

RESEARCH ARTICLE

COLLATION OF SCAPULAR PROPRIOCEPTIVE NEURO-MUSCULAR FACILITATION AND SCAPULAR MOBILIZATION WITH MOVEMENT IN ADHESIVE CAPSULITIS PATIENTS.

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Manuscript Info Abstract

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*Key words:-*Adhesive-Capsulitis, Scapular PNF, Scapular MWM.

Introduction:Adhesive-Capsulitis is a self-limiting condition of unknown etiology characterized by painful and stiff shoulder range of motion(ROM); with scapular dyskinesis. The treatment of Adhesive-Capsulitis aims at reducing pain and improving ROM and shoulder Function. However, treatment of scapular dyskinesis for the management of Adhesive-Capsulitis are limited to this date.

Aim Of Study:To compare the effects of Scapular Proprioceptive Neuromuscular Facilitation(PNF) and Scapular Mobilization With Movement(MWM), on Pain, ROM and Simple Shoulder Functional Activities, in patients having Adhesive-Capsulitis.

Method:It is a Comparative Study. 20 subjects having Adhesive-Capsulitis Stage- II/ III with scapular dyskinesis of age group of 40-70 years were included and patients with recent history of trauma, neurological conditions, shoulder fracture-dislocation, tumors and/or altered cognition were excluded.

Procedure:10 subjects per Groups, A and B were selected and screened for exclusion criteria. Groups received Scapular PNF and Scapular MWM respectively alongwith hotpack, shoulder-ROM exercise, capsular-stretching for period of 1 week.

Outcome Measures:Visual Analogue Scale (VAS), Goniometeric ROM, and Simple Shoulder Function Test on first day before the treatment and on seventh day after the treatment.

Results:Statistical analysis was done by using Wilcoxon within the groups and Man-Whitney between the groups. There was statistical significant difference(<0.005) in pain, ROM and functional outcome measure in both the groups. There was no statistical significant difference between the groups.

Conclusion:Scapular PNF & Scapular MWM are equally effective in reducing Pain, improving ROM and Simple Shoulder Functional Activities, in patients having Adhesive-Capsulitis.

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Introduction:-

Adhesive Capsulitis or Peri-arthritis or Frozen Shoulder is self-limiting condition of unknown cause, which affects usually middle- aged women of 40-70 yrs old¹ and rarely it occurs secondary to Rheumatoid Arthritis, Osteo-Arthritis, trauma or immobilization of shoulder joint. It is characterized by development of dense adhesions, capsular thickening, capsular restrictions which limitsactive and passive shoulder Range of Motion (ROM) with scapular dyskinesis. Though it is often self-limited, can persist for years and may never fully resolve. The disease process affects the anteriosuperior joint capsule, axillary recess, and the coracohumeral ligament. It has been shown through arthroscopy that patients tend to have a small joint with loss of the axillary fold, tight anterior capsule and mild or moderate synovitis but no actual adhesions.^{2,3} Contracture of the rotator cuff interval has also been seen in adhesive capsulitis patients, and greatly contributes to the decreased range of motion, mostly seen in population.⁴Condition is frequently defined as loss of more than 25% of normal shoulder range of motion in at least two directions, particularly abduction and external rotation^{2,4,5,6,7,8}. Faulty posture and muscle strength imbalance also are pre-disposing factors.

Clinical Entity of Adhesive Capsulitis progresses in 4 stages. STAGE-I-(PRE-FREEZING STAGE) characterized by gradual onset of pain which increases with movement and is present at night, along with restricted external rotation. This stage lasts for 3 months. STAGE-II (FREEZING STAGE) characterized by persistent and intense pain at rest with limited motion in every direction. This stage lasts for 3-9 months. STAGE-III (FROZEN STAGE) characterized by pain only with movement, significant adhesions, atrophy of scapular and shoulder muscles. This stage lasts for 9-15 months. STAGE-IV (THAWING STAGE) characterized by minimal pain and no synovitis but capsular restriction. This stage lasts for 15-24 months. The treatment of adhesive capsulitis aims at reducing pain, improving ROM and shoulder functional activities of patients by giving hotpack, capsular stretching, Shoulder ROM exercises, pendular exercise, scapula thoracic strengthening exercises⁹.

