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The effect of concomitant glenohumeral joint capsule release during rotator cuff repair—a comparative study

Jordan P. McGrath, BMed, MD, Patrick H. Lam, PhD, Martin T.S. Tan, BMed, MD, George A.C. Murrell, DPhil, MD*

The Orthopaedic Research Institute, St. George Hospital, The University of New South Wales, Kogarah, Sydney, NSW, Australia

Background: There is debate as to whether to operate or to defer surgery on patients with concomitant rotator cuff tear and shoulder stiffness. The purpose of this study was therefore to compare the outcomes in those patients who had both their rotator cuff tear and shoulder stiffness treated with the outcomes of patients who had a rotator cuff repair but no stiffness.

Methods: Twenty-five patients formed the stiffness group (receiving a concomitant rotator cuff repair and manipulation under anesthesia ± arthroscopic capsular release for preoperative ipsilateral stiffness), and a chronologically matched group of 170 rotator cuff repair–only patients formed the nonstiffness group. Patients ranked their pain and function scores preoperatively and at 1 week, 6 weeks, 12 weeks, 6 months, and 2 years postoperatively; examiners recorded range of motion, strength, and presence of impingement signs. Repair integrity was determined using ultrasound.

Results: Patients from both groups had significantly improved clinical outcomes at the 2-year follow-up compared with preoperative values. Range of motion was similar between groups at 2 years for forward flexion, abduction, and external rotation, whereas the nonstiffness group had a superior range of internal rotation ($P = .014$). Stiffness patients had 0 of 25 (0%) retears at 2 years compared with 34 of 170 (20%) in the nonstiffness group ($P = .009$).

Conclusions: The good outcomes of rotator cuff repair with glenohumeral capsular release disproved our hypothesis and suggest that there is no advantage in delaying repair of a rotator cuff tear to allow stiffness to resolve and that stiffness confers an advantage in terms of repair integrity.

Level of evidence: Level III; Retrospective Cohort Design; Treatment Study

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*Reprint requests: George A.C. Murrell, DPhil, MD, The Orthopaedic Research Institute, Level 2, St. George Hospital, 4-10 South Street, Kogarah, Sydney, NSW 2217, Australia.

E-mail address: murrell.g@ori.org.au (G.A.C. Murrell).

The most common complication of rotator cuff repair is a retear of the rotator cuff, with recent studies reporting retear rates of 14% to 41%.[26,27,35] Another common complication is postoperative stiffness.[5,18,21,28,30,33] Concomitant stiffness has been a traditional indicator to delay surgical repair of a rotator

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cuff tear until shoulder range of motion improves.[8,28,29,33] Surgical interventions for shoulder stiffness have included a manipulation under anesthesia (MUA) or an open or arthroscopic capsular release.[11,22,24] There are, however, potential benefits to repairing torn rotator cuffs early, as chronic rotator cuff tears are associated with fatty infiltration, muscle atrophy, and loss of elasticity of the remaining tendon.[2,3,12-14,29,36]

To date, there has been limited research examining the outcomes of concomitant treatment of rotator cuff tears and shoulder stiffness using a single operative procedure.[8,9,17,28,31] The aim of this study was to evaluate the clinical outcomes, particularly with regard to repair integrity and range of motion in patients who have both rotator cuff repairs and concomitant surgical treatment for shoulder stiffness. We hypothesized that patients treated with concomitant rotator cuff repair and glenohumeral joint capsule release will have similar or worse clinical outcomes compared with rotator cuff repair–only patients at a 2-year follow-up.

Materials and methods

Study design

The study was a retrospective case-controlled cohort study using prospectively collected data evaluating the midterm outcomes of patients who had had either rotator cuff repair surgery or rotator cuff repair concomitantly with a release of the glenohumeral joint capsule. The primary outcome was defined as the effect of arthroscopic rotator cuff repair or arthroscopic rotator cuff repair with glenohumeral joint capsule release on rotator cuff repair integrity 2 years after surgery. Secondary outcomes were defined as the outcomes of the combinations of these procedures on patient-ranked frequency of pain with activity, pain at night, and extreme pain; magnitude of pain at rest, at night, and with overhead activities; difficulty reaching behind the back or above the head; level of activity at work and level of sport currently played; overall shoulder stiffness; overall patient rating of the shoulder; and examiner-ranked range of motion, strength, and presence of impingement signs.

Patient selection

Between January 2005 and May 2012, 1232 primary arthroscopic rotator cuff repairs were performed at our center by the senior author. Of these, 43 had a concomitant MUA ± capsular release for shoulder stiffness.

