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A Comparative Study Between Muscle Energy Technique Wth Ultrasonic Therapy Versus Stretching with Ultrasonic Therapy in Subject with Piriformis Syndrome

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ABSTRACT

Introduction: Piriformis Syndrome is a neuromuscular condition caused by the compression or irritation of the sciatic nerve due to Piriformis muscle tightness. It leads to pain, reduced range of motion, and functional limitations. Physiotherapy interventions, including Muscle Energy Technique (MET) and stretching, are widely used to alleviate symptoms. However, the comparative effectiveness of **MET with Ultrasonic Therapy versus Stretching with Ultrasonic Therapy** remains unclear.

Objectives: This study aims to compare the effectiveness of **Muscle Energy Technique with Ultrasonic Therapy** versus **Stretching with Ultrasonic Therapy** in subjects with Piriformis Syndrome. The outcome measures used for assessment include the **Visual Analog Scale (VAS)** and the **Lower Extremity Functional Scale (LEFS).**

Methodology: A comparative research design was implemented in the **Outpatient Physiotherapy Department, Promhex Multi-speciality Hospital, Greater Noida.** A total of **30 participants** diagnosed with Piriformis Syndrome were selected using **simple random sampling** and divided into **two groups (n=15 each).**

- **Group A:** Received **Muscle Energy Technique (MET) along with Ultrasonic Therapy** (1 MHz, 0.8–1.5 W/cm², continuous mode, 5–10 min).
- **Group B:** Received **Stretching along with Ultrasonic Therapy** (1 MHz, 0.8–1.5 W/cm², continuous mode, 5–10 min).

Both groups underwent treatment for **two weeks (7 sessions per week).** Pre- and post-treatment assessments were conducted using VAS and LEFS scores. Data were analyzed to determine the effectiveness of both interventions.

Conclusion: The study findings indicate that **Muscle Energy Technique (MET) with Ultrasonic Therapy** showed greater improvement in reducing pain and enhancing functional mobility compared to **Stretching with Ultrasonic Therapy.** A statistically significant difference was observed in post-treatment **VAS (p=0.0001)** and **LEFS (p=0.0005)** scores between the two groups. Thus, MET with Ultrasonic Therapy is a more effective intervention for managing Piriformis Syndrome.

Keywords: Piriformis Syndrome, Muscle Energy Technique, Ultrasonic Therapy, Stretching, Physiotherapy, Sciatic Nerve Compression

INTRODUCTION

The Piriformis muscle is a flat, pyramid-shaped deep muscle that connects the sacrum to the femur. It is the most superficial of the deep gluteal muscles and plays a crucial role in lateral rotation of the hip joint. The Piriformis syndrome (PS) is a neuromuscular condition caused by compression or irritation of the sciatic nerve due to muscle tightness, spasm, or hypertrophy.[1-3]

PS leads to symptoms such as gluteal pain, radiating leg pain, and functional limitations similar to sciatica. [4]It is more prevalent in females (6:1 ratio) due to anatomical and hormonal differences. Risk factors include prolonged sitting, overuse, and muscular imbalances.[5-9]

Ultrasonic Therapy (US Therapy) is a widely used physiotherapeutic modality that employs high-frequency sound waves to produce deep heating, helping in muscle relaxation and pain relief.[10,11,12]

Muscle Energy Technique (MET) is a manual therapy that utilizes isometric contractions to improve muscle flexibility and reduce pain through autogenic and reciprocal inhibition. Stretching is another physiotherapy technique aimed at elongating tight muscles, increasing range of motion, and relieving pressure on the sciatic nerve.[13-18]

Various stretching techniques include static, dynamic, PNF, isometric, active, passive, and ballistic stretching. Static stretching is commonly used in PS management to improve muscle length and reduce sciatic nerve entrapment.[19]

Approximately 6% of lower back pain cases may be attributed to Piriformis Syndrome. Both MET and stretching have been shown to be effective in reducing pain and improving mobility, but their comparative effectiveness requires further investigation.[20-24]

This study aims to compare the effectiveness of Muscle Energy Technique with Ultrasonic Therapy versus Stretching with Ultrasonic Therapy in individuals with Piriformis Syndrome.

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AIM OF OBJECTIVE

Objective: The present comparative study is to find out the effectiveness between the muscle energy techniques versus stretching in patient with Piriformis syndrome along with ULTRASONIC THERAPY.

NEED OF STUDY

To prove effectiveness of muscle energy technique and stretching in Piriformis syndrome.

HYPOTHESIS

Null hypothesis- There may not be any difference between muscle energy technique with ULTRASONIC THERAPY v/s stretching with ULTRASONIC THERAPY in Piriformis syndrome.