Scapulo-humeral rhythm which is playing an important role in increasing shoulder ROM. The disturbance in the scapulohumeral rhythm creates the alterations in alignment of scapula and interferes with the function of upper limb^{10,11,12}. It is evident that the most effective techniques for adhesive capsulitis with scapular dyskinesis are Scapular Proprioceptive Neuromuscular Facilitation (PNF) and Scapular Mobilization with Movement (MWM). For proper functioning of the upper limb, the position of the scapula upon thorax and movement synchronization is mandatory ^{18,19}. The scapular patterns of PNF will facilitate and synchronize with Upper limb function of shoulder movements ²⁰.Manual therapy of scapula in adhesive capsulitis is used to realign the scapula in its normal position, by which correct recruitment of muscles will help in achieving pain free and increase shoulder ROM and shoulder function. The intent of MWM is to restore pain free motionat joints that have painful limitation of range of movement²¹.

The purpose of this clinical trial was to compare two techniques:- Scapular PNF and Scapular MWM, in patients having Adhesive Capsulitis with scapular dyskinesis.

Objectives:-

To see the individual effects of Scapular PNF and Scapular MWM on Pain, Shoulder ROM, Simple Shoulder Functional Activities and to compare both of their effects on Pain, Shoulder ROM, Simple Shoulder Functional Activities.

Methodology:-

The Study design was Comparative Experimental Study, Sampling method was convenient sampling with the sample size of 20 subjects and study duration of 1 week, Study setting was on Ortho OPD, Municipal Corporation Hospital, Ahmedabad.

Our Inclusion Criterias were- Patient with Adhesive Capsulitis of Stage- II or Stage- III, with Scapular Dyskinesis with Lateral Scapular Slide Test Positive. And our Exclusion Criterias were- recent H/O trauma, dislocation or fractures of shoulder, altered cognition, neurological conditions and tumors.

Materials used for the study- Visual Analogue Scale, Simple Shoulder Function Test, pen and paper, goniometer. Figure 1 depicts the questionnaire of Simple Shoulder Function Test used during the study.

Outcome measures were Visual Analogue Score for Pain, Goniometric Range of Motion and Simple Shoulder Functional Activities.

Figure 1Simple Shoulder Function Test Questionnane				
Simple Shoulder Test				
# 1	Is your shoulder comfortable with your arm at rest by your side?			
#2	Does your shoulder allow you to sleep comfortably?			
#3	Can you reach the small of your back to tuck in your shirt with your hand?			
#4	Can you place your hand behind your head with the elbow straight out to the side?			
# 5	Can you place a coin on a shelf at the level of your shoulder without bending your elbow?			
#6	Can you lift one pound (a full pint container) to the level of your shoulder without bending your elbow?			
#7	Can you lift eight pounds (a full gallon container) to the level of the top of your head without bending your elbow?			
# 8	Can you carry 20 pounds at your side with the affected extremity?			
#9	Do you think you can toss a softball underhand 10 yards with the affected extremity?			
# 10	Do you think you can throw a softball overhand 20 yards with the affected extremity?			
# 11	Can you wash the back of your opposite shoulder with the affected extremity?			
# 12	Would your shoulder allow you to work full-time at your usual job?			

Figure 1:-Simple Shoulder Function Test Questionnaire:-

Procedure:-

20 patients were taken of Stage- II and III Adhesive Capsulitis with scapular dyskinesis with LSST positive (>1.5); and all subjects were screened for exclusion criteria. Complete orthopaedic assessment was done prior. Patients were randomly divided into two groups. Flow Chart 1, below describes the division of groups, and treatment given to particular group.

Flow Chart 1:- Division Of Groups, Treatment Given To Specific Groups:-



Group-A:-

In Group-A, patients were asked to go in side-lying position, where the affected shoulder is facing the roof, and the therapist stood behind the patient, therapist pulled the scapula in elongated position, and gave resistance for the desired pattern. D1 Pattern consists of Anterior Elevation of Scapula and Posterior Depression of Scapula¹, as shown in Figure 2. D2 Pattern consists of Posterior Elevation and Anterior Depression of the Scapula¹, as shown in Figure 3. Rhythmic Initiation of the scapular muscles helps muscles to activate and the pattern helps to gain the scapula-humeral rhythm of the joint¹. The rhythmic initiation technique teaches the motion, helps the patient to relax, improves coordination, and normalizes the motion. The repeated contractions technique increases active range of motion and strength and guides the patient's motion towards the desired movement²². Usual dosage for this treatment was 20 repetitions with 20 second rest in between for each diagonal pattern, for 3 times¹.



