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Comparison of the effects of manual therapy and scapular stabilization exercises on pain, functional status, and quality of life in subacromial impingement syndrome

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ABSTRACT

Aims: This study aimed to determine the effects of manual therapy and scapular stabilization exercises combined with conventional physiotherapy on pain, functional status, and quality of life, and whether they are superior in individuals with subacromial impingement.

Methods: 30 patients between the ages of 25-65 who were diagnosed with subacromial impingement syndrome were included in the study. Individuals were randomized 1:1 to "conventional physiotherapy+scapular stabilization" and "conventional physiotherapy+manual therapy" groups. Individuals' age, gender, medication use, and presence of chronic disease were recorded. The presence of pain was measured by the Visual Analogue Scale, shoulder range of motion was measured by a goniometer, quality of life was measured by Short Form-12 Quality of Life Survey, and functional status was evaluated with the Questionnaire Quick Disability of the Arm, Shoulder, and Hand Problems. The conventional physiotherapy program applied to both groups included electrotherapy, passive and active assisted range of motion exercises, and rotator cuff strengthening exercises. Both groups received a total of 12 sessions of physiotherapy, 3 days per week, for 4 weeks.

Results: 19 females and 11 males, participated in the study. There were no statistically significant differences between the groups at baseline assessment for pain at rest, activity, and night (p=0,37; 0,39; 0,17, respectively), range of motion of shoulder flexion, abduction, internal rotation, and, external rotation (p=0,5; 0,1; 0,91; 0,9, respectively), Questionnaire Quick Disability of the Arm, Shoulder, and Hand Problems score (p: 0,09) and Short Form-12 Quality of Life Survey scores physical and mental component (p=0,23; 0,98, respectively). After treatment, both groups observed positive improvements in pain at rest, activity, and night (p=0,001), range of motion of shoulder flexion, abduction, internal rotation, and, external rotation (p=0,001), Questionnaire Quick Disability of the Arm, Shoulder, and Hand Problems score (p=0,001) and Short Form-12 Quality of Life Survey scores physical and mental component (Group1; p=0,001; 0,001, Group 2; p=0,001; 0,005, respectively). There was no statistically significant advantage among the treatment methods except for shoulder abduction and internal rotation range of motion parameters (p=0,04; 0,009, respectively).

Conclusion: When applied with traditional physiotherapy, both treatment methods provided significant improvements in pain, functional condition, quality of life, and joint motion clarity compared to before treatment. However, the methods applied are not superior to each other. It is important to choose the appropriate technique for the patient in the treatment of subacromial impingement syndrome, and it is useful to prepare personalized, combined programs. It is envisaged that researching more effective exercise methods for patients with subacromial impingement syndrome in the future will increase the usefulness of the treatment.

Keywords: Manual therapy, scapular stabilization, rehabilitation, subacromial impingement syndrome

INTRODUCTION

The shoulder complex is the most mobile joint in the human body. This range of motion is due to the incompatibility between the articular surfaces. This mismatch and increased range of motion make the shoulder joint vulnerable to injury and degeneration.[1]

Shoulder pain is the third most common reason for admission to the orthopedic clinic due to musculoskeletal system problems, and subacromial impingement syndrome is one of the pathologies that most frequently causes shoulder pain. Chronic or recurrent subacromial impingement syndrome negatively affects individuals' quality of life.[2]

Subacromial impingement syndrome is a syndrome that occurs due to reasons such as overuse, insufficient shoulder stabilization, and trauma, and if left untreated, results in movement limitation, functional limitation, and poor quality of life.[3]

While the first stage of this syndrome, which is staged in 3 degrees according to Neer, is reversible, irreversible degeneration is observed in the third stage. 4 Pain, loss of strength and proprioceptive sensation, and functional limitations are common symptoms.[5,6]

Chronic nociceptive stimuli cause cortical delay of motor output and decreased activity of the painful muscle,

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resulting in isometric and isokinetic rotator cuff muscle strength weakness, especially in shoulder abductors and external rotators.[5] Kinesthesia and decreased joint position sense in the affected shoulder are shown to be risk factors for increasing injury.[7] These symptoms cause functional disabilities and negatively affect people's daily living activities, roles, and participation in recreation.[8]

