Comparison of Reciprocal Inhibition and Post Isometric Relaxation on Iliopsoas Muscle Tightness in Healthy Young Individuals

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Abstract **- Background: This study was emphasized to compare the reciprocal inhibition and post isometric relaxation on iliopsoas muscle tightness in healthy young individuals, which provide a baseline information that Iliopsoas muscle is a hip flexor which rarely gets stretched in daily living activities which results to the tightness. The purpose of the study was to compare the effect of both Post Isometric Relaxation (PIR) and Reciprocal Inhibition (RI) are the two techniques, Muscle Energy Technique (MET) directed at iliopsoas muscle on hip extension. Methodology: Permission was taken from ethical committee. An experimental study was carried out on which two group studies involved 15 subjects in each group. Group A received Post Isometric Relaxation (PIR) and Group B received Reciprocal Inhibition (RI). Iliopsoas tightness and Hip ROM was assessed by using Modified Thomas Test and Universal Goniometer respectively pre and post intervention i.e. after 2 weeks of intervention. Results: There was significant improvement in iliopsoas muscle tightness in both PIR and RI groups. Statistical comparison of the results of the techniques showed that both the treatments were equally effective in reducing pain and increasing hip joint flexibility (p value= <0.0001). Conclusion: Both the treatments were equally effective in reducing pain and increasing hip joint flexibility.**

Index Terms **- Iliopsoas tightness, Post Isometric Relaxation, Reciprocal Inhibition, Modified Thomas Test, Universal Goniometer.**

INTRODUCTION

Muscle tightness is defined as the muscle is too short to permit full passive range of motion or complete active range of motion.[1] The muscles of lower limb which are prone to tightness are, Gastrocnemius-soleus, Tibialis posterior, Rectus femoris, Hamstrings, Hip adductors and iliopsoas. Iliopsoas muscle very uncommonly gets stretched in the activities of daily living which results in the tightness of iliopsoas. Iliopsoas muscle tightness has been significantly correlated with the back pain. The iliopsoas muscle is the strongest hip joint flexor, an important walking muscle. The iliopsoas compartment is composed of 3 muscles: the iliacus, psoas major and psoas minor. The origin of iliacus is from iliac wing and it inserts into the psoas tendon and lesser trochanter of femur. [2]

The psoas major is a long fusiform muscle that originates from:

1. The transverse processes of lumbar vertebrae,
2. On the vertebral bodies and
3. Intervertebral discs of T12-L5 and it inserts onto the lesser trochanter via psoas tendon.

The psoas minor originates from the vertebral bodies of T12-L1 and it inserts on the iliopectineal eminence and the iliac fascia. [3,4]

These three muscles act as hip flexors and trunk flexors as well as lateral flexors of the lower vertebral column.[3]

The iliopsoas muscle functions as a powerful hip flexor and also has important function in femoral external rotation and flexion and lateral bending of trunk. The function of iliacus is important for pelvis stabilization and for hip flexion while running, whereas psoas major is most important for sitting in erect position and for stability of spine in frontal plane. [4]

Previously, a study was conducted on iliopsoas syndrome in dancers, where on physical examination 3 of 49 patients with a positive iliopsoas test had

weakness only without pain. Thirty-eight (78%) patients had clicking or snapping of the hip, thirty-six (74%) had pain and/or tightness with passive iliopsoas stretching, twenty-two (49%) had symptoms while performing activities of daily living and twenty-two (45%) patients had associated ipsilateral lower back pain.[5]

Mills, et al. conducted a study on effect of restricted hip flexor muscle length on hip extensor muscle activity and lower extremity biomechanics during deep double leg squat performed in a closed kinetic chain. They found that there is less gluteus maximus activation and lower gluteus maximus: biceps femoris co-activation in same task during hip flexor muscle tightness.[6]

Previously it has been studied, that subjects who have limited hip extension range of motion which could be result from all hip one joint or two joint flexors muscles. Also, this study was performed on adolescent subjects who had one joint hip flexors specially iliopsoas muscle tightness by using Modified Thomas Test and differential tests were performed to exclude the subjects with two joint hip flexor tightness such as rectus femoris and Tensor Fascia Lata.[7]

