Effectiveness of Scapular Mobilization Exercises on Shoulder Joint Functions after Surgery for Rotator Cuff Tears

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ABSTRACT

Rotator cuff (RC) tear is a prevalent disorder that led to shoulder pain. Up to 70% of doctors' visits related to the shoulder joint are due to RC disorders.This study investigated the effectiveness of scapular mobilization exercises in improving shoulder function after rotator cuff tendon repair surgery. Forty patients were randomly assigned to two groups: an experimental group receiving scapular mobilization in addition to conventional therapy, and a control group receiving only conventional therapy. Both groups underwent three physiotherapy sessions per week for four weeks. Before and after the intervention, researchers assessed pain (VAS), shoulder function (Constant-Murley Score), range of motion, and disability (SPADI). The results demonstrated that the experimental group experienced significantly greater improvements in pain reduction, shoulder function, and range of motion compared to the control group.These findings suggest that incorporating scapular mobilization into the rehabilitation protocol for patients after rotator cuff tendon repair surgery can significantly enhance their recovery outcomes by improving pain relief, shoulder function, and range of motion.

Keywords: Rotator Cuff Tears, Arthroscopy Rotator Cuff Repair, Scapular Mobilization

1.0 INTRODUCTION

The shoulder joint playsan essential role in performing activities of daily living (ADL). Injuries to the shoulder joint can be debilitating due to several reasons. Injuries that affect shoulder joint's functions may affect individual's ADL and quality of life (QOL).Shoulder pain is a common complaint, with point prevalence and lifetime estimates up to 26 and 67%, respectively. One of the crucial muscles that has an important contribution in supporting the functions of the shoulder joint are the rotator cuff muscles(Hodgetts et al., 2021).

Rotator cuff (RC) tear is a prevalent disorder that led to shoulder pain. Up to 70% of doctors' visits related to the shoulder joint are due to RC disorder. Aging is one of the factors that increases the prevalence of RC tendon tears with about only 10% for individuals under the age of 20 to 62% for people above the age of 80 (Gutiérrez-Espinoza et al., 2022).

When conservative treatment for RC tears fails, surgery is typically necessary. Reconstruction (muscle transfer or processed tissue), open or arthroscopic repair, partial repair and/or debridement, and arthroplasty (hemi or reverse shoulder) are surgical possibilities. These operations can be carried out in an open, mini-open, or all-arthroscopic RC repair, according to the preferences of the patient, availability of resources, the surgeon's training, and their surgical expertise. Significant advancements in RC repair procedures have been linked to the widespread use of arthroscopy; at this time, open surgery has been replaced to arthroscopic repair, and has been successfully used to treat over 95% of all RC tears. (Sambandam et al., 2015).

Conservative treatment should be prioritized in partial rotator cuff tears. The goals of the conservative treatment are to reduce pain, eliminate joint motion limitation, enhance shoulder functions, and improve muscle strength. Physical therapy modalities and exercise programs have become increasingly important due to their role in reducing symptoms and improving function. If conservative management fails, surgical procedures are then suggested.The surgical indication is restricted to symptomatic cases that cause loss of function in full-thickness tears (Longo et al., 2021).

The objectives of post-operative rehabilitation encompass the preservation of the repaired muscle and tendon, along with the restoration of shoulder biomechanics and functions. This can be achieved through the careful equilibrium of scapula-thoracic and gleno-humeral force interactions. To determine the appropriate post-operative rehabilitation protocol, several factors should be taken into consideration. Factors such as age, having diabetes mellitus, smoking habits, activity level, tear characteristics, tendon quality, presence of fatty infiltration, muscle atrophy, and the surgical repair technique need to be assessed. These factorsmay affect the healing process and outcomes of the repaired tendonso it is important to check them first (Berton et al., 2021).

Joint mobilization techniques can be used to address joint stiffness and range of motion (ROM) limitations (van der Meijden et al., 2012). Specifically, scapular mobilization is one of the methods that can be used as a management option to relax muscles, realign collagen fibers, and promote scapular motion. Also, it has an analgesic impact associated with the neurophysiological influence (Hashem et al., 2022).

Scapular mobilization proves to be a highly effective approach for alleviating shoulder discomfort, enhancing shoulder ROM, and improving overall shoulder functions. This effectiveness stems from its ability to promote tissue remodeling and increase tensile loading, creating a stretching effect that encourages the reconfiguration of connective tissues, extracellular matrix, and collagen structures. Consequently, this process aids in breaking down adhesions, relieving tension in the scapular muscles, and fostering increased mobility of the scapula. Collectively, these positive effects ideally result in an improvement in shoulder ROM,decreasing in shoulder pain, and an overallimprovement in the functional capabilities of the shoulder(Hashem et al., 2022).

Conventional rehabilitation approaches may focus on the shoulder joint itself, forgetting the scapula's essential role in shoulder joint disorders. The only joint that can be mobilized through shoulder joint therapy is the glenohumeral joint.

