International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Effectiveness of Scapular Mobilization versus Myofascial Release of Subscapularis on Pain, ROM and Function in Subjects with Chronic Frozen Shoulder: A Comparative Study

Uma Sinha[1], Bibhuti Sarkar[2], Pravin Kumar[3]

[1]Professional Trainee (PT), [2]Demonstrator (PT), [3]Assistant professor (PT);
Department of Physiotherapy, National Institute for Locomotor Disabilities (Divyangjan),
B.T. Road, Bonhoogly, Kolkata-700090, West Bengal, India.

Corresponding Author: Uma Sinha

ABSTRACT

Background and Purpose: Frozen shoulder, also known as Adhesive Capsulitis, is a common condition involving scapulohumeral pain and loss of motion. Subscapularis trigger points (TrPs) are quite common in "frozen shoulder". Referred pain from subscapularis TrPs muscle concentrates in the posterior deltoid area and may extend medially over the scapula, down the posterior aspect of the arm.
Objective: To evaluate and compare the effectiveness of scapular mobilization versus myofascial release of subscapularis on pain, external rotation ROM and function in subjects with chronic frozen shoulder.
Subjects and Methods: Thirty-two (32) subjects with chronic Frozen Shoulder were assessed as per inclusion, exclusion criteria and randomly allocated in two groups. Subjects in Group-A (n=15, Male-7, Female-8) received scapular mobilization, supervised exercise protocol, moist hot packs (MHP) and home exercise program. Subjects in Group B (n=17, Male-6, Female-11) received myofascial release (MFR) of subscapularis, supervised exercise protocol, MHP and home exercise program. Both the group received 10 sessions of intervention (5 sessions/week) in 2 weeks.
Outcome Parameters: Pain intensity was measured by numerical pain rating scale (NPRS), Active external rotation ROM of shoulder by universal goniometer & functional disability by shoulder pain and disability index (SPADI). These parameters were measured at baseline and after 10 sessions of intervention.
Results: All outcome measures were homogenous at baseline ($p>0.05$). Intragroup analysis revealed significant changes in all outcome parameters. Whereas, intergroup comparison showed statistically insignificant difference for all outcome parameters.
Conclusion: The results of this study suggested that both the treatment methods (i.e. scapular mobilization and MFR) were effective in improving pain, ROM & function in subjects with Chronic Frozen Shoulder.
Keywords: Chronic Frozen Shoulder, Subscapularis trigger points, Scapular Mobilization, Myofascial release, Functional disability.

INTRODUCTION

The term “capsulitis” or “frozen shoulder” refers to a common shoulder condition characterized by the global restriction in the shoulder range of motion in a capsular pattern. [1] It has been reported to affect 2-5% of the general population and up to 11 – 30% of subjects with diabetes and thyroid disease. [2,3] Women (42%) are more affected than men (19%) with more

involvement of the dominant side. It commonly occurs in the age group of 40 to 65 years. [4]

This condition is characterized by thickening of the synovial capsule and adhesions within the sub acromial or sub deltoid bursa, adhesion to the biceps tendon and or obliteration of the axillary fold secondary to adhesion which results an insidious and progressive loss of active and passive range of motion of the glenohumeral (GH) joint. [5]

Travell and Simons (1983) reported that Subscapularis trigger points (TrPs) are often the key to a "frozen shoulder" syndrome. Subscapularis TrPs produces referred pain which concentrates in the posterior deltoid area and may extend medially over the scapula, down the posterior aspect of the arm and then skip to a band around the wrist. This TrPs may results in progressive painful restriction of abduction and lateral rotation of the arm. [6] The common factors responsible for restriction in glenohumeral external rotation are the glenohumeral capsule and the shoulder internal rotators (Ovesen and Neilsen, 1985). [7] Godges Joseph et al. 2003) [8] reported that subscapularis muscle flexibility deficit is responsible for glenohumeral external rotation restriction at 45° of abduction. A shortened subscapularis muscle has been implicated as a cause of limited motion in subjects with adhesive capsulitis (Bruce H. Greenfield and Brain J. (Bruce H. Greenfield and Brain J. Tovin, 2001). [9] Myofascial trigger points in the shoulder girdle muscle especially the subscapularis can initiate periarthritis of shoulder. Guarding of this muscle will restrict shoulder abduction and external rotation. [10]

