

Effects of Scapular Mobilizations in Improving External Range of Motion in Frozen Shoulder

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Author's Contribution

^{1, 3} Conception and design, Collection and assembly of data, Analysis and interpretation of the data, ^{2,4}Critical revision of the article for important intellectual content, Statistical expertise ³⁻⁵Final approval and guarantor of the article

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A B S T R A C T

Background: The coordinated and combined movement of 2 parts gleno-humeral to 1 part of scapulo-thoracic movement adds to normal shoulder elevation range. It was later accepted as 2:1 ratio between Gleno-humeral elevation and scapulo-thoracic upward rotation and this kinematics interaction is known as "scapulo-humeral rhythm". Along with many other techniques to improve shoulder range of motion the scapulothoracic mobilizations are helpful specially in improving external rotation of shoulder.

Objectives: To determine the effectiveness of scapular mobilizations in improving external rotation range of motion (ROM) in frozen shoulder

Methodology: It is a cross sectional study conducted in physiotherapy department- Ittefaq hospital, Lahore which was carried out over a period of 6 months from approval of synopsis. 51 patients of age 35 to 65 years with symptoms of frozen shoulder from at least 3-4 months were included in this study. Patients with any surgical history, trauma or psychological conditions were excluded from the study. A semi structured questionnaire was administered and pre-treatment and post treatment were recorded and documented by the physical therapist.

Results: The results show that external rotation (ER) after scapulothoracic mobilizations improved, with mean value before treatment recorded to be 43.4314 degrees with S.D 11.067 degrees and 83.6863 degrees with S.D 12.394 degrees post treatment. Wilcoxon Sign Rank test showed significant different between the two measurements.

Conclusion: Patients had their external rotation range of motion improved after sessions of scapulothoracic mobilizations sessions provided by the physical therapist, thereby improving the functional outcomes of patients.

Keywords: External rotation; Frozen shoulder, Scapulothoracic mobilization.

Introduction

Frozen shoulder formerly known as "periartitis scapulohumeral" and "arthrofibrosis" causes a significant morbidity as it causes aching and limited range of motion in shoulder joint.¹ Furthermore, this constraint in movement ranges is attributed to the slow and progressive inflammatory process that begins in capsule of glenohumeral joint and results in contracture formation that fetches the humeral head very close to the glenoid fossa.² The pain caused by this condition is not easy to manage in a short duration of time

and also the inadequacy of normal shoulder movements are intricate to characterize and to treat.³ Another term that was coined for this pathology was "scapulohumeral periartitis" by Simon-Emmanuel Duplay, to differentiate this condition from traditional "osteoarthritis" of shoulder joint.⁴ Frozen shoulder is expected to be resolved on its own between one and three years but it has been observed that almost twenty to fifty percent of the patients suffer from this for quite a long time.⁴ To achieve adequate functional activities and outcomes in these

kind of patients both surgical and non surgical procedures are required.⁴ Physical therapy plays a vital and significant role in dealing in with the frozen shoulder and can be carried out as the earliest and primary line of intervention depending upon the unique requirements of patients and his sign and symptoms.⁵

Since the rehabilitation of frozen shoulder is demanding for the patient as it causes psychological and economical stress on the patient, it is also very challenging for the physical therapist as it necessitates endeavor and persistence besides various rehabilitative strategies.⁶ Many studies have shown reduced scapular movements specially decreased external rotation, thus, restoration of scapulohumeral rhythm and regaining mobility of glenohumeral joint is integral to any rehabilitation program designed for patients of frozen shoulder.⁷ Capsular tension in another trouble which is very significant whether it is anterior or posterior capsular tension, anterior capsular tension decreases glenohumeral external rotation movements and vice versa, this capsular tension does not allow scapula and humerus to act as single unit.⁸

There are many studies that show effectiveness of different mobilization techniques along with capsular stretching techniques.⁹ Scapulo-thoracic mobilizations in particular when applied to the patients give dramatic effects in reducing pain and improving movement ranges thus enhancing the functional outcomes and regaining functional activities as before the onset of frozen shoulder.¹⁰ A combination of Scapulo-thoracic mobilization and manual posterior capsule stretching were also found to be effective in improving the range of movement in acute stage of frozen shoulder.⁶ However, very limited data has been documented on the effectiveness of scapula-thoracic mobilization and manually applied posterior capsule stretching in the patients with frozen shoulder.⁶ This implies particularly in Pakistan. This study will contribute in evaluating the effectiveness of Scapulo-thoracic mobilizations in improving external rotation of patients with frozen shoulder in our settings.

Methodology

A self-designed questionnaire with a maximum of 20 questions was used for this cross sectional study in order to collect data which included questions about age, gender, aggravating and relieving factors, type and nature of pain along with ability to perform activities of daily life. The questionnaire was administered by the physical therapist who asked the questions and documented the response of patient. Moreover the goniometric measurement through Universal Goniometer was also recorded by the physical therapist and documented in the respective section of questionnaire. Sample size was

calculated by Epi-tool software with 0.80 power of study, with 0.5 margin of error and 95% confidence interval. Total recruited participants were 51 with attrition rate of 13% (n=47). 67 patients were recruited through convenient sampling and assessed for eligibility criteria and asked for consent amongst which 51 patients consented to be included in the study. Male and female patients between age of 35 to 65 years with frozen shoulder from at last 3 months and shoulder range limit of 100o-120o flexion and 90o-100o abduction. Patients with diabetes mellitus, trauma history to the shoulder, surgical history as well as those with any psychological conditions were excluded from the study. Patients who were diagnosed with Frozen shoulder, Stage II & III were called for informed consent and their pre-treatment values were recorded. The researcher communicated with the physical therapists and asked them to inform them once the treatment sessions come to end in order to record their post treatment values. Data acquired was entered in SPSS version 22 and analyzed using Wilcoxon Sign Rank Test. A P value of less than 0.05 was considered significant.

