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Comparison of satisfied and dissatisfied patients 2 to 5 years after anatomic total shoulder arthroplasty

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Background: With an increasingly large number of patients undergoing total shoulder arthroplasty (TSA) combined with increased requirements for public reporting of patient outcomes, there is a greater need to better understand the underlying factors related to patient satisfaction. The purpose of this study was to compare patient demographics, nonorthopedic comorbidities, patient-reported outcome scores, and range of motion of patients who reported being either satisfied or dissatisfied with their procedure at midterm follow-up.
Methods: We identified 234 primary TSAs performed by a single surgeon for glenohumeral osteoarthritis with a minimum 2-year follow-up in a prospective shoulder arthroplasty registry. American Shoulder and Elbow Surgeons (ASES) score, patient satisfaction, and active forward flexion, abduction, and external rotation at 0° of flexion-abduction were assessed before and after TSA.
Results: Of the 234 patients, 207 (88.5%) were satisfied with their procedure. Dissatisfied patients had significantly lower ASES scores both before and after surgery ($P < .001$) as well as a significantly lower preoperative to postoperative change in ASES score ($P < .001$). Similarly, dissatisfied patients demonstrated significantly lower changes in active forward flexion ($P = .004$), abduction ($P = .02$), and external rotation ($P = .03$). Patients with ASES score changes <12 points were 19 times more likely to be dissatisfied after TSA (95% confidence interval, 4.4-81.4; $P = .0001$).
Conclusion: Dissatisfied patients had significantly lower improvements in pain, function, and range of motion. Furthermore, a change in ASES score <12 points was associated with a 19-fold increase in the risk of being dissatisfied after TSA.
Level of evidence: Level III; Retrospective Cohort Design; Treatment Study

Keywords: Total shoulder arthroplasty; osteoarthritis; outcome; activities of daily living; satisfaction; pain; range of motion

Anatomic total shoulder arthroplasty (TSA) provides an effective method to reduce pain and functional limitations associated with glenohumeral osteoarthritis.[4] As such, the annual number of shoulder arthroplasties performed in the United States demonstrated a 5-fold increase between 2000 and 2010.[23]

The Institutional Review Board of Texas Orthopedic Hospital approved this study (Protocol TOH162).

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Increased utilization combined with increased requirements for public reporting of patient outcomes has created a need to better understand the underlying factors related to patient satisfaction after TSA. The purpose of this study was to compare patient demographics, prevalence of nonorthopedic comorbidities, patient-reported outcome scores, and range of motion (ROM) of patients who reported being either satisfied or dissatisfied with their procedure 2 to 5 years after anatomic TSA. We hypothesized that dissatisfied patients would have a greater prevalence of nonorthopedic comorbidities as well as inferior postoperative outcomes and ROM.

Materials and methods

We identified 234 primary TSAs performed for primary glenohumeral osteoarthritis with a minimum 2-year follow-up in a prospective shoulder arthroplasty registry (153 men, 81 women; age, 66.7 ± 9.6 years; body mass index, 30.0 ± 5.8 kg/m^2). All procedures were performed by a single, high-volume surgeon (T.B.E.) at a high-volume hospital. Patients who underwent revision surgery or had an intraoperative or postoperative complication were excluded. Similar implant systems were used in all patients (Aequalis, Aequalis Ascend, and Aequalis Ascend Flex; Tornier, Bloomington, MN, USA) with previously described surgical techniques and standardized postoperative rehabilitation.[5,7,16]

Patient demographics and the following nonorthopedic comorbidities were collected as part of our registry: diabetes, depression, back pain, heart disease, high blood pressure, cancer, anemia, preoperative opioid use, smoking status, nickel allergy, kidney disease, liver disease, or lung disease. The American Shoulder and Elbow Surgeons (ASES) score[18] and active forward flexion, abduction, and external rotation at 0° of flexion-abduction were assessed preoperatively and 2 to 5 years postoperatively, with ROM measured using a long-arm goniometer. Patient satisfaction was also recorded at the most recent follow-up by asking the patients to rate themselves as being very satisfied, satisfied, dissatisfied, or very dissatisfied. Patients who were very satisfied or satisfied were categorized as being satisfied for the purposes of this study. Patients who were very dissatisfied or dissatisfied were considered dissatisfied. Patient satisfaction was available for all 234 patients; however, comorbidity information was missing for 1 patient with an incomplete health history form, and ROM was not available for 1 other patient.