There are various conservative methods available for treating frozen shoulder including stretching, strengthening exercises, proprioceptive neuromuscular facilitation (PNF) and mobilization techniques to relieve pain and improve glenohumeral ROM. Electrotherapy modalities like ultrasound (US), interferential therapy, transcutaneous electrical nerve stimulation, short wave diathermy and LASER are also used to restore function by reducing inflammation and pain and thus allowing the re-establishment of normal shoulder mechanics. [5,11]

Treatment of shoulder dysfunction including scapular-mobility exercises, or scapular-mobilization (SM) techniques is widely used in the management of musculoskeletal disorders of the shoulder. It involves the manual application of a sustained mobilization (in 4 directions) by a therapist to the scapulothoracic joint. [12] Soft tissue manipulation (Myofascial Release) improves viscoelastic properties of the muscle with TrPs and thus in turn improves the biomechanics of shoulder motion, resulting in less pain and improved function. [10]

There are limited literatures on the comparative effectiveness of scapular mobilization versus myofascial release on pain, external rotation ROM and function in subjects with chronic frozen shoulder. Thus, a need arises to compare their effectiveness in chronic frozen shoulder to find out a new effective management strategy. The current study thus intended to investigate and compare the effectiveness of scapular mobilization versus myofascial release of subscapularis on pain, external rotation ROM and function in subjects with chronic frozen shoulder.

MATERIALS AND METHODS

Total 106 subjects aged between 40-65 years with complain of shoulder pain for last 3 months, Myofascial TrPs at subscapularis and NPRS score between 3-8 were screened. Out of these 32 subjects who met all the above inclusion criteria were included after taking written informed consent. Approval of Institutional Ethics Committee of National Institute for Locomotor Disabilities (Divyangjan), Kolkata, India was obtained before commencement of the trial. Subjects with inflammatory pathologies such as rotator

cuff tendinitis, Rheumatoid arthritis, recurrent dislocation of shoulder, Fracture of humerus, scapula or clavicle and post fracture stiffness, previous shoulder surgeries, malignancy and Neurological disorders of upper extremity were excluded.

Subjects (n=32) were randomly allocated in two groups (Group-A & B) in 1:1 ratio by chit picking method (Fig-1). They were unaware about the group allocation and about the research question. Subjects in Group A (n=15, Male-7, Female-8) were treated by scapular mobilization, supervised exercises & home exercise programme. Whereas, subjects in Group B (n=17, Male-6, Female-11) were treated with myofascial release of subscapularis, supervised exercises & home exercise programme. All subjects of both groups were also treated by Moist Hot Packs for 10 minutes before starting the exercise protocol. Total ten sessions of intervention (5 sessions per week in 2 weeks) were given by a graduate physiotherapist. Two subjects from Group-B discontinued treatment due to other health issues (One female subject on 5th day and another male subject on 8th day). Outcome parameters were pain intensity measured by NPRS, Active External Rotation ROM by universal goniometer and function by Shoulder pain and disability index (SPADI). These parameters were measured by another postgraduate physiotherapist who was unaware about the group allocation and interventions on the first day of visit to the physiotherapy department before starting the treatment and after completion of 10 sessions of treatment.

