The average retirement age is increasing, and the indications for reverse total shoulder arthroplasty (RTSA) are being broadened. The goal of the current study was to determine objective findings for rate of return to work and time to return to work after RTSA. The authors performed retrospective data collection for consecutive patients who underwent RTSA at their institution between 2007 and 2013. All patients were asked to complete a questionnaire about their work history and their ability to participate in work-related activities. A total of 40 patients reported working before surgery. Average patient age was 74.7 years (range, 56-82 years). Average follow-up was 2.6 years (range, 1-4.7 years). Average American Shoulder and Elbow Surgeons score improved from 34.0 to 81.7 (P<.001). Average visual analog scale pain score decreased from 6.5 to 0.7 (P<.001). Most patients (65.4%) classified their job as sedentary, 34.6% classified their job as light work, and no patients classified their job as heavy work. Of patients who worked preoperatively, 65% (n=26) returned to work after RTSA. Only a previous diagnosis of heart disease affected return to work (P=.04). Overall, average time to return to work was 2.3 months (range, 0.5-11 months). Patients with sedentary jobs returned to work more quickly (1.4 months) than those with light work (4.0 months). A total of 96.2% of patients reported good to excellent surgical outcomes. Of patients who worked before RTSA, 65% were still working at final follow-up. Only 5% of patients retired for reasons attributed to the operated shoulder. On average, patients returned to work less than 3 months after surgery. [Orthopedics. 2016; 39(2):e230-e235.]

Indications for reverse total shoulder arthroplasty (RTSA) have expanded over the past decade.1-4 Younger patients (those younger than 65 years) increasingly meet the operative criteria for RTSA and achieve successful outcomes.1,5 As a result, the number of RTSA procedures performed annually has increased exponentially since 2000.2 Further, fiscal stresses imposed by the recent recession have caused many people to delay retirement. Current data show that the average retirement age in the United States has increased more than 15% since the late 1990s.3

Given the expansion of indications for RTSA, a younger population undergoing this procedure, and an aging workforce, it is critical to answer questions about return to work after RTSA. The literature on hip and knee arthroplasty reported timing of return to work of 8 to 14 weeks.4,6-11 This is valuable information that aids in physician-patient counseling and can lead to appropriate expectations. Only Mor...
ris et al\textsuperscript{12} evaluated return to work after RTSA, but this study evaluated patients with workers’ compensation claims rather than rate of return of all patients undergoing RTSA. Unfortunately, excluding studies of patients with workers’ compensation claims and studies of subacromial decompression, few articles on shoulder surgery have addressed return to employment\textsuperscript{13-15}

Only 1 study has evaluated return to work after RTSA. The goal of the current study was to determine objective findings for (1) rate of return to work, (2) risk factors for failure to return to work, and (3) time to return to work after RTSA.

**Materials and Methods**

After institutional review board approval was obtained, a patient list was obtained from the institution’s prospectively collected shoulder arthroplasty registry. This list was established by identifying consecutive patients who underwent RTSA between 2007 and 2013. The authors performed retrospective data collection to obtain final follow-up information. All procedures were performed at the authors’ institution by 5 shoulder surgeons (J.S.D., D.M.D., R.F.W., E.V.C., L.V.G.). Patients with a primary diagnosis of rheumatoid arthritis, proximal humerus fracture, osteoarthritis, or rotator cuff tear arthropathy were included. No preoperative diagnosis was excluded. Patients who underwent revision or bilateral procedures were included. Patients were excluded if they had follow-up of less than 1 year or if they reported that they had not worked in the 3 years before RTSA. All patients in the cohort received the Biomet Comprehensive Reverse Shoulder System (Biomet, Warsaw, Indiana). Patients who could not be reached after 5 attempts to contact them were considered lost to follow-up. Social Security records were used to determine deceased status.

Patient charts and operative records were reviewed for preoperative diagnosis, body mass index, age, medical comorbidities, and operative complications. Preoperative American Shoulder and Elbow Surgeons (ASES) scores and visual analog scale pain scores were obtained from the prospective registry.

