Original Article

The UCLA Shoulder Score Is a Better Predictor of Treatment Success Than the Constant and Oxford Shoulder Scores After Arthroscopic Rotator Cuff Repair: A 2-Year Follow-Up Study

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Purpose: The aim of this study was to determine the correlation between functional outcome scores and treatment success after arthroscopic rotator cuff repair. **Methods:** We conducted a retrospective cohort study of patients who underwent unilateral rotator cuff repair at a tertiary hospital between 2010 and 2015. University of California at Los Angeles Shoulder Score (UCLASS), Constant Shoulder Score (CSS), and Oxford Shoulder Score (OSS) were measured before and at 6, 12, and 24 months after surgery. Patients were divided into 2 groups at each follow-up: (1) those with successful treatment and (2) those with unsuccessful treatment. Treatment success was defined as simultaneous fulfilment of 3 criteria: clinically significant improvement in pain, expectations for surgery met, and patient satisfied with surgery. **Results:** A total of 214 subjects met the inclusion criteria. UCLASS was a consistent significant predictor of treatment success at 6 months (odds ratio [OR] 1.192, $P = .005$, 95% confidence interval [CI] 1.054-1.348), 12 months (OR 1.274, $P < .001$, 95% CI 1.153-1.406), and 24 months (OR 1.266, $P < .001$, 95% CI 1.162-1.380). Lower preoperative CSS was significant in predicting treatment success at 6 months (OR 0.952, $P = .001$, 95% CI 0.926-0.979), while larger tear size was significant in predicting treatment success at 24 months (OR 1.773, $P = .043$, 95% CI 1.019-3.083). **Conclusion:** UCLASS is a better tool for predicting treatment success than CSS and OSS in patients undergoing arthroscopic rotator cuff repair, up to a minimum of 24 months' follow-up. A holistic assessment of shoulder function, taking into account both subjective and objective evaluation of function, as well as patient-reported satisfaction, is important in determining treatment success after arthroscopic rotator cuff repair. **Level of Evidence:** III, retrospective comparative study.

Rotator cuff tears are the most common cause of shoulder pain in the elderly, which impairs daily functioning and health-related quality of life.[1] Arthroscopic rotator cuff repair is increasing in incidence and is a reliable treatment option for symptomatic rotator cuff tears, offering excellent results in both function and quality of life.[1-3] Although there is no consensus on what constitutes treatment success after arthroscopic rotator cuff repair, the current consensus among surgeons is to focus primarily on patient satisfaction, pain relief, and fulfilment of expectations because these generally constitute what a patient may perceive as treatment success.[4,5]

The degree of recovery after arthroscopic rotator cuff repair varies distinctly between patients and failure to achieve patient satisfaction or improvement in patient-reported outcome measures (PROMs) after arthroscopic rotator cuff repair has been estimated to vary from 7%

to >90% in the literature.[3,6,7] Several factors may affect the degree of recovery and treatment success in patients after a cuff repair, including demographics, clinical factors, cuff integrity, and repair construct (single vs double row).[8-10] Knowledge of these prognostic factors may lead to improved insight for surgeons and allow patients to be better informed about their expected recovery. Furthermore, it can contribute to the development of individualized protocols for surgery and rehabilitation.[11]

Different PROMs have been developed to measure functional outcomes after shoulder surgery. The University of California at Los Angeles Shoulder Score (UCLASS), Constant Shoulder Score (CSS) and Oxford Shoulder Score (OSS) are widely used for the evaluation of functional and quality-of-life outcomes after shoulder surgery, with good reliability and validity.[12-16] Such outcome measures are important tools for quantifying, standardizing, and determining the success of surgical treatments. However, it is currently unclear which of these scoring systems is the best predictor of treatment success after arthroscopic rotator cuff repair.

The purpose of this study was to determine the correlation between functional outcome scores and treatment success after arthroscopic rotator cuff repair. We hypothesized that UCLASS would be a better predictor of treatment success than CSS and OSS in patients undergoing arthroscopic rotator cuff repair, up to 2 years' follow-up, because it provides a more holistic assessment of shoulder function, taking into account patient-reported satisfaction.

