

Effectiveness of Routine Physical Therapy with and without Upper Thoracic Sustained Stretch Mobilization in Patients with Subacromial Impingement Syndrome

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Abstract;

Objective: The objective of this research was to evaluate the effectiveness of routine physical therapy with and without sustained stretch mobilization of upper thoracic spine in patients of subacromial impingement syndrome.

Methodology: In total 40 patients diagnosed with subacromial impingement syndrome were recruited in this controlled trial. Patients were randomly allocated in two groups, thoracic mobilization group ($n=20$), Routine Physical Therapy group ($n=20$). The parallel treatment was given to both groups for 4 weeks (3 sessions per week). Outcomes were measured at baseline and after successful completion of 4 weeks treatment. Pain intensity was measured through NPRS, and shoulder physical disability was measured through SPADI. Shoulder abduction and external rotation was measured through goniometry and T1-T4 level thoracic extension through 2 baseline bubble inclinometers. Data were analyzed through SPSS 23.0.

Results: Data were normally ($P>0.05$) distributed in both groups at base line. Both groups have statistically significant ($P\leq 0.05$) improvement for all outcome measures NPRS, SPADI, shoulder abduction and external rotation and thoracic spine extension.

Conclusion: Sustained stretch mobilization of upper thoracic spine (T1-T4) level should be used as adjunct therapy in management of extrinsic factor subacromial impingement syndrome.

Keywords: Routine physical therapy, Subacromial Impingement Syndrome, Shoulder pain syndrome and Thoracic mobilization,

Ethical Approval: This control trial was ethically approved from "Institutional Review Board" of the University of Lahore.

Reference Number:

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I. INTRODUCTION

Subacromial impingement syndrome is repetitive compression or mechanical abrasion of rotator cuff passing through the

subacromial space.(1) It is most prevalent condition accounts for 44-60% of all conditions that cause shoulder girdle pain and functional disability (2) Muscular dysfunction, biomechanical dysfunction and postural derangement are the extrinsic contributing factors in development of SIS. (3, 4) it is frequent cause of shoulder pain, disability and badly affect the quality of life(5).

Patients with SIS develop compensatory pattern of movement at GHJ and intervertebral joints of thoracic spine in order to protect the tissues. Thoracic spine dysfunction influenced the function of shoulder complex therefore treatment focused on thoracic spine accounts shoulder disability and pain. (6) This study provided the basic framework for clinical model utilizing the manual therapy interventions through regional interdependence (RI) model.(7) Altered Biomechanics and functional thoracic spine affects the kinematics of shoulder complex due to induced changes in contractile and non-contractile tissues of shoulder girdle.(1, 8) it is investigated and proved that manual therapy of upper thoracic spine is effective to manage the disorders of shoulder complex. (9) Recently there has been emerging evidence in field of physical therapy. (10) Manual therapy of spine immediately improves the pain for functioning of shoulder. (11)

Therefore this study was designed to investigate the effectiveness of upper thoracic sustained stretch mobilization to manage the symptomatic severity in patients with subacromial impingement syndrome.

II. METHODOLOGY

This randomized controlled trial was conducted at department of Physical Therapy, Bakhtawar Amin Trust and Teaching Hospital, Multan. The sample of n=40 diagnosed with subacromial impingement syndrome were recruited through non probability convenient sampling technique. The sample was calculated through G* power sample size calculator. All recruited subjects were equally divided in two groups thoracic mobilization group (n=20) and routine physical therapy group (n=20). Randomization was performed through online randomization (<https://www.randomizer.org/>) web service.

Inclusion criteria: (I) After taking written informed consent from voluntarily willing participants , (II) diagnosed with subacromial impingement syndrome through radiograph by orthopedic surgeon, (SIS), (II) Both male and female, of age 25-45 years (III)who had at least three positive physical tests from followings Neer impingement test, Hawkins kneddy test, Drop arm test, relocation test and apprehension test were included. (12) (V) Patients often had painful arc between 70° and 120° pain on forced movement above the head. (13) (VI) T1-T4 Extension $\leq 15^\circ$

Exclusion criteria: Patients with (I) history of rotator cuff tear, (II) shoulder and cervicothoracic surgery, (III) fracture, (IV) adhesive capsulitis, (V) abnormal neural response,(1) (VI) and presence of thoracic scoliosis on Adam's forward bend test (14) were excluded.

