

# Return to Work After Anatomic Total Shoulder Arthroplasty for Patients 55 Years and Younger at Average 5-Year Follow-up

JOSEPH N. LIU, MD; GRANT H. GARCIA, MD; ALEXANDRA C. WONG, BS; ALEC SINATRO, BA;  
HAO-HUA WU, MD; DAVID M. DINES, MD; RUSSELL F. WARREN, MD; LAWRENCE V. GULOTTA, MD

## abstract

As the number of anatomic total shoulder arthroplasties performed on younger patients continues to grow, return to work after surgery becomes increasingly important. The purpose of this study was to evaluate the ability of anatomic total shoulder arthroplasty to return patients 55 years or younger to work postoperatively. A retrospective review was performed of consecutive anatomic total shoulder arthroplasty patients. Inclusion criteria were age 55 years or younger at surgery, greater than 2 years of follow-up, and employment within 3 years of surgery. Employment was stratified by intensity of work (sedentary, light, moderate, or heavy). Return to work status and time out of work were also evaluated. Fifty-two patients worked before surgery. Average age was 48.4 years, with average follow-up of 5.4 years. Seventy-three percent were male, and average body mass index was 28.0 kg/m<sup>2</sup>. Average visual analog scale score improved from 5.5 to 0.9 ( $P < .0001$ ) and American Shoulder and Elbow Society score improved from 39.9 to 88.3 ( $P < .0001$ ). Forty-eight (92%) of 52 returned to work postoperatively after an average of 2.1 months. When stratified by intensity, all patients with sedentary, light, or moderate work returned, whereas 64% returned to heavy work ( $P < .01$ ). Eighty-seven percent were satisfied to very satisfied after surgery. In summary, most patients (92%) who undergo anatomic total shoulder arthroplasty at 55 years or younger return to work, on average, 2.1 months after surgery. [*Orthopedics*. 201x; xx(x):xx-xx.]

it is projected to increase by 333.3% by 2030.<sup>4</sup> In the current economic climate, which has led to an increasingly older retirement age,<sup>5</sup> the ability to return to work following shoulder arthroplasty becomes increasingly important for patients, particularly in this younger population.

Historically, the treatment of younger patients requiring shoulder arthroplasty has posed a difficult dilemma for surgeons, as concerns over glenoid wear and loosening may have influenced them to

*The authors are from the Section of Sports Medicine (JNL, GHG), Midwest Orthopaedics at Rush, Chicago, Illinois; Sports Medicine and Shoulder Service (ACW, AS, DMD, RFW, LVG), Hospital for Special Surgery, New York, New York; and the Department of Orthopaedics (H-HW), University of California, San Francisco, California.*

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*Correspondence should be addressed to: Joseph N. Liu, MD, Section of Sports Medicine, Midwest Orthopaedics at Rush, 1611 W Harrison St, Ste 200, Chicago IL 606012 (Joseph\_Liu@rush.edu).*

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**D**uring the past 2 decades, the use of shoulder arthroplasty has continued to rise,<sup>1,2</sup> with the use of anatomic total shoulder arthroplasty (aTSA) increasing from 14.5 per 100,000 individuals in 2002 to 24.0 per 100,000

individuals in 2011.<sup>3</sup> There has also been a concomitant rise in the number of procedures done on younger patients. Since 2002, the demand for shoulder arthroplasties in patients 55 years or younger has increased at a rate of 8.2% per year, and

**Activities After Shoulder Replacement**

**Phone Survey:**

- 1) Patient Name: \_\_\_\_\_
- 2) Patient Age/DOB: \_\_\_\_\_
- 3) Are you right-handed or left-handed? \_\_\_\_\_ RHD \_\_\_\_\_ LHD
- 4) Which shoulder/s did you have surgery on? \_\_\_\_\_ R \_\_\_\_\_ L \_\_\_\_\_ Both
- 5) Have you had surgery on your \_\_\_\_\_ (opposite) shoulder? \_\_\_\_\_ Yes \_\_\_\_\_ No
  - 6) If yes what type/s of surgery? \_\_\_\_\_
- 7) Why did you have a TSA?
 

