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A COMPARATIVE STUDY ON THE EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUES AND MOBILIZATION COUPLED WITH ULTRASOUND IN PATIENTS WITH PERIARTHRITIS OF THE SHOULDER JOINT

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ABSTRACT

Background: Periarthritis or Adhesive shoulder occurs among 7-21% of the population, which was characterized by traumatic stiff shoulders in both active and passive range of actions. The aim of the study was to compare the efficacy between Muscle energy technique (MET) and Mobilization technique (MT) coupled with ultrasound therapy in reduction of pain and increasing functional ability of subjects with adhesive shoulder.

Methods: 30 subjects were randomly assigned for the experimental study by the selection criteria and divided into 2 groups: Group A -Muscle energy technique with ultrasound therapy (METU) and Group B- Mobilization technique with ultrasound therapy (MTU). The period of intervention was 5 sessions per week for 21 days. The therapy progress was evaluated by VAS and SPADI scores pre and post every 7 days of therapy.

Results: The analysis was non-blind randomized experimental study for the subjects with adhesive shoulders. Both the treatment groups showed improvement comparing pre and post treatment, while Group A showed significant difference compared to Group B in pain relief and functional abilities. Statistically comparing the mean values of SPADI of the two treatment groups has indicated METU (28.93) as more efficient than MTU (36.80) at P≤ 0.001.

Conclusion: The current study has concluded that the muscle energy technique coupled with ultrasound therapy imparts more effective solution than the mobilization technique coupled with ultrasound. Hence, this study has demonstrated a better combination therapy regimen for the treatment of periarthritic shoulder the physiotherapists. Similarly, potential of this combination therapy can be explored on other types of ailments demanding physiotherapy.

Keywords: Muscle energy technique, Mobilization technique, Ultrasound therapy, VAS, SPADI scale.

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INTRODUCTION

Shoulder joint is one of the most rewarding and functional joints involved in daily routines including performances, occupational and recreational activities [1]. Operation of this joint facilitates stability and mobility which often mutually co-exist between the upper and lower limb movements during skilled and powerful activities of the hands. The joints in human body get affected by different disabilities, of which arthritis represents a major a major one. Arthritis of the shoulder joint is reported since 1872 [2], described as 'Humero Scapular Periarthritis'. The ailment was renamed as 'Frozen Shoulder' in 1934 by Codman [3] and later described as 'Adhesive Capsulitis', by Neviarer [4] in 1945, who reported the occurrence of this ailment amongst 7%-21% of the population. The condition is characterized by painful stiff shoulder.

The cases of chronic adhesive capsulitis are reported to be responding well to therapeutic massage with muscle energy technique (MET), leading to decreases in pain and increase in functional quality [5]. MET is generally classified as a direct technique against other methods, because the muscular effort is in the form of controlled position at specific direction against its counterforce. However, the key exercise of this method is to normalize the joint range, rather than improving joint flexibility. These techniques have been recommended for all joints with restricted Range of Motion (ROM) identified during the passive assessment [6, 7].

The correlation between the tightness in a joint capsule and pattern of motion restriction in a joint was revealed by Hannafin et al [8]. Agonizing shoulder, freezing stage with chronic pain, frozen stage with significant limitation of ROM and thawing phase with progressive improvement in ROM have been identified as the major phases of frozen shoulder [9]. End range mobilization of the shoulder joint and intensive mobilization techniques [MT] have been identified as useful approaches for reducing the risk of stiffness or joint contracture progression in patient with adhesive capsulitis. However, MET has been reported to be facilitating release of muscles and promoting body healing mechanisms and improving shoulder ROM [10].

MET is a unique technique in which the patient provides the corrective force rather than the care provider. MET is defined as the procedure that provides voluntary contraction of the muscle at varying levels of intensity, in a very controlled direction, against a force applied by the care provider. The potential applications of MET includes lengthening and strengthening of muscles, increasing fluid flow and decreasing local edema [11].

