

Comparison of conservative exercise therapy with and without Maitland Thoracic Manipulative therapy in patients with subacromial pain: Clinical trial

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Abstract

Objective: To determine the effect of conservative exercise therapy with and without Maitland thoracic manipulation in patients with subacromial pain.

Methods: The randomised controlled trial study was conducted at the Mayo Hospital, Lahore, Pakistan, from June 2015 to February 2016, and comprised patients with subacromial pain (group 1) and controls (group 2). Pre-assessment was done by using numeric pain rating scale and shoulder pain and disability index as subjective measurements, while range of motion was taken as objective measurement. SPSS version 21 was used for data analysis.

Results: Of the 40 participants, there were 20(50%) in each group. The baseline pain intensity on numeric pain rating scale for group 1 was 5.05 ± 1.538 and for group 2 was 5.35 ± 1.137 ; the values later changed to 0.70 ± 0.923 and 2.30 ± 0.979 , respectively. The baseline functional status score according to shoulder pain and disability index for group 1 and 2 was 40.25 ± 12.354 and 43.15 ± 7.343 that changed to 12.30 ± 4.714 and 22.55 ± 5.577 , respectively.

Conclusion: Maitland thoracic spinal manipulation with conservative exercise therapy was more effective than conservative exercise therapy alone.

Keywords: Shoulder impingement syndrome, Manipulation, Spinal, Physical therapy modalities. (JPMA 68: 381; 2018)

Introduction

American surgeon Charles Neer described shoulder impingement as reduced structural space between the head of humerus and the acromion of spine of scapula.¹ Shoulder impingement syndrome is the most common disease of the shoulder region that occurs by bony variations due to rotator cuff (RC) and scapular muscles imbalance and improper posture.² The prevalence of shoulder impingement syndrome is highest (36%) among the people with shoulder pain.³ In Iran, the prevalence of shoulder pain was found to be 41.6% in athletic population.⁴ RC tendinopathy accounts for 69% to 75% of shoulder pain cases.⁵

To describe the occurrence of subacromial pain, the term "regional interdependence" has been used in literature to explain that impairments in far anatomic region can associate patient's symptoms of shoulder pathology.⁶ The aetiology of RC tendinopathy has been portrayed as multifactorial and can be related to a blend of both intrinsic and extrinsic causes. Intrinsic causes that add to RC tendon degeneration are identified as adjustments in its structure, mechanical properties, morphology and

vascularity. Extrinsic factors that can add to the advancement of RC tendinopathy by diminishing the subacromial space incorporate anatomic variations of the acromion, modifications in scapular or humeral kinematics, postural anomalies, deficiencies in the execution of rotator cuff and scapular muscles or diminished flexibility of pectoralis minor or posterior shoulder.⁷

Initial treatment of subacromial impingement syndrome (SIS) and related shoulder issues is prevalently non-surgical, including rest, non-steroidal inflammatory drugs, corticosteroid infusions, and diverse modalities of physical therapy, specifically exercises. In the instance of symptoms not diminishing for over three months, referral to orthopaedic assessment is required.⁸ Numerous rehabilitation modalities exist to treat RC tendinopathy, for example, physiotherapeutic exercises include open chain, closed chain, and a range of motion (ROM) exercises,⁹ manual therapy, and electrotherapy. For practical concerns, multiple strategies for treating shoulder pain disorders are used in clinics but no one is more effective.¹⁰

Maitland postero-anterior mobilisation is frequently used to treat spinal pain. The technique comprises rhythmic, passive and gentle oscillations of the spine, and force and amplitude are applied permitting tissue responses and the individual's condition.¹¹ Thoracic spinal manipulation

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results in pain reduction and physical function improvement in subacromial impingement syndrome patients.¹²⁻¹⁴

The results of one systematic review has shown the impact of physiotherapy with activities in regard to decreasing pain and enhancing functional capacity in patients with SIS.¹⁵ In physical therapy, neck and shoulder pathologies are commonly managed by thoracic spinal manipulation.¹⁶ Physiotherapy interventions for subacromial pain are stretching and strengthening exercises, joint mobilisation and manipulation, scapular and proprioceptive training, taping, acupuncture and physical modalities.¹⁷ The current study was planned to determine the effect of therapeutic exercises with and without Maitland thoracic manipulation in patients with subacromial pain.