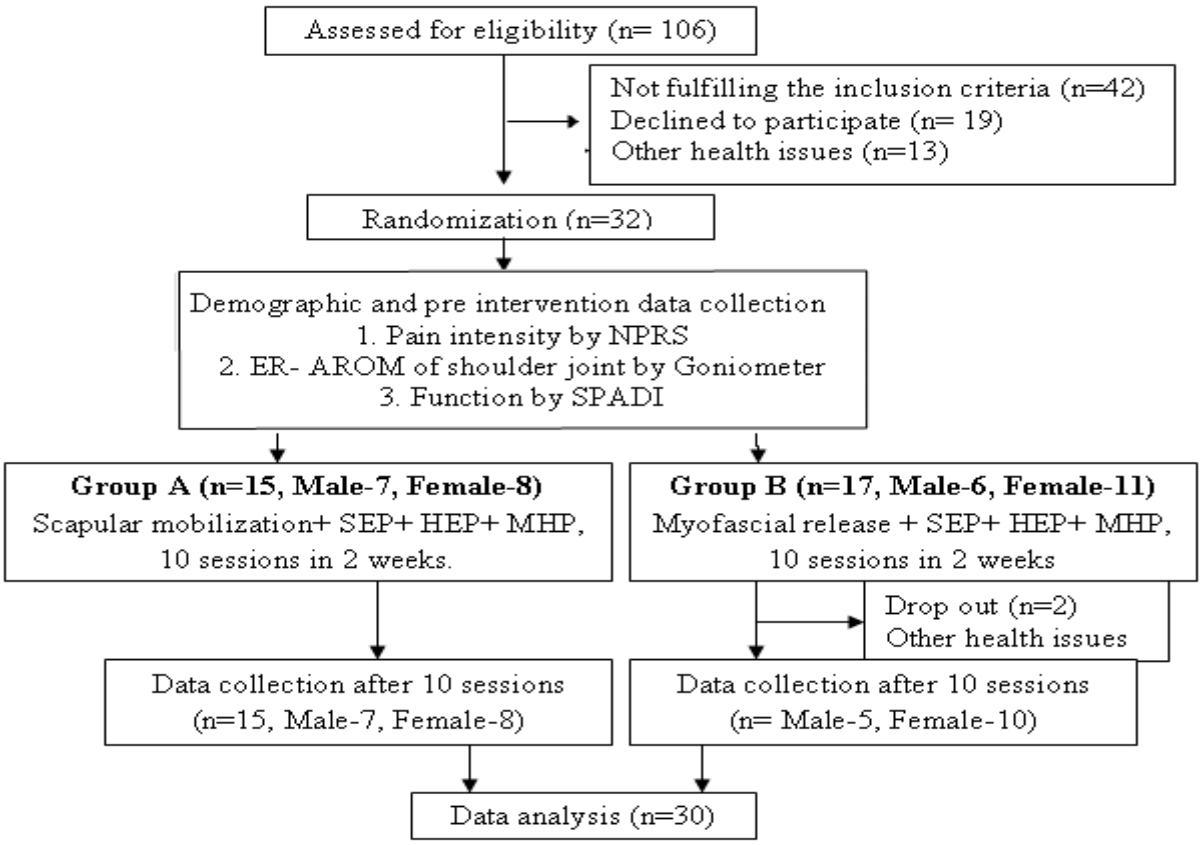

Fig-1: CONSORT FLOW CHART

OUTCOME MEASURES

NPRS is a self-assessment tool of 10 cm long line in which the numbers 0-10 are marked where 0 indicates no pain and 10 indicates most severe pain. Each subject was asked to mark the level of their

shoulder pain to the value that represents their current pain intensity and then the readings were taken. [13]

Active External Rotation ROM of the involved shoulder was measured by universal goniometer with the patient in supine lying position, shoulder 90° abducted, elbow 90° flexed and kept out of the supporting surface. The fulcrum of the goniometer was placed over the olecranon process, stationary arm was parallel to the floor and moveable arm placed along with the ulna, using the olecranon process and ulnar styloid as reference. The patient was then instructed to perform external rotation of the shoulder by moving the forearm posteriorly such that the dorsal surface of the hand faces the floor and measurement of ER-ROM taken. [14] Shoulder Pain and Disability Index (SPADI) is a self-administered questionnaire containing 13 questions. Five of which measure the severity of pain caused by various arm movements and the remaining eight questions measures the severity of disability. Instruction was given to the subjects to score each question on a scale from 0 (no pain or disability) to 10 (worst pain imaginable) that best describes their shoulder over the past week. [15] Final score was obtained by adding all the recorded scores and then divided by the highest score and finally the total score was multiplied by 100. [16,17]

INTERVENTIONS:

Interventions were started with application of Moist Hot Packs for 10 minutes to the involved shoulder joint with the subjects in high sitting position for both the groups.

Scapular Mobilization: for Group-A.

The subject was lying on the sound side and then Grade III and IV Maitland Scapular Mobilization was performed. The therapist was positioned in front of the shoulder being affected, over the medial border of scapula the index finger of one hand is placed, while the other hand grasped the superior border of scapula. The superior and inferior movement of the scapula is performed via the superior and inferior glide respectively followed by the scapular rotation in upward and downward direction. In order to distract the scapula from the thorax, the therapist uses the ulnar fingers under the medial scapular border. Ten sets of 10 repetitions were applied, with rest intervals of 30 s between sets. [5]

Myofascial release to subscapularis: for Group-B.

