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Effectiveness of muscle energy technique & neural tissue mobilization on buttock pain, hip internal rotation & functional disability in female patients with chronic non-specific low back pain having piriformis syndrome at the end of 10 sessions: A comparative study

Eeenal Jain, Asmita Moharkar and Sucheta Golhar

Abstract

Objective: To compare the effectiveness of Muscle energy technique & Neural tissue mobilization in patients with chronic non-specific low back pain having piriformis syndrome for reducing pain & improving internal rotation of hip joint & functional disability at the end of 10 sessions.

Background: This is limited study available that supports that MET and Neural Tissue Mobilization can be used in treatment of piriformis syndrome.

Study design: Comparative study

Methods: Ethical clearance was taken from college and consent was taken from 48 female patients diagnosed with piriformis syndrome and divided into 2 equal groups. Pre and post outcome measures of VAS for pain, goniometry for hip internal rotation, ODI for functional disability was taken. Group A underwent MET & conventional therapy (hot moist pack, piriformis stretching, hip abductors strengthening) and Group B underwent Neural Tissue Mobilization & conventional therapy.

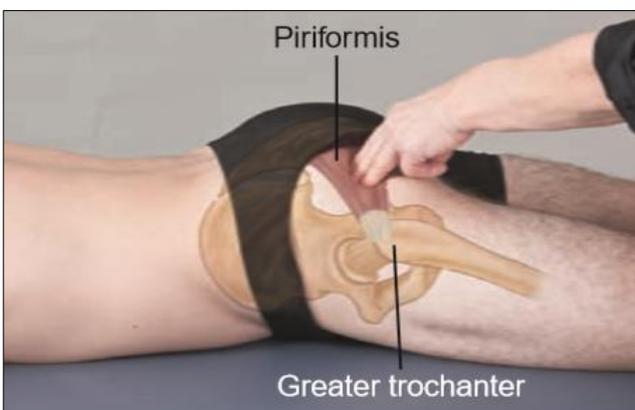
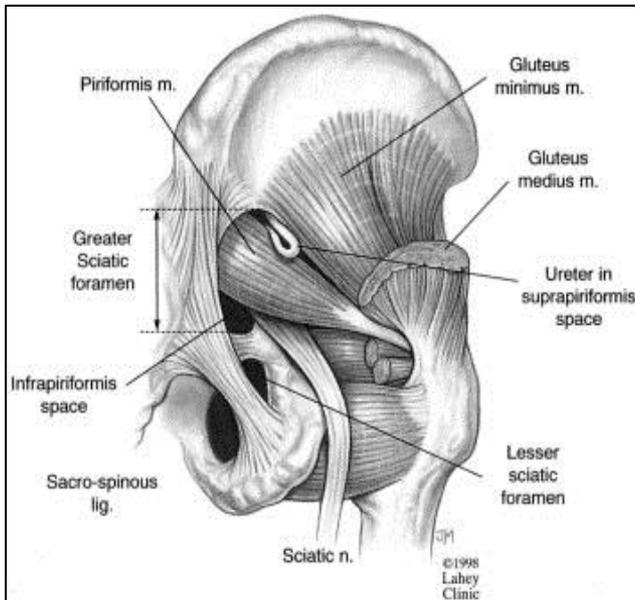
Results: Mean values for VAS was 3.16 ± 1.204 & 5.41 ± 1.742 for Group A and Group B respectively. Mean values for Goniometry was 5.83 ± 2.648 & 11.08 ± 3.647 for Group A and Group B respectively. Mean values for ODI was 13.05 ± 7.914 & 47.96 ± 6.249 for Group A and Group B respectively.

Conclusion: When compared neural tissue mobilization is more effective than muscle energy technique in reducing pain, improving hip internal rotation and functional disability in females patients with chronic non-specific low back pain having piriformis syndrome.

Keywords: Piriformis syndrome, MET, neural tissue mobilization, VAS, goniometry, ODI

1. Introduction

- Piriformis Syndrome is a neuromuscular condition characterized by pain in hip, buttock & may even refer to lower back & thigh as a result of shortening or spasm of piriformis muscle resulting in compression of sciatic nerve [7].
- The piriformis muscle originates from pelvic surface of sacrum, the greater sciatic notch, & the sacrotuberous ligament [8]. Insertion of muscle is to the medial side of upper border of greater trochanter of femur. The muscle is innervated with the branches from L5, S1, S2. Vascular supply is superior gluteal artery in buttock and lateral sacral artery in pelvis [1].
- Piriformis muscle in contraction acts as external rotator of hip, weak abductor of thigh and weak flexor of hip, providing in the same time postural stability during standing and ambulation [2]. In 96% of population, the sciatic nerve leaves the pelvis through the foramen infrapiriforme, deep along the inferior surface of piriformis muscle [2].
- The piriformis muscle can be palpated in lateral rotation, especially if gluteus maximus is relaxed, as when the limb is raised into slight flexion. The palpating fingers are placed posterior to greater trochanter & moved about somewhat until the best spot for palpation is located [5].



