Preoperative antibiotics do not decrease culture positivity in revision shoulder arthroplasty

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INTRODUCTION:

The diagnosis of periprosthetic shoulder infections is challenging and culture data remains the gold standard. To help improve culture yield during revision shoulder arthroplasty, some advocate holding prophylactic antibiotics until cultures are obtained. Currently the International Consensus Meeting(ICM) on Orthopedic Infections does not recommend holding antibiotics prior to cultures[1]. This statement is not supported by data in the shoulder and elbow realm, although this practice has strong support in the hip and knee literature[2]. Additionally, there is strong evidence in favor of prophylactic antibiotics given prior to surgical treatment to decrease the incidence of surgical site infections. The purpose of this study is to determine whether the timing of antibiotics during revision shoulder arthroplasty influences culture yield.

METHODS:

Patients who underwent revision shoulder arthroplasty at a single institution between 2015 and 2021 were identified. Revision surgery was performed by four shoulder and elbow fellowship trained surgeons. Indications for revision surgery included failed anatomic or reverse total shoulder arthroplasty. Timing of antibiotic administration was at the discretion of each surgeon. Patients without accurate documentation of antibiotic timing or without culture data for at least two weeks postoperatively were excluded. Basic demographic information was collected as well as the Charlson Comorbidity Index (CCI) and serum inflammatory markers. ICM criteria for definition of periprosthetic shoulder infection was collected.

Patients were categorized into either the Pre-culture antibiotic group, if antibiotics were given prior to, or Post-culture antibiotic group, if antibiotics were given after cultures were obtained in the operating room. The antibiotic administered was Cefazolin unless contraindicated, in which case Vancomycin or Clindamycin were used. Culture data was recorded and included the total number of cultures, the number of cultures that were positive, and the organism(s) cultured. Culture positivity was calculated as the ratio of positive cultures and total number of cultures taken.

Comparison between groups was analyzed using an independent Student t test for continuous variables. A chi-square test was used for categorical variables. A P-value <0.05 was considered statistically significant. A 95% confidence interval (CI) was also calculated for culture positivity.

RESULTS:

A total of 124 patients met inclusion criteria (Table 1). A total of 48 patients received antibiotics prior to cultures and 76 after cultures were taken. Between these groups, there was no significant difference in gender, age, BMI, CCI or preoperative serum inflammatory markers (Table 1, $p>0.5$). There were three confirmed infections prior to surgery in the Pre-culture antibiotic group and five in the Post-culture antibiotic group. ICM scores were not significantly different between the Pre-culture antibiotic and Post-culture antibiotic groups (1.9 vs. 2.3, $p=0.52$) Regarding culture yield between groups (Table 2), there was no difference in number of cultures taken between groups (5 vs 5, $p=0.53$). For culture positivity (ratio of total number of positive cultures and number of cultures taken), there was no difference between the Pre-culture antibiotic group and the Post-culture antibiotic group (16% vs 15%, $p=0.82$, CI 8-25% vs. 10-20%).

DISCUSSION AND CONCLUSION:

In our study group, receiving antibiotics prior to cultures in revision shoulder arthroplasty cases did not significantly impact culture yield. Given these findings, as well as the importance of preoperative antibiotics in prevention of surgical site infections, we do not recommend routinely holding antibiotics in cases of revision shoulder arthroplasty. A limitation of this study is the small sample size; although, when interpreting the confidence interval for culture positivity (8-25% vs. 10-20%) even the most extreme difference of 15% (25-10) in culture positivity between the two groups still may not justify holding antibiotics until cultures are obtained.

References

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2) Wouthuyzen-Bakker, et al (2017). Withholding Preoperative Antibiotic Prophylaxis in Knee Prosthesis Revision: A Retrospective Analysis on Culture Results and Risk of Infection. The Journal of Arthroplasty. 32. 10.1016/j.arth.2017.03.064.

Table 1
Patient Characteristics (n=124)

	Pre-culture antibiotic (n=48)	*Post-culture antibiotic (n=76)*	*P Value*
Gender, n (%)			
Male	27(56%)	37(49%)	0.41
Female	21 (44%)	39(51%)	0.41
Age in years, mean (SD)	68(13)	65(9)	0.25
BMI (kg/m^2), mean (SD)	32(7)	30(7)	0.47
CCI	4.3(2.3)	3.3(1.9)	0.08
Revision TSA, n			
Rotator cuff insufficiency	6	25	
Instability	1	6	
Loosening	7	10	
Painful NOS	14	11	
Infection	3	1	
Revision RSA, n			
Instability	6	9	
Loosening	4	7	
Painful NOS	2	6	
Infection	5	1	
Preoperative Serum*			
CRP (mg/dL), mean (SD)	2.2(4.3)	2.8(3.8)	0.73
ESR (mm/hr), mean (SD)	31(26)	27(27)	0.44
WBC (10^9/L), mean (SD)	7.6(2.7)	7.6(2.4)	0.88

**14 patients in the Pre-culture antibiotic group and 18 patients in the Post-culture antibiotic group were excluded given incomplete labs*

Total number (n), Standard Deviation (SD), Body mass index (BMI), Not otherwise specified (NOS), Charles Comorbidity Index (CCI)

Table 2
Culture Data(n=124)

	Pre-culture antibiotic (n=48)	*Post-culture antibiotic (n=76)*	*P Value*
Culture Yield			
Cultures Taken, mean (SD)	5 (1.5)	5 (1.7)	0.53
Culture positivity* % (CI)	16 (8-25)	15 (10-20)	0.82
Organism Cultured			
C.acnes, n	10	21	0.98
Other, n	6	12	0.98

*Positive cultures/total number of cultures taken
Standard Deviation (SD), Confidence interval (CI), Cutibacterium acnes (C. Acnes), Total number (n).