Complications after Primary and Revision Shoulder Arthroplasty: A Matched Cohort Study

Joshua I. Mathew[1,2], Peter J. Chabot[2], **Michelle E. Kew[2]**, Michael C. Fu[2], Samuel A. Taylor[2], Joshua S. Dines[2], David M. Dines[2], Lawrence V. Gulotta[2]

[1]*Icahn School of Medicine at Mount Sinai*; [2]*Hospital for Special Surgery*

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Background

- Total shoulder arthroplasty (TSA) patients typically have excellent clinical outcomes
- However, some patients require revisions for complications (infection, instability, pain)

Specific Aims:

(1) To compare the rates and types of surgical complications and patient-reported outcomes between primary and revision shoulder arthroplasty patients

(2) To identify factors associated with complications

Methods

- Retrospective chart review, 1/2015 – 5/2021
- Matched cohort (1:1), n = 152 each
  - **Primary** vs. **revision** shoulder arthroplasty
  - Matched by: implant (aTSA/rTSA), age (± 3 years), and DOS (± 3 months)

- Data collected:
  - Demographics, BMI, PSH
  - Surgical details, complications, reoperation
  - PROs: ASES, SANE, PROMIS-PF/PI/UE
    - Baseline and 2-year follow-up

Results

Table I – Patient information by cohort.

Variable	Primary (n = 152)	Revision (n = 152)	P value
Age (yr)	66.5 ± 8.6	66.1 ± 9.0	.787
Sex, n (%)			>.999
Female	78 (51.3%)	77 (50.7%)	
Male	74 (48.7%)	75 (49.3%)	
Body mass index	29.3 ± 6.9	28.1 ± 5.9	.277
Implant type before revision surgery	–		–
Hemiarthroplasty	–	44 (29.0%)	
TSA	–	78 (51.3%)	
rTSA	–	30 (19.7%)	
Final implant type			–
TSA	26 (17.1%)	26 (17.1%)	
rTSA	126 (82.9%)	126 (82.9%)	

Results – Primary Cohort

Table II – Primary cohort grouped by complications (Y/N).

Variable	No (N = 130)	Yes (N = 22)	P value
Sex, n (%)			.020*
Female	72.0 (55.4%)	6 (27.3%)	
Male	58.0 (44.6%)	16 (72.7%)	
PROMIS-PI Baseline Score	53.1 ± 7.3	57.1 ± 6.3	.020*
Other Surgery			<.001*
Before Primary, n (%)			
No	99 (76.2%)	8 (36.4%)	
Yes	31 (23.8%)	14 (63.6%)	
Implant Type, n (%)			>.999
TSA	22 (16.9%)	4 (18.2%)	
rTSA	108 (83.1%)	18 (81.8%)	
Manufacturer, n (%)			.970
Arthrex	7 (5.4%)	1 (4.6%)	
Biomet	77 (59.2%)	14 (63.6%)	
DJO	19 (14.6%)	4 (18.2%)	
Exactech	25 (19.2%)	3 (13.6%)	
Other	1 (0.8%)	0 (0%)	
Cemented Primary Humeral Stem, n (%)			>.999
No	126 (96.9%)	22 (100%)	
Yes	4 (3.1%)	0 (0%)	
Primary Indication, n (%)			.379
Avascular Necrosis	0 (0%)	0 (0%)	
Inflammatory Arthritis	4 (3.1%)	0 (0%)	
Osteoarthritis	44 (33.9%)	10 (45.5%)	
Proximal Humerus Fracture	10 (7.7%)	0 (0%)	
Rotator Cuff Arthropathy	72 (55.4%)	12 (54.5%)	
Estimated Blood Loss (cc)	134.6 ± 78.2	142.2 ± 74.0	.558
Primary Procedure Duration (minutes)	94.2 ± 32.8	94.1 ± 19.4	.512

Results – Revision Cohort

Table III – Revision cohort grouped by complications (Y/N).