Therefore, in the present study, we are planning to reduce shoulder pain from rotator cuff injuries and enhance shoulder functions, we therefore intend to examine the effects of scapula mobilization, strength training of the muscles surrounding the scapula, and improve mobility of shoulder joint.

2.0 RESEARCH DESIGN

A randomized controlled clinical study design was applied at Al-Maqassed Hospital in East Jerusalem in the period of February 2023 to October 2024.The inclusion criteria are patients with the following criteria were included: age group between 18- 60 years, both male and female,the patients who received arthroscopic repair of RCTs , post-operative immobilization 2 weeks.The exclusion criteria are Patients with the following criteria were excluded: osteoarthritis of glenohumeral joint, instability (labrum) injury, past history of shoulder surgery, past history of neck surgery, rheumatoid arthritis, diabetes mellitus,previous scapula dysfunction,external injury combined with upper-limb fracture and Neck disc pathologies.

2.1 Systematic Searching Strategies

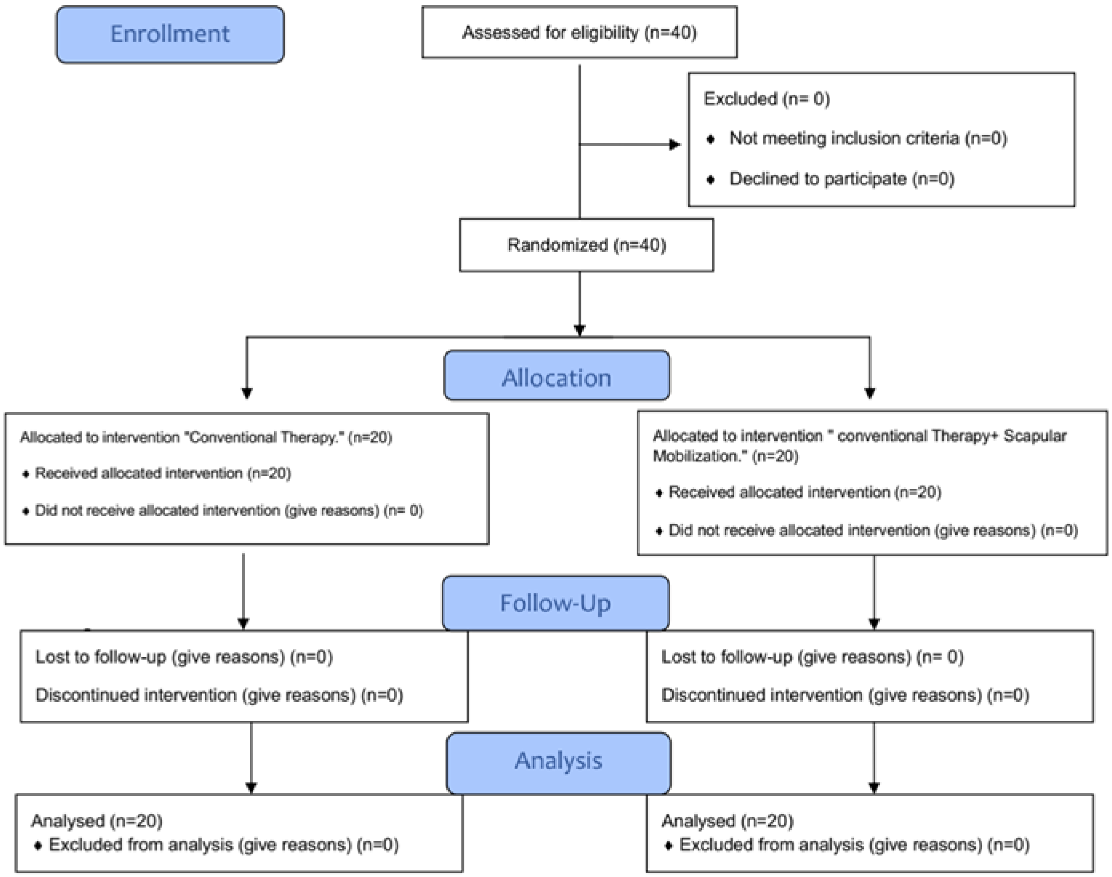

Fig 1: Flow diagram of the study.

2.2 Analysis process

The primary characteristics of the sample were examined using descriptive statistics. Although frequency and percentage were used to represent categorical variables, mean and standard deviation were used to represent continuous variables. The similarity of demographic data between groups was examined using the independent sample t-test. The difference before and after therapy was examined using the Wilcoxon Signed Ranks Test.

The G*Power 3.1.9.4 was utilized to determine the Wilcoxon Signed Ranks Test impact size. The two methods were compared using the Mann-Whitney test. To examine the changes among and between groups, SPSS 24.0 software was utilized.