For the purposes of this study, those patients who had a rotator cuff repair with concomitant release of the glenohumeral capsule by a manipulation or arthroscopic capsular release were defined as the "stiffness" group. As a general rule, those patients who underwent manipulation or arthroscopic capsular release as well as rotator cuff repair were noted to have significant stiffness on passive range of motion testing (ie, external rotation <20°, forward flexion <90°, abduction <90°, internal rotation <T12). These patients also had imaging, usually ultrasound, showing a full-thickness rotator cuff tear or a partial-thickness tear involving >60% of the thickness of the tendon. If the previously outlined restriction in range of motion was confirmed under anesthesia, these patients were treated with concomitant MUA ± arthroscopic capsular release as well as a rotator cuff repair.

The "nonstiffness" group was selected from chronologically matched patients to allow a surgical learning curve, 4 patients from a consecutive list of rotator cuff repairs before and 4 after each stiffness patient.

The exclusion criteria for both groups were (1) ipsilateral glenohumeral osteoarthritis graded either as moderate-severe, grade 3-4 or "marked," as determined intraoperatively, (2) irreparable or partially repaired rotator cuff tear, (3) rotator cuff repair using a polytetrafluoroethylene patch, (4) ipsilateral shoulder arthroplasty, (5) ipsilateral humeral head fractures, (6) previous ipsilateral shoulder surgery, and (7) patients unable to be contacted or unable to attend the 2-year follow-up clinic.

Surgical procedure

All cases were performed as day surgery, under interscalene regional anesthesia and light sedation, in the beach chair position.[22,34] Passive range of motion was assessed and recorded before surgery and at the end of the case.

MUA and arthroscopic capsular release

If a significant preoperative reduction of passive shoulder range of motion was confirmed under anesthesia, MUA with or without arthroscopic capsular release was performed before rotator cuff repair. Manipulation consisted of gradually moving the shoulder through forward flexion, abduction, external rotation, and internal rotation. During a successful manipulation, there was a sudden marked improvement in each of these planes of movement. If there was persistent restriction of movement or a "rubbery" end point was noted, a formal arthroscopic capsular release was performed, as previously described,[22] with sectioning of the anterior, inferior, and posterior capsule, to result in a 360° circumferential release. Arthroscopy was used to confirm that the glenohumeral joint capsule was divided (either by the manipulation or the capsular release) circumferentially around the glenoid.

Rotator cuff repair

Arthroscopic rotator cuff repair was performed while it was visualized from the glenohumeral joint space using single-row knotless tension band inverted mattress suture anchors (ArthroCare Corp, Austin, TX, USA).[1] Partial-thickness tears were converted to full-thickness tears with a scalpel under direct vision and then repaired in the same manner. Patients from both groups were discharged with a small abduction sling

(UltraSling; DJO, Sydney, NSW, Australia), which they were to use for 6 weeks.

Rehabilitation

Rehabilitation began on the first postoperative day, with phase 1 exercises aiming to gradually improve shoulder range of motion and strength, consisting of elbow flexion and extension, grip strengthening, scapular strengthening, and pendular reach. Patients in the stiffness group followed a modified phase 1 protocol, aiming to increase mobilization of the shoulder to prevent stiffness while still protecting the rotator cuff from a retear. The stiffness patients began passive shoulder flexion and internal/external rotation exercises on day 2 instead of week 2 and day 8, respectively. Stiffness patients also began shoulder extension exercises in week 1 instead of week 2. Both groups used the same phase 2 and 3 rehabilitation protocols, starting at 6 weeks and 3 months, respectively, consisting of isometric flexion/extension, adduction, and external/internal rotation, followed by active resistance external/internal rotation and adduction.

Rotator cuff integrity

The integrity of the rotator cuff was assessed by ultrasound at 6 months and 2 years.[10,25,29] If a tear was present, the size, location, and thickness were recorded.[4]

Pain and function assessment

Patient-determined shoulder pain and function were assessed by a validated patient self-reported shoulder pain and function L'Insalata Shoulder Rating Questionnaire[22,23] using Likert scores at each clinic visit (the preoperative consultation; follow-up at 1, 6, 12, and 26 weeks; and the 2-year evaluation). Pain frequency was graded during activity and at night, as was frequency of extreme pain. Pain frequency was ranked as never, monthly, weekly, daily, or always. Patient-reported pain levels were likewise ranked from no pain to mild, moderate, severe, or very severe and were reported for times of rest, on overhead activities, and at night. Patients also ranked their experienced level of shoulder stiffness from none to little, moderate, severe, or very severe.

