

Multidisciplinary Approach to Limb Salvage and Wound Healing Following an Infected Total Ankle Replacement

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INTRODUCTION

Periprosthetic joint infection (PJI) following total ankle replacement (TAR) is a serious complication that can result in significant morbidity and the need for lower extremity amputation. PJI accounts for nearly 80% of implant failures following a TAR, with wound healing complications noted in up to 40% of cases.¹ Surgical site infections remain some of the most common causes for emergency department visits and readmission following joint arthroplasty and can lead to the need for revisional surgery.^{1,2} There is little data regarding the optimal treatment algorithm of PJI in TAR, making it a difficult complication to treat. Outcomes of equally demanding pathology have been shown to be improved when patients are managed by a team of specialists as opposed to a single individual; however, there is little supporting evidence on the application and influence of multidisciplinary care on outcomes of PJI.³ Here we present a case of an infected TAR, with associated osteomyelitis and surgical site dehiscence that required the use of a multidisciplinary team to aid in limb preservation.

CLINICAL AND DIAGNOSTIC IMAGING

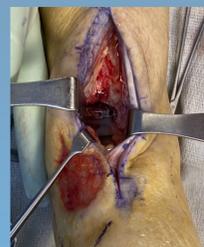
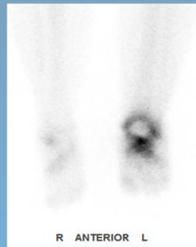
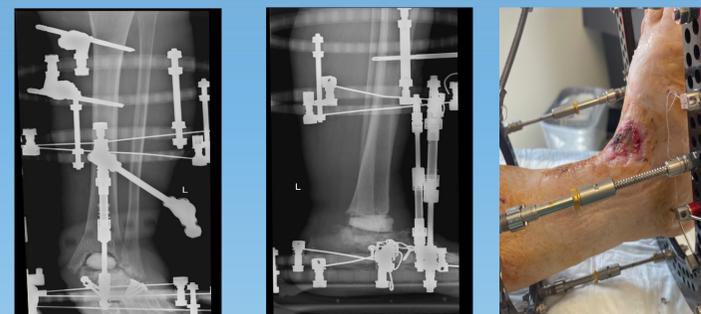


Figure 1: Positive 3-phase technetium-99 bone scan, Figure 2: Intra-operative during implant removal



Figures 3,4,5: following removal of implant, placement of antibiotic spacer and external fixation



Figures 5,6,7: Removal of antibiotic spacer, insertion of femoral head allograft and tibio-talo-calcaneal fusion

CASE STUDY

Our case follows a 68-year-old female with past medical history of hypertension, asthma, hypothyroidism, cerebrovascular accident, and hyperlipidemia, complicated by an extension list of drug allergies including Bactrim, cephalosporins, Penicillin, Levaquin, Keflex, and Ciprofloxacin. She had initial placement of a left total ankle arthroplasty in February of 2022 for management of a severely osteoarthritic left ankle joint. Approximately 3 weeks following TAR placement, she was admitted to the hospital for dehiscence of the incision site and localized soft tissue infection. Infectious disease was consulted for antibiotic management, given her multiple drug allergies.

She was discharged on oral antibiotics based on her sensitivities. Approximately 2 weeks later she presented to the emergency room with necrosis of the ulceration and continued drainage. At this time, the wound was noted to be full thickness, measuring 3.5cm x 4.5cm x 0.2cm with exposed anterior ankle tendons. Given the worsening ulceration, the vascular surgery team was consulted for evaluation of her lower extremity circulation. There was no stenosis noted, and as such, no vascular intervention was warranted at the time. We were able to determine that the delay in healing did not have a largely vascular component. Wound care was consulted, and proceeded with staged debridement, with wound vac and graft application. To prevent adhesions of the ankle joint, given the recent total ankle replacement, the tendons were wrapped with lyopreserved placental membrane, and the wound was covered in its entirety with a bilayer wound matrix. The patient was then discharged with an additional 2 weeks of intravenous antibiotics and was seen regularly at the wound care center and by infectious disease, where her wound was monitored weekly. The wound continued to remain stable with a notable decrease in size. Patient was then referred to plastic surgery for application of a split thickness skin graft (STSG), which was harvested from the left anterolateral thigh. Following application of the STSG, the patient was lost to follow-up.



Progression of treatment: Figure A: Initial Presentation, Figure B: Post initial debridement, Figure C: Post initial graft application, Figure D: Following second graft application, Figure E: Prior to removal of hardware, following joint aspiration, Figures F & G: final follow-up

Approximately 2 months later, the patient reported back to the wound care specialist with complaints of fever and chills, along with scant purulent drainage in the wound. MRI was performed, revealing a fluid collection anterior and posterior to the ankle joint, and she was subsequently admitted to the hospital. During this admission, blood cultures and wound cultures were noted to be positive for MRSA. CT was performed for evaluation of hardware; however, no lucency was noted. She then underwent a complex incision and drainage with staged closure and graft application, this time utilizing a cryopreserved umbilical allograft. She was then discharged with a PICC line for 6 weeks of intravenous antibiotics. She was treated weekly at the wound care center with serial debridements. Approximately 2 months after her last surgical intervention, clinical examination noted fluctuance and new onset pain to her ankle. She was admitted to the hospital where an MRI revealed a periarticular abscess to the anterior tibiotalar joint, and aspiration of the area was performed.