Therapist stood by the side the involved shoulder. One hand was placed just above the lateral border of the scapula in axillary region and the other hand was used to stabilize the subjects' arm[10]. Traction was applied on the arm to abduct the scapula adequately to increase accessibility of the subscapularis TrPs. [6] The subscapularis was palpated in the axilla using pincer grasp by going deep till reaching anterior aspect of scapula. The identification of the muscle was confirmed by feeling the contraction when the subject internally rotated the shoulder. After identification, the trigger points were then treated with myofascial release utilizing a combination of sustained manual pressure and slow deep strokes to the subscapularis muscle for 7 minutes. [10]

SUPERVISED EXERCISE PROTOCOL (SEP):

SEP consisted of strengthening of periscapular muscles namely serratus anterior, lower trapezius, infraspinatus and subscapularis with 2 Kg dumbbell. Three sets of 10 repetitions for each exercise were performed 3 days per week with 90 second rest interval between the sets. All the exercises were performed in pain free ROM. [18]

HOME EXERCISE PROGRAMME (HEP):

HEP consisted of stretching exercises for shoulder horizontal adductors, flexors, internal rotators and external rotators. Active or active assisted exercise of shoulder girdle in the form of wall ladder and Codman's pendulum exercise was also instructed and explained to all subjects.

All supervised exercise protocol as well as home exercise programme was done by all the subjects in both the groups. All

subjects were given a diary to monitor the compliance of HEP.

STATISTICAL ANALYSIS: Data analysis was done using SPSS 23.0 version. Demographic data, categorical and nominal data were analyzed by non-parametric test using Chi Square Test; ordinal, interval or ratio level data were analyzed by parametric test using Independent Sample t test. For outcome parameters, within (Intra) group difference were analyzed by using paired sample t test and between (Inter) group differences were analyzed by using Independent Sample t test. The tests were applied at 95% confidence interval on alpha value set at 0.05. For level of significance p value was set at ≤0.05.

RESULTS

All the outcome parameters in both the groups were homogenous at baseline (p≥0.05) (Table-1). Intragroup comparison revealed significant difference in NPRS, ER-ROM and SPADI in both the groups (Table-2). While intergroup comparison found insignificant difference for all outcome measures in both the groups (Table-3).

Table-1: Demographic Details

VARIABLES	GROUP-A (n=15)	GROUP-B (n=15)	P-value
AGE	52.0±7.22	55.13±6.23	0.21
NPRS	7.80±1.37	8.40±1.18	0.21
ER-ROM	21.33±9.14	22.67±7.80	0.67
SPADI	86.07±10.62	80.67±13.47	0.22

Intra Group analysis revealed reduction of pain intensity in both groups. Pain intensity was reduced in Group- A from 7.80±1.37 to 4.80±1.52. Similarly, in Group-B, pain intensity was reduced from 8.40±1.18 to 5.40±0.83. ER-ROM was increased in Group- A subjects from 21.33±9.14 to 34.40± 8.66 and in Group-B, it was increased from 22.67±7.80 to 28.53±7.48. SPADI score was decreased in Group- A from 86.07±10.62 to 56.80±15.11 and in Group-B it was decreased from 80.67±13.47 to 55.60 ± 11.39 from baseline to post intervention. Intra group analysis revealed a statistically significant difference of pain intensity, ER-ROM and SPADI scores (p<0.05) (Table-2). On the other hand, inter group analysis revealed statistically insignificant difference between Group-A and Group-B for all outcome parameters after 2 weeks of intervention (p>0.05) (Table-3).

