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Research Article

Arthroscopic superior capsular reconstruction versus reverse shoulder arthroplasty in patients with massive irreparable rotator cuff tears: A comparative clinical study

Alper Şükrü Kendirci[1], Mehmet Chodza[2], Koray Şahin[1], Serkan Bayram[1], Taha Kızılkurt[1], Ali Erşen[1]

[1]*Department of Orthopaedics and Traumatology, Istanbul University, Istanbul Faculty of Medicine, Istanbul, Turkey*
[2]*Department of Orthopaedics and Traumatology, VKV American Hospital, Istanbul, Turkey*

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ORCID iDs of the authors:
A.Ş.K. 0000-0001-6250-2469,
M.C. 0000-0002-6996-6597,
K.Ş. 0000-0002-4759-4729,
S.B. 0000-0001-7651-1200,
T.K. 0000-0001-9832-8140,
A.E. 0000-0001-6241-2586.

ABSTRACT

Objective: This study aimed to compare the clinical and functional outcomes of reverse shoulder arthroplasty versus arthroscopic superior capsular reconstruction in the treatment of patients with massive irreparable rotator cuff tears and Hamada grade 1-2 glenohumeral arthritis.

Methods: It is a retrospective case–control study comparing the prospective results of 2 different treatment methods. This retrospective comparison of groups was conducted between May 2016 and May 2020. The study included 40 people with massive irreparable rotator cuff tear and Hamada grade 1-2 arthropathy who had arthroscopic superior capsular reconstruction with tensor fascia latae autograft or reverse shoulder arthroplasty surgery. Patients were divided into 2 groups according to treatment. Clinical outcome measures included shoulder range of motion, pain, and functional scores (Constant–Murley, American Shoulder and Elbow Surgeons).

Results: The mean age was 61.85 ± 7.56 and 71.10 ± 6.42 years, respectively, for group I [superior capsular reconstruction (n=20)] and group II [superior capsular reconstruction (n=20)]. The mean follow-up was 22.30 ± 8.4 and 32.50 ± 8.11 months, respectively. In the postoperative data, flexion degrees and Constant scores were significantly higher in the superior capsular reconstruction group (P=.007, P=.043). No significant difference was found between the 2 groups in all parameters (P > .05) except abduction. The increase in abduction value in the reverse shoulder arthroplasty group was significantly higher than in the superior capsular reconstruction group (P=.003). In addition, postoperative data in all parameters in both groups showed significant changes compared to preoperatively.

Conclusion: This study has shown that superior capsular reconstruction with tensor fascia latae autograft can provide clinical and functional improvement similar to the reverse shoulder arthroplasty procedure in treating massive irreparable rotator cuff tears with Hamada grade 1-2 arthropathy.

Level of Evidence: Level III, Therapeutic Study.

Introduction

Full-thickness rotator cuff tears involving 2 or more tendons[1] or tears larger than 5 cm in sagittal plane are classified as massive rotator cuff tears.[2] Even though there is still debate, massive full-thickness rotator cuff tears with excessive tear retraction and severe muscle atrophy are traditionally considered as irreparable tears.[3] Multiple treatment options are available for the management of massive irreparable rotator cuff tears (MIRCTs), including debridement, partial repair, graft augmentation, tendon transfers, and subacromial spacers. However, treatment algorithm is still controversial. Reverse shoulder arthroplasty (RSA) is another alternative for treatment of MIRCTs, especially in elderly population with accompanying superior migration of humeral head and pseudoparalysis of the shoulder. Major concern with RSA is survival of the implant. However, with advances in surgical techniques and implant technology, RSA has become a preferable method in younger patients with MIRCT.

In 2013, Mihata et al[4] described arthroscopic superior capsular reconstruction (aSCR) procedure with tensor fascia latae (TFL) autograft, which is a biological treatment alternative for MIRCTs. The aim of the procedure was to promote deltoid function by preventing superior migration of the humeral head, thereby relieving pain and restoring the glenohumeral joint motion. Early results show that satisfactory functional improvement can be obtained with this procedure.[5-7] However, clear indications and exact place of aSCR in treatment algorithm of MIRCTs is still controversial.

The aim of the study is to compare the clinical outcomes of aSCR with TFL autograft, and RSA procedure in MIRCT patients with Hamada grade 1-2 cuff tear arthropathy diagnosis.

Materials and Methods

Study design

This retrospective analysis and comparison of 2 different prospectively followed-up cohort was conducted in a tertiary university hospital which is a referral

Corresponding author:
Alper Şükrü Kendirci
alpersukru@gmail.com

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center for shoulder disorders. Institutional review board approval and ethics approval were obtained before initiation of the study from Ethic Committee of Istanbul University Istanbul Faculty of Medicine (Document No: 2020/565). Written informed consent was obtained from all patients who were included to study.

