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Immediate Effect of Muscle Energy Technique on Quadratus Lumborum Muscle in Patients with Non-Specific Low Back Pain

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Abstract

[Purpose] The aim of this study was to evaluate the immediate effect of Muscle Energy Technique on Quadratus Lumborum Muscle on pain level and active Lumbar Range of motion in patients with acute and sub acute nonspecific Low back pain. [Subjects and Method] Sixty patients with nonspecific low back pain and limited lumbar ROM were selected. The subjects were randomly assigned to an experimental group(n=30), which received treatment consisting of Muscle Energy Technique to Quadratus Lumborum muscle and hot pack, while that of control group received only hot pack to lower back. Pain levels using NPRS and Lumbar ROM using Modified Schober's test were measured before and immediately after the interventions in both groups. [Results] Both the groups showed significant improvement in outcome measures. However, the Experimental group showed better results on comparing with control group. [Conclusion] The combination of Muscle Energy Technique to Quadratus Lumborum muscle along with hot pack treatment was found to be effective in reducing pain and improving lumbar ROM after a single intervention session.

Keywords: *Muscle Energy Technique, Quadratus Lumborum muscle, Non specific Low back pain.*

Abbrevations : MET - Muscle Energy Technique; ROM - Range Of Motion; NPRS - Numeric Pain Rating Scale

Introduction

Low back pain is the most common health problem that affects work performance and quality of life. It is defined as pain, stiffness ,muscle tension, or localized stiffness above the inferior gluteal folds and below the costal margin, with or without leg pain (sciatica). The prevalence of low back pain in India (2016) was found to be 42.4%[1]. The majority (60.9%) of population with low back pain experienced moderate disability. Non specific low back pain is characterized by the absence of structural change, that is there is nothing disc space reduction, nerve root compression ,bone or joint injury, marked scoliosis or lordosis that may lead to back pain.[2]Despite absence of structural change in nonspecific LBP, it can limit daily activities and inability to work. It is usually categorized in 3 subtypes: acute (<6 weeks), sub-acute (6 to 12 weeks) and chronic (>12 weeks) low back pain. The back muscles along with the abdominal, the glutea and the leg muscles play important role in the etiology of low back pain.

MET is defined as "treatment procedure that involves voluntary contraction of patient muscle in a precisely controlled direction, at varying level of intensity against a distinctly executed counterforce applied by the therapist."[3] According to the studies conducted by Noelle M Selkow (2009) [4] and Franke H Fryer G, (2015)[5],MET may be useful to decrease nonspecific low back pain. Norris (2000) describes the divided roles in which quadratus is involved:- The muscle act functionally different in its medial and lateral portions, with the medial portion being more active as a stabiliser of the lumbar spine, and the lateral more active as a mobiliser . Janda (1983)[6] observes that, when the patient is sidebending ,when the lumbar spine appears straight, with compensatory motion occurring only from the thoracolumbar region upwards, tightness of quadratus lumborum may be suspected.

Quadratus lumborum is a common source of lower back pain. Because it connects the pelvis to the spine and bilateral contraction produces extension, unilateral

contraction produces extension and sidebending to the same side[7].In dysfunction there is often a degree of spasm or tightness in the muscles which stabilise the region, notably: psoas and erector spinae of the thoracolumbar region, as well as quadratus lumborum and rectus abdominis . Quadratus fibres merge with the diaphragm (as do those of psoas), which makes involvement in respiratory dysfunction a possibility since it plays a role in exhalation, both via this merging and by its attachment to the 12th rib. Tightness of quadratus, or the presence of trigger points, can result in pain in the lower ribs and along the iliac crest if the lateral fibres are affected. Tightness of the medial fibres, or the presence of trigger points, can produce pain in the sacroiliac joint and the buttock. Thus, the purpose of study is to see the difference in pain scale and lumbar ROM immediately post Muscle Energy Technique intervention.

Method

60 Subjects were selected for the comparative study conducted at Bhausaheb Sardesai Talegaon Rural hospital, based on the following inclusion criteria- Both male and female between the age group of 20 – 45 years [8],with NPRS score of 4- 7 [9,] of having acute and sub acute low back pain localized paraspinally with Quadratus lumborum tightness present.[10,7] Exclusion criteria consists Radiating pain, paresthesia, numbness into buttocks or lower extremity, patients having low back pain of more than 12 weeks of duration (chronic) , Spondylolisthesis, Spondylosis, Lumbar disc herniation, Previous Spinal surgeries, Structural deformity, Systemic disease or inflammatory condition of spine, Hip joint pathology or fractures.

