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Clinical characteristics and patient-reported outcomes of total shoulder arthroplasty after anterior stabilization: a retrospective matched control study

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Background: Instability arthropathy is a known cause of glenohumeral osteoarthritis (OA) among patients with and without prior shoulder stabilization. This study aims to compare the clinical, radiographic, and patient-reported outcome measure (PROM) scores among total shoulder arthroplasty (TSA) patients with and without a history of shoulder stabilization.

Methods: A case-control study was performed comparing 20 patients with a history of anterior shoulder stabilization (11 open, 9 arthroscopic) who underwent TSA to a matched cohort of 20 TSA patients without a history of shoulder surgery (mean follow-up = 2.8 years). Patients were matched by sex, age, and baseline American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES) score within 10 points (mean age 59.6 ± 9.6 years). Patient characteristics, operative findings, and preoperative and postoperative radiographic characteristics for both groups were reported. Comparisons were made regarding PROM scores (ASES, 12-Item Short Form Health Survey (SF-12), Shoulder Activity Scale [SAS], numeric rating scale for pain) at baseline, 2 years, and 5 years and patient satisfaction at 2 years.

Results: Intraoperative findings of subscapularis scarring or attenuation was common among patients with prior anterior stabilization. The instability cohort did have a higher percentage of B2/B3 glenoid types than the OA cohort (45% vs. 15%), but this was not significantly different possibly because of the small sample size. At 2 years, both instability and OA groups reported significant improvement in pain, function, and activity level. There was no difference between groups on any PROMs or patient satisfaction level. At 5 years, instability patients had significantly lower scores on the ASES and the SF-12 PCS than the OA group.

Conclusion: There was notable alterations in both soft tissue and bony morphology among patients with prior anterior stabilization. After TSA, both instability and primary OA groups showed significant improvements at 2 years. However, PROMs for instability patients deteriorated at 5 years compared with the control group. Complex bony and soft tissue imbalances may contribute to more unpredictable long-term PROM scores. Thoughtful preoperative consideration of these factors should influence decision making regarding selection of TSA for management of OA in this complex patient cohort.

Level of evidence: Level III; Retrospective Cohort Comparison; Treatment Study

Keywords: Glenohumeral osteoarthritis; shoulder arthroplasty; patient-reported outcomes; instability; Putti-Platt; anterior stabilization; subscapularis; capsulorrhaphy

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Glenohumeral osteoarthritis (OA) after shoulder instability is commonly reported among patients with or without a history of shoulder stabilization.[2,16,26,33] Biomechanical changes to the shoulder following single or multiple dislocations may contribute to the development of glenohumeral OA. Furthermore, many historical anterior stabilization procedures, such as the Putti-Platt procedure and open capsulorrhaphy, can lead to overtightening of the anterior capsule and restriction in shoulder motion, which can contribute to capsulorrhaphy-related arthropathy.[33] Instability arthropathy represents a unique clinical challenge for those undergoing anatomic total shoulder arthroplasty (TSA). Previous shoulder surgery has been shown to be a risk factor for failing to achieve improvement after anatomic TSA.[22] Subscapularis dysfunction and scarring is a known contributor to poor outcomes following TSA for instability,[1,14,34] whereas recent studies have also shown that eccentric glenoid wear patterns may also contribute to inferior outcomes following TSA.[9,11,12,17,24] Although several studies have demonstrated inferior functional outcomes[1,25,32,34] for TSA in patients with a history of anterior stabilization, further evaluation of its effect on patient-reported outcomes is warranted. The purpose of this study is to evaluate the patient-reported outcomes, and clinical and radiographic characteristics among TSA patients who underwent prior shoulder stabilization compared with those who underwent TSA for primary OA. We hypothesize that the instability cohort would have more soft tissue and bony deformity and subsequently more inferior patient-reported outcomes compared with patients with primary OA.

