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Functional and Imaging Outcomes of Arthroscopic Simultaneous Rotator Cuff Repair and Bankart Repair After Shoulder Dislocations

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Background: Previous studies have investigated outcomes of simultaneous rotator cuff (RC) repair and superior labral injury repair; however, there is limited information in the literature on outcomes of simultaneous RC repair and Bankart lesion repair after acute shoulder dislocations.

Purpose: To determine functional and imaging outcomes of simultaneous arthroscopic RC repair and Bankart repair after acute shoulder dislocations and to compare functional outcomes to contralateral, asymptomatic shoulders.

Study Design: Cohort study; Level of evidence, 3.

Methods: Consecutive patients who underwent arthroscopic simultaneous RC repair and Bankart repair with a minimum of 2 years' follow-up were recruited. All patients had suffered an acute shoulder dislocation. The American Shoulder and Elbow Surgeons (ASES), Constant-Murley, and Short Form (SF)-36 scores were obtained. The affected shoulder also underwent ultrasound imaging to assess the integrity of the RC.

Results: Thirteen patients (mean age, 58.8 ± 11.2 years; mean follow-up, 38.5 ± 12.3 months) were recruited. In a comparison of the affected versus unaffected shoulder, there were no significant differences in the mean ASES score (89.7 ± 12.6 vs 95.0 ± 6.7 , respectively), mean Constant score (80.5 ± 18.9 vs 86.8 ± 7.9 , respectively), or mean abduction strength (15.4 ± 6.4 lb vs 15.4 ± 5.2 lb, respectively) ($P > .05$). The mean SF-36 physical component summary was 48.4. According to ultrasound imaging, there were persistent/recurrent full-thickness tears in 4 patients, and 1 patient had a new full-thickness tear. At follow-up, patients with full-thickness RC tears in the affected shoulder compared with their unaffected shoulder showed similar mean ASES scores (90.9 ± 11.8 vs 97.6 ± 4.3 , respectively), mean Constant scores (77.8 ± 20.3 vs 84.8 ± 7.2 , respectively), and mean abduction strength (11.5 ± 5.3 lb vs 12.6 ± 4.5 lb, respectively) ($P > .05$).

Conclusion: After simultaneous arthroscopic repair of the RC and a Bankart lesion in patients after shoulder dislocations, the affected extremity had similar functional outcomes compared to the noninjured, asymptomatic side at a mean of 3 years after surgery. Persistent or recurrent RC tears involving the operative extremity were common, but they did not significantly affect functional outcomes in this small study.

Keywords: arthroscopic rotator cuff; Bankart repair; functional outcomes scores

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Functional outcomes after shoulder injuries have been studied extensively. Specifically, recovery after the surgical repair of rotator cuff (RC) tears and labral injuries is well described, with multiple studies investigating simultaneous repair.^{1,5,6,18} To date, these results have been controversial. Some literature suggests that superior labral anterior-posterior (SLAP) lesions repaired concurrently with the RC result in similar outcomes to RC repair alone.⁵ Others have reported increased stiffness and worse functional outcomes in patients who undergo SLAP lesion repair with simultaneous RC repair compared with patients who undergo SLAP lesion debridement with simultaneous RC repair.^{1,6}

Currently, there is a lack of literature on the outcomes of simultaneous arthroscopic RC repair and Bankart lesion repair in patients after acute shoulder dislocations. Voos et al¹⁸ reviewed patients after SLAP or Bankart lesion repair with concurrent RC repair from various injury mechanisms and found similar outcomes between these groups. However, no comparison was made with the contralateral extremity, and the integrity of the RC repair was not confirmed with imaging. As elderly patients remain active longer into life, orthopaedic surgeons specializing in sports medicine may see more patients with combined RC and labral injuries after shoulder dislocations, and further studies are needed to facilitate more accurate patient counseling with regards to outcome expectations after treatment.

The purpose of this study was to compare functional outcomes of shoulders that have undergone simultaneous arthroscopic RC repair and Bankart lesion repair, which resulted from traumatic dislocations, and compare those results to the unaffected, asymptomatic contralateral shoulder in these patients. We hypothesized that in this specific population, the functional outcomes of simultaneous arthroscopic RC repair and Bankart repair would be similar to those in the contralateral, asymptomatic shoulders.

