

## Original Article

# A RANDOMIZED CONTROLLED TRIAL TO COMPARE THE EFFECT OF MUSCLE ENERGY TECHNIQUE WITH CONVENTIONAL THERAPY IN STAGE II ADHESIVE CAPSULITIS

B. Chakradhar Reddy \*<sup>1</sup>, Santosh Metgud <sup>2</sup>.

\*<sup>1</sup> Post graduate student, Department of Orthopaedic Manual Therapy, Institute of Physiotherapy, KLE University, Belgaum, Karnataka, India.

<sup>2</sup> Assistant Professor, Department of Orthopaedic Manual Therapy, Institute of Physiotherapy, KLE University, Belgaum, Karnataka, India.

## ABSTRACT

**Background and Objectives:** Adhesive capsulitis is a clinical diagnosis made from a history of the gradual onset of severe shoulder pain with the progressive limitation of active and passive glenohumeral movements. Muscle energy technique helps to mobilize restricted joints by stretching hypertonic muscles, capsules, ligaments, and fascia. The aim of the study is to find out and compare the effect of MET and Conventional therapy to reduce pain, improve the shoulder range of motion and function in stage 2 of adhesive capsulitis.

**Materials and Method:** The present randomized controlled trial was conducted among 30 participants who included both male and female symptomatic individuals from the age group of 40 years and above. Participants were randomly assigned into two groups of 15 each. Physical therapy treatment protocol which included Conventional therapy (group A) and MET along with conventional therapy (group B) was given for 15 days. The outcome measures recorded were pre and post 15<sup>th</sup> day of intervention using visual analogue scale, shoulder range of motion of flexion, abduction, External rotation and functional evaluation by Disability of Arm Shoulder Hand.

**Result:** In the present study, within group analysis showed that pain relief, improved range of motion and reduced disability was statistically significant in both the groups ( $p < 0.0001$ ) whereas the between group analysis revealed that Conventional group (group A) and MET group (group B) both are effective in reducing pain, improving range of motion and function.

**Conclusion:** Hence, it can be concluded that Conventional therapy and MET along with Conventional therapy both are equally effective in treatment of Adhesive Capsulitis.

**KEYWORDS:** Muscle Energy Technique, Stage II Adhesive Capsulitis, Pain and Function.

**Address for correspondence:** B. Chakradhar Reddy, Post graduate student, Department of Orthopaedic Manual Therapy, Institute of Physiotherapy, KLE University, Belgaum, Karnataka. India.

**Email:** bangaru.chakradhar@gmail.com

## Access this Article online

### Quick Response code



International Journal of Physiotherapy and Research

ISSN 2321- 1822

[www.ijmhr.org/ijpr.html](http://www.ijmhr.org/ijpr.html)

Received: 07-05-2014

Accepted: 16-05-2014

Peer Review: 07-05-2014

Published: 11-06-2014

## INTRODUCTION

Adhesive capsulitis is a clinical diagnosis made from a history of the gradual onset of severe shoulder pain with the progressive limitation of active and passive glenohumeral movements.<sup>1</sup>

<sup>2</sup> primarily; risk factors for frozen shoulder are Diabetes, thyroid disorder, history of shoulder trauma, cervical radiculopathy, post operative immobilization and shoulder surgery<sup>3</sup>. Research

suggests that the process is started with an inflammation of the lining of the joint within the shoulder. Gradually this area thickens and results in the shoulder becoming stiffer and more painful.<sup>4</sup>

The benefits for achieving goals by exercise therapy with heating are to increase the extensibility of collagen or to alter viscoelastic properties of connective tissue. Studies have

shown that as temperature of soft tissues between 40°C - 45°C there was a significant drop in tensile stress, compared with that recorded at room temperature (25°C).<sup>5, 6, 7</sup>

Interestingly, rather than heat in an adjunct to exercise and manipulation, Transcutaneous Electrical Nerve Stimulation (TENS) has been shown to significantly increase range of motion. Resisted exercises typically include strengthening of the scapular stabilizers and Rotator cuff, should give progressively with an appropriate intervention.<sup>8</sup>