Materials and Methods

Patient Selection and Study Design

We conducted a retrospective cohort study of patients who underwent unilateral rotator cuff repair at a tertiary hospital between 2010 and 2015. The study was approved by the institutional review board prior to commencement.

Inclusion criteria were patients aged 21 years or older with a full-thickness rotator cuff tear documented on preoperative shoulder ultrasonography or shoulder magnetic resonance imaging. Patients with traumatic tears, isolated subscapularis tears, concomitant adhesive capsulitis or glenohumeral instability were excluded from this study. Only patients with complete data at all follow-up timepoints were included in the analysis to ensure that the changes in scores were reflective of the changes in outcomes in the same group of patients.

Patients included in the study were divided into 2 groups at each follow-up: (1) those with successful treatment and (2) those with unsuccessful treatment. As per current literature, treatment success was defined as simultaneous fulfilment of 3 criteria: improvement in pain (a decrease in Visual Analog Scale [VAS] pain score of at least 2.4), expectations for surgery met (expectation score ≤4), and patient satisfied with surgery (satisfaction score ≤4).[5] The minimal clinically important difference of VAS after arthroscopic rotator cuff repair is 2.4 on a 10-point scale, based on a previous study by Tashjian et al.[17] At each follow-up, patients rated their expectations and their overall satisfaction with surgery. Expectations were rated on a 7-point Likert scale, with 1 being "greatly exceeding expectation" and 7 being "much less than expected," whereas satisfaction was rated on a 6-point Likert scale, with 1 being "extremely satisfied" and 6 being "extremely dissatisfied."

All patients, while under general anaesthesia, underwent arthroscopic double-row rotator cuff repair with subacromial decompression by a single, fellowship-trained shoulder surgeon. The surgeries were performed with patients in the beach chair position, with standard posterior, anterior, and lateral arthroscopic portals. An acromioplasty was routinely performed by removing the anteroinferior surface of the acromion from the medial articular margin to the anterolateral corner.

All patients underwent the same postoperative rehabilitation protocol. They were placed in an arm sling and started on pendulum exercises. The sling was discontinued at 4 weeks, and active shoulder range of motion was started. Strengthening exercises were started at 8 weeks after surgery.

Functional Outcomes

UCLASS, CSS, OSS, and VAS Pain Scores were measured for each patient by an independent healthcare professional before surgery and then followed up at 6, 12, and 24 months after surgery. Baseline demographics including age, gender, body mass index (BMI), rotator cuff tear size, and presence of concomitant biceps pathology were also noted before surgery.[18-20] Patient assessment and unaided PROM questionnaire administration was performed by an independent healthcare professional at each follow-up (principal physiotherapist).

The UCLASS is a combined subjective (pain, satisfaction, and function) and objective (active forward flexion and strength) patient-based score for assessing shoulder conditions including rotator cuff repair. The total score ranges from 0 to 35, with a higher score indicating better function and a normal range of 15.3 ± 4.9.[5,14]

The CSS is a 100-point scale that consists of physical examination findings and patient-reported subjective evaluation of shoulder function. The total score ranges from 0 to 100, with a higher score indicating better shoulder function and a normal range of 40.0 ± 18.9.[5,13]

The OSS is a validated patient-based questionnaire designed for self-assessment of pain and function of the shoulder after all shoulder operations other than stabilization. The total score ranges from 12 to 60, with a

Table 1. Baseline patient demographic (n = 214)

Clinical parameter	
Age (years)	60.1 ± 10.0
Sex (male/female)	96:118
BMI (kg/m^2)	25.7 ± 5.3
Side of surgery (right/left)	143:71
Biceps pathology (%)	14.5
Tear size (cm)	1.5 ± 0.8
UCLA Shoulder Score	15.2 ± 4.9
CSS	40.2 ± 18.9
OSS	31.4 ± 10.7
VAS Pain Score	6.5 ± 2.4

higher score indicating a greater degree of disability and a normal range of 28.4 ± 10.9.[5,12,21]

The VAS Pain Score assesses pain in the involved shoulder on a Likert Scale of 0 to 10, with 0 points representing no pain at all and 10 points representing the worst pain ever felt.

