Observed Posterior Shoulder Subluxation Varies based on Arm Position during Preoperative CT

Bradley S Schoch[1], Kevin A Hao, Jennifer Traverse, Stephanie Spetka Giles[2], Sandrine Veronique Polakovic, John M Tokish, Rupert Stanborough
[1]Mayo Clinic, [2]Mayo Clinic Florida

INTRODUCTION:
Indications for anatomic and reverse total shoulder arthroplasty (aTSA, rTSA) in the setting of glenohumeral osteoarthritis continue to evolve. Prior studies of aTSA have shown higher rates of complications when posterior humeral head subluxation is greater than 80%. This is frequently assessed on computed tomography (CT) as part of preoperative planning and factors into surgeon's decision making when considering aTSA versus rTSA. Preoperative CT scans are routinely performed with the arm adducted to the side. We hypothesized that observed posterior subluxation would be greater when measured with the arm externally rotated. The purpose of this study was to prospectively compare the differences in humeral head posterior subluxation on preoperative CT when imaged with the arm in maximum external versus internal rotation in patients undergoing primary shoulder arthroplasty.
METHODS: Following IRB approval, all patients indicated for primary shoulder arthroplasty from two sites by two surgeons were screened for study inclusion. Patients with cuff tear arthropathy, known massive rotator cuff tears, or severely restricted preoperative motion (external rotation less than neutral, internal) were eliminated. A prior power analysis demonstrated 14 patients were needed to achieve 95% power to detect a 5% difference in subluxation with one-tailed testing with an α=0.05. Sixteen patients met inclusion criteria and underwent 2 CT scans with the arm held in maximum external rotation and a second scan with the arm in maximum internal rotation with the arm by the side. CT scans were then evaluated for posterior humeral head subluxation.
RESULTS: Sixteen patients with a mean age of 71 years (range, 55-84). Females were more commonly included (56%). The mean subluxation was 61% (range, 38-82%) in external rotation and 55% (range, 37-78%) in internal rotation (mean difference=6.3%, p=0.002). Figure 1. Observed differences in posterior subluxation ranged from 0 to 20%.
DISCUSSION AND CONCLUSION: Posterior subluxation is a critical data point utilized by surgeons considering patients for aTSA. However, this study highlights that a single position CT may not accurately assess the dynamic relationship of posterior subluxation relative to arm position. Posterior subluxation is greatest with the arm externally rotated, which is divergent from most preoperative CT protocols which position the arm in neutral, potentially underestimating posterior subluxation. Larger studies are needed to clarify which patients have greater variability in subluxation and how this influences the results of aTSA.