ORIGINAL ARTICLE

CONTENTS

Dynamics of disability and pain indicators under the influence of physical therapy for adhesives capsulitis and myofascial pain syndrome

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ABSTRACT

Aim: To compare the effectiveness of end-range mobilization and therapeutic exercises, used in combination with ischemic compression, on disability and pain indicators among patients with adhesive capsulitis of the shoulder joint and thoracic myofascial pain syndrome.

Materials and Methods: The study involved 68 patients. Goniometry of the shoulder joint, assessment of pain in myofascial trigger points, and the Shoulder Pain and Disability Index questionnaire were used before and after physical therapy. The duration of physical therapy comprised 3 weeks. Physical therapy of the first group of patients consisted of end-range mobilization and ischemic compression. Patients of the second group performed therapeutic exercises and ischemic compression.

Results: Both groups demonstrated positive dynamics of shoulder joint mobility, Shoulder Pain and Disability Index and pain in trigger points. However, the final results of the studied indicators were better in the first group of patients.

Conclusions: Physical therapy based on the combination of end-range mobilization and ischemic compression had a more positive impact on disability and pain indicators for adhesive capsulitis of the shoulder joint and myofascial pain syndrome as compared to the combination of therapeutic exercises and ischemic compression.

KEY WORDS: musculoskeletal system, manual therapy, mobilization, therapeutic exercises, rehabilitation, recovery

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INTRODUCTION

Adhesive capsulitis of the shoulder joint (ACSJ) occurs in 2-5% of the population [1] and leads to serious functional consequences [2]. This disease is more common for people aged 50 to 55, as well as females [3]. Exact causes of ACSJ are usually unknown. Associations have been found with autoimmune disease states, thyroid disease, diabetes, trauma, neurosurgery, cardiovascular disease, and stroke [4]. The causes of mechanical limitation of movement amplitude in the shoulder joint are thickening, fibrosis and adhesion of the capsule [1]. Stiffness, pain, and deterioration of the shoulder joint function lead to problems with performing basic daily activities [4]. Development timeline of ACSJ is usually divided into 3 phases: freezing, frozen, thawing [3]. Recent scientific works mention permanent disability and constant functional limitations among patients with ACSJ [2].

Myofascial pain syndrome (MPS) is a chronic painful disorder characterized by the existence of trigger points (TPs) [5], excessively irritable spots in strained bands of skeletal muscles. These spots are marked by the presence of pain during the stretch, compression, contraction or overload of the tissue [6], which is often distant from the place of its origin and specific for each muscle [5]. Patients with various pathologies of the musculoskeletal system may have latent TPs [7]. The frequency of MPS reaches 95% in pain treatment centers, and the frequency of latent TPs reaches 55% of young adults without symptoms [8]. Some researchers indicate cases of ignoring MPS by clinicians [6].

The presence of long-term pain in patients with ACSJ and high prevalence of MPS make the problem of physical therapy for patients with ACSJ and MPS highly relevant. However, there are currently no studies focused on the search for the most effective interventions in such patients. Physical therapy plays a key role in the treatment of pathologies of the musculoskeletal system [9, 10, 11]. The effectiveness of various physical therapy interventions is studied in patients with ACSJ

or MPS. In particular, ACSJ treatment involves passive and active therapeutic exercises (stretching, pendulum exercises), cold and heat therapy, proprioceptive neuromuscular facilitation, end-range mobilization (ERM) [12]. TPs are treated with heat, ischemic compression (IC), ultrasound, transcutaneous electrical nerve stimulation, extracorporeal shock wave therapy, and various manual techniques [13].

AIM

The aim of the research was to compare the effectiveness of ERM and therapeutic exercises, used in combination with IC, on disability and pain indicators among patients with ACSJ and thoracic MPS.

MATERIALS AND METHODS

PARTICIPANTS

The study involved 68 patients treated at GI "Institute of Traumatology and Orthopedics of the National Academy of Medical Sciences of Ukraine". Ethical consent was provided by the ethics committee of the local institution (protocol No. 2 dated March 30, 2023) and in accordance with the Helsinki declaration. The patients participated in the study completely of their own free will, which is confirmed by their personally signed informed consents. Each patient was personally informed of their responsibilities and rights as well as the possibility to end the study at any time without any consequences and explaining the reasons for their actions. Inclusion criteria and exclusion criteria are presented in previous scientific works [14]. Before the physical therapy, the patients were consulted by an orthopedist-traumatologist and underwent diagnostic tests. The participants were divided into two groups according to the physical therapy they received.

