

Original Research Article

# Effectiveness of end range mobilization with scapular mobilization in frozen shoulder

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## Abstract

**Introduction:** Frozen shoulder is defined as an idiopathic condition of the shoulder characterized by the spontaneous onset of pain in the shoulder with restriction of movement in every direction. To regain the normal extensibility of the shoulder capsule, passive stretching of the shoulder capsule in all planes of motion by means of mobilization techniques (EMTs) has been recommended. Lack of research has been done to evaluate the combined effects of scapular mobilization and end range mobilization to improve the shoulder range of motion in frozen shoulder.

**Objectives:** To evaluate the effectiveness of end range mobilization with scapular mobilization in improving shoulder range of motion and function in subjects with frozen shoulder and to compare the effectiveness of end range mobilization with scapular mobilization over end range mobilization alone in improving shoulder range of motion and function in subjects with frozen shoulder.

**Materials and methods:** Hospital based comparative study was carried out to compare the effects of two different forms of mobilization techniques on two groups of patients of frozen shoulder among 30 patients attending the OPD of Physiotherapy Department of Oxford College, Bangalore. Assessment of patients included evaluation of Range of motion and disability index (SPADI) both pre and post treatment for both the groups. Data was analyzed by SPSS software ver. 21 using appropriate statistical tests.

**Results:** Shoulder pain and disability index (SPADI) and range of motion of shoulder in all the positions was assessed separately in both the groups, pre and post mobilization treatment therapy.

Improvement was observed in both the groups pre and post treatment and these results were statistically significant ( $p < 0.01$ ).

**Conclusion:** End range mobilization with scapular mobilization is more effective in improving range and functioning as compared to end mobilization alone.

## Key words

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End-range mobilization, Scapular mobilization, Frozen Shoulder, ROM, SPADI.

## Introduction

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Frozen shoulder is defined as an idiopathic condition of the shoulder characterized by the spontaneous onset of pain in the shoulder with restriction of movement in every direction [1].

The term “frozen shoulder” was first introduced by Codman in 1934. He described frozen shoulder as a painful condition of insidious onset that was associated with stiffness and difficulty in sleeping on the affected side. Codman also identified the marked reduction in forward elevation and external rotation that are the hallmarks of the disease. Long before Codman, in 1872, the same condition had already been labeled “Peri-arthritis” by Duplay. In 1945, Naviesar coined the term “Adhesive capsulitis” [2].

In a regional community based study Prevalence of frozen shoulder is around 3.06% [2]. To regain the normal extensibility of the shoulder capsule, passive stretching of the shoulder capsule in all planes of motion by means of end-range mobilization techniques (EMTs) has been recommended [3]. Theoretically, mobilization techniques performed in restricted plane close to the end-range should have effects on the corresponding glenohumeral ROM. Adequate humeral elevation and external rotation as well as scapular tipping is related in improving frozen shoulder symptoms. Specific mobilization techniques performed close to the corresponding glenohumeral end-range are necessary [4].

Elevation of the upper extremity (about 180 degree with trunk rotation) refers to combination of scapular, clavicular and humeral motion that occurs during arm movement. The scapular

upward rotation linearly varies with humeral angle and contributes to approximately 30% to 40% of the overall arm elevation in adults, classically described as the scapulohumeral rhythm. The abnormal scapular biomechanics that occur as a result of dysfunction create abnormal scapular positions that decrease normal shoulder function [4].

Therefore, treatment of shoulder dysfunction should include scapular-mobilization (SM) techniques. To perform full arm elevation in the scapular plane, coordination between the scapula thoracic and glenohumeral joints is important. Since lack of research has been done to evaluate the combined effects of scapular mobilization and end range mobilization to improve the shoulder range of motion in frozen shoulder.

The present study intended to evaluate the effectiveness of end range mobilization with scapular mobilization in improving shoulder range of motion and function in subjects with frozen shoulder and to compare the effectiveness of end range mobilization with scapular mobilization over end range mobilization alone in improving shoulder range of motion and function in subjects with Frozen shoulder.

