Functional Composite Spacer (Antibiotic Cement Around a Hemiarthroplasty) for the Treatment of Shoulder Infections: Minimum 5-Year Outcomes

Daniel F Schodlbauer, Casey Michelle Beleckas [1], Austin Vegas, Gagan Grewal, Albert Mousad, Jonathan Chad Levy[2]
[1]Levy Shoulder To Hand Center At the Paley Orthoped, [2]Levy Shoulder to Hand Center at the Paley Orthopedic & Spine Institute

INTRODUCTION:

Prosthetic joint infection (PJI) remains a challenging complication following shoulder arthroplasty and an ideal treatment protocol has yet to be established. Two-stage revision is a common approach. Historically, the first stage entails placement of an all-cement antibiotic spacer. While prior studies have reported on cement spacers as definitive management, persistent pain and/or inadequate function often result in a request for a second stage procedure. The functional composite spacer consists of a humeral hemiarthroplasty implant with antibiotic cement coated around the stem alone to preserve the metallic humeral head-glenoid articulation. Functional composite spacers have demonstrated improvements in function and motion with high patient satisfaction at 25 months, but longer-term follow-up is needed to better understand the role it may play in the definitive management of shoulder infections. The purpose of this study is to evaluate outcomes at a minimum of 5 years in patients who initially planned to undergo two-stage revision but elected to retain the functional spacer.

METHODS:

A retrospective review of a single institution's shoulder surgery repository from 2007 to 2018 identified 30 patients who underwent placement of a functional composite spacer. Overall, 5 patients underwent second stage reimplantation and 12 patients did not have 5-year follow-up (6 lost to follow-up and 6 deceased). A total 13 patients were included who maintained a functional composite spacer and had minimum 5-year follow-up. Patient-reported outcome measures (American Shoulder and Elbow Surgeons [ASES], Simple Shoulder Test [SST], Single Assessment Numeric Evaluation [SANE], Visual Analog Score [VAS] Function and VAS Pain scores), satisfaction, range of motion, and radiographic estimation of glenoid wear were evaluated.

RESULTS:

Two of 13 patients (15%) required additional surgery: one secondary closure for early superficial wound dehiscence and one revision spacer for pain which cultured negative at revision. There were no re-infections. At most recent follow-up (average of 7.9 ± 1.9 years post-operatively), patient satisfaction was high and significant improvements were noted for ASES (45.4; p<0.001), SST (5.3; p=0.003), SANE (47.3; p=0.002), VAS F (4.9; p=0.004), and VAS P (-4.4; p=0.007) as well as range of motion including abduction (39.2˚; p=0.005) and elevation (65.9˚; p=0.005), as noted in Table 1. At an average radiographic follow-up of 5.7 ± 3.4 years, there was no significant change in humeral head medialization (p=0.11).

DISCUSSION AND CONCLUSION:

The results of this study demonstrate that patients who do not undergo an early revision and retain a functional composite spacer maintain good function and range of motion with minimal pain at mid-term follow-up. These satisfactory outcomes suggest the composite spacer may sufficiently serve as definitive management when appropriate, avoiding the associated cost and risk with additional second-stage surgery.

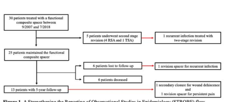

Figure 1. A Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) flow diagram displaying number of and reason why patients were excluded as well as the respective number of re-operations and recurrent infections. RSA, Reverse Shoulder Arthroplasty; TSA, Total Shoulder Arthroplasty.

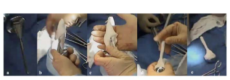

Figure 2. (a) Hemiarthroplasty stem used in the functional composite spacer. (b-d) Coating of stem with antibiotic cement. (e) Functional composite spacer prior to implantation.

