

Return to Work Following Shoulder Surgery

An Analysis of 1,773 Cases

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Background: There is limited information on patients' ability to return to work (RTW) after the majority of shoulder surgical procedures.

Methods: This study was a retrospective analysis of prospectively collected data on 1,773 consecutive patients who underwent shoulder surgery performed by a single surgeon from 2004 to 2017. A validated L'Insalata Shoulder Questionnaire was used to collect information on 32 preoperative factors, which were used for analysis. The questionnaire included the premorbid level of work and the levels preoperatively and at 6 months postoperatively.

Results: Six months following the shoulder operations, 77% of the patients returned to work (40% with full duties and 37% with light duties). Concomitant rotator cuff repair and stabilization was associated with the highest RTW rate (90%) whereas some of the lowest RTW rates were associated with reverse total shoulder arthroplasty (56%) and total shoulder arthroplasty (71%). The highest rate of RTW with full duties was associated with debridement for calcific tendinitis (62%). Capsular release provided a significant improvement in work level (on a scale ranging from none to strenuous) from preoperatively to postoperatively ($p = 0.0116$). Older patients with stiffer shoulders who were not working preoperatively had the lowest RTW rate at 6 months.

Conclusions: To our knowledge, this is the largest study of RTW outcomes of shoulder surgical procedures, and it showed that 4 out of 5 patients were able to RTW 6 months postoperatively with approximately half resuming full duties and half, lighter duties. Capsular release was the only procedure to result in a significant improvement in work level within 6 months. The best independent predictors of RTW were younger age, less stiffness, and working preoperatively.

Level of Evidence: Therapeutic Level IV. See Instructions for Authors for a complete description of levels of evidence.

Work is an important pillar of social organization and also, to a large extent, key to an individual's identity. Currently, studies of surgical procedures on the shoulder have focused on surgically orientated measures such as range of motion and strength. Although some existing scores assess patient-reported functional outcomes, many are limited with regard to the insight that they provide into the impact of surgery on people's lives, in particular return to work (RTW)¹. To our knowledge, the study by Hurwit et al.² is the only one that compared RTW between 2 interventions (hemiarthroplasty and reverse total shoulder arthroplasty [RTSA]). Authors of other studies have reported on RTW following

specific interventions individually. Gaining greater insight into RTW rates and the factors that contribute to them provides more detailed information for all stakeholders, including the patient, the physician, and potentially the employer.

Individual studies have revealed that the time to RTW has ranged between 2.4 and 10 months following arthroscopic rotator cuff repair³⁻⁶, 12 days and 14.2 weeks after acromioplasty⁷⁻⁹, 2.7 and 3.4 months after Bankart repair^{10,11}, 1.4 and 4 months after RTSA^{2,12}, and 3.1 and 13.1 months^{2,14} after hemiarthroplasty; the time to RTW averaged 4.2 months after anatomic total shoulder arthroplasty (TSA)¹³ and 5.1 weeks after calcific debridement¹⁵.

Disclosure: The authors indicated that no external funding was received for any aspect of this work. On the **Disclosure of Potential Conflicts of Interest** forms, which are provided with the online version of the article, one or more of the authors checked "yes" to indicate that the author had a relevant financial relationship in the biomedical arena outside the submitted work (<http://links.lww.com/JBJSOA/A194>).

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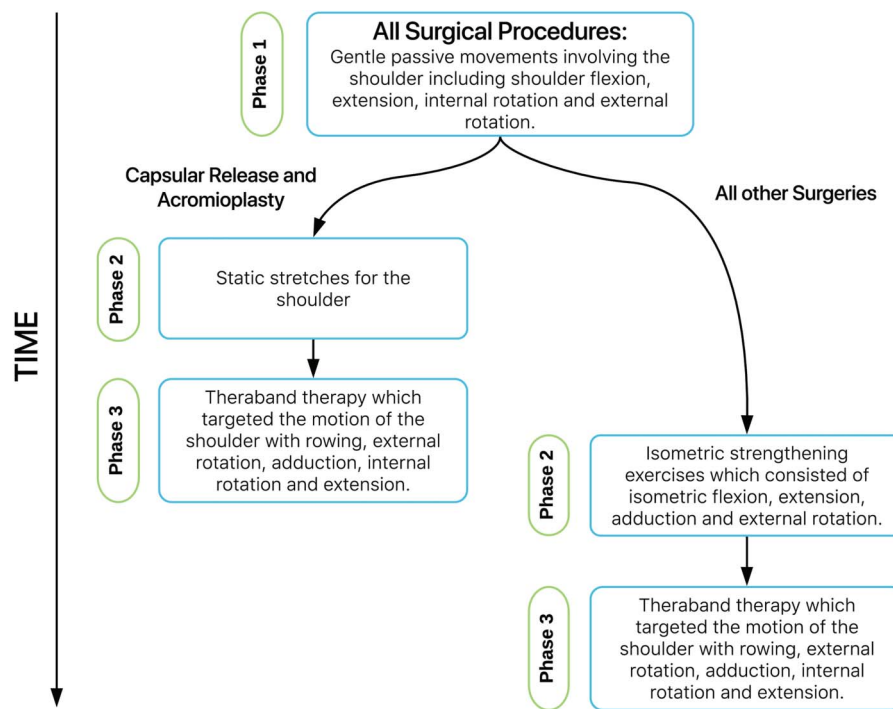