The prevalence of nonorthopedic comorbidities was compared between satisfied and dissatisfied patients using either the X^2 or Fisher exact test as appropriate. Separate 2 × 2 repeated-measures analyses of variance (group × pre/post test) were used to compare preoperative and postoperative outcome scores and ROM between groups. In addition, a receiver operating characteristic curve and odds ratio were calculated to determine if there was a threshold of improvement in ASES score associated with postoperative satisfaction. Spearman correlation coefficients (ρ) were calculated to better understand which preoperative and postoperative factors were related to postoperative satisfaction. An α level of $P < .05$ was considered statistically significant for all analyses. All statistical analyses were performed with SPSS Statistics version 22 (IBM, Armonk, NY, USA), with the exception of the odds ratio calculation, which was performed with MedCalc for Windows, version 12.5 (MedCalc Software, Ostend, Belgium).

Results

Of the 234 patients, 207 (88.5%) were satisfied with their procedure. There were no differences in either patient demographics or nonorthopedic comorbidities between groups; however, a significantly greater proportion of dissatisfied patients reported preoperative opioid use (Table I). Dissatisfied patients had significantly lower ASES scores both before and after surgery as well as a significantly lower preoperative to postoperative change in ASES score (Fig. 1). A change in ASES score ≥12 points was associated with a greater likelihood of being satisfied (receiver operating characteristic area under the curve, 0.79; $P < .001$; sensitivity, 0.99; specificity, 0.79). On the contrary, patients with ASES score changes <12 points were 19 times more likely to be dissatisfied after TSA (95% confidence interval, 4.4-81.4; $P = .0001$).

Table I Prevalence of coexisting nonorthopedic conditions for satisfied and dissatisfied TSA patients

	Satisfied patients, No. (%) (207 respondents)	Dissatisfied patients, No. (%) (26 respondents)	*P*
Anemia	11 (5)	2 (8)	.65
Back pain	71 (34)	11 (42)	.61
Cancer	31 (15)	3 (12)	.77
Depression	12 (6)	3 (12)	.39
Diabetes	13 (6)	4 (15)	.11
Heart disease	21 (10)	3 (12)	.74
High blood pressure	114 (55)	19 (73)	.14
Kidney disease	1 (0.5)	0 (0)	>.99
Liver disease	0 (0)	0 (0)	>.99
Lung disease	6 (3)	1 (4)	.58
Nickel allergy	4 (2)	1 (4)	.46
Preoperative opioid use†	48 (24)	12 (46)	.03*

* Statistically significant ($P < .05$).

† Preoperative opioid use information was available for 197 of 207 patients in the satisfied group.

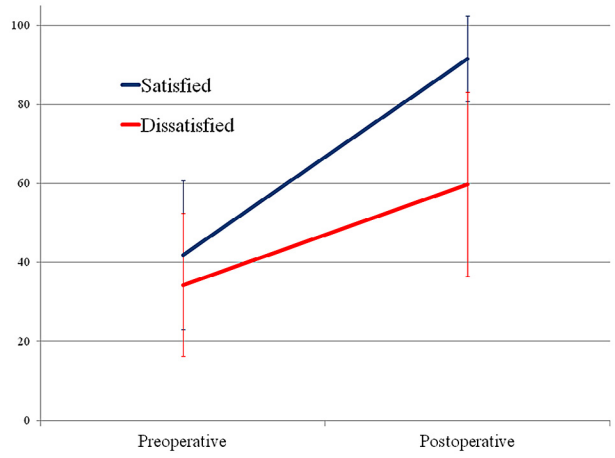

Figure 1 Preoperative and postoperative ASES scores were significantly lower for dissatisfied TSA patients, as was the change in ASES scores between the 2 time points.