Figure 2:-D1 Scapular PNF Pattern

Figure 3:-D2 Scapular PNF Pattern



GROUP-B:-

In Group-B, patients were given Scapular Mobilization With Movement, where patients were asked to go in sitting position, and the therapist stood behind the patient. The therapists left hand holds the scapula in a way that the

fingers are on the medial border, web space on inferior border and the thumb on the lateral border of the scapula. The right hand is on the superior part of the clavicle. The right hand thumb is on the spine of the scapula and the fingers anterior to the clavicle. The therapists moves/assists the scapula in upward rotation (left hand) and posterior tilting the scapula(right hand) as the patients goes into the end range of motion actively elevating the shoulder in scaption plane, as shown in Figure 4. It is done for the 10 repetitions for 3 times²⁸. This technique combines a sustained application of a manual technique 'gliding' force to a joint with concurrent physiologic (osteo-kinematic) motion of joint, either actively performed by the subject or passively performed by the therapist ²⁷.



Figure 4:-Scapular MWM

Patients were given Hotpacks; capsular stretching; and shoulder flexion, abduction, external & internal rotation ROM exercises for 10 repetitions, simultaneously with this techniques in both the groups forone week period. Outcome measures were taken on 1st day before the treatment and last day after treatment.

Data Anaysis And Results:-

Statistical Analysis was done using SPSS version 16. With Wilcoxon within groups, to compare pre and post data of VAS, shoulder ROM and Simple Shoulder Function Test (Functional outcome Measure-FOM). And Man-Whitney between the groups, which compares post data of both the groups.

Wilcoxon results for Group A are shown in Table 1 and in graphs 1a and 1b. Wilcoxon results for Group B are shown in Table 2 and in graphs 2a and 2b. Man-Whitney results for comparing post data of both the groups are shown in Table 3 and in graphs 3a and 3b.

Tuble 1. Wheokon Results Within Group 1							
	PRE	POST	Z. VALUE	P- VALUE			
VAS	7.23	4.32	(-2.803)	0.005			
SH. FLEX	111.5	140	(-2.807)	0.005			
SH. ABD	85	117.5	(-2.814)	0.005			
SH. ER	57	72	(-2.829)	0.005			
SH. FOM	1.9	6.9	(-2.827)	0.005			

Table 1:-Wilcoxon Results Within Group-A



Group-A Pre And Post Results

In Group-A, results signifies that; there is significant decrease in pain perception, that is decrease in VAS scores; increase in Shoulder Flexion, Abduction and External Rotation ROM and also there was significant improvement in daily Shoulder Functional Activities. Hence, there is SIGNIFICANT VARIATIION patient's pain perception, ROM, Shoulder Pain and function, after giving SCAPULAR PROPRIOCEPTIVE NEUROMUSCULAR FACILLIATATION for one week.

	PRE	POST	Z-VALUE	P- VALUE
VAS	7.96	4.99	(-2.814)	0.005
SH. FLEX	118.5	144	(-2.814)	0.005
SH. ABD	90.5	119	(-2.869)	0.005
SH. ER	53	67.5	(-2.829)	0.005
SH. FOM	2.6	6.7	(-2.823)	0.005

Table 2:-Wilcoxon Results Within Group-B:-



Graph 2a:-VAS and FOM

Graph 2b:-SH. FLEX, ABD And ER

Group-B Pre And Post Results

In Group-B, results signifies that; there is significant decrease in pain perception, that is decrease in VAS scores; increase in Shoulder Flexion, Abduction and External Rotation ROM and also there was significant improvement in daily Shoulder Functional Activities. Hence, there is SIGNIFICANT VARIATIION patient's pain perception, ROM, Shoulder Pain and function, after giving SCAPULAR MOBILIZATION WITH MOVEMENT for one week.

	GROUP-A	GROUP-B	U- VALUE	P- VALUE
VAS	3.11	2.546	37	0.325
SH. FLEX	28.5	25.5	40	0.438
SH. ABD	32.5	29	48.5	0.908
SH. ER	15	14.5	45.5	0.726
SH. FOM	5	4.1	36	0.278

Table 3:-Man-Whitney Results Between The Group-A And Group-B:-



Group-A And Group-B Pre And Post Results

By comparing both the groups, results clinically signifies that Group-A gave better results than Group-B, but statistically there is no significance between both the groups for VAS scores, Shoulder Flexion, Abduction and External Rotation and for Shoulder Functional Outcome Measure. Thus, the result shows there is NO SIGNIFICANT VARIATION in patient's ROM, Shoulder Pain and function BETWEEN THE GROUPS.

Discussion:-

According to result (WILCOXON), it suggests that there was significant difference (P<0.005) in Pain, ROM and Functional Outcome Measure in both the groups. And the comparison between Group A and B (MAN-WHITNEY) is not significant(P<0.01).

