

Management of Methicillin-Resistant *Staphylococcus aureus* Infection After Medial Open Wedge High Tibial Osteotomy

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Received: April 17, 2024; **Published:** May 10, 2024

Abstract

Background: Deep surgical site infection (SSI) after medial open-wedge high tibial osteotomy (MOWHTO) is considered one of the most detrimental complications. We report a case of methicillin-resistant *Staphylococcus aureus* (MRSA) infection after MOWHTO, in which the patient underwent treatment to control the infection without hardware removal in the first stage.

Case Presentation: A 54-year-old man diagnosed with left knee osteoarthritis underwent MOWHTO. A deep SSI after MOWHTO appeared 3 weeks after the operation. Debridement, placement of vancomycin-containing bone cement adjacent to the implants, percutaneous drainage for 2 weeks after surgery, and intravenous daptomycin administration with oral minocycline were performed without implants removal for 2 months. However, the infection did not subside. hardware without synthetic bone substitute was removed 3 months after MOWHTO. A long-leg brace was placed on the left leg for 3 months after surgery. A bony union was observed on radiography 16 months postoperatively. The wound was in good condition with no recurrence of infection, and Hospital for Special Surgery (HSS) score was 86.

Conclusion: The treatment for deep SSI after MOWHTO is difficult. Treatment options may also be considered depending on the degree of deep SSI, bacterial type, and patient condition.

Keywords: Medial Open Wedge High Tibial Osteotomy; Infection; Methicillin Resistant *Staphylococcus aureus*

Introduction

Medial open wedge high tibial osteotomy (MOWHTO) is a well-established surgical technique for knee osteoarthritis (OA) of the medial tibiofemoral compartment [1-3]. This is a widely used surgical procedure for the treatment of knee OA. Relatively good postoperative results have been obtained to improve the quality of life. However, various complications such as the surgical site infection (SSI), delayed union and nonunion, hardware failure, and lateral cortex fracture have been reported [4,5]. Once these complications occur, they can be difficult to treat. Postoperative deep SSI is regarded as one of the most detrimental complications, and may lead to multiple revision surgeries, loss of correction degree, and nonunion [6,7]. We report a case of methicillin-resistant *Staphylococcus aureus* (MRSA) infection after MOWHTO, in which the patient underwent plate removal to control the infection finally.

Case Report

A 54-year-old man had complained of left knee pain for the previous 2 years. He was diagnosed with knee OA at another hospital and was underwent conservative treatment; however, his symptoms worsened. The patient was then referred to our hospital for operative treatment. His past medical history and family histories were unremarkable. As for his life history, he had been drinking alcohol in moderation and smoking 15 cigarettes per day since he was 20 years old.

Physical examination revealed swelling, effusion and medial joint line tenderness in the left knee. The range of motion was between 0° and 131°. The McMurray test for the medial meniscus showed negative results. The knee-rating scale of the Hospital for Special Surgery (HSS) was 76. The Rosenberg view showed a Kellgren-Lawrence OA grade of 4. The anatomical lateral distal femoro-tibial angle (FTA) was 190° (Figure 1A and 1B). The day before the operation, pain and redness appeared in the left foot. Laboratory tests revealed an Hb level of 12.9 g/μL, WBC of 11600/μL, and CRP of 0.59 mg/dL. Cellulitis of the left foot was diagnosed, and intravenous cefazolin was administered. The symptoms improved quickly after intravenous cefazolin administration for 1 week, and the laboratory data normalized. One week later, MOWHTO was performed using the TomoFix Japanese and synthetic bone substitutes (Figure 2). A knee brace was placed on the right leg for one week. Range of motion (ROM) exercises were started 1 week postoperatively. It was planned that full weight bearing was allowed at 4 weeks. However, 3 weeks after surgery, redness and swelling of the wound appeared. Laboratory tests revealed a WBC of 24,100/μL, and CRP of 3.07 mg/dL. Radiography revealed no obvious bone lytic changes. Meropenem and daptomycin were administered intravenously; however, the infection did not resolve. Debridement was performed 26 days after HTO without the removal of hardware or synthetic bone substitutes. Intraoperative findings showed abscess formation and poor granulation tissue adjacent to the plate and in the gap between the artificial bone and the second proximal row of screws. After debridement of the abscess and poor granulation tissue, vancomycin-containing bone cement was placed adjacent to the plate and in the gap (Figure 3). Bacterial cultures revealed MRSA. Percutaneous drainage was performed for 2 weeks after surgery. Intravenous daptomycin with oral minocycline was administered for 2 months, and the patient's condition improved. Laboratory tests revealed a WBC of 5,200/μL, and CRP of 0.07 mg/dL. However, as soon as the antibiotics were discontinued, local heat and pain developed in the lower leg. Relapse of infection was considered. Therefore, hardware without synthetic bone substitute was removed 3 months after the MOWHTO (Figure 4). Intraoperative findings revealed no obvious signs of infection.