A 3-phase technetium-99 bone scan was then performed to evaluate the hardware, which revealed loosening of the tibial and talar component. Given her hardware failure, we proceeded with a staged limb preservation consisting of removal of hardware, antibiotic spacer and multi-planar external fixator application, along with the orthopedics department. Care was taken not to violate the existing incision or wound. Biopsies of the talus and tibia were obtained, and a human split thickness allograft was applied to the wound. Pathology from bone biopsies was negative; however, bone culture was noted to be positive for pseudomonas. She was then placed on a prolonged course of intravenous antibiotics via a PICC line per infectious disease.

Following completion of intravenous antibiotics, the external fixator was removed and biopsies of the talus, distal tibia and calcaneus were obtained. The wound was again debrided and an additional human split thickness allograft was applied. Bone biopsies were noted to be negative for bacterial growth and negative for osteomyelitis. We then proceeded with tibio-talo-calcaneal fusion with femoral head allograft. Due to her multiple surgical interventions along the anterior ankle, the tibio-talar-calcaneal fusion was performed through a lateral incision to prevent possible complications of residual scar tissue. The rest of her post-operative course was uneventful, and wound closure was obtained 3 weeks later. Limb preservation along with re-epithelialization of the wound was achieved at 10 months.

RESULTS AND DISCUSSION

Advances in the designs of total ankle replacements has led to an increase in the number of primary procedures performed, and ultimately an increase in the number of complications and revisions.^{1,4} PJI after total joint replacement is a severe complication resulting in significant morbidity and extensive cost for the health-care system. Surgical site infections remain one of the most common causes for emergency department visits and re-admission following joint arthroplasty.² Avram et al in a retrospective review reported that infections account for 23.2% of early re-admissions.⁵ Making an accurate diagnosis of infection in the early post-operative period can be challenging for an individual surgeon. One way to address this is to manage this complex group of patients with a multidisciplinary team.⁶

Our multi-disciplinary team is comprised of an infectious disease specialist, podiatric surgeon, wound care specialist, vascular surgeon, plastic surgeon, radiologist and clinical nursing specialists that all play an integral role in patient care and management. Each member of this team was involved in all stages of the management pathway, and are present in the hospital working in tandem to provide a seamless service to patients. Time to diagnosis and clinical outcomes have all been shown to be improved when the multi-disciplinary team functions well.^{2,7,5,8}

We report here our experience of a well-functioning multidisciplinary team managing a particularly difficult case and suggest that this become the standard of care for PJI in the setting of TAR.

REFERENCES

- Kotnis R, Pasapula C, Anwar F, Cooke PH, Sharp RJ. The management of failed ankle replacement. *J Bone Joint Surg Br.* 2006;88(8):1039-1047. doi:10.1302/0301-620X.88B8.16768
- Dattilo J, Gittings D, Sloan M, Charette R, Hume E, Lee, G-C. 'Hot joints' infection protocol reduces unnecessary post-operative re-admissions following total hip and knee arthroplasty. *J Bone Joint Surg Br.* 2017;99-B(12):1603-1610.
- Sandiford NA, Wronka K. The multidisciplinary approach to managing prosthetic joint infection: could this lead to improved outcomes? *Ann Joint* 2022;7:8.
- Glazebrook MA, Arsenault K, Dunbar M. Evidence-based classification of complications in total ankle arthroplasty. *Foot Ankle Int.* 2009;30(10):945-949.
- Avram V, Petruccioli D, Winemaker M, de Beer J. Total joint arthroplasty readmission rates and reasons for 30-day hospital readmission. *J Arthroplasty* 2014;29:465-468.
- Epstein NE. Multidisciplinary in-hospital teams improve patient outcomes: A review. *Surg Neurol Int* 2014;5:S295-303.
- Whisstock C, Volpe A, Ninkovic S, et al. Multidisciplinary Approach for the Management and Treatment of Diabetic Foot Infections with a Resorbable, Gentamicin-Loaded Bone Graft Substitute. *J Clin Med.* 2020;9(11):3586. Published 2020 Nov 6. doi:10.3390/jcm9113586
- Musuza J, Sutherland BL, Kurter S, Balasubramanian P, Bartels CM, Brennan MB. A systematic review of multidisciplinary teams to reduce major amputations for patients with diabetic foot ulcers. *J Vasc Surg.* 2020;71(4):1433-1446.e3. doi:10.1016/j.jvs.2019.08.244