Total Shoulder Arthroplasty vs. Hemiarthroplasty: A National Review of Outcomes and Complications in the Past 10 Years

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INTRODUCTION: Shoulder arthroplasty is a popular option for alleviating upper extremity pathologies including osteoarthritis, proximal humerus fractures, and rotator cuff-tear arthropathies.[1] The three main types of glenohumeral replacements include hemiarthroplasty (HA), an anatomic total shoulder replacement (aTSA), and a reverse total shoulder replacement (rTSA). HAs have the inherent advantage over TSA and rTSA by not requiring a glenoid socket implant, which has historically been the most common piece of arthroplasty failure.[2] However, complication rates following either HA, aTSA, and rTSA have been variable. Therefore, the purpose of this study was to analyze complication rates and trends of glenohumeral hemiarthroplasties compared to aTSAs and rTSA using the National Surgery Quality Improvement (NSQIP) database, a robust and nationally validated source of surgical outcomes data.
METHODS: Patients between 2012-2022 were identified as having undergone HA, aTSA, or rTSA by their respective CPT codes from the NSQIP database. Of note, CPT codes do not differentiate between aTSA and rTSA in NSQIP, so they were combined in the final analysis and denoted as "TSA". Post-operative complications including bleeding, death, cardiac arrest, upper arm fracture, and reoperation amongst others were assessed for both HA and TSA groups. One-way ANOVA and logistic regression analyses controlling for age, sex, race, hispanic or non-hispanic status, ASA class, history of chronic obstructive pulmonary disease, and history of diabetes were performed using R software.[3]
RESULTS SECTION: A total of 41,422 patients were included in the final analysis with 3,326 undergoing HA and 38,096 undergoing TSA. Patients undergoing TSA had significantly decreased time from admission to operation and shorter hospital stays than HA patients (**Table 1**). Patients who underwent HA were more likely to have 30-day complications of bleeding (OR 2.36; 95% CI 1.95-2.82, p = <0.001), death (OR 4.05; 95% CI 2.31-6.80 p = <0.001), cardiac arrest (OR 3.85; 95% CI 1.59-8.4, p = <0.001), upper arm fracture (OR 7.05; 95% CI 2.01-22.9; p = <0.001), and require a reoperation (OR 1.34; 1.01-1.75; p = 0.04) (**Table 2 & Figure 1**).
DISCUSSION: A meta-analysis by *Jagdev et al* demonstrated that patients undergoing hemiarthroplasty were more likely to have an increased risk of revision and complication rates, similar to the findings of our study.[4] Limitations of this study include lack of long term followup and lack of patient reported outcome measures to assess functional status and patient satisfaction after surgery. Future studies should further investigate if certain indications for surgery are contributing to these findings more so than others (ie. fractures vs osteoarthritis).
SIGNIFICANCE/CLINICAL RELEVANCE: Glenohumeral hemiarthroplasties are associated with increased complications, death, and reoperation rates compared to TSAs and should be further investigated for their specific indications in shoulder joint replacement.

REFERENCES: **1:** Lin DJ, Wong TT, Kazam JK. Shoulder Arthroplasty, from Indications to Complications: What the Radiologist Needs to Know. *Radiographics*. 2016;36(1):192-208. **2:** Matsen FA 3rd, Clinton J, Lynch J, Bertelsen A, Richardson ML. Glenoid component failure in total shoulder arthroplasty. *J Bone Joint Surg Am*. 2008;90(4):885-896. **3:** R Core Team (2023). R: A language and environment for statistical computing. Vienna, Austria. https://www.R-project.org/ **4:** Singh Jagdev B, McGrath J, Cole A, Gomaa AR, Chong HH, Singh HP. Total shoulder arthroplasty vs. hemiarthroplasty in patients with primary glenohumeral arthritis with intact rotator cuff: meta-analysis using the ratio of means. *J Shoulder Elbow Surg*. 2022;31(12):2657-2670.

IMAGES and TABLES:

Perioperative Data	n	Difference of mean (95% CI)	p-value
Hospital Admission to Operation	41,412	0.42 (0.14 - 0.69)	**< 0.01**
Total Length of Hospital Stay	41,392	0.77 (0.57-0.97)	**< 0.001**
Days from Operation to Discharge	41,411	0.38 (0.29-0.47)	**< 0.001**

Table 1. Perioperative data comparison between patients undergoing hemiarthroplasty and total shoulder arthroplasty

Perioperative Data	Odds Ratio	p-value
Bleed	2.36 (1.95-2.82)	**< 0.001**
Cardiac Arrest	3.85 (1.59-8.40)	**< 0.01**
Shoulder Fracture	7.05 (2.01-22.9)	**< 0.01**
Reoperation	1.34 (1.01-1.75)	**< 0.05**
Death	4.05 (2.31-6.80)	**< 0.001**

Table 2. Perioperative data comparing the odds ratio of hemiarthroplasty against TSA

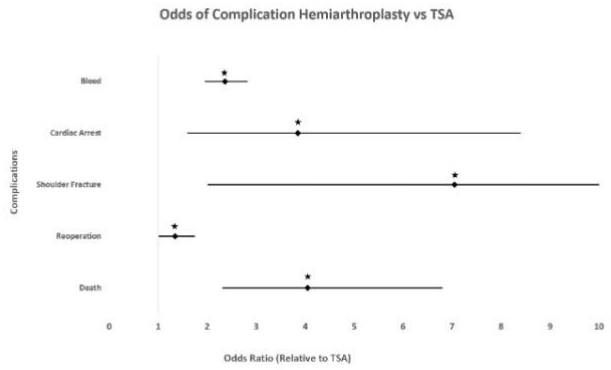

Figure 1. Forest Plot demonstrating increased complication rates in HA patients.