Pharmacological, surgical, and conservative treatments, reduce pain in subacromial impingement syndrome and treat mechanical problems that cause functional limitation. The main aim of the applied treatments is to increase joint range of motion and therefore shoulder mobility by reducing pain and inflammation, to restore normal scapulohumeral rhythm, and to increase quality of life by increasing participation in daily life activities.[9] Conservative treatment includes patient education and protection, modalities, manual therapy techniques, and exercise treatments for stretching, strengthening, postural control, proprioceptive, and neuromuscular control.[2,10-13] Manual therapy is an effective treatment for shoulder pain.[14,15] In addition, although studies on the effectiveness of exercise emphasize that exercise is an important treatment option, the most effective type of exercise remains unclear.[12,16,17]

This study aimed to determine the effects of manual therapy and scapular stabilization exercises combined with conventional physiotherapy on subacromial impingement syndrome, pain, functional status, and quality of life, and whether they are superior.

METHODS

The current study was carried out with the permission of İstanbul Atlas University Non-interventional Scientific Research Ethics Committee (Date: 28.04.2022, Decision No: E-22686390-050.01.04-17615). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

30 patients between the ages of 25-65 who were diagnosed with subacromial impingement syndrome by an orthopedist in Azerbaijan/ Baku were included in the study. The study was carried out in the HB Güven Clinic Physical Therapy and Rehabilitation unit. 18 The purpose and content of the study were explained to the individuals and their verbal and written consent was obtained. Thirty patients diagnosed with SIS by an orthopedist were included in the study.

Individuals were randomized 1:1 to conventional physiotherapy and scapular stabilization (n=15) and conventional therapy and manual therapy (n=15) groups. Individuals who were diagnosed with rheumatoid arthritis, frozen shoulder, cervical radiculopathy, had a previous fracture or operated shoulder joint, had steroid injections within 6 months, Neer 3 stage of SIS, which is considered to be irreversible degeneration phase, presence of additional rotator cuff injuries which requires invasive treatments, and had contraindications to exercise and modalities were excluded from the study.[19]

After recording the sociodemographic characteristics of the individuals such as age, gender, medication use, presence of chronic disease; the presence of pain at night, at rest, and during activity was measured by Visual Analogue Scale (VAS), shoulder joint range of motion was measured by goniometer, quality of life was measured by short form-12 quality of life survey (SF-12), and functional status was evaluated with the questionnaire quick disability of the arm, shoulder and hand problems (Q-DASH).

Visual Analog Scale was evaluated with a horizontal line of 0-100 mm in size and recorded by measuring with a ruler on the left side after the patient marked. High scores are associated with higher pain.[20] Painless and voluntary flexion, abduction, and internal and external rotation movements of the shoulder were evaluated with goniometric measurement. To perform goniometric measurements of shoulder movements, it is imperative to ensure the patient's comfort. The goniometer was meticulously set, and anatomical landmarks were precisely identified. Adjacent body parts were stabilized to isolate shoulder movement. Subsequently, the goniometer is carefully aligned along the axis of the shoulder joint. The patient is then directed to execute the specific shoulder movement, during which the degree of motion is recorded. With the data obtained by this measurement, the data attached to the person's mobility and function can be revealed objectively.[21] In the quality of life evaluation, which was evaluated by SF-12, a higher score between 0 and 100 is associated with a better quality of life.[22,23] Physical function and symptoms were evaluated with Q-DASH, and higher scores were considered to indicate difficulty in performing activity or more severe symptoms.[24,25]

The conventional treatment program was created by compiling studies in the literature examining electrotherapeutic methods for the treatment of subacromial impingement syndrome.[12] As conventional therapy, 20 minutes of TENS, 5 minutes of Ultrasound, and 20 minutes of high voltage intermittent galvanic current have been applied as therapeutic electrotherapy.[10,11,26] In addition to passive and active assistive joint range of motion exercises, in line with the literature, Wand exercises, Codman pendulum exercises, and rotator cuff strengthening exercises were applied.[17] This program was applied to 3 sessions a week for 4 weeks, a total of 12 sessions.[27,28] While the exercises remained the same, exercise duration, intensity, and frequency were modified within the framework of an individualized program according to the progress, treatment compliance, and tolerance of the patient.[29,30]

