Influence of Positive Cultures after Aseptic Revision for Failed Shoulder Arthroplasty

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Background

Periprosthetic joint infection (PJI) after primary total shoulder arthroplasty (TSA) is a devastating complication with an incidence of 0.7%-1.8%[1]. Unlike PJI of the hip and knee, PJI of the shoulder lacks clear-cut guidelines for diagnosis and management. Furthermore, PJI of the shoulder may not be clearly diagnosed preoperatively due to infection with low-virulence organisms. Thus, presumed aseptic revisions can yield unexpected positive tissue cultures (UPCs) resulting in a course of oral and/or intravenous antibiotics for an extended period of time. The purpose of this study is to compare patient-reported outcomes measures (PROMs) and rates of complications and reoperations in patients with UPCs after presumed aseptic revision shoulder arthroplasty with those who did not have UPC after aseptic revision.

Methods

We retrospectively analyzed all revision shoulder arthroplasties performed for presumed aseptic revision of failed shoulder arthroplasty to reverse TSA with minimum 1-year follow-up from 2016 to 2022. Patients were included if they did not meet PJI criteria for Definite Infection by the International Consensus Meeting, leaving 246 patients for analysis. Positive cultures were defined as having any single culture taken at the time of surgery positive for an organism. Patients were divided into one of two groups, (1) patients with 0-1 UPCs (207 patients) or (2) patients with ≥2 UPCs of the same organism (39 patients). One-year PROMs, shoulder range-of-motion (ROM), and rates of complications and reoperations were compared between the two groups.

Results

We identified 246 presumed aseptic revision to reverse TSA procedures who had available intraoperative cultures. The primary implant at the time of revision was hemiarthroplasty in 75 (30.5%), anatomic TSA in 96 (39.0%), and reverse TSA in 75 (30.5%) cases. There was no significant differences in primary implant type between the two groups (p=0.27), but the group with ≥2 UPCs was significantly younger (p=0.026) and more likely to be male (p<0.001). Overall, 65 patients (26.4%) had UPCs at the time of presumed aseptic revision, 26 patients (12.6%) had one UPC and 39 (18.8%) had ≥2 UPCs of the same organism. Comparing the 0-1 UPCs group and the ≥2 UPCs group, ASES score was not significantly different preoperatively (36.7 vs. 39.8, p=0.27), but was significantly higher at one year after revision (70.4 vs. 78.3, p = 0.012) in the ≥2 UPC group; SANE score was not significantly different preoperatively (25.0 vs 30.0, p=0.11) or at one year (75.0 vs 80.0, p=0.45); forward elevation was not significantly different preoperatively (120.0° vs 120.0°, p=0.18) or at one year (140.0° vs 150.0°, p=0.27); external rotation was significantly different preoperatively (30.0° vs 40.0°, p=0.008) but was not at one year (40.0° vs 40.0°, p=0.94). Both groups showed significant pre- to post-op improvement in ASES score, SANE score, and shoulder ROM (p<0.001 for all comparisons). There was no significant differences in non-antibiotic-related complications between the two groups, 52 (25.1%) in the 0-1 UPCs group and 7 (17.9%; p=0.34) in the ≥2 UPCs group. Significantly more antibiotic-related complications occurred in the ≥2 UPCs group (7, 17.9%) versus the 0-1 UPCs group (1, 0.5%; p<0.001). Reoperations occurred in 35 (16.9%) of the 0-1 UPCs group patients and in 4 (10.3%) of the ≥2 UPCs group patients, which was not significantly different (p=0.30). Six reoperations were for infection, 4 (1.9%) in the 0-1 UPCs group and 2 (5.1%) in the ≥2 UPCs group patients, which was also not significantly different (p=0.24).

Conclusion

There were no significant differences in one-year postoperative SANE score, shoulder ROM, overall complications, or reoperations between patients that had 0-1 UPCs and patients that had ≥2 UPCs after presumed aseptic revision to reverse TSA. Interestingly, one-year postoperative ASES score was significantly higher in patients with ≥2 UPCs as was the number of antibiotic-related complications, which may be due to these patients being younger males and more commonly being on antibiotics compared to the 0-1 UPCs group. Further research is needed to more precisely diagnose shoulder PJI prior to undergoing revision shoulder arthroplasty to help prevent unnecessary administration of antibiotics post-operatively and to more effectively manage those patients who are found to have an infection present.

Table 1.

Variable (unit)		Index	N	# of Positive Cultures		P value	
				0-1 (n=207)	≥2 (n=39)	Within UPC group	Pre-to Post-op
Age		Median (IQR)	246	67.0 (12.0)	66.0 (10.0)	0.026*	
Sex							
	F	n (%)	131 (53.3)	123 (59.4)	8 (20.5)	<0.001*	
	M	n (%)	115 (46.7)	84 (40.6)	31 (79.5)		
BMI		Median (IQR)	246	30.5 (8.1)	28.0 (7.5)	0.30	
CCI		Median (IQR)	246	0.0 (1.0)	0.0 (1.0)	0.57	
Implant type							
	HA	n (%)	75 (30.5)	63 (30.4)	12 (30.8)		
	TSA	n (%)	96 (39.0)	77 (37.2)	19 (48.7)	0.27	
	RSA	n (%)	75 (30.5)	67 (32.4)	8 (20.5)		
ASES							
	Pre-op	Median (IQR)	204	36.7 (21.0)	39.8 (22.0)	0.27	<0.001*
	Post-op	Median (IQR)	155	70.4 (36.0)	78.3 (14.0)	0.012*	
SANE							
	Pre-op	Median (IQR)	204	25.0 (40.0)	30.0 (25.0)	0.11	<0.001*
	Post-op	Median (IQR)	153	75.0 (40.0)	80.0 (25.0)	0.45	
FE							
	Pre-op	Median (IQR)	230	120.0 (60.0)	120.0 (60.0)	0.18	<0.001*
	Post-op	Median (IQR)	214	140.0 (30.0)	150.0 (50.0)	0.27	
ER							
	Pre-op	Median (IQR)	217	30.0 (30.0)	40.0 (30.0)	0.008*	<0.001*
	Post-op	Median (IQR)	199	40.0 (20.0)	40.0 (10.0)	0.94	
Complication							
	Non-abx related	n (%)	59 (24.0)	52 (25.1)	7 (17.9)	0.34	
	Abx related	n (%)	8 (4.6)	1 (0.5)	7 (17.9)	<0.001*	
Re-operation							
	Overall	n (%)	39 (15.9)	35 (16.9)	4 (10.3)	0.30	
	For Infection	n (%)	6 (2.4)	4 (1.9)	2 (5.1)	0.24	