## Materials and methods

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It was a Hospital based comparative study carried out to compare the effects of two different forms of mobilization techniques on two groups of patients of frozen shoulder. The study was conducted from January 2015 to December 2015, applying consecutive sampling technique all the patients attending the OPD of Physiotherapy department of Oxford college, Bangalore, aged 40-60 years suffering from

idiopathic frozen shoulder and with minimum of 50% reduction in range of motion (ROM) were included in the study.

Patients suffering from thoracic outlet syndrome, peripheral nerve injury, rheumatoid arthritis, osteoarthritis, damaged glenohumeral cartilage, trauma cases or any other bone pathologies were excluded from the study.

A total of 30 patients were enrolled in the study. These patients were then randomly assigned to two groups to receive type of mobilization treatment, using computer generated random numbers.

### Strategy

A Total of 2 groups were formed and 15 patients were enrolled in each group, all the participants received written and verbal explanations of the purpose and procedures of the study, if they agreed to participate they signed informed consent.

**Group 1:** Patients were given treatment using both End range mobilization and Scapular mobilization technique.

**Group 2:** Patients were treated using End range mobilization only.

To minimize bias, an independent trained outcome assessor, masked to this study evaluated the patients at baseline and after 4 weeks of therapy. Participants in both the groups received mobilization treatment four days a week for 30 minutes.

Assessment of patients included evaluation of Range of motion in all the positions i.e shoulder flexion, abduction, internal rotation and external rotation which was done using goniometer both before and after the treatment and functional assessment for disability was done using Shoulder pain and disability index (SPADI) both pre and post treatment for both the groups.

Ethical clearance was obtained from the ethics review committee of the institute. Data was analyzed using SPSS 21.0 (SPSS Inc., Chicago,

IL, USA), paired t test was used compare within the groups and unpaired t test was applied to compare between the 2 groups. Mann Whitney U test and Wilcoxon's sign rank test was used for non- normally distributed data for inter and intra-group analysis.

### Results

Most of the subjects were between 40-60 years of age and subjects of both the groups were matched for age and sex ( $p= 0.4$ ) (**Table – 1**). Shoulder pain and disability index (SPADI) and range of motion of shoulder in all the positions was assessed separately in both the groups, pre and post mobilization treatment therapy. Improvement was observed in both the groups pre and post treatment and these results were statistically significant ( $p<0.01$ ) (**Table – 2**). We also tried to evaluate the effect of 2 different types of techniques i.e. Scapular + end range mobilization in group 1 over End range mobilization alone in group 2 and statistically significant results were observed ( $p<0.05$ ) in group 1 patients for both types of assessment methods (SPADI and Range of motion) (**Table – 3**).

### Discussion

Frozen shoulder syndrome is a condition of uncertain etiology characterized by a progressive loss of both active and passive shoulder motion [5]. Hospital based comparative study conducted on 2 groups with 15 subjects each where group 1 received combined scapular mobilization and end range mobilization and group 2 received only end range mobilization. Several previous studies investigating the effectiveness of non-specific treatments in a more heterogeneous group of subjects have failed to find efficacy in these treatments [6]. The present study investigated a more homogenous sample using specific inclusion criteria and found significant differences in improvement in outcomes at 4 weeks. These findings support the hypothesis of improved outcomes when interventions are matched to more specific subgroups of subjects,

such as end-range mobilization and scapular mobilization.

Our results are in consistent with Yang, et al. [6] and also showed positive findings for the specific treatment techniques. There was a significant

improvement in ROM and functional ability in both the groups. Our results also support the findings of previous studies Vermeulen, et al. and Yang, et al. [5, 8] showing improvement after mobilization in a frozen shoulder.