Fig. 1
Standardized rehabilitation and physiotherapy protocol completed at our clinic.

The aim of our study was to determine the effectiveness of different surgical interventions on the shoulder in a single surgeon's practice in terms of allowing patients working prior to the morbid condition to RTW and to determine which preoperative factors had the most impact on the patients' ability to RTW. We hypothesized that capsular release would be the most effective procedure for allowing patients to RTW at 6 months.

Materials and Methods

A retrospective review of prospectively collected patient data was conducted to compare RTW rates following the various shoulder surgical procedures. The analysis included all patients who had undergone primary shoulder surgery carried out by a single shoulder surgeon at a single campus between 2004 and 2017. This study was undertaken following ethics approval granted by the South Eastern Sydney Local Health District Human Research Ethics Committee (reference number: HREC/11/STG/37).

Inclusion and Exclusion Criteria

More than 10 patients were required to have undergone a surgical procedure as primary treatment for the procedure to be included in the study. Concomitant surgery was also included as its own separate intervention group if the concomitant procedure was done on >10 patients. Grouping was according to the surgery performed, irrespective of indications and personal characteristics. All operations were performed by the senior author of this study. Patients were excluded from the study if they were not working before the

morbid condition, underwent revision surgery, had a concomitant shoulder fracture, or had missing work status data prior to the morbid condition, before the operation, or 6 months postoperatively. Patients were evaluated preoperatively and at 1 week, 6 weeks, 12 weeks, and 6 months postoperatively using the validated L'Insalata Shoulder Questionnaire¹⁶, which evaluates pain, activities of daily living, sport and work status, and overall satisfaction using Likert scales.

Examiners also measured the passive range of shoulder motion visually and active strength using a handheld dynamometer preoperatively and at postoperative follow-up. Range of motion and strength were recorded for forward flexion, abduction, external rotation, and internal rotation.

Surgical Technique

Arthroscopic techniques were utilized during acromioplasty for rotator cuff impingement¹⁷, Bankart repair and superior labral anterior to posterior (SLAP) repair¹⁸ for labral tears/instability, calcific debridement¹⁹ for calcific tendinitis, arthroscopic capsular release²⁰ for idiopathic adhesive capsulitis, arthroscopic rotator cuff repair²¹ for rotator cuff tears, and synthetic polytetrafluoroethylene (PTFE) patch rotator cuff repair²² for massive to irreparable rotator cuff tears. Open surgery was performed for the shoulder replacements, which included anatomical TSA, hemiarthroplasty²³, and RTSA²⁴.

Postoperative Management and Rehabilitation

Standardized rehabilitation and physiotherapy, as shown in Figure 1, were recommended for all patients.

TABLE 1 Preoperative Variables Showing a Significant Correlation with RTW, Ranked by Absolute Magnitude of Spearman Correlation Coefficient*

Preoperative Variable	Absolute Correlation	Direction of Correlation	P Value
Work status†	0.333	Positive	<0.001
Work activity level	0.243	Positive	<0.001
Age at operation	0.133	Negative	<0.001
Sports activity level	0.121	Positive	<0.001
Shoulder stiffness	0.111	Negative	<0.001
Overall perception of shoulder	0.111	Positive	<0.001
Premorbid sports activity level	0.11	Positive	<0.001
Frequency of extreme pain	0.108	Negative	<0.001
Forward flexion range of motion	0.108	Positive	<0.001
Lift-off strength	0.107	Positive	<0.001
External rotation strength	0.106	Positive	<0.001
Difficulty reaching behind back	0.103	Negative	<0.001
Difficulty with overhead activities	0.103	Negative	<0.001
Internal rotation strength	0.102	Positive	<0.001
Level of shoulder pain during overhead activities	0.1	Negative	<0.001
Abduction range of motion	0.096	Positive	<0.001
Work-related injury†	0.094	Negative	<0.001
Frequency of pain during activities	0.09	Negative	<0.001
Internal rotation range of motion	0.087	Positive	<0.001
Duration of symptoms	0.083	Negative	0.003
Level of shoulder pain when resting	0.081	Negative	0.001
Adduction strength	0.08	Positive	0.001
Premorbid work activity level	0.077	Negative	0.001
Supraspinatus strength	0.072	Positive	0.004
Level of shoulder pain during sleep	0.071	Negative	0.003
Frequency of pain during sleep	0.057	Negative	0.019