Table-2: Intragroup comparison

	VARIABLES	PRE	POST	P-value
GROUP-A	NPRS	7.80±1.37	4.80 ± 1.52	0.00
	ER-ROM	21.33±9.14	34.40± 8.66	0.00
	SPADI	86.07±10.62	56.80±15.11	0.00
GROUP-B	NPRS	8.40 ±1.18	5.40 ± 0.83	0.00
	ER-ROM	22.67±7.80	28.53 ± 7.48	0.00
	SPADI	80.67±13.47	55.60 ± 11.39	0.00

Table-3: Intergroup comparison

VARIABLES	GROUP-A	GROUP-B	p-value
NPRS	4.80 ± 1.52	5.40 ± 0.83	0.19
ER-ROM	34.40± 8.66	28.53 ± 7.48	0.57
SPADI	56.80±15.11	55.60 ± 11.39	0.80

DISCUSSION

Both the treatment groups showed statistically significant reduction in pain, improvement in external rotation ROM and function after ten sessions of treatment, however insignificant difference was noticed between the two groups for all the outcome parameters.

The improvement seen in Group-A is the result of scapular mobilization which results in pain reduction with improvement in shoulder range of motion and function. It is the result of various mechanisms such as neurophysiological effects achieved by the stimulation of type II mechanoreceptors, inhibition of type IV nociceptors, [19] stimulation of Golgi tendon organ activity and reflex inhibition of the muscle at the end of the passive joint mobilization. [20] Joint mobilization decreases muscle activity, reduces muscle activation, pain and muscle tension in periarticular tissue. [21]

The grade III and IV Maitland Scapular mobilization might have produced tissue stretch which desensitized the stretch induced pain leading to rearrangement of connective tissue, extra cellular matrix and collagenous tissues - occurrence of tissue remodeling which could have increased the

tensile loading, (Mueller and Maluf, 2002). [22] Maitland's mobilization can stimulate the type-2 dynamic mechanoreceptors and by this way can inhibit the type-4 nociceptive receptors and also has an effect on circulatory perfusion. [23] It might have also improved normal extensibility of the shoulder capsule and stretches the tightened soft tissues to induce beneficial effects (Yang et al, 2007). It may be attributed to the fact that the intent of Maitland mobilization is not only to restore joint play but also to stretch contracted periarticular structures. [24,25] Mechanical effects of mobilization involves breaking up adhesions, realign the collagen or increases fiber glide when specific movement stress the specific part of the capsular tissue. [26] This may be one of the major reason in improving ROM in Group-A. Mobilization techniques can also increase or maintain joint mobility by inducing rheological changes in synovial fluid, cartilage matrix and increased synovial turnover time (Noel et al, 2000). [27] Surenkok et al. [12] have suggested that scapular mobilization helps in disintegration and release of adhesions in the scapulothoracic muscles leading to improved scapular mobility.

Improvement of pain intensity in Group-B can be attributed to the treatment effect of MFR which might have caused normalization in apoptotic rate, changes in cell morphology and reorientation of fibroblasts. MFR might have led to returning the fascial tissue to its normative length by collagen reorganization. The analgesics effect of MFR can also be attributable to the stimulation of afferent pathways and the excitation of afferent A delta fibers, which can cause segmental pain modulation as well as modulation through the activation of descending pain inhibiting systems. [28] This study support the findings of Das DM. et al. (2017) who reported that subjects with periarthritis shoulder treated with subscapularis soft tissue mobilization showed a significant reduction of pain and improvement of glenohumeral external rotation range of motion. [10] This study also supported the finding of Nehal K et al. (2014) who stated that the immediate effect of myofascial release (MFR) with proprioceptive neuromuscular facilitation (PNF) does increase glenohumeral external rotation at more than 90°of shoulder abduction in patients with periarthritis shoulder. [29]

In this study, both the groups received MHP to the shoulder which might have resulted vasodilatation, improved blood circulation to the local area which facilitated removal of waste product from the soft tissues. Tissue heating can reduce viscosity of collagen, increase tissue extensibility and makes connective tissue less resistant to active or passive stretching. [30]

In both the groups, noticeable improvement in ROM may be due to beneficial effect of supervised and stretching exercises. Many studies have claimed that exercise programme is the most effective treatment for shoulder adhesive capsulitis. [31] It has been depicted that extensibility of soft tissues can be increased by stretching exercises leading to change in viscoelastic properties of tissue on the basis of creep respose. [32] Active exercises like shoulder wheel, Codman's exercises, overhead pulleys and finger ladder exercises help in maintaining the joint range of motion at the shoulder. [18]

The reason for the functional capacity may be attributed to the reduced pain and improved joint ROM leading to efficient performance in daily activities. There was subsequent reduction in the SPADI scores due to reduced pain. Both the groups illustrated reduced SPADI scores, reduced pain and improved ROM.

