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Comparative Efficacy of Myofascial Release and Muscle Energy Techniques in Upper Cross Syndrome: A Randomised Clinical Trial

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ABSTRACT

Background: Upper cross syndrome is a common postural imbalance marked by neck, shoulder, and upper back pain due to muscular dysfunction. Manual therapy techniques like muscle energy techniques and myofascial release are widely used for managing musculoskeletal pain. **Objective:** To compare the effects of myofascial release and muscle energy techniques in patients with upper cross syndrome. **Methodology:** The randomised clinical trial included 54 participants with upper cross syndrome at three hospitals in Faisalabad over four months, divided into two groups of 27, with a 20% attrition rate. Participants were selected using purposive sampling, with inclusion criteria consisting of both genders, age 20-60 years, diagnosis of UCS, pain intensity of 4 to 7 on the Numerical Pain Rating Scale, and duration of neck pain of 4 to 12 weeks. Exclusion criteria included rheumatoid arthritis, ankylosing spondylitis, cervical radiculopathy, recent trauma to the cervical spine, cancer, history of cervical spine surgery in the last 12 months, and fracture. Group A received the muscle energy techniques on the cervical region, involving 5 repetitions and a 20-second hold for each, while Group B received the myofascial release for 30-40 seconds. Measurements were taken at baseline and the end of the 4th week, with 3 sessions per week on alternate days for one month. Outcome measures included primary outcome measures of pain intensity and cervical range of motion, and secondary outcome measures of functional disability using the Neck Disability Index. Non-parametric tests, including the Wilcoxon signed-rank test and Mann-Whitney U test, were applied. **Results:** Group A consisted of 14 males and 8 females, while Group B contained 15 males and 7 females. Intra-group analysis utilising the Wilcoxon signed-rank test found that both groups experienced considerable pain reduction. Group A had a significant decrease in pain levels ($p<0.00$) after MET. Similarly, Group B saw considerable pain reduction ($p<0.00$) with MRT. Between-group comparisons revealed that the MET group experienced greater pain relief. **Conclusion:** The muscle energy techniques significantly decreased discomfort, increased neck range of motion, and facilitated functional activities in those with upper cross syndrome as compared to myofascial release.

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INTRODUCTION

Upper cross syndrome (UCS) is a condition characterised by muscle imbalances and joint dysfunction, leading to pain and discomfort in the shoulder girdle and cervicothoracic area.[1] Muscle imbalances and stiffness in UCS cause strain on the spine, resulting in pain in various areas, including the glenohumeral joint, atlanto-occipital joint, and thoracic region.[2] Poor posture, such as forward head position, thoracic kyphosis, and enhanced cervical lordosis, can reduce glenohumeral stability, leading to pain and discomfort.[3] Muscle imbalances may result in joint abnormalities, which lead to thoracic discomfort and limited mobility.[4] Prolonged sitting or lying down may aggravate muscular weakness and atrophy, causing discomfort as well as pain in individuals suffering from UCS.[5]

Muscular imbalances and movement dysfunctions can cause pain and discomfort, especially in the neck and shoulders.[6] Joint deterioration and inflammation can both induce pain and be aggravated by muscle imbalances.[7] Proper posture and stretching exercises can help alleviate pain associated with UCS. Strengthening exercises for weak muscles, such as the deep neck flexors, can also help reduce pain and improve posture.[8] The muscle energy method, a subset of osteopathic manipulative medicine, can be used to treat pain and musculoskeletal dysfunction by using the patient's muscle movement to correct muscular dysfunction.[9] Joint mobilisation and other modalities can also be used to enhance musculoskeletal function and reduce pain.[10]

