# BMI Does Not Increase Adverse Outcomes Following Anatomic TSA: Long-Term Clinical and Radiographic Analysis

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INTRODUCTION: While previous studies have extensively assessed the impact of body mass index (BMI) on complication and revision rates in various orthopedic surgeries, findings have varied throughout the literature. With the gradual rise in BMI scores among adult Americans, it is essential to understand how BMI may affect the long-term outcomes of orthopedic procedures, such as total shoulder replacement. Current evidence suggests that elevated BMI is associated with increased risk of revision and postoperative complications following shoulder arthroplasty. However, no studies have evaluated this association beyond a 5-year follow-up period. Therefore, we sought to determine the impact of BMI on anatomic total shoulder arthroplasty (aTSA) outcomes with a long-term follow-up.

METHODS: We performed a retrospective cohort study consisting of 146 aTSA patients that were stratified based on their BMI at the time of surgery: under/normal weight (BMI ≤25.0), overweight (BMI >25.0 ≤30.0), and obese (BMI >30.0). Clinical outcomes analyzed included range of motion (ROM) scores, including forward elevation, external rotation, and internal rotation, and patient-reported outcomes (PRO), including Visual Analog Scale scores (VAS), American Shoulder and Elbow Surgeon scores (ASES), and the Simple Shoulder Test (SST). An analysis of radiographic outcomes was also performed to assess for lateral humeral offset, acromiohumeral interval, and humeral radiolucency. All outcomes were compared across cohorts using inferential statistics, and Kaplan-Meier survival curves were generated to evaluate differences in risk of implant revision or removal based on obesity (non-obese vs. obese).

RESULTS: The average follow-up period of our study was 10.5 years. Of the 146 patients, 52 were under/normal weight (U/NW), 57 were overweight, and 37 were obese. BMI was negatively correlated with age at surgery ($r = -0.25$, $p<0.01$). Compared to their preoperative scores, patients of all three cohorts demonstrated improved forward elevation, external rotation, internal rotation, VAS, ASES, and SST postoperatively ($p<0.01$). There were no significant differences across cohorts in postoperative ROM nor in radiographic outcomes. The overweight cohort had significantly higher postoperative ASES ($p<0.01$) and SST scores ($p<0.01$) compared to the U/NW and obese cohorts, and lower VAS scores ($p=0.04$). Patients who were not obese (n=109) had a 5-year, 10-year, and 15-year implant survival of 99.1%, 93.9%, and 83.0%, respectively, versus a survival of 94.6%, 91.3%, and 84.8% in the obese group (n=37). However, there was no difference in the predicted survival times for these two groups ($p=0.57$).

DISCUSSION AND CONCLUSION: To our knowledge, this analysis is the longest follow-up period directly comparing aTSA outcomes across patient BMI classifications. Our findings demonstrated that patients requiring shoulder replacement at a younger age had significantly higher BMIs. However, following surgery, all patients had significantly improved ROM and PROs at a long-term follow-up of over a decade, regardless of BMI class. Elevated BMI also did not increase the risk of complications or revision operations. Therefore, our study demonstrates that aTSA is a viable and effective procedure in overweight and obese patients.