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Improved PROMs and Less Post-op Pain at 6 months with ACR and MUA Compared to MUA Alone in Patients with Resistant Frozen Shoulder

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ABSTRACT

Objective: To compare the effectiveness of arthroscopic capsular release (ACR) with manipulation under anesthesia (MUA) versus MUA alone in patients with resistant frozen shoulder, specifically focusing on patient-reported outcome measures (PROMs) and postoperative pain levels at 6 months.

Methodology: This retrospectively analyzed study was conducted at Allied Hospital, Faisalabad, from June 2019 to August 1st, 2022. The data of 50 patients who underwent ACR with MUA (Group A) and MUA alone (Group B) were analyzed retrospectively. Patients were assessed preoperatively using the VAS pain scale, ASES, OSS, and range of motion (ROM). Preoperative results were compared to postoperative results taken 6 months postoperatively. The results were analyzed using SPSS. Independent t-tests and paired sample t-tests were used to assess significant differences between the two groups.

Results: The mean age was 57 years with a mean duration of symptoms prior to surgery of 23 months. Both groups experienced a significant difference in the VAS pain scale, ASES, OSS, and ROM ($p < 0.05$). Patients treated with ACR and MUA (Group A) experienced significantly lower postoperative pain compared to patients treated with MUA alone (Group B) (16.68 vs. 23.72), as well as higher ASES (71.40 vs. 66.64) and OSS (37.68 vs. 34.04) scores, respectively ($p < 0.05$). The ROM was slightly higher in Group A; however, it was statistically insignificant.

Conclusion: ACR with MUA and MUA alone are effective treatments for adhesive capsulitis. ACR with MUA provides better pain relief and functional shoulder outcomes in the early postoperative period and at 6 months. Further studies are needed to confirm these results.

Keywords: Arthroscopy, Bursitis, Joint capsule release, Range of motion, articular.

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Introduction

Frozen shoulder, also known as adhesive capsulitis, is an inflammatory condition that affects the glenohumeral joint and persists for more than three months. It manifests as restricted shoulder joint movement accompanied by pain, which can significantly impact daily life activities like combing hair. The prevalence of frozen shoulder is approximately 5% in the general population and around 10-39% in individuals with diabetes, particularly those with uncontrolled diabetes.[1-3] Despite successful treatment with rest, physiotherapy, and corticosteroid injections for many patients, some individuals develop resistant frozen shoulder, characterized by a lack of response to nonsurgical management for at least six months. Resistant frozen shoulder often necessitates surgical interventions such as manipulation under anesthesia (MUA),

arthroscopic capsular release (ACR), or a combination of both (ACR plus MUA).[4]

Recent literature has demonstrated the effectiveness of both MUA and ACR as treatment options for frozen shoulder.5 MUA is a relatively straightforward procedure performed under general anesthesia, as it does not require arthroscopic equipment and is cost-effective. In contrast, ACR offers improved visualization inside the glenohumeral joint and enables the release of adhesions under arthroscopic guidance.[5,6] However, there is limited literature comparing the outcomes of ACR plus MUA versus MUA alone. Sivardeen et al. reported that ACR plus MUA had significantly better functional outcomes when compared to MUA for short-term (less than 12 months) follow up.[1]

In this study, we are aiming to compare ACR plus MUA with MUA alone in terms range of motion (ROM), and patient reported outcomes (PROMs) such as American Shoulder and Elbow Score (ASES), and Oxford Shoulder Score (OSS). We also compared the postoperative pain between the two groups, a variable which has previously not compared.

Methodology

This retrospectively analyzed study was conducted in allied hospital Faisalabad from June 2019 to 1st August 2022. Data of 50 patients, 25 in each group that underwent ACR with MUA (Group A) and MUA alone (Group B) were analyzed retrospectively. Ethical approval of the study was obtained by Ethical Review Committee of Faisalabad Medical University. Written informed consent was taken from the patients and patients were conveniently assigned to two groups. We included patients with isolated and resistant frozen shoulder aged 18 and above and patients with or without type 1 and type 2 diabetes. Patients with other comorbidities, rotator cuff tear, labral tear, and any other hidden injuries were excluded. Patients in group A underwent ACR plus MUA and patients in group B underwent MUA alone. Preoperative VAS pain score, range of motion (flexion, abduction, external rotation, and internal rotation), ASES, OSS were noted for all patients.

