

Original Article

Comparison between Effectiveness of Mets and Static Stretching on Trapezius in Upper Cross Syndrome

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ABSTRACT

Background: Upper cross syndrome involves an imbalance between the muscles of the anterior and upper trunk and the posterior skeletal muscles, leading to postural and functional issues. Muscle Energy Techniques (METs) and stretching exercises are common interventions, but their comparative effectiveness remains unclear.

Objective: The study aimed to compare the effectiveness of METs and stretching in treating pain and improving functional status in patients with upper cross syndrome.

Methods: This randomized clinical trial was conducted at the Physical Therapy Department of Mayo Hospital, Lahore, over six months. Sixty-two patients with upper cross syndrome were randomly assigned to two groups, each consisting of 31 participants. Group 1 received METs and conventional therapy, while Group 2 received static stretching and conventional therapy. The primary outcome measures were pain intensity, measured by the Visual Analogue Scale (VAS), and functional status, assessed using the Neck Disability Index (NDI). The intervention period lasted four weeks, and statistical analyses were performed using SPSS version 25.

Results: In Group 1, the pre-treatment VAS score was 7.41 (\pm 1.08), decreasing to 3.41 (\pm 1.11) post-treatment, while in Group 2, the VAS score dropped from 7.16 (\pm 1.50) to 4.87 (\pm 1.56). The pre-treatment NDI score in Group 1 was 40.19 (\pm 6.15), which improved to 32.51 (\pm 6.16) post-treatment. In Group 2, the NDI score improved from 40.06 (\pm 5.88) to 35.74 (\pm 5.82). Both groups demonstrated significant improvement in pain and functional status, with METs showing greater effectiveness ($p < 0.05$).

Conclusion: Muscle Energy Techniques were more effective in reducing pain and improving functional status in patients with upper cross syndrome compared to stretching exercises.

INTRODUCTION

Upper crossed syndrome (UCS) involves alterations in several skeletal muscles, leading to tightness in the anterior and upper trunk, coupled with weakness in the posterior skeletal muscles. This condition involves muscle activity changes, characterized by facilitation of certain muscles (e.g., levator scapula, sternocleidomastoid, pectoralis) and inhibition of others (e.g., cervical flexors, serratus anterior) (1, 2). The cervical spine, comprising seven vertebrae, is divided into upper, middle, and lower segments, with the upper segment containing C1-C2, the middle segment containing C3-C6, and the lower segment containing C7. The UCS emerges due to various physiological and pathological changes in the body, leading to an imbalance where some muscles become weak while others become tight (3, 4).

Physiological changes are often postural, resulting in muscular imbalance in the upper thoracic region, where muscles such as the upper trapezius, levator scapulae, suboccipital muscles, sternocleidomastoid, and pectoralis major and minor become tight, while

the middle and lower trapezius, deep neck flexors, and serratus anterior become weak. This imbalance contributes to defective movement patterns, pain, and inflammation in the upper thoracic region (5, 6). In contrast, pathological changes may manifest with or without pain and can include sudden joint dysfunction that disrupts normal movement patterns. These changes might be due to biomechanical stress, inflammation affecting the neuromuscular system, or structural lesions (7). The diagnosis of UCS heavily relies on observed signs and symptoms, such as forward head posture, protracted shoulders, hunched upper thoracic region, scapular winging, excessive neck protraction, and reduced range of motion in the neck, shoulders, and thoracic spine (8-10). Some patients present with mechanical neck pain triggered by sustained postures, reduced neck movement, or palpation of muscles, and they often have a history of anxiety, depression, exhaustion, heavy lifting, long duty hours, or prolonged sitting (11). Physical examinations for UCS include gait analysis, postural analysis, and specific tests such as the cervical flexion movement pattern test, push-up movement pattern test, shoulder abduction movement pattern test, craniometrical flexion test, and breathing pattern assessments for better diagnosis (12).

