

Enhancing Cervical Mobility and Pain Relief: Role of Muscle Energy Technique in the Management of Chronic Mechanical Neck Pain

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ABSTRACT

Chronic mechanical neck pain is a prevalent musculoskeletal condition that significantly impacts daily functioning and quality of life. Traditional physical therapy methods provide symptomatic relief but may not fully address underlying biomechanical dysfunctions. This randomized controlled trial aimed to evaluate the immediate effects of Muscle Energy Technique (MET) combined with conventional physical therapy versus conventional therapy alone on pain intensity and cervical range of motion (ROM) in individuals with chronic mechanical neck pain.

Fifty participants aged 18–50 years with non-specific neck pain persisting for over three months were randomized into two groups. The experimental group received one session of MET in addition to conventional therapy (hot packs, isometric exercises, postural correction), while the control group received only conventional therapy. Pain intensity was assessed using the Numeric Pain Rating Scale (NPRS), and cervical ROM was measured with a goniometer pre- and post-intervention.

Results indicated significant improvements in the MET group in pain reduction (NPRS: 6.4 to 3.2, $p = 0.024$) and all cervical ROM directions compared to the control group ($p < 0.05$). The control group showed minor, mostly non-significant improvements.

This study concludes that MET is an effective adjunct to conventional physical therapy for immediate improvement in pain and cervical mobility in chronic mechanical neck pain. Further research is warranted to explore its long-term effects and broader clinical applicability.

Keywords: Chronic neck pain, Muscle Energy Technique, cervical mobility, manual therapy, randomized controlled trial

INTRODUCTION

Chronic mechanical neck pain is a prevalent musculoskeletal disorder characterized by pain and stiffness in the cervical region, often resulting from poor posture, muscular imbalances, or repetitive strain (Kazeminasab et al., 2022; Chang et al., 2023; Liang et al., 2022). Globally, neck pain is one of the leading causes of disability, with a lifetime prevalence ranging from 30% to 50% in the general population (Li et al., 2023; de Melo Castro Deligne et al., 2021). It significantly impairs daily functioning, reduces quality of life, and contributes to a considerable socioeconomic burden through healthcare costs and lost productivity (Galvin et al., 2021; Gulyamova et al., 2023; Bosman et al., 2023). Conventional physical therapy approaches for neck pain include modalities such as heat therapy, stretching, strengthening exercises, and postural correction (Yang et al., 2023; He et al., 2023). While these treatments offer symptomatic relief, they may not adequately address underlying muscular dysfunctions or joint restrictions, particularly in chronic cases (El-Tallawy et al., 2021; Gandhi et al., 2024). This has led to increasing interest in manual

therapy techniques that target neuromuscular mechanisms and promote functional restoration (Pizzolato et al., 2021; Endo et al., 2023; Lippi et al., 2024).

Muscle Energy Technique (MET) is a form of manual therapy that utilizes voluntary isometric contractions of muscles against a counterforce applied by the therapist (Al Matif et al., 2023; Waxenbaum et al., 2024; Fryer et al., 2021). It is designed to lengthen shortened muscles, mobilize restricted joints, and improve circulation and proprioception (Nafees et al., 2023; Liu & Wu, 2023). Previous studies have shown that MET can be effective in reducing pain and improving range of motion in various musculoskeletal conditions, including low back pain and cervicogenic headaches. However, evidence on the effectiveness of MET in managing chronic mechanical neck pain remains limited and inconclusive. Few studies have directly compared MET combined with conventional therapy versus conventional therapy alone, especially in terms of immediate outcomes. Therefore, this study aims to evaluate the immediate effects of Muscle Energy Technique in combination with conventional

physical therapy on pain intensity and cervical range of motion in individuals with chronic mechanical neck pain. It is hypothesized that the addition of MET will produce superior outcomes compared to conventional therapy alone.