Methods. The active and passive amplitudes of abduction, flexion and rotations in the shoulder joint were measured in all the patients with the help of goniometer before and after the physical therapy. Goniometry was performed in accordance with the guidelines [15]. The amplitude of rotations was measured in the supine position with the shoulder retracted by 15°. Pain in TPs was assessed when applying 2.5 kg×cm2 pressure (using a digital force gauge VTSYIQI) and the highest score among the studied TPs was registered. The assessment was carried out according to a numerical scale before and after the physical therapy.

Shoulder Pain and Disability Index (SPADI) was also used in the study. This questionnaire is quite popular in orthopedics and physical therapy created to assess shoulder-related pain and disability according to functional results of the patients [16]. The SPADI includes 13 items and two subscales. Each item is assessed on a numerical scale from 0 to 10. Pain subscale includes 5 items. Disability subscale includes 8 items. Both subscales range from 0 to 100 points, which is achieved by converting item scores. The total SPADI score corresponds to the mean value of the subscales. Higher scores in the questionnaire items, subscales or total score correspond to a worse level of functional capabilities, more severe disability and pain.

INTERVENTION

The participants were split up into two groups: the first group (G1, n=34) and the second group (G2, n=34).

While consulting G1 patients, the physical therapist informed them of the specifics of performing ERM and IC (particularly, of pain during the procedures, of the necessity to interact with the physical therapist during mobilization of the joint, as well as of the measures to decrease discomfort during the interventions). ERM procedures were performed 5 times a week (20-25 minutes) in order to improve the range of motion in the shoulder joint. Intensive ERM was used up to and including the V degree. The planned duration of the intervention comprised 3 weeks. A full description of ERM is presented in the previous studies [14]. The physical therapist could slightly increase or decrease the number of ERM procedures. Most of G1 participants (82.4%) received 15 procedures. Other patients received either more or fewer procedures: 2.9% - two procedures fewer; 5.9% - one procedure fewer; 5.9% - one procedure more; 2.9% - two procedures more. Thus, the average duration of the physical therapy in G1 comprised 3 weeks.

At their first consultation, G2 patients received information from the physical therapist of the specifics of the therapeutic exercises and IC, watched a demonstration of the exercises by the specialist and conducted a trial performance of the exercises themselves. The exercises were described and pictured in the information booklet for G2 patients. The patients performed pendulum (from 7 to 10 minutes) and stretching exercises (from 15 to 20 minutes) at home twice a day. They also received two scheduled consultations and a final one. A full description of the therapeutic exercises is presented in the previous studies [17]. The duration of the physical therapy program for G2 patients comprised 3 weeks.

The patients of both groups were advised to perform all activities, including household ones, with the maximum possible range of motion in the shoulder joint.

Table 1. Me (25%;75%) indicators of movement amplitude of the shoulder joint during the first and final assessments, degrees

Movement		First assessment		p*	Final assessment		p*
		G1	G2		G1	G2	
Abduction	passive	58.5 (40; 64.3)	54.5 (46.8; 60)	0.404	125.5 (123.8; 126)	89.5 (85.8; 101.3)	<0.001
	active	55.5 (32; 61.3)	50.5 (42.8; 55.5)	0.364	125 (122.3; 126)	86 (83; 97)	<0.001
Flexion	passive	68 (55.8; 93)	67.5 (53.8; 72)	0.527	180 (180; 180)	130.5 (96; 137.3)	<0.001
	active	63.5 (51; 88)	64 (49; 70.3)	0.667	179 (179; 180)	120 (94; 126.3)	<0.001
Internal rotation	passive	15.5 (14; 20.3)	16 (14.8; 19)	0.975	90 (90; 90)	48 (46; 50)	<0.001
	active	12.5 (10.8; 17.5)	12 (11; 14)	0.868	90 (89; 90)	43.5 (41.8; 45)	<0.001
External rotation	passive	18 (16; 21)	18 (16.8; 20)	0.863	90 (90; 90)	48.5 (46; 50)	<0.001
	active	15 (12.8; 17.3)	14 (12.8; 17)	0.423	90 (89; 90)	45 (43; 46.3)	<0.001

Note. * – Mann-Whitney test.