3.0 RESULTS AND ANALYSIS

Results Related to Demographic Characteristics

This study involved forty participants with a mean age of 52.7 years, divided into two groups: an experimental group and a control group, each comprising 20 individuals. The demographic distribution indicated that 67.5% of participants were males, while 32.5% were females. The experimental group received scapular mobilization, while the control group underwent conventional therapy. Table 4.1 presents the baseline demographics of all patients in both the experimental and control groups. No statistically significant age-related changes were observed between the two groups (p = 0.185). The affected side exhibited a no significant difference between the groups (p = 0.465).

Table 4.1:Comparison of Demographic Characteristics between Groups at Baseline.

SD: Standard deviation, T: t-test value, p-value, probability value.

		Experimental group	Control group	Test statistics	p- value
Age, Mean ± SD		51.45±6.85	54.00±4.94	T=-1.34	0.185
Affected side, n (%)	Right	11 (55%)	12(60%)	Chi-Square=0.303	0.465
	Left	9(45%)	8(40%)		

Results Related to outcome measures

Table 4.2 compares various outcome measures including VAS, CMS, SPADI, and the pain score between the experimental group and the control group both before and after the intervention.

At baseline, the VAS scores were comparable between the experimental group (74.00 ± 15.00) and the control group (69.20 ± 20.70), with no significant difference (p = 0.408). After four weeks of intervention, the experimental group's VAS ratings reduced considerably to 18.00 ± 5.71, representing a 74.5% improvement. The control group demonstrated a less drop in VAS scores (58.50 ± 13.08), resulting in just a 15.4% improvement. After treatment, the experimental group had significantly lower pain intensity compared to the control group (p < 0.001).

According to CMS, at baseline, the CMS was similar between the experimental group (19.95 ± 2.98) and the control group (18.00 ± 3.69), with no significant difference (p-value = 0.091). Following therapy, the experimental group's CMS jumped by 200.6% to 72.70 ± 9.60. The control group's post-intervention score was 31.80 ± 8.91, representing a 76.7% increase. Following scapular mobilization, the experimental group had statistically better functional recovery than the control group (p < 0.001).

Table 4.2: Pain and Shoulder Function Outcomes (VAS, CMS, SPADI) in Experimental and Control Groups Pre- and Post-Treatment

	Group	Experimental group	Control group	Mean difference	Test statistics	p-value
		Mean ± SD	**Mean ± SD**			
VAS	Pre- treatment	74.00±15.00	69.20±20.70	4.8	T=0.84	0.408
	Post-treatment	18.00±5.712	58.50±13.08	-40.5	T=-12.68	<0.001
	Mean difference	56	10.7			
	Percent of changes %	74.5	15.4			
	Test statistics	T= 18.11	T=2.53			
	P -value	<0.001	0.018			
CMS	Pre- treatment	19.95±2.98	18.00±3.69	1.95	U=137.50	0.091
	Post-treatment	72.70±9.60	31.8±8.91	40.9	U=0.001	<0.001
	Mean difference	-52.75	-13.8			
	Percent of changes %	200.6	76.7			
	Test statistics	Z=-3.92	T=-7.49			
	P -value	<0.001	<0.001			
SPADI	Pre- treatment	40.40±3.42	42.00±4.99	-2.40	T=-1.18	0.245
	Post-treatment	5.20±4.37	36.50±4.77	-31.3	T=-21.31	<0.001
	Mean difference	35.2	5.5			
	Percent of changes %	87.1				
	Test statistics	T=30.40	T=9.63			
	P -value	<0.001	<0.001			
Pain Score	Pre- treatment	74.95±3.33	71.05±3.83	3.9	T=3.43	0.11
	Post-treatment	6.05±4.75	58.10±7.38	-52.05	T=-26.5	<0.001
	Mean difference	68.9	12.95			
	Percent of changes %	91.9	18.2			
	Test statistics	T=48.99	T=9.64			
	P -value	<0.001	<0.001			

VAS: Visual analog scale, CMS: Constant-Murley Shoulder Outcome Score, SD: Standard deviation, T: t-test value, Z: Wilcoxon Signed Ranks Tes value , U: Mann-Whitney test value, , p-value, probability value.

The SPADI, which assesses pain and functional impairment, showed that the experimental group (40.40 ± 3.42) and control group (42.00 ± 4.99) were statistically comparable at baseline (p-value = 0.245). Following therapy, the experimental group's SPADI score reduced significantly to 5.20 ± 4.37, indicating an 87.1% reduction in pain and disability. The control group improved somewhat, with a post-treatment score of 36.50 ± 4.77, a 13.1% decline. The experimental group showed a statistically reduction in pain and impairment compared to the control group (p < 0.001).

The experimental group had a slightly higher baseline pain score (74.95 ± 3.33) than the control group (71.05 ± 3.83), but the difference was not statistically significant (p-value = 0.11). The intervention significantly reduced pain in the experimental group, with post-treatment score decreasing to 6.05 ± 4.75, or a 91.9% reduction. The control group saw a much smaller drop, with a post-treatment pain score of

58.10 ± 7.38, indicating an 18.2% improvement. The post-treatment difference between groups was substantial ($p < 0.001$), with the experimental group demonstrating a larger reduction in overall pain score. In general, the experimental group that underwent scapular mobilization reported considerably higher improvements in all variables VAS, CMS, SPADI, and pain score than the control group. These findings demonstrate the efficacy of scapular mobilization in reducing pain, increasing shoulder function, and decreasing disability in individuals healing from RC tendon surgery.