Patients and Methods

This randomised controlled trial was conducted in the outpatient physiotherapy department of Mayo Hospital, Lahore, Pakistan, from June 2015 to February 2016, and comprised patients with subacromial pain and controls. Simple random sampling technique was used. Patients were divided into two groups (group 1: experimental, and group 2: control) by even and odd randomisation in which both groups have equal number of participants with a ratio of 1:1. By computer-generated random number table, each participant was assigned a random number. The sample size was measured by using G power priori analysis 3.1 software by assuming power 0.80 with 95% confidence interval (CI) on the difference. The mean difference between groups and effect size were calculated for the pain and function/disability outcomes using the equation:

$$d = \frac{\bar{X}_1 - \bar{X}_2}{\left(\frac{S_1^2 + S_2^2}{2} \right)^{1/2}}$$

In the equation, d = effect size; X1 and X2 are the group means, and S1 and S2 are the group standard deviations.

The effect sizes for studies that showed added benefit from manual therapy intervention ranged from 0.34 to 1.29 for pain measures and 0.34 to 1.66 for function/disability outcomes.¹⁸

The inclusion criteria were: shoulder impingement syndrome with positive physical test, shoulder pain for two to three months, shoulder pain score of at least 3 on the 10-point numeric pain rating scale, age 25-60 years, available documentation of patient consent. In contrast, patients with systemic rheumatic disease, operative interventions on shoulder, spine and thorax, shoulder

arthrosis, concomitant shoulder pathology, cognitive impairments and pregnancy were excluded.

In group 1, patients received thoracic manipulative therapy included 1 non-thrust mobilisation and 3 different thrust manipulation techniques directed at thoracic spine and exercise therapy including hot or cold pack, mobility exercises (flexion and extension exercises with arms in front of the wall, shoulder flexion 90°, and exercises with shoulder circles) and strengthening exercises (resistance exercise with elbow flexion 90° and an elastic band, shoulder flexion with elbow extension holding bar (1-4 kg), body lift from a seated position with elbows extended, and resistance exercises for external rotation).¹⁹ In group 2, patients received conservative exercise therapy including hot or cold pack, mobility exercises and strengthening exercises. Each patient's first assessment was done before the first treatment session and terminal assessment after the sixth treatment session. Patients were treated for two weeks with three sessions per week. Patients were followed for another week for any change in signs and symptoms (Figure).

The patient came to physical therapist either after being referred by an orthopaedic surgeon or by themselves. The therapist assessed patients using Neer impingement test (specificity=30.5, sensitivity=88.7) and Hawkins Kennedy impingement test (specificity=25%, sensitivity=92%).⁽²⁰⁾ The physical therapist completed the assessment after obtaining consent from the patient and then used numeric pain rating scale (NPRS) to measure pain intensity, range of motion for mobility and shoulder pain and disability index (SPADI) for functional status. The study was approved by the institutional ethics committee.

The data were analysed using SPSS version 21. Data was presented in the form of mean ± standard deviation (SD) along with its range, frequency tables, percentages and appropriate graphs. P<0.05 was considered significant. Pre- and post-assessed parameters for pain intensity, ROM and functional status were compared by mean difference. The comparison between pain intensity and functional status for experimental and control groups was done by repeated measures analysis of variance (ANOVA).

Results

Of the 45 patients, 40(88.9%) were included. Of them, there were 20(50%) in each group. The overall mean age was 49.55±9.706 years. Moreover, 22(55%) participants were females and 18(45%) males. Besides, 19(47.5%) participants had right shoulder

Table-1: Baseline demographics.

	Experimental group (n=20)	Control group (n=20)
Age (years)	49.30(9.985)	49.80(9.671)
Gender:		
Male	9(45%)	9(45%)
Female	11(55%)	11(55%)
Side Involved:		
Right	10 (50%)	9(45%)
Left	9(45%)	8(40%)
Bilateral	1(5%)	3(15%)
Duration of Symptoms:		
One month	5(25%)	6(30%)
Two month	6(30%)	7(35%)
Three month	4(20%)	3(15%)
Four month	5(25%)	4(20%)

impingement, 17(42.5%) left and 4(10%) bilateral shoulder involvement. The duration of symptoms was two months in 13(32.5%) cases, one month in 11(27.5%) cases and four months in 9(22.5%) cases (Table-1).