All patients were administered a telephone questionnaire that included questions about preoperative shoulder characteristics, occupation, and retirement status (Figure). Patients who could not be reached after 5 attempts by telephone and 1 mailed survey were considered lost to follow-up. Social Security records were used to determine deceased status. Patients who were employed were stratified by intensity of work performed (sedentary, light, or heavy), as defined by the US Department of Labor (Table 1).\textsuperscript{16} Patients who were retired were stratified by rationale for retirement (shoulder, medical causes, or other). These categories were designed based on a previous study by Cowie et al.,\textsuperscript{11} and the questionnaire was based on previous return to work studies in the hip and arthroplasty literature.\textsuperscript{6,8,9,15} Additionally, postoperative visual analog scale pain scores and ASES scores were obtained.

**Statistics**

Summary statistics were reported with mean and standard deviation for continuous variables and with frequency and percentage for categorical variables. Independent samples Student’s $t$-tests were
used to compare differences in continuous factors between patients who returned to work and those who did not. Chi-square and Fisher’s exact tests were used to evaluate discrete factors. Changes in patient-reported outcome measures were evaluated with a paired samples Student’s t test. All tests were conducted with 2-sided hypothesis testing, with statistical significance set at \( P \leq 0.05 \). Data analysis was performed with SPSS Statistics for Windows version 21.0 software (IBM Corp, Armonk, New York).

**RESULTS**

**Demographics**

In this study, 128 consecutive patients (132 shoulders) were screened. The shoulders of the 4 patients with bilateral surgery were considered independently. Of this group, 17 patients were lost to follow-up, 5 patients declined to participate, and 4 were deceased. Consequently, 102 patients remained available for study. The 62 patients who reported that they had not worked in the 3 years before undergoing RTSA were excluded from further analysis. The remaining 40 patients met the inclusion criteria and are the subject of this study.

Average patient age was 74.7 years (range, 56-82 years), average follow-up was 2.6 years (range, 1-4.6 years), and average body mass index was 28.8 kg/m\(^2\) (range, 14.8-46.2 kg/m\(^2\)). There was a female predominance (60%, n=24). The most common preoperative diagnoses were rotator cuff tear arthropathy (52.5%, n=21), osteoarthritis (25%, n=10), proximal humerus fracture (17.5%, n=7), and rheumatoid arthritis (5%, n=2). In 66% (n=26) of cases, the dominant extremity was involved. Of the 12 patients who had previously undergone ipsilateral shoulder arthroplasty, 10 (83%) had revision of shoulder arthroplasty other than RTSA and 2 (17%) underwent revision of RTSA. All revision procedures were categorized by the initial pathology. One patient in the current study returned to the operating room. This patient had a fracture of the prosthesis with revision of the humeral stem and did not return to work after surgery. No patients had dislocation or infection during the study period.

Average preoperative ASES scores improved from 34.0 (SD, 15.8) to 81.7 (SD, 16.9) \((P < .001)\). Average preoperative visual analog scale pain score decreased from 6.5 (SD, 2.5) to 0.7 (SD, 19.0) \((P < .001)\).

**Employment Status**

Of the 40 patients who reported working within the 3 years preceding RTSA, 65% returned to work after surgery. In addition, 14 patients (35%) retired after surgery. Of these 14 patients, only 2 retired for reasons that they attributed to the shoulder. The remaining 12 patients retired because of nonorthopedic causes.

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### Table 1

<table>
<thead>
<tr>
<th>Work Category</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary</td>
<td>Exerting up to 10-lb 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. Jobs are sedentary if they require walking and standing only occasionally and all other sedentary criteria are met.</td>
<td>Receptionist, secretary, accountant, tax preparer, counselor, telemarketer, bill collector, computer programmer</td>
</tr>
<tr>
<td>Light work</td>
<td>Exerting up to 20-lb force occasionally, and/or up to 10-lb 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 although 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.</td>
<td>Teacher, assembly line worker, sewing machine operator, retail clerk</td>
</tr>
<tr>
<td>Heavy work</td>
<td>Exerting 20- to 100-lb force occasionally, and/or 10- to 50-lb force frequently, and/or 5- to 20-lb force constantly to move objects. Physical demand requirements are in excess of those for light work.</td>
<td>Heavy machine operator, truck driver, mechanic</td>
</tr>
</tbody>
</table>

*Data from the US Department of Labor, Office of Administrative Law Judges.*

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either medical (n=2) or other (n=10). A total of 65.4% of patients reported their job as sedentary, 34.6% reported light work, and no patient reported heavy work. Additionally, no patient changed job demands after surgery. Job descriptions of patients who returned to work (n=26) by demand are shown in Table 2.