Statistical Analysis

Statistical analysis was performed with SPSS statistical software (version 24.0; SPSS, Chicago, IL). Univariate analysis was performed with χ^2 or the Fisher's exact test for comparison of proportions between 2 categorical data. Student's t-test was used to compare continuous variables. Level of significance was taken as $P < .05$ for all comparisons.

Covariates of baseline demographics and functional scores at the respective follow-up with a P value <0.2 in the univariate analysis were entered into the multivariate regression. Binary logistic regression models with backward elimination were used to identify independent predictors of treatment success at 6, 12, and 24 months after operation. Correlation between the UCLASS, CSS ,and OSS before and at 6, 12, and 24

Table 2B. Univariate analysis of clinical parameters associated with successful treatment at 12 months' follow-up

12 months	Successful (n = 157)	Not Successful (n = 27)	P value
Age (years)	60.5 ± 9.3	60.3 ± 12.4	.884
Sex (male/female)	73:84	13:14	.874
BMI (kg/m^2)	25.9 ± 5.3	24.5 ± 5.0	.220
Side of surgery (right/left)	113:44	14:13	.044*
Biceps pathology (%)	10.8	18.5	.330
Tear size (cm)	1.6 ± 0.8	1.5 ± 0.7	.697
UCLA Shoulder Score			
Preoperative	15.1 ± 4.8	14.8 ± 5.6	.728
12 months	29.6 ± 4.0	23.0 ± 6.7	<.001*
CSS			
Preoperative	39.2 ± 18.3	40.2 ± 21.1	.795
12 months	71.1 ± 13.3	51.4 ± 19.7	<.001*
OSS			
Preoperative	31.4 ± 10.4	33.1 ± 12.8	.446
12 months	15.1 ± 5.3	25.2 ± 11.1	<.001*

*$P < .05$.

months after surgery was analyzed using Pearson's correlation coefficient.

Results

Patient Demographics

From the electronic medical record, we identified 291 cases of arthroscopic rotator cuff repair between 2010 and 2015, which met our inclusion criteria and had 2-year follow-up data. A total of 77 patients had missing values at any of the 3 follow-up timepoints and were excluded because they were deemed lost to follow-up, leaving a total of 214 patients who were included in the final study. The demographic data of patients in this study is shown in Table 1. The majority of patients were female (55.1%), and the study group had a mean age of 60.1 ± 10.0 years and BMI of 25.7 ± 5.3 kg/m^2.

Table 2A. Univariate analysis of clinical parameters associated with successful treatment at 6 months' follow-up

6 months	Successful (n = 144)	Not Successful (n = 52)	P value
Age (years)	60.9 ± 9.4	58.8 ± 10.2	.174
Sex (male/female)	63:81	26:26	.516
BMI (kg/m^2)	25.8 ± 5.7	25.4 ± 4.4	.704
Side of surgery (right/left)	98:46	35:17	.526
Biceps pathology (%)	16.0	11.5	.503
Tear size (cm)	1.6 ± 0.8	1.3 ± 0.9	.152
UCLA Shoulder Score			
Preoperative	15.0 ± 4.9	16.1 ± 5.0	.168
6 months	28.0 ± 4.3	21.6 ± 6.4	<.001*
CSS			
Preoperative	39.2 ± 18.4	44.1 ± 20.1	.107
6 months	63.2 ± 13.0	48.5 ± 16.2	<.001*
OSS			
Preoperative	31.9 ± 10.6	30.3 ± 11.4	.365
6 months	17.5 ± 6.3	26.4 ± 11.2	<.001*

*$P < .05$.

