reduce MRSA infection rates, due to the smaller number of recruited patients per treatment arm, the five-day treatment period resulted in only a trend towards the reduction of colonization, 13 (59.1%) vs. 9 (90%) for CHG + MUP vs. S + P (p = 0.114). There was no difference in the proportion of MRSA infections between CHG + MUP (seven [31.8%]) vs. S + P (six [60%], p = 0.244). CHG + MUP was ineffective in eradicating MRSA from the anterior nares, but may reduce the incidence of infection [12].

A pilot RCT evaluated SSI among patients with open fractures that received prophylaxis during 24 hours with cefazolin compared with vancomycin and cefazolin, depending upon their *S. aureus* colonization status. MSSA and MRSA carriers were 20% and 3%, respectively. Although underpowered with a sample size too small for a clinical efficacy analysis, no significant difference in the rates of SSI was observed between the treatment arms. A significantly higher rate of MRSA SSIs was observed among MRSA carriers compared with noncarriers (33% vs. 1%, respectively, p = 0.003) [13]. Other factors that raise the risk of MRSA infection include the use of external fixation and a prolonged time to intramedullary nailing of long bone fractures [14].

Torbert's retrospective study identified *S. aureus* and gram-negative rods (GNRs) as most commonly seen in deep postoperative infections. GNRs were seen more frequently in the pelvis acetabulum and proximal femur injuries even in closed fractures. Resistance to GNRs was lower than *S. aureus,* and the infection rates for combined surgical approaches were twice that of a single approach for acetabular or pelvic surgery [15].

Severity of open fracture plays a role in the choice of antibiotics. There was no statistically significant difference in infection rates between the group treated with ciprofloxacin and that treated with cefamandole/gentamicin for Types I and II open fracture wounds. A high failure rate for the ciprofloxacin only treated Type III open fracture group, with patients being 5.33 times more likely to become infected than those in the combination therapy group [16].

The anatomic location of surgery should be considered when administering preoperative antibiotics. Corynebacterium genera are frequently associated with implants when surgical incisions were made near the perineum [17]. *Cutibacterium acnes* is bacterial species that is often seen in the axilla and coverage for these organisms should be considered when operating near this anatomical location [18].

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QUESTION 5: Is periprosthetic fracture a risk for the development of a periprosthetic joint infection (PJI)?

RECOMMENDATION: Infection rates from level III and IV evidence studies suggest an increased surgical site infection in patients who undergo re-operation for treatment of periprosthetic fracture of the femur after total hip and knee arthroplasty. There is limited literature available on periprosthetic acetabular and tibial fractures. Further study investigating the outcomes for treatment of periprosthetic fracture is recommended.

LEVEL OF EVIDENCE: Limited

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

RATIONALE

Periprosthetic fracture about a hip or knee replacement can be a devastating complication. Almost all studies involving periprosthetic fractures are limited to small, retrospective case series and many of the studies focus on one type of treatment for one type of fracture. Additionally, most of these studies focus on the return to function and union of the fracture as primary endpoints. As a result, there is limited data on the risk of surgical site infection in the presence of a periprosthetic fracture.

Periprosthetic fractures about the acetabular component of a total hip replacement are uncommon and typically involve high-energy injuries. Treatment is based on the fracture pattern and stability of the implant. Protected weightbearing or revision surgery, often with supplemental fixation, are utilized for treatment. A retrospective review of 11 patients did not discuss infection as a complication [1].

Periprosthetic fractures about the femoral component of a total hip replacement are most commonly reported in the literature. These fractures can be treated either nonoperatively or surgically, based on the fracture pattern and stability of the implant. Plate fixation, revision hip arthroplasty or combination treatment are the most common methods of surgical treatment. A study from the Swedish joint replacement registry identified 1,049 periprosthetic femur fractures treated surgically over a 21-year period. Over this period, 245 patients underwent re-operation, the most common reasons for failure being loosening, re-fracture and non-union. There was an infection rate of 2.3% (24 cases), and infection was more common in the plate fixation group than the revision hip arthroplasty group [2].

A study from the Mayo Clinic demonstrated 5 (4.2%) deep periprosthetic infections after femoral component revision of 118 Vancouver Type B periprosthetic fractures [3]. Similarly, a systematic review of 22 studies totaling 510 Vancouver Type B2 and B3 fractures demonstrated 13 (2.5%) surgical site infections [4]. In cases of extremely poor bone stock, a retrospective review demonstrated a 19% infection rate in 19 proximal femoral replacements [5].

Periprosthetic fractures about the distal femur after total knee replacement can be treated nonoperatively or surgically based on the fracture pattern and stability of the implant. Fractures can be treated with intra-medullary nail fixation, plate fixation or revision knee arthroplasty. A systematic review of 415 fractures from 29 case series demonstrated an infection rate of 3% [6].

Periprosthetic fractures about the tibia after total knee replacement are rare (0.4 to 1.7%) and can often be treated nonoperatively [7,8]. Surgical treatment with plate fixation, intramedullary nail fixation or revision arthroplasty is uncommon, and the current literature is limited to small retrospective case series.

While randomization would be difficult due to limited previous experience with these complicated cases, future study should involve prospective, multi-centered investigations involving larger numbers of patients to gain a better understanding of the natural history and outcomes of patients who undergo treatment for periprosthetic fractures.

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QUESTION 6: Are there predictors of the need for allogeneic blood transfusion (ABT) in patients undergoing arthroplasty for acute hip fractures?

RECOMMENDATION: Preoperative predictors for the need for ABT include (1) anemia and (2) dementia and hypoalbuminemia. (3) Anticoagulation or anti-platelet medications do not predict the need for ABT. There is conflicting data with regard to the need for ABT when comparing hemiarthroplasty (HA) to total hip arthroplasty (THA).

LEVEL OF EVIDENCE: (1) Strong, (2) Limited, (3) Moderate

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

RATIONALE

Preoperative anemia is a known risk factor for ABT in patients undergoing hip and knee arthroplasty [1,2]. A retrospective study of 1,484 patients with hip fractures from 2007 to 2010 identified the risk factors for ABT as older age, lower hemoglobin on admission, female gender, type of surgical implant used (cephalomedullary nail and dynamic hip screw more than HA) and a shorter time from admission to surgery. The study is limited by transfusion thresholds, which may artificially increase the rate of ABT [3]. In hip fracture patients, regardless of fixation or fracture type, hypoalbuminemia [4] and dementia [5] are associated with an increased need for ABT.