The Impact of Prior Arthroplasty Type on Minimum One-Year Clinical and Patient Reported Outcomes in Patients Undergoing Aseptic Revision to Reverse Total Shoulder Arthroplasty

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INTRODUCTION:

Shoulder arthroplasty volume has grown exponentially since the introduction of reverse total shoulder arthroplasty (RSA) to the United States in 2004. In keeping with the growing annual number of primary arthroplasties, revision shoulder arthroplasty incidence has also increased, with RSA becoming the dominant choice for implant. Over 10,000 revision surgeries were performed in 2017, and studies project this number will go up 300% by 2030. The shoulder arthroplasty literature has demonstrated significant improvement in clinical and patient reported outcome measures (PROM) after revision. However, compared to primary arthroplasty, revision outcomes are less predictable, and the rate of complications and reoperation remains high. Despite the growing number of revisions, the effect of pre-operative patient and implant factors on the outcome is unclear. This study aimed to examine associations between prior arthroplasty type, patient characteristics, and postoperative outcomes – including PROMs, shoulder range of motion (ROM), complication rates, and reoperation rates – in the context of aseptic revision to RSA.

METHODS: A retrospective review was performed to identify all patients who underwent aseptic revision to RSA at a single academic institution between 2016 and 2022. The primary variable of interest was prior arthroplasty type, defined as hemiarthroplasty (HA), anatomic total shoulder arthroplasty (TSA), and RSA. Electronic medical records were reviewed to identify patient demographics and pertinent medical history. Operative reports, radiographs, and clinic notes were reviewed to determine prior arthroplasty type, pre-operative and post-operative ROM, and complications and reoperations at minimum 1-year follow-up. PROMs were prospectively collected at pre-operative and post-operative visits in the form of the American Shoulder and Elbow Society (ASES) Score and Single Assessment Numeric Evaluation (SANE) score with minimum 1-year follow-up.

RESULTS: We identified 291 aseptic revision-to-RSA procedures performed between 2016 and 2022, with primary implants being HA in 83 patients (28.5%), TSA in 102 patients (35.1%) and RSA in 106 patients (36.4%). Patients who had prior HA were significantly younger than TSA and RSA (62 years vs 66 years vs 70 years, $p < 0.001$) and had lower Charlson Comorbidity Index (0 vs 1 vs 1, $p = 0.003$). Baseline ASES and SANE scores were not significantly different between the three groups. Baseline forward elevation (FE) was worse for RSA compared to HA and TSA (120^o vs 120^o vs 100^o, $p=0.038$), with no difference between the three groups in external rotation (ER) and internal rotation (IR) ($p>0.05$). RSA had significantly shorter time to revision than HA and TSA (168 months vs 174 months vs 97 months, $p < 0.001$). There was significant improvement from pre-op to post-op ASES and SANE scores in all three groups ($p < 0.001$). The total ASES score for the RSA cohort at one-year post-revision was significantly lower than the TSA and HA groups (69.6 vs 71.5 vs 59.7, $p=0.02$) (Table 1). Similarly, the one-year post-revision SANE score for RSA was also significantly lower than the TSA and HA groups (69.4 vs 69.5 vs 56.4, $p=0.022$). Post-operative ROM were found to be lower in the RSA group compared to HA and TSA group in FE (133.9^o vs 140.0^o vs 126.4^o, $p=0.007$), ER (40.1^o vs 45.1^o vs 38.9^o, $p=0.018$), and IR (lumbar for HA and RSA vs thoracic for TSA, $p=0.11$). The overall complication rate was 34% (n=99) with majority being instability, baseplate loosening, and periprosthetic fractures, and the overall reoperation rate was 16.8% (n=49). The RSA had a higher complication rate (26.5% vs 32.4% vs 41.5%, $p=0.09$) and reoperation rate (13.3% vs 13.7% vs 22.6%, $p=0.13$) compared to TSA and HA without statistical significance.

DISCUSSION AND CONCLUSION: With growing incidence of revision annually, understanding the implications of prior arthroplasty type on outcomes is crucial to both surgical planning and patient counseling. There is a current trend toward higher use of RSA in the primary arthroplasty setting. Our data shows that, at a single tertiary referral center with a high revision volume, in patients who underwent revision to RSA, patients with index RSA surgery had significantly worse PROMs and lower ROM metrics at one-year post-revision than patients with index TSA and HA for every variable analyzed. This data brings attention to the need for better long-term studies on the outcomes of revision total shoulder arthroplasty and should inform our decisions made on implant type during index surgery.

Table 1: One-year post-revision to RSA outcome measures (ASES score, SANE score, forward elevation, external rotation, internal rotation) by index arthroplasty type with significance levels (* indicates statistical significance)

Outcome	Scale	HA	TSA	RSA	Significance
1-year ASES	Mean (SD)	69.6 (23.3)	71.5 (21.7)	59.7 (26.0)	P=0.02*
1-year SANE	Mean (SD)	69.4 (25.9)	69.5 (28.0)	36.4 (29.0)	P=0.02*
FE	Mean (SD)	133.9° (28.7)	140.0° (25.0)	126.4° (126.4)	P=0.007*
ER	Mean (SD)	40.1° (14.6)	45.1° (15.6)	38.9° (15.8)	P=0.02*
IR	Median	Lumbar	Thoracic	Lumbar	p=0.11
Complications	n (%)	22 (26.5)	33 (32.4)	44 (41.5)	0.09
Reoperations	n (%)	11 (13.3)	14 (13.7)	24 (22.6)	0.13