In terms of preoperative diagnosis, patients with cuff tear arthropathy had a 62% rate of return to work. The remaining diagnoses and rates of return were rheumatoid arthritis (100%), proximal humerus fracture (71.4%), and osteoarthritis (60%). No significant difference was found between rates of return by diagnosis. For those with previous revision surgery, the rate of return to work was 67%, with no significant difference from patients undergoing primary surgery.

Time to Return to Work

Average time to return to full work was 2.3 months (range, 0.5-11 months). When stratified by job demand, return to work took an average of 1.4 months for sedentary work and 4.0 months for light work (Table 3). All patients stated that their return to work was determined by their overall physical ability to do their job as well as by surgeon recommendations.

Satisfaction and Factors Affecting Return to Work

Of the patients who returned to work, 96.2% (n=25) reported good to excellent surgical outcomes. No correlation was found between satisfaction with surgery and return to work (P<.28). No association was found between sex (P=.343), previous pathology (P=.71), body mass index (P=.13), dominant extremity (P=.813), age (P=.977), or revision surgery (P=.99). The only medical comorbidity that affected return to work was a previous diagnosis of heart disease (P=.04). No other comorbidities were significant, including hypertension, lung disease, diabetes, kidney disease, liver disease, cancer, and depression.

Table 2

<table>
<thead>
<tr>
<th>Occupation Intensity</th>
<th>Job Description</th>
<th>Average Age, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary work</td>
<td>Attorney, librarian, case manager, editor, communication executive (2), consultant, certified public accountant, information technology specialist, lawyer/real estate lawyer, business owner (2), appraiser, receptionist, private wealth investor, teacher</td>
<td>68.8</td>
</tr>
<tr>
<td>Light physical work</td>
<td>Artist (2), chef, dog groomer, industrial food worker, patient care nurse, outdoor guide, restaurant manager, waitress</td>
<td>72.6</td>
</tr>
</tbody>
</table>

Table 3

<table>
<thead>
<tr>
<th>Occupation Intensity</th>
<th>Working Before Reverse Total Shoulder Arthroplasty</th>
<th>Working After Reverse Total Shoulder Arthroplasty</th>
<th>Average Time to Return to Work, mo</th>
<th>Median Time to Return to Work (Range), mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary</td>
<td>25</td>
<td>17</td>
<td>1.4</td>
<td>1 (0.5-3)</td>
</tr>
<tr>
<td>Light</td>
<td>15</td>
<td>9</td>
<td>4.0</td>
<td>3 (0.5-11)</td>
</tr>
</tbody>
</table>

DISCUSSION

Patients commonly ask their surgeon about returning to work after surgery. In the current study, only 5% (2 of 40) of patients who underwent RTSA retired because of limitations related to their shoulder. Until now, physicians and patients alike have had limited evidence on which to base predictions about return to work after shoulder arthroplasty. In most cases, the hip and knee arthroplasty literature has investigated this clinically and socially relevant dilemma. The lack of information on shoulder arthroplasty may be the result of an inaccurate and unfounded belief that older patients undergoing RTSA do not seek employment after surgery. This study showed that 39.2% of patients (40 of 102) who were initially screened were in the workforce during the 3 years leading up to surgery. Further, the average age of patients who returned to work was 74.7 years. In addition, 65% of these patients returned to work with limited restrictions and were satisfied with their surgery.

