

Do Systemic Symptoms of Infection on Presentation Negatively Impact Outcomes of DAIR?

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Disclosures: A.V. Carli: 3B; Heraeus Medical. M.J. Fowler: None. E.S. Belay: None. Y.M. Chiu: None. D. Devine: None.

INTRODUCTION: Prosthetic Joint Infection (PJI) is a devastating complication of total joint arthroplasty (TJA), often presenting with a prolonged course of joint dysfunction and pain. However, patients can present with acute systemic symptoms of infection that can be life threatening, resulting in systemic inflammatory response syndrome (SIRS) or even sepsis. Such presentations necessitate urgent surgical debridement, antibiotics, and implant retention (DAIR). Previous studies based on small patient cohorts have determined that sepsis or a positive blood culture is associated with poor outcomes following DAIR. The purpose of the current study was to evaluate the effect of blood cultures, SIRS, and sepsis on DAIR outcomes in the largest related patient cohort collected to date.

METHOD: 275 patients underwent DAIR for PJI (defined by 2011 Musculoskeletal Infection Society [MSIS] criteria) at a single institution between January 2017 to January 2021. The presence of SIRS involved at least two of the following: body temperature $<36^{\circ}\text{C}$ or $>38^{\circ}\text{C}$, heart rate >90 beats/minute, respiratory rate >20 breaths/min, and serum leukocyte count >12000 or <4000 /microliter. Sepsis was defined as SIRS plus a positive blood culture. DAIR treatment success was defined at 1-year postoperatively according to the 2019 MSIS working group tiers. Multivariable logistic regressions were calculated to investigate the association between SIRS, blood culture, sepsis, and treatment success while adjusting for PJI chronicity, C-reactive protein, synovial white blood cells (WBC) count, positive tissue culture, body mass index (BMI), sex, and Charlson Comorbidity Index (CCI).

RESULTS: 47 (17.1%) PJI patients presented with SIRS on admission, 18 (6.5%) had a positive blood culture, and 6 (2.2%) presented with sepsis. DAIR treatment success at 1-year (MSIS Tiers 1 and 2) was achieved in 174 (63.3%) patients. In regression analysis, patients with BMI >40 (OR 3.1 95% CI (1.1-9.0), $p=0.049$) were more likely to present with SIRS. SIRS, positive blood culture, and sepsis had no significant association with DAIR treatment failure. CCI ≥ 3 , diabetes, and synovial WBC $>10,000$ were significantly associated with DAIR treatment failure.

DISCUSSION: Our study found no significant association between presence of SIRS, blood culture, or sepsis and increased risk of DAIR failure. Our findings did reveal that patients with BMI >40 had a significantly greater risk of presenting with systemic symptoms of PJI, suggesting these patients should be monitored closely in the postoperative period. While systemic symptoms were not predictive of treatment outcome, Charlson Comorbidity Index, diabetes mellitus, and synovial WBC were significantly associated with DAIR failure. This suggests that other factors may have more value in predicting DAIR outcomes than the presence or absence of sepsis. There are limitations to the present study. The association between systemic symptoms and DAIR outcomes was not statistically significant; however, it trended towards significance. While this is the largest study to date, we may have been underpowered to detect a significant association. While we were thorough with follow-up efforts, our institution is a tertiary care center without an emergency department, leaving the possibility that patients may have sought follow-up care at another institution.

CONCLUSIONS: This is the largest study to date to investigate the association between systemic PJI and DAIR outcomes. We observed that greater than 1 in 6 patients undergoing DAIR presented with SIRS and 1 in 50 presented with sepsis. The presence of SIRS, positive blood culture, and sepsis on admission were not associated with poorer infection control, suggesting that DAIR is an appropriate treatment in the context of these urgent clinical situations.