Patient selection

Patients who were diagnosed with MIRCT accompanied by Hamada grade 1-2 arthropathy and who underwent aSCR using TFL autograft between April 2017 and May 2020 constituted first study group. Second study group included patients who underwent RSA due to same diagnosis between May 2016 and January 2019. All patients were operated and followed-up by senior author. The diagnosis of MIRCT was reached clinically with presence of shoulder pseudoparalysis or radiologically using preoperative magnetic resonance imaging (MRI) indicating massive tears accompanied by tear size, severe fatty infiltration (Goutallier's grade > 2)[8] of rotator cuff muscles and severe tear retraction (Patte grade 3).[9] Patients were included in the study according to the determined criteria (Table 1).

Sample size

The sample size calculation was performed on the basis of the evidence available at the time, MCID value (26.3) of American Shoulder and Elbow Surgeons (ASES) score for rotator cuff repair.[10] The calculation resulted in a sample size of 20 patients for both groups with a power of 80% and a significance level of .05. The sample size calculation was performed using G*Power software (Version 3.1.9.4).

Surgical technique for arthroscopic superior capsular reconstruction with tensor fascia latae autograft

The technique described previously by Mihata et al[4] was performed in all procedures. All procedures were performed under general anesthesia with patients positioned in beach-chair position. Massive irreparable rotator cuff tear diagnosis was confirmed during diagnostic arthroscopy. Long head of biceps tenotomy was performed in all patients. Subacromial decompression, soft tissue debridement, and synovectomy were completed. Subscapularis tendon was evaluated following a 3-sided arthroscopic release. Debridement was performed in case of a grade 1 tear according to Lafosse classification.[11] Subscapularis tears with higher grades were repaired using intra-articular repair technique with #2 braided nonabsorbable sutures (Ultrabraid, Smith & Nephew, Andover, MA, USA) and knotless anchors (Footprint PK, Smith & Nephew, Andover, MA, USA). In the next step, cuff tissue release was performed in order to mobilize the remaining cuff and facilitate aSCR by improving glenoid exposure. Neviaser portal was established through supraclavicular fossa for placement of glenoid anchors under direct visualization using a spine needle. Two 4.5 mm suture-anchors (Healicoil PK Suture Anchor preloaded with #2 Ultrabraid, Smith & Nephew, Andover, MA, USA) were placed in superior glenoid medial to glenoid labrum at 11 and 1 o'clock positions through the Neviaser portal (Figure 1).

Table 1. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
• Age >18 years old • Hamada grade 1-2 arthropathy • Tear diameter >5 cm • Patte grade 3 retraction	• Hamada grade 3-4-5 arthropathy • Partial or reparable complete tear • Diagnonis of neurological disease • Deltoid dysfunction • Severe acromioclavicular joint arthritis • Same extremity trauma story
aSCR	
• Arthroscopy confirmed diagnosis • Definitely have sixth and twelfth month follow-up • MRI in last follow-up	• Irreparable subscapularis tear
RSA	
• Lateralized design prothesis • Minimum 2-year follow-up	• Medialized design prosthesis

aSCR, arthroscopic superior capsular reconstruction; MRI, magnetic resonance imaging; RSA, reverse shoulder arthroplasty.

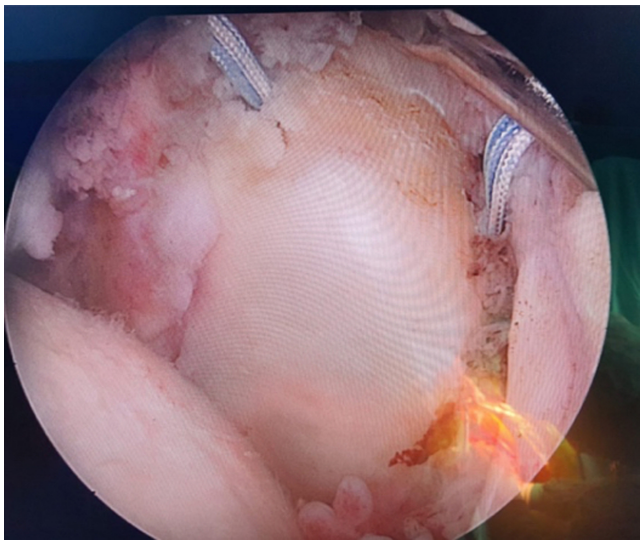


Figure 1. Anchors placed in the superior glenoid.

Following medial glenoid anchor placement, 2 4.5-mm suture-anchors (Healicoil PK Suture Anchor preloaded with #2 Ultratape, Smith & Nephew, Andover, MA,USA) were placed on the juxta-articular margin of the humeral head via the anterolateral portal, starting posterior to the bicipital groove using a similar technique to performing medial row anchor placement of rotator cuff repair. All sutures limbs coming out of the anchors were retrieved through anterolateral and posterolateral portals.