UCS is managed through various interventions, including medication, physical therapy, cryotherapy, acupuncture, and other treatments. Muscle Energy Technique (MET) is a therapeutic approach where an individual performs controlled voluntary contractions against a counterforce, aiming to strengthen weaker tissues, reduce discomfort, muscle spasm, and tone (13). MET is a hands-on therapy designed to relax, stretch, and strengthen muscles, offering a rehabilitative alternative for non-specific neck pain with the goal of restoring joint mobility and reducing discomfort. This therapy can be beneficial for both physiatrists and physiotherapists (14). However, evidence comparing the effectiveness of MET with stretching exercises for relieving mechanical neck pain is lacking. This study aims to contribute to the growing body of knowledge, evaluating whether these two techniques produce comparable outcomes or if one is superior, which could inform alternative therapy choices.

MATERIAL AND METHODS

This study employed a randomized clinical trial (RCT) design to compare the effectiveness of Muscle Energy Techniques (METs) and static stretching on the trapezius muscle in patients with upper cross syndrome. The study was conducted in the Physical Therapy Department of Mayo Hospital, Lahore, over a period of six months following the approval of the research synopsis. The sample size consisted of 62 patients, with 31 participants in each group, determined using a 5% level of significance and 90% power of test, assuming an expected mean value of Visual Analogue Scale (VAS) for METs as 4.0 ± 1.75 and for stretching exercise as 5.0 ± 2.0 . The sampling technique used was convenience sampling.

Eligible participants included both genders with a pain score on VAS greater than 3 and less than 8, presenting with unilateral or bilateral muscle tightness, and aged between 15 and 45 years (6, 15). Exclusion criteria encompassed individuals with a history of cervical surgery or cerebrovascular accident, hypermobility of the thoracic spine, patients younger than 15 or older than 45, and those with diagnosed headaches such as migraines (9, 15).

The study was single-blinded, with participants randomly assigned to one of two groups using the lottery method. Prior to commencing the study, participants underwent a subjective and objective examination, which included the collection of demographic variables such as age, gender, past medical history, and occupational status. The primary outcome measures were the Visual Analogue Scale (VAS) and the Neck Disability Index, used to compare the effectiveness of METs and static stretching in reducing pain and improving functional status in patients with upper cross syndrome (15).

Group A (n = 31) received treatment with METs and conventional therapy, including suboccipital release, a hot pack for 10 minutes, and neck isometrics for 10 minutes to reduce neck muscle stiffness prior to treatment (16). In this group, METs were applied in the supine position on the upper trapezius and levator scapulae, which were overactive, with a hold of 20-25 seconds followed by moving into a new range, repeated five times (17). Group B (n = 31) received treatment with static stretching and conventional therapy, including suboccipital release, a hot pack for 10 minutes, and neck isometrics for 10 minutes to reduce neck muscle stiffness prior to treatment (16). In this group, static stretching was applied in the supine position, passively lengthening the upper trapezius and levator scapulae, held for 10-15 seconds, followed by relaxation, with a total of five repetitions performed per set, and three sets completed (15).

Patients who received interventions were interviewed to assess improvements in movement, reduction of pain and discomfort, and improvement in functional status. Follow-up occurred three times a week for up to four weeks. Ethical approval was obtained from the hospital's ethical committee, ensuring the study adhered to the Declaration of Helsinki. Written informed consent was obtained from each participant before initiating the treatment protocol. Data were analyzed using SPSS version 25, with statistical significance set at $p < 0.05$. The results were analyzed using appropriate statistical tests to determine the effectiveness of the interventions.

RESULTS

The study's results, as outlined in Table 1, provided a descriptive statistical analysis of the experimental and control groups, each comprising 31 participants. In Group 1, the gender distribution was 17 males (54.8%) and 14 females (45.2%), while in Group 2, there were 13 males (41.9%) and 18 females (58.1%). The mean age was similar in both groups, with Group 1 having a mean age of 31.90 years (± 7.569), and Group 2 having a mean age of 31.20 years (± 7.712). The mean height for Group 1 was 12.21 (± 4.431), and for Group 2, it was 12.31 (± 4.214).