Scapular PNF is the therapeutic approach that works under the means such as stress relaxation, pain gate theory, autogenic inhibition that improves muscle activation and range of motion.^{13,14.} The greatest amount of muscle activation is by the reciprocal activation of both agonist and antagonists which are involved in PNF ^{15,16,17}. Scapular PNF has shown significant difference in VAS scores in single sessionalong with classic exercise and physiotherapy modalities in adhesive capsulitis.(Nilay Comuk Balc et al,2016)²². PNF techniques helps in improving ROM as it elongates the golgi tendon organ that facilitates relaxation of the antagonist muscles and early return to ADL.(Prasanna KJ et al, 2017)¹.Weon-Sik et al. investigated the effects of scapular pattern and hold-relax technique of PNF on ROM and pain in 30 patients with Adhesive Capsulitis. They treated the patients for 4 weeks and found that PNF was effective for improving ROM and Pain. Similarly, we found scapular PNF exercises combined with physiotherapy modalities were effective for improving pain, shoulder function, and ROM. However, these improvements were not directly caused by scapular PNF exercises²⁴. We believe that PNF may be effective when performed with a regular rehabilitation program over a long term.

Due to protracted and rounded shoulders, there is anterior tipping of scapula, which will limit the terminal ranges of shoulder; by tilting the scapula posteriorly and upward rotating the scapula (MWM), one can increase the terminal ranges of shoulder; especially shoulder external rotation. It has been described that during elevation of the arm in healthy subjects, the scapula should upwardly rotate and posteriorly tilt^{25,26}, by applying the posterior tilting and upward rotation of scapula with MWM, one can correct the scapular kinesis. Correctional mobilization is sustained, pain free function is restored and several repetitions will begin to bring lasting improvements which are coordinated

activity in scapular muscles for smooth movement of the scapula during arm motions²⁸. Cristina Lirio Romero et al, in 2015 studied that, Scapular MWMwith standard Shoulder Adhesive Capsulitis (AC) protocol, there is greater functionality improvement an with simple shoulder AC protocol which is of 20 repetition of Shoulder Flexion, Extension and Rotations²³. Manual therapy in adhesive capsulitis is used to decrease intra articular pressure by increasing mobility of the joint capsule and its surrounding soft tissue that results in a reduction of pain and increase range of motion and shoulder function. (Mehta Bryna Pankaj, et al)²¹.

Conclusion:-

The results of the study shows that both the treatments; Scapular PNF and Scapular MWM are equally effective in decreasing Pain, increasing Shoulder ROM and Shoulder Function. Both the techniques are useful in treating patients of Adhesive Capsulitis of Stage- II or III with Scapular Dyskinesis, and helps in improving function of shoulder joint.

Study Limitations And Future Study Prospectives:-

The limitations of the study were relatively small sample size; less duration of study and therefore cannot determine long-term effects of treatment. To increase the sample size and the duration of the study and to examine long- term effects of treatment are the future prospective of the study.

References:-

- 1. Prasanna KJ, Rajeshwari R, Sivakuma VPR. Effectiveness of Scapular Proprioceptive Neuromuscular Facilitation(PNF) Techniques in Adhesive Capsulitis of Shoulder Joint.(J Physiotherapy Res. November 13, 2017, Vol.1 No.2:9).
- 2. Dias R, Cutts S, Massoud S. Frozen shoulder. BMJ 2005; 331:1453-6.
- 3. Vermeulen HM, Rozing PM, Obermann WR, Cessie S, Vlieland T. Comparison of high-grade and lowgrade mobilization techniques in the management of adhesive capsulitis of the shoulder: Randomized clinical trial. Phys Ther 2006;86:355-368.
- 4. Kelley M, Mcclure P, Leggin B. Frozen shoulder: Evidence and a proposed model guiding rehabilitation. J Orthop Sports Phys Ther 2009;39:135-148.
- 5. Brue S et al. Idiopathic adhesive capsulitis of the shoulder: a review. Knee Surg Sports Traumatol Arthrosc. 2007. 15:1048-1054.
- 6. Cleland J, Durall CJ. Physical therapy for adhesive capsulitis: Systematic review. Physiotherapy 2002;88:450-457.
- 7. Bal A, Eskioglu E, Gulec B, Aydog E, Gurcay E, Cakci A. Effectiveness of corticosteroid injection in adhesive capsulitis. Clinical Rehabilitation 2008; 22:503-512.
- 8. Bussieres AE, Peterson C, Taylor JA. Diagnostic imaging guideline for musculoskeletal complaints in adults an evidence based approach: Part 2 upper extremity disorders. J Manipulative Physiol Ther 2008;31:2-32.
- 9. Martin J. Kelley et al. Shoulder pain and mobility deficits.-adhesive capsulitis. J. orthop sports phys. Ther. 2013; 43(5); A1-A31.
- 10.Gaspar PD, Willis FB (2009) Adhesive capsulitis and dynamic splinting: a controlled, cohort study. BMC Musculoskele disord 110: 111.
- 11. Taspinar F, Aksoy CC, Taspinar B, Cimbiz A. (2013) Comparison of patients with different pathologies in terms of shoulder protraction and scapular asymmetry. J Physiother sci 25: 1033-1038.
- 12. Choi SH, Lee BH (2013) clinical useful of shoulder stability exercises for middle aged women. J Physiother Sci 25: 1243-1246.
- 13.Etnyre BR, Abraham LD (1986) H-reflex changes during static stretching and two variations of proprioceptive neuromuscular facilitation techniques. Electroencephalogr Clin Neurophysiol 63: 174-179.
- 14. Alaca N, Atalay A, Guven Z (2015) comparison of the long-term effectiveness of progressive neuromuscular facilitation and continuous passive motion therapies after total knee arthroplasty. J Phys Ther Sci 27: 3377-3380.
- 15. Lee JH, Park SJ, Na SS (2013) The effect of proprioceptive neuromuscular facilitation therapy on pain and function. J Phys Ther Sci 25: 713-712.
- 16.Cengiz A (2007) EMG and peak force responses to PNF stretching and the relationship between stretching-induced force deficits and bilateral deficits. J Phys ther Sci 27: 631-634.
- 17. Adler SS, Beckers D, Buck M (2008) PNF in practice. Germany: springer.