\_\_\_\_\_ to play sports / continue activities \_\_\_\_\_ to relieve pain \_\_\_\_\_ to improve motion

\_\_\_\_\_ to return to work \_\_\_\_\_ Other
- 8) Was this the first surgery on your \_\_\_\_\_ (TSA side) shoulder? \_\_\_\_\_ Yes \_\_\_\_\_ No
  - 9) If no, what type/s of surgery have you had previously? \_\_\_\_\_
- 10) Is this your first TSA or is it a revision? \_\_\_\_\_ Primary \_\_\_\_\_ Revision
  - 11) If revision, how many surgeries did you have previously? \_\_\_\_\_ 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ >3
- 12) Did you ever have to return to the operating room for your \_\_\_\_\_ (TSA side) shoulder? \_\_\_\_\_ Yes \_\_\_\_\_ No
  - 13) If yes, what was done? \_\_\_\_\_
  - 14) If yes, how many times did you return to the operating room? \_\_\_\_\_
- 15) Did you have a job within three years prior to the surgery? \_\_\_\_\_ Yes \_\_\_\_\_ No
  - 16) If yes, what was your occupation? \_\_\_\_\_
  - 17) If yes, did you return to work after surgery? \_\_\_\_\_ Yes \_\_\_\_\_ No
  - 18) If yes, how many months after surgery did you return to work? \_\_\_\_\_ Months
  - 19) How would you classify your job status within three years prior to surgery?
 

\_\_\_\_\_ Sedentary \_\_\_\_\_ Light physical work \_\_\_\_\_ Heavy work

\_\_\_\_\_ Retired/Unemployed \_\_\_\_\_ Retired/Unemployed due to shoulder

\_\_\_\_\_ Retired/Unemployed due to other medical conditions
- 20) How satisfied are you with the surgery?
 

\_\_\_\_\_ Dissatisfied \_\_\_\_\_ Fairly Satisfied \_\_\_\_\_ Satisfied \_\_\_\_\_ Very Satisfied
- 21) Within 3 years prior to surgery, at the peak of your physical fitness, how many hours a week of physical activities did you do?
 

\_\_\_\_\_ 0-60 (1hr) \_\_\_\_\_ 60-120 (1-2 hrs) \_\_\_\_\_ 120-180 (2-3 hrs) \_\_\_\_\_ >180 (3hrs)
- 22) How does your physical fitness now compare to before surgery? \_\_\_\_\_ Better \_\_\_\_\_ Worse \_\_\_\_\_ Same

**Figure:** Patient questionnaire administered by phone. Abbreviations: DOB, date of birth; L, left; LHD, left-handed; R, right; RHD, right-handed; TSA, total shoulder arthroplasty.

recommend humeral-sided only arthroplasty options, such as hemiarthroplasty or humeral resurfacing. More recent literature has suggested, however, that primary aTSA outperforms hemiarthroplasty or humeral resurfacing in both implant survival and patient satisfaction at short-term follow-up in this younger population.<sup>6</sup> Paradoxically, despite aTSA offering better pain relief, patient satisfaction, patient-reported outcome measures, and range of motion compared with hemiarthroplasty or humeral resurfacing, return to work rates in the literature have reflected the opposite trend. In the 1 case series on return to work after hemiarthroplasty or hu-

meral resurfacing, Garcia et al<sup>7</sup> reported a higher rate of return to work (69.4%) after hemiarthroplasty or humeral resurfacing compared with rates reported in the literature following aTSA, which ranged from 30.7% to 38.6%.<sup>8,9</sup> This discrepancy may be explained by the differences in age, as aTSA may have been reserved for more elderly patients in these cohorts. Thus, these rates of returning to work may not be applicable to younger patients.

The purpose of this study was to evaluate the ability of modern aTSA to return patients in this younger population to work postoperatively. The primary outcomes of the study were to determine time

and rate of return to work in patients 55 years and younger at the time of surgery. The authors hypothesized that these patients would have a higher rate of return to work compared with historical trends and a low complication rate.