Table 2. Results of comparing the initial scores of the SPADI items in the groups

	Items	Groups		Criterion*	p
		G1	G2		
1	Pain at its worst	9.5 (8; 10)	10 (8; 10)	-0.617	0.537
2	Pain when lying on the involved side	9.5 (7; 10)	9 (6; 10)	-0.448	0.654
3	Pain when reaching for something on a high shelf	10 (7; 10)	9 (7; 10)	-0.351	0.726
4	Pain when touching the back of your neck	9 (6; 10)	9 (6.75; 10)	-0.172	0.864
5	Pain when pushing with the involved arm	10 (6; 10)	9 (8; 10)	-0.196	0.844
6	Difficulty when washing your hair	8 (6.75; 10)	10 (7; 10)	-0.906	0.365
7	Difficulty when washing your back	10 (8.5; 10)	9 (8; 10)	-0.798	0.425
8	Difficulty when putting on an undershirt or jumper	9 (7; 10)	9 (6; 10)	-0.167	0.868
9	Difficulty when putting on a shirt that buttons down the front	7 (5; 9)	7 (5.75; 9)	-0.509	0.611
10	Difficulty when putting on your pants	5 (4; 8)	7 (4.75; 9)	-1.179	0.238
11	Difficulty when placing an object on a high shelf	10 (7.75; 10)	9.5 (8; 10)	-1.026	0.305
12	Difficulty when carrying a heavy object of 10 pounds (4.5 kilograms)	8 (5; 10)	8 (5; 9)	-0.480	0.632
13	Difficulty when removing something from your back pocket	9 (7; 10)	8 (8; 10)	-0.412	0.681

Note. * – Mann-Whitney test.

For MPS therapy, G1 (in the clinic) and G2 (at home) patients performed IC without any assistance. Individual maps of latent and active TPs were drawn up by the physical therapist and handed out to the patients. Patients of both groups received instructions to perform IC for TPs of various locations. Compression of one point lasted half a minute. The patient could turn around and repeat the compression of the point. IC was performed once a day (15-20 minutes). A full description of IC is presented in the previous studies [14].

STATISTICAL ANALYSIS

SPSS Statistics 21 software was used in the study. Compliance with the law of normal distribution was checked by the Shapiro-Wilk test. Median (Me) and upper and lower quartiles (25%; 75%) of the obtained indicators were calculated since the results of the majority indicators did not conform to the law of normal distribution. The Wilcoxon test was used to compare primary and final results in the group of patients (the software converted the criterion into Z value). G1 and G2 groups were compared by means of the Mann-Whitney test (the software converted the criterion into Z value).

RESULTS

The age of the patients was 53.5 (50; 59) years in G1, and 52 (44.8; 62) years in G2 (Z = -0.559; p=0.576). Duration of symptoms comprised 5 (3, 7) months in G1 and 5.3 (3.4, 7.1) months in G2 (Z = -0.868; p=0.385). There were 26 females in G1 and 23 females in G2 (χ^2 = 0.657; p=0.417). The right upper limb was affected by ACSJ in 15 and 16 patients, respectively (χ^2 = 0.059;

Table 3. Results of comparing the final scores of the SPADI items in the groups

	Items	Groups		Criterion*	p
		G1	G2		
1	Pain at its worst	2 (1; 3)	6 (5; 7)	-6.134	<0.001
2	Pain when lying on the involved side	1.5 (1; 2)	4.5 (4; 5)	-6.305	<0.001
3	Pain when reaching for something on a high shelf	2 (0.8; 2.3)	5 (4; 6.3)	-6.186	<0.001
4	Pain when touching the back of your neck	1 (0; 2)	5 (4; 5)	-5.932	<0.001
5	Pain when pushing with the involved arm	1 (0.75; 2)	5 (4; 6)	-6.083	<0.001
6	Difficulty when washing your hair	1 (0; 2)	6 (4; 7)	-5.625	<0.001
7	Difficulty when washing your back	1 (0; 2)	6.5 (6; 8)	-6.685	<0.001
8	Difficulty when putting on an undershirt or jumper	1 (0; 2)	6 (5; 8)	-6.831	<0.001
9	Difficulty when putting on a shirt that buttons down the front	0 (0; 1)	5 (4.8; 7)	-6.641	<0.001
10	Difficulty when putting on your pants	0 (0; 0)	6 (3; 7)	-6.551	<0.001
11	Difficulty when placing an object on a high shelf	1 (0; 1)	6 (5; 8)	-6.738	<0.001
12	Difficulty when carrying a heavy object of 10 pounds (4.5 kilograms)	1 (0; 2)	5 (3; 7)	-5.830	<0.001
13	Difficulty when removing something from your back pocket	0 (0; 1)	6.5 (5; 7)	-7.140	<0.001

