

## EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE (MET) AND PASSIVE STRETCHING IN ADHESIVE CAPSULITIS AMONG POST-MASTECTOMY PATIENTS

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### ABSTRACT

Women undergoing mastectomy often experience shoulder pain, restricted movement, and functional limitations. Adhesive capsulitis is a common complication, characterized by stiffness and loss of motion, which negatively impacts daily living and quality of life. The present study aimed to assess and compare the effectiveness of Muscle Energy Technique (MET) and passive stretching in managing adhesive capsulitis among post-mastectomy patients. A randomized controlled trial was conducted using convenience sampling to recruit women aged 40–60 years diagnosed with adhesive capsulitis from the Departments of Oncology and Physiotherapy at Allied Hospital and Independent University Hospital, Faisalabad. Participants were randomly assigned into two equal groups using the sealed envelope method. Group A received MET, while Group B received passive stretching. Both groups additionally followed a standard physiotherapy program including pendulum, pulley, wheel, and finger ladder exercises for four weeks. Outcomes were measured using the Visual Analog Scale, goniometer, and Shoulder Pain and Disability Index at baseline, the 2nd week, and the 4th week. Twenty participants were enrolled (10 in each group). Group A demonstrated significantly greater improvements in pain reduction, range of motion, and functional ability compared to Group B after four weeks ( $p < 0.05$ ). The findings support the clinical use of MET as an effective intervention for adhesive capsulitis in post-mastectomy patients.

**KEYWORDS:** Adhesive Capsulitis, Frozen Shoulder, Muscle Energy Technique, Mastectomy, Passive Stretching, Shoulder pain, Physiotherapy.

### 1. INTRODUCTION

Adhesive capsulitis (AC), or frozen shoulder, is a disabling condition characterized by pain, stiffness, and progressive restriction of shoulder mobility.<sup>[1,2]</sup> Pathological changes include capsular thickening, fibrosis, synovial proliferation, and obliteration of capsular folds, resulting in limited function and impaired quality of life. Clinically, AC progresses through

freezing, frozen, and thawing stages, often lasting months to years.<sup>[3,6]</sup>

Post-mastectomy patients are particularly vulnerable to shoulder dysfunction due to pain, protective posturing, scar tissue, and axillary lymph node dissection. Radical mastectomy has been shown to triple the risk of shoulder stiffness compared to breast-conserving surgery.<sup>[7]</sup>

Adhesive capsulitis is therefore a common complication in this group, especially among women aged 40–60 years.<sup>[1,4,8,10]</sup>

Conservative physiotherapy is the mainstay of management. Passive stretching helps reduce pain and restore mobility by elongating shortened tissues and stimulating mechanoreceptors.<sup>[3,11]</sup> Muscle Energy Technique (MET), an osteopathic method involving patient-initiated contractions and relaxation, has also demonstrated effectiveness in improving pain, ROM, and functional outcomes in adhesive capsulitis.<sup>[3,8,11]</sup> However, existing studies are limited by small samples, short follow-ups, and methodological variations.

Despite positive findings for both interventions, few studies have directly compared MET and passive stretching in post-mastectomy patients with AC. Standardized protocols and long-term outcome evidence are lacking. This study addresses this gap by evaluating the comparative effectiveness of MET and passive stretching in this population.

This study aimed to assess and compare the effectiveness of Muscle Energy Technique (MET) and passive stretching in improving shoulder function, reducing pain, and enhancing range of motion in post-mastectomy patients with adhesive capsulitis.

## 2. MATERIALS AND METHODS

### 2.1 Study Design and Setting

This study was designed as a randomized controlled trial (RCT).<sup>[8]</sup> The trial was conducted in the Departments of

Oncology and Physiotherapy at Allied Hospital and Independent University Hospital, Faisalabad, Pakistan, over six months following ethical approval (ERC Reference No: IUH/IRB/000053).