Tensor fascia latae autograft was used as graft in reconstruction. Following determination of required graft size during arthroscopy, harvesting of the graft was initiated simultaneously by a second surgeon (Figure 2). The graft was harvested from the same side of the patient's thigh as a single piece with the open method, and it was folded 3 times and fixed and shaped in the required size with a locked continuation suture.

Suture limbs emerging from medial glenoid anchors were retrieved through lateral portal and were passed through the graft using a suture passer device (FirstPass, Smith & Nephew, Andover, MA,

HIGHLIGHTS

- In the treatment of irreparable massive rotator cuff tears (MIRCT), superior capsular reconstruction (SCR) with tensor fascia latae (TFL) autograft has satisfactory functional and clinical results. This study aimed to compare the clinical outcomes of arthroscopic SCR with TFL autograft and reverse shoulder arthroplasty procedures in MIRCT patients with Hamada grade 1-2 cuff-tear arthropathy.
- The results showed that SCR with TFL autograft in the treatment of MIRCT had similar to the results of reverse shoulder arthroplasty in terms of clinical outcomes except for abduction range of motion.
- The results from this study indicate that In MIRCT patients with early stage glenohumeral arthropathy, SCR may be preferred because it is a biological treatment method.

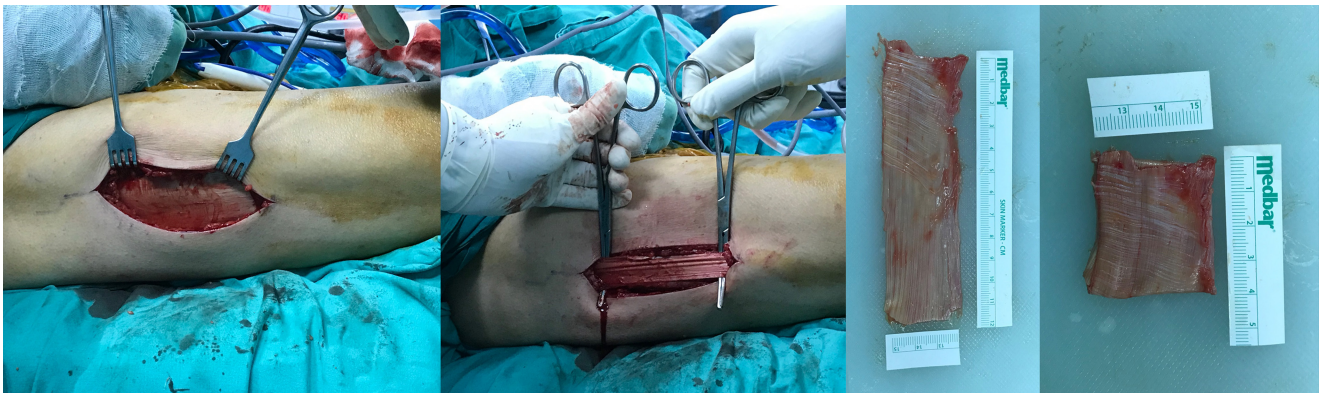


Figure 2. Harvesting and preparation of the tensor fasciae latae autograft.

USA) in accordance with the intra-articular graft placement. With aid of a surgical clamp and shuttle suture, the graft was inserted into the joint through lateral portal and placed in the desired location over glenoid. A single row fixation was performed on the glenoid side utilizing a sliding nonlocking knot followed by 3 alternating hitches (Figure 3A). Then sutures from greater tuberosity were tied using again a sliding nonlocking knot followed by 3 alternating hitches and medial row repair of the humeral side was performed. After this stage, these suture limbs were loaded to 2 knotless 5.5 mm lateral row anchors (Footprint PK, Smith & Nephew, Andover, MA, USA) and these anchors were inserted into the pilot holes inferiorly to great tuberosity by adjusting the tension of the graft and reducing it to an adequate position over the footprint (Figure 3B). The residual infraspinatus tendon and the graft were fixed with side to side repair using #2 braided nonabsorbable free suture (Ultrabraid, Smith & Nephew, Andover, MA, USA) (Figure 3C).

Surgical technique for reverse shoulder arthroplasty

All procedures were performed under general anesthesia with patients positioned in beach-chair position. Standard deltopectoral approach was used in all patients. Subscapularis tendon was lifted using peel-off technique from lesser tuberosity in association with anterior capsule leaving lower third part intact.

First, central screw hole was drilled using a 3.2-mm drill bit and a 6.5-mm central screw was inserted. Then 2 more peripheral (1 superior and 1 inferior) 4.7 mm screws with appropriate length were inserted and fixation of glenoid baseplate was completed. Following this step, the glenosphere with appropriate size (36 mm for females and 41 mm for males) was inserted and impacted.

