THE EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUES IN RELEIVING LOW BACK PAIN OF QUADRATUS LUMBORUM MYOFASCIAL ORIGIN

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ABSTRACT

Background: Low back pain (LBP) is a common condition that affects millions of people worldwide. Quadratus lumborum (QL) myofascial pain is a common cause of LBP. Muscle energy techniques (METs) are a form of manual therapy that have been shown to be effective in treating LBP.

Methods: A total of 30 patients with LBP of QL myofascial origin were randomly assigned to either a MET group or a control group. The MET group received 10 sessions of METs, while the control group received no treatment. The primary outcome measure was the change in pain intensity, as measured by the Visual Analogue Scale (VAS). Secondary outcome measures included the change in range of motion for side-flexion, tenderness, and Oswestry Disability Index.

Results: The results of the study showed that the MET group had a significant reduction in pain intensity, compared to the control group. The MET group also had a significant improvement in range of motion for side-flexion and a significant decrease in tenderness. The Oswestry Disability Index did not change significantly in either group.

Conclusions: These findings suggest that METs are an effective treatment for LBP of QL myofascial origin.

Keywords: low back pain, quadratus lumborum, myofascial pain, muscle energy techniques, manual therapy

INTRODUCTION

Low back pain (LBP) is a prevalent musculoskeletal condition that affects a significant number of individuals worldwide. It is estimated that 80% of adults will experience LBP at some point in their lives. It is a leading cause of disability, resulting in substantial economic and social burdens. The most common cause of LBP is mechanical, such as muscle strain or ligament sprain. Other causes of LBP include disc herniation, spinal stenosis, and arthritis. Among the various causes of LBP, myofascial trigger points in the quadratus lumborum muscle have been identified as a common source of pain and functional impairment.

Quadratus lumborum (QL) myofascial pain is a common cause of LBP. The QL is a large muscle that lies on the side of the lower back. It helps to stabilize the lumbar spine and to rotate the trunk (pelvis during movement). However, due to factors such as poor posture, repetitive motions, muscle imbalances, or trauma, myofascial trigger points can develop within the quadratus lumborum muscle. These trigger points are hyperirritable nodules within taut bands of muscle fibers and can cause referred pain and dysfunction in the lower back region. When the QL becomes tight or inflamed, it can cause pain in the lower back, hip, and groin.

Traditional treatment approaches for LBP often focus on symptomatic relief without addressing the underlying myofascial component. While modalities such as medication, physical therapy, and exercise can provide temporary relief, they may not effectively target the specific myofascial trigger points in the quadratus lumborum muscle. Therefore, there is a need for targeted interventions that directly address the myofascial origin of low back pain.

Muscle energy techniques (METs) have gained recogn ition as a therapeutic approach for various musculoskeletal conditions, including LBP. METs involve active engagement of the patient's muscles against resistance in specific directions, aiming to restore muscle balance, improve range of motion, and alleviate pain. One particular MET, myofascial release (MFR), focuses on the application of sustained pressure to release tension and adhesions within the myofascial tissues.

Muscle energy techniques (METs) are a form of manual therapy that have been shown to be effective in treating LBP. METs are based on the principle of reciprocal inhibition. When a muscle is contracted, its antagonist muscle is inhibited. METs use this principle to help to relax tight muscles and to improve range of motion.

The objective of this article is to provide a comprehensive analysis of the efficacy of METs, including MFR, in relieving low back pain specifically originating from quadratus lumborum myofascial trigger points. By reviewing the current literature, we aim to evaluate the effectiveness of METs in reducing pain, improving range of motion, decreasing disability, and enhancing functional outcomes in individuals with low back pain of quadratus lumborum myofascial origin.

Understanding the potential benefits of METs in addressing the myofascial component of low back pain can offer valuable insights for clinicians, researchers, and patients. By incorporating METs into clinical practice, healthcare professionals can adopt a patient-centered approach that directly targets the underlying myofascial trigger points and provides a more effective and holistic management strategy for individuals with low back pain.

MATERIAL AND METHODS

Study Design: This study utilized a pre-test-post-test experimental design. The independent variable was Muscle Energy Technique (MET), and the dependent variables included the Visual Analogue Scale (VAS) for pain assessment, Range of Motion (ROM) for side-flexion, Tenderness evaluation, and Oswestry Disability Index (ODI).

Subjects: A total of 30 patients with musculoskeletal low back pain were referred to the Department of Physiotherapy at Prakash Institute of Physiotherapy, Rehabilitation, and Allied Medical Sciences, Greater Noida. All patients were screened for inclusion in the study, and three patients did not complete the study. Therefore, three additional subjects were recruited to replace those who dropped out. The age range for inclusion was set at 20-45 years.