The baseline pain intensity on NPRS for group 1 was 5.05 ± 1.538 and for group 2 it was 5.35 ± 1.137 that was changed to 0.70 ± 0.923 and 2.30 ± 0.979 , respectively. The baseline functional status score according to SPADI for group 1 and group 2 was 40.25 ± 12.354 and 43.157 ± 3.43 that was changed to 12.30 ± 4.714 and 22.55 ± 5.577 , respectively (Table-2).

Repeated measures ANOVA for pain intensity and functional status score within subjects' comparison and between the subjects' comparison was carried out. The

Table-2: Comparison between Pain Intensity and functional Status Score.

	Baseline Mean(SD)	Group 1(n=20) After 2 Weeks Mean(SD)	P-value	Baseline Mean(SD)	Group 2(n=20) After 2 Weeks Mean(SD)	P-value
Pain Intensity (NPRS)	5.05 ± 1.538	0.70 ± 0.923	0.00	5.35 ± 1.137	2.30 ± 0.979	0.00
Functional Status Score (SPADI)	40.25 ± 12.354	12.30 ± 4.714	0.00	43.15 ± 7.343	22.55 ± 5.577	0.00

SD: Standard deviation. NPRS: Numeric pain rating scale. SPADI: Shoulder pain and disability index.

Table-3: Tests of Within-Subjects Contrasts.

Study Group	Source	Pain Intensity	Functional Status	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Experimental group	Pain_Intensity	Linear		10951.200	1	10951.200	193.053	0.000	0.910
	Error(Pain_Intensity)	Linear		1077.800	19	56.726			
	Functional_Status		Linear	5216.450	1	5216.450	206.248	0.000	0.916
	Error(Functional_Status)		Linear	480.550	19	25.292			
	Pain_Intensity * Functional_Status	Linear	Linear	2784.800	1	2784.800	167.335	0.000	0.898
Control Group	Error(Pain_Intensity*Functional_Status)	Linear	Linear	316.200	19	16.642			
	Pain_Intensity	Linear		16849.012	1	16849.012	537.370	0.000	0.966
	Error(Pain_Intensity)	Linear		595.737	19	31.355			
	Functional_Status		Linear	2796.612	1	2796.612	390.309	0.000	0.954
	Error(Functional_Status)		Linear	136.138	19	7.165			
	Pain_Intensity * Functional_Status	Linear	Linear	1540.012	1	1540.012	209.394	0.000	0.917
	Error(Pain_Intensity*Functional_Status)	Linear	Linear	139.738	19	7.355			

df: Difference. Sig.: Significance.

Table-4: Tests of Between-Subjects Effects.

Study Group	Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Experimental group	Intercept	16994.450	1	16994.450	214.043	0.000	0.918
	Error	1508.550	19	79.397			
Control Group	Intercept	26901.112	1	26901.112	649.754	0.000	0.972
	Error	786.637	19	41.402			

df: Difference. Sig.: Significance.

Table-5: Range of motion pre and post treatment statistics.