Then the broacher was removed and uncemented humeral stem with same size was inserted using a stem inserter with elbow at 90° of flexion by controlling the version with aid of a version control rod which was aligned parallel to forearm. Finally, a trial humeral tray/bearing was inserted, and the joint was reduced (Comprehensive Reverse Shoulder System, Zimmer Biomet, Warsaw, IN, USA). Subscapularis tendon was repaired to its native insertion using #2 braided unabsorbable polyester sutures (Ethibond Excel, Ethicon, Raritan, NJ, USA) for all patients.

Postoperative rehabilitation

Patients who underwent aSCR with TFL autograft were immobilized for 6 weeks with a 30° abduction arm sling. Immediate elbow and wrist motion were allowed post-operatively to avoid stiffness. At post-operative sixth week, full passive and active-assisted range of motion exercises were initiated. After the 12th week, full active range of motion was gradually allowed and strengthening exercises were initiated. Return to work was allowed after achieving a pain-free shoulder after fourth month postoperatively.

In patients who underwent RSA, immobilization with a simple arm sling was performed for 2 weeks. During this period, passive shoulder motion was allowed respecting pain except for external rotation exceeding 30° due to subscapularis repair. At fourth post-operative week, full active shoulder motion was allowed and, strengthening

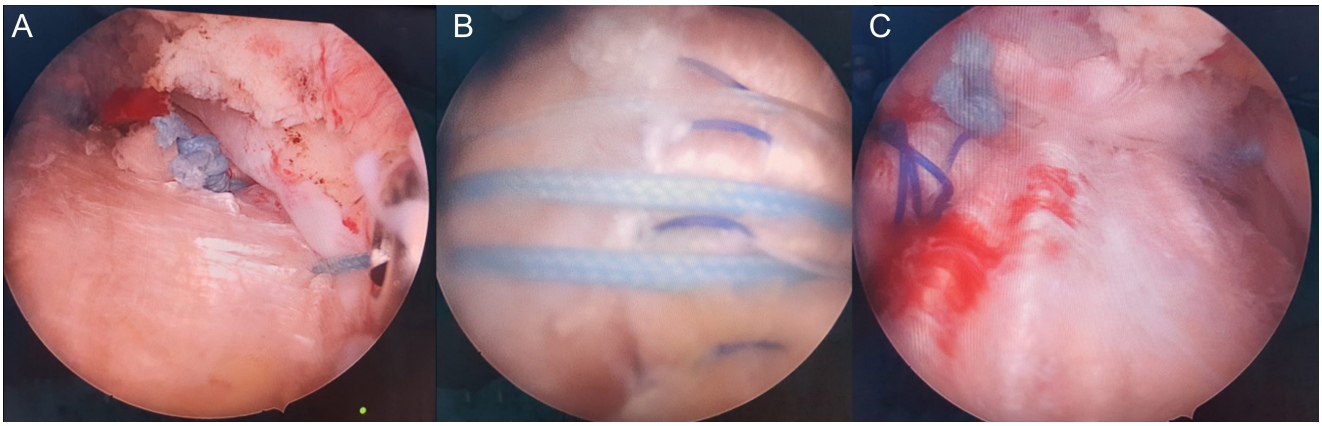


Figure 3. (A) Single row fixation of the graft to the glenoidal side. (B) Double row fixation of the graft on the tuberculum majus. (C) View of the graft from the anterolateral portal after fixation.

exercises were initiated at sixth week. Return-to-work was allowed after achieving pain-free shoulder motion after third month postoperatively.

Outcome measures and data collection

Clinical follow-up of patients in aSCR group was performed preoperatively and on 1st, 3rd, 6th, 12th months postoperatively and each following year. Active shoulder range of motion (forward flexion, abduction, and external rotation at side with elbow at 90° of flexion) was assessed using a goniometer. Functional outcome measures included Constant–Murley score and ASES score.[12,13] Shoulder abduction muscle strength was measured with a handheld dynamometer to be used in the Constant–Murley score. Subjective pain outcome was evaluated using a visual analog scale (VAS).[14] Data concerning surgery such as complications and need for re-operation were also recorded. Postoperative MRI evaluation was performed for all patients in the aSCR group at last follow-up visit in order to evaluate graft healing.[15]

Statistical analysis

All statistical analyses were performed using NCSS (Number Cruncher Statistical System, 2007, Kaysville, Utah, USA) software. The study data were analyzed using mean, median, SD, range, frequency, and percentage as descriptive statistical methods. Shapiro–Wilk test, Kolmogorov–Smirnov test, histograms, and probability plots were used to assess the distribution of quantitative variables. Student's *t*-test was used for comparison of normally distributed quantitative variables between 2 groups and Mann–Whitney *U*-test was used for comparison of non-normally distributed quantitative variables. Paired-samples *t*-test was used for intragroup comparisons of normally distributed quantitative variables and Wilcoxon signed-ranks test was used for non-normally distributed quantitative variables. Categorical variables were analyzed using Pearson chi-square test. Statistical significance level was set as $P=.05$ for all analyses.