- The 6 lateral rotators have an effective angle of pull for lateral rotation, but their ability to act as strong lateral rotator decreases as the hip moves in flexion; at 90 degrees of flexion their line of pull actually favours abduction rather than rotation, & piriformis becomes the medial rotator [5].
- Piriformis muscle has predominance of type-1 fibres which has a tendency to develop shortness or tightness when the muscle is abnormally stressed. When piriformis is shortened, its diameter increases & because of its location it creates pressure to sciatic nerve which passes under it in 80% of population [10].
- Observation will reveal limping gait, a classical antalgic gait, due to sciatic nerve irritation through a contracted piriformis muscle.
- Incidence rates for piriformis syndrome among low back pain vary widely from 5% to 36% with gender ratio as 6:1 female: male. [1] Most prevalent in females, this may be caused by difference in angle of Quadricep femoris muscle, difference in pelvic structure, or to hormonal changes, especially during pregnancy that affects the muscles around pelvis [9].
- Piriformis syndrome occurs more frequently during 4th & 5th decade of life and affects individuals of all occupations and activity levels [4].
- There are 2 types of piriformis syndrome: primary & secondary. Primary piriformis syndrome: has an anatomic cause such as split piriformis muscle, split sciatic nerve or an anomalous sciatic nerve path [11].
- Secondary piriformis syndrome: occurs as a result of a precipitating cause, including macrotrauma, microtrauma, ischemic mass effect & local ischemia [11].
- Macrotrauma of piriformis is represented by falling on the hip or buttocks. Microtrauma are represented by an overuse of muscle during prolonged gait or run, sitting for long time in same position. Other causes to lead to overuse the piriformis are weak gluteal muscles, chronic subluxation of SI joint and foot dysfunction [11].
- The piriformis muscle is under strain during the entire gait cycle & it is postulated that it may be more prone to hypertrophy than other muscle in the region. Gait abnormalities may accentuate this, especially if they result in increased internal rotation or adduction such as with leg length discrepancy [11].
- A thorough history & comprehensive physical examination plays a major role in clinical diagnosis of piriformis syndrome. Pace maneuver, Beatty maneuver, Lasegue sign, Freiberg's test, FAIR test & SLR test are frequently used clinical test to diagnose piriformis syndrome. Radiographic studies have limited application to diagnose piriformis syndrome but MRI & CT scan may be used to rule out piriformis muscle pathologies along with disc & vertebral pathologic conditions [1]. EMG can be beneficial in differentiating piriformis syndrome from intervertebral disc herniation [4].
- The management of piriformis syndrome generally includes NSAIDs, correction of biomechanical abnormalities such as leg length discrepancy, pelvic obliquity, foot, ankle or postural problems, life style modifications, stretching, strengthening, massage, core training, manual therapy interventions, electrotherapeutic modalities & surgical decompression of sciatic nerve [4].
- In this study, the aim is to find out the effect of Muscle energy technique & Neural tissue mobilization along with conventional therapy in piriformis syndrome female patients.
- Post isometric relaxation Muscle Energy Technique causes subsequent reduction in tone of agonist muscle after isometric contraction has been proven more effective than reciprocal inhibition type of MET. MET have helped in resolution of pathological changes of piriformis muscle and decrease stress on the sciatic nerve by piriformis muscle. PIR-MET works on neurophysiologic principles, states that after the muscle is contracted, it is automatically in a relaxed state for a brief latent period which causes a sustained contraction on the Golgi tendon organs. The response to such contraction seems to be to set the tendon and the muscle to a new length by inhibiting it [1].
- Neural tissue mobilization has been demonstrated to produce mechanical effects in terms of nerve strain. There are different methods of delivering NM including "sliding" and "tensioning" techniques. Sliding technique involve combination of movement that result in elongation of nerve bed at one joint, while reducing the length of nerve bed at adjacent joint. Tensioning technique involve increasing the distance between each end of nerve bed via elongation. Tensioning technique has been suggested to play a role in reducing intraneural

swelling and circulatory stasis by altering intraneural pressure associated with the technique [3].

A Thorough Questioning Will Reveal the Symptoms [2]

- Ambulatory buttock pain,
- Pain with sitting, or in standing,
- Pain in lying longer than 15-20 minutes,
- Radiating pain from sacrum through buttock down the posterior aspect of thigh, stopping usually above the knee,
- Usually pain reducing with ambulation but increasing with no movement,
- Pain elicited by raising from seated position or from squatting,
- No complete relieve of pain after position changing,
- Sometimes patient will complain about weakness in ipsilateral lower extremity, numbness in foot.