*Twenty-six of the 32 measured preoperative variables demonstrated a significant correlation with the patient's ability to RTW. For dichotomous variables (denoted by †), a positive correlation indicates that, if the variable was present, the patient's ability to RTW increased. For continuous or ordinal variables (all others), a positive correlation indicates that, as the value of the variable increased, so did the patient's ability to RTW. The 6 nonsignificant correlations were sex, side of affected shoulder (right or left), Workers' Compensation status, presence of osteoarthritis, injury related to a specific event, and preoperative external rotation range of motion. †Dichotomous variable.

Statistical Methods

The primary outcome analyzed was the change in the patient's response to "What is your current level of activity at work?", referring to their premorbid, preoperative, and 6-month postoperative status. The responses at the 3 different time points were graded using a Likert scale (none = 0, light activity = 1, moderate activity = 2, and strenuous labor = 3). Similar 4- and 5-point Likert scales were used for the remainder of the questions in the L'Insalata Shoulder Questionnaire, which were utilized for the secondary outcomes for this study.

Our study classified RTW as returning to full duties, returning to light duties, and returning to work overall. The classification was based on the comparison of the premorbid level of work and the level of work 6 months postop-

eratively. *Full-duties RTW* was defined as returning to the same or a higher level of work 6 months postoperatively compared with the premorbid level. *Lighter-duties RTW* was defined as returning to a lower level of work 6 months postoperatively compared with the premorbid level. *Unable to RTW* was defined as having a work level of 0 at 6 months postoperatively.

Dichotomous data relating to whether the patients were able to RTW or did not RTW were analyzed using the chi-square or Fisher exact test depending on the sample size of the group. Comparisons of work levels prior to the morbid condition and at 6 months postoperatively were completed using Wilcoxon matched-pair signed-rank tests for the nonparametric data. The improvement in work level at 6 months was compared between the different surgical

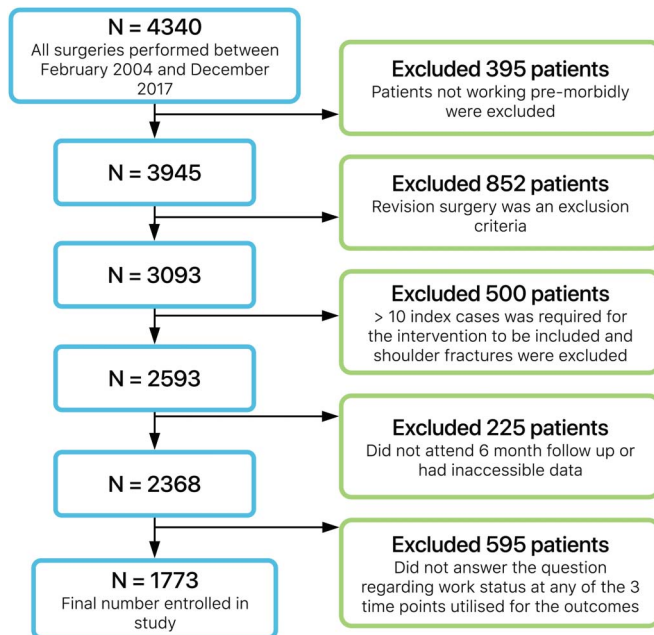


Fig. 2

Flowchart of patient enrollment into the study after application of the inclusion and exclusion criteria.

procedures by using the Kruskal-Wallis test with a Dunn correction.

Bivariate Spearman correlation tests were conducted on 32 preoperative factors to determine their correlation with the patients' ability to RTW (Table I). The most significant factors were assessed using a multiple logistic regression analysis in order to identify independent factors that best predict whether patients will RTW at 6 months postoperatively.

Results

Cohort Demographics

Between February 2004 and December 2017, 4,340 surgical procedures were performed by a single surgeon. After application of inclusion and exclusion criteria (Fig. 2), 1,773 patients were included in the study.

Patients were grouped according to the surgical intervention in the shoulder, resulting in 12 groups for the study with 2 of the groups consisting of >1 operation. The individual groups' demographics are shown in Table II.

The total study cohort consisted of 1,077 male and 696 female patients with a mean age (and standard error of the mean [SEM]) of 55 ± 0.3 years (range, 12 to 91 years) and a mean duration of symptoms of 24 ± 1.4 months (range, 0 to 488 months). Thirty-eight percent of the patients reported that the shoulder injury was work-related, and 12% of all cases were covered by Workers' Compensation insurance.