Table II Correlations (Spearman ρ) of preoperative and postoperative characteristics with postoperative patient satisfaction

	Preoperative	*P*	Postoperative	*P*
Pain†	−0.13	.04*	−0.47	< .001*
ADLs‡	0.06	.38	0.40	< .001*
Forward flexion	0.002	.98	0.16	.02*
Abduction	0.05	.48	0.15	.02*
External rotation	−0.09	.16	0.08	.24

* Statistically significant ($P < .05$).
† Pain was scaled from 0 to 10, with 0 being no pain.
‡ ADLs: subscale of ASES score indicating patient-perceived ability to perform activities of daily living. The score is scaled from 0 to 50, with 50 being the best.

Similarly, the preoperative to postoperative changes in active forward flexion ($P = .004$), abduction ($P = .02$), and external rotation ($P = .03$) were significantly lower in the dissatisfied group.

Postoperative satisfaction did not appear to be related to the patient's preoperative condition. Although statistically significant, small correlations were present between preoperative pain and postoperative satisfaction ($\rho = -0.13$; $P = .04$), which were most likely not clinically meaningful. Preoperative ability to perform activities of daily living (ADLs), forward flexion, abduction, and external rotation did not significantly correlate with postoperative satisfaction (Table II). Postoperatively, there were significant correlations between the patient's satisfaction and postoperative pain, the ability to perform ADLs, and the 3 ROM measures, although the ROM measures were not likely to be clinically meaningful (Table II). Furthermore, postoperative pain scores and self-reported ability to perform ADLs were related to one another ($\rho = -0.42$; $P < .001$), with less pain associated with an improved perception of functional ability.

Discussion

The purpose of this study was to compare patient demographics, prevalence of nonorthopedic comorbidities, patient-reported outcome scores, and ROM of patients who reported being either satisfied or dissatisfied with their procedure 2 to 5 years after anatomic TSA. To our knowledge, this represents one of the first attempts to quantify and to understand the underlying factors related to patient satisfaction after TSA. The 88.5% satisfaction rate after TSA is comparable to both other shoulder and arthroplasty procedures; 84% of patients older than 40 years were satisfied after repair of superior labrum anterior-posterior tears, and approximately 85% of patients reported being satisfied after total knee arthroplasty.[6,12,19]

We hypothesized that dissatisfied patients would have inferior postoperative outcomes and ROM, which was largely supported by the current results. By and large, subjective outcomes and active ROM improved after TSA for both satisfied and dissatisfied patients, but the improvements in pain, function, and ROM were significantly lower in the dissatisfied group. Furthermore, a change in ASES score <12 points was associated with a 19-fold increase in the risk of being dissatisfied after anatomic TSA.

Postoperative satisfaction after TSA did not appear to be related to preoperative condition as preoperative pain, ability to perform ADLs, and ROM poorly correlated with satisfaction. While patients with less severe disease at the time of surgery have been consistently reported to be at significantly greater risk of being dissatisfied with their surgery after total knee arthroplasty,[13] there does not appear to be a direct connection between disease severity and outcomes after TSA. Preoperative radiographic indicators of severity have not been found to correlate with postoperative clinical outcomes.[9] Also, no differences in subjective outcomes have been reported between those with concentric and those with more complex eccentric wear patterns, although greater glenoid loosening has been associated with an eccentric wear pattern.[11]

Patient satisfaction in our series was related more to postoperative pain and self-perceived ability to perform ADLs than to ROM. Similarly, significant losses in ROM have been reported after superior labrum anterior-posterior repair, but these losses may not have been clinically meaningful as they did not affect ASES scores or return to activity.[20] Because postoperative pain and functional ability appear to be the primary drivers of patient satisfaction, these results may guide our future interventions to improve patient satisfaction after TSA. First, improvements to perioperative pain control protocols may be necessary to reduce the prevalence of persistent postoperative pain. Second, our postoperative rehabilitation protocols may need to place a greater emphasis on strengthening and functional exercises more so than on ROM. Furthermore, higher preoperative expectations have been associated with significantly greater functional gains after TSA, and educational interventions to improve preoperative expectations may be warranted.[22]