Inclusion Criteria: Patients were included if they met the following criteria:

- Complaints of low back pain lasting more than three weeks.
- Diagnosed with musculoskeletal low back pain.
- Presence of spot tenderness in the Quadratus Lumborum muscle on at least one side, close to the 12th rib and next to the fifth lumbar transverse process.
- Evidence of stretch shortening of the muscle, not secondary to joint dysfunction, as measured on the side-bending test.
- Patient recognition of pain, jump sign, palpable band, or referred pain pattern as evidence of trigger point activity elicited on palpation.

Exclusion Criteria: Patients were excluded if they met any of the following criteria:

- Underwent back surgery within the past year.
- Showed clinical evidence of radiculopathy or myelopathy.
- Had a history of disk disease, degenerative joint disease, or fracture/dislocation in the thoracolumbar vertebrae.
- Had cognitive deficits.
- Were unwilling to participate.
- Received physical therapy intervention during the last three months.

Flow in the Study: Each patient participated in the study for one week, with three sessions per week. After the screening tests and clinical examination, eligible patients were invited to participate and were required to sign an institutionally approved Informed Consent form. Random allocation into experimental or control groups was done using a lottery system. The patients were called at different times to avoid interaction between the two groups and were blinded to the treatment.

Outcome Measures:

Visual Analogue Scale (VAS): Patients used a 10 cm horizontal line with anchors at every 1 cm to indicate their current level of pain. The scale ranged from 0 (no pain) to 10 (maximum possible pain). VAS recordings were taken before and immediately after each treatment session.

Range of Motion (ROM): Stretch shortening of the Quadratus Lumborum muscle was assessed using the side-bending test. The distance between the upper and lower marks on the patient's thighs was measured with a non-flexible tape. ROM recordings were taken before and immediately after each treatment session.

Tenderness: Tenderness assessment was performed with the patient in the Quadratus Lumborum position, i.e., side-lying on the uninvolved side. The therapist palpated the myofascial trigger points and graded the tenderness on a 5-point scale.

Oswestry Disability Index (ODI): The modified version of the ODI, a 10-item scale, was used to measure disability in patients with low back pain. The ODI scores were obtained before the first treatment session and after the third treatment session.

Data Collection: The primary investigator, who was not blinded to the study, collected the data and performed the intervention. However, the subjects participating in the study were called at different times and were blinded to the treatment to avoid bias.

Protocol: Patients with low back pain underwent a screening procedure to determine their eligibility for the study. Those who met the inclusion criteria were randomly allocated to either the experimental group or the control group. The experimental group received the Muscle Energy Technique (MET) intervention, while the control group did not receive any specific treatment.

For the experimental group, the MET intervention was administered by a trained physiotherapist. The MET technique involved the patient actively contracting the Quadratus Lumborum muscle against resistance in a specific direction while the therapist applied a counterforce. This technique was performed three times a week for one week, resulting in a total of three treatment sessions.

The control group did not receive any active treatment during the study period but continued with their regular daily activities.

Data on pain intensity (VAS), range of motion (ROM), tenderness, and disability (ODI) were collected at specific time points throughout the study. VAS scores were recorded before and immediately after each treatment session for both groups. ROM measurements were taken before and after each treatment session as well. Tenderness assessment and grading were performed before the first treatment session for both groups. The ODI questionnaire was completed by the participants before the first treatment session and after the third treatment session.

Data Analysis:

The data analysis was performed using STATA 9.0 and SPSS 14.0 in the Department of Biostatistics, AIIMS, New Delhi. Prior to the analysis, a Levene's test was conducted to assess the homogeneity of variance between the groups for all variables, except Oswestry Disability Index (ODI), and no statistically significant differences were found ($p \geq 0.05$). However, a statistically significant difference in ODI scores was observed between the two groups at the beginning of the study ($p=0.004$). Normal distribution was observed for all variables in the sample.

Independent t-tests were utilized to compare the mean pre- and post-intervention values between the control and experimental groups for Visual Analogue Scale (VAS), Range of Motion (ROM), Differences of Range of Motion, and Oswestry Disability Index. Repeated Measure ANOVA was employed to analyze the within-group changes in the mean pre- and post-intervention values of VAS, ROM, Differences of Range of Motion, and tenderness for both the control and experimental groups. ANOVA was also utilized to examine the effects of time, group, and the group × time interaction in the two groups. Post-hoc analysis was conducted to investigate the specific differences within the groups resulting from the intervention for any two of the six recordings.

