

COMPARISON OF EFFECTIVENESS OF THE COMBINATION OF MUSCLE ENERGY TECHNIQUES AND CONVENTIONAL PHYSIOTHERAPY OVER CONVENTIONAL PHYSIOTHERAPY ALONE IN PERIARTHRITIS OF SHOULDER: A RANDOMIZED STUDY

Lokesh M¹, Raja R², Prashantha S³, Rajeev A⁴

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ABSTRACT: **AIM:** To compare the efficacy of combination of muscle energy techniques and conventional therapy with conventional therapy alone in periarthritis of shoulder. **MATERIALS AND METHODS:** It was a comparative randomized study on two groups, 15 patients in each group. Group A was treated with Conventional therapy and Group B: was treated with Conventional therapy and Muscle energy techniques. Treatment was given for two weeks, six days a week. Assessment was taken before the starting of treatment and on the 3rd, 6th, 9th and 12th day of the treatment for range of motion, intensity of pain and functional deficit. Analysis was based on Visual Analog Scale (VAS) and Shoulder Pain and Disability Index (SPADI). **RESULTS:** There was a significant level of improvement ($p < 0.05$) in Range of Movement (ROM) and SPADI in group B when compared to group A whereas marginal differences in VAS is seen. This implies that muscle energy techniques are more beneficial in improving ROM and decreasing functional disabilities.

KEYWORDS: Periarthritis, muscle energy techniques, visual analogue scale, shoulder pain and disability index.

INTRODUCTION: Frozen shoulder or adhesive capsulitis or shoulder periarthritis affects 2-5% of the population and is most common in the 40-60 year old age group.¹ Women are more frequently affected than men. Bilateral involvement occurs in 10-40% cases. The incidence of adhesive capsulitis in people with diabetes is up to 20%.² It is characterized by the spontaneous onset of pain in the shoulder with restriction of movement in every direction.³

The onset is insidious and develops during a period of relative inactivity in the use of shoulder, the arm hanging constantly at the side. The pain is located over the antero-lateral aspect of the joint and radiates to the anterior aspect of the upper arm and occasionally to the flexor aspect of forearm. Discomfort is worse at night and interferes with sleep. Tenderness is generalized about the humeral head and over the bicipital groove. Active and passive motions are limited in all directions, pain being accentuated at the extremes of motion.

In recent advances the clinical utilization of soft tissue manipulation has increased dramatically which also include the muscle energy techniques.⁴

Both electrotherapeutic modalities and manual therapy methods will have a significant effect in improving the range of motion of shoulder joint, decreasing the pain and disability and improving the quality of life.

Hence this study was conducted to evaluate the efficacy of combined conventional therapy and muscle energy techniques with conventional therapy alone in patients with frozen

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shoulder. Based on the literature data, reflecting no differences between any treatments in the long term, the study was planned to search for the speedy recovery of the two methods in the early phase.⁵

MATERIALS AND METHODS: It was a comparative randomized study conducted at Kempegowda Institute of Medical Sciences and Kempegowda Institute of Physiotherapy, Bangalore. The study was approved by the Institutional Ethics Committee. 30 patients aged 40 to 60 years of either sex attending the OPD of Orthopedics, diagnosed as periarthritis shoulder with capsular pattern of restriction and history of pain for 3-18 months were included in this study. Patients with associated shoulder trauma or disorders, neurological disorders, radiating pain and neoplastic conditions were excluded from the study. An informed consent was taken from each subject willing to participate in the study. Patient details were entered in a pre-designed proforma and they were randomly assigned to either of the two groups. Group A received conventional therapy like moist packs, inferential therapy (IFT), mobilizations and stretching (Muscular & Capsular). Group B received combined conventional therapy and muscle energy techniques.

Post-isometric relaxation method of the muscle energy techniques was used to lengthen a shortened muscle and increase joint mobility. The joint is taken to its restricted range within the pain limits. 5-10 seconds hold time of the hypertonic muscle with 20% of the patient's available strength was used with 2-3 repetitions.