The term "Muscle Energy" suggests that effort and energy of person or patient performing movements provide the primary force involved in process. It is used to help mobilize restricted joints by stretching hypertonic muscles, capsules, ligaments, and fascia. This leads to improved postural alignment and the restoration of proper joint biomechanics and functional movement.<sup>9</sup>

Janda suggests that before any attempt is made to strengthen weak muscles, any hypertonicity in their antagonists should be addressed by appropriate treatment which relaxes (and if appropriate lengthens) them.<sup>10</sup>

Greenman (1989) depicts that Muscle Energy Technique helps to regain the mobility of the hypomobile joints by restoring normal length tension relationships which are shortened and by strengthening the weakened muscles and reduce edema by pumping action for lymphatic system.<sup>11</sup>

Handel et al quoted that MET procedures and post isometric procedures such as Proprioceptive Neuromuscular Facilitation (PNF), have concluded to be more effective than static stretching for improving extensibility of shortened muscle<sup>12</sup>. There is very little strain on the therapists as long as proper body mechanics are used. Individuals who suffer from headache or chronic shoulder, neck or back pain may find relief through MET.<sup>9</sup> An experimental study concluded that MET produced a change in ROM was possibly due to an increased tolerance to stretch, as there was no evidence of Viscoelastic change.<sup>13</sup>

There are only three studies identified that use of muscle energy technique for lower extremities

es<sup>13, 14, 15</sup> and only one for the upper extremity. The study claimed that muscle energy technique (MET) applied to glenohumeral joint (GHJ) horizontal abductors and MET applied to GHJ horizontal external rotators on improving GHJ adduction and internal rotation range of motion in posterior capsular tightness<sup>16</sup>. There are no studies done to evaluate and find out the effect of MET and Conventional Therapy in stage II adhesive capsulitis. Hence, the purpose of the study is to find out the effect and compare MET with Conventional therapy in stage II adhesive capsulitis.

## METHODS

In this study 30 subjects were recruited with stage II Adhesive Capsulitis from 15 March 2013 to 30 January 2014. The Inclusion criteria were A) Subjects diagnosed with stage 2 Adhesive Capsulitis. B) Age group 40 years and above. C) Adhesive Capsulitis subjects with limited Range of motion of shoulder abduction, external rotation and flexion. D) Subjects with bilateral and/or unilateral adhesive Capsulitis. E) Subjects without type 2 diabetes mellitus. F) Subjects who are willing to participate in the study. The Exclusion criteria were A) Subjects with Rotator cuff tears and other shoulder ligament injuries. B) History of any arthritis related to shoulder. C) Malignancy. D) Peri-arthritis shoulder secondary to fracture, dislocation, Reflex sympathetic dystrophy, neurological disorder. The study was carried out in KLES Dr. Prabhakar Kore Hospital and MRC, Belgaum, Karnataka. The study was approved by Institutional Ethics Committee on Human subjects.

### Outcome Measures:

Outcome measures were Visual Analogue Scale (VAS), Shoulder Range of Motion and Disability of Arm Shoulder Hand (DASH). Pain intensity was measured by asking the patient to point on a 10 cm line marked with numbers 0 to 10 was used, where 0 symbolizes no pain and 10 as maximum pain. Active Shoulder Abduction, External Rotation and flexion ROM measurement was taken both pre and post session of intervention with the help of universal goniometer. The functional index designed to determine the symptoms and limitations that participant was experiencing while performing daily activities. This scale consists of 30 items in the form of activities of

daily living with each item scoring from 0 to 4, where 0 is no difficulty in performing that activity and 4 is unable to do that activity. This was used to monitor the patient over time and to determine the effectiveness of an intervention. The readings were taken both pre and post 15th day of intervention for all the outcomes.

