



The effectiveness of manual therapy in supraspinatus tendinopathy

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Objectives: The aim of this randomized controlled study was to assess the efficacy of manual therapy in the treatment of patients with symptomatic supraspinatus tendinopathy.

Methods: Seventy-seven patients (age range, 30 to 55 years) with supraspinatus tendinopathy, were randomly assigned to one of the three treatment groups: a supervised exercise program (Group 1), a supervised exercise program combined with joint and soft tissue mobilization (Group 2), or a home-based rehabilitation program (Group 3). All patients had rehabilitation for 12 weeks. Pain level was evaluated with a visual analogue scale (VAS) and the range of motion (ROM) was measured with a goniometer. The Modified American Shoulder and Elbow Surgery (MASES) score was used in functional assessment. Flexion, abduction, internal and external rotation strengths were measured with a manual muscle test. All patients were evaluated before, and at the 4th and 12th week of the rehabilitation.

Results: All groups experienced significant decrease in pain and an increase in shoulder muscle strength and function by both the 4th and 12th weeks of treatment ($p < 0.05$). There was no significant difference between the groups in terms of function ($p > 0.05$). However, the greatest improvement in functionality was found in Group 2.

Conclusion: Supervised exercise, supervised and manual therapy, and home-based exercise are all effective and promising methods in the rehabilitation of the patients with subacromial impingement syndrome. The addition of an initial manual therapy may improve the results of the rehabilitation with exercise.

Key words: Exercise therapy; rehabilitation; shoulder impingement syndrome; supraspinatus tendinopathy.

Subacromial impingement syndrome (SIS) is the most common cause of shoulder pain, constituting 16-40% of all cases.^[1] This problem is frequently seen in the general population and a predisposing factor is resistive overuse.^[1,2] Supraspinatus is the most frequently involved tendon.

The aim of the rehabilitation in SIS is to provide a stable and pain-free shoulder joint with a full range of motion. The mobilization techniques minimize the joint inflammation, edema and pain by improving the circulation and releasing the adhesions. These modalities will also help to reduce voluntary and reflex

joint stiffness of the patients.^[3-6] However, the mobilization methods are not widely used because of their economic costs and impracticality. The current literature has few studies on this subject.

The aim of this randomized controlled study was to assess the efficacy of manual therapy in the treatment of patients with symptomatic supraspinatus tendinopathy.

Patients and methods

Seventy-seven patients (age range, 33 to 55 years) with partial supraspinatus tear (Stage 1) and/or SIS

diagnosis were included in this study at the Hacettepe University, Physiotherapy and Rehabilitation Department. The study was approved by the institutional review board and all the patients provided written consent. The inclusion criteria for the study was the presence of an SIS or Stage 1 rotator cuff tear, diagnosed by clinical examination and magnetic resonance imaging (MRI).

Patients with shoulder trauma, shoulder instability, frozen shoulder history, acromioclavicular and glenohumeral joint problems, calcified tendonitis, shoulder surgery and/or with a history of disease in the hand, wrist or in the cervical region, and patients who had had a physical therapy and rehabilitation program within the last two years were not included in this study.

The patients were randomly assigned by the SPSS software to one of the three conservative treatment groups. The patients in Group 1, the supervised exercise group (n=25; mean age: 48 years), were given glenohumeral and scapulothoracic exercises three times a week, under supervision of a physiotherapist. The patients in Group 2, the manual treatment group (n=30; mean age: 50 years), had joint and soft tissue mobilization exercises three times a week, in addition to the exercises of Group 1. The patients in Group 3, the home-based exercise group (n=22; mean age: 48 years), were given a self-exercise program at home. All patients underwent rehabilitation for 12 weeks.

The patients in all 3 groups had range of motion, stretching and strengthening exercises for the rhomboid, levator scapulae, serratus anterior and rotator cuff muscles. The exercise instructions were given by a physiotherapist and the patients were provided a leaflet which informed them about the specifics of the exercise program. The patients in Group 1 and Group 2 were supervised by a physiotherapist during the rehabilitation. In all groups, sporting activities were not allowed for 12 weeks. All exercises were done daily with 3 sets of 10 repetitions.