Corroborating the findings of all the outcome parameters it was observed that both the treatment methods i.e. scapular mobilization and myofascial release of subscapularis were effective in reducing pain, improving external rotation ROM and function in subjects with chronic frozen shoulder and they can be used

independently or in combination in clinical setting to treat chronic frozen shoulder.

Limitations and Suggestions:

The result of the present study need to be viewed in light of several limitations such as:

Small sample size.

Short study duration

No follow up.

Lack of control group

Suggestions:

A similar multicenter, randomized trial with large sample size and long term follow-up may be conducted in future to improve the validity of results.

CONCLUSION

The results of this study suggested that both the treatment methods i.e. scapular mobilization and myofascial release of subscapularis were effective in reducing pain, improving external rotation ROM and function in subjects with chronic frozen shoulder.

ACKNOWLEDGMENT

We are indebted to Director, NILD (Divyangjan), Kolkata for his invaluable support in carrying out the project at the institute campus.

Conflict of Interest: None

Funding: None.

REFERENCES

1. Cyriax, Text Book of Orthopaedic Medicine, vol. 1, Oxford, UK, 8th edition, 1982.
2. Shah N, Lewis M. Shoulder adhesive capsulitis: systematic review of randomized trials using multiple corticosteroid injections. Br J Gen Pract. 2007; 57:662-67.
3. Kelley MJ, Mcclure PW, Leggin BG. Frozen Shoulder: Evidence and proposed model guiding rehabilitation. J Orthop Sports Phys ther.2009; 39:135-48.
4. Martin j. kelley, phillip W. Mcclure, Brian G. Leggin. Frozen Shoulder: Evidence and a Proposed Model Guiding Rehabilitation , J Orthop Sports Phys Ther 2009.39:135-148.
5. Goyal M, Kumar M, Debnath U, Chatterjee S. PT efficacy of scapular mobilization in the treatment of adhesive capsulitis: a randomized clinical trial,International Journal of Scientific Research,2016,5(11): 246-250. www.researchgate.net/publication/309739368.
6. Simons D. G., Travell J. G., Simons L. S. Travell & Simons' myofascial pain and dysfunction: the trigger point manual. Volume 1. The upper body. 2nd ed, 1999;596–612, Lippincott Williams & Wilkins.
7. Ovesen J. and Neilsen S. 1985. Stability of the shoulder joint. Cadaver study of stabilizing structures. Acta Orthop Scand., 56(2):149-51.
8. Godges Joseph J, Melodie Mattson-Bell, Thorpe Donna et al.2003. The Immediate Effects of Soft Tissue Mobilization with Proprioceptive Neuromuscular Facilitation on Glenohumeral External Rotation and Overhead Reach. J Orthop Sports Phys Ther., 33:713-718.
9. Bruce, H. Greenfield and Brain, J. Tovin, 2001. Evaluation and treatment of the Shoulder. An integration of the guide to physical therapist practice. Philadelphia F.A.Davis
10. Das DM. Effectiveness of sub glenohumeral external rotation in periarthritis shoulder Key words: Subscapular soft tissue mobilization, Proprioceptive neuromuscular facilitation, Glenohumeral external rotation." International Journal of Current Research, 9, (12), 63484-63489.
11. Balci NC, Yuruk ZO, Zeybek A et al. Acute effect of scapular proprioceptive neuromuscular facilitation (PNF) techniques and classic exercises in adhesive capsulitis: a randomized controlled trial. J Phys Ther Sci. 2016;28(4):1219-27.
12. Surenkok O, Aytar A, Baltaci G. Acute effects of scapular mobilization in shoulder dysfunction: a double-blind randomized placebo-controlled trial. J Sport Rehabil. 2009 Nov;18(4):493-501.
13. Bijur PE, Latimer CT, Gallagher EJ. Validation of a verbally administered numerical rating scale of acute pain for use in the emergency department. Academic Emergency Medicine. 2003 Apr 1;10(4):390-2.
14. Norkin CC, White DJ. Measurement of joint motion: A guide to goniometry. 5th edition, F.A Davis Company,Philadelphia. 2004.