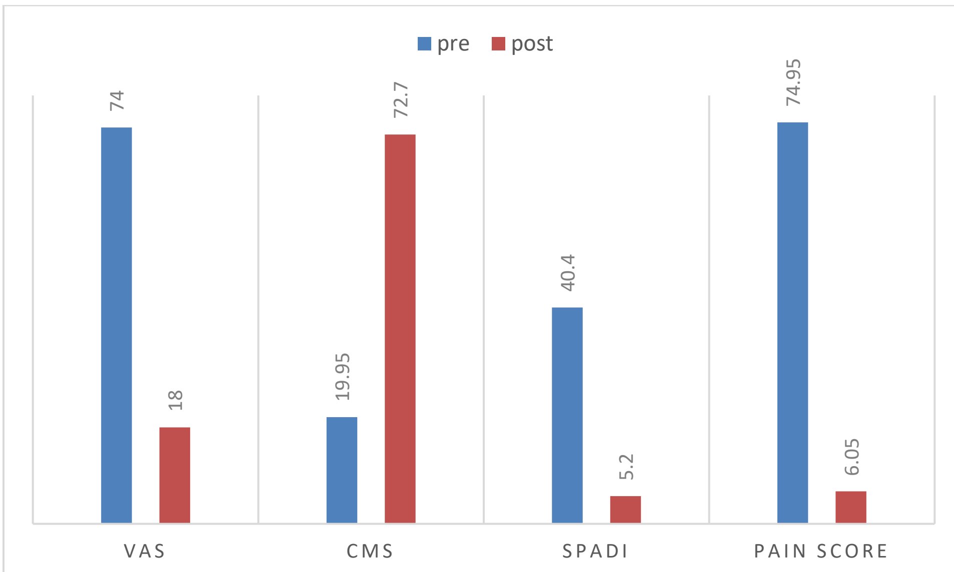

Chart 1: Pre- and Post-Intervention Comparison of Pain and Shoulder Function Outcomes in the Experimental group

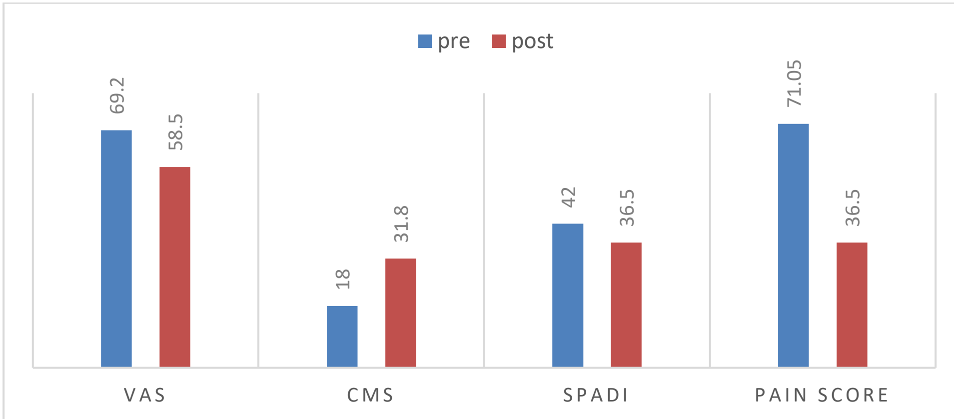

Chart 2: Pre- and post-intervention comparison of pain and shoulder function outcomes in the control group

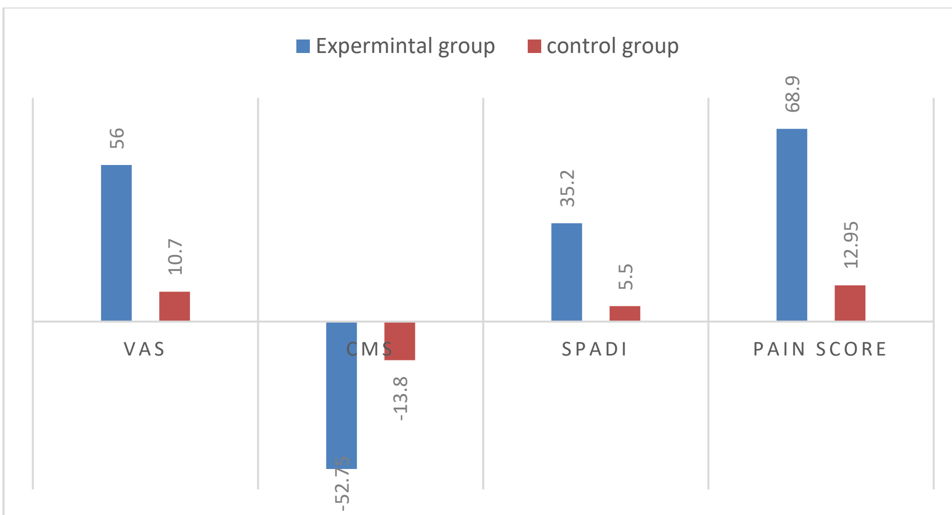

Chart 2: Mean differences in pre- and post-intervention pain and shoulder function outcomes between experimental and control groups

