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Outpatient versus inpatient anatomic total shoulder arthroplasty: outcomes and complications

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Background: Total shoulder arthroplasty (TSA) is an effective treatment option for glenohumeral arthritis. Historically, this surgical procedure was performed on an inpatient basis. There has been a recent trend in performing TSA on an outpatient basis in the proper candidates.
Methods: All patients who underwent outpatient TSA performed by a single surgeon between 2015 and 2017 were included. Demographic information and clinical outcome scores, as well as data on complications, readmissions, and revision surgical procedures, were recorded. This group of patients was then compared with a matched cohort of patients who underwent inpatient TSA over the same period.
Results: Overall, 94 patients (average age, 60.4 years; 67.0% male patients) underwent outpatient TSA and were included. Patients who underwent outpatient TSA showed significant improvement in all clinical outcome scores at both 1 and 2 years postoperatively. The control group consisted of 77 patients who underwent inpatient TSA (average age, 62.6 years; 53.2% male patients). No significant differences in complications or improvements in clinical outcome scores were found between the inpatient and outpatient groups.
Conclusion: TSA performed in an outpatient setting is a safe and reliable procedure that provides significant improvement in clinical outcome scores and no difference in complication rates compared with inpatient TSA.

Anatomic total shoulder arthroplasty (TSA) is an effective treatment option to reduce pain and improve function in patients with glenohumeral arthritis and a functioning rotator cuff.[5,10,11,16] As patients maintain a high activity level with increasing age, the number of TSAs performed each year has continued to increase.[1] Historically, TSA was performed on an inpatient basis with patients spending 1-3 days in the hospital, followed by discharge home or to a rehabilitation facility. As surgical techniques, blood management, and pain-control measures have improved, complication rates have improved as well.[9,15,17,18] With lower complication rates and improved pain control and blood management, migration of TSA to the outpatient setting, similar to total hip and total knee arthroplasty, has begun.

Outpatient TSA has become an option for healthy patients who do not need the monitoring or level of assistance that comes with inpatient surgery as some studies have found increased complications with inpatient stays following TSA.[2,12-14] Furthermore, facility fees are often lower in outpatient facilities and can therefore decrease costs associated with TSA in patients who are candidates for outpatient TSA.[7] However, to perform TSA in an outpatient setting, it is imperative that the procedure be safe and effective with no increase in complication or reoperation rates.

Therefore, the purpose of this study was to report the demographic characteristics, clinical outcomes, and complications of patients undergoing outpatient TSA. A secondary purpose was to compare the demographic characteristics, clinical outcomes, and complications in patients undergoing inpatient vs. outpatient TSA. We hypothesized that there would be significant improvements in clinical outcome scores and a low complication rate following outpatient TSA, with no difference in clinical outcomes and a lower number of complications compared with inpatient TSA.

Institutional review board approval was received from Salus IRB.

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Methods

All patients who underwent outpatient anatomic TSA between 2015 and 2017 performed by a single surgeon (R.G.) were eligible for inclusion. Patients were included if they underwent TSA and had a minimum of 2 years' follow-up. Patients were excluded if they had undergone surgery <2 years earlier. A matched control group of patients who underwent inpatient anatomic TSA over the same time frame was created. These patients were matched to those in the outpatient TSA group based on age, sex, body mass index (BMI), and smoking history. These 2 groups were then compared. Demographic information was obtained preoperatively from patients in both groups, including age and sex (Table I). Data were collected prospectively. Patients underwent TSA as outpatients if they were independent and had minimal medical comorbidities.

Clinical outcome scores including visual analog scale (VAS), American Shoulder and Elbow Surgeons (ASES), and Single Assessment Numeric Evaluation (SANE) scores were obtained preoperatively and at the 1- and 2-year follow-up marks. Finally, data on complications, readmissions, and revision surgical procedures were recorded in both groups. The 2 groups (inpatient vs. outpatient TSA) were then compared to determine whether differences existed between clinical outcome scores or complications at both 1 and 2 years postoperatively.

Statistics

Statistical analysis was conducted using SPSS software (version 17.0; IBM, Armonk, NY, USA). Continuous data were described by means and standard deviations. The 2-tailed unpaired *t* test and analysis of variance were performed (depending on variable distribution) to analyze the differences between the preoperative and postoperative functional outcome scores and to compare the demographic characteristics in the 2 cohorts. A 2-tailed *P* value < .05 was considered significant. The proportion of patients with complications in the inpatient vs. outpatient groups was compared via the Fisher exact test. The modified Wald method was used to calculate the 95% confidence intervals (CIs) for the percentage of patients with complications.

Results

Overall, 94 patients underwent outpatient TSA between 2015 and 2017. The average patient age was 60.4 years, and 67.0% were male patients. The average patient BMI was 29.7, and 17.0% of patients were smokers at the time of TSA (Table I). Preoperatively, the average ASES score was 44.8 ± 16.9; VAS score, 5.07 ± 2.5; and SANE score, 36.7 ± 20.5.