Materials and methods

Study cohort

A retrospective query of our institutional shoulder arthroplasty registry was performed to identify patients with a history of anterior shoulder stabilization who underwent anatomic TSA between 2010 and 2015 with complete preoperative and minimum 2-year postoperative patient-reported outcome measures (PROMs). Our institutional shoulder arthroplasty registry was started in 2010 and includes any patient who underwent shoulder arthroplasty performed by 1 of 8 senior fellowship-trained sports medicine and shoulder surgeons at our institution. Registry query yielded 23 patients with complete outcomes who met screening criteria. Patients with a history of inflammatory arthropathy (n = 1) and those who underwent reverse shoulder arthroplasty (n = 1) were subsequently excluded. The remaining eligible patients were then randomly matched to a control group of patients who underwent TSA for primary OA and had no history of prior shoulder surgery. Patients were matched based on sex, age within 5 years, and a baseline American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES) score within 10 points. Patients who could not be matched based on these criteria were excluded (n = 1).

A total of 40 patients (20 instability TSA, 20 OA TSA) were ultimately included in the study cohort. The majority of subjects were male (75%, 30/40 patients), and the average age at the time of arthroplasty was 59.6 years (range 33-77 years). Among the 20 patients with prior stabilization, open stabilization was performed in 11 patients and isolated arthroscopic stabilization was performed in the remaining 9 patients. One open stabilization patient had a prior arthroscopic stabilization. Among the subjects who underwent open stabilization, 1 patient had a coracoid transfer and the remaining 10 patients had an open anterior soft tissue plication, of which 6 involved a Putti-Platt procedure.

Clinical data

The operative record was reviewed for intraoperative characteristics such as soft tissue scarring, subscapularis tendon scarring or attenuation, and presence of any retained hardware or implants. Our hospital transitioned to electronic medical records in 2016, and the available paper records for patients treated before 2016 were limited to operative reports only. Clinical notes and electronic records from any patient documented after 2016 were reviewed. Complications or subsequent reoperations were reported. Operative record data were matched with the patients' subjective assessment of function reported within the shoulder arthroplasty registry. Our institution's shoulder arthroplasty registry collects both shoulder-specific PROMs and general health PROMs. Shoulder-specific PROMs include the ASES score and Shoulder Activity Scale that are collected via in-person, telephone, or mailed questionnaire at baseline and 1-, 2-, and 5-year follow-up. General health PROMs in the registry consist of the 12-Item Short Form Health Survey (SF-12) Mental Component Summary (MCS) and Physical Component Summary (PCS), which are collected at baseline and at a 2-year follow-up. Preoperative numeric rating scale for pain and overall satisfaction at 2 years were also collected. The mean follow-up for PROMs was 2.75 years for the instability cohort and 2.9 years for the OA cohort (range 2-5 years).

Radiographic analysis

All patients underwent preoperative AP, lateral and axillary radiographs, and/or axial imaging (computed tomography [CT] or magnetic resonance imaging [MRI]). Preoperative imaging was reviewed to determine glenoid morphology using the modified Walch classification.[31] Although axial imaging is considered the gold standard for determining Walch classification of glenoid morphology, recent studies have demonstrated moderate agreement on Walch classification with use of a plain radiograph axillary view.[19,31] Preoperative axial imaging was available for 12 of 20 instability patients (9 CT, 3 MRI) and 11 of 20 OA patients (11 CT, 0 MRI), whereas the remaining 17 patients had adequate radiographic imaging available for glenoid morphology analysis. In the instability cohort, 11 of 20 patients (55%) had preoperative eccentric posterior wear and/or posterior subluxation of the humeral head (Walch B1, 2 patients; B2, 6 patients; B3, 3 patients). The remaining 9 patients (45%) had a concentric glenoid wear pattern (Walch A1, 3 patients; A2, 6 patients). In the OA group, 11 of 20 patients (55%) had an A-type glenoid (Walch A1, 8 patients; A2, 3 patients) and the remaining 9 of 20 had a B-type glenoid

(Walch B1, 6 patients; B2, 1 patients; B3, 1 patient). There was no difference between the 2 groups in terms of glenoid morphology or posterior subluxation. Minimum 1-year postoperative radiographs were reviewed in 16 patients (7 instability, 9 OA) at an average of 38 months (range 13-69 months) after the procedure to evaluate for glenohumeral subluxation, periprosthetic radiolucency, or superior migration of the humeral component.