To analyze the ODI scores, they were converted into change scores following the method described by Little and MacDonald. The change scores of ODI were calculated and presented in Table 6**.** An independent t-test was performed to compare the mean percentage change scores of ODI between the control and experimental groups.

The statistical analyses allowed for a comprehensive evaluation of the effectiveness of muscle energy techniques in relieving low back pain originating from quadratus lumborum myofascial trigger points. The results obtained from these analyses provide valuable insights into the impact of the intervention on pain intensity, range of motion, functional disability, and other relevant outcome measures.

RESULTS

The study included a total of 30 participants, with 14 in the control group and 16 in the experimental group. The study evaluated the effectiveness of Muscle Energy Techniques (MET) in relieving low back pain of Quadratus Lumborum myofascial origin. The mean scores showed a greater improvement in the experimental group compared to the control group for all variables. The mean age of the subjects in the study was 32.3 ± 5.8 years, with the control group having a mean age of 30.1 ± 5.8 years and the experimental group having a mean age of 34.3 ± 5.2 years.

The mean Visual Analog Scale (VAS) scores for both the control and experimental groups are presented in Figure 1. Post-intervention scores at the end of the three sessions showed significant differences between the two groups (t=6.640, p=0.001), demonstrating that MET was effective in producing pain relief. There was a significant main effect of time (F=35.024, p=0.001) and group (F=6.919, p=0.014), as well as a significant interaction effect between time and group for VAS scores (F=22.710, p=0.001). The VAS scores improved significantly in the experimental group from day 1 to day 3, whereas the control group showed non-significant changes (F=10.889, p=0.178).

The mean left side-bending Range of Motion (ROM) scores for both groups are presented in Figure 2. There was a significant main effect of time (F=4.209, p=0.001) and group (F=5.041, p=0.033), as well as a significant interaction effect between time and group for left side-bending ROM scores (F=4.207, p=0.002). The range of left side-bending significantly increased post-MET intervention in the experimental group, while the control group showed relatively unchanged scores.

Similarly, the mean right side-bending ROM scores for both groups are presented in Figure 3. There was a significant main effect of time (F=18.515, p=0.001) and group (F=6.264, p=0.018), as well as a significant interaction effect between time and group for right side-bending ROM scores (F=8.405, p=0.001). The range of right side-bending significantly increased post-MET intervention in the experimental group, while the control group showed relatively unchanged scores.

The mean scores of tenderness for both groups are presented in Figure 5. There was a significant main effect of time (F=28.126, p=0.001), while the main effect of group was non-significant (F=0.619, p=0.253). There was a significant interaction effect between time and group for tenderness scores (F=3.922, p=0.002). The tenderness improved post-MET intervention in the experimental group, whereas the control group showed relatively unchanged scores.

The mean change scores of the Oswestry Disability Index (ODI) for both groups are presented in Table 7 and Figure 6. There was a statistically significant difference in the mean percentage change scores of the ODI between the two groups after the intervention (t=11 .630, p=0.001). A Levene's test indicated a significant difference in baseline scores between the two groups (F=9.734, p=0.004). The MET group showed a mean percentage improvement of 61.9% (SD=16.5%), while the control group had a mean improvement of 7.5% (SD=8.3%).

Illustrations (Tables & Graphical representation of Data)

Table 1: Comparison of VAS scores (mean ± S.D) in control & experimental groups

VAS		Control N=14	Experimental N=16	Student"s t-test	
				t value	p value
Day 1	Pre	5.8 ± 1.3	6.6 ± 1.6	1.447	0.159
	Post	4.6 ± 1.5	4.6 ± 1.5	0.100	0.922
Day 2	Pre	5.7 ± 1.6	4.7 ± 2.0	1.562	0.129
	Post	4.6 ± 1.7	3.1 ± 2.0	2.252	0.032
Day 3	Pre	5.8 ± 1.4	3.1 ± 1.6	4.950	0.001
	Post	5.1 ± 1.2	1.7 ± 1.5	6.640	0.001

Table 2: Comparison of Left side-bending ROM scores (mean ± S.D) in control & experimental groups