Application of ultrasound as a therapeutic modality has been in practice since the 1940's. Potential heating effect, promotion of tissue relaxation, easing local blood flow, and breaking down of the scar tissue achieved through ultrasound therapy makes it a highly useful treatment mode in physiotherapy. This therapy is used in the treatment of frozen shoulder as well. Availability of the portable ultrasound device makes it a convenient mode, followed at homes also [12, 13]. Visual Analog Scale (VAS) and Shoulder Pain and Disability Index (SPADI) are standard measurement tools in clinical practices comparing the pain and physical functional scores in a linear scale from mild to severe pain pre and post treatments.

Although, MET coupled with ultrasound therapy and joint mobilization technique coupled with ultra sound technique are effective in treating periarthritic shoulder, it would be interesting to determine the technique which is more effective in treating periarthritic shoulder. The present study intends to compare the effectiveness of MET coupled with ultrasound therapy and joint mobilization coupled with ultrasound therapy in patients with periarthritic shoulder.

METHODOLOGY

Subjects: 45 subjects with idiopathic/chronic periarthritic shoulder were recruited from the outpatient department of Physiotherapy, ACS Hospital Chennai, India for this study. The participants had been provided with written and verbal explanation about the procedure and purpose of the study. Patients with history of Rheumatoid arthritis, Malignance in the shoulder region, secondary fracture, dislocation, neurological disorder, dystrophy and tendon calcification were excluded from the study. Out of the 45 subjects, 15 subjects were excluded based on the exclusion criteria.

Experimental Design and Treatments: Parallel group non-blind Randomized Controlled Trial was chosen for comparing the effectiveness of the two methods of therapy separately coupled with ultrasound therapy. 30 patients comprising both males and females with age group ranging from 40-60 years were randomly assigned through the below mentioned criteria into 2 groups, Group A and Group B at the ratio of 1:1. The therapy progress was evaluated by VAS and SPADI scores. Performa of the patient enrollment sheet is provided in Table 1.

PROCEDURE

The subjects of Group A received Muscle energy technique coupled with ultrasound therapy (called as METU hereafter) for Glenohumeral joint restricted flexion, joint restricted abduction, and joint restricted external rotation.

For flexion, the therapist placed one hand at the subject's superior part of the scapula and glenohumeral joint to examine for motion. The other hand of the therapist supported the subject's flexed elbow and stretched the humerus bone at the glenohumeral joint in the sagittal plane to the initial point of resistance. The subject was subsequently instructed to extend his/her elbow against the therapist's counterforce. The force was maintained for 3-5 s and let to relax for 2 s.

For abduction, the therapist placed hand to cup the glenohumeral joint to examine for motion. The subject was directed to press his/her elbow towards the body.

For external rotation, the therapist placed one hand in a superior position to the subject's glenohumeral joint and the forearm of the other hand in a medial position to the

subject's flexed forearm, ensuring the subject's hand and the wrist were supported properly. The subject was told to internally rotate by pressing the hand. All the aforementioned processes were performed 5 times per set, 5 sets per session. Five sessions were conducted a week, for a period of three weeks.

The Group B patients received Mobilization technique (general) coupled with ultrasound therapy (called as MTU hereafter) for glenohumeral joint abduction, joint external rotation, joint forward flexion.

For flexion, the subject was allowed to lie in a supine position and the affected arm was made to rest on the edge of the resting table and the upper limb was brought forward to forward flexion. The arm of the subject was supported against the therapist's trunk; the distal humerus of the subject was grasped by the therapist's lateral hand. The lateral border of the therapist's top hand was placed in a distal position to the anterior margin of the joint, with the fingers positioned in a superior position. Caudal glide was performed to improve rotation and range beyond 90 degrees.

For abduction, the subject was made to lie in a supine position with the arm in resting position. The forearm of the subject was supported between the therapist's trunk and elbow. The therapist stood on the affect side of the subject facing toward the cephalic end. The therapist subsequently placed one hand on the subject's axilla thereby providing grade 1 distraction. The web space of the therapist's other hand was placed distally to the acromian and subsequently caudal glides were provided.