Table 2C. Univariate analysis of clinical parameters associated with successful treatment at 24 months' follow-up

24 months	Successful (n = 170)	Not Successful (n = 44)	P value
Age (years)	60.6 ± 10.0	58.4 ± 10.1	.202
Sex (male/female)	74:96	22:22	.498
BMI (kg/m^2)	25.8 ± 5.6	25.5 ± 4.0	.782
Side of surgery (right/left)	115:55	28:16	.720
Biceps pathology (%)	12.4	22.7	.094
Tear size (cm)	1.6 ± 0.8	1.3 ± 0.9	.066
UCLA Shoulder Score			
Preoperative	15.2 ± 4.6	15.3 ± 5.8	.942
24 months	31.2 ± 3.8	24.5 ± 6.6	<.001*
CSS			
Preoperative	39.9 ± 18.5	41.5 ± 20.5	.624
24 months	73.8 ± 11.1	59.1 ± 17.9	<.001*
OSS			
Preoperative	31.3 ± 10.1	31.6 ± 13.0	.879
24 months	14.3 ± 5.6	21.6 ± 8.5	<.001*

*$P < .05$.

Table 3. Logistic regression analysis of independent predictors of successful treatment at 6, 12 and 24 months follow-up

	Odds Ratio	P value	95% CI
Predictors at 6 months			
Preoperative CSS	.952	.001[*]	.926-.979
6 Months CSS	1.046	.056	.999-1.095
6 Months UCLASS	1.192	.005[*]	1.054-1.348
Predictors at 12 months			
12 Months UCLASS	1.274	<.001[*]	1.153-1.406
Predictors at 24 months			
Tear size	1.773	.043[*]	1.019-3.083
24 Months UCLASS	1.266	<.001[*]	1.162-1.380

[*]$P < 0.05$.

At 6, 12, and 24 months' follow-up, UCLASS ($P < .001$), CSS ($P < .001$), and OSS ($P < .001$) measured at the respective follow-ups were significantly associated with treatment success (Table 2).

Predictors of Successful Treatment

The logistics regression analyses of significant predictors of treatment success at 6, 12, and 24 months are presented in Table 3. UCLASS was a consistent significant predictor of treatment success at 6 months (odds ratio [OR] 1.192, $P = .005$, 95% confidence interval [CI] 1.054-1.348), 12 months (OR 1.274, $P < .001$, 95% CI 1.153-1.406), and 24 months (OR 1.266, $P < .001$, 95% CI 1.162-1.380).

Lower preoperative CSS was significant in predicting treatment success at 6 months (OR 0.952, $P = .001$, 95% CI 0.926 -0.979), whereas larger tear size was significant in predicting treatment success at 24 months (OR 1.773, $P = .043$, 95% CI 1.019-3.083). OSS was not a significant predictor of treatment success in any of the regression models.

Before surgery and at 6, 12, and 24 months' follow-up, respectively, UCLASS, CSS and OSS were all significantly correlated with each other ($P < .001$) (Table 4).

Discussion

The main finding of this study was that UCLASS was a better and more consistent significant predictor of treatment success at 6, 12, and 24 months' follow-up than CSS and OSS. Hence, the UCLASS may be a better tool for surgeons to quantify, standardize, and determine success after arthroscopic rotator cuff repair.

The UCLASS is used for patients with various shoulder conditions including rotator cuff disease and shoulder instability.[14,16] This instrument assigns a score to patients on the basis of 5 separate domains with varying weightage: pain, 28.6%; function, 28.6%; range of motion, 14.3%; strength, 14.3%; and satisfaction, 14.3%. It combines both subjective and objective evaluation of function, providing a holistic assessment of shoulder function. Likewise, the CSS combines physical examination tests with subjective evaluations by the patients to assess shoulder function. These are divided into 4 subscales: pain, 15%; activities of daily living, 20%; strength, 25%; and range of motion, 40%. However, unlike the UCLASS, the CSS is weighted heavily on range of motion (40%) and strength (25%) and does not include patient-reported satisfaction, which is a key factor for what a patient may perceive as treatment success.[4,5] Furthermore, the reliability of the CSS as an assessment tool has been evaluated on a limited basis. Conboy et al.[22] studied the reliability of CSS and demonstrated that based on 95% confidence limits of interobserver and intraobserver variability, the measured score would be within 17.7 points and 16.0 points of the true score respectively. Unlike the UCLASS and CSS, the OSS focuses purely on subjective patient-reported outcomes and fails to account for objective measures of functional recovery.[23] It is a 12-item questionnaire assessing shoulder disability, with 4 of the 12 questions being related to pain. Hence, it is likely that UCLASS is a better predictor of treatment success than CSS and OSS because it provides a more holistic assessment of shoulder function with sufficient weightage on patient-reported satisfaction. Nonetheless, all 3 scoring systems were significantly correlated with one another before surgery and at 6, 12, and 24 months' follow-up, likely because of the significant overlap in the domains comprising each score. Apart from these global scoring systems, surgeons should also consider the scores of key domains such as pain and patient satisfaction in predicting and determining treatment success.