**Table - 1:** Age and sex Distribution.

Variables	Group 1		Group 2		p- value
Age (+/- SD)	52.4	5.9	50.6	5.7	<b>0.402</b>
Males (%)	8	53.3%	8	53.3%	<b>1.0</b>
Females (%)	7	46.7%	7	46.7%	

**Table – 2:** Comparative evaluation within the groups (pre and post treatment).

Variables	Group 1		p- value	Group 2		p- value
	Pre	Post		Pre	Post	
SPADI*	75.33 ± 6.94	39.33±4.95	< <b>0.01</b>	73.33±7.94	64.00±6.32	< <b>0.01</b>
ROM in Flexion	76.33±10.43	109.67±9.15	< <b>0.01</b>	79.00±10.89	93.67±11.87	< <b>0.01</b>
ROM in Extension	19.00±6.04	40.33±5.16	< <b>0.01</b>	21.33±6.11	37.00±8.19	< <b>0.01</b>
ROM in Abduction	59.00±14.42	95.33±8.12	< <b>0.01</b>	53.67±11.41	69.33±12.52	< <b>0.01</b>
ROM in Internal Rotation	37.00±8.19	70.67±4.95	< <b>0.01</b>	32.00±8.62	46.67±8.80	< <b>0.01</b>
ROM in External Rotation	36.67±6.17	64.67±8.12	< <b>0.01</b>	37.33±6.51	56.33±8.76	< <b>0.01</b>

\* Wilcoxon's Sign rank test

**Table – 3:** Comparative evaluation between the groups (pre and post treatment).

Variables	Pre		p- value	Post		p- value
	Group 1	Group 2		Group 1	Group 2	
SPADI*	75.33 ± 6.94	73.33±7.94	<b>0.469</b>	39.33±4.95	64.00±6.32	< <b>0.01</b>
ROM in Flexion	76.33±10.43	79.00±10.89	<b>0.499</b>	109.67±9.15	93.67±11.87	< <b>0.01</b>
ROM in Extension	19.00±6.04	21.33±6.11	<b>0.302</b>	40.33±5.16	37.00±8.19	<b>0.193</b>
ROM in Abduction	59.00±14.42	53.67±11.41	<b>0.271</b>	95.33±8.12	69.33±12.52	< <b>0.01</b>
ROM in Internal Rotation	37.00±8.19	32.00±8.62	<b>0.115</b>	70.67±4.95	46.67±8.80	< <b>0.01</b>
ROM in External Rotation	36.67±6.17	37.33±6.51	<b>0.776</b>	64.67±8.12	56.33±8.76	< <b>0.01</b>

\* Wilcoxon's Sign rank test

For the predominant adhesive capsule and associated soft tissue tightness of the FSS, mobilization techniques have been most commonly addressed in clinical treatment approaches and research studies [6-11]. Maitland and Lin, et al., in their study, commented that mobilization techniques performed in the specific plane close to the end-range improve the corresponding extensibility of the shoulder capsule and stretch the specific tightened soft tissues to induce beneficial effects. Our results are in consistent with this premise and indicate that this effect can be achieved with specific mobilization techniques.

In our study, the end-range mobilization at a position of maximal humeral elevation and external rotation, combined with scapula mobilization, significantly improves subjects outcomes more than end range mobilization alone. Our findings are in accordance with study conducted by yang, et al. [12]. They suggested that insufficient scapulohumeral rhythm and posterior tipping of the scapula during arm elevation are important to consider in rehabilitation of patients with FSS. Specifically, end-range mobilization and scapula mobilization are important techniques for subjects with FSS.

## **Conclusion**

A subgroup of patients identified from a clinical prediction method and expected to benefit from specific end-range mobilization and scapular mobilization who received these specific treatments demonstrated significantly greater improvements than patients who received end range mobilization alone. Their scores in Shoulder Pain and Disability Index have reduced which indicates decreased level of disability and better functional ability. So, it indicates that end range mobilization with scapular mobilization is more effective in improving range and function when compared to end mobilization alone.

## **Recommendations**

Combination manual therapy (ERM+SCAPULAR MOBILIZATION) should

be incorporated in the treatment protocol of frozen shoulder patients to achieve better gain in the ROM and SPADI scores.

## **Limitations**

Small sample size was one of the limitations of the study. This can be attributing to the relative patient load of our institution and the time bound nature of the study. We thus recommend future multi-centric studies with larger sample size to further strengthen our study findings.

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