Case Report
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MODIFIED TWO-STAGE EXCHANGE FOR MRSA PERIPROSTHETIC JOINT INFECTION IN TOTAL KNEE ARTHROPLASTY: A CASE REPORT

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ABSTRACT

Periprosthetic joint infection (PJI) of the knee is a catastrophic complication that occurs in 1-2 % of patients after total knee arthroplasty. As the number of primary knee arthroplasty procedures increases, thus will the number of periprosthetic infections continues to be a major challenge with a significant financial burden and physical and psychological morbidity for patients. This report presents a case of MRSA Periprosthetic joint infection in TKA with a two-stage exchange as a treatment. A 79-year-old woman had a painful, swollen knee with a sinus tract with purulent discharge at her left knee. The KSS Knee Score was 25, and the Function Score was 15. According to the findings, the patient was diagnosed with Periprosthetic Joint Infection by the Modified MSIS criteria and underwent a two-stage revision surgery with rifampicin and ciprofloxacin antibiotic administration. PJI is a rare complication, with more than 50% of the cases caused by gram-positive cocci, Staphylococcus coagulase-negative, and Staphylococcus aureus. The treatment of PJI must be tailored according to the patient's clinical characteristics. Prosthesis exchange in one or two stages is the first choice of procedure. Two-stage revision surgery for knee PJI with dual antibiotics of rifampicin and ciprofloxacin is adequate to control infection and reinfection in a one-year follow-up.

Keywords: Periprosthetic joint infection, knee arthroplasty and surgery.

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INTRODUCTION

Periprosthetic Joint Infection (PJI) of the knee is a catastrophic complication that occurs in 1-2 % of patients following total knee arthroplasty; as the number of primary knee arthroplasty procedures increases, thus will the number of periprosthetic infections, which remain a major challenge with a significant financial burden, physical and psychological morbidity for patients (1-2). The incidence of methicillin-resistant Staphylococcus aureus (MRSA) infections is upward (3-6) and accounts for 30% to 60% of infections. MRSA infection treatment success rates have been reported to be as low as 16% to 18%, with a worse outcome. This report presents a case of MRSA Periprosthetic joint infection in TKA with the two-stage exchange as a treatment.

PRESENTATION OF CASE

A 79-year-old woman came to the emergency ward with a painful, swollen knee, a sinus tract, and purulent discharge at her left knee. Six months prior to hospital admission, she underwent a total knee arthroplasty procedure at an outside hospital due to chronic knee pain with the diagnosis of knee osteoarthritis. Approximately four months after the surgery, the patient returned with new complaints of swelling and increasing knee pain. She was afebrile, but her knee was tender with significant effusion. The previous surgeon then performed a debridement, antibiotic administration, and implant retention (DAIR) procedure, but the symptoms did not resolve.

Now the patient's activity level had dwindled to the point where she could only do things around the house. For independent mobility at home, she needed a walker or wheelchair. She had trouble standing and could no longer climb stairs without help. Her discomfort was proportional to her activity, antibiotics and nonsteroidal anti-inflammatory drugs (NSAIDs) were ineffective. She had no previous comorbidities. The patient remained afebrile all along. When she tried to bear weight, she suffered a lot of pain in her left knee.

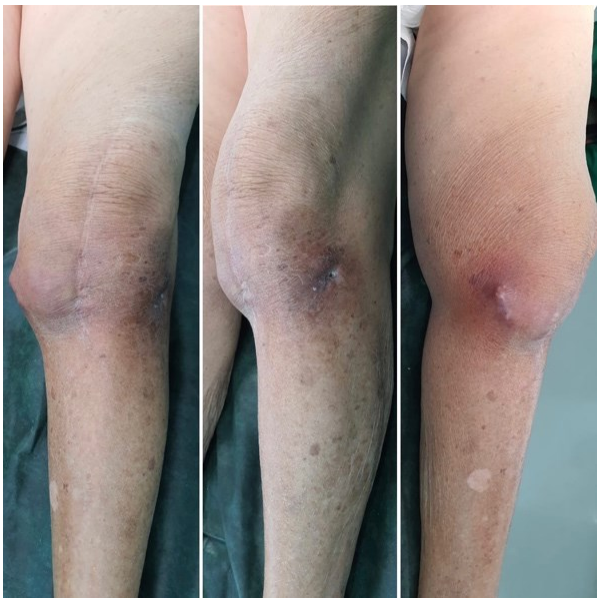

Figure 1. Left knee joint showed midline incision scars with a sinus tract at medial and lateral aspect of left knee joint with active purulent discharge, swelling and redness.