15. Guy Hains G, Descarreaux M, Hains F. Chronic shoulder pain of myofascial origin: a randomized clinical trial using ischemic compression therapy. J Manipulative Physiol Ther. 2010 Jun;33(5):362-9.
16. Angst F, Goldhahn J, Pap G, Mannion AF, Roach KE, Siebertz D, Drerup S, Schwyzer HK, Simmen BR. Cross-cultural adaptation, reliability and validity of the German Shoulder Pain and Disability Index (SPADI). Rheumatology. 2007 Jan 23;46(1):87-92.
17. Tveita E K, Ekeberg O M, Juel N G, Holter E B. Responsiveness of the Shoulder Pain and Disability Index in patients with adhesive capsulitis. BMC Musculoskeletal Disord. 2008;9:161-65
18. Donatelli R, Wooden JM. Orthopaedic Physical Therapy, Churchill Livingstone, New York, NY, USA, 2nd edition (1994).
19. Mangus BC, Hoffman LA, Hoffman MA, et al.: Basic principles of extremity joint mobilization using a Kaltenborn approach. J Sport Rehabil, 2002, 11: 235–250.
20. Lundberg A, Malmgren K, Schomburg ED: Role of joint afferents in motor control exemplified by effects on reflex pathways from Ib afferents. J Physiol, 1978, 284: 327–343.
21. Zusman M: Spinal manipulative therapy: review of some proposed mechanisms, and a new hypothesis. Aust J Physiother, 1986, 32: 89–99.
22. Mueller MJ, Maluf KS. Tissue adaptation to physical stress: a proposed "Physical Stress Theory" to guide physical therapist practice, education, and research. Phys Ther. 2002 Apr 1;82(4):383-403.
23. Goyal M, Bhattacharjee S, Goyal K. Combined effect of end range mobilization (ERM) and mobilization with movement (MWM) techniques on range of motion and disability in frozen shoulder patients: A randomized clinical trial. Journal of Exercise Science and Physiotherapy. 2013 Dec;9(2):74.
24. Johnson AJ, Godges JJ, Zimmerman GJ, et al.: The effect of anterior versus posterior glide joint mobilization on external rotation range of motion in patients with shoulder adhesive capsulitis. J Orthop Sports Phys Ther, 2007, 37: 88–99.
25. Vermeulen HM, Rozing PM, Obermann WR, et al.: Comparison of high-grade and low-grade mobilization techniques in the management of adhesive capsulitis of the shoulder: randomized controlled trial. Phys Ther, 2006, 86: 355–368.
26. Frank C, Akeson WH, Woo SL, et al.: Physiology and therapeutic value of passive joint motion. Clin Orthop Relat Res, 1984, (185): 113–125.
27. Noël G, Verbruggen LA, Barbaix E, et al.: Adding compression to mobilization in a rehabilitation program after knee surgery. A preliminary clinical observational study. Man Ther, 2000, 5: 102–107.
28. Ajimsha MS, Chithra S, Thulasyammal RP. Effectiveness of myofascial release in the management of lateral epicondylitis in computer professionals. Arch Phys Med Rehab. 2012 Apr;93(4):604-9.
29. Nehal K. Kalasval, Yagna U. Shukla, to study the immediate effect of myofascial release with proprioceptiveneuromuscular facilitation for subscapularis on glenohumeral external rotation in shoulder periarthritis-an interventional study, Indian journal of physical therapy, jul-dec 2014; 2(2)
30. Panchal DN, Eapen C. Effectiveness of end-range mobilization and interferential current or stretching exercise and moist heat in treatment of frozen shoulder-a randomized clinical trial. International Journal of Current Research and Review. 2015 Jul 15;7(14):21.
31. T. J. Neviaser, "Adhesive capsulitis," Orthopedic Clinics of North America, vol. 18, no. 3, pp. 439 443, 1987
32. J. F. Chen, K. A. Ginn, and R.D. Herbert, "Passive mobilization of shoulder region joints plus advice and exercise does not reduce pain and disability more than advice and exercise alone: a randomized trial," Aust J Physiother.2009;55(1).17–23.

How to cite this article: Sinha U, Sarkar B, Kumar P. Effectiveness of scapular mobilization versus myofascial release of subscapularis on Pain, ROM and function in subjects with chronic frozen shoulder: a comparative study. Int J Health Sci Res. 2019; 9(8):149-156.

******