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

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Introduction

The volume of shoulder arthroplasty in the United States has grown significantly, spurred by an expanding elderly population and the evolution of modern arthroplasty techniques and implants. As expected, the amount of revision shoulder arthroplasty has also grown, with more than 10,000 procedures performed in 2017 with the expectation of more than 40,000 by the year 2030. The revision of the humeral stem is a vastly understudied topic in the shoulder arthroplasty literature. Specifically, the effect of humeral stem removal versus retention of a well-fixed stem on patient outcomes is unclear. The goal of this study was to compare patient reported outcomes (PROMs), shoulder range of motion (ROM), complication and reoperation rates in aseptic revision to reverse shoulder arthroplasty (RSA) in patients that required humeral stem revision to those that retained a well-fixed stem.

Methods

A retrospective review was performed to identify all patients that underwent aseptic revision to RSA at a single academic institution between 2016 and 2022. Electronic medical records were reviewed to identify patient demographics and pertinent medical history. Operative reports and radiographs were reviewed to determine characteristics of the revision surgery, including arthroplasty type pre- and post-revision. PROMs in the form of American Shoulder and Elbow Society (ASES) Score and Single Assessment Numeric Evaluation (SANE) score were recorded both pre-op and with minimum 1-year follow up. Rates of post-operative complications, reoperations, post-operative ROM, and radiographic signs of proximal humeral bone loss at most recent follow up were also studied.

Results

We identified 291 aseptic revision-to-RSA procedures performed with primary implants being hemiarthroplasty (HA) in 83 cases (28.5%), anatomic total shoulder arthroplasty (TSA) in 102 (35.1%) and RSA in 106 (36.4%) patients. 172 of these procedures required complete revision of the humeral stem with 119 retaining part, or all, of a well-fixed stem with conversion of the proximal component to RSA. There was significant improvement from pre-op to post-op ASES and SANE scores in both groups ($p < 0.001$) (Table 1). The total ASES score after humeral revision at 1-year post-op was significantly higher than humeral retention (75.1 vs 70.0, $p=0.039$) while there was no difference between the groups in SANE scores ($p=0.30$). Patients who had humeral retention were older (68.0 vs 65.0, $P = 0.005$), had higher Charlton Comorbidity Index (1.0(1.0) vs 1.0(3.0), $P=0.006$) and their implants were predominantly RSA as opposed to HA and TSA ($P<0.001$). Post-operative forward elevation was found to be significantly greater in the revision group compared to the retention group ((147.5° vs. 140.0°, $p=0.031$) while external rotation was not significantly different (40° vs 40°, $p=0.45$). Complications (23.3% vs 29.4%, $p=0.24$) and reoperation rates (15.1% vs 19.3%, $p=0.35$) were high but similar between the humeral revision and retention cohorts, respectively.

Conclusion

Revision to RSA is a challenging procedure that is fraught with complications and reoperations, regardless of patient or surgical characteristics, and when faced with a well-fixed stem many surgeons will opt to retain the stem at all costs to avoid the perceived morbidity associated with its extraction. However, this data suggests that humeral stem revision in aseptic revision to RSA does not lead to worse 1-year PROMs and ROM and dose not increases the risk of complications or reoperations when compared to humeral stem retention.

Variable (unit)		Index	N	Humeral Component Revision		P value Within humeral revision	Pre-to-post-op
				No	Yes		
Age		Median (IQR)	291	68.0 (10.0)	65.0 (12.0)	0.005*	
Sex							
	F	n (%)	156 (53.6)	64 (41.0)	92 (59.0)	0.96	
	M	n (%)	135 (46.4)	55 (40.7)	80 (59.3)		
BMI		Median (IQR)	291	30.5 (8.9)	29.8 (8.7)	0.63	
CCI		Median (IQR)	291	1.0 (3.0)	1.0 (1.0)	0.006*	
Implant type							
	HA		83 (28.5)	13 (15.7)	70 (84.3)	<0.001*	
	TSA		102 (35.1)	25 (24.5)	77 (75.5)		
	RSA		106 (36.4)	81 (76.4)	25 (23.6)		
ASES							
	Pre-op	Median (IQR)	231	34.3 (21.0)	38.8 (23.0)	0.06	<0.001*
	Post-op	Median (IQR)	172	70.0 (43.0)	75.1 (31.0)	0.039*	
SANE							
	Pre-op	Median (IQR)	230	25.0 (29.0)	30.0 (31.0)	0.22	<0.001*
	Post-op	Median (IQR)	170	80.0 (40.0)	80.0 (45.0)	0.30	
FE							
	Pre-op	Median (IQR)	265	110.0 (50)	130.0 (61.0)	0.023*	<0.001*
	Post-op	Median (IQR)	249	140.0 (48.0)	147.5 (30.0)	0.031*	
ER							
	Pre-op	Median (IQR)	245	40.0 (30.0)	40.0 (30.0)	0.45	<0.001*
	Post-op	Median (IQR)	226	40.0 (28.0)	40.0 (30.0)	0.95	
Complication		n (%)	75 (25.8)	35 (29.4)	40 (23.3)	0.24	
Re-operation		n (%)	49 (16.8)	23 (19.3)	26 (15.1)	0.35	