Work Status Proportions

The patient's work level was analyzed at 3 main time points (premorbid, preoperatively, and 6 months postoperatively) (Fig. 3). The most obvious differences were the reduction in the percentage performing strenuous work preoperatively, the portion of patients who were unable to work preoperatively, and the portion of patients unable to work at 6 months postoperatively.

RTW Ability

Overall, 77% of the patients were able to RTW. The RTW rates for the individual surgical procedures are shown in Fig. 4.

Concomitant rotator cuff repair and stabilization was associated with the greatest ability of patients to RTW

TABLE II Demographics of Patients Undergoing Shoulder Surgery

Type of Surgery	Patients (no.)	Sex (M:F) (no.)	Age* (yr)	Workers' Compensation (no. [% of total])	Work-Related Incident (%)	Public:Private Insurance (% of total without Workers' Compensation)	Duration of Symptoms* (mo)	Operative Time* (min)
All surgical procedures	1,773	1,077:696	55 ± 0.3 (12-91)	182 (12†)	38	4:96	24 ± 1.4 (0-488)	26 ± 0.5 (3-200)
Rotator cuff repair	1,306	790:516	56 ± 0.3 (18-90)	121 (11†)	39	5:95	24 ± 1.6 (0-488)	21 ± 0 (3-110)
Bankart repair	82	65:17	28 ± 1.1 (12-58)	2 (2)	17	2:98	24 ± 4.0 (0-222)	29 ± 1 (7-65)
Synthetic PTFE patch rotator cuff repair	52	36:16	63 ± 1.3 (47-83)	4 (8)	36	6:94	20 ± 5.5 (0-224)	53 ± 3 (22-150)
Capsular release	55	22:33	54 ± 1.1 (24-74)	6 (11)	47	2:98	10 ± 1.4 (1-42)	18 ± 1 (7-40)
Rotator cuff repair + capsular release	53	23:30	56 ± 1.2 (32-71)	8 (15)	48	4:96	12 ± 2.0 (0-64)	23 ± 2 (5-60)
RTSA	34	18:16	72 ± 1.6 (54-91)	2 (6)	19	9:91	76 ± 21.5 (2-482)	91 ± 5 (60-150)
SLAP repair	54	46:8	35 ± 1.4 (19-54)	17 (32)	52	5:95	18 ± 4.1 (0-158)	26 ± 2 (6-70)
TSA	38	21:17	65 ± 1.6 (48-86)	0 (0)	8	0:100	86 ± 29.0 (2-426)	102 ± 4 (60-200)
Rotator cuff repair + stabilization	42	34:8	42 ± 1.6 (21-71)	8 (19)	42	0:100	12 ± 2.4 (0-61)	29 ± 2 (8-75)
Acromioplasty	25	10:15	44 ± 2.5 (21-66)	11 (44)	69	7:93	28 ± 7.0 (1-151)	24 ± 2 (11-45)
Calcific debridement	21	9:12	51 ± 2.5 (38-76)	2 (10)	25	0:100	13 ± 3.3 (0-43)	28 ± 2 (13-45)
Hemiarthroplasty	11	3:8	72 ± 2.7 (57-84)	1 (9)	18	0:100	†	71 ± 8 (45-120)

*Mean \pm SEM (range). †Based on different n value as data missing for 205 patients treated with rotator cuff repair. ‡No patients filled out the required question.

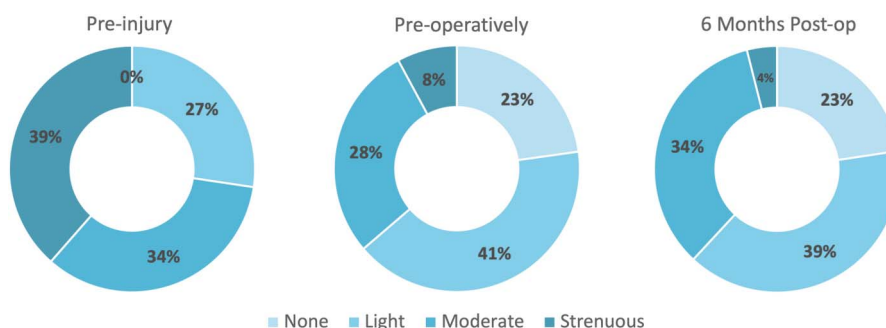


Fig. 3 Work levels of the patients at the 3 main data-collection points: premorbid, preoperative, and 6 months after the shoulder surgery.

postoperatively, with 90% of patients back at work with either full or lighter duties after 6 months. That procedure was associated with significantly higher RTW rates than TSA ($p = 0.0428$), PTFE patch repair ($p = 0.0116$), and RTSA ($p = 0.001$). In contrast, patients who underwent RTSA had the worst RTW outcomes, with only 56% returning after 6 months. The RTW rates were significantly lower than those associated with calcific debridement ($p = 0.037$), Bankart repair ($p = 0.002$), capsular release ($p = 0.0143$), SLAP repair ($p = 0.0147$), and rotator cuff repair ($p = 0.0066$).