Results

The demographical characteristics are given below in Table I.

Table I: Descriptive statistics of demographical characteristics

Demographic characteristic	Descriptive statistics
Age of the patients	54.67 ± 8.16 years
Gender of the patients	Females: 28 (54.91%) Males: 23 (45.1%)
Marital status of patients	Single: 2 (3.9%) Married: 49 (96.1%)
Occupation of patients	Employed: 31 (60.81%) Unemployed: 20 (39.2)
Affected arm of patients	Right side: 24(47.1%) Left side: 27 (52.9%)
Type of pain	Persistent pain: 29 (56.9%) Intermittent pain: 22(43.1%)
Nature of pain	Burning: 2 (3.9%) Shooting: 20 (39.2%) Stabbing: 8 (15.7%) Dull ache: 21 (41.2%)
Aggravating factors	Activity: 30 (58.8%) Sleeping on affected side: 9 (17.6%) Lifting heavy objects: 5 (9.8%) While pushing/pulling with affected arm: 7 (13.7%)
Relieving factors	Taking rest: 25 (49.0%) Analgesics, Corticosteroid injection etc: 9 (17.6%) Physical therapy/exercise: 17 (33.0%)

The functional status of patients (Table II) was also inquired and categorized according to the level of difficulty i.e. limited, difficulty in execution of task and normal. The level of assessment (Table III) was also recorded as pre-treatment shoulder external range of motion and post treatment shoulder external range of motion. Mean range of motion recorded pre-treatment was 43.43 degrees whereas post treatment ROM was 83.68 degrees. Similarly S.D values before treatment is 11.06 and after treatment it is 12.39. This calculation shows that there is significant difference ($p=0.000$) between external rotation range of motion after scapulothoracic mobilization treatment technique.

Table II: Functional status of patients			
Functional activity	Limited	Difficulty in task execution	Normal
Buttoning the shirt	8 (15.7%)	38 (74.5%)	5 (9.8%)
Combing hair	11 (21.6%)	35 (68.6%)	5 (9.8%)
Reaching back pocket	17 (27.5%)	35 (68.6%)	2 (39%)

Table III: Levels of assessment and their inferential statistics				
Level of assessment	Mean	Standard Deviation	Z	P value
Pre-treatment external rotation ROM of shoulder	43.43°	11.06	-6.25	0.06
Post-treatment external rotation ROM of shoulder	83.68°	12.39	1.23	0.01

Discussion

Statistical results of this study have showed significant improvements in the range of motion of shoulder in patients of frozen shoulder. The improvements in external rotation of shoulder range of motion are directly related to application of scapulothoracic mobilization that were applied on the shoulder complex which ultimately result in reduction of pain while improving shoulder range as well as function of the joint.⁷ This is due to the various mechanisms such as the neurophysiological changes that occur at the end of passive joint mobilization. These effects may be achieved by the stimulation of type II mechanoreceptors, stimulation of Golgi Tendon organ activity, inhibition of type IV nociceptors and reflex inhibition of muscles. Mobilization of scapulothoracic joint improve muscle activity, muscle activation along with reduction in pain and periarticular muscle tension. Maitland

scapulothoracic mobilization of grade III and IV might also produce tissue stretch which promptly desensitizes pain induced by stretch leading to connective tissue rearrangement, collagenous tissues and extra cellular matrix.⁸ Tissue remodelling occurring in response to these changes may also increase tensile loading. Maitland mobilization can also stimulate the type 2 dynamic receptors and by this way they also inhibit type IV nociceptive receptors, ultimately affecting circulatory perfusion. These mobilizations may also improve the normal extensibility of glenohumeral capsule and stretches the surrounding tight soft tissues in order to achieve beneficial effects.⁹ The only intention of application of Maitland mobilization is not only to restore joint play but it also is known to stretch the contracted periarticular structures. The mechanical effects of mobilization include adhesion breakage and collagen realignment as well as increases fiber glide in case of specific movement stressing the specific part of capsular tissue. This ultimately proves to be the major reason in improving ROM in patients with frozen shoulder. These mobilizations can also increase joint mobility by producing rheological changes in synovium, collagenous matrix and increased synovial turnover time.⁵ Few studies have also suggested that scapulothoracic mobilization disintegrate and release adhesions formed in scapulothoracic muscles which lead to scapular mobility.¹⁰

Limitations: Sample size was small because of low turnover of patients so the results of study are not world widely applicable. Few Patients with bursitis, tendonitis and impingement syndrome were misdiagnosed for frozen shoulder. Randomized control trials need to be carried out with one group receiving standard physical therapy regime plus scapulothoracic mobilization and the other group receiving standard therapy protocol only. Future studies should be multi-centered.

Conclusion

Patients had their external rotation range of motion improved after sessions of scapulothoracic mobilizations sessions provided by the physical therapist, thereby improving the functional outcomes of patients.

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