The Importance of External Rotation Following Reverse Total Shoulder Arthroplasty is Dependent Upon Arm Position

Sai Devana, MD, Oliver Forst, BS, Amir Boubekri, MD, Jay D Keener, MD, Alexander Aleem, MD, Benjamin Zmistowsk, MD
Washington University in St. Louis

Introduction

Reverse total shoulder arthroplasty (rTSA) alone has limited capacity to improve active external rotation (ER). There remains debate regarding the importance of external rotation ability for success of rTSA and the need for augmentation of external rotation through tendon transfers. To date, the literature has assessed post-operative external rotation at the side. This study aims to understand the impact of post-operative external rotation (at the side and in abduction) on patient-reported outcomes.

Methods

Following local institutional review board approval (IRB), we performed this retrospective analysis of our prospectively maintained shoulder arthroplasty registry. We identified all patients treated with rTSA who had completed two-year follow-up surveys. Utilizing a validated patient-reported range-of-motion, we stratified patient into three groups based on ER in abduction Group 1 (0°–30°), Group 2 (60°), and Group 3 (90°) and 4 groups based on ER with arm at side: Group 1 (0°–20°), Group 2 (40°), Group 3 (60°), and Group 4 (80°). rTSA success was defined utilizing a previously validated single assessment numeric evaluation (SANE) score greater than 75. Groups were globally compared using Kruskal-Wallis tests and a post hoc pairwise comparison using Dunn's test with Bonferroni correction was performed to stratify statistically significant differences between group PROMs.

Results

393 rTSA with an average age of 69.4 years (95% CI: 68.6-70.3), 220 female (56.6%), and 137 (34.9%) performed for osteoarthritis were included in this analysis. At two years, the mean SANE was 69.5 (95% CI: 66.9-72.1) with 214 (54.4%) achieving patient acceptable symptom state (PASS). In this analysis, 224 (57.0%) and 316 (80.4%) shoulders achieved greater than or equal to 60 degrees of external rotation in adduction and abduction, respectively. All planes of motion were associated with patients achieving PASS. When limiting the cohort to those patients with forward elevation of at least 135 degrees, abduction of 135 degrees, and internal rotation to the mid-lumbar spine (n=339 shoulders; 86.3%), external rotation in abduction had a greater strength of association (Gamma=0.48; 95% CI: 0.32-0.63) than external rotation with the arm by the side (Gamma=0.35; 95% CI: 0.20-.5) for PASS. In multivariate analysis, external rotation in abduction (p=0.02), internal rotation behind the back (p<0.001), and surgical indication (p=0.04) were independently associated with achieving PASS. While external rotation in abduction was statistically associated with each task of the ASES score (p<0.001), it was most strongly associated with combing hair (Gamma=-0.53) and lifting 10 pounds overhead (Gamma=-0.45) and least strongly associated with washing your back (Gamma=-0.30).

Discussion

External rotation in abduction is more strongly associated with patient-reported outcomes than external rotation with the arm by the side. When controlling for confounding variables, external rotation in abduction is independently associated with achieving PASS. Inability to externally rotate in abduction strongly predicts overhead activities, such as combing your hair. In pursuing optimal outcomes following rTSA, an emphasis on restoration of external rotation with the arm abducted will yield significant results.