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ORIGINAL ARTICLE

Is the Simple Shoulder Test a valid outcome instrument for shoulder arthroplasty?

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Background: The Simple Shoulder Test (SST) is a brief, inexpensive, and widely used patient-reported outcome tool, but it has not been rigorously evaluated for patients having shoulder arthroplasty. The goal of this study was to rigorously evaluate the validity of the SST for outcome assessment in shoulder arthroplasty using a systematic review of the literature and an analysis of its properties in a series of 408 surgical cases.

Methods: SST scores, 36-Item Short Form Health Survey scores, and satisfaction scores were collected preoperatively and 2 years postoperatively. Responsiveness was assessed by comparing preoperative and 2-year postoperative scores. Criterion validity was determined by correlating the SST with the 36-Item Short Form Health Survey. Construct validity was tested through 5 clinical hypotheses regarding satisfaction, comorbidities, insurance status, previous failed surgery, and narcotic use.

Results: Scores after arthroplasty improved from 3.9 ± 2.8 to 10.2 ± 2.3 ($P < .001$). The change in SST correlated strongly with patient satisfaction ($P < .001$). The SST had large Cohen's *d* effect sizes and standardized response means. Criterion validity was supported by significant differences between satisfied and unsatisfied patients, those with more severe and less severe comorbidities, those with workers' compensation or Medicaid and other types of insurance, those with and without previous failed shoulder surgery, and those taking and those not taking narcotic pain medication before surgery ($P < .005$).

Conclusion: These data combined with a systematic review of the literature demonstrate that the SST is a valid and responsive patient-reported outcome measure for assessing the outcomes of shoulder arthroplasty.

Level of evidence: Basic Science Study; Validation of Outcome Instrument

Keywords: Simple Shoulder Test; psychometric properties; validity; shoulder arthritis; shoulder arthroplasty; outcomes

Outcome assessment can serve at least 2 important functions. For the individual practitioner, the systematic assessment of patient-reported comfort and function before and after surgery will reveal which patients and conditions benefit from the different treatments used by that surgeon. The second important function of outcome assessment is to enable clinical research into the benefits of treatment across diverse populations of patients to clarify which patient, shoulder, procedure,

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and physician factors are associated with better results and which are most cost-effective. In either of these 2 applications, it is desirable to have a tool that is valid on the one hand and inexpensive and practical in the context of busy practices on the other. Lengthy questionnaires increase survey fatigue, decrease response rates, and limit practical use. Outcome tools that require measurements of strength and range of motion are subject to inconsistency among observers.[32] Some approaches—such as the Patient-Reported Outcomes Measurement Information System computer adaptive testing system—require a computer interface that many practices do not have the opportunity or adequate resources to incorporate.[7]

Among the many shoulder outcome scores currently in use, the Simple Shoulder Test (SST) is a simple, short survey that employs 12 yes or no questions about pain and function of the shoulder (Fig. 1).[1,7,13,19,26,30,36,38,41] It does not require any potentially biasing participation by physicians, nurses, or therapists; it can be completed without a computer and without the patient's having to return to the surgeon's office. It has been adapted and validated in English[5-7,13,27,30,36,39] as well as in Persian,[10,25] Spanish,[2,21] Portuguese,[26] Dutch,[38] and Turkish.[3]

A systematic review of 654 studies using the SST (Appendix S1) demonstrated that this outcome score is commonly used to evaluate patients with rotator cuff disease (174 studies [27%]) and patients with arthritis and arthroplasty patients (153 studies [23%]). Up to this point, most of the validation studies have focused on rotator cuff conditions (Appendix S2). Whereas the psychometric properties are well documented in patients with rotator cuff disease,[5-7,13,27,30,36,39] high-quality studies on the psychometric properties in patients with shoulder arthritis are limited. Specifically, the evaluation of the content and criterion validity of the SST in shoulder arthroplasty is lacking in the literature.

Given this background, the goal of this study was to rigorously assess the validity of the SST in evaluating the comfort and function in a large cohort of patients undergoing shoulder arthroplasty with minimum 2-year follow-up.

Simple Shoulder Test	
# 1	Is your shoulder comfortable with your arm at rest by your side?
# 2	Does your shoulder allow you to sleep comfortably?
# 3	Can you reach the small of your back to tuck in your shirt with your hand?
# 4	Can you place your hand behind your head with the elbow straight out to the side?
# 5	Can you place a coin on a shelf at the level of your shoulder without bending your elbow?
# 6	Can you lift one pound (a full pint container) to the level of your shoulder without bending your elbow?
# 7	Can you lift eight pounds (a full gallon container) to the level of the top of your head without bending your elbow?
# 8	Can you carry 20 pounds at your side with the affected extremity?
# 9	Do you think you can toss a softball underhand 10 yards with the affected extremity?
# 10	Do you think you can throw a softball overhand 20 yards with the affected extremity?
# 11	Can you wash the back of your opposite shoulder with the affected extremity?
# 12	Would your shoulder allow you to work full-time at your usual job?

Figure 1 The 12 questions of the Simple Shoulder Test.

Methods

Study subjects

Patients in our practice undergoing shoulder arthroplasty between the dates of August 2010 and March 2014 were invited to participate in a prospective outcome study. Those patients with complete baseline characteristics and 2-year outcomes during the time period were included in this analysis. Patients completed the SST and the 36-Item Short Form Health Survey (SF-36) questionnaire preoperatively (within 30 days of surgery) and postoperatively at 2 years. A total of 522 patients were enrolled in the database. Fourteen patients died, and 100 did not submit a final survey; thus, complete information was available for a total of 408 patients (78.2%).

Operations were performed at a single institution. The surgical procedure for each shoulder was selected by surgeon/patient-shared decision-making. The demographics of the patients are summarized in Table I. The average age of the cohort was 64.0 ± 12.1 years. The majority of patients were male (64%). Primary osteoarthritis was the diagnosis in 279 patients (68%); 127 patients (33%) had previous surgery on the shoulder. Procedures performed included 178 total shoulder arthroplasties, 150 ream and run arthroplasties, 27 hemiarthroplasties, 33 cuff tear arthropathy arthroplasties, and 20 reverse shoulder arthroplasties. Because the purpose of the study was to explore the psychometric properties of the SST in patients with shoulder arthroplasty, it is appropriate to include different types of shoulder joint replacement in the analysis.

Table I Demographics of the patients (N = 408)

Age, y	64.0 ± 12.1	range, 21-90
	No.	%
Sex		
Male	261	64
Female	147	36
Diagnosis		
Osteoarthritis	279	68
Rheumatoid arthritis	3	1
Avascular necrosis	15	4
Capsulorrhaphy arthropathy	17	4
Post-traumatic arthritis	20	5
Cuff tear arthropathy	52	13
Other	22	5
Previous surgery		
Yes	127	33
No	256	67
Procedures performed		
Total shoulder arthroplasty	178	44
Ream and run arthroplasty	150	37
Hemiarthroplasty	27	7
CTA arthroplasty	33	8
Reverse shoulder arthroplasty	20	5

CTA, cuff tear arthropathy.