Resistant frozen shoulder (RFS) was defined as frozen shoulder resistant to non-pharmacological therapies (intraarticular corticosteroid injection and physiotherapy) for 6 months, with limitations to the restriction of both passive and active glenohumeral and scapulothoracic motion, equal to or less than 100° of elevation, and 50% less external rotation in the affected shoulder than the healthy side.[2] RFS was considered as an indication for surgical treatment, and the surgical procedures were carried out by a single surgeon in a tertiary care hospital (Figure 1 and 2).

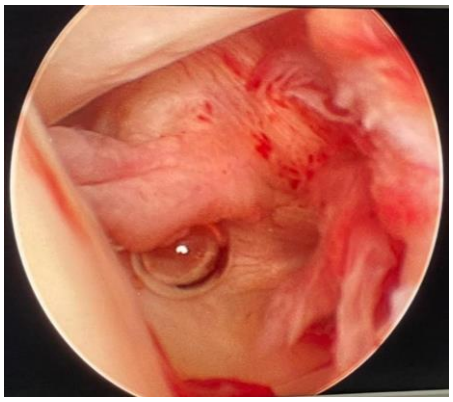

Figure 1. Inflamed capsule in rotator interval in Primary Resistant Adhesive Capsulitis.

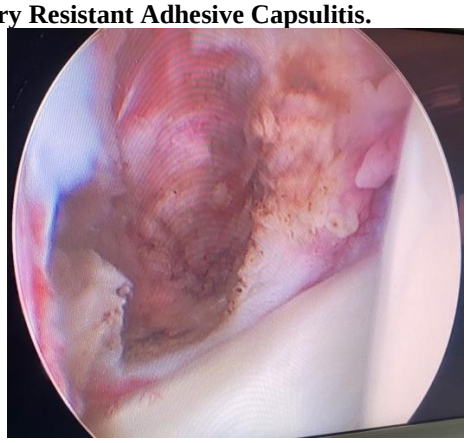

Figure 2. Opened Capsule after release.

On post-operative day 1, guided passive exercise was started, and all patients were discharged from the hospital. Patients were encouraged to follow up weekly for four weeks, followed by a visit at 3 months and a final visit at 6 months. All patients underwent guided physical therapy for 3 months and were encouraged to continue performing other exercises indefinitely.

Post-operative pain, range of motion (ROM), and patient-reported outcomes (ASES and OSS) were assessed at 6 months postoperatively. Internal rotation was measured by how far the end of the patient's thumb could reach behind their back, which was then converted into the American Shoulder and Elbow Surgeons (ASES) subscore of internal rotation. The points allocated were as follows: 0 points for thumb to the lateral thigh; 2 points for thumb to the buttock; 4 points for thumb to the lumbosacral junction; 6 points for thumb to L3 (waist); 8 points for thumb to T12; and 10 points for thumb to T7 (interscapular).[3]

Data were imported and analyzed using SPSS (version 28, IBM Corp.). Independent sample t-tests were used to

compare mean ROM functional scores between the two groups, while paired sample t-tests were used to determine the difference between pre- and post-operative pain scores, ROM, and functional scores in both groups. A p-value of < 0.05 was considered statistically significant.

Results

Results were calculated using SPSS and the patient descriptive are shown below (Table I). Mean age of the patients were 57.24 ± 4.57 with mean duration of 23 ±15.09 months since the onset of symptoms. Females were the predominant patient population and diabetes was present in 46% of patients.

Table 1: Patient descriptive.