**MATERIALS AND METHODS**

Institutional review board approval was obtained prior to initiation of the study. A retrospective review was performed of all patients who underwent aTSA from an academic institution’s prospectively collected shoulder arthroplasty registry. Inclusion criteria were age of 55 years or younger at the time of surgery and minimum 2-year follow-up. All patients received a Comprehensive Total Shoulder System (Biomet, Warsaw, Indiana). All procedures were performed through the deltopectoral approach in similar fashion.

Deceased status was determined using Social Security records. Nondeceased patients were then contacted via phone and a questionnaire was administered. The questionnaire included work-related questions based on past literature (Figure). Five attempts were made to reach patients, including 1 mailed survey. Patients were considered lost to follow-up if they failed to respond. Data retrieved from the prospective registry included American Shoulder and Elbow Surgeons (ASES) scores and visual analog scale (VAS) preoperative pain scores.

Initial preoperative diagnoses, body mass index (BMI), age, medical comorbidities, and operative complications were obtained from patient records and then confirmed via phone. Employed patients were stratified by intensity of work (sedentary, light, moderate, or heavy), as defined by the US Department of Labor (Table 1).<sup>10</sup> Retirees were stratified by rationale for retirement (shoulder, medical causes, or other). These categories were designated based on prior literature.<sup>11</sup>

**Statistics**

Changes in patient-reported outcome measures were assessed using paired Stu-

dent's *t* tests. Binary logistic regression was used to determine the correlation between demographics and return to work rate. Fisher's exact test was used to compare the rate of return to work when stratified by intensity. After Levene's statistic determined the homogeneity of variances, one-way analysis of variance with post hoc Tukey tests was used to compare differences in mean time to return to work. All tests were conducted using 2-sided hypothesis testing with statistical significance set at  $P \leq .05$  and with SPSS version 22.0 software (IBM, Armonk, New York).

## RESULTS

### Demographics

A total of 1475 patients who underwent aTSA were screened from the shoulder registry from 2007 to 2015; 70 patients (72 shoulders) met inclusion criteria. Average age of the excluded aTSA patients was  $67.22 \pm 9.35$  years (range, 56-96 years). Eleven patients were lost to follow-up; thus, 59 patients (61 shoulders) were available for the study. Seven patients had not worked within 3 years before undergoing surgery, leaving 52 patients (54 shoulders) eligible for final analysis. Average age at surgery was 48.4 years (SD, 7.8 years; range, 23-55 years). Average follow-up was 5.4 years (SD, 1.8 years; range, 2.5-8.6 years). Seventy-three percent ( $n=38$ ) of the patients were male. Average BMI was  $28.0 \text{ kg/m}^2$  (SD,  $5.9 \text{ kg/m}^2$ ; range,  $18.1\text{-}52.9 \text{ kg/m}^2$ ). The dominant shoulder was involved in 46% of cases. Of the 54 shoulders included in the final analysis, 39 (72.2%) of 54 were implanted with mini (83 mm) humeral stems, 11 (20.4%) of 54 were implanted with standard (122 mm) humeral stems, and 4 (7.4%) of 54 were implanted with micro (55 mm) humeral stems. Most patients (81%) underwent aTSA for end-stage osteoarthritis, followed by failed prior arthroplasty (13%), avascular necrosis (4%), and rheumatoid arthritis (2%). Of the 7 patients revised to aTSA from prior arthroplasties, 5 were revised from