### 2.2 Participants and Sampling

A total of 45 post-mastectomy patients were screened, and 20 eligible participants were recruited using non-probability convenience sampling.<sup>[3,12]</sup> Women aged 40–60 years with stage II adhesive capsulitis, at least 13–18 months post-mastectomy, and experiencing shoulder pain and stiffness for  $\geq 3$  months were included.<sup>[8,9]</sup> Patients with systemic conditions such as diabetes, rheumatoid arthritis, neurological impairments, or shoulder osteoarthritis were excluded.<sup>[3,11]</sup>

### 2.3 Randomization and Allocation

Eligible participants provided written informed consent and were randomly assigned into two groups using the sealed-envelope method for allocation concealment.<sup>[11]</sup>

### 2.4 Interventions

Both groups performed standardized physiotherapy exercises (pendulum, pulley, wheel, and finger ladder) as described by Serg *et al.* (2023).<sup>[8]</sup> Group A received Muscle Energy Technique (MET) targeting shoulder flexors, abductors, and rotators.<sup>[8]</sup> Group B received passive stretching (PS) for shoulder flexion, abduction, and rotations.<sup>[11]</sup> Each session lasted 30–40 minutes, delivered three times per week for four weeks. Consort flow diagram of the study has been shown in Figure 1.

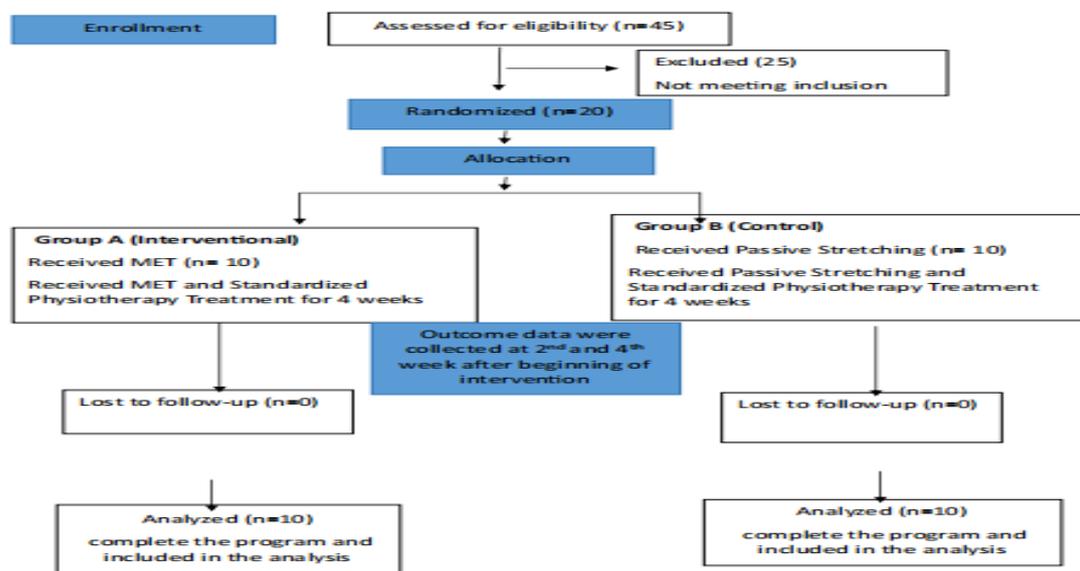


Figure 1: Consort Flow Diagram.

### 2.5 Outcome Measures and Variables

Primary outcomes included: 1) Pain intensity: Visual Analog Scale (VAS).<sup>[13]</sup> 2) Range of motion (ROM): Measured with a goniometer.<sup>[3,14]</sup> Shoulder

function/disability: Shoulder Pain and Disability Index (SPADI).<sup>[11,15]</sup> Assessments were conducted at baseline, week 2, and week 4.

Independent variables were MET and Passive Stretching. Dependent variables included Pain, ROM and functional disability. Confounding variables were controlled through strict inclusion/exclusion criteria.<sup>[8]</sup>

### 2.6 Data Analysis

Data were analyzed using SPSS version 27. Descriptive statistics were reported as mean  $\pm$  SD, while between-group differences were tested using appropriate inferential tests with significance set at  $p < 0.05$ .