Returning to Full Duties Versus Lighter Duties

After stratification into full-duties and lighter-duties RTW (Fig. 5), calcific debridement was found to be the most effective surgery for allowing full-duties RTW at 6 months postoperatively, with 62% of all patients returning to their premorbid work level. The calcific debridement procedure was associated with a significantly better full-duties RTW rate than SLAP repair ($p = 0.0166$), acromioplasty ($p = 0.036$), RTSA ($p = 0.0092$), and rotator cuff repair ($p = 0.0421$). Second best was hemiarthroplasty, which allowed 55% of the patients to RTW at full duties; however, the cohort had a limited number of

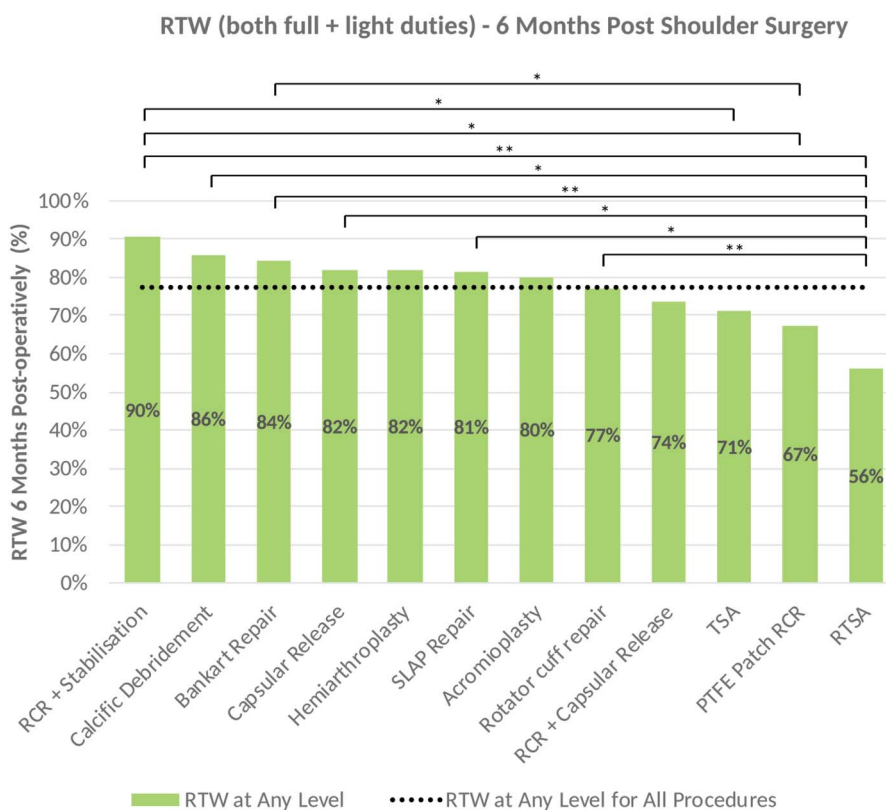


Fig. 4 Overall RTW at any level (full or lighter duties) for each individual procedure. RCR = rotator cuff repair. * $P < 0.05$ and ** $p < 0.01$ (Fisher exact test).