Table 1

Physical Job Demand Categories <sup>a</sup>	
Intensity	Definition
Sedentary	Exerting up to 10 pounds of force occasionally (occasionally: activity or condition exists up to one-third of the time) and/or a negligible amount of force frequently (frequently: activity or condition exists from one-third to two-thirds of the time) to lift, carry, push, pull, or otherwise move objects, including the human body. Sedentary work involves sitting most of the time, but may involve walking or standing for brief periods of time. Jobs are sedentary if walking and standing are required only occasionally and all other sedentary criteria are met.
Light	Exerting up to 20 pounds of force occasionally, and/or up to 10 pounds of force frequently, and/or a negligible amount of force constantly (constantly: activity or condition exists two-thirds or more of the time) to move objects. Physical demand requirements are in excess of those for sedentary work. Although the weight lifted may be only a negligible amount, a job should be rated light work: (1) when it requires walking or standing to a significant degree; or (2) when it requires sitting most of the time but entails pushing and/or pulling of arm or leg controls; and/or (3) when the job requires working at a production rate pace entailing the constant pushing and/or pulling of materials even though the weight of those materials is negligible. NOTE: The constant stress and strain of maintaining a production rate pace, especially in an industrial setting, can be and is physically demanding of a worker even though the amount of force exerted is negligible.
Moderate	Exerting 20 to 50 pounds of force occasionally, and/or 10 to 25 pounds of force frequently, and/or greater than negligible to 10 pounds of force constantly to move objects. Physical demand requirements are in excess of those for light work.
Heavy	Exerting 50 to 100 pounds of force occasionally, and/or 25 to 50 pounds of force frequently, and/or 10 to 20 pounds of force constantly to move objects. Physical demand requirements are in excess of those for moderate work.

<sup>a</sup>Data from the US Department of Labor, Office of Administrative Law Judges.

prior hemiarthroplasties for progression of arthritis and 2 were revised from previous aTSA performed at outside institutions for persistent pain.

### Patient-Reported Outcome Measures, Postoperative Complaints, and Complications

Average VAS pain score improved from 5.5 (SD, 2.5) to 0.9 (SD, 1.6) ( $P < .0001$ ) and average ASES score improved from 39.9 (SD, 17.9) to 88.3 (SD, 15.7) ( $P < .0001$ ) postoperatively. Eighty-seven percent of the patients were satisfied to very satisfied with their surgery.

Twenty-two (42.3%) of 52 patients reported postoperative problems with their shoulder. The most common complaints were stiffness (17 of 52, 32.7%), fol-

lowed by chronic pain (6 of 52, 11.5%) and instability (3 of 52, 5.8%). Most of these complaints were treated nonoperatively with physical therapy and/or pain management as needed unless there was an anatomic reason for the symptoms that necessitated further surgery or conservative management had failed. Four (7.7%) of 52 patients returned to the operating room for additional surgery to improve pain and/or function (biceps tenotomy for pain, subscapularis repair for pain and anterior instability, arthroscopic synovectomy/bursectomy of the glenohumeral joint and subacromial space for pain and stiffness, and conversion to reverse shoulder arthroplasty for pain, instability, and poor function due to rotator cuff insufficiency). The final patient with perceived

Table 2

Return to Work After Total Shoulder Arthroplasty				
Occupation Intensity	No. of Patients Participating Before Arthroplasty	No. of Patients Participating After Arthroplasty	Rate of Return to Work	Average Time to Return to Work, mo
Sedentary	10	10	100%	1.3
Light	14	14	100%	1.6
Moderate	17	17	100%	2.0
Heavy	11	7	64% <sup>a</sup>	4.2 <sup>b</sup>
Total	52	48	92%	2.1

<sup>a</sup>Heavy intensity work had a statistically lower rate of return ( $P < .01$ ) compared with all other occupation intensities.

<sup>b</sup>Heavy intensity work had a statistically greater average time to return to work compared with light-intensity ( $P = .002$ ), sedentary ( $P = .003$ ), and moderate-intensity ( $P = .01$ ) jobs.