	Mean±SD or N (%)
Age	57.24 ± 4.57
Gender	
Male	34 (68)
Female	16 (32)
Affected shoulder	
Right	31 (62)
Left	19 (38)
Dominant Arm	
Right	30 (60)
Left	20 (40)
Diabetes	
Type 1	3 (6)
Type 2	20 (40)
No	27 (54)
Duration of Symptoms (months)	23.08 (15.09)

Independent t-test analyses showed statistically insignificant values for VAS pain, ROM, and PROMs between both groups. Paired sample t-tests showed that there were significant differences in preoperative and post-operative pain, ROM, and PROMs in both groups (Table II). We noted statistically significant differences at 6 months between post-op pain and PROMs (ASES and OSS) between group A and B. Group A, i.e., patients who underwent ACR plus MUA reported significantly lower VAS pain scores at four weeks follow up and reported improved function, PROMs (ASES and OSS) at 6 months as compared to MUA alone (Table III). Three patients suffered from complications (two in group A and one in group B). One participant in each group suffered from neuropraxia and recovered spontaneously at four months. One patient in group A suffered from delayed post-operative infection (at four weeks) which was treated with IV antibiotics.

Discussion

Resistant frozen shoulder requires surgical management, which involves ACR or MUA. Both of these techniques provide effective options for improving ROM and functional outcomes, leading to an improved quality of life.[4–6]

MUA has been considered equally effective as other non-surgical methods (intraarticular injection, physiotherapy) and surgical procedures such as ACR in the treatment of frozen shoulder.[7-9] It is a quick and cost-effective procedure with rapid results, such as pain reduction within 1 week of manipulation.[10] Various studies have reported that MUA alone brings significant improvements in range of motion, decreases pain, and improves the quality of life.[8,11,12,13] A recent RCT compared the effects MUA and celecoxib for frozen shoulder concluded that MUA was superior than celecoxib in terms of pain control and passive ROM.[14] However, MUA is a less precise procedure, and authors have pointed out that it is not evident whether the manipulation is causing more damage than good. Moreover, other reported adverse effects include proximal humeral (shaft) fracture, glenoid rim fracture, and brachial plexus traction injury. These facts make MUA alone a controversial surgical option for the treatment of frozen shoulder.[15]

Table II: Paired sample t-test for difference in means of preoperative and post-operative (6 months).

Combined Preoperative and Post-operative Comparison of PROMs and ROM					
	Treatment Given	**Preoperatively**	**6 months**	**Mean Difference**	**P-value**
VAS Pain score	ACR + MUA	71.28 ± 9.70	16.68 ± 4.31	-54.60	<0.01*
	MUA	69.20 ± 11.48	23.72 ± 6.47	-45.48	
ASES (%)	ACR + MUA	28.72 ± 11.06	71.40 ± 3.84	42.68	<0.01*
	MUA	32.48 ± 8.64	66.64 ± 4.33	34.16	
OSS (Max=60)	ACR + MUA	20.56 ± 5.36	37.68 ± 4.22	17.12	<0.01*
	MUA	20.32 ± 4.99	34.04 ± 3.15	13.72	
Flexion (degrees)	ACR + MUA	83.18 ± 4.97	151.92 ± 5.39	68.74	<0.01*
	MUA	81.98 ± 4.39	152.32 ± 7.56	70.34	
Abduction (degrees)	ACR + MUA	70.12 ± 6.81	151.96 ± 7.54	81.84	<0.01*
	MUA	70.87 ± 6.83	150.92 ± 8.21	80.05	
External rotation (degrees)	ACR + MUA	19.87 ± 6.89	65.17 ± 3.39	45.30	<0.01*
	MUA	20.48 ± 7.34	65.59 ± 3.36	45.11	