Results Related to shoulder Range of Motion

Table 4.3 shows the average shoulder ROM before to and after intervention for both groups. Initial measurements showed that the experimental group (51.25 ± 11.79) along with the control group (52.25 ± 9.38) had identical shoulder flexion ranges, with no statistically significant difference (p-value = 0.923). Following of therapy, the experimental group increased their flexion range to 178.25 ± 2.44, a 200.4% improvement. In comparison, the control group showed an increase, although their post-treatment flexion range reached only 104.5 ± 21.39, indicating 100% improvement. The experimental group gained more improvement from scapular mobilization, as shown by a statistically significant difference ($p < 0.001$) after therapy.

The experimental group had somewhat greater pre-treatment shoulder extension (17.75 ± 4.72) than the control group (14.50 ± 3.94), but this difference was not statistically significant (p-value = 0.07). Following the intervention period, the experimental group's extension range increased by 200.3%, reaching 59.00 ± 2.05. The control group also improved, but to a smaller amount, with a post-treatment extension range of 30.5 ± 6.06, or a 53.3% increase. The difference between groups after treatment was exceedingly significant ($p < 0.001$).

At baseline, shoulder abduction did not differ significantly between the experimental group (33.75 ± 7.92) and the control group (32.00 ± 7.32) (p -value= 0.541). Following therapy, the experimental group's abduction range increased by 400.25% to 177.25 ± 0.03, indicating significant improvement. The control group reported a mild improvement, with an after treatment abduction range of 70.75 ± 12.59, suggesting a 100.2% increase. After treatment, there was a significant difference between the two groups ($p < 0.001$), indicating that scapular mobilization was more successful in improving abduction range.

For the adduction range, it was comparable between the experimental group (13.30 ± 4.09) and the control group (10.70 ± 4.04), with no significant difference ($p = 0.056$) at baseline. After therapy, the experimental group's adduction increased substantially to 37.75 ± 4.12, or a 100% improvement. The control group also improved, though less significantly, with a post-treatment adduction of 27.50 ± 4.44, or a 100.7% rise. The experimental group had a significant increase in adduction ($p < 0.001$) compared to the other groups.

Pre-treatment external rotation showed no significant difference between the groups, with the experimental group starting at 17.15 ± 5.92 and the control group at 18.45 ± 5.67 ($p = 0.471$). After therapy, the experimental group improved to 87.25 ± 4.12, a 400.08% rise, whereas the control group improved to 39.75 ± 5.95, a 100.15% gain. The experimental group showed more progress in external rotation, as shown by a very significant difference ($p < 0.001$).

The baseline internal rotation was similar between the experimental group (16.70 ± 6.27) and the control group (13.50 ± 4.32), with no statistically significant difference ($p = 0.104$). After therapy, theexperimental group's internal rotation rose to 65.25 ± 5.49, a 200.90% change. The control group improved less significantly, with post-treatment internal rotation of 33.80 ± 6.30, suggesting a 100.50% change. The experimental group outperformed the control group ($p < 0.001$) in terms of internal rotation improvement.

Table 4.3: Range of Motion (ROM) Outcomes for Shoulder Movements in Experimental and Control Groups Pre- and Post-Treatment

ROM degree	Group	Experimental group	Control group	Mean difference	Test statistics	p-value
		Mean ± SD	**Mean ± SD**			
Flexion	Pre- treatment	51.25±11.79	52.25±9.38	-1	U=196.5	0.923
	Post-treatment	178.25±2.44	104.5±21.39	73.75	U=-0.001	<0.001
	Mean difference	-127	-52.25			
	Percent of changes %	200.4	100			
	Test statistics	Z= -3.93	Z=-3.931			
	P -value	<0.001	<0.001			
Extension	Pre- treatment	17.75±4.72	14.50±3.94	3.25	U=123.5	0.07
	Post-treatment	59.00±2.05	30.5±6.06	28.5	U=0.001	<0.001
	Mean difference	-41.25	16			
	Percent of changes %	200.3	53.3			
	Test statistics	Z=--3.95	Z=--3.931			
	P -value	<0.001	<0.001			
Abduction	Pre- treatment	33.75±7.92	32.00±7.32	1.75	U=178.00	0.541
	Post-treatment	177.25±.03	70.75±12.59	99.75	U=0.001	<0.001
	Mean difference	-143.5	-38.75			
	Percent of changes %	400.25	100.2			
	Test statistics	Z=-3.94	Z=-3.931			
	P -value	<0.001	<0.001			
Adduction	Pre- treatment	13.30±4.09	10.70±4.04	2.60	U=129.50	0.056
	Post-treatment	37.75±4.12	27.50±4.44	10.25	U=0.001	<0.001
	Mean difference	-24.45	-18.80			
	Percent of changes %	100.8	100.7			
	Test statistics	Z=-3.94	Z=-3.943			
	P -value	<0.001	<0.001			
External rotation	Pre- treatment	17.15±5.92	18.45±5.67	-1.3	U=174.0	0.471
	Post-treatment	87.25±4.12	39.75±5.95	47.50	U=30	<0.001
	Mean difference	-70.10	-21.3			