MATERIALS AND METHODS

Patients who underwent simultaneous arthroscopic RC repair and Bankart lesion repair were identified by Current Procedural Terminology codes from 2007 to 2011. Clinic notes were reviewed, and patients with a documented shoulder dislocation were identified. All injuries were acute and traumatic. Patients who had undergone Bankart lesion repair with simultaneous RC repair, were aged ≥ 18 years, and had an acute shoulder dislocation as the mechanism of injury resulting in persistent weakness and feelings of instability were included. Patients with a previous injury or recent surgery of their contralateral shoulder were excluded. All RC injuries were confirmed by ultrasonography or magnetic resonance imaging (MRI) before surgery. The minimum time from surgery to study evaluation was 24 months. These criteria yielded 16 potential study candidates.

Demographic and functional outcome data were obtained through chart review and follow-up examination, including American Shoulder and Elbow Surgeons (ASES), Constant-Murley, and Short Form (SF)-36 scores. Shoulder abduction strength was measured with a handheld dynamometer (Lafayette) at the level of the wrist with the arm abducted at 90°. A standard goniometer was used to assist with measuring shoulder range of motion. Shoulder apprehension was tested with the arm in 90° of abduction and progressive external rotation.

Ultrasound examination of the affected shoulder was performed on the patients using a SonoSite Edge ultrasound unit (Fujifilm SonoSite Inc). A standard high-frequency musculoskeletal transducer (HFL50 15-6 MHz) was used. Imaging of each of the RC muscles/tendons was performed in both the long axis and short axis

including dynamic examination when indicated, as described by published guidelines of the European Society of Musculoskeletal Radiology.¹⁰ Ultrasound was performed and interpreted by a blinded, board-certified primary care sports physician with training in musculoskeletal ultrasound.

The surgical procedures were performed by 3 attending surgeons at our institution. Standard portals were utilized, including posterior, anterosuperior, anteroinferior, and lateral. Bankart lesions were repaired with Biocomposite SutureTak suture anchors (Arthrex Inc) and FiberWire sutures (Arthrex Inc). Simple stitches were utilized for Bankart lesions with a mean of 2.3 anchors per repair (range, 1-4 anchors). Six patients underwent RC repair with transosseous equivalent double-row fixation, and 7 were repaired with single-row fixation. Repair techniques were chosen based on surgeon preference; on average, 1.6 titanium Corkscrew suture anchors (5.5 mm) (Arthrex Inc) were utilized.

All patients underwent a standard rehabilitation protocol identical to the isolated arthroscopic RC repair protocol employed at our institution. This consists of a sling for 6 weeks, with passive pendulums at 1 week, supine passive range of motion at 2 weeks, progression to active assisted range of motion and active range of motion at 6 weeks, followed by strengthening at 12 weeks after surgery.

A power analysis ($P = .80$) revealed that 12 patients would be sufficient to detect a clinically important difference between affected and unaffected shoulders. This was calculated based on the minimal clinically important difference (MCID) reported by Tashjian et al¹⁷ for the ASES score as a minimum of 12 and the MCID for the Constant score reported as 10 by Kukkonen et al.¹¹

Comparative statistics were carried out with Student *t* tests or Mann-Whitney *U* tests (for the ASES score only) (SPSS version 19, SPSS Inc). Shoulders that dislocated and underwent surgery have been termed "affected," while the contralateral, uninjured shoulder has been termed "unaffected." We compared outcomes between affected and unaffected shoulders in this study. Data are presented as mean \pm SD. This study was approved by the university institutional review board.