Patients were asked to rank their level of difficulty on both overhead activities and reaching behind the back as none, mild, moderate, severe, or very severe. Overall shoulder satisfaction was ranked from very bad to bad, poor, fair, or good. Level of current work was ranked as none, light, moderate, or strenuous labor, and level of current sport was ranked as none, hobby, club, or national-level sport.

Range of motion

Passive range of shoulder motion was assessed by an examiner through visual estimation, as previously described and validated.[16,32]

Strength

Shoulder strength in internal and external rotation, abduction in the scapular plane (supraspinatus strength), liftoff, and adduction was measured using a hand-held dynamometer to determine maximum voluntary muscle contractions in newtons, as previously described and validated.[6,15,32]

Impingement

The presence of an impingement sign of the shoulder was assessed by the examiner in both internal and external rotation.[32]

Statistical analysis

Results are reported as mean ± standard error of mean, with the level of significance set at $P \leq .05$. Parametric data were analyzed using 2-tailed Student *t* tests, with paired *t* tests used for analyses within groups and unpaired heteroscedastic *t* tests for analyses between groups. For nonparametric data, Mann-Whitney *U* tests were used for analyses between groups; for analyses within groups, Wilcoxon signed-rank tests were used. When appropriate, Pearson χ^2 test was used to perform analysis between groups as well as Fisher exact test when necessary. Impingement analyses within groups were conducted using McNemar's test. Multiple logistic regression analysis was used to determine the impact of demographic factors on results.

Results

Study groups

Of 43 patients who had an arthroscopic rotator cuff repair with MUA ± capsular release during the study period, 3 were excluded for glenohumeral osteoarthritis, 1 was excluded because of previous ipsilateral shoulder surgery, 5 were unable to be contacted, and a further 9 were unavailable to attend the 2-year follow-up clinics, leaving a group of 25 patients forming the stiffness group. Of the 25 patients in the stiffness group, 8 patients had a rotator cuff with MUA only, with the remaining 17 patients having both MUA and capsular release concomitantly with their rotator cuff repair. A corresponding group of 200 patients was selected from a consecutive series of 4 rotator cuff repair–only patients before and after each of the 25 patients in the stiffness group. From this group of 200 rotator cuff repair–only patients, 9 were excluded because of glenohumeral osteoarthritis, 4 were unable to be

Table I Comparison of patient demographics between groups

Demographic	RCR	RCR + MUA ± CR	RCR vs. RCR + MUA ± CR
No. of patients	170	25	—
Male:female*	86:89	12:13	NS
Age at surgery† (years)	60.1 (18-88)	57.9 (45-70)	NS
Symptom duration† (months)	21.2 ± 2.9 (1-231)	10.3 ± 2.9 (3-73)	$P = .01$
Affected shoulder* (left:right)	72:98	14:11	NS
Diabetes status*	6	7	$P < .001$
Work-related injury*	37	8	NS
Time from operation to midterm follow-up† (years)	2.6 ± 0.1 (1.2-6.5)	2.3 ± 0.2 (1.2-4.8)	NS

Demographic information in patients undergoing an arthroscopic rotator cuff repair (*RCR*, "nonstiffness," n = 170) vs. rotator cuff repair with manipulation under anesthesia ± capsular release (*RCR + MUA ± CR*, "stiffness," n = 25), mean ± SEM (range).
NS, no significance.
* Comparisons between groups using χ^2 analysis with Yates correction for small sample size.
† Comparisons between groups using 2-tailed unpaired heteroscedastic *t* tests.

Table II Comparison of patient surgical demographics between groups

Demographic	RCR	RCR + MUA ± CR	RCR vs. RCR + MUA ± CR
Tear size area† (mm^2)	333.3 ± 28.5 (15-2000)	223.8 ± 57.6 (1-1200)	NS
Full-thickness tears*	95	7	$P < .01$
Partial-thickness tears*	75	18	$P < .01$
No. of anchors used†	2.1 ± 0.1 (1-6)	1.8 ± 0.2 (1-6)	NS
Acromioplasty*	29/175 (17%)	7/25 (28%)	NS
Operation time† (minutes)	24.5 ± 1.0 (6-53)	28.2 ± 4.0 (14-52)	$P = .04$

Surgical demographic information in patients undergoing an arthroscopic rotator cuff repair (*RCR*, "nonstiffness," n = 170) vs. rotator cuff repair with manipulation under anesthesia ± capsular release (*RCR + MUA ± CR*, "stiffness," n = 25), mean ± SEM (range).
NS, no significance.
* Comparisons between groups using χ^2 analysis with Yates correction for small sample size.
† Comparisons between groups using 2-tailed unpaired heteroscedastic *t* tests.

contacted, 12 were unavailable to attend the 2-year follow-up, 4 were excluded for previous ipsilateral shoulder surgery, and 1 patient was excluded because of an ipsilateral humeral fracture, leaving the study group of 170 nonstiffness patients.