All patients in this series underwent primary anatomic total shoulder arthroplasty using either the Biomet Comprehensive TSA (Biomet, Warsaw, IN, USA; n = 39) or the Zimmer Biglani-Flatow TSA (Zimmer, Warsaw, IN, USA; n = 1). The surgical technique and postoperative rehabilitation protocol were identical in all patients. Shoulder arthroplasty was performed through a deltopectoral approach. Humeral version was placed in the anatomic position using a press-fit technique in all patients. Eccentric glenoid wear was managed with partial corrective reaming of the glenoid when deemed appropriate. Degree of glenoid version correction was not quantified. A standard cemented all-polyethylene pegged glenoid component was inserted in all cases. The postoperative rehabilitation protocols were standardized for both cohorts. Patients were placed in a simple sling for 4 weeks postoperatively with external rotation limited to 30° to protect the subscapularis.

Statistical analysis

The *t* test was used to compare the difference in mean PROM scores between the instability and OA groups at baseline, 2-year, and 5-year follow-up. Statistical significance was defined by $P < .05$.

Results

Clinical and radiographic characteristics

Review of the operative records noted significant alteration of the surgical field in the majority of instability patients, including all 11 open stabilization patients. Subscapularis scarring or attenuation was found in 8 of 11 open stabilization and 3 of 9 arthroscopic stabilization patients. Loss of external rotation was reported intraoperatively in 3 cases, all of which had prior open stabilization. Migration to the deltoid region of a previous staple, which subsequently was not removed, was noted in 1 patient with prior Putti-Platt procedure. Previous screw fixation for the coracoid transfer was removed in 1 patient. No OA patients had surgical field scarring or subscapularis scarring.

Among the 7 instability patients with radiographs longer than 1 year after TSA, there was no evidence of radiographic loosening. Two patients with prior arthroscopic stabilization demonstrated static posterior subluxation at last radiographic follow-up (62 and 69 months after TSA). One of the 2 arthroscopic stabilization patients was a 59-year-old man with perioperative B2 morphology and intraoperative findings of subscapularis scarring. This patient had radiographic evidence of polyethylene wear with increased pain at that last clinical follow-up (69 months). The second arthroscopic stabilization patient was a 47-year-old man with A2 glenoid morphology and no subscapularis contracture or attenuation. A third instability patient with a prior open soft tissue stabilization and preoperative A2 morphology had superior humeral head migration at 60 months after TSA and presented with pain, which resolved with a course of physical therapy. No patients in the OA group with follow-up radiographs had evidence of posterior subluxation or polyethylene wear. One patient with preoperative A1 morphology demonstrated superior migration at 52 months after surgery but was clinically asymptomatic. Clinical and radiographic characteristics of both groups are outlined in Table I.

Patient-reported outcome measures

There was no significant difference between the instability and OA groups in terms of preoperative PROM scores (ASES, SF-12, and Shoulder Activity Scale), and both groups had similar preoperative numeric rating scale for pain scores (a mean of 64/100 in the instability group vs. 68/100 in the OA group; $P = .54$). At 2 years, 100% of instability patients and 93.8% of the OA patients endorsed satisfaction with surgery and reportedly would undergo the procedure again. Both groups demonstrated improvements in all patient-reported outcomes at 2 years. At 5-year follow-up, there was a significantly lower score for the instability group on the SF-12 PCS, ASES score, and Shoulder Activity Scale ($P < .05$). Patient-reported outcomes are illustrated in Figure 1. When open stabilization patients were compared to arthroscopic stabilization patients, there was no significant difference in all PROMs at baseline, 2 years, and 5 years ($P > .05$). There was no difference in the level of satisfaction at 2 years ($P > .05$). Similarly, there was no significant difference in any of the outcome measures between the OA group vs. open or arthroscopic stabilization ($P > .05$) (Table II).

Complications

There was 1 major complication in the instability group and 3 major complications in the OA group. The instability patient had an acute atraumatic subscapularis rupture within 3 months of the initial surgery. The patient subsequently underwent revision to a reverse total shoulder arthroplasty. That patient had a prior arthroscopic stabilization and did not have extensive scarring or subscapularis contracture reported during the initial arthroplasty procedure. Among the 3 OA group complications, 1 patient had an anterior dislocation of their prosthesis after sustaining a fall 5 weeks after TSA. The patient was managed with an acute subscapularis repair. Two patients underwent reoperation

Table I Patient clinical and radiographic characteristics of prior stabilization and primary OA groups