A sedentary lifestyle is a major risk factor across a spectrum of preventable diseases that lowers the quality of life which can lead to various problems like tightness of muscle, decreased range of motion and decreased flexibility that hampers the daily living activities of individuals. Prolonged sitting for extended period of time put load on the muscle with large amount of force increases risk of injury and causes alteration in pelvic position that is tilt which leads to shortness of muscle. [8]

Short iliopsoas group pulls the spine into hyper lordosis and an anteriorly tilted pelvis which put stress on all spinal muscles, including the erector spinae and can twist the vertebrae which cause excessive compression of disc and other vertebral joints which may lead to herniation of disc. Iliopsoas dysfunction leads to the symptoms like pain in lower back, SI joint and hips, pain and discomfort while driving with extended or flexed legs and pain upon twisting the spine.[9] Therefore, flexibility of iliopsoas muscle is necessary because it allow the tissue to accommodate more easily to stress to abandoned shock impact and to improve the efficiency and effectiveness of the movement.[1]

There are different techniques to reduce iliopsoas muscle tightness such as: stretching technique (static stretching) [10], Proprioceptive neuromuscular facilitation technique [11], Yoga asanas such as (Navasana, Virabhadrasana and Sarvangasana) [12], Myofascial release [13] and Muscle energy techniques [14]

Muscle energy techniques are used to stretch the tight muscle and fascia, to mobilize the joints in which movement is restricted, to strengthen the weak muscles and to improve the local circulation. [15] MET is a manual technique that use contraction of specific muscles and are found to be effective in increasing flexibility of muscles and also improves the range of motion. [16]

Post isometric relaxation is a relaxation to the effect of subsequent reduction in tone experienced by muscle or group of muscles [17], it is a technique designed to relax tight muscles without initiating stretch reflex.[18] It reduces muscle spasm and improves range of motion. The principle is relaxation of muscle following its isometric contraction, facilitation and inhibition of muscle that accompanist breathing.[19] Post isometric relaxation involves applying minimal resistance (isometrically) and hold the breath for 7-10 seconds with 3 repetitions.

Reciprocal inhibition is a neuromuscular reflex which inhibits opposite muscle during movement. An increase in neural drive of a muscle or a group of muscles, reduces the neural activity of functional antagonists. This plays a significant role in improving the efficiency of the human movement system and creating ideal arthrokinematics.[14] Reciprocal inhibition involves applying minimal resistance (isometrically) and hold the breath for 7-10 seconds with 3 repetitions.

METHODOLOGY

- Study design: Experimental study
- Sampling method: convenient sampling
- Study duration: 6 months
- Sample size: 30
- Study set up: In and around Pune
- Target population: Individuals with iliopsoas muscle tightness

MATERIALS

- Data collection sheet
- Consent form
- NPRS scale
- Goniometer
- Plinth

INCLUSION CRITERIA

1. Age between18-30 years
2. Both male and female
3. Healthy Young individuals with iliopsoas muscle tightness with positive Modified Thomas test

EXCLUSION CRITERIA

1. Postural deformity / abnormality
2. Low back pain
3. Restricted hip ROM due to any other pathology
4. Recent Fracture of femur, spine and pelvic bone and hip joint dislocation.
5. Undergoing any recent physiotherapy treatment

OUTCOME MEASURES

1. Numerical Pain Rating Scale (NPRS)
2. Universal Goniometer
3. Modified Thomas Test

METHODS

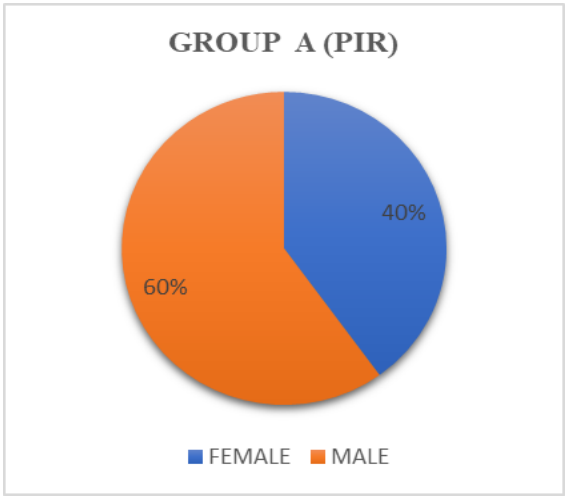
1. POST ISOMETRIC RELAXATION: Have the patient sit at the edge of a table, the non-tested leg in flexion at both hip and knee and allowing the experimental thigh and leg to hang. Extend the knee of the opposite thigh up to the barrier. Then the patient is asked to flex the hip against minimal resistance (isometrically) and hold the breath for 7-10 seconds with 3 repetitions. Procedure should be repeated (for 6 sessions/week) over 2-week period.[20]