For extension, the patient was made to lie in a prone position. The therapist stood in a forward stride position facing the top of the resting table and leg close to the table. The subject's hand was positioned against the outside hand of therapist. Subsequently, the lunar part of the therapist's other hand was positioned distally to the acromian; the fingers were positioned superior to provide anterior glide in order to improve external rotation. Three sets of 15-30 glides were provided in a day with a gap of 30s between each set. The technique was employed 5 days per week, for a course of 3 weeks.

Ultrasound therapy with intensity of 1.5 watt/cm sq and 1MHZ frequency was applied for 8 minutes during each session [14]. The treatments were carried out in 5 sessions a week, for a period of 3 weeks.

RESULTS

Statistical analysis: All statistical analysis was performed with statistical package for social science (SPSS version 17). To test the efficacy among the two treatment groups, Analysis of variance (ANOVA) was performed using the follow up data of 21 days with 7 days intervals, by compensating the baseline values of the outcome of interest. The dropouts were excluded. The analysis was performed using survival analysis and student *t*-test.

The effectiveness and functional activity was assessed before and after treatment using VAS and SPADI. The collected data were tabulated and analyzed using descriptive and inferential statistics Mean and standard deviation. Paired *t*-test was adopted to find out the effectiveness in METU group and MTU group. Independent *t*-test (student *t*-test) was used to compare the changes in mean values of all the parameters between the treatment groups.

Table 1: Performa of patient enrollment sheet.

Treatment Groups	METU {N=15}	MTU {N=14}
Age	48-60	48 - 60
Body mass index	30-40	35-40
Shoulder affected no:		
Left	5	6
Right	10	08
Severity of pain (no.)		
Mild		
Moderate	9	8
Severe	6	7
Duration of pain (wk)		
Median	8 months	7 months
Interquartile range	5-24 months	5-12 months
Previous drug therapy (no.)	Nil	Nil
Degree of pain on abduction (no.)		
None		
Slight	9	8
Moderate	6	7
Severe		
Pain on external rotation (no.)		
None		
Slight	9	8
Moderate	6	7
Severe		
Pain on internal rotation (no.)		
None		
Slight	9	8
Moderate	6	7
Severe		
Pain on active abduction (no.)		
None		
Slight		
Moderate	9	8
Severe	6	7

Details of patient recruitment and study design are presented in Fig.1. One subject from MTU failed to attend the treatment and no subjects reported performing at home.