2. Need of Study

- Due to high incidence (5% to 36%) of low back pain in our society, piriformis syndrome goes unrecognized or misdiagnosed in clinical setting. In this study, emphasize is placed to recognize signs & symptoms that are unique to piriformis syndrome & then find out the effectiveness of Muscle Energy Technique & Neural Tissue Mobilization along with conventional therapy in patients with low back pain having piriformis syndrome.
- Muscle energy technique and neural tissue mobilization has been proved separately to be effective in piriformis syndrome in previous studies. In this study, the purpose is to compare the effectiveness of Muscle Energy Technique & Neural tissue mobilization in piriformis syndrome patients.

3. Aim

- To compare the effectiveness of Muscle Energy Technique & Neural tissue mobilization in patients with chronic non-specific low back pain having piriformis syndrome for reducing pain & improving internal rotation of hip joint & functional disability at the end of 10 sessions.

4. Objective

- To study the effectiveness of Muscle energy technique in patients with chronic non-specific low back pain having piriformis syndrome for reducing pain & improving internal rotation of hip joint & functional disability at the end of 10 sessions.
- To study the effectiveness of Neural tissue mobilization in patients with chronic non-specific low back pain having piriformis syndrome for reducing pain & improving internal rotation of hip joint & functional disability at the end of 10 sessions.
- To compare the effectiveness of Muscle energy technique & Neural tissue mobilization in patients with chronic non-specific low back pain having piriformis syndrome for reducing pain & improving internal rotation of hip joint & functional disability at the end of 10 sessions.

5. Hypothesis

- **Null hypothesis:** There will be no difference between the effectiveness of Muscle energy technique & Neural

tissue mobilization along with conventional therapy in patients with chronic non-specific low back pain having piriformis syndrome in reducing pain, improving hip internal rotation & functional disability at the end of 10 sessions.

• Alternate hypothesis

H1: Muscle energy technique will be more effective than neural tissue mobilization along with conventional therapy in patients with chronic non-specific low back pain having piriformis syndrome in reducing pain, improving hip internal rotation & functional disability at the end of 10 sessions.

H1-A: Muscle energy technique will be more effective than neural tissue mobilization along with conventional therapy in patients with chronic non-specific low back pain having piriformis syndrome in reducing only pain at the end of 10 sessions.

H1-B: Muscle energy technique will be more effective than neural tissue mobilization along with conventional therapy in patients with chronic non-specific low back pain having piriformis syndrome in improving only hip internal rotation at the end of 10 sessions.

H1-C: Muscle energy technique will be more effective than neural tissue mobilization along with conventional therapy in patients with chronic non-specific low back pain having piriformis syndrome in improving only functional disability at the end of 10 sessions.

H2: Neural tissue mobilization will be more effective than muscle energy technique along with conventional therapy in patients with chronic non-specific low back pain having piriformis syndrome in reducing pain, improving hip internal rotation & functional disability at the end of 10 sessions.

H2-A: Neural tissue mobilization will be more effective than muscle energy technique along with conventional therapy in patients with chronic non-specific low back pain having piriformis syndrome in reducing only pain at the end of 10 sessions.

H2-B: Neural tissue mobilization will be more effective than muscle energy technique along with conventional therapy in patients with chronic non-specific low back pain having piriformis syndrome in improving only hip internal rotation & at the end of 10 sessions.

H2-C: Neural tissue mobilization will be more effective than muscle energy technique along with conventional therapy in patients with chronic non-specific low back pain having piriformis syndrome in improving only functional disability at the end of 10 sessions.

6. Tools and Materials

- Pen, paper
- Hot moist pack [1]
- Weight cuffs [1]
- Assessment form
- Consent form
- Universal Goniometer (360°) [1] (Reliability-0.93 & Validity -0.98)
- Visual Analogue scale (VAS) [4] (Reliability-0.94)
- Oswestry Disability Index (ODI) [4] (Reliability-0.877 & Validity -0.71)

7. Methodology

- Sample size: 48

- Study population: Female individuals (25-45 age)
- Study setting: Out Patient Department (OPD) in and around Pune city.
- Study design: Pre and Post Comparative Study
- Study type: Comparative Study
- Study sampling: Convenient Sampling
- Study duration: 6 months
- Treatment duration: 10 sessions (35-45 minutes/session)

8. Inclusional Criteria

- Age group in between 25-45 years ^[1].
- Female individuals.
- Chronic non-specific low back pain patients.
- Hip abductors MMT grade 3.
- FAIR test, Beatty test, Freiberg test, pace test – any 3 of them should be positive ^[1].
- SLR positive below 60 degrees ^[7].
- VAS score: 6-10
- Internal rotation of hip less than 45 degrees.