At 24 months there were also no responses with the maximum or minimum score for UCLASS, CSS, or OSS, thus reducing the effect of bias in interpreting the outcomes of arthroscopic rotator cuff repair. This is in

Table 4. Correlation between UCLASS, CSS, and OSS scores preoperatively and at 6, 12, and 24 months' follow-up

	R		
	UCLASS	CSS	OSS
Preoperative			
UCLASS	−9	0.829[*]	−0.796[*]
CSS	0.829[*]	—	−0.797[*]
OSS	−0.796[*]	−0.797[*]	—
6 Months			
UCLASS	—	0.787[*]	−0.771[*]
CSS	0.787[*]	—	−0.791[*]
OSS	−0.771[*]	−0.791[*]	—
12 Months			
UCLASS	—	0.765[*]	−0.808[*]
CSS	0.765[*]	—	−0.812[*]
OSS	−0.808[*]	−0.812[*]	—
24 Months			
UCLASS	—	0.785[*]	−0.805[*]
CSS	0.785[*]	—	−0.802[*]
OSS	−0.805[*]	−0.802[*]	—

[*]$P < .001$.

line with previous studies that have shown a low floor/ceiling effect with these scoring systems.[24-26]

Studies have shown that arthroscopic rotator cuff repair can improve function and quality of life through a combination of PROMs and different clinical parameters, which can in turn be used as indicators of treatment success which constitutes a clinically significant improvement in pain, patient satisfactions and expectations met after surgery.[27] Such outcome measures have become increasingly important for today's informed patients to make decisions regarding treatment based on clinical evidence. However, it is currently unclear which of the widely used scoring systems is the best predictor of treatment success. Baettig et al.[28] found that postoperative CSS was a significant predictor of patient satisfaction after reconstructive shoulder surgery. Likewise, Tashjian et al.[17] demonstrated significant correlation of patient satisfaction with Simple Shoulder Test, Disability of the Arm, Shoulder, and Hand, and Short Form 36 domain scores.[29] Conversely, Herring et al.[30] reported that patients who met the criteria of treatment failure had significantly worse Western Ontario Rotator Cuff index scores at 1 and 2 years after operation than those with successful treatment. The present study was designed to determine the correlation between functional scores and treatment success after arthroscopic rotator cuff repair using UCLASS, CSS, and OSS.

Another finding of the present study was that lower preoperative CSS and larger tear size were significant predictors of treatment success at 6 and 24 months' follow-up, respectively. It is likely that these factors indicate patients with more severe cuff tears and impaired function at baseline. For a given postoperative functional level, such patients would have achieved a greater improvement than those with milder baseline symptoms. Hence, they are more likely to be satisfied and have had their expectations met after the surgery.[31] This supports current recommendations that a nonoperative approach should be the first-line management for all patients with small cuff tears and mild preoperative symptoms.[32,33] Arthroscopic rotator cuff repair should be recommended when conservative treatment fails or in patients with larger tears and more severe preoperative functional impairment, to increase the odds of treatment success.[34]

The present study has several strengths. First, the data represents patients operated on by a single surgeon, thus reducing heterogeneity in surgical technique and postoperative rehabilitation. Secondly, our robust follow-up protocol allowed for serial measurement of functional outcome scores at fixed intervals after operation.