Data was analyzed using standard deviation, t-test, one way ANOVA. p value <0.05 was considered to be statistically significant.

Treatment was given for two weeks, six days a week. Assessment was taken before the starting of treatment and on the 3rd, 6th, 9th and 12th day of the treatment for range of motion (goniometer), intensity of pain (VAS) and functional deficit (SPADI).

TECHNIQUE:

Group A: Moist heat was given using a hot pack for a period of 20 minutes with a coupling medium (layers of towels)

Static Stretching was given to the shortened muscles around the shoulder girdle with a stretch duration of 30 seconds applied for four repetitions.

To increase the flexion of the Shoulder: (Stretch shoulder Extensors).

Hand placement and Procedure: Grasp the posterior aspect of distal humerus just above the elbow. Stabilize the axillary border of the scapula to stretch teres major or stabilize the lateral aspect of the thorax and superior aspect of the pelvis to stretch latissimus dorsi. Move the patient's arm into full shoulder flexion to elongate the shoulder extensors.

To increase the abduction of the Shoulder: (To stretch the Adductors).

Hand placement and Procedure: With the elbows flexed to 90°, grasp the distal humerus. Stabilize the axillary border of the scapula. Move the patient into full shoulder abduction to lengthen the adductors of the shoulder.

To increase the hyper extension of the Shoulder: (To stretch the shoulder Flexors)

Patient's Position: Place the patients in a prone position

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Hand placement and Procedure:Support the forearm and grasp the distal humerus.Stabilize the posterior aspect of the scapula to prevent substitute movements.Move the patients arm into full hyperextension of the shoulder to elongate shoulder flexors.

To increase the external rotation of the Shoulder: (To stretch the internal Rotators)

Hand placement and Procedure:Abduct the shoulder to a comfortable position (initially to 30⁰-45⁰ and later to 90⁰ if the Glenohumeral joint is stable)Flex the elbow to 90⁰ so that the forearm can be used as lever. Grasp the volar surface of the mid forearm with one hand.Stabilization of the scapula is provided by the table upon which the patient is lying.Externally rotate the patients shoulder by moving the patients forearm closer to the table. This will fully lengthen the internal rotators.

To increase the internal rotation of the Shoulder: (To stretch the external Rotators)

Hand placement and Procedure:Abduct the shoulder to a comfortable position that will allow internal rotation to occur without the thorax blocking the motion (initially to 45⁰ and then to 90⁰)Flex the elbow to 90⁰ so that the forearm can be used as a lever. Grasp the dorsal surface of the mid forearm with one hand and stabilize the anterior aspect of the shoulder and support the elbow with your other forearm and hand.Move the patients arm into internal rotation to lengthen the external rotators of the shoulder.Capsular stretching was given for the tightened joint capsule with five repetitions, holding each stretch for 30 seconds.

Posterior capsule stretching was performed as a cross-body stretch by pulling the humerus across the body into horizontal adduction with the opposite hand.

Anterior capsular stretch was performed by the patient standing facing the corner of a room with his both arms abducted to 90⁰, elbows flexed to 90⁰ and placed on the adjacent walls. The patient then pushes his body towards the wall which stretches his anterior capsule.

Stretching was done to a point of mild discomfort, once daily for 5 repetitions holding each stretch for 3 seconds.

Mobilization techniques were applied with the intensities according to Maitland grades III & IV. The duration of prolonged stress on the shoulder capsule in the end range position varied according to subject's tolerance. If pain worsened or continued for more than 4 hours after treatment then the intensity of mobilization techniques were decreased in the next session.

To increase the abduction range of Motion: Caudal glide of the humeral head was performed.

Starting Position:Therapist stands/kneels by the side of the patient's right elbow. Therapist flexes the patients right elbow and holds his wrist in right hand gently and then places the fingers of his left hand over the patients upper arm anteriorly with the lateral border of the proximal phalynx of the index finger against the anterior surface of the proximal end of the patients fore arm and thumb against the lateral surface of the elbow. Patient's right upper arm is lifted fractionally off the couch.