Physical examination from inspection revealed midline incision scars with a sinus tract at the medial and lateral aspect of the left knee joint and active purulent discharge, swelling, and redness (Figure 1.). A Radiograph examination of the patient

showed a loosening of the medial part of the tibial base, especially along the lateral femoral condyle of the knee joint. A Blood examination revealed an elevated sedimentation rate (ESR) of 61 mm/hr (Figure 2.). White blood cell count (WBC) was normal at9.430/uL. Aerobic and anaerobic cultures showed positive for Methicillin-Resistant Staphylococcus Aureus (MRSA).

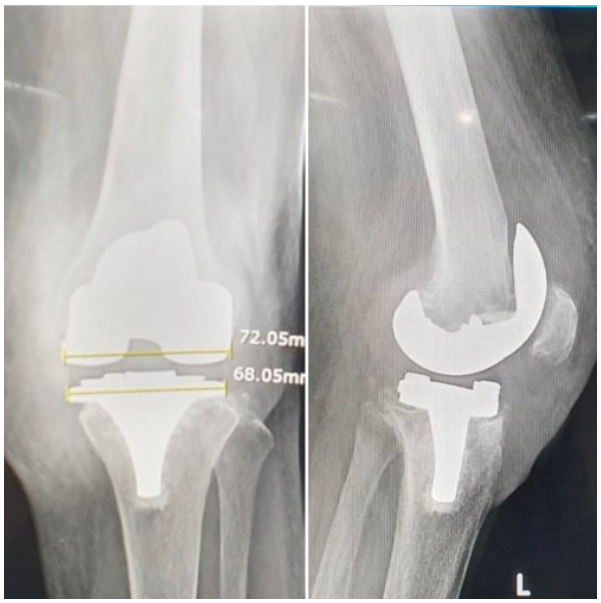

Figure 2. Radiograph examination of the patient showed a loosening of the medial part of the tibial base, especially along the lateral femoral condyle of knee joint.

The right knee joint's range of motion (ROM) was 10-80◦ of flexion but was limited due to pain. The KSS Knee Score was 25, and Function Score was 15. According to the findings, the patient was diagnosed with Periprosthetic Joint Infection by the Modified MSIS criteria.

The patient returned to the operating room for first-stage implant resection with aggressive debridement and synovectomy (Figure 3.). The implants were explanted without bone loss, and the medial posterior capsule was cleaned. Periprosthetic tissue samples were sent for microbiologic analysis.

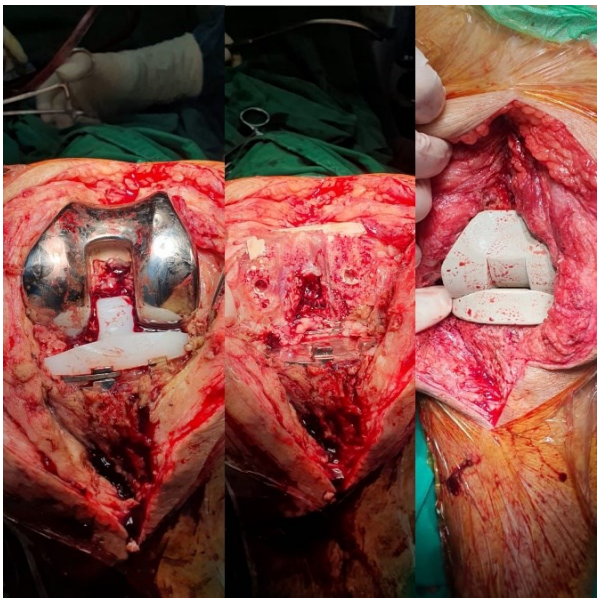

Figure 3. The first stage surgery was an explanted of implant and replacement with antibiotic spacer.

The femoral and tibial components were cleared of cement, and the antibiotic spacer containing 4.8 gr of gentamycin, and 8 gr of Vancomycin was placed. We used hinged knee braces, and the patient was only allowed for partial weight bearing using two crutches. Postoperatively, we routinely checked the ESR and CRP levels to monitor the infection after the spacer was used. We used vancomycin antibiotics for post-operative medications for 20 days. The microbiologic analysis confirmed MRSA positivity, and the ESR CRP level was rising initially but continued to decrease steadily.

Nine weeks later, the patient returned for the second-stage TKA conversion surgery. The spacer was removed without difficulty, and the spacer was then replaced with a

cruciate substituting device with a 10 mm insert (Figure 4.). After the second stage of surgery, we used an antibiotic combination of ciprofloxacin and rifampicin for two weeks and discontinued it later. The patient reported no pain and swelling around her left knee joint three months after the conversion surgery (Figure 5.).