9. Exclusion Criteria

- History of vertebral fracture, spinal surgery ^[7].
- Lumbo-sacral disc lesion and Spinal stenosis ^[4].
- Lumbo sacral spondylolisthesis ^[4].
- Degenerative spine, hip, knee and ankle. ^[4]
- SI joint disorder ^[1].
- Intermittent claudication ^[7].
- TB spine, rheumatoid disease ^[7].

10. Diagnostic Criteria

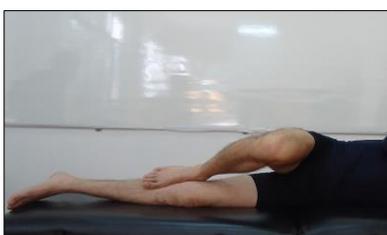
▪ Fair Test

(Flexion, Adduction, Internal Rotation)



- Patient in lateral recumbent position, with affected side up.
- The examiner will flex the patient's hip to an angle of 60 degrees and the knee to an angle between 60 and 90 degrees.
- One hand of examiner stabilizes the hip of and the other hand rotates adducts the hip by applying a downward pressure to the knee.
- The FAIR test is considered positive if the patient reports pain profound in middle of the buttock ^[2].

▪ Beatty Maneuver



- -The patient is in side lying position with the affected side up.
- The unaffected lower limb will keep hip and knee extended while hip and knee on affected side will be bent at an angle of 90 degrees, with the knee resting on the table.
- Patient will be asked to lift the knee of the affected side a few inches from the table and maintain the position.
- This active abduction will reproduce the pain deep in the buttock if the sciatic nerve is compressed by the piriformis muscle ^[2].

▪ Pace Test



- Patient seated on the bedside with both thigh adducted in a normal resting position will be asked to push apart from hands, of the examiner, placed on the lateral aspect of the knee.
- This abduction movement will induce deep buttock pain and the examiner will observe faltering and weakness on the same side.
- It demonstrates not only the sciatic pain due to bulky overstressed piriformis but also a loss of function ^[2].

▪ Freiberg Test



- Patient is in prone position with the knee of painful site flexed to an angle of 90 degrees.
- The examiner will place one hand under the flexed knee and the other on the heel of same leg and will induce an internal rotation of the thigh by pushing laterally the heel.
- This movement stretches the piriformis muscle and elicit the pain in sciatic notch area ^[2].

▪ SLR Test



- Patient in supine relaxed position, both extended on couch.
- The examiner raises the leg on the side to be examined by supporting with one hand at an ankle, until pain is reported.
- Usually if pain appears at an angle of 0-35 degrees of straight leg flexion, the pain is elicited by piriformis syndrome [2] & tingling appear at 0-60 degrees which is due to sciatic nerve compression [7].

11. Procedure

Ethical clearance was taken from the ethical committee of the college.

Patients of age between 25-45 years with low back pain, buttock pain or leg pain were taken into considerations.

From these patients, the piriformis syndrome subjects are selected by proper screening and fulfilling the inclusive and exclusive criteria and were divided into 2 group - Group A & Group B.

Informed consent was taken from each of the patients prior to participation. Patients provided their demographic details prior to the study. All outcome measures was taken at baseline & at the end of the 10 treatment sessions. Instructions was given to the patients about the techniques performed.

A total of 48 patients were divided equally into 2 groups by random allocation method (chit method)

Group A, 24 patients received muscle energy technique along with conventional therapy (hot moist pack, piriformis stretching & hip abductor strengthening)

Group B, 24 patients received Neural tissue mobilization along with conventional therapy.

Treatment program, lasting for 10 sessions (3 session/week)

12. Treatment Interventions

Group A: Muscle Energy Technique

Patient lying in supine lying position, with the treated leg is placed into flexion at hip and knee, so that the foot rests on the table lateral to the contra lateral knee (the leg on the side to be treated is crossed over the another).

Therapist places one hand on the contra lateral ASIS to prevent pelvic motion, while 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 1st sign of resistance towards end range.

Therapist force will be same as patient's force. Initial effort is approximately 20% of patient strength.

Duration of contraction is 7-10 seconds with 3 repetitions [1].



Group B: Neural Tissue Mobilization

Neural mobilization was given for approximately 10 minutes per session including 30 sec hold & 1 min rest.

The SLR was done for inducing longitudinal tension as the sciatic nerve runs posterior to hip and knee joint while maintaining extension at the knee.

In order induce dural motion through sciatic nerve; the leg was raised past 35 degrees in order to take up slack in the nerve.

Since the sciatic nerve is completely stretched at 70 degrees. To introduce additional traction into the proximal aspect of sciatic nerve, hip adduction was added to straight leg raise [3].