Grade III & IV can be performed with the variations in the amplitude and depth of range being controlled by the therapist. When direct pressure is used against the head of the humerus, the therapist stands beyond the patients head (right side) and places the pads of his thumbs against the head of the humerus, adjacent to the anterior and lateral border of the acromion process.

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To increase the flexion and internal Rotation: Antero-posterior glide of the humeral head was performed.

Starting Position: Therapist stands by the patient's right upper arm facing across his body. With the fingers of his right hand the therapist supports the lower end of the patient's humerus posteriorly from the medial side and then rests patients forearm on his forearm. Therapist raises patient's upper arm approximately 200 anteriorly to the coronal plane of the trunk. Therapist then places the cupped heel of his left hand anteriorly over the head of the humerus, while his fingers extending superiorly and posteriorly over the acromion process. The antero-posterior glide can be performed by the pressure of the cupped heel of therapist hand against the head of the humerus.

To increase external Rotation: Postero-anterior glide of the humeral head was performed.

Starting Position: The patient is in supine with his /her elbow flexed and forearms resting against the pillow on his trunk and a pillow or blanket placed under his elbow.

The therapist kneels laterally and superiorly to the patients shoulder and positions his two thumbs back to back, with the tips in contact with the posterior surface of the head of humerus adjacent to the acromion process and pointing towards ceiling.

The fingers of his left hand are spread over clavicular area and those of the right hand spread over the deltoid. Movement should be produced by the physiotherapists arm and not by finger flexors. The slack of scapular movement is taken by lifting the head of the humerus so that any further oscillatory movements will be associated with the posterior-anterior glenohumeral movement.

IFT was given per 15 minutes in the quadripolar method to the shoulder for pain relief.

Group: B

Moist heat was given using a hot pack for a period of 20min with a coupling medium (layers of towels)

Post -isometric relaxation method of the muscle energy techniques was used to lengthen a shortened muscle and increase joint mobility. The joint is taken to its restricted range within the pain limits. 5-10seconds hold time of the hypertonic muscle with 20% of the patient's available strength was used with 2-3 repetitions.

Restriction of Flexion (Right Side):

Position: Left lateral recumbent

Procedure:Therapist stands in front of the patient.Right hand is placed over the top of the patients shoulder (superior part of scapula) to palpate the motion. Left hand and forearm supports the patients flexed right elbow. The patient's humerus is flexed at the gleno-humeral joint in the sagittal plane to initiate the point of resistance.

The patient is asked to extend the elbow against the counterforce at the localized segment (5-10 seconds).The patient is asked to gently cease the directive force.

Rest time of 2 seconds for the tissues to relax is given and then taken up the slack to the new point of initial resistance.

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Restriction of Abduction (Right Side):

Position: Left lateral recumbent.

Procedure: Therapist stands in front of the patient. Right hand is placed over the top of the patients shoulder (superior part of scapula) to palpate the motion. The patients flexed right elbow is supported with the therapist left hand and arm abducted to initial resistance. The patient is directed to press the elbow towards the body (adduct) against equal counterforce at the elbow. Forces are maintained long enough to sense the patient's contractile force at the localized segment (5-10 seconds). The patient is asked to gently cease the directive force. Rest time of 2 seconds for the tissues to relax is given and then taken up the slack to the new point of initial resistance.

Restriction of internal rotation (Right Side):

Position: Left lateral recumbent.

Procedure: Therapist stands in front of the patient. The dorsum of the patient's right hand is placed carefully against the patients back within the range of comfort.