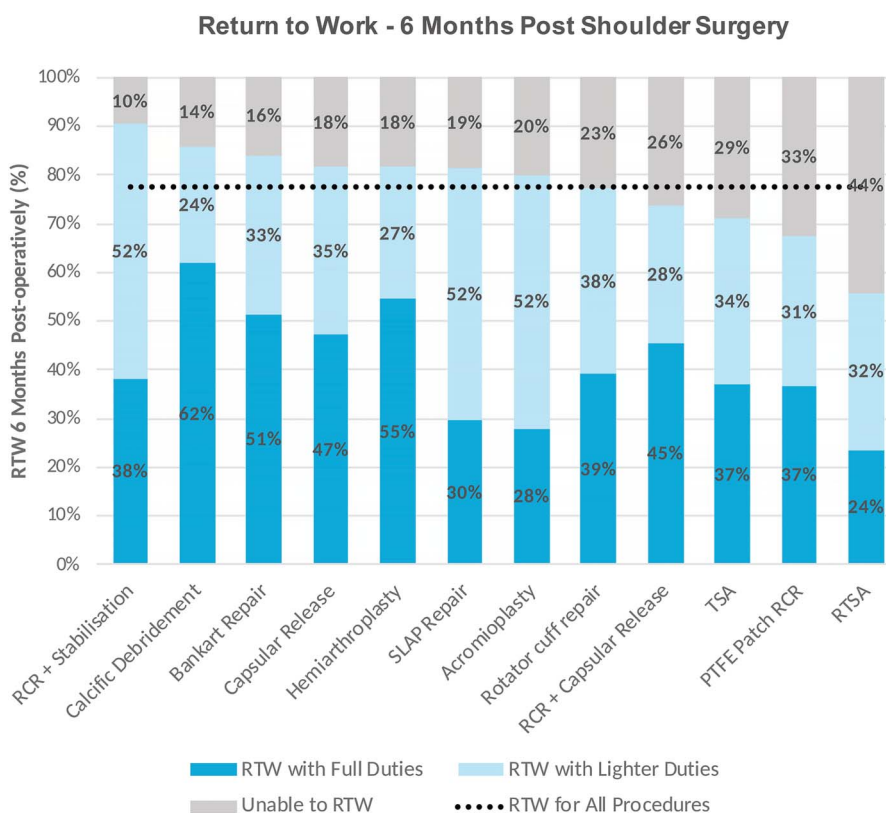


Fig. 5
RTW categorized as returning to full duties, returning to light duties, and unable to RTW. RCR = rotator cuff repair.

patients. Bankart repair was the third best, with a 51% rate of RTW with full duties, and was significantly better than SLAP repair ($p = 0.0139$), RTSA ($p = 0.0074$), and rotator cuff repair

($p = 0.0358$). Combined rotator cuff repair and capsular release ($p = 0.0443$) and capsular release alone ($p = 0.0275$) provided significantly better outcomes than RTSA.

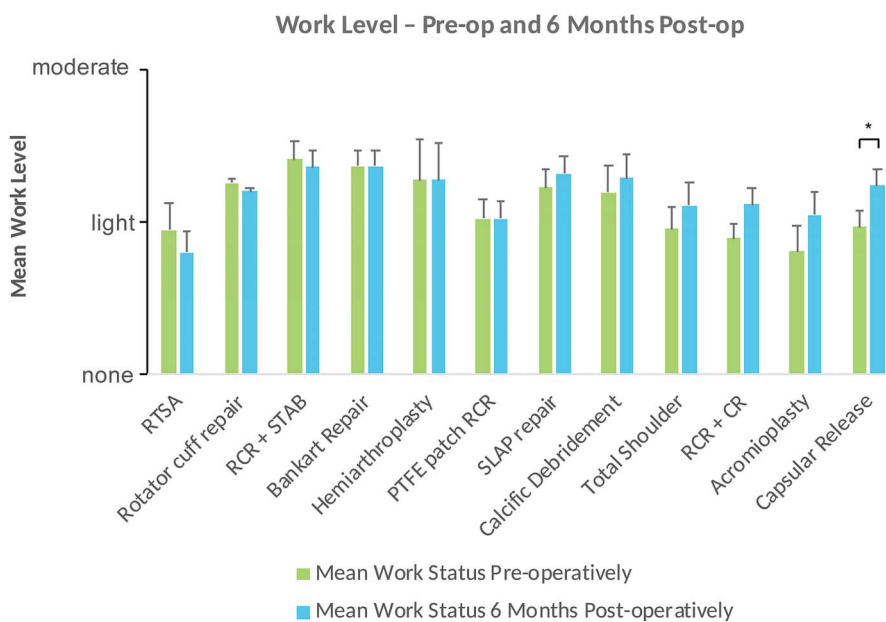


Fig. 6
Work levels preoperatively and at 6 months postoperatively. $P < 0.05$ (Fisher exact test). RCR = rotator cuff repair, STAB = stabilization, and CR = capsular release.

TABLE III Predictive Factors for RTW 6 Months Postoperatively Ranked by Strength of Prediction

Variable	Coefficient	Wald Statistic	P Value
Working preoperatively	1.583	149.6	<0.001
Age	-0.018	13.5	<0.001
Preoperative stiffness	-0.135	8.2	<0.004

Changes in Work Level from Preoperatively to 6 Months Postoperatively

A subgroup analysis of the individual procedures was conducted to determine which provided a significant change in work level from the preoperative status to 6 months postoperatively (Fig. 6). Capsular release provided the greatest improvement between these 2 time points ($p = 0.0116$). No other procedure was associated with a significant change.

Regression Analysis

Bivariate Spearman correlation analysis showed 26 of the 32 preoperative factors to be significantly correlated with the patient's ability to RTW (Table I). Multiple logistic regression was used to determine which of the 26 preoperative factors had the greatest independent effect on the likelihood of RTW. Younger patients who reported less preoperative stiffness and were still working preoperatively had the greatest likelihood of RTW 6 months following surgery (Table III). Of note, Workers' Compensation status, the intensity level of the patient's work, and preoperative pain were not predictive.

