

# Preoperative Weight Loss Among Morbidly Obese Patients Is Associated With Lower Early Revision Rates Following Shoulder Arthroplasty

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**INTRODUCTION:** Severe obesity (BMI  $\geq 35$ –40) has been associated with increased perioperative risk following total shoulder arthroplasty (TSA). The effect of intentional preoperative weight loss on outcomes in this high-risk group is unknown. This study evaluated whether  $\geq 5\%$  preoperative BMI reduction within 1 year of surgery influences early complication rates, revision rates, and patient-reported outcomes in patients undergoing anatomic TSA (aTSA) or reverse TSA (rTSA).

**METHODS:** Institutional Review Board approval was obtained. A retrospective review of an institutional shoulder arthroplasty registry identified patients with BMI  $\geq 35$  or  $\geq 40$  who underwent primary aTSA or rTSA between 2016–2022 for osteoarthritis or cuff tear arthropathy. BMI recorded  $\geq 3$  months prior to surgery and at surgery was used to calculate percent BMI change. Patients were classified as weight loss ( $\geq 5\%$  decrease), no change ( $< 5\%$  change), or weight gain ( $\geq 5\%$  increase). Demographics, Charlson Comorbidity Index (CCI), PROMs (ASES, SANE, CSPS, PROMIS domains), and early complications ( $\leq 90$  days) were recorded (Figure 1). Revisions were tracked longitudinally. Continuous outcomes were compared using ANOVA or Kruskal-Wallis; categorical outcomes with chi-square, Fisher's exact, likelihood ratio, or linear-by-linear association tests. Significance was set at  $p < 0.05$ .

**RESULTS:** BMI  $\geq 35$  cohort: aTSA (n=128): Revision rates were lowest in the weight loss group (2.6%) vs. no change (6.3%) and weight gain (10.0%) (Figure 2). ASES improvement approached significance ( $p=0.092$ ), and PROMIS Physical Function improvement trended toward significance ( $p=0.091$ ), favoring weight loss. rTSA (n=149): All revisions (4.7%) and complications (2.0%) occurred in the no change group. Revision rate trend: Likelihood Ratio  $p=0.052$ ; Linear-by-Linear Association  $p=0.078$ . BMI  $\geq 40$  cohort: aTSA (n=44): ASES change differed significantly by BMI group ( $p=0.003$ ) (Figure 3). rTSA (n=41): All revisions (7.3%) and the only complication (2.4%, DVT) occurred in the no change group. ASES improvement trended toward significance ( $p=0.076$ ).

**DISCUSSION:** Across both BMI  $\geq 35$  and BMI  $\geq 40$  cohorts, patients achieving  $\geq 5\%$  preoperative weight loss demonstrated consistently lower early revision rates and trends toward superior functional improvement. In rTSA, this pattern was particularly pronounced with no weight loss patient experienced revision or early complication in either BMI threshold group, while all such events occurred in the no change group. For aTSA, BMI  $\geq 40$  patients in the weight loss group demonstrated significantly greater ASES improvement ( $p=0.003$ ), and BMI  $\geq 35$  patients showed near-significant gains in both ASES ( $p=0.092$ ) and PROMIS Physical Function ( $p=0.091$ ). These findings suggest that even modest preoperative weight reduction may confer early postoperative benefits in this high-risk population. While not all differences reached statistical significance, likely due to small event counts, these results underscore the importance of preoperative counseling on achievable weight loss goals. Future prospective studies with larger samples are warranted to confirm these associations.

**SIGNIFICANCE/CLINICAL RELEVANCE:** This is the first study to evaluate the effect of intentional preoperative weight loss in severely obese TSA patients. Findings suggest that modest preoperative weight reduction may improve early safety and recovery, supporting preoperative optimization strategies and warranting prospective validation.

**Table 1. Cohort Characteristics and BMI-Trajectory Distribution**

Cohort	N	Weight Loss $\geq 5\%$ n (%)	No Change $< 5\%$ n (%)	Weight Gain $\geq 5\%$ n (%)	Surgical BMI (Mean $\pm$ SD)	% BMI Change (Mean $\pm$ SD)	Age (Mean $\pm$ SD)	CCI (Mean $\pm$ SD)
BMI $> 35$ aTSA	128	38 (29.7%)	80 (62.5%)	10 (7.8%)	40.0 $\pm$ 3.2	-2.45% $\pm$ 6.25	62.8 $\pm$ 9.9	2.50 $\pm$ 1.18
BMI $> 35$ rTSA	149	36 (24.2%)	99 (66.4%)	14 (9.4%)	39.7 $\pm$ 3.6	-1.60% $\pm$ 6.13	68.2 $\pm$ 8.1	3.23 $\pm$ 1.47
BMI $> 40$ aTSA	44	9 (20.5%)	28 (63.6%)	7 (15.9%)	42.6 $\pm$ 3.4	-0.39% $\pm$ 7.10	64.0 $\pm$ 10.0	3.00 $\pm$ 1.00
BMI $> 40$ rTSA	41	3 (7.3%)	29 (70.7%)	9 (22.0%)	43.1 $\pm$ 4.2	+1.57% $\pm$ 7.21	69.0 $\pm$ 7.0	4.00 $\pm$ 2.00

**Table 2. Early Complications ( $\leq 90$  Days) and Revision Rates by BMI-Change Group**

Cohort	Weight Loss $\geq 5\%$	No Change $< 5\%$	Weight Gain $\geq 5\%$	p-value (Revision)	p-value (Complication)	Notes
BMI $> 35$ aTSA	1/38 (2.6%) rev; 0 comp	5/80 (6.3%) rev; 0 comp	1/10 (10.0%) rev; 0 comp	—	—	Lowest rev in WL group
BMI $> 35$ rTSA	0/36 rev; 0 comp	7/99 (7.1%) rev; 3 comp	0/14 rev; 0 comp	**0.052** †	NS	All events in NC group
BMI $> 40$ aTSA	1/9 (11.1%) rev; 0 comp	2/28 (7.1%) rev; 0 comp	1/7 (14.3%) rev; 0 comp	0.783	—	—
BMI $> 40$ rTSA	0/3 rev; 0 comp	3/29 (10.3%) rev; 1 comp	0/9 rev; 0 comp	1.000	1.000	—

**Bold** = significant or trending p-value. † Trending towards significance ( $0.05 < p \leq 0.10$ )

**Table 3. Two-Year PROM Changes by BMI-Change Group**

Cohort	Outcome Measure	Weight Loss $\geq 5\%$ (Mean $\pm$ SD)	No Change $< 5\%$ (Mean $\pm$ SD)	Weight Gain $\geq 5\%$ (Mean $\pm$ SD)	p-value
BMI $> 35$ aTSA	ASES Change	—	—	—	0.092 †
BMI $> 35$ aTSA	PROMIS-Physical	—	—	—	0.091 †
BMI $> 35$ rTSA	ASES Change	—	—	—	0.609
BMI $> 35$ rTSA	PROMIS-Mental	—	—	—	0.132
BMI $> 35$ rTSA	PROMIS-Physical	—	—	—	0.875
BMI $> 35$ rTSA	SANE Change	—	—	—	0.203
BMI $> 40$ aTSA	ASES Change	—	—	—	**0.003** †
BMI $> 40$ rTSA	ASES Change	—	—	—	0.076 †

**Bold** = significant ( $p \leq 0.05$ ). † = trending ( $0.05 < p \leq 0.10$ ). \* = statistically significant.