Patient demographics

This study involved 195 patients in total, 25 in the stiffness group and 170 in the nonstiffness group. On average, the nonstiffness group experienced preoperative symptoms for 11 months longer before the initial presentation than the stiffness group ($P = .01$). There were a larger proportion of diabetic patients in the stiffness group (28%) than in the nonstiffness group (4%; $P < .001$) (Table I). The stiffness group had a higher proportion of partial-thickness rotator cuff tears (72%) than the nonstiffness group (44%; $P < .01$) (Table II). Otherwise, the groups were similar in gender, age, affected shoulder, WorkCover status (workers' compensation), time from operation to final follow-up, tear size area, anchors used, and acromioplasty status. Multiple logistic regression analysis demonstrated that the differences between groups in symptom duration, diabetic status, or proportion of partial-thickness tears did not affect the rate of retear at 2 years, the primary outcome of the study ($P = .519$, $P = .559$, and $P = .084$, respectively).

Rotator cuff integrity

Our primary outcome measure was the proportion of intact repairs at 2 years. The stiffness group did not experience any retears at either the 6-month (0%) or 2-year follow-up (0%), whereas the nonstiffness group included 22 retears at 6 months from 153 shoulders (14%), 34 of 170 (20%) at 2 years (Fig. 1). This difference between groups was significant at 6 months ($P = .047$) and 2 years ($P = .009$). At 2 years post hoc power analysis revealed that the retear rate comparison between the 2 groups was correctly powered (.98) to detect a significant difference. No other postoperative complications, such as instability or infection, were experienced by any patients.

Patient-reported pain and function scores

There were no differences between groups for any measure of pain frequency or severity at any time point before or after operation. All pain scores for both groups improved at the

6-month and 2-year follow-ups compared with preoperative levels ($P < .01$).

As expected, the stiffness group experienced significantly more shoulder stiffness than the rotator cuff repair–only group preoperatively ($P < .0001$). Postoperatively, there were no significant differences between groups for patient-ranked shoulder stiffness ratings at any time point, with both groups improving from preoperative levels at the 2-year follow-up ($P < .0001$) (Fig. 2). Preoperatively, the stiffness group experienced significantly more difficulty with overhead activities ($P = .01$) and activities behind the back ($P < .0001$) than the nonstiffness group. However, by the 6-month and 2-year follow-ups, the stiffness group had recovered to a similar level of difficulty as the nonstiffness group, with both groups experiencing a significant improvement from preoperative levels ($P < .0001$).

The level of activity at work was similar between groups at all points during the study. The nonstiffness group had a decrease in level of work activity at 12 weeks ($P = .04$), but this returned to preoperative levels by 6 months and remained so at 2 years. The stiffness group did not see a significant change in level of work during the study.

With regard to overall shoulder function, the nonstiffness group reported better shoulder function preoperatively ($P = .03$). However, there was no difference between groups at any time point postoperatively, with both groups showing a significant improvement at 2 years ($P < .0001$) (Fig. 3).

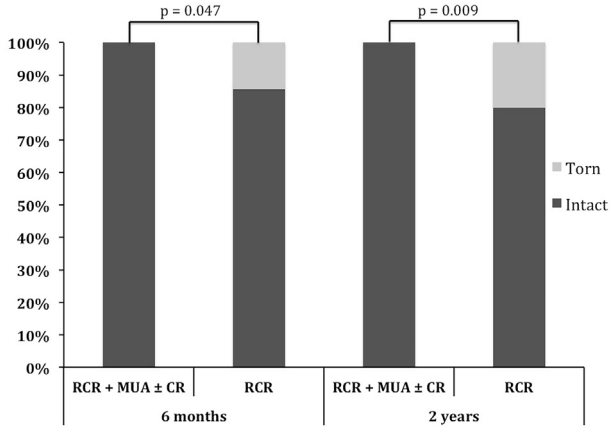

Figure 1 Rotator cuff repair integrity at 6 months and 2 years after rotator cuff repair (*RCR*) or rotator cuff repair and manipulation under anesthesia ± capsular release (*RCR + MUA ± CR*). Comparisons between groups using Fisher exact test.