Manual treatment consisted of deep friction massage on the supraspinatus muscle, radial nerve stretching, scapular mobilization, glenohumeral joint mobilization, and proprioceptive neuromuscular facilitation techniques.

All patients were evaluated before the treatment and on the 4th and 12th weeks. Night pain, rest pain and pain with movement were assessed with a 10-cm

visual analogue scale (VAS). VAS measurements were repeated before the treatment, and on the 4th and 12th week follow-ups.^[7] The shoulder range of motion (ROM) was measured with a goniometer and degrees of restriction were recorded.^[8,9]

Shoulder muscle strengths were measured by Dr. Lovett's manual muscle test, assessed on a scale of 0 to 5.^[4,8,9]

Neer and Hawkins tests were used for the clinical diagnosis of the SIS.^[4,8,10] The shoulder stability was assessed by the sulcus sign, and apprehension and relocation tests.^[8,11]

The sensitivity of the supraspinatus, infraspinatus, the subscapularis and the biceps tendon was also assessed during the physical examination. The patients were functionally evaluated by the modified American Shoulder and Elbow Surgeon's (MASES) questionnaire.^[12-14] The reliability of test-retest (ICC=0.84) and internal consistency (Cronbach's alpha=0.86) values were found within an acceptable range.^[15]

Statistical analysis

SPSS for Windows version 11.5 was used in the statistical analysis. The p values, less than 0.05, were considered significant. The normality of the data distribution was assessed by the Shapiro-Wilk test. The data showing normal distribution was assessed with one-way analysis of variance and the data without normal distribution was assessed with the Kruskal-Wallis test. Analysis of variance and Friedman test were used for comparisons. Qualitative variables were compared with the chi-square test. Changes in time were assessed by the Cochran Q test and the McNemar test was used for comparison.

Results

The groups were homogenous for the average age, height, weight, and pain intensity of the patients before treatment (p>0.05) (Table 1).

Table 1. Demographic data of the patients.

Parameters	Treatment groups			P
	Group 1 $\bar{X} \pm SS$	Group 2 $\bar{X} \pm SS$	Group 3 $\bar{X} \pm SS$	
Age (year)	48.2±7.9	50.5±10.6	48.0±9.0	0.562
Height (cm)	164.8±9.8	166.1±9.2	169.2±9.4	0.219
Weight (kg)	72.5±13.8	73.2±10.0	73.8±10.7	0.923

In all groups, there was a statistically significant improvement in shoulder functions and reduction in pain ($p < 0.05$). There was no significant difference between the pain levels of the groups ($p > 0.05$). While the night pain improved faster in the manual therapy group (Group 2) the difference was not significant ($p > 0.05$) (Fig. 1). The pain with movement similarly decreased in the manual therapy group in the Week 4 assessment. However, there was again no difference between the groups in the Week 12 assessment. There was no significant difference between rest pains of the groups ($p > 0.05$). At the end of treatment, all groups had a significant pain relief ($p < 0.05$) (Fig. 2).

There was no significant difference between the shoulder range of motions of the groups ($p > 0.05$), while all groups showed a significant increase in the range of motion with treatment ($p < 0.05$). There was no significant difference between muscle strengths of the groups, while all groups showed a significant increase in the strength of the rotator cuff muscles with treatment ($p < 0.05$).

There was no significant difference between the groups in the rate of positivity of impingement, tendon tenderness (Table 2) and instability tests. The rate of positive tests was significantly decreased with treatment ($p < 0.05$).