Note. * – Mann-Whitney test

p=0.808). The shoulder joint of the dominant upper limb was affected in 14 patients from G1 and 16 patients from G2 (χ^2 = 0.239; p=0.625).

One patient from G2 had received a steroid injection before consultation with a physician; there were no such patients in G1 (χ^2 = 1.015; p=0.314). One patient from G1 had previously received physical therapy, while G2 had no such patients (χ^2 = 1.015; p=0.314). 32.3% of patients from G1 and 38.2% of patients from G2 received steroid injections after consultation with an orthopedist-traumatologist (χ^2 = 0.258; p=0.612). Two patients from G1 and one patient from G2 took nonsteroidal anti-inflammatory drugs during the course of physical therapy (χ^2 = 0.350; p=0.554).

The results of the first goniometry measurement did not differ in patient groups (Table 1). According to the Wilcoxon test, both groups showed positive dynamics in the mobility of the shoulder joint (p<0.001). The final results were better in G1.

Both groups of patients had similar results of the SPADI items during the first assessment (Table 2). The results of the Pain subscale during the first assessment were 91 (69, 100) points in G1 and 88 (67.5, 100) points in G2 (Z = -0.319; p=0.750). The results of the Disability subscale were 84.4 (65.3; 89.7) points and 82.5 (62.5; 95) points, respectively (Z = -0.325; p=0.745). The total SPADI score was 87.7 (65.1, 94.4) points in G1 and 86.8 (64.5, 96.4) points in G2 (Z = -0.172; p=0.864).

According to the Wilcoxon test, both groups of patients had positive changes in all SPADI items, with the final results being statistically different from the initial ones (p<0.001).

Subscale results and the total SPADI score also improved significantly in both groups of patients. The final statistical results of the Pain subscale decreased to 16 (5.5, 24) points (Z = -5.088; p<0.001) in G1. The results of the Disability subscale decreased to 6.9 (3.1; 15) points (Z = -5.087; p<0.001). The total SPADI score decreased to 10.7 (3; 17.7) points in G1 (Z = -5.087; p<0.001). In G2, the final statistical results of the Pain subscale decreased comparing with the initial ones to 50 (44; 53) points (Z = -5.089; p<0.001). The results of the Disability subscale also decreased to 56.9 (45; 74.1) points (Z = -5.090; p<0.001). The total SPADI score decreased to 52.4 (45.7, 63.8) points in G2 (Z = -5.087; p<0.001).

At the same time, comparison of the final results of the patient groups established statistical differences in all SPADI items according to the results of the final assessment (Table 3). G1 had statistically better results. Accordingly, G1 had better final results of the Pain subscale (Z = -6.409; p<0.001), the Disability subscale (Z = -6.784; p<0.001) and total SPADI score (Z = -6.760; p<0.001) as compared to G2.

Specifics of the changes in the distribution of the total SPADI score in patient groups during both assessments are shown in Fig 1.

Pain in TPs during the first assessment did not differ between patient groups, with Me (25%; 75%) indicators being 9 (9, 9) points in both groups (Z = -0.680; p=0.497). The analysis of the final results revealed better results in G1 (Z = -2.789; p=0.005). Pain in TPs during the final assessment was 3 (3; 4.3) points in G1 patients and 4 (4; 4.3) points in G2. At the same time, both groups had better final indicators than the initial ones (p<0.001).