Fig.1. CONSORT 2010 Flow chart for the comparison of METU with MTU

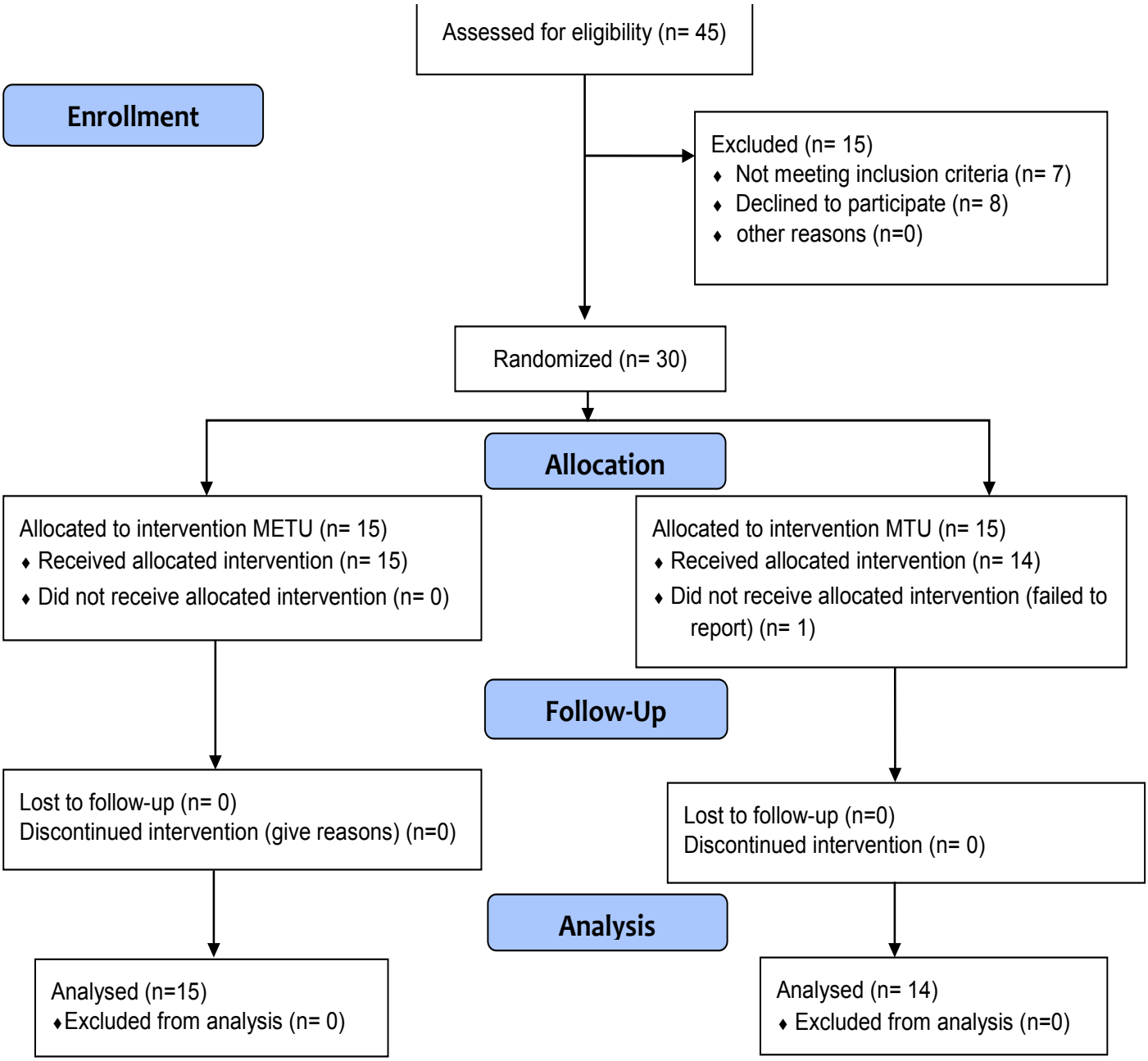

Table- 2: Comparison of Visual Analog scale score between Treatment Group A and B in pre and post treatment

VAS scale	Group A (METU)		Group B (MTU)		t-Test	Significance
	Mean	SD	Mean	SD		
Pre-Test	7.33	0.816	7.40	0.828	2.22	0.826**
Post-Test	4.00	1.00	0.533	0.833	4.56	0.000***

(***P< 0.001), (**P>0.05)

Both the groups have reduction in visual analogue scale score but no significant difference in the post test mean values between group A and group B.[**P>0.05]

Table-3: Comparison of shoulder pain and disability index scale [SPADI] between Group-A and Group-B in pre and post treatment

SPADI scale	Group A (METU)		Group B (MTU)		t-Test	Significance
	Mean	SD	Mean	SD		
Pre-Test	72.40	2.22	71.0	2.36	1.67	0.206**
Post-Test	28.93	4.69	36.80	3.83	6.29	0.000***

[**P < 0.05] [***P ≤ 0.001]

Comparison of the mean values of VAS between treatment Group A and treatment Group B is presented in Table 2. Significant reduction in the VAS score was confirmed from

pre-treatment to post-treatment values of both METU and MTU. The rotation of glenohumeral joint mobilization with exercise showed improved effects compared to the exercise alone.