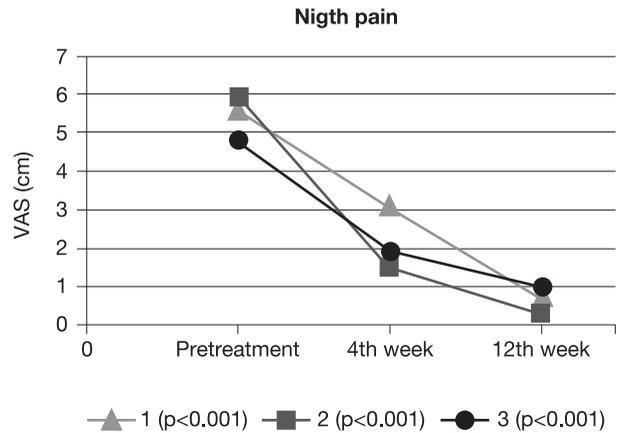


Fig. 1. The mean night pain level of the groups.

Table 2. The number and rates of the patients with a positive supraspinatus tendon test.

Group	Supraspinatus tendon test						
	Pre-treatment		4th week		12th week		P
	n	%	n	%	n	%	
Group 1 (n=30)	29	96.7	13	43.3	6	20.7	<0.001
Group 2 (n=22)	18	81.8	12	54.5	5	31.3	<0.001
Group 3 (n=25)	25	100	10	40.0	7	36.8	<0.001
P (Chi-square)	0.280		0.580		0.453		

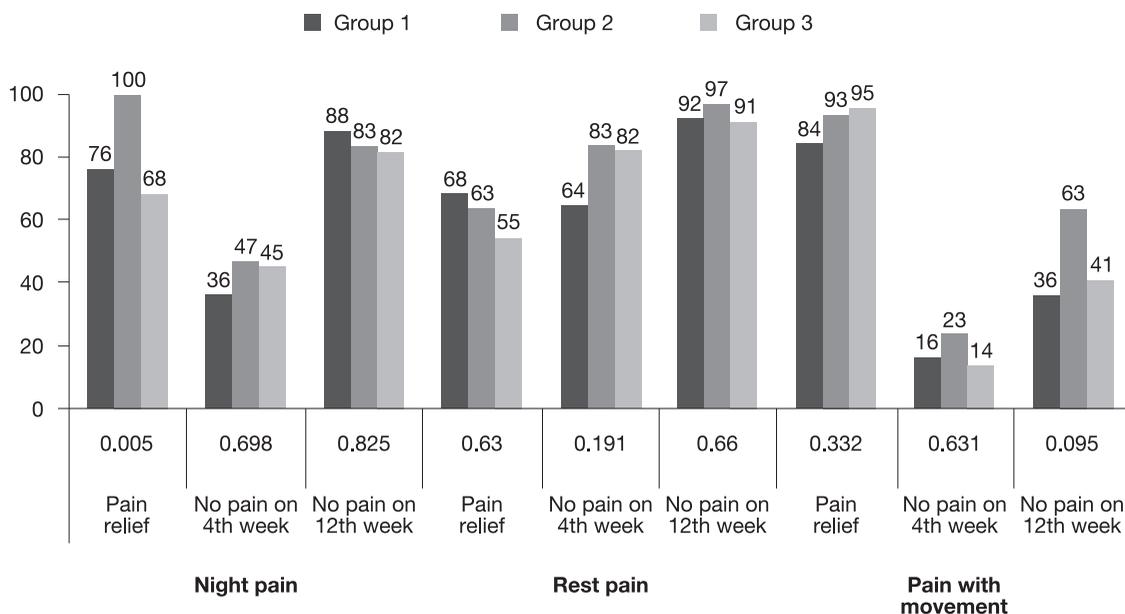


Fig. 2. The percentage of the patients with pain relief and no pain at the 4th and 12th week follow-ups.

The groups showed a significant difference in their MASES score at 4 weeks, while there was no difference at the 12 week follow-up ($p>0.05$) (Fig. 3).

At the 12 week follow-up, the best results were seen in the manual therapy group ($p<0.05$) and there was no difference between the two other groups.