**Interventions:**

The participants were randomly allocated into two groups:

Group A received Conventional Therapy; Group B received MET and conventional Therapy. Conventional Therapy Protocol Includes Hot Moist Pack, TENS and Shoulder Mobility Exercises. These treatment protocols were given one session per day for 15 days. Whereas, Muscle energy techniques were given for 5 repetitions per set, 3 sets per session, 1 session per day for 15 sessions.

**PHOTOGRAPHY:**

**Fig. 1:** MET For Shoulder Abduction in Sitting Position.



**Fig. 2 (a) (b):** MET For Shoulder Flexion and External Rotation In Supine Position.



**RESULTS**

The results of this study were analyzed in terms of pain relief indicated by decrease in visual analogue scale scores, Active ROM of shoulder Abduction, External Rotation and Flexion which was measured by using Universal goniometer and Variations in functional disability of Shoulder was recorded by Disability of arm shoulder hand questionnaire (DASH).

**Statistical Analysis:**

Statistical analysis of the present study was done manually as well as by using SPSS software version 10 so as to verify the results. Various statistical measures such as mean, standard deviation and tests of significance such as paired "t" test for within group variables, unpaired "t" test for between group variables were used. Probability values less than 0.05 were considered statistically significant and probability values less than 0.001 were considered highly significant.

**Table 1:** Demographic Data.

Characteristics	Group A	Group B	P- value
Gender (M,F)	(10,5)	(6,9)	
Side Affected(Lt, Rt)	(8,7)	(6,9)	
Mean Age group	52.73±5.42	55.67±7.71	0.46
BMI	25.87±3.60	27.71±4.50	0.35
Duration of Symptoms (months)	4.80±2.51	3.73±1.44	0.29

**Demographic Profile- (Table 1)**

The mean age of the participants in group A was 52.73±5.42 years and group B was 55.67±7.71 years. There was no significant difference between the mean ages of the participants in between the groups.

In the present study there were 16 males and 14 females. The gender ratios of participants in group A was 10 males and 5 females (66.67%

and 33.33) and participants in group B was 6 males and 9 females (40% and 60%). The participants affected with left shoulder were 8 (55.33%) and 7 (46.67%) with right side involvement in group A, 6 (40%) with left side involvement and 9 (60%) with right involvement in group B respectively.

The mean onset of duration of symptoms in group A was 4.80±2.51 months and in group B was 3.73±1.44 months. The mean BMI of participants in group A was 25.87±3.60 kg/m<sup>2</sup> and in group B was 27.71±4.50 kg/m<sup>2</sup>.

**Table 2:** Inter Group comparison of outcome measures of both groups.

	Pre intervention (p-value)	Post intervention (p-value)	Change from pretest to 15th day (p-value)
VAS Score	0.39	0.13	0.19
DASH Score	0.63	0.13	0.52
Flexion	0.79	0.2	0.41
Abduction	0.7	0.83	0.4
External Rotation	0.03*	0.1	0.07

VAS: Visual Analogue Scale.

DASH: Disability of Arm Shoulder Hand

**Outcome measures (Table 2&3)**

**Visual Analogue Scale (cms) score:** In group A the mean VAS score on pre intervention was 7.02±1.08 cms and post intervention was 2.44±1.18 cms and in group B day 1 score was 6.77±1.23 cms and post intervention was 1.89±1.28 cms. There was a statistically significant reduction in overall VAS score of both the groups from day 1 to day 15.

On comparing between the group A and group B, values of VAS scores on pre intervention to 15<sup>th</sup> day of intervention was statistically significant with the p value (p = 0.04).

**Disability of arm shoulder hand:** In group A the mean DASH score on pre intervention was 72.13±14.68 and post intervention 24.73±12.38 and in group B pre intervention score 67.93±16.98 and post intervention 16.13±13.53. There was no statistically significant reduction in overall DASH score of both the groups but clinically there was significant difference from day 1(p=0.65) to day 15 (p=0.18). Pair wise comparison of both the groups did not show any significant reduction in DASH scores.

**Shoulder Active Flexion ROM:** In group A the mean Active Flexion on the day 1 was 102.53±13.51 and post intervention was

147.87±15.86 and group B the score on pre intervention was 105.60±17.52 and post intervention was 156.87±15.36. Pair wise comparison between the groups, group A and group B showed significant improvement of Active Flexion range.