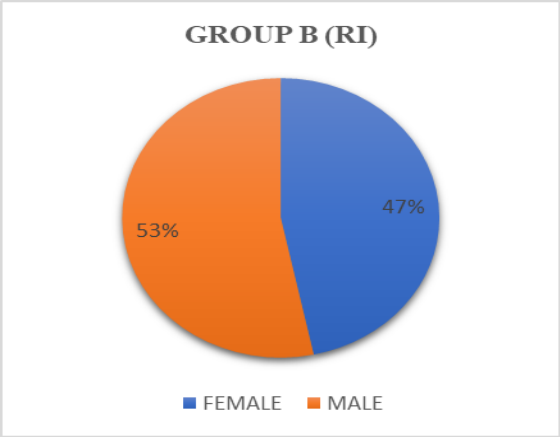
2. RECIPROCAL INHIBITION: Have the patient sit at the edge of a table, the non-tested leg in flexion at both hip and knee and allowing the experimental thigh and leg to hang. Then patient is asked to extend the hip against minimal resistance (isometrically) and hold the breath for 7-10 seconds with 3 repetitions. Procedure should be repeated (for 6 sessions/week) over 2-week period.[20]

RESULTS

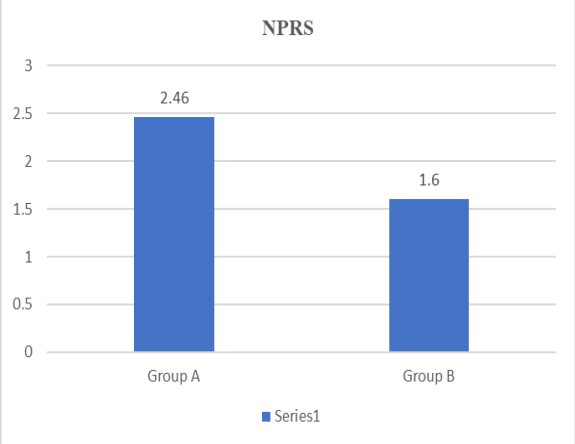
Microsoft excel office 2007 and Instat software used for statistical analysis. Average values for various parameters were calculated. Data was tested for normality using Shapiro Wilk test. Data did not pass normality hence nonparametric test was for comparison between the group and within the group.

GRAPH NO. 1: GENDER DISTRIBUTION

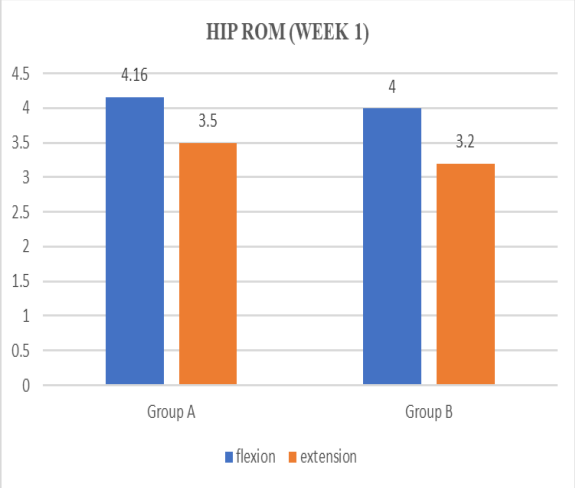




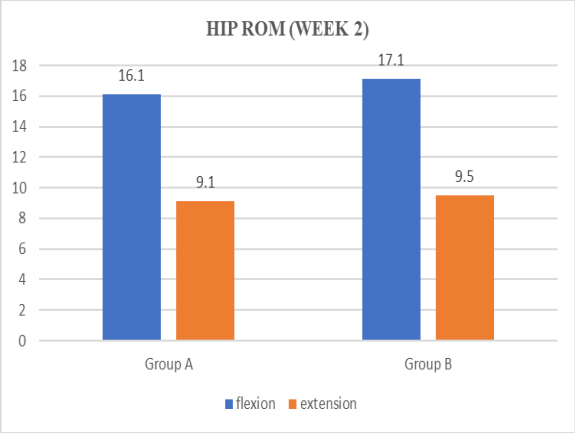
GRAPH NO. 2: NPRS SCORE B BETWEEN GROUP A (PIR) AND GROUP (RI)