Variable	No (N = 94)	Yes (N = 58)	P value
Sex, n (%)			.620
Female	46 (48.9%)	31 (53.4%)	
Male	48 (51.1%)	27 (46.6%)	
SANE Baseline Score	23.4 ± 20.2	15.3 ± 22.4	.035*
Other Surgery Before Primary, n (%)			.147
No	71 (75.5%)	50 (86.2%)	
Yes	23 (24.5%)	8 (13.8%)	
Primary Implant Type, n (%)			.722
Hemiarthroplasty	29 (30.9%)	15 (25.9%)	
TSA	48 (51.0%)	30 (51.7%)	
rTSA	17 (18.1%)	13 (22.4%)	
Cemented Primary Humeral Stem, n (%)			>.999
No	86 (91.5%)	53 (91.4%)	
Yes	8 (8.5%)	5 (8.6%)	
Final Implant Type, n (%)			.509
TSA	14 (14.9%)	11 (19.0%)	
rTSA	80 (85.1%)	47 (81.0%)	
Other Procedures between Primary and Revision, n (%)			.826
No	79 (84.0%)	48 (82.8%)	
Yes	15 (16.0%)	10 (17.2%)	
Time between Primary and Revision Procedures (mo)	29.3 ± 6.9	28.1 ± 5.9	.277
Estimated Blood Loss (cc)	125.0 ± 83.0	165.2 ± 110.4	.049*
Revision Procedure Duration (min)	114.9 ± 55.3	127.3 ± 84.2	.568

Results – Primary vs. Revision

Table IV – Primary vs. revision cohorts.

Variable	Primary (N = 152)	Revision (N = 152)	P value
SANE Baseline Score	24.92 ± 23.27	19.95 ± 21.40	.0975
SANE Postoperative Score (2 y)	72.6 ± 26.3	50.9 ± 30.6	.002*
SANE Difference (Baseline-2 y)	52.3 ± 32.5	33.9 ± 35.9	.036*
Manufacturer, n (%)			<.0001*
Arthrex	8 (5.3%)	5 (3.3%)	
Biomet	91 (59.9%)	62 (40.8%)	
DJO	23 (15.1%)	7 (4.6%)	
DePuy	0 (0%)	4 (2.6%)	
Exactech	28 (18.4%)	10 (6.6%)	
Hemiarthroplasty	0 (0%)	26 (17.1%)	
Other	1 (0.7%)	6 (4.0%)	
Unknown	1 (0.7%)	32 (21.0%)	
Primary Indication, n (%)			<.0001*
Avascular Necrosis	0 (0%)	6 (4.6%)	
Inflammatory Arthritis	4 (2.6%)	0 (0%)	
Osteoarthritis	54 (35.5%)	87 (65.9%)	
Proximal Humerus Fracture	10 (6.6%)	16 (12.1%)	
Rotator Cuff Arthropathy	84 (55.3%)	23 (17.4%)	
Cemented Primary Humeral Stem, n (%)			.043*
No	148 (97.4%)	139 (91.4%)	
Yes	4 (2.6%)	13 (8.6%)	

Results – Primary vs. Revision

Table IV – Primary vs. revision cohorts.

Primary Procedure Duration (min)	94.2 ± 31.1	119.6 ± 67.7	<.0001*
Complication, n (%)			<.0001*
No	130 (85.5%)	94 (61.8%)	
Yes	22 (14.5%)	58 (38.2%)	
Complication Type, n (%)			.039*
Acromial Stress Reaction	2 (9.1%)	1 (1.7%)	
Component Failure	2 (9.1%)	7 (12.1%)	
Periprosthetic Fracture (Intraoperative)	0 (0%)	1 (1.7%)	
Periprosthetic Fracture (Postoperative)	1 (4.6%)	4 (6.9%)	
Glenoid Loosening	0 (0%)	3 (5.2%)	
Hematoma/Seroma	0 (0%)	2 (3.5%)	
Infection	1 (4.6%)	10 (17.2%)	
Instability	4 (18.2%)	9 (15.5%)	
Nerve Injury	0 (0%)	1 (1.7%)	
Persistent Pain	6 (27.3%)	20 (34.5%)	
Rotator Cuff Failure	2 (9.1%)	0 (0%)	
Scapular Notching	1 (4.6%)	0 (0%)	
Scapular Spine Fracture	1 (4.6%)	0 (0%)	
Stiffness	2 (9.1%)	0 (0%)	
Reoperation, n (%)			.615
No	8 (36.4%)	26 (44.8%)	
Yes	14 (63.6%)	32 (55.2%)	

Conclusions

- Revision patients at an increased risk for surgical complications and worse clinical improvement compared to primary patients

- Differing profiles of post-op complication types between primary and revision procedures
  - Useful in pre-surgical patient counseling

- Most common surgical complications:
  - Primary: persistent pain, instability
  - Revision: persistent pain, prosthetic joint infection

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