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Case Report

Lactobacillus Rhamnosus Infection of a Metal on Metal Hip Arthroplasty

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Abstract

Lactobacillus rhamnosus is a Gram positive rod, which forms part of the normal bacterial flora in humans. It has low pathogenicity and is widely used in the food industry. We present a patient who had a primary metal on metal hip replacement, which subsequently became infected with the organism. He was successfully treated with daptomycin and rifampicin combination therapy. Due to its low pathogenicity, *Lactobacillus rhamnosus* infections have been previously reported in only vulnerable patients. Our patient had good health and we discuss the factors that may have led to him developing the infection. Prosthetic joint infection with this organism has not been previously reported in the literature. This is the first report of successful treatment with daptomycin in combination with rifampicin.

Keywords: *Lactobacillus rhamnosus*; Prosthetic joint infection; C-reactive protein; Co-Cr hip implants

Case Report

A 71-year-old male underwent a left Birmingham (Smith and Nephew) modular metal on metal total hip arthroplasty with an uneventful post-operative recovery and a fully healed wound. Eight months post operatively, he presented to his referring hospital with a two week history of pain, swelling and a discharging wound over his hip. He remained systemically well and therefore no antibiotics were administered prior to the first washout and debridement of his hip. From that operation, all five deep fluid and tissue samples grew a mixture of metronidazole sensitive anaerobic streptococci and penicillin sensitive coagulase negative staphylococci. A diagnosis of Prosthetic Joint Infection (PJI) was made. The patient received a course of intravenous benzylpenicillin and metronidazole for four weeks followed by oral amoxicillin and metronidazole for four weeks. There was substantial improvement in the patient's symptoms.

Three months after the first washout, the patient presented again with a discharging wound and he was referred to our institution. The wound, following his initial debridement, had never healed and had formed a sinus with a purulent discharge. Blood tests revealed a normal white cell count but an elevated C-reactive protein of 102mg/L. His serum cobalt and chromium ion concentrations were 112nmol/L and 102nmol/L respectively (accepted threshold 120nmol/L and 135nmol/L) [1]. A computerised tomographic scan showed gas within the hip joint but no evidence of loosening of the prosthetic implants and a magnetic resonance scan of the left hip confirmed the appearance of infection with no mass lesion evident. He underwent the first stage of a two-stage revision hip arthroplasty. All the metalwork was completely removed; the surrounding soft tissue debrided with excision of the sinus tract and a gentamicin containing cement spacer was inserted. Five deep tissue samples were sent for microbiological testing and to histology.

Extended cultures of four of the five tissue samples, using rRNA sequencing, identified a Gram positive rod, *Lactobacillus rhamnosus.* The organism was resistant to penicillin and vancomycin but sensitive to rifampicin and daptomycin. Creatine kinase levels, liver function tests and C-reactive protein were monitored weekly and the patient was discharged with outpatient antibiotic therapy.

The patient did not have a history of consuming probiotic drinks and his dietary history was unremarkable. He had had no recent gastro-intestinal disturbances or procedures on the gastro-intestinal tract and there was no prior history of broad-spectrum antibiotic use. No specific investigations were undertaken to look for the source of the bacterium. His past medical history included hypertension and hypercholesterolemia but he was not systemically immunocompromised or diabetic and had no clear risk factors for infection from this organism.

The patient received intravenous daptomycin and oral rifampicin for 6 weeks during which there was significant improvement in his clinical condition and inflammatory markers. Six weeks after stopping antibiotic treatment, he developed a new infection and had a repeat washout and debridement of his hip. Three of five deep tissue samples from this operation grew a Vancomycin Resistant *Enterococcus* (VRE) faecium but no further *Lactobacillus* was isolated. He was re-started on daptomycin but died four months later due to VRE septicaemia.

Discussion

Lactobacilli are Gram positive rods which form part of the normal flora of the human gastrointestinal and female genito-urinary tract. Some species of the bacterium are used in the food industry for the production of yoghurt, cheese, beer, wine and chocolate. They are often termed 'friendly bacteria' due to their connection with commercial probiotic drinks. The bacterium is of low pathogenicity and rarely isolated from clinical specimens. There have been a few isolated case reports of infection with this organism, usually in patients who are immune-compromised, have chronic disease or are severely debilitated [2]. The infections include bacteraemia, endocarditis, abscesses, meningitis and empyema [3-6]. Kunz et al.

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hypothesize that the in presence of bowel pathology, such as short gut syndrome, bacteria may translocate into the blood stream [7]. Our patient was not systemically immunocompromised, had no obvious risk factors for infection nor a history of consumption of any probiotic drinks. However, his preceding hip surgery and Cobalt and Chromium (Co-Cr) hip implants may have contributed to a localised state of immunocompromise and therefore allowed opportunistic infection. As his initial and subsequent infections were caused by 'enteric bacteria', his infection was likely to have been endogenous.

Metallic prosthetic joints may alter the local immune response. Metal Co-Cr ions used in metallic prosthetic joints may modulate local and systemic immunocompetant cells by various immunostimulatory and immunosuppressive mechanisms via the blood and lymphatic system [8]. Serum concentrations of cobalt and chromium above 85nmol/L have been shown to cause a local reduction of CD8+ and T-cell lymphocytes [9]. Zimmerli et al. concluded that the presence of a foreign body can hamper leukocyte bactericidal activity, oxidative metabolism and granular enzyme content [10]. Shanbhag et al. reported that Co-Cr particles inhibit the free-radical oxidation used by neutrophils to kill bacteria [11]. Additionally, metal ions and wear debris particles can induce a delayed type IV hypersensitivity response [12].

There is no data in the literature directly linking metal on metal implants to a higher infection rate. Anecdotally, the soft tissue destruction and necrosis in failed metal on metal hips can appear similar to infected tissue but in the majority of cases the tissue culture is negative. Further research is required to evaluate the relationship; however, we postulate that in this patient, a localized 'immunosuppressive state', caused by the Co-Cr debris, contributed to the opportunistic infection with this endogenous organism.

Daptomycin has been used successfully in the treatment of PJIs and is often reserved for resistant gram-positive bacteria including, Methicillin Resistant *Staphylococcus Aureus* (MRSA), and Vancomycin Resistant *Enterococcus* (VRE) [13]. This is the first reported case of successful treatment of a *Lactobacillus* PJI with daptomycin and rifampicin.

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