	Prior stabilization (n = 20)	No prior shoulder surgery (n = 20)
Sex, male, n (%)	15 (75)	15 (75)
Age, mean (SD)	59.6 (8.7)	58.4 (10.4)
BMI, mean (SD)	26.9 (2.8)	27.7 (6.8)
Operated on dominant arm, n (%)	12 (60)	10 (50)
Surgery history, n (%)		
Open stabilization*	11 (55)	N/A
Arthroscopic stabilization	9 (45)	N/A
Glenoid morphology (Walch classification), n (%)		
A1	3 (15)	7 (35)
A2	6 (30)	4 (20)
B1	2 (10)	6 (30)
B2	6 (30)	2 (10)
B3	3 (15)	1 (5)
Intraoperative findings		
Surgical approach scarring, n (%)	14 (70)	0 (0)
Open, n	11	
Arthroscopic, n	3	
Subscapularis scarring/contracture, n (%)	9 (45)	0 (0)
Open, n	7	
Arthroscopic, n	2	
Subscapularis attenuation, n (%)	1 (5)	0 (0)

OA, osteoarthritis; *SD*, standard deviation; *BMI*, body mass index.

* One patient with history of both arthroscopic and open stabilization was classified as open stabilization.

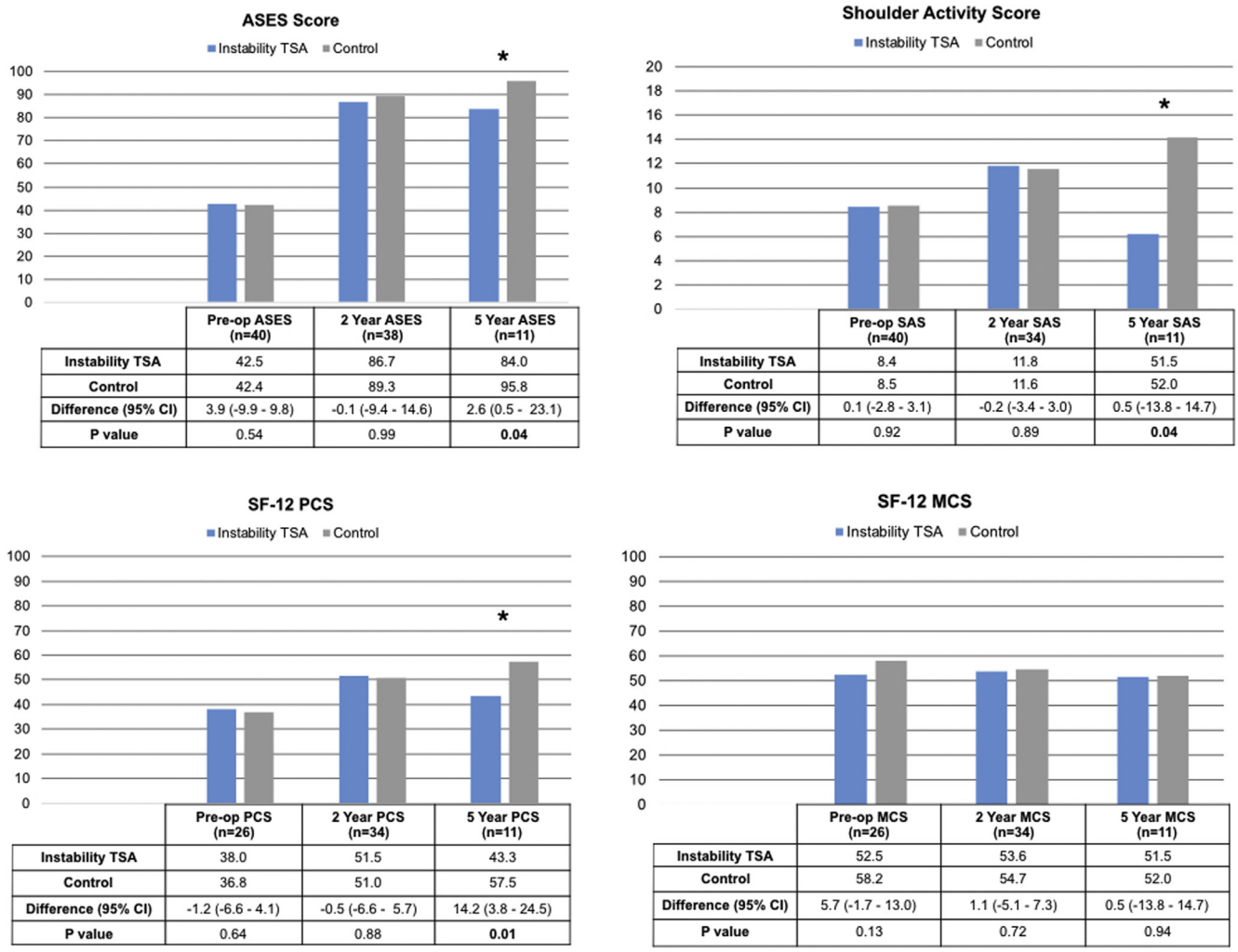
for infection. One had a septic subacromial bursitis infection 20 months after TSA that was managed with arthroscopic irrigation and débridement and bursectomy. After cultures confirmed no intra-articular involvement, the patient was treated with a 4-week course of intravenous antibiotics followed by a course of oral antibiotics. The second patient had an infected prosthesis 12 months after the procedure and underwent irrigation and débridement and single-stage implantation of an antibiotic spacer.