Muscle energy technique (MET) is a safe procedure that can help reduce pain and shorten hospital stays in inpatients.[11] However, it is not recommended for patients with certain conditions, such as those in the ICU, post-surgical patients, and those with poor vitality, as it may exacerbate pain.[11] MET can be used to treat pain by utilising various physiological principles, including post-isometric relaxation, which is the most commonly applied technique.[12] Understanding muscular physiology is necessary for effective MET treatment, including the classification of muscle contractions, such as isometric, concentric, eccentric, or isotonic, which can help reduce pain and improve musculoskeletal function.[13] The intrinsic sensory system, including nuclear bag and nuclear chain fibres, detects changes in muscle length, contraction speed, and acceleration, which can contribute to pain. During MET with post-isometric relaxation, the nuclear bag fibres are engaged, leading to a refractory interval and reduced pain.[14]

Myofascial release technique (MRT) is a physical therapy technique used to treat myofascial pain syndrome, a chronic pain condition caused by hypersensitivity and tension in myofascial tissues surrounding muscles.[15] This technique involves lightly massaging the myofascial, feeling for tight or stiff spots, and applying gentle physical pressure to stretch and massage affected areas, releasing tension and pressure in the tissue and supporting the sheath.[16] Myofascial release can help alleviate pain by targeting a wider network of muscles, benefiting individuals with myofascial pain syndrome and persistent headaches.[17] Therefore, UCS is a condition that can cause significant pain and discomfort in the shoulder girdle and cervicothoracic area. Muscle imbalances and poor posture can contribute to this condition, and proper treatment can help alleviate symptoms. Techniques such as MET and MRT can be effective in reducing pain and improving mobility. It is essential to consult with a healthcare professional to determine the best course of treatment for individual cases.

METHODOLOGY

This randomised clinical trial investigated pain management in individuals with Upper Cross syndrome at three hospitals in Faisalabad over four months. The study included 54 participants, divided into two groups of 27, with a 20% attrition rate. The sample size was calculated using the Open Epi tool, with parameters including a desired power of 80%, a significance level of 90%, an expected mean difference in pain of 0.53, and standard deviations of pain in Groups A and B of 0.37 and 0.8, respectively. Participants were selected using purposive sampling, with inclusion criteria consisting of both genders, age 20-60 years, diagnosis of UCS, pain intensity of 4-7 on the Numerical Pain Rating Scale (NPRS), and duration of neck pain of 4-12 weeks. Exclusion criteria included rheumatoid arthritis, ankylosing spondylitis, cervical radiculopathy, recent trauma to the cervical spine, cancer, history of cervical spine surgery in the last 12 months, and fracture.

The study employed a hot pack as a baseline treatment for 10 minutes to reduce pain and

enhance blood circulation. Group A received the MET on the cervical region, involving 5 repetitions and a 20-second hold for each, while Group B received the MRT for 30-40 seconds to relieve neck stiffness and spasms. Measurements were taken at baseline and the end of the 4th week, with 3 sessions per week on alternate days for one month. Outcome measures included primary outcome measures of pain intensity and cervical range of motion (ROM), and secondary outcome measures of functional disability associated with neck pain. Tools used included the NPRS, goniometer, and Neck Disability Index (NDI). Statistical analysis was performed using SPSS version 26, with descriptive statistics, normality tests, and non-parametric tests including the Wilcoxon signed-rank test and Mann-Whitney U test. The significance level was set at p-value ≤0.05.

RESULTS

The demographic data of the two groups revealed notable trends. Group A (MET) had a mean age of 42.95 years, with a majority of participants (54.6%) falling in the 42-51 age range, while Group B (MRT) had a mean age of 39.36 years, with a more even distribution across age ranges. In terms of gender, both groups had a similar distribution, with a slight majority of males (63.6% in Group A and 68.2% in Group B). The data was tested for normality using the Kolmogorov-Smirnov test, revealing that the data for the NPRS, NDI, and various neck movements were not normally distributed, with significant p-values indicating non-normality.