Results

During the study period, 22 patients were diagnosed with MIRCT, but 20 patients underwent aSCR with TFL autograft procedure (2 patients were excluded due to partial repair was performed) and they were enrolled to study cohort. All patients were available until last follow-up visit and were included to final analysis of the study. The RSA group was constituted of a prior cohort of 43 patients who were also prospectively followed up. Twenty-three patients were excluded due to severe preoperative glenohumeral arthropathy (Hamada grade 3-4-5) and 20 patients were included to study (Figure 4).

In the aSCR group, the mean age of patients was 61.85 ± 7.56 (range: 45-72) years, and there were 1 male and 19 female patients. The mean follow-up duration was 22.30 ± 8.40 (range: 12-40) months. In the RSA group, the mean age of patients and mean follow-up duration was 71.10 ± 6.42 (range: 60-83) years and 32.50 ± 8.11 (range: 24-49) months, respectively. There were 15 female and 5 male patients. Comparison of demographic data between 2 study groups showed significant difference in terms of age ($P=.004$) and follow-up duration ($P=.007$) and showed no significant difference in terms of sex

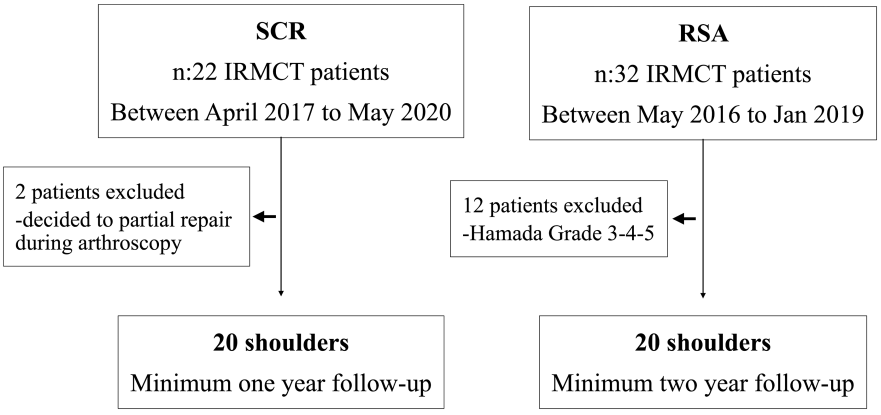


Figure 4. Flowchart of the study.

Table 2. Demographics data of patients

		SCR (n=20)	RSA (n=20)	*P*
Age	Mean ± SD	61.85 ± 7.56	71.10 ± 6.42	***.004***[**a]
	Median (minimum–maximum)	65 (45-72)	69 (60-83)	
Sex	Female	19 (95)	15 (75)	***.077***[b]
	Male	1 (5)	5 (25)	
Side	Left	5 (25)	7 (35)	***.490***[b]
	Right	15 (75)	13 (65)	
Dominance	Yes	16 (80)	15 (75)	***.705***[b]
	No	4 (20)	5 (25)	
Follow-up (months)	Mean ± SD	22.30 ± 8.40	32.50 ± 8.11	***.007***[**a]
	Median (minimum–maximum)	21.50 (12-40)	29.50 (24-49)	
Arthropathy (Hamada)	Grade 1	16 (80)	10 (50)	***.197***[b]
	Grade 2	4 (20)	10 (50)	

[a]Sample *t*-test: *$P < .05$; **$P < .01$.
[b]Pearson chi-square test.
RSA, reverse shoulder arthroplasty; SCR, superior capsular reconstruction.