Outcome measures

The **shoulder pain intensity** was measured at 11 items self-reported numeric pain and rating scale (NPRS)(15) and **shoulder physical disability** was measured at shoulder pain and disability index (SPADI). (11) Shoulder ROM was measured through universal goniometer. **Shoulder abduction** was performed in sitting position. The fixed arm of universal goniometer was placed parallel to median line of thorax and moveable arm was aligned with humerus. Patients were instructed to separate the arm in frontal plane. **Shoulder external rotation** was performed in prone position. The arm of patient was placed in 90° abduction position with 90° flexion at elbow. Fixed arm of goniometer was placed perpendicular the surface while moveable along the line of radius. External rotation was measured by asking the patient to rotate the arm as far as possible.(16) **Thoracic spine (T1-T4) extension** was measured through Baseline bubble inclinometers. Patient was placed prone. One inclinometer was placed at C7 and other was placed at T4. Number dial was organized along with bubble mercury. Patient was instructed to elevate the neck and upper thorax. Measurement on both inclinometers was noted. Then difference of noted degrees were calculated. (1) Both groups were parallel treated for 3 sessions per week for total 12 sessions in 4 weeks. Data were collected at baseline prior to treatment and after every 4 sessions.

Thoracic Mobilization Group

Total 12 sessions of kaltenborn mobilization for the period 4 weeks. The patient was in prone position on manual therapy couch.

Physiotherapist applied central posteroanterior (PA) glide by keeping the elbows straight and (17) using thumb held in spinous process back to back. (18) The mobilization was given beyond transition zone for grade III stretching of joint capsule and soft tissue. Each stretch was sustained for 30-40 second.(19) This procedure was repeated cyclically three times in a session.

Routine Physical Therapy

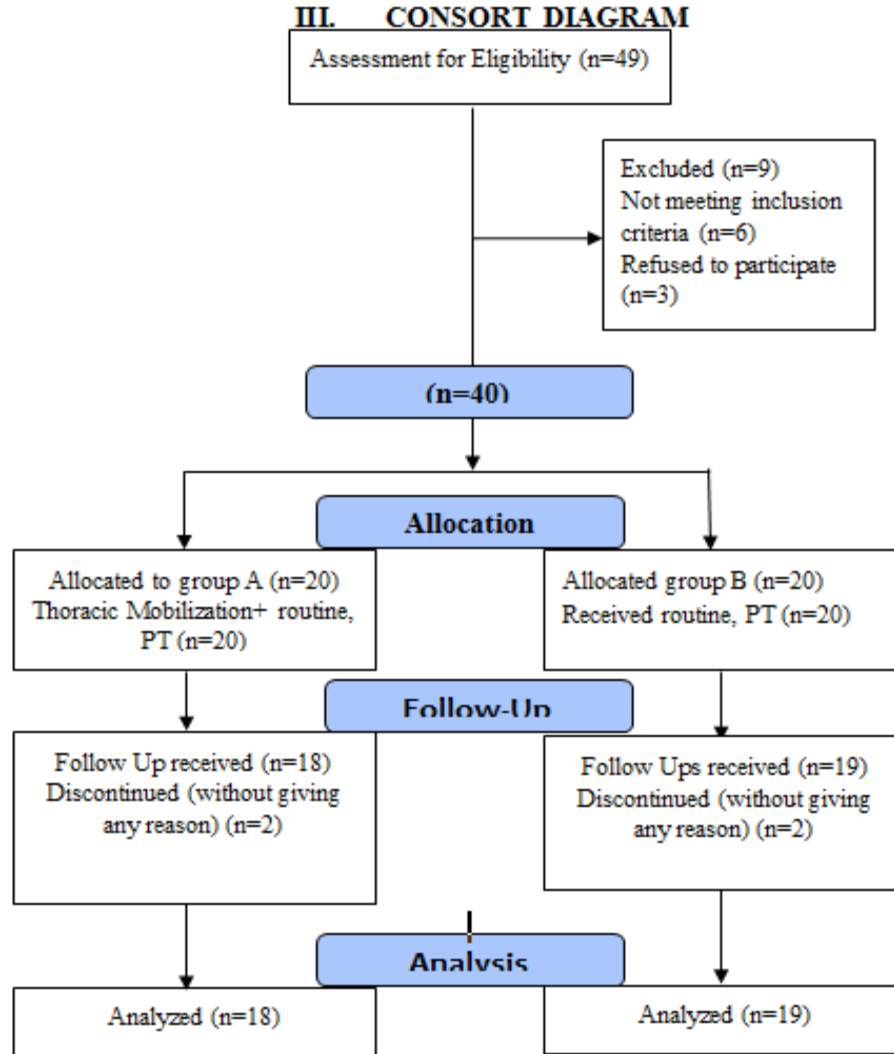
Both groups were parallelly treated with routine physical therapy. (I) Close chain wall exercises, (II) Codman's Exercises (III) thermotherapy 15 minute before treatment session and (IV) multiple angle isometric.