Significant improvements in all clinical outcome scores were seen from preoperatively to postoperatively in patients who underwent outpatient TSA (Table II). Overall, 2.0% of patients had complications following outpatient TSA. Both of these complications were subscapularis failures; they required conversion to reverse TSA. These were the only revision surgical procedures in the outpatient group.

When we compared patients who underwent outpatient vs. inpatient TSA, those who underwent outpatient TSA were significantly less likely to have diabetes than those who underwent inpatient TSA (Table I). Patients who underwent outpatient TSA had a significantly higher preoperative ASES score and significantly lower preoperative VAS score than those who underwent inpatient TSA (Table III). There were no differences between the outpatient and inpatient TSA groups regarding postoperative clinical outcome scores (Table III). The changes in the clinical outcome scores from preoperatively to postoperatively showed no difference between patients who underwent inpatient TSA and those who underwent outpatient TSA (Table IV). Complications were more frequent in patients who underwent inpatient TSA (11.4% [9 of 79]; 95% CI, 4.1%-17.4%) than those who underwent outpatient TSA (2.1% [2 of 94]; 95% CI, 0.1%-7.7%), although this difference did not reach statistical significance ($P = .080$) (Table V). Revision surgical procedures following inpatient TSA included conversion to reverse TSA (n = 6), incision and drainage (n = 1), lysis of adhesions (n = 1), and revision biceps tenodesis (n = 1).

Table I
Demographic information in outpatient and inpatient TSA groups

	Outpatient	Inpatient	*P* value
n	94	77	—
Mean age, yr	60.44	62.61	.110
Male, n	63	41	.068
Female, n	31	36	.068
Mean BMI	29.74	29.67	.753
Smoking history, n	16	7	.116
Diabetes, n	3	9	.041*

TSA, total shoulder arthroplasty; *BMI*, body mass index.
Patients who underwent TSA as outpatients were significantly less likely to have diabetes than patients who underwent TSA as inpatients.
* Statistically significant ($P < .05$).

Discussion

TSA is an effective treatment option for patients with glenohumeral osteoarthritis. Our hypotheses were confirmed as there were significant improvements in clinical outcome scores and a low complication rate following TSA performed on an outpatient basis, with no difference in clinical outcomes and no difference in complications compared with inpatient TSA.

Basques et al[3] used the US Medicare Standard Analytical Files database to compare 30- and 90-day readmission rates and complications following inpatient vs. outpatient shoulder arthroplasty. They found that although 123,347 patients in the database underwent shoulder arthroplasty between 2005 and 2012, only 2.8% (3493) underwent shoulder arthroplasty on an outpatient basis. Regarding demographic characteristics, women and smokers made up a significantly greater proportion of patients who underwent inpatient TSA. Furthermore, patients who underwent inpatient TSA had a greater incidence of various medical comorbidities including diabetes, coronary artery disease, congestive heart failure, and chronic kidney disease. It is important to note that the authors reported significantly higher readmission rates for inpatients at both 30 days (0.83% vs. 0.60%, $P = .016$) and 90 days (2.87% vs. 2.04%, $P < .001$), with higher rates of thromboembolic events and surgical-site infection seen in inpatients. Leroux et al[13] performed a similar study using a database to compare

Table II
Preoperative and postoperative clinical outcome scores of patients who underwent TSA in outpatient setting

	Preoperative	Postoperative		*P* value
		1 yr	2 yr	
ASES score	44.8 ± 16.9	83.5 ± 15.2	85.2 ± 15.9	<.0001*
VAS score	5.1 ± 2.5	1.4 ± 1.9	1.41 ± 2.1	<.0001*
SANE score	36.7 ± 20.5	79.1 ± 17.9	80.0 ± 18.6	<.0001*

TSA, total shoulder arthroplasty; *ASES*, American Shoulder and Elbow Surgeons; *VAS*, visual analog scale; *SANE*, Single Assessment Numeric Evaluation.
Data are presented as mean ± standard deviation.
* Statistically significant ($P < .05$).

Table III
Comparison of preoperative and postoperative clinical outcome scores of patients who underwent outpatient vs. inpatient TSA

	Preoperative			Postoperative					
				1 yr			2 yr		
	ASES score	VAS score	SANE score	ASES score	VAS score	SANE score	ASES score	VAS score	SANE score
Outpatient	44.8 ± 16.9	5.1 ± 2.5	36.7 ± 20.5	83.5 ± 15.2	1.4 ± 1.9	79.1 ± 17.9	85.2 ± 15.9	1.4 ± 2.1	80.0 ± 18.6
Inpatient	36.9 ± 14.8	5.9 ± 2.5	34.2 ± 19.9	80.6 ± 15.9	1.4 ± 1.8	71.9 ± 25.9	81.3 ± 17.3	1.5 ± 2.0	78.6 ± 20.0
P value	.0012*	.019*	.428	.232	.933	.039	.188	.793	.681

TSA, total shoulder arthroplasty; *ASES*, American Shoulder and Elbow Surgeons; *VAS*, visual analog scale; *SANE*, Single Assessment Numeric Evaluation.
Data are presented as mean ± standard deviation. *P* values were calculated using the 2-way unpaired *t* test (type I error = .05).
* Statistically significant ($P < .05$).

complications and readmission rates in patients who underwent inpatient vs. outpatient TSA and found a higher 30-day adverse event rate and 30-day readmission rate in the inpatient TSA cohort. These results are consistent with those of our study as patients who underwent outpatient TSA had fewer complications than patients who underwent inpatient TSA, although this difference did not reach statistical significance.

