical specificity [11, 12]. A custom-made polymethyl-methacrylate (PMMA) hip spacer was fashioned and placed in the femoral lumen. We used gentamicin-loaded Palacos R+G® bone cement (Zimmer, Inc. Warsaw, IN). When using an antibiotic loaded bone cement, we routinely admixture a second antibiotic (preferably vancomycin or other based on preoperative cultures and antibiogram, if available) to increase the local concentration of antibiotics and to obtain a synergistic effect, as adding a second antibiotic seems to increase the elution of both antibiotics [13, 14]. The osteotomy was repaired with cerclage wires (Fig. 3). The sinus tract was resected. The patient was given 600mg of teicoplanin iv intraoperatively and was subsequently started on a standing daily dose of the same regimen.

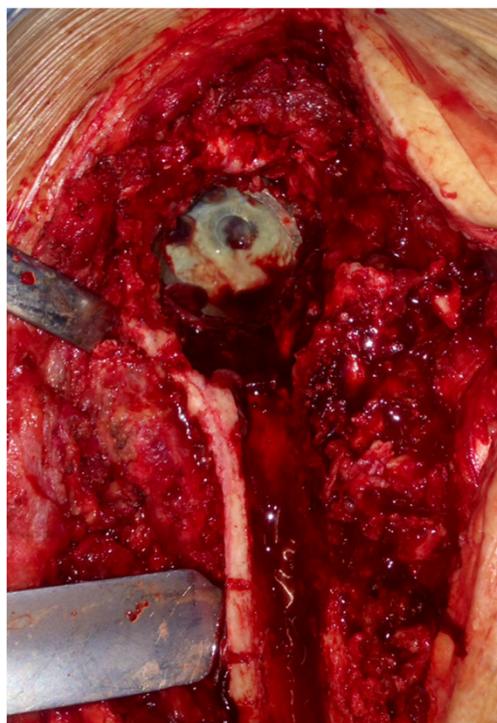


Figure 2: Intraoperative photograph shows the infected acetabular cup. The femoral stem has been removed via Paprosky osteotomy.

Postoperative recovery was uneventful and the patient was afebrile without any wound healing problems. Partial weight bearing with a walker was started on postoperative day two, and progressed as tolerated. Intraoperative tissue cultures were negative. Sonication of the implant at 15 days showed *Pseudomonas oryzihabitans* bacterial isolate (Fig. 4). Based on antibiotic susceptibilities, intravenous teicoplanin 600 mg and piperacillin/tazobactam 4.5 g qid was administered for 3 weeks, followed by ciprofloxacin 750 mg bid and clindamycin 600 mg qid

for another four weeks, aiming for a second stage revision surgery. However, because of cardiovascular comorbidities, the patient was informed for the high risk associated with a second operation and did not consent for further surgery.

At the last follow-up, 24 months after the first stage THA revision, the patient is well, without any clinical, laboratory or imaging evidence of infection; his wound healed completely, he could ambulate with crutches for short distances with mild pain, and inflammatory markers had reduced to normal values. Radiographs of the left hip joint showed a stable PMMA spacer, without any evidence of osteolysis or loosening, and with extensive periarticular heterotopic bone formation that obviously provided for the stability of the joint (Fig. 5). The patient denied further surgery and remains at close follow-up for the risk of recurrent *Pseudomonas oryzihabitans* infection.

Discussion

The genus *Pseudomonas* was originally described in 1894 [15, 16]. The species *oryzihabitans* was first identified by Dresel and Stickl in 1928 in urine and gastrointestinal specimens [17, 18]. At first, as the organism closely resembled the bacteria that caused enteric fever, it was given the name *Chromobacterium typhiflavuum* [17]. The name change to *Pseudomonas oryzihabitans* occurred in 1985, after Kodama et al. [3] isolated the microorganism from rice fields in Japan, and were able to demonstrate phenotypic similarities to other *Pseudomonas* species. However, in 1987, Holmes et al. [19] proposed yet another name, *Flavimonas oryzihabitans*, as these bacteria are oxidase negative and show little DNA homology to other *Pseudomonas* strains.