Limitations

This study has limitations. First, there are inherent selection and observer biases as the data represents patients from a single tertiary institution. Second, we did not have complete data in our study group, with 8.4% (n = 18) and 14.0% (n = 30) having missing functional outcomes data at 6 and 12 months, respectively, because of defaulted follow-up. Third, the present study does not account for other potential confounders such as Goutallier stage, specific biceps pathology, opioid use, depression, and smoking. Fourth, all the PROM and satisfaction questionnaires were filled out by patients at the same time during each visit, potentially introducing bias in reporting.

Conclusion

UCLASS is a better tool for predicting treatment success than CSS and OSS in patients undergoing arthroscopic rotator cuff repair, up to a minimum of 24 months' follow-up. A holistic assessment of shoulder function, taking into account both subjective and objective evaluation of function, as well as patient-reported satisfaction, is important in determining treatment success after arthroscopic rotator cuff repair.

References

1. Cho CH, Song KS, Hwang I, Warner JJ. Does rotator cuff repair improve psychologic status and quality of life in patients with rotator cuff tear? *Clin Orthop Relat Res* 2015;473:3494-3500.
2. Colvin AC, Egorova N, Harrison AK, Moskowitz A, Flatow EL. National trends in rotator cuff repair. *J Bone Joint Surg Am* 2012;94:227-233.
3. Cole BJ, McCarty LP 3rd, Kang RW, Alford W, Lewis PB, Hayden JK. Arthroscopic rotator cuff repair: prospective functional outcome and repair integrity at minimum 2-year follow-up. *J Shoulder Elbow Surg* 2007;16:579-585.
4. Zhu M, Chen J, Teo T, Koo K, Rikhraj I. Predicting treatment success after scarf osteotomy for hallux valgus using The American Orthopedic Foot and Ankle Society and Short Form Health Survey Scores. *J Foot Ankle Surg* 2018;5:59-63.
5. Xu S, Chen JY, Lie HME, Hao Y, Lie DTT. Determination of threshold scores for treatment success after arthroscopic rotator cuff repair using Oxford, constant, and University of California, Los Angeles Shoulder Scores. *Arthroscopy* 2019;35:304-311.
6. Manaka T, Ito Y, Matsumoto I, Takaoka K, Nakamura H. Functional recovery period after arthroscopic rotator cuff repair: Is it predictable before surgery? *Clin Orthop Relat Res* 2011;469:1660-1666.
7. Le BT, Wu XL, Lam PH, Murrell GA. Factors predicting rotator cuff retears: An analysis of 1000 consecutive rotator cuff repairs. *Am J Sports Med* 2014;42:1134-1142.
8. Warrender WJ, Brown OL, Abboud JA. Outcomes of arthroscopic rotator cuff repairs in obese patients. *J Shoulder Elbow Surg* 2011;20:961-967.
9. Chung SW, Oh JH, Gong HS, Kim JY, Kim SH. Factors affecting rotator cuff healing after arthroscopic repair: Osteoporosis as one of the independent risk factors. *Am J Sports Med* 2011;39:2099-2107.
10. Jenssen KK, Lundgreen K, Madsen JE, Kvakestad R, Dimmen S. Prognostic factors for functional outcome after

rotator cuff repair: A prospective cohort study with 2-year follow-up. *Am J Sports Med* 2018;46:3463-3470.

11. Chung SW, Park JS, Kim SH, Shin SH, Oh JH. Quality of life after arthroscopic rotator cuff repair: Evaluation using SF-36 and an analysis of affecting clinical factors. *Am J Sports Med* 2012;40:631-639.

12. Dawson J, Fitzpatrick R, Carr A. Questionnaire on the perceptions of patients about shoulder surgery. *J Bone Joint Surg Br* 1996;78:593-600.

13. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res* 1987;214:160-164.

14. Amstutz HC, Sew Hoy AL, Clarke IC. UCLA anatomic total shoulder arthroplasty. *Clin Orthop Relat Res* 1981;155:7-20.

15. Placzek JD, Lukens SC, Badalanmenti S, et al. Shoulder outcome measures: A comparison of 6 functional tests. *Am J Sports Med* 2004;32:1270-1277.