Ethical Consideration

This randomized control trial was ethically approved from institutional review board of University of Lahore. (**Ref. Number: IRB-UOL-FAHS/450/2019**) All the recruited patients (n=40) were included after taking written informed consent. Patients informed about benefits and all possible side effects of proposed interventions. All patients were authorized to withdraw from study at any time.

Data Analysis

Data were analyzed by SPSS software version 23.0. Frequency and percentages were shown in frequency distribution and categorical variables. Mean \pm S.D was calculated for numerical variable. Data were normally distributed in both groups. Paired sample t-test was performed to evaluate the effects from baseline to after treatment. Independent sample t-test was performed to compare the means of both groups. P-value ≤ 0.05 was considered as significant value.



III. RESULTS

Total 40 out of 49 were equally allocated in both groups. Moreover 21(56.8%) were male and 16(43.2%) were female. Besides, dominant shoulder was affected more 22(59.5%) than non-dominant shoulder 13

(35.1%). It was more common in peoples, whose work involved overhead activity 25(67.6%) than 12(32.4%)

Data were normally distributed for all variables NPRS, SPADI, Thoracic extension and shoulder ROM at baseline.

Table 1: Comparison of pain, physical disability, shoulders ROM and thoracic extensions between the groups.

Variables	Thoracic Mobilization Group (18) (Mean ±SD)		Routine Physical Therapy Group (19) (Mean ±SD)		After Treatment Comparison		
	Baseline	After Treatment	Baseline	After Treatment	F	t-test	P-Value
NPRS	5.89±1.08	2.56±0.78	5.79±1.36	3.26±1.05	0.97	-2.32	0.026
SPADI	56.39±14.27	30.83±6.91	63.79±12.99	44.95±11.72	8.16	-4.43	0.000
T1-T4 Extension	9.11±2.91	15.89±2.47	9.26±2.77	9.95±3.49	2.72	5.95	0.000
Shoulder Abduction	84.22±15.17	145.28±21.66	87.26±20.05	128.42±14.91	5.77	2.77	0.01
Shoulder External Rotation	42.17±6.78	68.17±7.11	44.16±8.37	59.16±8.70	0.73	3.44	0.001

Table 1: Numeric Pain Rating Scale (NPRS), Shoulder Pain and Disability Index (SPADI), S.D = Standard deviation.

After successful completion of 4 weeks treatment the comparison was done for all variables. All variables had significant $P < 0.05$ difference between groups. Significance level for SPADI and T1-T4 extension was more significant $t =$

4.43 ($P = 0.000$) and $t = 5.95$ ($P = 0.000$) respectively than NPRS $t = -2.32$ ($P = 0.026$). In comparison of shoulder ROM abduction had more significant $P \leq 0.01$ difference than external rotation $P \leq 0.001$.