ROM left		Control N=14	Experimental N=16	Student"s t-test	
				t value	p value
Day 1	Pre	48.7 ± 4.6	45.7 ± 5.3	1.659	0.108
	Post	48.6 ± 4.4	45.0 ± 4.8	2.128	0.042
Day 2	Pre	48.7 ± 4.4	45.5 ± 5.2	1.835	0.077
	Post	48.5 ± 4.4	44.6 ± 4.2	2.508	0.018
Day 3	Pre	48.9 ± 4.5	44.8 ± 4.3	2.576	0.016
	Post	48.7 ± 4.4	44.3 ± 4.3	2.775	0.010

Table 3: Comparison of Right side-bending ROM scores (mean ± S.D) in control & experimental groups

ROM Right		Control N=14	Experimental N=16	Student"s t-test	
				t value	p value
Day 1	Pre	48.8 ± 4.5	46.0 ± 4.1	1.798	0.083
	Post	48.6 ± 4.4	45.0 ± 4.1	2.321	0.028
Day 2	Pre	49.0 ± 4.5	45.2 ± 3.8	2.509	0.018
	Post	48.6 ± 4.4	44.4 ± 4.1	2.734	0.011
Day 3	Pre	48.7 ± 4.4	44.6 ± 3.9	2.713	0.011
	Post	48.4 ± 4.3	44.1 ± 3.8	2.884	0.008

Table 4: Comparison of Difference of left & right side-bending ROM scores (mean ± S.D) in control & experimental groups

Difference in ROM (affected-unaffected)		Control N=14	Experimental N=16	Student"s t-test	
				t value	p value
Day 1	Pre	2.5 ± 1.4	3.2 ± 1.7	1.190	0.244
	Post	2.2 ± 1.4	1.3 ± 1.6	1.647	0.111
Day 2	Pre	2.4 ± 1.1	2.0 ± 2.1	0.644	0.512
	Post	2.4 ± 1.2	0.9 ± 1.1	3.458	0.002
Day 3	Pre	2.6 ± 1.4	1.0 ± 1.0	3.536	0.001
	Post	2.5 ± 1.4	0.3 ± 1.0	4.936	0.001

Table 5: Comparison of Tenderness scores (mean ± S.D) in control & experimental groups

Groups	Day1 (Pre)	Day 1 (Post)	Day2 (Pre)	Day 2 (Post)	Day 3 (Pre)	Day 3 (Post)	Time effect: F=28.126,p=0.001
Control N=14	1.9 ± 0.7	1.2 ± 0.4	1.6 ± 0.5	1.3 ± 0.5	1.6 ± 0.5	1.2 ± 0.4	Group effect: F=0.253, p=0.619
Experimental N=16	2.2 ± 0.8	1.3 ± 0.5	1.7 ± 0.6	1.0 ± 0.0	1.3 ± 0.5	0.9 ± 0.4	Time*Group effect: F=3.922,p=0.002

Table 6: Conversion of ODI scores into Percentage Change Scores

Control group					Experimental group				
Pre score (O1)	Post score (O2)	% O1	% O2	% change	Pre score (O1)	Post score (O2)	% O1	% O2	% change
9	8	18	16	11	11	3	22	6	73
12	10	24	20	17	2	1	4	2	50
7	7	14	14	0	19	5	38	10	74
13	12	26	24	8	12	3	24	6	75
6	5	12	10	17	12	4	24	8	67
6	5	12	10	17	6	2	12	4	67
3	3	6	6	0	8	4	16	8	50
9	9	18	18	0	16	4	32	8	75
7	7	14	14	0	18	10	36	20	44
13	11	26	22	15	23	16	46	32	30
4	4	8	8	0	7	2	14	4	71
3	3	6	6	0	7	3	14	6	57
4	4	8	8	0	13	8	26	16	39
10	8	20	16	20	12	2	24	4	83
					14	2	28	4	86
					10	5	20	10	50

Table 7: Comparison of percentage change in ODI scores (mean ± S.D) in control & experimental groups

ODI	Control N=14	Experimental N=16	Student"s t-test	
			t value	p value
Percentage change	7.5 ± 8.3	61.9 ± 16.5	11.160	0.001