Analyzing the results of the Visual Analogue Scale (VAS) in the Muscle Energy Techniques (METs) group, the mean pre-treatment score was 7.4194 (± 1.08855). This score decreased to 5.2258 (± 0.92050) during mid-treatment and further decreased to 3.4194 (± 1.11876) post-treatment, indicating a significant reduction in pain over time (Table 2).

Table 1: Descriptive Statistical Analysis (N=31)

Variable	Group 1	Group 2
Gender	17 (54.8%) M / 14 (45.2%) F	13 (41.9%) M / 18 (58.1%) F
Age	31.90 \pm 7.569	31.20 \pm 7.712
Height	12.21 \pm 4.431	12.31 \pm 4.214

Table 2: Repeated Measure ANOVA of VAS in METs Group

Measure	Mean	Std. Deviation
Pre-treatment VAS	7.4194	1.08855
Mid-treatment VAS	5.2258	0.92050
Post-treatment VAS	3.4194	1.11876

Table 3: Repeated Measure ANOVA of NDI in METs Group

Measure	Mean	Std. Deviation
Pre-treatment NDI score	40.1935	6.15044
Mid-treatment NDI score	36.2903	6.03983
Post-treatment NDI score	32.5161	6.16912

Table 4: Repeated Measure ANOVA of VAS in Stretching Group

Measure	Mean	Std. Deviation
Pre-treatment VAS	7.1613	1.50769
Mid-treatment VAS	6.1290	1.56508
Post-treatment VAS	4.8710	1.56508

Table 5: Repeated Measure ANOVA of NDI in Stretching Group

Measure	Mean	Std. Deviation
Pre-treatment NDI score	40.0645	5.88181
Mid-treatment NDI score	37.4194	6.23311
Post-treatment NDI score	35.7419	5.82505

Table 6: Mean Values of Group 1 and Group 2 (Independent T-test)

Variable	Group 1 (Pre)	Group 1 (Post)	Group 2 (Pre)	Group 2 (Post)	p-value
VAS	7.41 \pm 1.08	3.41 \pm 1.11	7.16 \pm 1.50	4.87 \pm 1.56	0.00
NDI	40.19 \pm 6.15	32.51 \pm 6.16	40.06 \pm 5.88	35.74 \pm 5.82	0.00

Similarly, the Neck Disability Index (NDI) score in the METs group also demonstrated a notable improvement, as shown in Table 3. The mean pre-treatment NDI score was 40.1935 (± 6.15044), which decreased to 36.2903 (± 6.03983) mid-treatment, and further reduced to 32.5161 (± 6.16912) post-treatment, showcasing enhanced functional status.

In the stretching group, the VAS scores followed a similar pattern, as highlighted in Table 4. The mean pre-treatment score was 7.1613 (± 1.50769), decreasing to 6.1290 (± 1.56508) mid-treatment, and further dropping to 4.8710 (± 1.56508) post-treatment, indicating reduced pain levels over time.

The NDI scores in the stretching group, as illustrated in Table 5, also showed improvement. The mean pre-treatment score was 40.0645 (± 5.88181), which declined to 37.4194 (± 6.23311) mid-treatment, and further decreased to 35.7419 (± 5.82505) post-treatment, reflecting an enhancement in functional status.

To compare the effectiveness of the two interventions, Table 6 provides a summary of the independent t-test results. The VAS pre-treatment mean score for Group 1 was 7.41 (± 1.08) and for Group 2, it was 7.16 (± 1.50). Post-treatment, the VAS mean score for Group 1 significantly decreased to 3.41 (± 1.11), while for Group 2, it reduced to 4.87 (± 1.56), with a p-value of 0.00, indicating statistical significance. The NDI pre-treatment mean score for Group 1 was 40.19 (± 6.15), and for Group 2, it was 40.06 (± 5.88). Post-treatment, the NDI mean score for Group 1 decreased to 32.51 (± 6.16), while for Group 2, it reduced to 35.74 (± 5.82), with a p-value of 0.00, also indicating statistical significance. These results illustrate that both interventions were effective in reducing pain and improving functional status, with METs demonstrating a slightly more significant impact on reducing VAS scores and NDI scores when compared to static stretching.