Table 3. Comparison of pre- and postoperative clinical data of the groups

			SCR (n=20)	RSA (n=20)	*P*
Abduction	Preoperative	Mean ± SD	113.50 ± 38.01	83.50 ± 19.54	***.005**[b]*
		Median (minimum–maximum)	95 (60-180)	80 (50-150)	
	Postoperative	Mean ± SD	137.75 ± 31.64	134.25 ± 29.70	***.744**[a]*
		Median (minimum–maximum)	140 (80-180)	137.50 (75-175)	
		P[c]	***.001***	***.001***	
Flexion	Preoperative	Mean ± SD	117.25 ± 41.66	92.5 ± 19.97	***.102**[b]*
		Median (minimum–maximum)	120 (60-180)	90 (70-160)	
	Postoperative	Mean ± SD	147.50 ± 31.27	121.00 ± 25.11	***.007**[b]*
		Median (minimum–maximum)	150 (90-180)	115 (80-170)	
		P[c]	***.001***	***.002***	
External rotation	Preoperative	Mean ± SD	28.25 ± 8.77	27.50 ± 8.35	***.904**[b]*
		Median (minimum–maximum)	30 (20-45)	30 (15-40)	
	Postoperative	Mean ± SD	36.75 ± 11.72	37.50 ± 11.75	***.849**[b]*
		Median (minimum–maximum)	40 (15-50)	40 (10-50)	
		P[c]	***.004***	***.008***	
Constant score	Preoperative	Mean ± SD	41.50 ± 11.39	32.95 ± 12.15	***.027**[a]*
		Median (minimum–maximum)	42 (23-60)	31 (15-64)	
	Postoperative	Mean ± SD	72.55 ± 11.93	66.30 ± 7.73	***.043**[a]*
		Median (minimum–maximum)	74 (50-88)	66 (52-81)	
		P[c]	***.001***	***.001***	
ASES score	Preoperative	Mean ± SD	38.39 ± 13.59	26.70 ± 5.84	***.008**[b]*
		Median (minimum–maximum)	34.15 (20-56.6)	25.50 (18-38)	
	Postoperative	Mean ± SD	80.30 ± 15.91	75.30 ± 10.69	***.091**[b]*
		Median (minimum–maximum)	82.50 (31.6-95)	78.50 (50-88)	
		P[c]	***.001***	***.001***	
VAS	Preoperative	Mean ± SD	6.90 ± 1.86	6.55 ± 1.28	***.492**[a]*
		Median (minimum–maximum)	7 (4-10)	7 (4-8)	
	Postoperative	Mean ± SD	1.25 ± 2.49	0.60 ± 1.10	***.674**[b]*
		Median (minimum–maximum)	0 (0-10)	0 (0-3)	
		P[c]	***.001***	***.001***	

[a]Sample *t*-test: **P* < .05; ***P* < .01.
[b]Mann–Whitney *U*-test.
[c]Wilcoxon sign-rank test.
ASES, American Shoulder and Elbow Surgeons; RSA, reverse shoulder arthroplasty; SCR, superior capsular reconstruction; VAS, visual analog scale.

(*P*=.077), side (*P*=.490), dominance (*P*=.705), and grade of arthropathy (Table 2). Pseudoparalysis was present in the preoperative evaluation in 4 patients in the aSCR group and in 3 patients in the RSA group.

Clinical outcomes

There was no significant difference between the preoperative range of motion except for abduction (*P*=.005), showed significant difference in terms of Constant score and ASES score (*P*=.027; *P*=.007, respectively) (Table 3 and Figure 5).

Both study groups showed statistically significant improvement in all clinical outcome measures at last follow-up control compared to preoperative status (Table 3). If improvements observed in clinical outcomes are compared between 2 study groups showed no significant difference (*P* > .05) except for abduction range of motion (*P*=.003) (Table 4).

In addition, 13 patients in the aSCR group had graft healing on MRI at the last follow-up. The graft was non-intact in 7 patients, which was

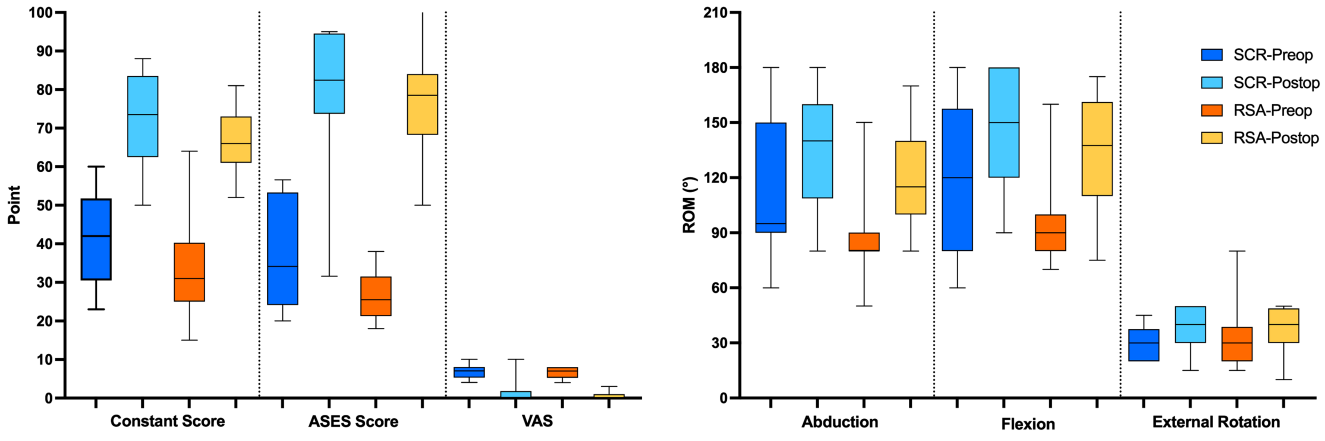


Figure 5. Box plot of pre- and postoperative data of groups.