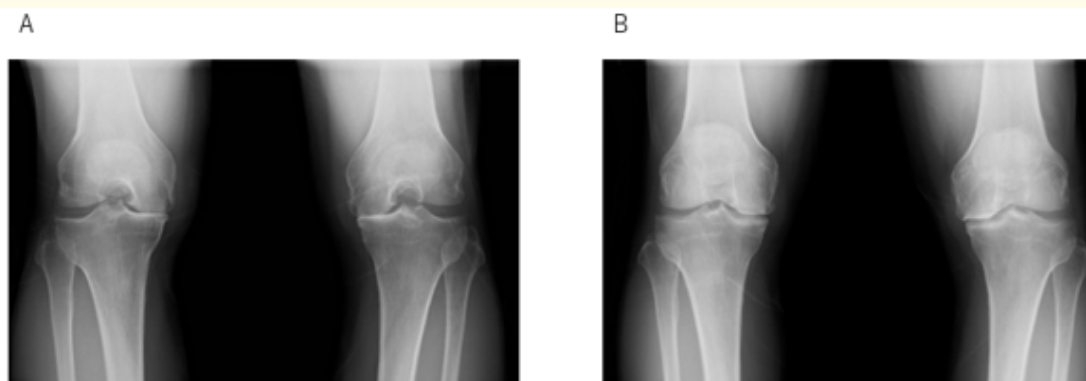


Figure 1A and 1B: A: Rosenberg view showed Kellgren-Lawrence OA grade 4. B: The anatomical lateral distal femoro-tibial angle (FTA) was 190°.



Figure 2: Postoperative X-ray image.

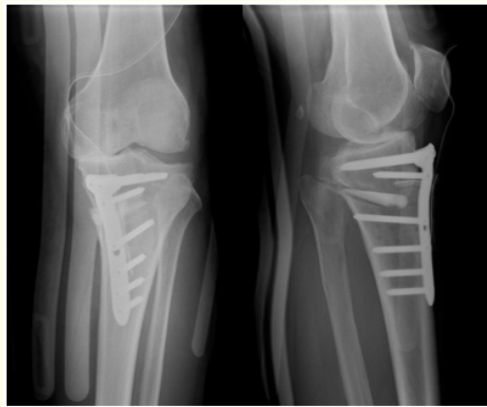


Figure 3: X-ray image after debridement of the abscess and poor granulation tissue. vancomycin-containing bone cement was placed adjacent to the plate and in the gap.

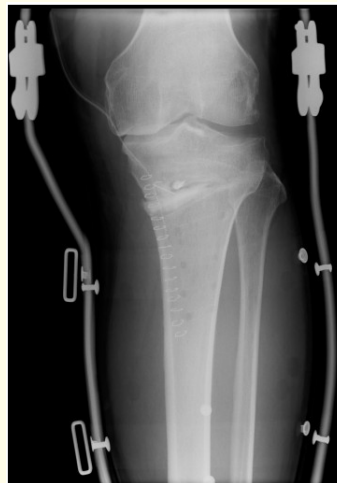


Figure 4: Postoperative X-ray image showing removed hardware without synthetic bone substitute.