Age as a Factor Affecting RTW

Patients older than 60 years were significantly less likely to RTW at 6 months postoperatively than the majority of the younger age groups (Fig. 7); of note, arthroplasties were performed more frequently in older patients (Fig. 8).

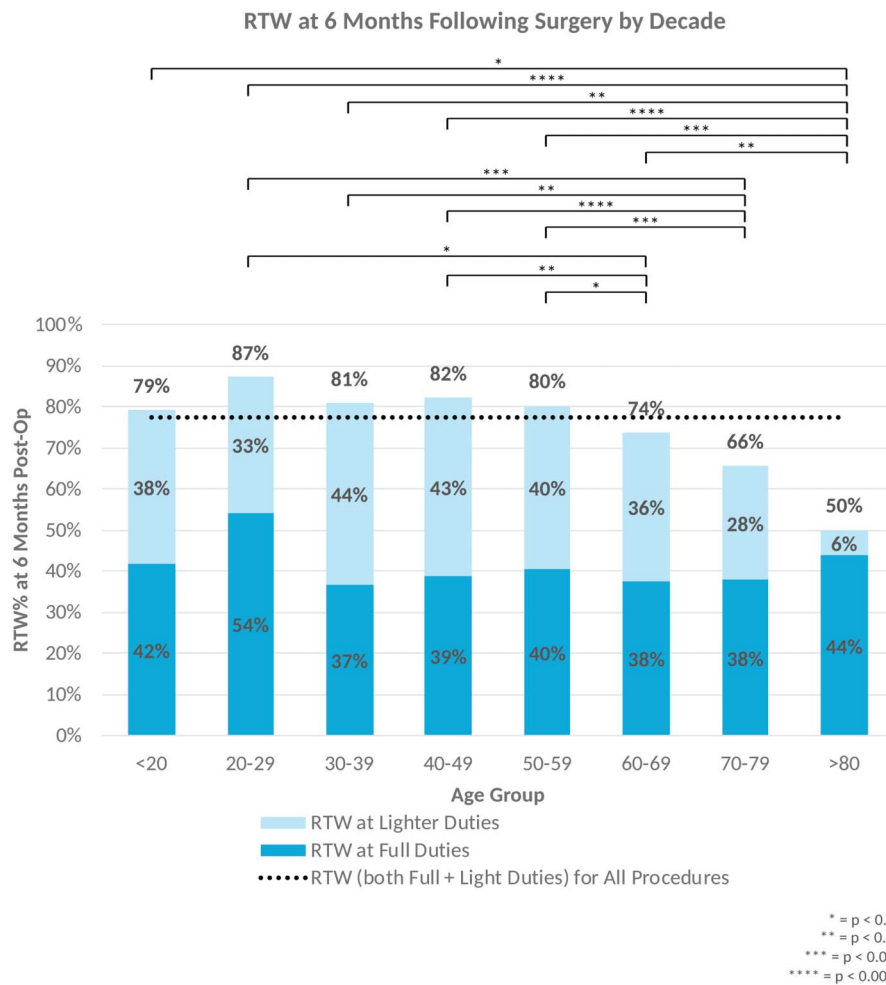


Fig. 7

RTW stratified by age decade. * $P < 0.05$, ** $p < 0.01$, *** $p < 0.001$, and **** $p < 0.0001$ (Fisher exact test) for comparison of overall RTW (full duties and light duties) between age groups.

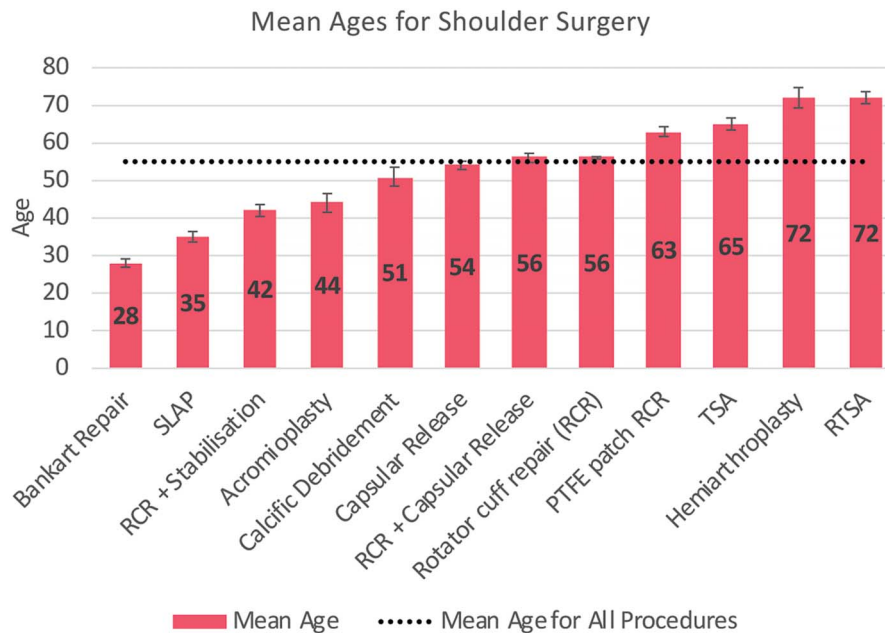


Fig. 8

Mean patient age and SEM for each of the different shoulder surgical procedures. RCR = rotator cuff repair and CR = capsular release.

