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T Vasundra Devi
Physiotherapist, Sri Ramakrishna College of Physiotherapy, Coimbatore, Tamil Nadu, India

Murugan V
Assistant Professor, MPT (Neuro), Sri Ramakrishna College of Physiotherapy, Coimbatore, Tamil Nadu, India

Corresponding Author:
T Vasundra Devi
Physiotherapist, Sri Ramakrishna College of Physiotherapy, Coimbatore, Tamil Nadu, India

The effects of muscle energy technique to reduce pain and improve functional mobility in female receptionist with piriformis syndrome

T Vasundra Devi and Murugan V

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Abstract
Introduction: Piriformis Syndrome is a condition that occurs due to prolonged sitting which leads to abnormality such as shortening, spasm, hypertrophy or inflammation of piriformis muscle or any anatomic variation of this muscle that results in compression of Sciatic Nerve. It is a musculoskeletal condition characterised by hip and buttock pain and may result in referred pain in the lower back and thigh, which is more common in women than man with a ratio of 6:1.
Aim: This study aims the effect of muscle energy technique to reduce pain and improve function mobility in female receptionist with piriformis syndrome
Objective
- To determine the effect of Muscle Energy Technique to reduce the Pain using NPRS.
- To determine the effect of Muscle Energy Technique to improve the Functional Mobility using LEFS.

Design: Quasi- Experimental Study.
Methodology: This study was designed on a quasi-experimental study design, with the total of 20 participants according to inclusion and exclusion criteria. Participants will be evaluated using NPRS and LEFS before the intervention. The patients received the Muscle Energy Technique along with Conventional Therapy for 3 sessions on alternative days for a period of 4 weeks and they were assessed after 4weeks intervention program using NPRS and LEFS score.
Result and Conclusion: The result of the study concluded that Muscle Energy Technique along with conventional therapy were found to be effective in reducing pain and improving functional mobility in female receptionist with piriformis syndrome.

Keywords: Numerical pain rating scale (NPRS), lower extremity functional scale (LEFS)

Introduction
Piriformis syndrome is a painful musculoskeletal condition characterized by hip and buttock pain, may result in referred pain in lower back and thigh [1]. It is more common in females, with a female-to-male ratio of approximately 6:1, and is typically diagnosed in middle-aged individuals [2]. Occupations involving prolonged sitting, such as receptionists, predispose to piriformis muscle tightness and adaptive shortening, which contributes to pain and functional restrictions [3].
The causes of piriformis syndrome can be classified as primary and secondary. Primary piriformis syndrome, observed in about 15% of cases, results from anatomical variations of the piriformis muscle and sciatic nerve. Secondary piriformis syndrome develops due to repetitive trauma, ischemia, or postural strain [1]. Clinically, patients present with buttock pain, numbness radiating into the leg, and reduced hip mobility. Symptoms are often aggravated by prolonged sitting, walking, or running, which can significantly limit daily activities [4].
The piriformis muscle, originating from the anterior sacrum and sacro tuberous ligament and inserting on the greater trochanter of the femur, is innervated by the S1-S2 spinal segments. Its main function is external rotation of the thigh and abduction during hip flexion [1]. During prolonged sitting, weakness of the gluteal muscles causes compensatory hyperactivity of the piriformis, leading to stiffness, spasm, and irritation of the sciatic nerve [5].
Management of piriformis syndrome is primarily conservative. Physiotherapy interventions include stretching, strengthening of hip abductors, soft tissue release, joint mobilization, and

electrotherapy [1]. Among these, Muscle Energy Technique (MET) has gained increasing clinical relevance. Developed by Fred Mitchell in 1948, MET is a manual therapy technique in which a submaximal isometric contraction is followed by passive stretching, allowing relaxation and lengthening of tight muscles [6]. It improves mobility, reduces pain, and restores muscle balance. Two common variants are Post-Isometric Relaxation (PIR), which reduces muscle tone through autogenic inhibition, and Reciprocal Inhibition (RI), where contraction of the antagonist muscle facilitates relaxation of the agonist [1].

