



Case Report

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Three Concurrent Prosthetic Joint Infections: A Case Report and Literature Review

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Abstract

Prosthetic joint infections are a major cause of morbidity and mortality in total joint arthroplasty. Two stage arthroplasty, with the use of an antibiotic cement spacer, is an effective way to manage prosthetic joint infections. There is a lack of data on the management and prognosis associated with multiple concurrent total joint infections. We present a case of a patient with successfully treated for three concurrent joint infections of his bilateral knees and unilateral hip.

Keywords: Concurrent prosthetic joint infection; Prosthetic joint infection; Total hip arthroplasty; Total knee arthroplasty; Two stage arthroplasty

Introduction

Prosthetic Joint Infection (PJI) is a rare but serious complication associated with both primary and revision Total Joint Arthroplasty (TJA). The prevalence of PJI in primary hip and knee procedures is estimated to be between 0.5% and 3% [1]. While infection rates in primary arthroplasty cases remains low, PJI is third most common indication for prosthesis failure and revision surgery [2]. As the number of primary hip and knee arthroplasties continues to rise, the number of prosthetic infections can also be expected to increase [3].

The current standard of care in the management of PJI is two-stage arthroplasty, which involves prosthetic resection, introduction of an Antibiotic Cement Spacer (ACS), followed by eventual re-implantation of a prosthesis [1-5]. Multiple studies have demonstrated systemic complications of two-stage arthroplasty for primary PJIs, including elevation in hepatic enzymes, allergic reactions, and Acute Kidney Injury (AKI) which has been shown to occur in up to 17% [5]. Yet, there is an overall paucity of data available on the risk factors and complications of multiple concurrent PJIs. We present a case of a patient with

three concurrent PJIs treated with ACS and ultimate successful eradication of infection. The patient did develop a post-operative AKI, which resolved by final follow up. To our knowledge, this is the first case report describing the presentation, post-operative course, and relevant literature in a patient treated with ACS for multiple concurrent hardware infections.

Case

A 71-year-old male with a history of hyperlipidemia, sick sinus syndrome status post pacemaker placement, recent history of bacteremia, and remote history bilateral TKA's and right hip arthroplasty presented to the Emergency Department (ED) with left knee pain and inability to ambulate for two days. Approximately 6 weeks prior to presentation, the patient was admitted for Methicillin-Resistant *Staphylococcus aureus* (MRSA) endocarditis and underwent removal of his pacemaker. The patient was placed on a 6-week course of ceftaroline and discharged to an acute rehab facility.

On presentation to the ED, his exam revealed an erythematous, swollen left knee with pain elicited on passive range of motion. Inflammatory markers were significant for a white blood cell count of 7.0 K/mcL and an erythrocyte sedimentation rate of 77 mm/hr. A C-reactive protein level was 24.58 mg/L. Arthrocentesis of the left knee revealed gram positive cocci and a synovial white cell count of 83,000 cells/mL. Preliminary cultures of the synovial fluid grew

Staphylococcus aureus and blood cultures were ultimately positive for MRSA. He was started on weight-adjusted Intravenous (IV) vancomycin as well as oral rifampin. Vancomycin was dosed at 1 g every 12 hours.

On day two of admission, the patient was taken to the Operating Room (OR) for debridement and explantation of his left knee prosthesis, and placement of a static antibiotic spacer using 120 g of bone cement (3 bags - DePuy MV bone cement) hand mixed with 9 g of vancomycin and 10.8 g of tobramycin. Serum Creatinine (Cr) was 1.0 mg/dL and Blood Urea Nitrogen (BUN) was 19 mg/dL on the day of surgery. Intraoperative aspiration of his contralateral knee and right hip with fluoroscopy were positive for MRSA. The patient was subsequently taken back to the OR for explantation and placement of an antibiotic spacer in his right knee on Post-Operative Day (POD) 2 and his right hip on POD 6. Identical formulations were used for each ACS preparation.

