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Comparison of muscle energy technique and post isometric relaxation on iliopsoas tightness to improve flexibility in healthy young individuals

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Abstract

Background & purpose: Iliopsoas muscle uncommonly gets stretched in daily activities. Thus results into tightness. The purpose of this study was to compare the effectiveness of two osteopathic techniques, muscle energy (MET) and post isometric relaxation (PIR), directed at the iliopsoas muscle, on hip extension.

Materials and Methodology: Two group studies involved 15 patients in each group. Group a received MET and Group B received PIR. Iliopsoas tightness is assessed by modified Thomas test and degrees of hip extension measured with the help of goniometer pre and post intervention, i.e. after 3 weeks of intervention.

Results: There was significant improvement in iliopsoas flexibility in both MET and PIR groups. Statistical comparison of the results of the techniques showed that MET group had greater improvement than the PIR group. (t value= 3.198, p value= <0.0001)

Conclusion: MET is more effective in improving iliopsoas flexibility than PIR in healthy young individuals.

Keywords: Muscle energy technique, post isometric relaxation, Iliopsoas flexibility, modified Thomas test

1. Introduction

Muscle tightness is defined as the muscle is just too short to allow the full passive or active range of motion. Muscles in the lower extremity which are prone to tightness are gastro-soleus, tibialis posterior, rectus femoris, iliopsoas, tensor fascia lata, the hamstrings and the hip adductors [1].

Iliopsoas muscle very uncommonly gets stretched in activities of daily living which results in its tightness. The iliopsoas muscle belongs to the inner hip muscles. The iliopsoas muscle is its strongest flexor of the hip joint, important walking muscle, it rotates the thigh lateral and unilateral contraction leads to a lateral flexion of the lumbar vertebrae. Altogether it plays a significant role in the movement and stabilization of the pelvis [2].

Iliopsoas tightness has also been shown to significantly correlate to back pain. A short iliopsoas group pulls the spine into hyper lordosis and an anteriorly tilted pelvis which put stress on all the spinal muscles, including the erector spinae. A short or tight iliopsoas can pull and twist the vertebrae, causing excess compression of the discs and other vertebral joints. This may lead to disc herniation. Tightened psoas can inhibit gluteal function. Some common symptoms arising from Iliopsoas dysfunction are: pain in low back and hips, discomfort or pain while driving with extended or flexed legs, pain upon twisting the spine [3]. Therefore flexibility of iliopsoas muscle is necessary.

Flexibility has been defined as the ability to move a joint through a normal ROM without undue stress to the musculotendinous unit [4]. There are different methods to reduce iliopsoas tightness such as- Stretching techniques [5]. Proprioceptive neuromuscular facilitation technique [6]. Yoga asanas like Navasana, Virabhadrasana and Setu Bandha Sarvangasana. [7], Myofascial release [8].

Giving only stretching and massage relax the muscle but don't retrain muscles into healthy coordination and healthy tone. The direct approach is to retrain muscle/movement memory by training that actively uses muscles to normalize their tone and improves coordination [9]. Muscle energy technique (MET) is defined as a form of soft-tissue treatment, in which the patient's muscles are actively used, on request, from a precisely controlled position, in a specific direction, and against a distinctly executed therapist-applied counterforce. A manual technique that involves precise contraction of subject's muscle, and is claimed to increase muscle extensibility and joint motion [10].

MET utilizes repeated, sub maximal, active resisted isometric contraction of a muscle followed by passive stretch in order to increase its extensibility and the range of motion (ROM) in the joint [15].

Post isometric relaxation is a technique designed to relax tight muscles without initiating stretch reflex [11]. It reduces muscle spasm and increases range of motion. The principle is relaxation of muscle following its isometric contraction, facilitation and inhibition of muscle that accompanies breathing [12].

Study comparing effectiveness of Muscle energy technique (MET) and Post isometric relaxation (PIR) on iliopsoas muscle flexibility has not been carried out previously. Hence the present study was conducted with the objective to compare the effectiveness of Muscle energy technique and Post isometric relaxation on iliopsoas flexibility in healthy young individuals.

2. Methods

2.1 Study design: This study was primary and prospective, pretest-posttest experiment intervention with 2 independent variables, MET and PIR. The dependent variable was the number of degrees by which hip extension increased.

2.2 Ethical approval: Permission and approval was taken to carry out the research work was obtained from the institutional ethical committee and the head of institute. Participation of subjects was confirmed by obtaining written informed consent from each subject.

