

Reverse Total Shoulder Arthroplasty for Fracture and Rotator Cuff Arthropathy: A Retrospective Analysis of Outcomes and Implant Longevity

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INTRODUCTION: Over the past few decades, the indications of reverse total shoulder arthroplasty (RTSA) have expanded beyond rotator cuff arthropathy to include a variety of complex shoulder pathologies, including proximal humerus fracture. With an increasing elderly population in the United States, the incidence of such fractures is rising rapidly. There is limited research assessing differences in functional outcomes and complications between RTSA for fracture and elective indications such as rotator cuff arthropathy. The purpose of this study was to analyze differences in clinical and functional outcomes in patients undergoing RTSA for fracture and rotator cuff arthropathy at a minimum 2-year follow up. We hypothesized that fracture patients undergoing RTSA will exhibit worse functional outcomes and higher complication rates compared to rotator cuff arthropathy patients.

METHODS: Institutional records were searched for all patients who underwent RTSA between 7/01/2009 to 10/01/2019 with a minimum 2-year follow up. Patients were separated into cohorts based on indication for surgery, specifically rotator cuff arthropathy and fracture. The fracture cohort included patients with acute fracture, post-fracture osteoarthritis, fracture mal- or nonunion, and post-fracture avascular necrosis. Exclusion criteria included revision RTSA or conversion to a reverse from an anatomic or hemiprosthesis. Electronic medical records were retrospectively evaluated for patient demographic information, postoperative range of motion and strength measurements, and surgical complications. Continuous variables were analyzed using the Two-sample *t*-Test, ordinal variables were analyzed via ordinal logistic regression, categorical variables were analyzed using the Chi-squared test, and a 5-year survivor analysis was performed.

RESULTS: A total of 154 patients met the inclusion criteria, with 33 in the fracture cohort and 121 in the arthropathy cohort. Fracture patients exhibited significantly higher mean BMI (33.6 ± 10.7 vs. 30.4 ± 5.9 ; p-value 0.0295) and proportion of female patients (78.8% vs. 54.5%; p-value 0.012) than the rotator cuff arthropathy group. There were no significant discrepancies in mean age or follow up between groups. Postoperatively, the fracture group exhibited less forward elevation ($122.4^\circ \pm 42.9^\circ$ vs. $141.8^\circ \pm 21.3^\circ$; p-value < 0.001) than rotator cuff arthropathy patients. There were no significant differences in external rotation, internal rotation, or strength measurements between groups. Survival analysis revealed a 2-year survival rate of 100% and a 5-year survival rate of 72.3% (26.2-92.5% confidence interval) in the fracture cohort as well as a 2-year survival rate of 98.2% (92.9-99.5% confidence interval) and a 5-year survival rate of 89.3% (78.5-94.8% confidence interval) in the rotator cuff arthropathy cohort. One fracture patient and two rotator cuff arthropathy patients suffered postoperative fractures. Two revision procedures were required in the fracture group and three revisions were required in the arthropathy group.

DISCUSSION AND CONCLUSION: RTSA is a useful intervention that improves shoulder functionality in acute fracture and fracture sequelae patients. However, despite increases in functionality after fracture, implant longevity, particularly at 5 years, and forward elevation range of motion outcomes after RTSA for fracture were significantly worse when compared to patients undergoing RTSA for rotator cuff arthropathy. Continued research with larger sample sizes is necessary to elucidate the mechanisms behind the observed differences in clinical and functional outcomes as well as optimize the longevity and functionality of reverse implants following RTSA for fracture.

Table 1. Postoperative functional measurements after RTSA for fracture.

	Fracture		Rotator Cuff Arthropathy		p-value
	Sample Size	Measurement	Sample Size	Measurement	
Forward Elevation ROM	31	122.4 ± 42.9	117	141.8 ± 21.3	0.005
External Rotation ROM	31	42.9 ± 18.8	117	40.4 ± 11.8	0.3660
Internal Rotation ROM	29	L5	101	L5	0.362
Forward Elevation Strength	26	4+/5	108	5/5	0.559
External Rotation Strength	26	4+/5	102	4+/5	0.358
Internal Rotation Strength	25	4+/5	108	5/5	0.096

RTSA: reverse total shoulder arthroplasty
ROM: range of motion
Bold Text Indicates Significance

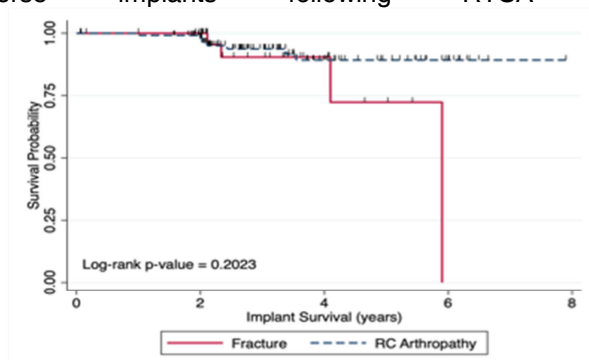


Figure 1. 5-year implant survival in RTSA for fracture vs rotator cuff arthropathy patients.