Outcome measures for piriformis syndrome typically include pain and functional ability. The Numerical Pain Rating Scale (NPRS) is a reliable and sensitive 0-10 scale widely used for pain assessment [7]. Functional limitations can be evaluated using the Lower Extremity Functional Scale (LEFS), a validated 20-item patient-reported questionnaire with strong test-retest reliability [7].

Given the occupational risk of piriformis syndrome in female receptionists who spend long hours sitting, and the need for effective conservative interventions, this study was conducted to evaluate the effect of MET in reducing pain and improving functional mobility in this population.

Materials and Methods

Materials Required

- Pillows
- Couch
- Covering sheet
- Hot pack
- Light resistance TheraBand.
- Towel

Methodology

Study Design

Quasi-experimental design**.**

Study Setting

Sri Ramakrishna Hospital, Coimbatore-6414044**.**

Sampling Method

Convenient sampling method**.**

Selection Criteria

Inclusion criteria

- Gender -Female
- Middle aged group (25-35years).
- Unilateral involvement of piriformis muscle.
- Buttock pain aggravated with prolonged sitting.
- Pain reproducing on stretching piriformis muscle.
- Positive test-FAIR test, Freiberg test, sign of Pace and Nagel (any 1 or 2 positive test).

Exclusion criteria

- Any pathology or recent injury around hip, knee, SI joint.
- Pain due to spinal or pelvic origin.
- Pregnancy.
- Psychiatric condition.
- Malignancy.
- Cardiac condition.
- Radiculopathy.
- Fracture.
- Postural deformity.

Study Duration

6 months

Sample Size

15 patients were taken for the study**.**

Duration of Intervention

Three sessions on alternative days for a period of 4 weeks with total duration of 35 minutes.

Variable

Independent Variable

- Muscle energy technique.
- Hot pack.
- Stretching.
- Strengthening exercise.

Dependent Variable

- Pain.
- Functional mobility**.**

Assessment Tool

- Numerical Pain Rating Scale [NPRS].
- Lower Extremity Functional Scale [LEFS].

Procedure

Hot Pack Application

- **Patient Position:** Prone lying.
- **Therapist Position:** The therapist stands towards the affected side.

Procedure

Gluteal region is covered with towel for insulation and hot pack is placed on it which is followed by the stretching of piriformis muscle.

Piriformis Stretching

Patient Position: Patient is made to lie on the back with both knees bent and the foot of the affected leg flat on floor. Then the patient is asked to rest the ankle of the affected leg over the knees of the unaffected leg.

Procedure

- The patient then grasped the thigh of the unaffected leg and pulled it towards the chest until a stretch was felt around the buttock and along the outside of the hip on the affected leg.
- The stretch was held for 30 seconds and then slowly returned to the normal position.

Muscle Energy Technique

Post Isometric Relaxation

- **Patient Position:** Supine position.
- **Therapist Position:** Walk stance position.

Procedure

The patient lying in supine position, with the treated leg is placed into flexion at the hip and knee, so that the foot rests on the table lateral to the contralateral knee (the leg on the side to be treated is crossed over the other). Therapist places one hand on the contralateral ASIS to prevent pelvic motion, while the other hand is placed against the lateral flexed knee as this is pushed into resisted abduction to contract piriformis. The starting position will be the first sign of resistance towards end range. Therapist force will be same

as patient's force. Initial effort is approximately 20% of patient's strength. Duration of contraction is 7-10 seconds with 3 repetitions.

Reciprocal Inhibition
Patient Position: Supine position.
Therapist Position: Walk stance position.

Procedure
The patient lying in supine position, with the treated leg is placed into flexion at the hip and knee, so that the foot rests on the table lateral to the contralateral knee (the leg on the side to be treated is crossed over the other). Therapist place one hand on the contralateral ASIS to prevent pelvic motion, while the other hand is placed against the lateral flexed knee as this is pushed into resisted adduction to contract antagonist or to inhibit piriformis muscle. The starting position will be the first sign of resistance towards the range. Duration of contraction is 7-10 seconds with 3 repetitions.