2.3 Sample size and Study duration: In this study, 30 students both male and female aged between 18 to 25 years were recruited by convenience sampling. Intervention was given for 4 Months with intervention of 3 weeks. The participants were selected on the basis of Inclusion criteria and Exclusion criteria.

2.4 Inclusion criteria: Subjects were included in this study if they aged between 18-25 years (both gender) with unilateral positive modified Thomas test.

2.5 Exclusion criteria: Subjects were excluded if they gave history of trauma of lumbar spine, pelvis, hip, Presence of tumours that can restrict hip range of motion, infective arthropathy at hip joint and pelvis. Lower limb traumas/myopathies.

2.6 Grouping: Subjects fulfilling inclusion criteria were randomly assigned into two groups.

Group A – Muscle energy technique (MET) and Group B- Post isometric relaxation (PIR) with equal number of subjects in each group (n=15).

3. Methodology

From the participating subjects demographic data obtained. Modified Thomas test is performed and measurement of hip extension range of motion is taken on all the subjects before and after intervention.

Modified Thomas test [14] Procedure was performed in following manner. The patient lies supine with buttocks as close to the end of the table as possible, the non-tested leg in flexion at both hip and knee, held by the participant. Full flexion of the hip helps to maintain the pelvis in full rotation with the lumbar spine flat. If the thigh of the tested leg lies in horizontal position in which it is parallel to the floor, then indication is that Iliopsoas is not short. If the thigh rises above the horizontal then indication is that Iliopsoas is short.



Fig 1: A negative modified Thomas test; the test leg drops below horizontal line indicating no evidence of a restriction in hip extension.



Fig 2: A positive modified Thomas test; the test leg fails to drop below horizontal line indicating a restriction in hip extension.

Muscle energy technique: [10]

The subject is in prone lying with a pillow under the abdomen to reduce the lumbar curve and offering a stable pelvis. The practitioner stood adjacent to the participant at the end of the table facing the participant's experimental leg. The practitioner then placed their one hand over the participant's distal thigh just above the knee and their other hand over the participant's Iliac crest to stabilise the pelvis. The practitioner flexes the knee and extends the hip once the barrier is identified the participant is asked to bring the thigh towards the table against resistance using 15-25% of their maximal voluntary contraction potential for 7-10 seconds.

Then give the stretch and hold for 30 seconds. Procedure was repeated two more times. MET is given for three times in a week for 3 weeks.

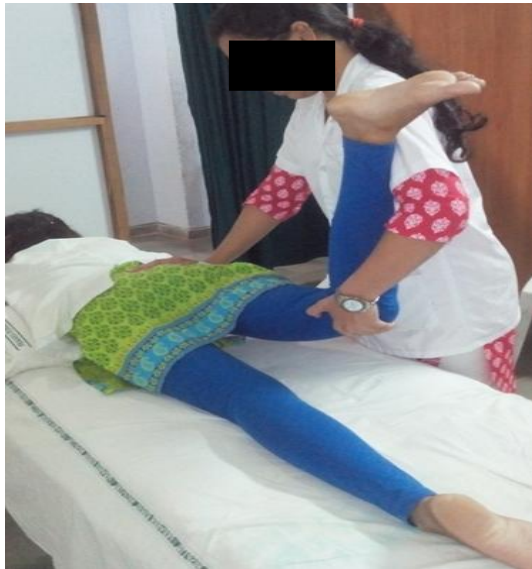


Fig 3: MET Technique

Post isometric relaxation: [13]

Have the patient sit at the edge of a table, the non-tested leg in flexion at both hip and knee and allowing the experimental thigh and leg to hang. Extend the knee of the opposite thigh upto the barrier. Then the patient is asked to flex the hip against minimal resistance (isometrically) and to breathe in for 10 seconds. The patient is then told to 'let go' (relax) and exhale slowly. Wait for 10 to 20 seconds or longer as long as relaxation is taking place. Procedure was repeated two more times. Perform the technique 3 times in a week for 3 weeks.