Figure 3: Postoperative anteroposterior radiograph after first stage revision shows the custom PMMA spacer that was fashioned and placed in the femoral lumen and the Paprosky osteotomy repair with cerclage wires.

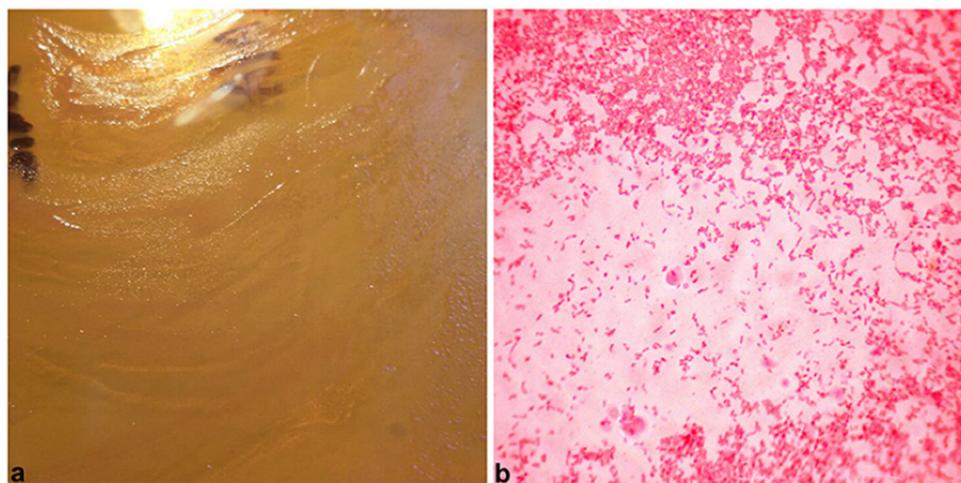


Figure 4: Transparent, rough, wrinkled colonies, cultured from material obtained with sonication of the removed prosthesis (a); Gram stain (400x) reveals small, rod-shaped, gram-negative bacteria (b).



Figure 5: Anteroposterior radiograph of the left hip at the last follow-up shows a stable PMMA spacer, without any evidence of osteolysis or loosening, and with extensive periarticular heterotopic bone formation.

Little is known regarding the pathogenesis of *Pseudomonas oryzihabitans* and the circumstances under which it becomes virulent. Patients are generally likely to have an underlying disease, have already been hospitalized for a long time, have a compromised immune system, and have implanted prosthetic material such as indwelling central catheters, ambulatory peritoneal dialysis catheters and port-a-caths, or have consistent contact with contaminated respiratory equipment [20-22]. Administration of steroids, AIDS and hematological malignancies are also known predisposing factors [20]. Among the clinical manifestations of the disease, a literature search can yield cases of bacteremia in malnourished children, sepsis in premature neonates, biliary tract infections, meningitis, pneumonia, indwelling catheter-related infections, peritonitis, endophthalmitis, subdural empyema, sinusitis, soft-tissue and urinary tract infections [5-8, 21, 23]. To the best of our knowledge, there is no previous report of a *Pseudomonas oryzihabitans* PJI.

Pseudomonas oryzihabitans is rarely resistant to antibiotic therapy and thus fairly easy to eradicate.

These bacteria are usually susceptible to fluoroquinolones, aminoglycosides and carbapenems, whereas occasional resistance has been reported to ampicillin, amoxicillin-clavulanic acid and cefazolin [7, 21]. Even though antibiotics should clear up the infection most of the time, they do not as often obviate the need for prosthetic material removal, usually deemed necessary for complete eradication [6]. In the patient presented herein, implant removal was done, followed by a short (approximately 7 weeks) of antibiotics aiming for the second stage revision surgery. At the last follow-up, the patient was feeling well, with mild pain and no evidence of recurrent infection. He had a stable joint, which we attribute to the periarticular heterotopic bone formation, and therefore, he denied further surgical treatment. In the present patient, although antibiotics were administered for a short time, we believe that implant removal was beneficial for eradication of his infection. In our practice, as in the present patient, we are always in favor of complete implant removal for PJIs.

Competing Interests

The authors have declared that no competing interest exists.

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