16. Kirkley A, Griffin S, Dainty K. Scoring systems for the functional assessment of the shoulder. *Arthroscopy* 2003;19:1109-1120.

17. Tashjian RZ, Shin J, Broschinsky K, et al. Minimal clinically important differences in the American Shoulder and Elbow Surgeons, Simple Shoulder Test, and visual analog scale pain scores after arthroscopic rotator cuff repair. *J Shoulder Elbow Surg* 2020;29:1406-1411.

18. Gartsman GM, Brinker MR, Khan M. Early effectiveness of arthroscopic repair for full-thickness tears of the rotator cuff: An outcome analysis. *J Bone Joint Surg Am* 1998;80:33-40.

19. Romeo AA, Hang DW, Bach BR Jr, Shott S. Repair of full thickness rotator cuff tears. Gender, age, and other factors affecting outcome. *Clin Orthop Relat Res* 1999;367:243-255.

20. Moorthy V, Tan AHC. Should long head of biceps tenodesis or tenotomy be routinely performed in arthroscopic rotator cuff repairs? *J Orthopaed* 2020;21:161-165.

21. Olley L, Carr A. The use of a patient-based questionnaire (The Oxford Shoulder Score) to assess outcome after rotator cuff repair. *Ann R Coll Surg Engl* 2008;90:326-331.

22. Conboy VB, Morris RW, Kiss J, Carr AJ. An evaluation of the Constant-Murley shoulder assessment. *J Bone Joint Surg Br* 1996;78:229-232.

23. Booker S, Alfahad N, Scott M, Gooding B, Wallace WA. Use of scoring systems for assessing and reporting the outcome results from shoulder surgery and arthroplasty. *World J Orthop* 2015;6:244-251.

24. Angst F, Pap G, Mannion AF, et al. Comprehensive assessment of clinical outcome and quality of life after total shoulder arthroplasty: Usefulness and validity of subjective outcome measures. *Arthritis Rheum* 2004;51:819-828.

25. Christie A, Hagen KB, Mowinckel P, Dagfinrud H. Methodological properties of six shoulder disability measures in patients with rheumatic diseases referred for shoulder surgery. *J Shoulder Elbow Surg* 2009;18:89-95.

26. Huber W, Hofstaetter JG, Hanslik-Schnabel B, Posch M, Wurnig C. The German version of the Oxford Shoulder Score—Cross-cultural adaptation and validation. *Arch Orthop Trauma Surg* 2004;124:531-536.

27. Strauss EJ, Salata MJ, Kercher J, et al. Multimedia article. The arthroscopic management of partial-thickness rotator cuff tears: A systematic review of the literature. *Arthroscopy* 2011;27:568-580.

28. Baettig SJ, Wieser K, Gerber C. Determinants of patient satisfaction following reconstructive shoulder surgery. *BMC Musculoskelet Disord* 2017;18:458.

29. Tashjian RZ, Bradley MP, Tocci S, Rey J, Henn RF, Green A. Factors influencing patient satisfaction after rotator cuff repair. *J Shoulder Elbow Surg* 2007;16:752-758.

30. Herring MJ, White M, Braman JP. The WORC Index and predicting treatment failure in patients undergoing primary arthroscopic rotator cuff repair. *Orthop J Sports Med* 2019;7:2325967119859518.

31. Novoa-Boldo A, Gulotta LV. Expectations following rotator cuff surgery. *Curr Rev Musculoskelet Med* 2018;11:162-166.

32. Tashjian RZ. Epidemiology, natural history, and indications for treatment of rotator cuff tears. *Clin Sports Med* 2012;31:589-604.

33. Ryösä A, Laimi K, Äärimaa V, Lehtimäki K, Kukkonen J, Saltychev M. Surgery or conservative treatment for rotator cuff tear: A meta-analysis. *Disabil Rehabil* 2017;39:1357-1363.

34. Schmidt CC, Jarrett CD, Brown BT. Management of rotator cuff tears. *J Hand Surg Am* 2015;40:399-408.