METHODOLOGY

A single-blinded randomized controlled trial (RCT) was conducted at General Hospital, Lahore, between February 2023 and April 2024 to evaluate the immediate effects of the Muscle Energy Technique (MET) combined with conventional physical therapy, compared to conventional therapy alone, on pain intensity and cervical range of motion (ROM) in individuals with chronic mechanical neck pain.

A total of 70 participants aged between 18 to 50 years, with non-specific neck pain persisting for three months or more, were screened for eligibility. After applying inclusion and exclusion criteria, 50 participants were enrolled in the study. Participants were randomly assigned into two groups using a lottery method to ensure randomization.

- The experimental group (n = 25) received a single session of Muscle Energy Technique (MET) in addition to standard conventional physical therapy, which included hot packs, isometric neck exercises, and postural correction.
- The control group (n = 25) received only the conventional physical therapy program.

Outcome measures included:

- Neck pain intensity, assessed using the Numeric Pain Rating Scale (NPRS), ranging from 0 (no pain) to 10 (worst pain imaginable).
- Cervical range of motion (ROM), measured using a universal goniometer for flexion, extension, right/left lateral flexion, and right/left rotation.

Both assessments were conducted pre-intervention (baseline) and immediately post-intervention by a blinded assessor.

Demographic data revealed that the mean age of participants was 32.30 ± 7.75 years. Out of 50 participants, 34 (68%) were male and 16 (32%) were female.

Ethical approval for the study was obtained from the Institutional Review Board (IRB), and informed consent was taken from all participants prior to data collection.

RESULTS

A total of 50 participants completed the study, with 25 individuals in each group. The mean age of the participants was 32.30 ± 7.75 years. The

experimental group consisted of 17 males (68%) and 8 females (32%), while the control group had 17 males (68%) and 8 females (32%) as well, with no significant difference in gender distribution between the groups.

At baseline, there were no statistically significant differences between the experimental and control groups in terms of pain intensity or cervical ROM ($p > 0.05$), indicating successful randomization.

After a single treatment session, the experimental group showed significant improvements in all outcome measures compared to the control group. Post-intervention pain intensity significantly reduced in the experimental group (mean NPRS score reduction from 6.4 to 3.2; $p = 0.024$), whereas the control group showed only a modest reduction (from 6.2 to 5.4; $p > 0.05$).

Similarly, significant improvements were observed in cervical ROM in the experimental group for flexion ($p < 0.001$), extension ($p = 0.003$), right and left rotation ($p < 0.001$), and right and left lateral flexion ($p < 0.05$) compared to the control group.

Table 1: Baseline Demographic Characteristics of Participants

Variable	Experimental Group (n = 25)	Control Group (n = 25)	p-value
Age (years), Mean $\pm$ SD	32.60 $\pm$ 7.80	31.90 $\pm$ 7.70	0.74
Gender (M/F)	17 / 8	17 / 8	1.00
Duration of Pain (months), Mean $\pm$ SD	5.8 $\pm$ 1.6	5.6 $\pm$ 1.4	0.60
NPRS Baseline	6.4 $\pm$ 1.2	6.2 $\pm$ 1.3	0.48

Table 2: Comparison of Pain and Cervical ROM Pre- and Post-Intervention

Outcome Measure	Group	Pre-Treatment (Mean $\pm$ SD)	Post-Treatment (Mean $\pm$ SD)	p-value (Between Groups)
Pain (NPRS)	Experimental	6.4 $\pm$ 1.2	3.2 $\pm$ 1.0	0.024
	Control	6.2 $\pm$ 1.3	5.4 $\pm$ 1.1	
Flexion (°)	Experimental	35.5 $\pm$ 4.2	45.1 $\pm$ 3.6	<0.001
	Control	35.2 $\pm$ 3.9	38.0 $\pm$ 4.1	
Extension (°)	Experimental	38.1 $\pm$ 4.6	47.3 $\pm$ 4.0	0.003
	Control	37.9 $\pm$ 5.0	40.2 $\pm$ 4.7	
Right Rotation (°)	Experimental	50.2 $\pm$ 5.4	62.7 $\pm$ 4.3	<0.001
	Control	50.0 $\pm$ 5.2	53.1 $\pm$ 5.1	
Left Rotation (°)	Experimental	49.8 $\pm$ 5.1	62.0 $\pm$ 4.5	<0.001
	Control	49.7 $\pm$ 5.0	52.9 $\pm$ 5.4	
Right Lateral Flexion (°)	Experimental	30.5 $\pm$ 3.9	38.7 $\pm$ 3.7	<0.001
	Control	30.2 $\pm$ 3.8	35.1 $\pm$ 3.5	