Range of motion

Preoperatively, the stiffness group had a significantly worse range of motion than the nonstiffness group in all movements ($P < .0001$). The stiffness group had a mean preoperative passive forward flexion range of 104° compared with 150° in the nonstiffness group ($P < .0001$). At 2 years postoperatively, the stiffness group had recovered to a mean of 161°, whereas the nonstiffness group had a range of 166° ($P = .415$; Fig. 4, *A*).

Stiffness patients had a significantly lower preoperative passive range of abduction than the nonstiffness group (means of 81° and 128°, respectively; $P < .0001$). At the 2-year follow-up, the stiffness group had improved to a mean of 148°,

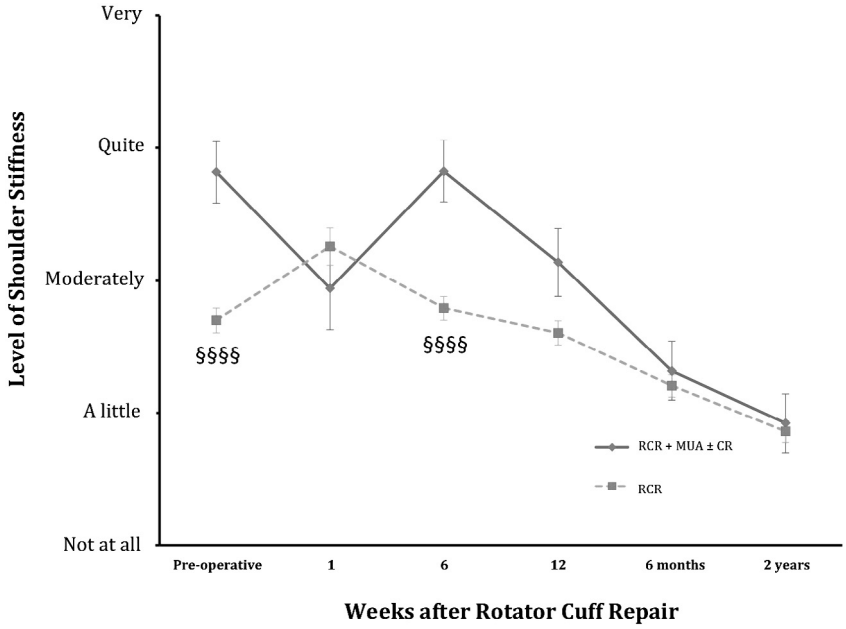

Figure 2 Patient-ranked level of shoulder stiffness in patients undergoing an arthroscopic rotator cuff repair (*RCR*, n = 170) vs. rotator cuff repair with manipulation under anesthesia ± capsular release (*RCR + MUA ± CR*, n = 25), mean (SEM); §$P < .05$, §§$P < .01$, §§§$P < .001$, §§§§$P < .0001$ for comparisons between groups using Mann-Whitney *U* tests.