In addition to the conventional therapy, wall push-up, shoulder wall roll (the elbow is in full extension and the shoulder in 90 degrees flexion, without dropping the ball on the wall, clockwise movement of the shoulder), lawnmower pull, which requires retraction and external rotation of the shoulder during trunk rotation, scapular depression, which is performed by pushing a bed, and transfer of body weight from the unaffected shoulder to the affected shoulder and vice versa exercises has given to the scapular exercises group (group 1).[31-33]

In addition to conventional therapy, scapular mobilization including passive adduction, abduction, elevation, depression, and rotation of the scapula, upper trapezius myofascial release with light pressure for 20 seconds, and posterior and inferior mobilization of the glenohumeral joint was applied to the manual therapy group (Group 2).[34-36]

Statistical Analysis

SPSS v26 (IBM SPSS Statistics Inc., USA) program was used for statistical analysis. The given normal distribution analysis was performed using the Shapiro-Wilk test. Qualitative variables were analyzed with the chi-square test ($\chi 2$). In normally distributed numerical data, the Paired Sample T-test was used for intra-group comparisons, and the Independent Samples T-test was used for inter-group comparisons. Wilcoxon test for within-group comparisons of non-normally distributed or ordinal data, Mann Whitney U test was used for intergroup comparisons. The statistical significance level was accepted as $p<0.05$ for all analyses.

RESULTS

Of the individuals participating in the study, 19 (group 1=9, group 2=10) were female, and 11 (group 1=6, group 2=5) were male. There was no significant difference between the groups in terms of age, gender, height, weight, body mass index, chronic disease existence, and medication use (p=0,86; 0,7; 0,6; 0,45; 0,41; 0,92; 1, respectively).

In the pretreatment assessment, there was no statistically significant difference between groups in terms of the range of motion at rest, activity, and night pain (respectively, p=0.37; 0.39; 0.17), shoulder flexion, abduction, internal rotation, and external rotation (respectively, p=0.5; 0.1; 0,91; 0,9), Q-DASH scores (p=0.09), SF-12 physical component and mental component (respectively, p=0.23; 0.98) (Table 1).

Table 1. Pre-treatment evaluation parameters of Groups 1 and 2

	Group I (n=15)	Group 2 (n=15)	p value
Pain			
VAS rest (mm)	34.07±17.40	28.87±12.06	0.372
VAS activity (mm)	70.67±11.44	72.60±12.77	0.394
VAS night (mm)	71.20±16.38	65.53±18.21	0.171
Range of Motion			
Shoulder flexion (°)	108.06±10.73	110.86±10.51	0.506
Shoulder abduction (°)	89.40±10.97	94.23±10.73	0.105
Shoulder internal rotation (°)	50.13±6.55	50.20±7.01	0.917
Q-DASH			
Shoulder external rotation (°)	60.93±8.19	60.60±7.50	0.901
Q-dash score	68.86±11.44	60.75±15.89	0.097
SF-12			
SF12 - Physical component	28.85±4.16	32.53±6.67	0.237
SF12 - Mental component	41.81±5.61	40.41±12.87	0.983

The results are given as x ± sd. VAS: Visual Analogue Scale; mm: millimeter; °: degree; Q-Dash: Quick DASH (Quick Questionnaire for Arm, Shoulder and Hand Problems); SF12: Short Form-12 Quality of Life Survey

After treatment, patients in both groups had better rest, activity, and night pain (p=0.001), shoulder flexion, abduction, internal rotation and external rotation joint range of motion (p=0.001), Q-DASH scores (p=0.001), SF-12 physical component and mental component (Group 1, p=0.001; 0.001; Group 2, p=0.001; 0.005, respectively) parameters showed a statistically significant difference (Table 2).

Table 2. Comparison of pre-and post-treatment evaluation parameters of Groups 1 and 2

