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Staged surgical intervention in the treatment of septic ankle arthritis with autologous circular pillar fibula augmentation: A case report

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Surgical management of chronic septic arthritis of the ankle joint is a challenging problem. Failure to initiate appropriate antibiotic therapy and perform incision and drainage within the first 24 to 48 hours of onset can result in subchondral bone loss and permanent joint dysfunction. Patients with chronic infection are not only at risk for loss of joint function, but also limb loss. This case report presents a staged procedure for limb salvage of patients with chronic septic arthritis of the ankle joint. Our technique includes use of both internal and external fixation, along with infection control and autologous pillar grafts. Though our case study is limited, the results are comparable to previous studies. This approach appears to be reasonable for limb salvage in end-stage degenerative joint disease following septic ankle arthritis.

Keywords: septic arthritis, ankle, pillar graft, internal fixation, external fixation

Surgical management of chronic septic arthritis of the ankle joint is a challenging problem. Failure to initiate appropriate antibiotic therapy and perform incision and drainage within the first 24 to 48 hours of onset can result in subchondral bone loss and permanent joint dysfunction. Joint function after Staphylococcus aureus (S. aureus) septic arthritis is generally lost 25-50% of the time [1-4]. The mortality rate for septic arthritis has been reported as high as of 10-15% [1-2, 5-8].

Internal ankle arthrodesis techniques are reported to have between 88% to 100% primary fusion rates in patients with aseptic arthritis [9-12]. However the fusion rate for ankle arthrodesis in the setting of sepsis is roughly 71% to 93% [13-19].

Surgical management of septic arthritis requires debridement of all non-viable infected soft tissue and bone in order to eradicate infection [14-15, 20]. In addition to debridement, the use of local antibiotic delivery through polymethylmethacrylate (PMMA) has been shown to be an effective adjunct in treating infection [21-24]. Bactericidal levels of antibiotics from PMMA spacers are achieved through the process of elution where high concentrations of antibiotic are released locally, with minimal systemic effect, and limited risk to the patient. Peak antibiotic concentrations are mostly reached within the first week after placement; however, some studies have shown antibiotics may still be released at effective concentrations even after 4-6 weeks of implantation [25-30].

The use of long term intravenous (IV) or suppressive oral antibiotic therapy in conjunction with debridement is an important part of treatment. A 2-6 week course of IV antibiotic therapy is recommended

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depending on the severity of the infection and host immunity [14, 15, 20, 31].

Fixation techniques for arthrodesis of the diseased ankle secondary to septic arthritis have been controversial. External fixation has been shown to provide adequate torsional stability, but is less effective in maintaining sagittal plane stability. On the other hand, internal fixation has been shown to provide excellent sagittal plane stability, but limited torsional stability. [19] Some authors believe a combination of both fixation techniques lead to optimal outcomes [12, 14, 15, 19, 20].

A concern with arthrodesis is following septic arthritis is loss of limb length. Cancellous bone graft has been shown to be effective in aiding with small defects [15, 20, 31]. Free vascularized bone graft has also been shown to be effective with large bony defects [14, 15, 20]. Use of allograft or synthetic bone grafts have rarely been mentioned in the literature [32]. One technique which has been described in aseptic ankle joint arthrodesis is the use of fibular pillar grafts as structural grafts to maintain length [33].

Patients with chronic infection are not only at risk for loss of joint function, but also limb loss. Cierny et al. related a 25% amputation rate for patients with arthrodesis of septic ankle joints [15]. This case report presents a staged procedure for limb salvage of patients with chronic septic arthritis of the ankle joint.

Case Report

A 54-year-old female with chronic right septic ankle arthritis for 6 months presented for evaluation. The patient had undergone arthrocentesis with corticosteroid, I&D with washout and long-term IV antibiotic therapy. She was offered a below knee amputation elsewhere but was reluctant to proceed and sought a second opinion. Her pre-operative radiographs can be seen in Figure 1 A-C and pre-operative MRI may be seen in Figure 2 A-B. The patient chose to proceed with staged surgical approach for limb salvage.

Figure 1 Pre-operative radiographs; Mortise view, AP view, and Lateral view.

The patient underwent needle biopsy of the tibia and talus with arthroscopic debridement. Arthroscopy was performed in standard fashion using a 2.7mm 30-degree arthroscope, utilizing a burr and shaver for ankle joint debridement. Arthroscopic evaluation of the ankle joint revealed destruction of both tibial and talar articular surfaces. Cartilage of both articular surfaces was degraded and granular in nature. Cultures recovered S. aureus infection of the tibia.