Table 2: Comparison of variables at baseline and after treatment within group

Variables	Thoracic Mobilization Group			Routine Physical Therapy Group		
	Mean Difference (Mean ±SD)	t-test	P-Value	Mean Difference (Mean ±SD)	t-test	P-Value
NPRS	3.33±0.77	18.439	.000	2.53±0.96	11.420	.001
SPADI	25.56±10.01	10.828	.000	18.84±10.52	7.806	.001
T1-T4 Extension	-6.78±2.16	-13.330	.000	-0.68±01.00	-2.974	.008
Shoulder Abduction	-61.06±14.81	-17.490	.000	-41.16±15.57	-11.521	.000
Shoulder External Rotation	-26.00±5.04	-21.882	.000	-15.00±02.89	-22.650	.000

Table 2: NPRS= Numeric Pain Rating Scale, SPADI= shoulder pain and disability index, Coefficient of alpha is ($P < 0.05$), $t =$ Paired Sample t-test,

IV. DISCUSSION

In this study the upper thoracic (T1-T4) sustained stretch Posterior-Anterior mobilization was applied in addition to routine physical therapy in patients with extrinsic factor subacromial impingement syndrome. According to our study, The upper thoracic sustained stretch mobilization along with routine physical therapy have superior effects in management of all outcome measures including shoulder pain, physical disability and thoracic extension than routine physical therapy alone. Spinal manual therapy is also effective in management of pain severity by reducing activation of pressure pain threshold in activation of central pain process. (20) We hypothesised that, limited thoracic extension 15° results biomechanical and muscular dysfunctions of shoulder complex. In our study thoracic mobilization along with routine physical therapy was more significant ($P \leq 0.0001$) for all variables with in group subject effect. While routine physical therapy was more effective for shoulder abduction and external rotation ($P \leq 0.0001$) than pain intensity and shoulder physical disability ($P \leq 0.001$). It affects the thoracic extension ROM less significantly ($P \leq 0.008$) as compared to all other outcome measures. It is because of RPT was not directly applied on thoracic region. Little significant is in result of muscle shoulder girdle originates from thoracic region. Cyclical posterior- anterior stretching of thoracic capsule improves the hypomobility of non-contractile tissues and could restore the extension of thoracic segments. (1) Multiple researchers addressed the spinal mobilizations are beneficial for removing

inhibitory responses and improve the strength and motor activities.(21) Stretching of segmental capsule and ligaments by joint mobilization of grade III removes the barriers to arthokinetic reflexes. (18) Restoration of spinal movements allows the wide range of scapular play in lateral upward rotations, which facilitates in maximum shoulder functioning, and forward tilting.(22) Forward tilting of shoulder decreases the mechanical loading on rotator cuff tendon. Multiple clinical trials that incorporate thoracic manual therapy improves patient reported outcomes more as compared to treatments that did not includes thoracic manual therapy.(10) Subacromial impingement syndrome is commonest complain in dominant shoulders.(23).

Limitations of Study

Specific spinal stiffness and thoracic muscle dysfunction was not addressed. Biomechanics and postural derrangement are subject of recommendations. This study was single centered with limited number of followups. Neurophysiological response of thoracic mobilization should be addressed.

V. CONCLUSION

Limited upper thoracic mobility is a contributor in development of external subacromial impingement syndrome. Stretching of capsule thoracic segment and restoration of thoracic extension is effective to manage the pain and physical disabilities of shoulder. Upper thoracic manual therapy should be used as adjunct therapy with routine physical therapy for management extrinsic subacromial impingement syndrome.

VI. DISCLAIMER

This research paper is a part of 1st author thesis of degree “Master of Science in Physical Therapy (Musculoskeletal).

Conflict of Interest: There is no conflict of Interest among authors.

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