RESULTS

Thirteen of the 16 eligible patients (81%) who underwent simultaneous arthroscopic RC repair and Bankart repair after shoulder dislocations were successfully recruited. The mean age was 58.8 ± 11.2 years (range, 42-75 years) at the time of the procedure. Surgeries were performed at a mean of 1.8 ± 1.0 months (range, 1-4 months) from injury (Table 1). Surgical indications for all 13 patients included acute weakness from an RC injury after a shoulder dislocation and persistent feelings of shoulder instability with suspected or MRI-confirmed capsulolabral injuries. Eleven patients had experienced first-time dislocations, while 2 patients had previous dislocations previously treated without surgery. Seven patients were initially treated with physical therapy (mean age, 65.3

TABLE 1
Basic Demographics and Pertinent Characteristics
of Study Population

	Values
Age, mean \pm SD, y	58.8 \pm 11.2
Body mass index, mean \pm SD, kg/m ²	29.5 \pm 5.0
Time from surgery to study examination, mean \pm SD, mo	38.5 \pm 12.3
Current smokers, n (%)	2 (15)
History of depression, n (%)	2 (15)
Time from injury to surgery, mean \pm SD, mo	1.8 \pm 1.0
Workers' compensation cases, n (%)	1 (8)

years), while the rest (mean age, 55.7 years) went directly to surgery.

Two patients had a remote history of depression; however, no patients had any active psychiatric conditions that might confound the functional outcomes. A single patient was covered by workers' compensation insurance. There were 2 current smokers, 3 who had quit smoking before their injury, and 8 who had never smoked. Eight patients (61.5%) injured their dominant shoulder, and 1 patient underwent contralateral RC repair in 1977. All contralateral shoulders were asymptomatic at the time of the study.

Preoperatively, there were 5 patients with isolated full-thickness tears of the supraspinatus; 3 patients with combined full-thickness infraspinatus and supraspinatus tears; 1 patient with a full-thickness subscapularis tear with a near full-thickness supraspinatus tear; 1 patient with an isolated full-thickness subscapularis tear; 1 patient with full tears of the supraspinatus, infraspinatus, and subscapularis; and 2 patients with near full-thickness tears of the supraspinatus (>90% of the greater tuberosity footprint's width was detached) based on MRI, ultrasound, and intraoperative arthroscopic assessment. The mean follow-up after surgery at the time of data collection was 38.5 \pm 12.3 months (range, 24-54 months).

The mean ASES scores did not differ between the affected (89.7 \pm 12.6) and unaffected shoulders (95.0 \pm 6.7) ($P > .05$). The mean Constant scores between the affected (80.5 \pm 18.9) and unaffected shoulders (86.8 \pm 7.9) were also similar ($P > .05$). The mean abduction strength of the affected shoulder (15.4 \pm 6.4 lb) was indistinguishable from that of the unaffected shoulder (15.4 \pm 5.2 lb) ($P > .05$) (Table 2). The mean SF-36 physical component summary (48.4) was slightly below the mean for the United States (US) population, while the mean mental component summary (58.9) was above the mean for the US population. Mean values for SF-36 subgroups of physical function (50.4) and bodily pain (51.4) were near mean population norms (Table 3).¹² See Figures 1 and 2 for distributions of the ASES and Constant scores. Of the 3 patients with the worse outcomes in these areas, 2 were the active smokers, and 1 was the workers' compensation case.

Ten affected (77%) and 12 unaffected (92%) shoulders had over 150° of forward flexion ($P = .77$) (Figure 3). Ten

TABLE 2
Functional Outcome Scores of Affected and
Unaffected Shoulders^a

Outcome Measure	Affected Shoulder (n = 13)	Unaffected Shoulder (n = 13)	P Value
ASES	89.7 \pm 12.6	95.0 \pm 6.6	>.05
Constant-Murley	80.5 \pm 18.9	86.8 \pm 7.9	>.05
Abduction strength, lb	15.4 \pm 6.4	15.4 \pm 5.2	>.05

^aValues are expressed as mean \pm SD. The American Shoulder and Elbow Surgeons (ASES) score, Constant score, and abduction strength were not significantly different between affected shoulders with concomitant rotator cuff repair and Bankart lesion repair and unaffected shoulders.