Fig 4: Post Isometric Relaxation Technique



Fig 5: Post MET modified Thomas test



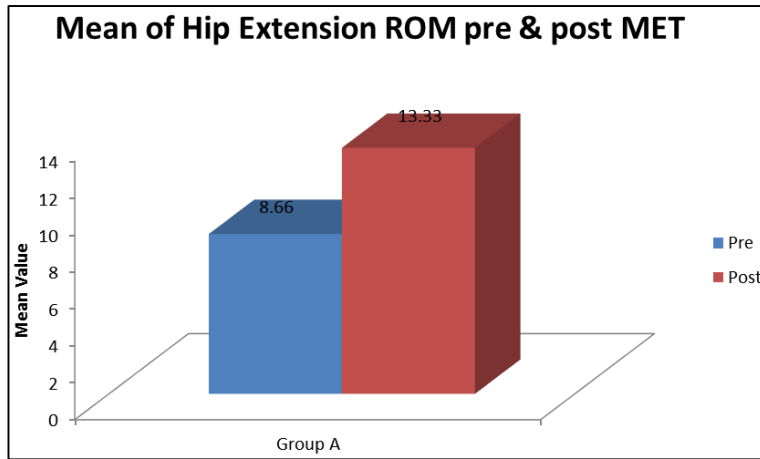
Fig 6: Post PIR modified Thomas Tes

4. Data Analysis and result

Statistical analysis was performed by using Graphpad instat 3 software. Student t-test: was used to compare the group A (MET) and B (PIR) for different treatment technique and to find their effectiveness and which technique is better for increasing iliopsoas flexibility in adults. Unpaired t test was used to compare Post mean Difference scores between group A and group B. Paired t test was used to compare Pre and Post scores within group A and B.

Table 1: Shows the Pre and Post result of MET on Hip Extension ROM

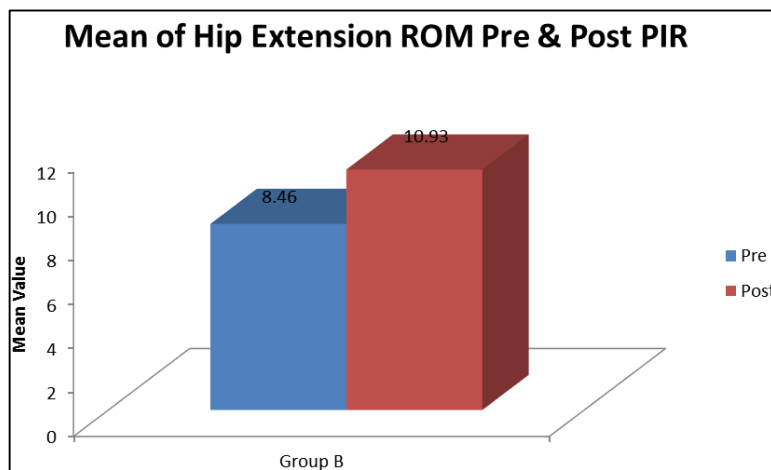
	Pre	Post	't value'	'p value'	Inference
	Hip Ext ROM	Hip Ext ROM			
Group A	8.66±1.799	13.33±1.952	18.520	<0.0001	Extremely Significant



Graph 1: the above Graph shows increase in the mean Hip Extension ROM post MET Treatment

Table 2: Shows the Pre and Post result of PIR on Hip Extension ROM

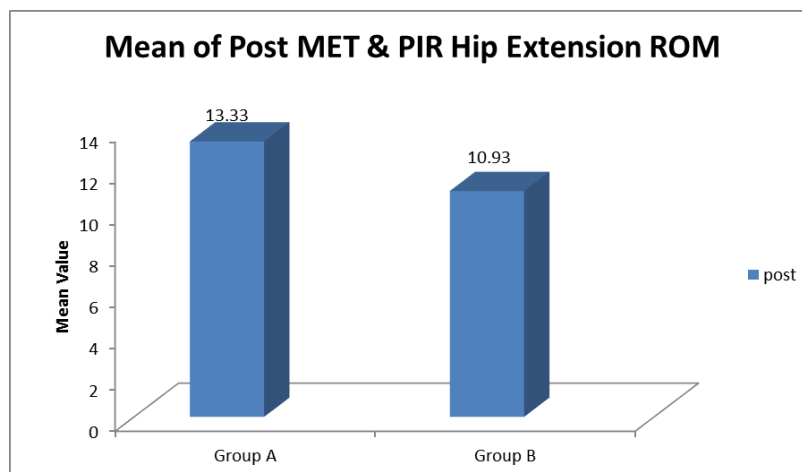
	Pre	Post	't value'	'p value'	Inference
	Hip Ext ROM	Hip Ext ROM			
Group B	8.46±2.134	10.93±2.154	18.500	<0.0001	Extremely Significant



