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Clinical outcomes following arthroscopic repair of articular vs. bursal partial-thickness rotator cuff tears with follow-up of 2 years or more

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Background: The diagnosis and treatment of partial-thickness rotator cuff tears remain controversial, and only a few studies have carried out clinical evaluation and comparison based on different types of tears. The aim of this study was to compare the clinical outcomes of arthroscopic cuff repairs using the suture bridge technique in patients with articular partial-thickness rotator cuff tears (APRCTs) vs. those with bursal partial-thickness rotator cuff tears (BPRCTs).

Methods: We retrospectively evaluated 29 patients with APRCTs and 22 patients with BPRCTs who underwent arthroscopic cuff repair using the suture bridge technique with a minimum 2-year follow-up. Clinical outcomes were evaluated preoperatively and postoperatively using the visual analog scale score, Japanese Orthopaedic Association (JOA) score, Constant score (CS), active range of motion (ROM) of shoulder flexion and abduction, improvement rate for each score, and retear rate.

Results: The APRCT group had more women, fewer cases of subacromial decompression, and more patients whose condition changed intraoperatively and transitioned into a complete tear. Preoperatively, the JOA score, CS, ROM of shoulder flexion, ROM of shoulder abduction, and external shoulder rotation strength were lower in the APRCT group. Postoperatively, all scores improved significantly in both groups, and the JOA score, CS, and external shoulder rotation strength remained significantly lower in the APRCT group. Improvement and retear rates were not significantly different between the groups.

Conclusions: The suture bridge technique significantly improved the clinical outcomes of patients with APRCTs and BPRCTs. Preoperative and postoperative functional parameters were worse in APRCT patients.

The diagnosis and treatment of partial-thickness rotator cuff tears remain controversial.[1,2,8,9,12–14] Partial-thickness tears include articular partial-thickness rotator cuff tears (APRCTs) or bursal partial-thickness rotator cuff tears (BPRCTs) and intratendinous tears, but only a few studies have carried out clinical evaluations and comparisons based on different types of tears. Previous reports have found more lesions in BPRCTs than in APRCTs in a subacromial model in rats and found more BPRCTs with an onset of a degenerative nature compared with APRCTs in the histologic examination of patients with rotator cuff tears.[7,10] However, no unified view has been obtained thus far, as Nakajima et al[9] have reported that tears occur more easily in cases of APRCTs than in cases of BPRCTs from the perspective of biomechanics. We have also experienced differences in progress after APRCTs and BPRCTs in clinical practice.

To our knowledge, only 1 study has compared the clinical outcomes of APRCTs and BPRCTs: Kim et al[6] reported that the Constant score (CS) was significantly lower in the APRCT group than in the BPRCT group; however, the postoperative retear rate did not differ significantly between the groups. Moreover, they reported that, in the BPRCT group, operative decompression was effective and led to good postoperative BPRCT results. However, our impression is that for the APRCT group, shoulder pain prior to surgery was relatively intense, and even if a procedure such as decompression, as in the BPRCT group, was performed, many patients still experience persistent arthritic-like pain even after surgery.

As the pathologic condition varies for patients with APRCTs, BPRCTs, and even the same partial-thickness rotator cuff tears, this is likely the reason the outcomes before and after surgery differ. Hence, knowing such characteristics is important when treating a partial-thickness rotator cuff tear, as it can aid the surgeon in

This study was approved by the Institutional Review Board of Asahikawa Kosei Hospital (no. 3051). Written informed consent was obtained from each patient's parent prior to participation.

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explaining the pathology to the patients and in predicting progress after surgery.

The aim of this study was to compare the clinical outcomes of arthroscopic rotator cuff repairs (ARCRs) using the suture bridge technique in patients with APRCTs and BPRCTs. The hypothesis of this study was that patients with APRCTs would have worse clinical outcomes and imaging evaluation results than those with BPRCTs, regardless of the ARCR technique.

Materials and methods

Patient selection

This retrospective single-center study included patients with APRCTs and BPRCTs who had undergone ARCR using the suture bridge technique between 2012 and 2015. The minimum follow-up period was 2 years. Rotator cuff repairs were indicated when the depth was at least 3 mm, the grade was 2 or 3 according to the Ellman classification, and the diagnosis was made arthroscopically during surgery.[3]

The exclusion criteria were previous surgical procedures performed on the affected shoulder, intratendinous partial-thickness tears, and combined APRCTs and BPRCTs. All patient data were collected for a retrospective review, and 1 author assessed the patients and credentials.