Lateral Flexion (°)	al			
	Control	30.4 ± 3.8	32.9 ± 4.0	
Left Lateral Flexion (°)	Experiment al	30.3 ± 4.1	37.9 ± 3.9	0.027
	Control	30.1 ± 4.2	32.4 ± 4.1	

DISCUSSION

The present study aimed to investigate the immediate effects of Muscle Energy Technique (MET) in combination with conventional physical therapy compared to conventional therapy alone on pain intensity and cervical range of motion (ROM) in individuals with chronic mechanical neck pain. The findings demonstrated that a single session of MET alongside conventional therapy led to significantly greater reductions in pain and improvements in cervical mobility than conventional therapy alone.

Chronic mechanical neck pain is commonly associated with muscular dysfunction, restricted joint mobility, and postural imbalances. MET, a manual therapy technique involving isometric muscle contractions against resistance, is believed to address these issues by promoting muscle relaxation, increasing joint mobility, and enhancing neuromuscular control. In our study, participants in the MET group showed statistically significant improvements in pain and ROM in all planes of cervical motion, suggesting the potential neuromuscular and biomechanical benefits of this approach.

The reduction in pain intensity observed in the MET group (mean NPRS reduction of 3.2 points) aligns with findings from prior research indicating that MET can stimulate Golgi tendon organ activity, leading to reduced muscle tone and pain modulation. Moreover, the notable improvements in cervical flexion, extension, rotation, and lateral flexion demonstrate that MET may effectively address mechanical restrictions and soft tissue limitations often seen in chronic neck pain.

In contrast, while the control group receiving only conventional physical therapy also showed minor improvements, these were not statistically significant in most outcomes. This emphasizes that

while conventional modalities such as hot packs and isometric exercises are beneficial, they may not offer the same immediate biomechanical corrections that MET provides.

The strengths of this study include its randomized design, the use of objective outcome measures (NPRS and goniometry), and a blinded assessor to reduce bias. However, some limitations must be acknowledged. The study focused on immediate effects, and no follow-up was conducted to assess the long-term benefits of MET. Additionally, the sample size was relatively small, and all participants received only a single intervention session, which may not reflect cumulative clinical outcomes from a longer treatment regimen.

In conclusion, the findings support the incorporation of Muscle Energy Technique as an effective adjunct to conventional physical therapy for managing chronic mechanical neck pain. Future studies with larger sample sizes and long-term follow-up are warranted to further validate and explore the sustained benefits of MET in different clinical settings.

CONCLUSION

This study demonstrates that a single session of Muscle Energy Technique (MET), when combined with conventional physical therapy, significantly improves pain and cervical range of motion in individuals with chronic mechanical neck pain compared to conventional therapy alone. MET offers an effective manual therapy approach that targets neuromuscular dysfunctions and joint restrictions commonly observed in chronic neck conditions. The immediate benefits observed—particularly in pain relief and multidirectional cervical mobility—highlight the potential of MET as a valuable addition to physical therapy protocols. Despite its promising results, the study's short-term design and limited sample size suggest a need for further research to assess long-term efficacy, optimal treatment frequency, and effects across diverse populations. Incorporating MET into routine clinical practice may enhance rehabilitation outcomes and reduce the burden of chronic neck pain if supported by broader and longer-term investigations.

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