For Both Groups A and B: Conventional Therapy

All the patients with piriformis syndrome was treated with:

- moist heat application over piriformis muscle [1].
- stretching of piriformis muscle (3 repetitions with 30 seconds hold) [1].
- strengthening exercises for hip abductors [1].



Piriformis stretching



Abductors strengthening

13. Outcome Measures

- **Pain Intensity Assessment Visual Analogue Scale (VAS):** was used to measure pain intensity. A 10 cm line marked with number 0 & 10 was used where 0 symbolizes no pain & 10 is maximum pain tolerable.
- **Hip ROM Assessment:** Universal goniometer (360^o) was used to measure internal rotation of hip.
- **Functional Disability Measures:**

Oswestry Disability Index (ODI)

Scoring Method Each of the 10 items is scored from 0 - 5. The maximum score is therefore 50. The obtained score can be multiplied by 2 to produce a percentage score. If the FIRST statement is marked, the section score = 0, If the LAST statement is marked, it=5. If all ten sections are completed the score is calculated as followed: Example: 10(Total score of the patient), 50 (total possible raw score), $10/5 \times 100=20\%$ if one section is missed or not applicable, the score is calculated as followed:

Example: 15 (Total score of the patient), 45 (total possible score), $15/45 \times 100 = 30\%$

Interpretation

1. **0%-20%: Minimal disability:** This group can cope with most living activities. Usually no treatment is indicated, apart from advice on lifting, sitting posture, physical fitness, and diet. In this group some patients have particular difficulty with sitting, and this may be important if their occupation is sedentary, e.g., a typist or truck driver.
2. **20%-40%: Moderate disability:** This group experiences more pain and problems with sitting, lifting, and standing. Travel and social life are more difficult and they may well be off work. Personal care, sexual activity, and sleeping are not grossly affected, and the back condition can usually be managed by conservative means.
3. **40%-60%: Severe disability:** Pain remains the main problem in this group of patients, but travel, personal care, social life, sexual activity, and sleep are also affected. These patients require detailed investigation.
4. **60%-80%: Crippled:** Back pain impinges on all aspects of these patients 'lives-both at home and at work-and positive intervention is required.
5. **80%-100%:** These patients are either bed-bound or exaggerating their symptoms. This can be evaluated by careful observation of the patient during medical examination.

14. Review of Literature

- **Gopal Nambi Subash Chandra Bose et al. March (2018)**

Author conducted the study was to compare the effect of Reciprocal inhibition and post Isometric relaxation in piriformis syndrome. 64 subjects were divided into 3 groups by random allocation method. Group A received Reciprocal inhibition and group B received post Isometric relaxation & Group C received conventional intervention only. Treatment last for 12 sessions over 2 week period. Pain intensity, hip ROM and functional disability were measured at baseline and at the end of 12 treatment sessions. Concluded that post Isometric relaxation is more effective in reducing pain, improving hip ROM and functional outcome in participants with piriformis syndrome.

- **Atik A Mulla et al. March (2018)**

Author conducted the study was to assess the effect of piriformis stretching and neural tissue mobilization in piriformis syndrome. 30 subjects with piriformis syndrome were included in this study. Following the data collection, the subjects were allotted into 2 groups by simple random sampling. Group A (experimental group) received piriformis stretching, ultrasound and hot moist pack, neural tissue mobilization. Group B (conventional group) received piriformis stretching, ultrasound & hot moist pack. Before and after the treatment protocol subjects were accessed by Ronald Morris back questionnaire, VAS, hip flexion ROM these outcome measures were analyzed. From this study it was concluded that there was extremely significant improvement in subjects who underwent experimental group statically and clinically. Overall there was significant difference found between these groups.

- **Malika Mondal et al. July (2017)**

Author conducted the study was to find out the prevalence and causes of piriformis syndrome in patients with complaints of low back pain/buttock pain with sciatica. Out of 2910 patients, 182 cases (M:28, F:154) in the age range of 19-75 years with a mean age of 43 years were clinically diagnosed as piriformis syndrome. Prevalence of piriformis syndrome was 6.25%. Concluded that individuals of all activity levels can be affected. Causes are overuse, prolonged sitting, trauma and vigorous massage. Diagnosis is by exclusion of other causes.

- **Mukhil Singh (2016)**

Author conducted the study was to evaluate the effectiveness of the muscle energy technique along with deep friction massage on pain, disability and IR ROM of hip joint in individuals with piriformis syndrome. The outcome measures used were standard goniometer, VAS and Oswestry Disability Index. In this study 2 groups with piriformis syndrome were treated with 2 different treatment approaches. Control group were treated with ultrasound and piriformis muscle stretching and the experimental group with muscle energy technique and deep friction massage. The group treated with muscle energy technique and deep friction massage has significant improvement in IR ROM of hip joint, pain and disability due to piriformis syndrome than those treated with ultrasound and piriformis muscle stretching.