Discussion

This study demonstrates that patients with a history of anterior stabilization have good improvement in self-reported pain and function following anatomic TSA. However, with longer term follow-up among a small subset of patients, SF-12 PCS, ASES score, and Shoulder Activity Scale appeared to be significantly lower than the OA cohort. The etiology behind the functional deterioration in this cohort is unclear; however, we suspect that alterations in both soft tissue and glenoid morphology are contributing factors.

Historically, open anterior stabilization procedures have consisted of soft tissue–only procedures such as the Putti-Platt procedure, Magnussen-Stack, and open Bankart repair or bone-block procedures such as the Eden-Hybinnette (iliac crest bone block) and coracoid process transfers such as the Bristow or Latarjet procedure.[18,29] In all open stabilization procedures, violation of the subscapularis tendon occurs in varying degrees, which can lead to scarring and contracture of the subscapularis and anterior capsule. Subsequently, alteration of the surgical field and the subscapularis is common in patients with prior open anterior stabilization who undergo TSA.[1,14,34] This may increase the degree of surgical difficulty of these procedures because of both challenges achieving exposure due to distorted anatomy and difficulty achieving consistent restoration of soft tissue balance.

Like the present study, most studies on arthroplasty following anterior stabilization have reported significant improvement in outcomes following TSA.[1,4,14,32,34] However, several of these studies also indicated that the internal rotation contracture and subscapularis scarring commonly encountered in these patients contributes to a higher rate of complications and also inferior early postoperative functional outcomes and range of motion compared with TSA for primary OA.[1,14,34] In our study, all patients with a prior open stabilization had alteration or scarring of the surgical field, which is in line with the earlier studies. However, open stabilization patients did not have significantly worse patient-reported outcomes or lower level of satisfaction at 2 years than did patients with prior arthroscopic stabilization or when compared to patients with primary OA. The sole reoperation in our instability cohort occurred in 1 patient with prior arthroscopic stabilization (without reported subscapularis contracture), who had an acute subscapularis rupture 3 months after TSA. However, we agree with



	Pre-op ASES (n=40)	2 Year ASES (n=38)	5 Year ASES (n=11)
Instability TSA	42.5	86.7	84.0
Control	42.4	89.3	95.8
Difference (95% CI)	3.9 (-9.9 - 9.8)	-0.1 (-9.4 - 14.6)	2.6 (0.5 - 23.1)
P value	0.54	0.99	**0.04**

	Pre-op SAS (n=40)	2 Year SAS (n=34)	5 Year SAS (n=11)
Instability TSA	8.4	11.8	51.5
Control	8.5	11.6	52.0
Difference (95% CI)	0.1 (-2.8 - 3.1)	-0.2 (-3.4 - 3.0)	0.5 (-13.8 - 14.7)
P value	0.92	0.89	**0.04**

	Pre-op PCS (n=26)	2 Year PCS (n=34)	5 Year PCS (n=11)
Instability TSA	38.0	51.5	43.3
Control	36.8	51.0	57.5
Difference (95% CI)	-1.2 (-6.6 - 4.1)	-0.5 (-6.6 - 5.7)	14.2 (3.8 - 24.5)
P value	0.64	0.88	**0.01**