Table 4. Comparison of mean improvement of clinical outcomes between the groups

	SCR (n=20) (Mean ± SD)	RSA (n=20) (Mean ± SD)	*P*
Abduction	24.25° ± 21.35	50.75° ± 26.67	***.003**[a]*
Flexion	30.25° ± 25.78	28.50° ± 32.16	***.989**[a]*
External rotation	8.50° ± 10.27	9.75° ± 9.39	***.617**[b]*
Constant score	31.05 ± 11.82	33.35 ± 15.02	***.383**[a]*
ASES score	41.91 ± 15.17	48.60 ± 11.08	***.114**[b]*
VAS	-5.65 ± 2.78	-5.95 ± 1.57	***.678**[a]*

[a]Sample *t*-test: **P* < .05; ***P* < .01.
[b]Mann–Whitney *U*-test.
ASES, American Shoulder and Elbow Surgeons; RSA, reverse shoulder arthroplasty; SCR, superior capsular reconstruction.

defined as failure. There were no significant differences between 2 groups—healed and failure graft—in all parameters ($P > .05$) (Table 5).

Complications and failures

No complications or failure was observed during follow-up period in RSA group. However; in aSCR group, 1 patient developed hematoma in donor site and treated with surgical debridement. Another patient suffered from new onset shoulder pain during follow-up period. Acromioclavicular arthritis was detected, and this patient was treated with arthroscopic distal clavicle excision.

Discussion

The most important finding of this study is that aSCR with TFL autograft has shown comparable clinical outcomes to RSA in short-term in the treatment of MIRCTs and both techniques showed significant clinical improvement. Treatment algorithm for MIRCTs is still controversial. There are numerous different techniques described in the literature including biological and nonbiological techniques. While aSCR with TFL autograft is a biological reconstruction technique, RSA is a nonbiological and nonanatomical treatment involving joint replacement. In patients with Hamada 1-2 cuff tear arthropathy, aSCR with TFL autograft can be preferred as an alternative to RSA for treatment of MIRCTs.

Preservation of native anatomy and bone stock of the patient can be considered as an advantage of aSCR with TFL autograft over RSA. Since the material used in the described technique is autograft, it does not include concerns about utilization of allografts such as disease transmission or graft reaction. In addition; due to preservation of native anatomy, an eventual revision would be much easier compared to RSA in case of a potential treatment failure revision. However; due to scarce knowledge about long-term outcomes of

Table 5. Comparison of TFL autograft integrity

		Graft status		
		Failure (n=7)	Intact (n=13)	*P*
Flexion				
Preoperative	Mean ± SD	110 ± 52.6	123.75 ± 36.63	***.432**[a]*
	Median (minimum–maximum)	100 (60-180)	127.5 (70-180)	
Postoperative	Mean ± SD	136.25 ± 35.83	155 ± 26.8	***.238***
	Median (minimum–maximum)	125 (90-180)	160 (100-180)	
Preop–postop Δ	Mean ± SD	28.75 ± 30.44	31.25 ± 23.56	***.792***
Abduction				
Preoperative	Mean ± SD	108.57 ± 44.13	118.33 ± 36.64	***.536**[a]*
	Median (minimum–maximum)	100 (60-180)	110 (60-160)	
Postoperative	Mean ± SD	133.75 ± 38.89	140.42 ± 27.34	***.669***
	Median (minimum–maximum)	135 (80-180)	140 (90-180)	
Preop–postop Δ	Mean ± SD	27.5 ± 23.15	22.08 ± 20.83	***.583***
External rotation				
Preoperative	Mean ± SD	27.14 ± 9.51	28.75 ± 9.08	***.711**[a]*
	Median (minimum–maximum)	20 (20-40)	30 (20-45)	
Postoperative	Mean ± SD	33.57 ± 14.92	39.09 ± 8.31	***.482***
	Median (minimum–maximum)	40 (15-50)	40 (30-50)	
Preop–postop Δ	Mean ± SD	5 ± 8.66	10.45 ± 11.06	***.230***
Constant score				
Preoperative	Mean ± SD	38.14 ± 14.17	43.92 ± 9.91	***.384**[a]*
	Median (minimum–maximum)	32 (26-60)	44.5 (23-55)	
Postoperative	Mean ± SD	67.5 ± 13.89	75.92 ± 9.6	***.728***
	Median (minimum–maximum)	64.5 (50-88)	78.5 (52-85)	
Preop–postop Δ	Mean ± SD	29.63 ± 12.74	32 ± 11.65	***.734***
ASES score				
Preoperative	Meant ± SD	35.69 ± 13.41	40.66 ± 14.3	***.536**[a]*
	Median (minimum–maximum)	33.3 (23.3-55)	43.3 (20-56.6)	
Postoperative	Mean ± SD	77.68 ± 13.93	82.04 ± 17.47	***.295***
	Median (minimum–maximum)	76.7 (51.6-95)	86.6 (31.6-95)	
Preop–postop Δ	Mean ± SD	42.7 ± 16.7	41.38 ± 14.82	***.877***
VAS				
Preoperative	Mean ± SD	7.43 ± 1.9	6.58 ± 1.93	***.432**[a]*
	Median (minimum–maximum)	7 (5-10)	6.5 (4-10)	
Postoperative	Mean ± SD	1.75 ± 1.83	0.92 ± 2.87	***.051***
	Median (minimum–maximum)	1.5 (0-5)	0 (0-10)	
Preop–postop Δ	Mean ± SD	1.75 ± 1.83	0.92 ± 2.87	***.725***