TABLE 3
SF-36 Results Compared With Normative
Values of US Population^a

	Current Study	Normative Values of US Population
SF-36 score		
PCS	48.41	49.22
MCS	58.90	53.78
Bodily pain	51.40	50.66
Physical function	50.35	50.68

^aValues are expressed as the mean. Normative values from Forsthe et al.⁵ MCS, mental component summary; PCS, physical component summary; SF-36, Short Form-36; US, United States.

affected (77%) and 11 unaffected (85%) shoulders had over 150° of abduction ($P = .99$) (Figure 4). Constant-Murley motion scoring categories revealed that only 3 patients had affected shoulders with worse internal and/or external rotation compared with the contralateral shoulder.

Ultrasonography of the affected shoulders at the time of follow-up demonstrated persistent or recurrent full-thickness tears in 4 (31%) patients and 1 patient with a new tear. Of the 4 recurrences, 1 patient had complete supraspinatus and subscapularis tears, while 3 patients had isolated, complete supraspinatus tears. One patient had a new isolated, complete subscapularis tear with a previously repaired supraspinatus tear that healed. At follow-up, when comparing patients with confirmed full-thickness RC tears in the affected shoulder with their unaffected shoulder, there were similar mean ASES scores (90.9 \pm 11.8 vs 97.6 \pm 4.3, respectively), mean Constant scores (77.8 \pm 20.3 vs 84.8 \pm 7.2, respectively), and mean abduction strength (11.5 \pm 5.3 lb vs 12.6 \pm 4.5 lb, respectively) ($P > .05$) (Table 4).

No patients had experienced a recurrent dislocation at the time of follow-up. Of the 7 patients employed at the time of injury, 6 returned to their previous level of work. The 1 patient who did not return to their previous work was the workers' compensation case. Two patients reported apprehension with the arm in 90° of abduction and full external rotation; however, their ASES and

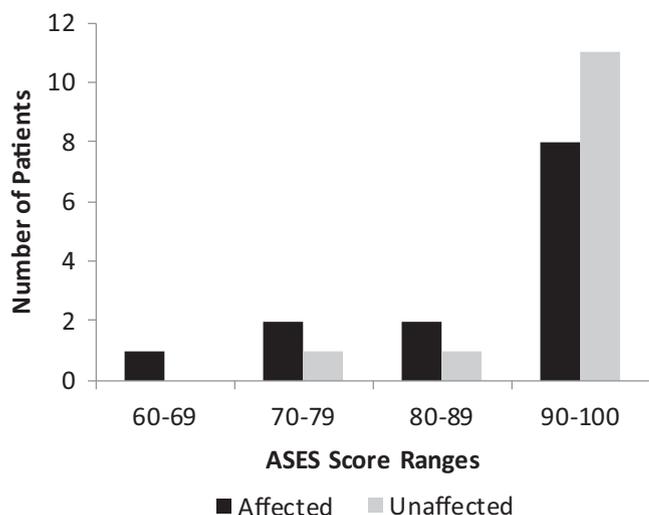


Figure 1. Distribution of American Shoulder and Elbow Surgeons (ASES) scores for affected and unaffected shoulders.

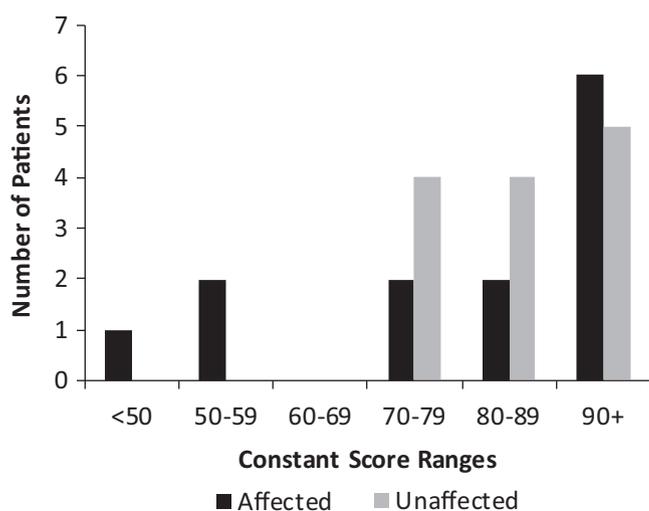


Figure 2. Distribution of Constant-Murley score ranges for affected and unaffected shoulders.

