Assessment of the optimal shoulder outcome score for reverse shoulder arthroplasty

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Background: With growing attention being paid to quality and cost-effectiveness in health care, outcome evaluations are becoming increasingly important. This determination can be especially difficult in reverse shoulder arthroplasty (RSA) given the complex pathology and extensive disabilities in this patient population. This study evaluated the use of 3 validated questionnaires used to assess outcomes for RSA.
Methods: Using a database of patients treated with RSA, we assessed preoperative and postoperative Constant-Murley Scores, American Shoulder and Elbow Surgeons Scores, and Subjective Shoulder Values in 148 shoulders. The outcomes at each scoring period were described, and the scores were compared with one another as well as with active range of motion.
Results: There were no significant differences in the mean improvement of any of the scores. Improvements in all of the outcome scales were correlated with each other and with improvement in forward elevation but not with external rotation. Multivariate regression analysis the 3 outcome measures was able to predict 38.9% of the variation in improvement in functional outcomes (forward elevation). This was only slightly greater than that provided by improvements in the outcome variable Constant-Murley score alone (36.7%).
Conclusions: The 3 shoulder outcome scores evaluated, regardless of whether they were patient reported or physician based, appear to appropriately reflect improvements after RSA with equal validity. The objective physician-assessed Constant-Murley score had the strongest correlation with function of the arm, and use of a combination of all 3 outcome scores did not increase the ability to predict range of motion compared with using the Constant-Murley score alone.
Level of evidence: Basic Science Study, Development or Validation of Outcomes Instruments/ Classification Systems.
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Reverse shoulder arthroplasty (RSA) is often used in more complex shoulder disorders with coexisting rotator cuff deficiency. RSA has been used successfully in patients with cuff tear arthropathy (CTA), complex proximal humeral fractures, and for revision of failed shoulder

arthroplasties.[8,11] RSA provides the potential for improvements in function to a group of patients who previously had no other options.[5,8]

RSA is performed in patients with significant impairment and disability before surgery; therefore, full functional recovery is rarely expected. Furthermore, because function is multifactorial, assessing functional outcomes based on an evaluation of isolated variables, such as range of motion or strength, can be difficult. This had led to an emphasis on patient satisfaction as an essential criterion for outcomes assessments. The optimal outcomes assessment should include patient-reported function and satisfaction data combined with clinical (or functional) outcome assessments. With growing attention being paid to quality and cost-effectiveness in health care, outcome evaluations are evolving in emphasis and importance for musculoskeletal surgeries. Clinicians and researchers share a common goal of determining whether interventions provide sufficient benefit to quality of life while being cost-effective. This determination can be especially difficult in RSA given the complex pathology and extensive disabilities in this patient population.

Many such outcome evaluations are being used for shoulder pathology. One commonly used system is the American Shoulder and Elbow Surgeons (ASES) score. This score is based equally on the patient's subjective quantification of pain (50%) as well as a subjective review by the patient of his or her ability to perform various activities of daily living (50%).[6] This test has demonstrated appropriate reliability and validity when used in groups of patients with shoulder instability, arthritis, and rotator cuff disease.[4]

Another commonly used scoring system is the Constant-Murley score (CMS). This score, first published by Constant and Murley in 1987, provides an assessment based on the patient's subjective assessment of pain (15%) and activities of daily living (20%). This is also expanded on by a physician's assessment of the patient's range of motion (40%) and strength in abduction (25%).[1] This score has been widely used and is endorsed by the European Society for Surgery of the Shoulder and the Elbow. A recent systematic review has shown this scoring system to provide adequate validity and reliability.[7]

The Subjective Shoulder Value (SSV) was created to provide a simpler alternative to these other scoring systems. This score is calculated by asking the patient to rate his or her shoulder on a scale, with 100 being a normal shoulder. Although simple, this score has been demonstrated to be responsive and valid compared with the CMS and is advocated as a useful adjuvant in assessment of shoulder function.[2] This score is also referred to as the Single Assessment Numeric Evaluation (SANE) in the literature.[14,15]

Currently, there are little data supporting the use of these scoring systems to assess outcomes for patients undergoing RSA. This study examined and compared these 3 validated questionnaires to determine the optimal outcome assessment tool for patients undergoing RSA. Our goal was to assess the responsiveness of these scoring systems to postoperative changes after RSA and to determine if one score was superior to the others or if there was an optimal combination of scores that would more reliably predict outcomes.

Methods

All patients treated with a RSA between 2006 and 2010 by 2 senior subspecialty shoulder surgeons (V.J.S. and J.M.W.) were offered to be included in this study. Patients treated for acute fracture, revision arthroplasty, or for post-traumatic deformity were excluded from this study. There was a minimum of 12-month follow-up, with an average follow-up of 30.5 months (range, 12-81 months) for all participants in this study. This yielded a study cohort of 140 patients, of which 8 patients had bilateral RSA surgery (148 shoulders). All patients were treated with a Grammont style RSA prosthesis using standard manufacturer's instrumentation and guidelines. Procedures were performed with the patient in the seated beach chair position through a deltopectoral approach.

CMS, score, SSVs, and range of movement were measured at preoperative and postoperative visits. The subjective portions of these scores were determined through the administration of paper-based surveys that were independently completed by the participants during routine clinic visits. Preoperative and postoperative means were recorded from the group. Preoperative and postoperative assessments were compared to yield changes in scores. Mean values, standard deviations, and skewness were recorded for all 3 tests when used preoperatively, postoperatively, and for changes in scores for each patient.

Correlations between the outcome scores and functional outcomes (forward elevation and external rotation) and other outcome scores were analyzed using the Pearson correlation coefficient. The mean improvements for the scores were then compared using analysis of variance testing. To assess the ability of these scoring systems to predict functional outcomes, multiple regression analysis was also performed, and the coefficient of determination (R^2) was used to describe the variation of measured postoperative function (forward flexion) explained by a combination of these 3 outcome scores. This was compared with univariate linear analysis for each score independently to determine if the combination of all 3 scores offered a better prediction of functional outcomes and to determine which score independently was the best predictor of outcome. Statistics were performed using SPSS 22.0 software (IBM Corp, Armonk, NY, USA).

Results

The study enrolled 140 patients, 8 of whom had bilateral RSA surgery, accounting for 148 shoulders. Of those patients, there were 93 completed CMS, 146 completed ASES Scores, and 145 completed SSVs. Functional forward elevation was evaluated in 147 shoulders and external rotation was evaluated in 148. There were 104 diagnoses