New vancomycin-containing bone cement was placed in the gap between the artificial bone and the second proximal row of the screws. A long-leg brace was placed on the left leg for 3 months after surgery. Full weight bearing was allowed at 3 months. A bony union was observed on radiography 16 months after the surgery (Figure 5). The wound was in good condition with no recurrence of infection, and the HSS was 86. The patient demonstrated relatively good functioning, and was able to return to daily activities.

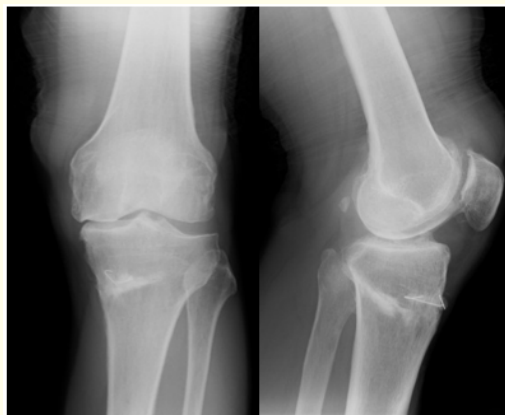


Figure 5: Postoperative X-ray image at 16 months after the surgery.

Discussion

MOWHTO is a revolutionary surgical technique that does not require fibular osteotomy and uses a locking plate to allow early loading [8]. MOWHTO has been shown to have a high survival rate and can improve quality of life, pain, and knee range of motion according to long-term follow-up [2]. However, complications following MOWHTO have been reported in the literatures [4-7]. Postoperative infections are among the most detrimental complications. The postoperative infection rate is slightly higher than after total knee arthroplasty (TKA) [9,10]. For deep SSI after TKA, it is necessary to remove the implant and replace the prosthesis regardless of the type of staged surgery required [11-13]. However, when the implants used in MOWHTO are removed, fixation of the osteotomy portion becomes difficult, along with the loss of the correction angle. A few reports suggest debridement, followed by hardware removal or retention, as the mainstay treatment modality, for the management of deep SSI after MOWHTO [6,8,9,14]. The treatment of deep SSI after MOWHTO without implant removal is difficult. Several reports have described the treatment of postoperative HTO infections without implant removal [9,15]. However, most of these infections were caused by methicillin susceptible *S. aureus* or other organisms, and reports of infections caused by MRSA are rare. In the present case, debridement, placement of vancomycin-containing bone cement adjacent to the implants, percutaneous drainage for 2 weeks after surgery, and intravenous daptomycin administration with oral minocycline were performed for 2 months, and the patient's progress was relatively good. Consequently, the infection did not resolve. However, by calming the infection, the patient was able to achieve some bone fusion after MOWHTO. Therefore, with a long leg brace for 3 months, loss of the correction angle might be prevented.

According to the risk factors for deep SSI after MOWHTO, Kawata., *et al.* reported that smoking, male gender, and prolonged anesthesia were factors associated with a higher incidence of SSI [7]. Anagnostakos., *et al.* indicated that the risk factors for HTO-associated SSI were oblique skin incision, insertion of artificial bone grafts, and one day of hospitalization [2]. This patient was a male smoker with no relevant medical history. Smoking may be the greatest risk factor for deep SSI after MOWHTO [16]. In addition, it has been reported that the administration of antibiotics within 4 weeks of surgery increases the incidence of MRSA [17]. In this patient, intravenous antibiotics were administered prior to infection. The administration of antibiotics prior to infection could be considered a high risk factor for deep SSI after MOWHTO.

Conclusion

For deep SSI after MOWHTO, selecting the best treatment is challenging. Treatment option may also be considered depending on the degree of deep SSI, the bacterial type, and patient condition.

Funding Support

This research was supported by the commissioned research expenses to Kanmon Medical Center (Shimonoseki, Japan) from Kyocera Japan and Japan Medical Dynamic Marketing ING.

Availability of Data and Material

Not applicable.

Consent for Publication

We have obtained consent to publish from the participants.

Competing Interests

The authors declare that they have no competing interests.

Ethics Approval and Consent to Participate

Not applicable.

Human and Animal Rights

Not applicable.

Standards of Reporting

CARE guidelines have been used for conducting this research.

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Volume 15 Issue 4 April 2024

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