	Group I (n=15)			Group 2 (n=15)		
	Pre-Treatment	Post-Treatment	p-value	Pre-Treatment	Post-Treatment	p-value
Pain						
VAS rest (mm)	34.07±17.40	28.53±14.46	0.001	28.87±12.06	23.13±10.94	0.001
VAS activity (mm)	70.67±11.44	41.33±12.57	0.001	72.60±12.77	37.07±11.59	0.001
VAS night (mm)	71.20±16.38	28.53±14.46	0.001	65.53±18.21	23.13±10.94	0.001
Range of Motion						
Shoulder flexion (°)	108.06±10.73	134.53±13.63	0.001	110.86±10.51	136.40±14.35	0.001
Shoulder abduction (°)	89.40±10.97	109.86±12.02	0.001	94.23±10.73	110.66±10.91	0.001
Shoulder internal rotation (°)	50.13±6.55	63.13±7.50	0.001	50.20±7.01	59.93±6.61	0.001
Shoulder external rotation (°)	60.93±8.19	73.46±7.63	0.001	60.60±7.50	72.40±7.31	0.001
Q-DASH						
Q-dash score	68.86±11.44	41.04±10.60	0.001	60.75±15.89	32.25±11.37	0.001
SF-12						
SF12 - physical component	28.85±4.16	41.38±5.20	0.001	32.53±6.67	42.61±6.44	0.001
SF12 - mental component	41.81±5.61	51.92±4.33	0.001	40.41±12.87	50.94±7.17	0.005

The results are given as x ± sd. VAS: Visual Analogue Scale; mm: millimeter; °: degree; Q-Dash: Quick DASH (Quick Questionnaire for Arm, Shoulder and Hand Problems); SF12: Short Form-12 Quality of Life Survey.

According to the post-treatment intergroup analysis, there were no significant changes in resting, activity, and night pain scores (p=0.93; 0.36; 0.93, respectively), and shoulder flexion and shoulder external rotation joint range of motion values (p=0.66; 0.6, respectively), Q-DASH scores (p=0.8), physical component and mental component parameters of SF-12 scoring (p=0.22; 0.69, respectively). No significant difference was found between the groups (Table 3).

Table 3. Comparison of parameters between groups

	Group I (n=15)	Group 2 (n=15)	p value
Pain			
VAS rest (mm)	-42.66±13.35	-42.40±12.48	0.934
VAS activity (mm)	-28.86±15.06	-24.33±8.82	0.361
VAS night (mm)	-42.66±13.35	-42.40±12.48	0.934
Range of Motion			
Shoulder flexion (°)	26.46±6.95	25.53±5.09	0.662
Shoulder abduction (°)	20.46±6.93	15.93±4.11	0.043
Shoulder internal rotation (°)	13.00±3.56	9.73±2.49	0.009
Shoulder external rotation (°)	12.53±3.81	11.80±1.97	0.6
Q-DASH			
Q-Dash score	-27.82±6.20	-28.50±9.92	0.803
SF-12			
SF12 - physical component	12.53±5.44	10.08±5.98	0.221
SF12 - mental component	10.11±5.29	10.53±11.75	0.694

The results are given as x ± sd. Δ: Delta (difference); VAS: Visual Analogue Scale; mm: millimeter; °: degree; Q-Dash: Quick DASH (Quick Questionnaire for Arm, Shoulder and Hand Problems); SF12: Short Form-12 Quality of Life Survey

Post-treatment shoulder abduction and shoulder internal rotation difference values were significantly higher in group 1 compared to group 2 (p=0.04; 0.009, respectively) (Table 3).

Since the parameter that most causes patients' functional limitations is pain during activity, the actual power of the study is 0.97, and the effect size is 2.5193590, with a 0.05 error rate and 0.95 power, according to the post-power analysis calculated by taking into account the pain parameter at the activity level of the patients.

DISCUSSION

Our study aims to determine the effectiveness of manual therapy and scapular stabilization exercise program and their superiority over each other in patients diagnosed with subacromial impingement syndrome. In the research process, it was aimed to add manual therapy and scapular stabilization exercise programs to conventional physiotherapy practices in patients diagnosed with subacromial impingement syndrome and to compare the results. According to the results of our study, although scapular stabilization exercises and manual therapy applied in addition to conventional physiotherapy have positive effects on pain, function, and quality of life, these applications do not have superiority over each other.

There are different levels of evidence in the literature regarding the usefulness of exercise and electrotherapy agents used in the treatment of shoulder injuries.[37] In their study, Gunay Ucurum et al.[27] compared three different electrotherapy agents (TENS, US, interferential current) given in addition to exercise in the treatment of SIS. It has been shown that all three agents have positive effects on pain, function, and quality of life, but they are not superior to each other.[27] Our study was designed in accordance with the literature with the conventional physiotherapy program it contains. In addition, the data we obtained supports the existing literature.