The SPADI scale contained 12 items scores ranging from 0-10, which measures the pain and disability. The comparison of the mean values of SPADI of the two treatment groups (Table 3) has indicated METU (28.93) as more efficient than MTU (36.80) at P≤ 0.001.

At the end of 3 weeks of therapeutic session, subjects who underwent METU had greater level of reduction in pain and improved functional ability of the shoulder compared to those of the group received MTU. Our study has demonstrated the complementary role of ultrasound with other treatment methods.

DISCUSSION

Adhesive capsulitis, commonly known as frozen shoulder syndrome, is a common ailment of the shoulder joint often demanding physiotherapy for its treatment [15]. Mobilization techniques [16], massaging and therapeutic exercise [17] have been in common practice for alleviating the pain and abduction of the joint. Application of ultrasound therapy for the treatment of calcific tendinitis of the shoulder and its effectiveness in solving calcification and relieving pain has been reported earlier by Ebenblicher et al., in 1999 [18]. Mobilization techniques have been widely used to treat frozen shoulder syndrome. Yang et al., 2007 [5] performed a study on mobilization techniques on subjects with Adhesive capsulitis in a randomized trial and found that end-range mobilization technique was effective in alleviating pain [13].

The MET has shown to alleviate pain, improve ROM and functional ability in adhesive capsulitis patients. There have been numerous studies performed to implicate the effectiveness of MET in treating adhesive capsulitis. Stephanie et al., 2011 performed a study on the application of MET in a cohort of 61 basketball players and observed that treatment for glenohumeral joint abduction using MET resulted in improvement of horizontal abduction and internal range of motion [19]. A study performed by Patil et al., 2010 recruited 40 patients suffering from acute low back pain to compare the effectiveness of interferential therapy and interferential therapy coupled with MET. It was observed that interferential therapy combined with MET was significantly better in improving the ROM and decreasing the disability than interferential therapy alone [20]. Narayan et al., 2014 also states the efficacy of MET in improving the functional ability of shoulder in patients with frozen shoulder syndrome [21].

There are numerous studies implicating the efficacy of mobilization techniques and MET in treating adhesive capsulitis. The current study has attempted the comparison of the efficacy of treating patients with adhesive capsulitis with METU and MT. The outcomes of our study has clearly indicated that METU was more effective in treating adhesive capsulitis than MTU and the findings were found to be statistically significant with a p-value< 0.001. This is in concordance with a study performed by Suri et al., 2013, in which 30 subjects with adhesive capsulitis were grouped into two cohorts; 15 subjects received MT treatment and 15 subjects received MET treatment. It was observed that subjects who received MET treatment experienced better reduction in pain [22].

The limitations of the study are as follows: The subjects were not segregated based on the shoulder being affected (i.e. right or left), but were assessed together. The rate and extent of pain relief may be influenced by the pre-treatment pain status. However, the severities of pre-treatment pain were not taken into consideration in this study to maintain a reasonable sample size of the subjects. Comparison of the outcomes of MET vs. METU and MT vs. MTU were not performed, which would have added more value for the findings.

CONCLUSION

The current study has provided adequate level of evidence for the synergistic effect of ultrasound therapy on periarthritic shoulder when coupled with MET and MT through the course of a 3 weeks treatment sessions. Both the treatment groups showed improvement comparing pre and post treatment, while Group A showed significant difference compared to Group B in pain relief and functional abilities. Statistically comparing the mean values of SPADI of the two treatment groups has indicated METU (28.93) as more efficient than MTU (36.80) at P≤ 0.001. The study has demonstrated METU as a better treatment strategy than MTU for periarthritic shoulder. Furthermore, the potential of this combination therapy can be explored on other types of ailments demanding physiotherapy.

CONFLICTS OF INTEREST

All contributing authors declare that they have no conflicts of interest. The study was approved by Institutional Review Board of Faculty of Physiotherapy, Dr.MGR Educational & Research Institute University, Chennai.

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