Constant scores were nearly identical between the affected and unaffected shoulders, and they denied feelings of instability with daily activities. The 2 patients with a previous dislocation had ASES and Constant scores ± 3 points of their contralateral extremity. See Table 5 for details on all patients.

DISCUSSION

Outcomes in patients who have sustained a Bankart lesion and RC injury from an episode of traumatic shoulder instability and undergo simultaneous arthroscopic repair of both lesions have not been previously studied. Our data suggest that this patient population can return to a level of function that is similar to the uninjured side based on

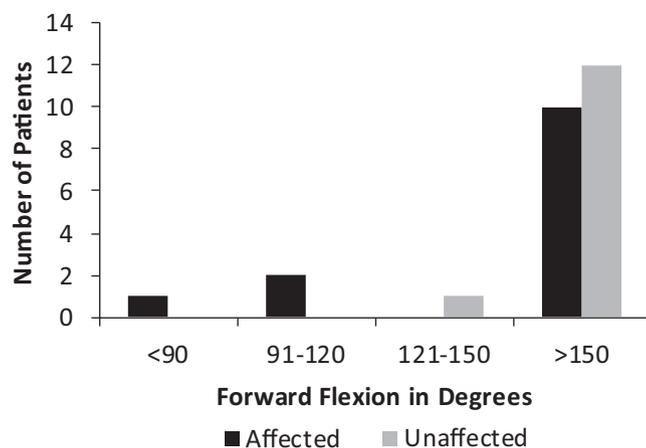


Figure 3. Distribution of forward flexion motion in affected and unaffected shoulders.

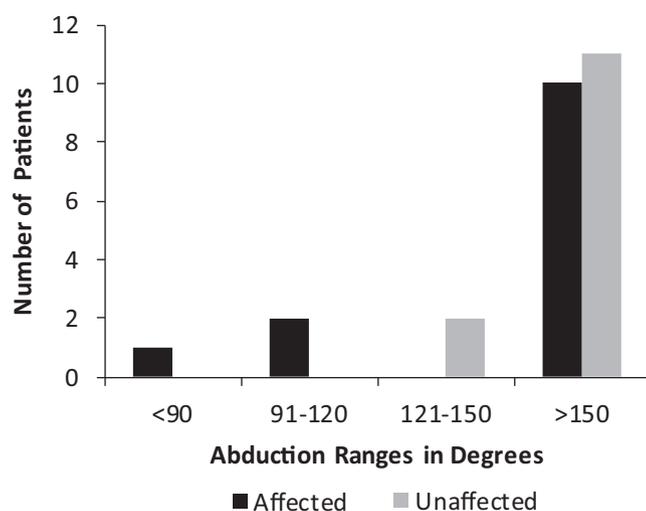


Figure 4. Distribution of shoulder abduction ranges for affected and unaffected shoulders was similar between the 2 groups.

ASES and Constant scores. Previous studies have suggested that repairing the RC and a Bankart lesion simultaneously yields similar results to simultaneous type II SLAP and RC repair.¹⁸ However, outcomes from combined RC and type II SLAP repair compared with RC repair alone have returned mixed results, with some reporting equivalent outcomes⁵ and others reporting better outcomes for RC repair alone.^{1,6} Previous reports on simultaneous RC repair and Bankart lesion repair did not compare outcomes to the contralateral shoulder and reported on a variety of injury mechanisms, whereas this study used the uninjured shoulder as a control and limited injury etiology to shoulder dislocations.¹⁸ The SF-36 data collected in this study show that the outcomes of patients with acute shoulder dislocations treated with arthroscopic treatment of RC and Bankart lesions are comparable with US population norms.¹²

TABLE 4
Functional Outcome Scores for Affected Shoulders With Persistent or Recurrent Full-Thickness Rotator Cuff Tears^a

Outcome Measure	Affected Shoulder (n = 5)	Unaffected Shoulder (n = 5)	P Value
ASES	90.9 ± 11.8	97.6 ± 4.3	>.05
Constant-Murley	77.8 ± 20.3	84.8 ± 7.2	>.05
Abduction strength, lb	11.5 ± 5.3	12.6 ± 4.5	>.05

^aValues are expressed as mean ± SD. The American Shoulder and Elbow Surgeons (ASES) score, Constant score, and abduction strength were similar between affected shoulders with full-thickness rotator cuff tears at the time of examination compared with the unaffected contralateral shoulder.