The results showed that many patients who undergo RTSA return to employment after surgery. Because only 1 study has evaluated return to work after shoulder arthroplasty, the current authors have limited benchmarks with which to compare their results. Morris et al evaluated 25 patients who worked before undergoing RTSA and reported a rate of return to work of 25%, which is significantly lower than the rate of 65% reported in the current study. Because this is the only shoulder study available for comparison, the data on hip and knee arthroplasty provide the best comparison. Although the rates of return to work after total hip arthroplasty and total knee arthroplasty were higher, ranging from 78% to 90.4%, it is important to remember that many of these studies excluded patients older than 65 years.
In the current study, patients who returned to their previous occupations returned to work an average of 2.3 months after surgery. These findings are comparable to previous studies of total knee arthroplasty and total hip arthroplasty that reported an average time of return to work of 8 to 14 weeks. Because no patients in this series had a job that involved moderate or heavy work, no rates of return can be reported for this cohort. The absence of patients who performed heavy work was not a result of surgeon protocol. The senior surgeons placed no work restrictions on patients postoperatively. No maximum workload was enforced as long as patients could return to work without pain or dysfunction. With expansion of the indications for RTSA, a younger population is undergoing this procedure. With this expansion, further studies will be needed because rates of return to employment may differ from those reported in the current study.

Interestingly, limited research has focused on revision arthroplasty. In the current study, 44% of patients who returned to work did so despite having undergone revision surgery, and this had no significant effect on the rate of return to work. It is difficult to compare these findings with the data on lower extremity arthroplasty because most studies involved only primary joint replacement. The revision arthroplasty population may be an area for future research because the existing literature is sparse.

The only factor that was a negative predictor for return to work after RTSA was pre-existing heart disease. No other factors (age, sex, body mass index, pathologic process, or revision status) affected the rate of return to work. The current findings differ from many of those in the hip and knee arthroplasty literature. Styron et al. found that female sex and higher preoperative physical function were associated with higher rates of return to work after total knee replacement. Mobasher et al. found that male sex was associated with improved return to employment after total hip replacement. Sankar et al. found that male sex and jobs with lower physical demand predicted faster rates of return to work after both hip and knee arthroplasty. Finally, Bulhoff et al. evaluated return to work after total shoulder arthroplasty, with only 14% of patients returning to work at final follow-up of an average of 6.2 years. Although the current study reported a substantially higher rate of return to work, it did have shorter follow-up. Furthermore, because Bulhoff et al. did not estimate time to return to work or analyze factors that predicted return to work, it is difficult to compare their outcomes with the current cohort.

Only 1 study investigated return to work after RTSA. Morris et al. compared 14 patients who underwent RTSA and had workers’ compensation claims with matched control subjects with an average age of 60.9 years. They found a 14.2% rate of return to work for the workers’ compensation claim group and a 45.5% rate of return to work for the control group. Overall, the rate of return for the entire cohort was 28%. In the current study, the rate of return to work was higher, at 65.4%, but this finding may be explained by the decision to interview the entire cohort rather than a small, select group. Another reason for the higher rate of return to work in the current study may be that the study did not include any patients with workers’ compensation claims. However, even compared with control subjects, the current study showed a rate of return to work that was more than 20% higher than that of a cohort that was an average of more than 14 years older. Unfortunately, Morris et al. did not report combined results, so it is difficult to compare the satisfaction and outcome scores of the current study with their patients. The differences are concerning because it is possible that Morris et al. significantly underestimated the ability of patients to return to work after RTSA. The current study contributes to the literature by reporting outcomes and rates of return to work for the largest reported cohort of employed patients undergoing RTSA.

The limitations of this study are primarily its retrospective nature and the associated recall bias. Prospective collection of employment status may have helped to eliminate these biases. Ideally, a larger patient population may have shown greater statistical differences in factors affecting the rate of return to work. An additional concern is that the current results included all preoperative diagnoses. Because most patients undergoing RTSA are older than 70 years, it would have been difficult to obtain any statistical values on return to work by separating the cohort by individual diagnosis. Although this approach may lead to some confounding variables, the authors did not find any significant difference in their rates of return to work. In addition, the authors did not review the findings of postoperative physical examinations or radiographs. Although this information may have provided better insight into postoperative outcomes, the authors believe that ASES scores in addition to the survey on satisfaction and return to work provided an adequate assessment of postoperative function for the purpose of this investigation. Despite the limitations of the study, the findings provide crucial data to help manage physician and patient expectations about return to work after RTSA.

**CONCLUSION**

The study findings showed that 65% of patients who worked before RTSA were still working at final follow-up. Only 5% of patients retired for reasons attributed to the operated shoulder. Patients returned to work an average of less than 3 months after surgery. Only comorbid heart disease was a poor prognostic indicator for return to work.

**REFERENCES**


