

Patient Survivorship after Anatomic Total Shoulder Arthroplasty: Are Patients Failing Before Their Prosthetics? A 10 year minimum follow-up analysis.

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INTRODUCTION:

Since the development of shoulder replacement, focus has been placed on the timeline in which glenoid loosening occurs or rotator cuff integrity fails amongst other surgery specific pitfalls of the operation. What has been less researched is longer term patient survival following shoulder arthroplasty. Short-term mortality following primary shoulder arthroplasty has been well defined in the literature, quoted at a rate of 0.09% in-hospital, 0.25% 30-day mortality, and 1.3% 90-day mortality. One goal of shoulder replacement is to provide an operation that will last the patient through their lifetime. With this goal in mind, the long term patient survival relative to implant survival is an important consideration during preoperative patient counseling. This study aimed to evaluate patient and implant survivorship after anatomic total shoulder arthroplasty for glenohumeral osteoarthritis at minimum 10 year follow-up and identify risk factors for mortality and revision surgery.

METHODS:

This was a single institution, retrospective, cohort study of all patients who underwent primary anatomic total shoulder arthroplasty for glenohumeral osteoarthritis from 2005 to 2011. Patient characteristics including age, sex, BMI, race, and Charleston co-morbidity index (CCI) were recorded. A patient medical record query and a national obituary database query were performed to assess for revision surgery or patient mortality. Reason for revision surgery was recorded. Patients were stratified into groups based on whether they underwent a revision surgery or passed away prior to a revision procedure. Analysis of Variance (ANOVA) was performed to compare groups and assess for associated risk factors ($p < 0.05$ was significant). Kaplan-Meier survival analysis was utilized to project long term revision and patient survival rates.

RESULTS: Three Hundred and Sixty Two patients met inclusion criteria. Mean patient age was 65.4 +/- 10.02 years and 242 (66.9%) patients were male. Mean BMI was 29.73 +/- 5.62 and the mean CCI was 3.28 +/- 1.29. Fifty six patients (15.5%) passed away within the study period prior to undergoing revision surgery. Twenty patients (5.5%) underwent revision surgery within the study period. Reason for revision included rotator cuff insufficiency (8), glenoid loosening (4), posterior instability (4), infection (3), and culture negative continued shoulder pain (1). On ANOVA analysis, older age and higher CCI were associated with an increased risk of mortality ($p < 0.001$) [Table]. Patients in the revision cohort were significantly younger than patients that did not undergo revision surgery (60.3 years vs 64.3 years, $p = 0.01$). Sex, BMI, and race were not associated with revision or mortality in this cohort [Table]. Kaplan-Meier survival analysis is demonstrated in the **Figure** for both revision surgery and mortality.

DISCUSSION AND CONCLUSION:

At minimum of 10 years following anatomic total shoulder arthroplasty, 15.5% of patients passed away with their index procedure implants; 5.5% of patients underwent revision shoulder surgery with rotator cuff insufficiency being the most common reason for revision. Older patients (mean age 72.2) and patients with more medical co-morbidities are more likely to retain their index procedure implants throughout their lifetime than undergo revision surgery. This study provides data to help with preoperative patient guidance and shared medical decision making. Furthermore, in cases where a patient's shoulder pathology (i.e. glenoid deformity or rotator cuff status) does not definitively dictate the operative indication (anatomic or reverse arthroplasty), this knowledge provides insight to help guide implant selection on the part of the surgeon.

Figure. Kaplan-Meier survival analysis demonstrating long term risk for progression to **A)** revision surgery compared to **B)** patient mortality.

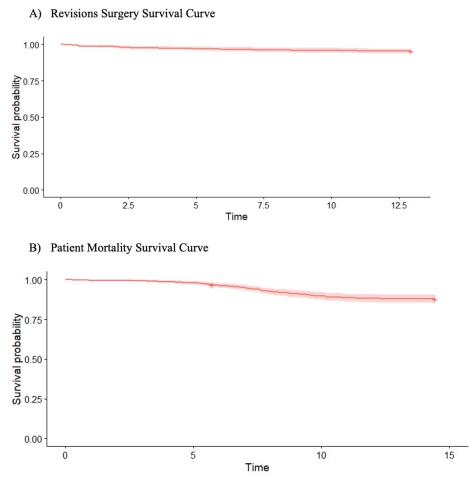


Table. Patient characteristic and risk factor analysis for revision surgery and patient mortality following primary anatomic total shoulder arthroplasty. Analysis of Variance (ANOVA) statistical analysis was utilized with significance set at $p < 0.05$.

	No Revision or Mortality (N=286)	Revision (N=20)	Mortality (N=56)	p-value
Age (SD)	64.3 (9.59)	60.3 (10.8)	72.2 (8.97)	<0.001
Sex				
Female (%)	92 (32.2%)	6 (30.0%)	22 (39.3%)	0.558
Male (%)	194 (67.8%)	14 (70.0%)	34 (60.7%)	
BMI (SD)	29.7 (5.42)	31.3 (5.46)	29.6 (6.68)	0.453
Charleston Comorbidity Index (SD)	3.12 (1.23)	2.95 (1.23)	4.20 (1.29)	<0.001
Race				
White	267 (93.4%)	20 (100%)	55 (98.2%)	0.267
Non-White	19 (6.64%)	0 (0.00%)	1 (1.79%)	