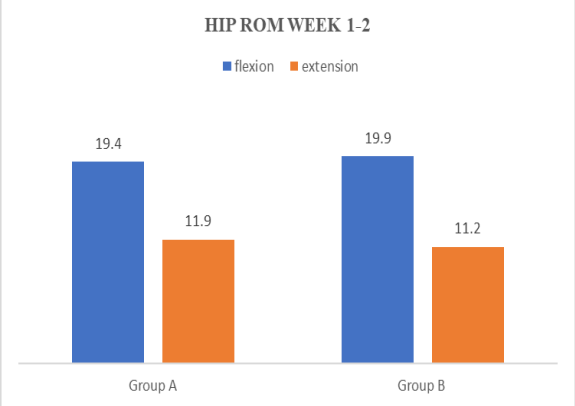
GRAPH NO. 3: COMPARISON OF HIP ROM BETWEEN GROUP A (PIR) AND GROUP B (RI) FOR WEEK 1



GRAPH NO. 4: COMPARISON OF HIP ROM BETWEEN GROUP A (PIR) AND GROUP B (RI) FOR WEEK 2



GRAPH NO. 5: COMPARISON OF HIP ROM BETWEEN GROUP A (PIR) AND GROUP B (RI) FOR WEEK 1-2



In this study, Graph no.1 shows Gender Distribution which shows that Group A (PIR) had 9 males and 6 females which in total were 15 healthy young individuals. While Group B (RI) had 8 males and 7 females which in total were 15 healthy young individuals. Previous study supports our article Malika Mondal et al. "Prevalence of Piriformis Tightness in Healthy Young Individuals: A Cross-Sectional Study" concluded that males were more prone to the tightness than female. Because males have tendency to sit more in open leg position, therefore, piriformis muscles act as external hip rotators and get tighten. Whereas in females, they used to sit with leg crossed which changes the weight or load on soft tissues, muscles and provides stability to lower extremity.[21]

Graph no.2 shows the pre and post value of Numerical Pain Rating Scale (NPRS) which shows that the Group A (PIR) had mean value (3.6 ± 0.63) pre-intervention which was reduced post intervention to (1.06 ± 0.7) which concludes that there was reduction in pain due

to iliopsoas tightness in healthy young individuals after Post Isometric Relaxation. The Group B (RI) had mean value (2.86 ± 0.83) pre-intervention which was reduced to (1.26 ± 0.79) post intervention which shows that the pain on NPRS was reduced after Reciprocal Relaxation. This study shows that the pain due to tightness in healthy young individuals were reduced in both Group A (PIR) and Group B (RI) but when compared, there was significant difference with P value (0.0057). This result shows that both treatments are equally effective on pain when compared with one another. This study supports to the previously study done by Rahul Tanwar, et al. on "Effect of Muscle Energy Technique to Improve Flexibility of Gastro-Soleus Complex in Plantar Fasciitis: A Randomised Clinical, Prospective Study Design" found that pain was significantly improved by both MET and static stretching on NPRS.[22] Ahmed et al. studied 'Effects of dynamic stabilization exercises and muscle energy technique on selected biopsychosocial outcomes for patients with chronic non-specific low back pain: a double-blind randomized controlled trial" is an another article which supports our study had concluded that DSE + MET revealed that the pain was reduced when compared to other interventions (DSE or conventional physiotherapy) by stretching contracted muscle, strengthening weak muscles, improving joint mobility, reducing muscular tension, normalizing muscular tension and by relaxation of muscles.[23]

In the above study Graph no.3 shows the Hip Range of Motion (Week 1) with pre and post value of both Group A and Group B. Group A shows there is increase in hip ranges i.e. flexion (86.23 ± 8.88) and extension (12.46 ± 2.03) pre value when compared with post value hip ranges i.e. flexion (90.4 ± 8.36) and extension (16.06 ± 3.4) respectively. Group B also showed that there is increase in hip ranges i.e. flexion (84.3 ± 9.3) and extension (12.7 ± 1.8) pre value when compared with post value hip ranges i.e. flexion (88.3 ± 9.2) and extension (15.9 ± 2.9) respectively. Comparison between both the Groups showed that p value is not significant with the mean value (4.16 ± 1.7 and 4 ± 1.8) for Group A and Group B of Hip flexion and with mean value (3.5 ± 2.3 and 3.2 ± 2.2) for Group A and Group B of Hip extension respectively. When compared within the group it showed that there was significant difference between both groups. Hence, it shows that both groups are equally effective on hip ranges after post-intervention.

