Limb salvage after severe Klebsiella pneumonia infection following ipsilateral total hip and knee arthroplasty- A case report and literature review.

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Each author of this case report fulfilled ALL 4 Criteria of Authorship:
1. Conception of the case report
2. Drafting the case report or revising it critically for important intellectual content.
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ABSTRACT

Total hip and knee replacement is one of the most common procedure in the world. Infection of the hip and knee replacement could be devastating. The infection rate after primary arthroplasty is 1% to 2% and after revision arthroplasty is 2.5% to 3.2%. The infection of ipsilateral hip and knee is a rare condition. We are presenting a case of 48 years old female who presented to us with this condition. She had Klebsiella Pneumonia infection of the ipsilateral hip and knee. She undergone removal of the total hip and total knee implants followed by multiple debridement and irrigation of the femur and tibia. Later on revision total hip arthroplasty was done with custom design prosthesis and knee arthrodesis at the ipsilateral knee. Patient did very well and manage to walk out of the hospital. We managed to salvage the limb with good outcome.

Keyword: Klebsiella pneumonia, limb salvage, total hip replacement, total knee replacement, Prosthesis, Joint infection.

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INTRODUCTION

Total hip and total knee arthroplasty is the most definitive surgery used to manage degenerative osteoarthritis of the hip and knee respectively. Hip and knee arthroplasty have high success rates as elective procedures with more than 95% survivorship of the prosthetic joint at ten years.[1] Despite good outcomes and significant functional improvement in these patients, one of the dreaded complications is prosthetic joint infection. Management of superficial or deep prosthetic joint sepsis is a significant health care burden which can result in a patient requiring numerous revision surgeries, prolonged hospital stay, increased cost, and can result in significant morbidity.

The management of prosthetic joint infection requires multiple staged surgical revisions and long-term targeted antimicrobial treatment. The infection itself and the surgical debridements to eradicate it can lead to devastating morbidity in long term.[2]

After primary arthroplasty the prevalence of infection is 1% to 2%, and after revision arthroplasty it is 2.5% to 3.2%. Simultaneous prosthetic joint infection of ipsilateral arthroplasty of the same limb is a rarity.[3] We present a case of prosthetic joint infection of the ipsilateral total hip and total knee arthroplasty.

CASE PRESENTATION

A 48 year old female with breast carcinoma was presented to our department. She had bone metastases for which she had received both chemotherapy and radiotherapy and was in remission. She developed avascular necrosis of the right hip as a result of radiation to that area and due to bone metastases. She had Osteoarthritis of the right knee. She was treated with right total hip arthroplasty which was complicated one year later by dislocating laterally. She underwent revision of the right with a dual mobility cup. Six months later she developed pain in the right knee due to degenerative changes and underwent right total knee replacement. Shortly afterwards she fell at home and damaged the

knee prosthesis requiring a revision of the right knee. Two years after the primary hip arhtroplasty, she developed swelling and a draining sinus at both the right knee and right Hip. She had multiple debridements and irrigation of the wound.

On examination the right hip and knee was swollen and erythematous with a draining sinus on the lateral aspect of the right thigh and multiple draining sinuses on the anterior aspect of the right knee each oozing purulent and foul smelling fluid. She had a limited range of movement of both the right hip and knee due to pain. The distal limb was well perfused with no neurological deficit.Her haemoglobin was 8.5, Neutophils count was 14 mg/l, ESR 68 and CRP 43. Pus and tissue was retrieved from the sinus under sterile conditions in theatre from both the hip and knee and was sent for microscopy, culture and sensitivity.

Klebsiella pneumoniae was identified and was found to be sensitive to Cephalosporins (Cefotaxime and Ceftriaxone) and Carbapenems (Imipenem or Cilastatin).