- **Rahul Krishnan Kutty et al. (2014)**

Author conducted the study to see the effectiveness of Neural tissue mobilization on individual with piriformis syndrome and to access the effectiveness over conventional physical therapy treatment. The sample consisted of 42 subjects, from both sexes, ranging from 30-50 years old. Parameter used are the VAS and goniometry measurement for diagnosis and prognosis of the condition. An experimental design was used in this study. It is concluded that there is significant difference with in the experimental group.

- **Mariana Barzu. (2013)**

Author conducted the study to gather the most popular functional tests used in the practice to diagnose the piriformis syndrome.

15. Discussion

The objective of the study is to compare the effect of Muscle Energy Technique and Neural tissue Mobilization along with conventional therapy in female patients with chronic non-specific low back pain having piriformis syndrome to reduce pain, improving hip internal rotation ROM and functional disability at the end of 10 sessions.

Samples were assessed and pre-treatment scores for pain, hip internal rotation ROM and functional disability was recorded.

48 patients diagnosed with piriformis syndrome having pain, internal rotation ROM deficit and disability was selected and grouped into Group A and Group B. Group A was given Muscle Energy Technique along with conventional therapy and Group B was given Neural Tissue Mobilization along with conventional therapy.

The outcome measures used was VAS to measure pain intensity, Oswestry Disability Index to measure functional disability and standard goniometer to detect internal rotation ROM deficit. Each measurement was done on 1st day of treatment (pre-test) and on the last day of treatment (post-test).

Pre and post data analysis in Group A for VAS & hip goniometry was analyzed by using paired t-test within the group which revealed significant reduction in pain, improving hip internal rotation.

Pre and post data analysis in Group A for Oswestry Disability Index was analyzed by using Wilcoxon signed Rank test within the group which revealed significant improvement in functional disability.

According to Fred Mitchell, effect of Muscle Energy Technique was to lengthen tight muscle fibres and fascia, to improve joint ROM, strengthen muscle fibres that become weak and hypotonic.

Pre and post data analysis in Group B for VAS & hip goniometry was analyzed by paired t-test within the group which revealed significant reduction in pain, improving hip internal rotation.

Pre and post data analysis in Group B for Oswestry Disability Index was analyzed by using Wilcoxon signed Rank test within the group which revealed significant improvement in functional disability.

Statistically data revealed that Neural Tissue Mobilization along with conventional therapy is more effective than Muscle Energy Technique along with conventional therapy.

According to Atik A Mulla *et al.*, effects of Neural tissue Mobilization are it helps in improving intra neural mobility, axoplasmic blood flow, mechano-sensitivity there by reduction in pain and inflammation. So there is increasing ROM of hip internal rotation and reduction of pain and disability.

Conventional therapy included hot pack for relaxation of muscle and increase flexibility; stretching of piriformis muscle which helps in improving ROM, improves circulation; strengthening helps in correction of abnormal movement pattern and minimize stress in piriformis.

On inter group statistical analysis, patients showed significant improvement for pain on the VAS with Group A mean 3.16 and Group B mean 5.41

On inter group statistical analysis, patients showed significant improvement for pain on the VAS with Group A mean 5.83 and Group B mean 11.08

On inter group statistical analysis, patients showed significant improvement for internal rotation ROM on

goniometer with Group A mean 3.16 and Group B mean 5.41

On inter group statistical analysis, patients showed significant improvement for functional disability on Oswestry Scale with Group A mean 13.05 and Group B mean 47.96

This study concludes that Neural Tissue Mobilization And Muscle Energy Technique are individually effective in reducing pain, improving hip internal rotation and functional disability in females patients with chronic non-specific low back pain having piriformis syndrome.

Hence, the study reveals that Neural Tissue Mobilization along with conventional therapy is more effective than Muscle Energy Technique along with conventional therapy in reducing pain, improving hip internal rotation and functional disability in female patients with chronic non-specific low back pain having piriformis syndrome.

16. Conclusion

- This study concludes that Neural Tissue Mobilization And Muscle Energy Technique are individually effective in reducing pain, improving hip internal rotation and functional disability in females patients with chronic non-specific low back pain having piriformis syndrome.
- However, when compared Neural Tissue Mobilization Is More Effective Than Muscle Energy Technique in reducing pain, improving hip internal rotation and functional disability in females patients with chronic non-specific low back pain having piriformis syndrome.

