

recommend performing these procedures on a case-by-case basis, taking into account the history of colonization and the presence of risk factors for MRSA [10,15].

Most guidelines advocate for the administration of prophylactic antibiotics within 60 minutes prior to surgery [3,4,6,7,10]. Studies that assessed patterns of antibiotic bone penetration in prosthetic joint replacements report that effective serum levels of Cefazolin persisted for over eight hours after intravenous administration, achieving peak concentration in bone tissue 40 minutes after the dose [13]. Antibiotic administration 15 minutes prior to incision has not proven to be better than 15-60 minutes before the procedure [2]. Experts advise redosing if procedure time exceeds one to two times the half-life of the antibiotic (1.5-two hours in case of Cefazolin) [3,4,6]. There is conflicting evidence for the need to continue prophylaxis postoperatively, but it is clear that there is no benefit in extending the administration of antibiotics beyond 24 hours after the surgical procedure [4-7,10]. If a proximal tourniquet is used, the antimicrobial should be completely infused before inflation [10,13].

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## QUESTION 6: What is the optimal management of patients with prior septic arthritis of the ankle who are undergoing total ankle arthroplasty (TAA)?

**RECOMMENDATION:** There is a paucity of data regarding TAA in patients with prior infection involving the ankle, whether it be septic arthritis, osteomyelitis or infection of the surrounding soft tissues.

We recommend that patients with prior infections in the affected ankle be worked up for infection, including a thorough history and physical examination, as well as ordering serological tests and possible aspiration of the joint. During ankle arthroplasty in patients with prior infection, antibiotics should be added to the cement (if used), and the joint should be thoroughly cleansed. Intraoperative cultures of bone and soft tissue should also be obtained.

**LEVEL OF EVIDENCE:** Consensus

**DELEGATE VOTE:** Agree: 100%, Disagree: 0%, Abstain: 0% (Unanimous, Strongest Consensus)

## RATIONALE

TAA has been used with increasing frequency for the treatment of end-stage arthritis of the ankle. The rate of periprosthetic joint infection (PJI) of the ankle varies in the literature. When it occurs, it can have devastating consequences. There is a paucity of literature regarding the work-up, management and outcomes of PJI in TAA.

With regards to total ankle arthroplasty in patients with a history of infection involving the ankle, only one study in the literature was identified and was a level IV case series. A history of infection in or around the ankle was traditionally seen as a relative, if not absolute, contraindication to TAA [1,2]. However, until 2015, there were no studies on the matter in the foot and ankle literature.

Shi et al. retrospectively identified 22 patients over a 7-year period who underwent TAA who had a history of septic arthritis of the ankle or periarticular osteomyelitis [3]. The preoperative

workup for these patients differed based on clinical suspicion and the treating surgeon's preferences. At the very least, all patients had preoperative blood work in the form of a complete blood count (CBC), erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels. The decision to perform a preoperative joint aspiration or send intraoperative frozen sections or tissue samples for culture was surgeon-dependent.

At a mean follow-up of 29.3 (range, 11.4 to 83.8) months, there were no PJIs, evidence of radiographic loosening or need for revision of the components. The TAA was performed at an average of 8.8 (range, 0 to 44) years after the diagnosis of infection in or around the ankle. Three patients (14%) had delayed wound healing, and three others (14%) underwent subsequent procedures, which were not for the infection and did not involve revision of any of the ankle arthro-

plasty components. The authors of this study concluded that TAA may be a viable option for patients with a history of infection of the ankle [3].

While this study does demonstrate the potential for infection-free survival of a TAA in patients with a history of infection in or around the ankle, the follow-up of the cohort is too short to allow conclusive recommendations to be made regarding this patient population. Therefore, further studies on the topic are needed. In the interim, we recommend that all patients with infection in or around an ankle that is being considered for TAA be worked up for infection prior to the elective arthroplasty. During the arthroplasty, additional

measures should be implemented to reduce the risk of subsequent SSI/PJI.

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## QUESTION 7: During draping for total ankle arthroplasty (TAA), should the foot be prepped into the surgical field or be covered?

**RECOMMENDATION:** There is insufficient data demonstrating any advantage or disadvantage to covering the toes during TAA.

**LEVEL OF EVIDENCE:** Moderate

**DELEGATE VOTE:** Agree: 100%, Disagree: 0%, Abstain: 0% (Unanimous, Strongest Consensus)

### RATIONALE

Multiple studies have shown increased rates of bacterial colonization in the toes after skin preparation [1-4]. Zacharias et al. reported on the pre-procedural cultures in 12 patients who underwent lower extremity orthopaedic surgery not involving the foot [4]. The authors performed pre-procedural toe cultures, prepared the extremity with povidone-iodine and followed with coverage of the toes with a self-adherent wrap. The authors found a 75% rate of positive pre-procedural and aerobic cultures, concluding that there is some benefit to applying sterile draping to the toes in order to minimize the risk of infection. However, the major weaknesses of the latter study are the small sample size ( $n = 12$ ), lack of a control group, preparation of the surgical site being done by an operating room nurse not aware of the study and the use of povidone-iodine.

In another study, Brooks et al. demonstrated that there was a significantly lower rate of bacterial recolonization in patients who underwent a standard antiseptic technique in combination with sliding a gauze swab soaked in topical antiseptic multiple times between the toes compared to standard antiseptic technique alone [1].

Hort and DeOrto designed a study that assessed the amount of residual bacterial contamination after surgical preparation of the foot and ankle with or without the use of alcohol [2]. In this study, the 49 patients were randomly assigned to either a standard preparation with chlorhexidine gluconate home scrubs and preoperative povidone-iodine or a standard preoperative preparation with the addition of 70% alcohol. While there was a trend towards significance, the authors found no significant difference in colonization rates with or without the use of alcohol. However, they found high rates of residual colonization (35% in the standard surgical group and 57% in standard preparation plus alcohol). Subsequently, the authors' conclusions included the recommendation of covering the toes during hindfoot and ankle surgery. No patient had any clinical evidence of infection or wound problems. It should be noted, however, that this study did not specifically compare patients with their toes uncovered or covered.

However, despite the presence of studies recommending covering the toes to decrease the risk of contamination in lower

extremity surgeries, there are limited studies assessing the rates of infection with the toes covered versus uncovered. Goucher et al. performed a prospective, randomized study to assess the effect of covering the toes during hindfoot and ankle surgery [5]. In this study, they performed three sets of cultures (before skin prep, immediately after skin prep and after the conclusion of the surgery) from the foot and toes from one group of 20 patients with their toes covered and a second group of 20 patients with their toes uncovered. Of 40 patients, only two postoperative cultures were positive, and neither of these patients showed any signs of postoperative infection. Additionally, while seven patients showed signs of superficial infection (erythema, superficial dehiscence or suture abscess), there was no difference between the two groups. Therefore, the authors concluded that there were no benefits in covering the toes in hindfoot and ankle surgery.

Recently, the order of skin preparation has also been investigated. Hunter et al. performed a prospective, randomized control study to assess the proper order of skin preparation of foot and ankle orthopaedic surgeries [6]. The authors found that there were lower rates of positive post-procedural cultures in patients undergoing preparation with isopropyl alcohol followed by chlorhexidine compared to patients undergoing preparation with chlorhexidine followed by isopropyl alcohol. However, no assessment was performed comparing coverage versus non-coverage of the toes during the procedure.

Although inconclusive, there is ample evidence of persistence of bacterial colonization irrespective of skin preparation technique of the foot. Consideration should be given to covering the toes to limit the risk of contamination of the surgical site and the potential for subsequent infection.

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