Throughout the post-operative course, the patient remained afebrile with a normal WBC. The post-operative course was complicated by elevated Cr of 1.46 mg/dL and BUN of 24 mg/dL on POD 8. Vancomycin trough level at that time was found to be elevated at 29.4 mcg/mL (normal 10-20 mcg/mL) and the next dose was held. Repeat vancomycin trough approximately 24 hours later was 22.9 mcg/mL. Vancomycin was discontinued and the patient was started on IV daptomycin.

Despite discontinuation of vancomycin and adequate fluid resuscitation, Cr levels continued to rise. Cr levels peaked on POD 13 at 3.69 mg/dL. On POD 9, a random tobramycin level was drawn to determine if antibiotic elution from the cement spacers was occurring and found to be 10.4 mcg/mL (normal reference 0.57-1.30). Hemodialysis (HD) was started on POD 14. The patient received HD for a total of 13 days after which he was transitioned to peritoneal dialysis for a total of 64 days with complete recovery of renal function and normalization of serum creatinine levels.

Three months after resolution of the patient's AKI and resolution of infection, the patient returned for a right hip replantation without complication. Pre-operative labs demonstrated a Cr of 1.05 mg/dL and a BUN of 19 mg/dL. Bilateral knee replantation arthroplasties were performed 6 weeks later. At two-year follow-up, the patient's bilateral TKA's and right THA were well positioned and showed no evidence of infection. The patient continued to attend regular physical therapy. Kidney function was normal.

Discussion

Prosthetic joint infections are a potentially devastating complication of total joint arthroplasty. While risk factors for a single PJI have been previously described, the risk factors for multiple concurrent PJIs are less well understood [6-7]. Jafar et al. in 2012 attempted to retrospectively identify risk factors associated with multiple infected prosthetic joints. The overall rate of multiple PJI in the study was 20% (11/55 patients) with the majority of observed infections being metachronic with mean time to second infection of 2.0 years (range 0-6.88 years) [8]. Only two patients (3%) in that study were found to have concurrent PJIs as

was seen in the current case [8].

Two-stage arthroplasty is the current standard of care in the treatment of single or multiple PJIs as it allows for the delivery of a high local concentration of antibiotics. In 2004, Springer et al. showed that high dose antibiotic cement was clinically safe and the use of the two-stage arthroplasty technique has been shown to result in both improvement in functional outcomes post-operatively as well as successful eradication of infection in more than 90% of cases [5-11].

Re-infection following two stage arthroplasty has been estimated to be as high as 37%, however a recent systematic review performed by Kunutsor et al. reported re-infection rates to be between 7.2–10.6% [5-12]. To our knowledge, there is no available data on outcomes in the treatment of multiple concurrent PJIs.

The reported mortality rate from PJI ranges from 2.7-18% [13-14]. Additionally, a five-fold increase in mortality rate at one-year post operatively has been reported in cases of revision TJA secondary to PJI as compared with revision TJA due to aseptic failure [15]. Sepsis is an important cause of mortality in patient with PJIs, however there appears to be a trend toward an increase in mortality in patients with other medical comorbidities, particularly cardiac disease, AKI, and MRSA infections [15]. Prosthetic joints infected with MRSA, as in the current case, are associated with increased mortality, poor outcomes, and increased health care costs [15-16].

Despite multiple medical comorbidities and MRSA infection, at two year follow up, the patient's bilateral TKA's and right THA showed no evidence of infection and kidney function was normal. Nevertheless, kidney injury represents an important complication of two-stage arthroplasties as it has been shown that AKI is independently associated with increased mortality, length of stay, and increased cost in hospitalized patients [17]. We theorize that the observed AKI was multifactorial secondary IV vancomycin, increasing age, as well as antibiotic elution from the implanted spacers. A retrospective cohort study of 84 patients by Menge et al. showed that a higher dose of antibiotics in an ACS is positively associated with an increased risk of AKI [18].

However, as this case suggests, two stage arthroplasty using high doses of antibiotics may be necessary to adequately treat PJIs given the significant morbidity and mortality associated with an infected prosthesis. The risk of high dose antibiotics must ultimately be weighed against risks of inadequate treatment of an ongoing infection. Further research is necessary to help identify risk factors and complications of concurrent PJIs and to help guide future management.

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