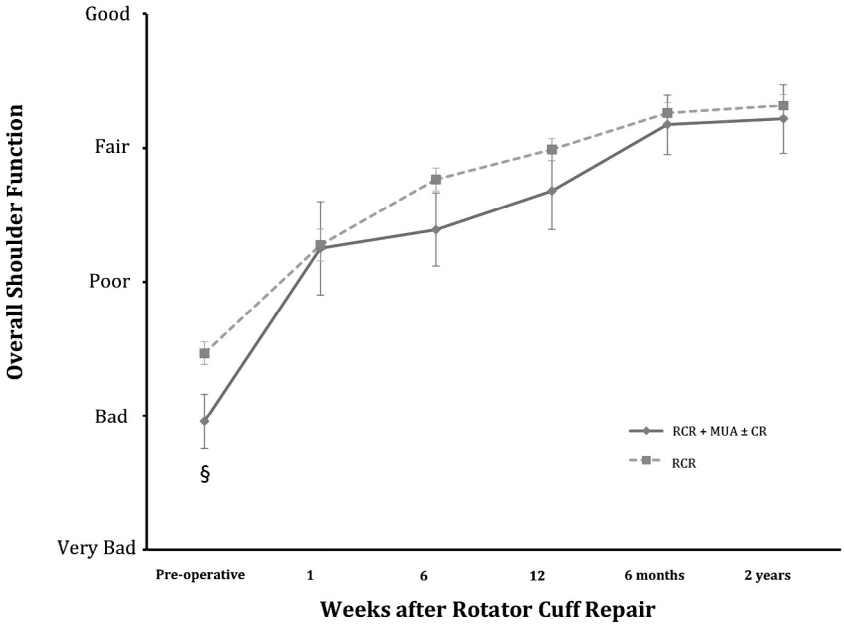

Figure 3 Patient-determined overall shoulder function in patients undergoing an arthroscopic rotator cuff repair (*RCR*, n = 170) vs. rotator cuff repair with manipulation under anesthesia ± capsular release (*RCR + MUA ± CR*, n = 25), mean (SEM); §$P < .05$, §§$P < .01$, §§§$P < .001$, §§§§$P < .0001$ for comparisons between groups using Mann-Whitney *U* tests.

whereas the nonstiffness group had also recovered to 150°, with a difference no longer apparent between groups ($P = .831$). This recovery from preoperative to 2-year values was significant in both groups ($P < .0001$; Fig. 4, *B*).

There was an increase in passive range of external rotation in the stiffness group from preoperative levels at the 2-year follow-up, recovering from a mean range of 29° to 59° ($P < .0001$). The nonstiffness group saw an increase in external rotation at 12 weeks ($P < .05$), but this improvement was no longer apparent at 2 years. This recovery in the stiffness group meant that both groups were similar at the 2-year follow-up ($P = .963$; Fig. 4, *C*).

The stiffness group also had an increase in internal rotation from preoperative levels, improving from the mean vertebral level S2 to T12 ($P < .001$). The nonstiffness group had an increase from L1 to T10 ($P < .0001$). The nonstiffness group maintained a superior range of internal rotation during the study; however, the difference between groups reduced over time, from a mean difference of 6 vertebral levels preoperatively ($P < .0001$) to 2 vertebral levels at 2 years ($P = .014$; Fig. 4, *D*).

Strength

Preoperatively, there were no significant differences in shoulder strength parameters between groups. No significant differences were observed between groups for any strength parameter at 6 months or 2 years postoperatively. The stiffness group had a reduction in strength at 6 weeks in all 5 strength parameters ($P < .02$); however, this fall was no longer evident by 6 weeks or 2 years postoperatively. The nonstiffness group experienced a similar postsurgical drop in both supraspinatus and adduction strength ($P < .05$), which was also no longer present at the 6-week or 2-year follow-up.

Impingement

For internal rotation impingement, the preoperative prevalence of positive signs was 74% in the nonstiffness group and 61% in the stiffness group ($P = .171$). Postoperatively, a higher number of patients in the stiffness group experienced positive impingement signs at 12 weeks ($P = .047$); however, this difference was no longer significant at 2 years. Both groups had recovered by the 2-year point compared with preoperative values ($P < .01$), with a prevalence of 19% in the nonstiffness group and 16% in the stiffness group.

For external rotation impingement, the preoperative prevalence of positive signs was 55% in the nonstiffness group and 57% in the stiffness group, with no significant difference noted between groups at any time point in the study. By 2 years, both groups had improved, compared with preoperative values ($P < .01$), to 13% in the nonstiffness group and 8% in the stiffness group.

Discussion

This study showed that releasing the glenohumeral joint capsule at the time of rotator cuff repair is a highly effective treatment modality for patients with a rotator cuff tear and ipsilateral shoulder stiffness, which refuted our hypothesis. Patients with concomitant MUA ± capsular release