- 18.Park SE, Wang JS (2015) effect of joint mobilization using KEOMT and PNF on a patient with CLBP and a lumbar transitional vertebra: a case study. J phys ther Sci 27: 1629-1632.
- 19. Paine RM, Voight M (1993) the role of the scapula. J orthop sports phys ther 18: 386-391.
- 20. Jaruga M, Manikowski W, Romanowski L, Lubiatowski P, SpÃ.. Â, awski R. (2003) Pre-and postoperative principles of rehabilitation in arthroscopic treatment of painfull shoulder. Ortopedia, traumatologia, rehabilitacja. Ortop Traumatol Rehabil. 5: 469-474.
- 21. Mehta Bryna Pankaj, et al. Comparative effect of Gong's mobilization versus Mulligan's mobilization on pain and shoulder abduction mobility in frozen shoulder, International J. phys. Ther. 2013; 1(5): 227-37.
- 22.Nilay Comuk Balc, Zeliha Ozlem Yuruk, Aslican Zeybek, Mustafa Agah Tekindal: Acute effect of scapular PNF techniques and classic exercises in adhesive capsulitis: a randomized controlled trial. (J Physical Therapy Sci. 2016 April; 28(4): 1219-1227).
- 23. Cristina Lirio Romero, Maria Torres Lacomba, Gema Bodes Pardo. Mobilization with movement for shoulder dysfunction in older adults: a pilot study. (J Chriopractic Medicine. 2015 Dec; 14(4): 249-258).
- 24.Weon-Sik L, Hyung-Soo S, In-Sup K, et al. : The effects of scapular pattern and hold-relax technique of PNF on the ROM and VAS in frozen shoulder patients. J Korean Soc Phys Ther, 2002, 14: 15–26.
- 25.Ludewig PM, Cook TM, Nawoczenski DA. Three-dimensional scapular orientation and muscle activity at selected positions of humeral elevation. J Orthop Sports Phys Ther. 1996;24(2):57-65.
- 26.McClure PW, Michener LA, Sennett BJ, Karduna AR. Direct 3-dimensional measurement of scapular kinematics during dynamic movements in vivo. J Shoulder Elbow Surg. 2001;10(3):269-77.
- 27.Lipika Boruah, Abhijit Dutta, Pritam Deka, Jeutishree Roy, TO STUDY THE EFFECT OF SCAPULAR MOBILIZATION VERSUS MOBILIZATION WITH MOVEMENT TO REDUCE PAIN AND IMPROVE GLENO-HUMERAL RANGE OF MOTION IN ADHESIVE CAPSULITIS OF SHOULDER: A COMPARATIVE STUDY, International J of Phys, Volume : 2 Issue :5 Month : October (2015) Page No : 811-818.
- 28. Ajit Dabholkar, Tejashree Dabholkar, Sujata Yardi, Efficacy of Scapular Movement with Mobilization in Patients with Shoulder Impingement, Indian Journal of Physiotherapy & Occupational Therapy-An International Journal; Vol 7, No 3 (2013): 20-24.