Surgical procedures

All surgical procedures were performed by the senior author (K.H.). After administration of a supplemental interscalene block and general anesthesia, the patient was placed in the lateral decubitus position. Thereafter, 3-4 kg of a balanced suspension was applied with the arm in 45° of abduction and 15° of flexion. Glenohumeral arthroscopy was performed using a 30° arthroscope through a standard posterior portal, and an arthroscopic pump maintained pressure of 30-50 mm Hg.

After arthroscopic subacromial decompression was performed for cases of narrowing of the subacromial space in both groups, 1 or 2 suture anchors were inserted medially, adjacent to the articular margin of the greater tuberosity in the humerus. Subsequently, by use of the suture bridge technique, sutures were passed through the rotator cuff stump, the suture limbs were threaded through the eyelet of a knotless anchor, and 1 or 2 anchors were inserted about 5 mm distal to the lateral edge of the greater tuberosity to secure the sutures.

The decision to perform arthroscopic subacromial decompression depended on whether narrowing was considered present when the affected arm was moved passively. To perform this assessment, the weight on the arm was temporarily detached and measurements were carried out at the angle of the traction table. During the assessment, an assistant held the acromion down. If impingement between the acromion and rotator cuff was observed during internal or external rotation, we performed arthroscopic subacromial decompression. The procedure was not performed in cases without narrowing of the subacromial space in which lateral or medial rotation of the glenohumeral joint did not cause collision or contact between the inferior surface of the acromion and the rotator cuff. Because impingement may vary in some patients depending on the use of anesthesia, decompression was performed if impingement was present, even for patients with APRCTs. In addition, "manipulation" (ie, the release of intra-articular adhesions under general anesthesia) was carried out preoperatively in patients with contractures whose shoulders' preoperative range of motion (ROM) under general anesthesia showed flexion limited to 100° or less and lateral rotation limited to 10° or less in a shoulder abduction position.

In the APRCT group, the suturing methods for the rotator cuff were as follows: In 17 cases, 2 sutures of 1 medial anchor were passed in a horizontal-mattress fashion across the rotator cuff stump, and the free ends of the medial suture limbs were bridged at the distal-to-lateral side using 1 or 2 push-in anchors. In 6 cases, 2 sutures of 1 or 2 medial anchors were pre-knotted, 4 or 8 independent sutures were passed through all layers, and the sutures were alternately bridged at the distal-to-lateral side using 2 push-in anchors. In 5 cases, 1 tape was used with 1 medial anchor and was passed through all layers and bridged at the distal-to-lateral side using 1 or 2 push-in anchors. In 1 case, 2 sutures of 1 medial anchor were placed and knotted side to side in an anteroposterior manner; thereafter, the free ends of the medial suture limbs were bridged at the distal-to-lateral side using 1 push-in anchor.

In the BPRCT group, the suture for the rotator cuff was inserted as follows: In 7 cases, 2 sutures of 1 medial anchor were alternately passed in a horizontal-mattress fashion and were bridged at the distal-to-lateral side using 1 or 2 push-in anchors. In 6 cases, 2 sutures of 1 medial anchor were pre-knotted, 4 independent sutures were passed through all layers, and the sutures were alternately bridged at the distal-to-lateral side using 1 or 2 push-in anchors. In 4 cases, 1 tape was used on 1 medial anchor and was passed through the rotator cuff stump; it was then bridged with the farthest lateral side using 1 or 2 push-in anchors. In 4 cases, 2 or 3 sutures of 1 or 2 medial anchors were alternately passed to the mattress from the anterior side and were bridged with the farthest lateral side using 2 push-in anchors. In 1 case, 3 sutures and 1 medial anchor were pre-knotted, 6 independent sutures were passed through all layers, and the sutures were alternately bridged with the farthest lateral side using 2 push-in anchors.

In the APRCT group, we used 1 anchor in 26 cases and 2 anchors in 3 cases for the medial anchors and 1 anchor in 19 cases and 2 anchors in 10 cases for the lateral anchors. In the BPRCT group, we used 1 anchor in 19 cases and 2 anchors in 3 cases for the medial anchors and 1 anchor in 8 cases and 2 anchors in 14 cases for the lateral anchors.