We also hypothesized that dissatisfied patients would have a greater prevalence of nonorthopedic comorbidities, which was not supported by the current results. Coexisting conditions often associated with poor postoperative outcomes did not differ between satisfied and dissatisfied TSA patients. Depression has been associated with reduced patient satisfaction after other arthroplasty procedures and has been associated with inferior short-term results, such as increased need for blood transfusions and a greater likelihood of nonroutine hospital discharge after TSA.[2,3] On the contrary, depression did not appear to be related to postoperative satisfaction at midterm follow-up in our series of patients. In the current study, pain and ability to perform ADLs were significantly correlated with one another, implying that postoperative pain is associated with movement. Movement-elicited pain and pain at rest have different underlying mechanisms. Pain with movement is directly related to peripheral nociceptor stimulation, whereas pain at rest is influenced both by peripheral input and by central processing.[10] Because of the role of central processing, patients with depression or anxiety may be more likely to suffer chronic pain at rest.[10,15,17] In the case of TSA, it appears that pain is related to movement, thereby lessening the influence of comorbid depression seen in total knee arthroplasty.

This study was not without limitation. First, the prevalence of nonorthopedic conditions in this study was self-reported by the patient, and our analyses may be limited by the accuracy with which patients completed their health history questionnaires. For example, depression was reported by 17 of 234 patients (7.3%) in the current study, whereas others have reported that between 16% and 19% of symptomatic osteoarthritis patients have concomitant depression.[8,21] Depression may have been under-reported by our series of TSA patients, as depression and anxiety have been previously found to be under-reported by patients when they are completing orthopedic intake paperwork.[14] Second, whereas many variables are captured as part of the prospective outcomes registry, other factors that have been reported to influence patient satisfaction after arthroplasty, such as socioeconomic status, race, level of education, social support network, and preoperative expectations, were not collected.[1,13,22,24] Future studies are necessary to determine the role of these factors on satisfaction after TSA.

Conclusion

Dissatisfied patients had significantly lower gains in pain, function, and ROM. Furthermore, a change in ASES score of 12 points was associated with a 19-fold increase in the risk of being dissatisfied after TSA. Patient satisfaction was related more to postoperative pain and self-perceived ability to perform ADLs than to ROM. Future studies are necessary to determine if improvements in perioperative pain control or a greater emphasis on functional exercises may improve patient satisfaction after anatomic TSA.

Disclaimer

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References

1. Barrack RL, Ruh EL, Chen J, Lombardi AV Jr, Berend KR, Parvizi J, et al. Impact of socioeconomic factors on outcome of total knee arthroplasty. Clin Orthop Relat Res 2014;472:86-97. http://dx.doi.org/10.1007/s11999-013-3002-y
2. Blackburn J, Qureshi A, Amirfeyz R, Bannister G. Does preoperative anxiety and depression predict satisfaction after total knee replacement? Knee 2012;19:522-4. http://dx.doi.org/10.1016/j.knee.2011.07.008
3. Bot AGJ, Menendez ME, Neuhaus V, Ring D. The influence of psychiatric comorbidity on perioperative outcomes after shoulder arthroplasty. J Shoulder Elbow Surg 2014;23:519-27. http://dx.doi.org/10.1016/j.jse.2013.12.006
4. Duan X, Zhang W, Dong X, Liu M, Gao Y, Huang F, et al. Total shoulder arthroplasty versus hemiarthroplasty in patients with shoulder osteoarthritis: a meta-analysis of randomized controlled trials. Semin Arthritis Rheum 2013;43:297-302. http://dx.doi.org/10.1016/j.semarthrit.2013.04.002
5. Edwards TB, Labriola JE, Stanley RJ, O'Connor DP, Elkousy HA, Gartsman GM. Radiographic comparison of pegged and keeled glenoid components using modern cementing techniques: a prospective randomized study. J Shoulder Elbow Surg 2010;19:251-7. http://dx.doi.org/10.1016/j.jse.2009.10.013
6. Erickson J, Lavery K, Monica J, Gatt C, Dhawan A. Surgical treatment of symptomatic superior labrum anterior-posterior tears in patients older than 40 years: a systematic review. Am J Sports Med 2015;43:1274-82. http://dx.doi.org/10.1177/0363546514536874
7. Gartsman GM, Edwards TB. Shoulder arthroplasty. Philadelphia: Saunders Elsevier; 2008 ISBN-13: 978-1416038573, ISBN-10: 1416038574.
8. Gleicher Y, Croxford R, Hochman J, Hawker G. A prospective study of mental health care for comorbid depressed mood in older adults with painful osteoarthritis. BMC Psychiatry 2011;11:147. http://dx.doi.org/10.1186/1471-244X-11-147
9. Gracitelli MEC, Duarte FA, Toffoli RP, Burnato JH, Malavolta EA, Neto AAF. Shoulder arthroplasty in osteoarthritis: correlation between function and radiographic parameters. Acta Orthop Bras 2013;21:98-102. http://dx.doi.org/10.1590/S1413-78522013000200006
10. Grosu I, Lavand'homme P, Thienpont E. Pain after knee arthroplasty: an unresolved issue. Knee Surg Sports Traumatol Arthrosc 2014;22:1744-58. http://dx.doi.org/10.1007/s00167-013-2750-2
11. Hussey MM, Steen BM, Cusick MC, Cox JL, Marberry ST, Simon P, et al. The effects of glenoid wear patterns on patients with osteoarthritis in total shoulder arthroplasty: an assessment of outcomes and value. J Shoulder Elbow Surg 2015;24:682-90. http://dx.doi.org/10.1016/j.jse.2014.09.043