Graphs

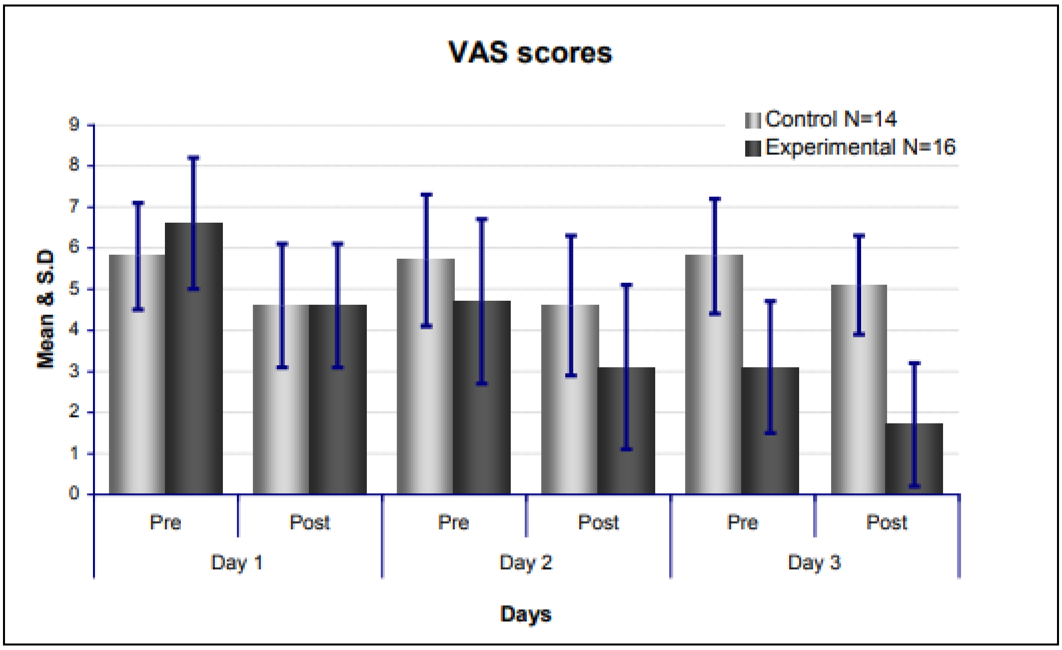

Figure 1: Mean & Standard Deviation for VAS scores in between the two groups

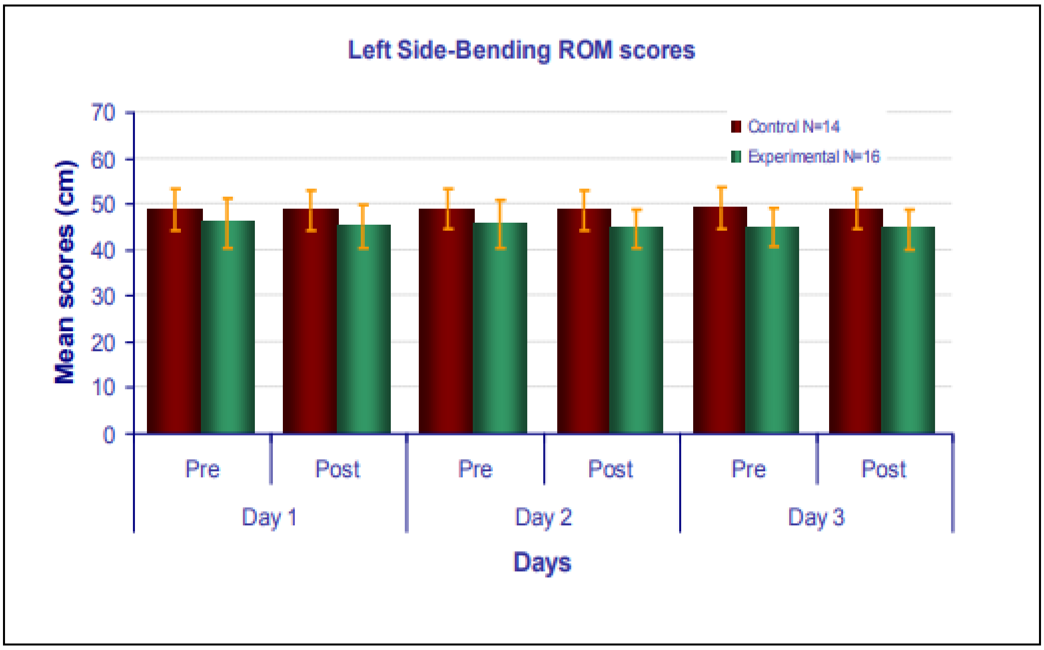

Figure 2: Mean & Standard Deviation for Left side-bending ROM in between the two groups

