Is Periprosthetic Joint Infection Associated with Increased Mortality Rate in Revision Shoulder Arthroplasty?

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INTRODUCTION:
Periprosthetic joint infections (PJI) are a devastating complication after shoulder arthroplasty and may carry an increased mortality risk, as seen in hip and knee arthroplasty patients. Shoulder PJI organisms differ from hip and knee infections, as lower virulence organisms, such as *C. acnes*, are more commonly the offender. Therefore, the findings from the lower extremity literature should not be directly extrapolated to the upper extremity. This study evaluated the impact of PJI in the setting of revision shoulder arthroplasty on mortality.

METHODS: We retrospectively identified 411 patients who underwent revision shoulder arthroplasty from 2007 to 2020 at a single institution. 2018 ICM criteria were used to categorize each case as definite, probable, possible, or unlikely PJI. Mortality rate was assessed by performing chart reviews and an obituary search. Revision cases were grouped into a septic cohort (definite and probable PJI) and an aseptic cohort (possible and unlikely PJI). Statistical analysis was performed to describe mortality rate at thirty days, ninety days, one year, two years, and five years after surgery. Demographic information and culture data were collected. PJI organisms were categorized as virulent or non-virulent per an infectious disease specialist with non-virulent organisms including those associated with an indolent presentation. Group comparisons were performed to identify possible predictors of mortality. Subgroup analysis within the septic group compared mortality between virulent and *C. acnes* infections.

RESULTS:
333 patients were categorized in the aseptic group and 78 in the septic group. The overall mortality rate was significantly greater ($p<0.001$) in the septic group (20.5%) than in the aseptic group (6.6%). When evaluating time from revision surgery to death, patients with PJI had significantly greater mortality compared to those undergoing aseptic revision at two years (7.7% vs 2.1%, $p=0.01$) and five years (17% vs 5.1%, $p<0.001$). BMI, Charlson Comorbidity Index (CCI), race, sex, and age were not significantly different between groups. Groups differed in utilization of staged procedures (65% septic, 9% aseptic, $p<0.001$). Multivariate regression analysis found that the variables most associated with mortality were septic revision, staged procedures and CCI. In the septic group, 60% (47/78) of infections were due to virulent organisms and 40% (31/78) were non-virulent. Virulent organism infections had a significantly greater mortality rate than *C. acnes* infections (26.5% vs. 4.5%, $p=0.046$).

DISCUSSION AND CONCLUSION: Revision shoulder arthroplasty in the setting of PJI not only carries severe functional consequences for patients, but also increases mortality risk. Furthermore, septic revisions caused by virulent organisms portend a worse prognosis than those infected with C. acnes. Continued efforts to decrease shoulder arthroplasty infection rates are warranted and may influence long-term patient survival.