Strengthening Exercise
Hip Extensor Strengthening
Patient Position: Prone lying position.

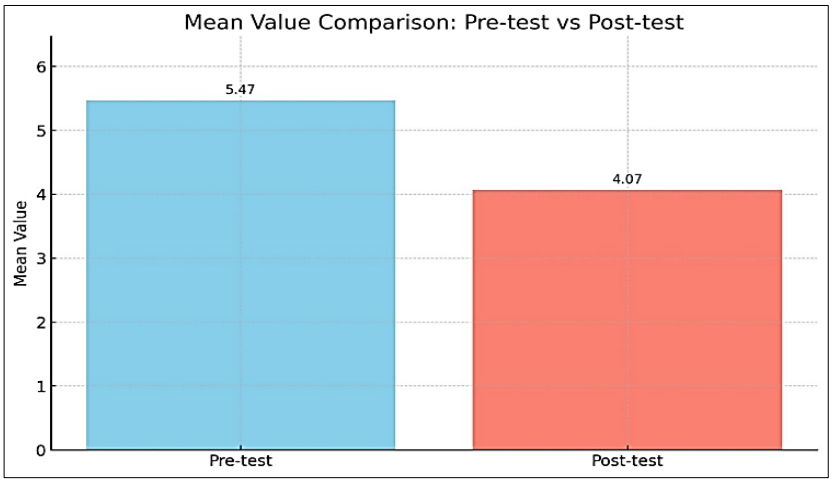
Procedure
Patient was in prone lying position keeping both the ankle out of the couch. Pelvis was stabilized by the therapist beside the couch. One end was tied around the distal leg and other end around the leg of the couch. Patient were instructed to lift the leg towards the ceiling keeping the elastic band perpendicular to the floor.

Clamshells Exercise
Patient Position: Side lying position

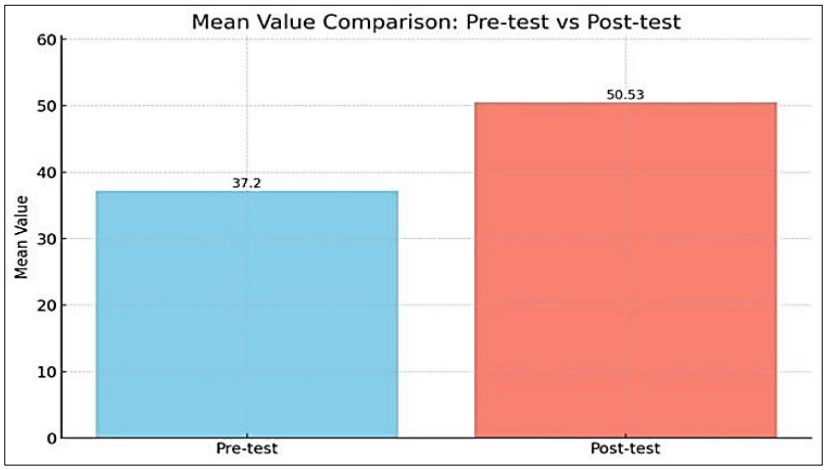
Procedure
- Patient position was in side lying with the affected side upward. Both hips flexed at 45 degrees, the knee flexed at 90 degrees
- Wearing the resistance band around both the legs, just above the knees. Slowly lift the top knee away from the bottom knee against the resistance.
- Hold for 2 to 3 seconds and slowly return to starting position.

Results
The mean NPRS score decreased from 5.47±1.40 (pre-test) to 4.07±1.05 (post-test), with a significant mean difference of 1.40 (t = 5.13, p<0.05), indicating reduction in pain. Similarly, the mean LEFS score improved from 37.20±6.23 to 50.53±6.23, with a mean difference of 13.33 (t = 8.30, p<0.05), showing significant improvement in functional mobility.