	Percent of changes %	400.08	100.15			
	Test statistics	Z=-3.94	Z=-3.948			
	P -value	<0.001	<0.001			
Internal rotation	Pre- treatment	16.70±6.27	13.50±4.32	3.2	U=143.0	0.104
	Post-treatment	65.25±5.49	33.80±6.30	31.45	U=0.001	<0.001
	Mean difference	-48.55	-20.30			
	Percent of changes %	200.90	100.50			
	Test statistics	Z=-3.95	Z=-3.950			
	P -value	<0.001	<0.001			

In general, no statistically significant changes were seen between the two groups regarding shoulder function and range of motion (flexion, extension, abduction, adduction, external rotation, and internal rotation) at pre-intervention ($p > 0.05$). Following the intervention, a statistically significant improvement in shoulder range of motion was measured in the experimental group compared to the other group ($p > 0.001$), as depicted in Table 4.3.

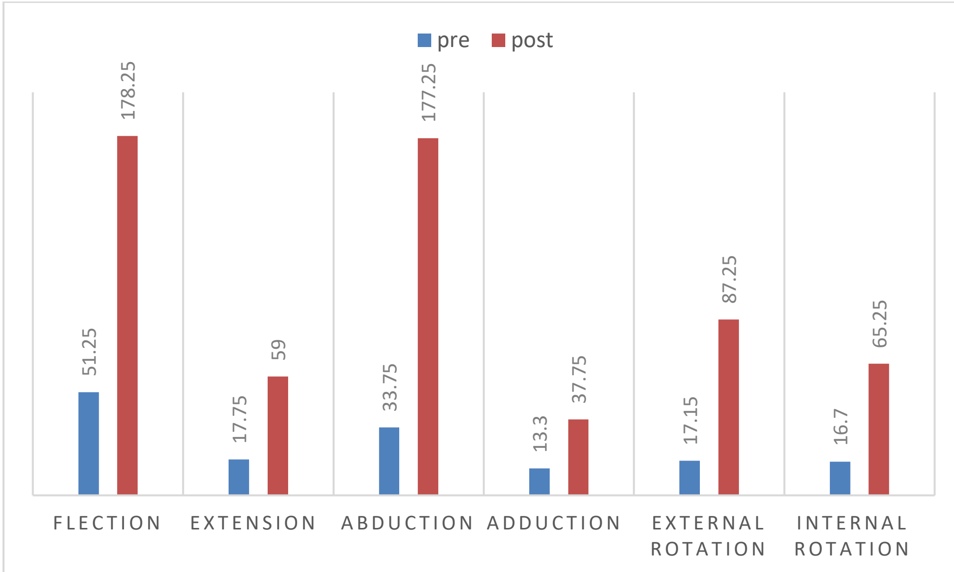

Chart 3: Pre- and post-intervention comparison of ROM outcomes in the experimental group

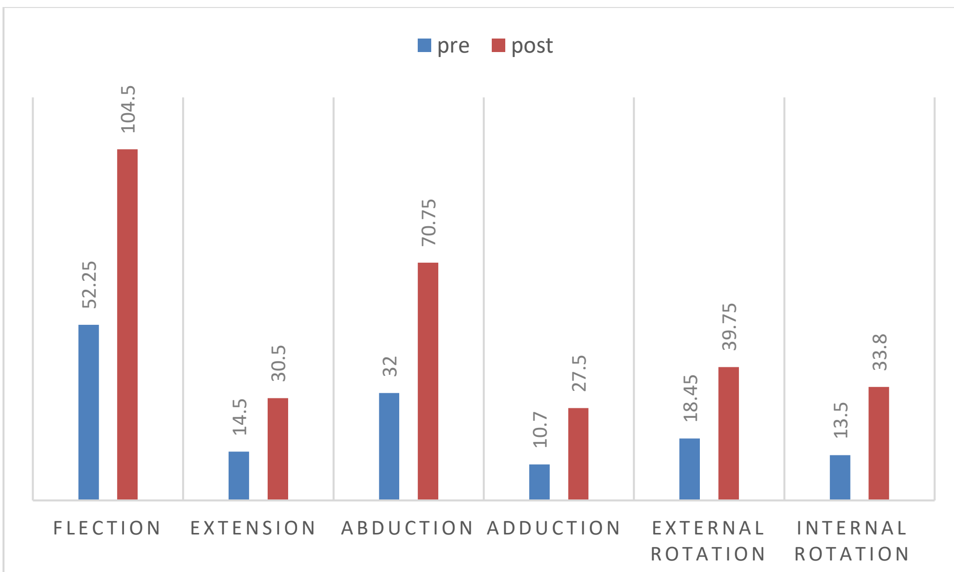

Chart 4: : Pre- and post-intervention comparison of ROM outcomes in the control group