Therapist's right hand is placed over the top of the shoulder and superior part of the scapula with the therapist's fingers pointing posteriorly and the therapist right palm protecting the anterior side of the shoulder capsule. The patient's right glenohumeral joint is palpated for motion. The fingers of the therapists left hand is placed posteriorly to the patients flexed right elbow. This is gently pulled anteriorly to internally rotate the humerus to the initial resistance. The patient is directed to press his/her right elbow against the therapist fingers. This attempt to produce lateral or external rotation of the humerus at the glenoid fossa. Counterforce is maintained with the therapist left hand. Forces are maintained long enough to sense the patient's contractile force at the localized segment (5-10 seconds). The patient is asked to gently cease the directive force. Rest time of 2 seconds for the tissues to relax is given and then taken up the slack to the new point of initial resistance.

Restriction of external rotation (Right Side):

Position: Left lateral recumbent

Procedure: Therapist stands behind the patient. Therapist left hand is placed superior to the patient's glenohumeral joint. Therapist right forearm is placed medial to the patients flexed right forearm and the therapist right hand supporting the patients right hand and wrist. The elbow is held close to the patient's body. The patients arm is externally rotated to an initial resistance. The patient is directed to attempt to internally rotate the arm by pressing the right hand against the equal counterforce of the therapist right hand. The patient's right elbow is used as the pivot joint. Forces are maintained long enough to sense the patient's contractile force at the localized segment (5-10 seconds). The patient is asked to gently cease the directive force. Rest time of 2 seconds for the tissues to relax is given and then taken up the slack to the new point of initial resistance.

Home Programme: Active and pendulum exercises were performed by the two groups after each session. All patients in the study group were also instructed in a standardized home exercise program consisting of active ROM and pendulum exercises to be performed every day.

ASSESSMENT TOOLS

1) Universal Goniometer: Active range of motion was measured with a conventional goniometer in accordance with the guidelines of American Academy of Orthopedic Surgeons. These goniometric measurements of the shoulder have been found to be highly reliable. Range of motion of the shoulder in all the planes was assessed while the patients were lying supine. Shoulder flexion was assessed in the sagittal plane with the arm at the side and the hand pronated, while the shoulder abduction was measured in the frontal plane with the arm at the side and shoulder internal and external rotation was measured in the transverse plane while the arm was abducted to 90°, elbow flexed to 90°, hand pronated and forearm perpendicular to floor.

2) Shoulder pain and disability Index (SPADI): The shoulder pain and disability index is a self-report questionnaire developed to measure the pain and disability associated with shoulder pathology.

The SPADI consists of 13 items in two sub scales, pain (5 items) and disability (8 items).

Pain scale: - Patient is asked to circle the number that best describe his/her pain where 0 is no pain and 10 is worst pain imaginable.

There are 5 items in the pain scale.

Total pain score = -----/50 x 100

3) Shoulder Disability Index:

It has good group level reliability and acceptable validity.

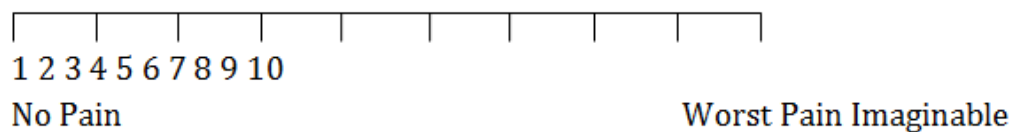
Patient was asked to circle the number that best describes his/her experience where (0= no difficulty and 10 =so difficult that it requires help) during treatment period to the shoulder problem. There are 8 items in the disability index.

Total Disability Score=-----/80 x 100

Total SPADI = -----/ 130 x 100

4) Visual Analogue Scale (VAS):The absolute Visual Analogue Scale (VAS) has been said to be the best pencil and paper method of assessing the intensity of clinical pain.

The AVAS consists of a 10 cm line bounded with verbal descriptions such as no pain at one end and pain as bad as it could possibly be at the other.