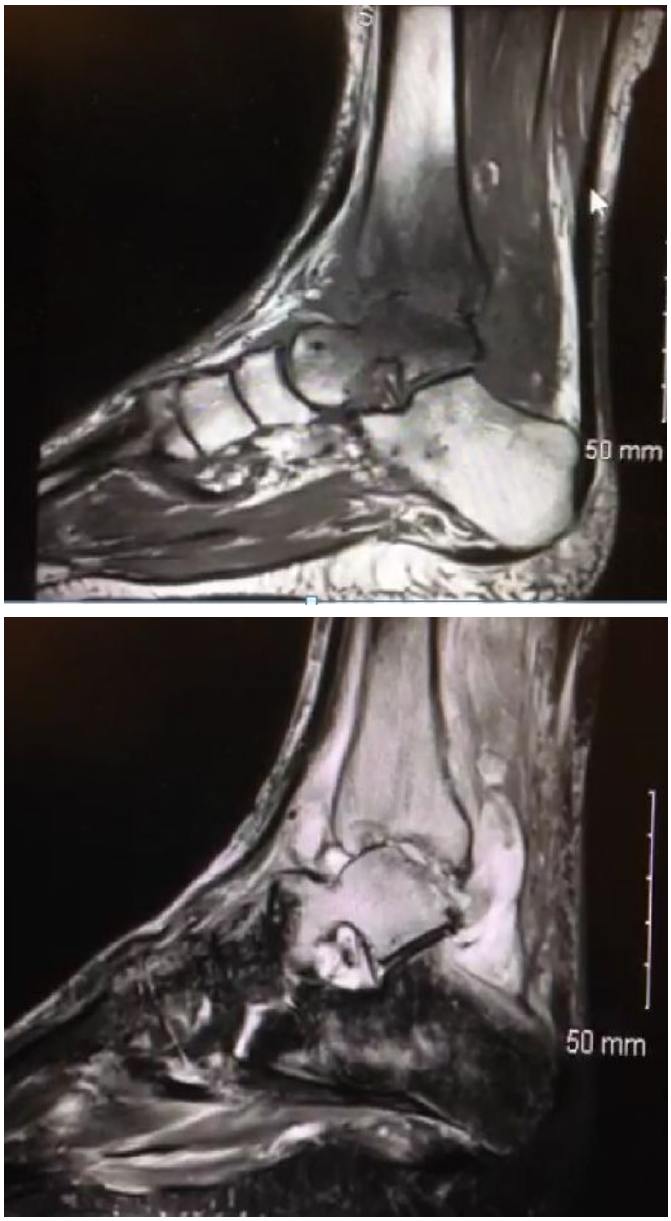

Figure 2 Pre-operative MRI; T1 Sagittal view, T2 Sagittal view.

Thirteen days later, open arthrotomy of the ankle joint with extensive debridement of the tibia and talus, as well as insertion of a Vancomycin cement spacer was performed. The arthrotomy was performed using a lateral approach with a fibular osteotomy. The fibula was sent for pathology evaluation and culture, which were shown to be free of any bacterial infection. Debridement was performed through osteotomies of both the tibia and talus which included the articular cartilage and subchondral plate (Figure 3). The joint was then pulse lavaged with 3L of normal saline-bacitracin mixture and a Vancomycin PMMA spacer was placed within the current ankle joint (Figure 4).

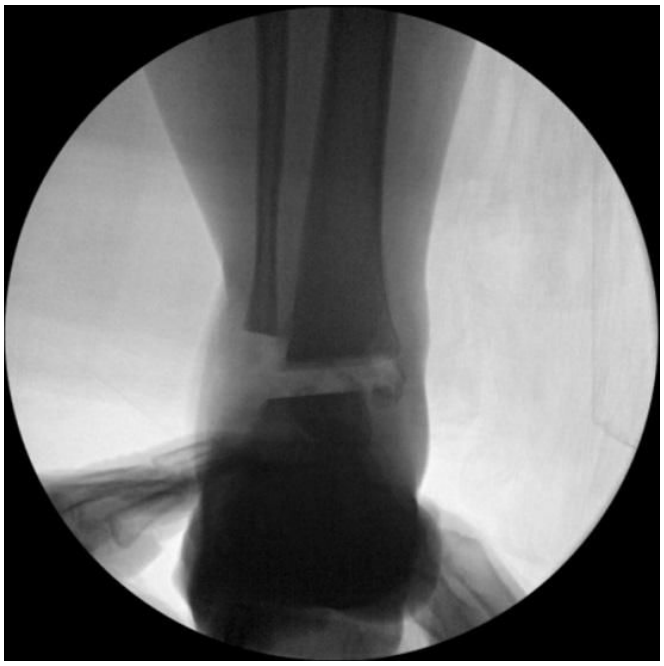

Figure 3 Intra-op radiograph status post fibula take down and wide excisional debridement of tibia and talus.

Figure 4 Intra-op radiographs and picture of Vancomycin PMMA spacer.

This was then stabilized with a monolateral external fixator. The patient was placed on 6 weeks of antibiotic therapy by Infectious Disease including IV Cephazolin and PO Rifampin.