Charles et al[8] reported the results of 50 patients (44 of whom underwent TSA) with an average age of 56.9 years, an average BMI of 29.75, and an average Charlson Comorbidity Index of 1.6 who underwent outpatient shoulder arthroplasty. They reported 6 complications (12%), including hematoma, deep venous thrombosis, axillary nerve injury, acute infection, and 2 subscapularis failures. Of these 6 complications, 4 occurred within the 90-day global period and only 1 required readmission. Furthermore, patients showed significant improvement in range of motion and functional outcome scores. Similarly, Bean et al[4] reported on the clinical outcomes and complications of 61 shoulder arthroplasty procedures (21 outpatients and 40 inpatients). No major complications or readmissions occurred in the outpatient cohort; the 90-day complication rate was 9.5% and 17.5% for the outpatient and inpatient cohorts, respectively; and no difference in the percentage of patients who visited an emergency department or urgent care facility within 90 days was found between the outpatient and inpatient groups (4.8% vs. 5.0%). These results are similar to those of our study as complication rates in the outpatient group (2.1%) and inpatient group (11.4%) were both relatively low. Finally, Brolin et al[6] reported on 30 patients who underwent outpatient TSA and compared them with 30 patients who underwent inpatient TSA. No significant differences between the inpatient and outpatient groups were found regarding average age, preoperative American Society of Anesthesiologists score, operative indications, or BMI. Similarly, no reoperations or post-discharge hospital admissions occurred in either group. Finally, the complication rates (13% vs. 10%) were not significantly different between the outpatient and inpatient groups. The results of our study are in line with the findings of these prior studies.

Although patient safety and outcomes are by far the most important factors following surgery, cost has become a more important issue in recent years. Gregory et al[12] used the Texas Health Care Information Collection database to evaluate all inpatient and outpatient TSAs performed between 2010 and 2015 and determined patient-level costs (total charges and itemized charges) for TSA based on whether the surgical procedure was performed on an inpatient or outpatient basis. They found that overall inpatient TSA costs were significantly higher than outpatient TSA costs ($76,109 vs. $22,907). It is interesting to note that, after the authors excluded inpatient-specific charges, inpatient TSA remained 41.1% more expensive than outpatient TSA ($32,330 vs. $22,907). Although certain patients with multiple comorbidities should have their TSA procedure performed in an inpatient setting, many patients are able to undergo TSA safely and effectively in an outpatient setting with excellent results and a lower cost to the patient.

Limitations

A higher percentage of patients in the inpatient TSA group had diabetes, which may have affected the results. In addition, patients in the inpatient TSA group had a lower ASES score and higher VAS score to begin with, which could have affected the results. Finally, a single surgeon who is shoulder and elbow fellowship trained and who performs >200 shoulder arthroplasties each year performed all surgical procedures in this series. Hence, these results may not be translatable to lower-volume surgeons or surgeons who are less experienced.

Conclusion

TSA performed in an outpatient setting is a safe and reliable procedure that provides significant improvement in clinical outcome scores and no difference in complication rates compared with inpatient TSA.

Disclaimer

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Table IV
Comparison of changes in clinical outcome scores from preoperatively to postoperatively in outpatient vs. inpatient TSA groups

	1 Year			2 Year		
	Change in ASES Score	Change in VAS Score	Change in SANE Score	Change in ASES Score	Change in VAS Score	Change in SANE Score
Outpatient	38.7 ± 22.1	3.6 ± 2.9	42.4 ± 24.0	42.9 ± 25.6	3.9 ± 3.4	44.0 ± 29.8
Inpatient	43.8 ± 18.8	4.4 ± 2.9	37.6 ± 34.3	44.6 ± 19.9	4.2 ± 3.0	43.4 ± 28.0
P value	.103	.099	.302	.696	.501	.911

TSA, total shoulder arthroplasty; *ASES*, American Shoulder and Elbow Surgeons; *VAS*, visual analog scale; *SANE*, Single Assessment Numeric Evaluation.
Data are presented as mean ± standard deviation. *P* values were calculated using the 2-way unpaired *t* test (type I error = .05).

Table V
Complications, readmissions, and subsequent surgical procedures in patients who underwent inpatient vs. outpatient TSA

Complication	Inpatient	Outpatient
Acromion fracture	1	0
Subscapularis tear	3	2
Infection	1	0
Transient numbness in hand	1	0
Fall	1	0
Stiffness requiring lysis of adhesions	1	0
Revision biceps tenodesis for deformity	1	0
Total	9	2

TSA, total shoulder arthroplasty.

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