Active Range of Motion	Study Group	N	Mean	Std. Deviation	Std. Error Mean
Rt_ AROM_flexion_1	Experimental group	20	131.00	33.388	7.466
	Control Group	20	119.50	34.864	7.796
Rt_ AROM_flexion_2	Experimental group	20	161.00	5.525	1.235
	Control Group	20	149.00	14.105	3.154
Rt_ AROM extension_1	Experimental group	20	39.25	11.271	2.520
	Control Group	20	33.25	12.698	2.839
Rt_ AROM_extension_2	Experimental group	20	48.75	4.833	1.081
	Control Group	20	39.25	7.826	1.750
Rt_ AROM_abduction_1	Experimental group	20	127.25	36.255	8.107
	Control Group	20	116.00	36.187	8.092
Rt_ AROM_abduction_2	Experimental group	20	157.50	6.977	1.560
	Control Group	20	142.50	13.908	3.110
Rt_ AROM_external rotation_1	Experimental group	20	40.75	16.802	3.757
	Control Group	20	35.00	10.513	2.351
Rt_ AROM_external rotation_2	Experimental group	20	54.25	10.915	2.441
	Control Group	20	46.25	7.412	1.657
Rt_ AROM_internal rotation_1	Experimental group	20	49.50	17.313	3.871
	Control Group	20	42.75	17.806	3.981
Rt_ AROM_internal rotation_2	Experimental group	20	62.50	9.528	2.131
	Control Group	20	55.00	12.247	2.739
Lt_ AROM_flexion_1	Experimental group	20	130.00	31.954	7.145
	Control Group	20	125.00	31.539	7.052
Lt_ AROM_flexion_2	Experimental group	20	160.50	6.863	1.535
	Control Group	20	147.75	14.910	3.334
Lt_ AROM_extension_1	Experimental group	20	37.90	12.578	2.812
	Control Group	20	34.65	9.965	2.228
Lt_ AROM_extension_2	Experimental group	20	48.40	4.489	1.004
	Control Group	20	41.00	7.363	1.646
Lt_ AROM_abduction_1	Experimental group	20	126.00	30.677	6.859
	Control Group	20	124.00	30.890	6.907
Lt_ AROM_abduction_2	Experimental group	20	157.75	6.781	1.516
	Control Group	20	146.75	13.599	3.041
Lt_ AROM_external rotation_1	Experimental group	20	41.25	12.863	2.876
	Control Group	20	35.50	12.450	2.784
Lt_ AROM_external rotation_2	Experimental group	20	53.25	8.626	1.929
	Control Group	20	45.25	9.525	2.130
Lt_ AROM_internal rotation_1	Experimental group	20	49.00	18.180	4.065
	Control Group	20	46.00	13.822	3.091
Lt_ AROM_internal rotation_2	Experimental group	20	65.25	5.955	1.332
	Control Group	20	56.50	10.650	2.381

