Minimum 10 Year Survivorship and Risk Factors for Failure Following Reverse Total Shoulder Arthroplasty

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INTRODUCTION: Although prior studies have explored risk factors for short- and mid-term failure following reverse total shoulder arthroplasty (RTSA), there is a paucity of data characterizing factors associated with long-term survivorship. This study aims to evaluate minimum 10-year survivorship and identify risk factors for failure in patients undergoing RTSA.

METHODS: A retrospective cohort study was conducted using the PearlDiver Mariner database to identify patients who underwent RTSA from 2010 to 2013, identified using the International Classification of Diseases (ICD) procedural code ICD-9-P-8188. Patients without active medical records at least 10 years postoperatively were excluded. Failure was defined as the incidence of revision prior to final follow-up using Current Procedural Terminology (CPT) codes (CPT-23473, CPT-23474) and ICD codes (ICD-9-P-8197, ICD-10-P-0RWJ0JZ, ICD-10-P-0RWJ4JZ, ICD-10-P-0RWK0JZ). Due to patient cohorts available with the relevant CPT codes, we defined revision as any alteration or replacement related to the metal arthroplasty components. Kaplan-Meier survival analysis was used to estimate survivorship at 2, 5, and 10 years postoperatively. Multivariate logistic regression was used to identify risk factors for failure within 10-year follow-up. Primary outcomes were failure rates and time to failure; secondary outcomes included risk factors for failure.

RESULTS:

A total of 5,269 patients undergoing reverse total shoulder arthroplasty (RTSA) from 2010 to 2013, with active records 10 years postoperatively, were identified and retained in the final analysis. A total of 273 patients underwent revision surgery within the follow-up period. One-year, five-year, and ten-year survival rates following RTSA were 97.8%, 95.7%, and 95.0%, respectively. The average time to revision was 928.16 days (2.54 years) while 50% of the revisions occurred within 509 days (1.39 years). On multivariate analysis, male gender was significantly associated with increased odds of reoperation (OR 1.58, p<0.001) in addition to prior arthroscopy (OR 1.49, p=0.046) and a primary diagnosis of glenohumeral osteoarthritis (OR 1.34, p=0.02). Increasing age at the time of surgery was protective (OR 0.96, p<0.001). Charlson comorbidity index, diabetes, tobacco use, primary diagnosis of proximal humerus fracture, and socioeconomic factors, were not associated with failure on multivariate analysis.

DISCUSSION AND CONCLUSION:

Reverse total shoulder arthroplasty demonstrates excellent 10-year survivorship (95.0%) with a low revision rate. Most patients who failed underwent revision RTSA within 2 years of the index procedure. Male sex, younger age, prior shoulder arthroscopy, and a primary diagnosis of glenohumeral osteoarthritis were risk factors for failure at long-term follow-up. Long term database studies are helpful augments to the shoulder arthroplasty survival literature, which is largely dominated by individual surgeon series and registry data.

Figure 1. Kaplan-Meier Survival Curve for Revision-Free Survival Over 10 Years

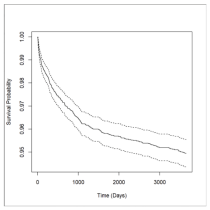

Table 1. Patient Demographics and Co-Morbidities

Characteristic	N (%)
Total Patients	5, 269
Male	1791
Female	3478
Age	68.30 ± 6.36
Average CCI	1.59 ± 1.84
Average Length of Stay	2.75 ± 2.07
Comorbidities	
Hypertension	3234 (61.4)
COPD	177 (3.4)
CHF	195 (3.7)
Tobacco Use	542 (10.3)
CKD	256 (4.9)
Diabetes	1168 (22.2)
Alcohol Use	62 (1.2)

CCI: Charlson Comorbidity Index
COPD: Chronic Obstructive Pulmonary Disease
CHF: Congestive Heart Failure
CKD: Chronic Kidney Disease

Table 2. Kaplan – Meier Summary Survival after RTSA

Timepoint	Survival Rate	95% CI
1-year	97.8%	(97.4-98.2)
5-year	95.7%	(95.2-96.3)
10-year	95.0%	(94.4-95.5)
Average Time to Failure	928.16 ± 1066.13 days	
Median Time to Failure	509 days	
25th Percentile	123 days	
75th Percentile	1272 days	

Table 3. Risk Factors of Failure Following RTSA at 10 Year Follow-up

	Unadjusted OR	P-Value	Adjusted OR	P-Value
Predictor				
Age	**0.95**	**<0.001**	**0.96**	**<0.001**
Male Gender	**1.62**	**<0.001**	**1.58**	**<0.001**
Region NE	0.74	0.062	0.76	0.220
Region SO	0.89	0.310	0.86	0.283
Region WE	0.94	0.670	0.94	0.744
CCI	1.05	0.323	1.02	0.514
Prior Arthroscopy	**1.67**	**0.002**	**1.49**	**0.046**
Osteoarthritis	**1.33**	**0.006**	**1.34**	**0.021**
Fracture	0.96	0.775	1.34	0.123
Diabetes	1.17	0.165	1.06	0.698
Smoking	**1.87**	**<0.001**	1.20	0.301
Mean Family Income	1.00	0.454	1.00	0.407
Unemployment Rates	6.73	0.387	5.76	0.526