Postoperative protocol

The patient's shoulder was maintained in 30° of internal rotation and 20° of abduction using an UltraSling brace (DJ Orthopedics, Vista, CA, USA) for 3 weeks. On day 3, gradual passive ROM was initiated. At 4 weeks, active ROM was initiated. After 5 weeks, cuff muscle–strengthening exercises were initiated. Rehabilitation continued for 3 months. Heavy manual work and activities that involved raising the arms over the head were allowed at 6 months.

Clinical outcomes

Clinical outcomes were evaluated preoperatively and postoperatively using the visual analog scale (VAS) score, Japanese Orthopaedic Association (JOA) score, CS, active ROM of shoulder flexion and abduction, strength of the shoulder abductors and external rotators, and improvement rate for each score.

The VAS scores were used in this study to evaluate pain. Shoulder ROM was measured in the sitting and supine positions using a goniometer. To measure the strength of the shoulder abductors, the patient was seated upright on a chair, a dynamometer (Isoforce GT-300; OG Giken, Okayama, Japan) was centered on the dorsal aspect of the distal forearm, and the measurement was recorded at a position of 90° of shoulder abduction and neutral forearm pronation-supination. If it was impossible to abduct at 90°,

the measurement was recorded at the maximum degree of abduction possible. To measure the strength of the shoulder external rotators, the patient was placed in the supine position, and the affected extremity was placed by his or her side with 90° of elbow flexion and neutral forearm pronation-supination. All physical examinations were performed by physical therapists.

The improvement rate was calculated by dividing the postoperative improvement score by the maximum possible postoperative improvement in the VAS score, JOA score, CS, and active ROM of shoulder flexion and abduction. The improvement rate was calculated by dividing the postoperative score by the preoperative score of the strength of the shoulder abductors and external rotators.

Imaging evaluation

Retears were assessed based on the final magnetic resonance imaging (MRI) study performed at least 3 months after surgery using the Sugaya classification.[11] Sugaya type I indicates thick rotator cuff repairs with a uniformly low signal; type II, thick rotator cuff repairs with high signal intensities in localized areas; type III, maintained continuity of rotator cuff repairs but lacking thickness; type IV, no continuity of rotator cuff repairs in certain slices; and type V, large areas of discontinuity. Type V also often exhibits a broadening in the sagittal plane.

Sugaya types IV and V on T2-weighted images were classified as retears. All imaging evaluations were performed by the senior author (K.H.).

MRI was performed with a 1.5-T closed-type scanner with a shoulder coil (Achieva; Philips, Best, The Netherlands). The MRI parameters for T2-weighted coronal and sagittal images were as follows: repetition time (TR), 300 milliseconds; echo time (TE), 90 milliseconds; received bandwidth (RBW), ±288.6 kHz; field of view (FOV), 160 cm; matrix, 243 × 304; slice thickness/gap, 3 mm/0.3 mm; number of excitations (NEX), 1; and total scan time, 2 minutes 15 seconds. The MRI parameters for T2 fat suppression coronal images were as follows: TR, 3000 milliseconds; TE, 50 milliseconds; RBW, ±245.1 kHz; FOV, 160 cm; matrix, 218 × 272; slice thickness/gap, 3 mm/0.3 mm; NEX, 1; and total scan time, 1 minute 54 seconds. The MRI parameters for T2-weighted transverse images were as follows: TR, 660 milliseconds; TE, 18.42 milliseconds; RBW, ±109.3 kHz; FOV, 160 cm; matrix, 256 × 256; slice thickness/gap, 3.5 mm/0.35 mm; NEX, 1; and total scan time, 3 minutes 46 seconds. The MRI parameters for proton density–weighted imaging coronal images were as follows: TR, 2000 milliseconds; TE, 8.5 milliseconds; RBW, ±354.3 kHz; FOV, 160 cm; matrix, 245 × 288; slice thickness/gap, 3 mm/0.3 mm; NEX, 1; and total scan time, 2 minutes 18 seconds.

Statistical analysis

Continuous, discontinuous, and categorical variables were evaluated by applying the Student *t* test, Mann-Whitney *U* test, and χ^2 test, respectively. $P < .05$ was considered statistically significant.