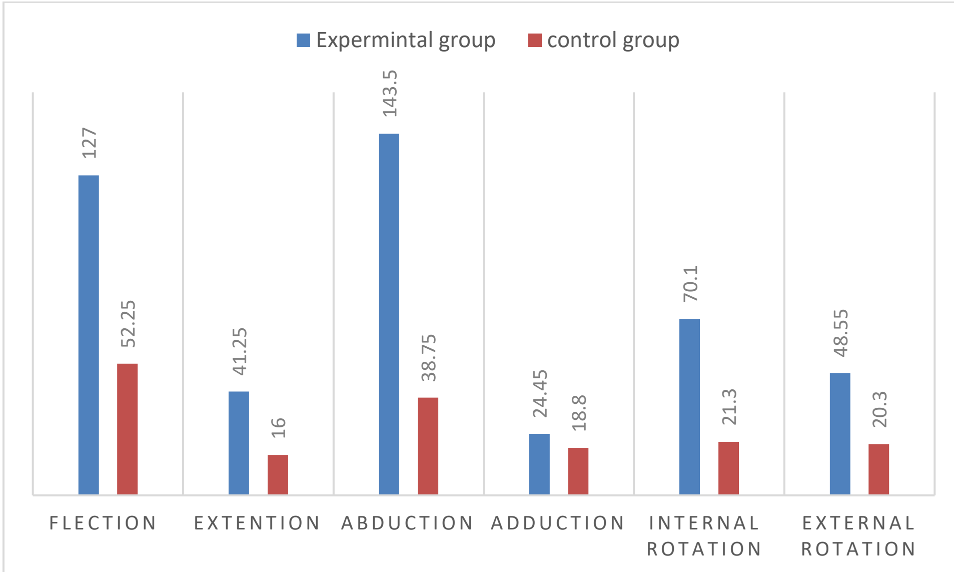

Chart 5: Mean differences in pre- and post-intervention ROM outcomes between experimental and control groups

4.0 DISCUSSION

After ARCR, the main objectives of the rehabilitation protocol are to minimize shoulder stiffness and muscle atrophy, promote healing of the repaired tendons, restore function, and increase shoulder strength and range of motion. There are currently very few high-level evidence-based studies throughout the literature that give close consideration to postoperative rehabilitation protocols and there is still disagreement on the best postoperative protocol to follow.

This study aimed to assess the efficacy of scapular mobilization exercise on shoulder function in the rehabilitation of ARCR patients. The study addresses a significant research gap in the field of rehabilitation protocol of ARCR physiotherapy. This work is important for clinical practice as it provides insights into the effectiveness of this approaches, which could potentially enhance patient outcomes. Prior studies have highlighted the traditional rehabilitation protocol that treatment after ARCR. Which requires a long-term rehabilitation period. These elements include biological, psychological, and environmental influences. It is however, crucial to create treatment strategies that take into account these many factors in order to effectively address the rehabilitation of ARCR.

The direct comparison between the scapular mobilization exercise and conventional therapy in the current study fills in a specific important research gap, which is a big addition to the body of research. The results of the present study are great help for physiotherapists and medical professionals in related fields to choose the best specific rehabilitation protocol of ARCR patients.

The study's sample size was decided through estimation and calculation before it began. It included forty participants, who were separated into two groups: Group A and Group B. The allocation of patients to either Group A, which received scapular mobilization exercise, or Group B, where conventional therapy after ARCR, was determined using randomization.

In this study, the researchers employed independent sample t-tests to assess differences between Group A and Group B in terms of demographic data, including age and affected side. The results suggested that there were no statistically significant age-related changes were observed between the two groups ($p = 0.185$). The affected side exhibited no significant difference between the groups ($p = 0.465$).This indicates that the participants in both intervention groups were different in terms of these demographic data.

Melo et al. (2024) reported a significant effect of specific scapular therapeutic exercises in patients with shoulder pain. The study assessed to evaluate the efficacy of scapular therapeutic exercises, either by one another or in combination with a baseline intervention, in conditions including shoulder pain, taking into consideration factors related to scapular motor control, shoulder function, and shoulder pain.The study involved a systemic review with meta-analysis was performed in April 2023 in five main databases (EMBASE; Cochrane Library; MEDLINE via PubMed; Web of Science; PEDro), in the database of the World Health Organization (WHO ICTRP), and in the US National Institutes of Health.According to the meta-analysis, scapular therapeutic exercise methods are better than other methods in terms of improving shoulder function post-intervention. It also found that the benefits of adding scapular exercises to the control interventions when the protocol has a total duration of 6 or more weeks and/or when a maximum of 30 repetitions of each exercise are done.