TABLE 5
Individual Information for All Study Patients^a

Patient No.	RC Muscles Torn Preoperatively (Intraoperative Findings) ^b	Time From Surgery to Study Evaluation, mo	Dominant Extremity Involved	Workers' Compensation	Smoking Status ^c	Full-Thickness RC Muscle Tears at Time of Study Evaluation	ASES Score		Constant Score		SF-36	
							Affected Shoulder	Unaffected Shoulder	Affected Shoulder	Unaffected Shoulder	PCS	MCS
1	Supraspinatus	24	Yes	No	Yes	NA	81.7	88.3	57.4	77.0	39.3	59.3
2	Partial supraspinatus	45	Yes	Yes	No	NA	61.7	90.0	50.0	79.7	50.9	58.5
3	Supraspinatus	54	Yes	No	No	NA	100.0	100.0	99.0	97.6	58.9	55.6
4	Supraspinatus, infraspinatus	24	No	No	Yes	Supraspinatus, subscapularis	71.8	100.0	42.6	74.0	39.7	58.9
5	Subscapularis, partial supraspinatus	53	No	No	No	Supraspinatus	88.0	90.0	78.0	81.0	37.7	63.5
6	Supraspinatus	34	No	No	No	NA	100.0	100.0	95.0	92.0	49.1	62.1
7	Partial supraspinatus	31	Yes	No	No	NA	95.0	95.0	86.2	88.4	55.2	59.3
8	Supraspinatus	24	Yes	No	No	Supraspinatus	100.0	100.0	87.4	88.4	60.0	49.6
9	Supraspinatus, infraspinatus	51	Yes	No	No	Subscapularis	100.0	100.0	91.0	92.0	57.9	62.1
10	Supraspinatus, infraspinatus	24	Yes	No	No	Supraspinatus	95.0	95.0	93.0	96.0	57.1	59.0
11	Supraspinatus	44	Yes	No	No	NA	95.0	98.0	90.0	88.5	55.6	57.8
12	Supraspinatus, infraspinatus	53	No	No	No	NA	78.3	78.3	76.9	78.5	29.3	57.7
13	Subscapularis	40	Yes	No	No	NA	100.0	100.0	100.0	95.0	38.7	62.4

^aASES, American Shoulder and Elbow Surgeons; MCS, mental component summary; NA, not applicable; PCS, physical component summary; RC, rotator cuff; SF-36, Short Form-36.

^bPartial tears refer to tears ≥90% of the footprint.

^cYes = current smoker who smoked during time of surgery and rehabilitation; no = never smoked or had quit before surgical intervention.

Voos et al¹⁸ have previously reported outcomes of simultaneous RC repair and Bankart lesion repair. The mean ASES score was slightly higher (95.8) in their cohort after RC repair and Bankart repair, but the patients were also much younger (mean age, 47 years), which may account for the higher score. Only 6 patients in their study had documented shoulder dislocations, and it is unclear exactly how many of those were in the cohort with RC/Bankart repair, whereas all of our patients had documented shoulder dislocations. No functional outcomes were obtained on the nonoperative extremity for comparison, and imaging was not used to evaluate the integrity of the RC repair. They also found range of motion to be similar to that of the nonoperative extremity.¹⁸