Std: Standard

Lt: Left

Rt: Right

AROM: Active Range of Motion

1: Pre-treatment

2: Post-treatment

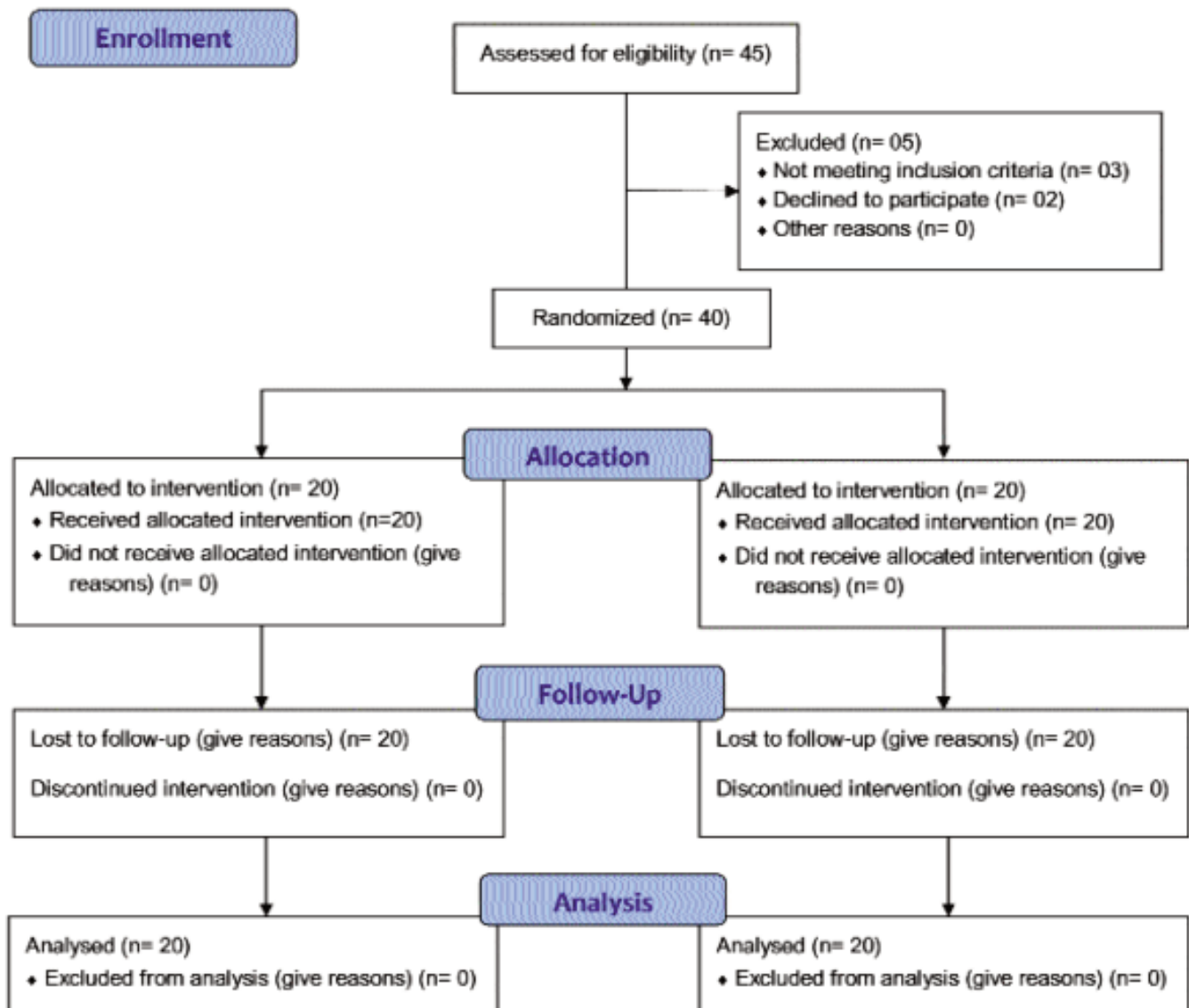


Figure: Consort Flowchart showing the flow of participants through each stage of a randomised trial.

pain intensity and functional status scores after treatment were significant ($p < 0.05$) (Tables 3-4).

Mean values for active ROM of shoulder flexion, extension, abduction, external rotation and internal rotation ranged between 33.25 ± 12.698 and 161 ± 5.525 (Table-5).

Discussion

Our study findings suggest that subacromial pain was more common in females as compared to males. Moreover, the patients of subacromial pain belonged to the age group of 49-50 years because we collected data from a public hospital where the ratio of old

population with shoulder pain was high. In a previous study, the mean age was 31.15 ± 12.2 years.²¹ The duration of onset of shoulder pain symptoms in the current study was 4 to 8 weeks as compared to >12 weeks in a previous study.²¹ The difference can be explained by the fact that about 50% patients in the present study had one- to two-month history of onset of shoulder pain and that the age group differed between the two studies.

Impingement syndrome is the most common cause of shoulder or subacromial pain.² The main findings of this study suggest that thoracic spinal manipulative therapy (SMT) with conservative physical therapy have

greater effect on pain reduction and shoulder functional status improvement in subacromial impingement syndrome than conservative physical therapy alone.

Pain intensity scores in comparison to the control group changed 4.3 points on the numeric pain rating scale from pre- to post-treatment in the experimental group. The difference of change in the NPRS score was more significant in the experimental group. The previous study reported 0.9-point change in score on NPRS by applying thoracic spinal manipulative therapy and 1.5-point change for the sham spinal manipulative therapy group.²¹

The functional status score on the SPADI scale changed by 27.95 points in the experimental group and 20.6 points in the control group. The more improvement was noted in the experimental group in terms of functional status. But in comparison, Penn scale was used that showed a change of 9.2 points in the thoracic SMT group and 11 points in the sham SMT group.²¹ The results of a previous study for functional status showed more improvement in the sham SMT group than in the thoracic SMT group, but the difference was very small and also different scale was used, therefore its results can be compared to our study.

The active ROM for shoulder flexion, extension and external rotation consistently increased from pre- to post-treatment in both groups except left-side abduction (mean difference =31.75) and internal rotation (mean difference =16.25) for the experimental group.

The current study had a few limitations as well. The data was collected from a single department of the hospital; therefore, the results and conclusions had limited applicability. Due to shortage of time, the data was obtained from fewer patients. Moreover, some illiterate and hesitant patients did not give appropriate answers and were less responsive.

Future research is necessary to know the mechanism of thoracic SMT in patients with shoulder pain. There should be a long-term follow-up to check the relation of thoracic manipulation with shoulder impingement syndromes. Besides, future research should examine changes in kinematics or neurophysiologic variables in groups of patients with shoulder pain who respond to thoracic SMT compared to the control group.

Conclusion

The Maitland mobilisation and manipulation with conservative physical therapy for subacromial pain was

better and yielded improved outcome than conservative physical therapy.

Disclaimer: None.

Conflict of Interest: One of the authors was also Incharge of the ethics committee during that tenure. That article has been retrieved from thesis work.

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