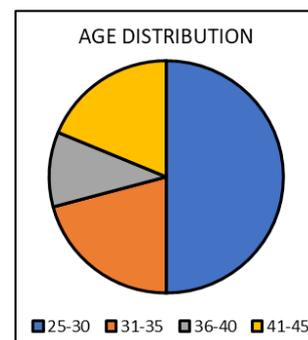
17. Data Analysis

- Improvement in range of motion and reduction in pain and disability were analyzed using Universal Goniometer, Visual Analog Scale (VAS) and Oswestry Disability Index respectively.
- The data was entered in Excel spreadsheet, tabulated and subjected to Statistical Analysis.
- Data entered was analyzed with the help of application Primer of Biostatistics (version 7), checking effectiveness of Muscle Energy Technique and Neural Tissue Mobilization in female patients with chronic non-specific low back pain.

Table 1. xxxx

Age Group	no. of Samples
25-30	24
31-35	10
36-40	5
41-45	9

Among age group 25-45 years, the sample number for age group of 25-30 years were more.



18. Statistical Analysis

- The level of significance for pre and post VAS in Group A and Group B was calculated by using paired t-test respectively.
- The level of significance for pre and post hip internal rotation range of motion in Group A and Group B was calculated by using paired t-test respectively.
- The level of significance for pre and post Oswestry Disability Index in Group A and Group B was calculated by using Wilcoxon Signed Rank Test respectively.
- Group A and Group B inter group data analysis for VAS was analyzed by using unpaired t-test.
- Group A and Group B inter group data analysis for hip internal rotation ROM was analyzed by using unpaired t-test.

- Group A and Group B inter group data analysis for Oswestry Disability Index was analyzed by using Mann-Whitney U test.

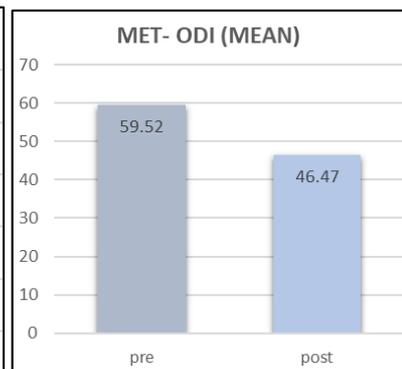
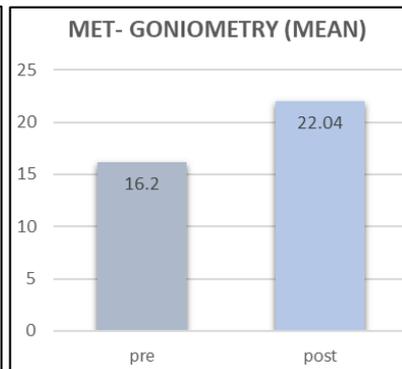
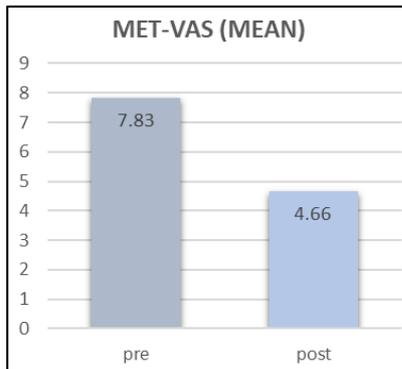
Intragroup Analysis

Group A: Muscle Energy Technique

- Pre and post data analysis in Group A for VAS & hip goniometry was analyzed by using paired t-test within the group which revealed significant reduction in pain, improving hip internal rotation.
- Pre and post data analysis in Group A for Oswestry Disability Index was analyzed by using Wilcoxon signed Rank test within the group which revealed significant improvement in functional disability.

Table 2.

		Mean	Sd	P Value	T Value	Result
Vas	Pre	7.83	1.465	<0.001	12.886	Extremely significant
	Post	4.66	1.523			
Goniometry	Pre	16.21	5.217	<0.001	-10.79	Extremely significant
	Post	22.04	6.054			
Odi	Pre	59.52	12.59	<0.001	z sub W = 4.283	Extremely significant



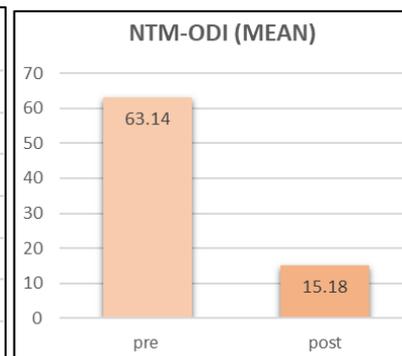
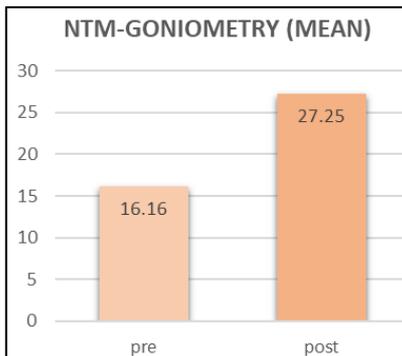
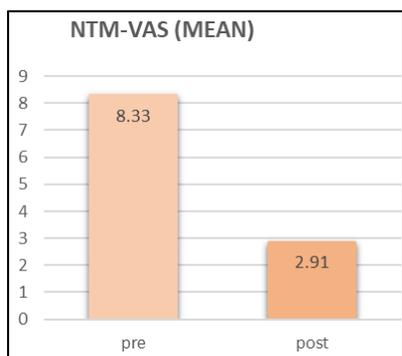
Group B: Neural Tissue Mobilization