The Q-Q plots supported these findings, and additional tests showed that the data for neck right side rotation, lateral flexion left and right side were also not normally distributed. The NPRS results showed a significant reduction in pain for both groups, with a significant difference between them. The median NPRS score decreased from 6 to 2 in Group A and from 5 to 3 in Group B. Table 1 shows a comparison of both groups' first, at baseline, the median of both groups was 6.00. After the treatment at the 4th week median was reduced to 2.5. The NDI results showed a significant reduction in disability for both groups, but no significant difference between the two groups. The median NDI score decreased from 27.5 to 9 in Group A and from 26.5 to 14.5 in Group B. The above table shows a comparison of both groups' first. At the baseline, the median of both groups was 27.00. And after The treatment at the 4th week median was reduced to 11.

The neck flexion results showed a significant improvement in the ROM for both groups, with a significant difference between the two groups. The median neck flexion score increased from 47 to 78 in Group A and from 50.5 to 66 in Group B. The above table shows a comparison of both groups' first, at baseline, the median of both groups was 47, and after treatment at the 4th week median was reduced to 71. The neck extension results showed a significant improvement in the ROM for both groups, with a significant difference between the two groups. The median neck extension score increased from 32 to 65 in Group A and from 32 to 50 in Group B. The above table shows a comparison of both groups' first, at baseline, the median of both groups was 32.00 and after the treatment, at the 4th week median was reduced to 62.00. Initially, there was no significant difference between the two techniques, with a p-value of 1.00 at baseline. However, after treatment, the p-

Table 1: Variables between-groups analysis

Variables		Percentiles		
		25th	50th (Median)	75th
NPRS	Pre-treatment	5.00	6.00	7.00
	Post-treatment	2.00	2.50	3.00
NDI	Pre-treatment	25.00	27.00	30.00
	Post-treatment	6.00	11.00	14.75
Neck Flexion	Pre-treatment	45.00	47.00	55.00
	Post-treatment	65.25	71.00	78.00
Neck Extension	Pre-treatment	32.00	32.00	34.00
	Post-treatment	50.00	62.50	65.00

Table 2: Test statistics of variables between Group A and Group B analysis

Variables		Test statistics			
		Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
NPRS	Pre-treatment	206.00	459.00	-.92	.35
	Post-treatment	70.00	323.00	-4.33	.000
NDI	Pre-treatment	241.50	494.50	-.012	.991
	Post-treatment	182.00	435.00	-1.41	.156
Neck Flexion	Pre-treatment	221.50	474.50	-.49	.62
	Post-treatment	57.50	310.50	-4.35	.000
Neck Extension	Pre-treatment	242.00	495.00	.00	1.00
	Post-treatment	30.50	283.50	-5.03	.000

value changed to 0.00 in the 4th week of neck extension, indicating a statistically significant difference between the groups. Both techniques showed significant improvements in pain, disability, and range of motion, but Group A demonstrated greater improvements in neck flexion and extension.

Specifically, Group A showed significant improvements in neck extension (median score increased from 32 to 62.5), left-side neck rotation (median increase from 47 to 80), right-side neck rotation (median increase from 32 to 72.5), and lateral flexion on both sides (median increases from 17 to 35 and 15 to 35, respectively). Group B also showed significant improvements, but to a lesser extent. The differences between the two techniques were statistically significant, with p-values less than 0.001 for most outcomes. Overall, both techniques showed significant improvements in neck extension, rotation, and lateral flexion, but the muscle energy technique showed greater improvements in most areas.

DISCUSSION

This randomised controlled trial compared the effectiveness of the MET and MRT on pain, range of motion, and functional disability in individuals with upper cross syndrome. The Wilcoxon test revealed that Group A demonstrated better pain alleviation ($p<0.05$) compared to Group B. This finding is supported by a study conducted by Shwetha Sasidharan and colleagues, which found that MET resulted in significant reductions in pain (NPRS) among IT professionals with upper cross syndrome.[18] The study's findings suggest that MET is a superior choice of treatment for upper cross syndrome compared to MRT, with better outcomes in terms of pain alleviation (NPRS), improvement in cervical ROM by goniometer, and enhanced functional performance of the neck using NDI. The study's results have implications for the management of upper cross syndrome, highlighting the effectiveness of MET in reducing pain and improving functional ability.