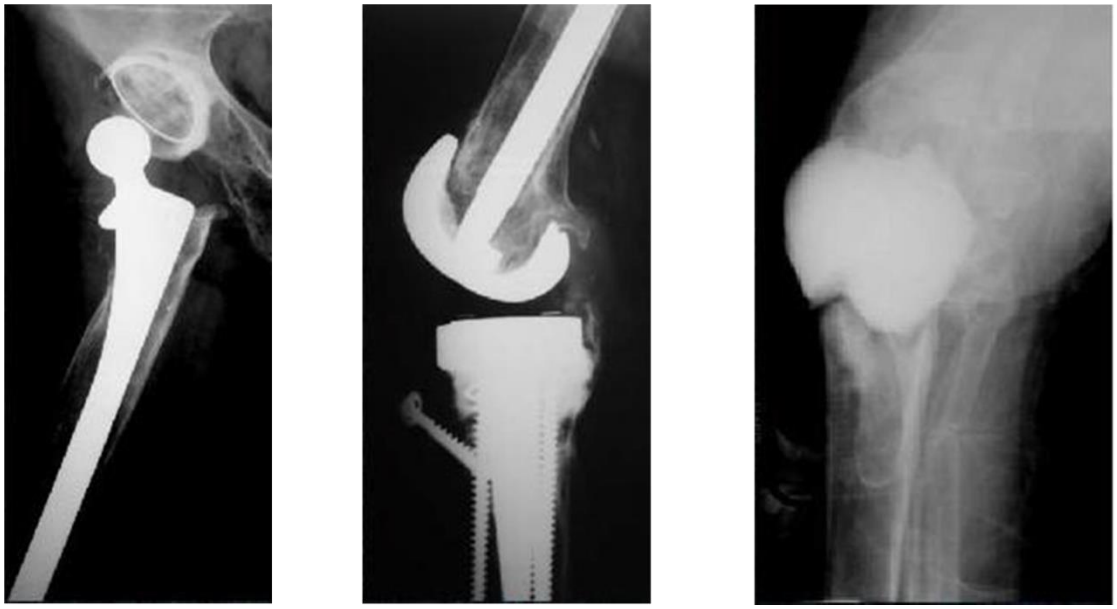

Figure 1 A: X-ray of showing the total hip replacement with the long stem and cemented acetabulum with dislocation of the right hip
1B: X-ray of the right knee showing total knee replacement with revision prosthesis of the right knee
1C: X-ray of the right knee after removal of the implant with the cemented spacer in the right knee

Figure II: Clinical picture of the right knee showing skin loss at the anterior part of the right knee

Figure III: Gastrocnemius flap and across knee Illizarov fixator of the right knee to achieve knee arthrodesis

The patient had consulted many orthopaedic surgeons and hindquarter amputation was recommended. We on the other hand attempted to save the limb. A number of staged operations were carried out. The right knee had first been treated with implant removal, debridement and irrigation. The implant was removed, debridement was performed and irrigation of the right hip with gentamicin impregnated and moulded cement spacer was inserted.(Fig.1A-1C) During this period culture-directed therapy in the form of intravenous Imipenem was administered.

We tried arthrodesis of the right knee with an Illizarov external fixator once the sepsis had resolved. A gastrocnemius flap was being used to close the soft tissue defect and the loss of the patella tendon (Figure II, III). At three months the Illizarov frame arthrodesis was found to be unsuccessful. The last surgery includes removing the hip cement spacer and replacing it with a custom-made prosthesis to achieve hip arthroplasty and knee arthrodesis at the same time (Figure IV & V). We addressed the resulting 12cm limb length discrepancy with a heel elevated shoe. (Figure VI, VII A & B). The patient walked out of the hospital unassisted after being discharged.

Fig IV: Gentamycin molded hip spacer

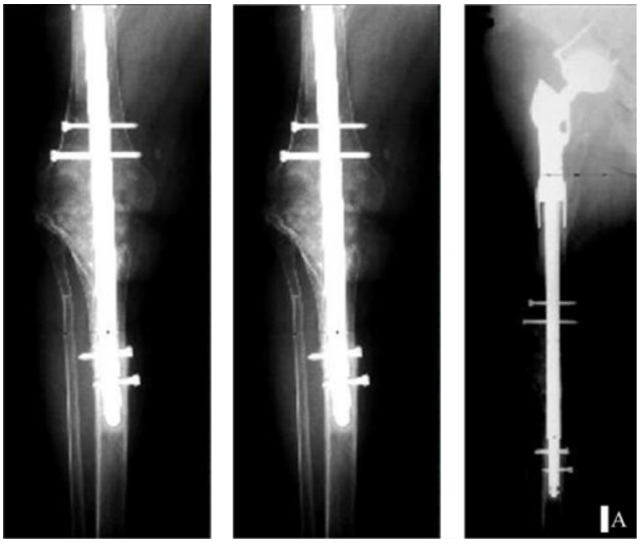

Fig V: Tumor prosthesis with long stem crossing the knee joint to achieve knee arthrodesis

Fig VI: Final Clinical picture of the right lower limb of the patient

Fig VII A & B: Standing View of the patient showing the leg length discrepancy of 12cm of the right leg as compare to the left leg.