Table I. Patient Summary

Patient	Sex	Age at Spacer Surgery	Follow-Up (yr)	Time: Prior Surgery-Spacer (mo)	Previous Surgery	Organism Cultured
1	M	65	5.2	53	Revision TSA	*P. acnes*
2	M	74	9.5	17	TSA	*P. acnes*
3	M	62	9.6	18	Hemiarthroplasty	*S. lugdeness*
4	F	74	9.3	9	TSA	*P. mirabilis*
5	F	73	6.2	39	TSA	*S. warneri*
6	M	54	5.7	47	Hemiarthroplasty	*P. acnes*
7	M	64	9.3	45	Hemiarthroplasty	*P. acnes*
8	M	51	6.2	1	Arthroscopy	*P.acnes*, MSSA
9	M	70	8.2	20	Revision TSA	MSSA
10	M	74	6.9	100	Hemiarthroplasty	*P. acnes*
11	M	51	11.6	12	TSA	*S.epidermidis*
12	F	62	5.8	6	Revision TSA	*P. acnes*
13	M	72	11.3	91	Revision TSA	*P. acnes*

TSA, Total Shoulder Arthroplasty; MSSA, methicillin-susceptible S. *aureus.*

Table II. Comparison of Patient Reported Outcomes and Range of Motion

	Preoperative Mean ± SD	Most Recent Follow-Up Mean ± SD	*P*
ASES	30.7 ± 18.6	76.1 ± 25.6	**<0.001**
SST	3.2 ± 2.3	8.5 ± 3.0	**0.003**
SANE	23.1 ± 13.0	70.9 ± 33.5	**0.002**
VAS Function	2.6 ± 1.3	7.5 ± 2.8	**0.004**
VAS Pain	5.3 ± 2.5	0.9 ± 2.2	**0.003**
Range of Motion			
Abduction (˚)	46.2 ± 14.7	85.4 ± 20.3	**0.004**
Elevation (˚)	55.4 ± 25.6	121.3 ± 27.7	**0.003**
External Rotation (˚)	13.8 ± 24.6	47.5 ± 16.3	**0.004**
Internal Rotation*	2.8 ± 1.0	4.5 ± 2.5	0.049

ASES, American Shoulder and Elbow Surgeons; SST, Simple Shoulder Test; SANE, Single Assessment Numeric Evaluation; VAS, Visual Analog Scale; SD, Standard Deviation. *IR was scored on a 10-point scale using the following conversions: buttock/greater trochanter = 2, sacrum–L4 = 4, L1–L3 = 6, T8–T12 = 8, T1–T7 = 10.

Table III. Individual Outcomes at Most Recent Follow-up

	Patient-Reported Outcome Measures					Range of Motion				Satisfaction	Would have same surgery again?
	ASES	SST	SANE	VAS F	VAS P	Abd.	Elev.	ER	IR*		
1	100	11	1	10	0	90	130	60	4	Excellent	Yes
2	82	8	45	6	0	85	105	10	6	Good	Yes
3	33	7	88	9	1	90	140	40	4	Excellent	Yes
4	88	7	100	8	0	90	95	50	2	Excellent	Yes
5†	15	1	4	0	8	-	-	-	-	Unsatisfactory	No
6	98	12	82	9	0	90	135	40	8	Excellent	Yes
7	93	11	98	10	0	100	150	60	2	Excellent	Yes
8	97	11	97	9	0	65	75	80	6	Excellent	Yes
9	68	8	50	4	0	75	140	40	2	Good	Yes
10	85	8	88	9	0	110	120	35	2	Excellent	Yes
11	100	12	98	10	0	100	160	55	8	Excellent	Yes
12	63	9	84	6	3	30	70	50	2	Excellent	Yes
13	67	10	87	8	0	100	135	50	8	Excellent	Yes

ASES, American Shoulder and Elbow Surgeons; SST, Simple Shoulder Test; SANE, Single Assessment Numeric Evaluation; VAS F, Visual Analog Scale Function; VAS P, Visual Analog Scale Pain; Abd., abduction; Elev., elevation; ER, external rotation; IR, internal rotation. *IR was scored on a 10-point scale using the following conversions: buttock/greater trochanter = 2, sacrum–L4 = 4, L1–L3 = 6, T8–T12 = 8, T1–T7 = 10. †Most recent range of motion data not available.