Above readings are in line with a study done by Richa M. et al. on "Comparative Effectiveness of Muscle Energy Technique and Static Stretching for Treatment of Subacute Mechanical Neck Pain" concluded that both techniques were effective in alleviating the pain and increasing active cervical ROM between two groups, but MET was more effective than static stretching in decreasing pain intensity and increasing active cervical ROM by reflex muscle relaxation followed by contraction of muscle by activation of the Golgi tendon organs, their inhibitory influence on motor neuron and changes to stretch tolerance. [24]

Graph no.4 shows the Hip Range of Motion (Week 2) with pre and post value of both Group A and Group B. Group A shows there is increase in hip ranges i.e. flexion (89 ± 8.9) and extension (14.93 ± 3.5) pre value when compared with post value hip ranges i.e. flexion (105.3 ± 7.2) and extension (24.36 ± 2.9) respectively. Group B also showed that there is increase in hip ranges i.e. flexion (86.83 ± 9.4) and extension (14.53 ± 2.8) pre value when compared with post value hip ranges i.e. flexion (104.2 ± 7.8) and extension (24.03 ± 3.06) respectively. Comparison between both the Groups showed that p value is not significant with the mean value 16.1 ± 4.5 and 17.5 ± 4.9 for Group A and Group B of Hip flexion and with mean value 9.1 ± 3.3 and 9.5 ± 2.7 for Group A and Group B of Hip extension respectively. When compared within the group it showed that there was significant difference between the groups. Hence, it proves that both groups are equally effective on hip ranges after post-intervention.

Shiwani R. et al. had studied that Post Isometric Relaxation helps to lengthen the tight iliopsoas by contraction and relaxation of muscle as well as facilitating a muscle inhibition that accompanies breathing. The concept of post isometric relaxation is contracting the tensed muscle isometrically and then it encourages the muscle to lengthen during complete voluntary relaxation.[2] It concluded that MET is more effective in improving iliopsoas flexibility than Post Isometric Relaxation in healthy young individuals.

Graph no.5 shows the Hip Range of Motion (Week 1-Week 2) with pre and post value of both Group A and Group B. Group A shows there is increase in hip ranges i.e. flexion (86.23 ± 8.8) and extension (24.36

± 2.01) pre value when compared with post value hip ranges i.e. flexion (105.3 ± 7.2) and extension (24.36 ± 2.9) respectively. Group B also showed that there is increase in hip ranges i.e. flexion (84.3 ± 9.3) and extension (12.73 ± 1.8) pre value when compared with post value hip ranges i.e. flexion (104.2 ± 7.8) and extension (24.03 ± 3.06) respectively. Comparison between both the Groups showed that p value is not significant with the mean value 19.4 ± 4.5 and 19.9 ± 4.5 for Group A and Group B of Hip flexion and with mean value 11.9 ± 2.8 and 11.2 ± 2.9 for Group A and Group B of Hip extension respectively. When compared within the groups it showed that there is significant difference between the groups. Hence, it has been concluded that both groups are equally effective on hip ranges after post-intervention.

Bose, G. N. S. C studied "Effect of Reciprocal Inhibition and Post Isometric Relaxation; Types of Muscle Energy Technique in Piriformis Syndrome–A Comparative Study" concluded that concept of post isometric relaxation refers to the reduction in tone of muscle after the isometric contraction of muscles. Reciprocal Inhibition refers when agonist muscle contracts isometrically there is inhibition of antagonist muscle which happens due to stretch receptors within the muscle fibres- muscle spindles and when muscle gets stretched, muscle spindles discharge the nerve impulses due to which there is increase in muscle contraction, thus it prevents the over-stretching of muscle. This study concluded that Post Isometric Relaxation is more effective than Reciprocal Inhibition.[20]

CONCLUSION

The Comparison of reciprocal inhibition and post isometric relaxation on iliopsoas muscle tightness in healthy young individuals concluded that both treatments were equally effective in reducing pain and increasing hip joint flexibility.

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