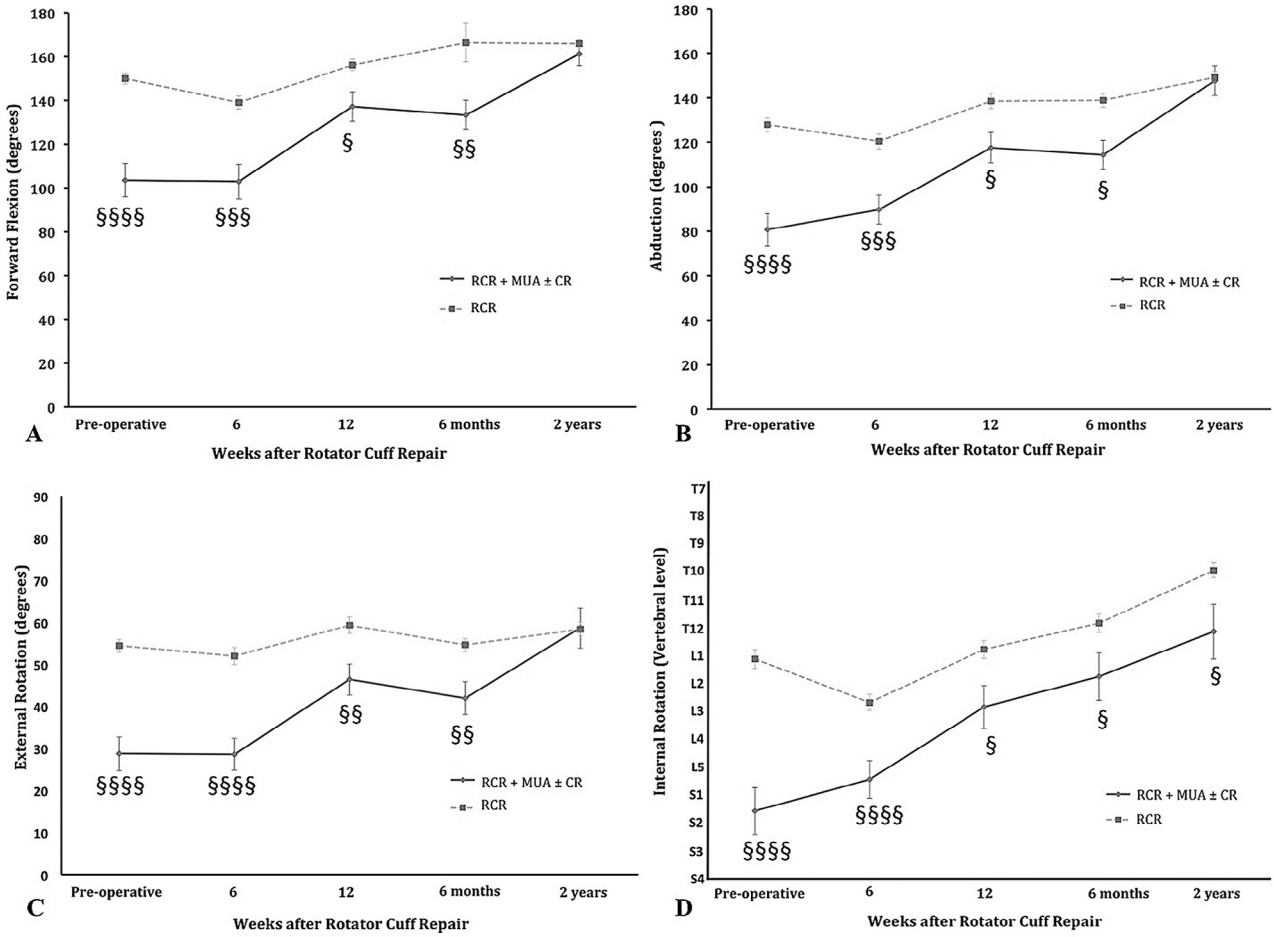

Figure 4 Range of shoulder motion in (**A**) forward flexion, (**B**) abduction, (**C**) external rotation, and (**D**) internal rotation in patients undergoing an arthroscopic rotator cuff repair (*RCR*, n = 170) vs. rotator cuff repair with manipulation under anesthesia ± capsular release (*RCR + MUA ± CR*, n = 25), mean (SEM); §$P < .05$, §§$P < .01$, §§§$P < .001$, §§§§$P < .0001$ for comparisons between groups using 2-tailed unpaired heteroscedastic *t* tests.

experienced clinical outcomes in most parameters similar to or better than those of rotator cuff repair–only patients at 2 years.