12. Jacobs CA, Christensen CP. Factors influencing patient satisfaction two to five years after primary total knee arthroplasty. J Arthroplasty 2014;29:1189-91. http://dx.doi.org/10.1016/j.arth.2014.01.008
13. Jacobs CA, Christensen CP, Karthikeyan T. Patient and intraoperative factors influencing satisfaction two to five years after primary total knee arthroplasty. J Arthroplasty 2014;29:1839-41. http://dx.doi.org/10.1016/j.arth.2014.03.022
14. Jacobs CA, Christensen CP, Karthikeyan T. Chronic non-orthopedic conditions more common in patients with less severe degenerative changes that have elected to undergo total knee arthroplasty. J Arthroplasty 2015;30:1146-9. http://dx.doi.org/10.1016/j.arth.2015.01.051
15. Kehlet H, Jensen TS, Woolf CJ. Persistent postsurgical pain: risk factors and prevention. Lancet 2006;367:1618-25. http://dx.doi.org/10.1016/S0140-6736(06)68700-X
16. Liotard JP, Edwards TB, Padey A, Walch G Boulahia A. Hydrotherapy rehabilitation after shoulder surgery. Tech Shoulder Elbow Surg 2003;4:44-9.
17. Malfait AM, Schnitzer TJ. Towards a mechanism-based approach to pain management in osteoarthritis. Nat Rev Rheumatol 2013;9:654-64. http://dx.doi.org/10.1038/nrrheum.2013.138
18. Michener LA, McClure PW, Sennett BJ. American Shoulder and Elbow Surgeons standardized shoulder assessment form, patient self-reported section: reliability, validity, and responsiveness. J Shoulder Elbow Surg 2002;11:587-94. http://dx.doi.org/10.1067/mse.2002.127096
19. National Institutes of Health. NIH Consensus Statement on total knee replacement. NIH Consens State Sci Statements 2003;20:1-34.
20. Neri BR, Vollmer EA, Kvitne RS. Isolated type II superior labral anterior posterior lesions: age-related outcome of arthroscopic fixation. Am J Sports Med 2009;37:937-42. http://dx.doi.org/10.1177/0363546508328417
21. Rosemann T, Gensichen J, Sauer N, Laux G, Szecsenyi J. The impact of concomitant depression on quality of life and health service utilization in patients with osteoarthritis. Rheumatol Int 2007;27:859-63. http://dx.doi.org/10.1007/s00296-007-0309-6
22. Styron JF, Higuera CA, Strnad G, Iannotti JP. Greater patient confidence yields greater functional outcomes after primary total shoulder arthroplasty. J Shoulder Elbow Surg 2015;24:1263-7. http://dx.doi.org/10.1016/j.jse.2015.04.018
23. Trofa D, Rajaee SS, Smith EL. Nationwide trends in total shoulder arthroplasty and hemiarthroplasty for osteoarthritis. Am J Orthop 2014;43:166-72.
24. Vina ER, Cloonan YK, Ibrahim SA, Hannon MJ, Boudreau RM, Kwoh CK. Race, sex, and total knee replacement consideration: role of social support. Arthritis Care Res 2013;65:1103-11. http://dx.doi.org/10.1002/acr.21925