Discussion

In our analysis of 12 surgical procedures of the shoulder in 1,773 consecutive patients, 77% patients returned to work at 6 months overall; 40% of the total cohort returned to the same level of work (full duties) as prior to the morbid condition and 37%, to lighter duties. The 3 shoulder surgical procedures that were associated with the highest RTW rates were concomitant rotator cuff repair and stabilization (90%), calcific debridement (86%), and Bankart repair (84%). The 3 that were associated with the lowest RTW rates were TSA (71%), synthetic patch rotator cuff repair (67%), and RTSA (56%). Older patients with stiffer shoulders who were not working preoperatively were the least likely to RTW at 6 months.

To our knowledge, this is the first study to analyze short-term RTW outcomes after concomitant rotator cuff repair and stabilization, Bankart repair, synthetic PTFE patch repair of the rotator cuff, calcific debridement for calcific tendinitis, or capsular release. Concomitant rotator cuff repair with stabilization and Bankart repair were done in relatively young cohorts (mean age, 42 and 28 years, respectively), and this together with the acuteness of the condition (mean duration of symptoms, 12 and 24 months, respectively) may explain the high RTW rates. The results for Bankart repairs are comparable with those in other long-term studies, in which the RTW rates were 82% to 100% at 48 months^{11,25}. In contradistinction, patients undergoing TSA or RTSA were significantly older and fewer returned to work, which is consistent with other studies evaluating return to work following shoulder arthroplasty, in which the RTW rates were 46% to 65%^{2,12,13,26,27}.

In terms of RTW at full duties (same or higher work level compared with the pre-morbid level), calcific debridement for

calcific tendinitis was the best procedure, allowing 62% of patients to return to full duties. Removing the calcific material reduces the pain and vigorous inflammatory response within the tendon²⁸.

Capsular release was the only surgical procedure that was followed by a significant improvement in the patient-reported work level at 6 months postoperatively. The rehabilitation period for capsular release included minimal physical restriction, which allowed for rapid short-term improvements. The average duration of symptoms prior to capsular release was 10 months, which was the shortest among all procedures. Paraparan et al.²⁹ found that capsular release provided the greatest effect size in terms of patient-rated overhead function. Weber et al.³⁰ found that capsular release was the only procedure associated with significant improvement in patient-reported sports level 6 months following surgery.

Our study had several strengths. Previous studies analyzing RTW outcomes of shoulder surgery have had limited sample sizes, with the largest including 365 patients, to our knowledge³¹. Our study included 1,773 patients, from 12 to 91 years of age, who had a wide range of work-intensity levels and who were all operated on by the same surgeon at the same institution. The number of patients in each of our surgery groups was equivalent to or larger than those in previous studies. Moreover, it is one of the few studies that stratified RTW into full duties and light duties, which revealed nuanced results.

Limitations to this study included that it was a retrospective cohort analysis. Although, the majority of data were prospectively collected from the time of diagnosis onward, the pre-morbid data for “What is your current level of activity at work?” contain inherent recall bias. The study’s high internal

validity may inherently limit the applicability of its findings to external settings. The follow-up period of 6 months may not have allowed for the full effects of surgery to be realized. Patients' decisions to return to work may have been impacted by their interpretation of the surgeon's recommendation of limiting lifting and overhead activities. Finally, it is important to consider that the different surgical interventions under comparison were for different indications and that the study groups had different sample sizes.

Conclusions

In conclusion, 4 out of 5 patients were able to return to work 6 months following shoulder surgery, with approximately half returning to full duties and half, to lighter duties. The highest RTW rates were seen after concomitant rotator cuff repair and stabilization (90%), calcific debridement (86%), and Bankart repair (84%) whereas the lowest RTW rates were seen with TSA (71%), synthetic PTFE patch rotator cuff repair (67%), and RTSA (56%). Calcific debridement was highly associated with

patients returning to full duties. Capsular release was associated with a significant improvement between the preoperative and 6-month postoperative work level. The best independent predictors of RTW were younger age, less patient-reported preoperative stiffness, and employment at the time of the procedure. ■

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