**Table 1: Baseline characteristics of participants.**

Variable	Group A (n=10) Mean $\pm$ SD	Group B (n=10) Mean $\pm$ SD	p-value
Age (years)	51.60 $\pm$ 5.15	50.70 $\pm$ 4.83	0.692
Duration of symptoms (months)	4.00 $\pm$ 1.00	5.15 $\pm$ 1.49	0.058
Side affected (Right/Left)	6 / 4	7 / 3	0.639

### 3.2 Pain and Disability Outcomes (SPADI)

Both groups showed significant reductions in pain and disability scores over 4 weeks. Group A had greater improvement than Group B, with significant between-

## 3. RESULTS

### 3.1 Demographics and Baseline Characteristics

Twenty post-mastectomy patients with adhesive capsulitis were enrolled (Group A = 10; Group B = 10). The groups were comparable in age, duration of symptoms, and side affected ( $p > 0.05$ ), confirming baseline homogeneity (Table1).

group differences at week 4 for pain ( $p = 0.003$ ), disability ( $p = 0.011$ ), and total SPADI scores ( $p = 0.002$ ) (Table 2).

**Table 2: Comparison of SPADI scores between groups.**

Outcome	Time	Group A Mean $\pm$ SD	Group B Mean $\pm$ SD	p-value
Pain	Baseline	35.50 $\pm$ 4.38	36.40 $\pm$ 3.37	0.555
	Week 2	27.00 $\pm$ 2.11	30.40 $\pm$ 3.44	0.011
	Week 4	21.30 $\pm$ 2.45	25.60 $\pm$ 3.13	0.003
Disability	Baseline	48.40 $\pm$ 5.37	49.10 $\pm$ 3.90	0.724
	Week 2	40.30 $\pm$ 4.24	43.30 $\pm$ 3.68	0.071
	Week 4	33.70 $\pm$ 6.14	39.90 $\pm$ 3.07	0.011
Total SPADI	Baseline	58.10 $\pm$ 5.11	58.90 $\pm$ 4.42	0.694
	Week 2	46.65 $\pm$ 3.86	51.85 $\pm$ 4.41	0.011
	Week 4	42.29 $\pm$ 5.63	51.18 $\pm$ 5.13	0.002

### 3.3 Range of Motion (ROM) Outcomes

Both groups demonstrated significant improvements in flexion, abduction, and rotation ROM ( $p < 0.001$ ). Between-group differences were generally not significant,

except for: 1) External rotator ROM at baseline ( $p = 0.013$ ), favoring Group B. 2) Internal rotator ROM at week 4 ( $p = 0.034$ ), favoring Group A.

**Table 3: Comparison of shoulder ROM between groups.**

Motion	Time	Group A Mean $\pm$ SD	Group B Mean $\pm$ SD	p-value
Flexion ( $^{\circ}$ )	Baseline	95.00 $\pm$ 9.42	97.20 $\pm$ 8.73	0.617
	Week 2	114.00 $\pm$ 6.67	110.60 $\pm$ 8.06	0.330
	Week 4	128.50 $\pm$ 8.65	122.90 $\pm$ 7.47	0.143
Abduction ( $^{\circ}$ )	Baseline	82.20 $\pm$ 6.27	84.40 $\pm$ 5.68	0.441
	Week 2	101.30 $\pm$ 7.06	98.30 $\pm$ 6.74	0.328
	Week 4	116.40 $\pm$ 8.04	111.50 $\pm$ 7.22	0.204
External Rotation ( $^{\circ}$ )	Baseline	26.30 $\pm$ 2.21	29.90 $\pm$ 2.42	0.013*
	Week 2	38.30 $\pm$ 2.21	36.70 $\pm$ 2.11	0.102
	Week 4	46.50 $\pm$ 2.67	44.10 $\pm$ 2.02	0.052
Internal Rotation ( $^{\circ}$ )	Baseline	20.80 $\pm$ 2.39	22.10 $\pm$ 2.28	0.232
	Week 2	29.00 $\pm$ 2.11	27.90 $\pm$ 1.85	0.216
	Week 4	36.70 $\pm$ 2.50	34.60 $\pm$ 1.78	0.034*

\*Significant between-group differences.