DISCUSSION

Infection following revision arthroplasty of the hip and knee is relatively rare. To our knowledge no case has been reported in the literature on prosthetic joint infection of ipsilateral hip and knee. The most common organism isolated in prosthetic joint infections are meticilline-resistant or meticilline sensitive Staphylococcus Aureus and meticilline-resistant and meticilline-sensitive Staphylococcus epidermidis. Authors from other studies noted a decreased prevalence of infections with Gram-negative and coagulase -negative Staphylococcus bacteria.[4] Mechanisms of seeding include direct seeding of the skin flora through direct communication to the joint or contiguous spread from the surrounding tissue and hematogenous spread from distant sites in the body. Foreign body increases susceptibility to infection by providing an inert surface for bacteria to adhere to. A biofilm is a glycocalyx barrier that is produced by bacteria that surrounds the focus of infection. It is impermeable to the host immune system and antibiotics and surgical debridement is the only effective way to irradicate infection once a biofilm is formed. The risk factors contributing to prosthetic joint infection can be patient specific factors and environmental factors. Comorbidities and habits [5] such as uncontrolled diabetes,[6] malnutrition,[7] morbid obesity,[8] smoking,[9] alcohol use,[10] uncontrolled immunocompromised disease,[11] and drug use are examples of patient-specific modifiable risk factors.[12] Age and the presence of S. Aureus nasal colonists are non-modifiable risk factors.[13] Meticilline – resistant S. Aureus (MRSA) accounts or 12-23% of periprosthetic joint infection in the United States of America. Nasal carriers of MRSA have a three to six times higher infection risk that non-carriers. A preoperative regime including a nasal application of Mupiraocin and skin decontamination with Chlorhexidine was found to have decreased rates of MRSA prosthetic joint infection in comparison with placebo.[13] An international study on peri-prosthetic joint infection concluded that the prevalence of prosthetic joint infection with K. Pneumonia ranges from 0.7-6.0%.[14]

Numerous factors may have contributed to the septic complications in our patient. Firstly, she was a breast cancer survivor and was in complete remission after having completed chemotherapy and radiotherapy. She had however, received radiotherapy to the hip which most likely compromised the vitality and healing capacity of the surrounding bone and soft tissues. Furthermore, she was on long term immunosuppressive therapy which was most likely contributed to her increased risk of infection.

The three unusual problems we faced in this patient's care was eradicating the infection in both the hip and knee at almost the same time. Second was to achieve a successful arthrodesis at her knee and the third was to address 12cm limb length discrepancy. To deal with the first problem we used a combination of treatments to get rid of the infection, including reaming, debriding, antibiotic irrigation, Lautenbach irrigation, and intravenous Imipenem.[15] The patient was brought to the operating room many times for debarment and wound treatment using the Lautenbach irrigation system. The irrigation was stopped after two weeks.The second challenge was addressed with a custom-made tumour arthroplasty with a long extension underneath the prosthesis to achieve arthrodesis of the knee. The third challenge of final leg length discrepancy of 12 cm was address with a heel raise shoe. Our patient became accustomed to the heal raise shoe and was able to complete activities of daily living. The patients' expectations to avoid a hindquarter amputation and maintain ability to perform activities of daily living were met.

CONCLUSION

Prosthetic joint infection can lead to devastating complications. Thorough risk assessment, optimization and infection prophylaxis is therefore critical when planning for any arthroplasty. Our case study has shown that even cancer patients in remission can have an increased susceptibility to infection. In simultaneous, ipsilateral prosthetic joint infection of the hip and knee limb salvage can be achieved by employing a staged surgical approach with Lautenbach irrigation. We achieved good patient satisfaction and good outcome in our case.

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