After the approval of Institutional Ethical Committee , written informed consent was taken from all the 60 subjects and were divided in two groups by chit method of random sampling. Subjects within experimental group were treated with hot pack for 20 minutes[11] on low back in prone position and MET to Quadratus Lumborum as follows - (figure-1) The practitioner stands behind the side-lying patient, at waist level. The patient has the uppermost arm extended over the head to firmly grasp the top end of the table and, on an inhalation, abducts the uppermost leg until the practitioner palpates strong quadratus activity (elevation of around 30° usually). The patient holds the leg isometrically in this manner, allowing gravity to provide resistance for 10-second , the patient allows the leg to hang slightly behind him over the back of the table. The practitioner straddles this and, cradling the pelvis with both hands (fingers interlocked over crest of pelvis), leans back to take out all slack and to ease the pelvis away from the lower ribs during an exhalation. The stretch should be held for between 10 and 30 seconds. Contraction followed by stretch is repeated with raised leg in front of, behind the trunk in order to activate different fibers and was given bilaterally. The control group subjects were treated with only 20 minutes hot pack on low back in prone.

Outcome was measured before intervention and immediately post treatment by Modified Schobers test for all Lumbar spine ranges and NPRS scale for pain intensity.

Results

Descriptive statistics was done in the form of mean and standard deviation. Interferential statistics evaluated changes in the NPRS using Mann-Whitney test between the groups and Wilcoxon matched pairs test was used to measure changes within groups, while changes in Lumbar range were evaluated using Paired t test and Unpaired t test in both control and experimental group. Data analysis was done using InStat (Version 3.05, created September 2000). Significance was accepted with $p<0.05$

Study showed extremely significant difference in NPRS of experimental group with mean difference of 4.23 ± 1.0 and p value= 0.0001,while significant difference in pain scale of control group with mean difference of 2 ± 0.7 and p value= 0.0001, with U'= 44.0 (Table 1)

Comparison of mean difference of lumbar ranges by Modified Schobers test between experimental and control group showed that there was significant improvement in lumbar flexion , side flexion and rotation of experimental group than in control group.(Table 2)

Table 1. Comparison of pre and post means of NPRS

NPRS	Pre-Mean	Post- Mean	Mean Difference	p Value	Significance
EXPERIMENTAL GROUP	5.7 ± 1.02	1.46 ± 1.04	4.23 ± 1.0	0.0001	Extremely Significant
CONTROL GROUP	5.3 ± 0.91	3.3 ± 0.9	2 ± 0.7	0.0001	Extremely Significant

Table 2. Comparison of Lumbar ROM pre and post treatment using Paired T test

Range of motion	Experimental Group		p Value	Paired T test	Control Group		p Value	Paired T test
	Pre-mean	Post- mean			Pre-mean	Post- mean		
Flexion	3.01 ± 0.75	4.83 ± 0.49	0.0001	17.41	3.56 ± 0.9	4.12 ± 0.85	0.0001	8.43
Extension	1.63 ± 0.81	3.12 ± 0.70	0.0001	11.54	2.12 ± 0.76	2.47 ± 0.63	0.0001	4.78
Right side flexion	15.9 ± 4.80	19.3 ± 4.55	0.0001	12.71	16.56 ± 2.55	16.9 ± 2.61	0.0002	4.247
Left side flexion	15.7 ± 4.5	19.5 ± 4.5	0.0001	11.13	17.0 ± 2.67	17.43 ± 2.7	0.0001	4.46
Right rotation	7.13 ± 1.16	8.99 ± 1.06	0.0001	13.66	7.2 ± 0.87	7.6 ± 1.02	0.0001	5.48
Left rotation	7.06 ± 1.33	9.16 ± 1.55	0.0001	13	7.4 ± 0.95	7.70 ± 0.80	0.0014	3.52

Figure 1: The practitioner stands behind the side-lying patient, at waist level with the patient's uppermost arm extended over the head to firmly grasp the top end of the table. The patient holds isometric hip abduction during inhalation and later allowing the leg to hang slightly behind him over the back of the table. The practitioner cradle the pelvis with both hands (fingers interlocked over crest of pelvis), leans back to take out all slack and to ease the pelvis away from the lower ribs during an exhalation.

