QUESTION 10: What is the optimal choice and duration of antibiotic therapy in polymicrobial surgical site infection/periprosthetic joint infection (SSI/PJI)?

RECOMMENDATION: The optimal choice and duration of antimicrobial therapy in polymicrobial PJs remain unknown. Antimicrobial therapy for polymicrobial PJI should be targeted at the organisms that are present. There is limited literature on the antibiotic treatment as polymicrobial PJs are very heterogeneous. We recommend four to six weeks of intravenous or highly-available oral antimicrobial therapy, that is based on the in vitro susceptibilities of the individual microorganisms, patient allergies and intolerances.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 92%, Disagree: 5%, Abstain: 3% (Super Majority, Strong Consensus)

RATIONALE

Polymicrobial PJI, as identified by isolation of multiple organisms by culture, constitutes between 6% and 37% of reported PJI [1–4]. Patients with polymicrobial PJI have worse outcomes when compared to monomicrobial PJI and culture-negative PJI, regardless of the surgical treatment [5,6]. Studies have shown a lower success rates of polymicrobial PJs (37 to 67%) compared to that of monomicrobial PJs (69% to 87%) [5–9]. The treatment often requires broad-spectrum antibiotics or multiple antibiotics given that multiple organisms need to be targeted. Unfortunately, there is minimal literature regarding the optimal choice and duration of antibiotic therapy in patients with polymicrobial PJI. This is largely due to the fact that polymicrobial PJs are very heterogeneous and may represent many combinations of infecting organisms including fungi. However, there are many studies that have demonstrated that polymicrobial PJs are associated with certain bacteria. Marculescu et al. found that methicillin-resistant Staphylococcus aureus (26.4% versus 7.1%) and anaerobes (11.7% versus 2.8%) were more common in polymicrobial PJs. In addition, Tan et al. reported that the isolation of gram-negative organisms (p < 0.01), enterococci (p < 0.01), Escherichia coli (p < 0.01), and atypical organisms (p < 0.01) was associated with polymicrobial periprosthetic joint infection. Furthermore, many of these organisms are associated with high failure rates and the optimal antimicrobial for these organisms are still being defined [10,11].

While there are no randomized studies to compare the duration of treatment for polymicrobial PJs compared to monomicrobial PJs, patients treated for polymicrobial PJs received four to six weeks of antimicrobial therapy [6–8], with the choice of an initial two weeks of parenteral antimicrobial therapy followed by four weeks of oral and highly-available antibiotic therapy [7,8]. Current Infectious Disease Society of America (IDSA) guidelines, while not specifically addressing polymicrobial PJs, suggest four to six weeks of pathogen specific intravenous or highly-available oral antimicrobial therapy, which does not differ from the treatment of monomicrobial PJs [12].

A study done by Moran et al. on 112 patients showed that polymicrobial organisms were present in 46.7% in the early postoperative period (within 3 months of prosthesis implantation) [3]. While in this study gram-negative organisms were seen only in 8% of the polymicrobial isolates, among these isolates were organisms classically associated with chromosomal AmpC inducible beta-lactamases (E. cloacae, Serratia spp, Morganella morganii), and resistant Acinetobacter spp. These findings, along with a high rate of beta-lactam resistance among coagulase-negative staphylococci (CoNS) have led the authors to recommend a broad-spectrum empirical antimicrobial coverage with a glycopeptide and a carbapenem [3]. In contrast, a study by Sousa et al. found no increased prevalence of polymicrobial infection in the early postoperative period, but they too recommend a carbapenem and vancomycin as empirical antimicrobial therapy for chronic and hematogenous infections when polymicrobial infection was present [13].

When selecting empirical antimicrobial therapy for polymicrobial PJs, it is therefore important to be aware of the local and institutional gram-negative and gram-positive resistance pattern. Broad-spectrum antimicrobials should be stopped as soon as susceptibility results are available and effective antimicrobials with the narrowest spectrum of activity should be selected for completing the therapy.

Given that outcomes are poor with polymicrobial PJs, chronic suppression may be warranted as multiple studies have demonstrated increased survivorship with the addition of oral antibiotics [14,15]. Frank et al. demonstrated that patients treated with oral antibiotics failed secondary to infection less frequently than those not treated with antibiotics (5% versus 19%, p = 0.016) in a prospective randomized controlled trial [14].

REFERENCES