Graph 2: The Above Graph shows increase in the mean Hip Extension ROM post PIR Treatment

Table No.3 Shows the Post result of MET & PIR on Hip Extension ROM

	post	't value'	'p value'	Inference
	Hip Ext ROM			
Group A	13.33 + 1.952	3.198	<0.0001	Very significant
Group B	10.93 + 2.154			



Graph 3: Graph shows mean value of Hip Extension ROM post MET & PIR

As seen in Table 1, there is statistical significance ($p < 0.0001$) between pre and post values of hip extension range in MET group. The range of hip extension is increased post intervention which shows increased flexibility of Iliopsoas muscle.

Table 2: Shows statistical difference ($p < 0.0001$) between pre and post values of hip extension range in PIR group which shows increased flexibility of Iliopsoas muscle.

Table 3: Shows statistical significant difference ($p < 0.0001$) between MET & PIR group.

When mean difference of post intervention hip extension ROM was compared between both the groups MET technique showed better results than PIR technique.

5. Discussion

MET group showed significant improvement on hip extension range of motion and iliopsoas tightness. This can be correlated with study conducted by Nicholas H K concluded that immediately following the MET intervention a mean increase of 5.3 degrees of hip extension was observed which represented moderate effect. This was compared with the passive stretch procedure for which mean increase of 2.1 degrees was measured representing the small effect and can also be correlated with another comparative study done by Lisa Opie (2010) on the effects of muscle energy technique and inhibition, directed at iliopsoas muscle, on hip extension. Paired t-tests showed a statistical difference in the change in degrees of hip extension for MET but not for inhibition or control. No significant difference in degrees of hip extension was shown between inhibition and control groups.

This implies that MET has produced significantly greater gains in range of motion compared to inhibition and control. MET produces effect on both soft tissue and articular component of somatic dysfunction. MET involves enhanced mobility. The mechanism is during isometric contraction there is stretching of the series of elastic components of sarcomeres which increases their length, particularly if active or passive stretching follows after MET [10]. MET utilizes repeated, sub maximal, active resisted isometric contraction of a muscle followed by passive stretch in order to increase its extensibility and the range of motion (ROM) in the joint [15].

The PIR group also showed improvement in iliopsoas flexibility. Post isometric relaxation (PIR) exercise helps in lengthening of tight Iliopsoas by its contraction and relaxation method as well as facilitation an inhibition of muscles that accompanies breathing. PIR helps in flexibility of tight iliopsoas muscle because of its contraction and relaxation method.

The basic concept of PIR is to contract the tense muscle isometrically and then to encourage it to lengthen during a period of complete voluntary relaxation. Gravity is used to encourage release of muscle tension and taken up the slack [13].

The present study can also be correlated with the study done by Stodolny and Mazur. They published their findings of a study done on the effect of post-isometric relaxation exercise on iliopsoas muscle in patients with lumbar discopathy. They found an appreciable reduction of shortening within these patient populations and also with another study conducted by Gandhi Hiral *et al* who found that post isometric relaxation can be used as an effective

technique to improve hamstring flexibility in normal individuals when compared with static stretching.

In the present study MET and PIR interventions are given for three times in a week for 3 weeks. Both the group showed significant improvement in hip extension range of motion. This can be correlated with the study done by Talapalli R *et al* in year 2014 on Comparison of Muscle Energy Technique and Post Isometric Relaxation on Hamstring Flexibility in Healthy Young Individuals with Hamstring Tightness. Intergroup comparison showed that popliteal angle increased significantly in the MET group compared to PIR group ($p < 0.05$).

Inter group comparison in the present study proved that MET may have an influence on tight muscle at a faster rate and more number of subjects achieved increase in ROM and flexibility of iliopsoas muscle than PIR. (t value= 3.198, p value= < 0.0001) Limitations of the study were that only healthy young subjects were included in this study.

MET increases ROM at faster rate because it involves the active and precise recruitment of muscle activity. This could be the reasons for muscle energy technique to be more effective as compared to PIR.

Limitations of the study were that only healthy young individuals were included in this study.

5.1 Clinical implication: MET can be used in young individuals with tight iliopsoas to prevent injuries before performing exercises.

6. Conclusion

This study concluded that although both MET and PIR are effective techniques to improve iliopsoas flexibility, MET is better and effective technique as compared to PIR.

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