Results

Follow-up and surgical status

We retrospectively evaluated 29 APRCT shoulders and 22 BPRCT shoulders for which ARCR was performed between November 2012 and May 2015. We excluded 1 case that underwent previous surgical procedures on the affected shoulder, 7 cases of intratendinous partial-thickness tears, 9 cases of combined APRCTs and BPRCTs, and several cases with less than 2 years of follow-up (9 APRCT shoulders and 14 BPRCT shoulders). All patient data were collected for the retrospective review. The mean postoperative follow-up periods were 24.5 months (range, 24-38 months) for APRCTs and 24.1 months (range, 24-26 months) for BPRCTs.

Table I
Clinical and demographic characteristics

	APRCT	BPRCT	*P* value
No. of patients	29	22	
Age at surgery, yr	64.8 ± 8.91	61.2 ± 6.92	.053
Sex: male/female	11/18	16/6	.029*
Affected side: right/left	13/16	7/15	.397
Ellman classification: II/III	26/3	16/6	.150
Subacromial decompression	15	21	.001*
Complete transition into tear	29	6	<.001*
Medial anchor with pre-knotting	5	7	.320
Manipulation	11	6	.552

APRCT, articular partial-thickness rotator cuff tear; *BPRCT*, bursal partial-thickness rotator cuff tear.
Demographic data revealed that there were more women (18 vs. 6, $P = .029$), fewer cases of subacromial decompression (15 vs. 21, $P = .001$), and more patients whose condition changed intraoperatively and transitioned into a complete tear (26 vs. 9, $P < .01$) in the APRCT group than in the BPRCT group.
* Significant difference ($P < .05$).

The grades for partial tears were grade II in 26 shoulders and grade III in 3 in the APRCT group and grade II in 16 and grade III in 6 in the BPRCT group. Subacromial decompression was performed in 15 of 29 shoulders in the APRCT group and 21 of 22 shoulders in the BPRCT group.

Before suturing of the rotator cuff stump, débridement was performed with a shaver on the rotator cuff surface. We carried out resection to the most feasible extent. Suturing was performed in 29 shoulders in the APRCT group and 6 in the BPRCT group after a complete transition into a tear. However, 16 shoulders in the BPRCT group did not have full transitions into tears. Therefore, the tendon components that were not removed through débridement were conserved, and only the torn bursal-sided tendon was sutured. If the rotator cuff could not be resected with a shaver, we considered the remaining tissue sufficient, and thus, there was no need to resect it and complete the tear. In cases with bursal partial-thickness tears, there is still residual delamination on the articular side. In cases with articular tears, all layers are sutured after creation of a complete tear; however, there is still residual delamination.

The footprint was created on the lateral side of the attaching area of the remaining rotator cuff, and a medial anchor was inserted. Therefore, these cases had a form that still has delamination (interlaminar separation). Manipulation was performed in 11 cases in the APRCT group and 6 cases in the BPRCT group.

Demographic data revealed more women (18 vs. 6), fewer cases of subacromial decompression (15 vs. 21), and more patients whose condition changed intraoperatively and transitioned into a complete tear (29 vs. 6) in the APRCT group than in the BPRCT group. No significant differences were found in terms of age, affected side, grade according to the Ellman classification system, number of patients subjected to pre-knot tying of medial anchors, or number of patients subjected to manipulation (Table I).

Clinical outcomes

The preoperative JOA score (63.6 vs. 73.0), CS (51.1 vs. 58.2), ROM of shoulder flexion (119.3° vs. 133.4°), ROM of shoulder abduction (108.2° vs. 121.3°), and strength of the shoulder external rotators (5.51 kg vs. 8.29 kg) were lower in the APRCT group than the BPRCT group ($P < .05$). Postoperatively, all scores improved significantly in both groups ($P < .05$). However, the JOA score (90.8

Table II
Preoperative scores

	APRCT	BPRCT	*P* value
VAS score	40.1 ± 15.5	49.6 ± 21.2	.132
JOA score	63.6 ± 13.3	73.0 ± 9.83	.004*
CS	51.1 ± 15.5	58.2 ± 18.2	.013*
Shoulder ROM, °			
Flexion	119.3 ± 28.1	133.4 ± 31.1	.043*
Abduction	108.2 ± 35.8	121.3 ± 39.6	.017*
Shoulder strength, kg			
Abduction	5.53 ± 4.10	5.07 ± 2.67	.922
External rotation	5.51 ± 3.10	8.29 ± 4.06	.011*

APRCT, articular partial-thickness rotator cuff tear; *BPRCT*, bursal partial-thickness rotator cuff tear; *VAS*, visual analog scale; *JOA*, Japanese Orthopaedic Association; *CS*, Constant score; *ROM*, range of motion.
The JOA score (63.6 vs. 73.0), CS (51.1 vs. 58.2), ROM of shoulder flexion (119.3° vs. 133.4°), ROM of abduction (108.2° vs. 121.3°), and strength of the shoulder external rotators (5.51 kg vs. 8.29 kg) were lower in the APRCT group.
* Significant difference ($P < .05$).