**Shoulder Active Abduction ROM:** In group A the mean value of pre intervention for Active Shoulder Abduction was 88.60±16.66 and post intervention was 138.13±13.91, In group B pre score was 85.13±19.95 and post intervention was 140.60±24.05. In comparison between groups, Active range of motion did not show significant improvement in both groups.

**Shoulder Active External Rotation(ER) ROM:** In this study mean of within group comparison of pre intervention and post 15<sup>th</sup> intervention values were taken. In group A the mean Active ER score on pre intervention was 23.13±11.43 and post intervention was 45.07±8.77. In group B the mean Active ER score on pre intervention was 35.00±15.22 and post intervention was 55.00±16.92. Pair wise comparison of both the groups did not showed any statistical significant improvement in Active ER range on 15<sup>th</sup> day of intervention but showed significant difference at baseline values.

**Table 3:** Within Group comparison of outcome measures of both the groups.

	Pre intervention	Post intervention	Change from pretest to 15 <sup>th</sup> day	p value
<b>VAS Score (in centimetres)</b>				
Group A	7.02±1.08	2.44±1.18	4.45±1.04	0.0006*
Group B	6.77±1.23	1.89±1.28	4.88±1.31	0.0006*
p value	0.4	0.04*	0.04*	
<b>Flexion ROM (in degrees)</b>				
Group A	102.53±13.51	147.87±15.86	45.33±10.15	0.0001*
Group B	105.60±17.52	156.87±15.36	51.27±15.30	0.0001*
p value	0.74	0.00*	0.01*	
<b>Abduction ROM (in degrees)</b>				
Group A	88.60±16.66	138.13±13.91	49.53±14.48	0.0001*
Group B	85.13±19.95	140.60±24.05	55.47±14.21	0.0001*
p value	0.73	0.01*	0.00*	
<b>External Rotation (in degrees)</b>				
Group A	23.13±11.43	45.07±10.44	21.93±8.77	0.0001*
Group B	35.00±15.22	55.00±16.92	20.00±5.87	0.0001*
p value	0.02*	0.06	0.01*	
<b>DASH Score</b>				
Group A	72.13±14.68	24.73±12.38	47.40±10.50	0.0001*
Group B	67.93±16.98	16.13±13.53	51.80±13.00	0.0001*
p value	0.65	0.06	0.18	

\*P ≤ 0.01 is significant, p ≤ 0.001 is highly significant.

## DISCUSSION

The present study conducted was a Randomized controlled trial to compare the effectiveness of Muscle Energy Technique and Conventional Therapy in participants with stage II Adhesive capsulitis. The results of present study regarding gender ratio consistent with the previous literatures that suggests males are more affected by Shoulder Capsulitis as compared to females.<sup>17, 18</sup>

In the present study majority of the subjects 16 were affected with more on right shoulder and then 14 were affected with the left shoulder. Subjects with left shoulder affected in group A were 8 and group B were 6 and whereas with right shoulder in group A and B were 7 and 9 respectively. A study conducted by Sang-Yeol and Hyun et al on Adhesive capsulitis also supports the present study that right shoulder is affected more than left shoulder.<sup>19</sup>

It is important to note that both group participants in the present study were treated with hot moist pack, TENS and Shoulder mobility Exercises as a conventional method of treatment. Conventional therapy also showed significant improvement in pain reduction after treatment protocol. The results of present study is supported by study of Doner and Guven (2012)<sup>20</sup> which showed Conventional therapy was also showed significant improvement after a three week treatment intervention for shoulder Adhesive capsulitis.

