Clinically Significant Outcome Thresholds and Rates of Achievement by Shoulder Arthroplasty Type and Preoperative Diagnosis

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INTRODUCTION:
Clinically significant outcome (CSO) benchmarks have been previously established for shoulder arthroplasty by assimilating preoperative diagnoses and arthroplasty types. However, conventional practice recommends developing and utilizing such thresholds on patients with similar diagnoses and procedures. Recent evidence has shown that patients receiving a reverse shoulder arthroplasty (RSA) for either rotator cuff arthropathy (RCA) or glenohumeral osteoarthritis with an intact rotator cuff (OA) have significant differences in their postoperative outcomes. The purpose of this study was to establish CSO thresholds and to determine the time-to-achievement of these for RSA for OA, RSA for RCA, and total shoulder arthroplasty (TSA) for OA.
METHODS:
We retrospectively identified consecutive patients who underwent elective RSA for OA, TSA for OA, or RSA for RCA between February 2015 and May 2020, with 2-years minimum follow up, from a prospectively maintained single surgeon registry. The American Shoulder Elbow Surgeons (ASES) score was administered preoperatively, 2-weeks, 6-weeks, 3-months, 6-months, 1-year, and 2-years postoperatively. Satisfaction and subjective overall improvement questionnaires were administered at the time of final follow up. The distribution-based methods was used to calculate the Minimal Clinically Important Difference (MCID), and anchor-based methods were used to calculate the Substantial Clinical Benefit (SCB) and the Patient Acceptable Symptom State (PASS). Average time to achievement, individual incidence of achievement at each timepoint, and cumulative incidence of achievement calculated using Kaplan-Meier survival curve analysis with interval censoring, were compared between groups for each CSO. Patients with missing ASES scores at a given timepoint were included in the analysis and considered to be nonachievers of the CSO at that time.
RESULTS: Overall, 293 patients were included (141 RSA for OA, 79 TSA for OA, and 73 RSA for RCA). The calculated CSO thresholds for each group are found in Table 1. Patients in the TSA for OA group were significantly younger (61.2, 71.1, 70.3 years, P<0.001), more often male (62% 41.4%, 47.2%, P=0.13), and had better active forward elevation (101°, 87°, 88°, P=0.002) than the RSA for OA and RSA for RCA groups, and patients receiving RSA for RCA more often had previous ipsilateral shoulder surgery relative to RSA for OA and TSA for OA patients (52.8%, 18.6%, 34.2%, P<0.001). For SCB, there was a significant difference in the cumulative percentage of patients in each group reaching this threshold at the 3-month timepoint (RSA for OA: 58.7%, TSA for OA: 59.4%, RSA for RCA: 55.4%, P=0.003). For MCID, there were significant differences at the 6-week (RSA for OA: 76%, TSA for OA: 62.2%, RSA for RCA: 61.5%, P=0.047), 3-month (RSA for OA: 88%, TSA for OA: 72.5%, RSA for RCA: 73.2%, P=0.016), 1-year (RSA for OA: 99.2%, TSA for OA: 94/1%, RSA for RCA: 88.9%, P=0.005), and 2-year (RSA for OA: 98.6%, TSA for OA: 92.3%, RSA for RCA: 91.7%, P=0.035) timepoints. For PASS, there were significant differences at the 6-week (RSA for OA: 46.4%, TSA for OA: 24.3%, RSA for RCA: 36.9%, P=0.008) and 3-month (RSA for OA: 88%, TSA for OA: 72.5%, RSA for RCA: 73.2%, P=0.016) timepoints. However, there were no significant differences in mean time to achievement of any CSO between patients receiving RSA for OA, TSA for OA, and RSA for RCA (SCB: 6.3, 7.5, 7.8 months, P=0.361; MCID: 2.7, 3.6, 4.1 months, P=0.137; PASS: 4.6, 5.9, 5.4 months, P=0.297). Log-rank tests analysis revealed that the survival curves significantly differed for MCID (P=0.04), with patients receiving RSA for OA having the fastest time to achievement, but not for SCB (P=0.408) or PASS (p=0.192) (Figure 1).
DISCUSSION AND CONCLUSION: In this investigation we established distinct CSO thresholds for patients receiving RSA for OA, TSA for OA, or RSA for RCA. Using these thresholds, we determined that these groups significantly differ in the proportion of patients who achieve CSOs at different individual timepoints and that patients receiving RSA for OA have the fastest cumulative incidence of MCID achievement.

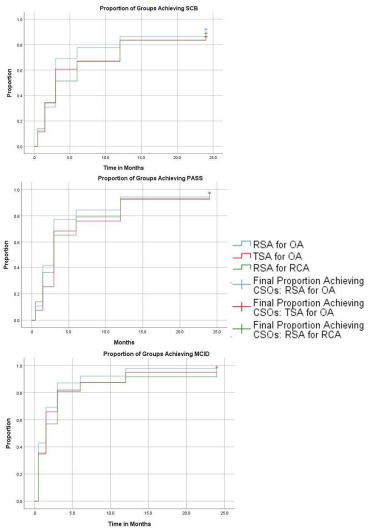

Table 1. CSO for changes in ASES score by procedure and diagnosis

Diagnosis and Procedure	MCID	SCB (AUC/Sensitivity/Specificity)	PASS (AUC/Sensitivity/Specificity)
TSA for OA	12.3	31.1 (0.89/0.82/0.75)	68.9 (93.9/90.5/100)
RSA for OA	9.6	32.6 (0.93/0.88/100)	62.2 (96.5/94.8/100)
RSA for RCA	11.1	25.3 (96.4/82.1/100)	57.1 (98.6/91.5/100)