Several studies have investigated the effectiveness of various techniques in managing upper cross syndrome, a condition characterised by pain, limited range of motion, and functional disability. Asima et al. conducted a trial that compared the potency of stretching exercises and MET combined with cervical mobilisation.[19] The study found that both methods were equally beneficial in alleviating pain and improving cervical range of motion and functionality. Similarly, Hira Shehzad et al. found that MET showed noticeable improvement in pain and functional performance, making it a fruitful approach for managing upper cross syndrome.[20]

Kashif et al. in 2024 compared the effects of MET and static stretching on the trapezius muscle in terms of pain and functional status.[21] The study revealed that MET was more successful in improving trapezius function, supporting the outcome of the current study. Sai Vispute and Neeraj Kumar compared the immediate effects of the MRT and positional release technique on pain, cervical ROM, and neck disability among college students with trapezius.[22] The study found that both techniques demonstrated significant improvement in pain, cervical range of motion, and functionality, correlating with the outcome of the current study. The current study found that MET was superior to MRT in managing upper cross syndrome. These findings are consistent with previous studies, highlighting the effectiveness of MET in reducing pain and

improving functional ability in individuals with upper cross syndrome.

Several studies have compared the effectiveness of the MRT and MET in managing pain, cervical movements, and disability in individuals with chronic trapezius and upper cross syndrome. Aneri Jhaveri and Payal Gahlot found that MET demonstrated significant effectiveness in alleviating pain and improving cervical movements and functionality, supporting the results of the current trial.[23] In contrast, Meena Gupta and colleagues found that MRT was more effective than a combined approach including MET and passive stretching exercises in alleviating pain and increasing the range of movement of the cervical segment.[24] However, Kalpana Zutshi and team found that MRT was more successful in reducing pain and improving overall cervical functional performance.[25], whereas Gayathri K et al. found that MET was superior to MRT in alleviating pain and enhancing functional performance among subjects with trapezius.[26] The current study corresponds to these studies, as trapezius muscle weakness in both trigger point and upper cross syndrome leads to pain, decreased neck movements, and disturbed functional performance.

The current study manifests that MET was more advantageous in comparison with MRT in managing pain, cervical motions, and functional performance in upper cross syndrome. The findings of these studies suggest that both MET and MRT are effective in managing pain and improving functional performance, but MET may be more advantageous in certain cases. Further studies with a longer duration of follow-up and a larger pool of participants are recommended to amalgamate these findings and explore further outcomes. The current clinical trial reinforces the existing evidence proving the efficacy of MET and MRT in alleviating pain, improving cervical movements, and enhancing functional performance among individuals with upper cross syndrome.

CONCLUSION

The trial concluded that the muscle energy techniques significantly decreased discomfort, increased neck range of motion, and facilitated functional activities in those with upper cross syndrome. In a similar way, the myofascial release technique lowered discomfort while improving neck function and range of motion. Both approaches were equally successful in reducing impairment, allowing patients to engage in occupational tasks without discomfort. However, the study had drawbacks, such as a small sample size and geographical breadth, as it only included patients from three hospitals in Faisalabad, Pakistan.

The subsequent studies ought to attempt to expand the sample size and geographical breadth in order to further enhance generalisability. In addition, including more demographic information and investigating other preventative techniques to alleviate discomfort caused by upper cross syndrome might bring significant insights. The research investigation recommends combining MET and MRT with additional physical therapy methods to improve upper cross syndrome management results. Physiotherapists may implement these strategies in clinical settings to effectively treat individuals with upper cross syndrome. More study is required to assess the efficacy of various therapies and create preventative strategies for this condition.

DECLARATIONS

Consent to participate: Written consent had been obtained from patients. All methods were performed following the relevant guidelines and regulations.

Availability of Data and Materials: Data will be made available upon request. The corresponding author will submit all dataset files.

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CONSORT Guidelines: All methods were performed following the relevant guidelines.

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