The present study's findings align with the results of randomized controlled trial conducted by Antari et al.(2021), which demonstrated the efficacy of adding scapulothoracic joint mobilization in increasing the range of motion and functional ability. This trial supported the use of scapulothoracic joint mobilization as an effective intervention, showing a significant reduction in pain among 12 patients with frozen shoulder after four weeks of follow-up, with treatment given three times per week. The finding suggests that the addition of scapulothoracic joint mobilization increases the range of motion and reducing disability in the shoulder joint.

In addition to pain, Dhungana et al (2024) evaluates the effectiveness of scapular therapeutic exercises, performed in addition to a baseline intervention in shoulder range of motion and pain relief are consistent with the physiological effects of the mobilization techniques used.The results of this study showed importance of integrating scapular and shoulder end-range mobilization techniques into the rehabilitation protocol. Post-operative stiffness following arthroscopic SLAP and Bankart surgery both seem to be useful in reducing pain and improving functional outcomes, which supports their inclusion in comprehensive physiotherapy programs. Additional information about the effectiveness and optimization of these interventions in clinical practice may be obtained through investigating their long-term effects and how they affect quality of life.

At the study there was a statistically significant considerably higher improvements in all variables VAS, CMS, SPADI. This improvement demonstrated how well efficacy of scapular mobilization in reducing pain, increasing shoulder function, and decreasing disability after ARCR. This finding aligned with recent research by (Rezaie et al., 2024), they demonstrated that adding scapulothoracic joint rehabilitation to conventional physiotherapy for improved patients' pain, function, range of motion (ROM), quality of life, and outcome of treatment after shoulder arthroscopic rotator cuff tendon repair (ARCR).This trial supported the use of scapulothoracic joint mobilization as an effective intervention, showing a significant reduction in pain among 14 patients with shoulder arthroscopic rotator cuff tendon repair (ARCR). After twelve weeks of follow-up, with treatment given three times per week. And treatment effectiveness was assessed both pre- and post-intervention, along with a 3-month follow-up. The results indicate that addition of scapulothoracic joint mobilization improving quality of life, disability, pain, range of motion, and treatment efficacy in patients after ARCR.

In the current study, there was a statistically significant improvement in shoulder range of motion. Similarly, in the study published in October 2020, they founded an increased emphasis on scapular training exercises led to greater improvements in shoulder range of motion. Zhang et al 2020reported that the combination of scapular training activities and conventional rehabilitation therapies has been shown to be a successful treatment for shoulder dysfunction after rotator cuff injury repair.

Furthermore, the systematic review (Shahzad et al., 2024) on the therapeutic effects of mobilization for adhesive capsulitis, commonly known as frozen shoulder, highlights the significant benefits of mobilization techniques in alleviating pain and enhancing shoulder mobility. The findings indicate that techniques such as Mulligan mobilization are particularly effective, with three out of six studies demonstrating a notable reduction in pain levels among participants. Furthermore, the majority of studies reported improvements in various aspects of range of motion (ROM), including flexion, abduction, and external rotation, with four studies achieving statistically significant results. Despite these encouraging outcomes, the review raises concerns about the overall quality of the included studies. Issues such as inadequate blinding and lack of allocation concealment could potentially compromise the validity of the findings. As a result, while the evidence supports the use of mobilization as a therapeutic intervention for frozen shoulder, the authors emphasize the need for further rigorous research to confirm these results and explore the underlying mechanisms of mobilization.

Based on the above articles, it is obvious that adding the scapular mobilization exercises is effective for people with ARCR. The role of scapular mobilization was superior than other traditional treatments on reducing pain after surgery. Additionally, upper limb disability was significantly reduced after the utilization of scapular mobilization. Moreover, functional ability of the shoulder joint was significantly improved using scapular mobilization. Furthermore, shoulder ROM in all directions was improved significantly after utilizing scapular mobilization.

The study's findings reveal high effect size, indicating strong statistical power. This suggests that scapular mobilization exercises are highly effective in relieving shoulder pain after ARCR. By including the scapula mobilization into treatment protocols, physiotherapists can depend on consistent pain reduction and improve functional ability as evidenced by the current study and earlier numerous studies.

5.0 CONCLUSION

The present study conducted the efficacy of the scapular mobilization exercises for people with arthroscopy rotator cuff repair (ARCR). Our study proved that scapular mobilization was effective in reducing pain and disability and improving functions and range of motion in the shoulder joint after surgery. Therefore, it is recommended to add scapular mobilization to the rehabilitation protocol in the management of people with ARCR.

ACKNOWLEDGEMENT

I thank all the staff of Master Physiotherapy Department, Palestine Ahliya University for their cooperation and kind support throughout my research period. Special thanks to Dr. Suleiman Alfaqih for data analysis and technical assistance. Their extraordinary contributions have greatly improved the quality of this thesis paper.

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