Nowadays, ACR is considered one of the most frequently carried out surgical procedures for frozen shoulder. It is considered safe and effective and has been shown to be equally effective in restoring ROM as MUA, intraarticular steroid injections, and hydrolyzation.[7,12] A recent meta-analysis carried out by Challoumas et al. concluded that neither ACR nor MUA have significant differences in the clinical outcomes. However, it recommended the use of intraarticular steroid injection early in the onset of frozen shoulder to avoid resistant frozen shoulder.[16] Despite the lack of clinical superiority, ACR has several advantages over MUA, including direct visualization of the adhesive capsule and joint architecture, enabling the removal of inflammatory tissue under vision, countering the relative restricted vision in MUA.[17] On the contrary, ACR has been considered a less cost-effective procedure. With many recent studies pointing towards similar efficacy of both procedures, ACR adds an additional level of complexity and cost for the treatment.[6]

Table III: Comparison of Patient-Reported Outcome Measures (PROMs) and Range of Motion (ROM) between Groups A and B at 6 Months Follow-Up.

	Treatment given	N	Mean ± S.D	P-value
Post-op VAS Pain score	ACR + MUA (group A)	25	16.68 ± 4.31	<0.01*
	MUA (group B)	25	23.72 ± 6.47	
Preoperative ASES	ACR + MUA	25	28.72 ± 11.06	0.187
	MUA	25	32.48 ± 8.64	
ASES at 6 Months	ACR + MUA	25	71.40 ± 3.84	<0.01*
	MUA	25	66.64 ± 4.33	
OSS at 6 Months	ACR + MUA	25	37.68 ± 4.22	0.01*
	MUA	25	34.04 ± 3.15	
Flexion at 6 Months	ACR + MUA	25	151.92 ± 5.39	0.70
	MUA	25	152.32 ± 7.56	
Abduction at 6 Months	ACR + MUA	25	151.96 ± 7.54	0.83
	2 MUA	25	150.92 ± 8.21	
External rotation at 6 Months	ACR + MUA	25	65.17 ± 3.39	0.71
	MUA	25	65.53 ± 3.36	

Our study provides similar results in terms of significantly better outcomes at 6 months in both groups. Theoretically, when used in combination, ACR with MUA should provide better results than any one procedure alone. With an arthroscopic view, the side effects of MUA, such as humeral fractures and glenoid injury, can be offset.[10,17] However, literature supporting this theory is not available. Some authors have reported that ACR with MUA has better functional outcomes in the early post-operative course (6-12 months); however, this difference disappears in follow-ups longer than 12 months. Others have reported that no procedure is superior to the other in terms of PROMs and ROM. Our study supports the findings reported by Sivardeen et al. that ACR with MUA provides better functional outcomes at 6 months compared to MUA alone.[1] The patients who had MUA plus ACR had an average ASES score of 19.6 before surgery, 78.3 at six months, and 80.1 after twelve months. Preoperatively, the mean OSS was 32.5; after 6 months, it was 53.6; and at 12 months, it was 53.8. The mean ASES score for the patients who underwent MUA was 28.7 before surgery, 57.9 at six months, and 58 at twelve months. The mean OSS before surgery was 33, 42.5 at six months, and 48 at twelve months.[1] However, due to the lack of RCTs and meta-analyses and the fact that most studies consider both procedures equally effective, it cannot be concluded whether ACR with MUA or MUA alone is a better option for treating resistant frozen shoulder.[6,16] Lastly, our study focused on post-operative pain, measured at four weeks post-operatively, which was seen to be significantly lower in patients who underwent ACR with MUA compared to MUA alone. This comparison is likely the first to be reported in the literature when it comes to a comparison between ACR with MUA and MUA alone.

Our study has several limitations, including a retrospective study design. The cohort was also small, which limited the generalizability of the results to the general population. However, bias was reduced by surgical procedures performed by a single surgeon. Larger cohorts and RCTs are required to compare these two procedures in patients with resistant frozen shoulder.

Conclusion

ACR with MUA and MUA are both effective treatment options for adhesive capsulitis (frozen shoulder) and result in improved shoulder scores, ROM, and reduced pain. However, ACR with MUA provides superior results in terms of post-operative pain and better shoulder functional scores at 6 months postoperatively. RCTs with a larger

sample size and increased follow-up time are needed to confirm these results.

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