Discussion

The study was undertaken to assess the immediate effectiveness of Muscle Energy Technique on Quadratus Lumborum muscle in patients with acute and sub acute nonspecific low back pain. For the purpose of this study, 60 patients were selected and divided into two groups. Experimental group was given 20 min hot pack to low back and MET for Quadratus Lumborum, while the control group was given 20 min hot pack. The changes observed in this study are noteworthy, within the group comparison showed that there was significant reduction in low back pain in both the groups. According to Table 1 the post treatment reduction in pain scale was significant with p value = 0.0001 of experimental group . It should be noted that the control group produced good outcome, but addition of the MET improved the outcomes substantially.

The reduction in pain due to MET can be explained on the basis of neurophysiology, as described by Chaitow that Post-isometric relaxation refers to: the subsequent reduction in the tone of agonist muscle after isometric contraction, it occurs due to Golgi tendon organ stretch receptors located in the tendon of the agonist muscle. These stretch receptors react to overstretching of muscle by inhibiting further muscle contraction. The fact that increasing the length of shortened muscles relieve tenderness and pain, supports a muscular origin of the pain. According to the study conducted by Harald Brodin, Stockholm, describes the effect of using MET in a group of low back pain sufferers. 41 patients (24 female, 17 male) who had suffered pain in and around lumbar segments, with reduced mobility for a duration of atleast 2 months, were randomly assigned to two groups, one receiving no treatment and the other receiving MET of lumbar spine 3 times a week, both groups recorded their pain level at rest and also during activity. Results showed that the group receiving MET treatment showed pain reduction statistically greater than in non treated group, as well an increase in mobility of lumbar spine. Low back pain reduction due to hot pack is explained on the basis of physiological changes which are, application of thermotherapy and hot water lead to significant increase in soft tissue flexibility, improvement in blood circulation through muscles, easier and better contraction of smooth muscles, also improvement in the motor function of muscles. Besides, hot pack triggers decline in pain especially low back pain by inhibiting the pain signal and exerting pressure on back muscles. The study conducted by Morteza Dehghan, Journal of Clinical and Diagnostic Research. examined the efficiency of thermotherapy , cryotherapy alongside a routine pharmacological treatment, on pain relief in acute low back back patients. Clinical trial study was conducted on 87 patients randomly assigned to three group of 29 each. First (thermotherapy) group underwent hot water bag and naproxen, Second (cryotherapy) group was treated with ice and naproxen, and the third group was only treated with naproxen, all for one week. The data were analysed by SPSS software using paired t-test, ANOVA, and chi-sqaure. Results indicated that the application of thermotherapy compared to cryotherapy and control group reported significant less pain(<0.05)

In this study, the experimental group showed significant improvement in lumbar ranges as compared to control group, due to mechanism that muscle contraction against equal counterforce triggers the Golgi tendon organ. The afferent nerve impulse from the Golgi tendon organ enters the dorsal root of the spinal cord and meets with an inhibitory motor neurone, which stops the discharge of the efferent motor neurones impulse and therefore prevents further contraction, the muscle tone decreases, which in turn results in the agonist relaxing and lengthening, so there is increase in the ROM.

A study conducted by Ronald Schenk, Amy MacDiarmid, The Journal of Manual and Manipulative Therapy 10, examined whether the application of a muscle energy technique (MET) to the lumbar spine could significantly influence lumbar range of motion in an asymptomatic population. 26 volunteer subjects, with limited range of motion in lumbar extension, were divided in control group and treatment group. Treatment group subjects underwent eight sessions of MET , twice a week for 4 weeks. An independent group t test was done to analyze the data, and mean changes were compared for both groups. Statistical significance was found at the $p < 0.05$ level indicating that the MET group significantly improved in lumbar range of motion.

Thus from the above result and Statistical data analysis, research hypothesis is significantly proven.

Conclusion

It can be concluded that Muscle energy technique of Quadratus Lumborum along with hot pack is beneficial in immediately reducing non specific low back pain and improving lumbar spine mobility as compared to hot pack alone.

Conflict of Interest: NIL

Source of Funding : Self

Ethical Clearance: Taken from Institutional Ethical committee

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