Table III
Postoperative scores

	APRCT	BPRCT	*P* value
VAS score	13.8 ± 11.0	8.11 ± 11.4	.075
JOA score	90.8 ± 7.43	96.7 ± 2.96	.001*
CS	77.8 ± 9.02	84.0 ± 7.51	.022*
Shoulder ROM, °			
Flexion	153.9 ± 11.6	160.1 ± 12.4	.089
Abduction	156.0 ± 16.6	160.1 ± 15.1	.279
Shoulder strength, kg			
Abduction	6.98 ± 3.10	6.38 ± 2.51	.669
External rotation	7.06 ± 2.47	9.87 ± 3.71	.002*

APRCT, articular partial-thickness rotator cuff tear; *BPRCT*, bursal partial-thickness rotator cuff tear; *VAS*, visual analog scale; *JOA*, Japanese Orthopaedic Association; *CS*, Constant score; *ROM*, range of motion.
The JOA score (90.8 vs. 96.7), CS (77.8 vs. 84.0), and strength of the shoulder external rotators (7.06 kg vs. 9.87 kg) remained significantly lower in the APRCT group vs. the BPRCT group.
* Significant difference ($P < .05$).

vs. 96.7), CS (77.8 vs. 84.0), and strength of the shoulder external rotators (7.06 kg vs. 9.87 kg) remained significantly lower in the APRCT group than the BPRCT group.

Improvement rates were not significantly different between the groups (APRCT vs. BPRCT), as noted by the following data: VAS score, 65.0 vs. 69.0; JOA score, 68.5 vs. 71.0; CS, 46.5 vs. 57.0; ROM of shoulder flexion, 47.8° vs. 50.0°; ROM of shoulder abduction, 56.2° vs. 57.8°; strength of the shoulder abductors, 162.0 kg vs. 156.1 kg; and strength of the shoulder external rotators, 155.2 kg vs. 147.0 kg. Clinical outcomes are summarized in Tables II-IV.

Imaging evaluation

Retears were found in 2 patients in the APRCT group and 1 in the BPRCT group. No significant differences were found in the retear rates ($P = .372$). None of the 3 patients with retears had evident muscle atrophy, fatty infiltration, or bicep tendon injury. The patient with an articular-sided tear experienced a relapse of right shoulder pain 7 months postoperatively, when his affected arm was pulled as he was walking his dog. This retear was conceivably caused by an external force. The other 2 patients (1 with articular-sided tearing and 1 with bursal-sided tearing) demonstrated cuff retears without any particularly major injury.

Discussion

Clinical treatment results

The scores improved significantly in both groups, but there were no significant differences in the improvement rate for each score and the retear rate. The suture bridge technique was effective for both APRCTs and BPRCTs. However, preoperative and postoperative functional parameters for patients with APRCTs were worse than those for patients with BPRCTs.

Comparisons between single- and double-row anchoring techniques and suture bridge technique

Horigome et al[5] compared the clinical outcomes of patients with APRCTs vs. those with BPRCTs who underwent ARCR with the single- or double-row anchoring technique in our institution. Between 2003 and 2010, among 19 APRCTs and 29 BPRCTs, significantly worse postoperative outcomes were reported (APRCT vs. BPRCT) for APRCTs in terms of the JOA score (86.8 vs. 98.1), CS (67.5 vs. 81.6), and strength of the shoulder abductors (4.9 kg vs. 6.9 kg) and external rotators (7.6 kg vs. 9.8 kg).