One of the more interesting outcomes of this study was related to retear rate. We found a 0% retear rate in patients who received a concomitant rotator cuff repair and glenohumeral capsule release compared with 20% nonstiffness patients who received a rotator cuff repair only. It may be that patients with preoperative stiffness experience more aggressive healing of the rotator cuff, related to the pathologic process resulting in the stiffness itself. Alternatively, the lower retear rate may have been due to the capsular release reducing the level of tension on the rotator cuff repair, as suggested by 2 early biomechanical studies.[14,36] To the best of our knowledge, no study has reported a difference in retear rates between patients who receive a 1-stage treatment for rotator cuff tear and shoulder stiffness and patients without stiffness who receive a rotator cuff repair alone. Several authors have described retear rates in patients with rotator cuff tears and shoulder stiffness, with retear rates for patients receiving a cuff repair and manipulation or capsular release for shoulder stiffness ranging from 4% to 33%.[19,20,28,31] Kim et al compared 33 patients who received 1-stage treatment with a rotator cuff repair and arthroscopic capsular release for stiffness with 30 patients who had a delayed rotator cuff repair after 6 months of preoperative rehabilitation for concomitant stiffness, finding retear rates of 12% and 13%, respectively ($P = .13$), concluding that there was no advantage to delay a rotator cuff repair to allow treatment of concomitant stiffness.[20] The good outcomes in our study suggest that there is no advantage to delaying a rotator cuff repair to allow stiffness to resolve, as stiffness patients experience fewer retears than nonstiffness patients.

At 2 years, pain and functional scores in both groups were greatly improved from preoperative level, with no significant difference between groups. These results are consistent with other recent reports that patients with concomitant rotator cuff tears and shoulder stiffness experience good midterm pain

and function outcomes when treated using rotator cuff repair and manipulation, with or without capsular release.[7-9,17,19,20,28,31]

Both groups in this study had significantly improved range of shoulder motion at 2 years. Preoperatively, the rotator cuff repair with capsular release group had significantly worse range of motion; however, by the 2-year follow-up, there was no difference in range of forward flexion, abduction, or external rotation between groups, whereas the mean level of internal rotation was approximately 2 vertebral levels lower in the MUA ± capsular release group than in the rotator cuff repair–only group. Other research groups have reported good pain, function, and range of motion outcomes of rotator cuff repair with MUA or capsular release for patients with rotator cuff tears and concomitant shoulder stiffness.[7,8,17,19,20,28] The results of these authors, and our results, are in contrast to those reported by Tauro,[33] who found patients with stiff shoulders who had a rotator cuff repair only often had problems with postoperative stiffness, and a number of patients came to MUA or capsular release several months later.

Two studies have compared manipulation alone with manipulation and capsular release performed concomitantly in rotator cuff repair patients with shoulder stiffness. Chuang et al[9] reported significantly higher levels of forward flexion and external rotation range of motion in the group with capsular release added; however, other range of motion and strength parameters were similar between groups. Park et al[31] found no difference between groups for either forward flexion or external rotation (the only range of motion parameters studied), strength parameters, or retear rate. Several authors have reported performing secondary arthroscopic capsular release on rotator cuff repair patients with persistent postoperative stiffness, following the initial rotator cuff repair.[5,18,21] In our study, no patient required a secondary capsular release. Our findings suggest that releasing the shoulder capsule during rotator cuff repair in patients with stiffness may eliminate the need for a second later operation.

Interestingly, the stiffness group in our study also had a higher incidence of diabetes mellitus (28%) than the nonstiffness group (4%; $P < .001$). This finding is congruent with that of Park et al,[31] who found a diabetes incidence of 31% in rotator cuff repair with stiffness patients and advocated cuff repair with capsular release for these patients.

Strengths of this study included the use of a single surgeon to ensure consistency in surgical technique, a single ultrasonographer imaging all shoulders to ensure uniformity in tear/retear reporting, use of a standardized questionnaire and examination and operative forms for all patients to ensure homogeneity in all data fields, and collection of these data at predefined temporal time points.

There are, however, several limitations to our study. First, it was not a randomized controlled trial; there was no control group of rotator cuff repair patients with untreated shoulder stiffness. This study design also does not allow us to determine if the improved rotator cuff integrity was a result of the glenohumeral capsule release or the shoulder stiffness itself. The study used a single experienced surgeon, and as such, these results may not apply to other surgeons.

Conclusion

This study showed that patients who have an arthroscopic rotator cuff repair concomitantly with capsular release for shoulder stiffness experience clinical outcomes similar to those without shoulder stiffness who have a rotator cuff repair only, which refuted our hypothesis. There was, however, a difference in repair integrity as those patients who had a rotator cuff repair with glenohumeral joint capsule release had no retears. This is the first cohort of patients we have identified that has had all of their repairs intact, ie, a 0% retear rate, at a 2-year follow-up. The good outcomes of concomitant treatment of rotator cuff tears with stiffness suggest that there is no advantage in delaying surgical repair of a rotator cuff tear to allow stiffness to resolve. This study also supports the theory that patients who require a glenohumeral release for stiffness have a greater propensity to heal their rotator cuff than those without stiffness.

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