[a]Mann–Whitney *U*-test.
ASES, American Shoulder and Elbow Surgeons; TFL, tensor fascia latae; VAS, visual analog scale.

aSCR with TFL autograft, it is still difficult to suggest this technique as an option for treatment all MIRCTs and determination of clear indications are still needed.

Lacheta et al[16] reported comparable functional outcomes and return-to-sports ratio between aSCR with dermal allograft and RSA. Authors concluded that aSCR with dermal allograft might be an alternative salvage procedure to RSA with correct indication. As a difference from this study, we used TFL autograft for aSCR technique but, our result is similar to Lacheta et al, the improvement values in all parameters, showed no significant differences except for abduction. In addition, the mean follow-up times of their patients are similar to our study. We can say that, aSCR with TLF autograft procedure has got comparable outcomes with RSA.

There are several reports indicating outcomes of aSCR performed using TFL autograft. Arthroscopic superior capsular reconstruction is a biological treatment option for patients diagnosed with MIRCTs. Preservation of joint anatomy is an important advantage. Mihata et al reported results of 30 patients with 5 years of follow-up and showed significant improvement in shoulder range of motion, pain outcome, and functional scores. Authors concluded that the aSCR procedure provides recovery of shoulder functions and relief of shoulder pain in MIRCT and that graft healing plays a key role in restoring shoulder functions and minimizing the progression to cuff arthropathy.[17] In their study with 19 patients, Azevedo et al[5] reported significant improvement in range of motion, abduction strength, and functional outcomes. They also reported that complete graft tears correlated with decreased external rotation muscle strength and increased grade of infraspinatus and teres minor fatty degeneration. In another study with 36 patients, Lee et al[18] reported significant improvement in shoulder range of motion, pain outcome, and functional outcomes after aSCR with TFL autograft. Authors detected 13 (36.1%) retears in the graft and re-grouped and compared the patients according to graft integrity. They reported significant difference in postoperative ASES score, Constant score, pain scores, and forward flexion, but no significant difference was observed in external or internal rotation. They also indicated that the postoperative acromiohumeral distance was also closely related to graft failure. In our study, similar to these articles, in patients who underwent aSCR with TFL autograft, statistical results were obtained in all postoperative parameters. According to the graft status, 35% graft failure was present in our study, similar to the study of Lee et al. However, in our study, no parameter was statistically significant in comparison according to graft status.

When the studies reporting the results of RSA in patients with MIRCT were evaluated; Kääb et al[19] applied RSA to 108 patients with early stage GHOA in their study and reported that there was a significant pre-postoperative improvement in ASES and Constant score, abduction amount, and VAS data in the minimum 30-month follow-up results ($P < .05$). Similarly, in our study, there was a statistically significant difference in the postoperative data compared to the preoperative data in all parameters of the patients who underwent RSA for MIRCT with Hamada grade 1-2 arthropathy.

Although our study makes important contributions to the literature, it has several limitations. First of all, although the data were collected prospectively, it is a retrospective study. Groups are not matched by age and follow-up duration. Clinical evaluation by a single surgeon and not being blinded may cause bias. The number of patients in the groups and the follow-up periods can be increased. The mean follow-up time was 22.3 months (12-40 m) in the aSCR group, so the results were considered short-term. Although positive clinical and functional results are obtained in the short term, studies with longer follow-up are needed to reach definitive conclusions.

To the best of our knowledge, this is the first study to compare the results of aSCR with TFL autograft and RSA. It showed aSCR with TFL autograft has significant clinical improvement and comparable outcomes to RSA in MIRCTs patients with Hamada grade 1-2 arthropathy. Arthroscopic superior capsular reconstruction with TFL autograft could be a promising biological option for treatment of MIRCTs with early stage arthropathy and has notable advantages such as preservation of native anatomy and bone stock. However, clear indications are yet to be defined and further research with higher evidence level are still needed on this topic.

Ethics Committee Approval: This study was approved by Ethic Committee of Istanbul University, Istanbul Medical Faculty (Document No: 2020/565).

Informed Consent: Written informed consent was obtained from all patients included in the study.

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