Table IV
Improvement rates

	APRCT	BPRCT	*P* value
VAS score	65.0 ± 27.5	69.0 ± 63.0	.056
JOA score	68.5 ± 35.4	71.0 ± 60.1	.133
CS	46.5 ± 48.4	57.0 ± 23.0	.430
Shoulder ROM, °			
Flexion	47.8 ± 36.2	50.0 ± 32.0	.842
Abduction	56.2 ± 41.6	57.8 ± 36.9	.754
Shoulder strength, kg			
Abduction	162.0 ± 94.1	156.1 ± 88.0	.783
External rotation	155.2 ± 69.3	147.0 ± 94.0	.503

APRCT, articular partial-thickness rotator cuff tear; *BPRCT*, bursal partial-thickness rotator cuff tear; *VAS*, visual analog scale; *JOA*, Japanese Orthopaedic Association; *CS*, Constant score; *ROM*, range of motion.
No significant differences were found between groups.

Compared with the results of ARCR with single- or double-row fixation, the results of the suture bridge technique showed worse postoperative VAS scores, CS values, and flexion angle scores for the APRCT group. Therefore, the outcomes of the APRCT group tended to be poor for both surgical techniques. However, in our study, the postoperative abduction angle was no longer significantly different between the 2 groups, which may reflect the advantage of the suture bridge technique.

Using cadavers, Hatta et al[4] biomechanically examined the differences in the impact of double-row repair and the suture bridge technique for rotator cuff tears and the mechanical properties of the rotator cuff muscles. In cases of moderate and severe rotator cuff tears, the tension in the posterior shallow layer of the rotator cuff was significantly increased compared with that of other sites after double-row rotator cuff repair. Furthermore, this method led to uneven tension on the rotator cuff. This uneven tension was suggested to cause retearing or a decline in postoperative glenohumeral joint function. This study focused on partial tears of the supraspinatus muscle. In addition, the rotator cuff was repaired more evenly with the suture bridge method, leading to greater recovery of the abduction motion.

Comparisons between this study and previous studies

Kim et al[6] reported that, in addition to cuff repair, subacromial decompression may contribute to better postoperative clinical outcomes because it reduces compounding factors found in BPRCTs. They performed subacromial decompression in 6 of 20 shoulders in the APRCT group compared with 21 of 23 shoulders in the BPRCT group.

In our study, subacromial decompression was performed in 15 of 29 shoulders in the APRCT group compared with 21 of 22 shoulders in the BPRCT group. In other words, a larger proportion of our patients with APRCTs were treated with subacromial decompression. The results of our study were similar to those of the study by Kim et al,[6] which led us to believe that other factors may also contribute to the less desirable postoperative clinical outcomes of APRCTs. These findings suggest that intra-articular lesions may be contributing factors to shoulder joint impairment.

The onset of APRCT may be related to endogenous factors, such as mechanical weakness caused by differences in tension distribution or reduced blood flow.[8,9,12] Furthermore, some cases can be complicated by intra-articular lesions, such as capsulitis, which may also account for the inferior postoperative clinical outcomes of APRCTs because cuff repair alone may not completely eliminate pain.

On the basis of the aforementioned findings, as arthritis symptoms are the main issue in cases of APRCT, pain is expected to continue; hence, it should be discussed when explaining the pathology to the patients and when predicting progress after surgery.

Limitations

This study had several limitations, including its retrospective design, small sample size, different group sizes, lack of a power analysis, and short follow-up duration. In addition, imaging evaluations were performed by 1 person (the senior author), and the physical examinations performed by physical therapists were not blinded. The types of tears varied among patients, giving rise to differences in the number of anchors and suture methods used. No control group was assigned, and pathologic testing was not performed. In addition, this study included patients with frozen shoulder (contracture), which represented a confounder. However, manipulation was carried out in patients with contracture under anesthesia, and as there was no difference between the 2 groups in the number of patients who underwent manipulation, we believe that it had little effect. Surgery was performed in patients who had positive results on the supraspinatus or infraspinatus test during the preoperative examination; if the result was negative, the diagnosis was frozen shoulder and conservative therapy was adopted.

The strengths of this study were that a single surgeon performed the surgical procedures in all cases in both groups and there were no differences in the preoperative Ellman classifications, which enabled the comparison of both groups under the same conditions.

Conclusion

Our study showed that the suture bridge technique significantly improved the clinical outcomes of patients with APRCTs and BPRCTs. However, the overall postoperative scores of the APRCT group were worse than those of the BPRCT group, regardless of the cuff suture technique, thus proving our hypothesis. Further longitudinal studies involving more patients are necessary for a better elucidation of the factors affecting the outcomes of surgical management of partial-thickness rotator cuff tears.

Disclaimer

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