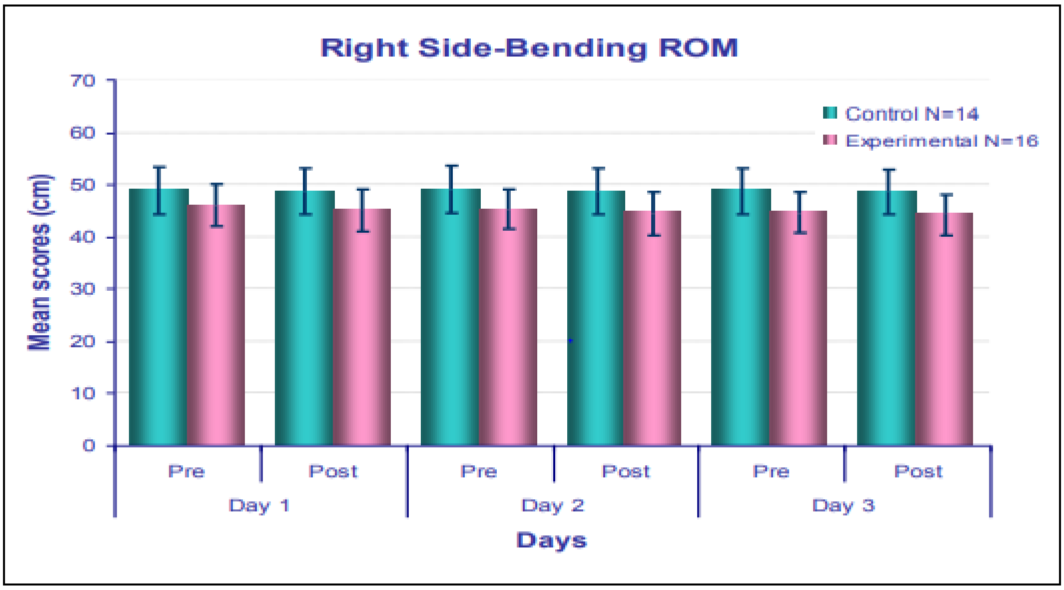

Figure 3: Mean & Standard Deviation for Right side-bending ROM in between the two groups

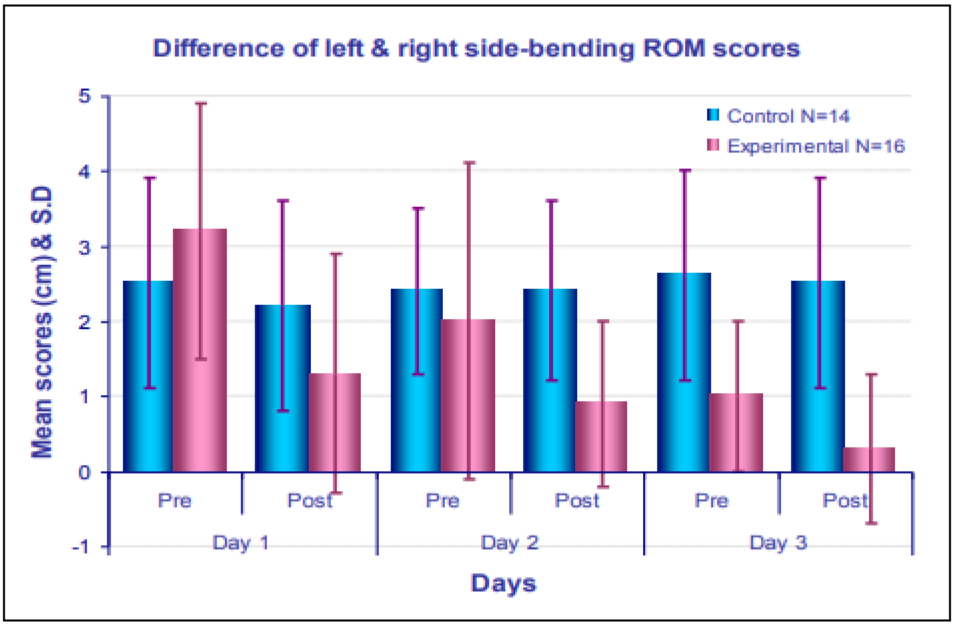

Figure 4: Mean & Standard Deviation for Difference of Left-Right side-bending ROM in between the two groups