Table 3

Occupations of Patients Working Postoperatively	
Occupation Intensity	Job Description
Sedentary	Television editor, driver, New York City transit manager, information technology manager, marketing and investor relations for a hedge fund, certified public accountant, self-employed, administrative assistant, chief executive officer, financial analyst
Light	Teacher, accountant, sales manager, sales, pharmacist, administrative assistant, consultant (n=3), technology adviser, investment management, natural gas trader, sales and marketing, project manager (construction)
Moderate	Real estate broker, mechanic, seamstress, president of chemical company, occupational therapist, professional in financial services industry, teacher/choreographer, sales, police department, self-employed, nurse practitioner, consultant, bartender, registered nurse, clothing store owner, physician (n=2)
Heavy	Pool cleaning business owner, painter, veterinarian, state police, professional golfer <sup>a</sup> , physical education teacher and football coach, day care

<sup>a</sup>Preoperatively, this patient was a professional football player.

shoulder instability felt “unstable” with heavy overhead activities. With activity modification, his perceived instability resolved. The 1 patient who underwent additional biceps tenotomy was the only patient who did not have a biceps tenodesis at the index procedure. There were no work-related complications.

**Work Outcomes**

Forty-eight (92%) of 52 patients returned to work postoperatively at an average of 2.1 months (SD, 1.7 months)

after surgery. Both patients with bilateral aTSAs returned to work after each respective shoulder surgery. All 5 patients covered by workers’ compensation returned to work after surgery. Only 1 of the 7 revision cases failed to return to work. When stratified by intensity (Table 2), all (41 of 41, 100%) patients who previously had sedentary, light, or moderate work returned to the same level of work. Patients who had heavy-intensity work returned at a statistically lower rate (7 of 11, 64%) than patients with all other in-

tensities ( $P < .01$ ). Only 1 patient changed jobs after surgery. Preoperatively, this patient was a professional football player; postoperatively, he became a professional amateur golfer (Table 3). Of the 4 patients who did not return to work, only the patient who underwent the postoperative conversion to reverse total shoulder for rotator cuff insufficiency retired specifically because of shoulder pain and limited range of motion. She had previously worked as a food service manager but is currently receiving disability because of her operative shoulder. Two patients (a fireman and a professional hockey player) retired because of personal reasons unrelated to the shoulder, and the last patient, who worked as a carpenter, retired because of other health-related issues. The other 3 patients who returned to the operating room postoperatively were also able to return to work after their second operation.

Intensity of work was positively correlated with time to return to work ( $P = .001$ ). There was a statistically greater time to return to work when comparing heavy-intensity jobs with light-intensity ( $P = .002$ ), sedentary ( $P = .003$ ), and moderate-intensity ( $P = .01$ ) jobs. However, there was no difference in time to return to work among patients with sedentary, light, or moderate jobs.

There was no correlation between age at surgery ( $P = 1$ ), sex ( $P = .999$ ), BMI ( $P = .997$ ), comorbidities ( $P = .998$ ), surgery on dominant extremity ( $P = 1$ ), revision ( $P = .999$ ), workers’ compensation status ( $P = 1$ ), or satisfaction after surgery ( $P = 1$ ) and a patient’s ability to return to work.

**DISCUSSION**

An increasing number of younger patients are undergoing shoulder arthroplasties. In the current economic climate, these younger patients are more likely to be working preoperatively. Thus, important issues for these patients are whether they will be able to return to work after surgery



and how much time will pass until they can resume all of their duties. In discussing expectations with patients following aTSA, the results of this study show that most patients 55 years and younger (92%) return to work, on average, 2.1 months after surgery without changing occupations. Only patients with heavy-intensity jobs had not only a lower rate of return to work (64%) but also a longer time out of work before returning to full duties (average, 4.2 months). The results of this study are helpful for managing patient expectations postoperatively.

This study reports the highest rate of return in patients undergoing aTSA found in the literature<sup>7-9,12</sup> and is the first to report on return to work in this younger population. There have been only 2 prior studies published in English specifically addressing the rate of return to work following aTSA, with both reporting less than 40% of patients returning. Jawa et al<sup>8</sup> reported a 30.8% rate of return following aTSA. In this cohort, not only were most (12 of 13) of the patients heavy laborers, but there may have been other financial implications because all of the patients were cared for under workers' compensation. Bulhoff et al<sup>9</sup> reported a 38.6% rate of return but had a cohort with an average age of 71 years, which is more than 20 years older than the average age of the current study's patients. Given the rising average retirement age,<sup>5</sup> many of the patients in the Bulhoff et al<sup>9</sup> cohort may have been at the age where they were more likely to retire than to resume work. Because both of these historical cohorts had demographics significantly different from those investigated in the current study, the authors are unable to confirm their original hypothesis suggesting a higher rate of return to work compared with historical trends. Nevertheless, surgeons caring for a population similar to the current one can use these data to help counsel patients accordingly.