	Pre-op MCS (n=26)	2 Year MCS (n=34)	5 Year MCS (n=11)
Instability TSA	52.5	53.6	51.5
Control	58.2	54.7	52.0
Difference (95% CI)	5.7 (-1.7 - 13.0)	1.1 (-5.1 - 7.3)	0.5 (-13.8 - 14.7)
P value	0.13	0.72	0.94

Figure 1 Functional outcomes of instability and control total shoulder arthroplasty patients at 2 years and 5 years. * indicates statistically significant difference $P < .05$.

previous arthroplasty studies by Lehman et al[20] and Green and Norris[14] that both concluded that soft tissue imbalances related to previous anterior stabilization may affect TSA outcomes. Restoration of this soft tissue balance is inherently difficult to assess both intraoperatively and longitudinally and may contribute to unpredictability in long-term outcomes.

The alteration in glenoid morphology from both anterior instability and subsequent anterior capsulorrhaphy may be the other significant factor affecting outcomes following TSA. In the setting of shoulder instability that is managed surgically, it is postulated that excessive anterior capsular and subscapularis tightening results in increased posterior subluxation of the humeral head, which in turn increases the shearing forces on the posterior glenoid. As a result, more severe posterior glenoid wear secondary to capsular overtightening, termed ''capsulorraphy arthropathy,'' may be encountered in this subset of patients.[20,33] However, it has not borne out clinically that surgically managed instability patients have higher rates of posterior glenoid wear than nonoperatively managed instability patients or primary OA patients.[16,23,25] What has been shown is that posterior glenoid wear and subsequent static posterior subluxation[13] may contribute to worse outcomes and more complications[21] for both the surgically stabilized patient[4,20,32] and for the primary OA patient undergoing TSA. This may be particularly evident if excessive corrective reaming is performed for management of the excessively retroverted shoulder.[9,12,24] Our instability cohort did have a higher percentage of B2/B3 glenoid types than the OA cohort (45% vs. 15%), but there was no statistically significant difference between the groups, possibly because of the small sample size. Anecdotally, the one patient in our study with both polyethylene wear and pain at 5 years was a 59-year-old with history of arthroscopic stabilization with preoperative B2 morphology, intraoperatively noted subscapularis scarring, and static posterior subluxation on postoperative radiographs. Sperling et al[32] noted that in

Table II Patient-reported outcomes at 2 years for stabilization by type compared with primary OA cohort

Arthroscopic stabilization vs. no prior surgery (OA group)			
	Scope	Control	*P* value
NRS-Pain	72.3	64.3	.24
SF-12 PCS	35.8	38.1	.54
SF-12 MCS	51.8	52.6	.85
SAS	8.4	8.4	.96
ASES	42.1	42.5	.94
Open stabilization vs. no prior surgery (OA group)			
	Open	Control	*P* value
NRS-Pain	60.3	64.3	.59
SF-12 PCS	40.2	38.1	.49
SF-12 MCS	51.5	52.6	.78
SAS	8.5	8.4	.89
ASES	44.1	42.5	.79

OA, osteoarthritis; *NRS-Pain*, numeric rating scale for pain; *SF-12*, 12-Item Short Form Health Survey; *PCS*, Physical Component Summary; *MCS*, Mental Component Summary; *SAS*, Shoulder Activity Scale; *ASES*, American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form Score.

their postoperative radiographic analysis (mean 5.5 years) of shoulder arthroplasty following instability, 59% of patients had superior or posterior glenoid subluxation. Furthermore, overall survivorship of the implant was 86% at 5 years but decreased to 61% at 10 years. It is unclear if higher rates of component subluxation would have been reported in our study if we had longer radiographic follow-up. However, we did note that in the small subset of patients with outcomes reported at 5 years, there was significantly lower ASES scores and SF-12 PCS scores, which had not been seen at 2 years. This may allude to similar deterioration in outcomes around 5 years in the cohort of TSA patients with prior instability. Therefore, we postulate that while eccentric glenoid wear and posterior subluxation was not universal in our cohort of instability patients, it may be one of several contributing factors to worsening outcomes at 5 years.