Pain relief achieved in MET group (group B) observed to be statistically significant reduction in pain scores as compared to Conventional therapy (group A). But when mean value of inter group comparison was made, no significant reduction was noticed. The study done by Freyer and Fossum (2010) on pain reduction by MET, explained that centrally mediated pain inhibitory mechanism and neuronal mechanism in dorsal horn is by neurological and tissue factors such as stimulation of low threshold mechanoreceptors which leads to possible gating effects and effect of rhythmic muscular contraction on interstitial and tissue fluid flow.<sup>21</sup>

In Conventional group (group A) the mean value of baseline and post intervention showed statistical significant reduction in quality of pain

on VAS score. Reduction in pain is achieved by application of hot moist pack was consistent with study done by Rabkin et al on physiological effect of local heat include analgesia, increase in metabolic activity<sup>22</sup>.

In present study VAS score in MET group (group B) showed significant reduction in quality of pain on post 15<sup>th</sup> day. The present study also consistent with the study done by Noelle and Terry et al on individuals with non-specific lumbopelvic pain showed Short term effects (i.e. immediately after 24 hours) in MET group.<sup>13</sup>

The study done by Kristinn Heinrichs explained that sensory receptors of the skin and afferent nerves stimulated by heat may have an analgesic effect which acts on the pain gate control mechanism. It has been suggested that heating the secondary afferent muscle spindle nerve endings and Golgi tendon endings could be the way in which muscle spasm is reduced by heating.<sup>23</sup>

Improvement in mean values of shoulder function in terms of reduction of DASH scores was also found from pretest to post 15<sup>th</sup> day in both the groups. When the intra or within group comparison of "p" values of Disability of Arm Shoulder Hand (DASH) was analyzed, it found to be statistically not significant in both the groups, even inter or in between group comparisons also had no statistical difference. This suggests that both the interventions given were equally effective.

The increased active range of motion and flexibility following MET may be due to various factors like neural, Viscoelastic and thixotropic properties<sup>24, 25</sup>. After application of MET, Musculotendinous junction acts in a Viscoelastic manner and leads to the properties of creep and stress relaxation. The improvement noticed in the shoulder range of motions supports the explanation given by previous authors that the musculotendinous units of hamstrings deform or lengthen as it is being stretched and goes through elastic phase and then occurs the plastic deformation<sup>26, 27</sup>.

### Limitations:

Subjects could not be followed up for longer periods. No blinding of evaluators of outcomes was done. Shoulder Internal Rotation and Exten-

sion range of motion were not considered in the study. Exclusion of type II Diabetes Mellitus subjects might have reduced sample size.

## CONCLUSION

The present randomized controlled trial provided evidence to support the use of interventions in the form of Conventional therapy and MET are useful in by reducing pain, improving range of motion and functional ability in terms of DASH in subjects with stage 2 Adhesive Capsulitis. Hence, it can be concluded that both Conventional therapy and MET are equally effective in treatment of Adhesive Capsulitis.

### Scope for further study:

Studies with ways to measure the amount of force, i.e. Maximum voluntary contraction, required during the MET procedures to produce desired effect, can be designed to standardize the technique. Studies with all the shoulder range of motions to be included in determining the consistent outcomes. Studies with comparison of Shoulder ROM with Diabetes Mellitus and without Diabetes Mellitus individuals were to be recommended.