- Pre and post data analysis in Group B for VAS & hip goniometry was analyzed by paired t-test within the group which revealed significant reduction in pain, improving hip internal rotation.

- Pre and post data analysis in Group B for Oswestry Disability Index was analyzed by using Wilcoxon signed Rank test within the group which revealed significant improvement in functional disability.

Table 3.

		Mean	SD	P Value	T Value	Results
VAS	Pre	8.33	1.465	<0.001	15.229	Extremely significant
	Post	2.91	1.349			
Goniometry	Pre	16.17	5.247	<0.001	-14.890	Extremely significant
	Post	27.25	4.436			
ODI	Pre	63.14	6.284	<0.001	z sub W = 4.282	Extremely significant
	Post	15.18	2.753			



Intergroup Analysis: Group A Vs Group B

Vas

- Mean values for VAS were 3.16 & 5.41 in Group A & Group B respectively.
- Unpaired t-test was used to compare the effectiveness in both the groups.
- The p value was <0.001 which is considered extremely significant.

Hip Internal Rotation Range

- Mean values for internal rotation ROM were 5.83 & 11.08 in Group A & Group B respectively.

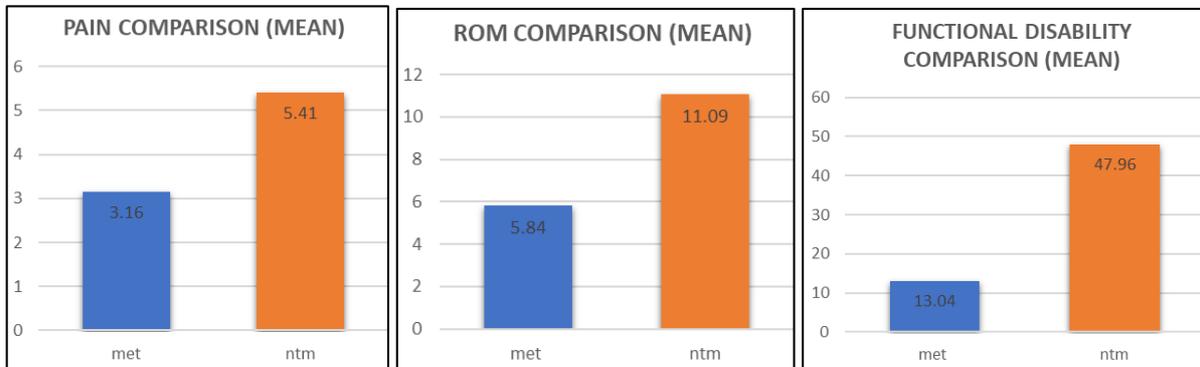
- Unpaired t-test was used to compare the effectiveness in both the groups.
- The p value was <0.001 which is considered extremely significant.

Oswestry Disability Index Score

- Mean values for functional disability were 13.05 & 47.96 in Group A & Group B respectively.
- Man-Whitney U test was used to compare the effectiveness in both the groups.
- The p value was <0.001 which is considered extremely significant.

Table 4.

		Mean	SD	P Value	T Value	Result
VAS	Group A	3.16	1.204	<0.001	-5.205	Extremely significant
	Group B	5.41	1.742			
Goniometry	Group A	5.83	2.648	<0.001	-5.707	Extremely significant
	Group B	11.08	3.647			
ODI	Group A	13.05	7.914	<0.001	Z sub T = 5.918	Extremely significant
	Group B	47.96	6.249			



19. Result

- The findings of the study revealed that Neural Tissue Mobilization is more effective than Muscle Energy Technique ($P<0.001$) in reducing pain, improving hip internal rotation and functional disability in females patients with chronic non-specific low back pain having piriformis syndrome at the end of 10 sessions.

20. Limitations

- The study was done using a small sample size.
- Age group was only 25-45 years.
- Samples taken were of chronic non-specific low back pain only.
- Individuals taken were only females.

21. Future Scope of Study

- The study can be performed using a large sample size.
- Can be done by using other outcome measures.
- To establish greater efficacy of the treatment, the study can be undertaken on longer follow up.
- The study can be done in long-standing or long-sitting job professions.

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