Pain and limitation of movement, which are the most common symptoms in SIS, often occur during overhead activities and weight bearing. Reducing pain, which also affects functional activity performance, should be the primary goal of treatment.[38] Ginn et al.[39] reported a reduction in shoulder pain with the long-term exercise, mobilization, and modalities they applied to the patients, and they reported a decrease in shoulder pain with the treatment they used. Similarly, Bergman et al.[40] in a study on shoulder pain, showed that both conventional physiotherapy and manual therapy helped a significant reduction in pain levels. Lombardi et al.[41] on the other hand, applied exercise therapy to patients with SIS and reported statistically significant decreases in VAS scores used to assess pain. It was thought that the joint mobilization applied in our study led to an increase in joint range of motion and functionality by activating joint mechanoreceptors and reducing pain.

Surenkok's[42] study reported that scapular mobilization provided significant improvements in shoulder range of motion, scapula upward rotation, and pain. In the study of Turgut et al.[43] the effects of scapular stabilization exercises on scapular kinematics were emphasized and the importance of reducing pain was emphasized. In light of these data, the effectiveness of the scapular mobilization technique and scapular stabilization exercises was compared in our study. Similar results were obtained within the group, but no difference was found between the groups.

Camargo et al.[28] compared manual therapy and exercise training in addition to manual therapy in people with SIS and showed that pain, mechanical sensitivity, and DASH scores improved similarly at the end of the intervention period in both groups. In our study, scapular stabilization and kinematic improvement were thought to be the reason for the increase in functionality and decrease in pain, which was similar and not superior to each other in both groups.

In their systematic review and meta-analysis study, Steuri et al.[44] reviewed 200 studies comparing treatment

strategies in patients diagnosed with SIS. Exercise has been reported to be more effective than doing nothing, and specific exercise has been reported to be more effective than nonspecific exercise for pain and function. For pain, manual therapy was superior to doing nothing or a placebo, while exercise combined with manual therapy was found to be superior to exercise alone.[44] In our study, we observed that scapular stabilization exercises in addition to conventional physiotherapy - which can be defined as specific exercise - and manual therapy in addition to conventional physiotherapy do not have any superiority over each other in terms of pain and function. We think that future studies may contribute to the determination of an effective protocol in the treatment of SIS by adding conventional physiotherapy + scapular stabilization exercise + manual therapy group.

In our study, only shoulder abduction and shoulder internal rotation range of motion values improved more in the scapular stabilization group than in the manual therapy group. However, there was no statistically significant difference between the groups in other parameters, except for the difference in values of shoulder abduction and shoulder internal rotation joint range of motion after treatment. Although the cause of this statistically significant difference, which is detected only in shoulder abduction and shoulder internal rotation, is unclear, it is foreseen that the positive effects of the personalized exercise program on kineziophobia have this condition. To reveal the cause of this difference, detailed randomized controlled studies are required.

To our best knowledge, no study has been found in the literature comparing the effectiveness of manual therapy and scapular stabilization exercise, applied in addition to conventional physiotherapy, on pain, function, ROM, and quality of life in the treatment of SIS. Although our study has strengths, it also has some limitations. The small sample size in our study and the lack of long-term follow-up on the effectiveness of the treatment are the main limitations of the study. In addition, considering the differences in the tissue healing process with age, it is thought that the wide age range of the patients included in the study may affect the results of the study. On the other hand, not having a control group containing only conventional physiotherapy may be among our limitations.

CONCLUSION

The results obtained from the study, in line with the literature, showed that scapular stabilization exercises and manual therapy applied in addition to conventional physiotherapy in patients diagnosed with SIS provided a significant improvement in pain, functional status, quality of life, and joint range of motion compared to the pre-treatment assessment. The additional methods, which were applied as an addition to conventional therapy, were not superior to each other. Results in accordance with the ICF framework were obtained. In this regard, it is important to choose the appropriate technique for the patient, such as patient compliance, joint mobility status, etc., in planning the physiotherapy program for SIS and it would be beneficial to prepare an individualized, combined (exercise, manual therapy, and electrotherapy) program. It is envisaged that researching more effective exercise methods for patients with SIS in the future will increase the usefulness of the treatment.

ETHICAL DECLARATIONS

Ethics Committee Approval: The current study was carried out with the permission of İstanbul Atlas University Non-interventional Scientific Research Ethics Committee (Date: 28.04.2022, Decision No: E-22686390-050.01.04-17615).

Informed Consent: Written consent was obtained from the patient participating in this study.

Referee Evaluation Process: Externally peer reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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