**Conflicts of interest:** None

## REFERENCES

1. Ombregt L, Bisschop P, Ter Veer HJ. A system of Orthopaedic Medicine. 2<sup>nd</sup> edition. London: Churchill Livingstone. 2003; 34-48.
2. Siegel LB, Cohen NJ, Gall E. Adhesive capsulitis: A sticky issue. *Am Fam Physician*. 1999; 59(7): 1843-1850.
3. Buchbinder R, Green S. Effect of Arthrographic shoulder joint distension with saline and corticosteroid for Adhesive Capsulitis. *Brazilian Jour Sports Med*. 2004; 38(4): 384-385.
4. Philpage, Andre Labbe. Adhesive Capsulitis: Use the evidence to integrate your interventions. *N Am J Sports Phys Ther*. 2010; 5(4): 266-273.
5. Hardy M, Woodall W. Therapeutic effects of heat, cold and stretch on connective tissue. *J Hand Ther*. 1998; 11: 148-156.
6. Lehmann JF, Masock AJ, Warren CG, Koblanski JN. Effect of Therapeutic Temperatures on Tendon Extensibility. *Arch Phys Med Rehab*. 1970; 51: 481-487.
7. Mason P, Riby BJ. Thermal Transitions in Collagen. *Biochim Biophys Acta*. 1963; 66: 448-450.
8. Rizk TE, Christopher RP, Pinals RS, Higgins AC, Frix R. Adhesive capsulitis (Frozen Shoulder): A New Approach to its Management. *Arch Phys Med Rehabil*. 1983; 64:29-33.
9. Dr. Kerry D Ambrogio: Muscle Energy Technique. Revised edition. 2012; 11.
10. Chaitow L. Muscle energy techniques. 2nd ed. Edinburgh: Churchill Livingstone; 2006:1-187
11. Greenman P: Principles of Manual Medicine. First edition. Williams and Wilkins. Baltimore. 1989; 88.
12. Leon chaitow: Multidisciplinary Management of Migraine. Part 3. 2013, 186-187.
13. Ballantyne, G Fryer, P Mc Laughlin. The effect of Muscle Energy Technique on hamstring extensibility: The Mechanism of Altered Flexibility. *Journal of Osteopathic Medicine*. 2003; 6(2): 59-63.
14. Shadmehr A, Hadian MR, Naiemi SS, Jalaie S. Hamstring flexibility in young women following passive stretch and muscle energy technique. *J Back Musculoskelet Rehabil*. 2009; 22:143-148.
15. Smith M, Fryer G. A comparison of two muscle energy techniques for increasing flexibility of the hamstring muscle group. *J Body Mov Ther*. 2008; 12:312-317.
16. Stephanie D Moore, Kevin G Laudner. Immediate effects of MET on posterior shoulder tightness: RCT. *Jour of Orthopaedic and Sports Physical Therapy*. 2011; 41(6): 400-407.
17. Henricus M, Wim R Obermann, Bart J, Gea J. End range mobilization techniques in adhesive capsulitis of shoulder joint: A Multiple subject case report. *Physical Therapy*, 2000; 80(12): 1204-1213.
18. Abhay Kumar, Suraj Kumar, Anoop Agarwal. Effectiveness of maitland techniques in idiopathic shoulder in adhesive capsulitis. *ISRN Rehabilitation*. 2012; Article ID 710235, 1-8.
19. Sang-Yeol, Hyun Dong Je, Ji Hoon Jeong. Effects of whole body cryotherapy in management of adhesive capsulitis of shoulder. *Arch Phys Med Rehabilitation Medicine*. 2012; 20: 1-8.
20. Gokhan Doner, Zeynep Guven. Evaluation of Mulligan's Technique for Adhesive Capsulitis. 2012; 4: 45.
21. Leon Chaitow: Muscle Energy Techniques. 4<sup>th</sup> edition. Churchill Livingstone. 2013; 22-25.
22. Rabkin JM, Hunt TK. Local heat increases blood flow and oxygen tension in wounds. *Arch Surg*. 1987; 122(2): 221-225.
23. Kristinn Heinrichs. Superficial Thermal Modalities. *Jour of Physical Therapy*. 2003; 16: 277-289.
24. Leon Chaitow, Judith Walker Delany. Clinical application of neuromuscular techniques. Volume 1, the upper body; Forwarded by John Lowe and Benny Vaughn, Churchill Livingstone. 2000.
25. L. Jami. Golgi tendon organ in mammalian skeletal muscle: functional properties and central actions. *Physiological review*. 1992; 72(3): 623-666.
26. Spernoga SG, Uhl TL, Arnold BL, Gansneder BM. Duration of maintained hamstring flexibility after a one-time, modified hold-relax stretching protocol. *Journal of Athletic Training*. 2001; 36 (1): 44-48.
27. D. D Stromberg and C. A Wiederhielm. Viscoelastic description of a collagenous tissue in simple elongation. *Journal of applied physiology*. 1969; 26(6): 857-862.