### 3.4 Within-Group Changes

Friedman tests (for VAS and strength) and repeated measures ANOVA (for SPADI and ROM) confirmed

significant improvements within each group across all outcome measures from baseline to week 4 (all  $p < 0.001$ ).

### 3.5 Summary of Findings

Both groups experienced significant improvements in pain, disability, and ROM following 4 weeks of intervention. However, Group A (MET) demonstrated greater reductions in pain and disability, as well as superior improvement in internal rotator ROM, compared to Group B (Passive Stretching).

## 4. DISCUSSION

Shoulder pain, restricted mobility, and functional impairments are common complications following mastectomy. Adhesive capsulitis is one of the most disabling conditions in this population, leading to pain, stiffness, and reduced quality of life. The present study compared the effectiveness of Muscle Energy Technique (MET) and Passive Stretching (PS) for managing adhesive capsulitis in post-mastectomy patients. Findings indicated that MET was more effective than PS in improving pain, range of motion (ROM), muscle strength, and functional ability after a four-week intervention.

Between-group analyses demonstrated that participants in the MET group had significantly lower pain and disability scores than those in the PS group by the end of the fourth week. These results align with previous studies, including Sharma and Patel (2020), who found MET superior to capsular stretching in improving SPADI outcomes,<sup>[3]</sup> and Iqbal et al. (2020), who reported MET's greater effectiveness in reducing pain and improving ROM compared to passive stretching.<sup>[11]</sup>

Both groups showed improvements across ROM parameters such as flexion, abduction, and rotation; however, MET produced greater gains, particularly in internal rotation, which was statistically significant at week four. This is consistent with Afzal (2022), who demonstrated that MET was more effective than Kaltenborn mobilization in improving flexion and abduction ROM.<sup>[16]</sup> Similarly, Serg et al. (2023) also confirmed MET's superiority in enhancing shoulder mobility among post-mastectomy patients.<sup>[8]</sup>

In terms of pain management, VAS results highlighted that MET offered superior analgesic effects compared to PS by week four. These findings are in line with Vijayan and Jayabharathi (2019), who showed that MET combined with mobilization provided better outcomes than Cyriax's deep friction therapy.<sup>[17]</sup> Muscle strength also improved significantly in the MET group, consistent with the neuromuscular activation principle underlying this technique. MET involves isometric contractions that stimulate proprioceptors and promote muscle relaxation and flexibility.<sup>[8]</sup>

The physiological benefits of MET, including enhanced proprioception, stimulation of mechanoreceptors, and stretching of the joint capsule, provide a plausible explanation for its effectiveness. Beyond mechanical effects, MET actively engages the patient, promoting kinesthetic awareness and functional participation in

rehabilitation, making it a holistic approach compared to passive methods.

Overall, the present findings are consistent with the existing literature and provide further evidence supporting the clinical utility of MET for adhesive capsulitis management in post-mastectomy patients.

## 5. CONCLUSION

This study demonstrated that Muscle Energy Technique (MET) is more effective than Passive Stretching (PS) in reducing pain, enhancing shoulder mobility, improving muscle strength, and restoring function in post-mastectomy patients with adhesive capsulitis. MET empowers patients to actively participate in rehabilitation and should be considered as a preferred intervention in clinical practice for this population.

## 6. LIMITATIONS

Despite meaningful results, this study has certain limitations. First, the small sample size restricts the generalizability of the findings. Second, the intervention duration was limited to four weeks, preventing assessment of long-term outcomes. Third, factors such as adherence to the exercise program, psychosocial influences, and emotional well-being were not evaluated, though they may play a role in recovery.

## 7. RECOMMENDATIONS

Future studies should:

- Employ larger and more diverse samples for stronger generalizability.
- Compare MET with other modern manual therapy approaches to identify the most effective rehabilitation protocols.
- Extend follow-up duration to determine the long-term sustainability of MET outcomes.
- Include patient-reported outcome measures and psychological assessments to provide a more comprehensive understanding of recovery.

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## CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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