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QUESTION 4: What preoperative optimization should be implemented to reduce the risk of surgical site infection/periprosthetic joint infection (SSI/PJI) in patients undergoing total ankle arthroplasty (TAA)?

RECOMMENDATION: We recommend that patients awaiting TAA be optimized prior to surgery by implementing skin cleansing, nutritional status enhancement, glycemic control, body mass index (BMI) optimization, smoking cessation, and management of immune-modulating comorbidities.

At the time of surgery, there is strong evidence that optimal preparation of the surgical site with an alcohol-containing agent, weight-based and timely administration of antibiotic prophylaxis, and reducing operating room traffic should also be put in place.

LEVEL OF EVIDENCE: Moderate

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

RESPONSE

PJIs complicating total joint arthroplasty (TJA) are potentially catastrophic events to patients and immense financial burden to the healthcare system [1,2]. These events can occur intraoperatively, immediately postoperatively or as a late complication via direct or hematogenous spread of pathogens to the prosthetic joint. The prevention of this potentially serious complication should always be a priority, and this is best achieved by the implementation of proper preventive strategies. Though preoperative optimization prior to TAA is limited in the literature. We recommend utilizing similar methods proven to prevent infection after total knee and hip arthroplasty.

In an attempt to decrease SSIs caused by *Staphylococcus aureus* (*S. aureus*), or MRSA, Alexander et al. recommended the use of chlorhexidine footbaths in patients with nasal colonization of *S. aureus* beginning five days prior to their foot and ankle surgery in addition to standard operative disinfection protocols [3]. Colling et al. demonstrated that a preoperative antiseptic shower and bath policy was associated with a significant decrease in *S. aureus* and MRSA SSI [4]. Despite being a valid option in preventing *S. aureus* and MRSA infections, this shower and bath policy failed to achieve a decrease in the total incidence of SSI. Prior to the procedure, prophylactic antibiotics such as cefazolin can be administered to patients, as this is considered an essential part of the foundation of SSI prevention due to its long-accepted reduction of infection in orthopaedic procedures and a current recommendation from the American Academy of Orthopaedic Surgeons [5–7]. Interestingly, in their retrospective study comparing the use of antibiotic prophylaxis either 15–60 minutes or less than 15 minutes prior to foot and ankle surgeries, Tantigate et al. found that the timing of intravenous antibiotic prophylaxis did not play a significant role in the risk of developing SSI [5].

In addition to external preventative measures, optimizing the nutritional status of patients undergoing TAA to optimize the immune system is important. Several studies on infections following orthopaedic procedures have demonstrated that a lymphocyte count below 1,500 cells/mL, an albumin level below 3.5 g/dL, a zinc level below 5 mg/dL, and a transferrin level below 200 mg/dL have been associated with increased risks of infection and delayed wound healing [8–12]. Therefore, nutritional parameters should be measured in those suspected of being malnourished and the abnormal parameters corrected prior to elective arthroplasty.

The optimization of medical comorbidities should also be considered an essential part of the preoperative protocol aimed at reducing PJI following TAA. Marchant et al. reported that the current glycemic control of patients with diabetes mellitus (DM) is more

important toward the risk of infection following TJA rather than the diagnosis of DM itself, as the risk of infection of diabetic patients with controlled glucose levels was the same as patients without DM [13]. In their study on total hip and knee arthroplasties, Mraovic et al. further concluded that blood glucose levels immediately prior to and after surgery were significantly correlated with subsequent infection risk. These authors reported that non-DM patients with blood glucose levels greater than 140 mg/dL on the morning following surgery had a three-fold increase in infection risk [14]. Therefore, proper glycemic control in all patients should be performed in order to decrease the risk of SSI and PJI.

As obesity has been consistently shown to be associated with SSI risk in total hip and knee arthroplasties, especially BMI > 30 kg/m², weight reduction strategies leading up to surgery as well as dose-based antibiotic prophylaxis immediately prior to surgery in obese patients should be performed [1,15,16].

Certain other comorbidities are also highly related to an increased risk of infection in TJA due to decreased patient immunity, and these should be taken into consideration prior to surgery [1]. In their investigation into patient-related risk factors for PJI following TAA, Althoff et al. reported that, in addition to DM and obesity, a BMI < 19 kg/m², tobacco use, inflammatory arthritis, peripheral vascular disease, chronic lung disease and hypothyroidism were independent risk factors for PJI development following TAA [17]. Therefore, smoking cessation and optimization of these other aforementioned medical comorbidities should be performed prior to surgery. In their discussion of infection reduction following TJA, Matar et al. recommends this optimization of patient health through a preoperative evaluation by an internal medicine consultant or cardiologist, who subsequently follows the patient throughout their hospital course and postoperative period [18].

In the period immediately prior to surgery and within the operating room, we recommend utilizing the specific measures reported by Illingworth et al. and Matar et al. regarding infection minimization in TJA [1,18]. Optimization through the assessment of the skin around the ankle for any irregularities, surgical site skin decontamination through alcohol and betadine solutions, surgical site shaving, planning of surgical incision path, and appropriate draping with plastic adhesive, iodine-impregnated drapes should be considered in order to reduce PJI following TAA [18,19]. In addition, implementation of intraoperative measures, such as reducing foot traffic, having an operating room with an efficient ventilation system to reduce aerosolized particles and performing the surgery in an expeditious manner, are all proven to reduce the risk for subsequent SSI/PJI [18, 20–25].

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QUESTION 5: What prophylactic antibiotic (type, dose and route of administration) should be administered perioperatively for patients undergoing total ankle arthroplasty (TAA)?

RECOMMENDATION: The administration of prophylactic antibiotics before TAA potentially reduces the incidence of surgical site infection (SSI) and/or periprosthetic joint infection (PJI). Weight-based (of at least 2 gm) Cefazolin administered intravenously within 60 minutes prior to the procedure can be an adequate choice for antibiotic prophylaxis.

If the patient has a beta-lactam anaphylaxis, we recommend an appropriate alternative antibiotic effective against *Staphylococcus*.

It is unclear whether prophylaxis should be given as a single dose or as multiple doses.

LEVEL OF EVIDENCE: Strong

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

RATIONALE

Published studies report a rate of PJI after TAA that ranges from 2 to 8.6%, exceeding the risk of infection following knee and total hip replacements [1]. Likewise, the incidence of SSI following foot and ankle elective surgeries (2–4.5%) is higher than other orthopaedic procedures [2].

Most expert panels consider it appropriate for antimicrobial prophylaxis to be routinely utilized in surgeries involving prosthetic joints [3–8]. Unfortunately, no high level evidence is available to corroborate its indication specifically in TAA [9,10].

Gram-positive cocci are the most prevalent pathogens in SSI and PJI in foot and ankle surgeries [15,11]. Cefazolin is the more widely used antibiotic for standard prophylaxis in orthopaedic surgeries,

due to its effective and rapid bone and soft tissue penetration, excellent gram-positive coverage and its long half-life [12,13]. One to 2 grams of Cefazolin administered intravenously is the standard dosage recommended in most guidelines, although some experts suggest increasing the dose to 3 grams if the patient weighs more than 120 kilograms [3,4,7,12]. In patients with a history of severe beta-lactam allergy, who cannot receive cephalosporins, vancomycin or clindamycin are adequate alternatives [3,4,12].

Some studies show reduced SSI rates associated with methicillin-resistant *Staphylococcus aureus* (MRSA) screening and decolonization protocols in elective orthopaedic procedures, but there is no specific data in foot and ankle surgeries or TAA [14,15]. Most experts