There is also a dearth of literature regarding return to work for other shoulder

arthroplasty procedures. In the 1 prior study on return to work after hemiarthroplasty, Garcia et al<sup>7</sup> reported a 69% return rate in a cohort with an average age of 63.8 years at the time of surgery. Although the hemiarthroplasty rate of return to work may be slightly skewed by an average age nearing retirement, the return rate in the current study was higher than that of the hemiarthroplasty cohort across all work intensities. In the reverse total shoulder arthroplasty literature, rates between 28% and 65% have been reported,<sup>12,13</sup> although a large proportion of these patients were also involved in workers' compensation cases.<sup>13</sup> The current authors suspect that most of the previous shoulder arthroplasty studies included mainly older patients, which may explain the dearth of literature specifically addressing return to work.

In the current study, although the overall rate of revision surgery was low (7.7%), a significant portion (42.3%) of these patients did have some type of postoperative complaint. Most of these complaints were of mild pain and stiffness, which were treated nonoperatively with activity modification, physical therapy, and/or pain management. The increased incidence of postoperative complaints may be linked to increased preoperative expectations in this younger population, who are often more active in both their professional and their personal lives; therefore, they may be more likely to engage in activities that place greater stress on the shoulder, leading to increased pain, or activities that require more normal range of motion, leading to an increased reported rate of stiffness. Although there were no overt signs of infection, subclinical low-grade infection such as with *Propionibacterium acnes* cannot be definitely ruled out without definitive tissue microbiology, despite the pretest probability being low.

The concern over glenoid wear may discourage some orthopedic surgeons from recommending return to work, particularly for those patients who are involved in heavy-intensity or high-load

upper extremity work. In this cohort involving largely short- to mid-term follow-up, there may be subclinical glenoid wear or loosening that may not be reported. Therefore, some orthopedic surgeons may be more inclined to recommend glenoid-sparing arthroplasties (eg, hemiarthroplasty or humeral head resurfacing). However, increasing evidence suggests that the need for glenoid resurfacing for arthritis progression or persistent pain after hemiarthroplasty or humeral resurfacing may actually be higher than the revision rate for glenoid loosening after aTSA,<sup>14,15</sup> particularly in this younger population.<sup>16</sup> This increased revision rate may explain the decrease of 16.5% per year from 2002 to 2011 in the rate of hemiarthroplasties in patients 55 years or younger.<sup>4</sup> The results of and lack of work-related complications in the current study add to the mounting evidence that aTSA performs better than hemiarthroplasty overall for return to activity and more reliably returns patients to work. Nevertheless, long-term survival studies are lacking, particularly in this younger population.

This study's main limitations stem from its retrospective nature. Additionally, given the use of a phone survey, the results may be more subjective and have the potential for patient recall bias and investigator bias. However, compared with mail surveys,<sup>17</sup> phone surveys have been shown to increase the response rate and were responsible for the high response rate in this study. To reduce the effect of bias, all patient information received via phone was cross-referenced with patient records when available. Additionally, this cohort may have geographic bias, with most patients having sedentary, light-, or moderate-intensity jobs; therefore, the results may not be applicable to patient populations with higher proportions of heavy laborers. Finally, this sample was relatively small compared with other studies involving aTSA. However, given the inclusion criteria (55 years and younger at the time of surgery) and the goals of the

study, the number of patients could not be increased.

## CONCLUSION

Most patients 55 years and younger (92%) return to work, on average, 2.1 months after surgery without changing occupations. Patients involved in heavy-intensity work have the lowest rate of return (64%) and the longest time out of work (4.2 months) compared with patients with all other intensities.

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