Previous studies of simultaneous SLAP or Bankart and RC repair have reported ASES scores similar to those in our study.^{5,18} The Constant scores in our population of Bankart and RC repair seem lower than previously reported Constant scores, averaging about 100 in patients

with SLAP and RC repair.⁵ However, the use of asymptomatic, contralateral shoulders as a control in this study suggests that most shoulders returned to a level of function indistinguishable from that before injury. Different pathological disorders in terms of mechanisms of injury for labral and RC tears, along with differences in patient ages, may account for these differences, and for these reasons, we cannot adequately compare the results of these reports. Studies looking at Bankart repair alone have similar ASES and Constant scores to those of our cohort.^{13,19} Published outcomes for Constant and ASES scores of RC repair alone are also similar to our results.^{5,7,20} This suggests that simultaneous arthroscopic repair of RC and Bankart lesions in patients after shoulder dislocations may result in similar outcomes as would be expected from the repair of isolated Bankart or RC lesions; however, these assertions require further investigation. A cohort of patients with shoulder dislocations who sustain RC and Bankart lesions and only undergo RC repair would be needed for

comparison to confirm any advantage or disadvantage to simultaneous repair. Until this is done, the need for Bankart repair in this patient population will remain controversial, with the possibility remaining that RC repair alone in these patients may restore strength and relieve feelings of instability. Our small group of patients at least regained function comparable with that of the contralateral extremity, and there was no clear trend for decreased range of motion, a previously published concern with simultaneous repair.^{1,6}

The MCID for functional outcomes is a useful measure to determine if differences are clinically meaningful. The MCID for the ASES score has most recently been reported as 12 to 17, while the MCID for the Constant score has been suggested to be about 10, with both for RC disease.^{11,17} In this study, 11 of 13 (85%) patients had ASES scores of the affected shoulder that were ± 12 points of those of the contralateral shoulder. Similarly, 10 of 13 (77%) patients had Constant scores of the affected shoulder that were ± 10 points of those of the contralateral shoulder.

Three patients in this study had affected shoulders with significantly lower functional scores and worse ranges of motion compared with the uninjured shoulder. These patients are represented on the distribution graphs as those with ASES scores < 80 and Constant scores < 70 for affected shoulders. Two of these patients were active smokers, and the third was the workers' compensation case. It is known that smoking not only delays RC healing¹⁵ but also negatively correlates with self-reported pain and function related to RC disease.¹⁴ Workers' compensation has been well established as a negative predictor of function and pain before and after shoulder surgery.^{3,4,8,14} It is possible that these variables influenced the outcomes in these patients.

Ultrasound was utilized to verify the integrity of the RC after repair. Four patients had recurrent or persistent full-thickness tears of at least 1 RC tendon (31%), and 1 patient had a new RC tear. Despite the tears, these patients still had function similar to that of the contralateral shoulder. In fact, the mean ASES score for the affected shoulder in patients with a full-thickness RC tear was higher, but not statistically, than the overall group mean. Other studies have reported nonhealing rates between 25% to 50%, and patients with unhealed RCs had similar functional outcomes compared with patients with healed RCs.^{2,9,16} Of the 2 smokers in this study, 1 healed their RC after surgery, and the other had persistent full-thickness tears.

Weaknesses of this study include the potential selection bias based on our inclusion criteria. These patients were not studied prospectively, and therefore, the patient outcomes collected are at various time points from their surgery, and no data were collected before surgery or at periodic time points before final evaluation. We did not perform ultrasound on the unaffected shoulder, and therefore, we cannot comment on the presence of asymptomatic lesions. It is common for asymptomatic tears to be present in patients, which may also explain why outcomes were similar between affected and unaffected shoulders in patients with full-thickness RC tears at the time of follow-up. Our overall sample size was small with only 13 patients, which

introduces the potential for bias. Furthermore, only 5 patients had full-thickness RC tears on ultrasonography at the time of follow-up, and our results looking specifically at these patients should be interpreted with caution. There were also multiple surgeons performing these operations, and although equipment, implants, and approaches were largely similar, small variations between surgeons can lead to more heterogeneous results. However, this may also make the results more widely applicable.

CONCLUSION

Patients who sustain symptomatic, acute RC and Bankart lesions from a traumatic shoulder dislocation and undergo simultaneous arthroscopic repair of both injuries are likely to have functionally similar ASES scores, Constant scores, and abduction strength compared with their asymptomatic, contralateral shoulder. A significant portion of these patients may go on to have retears or persistent RC tears, which did not clearly affect functional outcome scores in this small study.

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