Ten weeks later, the patient underwent intramedullary (IM) nail tibiotalocalcaneal arthrodesis (TTC) (Figure 5). The original lateral incision was utilized to access the ankle joint. The Vancomycin spacer was removed and soft-tissue specimens from the tibia and talus, which were sent for frozen section evaluation by pathology, were negative for infection. The bony surfaces were then prepared for arthrodesis in standard fashion using curettes, osteotomes, and drills. The subtalar joint was prepared in a similar fashion.

Figure 5 Intra-op radiographs (axial view, AP view, and lateral view) of IM nail with fibular pillar grafts.

The ankle was grafted with morselized femoral head combined with bone morphogenic proteins to provide osteoconduction and osteoinduction, as well as fibular pillar grafts to provide structural support and maintain length. Fixation was accomplished with an IM nail. The patient remained non-weight bearing for 3 months. She was then transitioned into a fracture boot for an additional month and then into a sneaker. No major or minor complications were noted throughout her recovery process. The patient has continued to improve throughout the post-operative course and is able to bear weight without assistance in standard foot gear. Serial radiographs have demonstrated complete union of all involved joints (Figure 6).

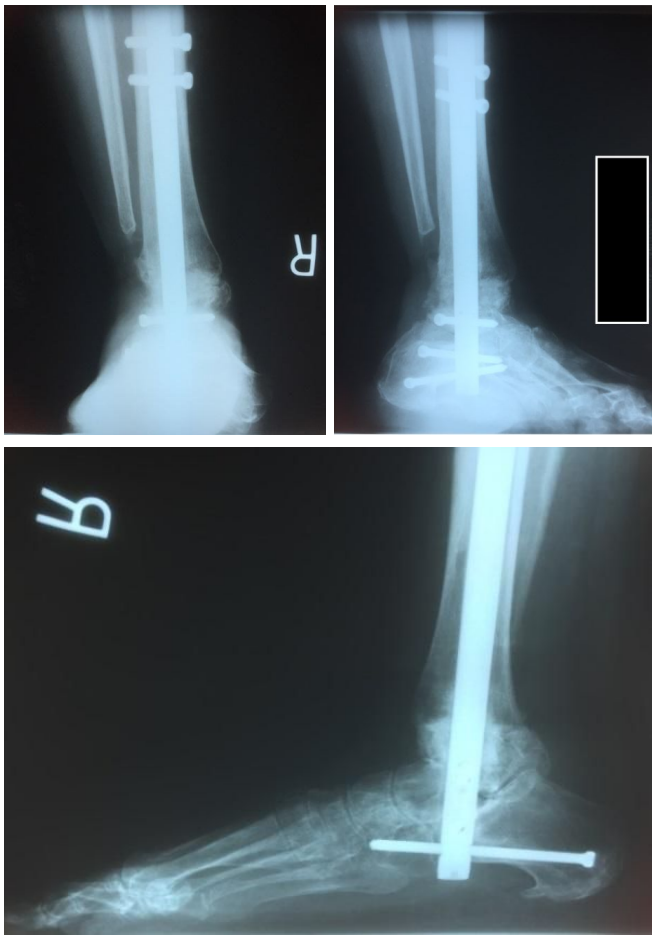

Figure 6 Final radiographs showing consolidation (AP ankle, oblique ankle, lateral view) of IM nail with fibular pillar grafts.

Discussion

The fusion rate within the literature varies dramatically. Hawkins showed a variation between 71-94% depending on the control of infection within the joint [13]. Richter also reported a fusion rate of 86.6% for septic ankles [14]. Cierny et al reported results of 83% to 100%. Cierny believed this was secondary to the quality of the surrounding soft tissues. These cases used either external, or hybrid fixation techniques for their fusion [15].

Treatment of S. aureus septic ankle arthritis should include immediate lavage and debridement of the joint with culture and sensitivity driven antibiotic therapy [14, 15, 20]. However, this treatment alone leaves the patient predisposed to continued pain and discomfort secondary to sequela of septic arthritis. Therefore, ankle arthrodesis should be considered as a long-term option following resolution of the infection [4].

External fixation or a hybrid of external and internal fixation has been recommended for arthrodesis following septic ankle arthritis. We used a solitary IM nail for fixation in our cases. Klouche et al. discussed the use of internal fixation in a one-stage procedure using two cross screws through a lateral approach. There technique provided a cure rate of 85% and a consolidation rate of 89.5% at 4.8 months. Empiric antibiotics were administered to all patients and were modified based on culture and sensitivity results obtained at the time of surgery. No local antibiotics were used with their technique [34]. We used IV antibiotics before and after our definitive procedure, as well as, a Vancomycin loaded cement spacer following debridement of the infected bone.

Though our case study is limited, the results have been comparable to previous studies. This approach appears to be reasonable for limb salvage in end-stage degenerative joint disease following septic ankle arthritis. An evidence based study with increased numbers of patients and long term follow up would be beneficial in further accessing this technique for the treatment of septic arthritis of the ankle.

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