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RESULTS:

MEAN VALUES AND STANDARD DEVIATIONS OF EACH PARAMETER IN GROUP A AND B

Group A										
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Days	0		3		6		9		12	
ER	15.33	5.49	18.46	5.15	21.73	5.43	25.06	5.22	28.73	5.86
Abd	71.33	13.66	77.6	14.04	83.55	12.98	89.2	13.33	95.46	13.92
int rot	23	7.27	27.33	7.15	32.13	7.23	37.46	6.08	44.06	10.52
Flex	78.33	13.04	84.33	13.26	91.66	13	95.93	13.11	101.53	13.37
Vas	29.53	6.54	27.53	5.97	24.2	5.6	21.93	5.45	19.4	5.26
Pas	75.6	12.6	68.93	12.3	63.33	12.16	56.5	11.14	50.93	10.66
Ds	75.75	14.42	70.83	12.88	65.41	12.33	60	12.11	54.74	12.25
Tds	76.09	9.19	70.06	8.89	64.66	8.59	58.65	8.52	53.25	8.39

TABLE 1

Group B										
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Days	0		3		6		9		12	
ER	16.33	7.66	21.2	7.47	26.66	6.72	32.33	7.28	36.33	5.81
Abd	71.66	14.22	81	13.25	90.33	16.41	100	15.4	111	15.02
int rot	27	8.4	31.73	8.41	37.33	9.42	40.66	8.63	45.33	6.67
Flex	73.66	15.17	84	16.81	93.66	14.81	101.33	14.55	111	14.16
Vas	30	59.4	26.46	5.9	23.2	5.6	20.4	5.09	17	4.92
Pas	75.66	9.84	65.2	9.4	56.93	9.79	48.66	8.9	40.8	8.16
Ds	79.66	10.94	72.08	10.2	64.5	10.73	57.19	10.96	50.5	10.87
Tds	77.46	9.4	69.43	8.72	62.12	8.63	55.12	8.61	46.89	8.77

TABLE 2

* ER- external rotation

Abd – abduction

int rot – internal rotation

Flex – flexion

Vas – visual analogue scale

Pas – pain score

Ds- disability score

Tds – total SPADI

DISCUSSION: While many treatments have been employed in the management of frozen shoulder, few have been proved to be effective in randomized controlled trials. Non-steroidal anti-inflammatory drugs, local anesthetic and corticosteroid injections into the glenohumeral joint, antidepressants and calcitonin, distension arthrography, closed manipulation, physical therapy modalities exercises can be listed among the most common non-surgical approaches to treatment in adhesive capsulitis.⁶

With respect to physical therapy, patient with frozen shoulder will usually require both joint and soft tissue mobilization and stretching techniques for improving shoulder range of motion.

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Traditionally physiotherapy management includes a variety of interventions like heat or ice applications, ultrasound therapy, interferential therapy, transcutaneous electrical nerve stimulation, active and passive range of motion (ROM) exercises, Proprioceptive neuromuscular facilitation techniques and mobilization techniques.⁷

Implementation of muscle energy techniques along with conventional therapy, demonstrated a significant decrease in pain and improved ROM and functional disability which supports the alternate hypothesis.

Statistical analysis showed that both groups receiving treatment had an improvement in gleno-humeral joint motion with a decreased pain and disability score. The analysis also showed that MET with conventional treatment had earlier effect on the joint with a better outcome measure.

There was better results of increase in ROM and decrease in pain and disability in group B when compared to group A.

The results of this study support the studies done by Ian Johnson⁸ which concludes that there is evidence that there is medium-term increase in ROM and decrease in disability and pain achieved in elderly patients by post-isometric muscle relaxation. The reasons for this improvements is that the effect of post isometric muscle relaxation is said to be mediated by afferent input from the golgi-tendon organs when muscle is held in an isometric contraction, the afferent feedback leads to inhibition of the given muscle, which is thought to result in relaxation of the muscle when the contraction is released.⁹

Conventional treatment methods have also proved to be beneficial in patients with peri-arthritis. This was evident in this study as there were improvements in all the outcome measures in the conventional group (group A). This is in concordance with the studies done by Zinovieff. Aand Harborow PR.⁵

In a study done by Henricus M Vermeulanetal, inferred that in many physical therapyprograms for adhesive capsulitis of shoulder, mobilization techniques are an important part of the intervention.¹⁰