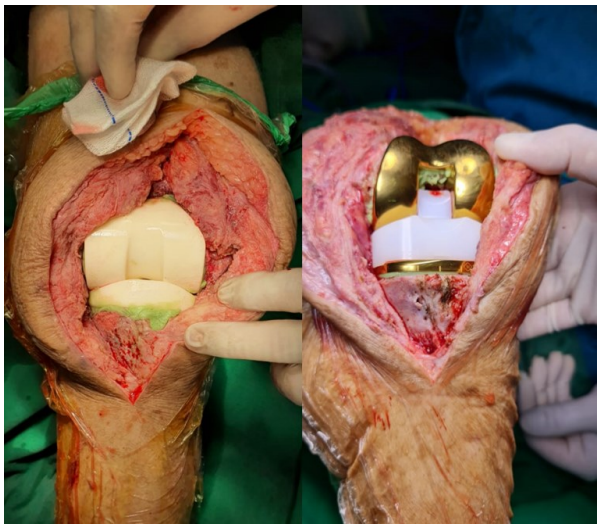

Figure 4. Second stage exchange using a cruciate substituting device with a 10 mm insert.

At one year follow-up, the patient performed daily activity painlessly, with her range of motion up to 120 degrees, and her KSS Knee Score had improved to 87 with the Function Score of 80.

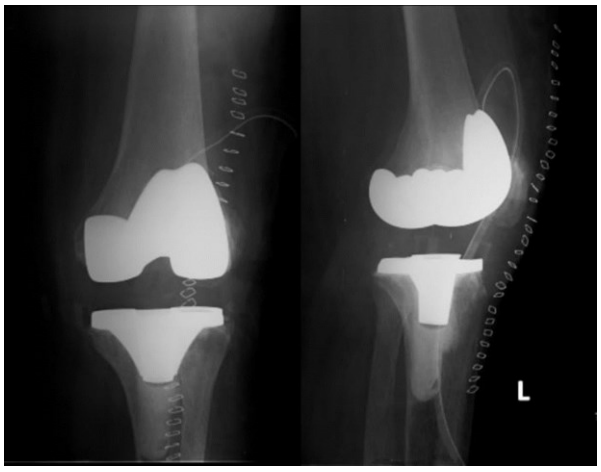

Figure 5. Post operative after second stage exchange, anteroposterior and lateral view

DISCUSSION

The diagnosis of Prosthetic Joint Infection (PJI) was made according to the MSIS score, and the newer scoring system published by Parvizi et al. for this patient, which included a positive culture and the presence of sinus tract for the significant criteria and elevated CRP and ESR in the blood serum for the minor criteria in the preoperative evaluation (1). Both scoring system results were clear enough to diagnose PJI in this case. PJI is a rare complication, with more than 50% of cases caused by gram-positive cocci, Staphylococcus coagulase-negative, and Staphylococcus aureus. The treatment of PJI must be tailored according to the patient's clinical characteristics. Prosthesis exchange in one or two stages is the first choice of procedure (2).

As in this case, we performed a two-stage surgery by removing the implant, placing an antibiotic spacer for the first stage, and proceeding to the second stage with dual antibiotic administration (rifampicin and ciprofloxacin) and an exchange of the spacer into a new knee prosthesis. The identification of the responsible microorganism was carried out before proceeding to the second stage of surgery. The International consensus on Orthopedic Infections recommends the identification of responsible microorganisms before performing debridement, antibiotics, and implant retention, and it should not be prevented by timely surgical intervention (3). Under the recommendation, delay

surgery until the MRSA pathogen has been identified, as this is thought to promote further biofilm formation and compromise the outcome of surgical intervention.

Recent studies reported the result of two stage revisions for the treatment of PJI. Leung et al. reported that the infection control rate for MRSA/MRSE-related PJI of the hip was 79% (4). Parvizi et al. reported a 60% control of MRSA infection in PJI cases; a similar result was also reported by Santoso et al., where an infection control of 71% due to MRSA was obtained (1,5). According to another study, two-stage arthroplasty surgery has a 93% success rate for short-term infection control in a PJI caused by a fungal infection (6). In our case, through a one-year follow-up, the patient noted no recurrent infection symptoms.

Most of the studies mentioned above use Vancomycin as the most used antibiotic to eradicate MRSA and demonstrated a successful infection control rate of 60-79% (1,5,6). We administered Rifampicin and Ciprofloxacin as the antibiotic of choice due to their ability to penetrate the biofilm and kill sessile bacteria (7). Due to the rapid development of antibiotic resistance, rifampicin should be used in combination with another antimicrobial agent. Rifampicin appears to be promising in treating gram-positive implant related infections (8). However, some studies found no significant differences between the use of rifampicin as the antibiotic of choice and control group (9), and these studies were small or observational in nature (10).

CONCLUSIONS

In conclusion, two-stage revision surgery for knee PJI with dual antibiotics (rifampicin and ciprofloxacin) is adequate to control infection and reinfection in a one-year follow-up. However, a more extensive study using more subjects is required to address the efficacy of two-stage revision surgery and the combination of rifampicin and ciprofloxacin antibiotic as an adjunct.

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