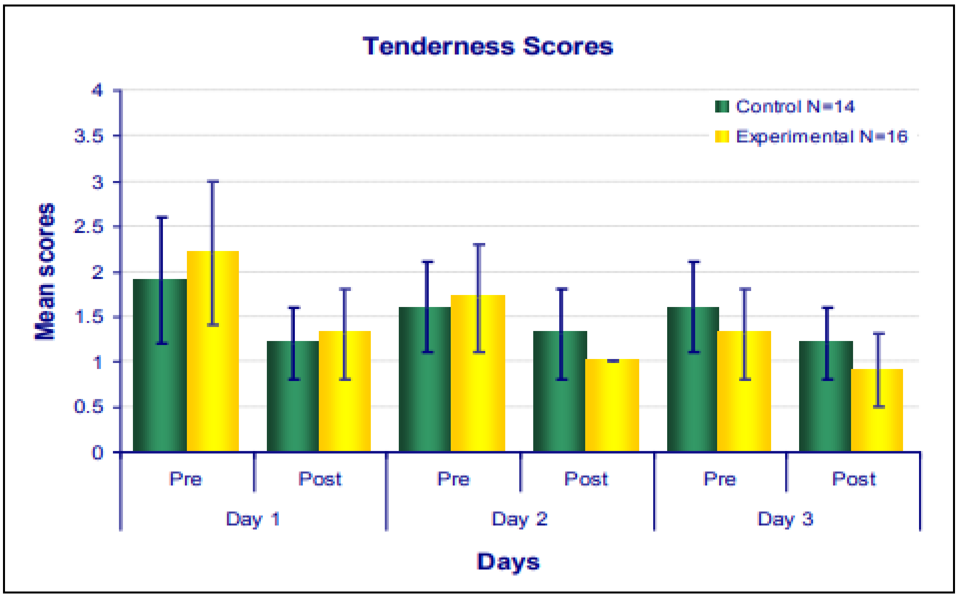

Figure 5: Mean & Standard Deviation for Tenderness scores in between the two groups

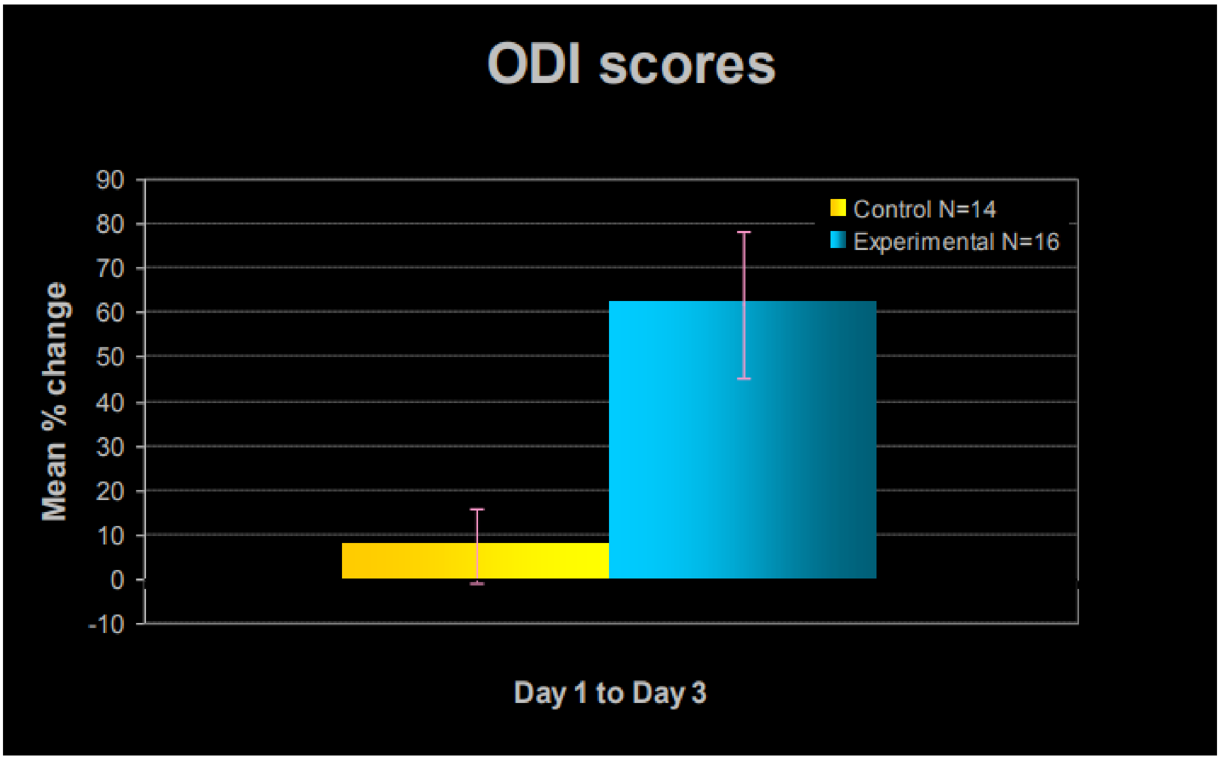

Figure 6: The difference in mean change scores of ODI between the groups

Overall, the results of the study demonstrate the effectiveness of MET in reducing low back pain, improving the stretch ROM of the Quadratus Lumborum muscle, alleviating tenderness, and improving functional disability associated with Quadratus Lumborum myofascial trigger points.