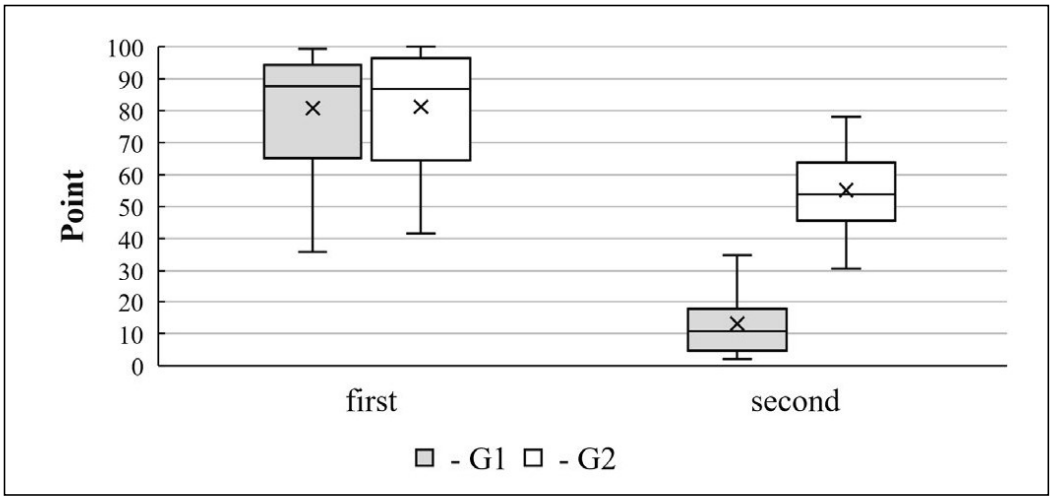

Fig 1. Distribution of the total SPADI score during the first and second assessments in patient groups

DISCUSSION

Both groups had positive dynamics of shoulder joint mobility, SPADI and pain indicators in TPs. However, the use of ERM with IC was more effective as compared to the use of therapeutic exercise with IC. At the same time, it should be noted that the difference in the final indicators of pain in TPs was less significant, which can be hypothetically explained by the influence of two factors: the use of the same MPS therapy in the groups; different dynamics of improving mobility in the shoulder joint and its functional capabilities.

There are no studies comparing the impact of combined physical therapy interventions for patients with ACSJ and thoracic MPS on functional capacity, disability, and pain indicators. However, the impact of shoulder mobilization and therapeutic exercises on pain and disability scores has been studied in patients with ACSJ, and the effectiveness of IC – among patients with MPS.

Having analyzed and compared the effectiveness of passive stretching exercises and mobilization (ERM and scapular mobilization) for ACSJ, S.S. Maarouf et al. [18] established the advantages of mobilization according to the indicators of the SPADI subscales, and the amplitude of movements for flexion and abduction. A. Anitha et al. [19] confirmed the effectiveness of including ERM in the conventional treatment protocol. The researchers found a positive impact on the mobility and scores of the Disabilities of the Arm, Shoulder and Hand questionnaire.

At the same time, the obtained data are consistent with the results of G.Y. Kumar et al. [20], who confirmed the improved dynamics of disability in ACSJ caused by adding mobilizations (3-4 grade) and exercises for scapular stabilization to the ordinary therapy program. The obtained results are consistent with the conclusions of A. Razzaq et al. [21], who indicate the effectiveness of mobilization on disability and joint mobility as compared to the muscle energy technique.

The results of H.A. Qadri [22] also confirmed the effectiveness of ERM on reducing SPADI in patients with ACSJ.

The effectiveness of IC has been studied in many scientific works. For example, one of the recent studies confirmed the effectiveness of IC on improving pressure pain threshold, range of motion, and disability [23]. Another study also confirmed the effectiveness of IC in the therapy of TPs in the sternocleidomastoid muscle according to the indicators of intensity, frequency and duration of headache, pressure pain threshold, and TPs area [24]. Adding IC to TPs therapy improves pain assessment and pressure pain threshold [25].

The obtained results are consistent with the results of the previous studies and complement the findings of the abovementioned scientists regarding the effectiveness of ERM and therapeutic exercises in ACSJ, as well as the effectiveness of IC in TPs therapy among patients with MPS.

CONCLUSIONS

Physical therapy based on the use of ERM and IC had a more positive effect on the indicators of disability and pain in ACSJ and MPS as compared to therapeutic exercises and IC.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest

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