Comparsion of Mean Values of Pain between Pre and Post Test-NPRS



Comparsion of Mean Values of Functional Mobility between Pre and Post Test-Lefs



Discussion

Piriformis syndrome is a musculoskeletal disorder caused by pressure of an injured or irritated piriformis muscle. Symptoms associated with piriformis syndrome typically consists of buttock pain that radiates into the hip, posterior aspect of the thigh and the proximal portion of lower leg. In general, pain increases with sitting or squatting, but persons with piriformis syndrome may experience difficult with walking or other functional activities.

The present study was executed to find the effects of muscle energy technique along with application of hot pack, stretching and strengthening exercise in the management of piriformis syndrome. Findings of the study reveals that Muscle Energy Technique along with application of hot pack, stretching and strengthening exercise shows significant improvement on functional mobility and reduction in pain.

In dependent "t" test, of the Numerical Pain Rating Scale (NPRS), the pre-test and post-test mean values were 5.47 and 4.07respectively with a mean difference of 1.40. The post-test values show decrease in pain when compared to the pre-test values.SD and 't' values were 1.055and 5.1366 respectively. The calculated dependent 't' value is5.1366 which is greater than the table value at the level of 0.05 significance.

In dependent 't' test, of the Lower Extremity Functional Scale (LEFS), the pre-test and post-test mean values were 37.20 and 50.53 respectively with a mean difference of 13.3. The post-test values show increase in functional mobility when compared to the pre- test values. SD and 't' values were 6.225 and 8.3045 respectively. The calculated dependent 't' value is 8.3045 which is greater than the table value of at the level of 0.05 significance.

Hot pack usually gets absorbed more in tissues with high fluid content especially muscle. Piriformis muscle being a deep-seated muscle must have got adequate heating effects, which could have reduced inflammatory process and subsequently has reduce spasm and increased flexibility of this muscle. Application of hot pack causes increase in the metabolism of the body; extensibility of the soft tissue is increased. It stimulates the afferent nerves which activates the pain control mechanism as mechanoreceptors, this results in the local analgesics effect of heating.

Strengthening of hip musculature may help in correction of abnormal movement pattern and minimize stress on piriformis thus reduces compression on sciatic nerve. Improved performance of hip musculature helps to decrease the demand on the piriformis through agonist activity and prevent hip motion that would cause increased strain on the piriformis.

Stretching of piriformis muscle can help to relieve pain and tightness of muscle and also help to improve mobility of the muscle.

Post isometric relaxation refers to the subsequent reduction in tone of the agonist muscle after isometric contraction. This occurs due to stretch receptors (Golgi tendon organs). These receptors react to overstretching of muscle by inhibiting further muscle contraction. This is naturally a protective reaction, preventing rupture and has a lengthening effect due to the sudden relaxation of the entire muscle under stretch. Reciprocal inhibition refers to the inhibition of the antagonist muscle when agonist contract isometrically. This happens due to stretch receptors within the agonist muscle fibres- muscle spindles. Muscle spindles work to maintain constant muscle length by giving feedback on the changes in contraction, in this way muscle spindles play a part in proprioception. In response to being stretched, muscle spindles discharge nerve impulses, which increase contraction, thus preventing over stretching.

Conclusion

The result of the study concluded that Muscle Energy Technique along with conventional therapy were found to be effective in reducing pain and improving functional mobility in female receptionist with piriformis syndrome.

Hence rejecting the null hypothesis and accepting the alternate hypothesis, the study concluded that "there is significant difference in the muscle energy technique along with conventional therapy for the management of piriformis syndrome".

Acknowledgments

Ms or Mrs agrees to take part in the project study conducted on **"**The effect of muscle energy technique to reduce pain and improve functional mobility in female receptionist with piriformis syndrome". I was explained about the procedure of the study and I clearly understand the requirements and benefits of the study. I understand the purpose of the program is to reduce pain and improve functional activities in daily life. I am surely giving my consent for the study. My consent in this study is voluntary and that I am free to withdraw at any time, without any reason. The information obtained for the study will be kept confidentially and will be available only the researcher.

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