Given the unpredictability of outcomes of TSA patients with glenoid retroversion, it has been suggested that RTSA may yield more predictable outcomes in retroverted patients.[3,7,10,24] Similarly, RTSA for primary management of instability arthropathy has recently been advocated to achieve predictably favorable outcomes.[6,8,15,27,28] Recently, Patel et al[27] compared 10 RTSA patients to 15 TSA patients, both groups with history of anterior stabilization. They found that RTSA patients had better improvements in all functional outcomes and a substantially lower rate of reoperations and complications than the TSA group. Hasler et al[15] compared 10 patients who underwent RTSA for shoulder instability to 20 patients who underwent RTSA for cuff deficiency and found significant improvement in both groups in terms of the Constant score, satisfaction score, and complication rate. Chalmers et al[6] similarly reported good outcomes in terms of pain and range of motion in a subset of 24 patients who underwent RTSA for history of glenohumeral dislocation. A meta-analysis by Cerciello et al[5] evaluated outcomes of shoulder arthroplasty for sequelae from instability surgery and noted that RTSA had a lower revision surgery rate than TSA or HA.

The role for RTSA is expanding, and there is growing support for use in select patients younger than 65 years.[7,30] During the study period, the RTSA at our institution was often reserved for patients older than 65 years with rotator cuff tear arthropathy and/or pseudoparalysis. The younger age of our patient cohort (59 years) may have influenced the decision to pursue TSA in these patients. On retrospective review, in the setting of both extensive anterior scarring and excessive glenoid retroversion, we would now agree that the inherent challenges of performing TSA in this combined instability/retroverted patient may not yield predictable enough outcomes to justify TSA over RTSA, even in the younger patient. As the role of RTSA expands in younger patients, there may be greater role for RTSA in the primary management of instability patients, particularly those with significant glenoid deformity.

Our study has several limitations. This is a retrospective review of patients managed by 8 different surgeons who contribute to our shoulder arthroplasty. Although the prospective data within our registry and the postoperative rehabilitation of all TSA patients in the registry is uniform, there is inherent heterogeneity in the surgical decision-making and follow-up intervals used by the 8 surgeons within the registry. We concede that this provides some ambiguity in the interpretation of correlation of surgical factors to outcomes. We did attempt to achieve homogeneity within our comparative groups and used a more

stringent algorithm for matching patients to include baseline PROM scores, age, and sex.

Furthermore, in this retrospective review, we were limited to the data that are available within the registry and then matched to the patient clinical record. There was limited availability of complete clinical and radiograph data for each registry patient. We decided to include only registry patients with minimum 2-year PROMs and complete preoperative imaging and an available operative record. We did not exclude patients without long-term radiographic imaging or long-term clinical notes. Although we understand that this limits some of the available context that would allow us to understand the long-term outcomes of these patients, we would argue that preoperative imaging and operative record when combined with patient-reported outcomes still provides important clinical context for the study cohort without sacrificing the number of available patients for analysis. Another limitation is that postoperative range of motion and shoulder-specific functional assessments like the Constant score are not part of our institutional registry. Based on previously discussed studies that have noted inferior range of motion and inferior outcomes[1,32,34] at intermediate follow-up in TSA patients with prior stabilization, we would postulate that inferior postoperative range of motion may have a detrimental effect on both patient-perceived function and satisfaction following TSA. However, because we could not measure postoperative range of motion in this patient cohort, we are unable to analyze how this clinical factor affected our patients' outcomes, and we cannot retroactively obtain this information.

In spite of the limitations noted above, we believe that this study contributes to the growing body of literature evaluating the outcomes of TSA following anterior stabilization. Although our study consisted of a relatively small cohort, we chose to closely match patients based on baseline patient-reported outcomes in addition to age and sex and limited our cohort to only TSA. Using validated measures of patient-perceived function, activity, and pain, we observed a deterioration in intermediate-term outcomes in this cohort compared with primary OA patients. This aligns with other studies that have demonstrated overall good postoperative outcomes that are still inferior in the longer term to TSA for primary OA.

Conclusion

In this small cohort, there was notable alterations in both soft tissue and bony morphology among patients with prior anterior stabilization. After TSA, instability patients had significant improvements in all patient-reported outcomes and patient satisfaction, which did not differ from a matched primary OA cohort at 2 years. However, outcomes deteriorated at 5 years compared with the OA group. The etiology behind deterioration is not clear but complex bony and soft tissue imbalances may contribute to a more unpredictable long-term postoperative outcome. Thoughtful preoperative consideration of these factors should influence decision making regarding selection of TSA for management of OA in this complex patient cohort.

Disclaimer

Samuel A. Taylor receives personal fees as a consultant for DJO Shoulder Arthroplasty.

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