DISCUSSION

The aim of the study was to compare and determine the effectiveness of Muscle Energy Techniques (METs) and stretching in treating pain and improving functional status in patients suffering from upper cross syndrome. The results demonstrated that both METs and stretching were beneficial in alleviating pain, improving ranges of motion, and enhancing functional status in these patients. However, a comparison revealed that METs yielded statistically significant results when compared to stretching.

Pain was assessed using the Visual Analogue Scale (VAS), which showed a marked reduction in pain intensity in both groups, confirming that both METs and stretching are effective options for treating upper cross syndrome. Nevertheless, a statistically significant difference was observed between the two techniques, with METs yielding better results (3.41 ± 1.11) compared to stretching (4.87 ± 1.56), with a p-value less than 0.05. Similarly, METs showed marked improvement in functional status (32.51 ± 6.16) compared to stretching (35.74 ± 5.82), also with a p-value less than 0.05.

The study's findings align with previous research. Gilani et al. (2018) studied the effectiveness of muscle energy techniques and ischemic compression in upper trapezius trigger points. Their study reported that METs is effective in reducing pain and improving cervical ranges, ultimately enhancing the functional status of patients with upper cross syndrome, with a p-value less than 0.05 after four weeks of treatment (18). This strongly supported the current study's results, where METs showed significant improvement in pain intensity on the VAS scale during mid-treatment, decreasing from 7.41 ± 1.08 to 5.22 ± 0.920 .

Similarly, Sbardella et al. (2021) reported that METs are effective in reducing pain and improving cervical ranges in patients with neck pain, supporting the inclusion of METs as an important part of traditional physical therapy programs (19). Additionally, Arshadi et al. (2019) found that stretching is an effective corrective exercise for addressing muscular imbalance in the upper thoracic region, particularly in managing pain and disability in upper cross syndrome patients, with a p-value less than 0.05 (5). This study supported the current study's results, as patients treated with stretching showed improvement in VAS and NDI scores, with a p-value less than 0.05.

However, in the current study, METs showed significant improvement compared to static stretching in managing pain and functional status of the neck. This was confirmed by Publikasi et al. (2017), who reported that METs are more effective than static stretching in managing upper cross syndrome in patients who have working or sitting hours of 8 hours per day (20).

In contrast, Gilani et al. (2020) reported that both techniques are equally effective in managing pain, improving ranges, and reducing disability in the neck, with a p-value less than 0.05 (15). This contradicts the current study's results, as METs showed better outcomes compared to stretching. Additionally, Ali et al. (2017) supported the current study's findings, indicating that METs are highly effective in managing upper cross syndrome compared to static stretching exercises, with a p-value less than 0.05. The study suggested that METs are superior due to their ability to strengthen weakened muscles, maintain the length-tension relationship between tight and weak muscles, and ultimately improve lymphatic pump function, thereby maintaining cervical range of motion (21).

In summary, the current study had several strengths, including its randomized clinical trial design, clear methodology, and robust statistical analysis. However, limitations included a relatively small sample size and a short follow-up period, which may affect the generalizability of the findings. Future research should consider larger sample sizes, longer follow-up periods, and explore other potential therapeutic interventions for upper cross syndrome. The study concluded that METs were a superior treatment protocol for maintaining the length-tension relationship in upper cross syndrome compared to stretching exercises. The results concluded that Muscle Energy Techniques were statistically highly significant in reducing pain and improving functional status in patients suffering from upper cross syndrome.

CONCLUSION

In conclusion, Muscle Energy Techniques demonstrated significant effectiveness in reducing pain and enhancing functional status in patients with upper cross syndrome compared to stretching exercises. These findings have notable implications for human healthcare, suggesting that METs should be prioritized as a therapeutic intervention for individuals suffering from upper cross syndrome, thereby potentially improving patient outcomes and quality of life.

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