The significance and efficiency of MET over conventional treatment is due to the difference in the rationale. The rationale is that loosening tight muscles in the region of joint restriction will result in a more comfortable, successful and easily administered adjustment. The muscle stretching is considered a preparatory procedure for primary intervention, the adjustment unfortunately situations exist where joint hypo-mobility and/or pain can interfere with the performance of muscle stretching.⁹

There is evidence that MET procedures actually result in increased myoelectric activity of the target muscle. The clinical benefit derived from MET stretching may be due to patients feeling more involved or confident in the procedure and willing to tolerate the discomfort of the stretch rather than any neurologic muscular relaxation.

Thus MET are interventions that can reduce pain and muscle rigidity, lengthen muscle fibers and increase ROM necessary for motor behavior.

The mean differences and standard deviations of each parameter were seen day wise (0, 3, 6, 9, 12) and comparison between the two groups revealed that there were faster improvements in the earlier treatment sessions in group B compared to group A which proves the efficacy of MET

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There was a significant level of improvement ($p < 0.05$) in ROM and SPADI in group B when compared to group A whereas marginal differences in VAS is seen. This implies that muscle energy techniques are more beneficial in improving ROM and decreasing functional disabilities.

CONCLUSION: There was significant improvement seen both in conventional group and also in the group which received both conventional and MET. But the results in the group which received combined MET and conventional therapy have shown faster and better improvements compared to only conventional therapy.

Limitations of the study is small sample size and that objective, functional disability measurements and treatments were based only on the glenohumeral joint in the shoulder complex and hence may lead to variations in outcome.

REFERENCES:

1. Jalenajurgel, LauriRannama et al, Shoulder function in patients with frozen shoulder before and after 4 weeks rehabilitation, *medicina (Kaunas)* 2005;41(1).
2. Kulkarni, Textbook of orthopedic and Trauma, Jaypee brothers, 1999, 1st edition: 2591-2595
3. Peter J Rundquist et al, Shoulder kinematics in subjects with frozen shoulder, *Arch Phys Med, RBNVol* 84, Oct 2003.
4. Leon Chaitow et al, *Clinical application of neuromuscular techniques*, 1998:vol 1; 3rd edition
5. Zinovieff A, Harborow PR, Comparison of the early response of two methods of rehabilitation in adhesive capsulitis, *Swiss Med Weekly*, 2004, 134: 353- 358.
6. Samuel I Turek, *Orthopedics, principles and their applications*; 2000 4th edition: 932- 935.
7. Henricus M Vermeulen et al, Comparison of high grade and low grade mobilization techniques in the management of the shoulder: randomized control trial, *Physical Therapy* 80 A:No 3A, March2006.
8. Ian Johnson – Low force chiropractic adjustment and post isometric muscle relaxation for the ageing cervical spine: a case study and literature review, *the British Journal of Chiropractic*, 2001/2 Vol 5, No 3.
9. Lisi, Anthony J, *Muscle Energy Techniques in Chiropractic Practice*, Oct 2002.
10. Henricus M Vermeulen et al, Comparison of high grade and low grade mobilization techniques in the management of the shoulder: randomized control trial, *Physical Therapy* 80 A:No 3A, March2006.

AUTHORS:

1. Lokesh M.
2. Raja R.
3. Prashantha S.
4. Rajeev A.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Orthopaedics, Kempegowda Institute of Medical Sciences, Bangalore.
2. Associate Professor, Department of Physiotherapy, Kempegowda Institute of Physiotherapy, Bangalore.
3. Lecturer, Department of Physiotherapy, Kempegowda Institute of Physiotherapy, Bangalore.

4. Lecturer, Department of Physiotherapy, Kempegowda Institute of Physiotherapy, Bangalore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Lokesh M,
Assistant Professor,
Department of Orthopaedics,
Kempegowda Institute of Medical
Sciences Hospital, V. V. Puram,
Bangalore-04.
E-mail: drloky76@yahoo.co.in

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