DISCUSSION

Regarding method, the challenge of determining the ideal number of sessions required to alleviate trigger points and improve range of motion (ROM). Previous studies have shown varying results, with some indicating that a single session can be effective while others require multiple sessions. In this study, three sessions conducted with four repetitions each over a one-week period to assess the improvement in symptoms after one intervention.

The choice of outcome measures, specifically localized tenderness and limited stretch range, for identifying trigger points in the Quadratus Lumborum muscle. These measures were selected because they can be objectively measured and have been shown to be clinically useful in identifying trigger points.

Moving on to the results, the study found that Muscle Energy Techniques (MET) combined with hot packs and active range of motion (AROM) resulted in superior pain relief compared to the control group. The experimental group showed significant improvement in pain relief, restoration of muscle stretch length, and reduction in trigger point tenderness. The visual analog scale (VAS) scores, used to assess pain, demonstrated a progressive decrease in the experimental group, indicating the effectiveness of MET in relieving low back pain of Quadratus Lumborum myofascial origin.

The study also examined the range of motion (ROM) and found significant improvements in left side-bending and right side-bending scores in the experimental group compared to the control group. The improvement in ROM suggests that MET was effective in improving the stretch length of the involved Quadratus Lumborum muscle. The authors cite previous research that supports the positive effects of MET on spinal range of motion.

Furthermore, the study evaluated the differences in ROM between the involved and uninvolved sides. The experimental group showed a significant decrease in these differences, indicating a normalization of side-bending ranges on both sides. This suggests that MET was effective in reducing the asymmetry caused by the shortening of the Quadratus Lumborum muscle.

The restricted range of motion observed in symptomatic individuals may not necessarily be indicative of spinal pain or dysfunction. It is noted that normal variation and other factors, such as shortness in other muscle groups, could contribute to residual differences after treatment.

Finally, the study assessed tenderness scores and found a progressive decrease in tenderness in the experimental group compared to the control group. These findings align with previous research on the effects of MET on myofascial pain.

In summary, this study provides evidence supporting the effectiveness of Muscle Energy Techniques in relieving low back pain of Quadratus Lumborum myofascial origin. The combination of MET with hot packs and AROM resulted in superior pain relief, improved range of motion, and reduced trigger point tenderness. These findings contribute to the understanding of the potential benefits of MET in the management of Quadratus Lumborum myofascial pain. Further research, including histologic and electromyographic studies, is needed to elucidate the precise mechanisms of action of MET in trigger point management.

CONCLUSION

The findings of this comprehensive analysis indicate that Muscle Energy Techniques (METs) are effective in reducing pain, improving the stretch length of the shortened quadratus lumborum muscle housing the trigger points, alleviating tenderness, reducing disability, and enhancing overall function in individuals with low back pain of quadratus lumborum myofascial origin. The response of tenderness to the given number of METs sessions varied among the patients, with some improvement observed after three sessions. However, residual tenderness remained in some patients, suggesting that a higher number of METs sessions might have completely alleviated the tenderness. It is important to note that baseline differences in the Oswestry Disability Index (ODI) scores between the two groups may have influenced the results obtained for the improvement of functional disability.

The results of this study contribute to the growing body of evidence supporting the efficacy and appropriate use of the muscle energy technique in the treatment of low back pain originating from myofascial trigger points in the quadratus lumborum muscle. These findings highlight the potential value and usefulness of METs as a valuable tool in clinical practice. Clinicians can consider incorporating METs into their treatment approach for patients with low back pain of quadratus lumborum myofascial origin, as it has demonstrated positive outcomes in terms of pain reduction, improved muscle flexibility, decreased tenderness, and enhanced functional abilities.

Further research is warranted to explore the optimal number of METs sessions required to achieve complete resolution of tenderness and to determine the long-term effects of METs on pain relief and functional outcomes. Additionally, future studies should investigate the comparative effectiveness of METs with other treatment modalities to further strengthen the evidence base and guide clinical decision-making.

Overall, this study contributes to advancing our understanding of the role of Muscle Energy Techniques in addressing low back pain of quadratus lumborum myofascial origin and provides support for its integration into orthopedic physiotherapy practice.

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