Discussion

Most studies did not reveal a difference between the conservative and operative treatment of supraspinatus tendinosis.^[16-18] The effectiveness of the exercise treatment has been proven in several studies.^[19-21] Our results supported these conclusions.

The supraspinatus has a primary role for the initiation of abduction and its tendinosis can cause a considerable functional restriction.^[22]

In our study, all 3 groups showed a significant decrease in the mean pain level by the end of the treatment. The patients in the manual therapy group showed a faster recovery of night pain than the patients in the other two groups. By 4 weeks, all the patients of the manual therapy group showed a significant reduction in night pain, with 47% having had full recovery. By 12 weeks, the rate of full night pain recovery increased to 83%.

The best results in pain relief and functional recovery was in the manual therapy group.

In previous studies on ROM measurement in SIS patients, no difference in the range of flexion was detected when the measurement was performed with the patients in supine or sitting positions. However, the range of abduction was greater in the supine position.^[23] In our study, the sitting position caused greater difficulty during ROM assessment than the supine position.

It has been advocated that mobilization techniques can be a beneficial treatment of refractory shoulder problems. It has also been proven that exercise programs effectively increase muscle strength.^[24-28] Our findings supported these results.

On their study on rotator cuff tendon injuries during resistive exercises, Lombardi and Troxel found that 13% of the cases had rotator cuff injuries during exercise, with 27% occurring during home-based programs.^[29] During our exercise programs, none of our patients showed signs of rotator cuff injury.

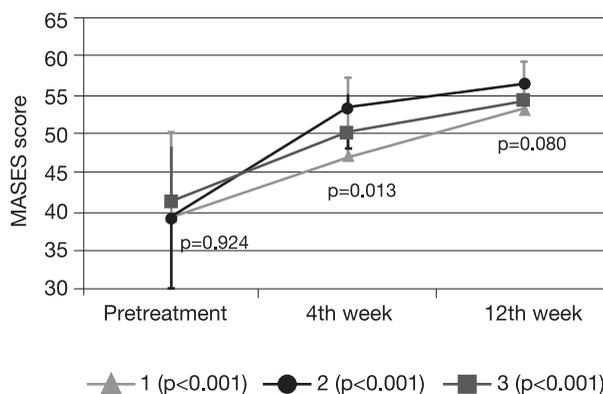


Fig. 3. MASES scores before treatment, at 4th and 12th week follow-ups.

In their study comparing exercises, joint mobilization, laser, ultrasound and acupuncture in the treatment of SIS, Michener et al.,^[30] emphasized the importance of mobilization and exercises. Bergman et al.^[31] found lesser rates of rotator cuff re-injuries with manipulation therapy. Bang and Deyle,^[32] had the best results for pain relief, functional recovery and muscle strength in patients who had manipulative therapy in addition to an exercise program. The manipulative therapy was also found to be useful in the treatment of frozen shoulder.^[33,34] Our findings also support these results.

The deep transverse friction massage was shown to be effective in the early phases of SIS.^[35] Our study supports this finding and shows that a 4-week manual therapy can significantly relieve the symptoms of SIS.

In previous studies, the use of physical therapy, exercise or shoulder orthosis did not result in a significant difference in shoulder strength and pain relief.^[21,36]

Takeda et al.^[37] showed that “empty can” and “full can” were the most effective exercises in supraspinatus strengthening. We introduced the “empty can” exercise to all of our patients and detected a significant increase in muscle strength.

Leggin et al. did not find a difference between the 3 different muscle testing methods and reported that Nicholas’s manual muscle testing was performed in shorter period of time.^[38] We used manual muscle testing because of its practicality.

In conclusion, our study showed the effectiveness of manual therapy in supraspinatus tendinopathy. The use of manipulative therapy may help relieve the pain and increase the shoulder range of motion. It may also shorten the treatment period and reduce the treatment cost. The addition of manual therapy, of at least 3 weeks, should be considered in the treatment of supraspinatus tendinopathy.

Conflicts of Interest: No conflicts declared.

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