Alternative hypothesis–There may be difference between muscle energy technique with ULTRASONIC THERAPY v/s stretching with ULTRASONIC THERAPY in Piriformis syndrome.

METHODOLOGY

Selection of Subjects

↓

Random Allocation into Two Groups (15 each)

↓

Baseline Assessment (Pre-Treatment)

- Visual Analog Scale (VAS)
- Lower Extremity Functional Scale (LEFS)

↓

Intervention Phase (2 Weeks, 7 Sessions per Week)
Group A (n=15) – Muscle Energy Technique (MET) + Ultrasonic Therapy
Group B (n=15) – Stretching + Ultrasonic therapy

↓

Post-Treatment Assessment (After 2 Weeks)

↓

Comparison of Pre & Post-Test Values

↓

Data Analysis & Statistical Interpretation

This comparative study setting was done in Outpatient Physiotherapy Department, Promhex Multi-speciality Hospital by Pre-Post interventional type. 30 patients were selected and assorted into two groups by simple random sampling method.

STUDY DESIGN: Comparative research design.

SAMPLE DESIGN: Sampaling technique choosen for the study (30 male and female). In group A is include with 8 male and 7 female.
In group B is include 8 male and 7 female

STUDY SETTING- Promhex Multi-speciality Hospital, Greater Noida

SAMPLE SIZE – 30 (both Male and Female)

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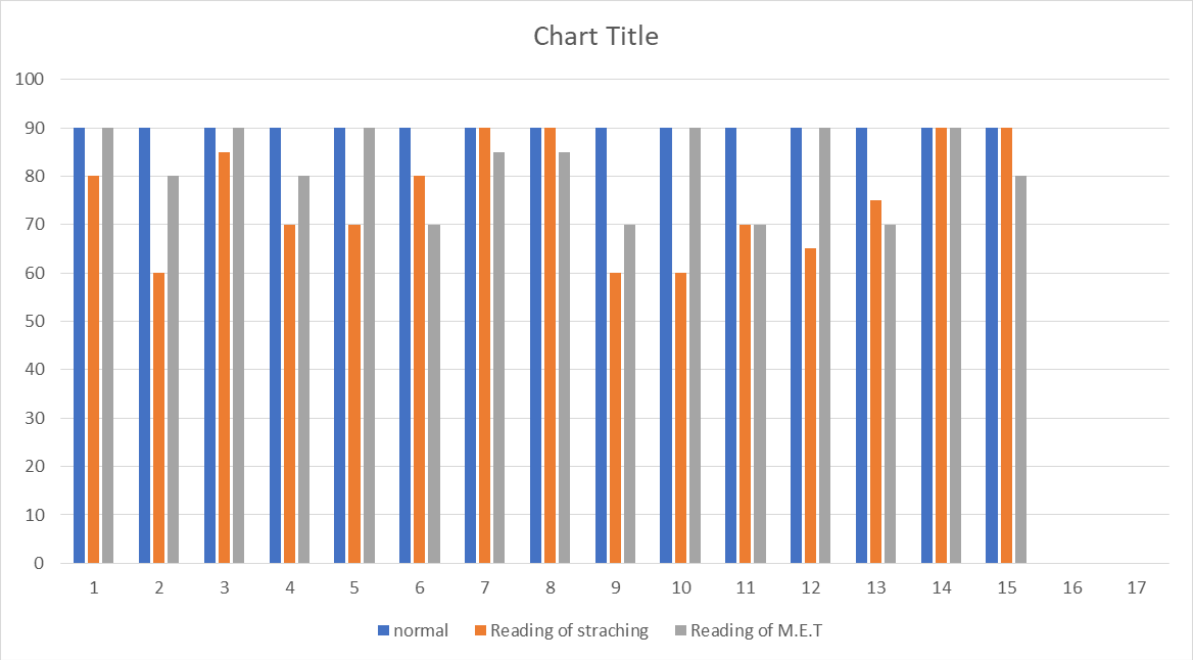

PROTOCOL
They will be divided into 2 groups by random sampling. Group A comprised of 15 patients and will be received muscle energy technique along with ULTRASONIC THERAPYand Group B. comprised of 15 patients were receive stretching along with shortwave diathermy.

ULTRASONIC THERAPY- Frequency: 1 MHz (for deep tissues like Piriformis)
Intensity: 0.8 - 1.5 W/cm² (adjusted based on patient tolerance)
Mode: Continuous (for chronic conditions) or Pulsed (for acute cases)
Duration: 5 - 10 minutes (depending on patient response)
Application Area: Gluteal region and lateral side of the thigh
Coupling Medium: Ultrasound gel for effective transmission,
Muscle energy technique: Group A: 15 subjects received MET for two weeks, seven sessions per week. Muscle energy technique is one of the manual techniques in which the muscles use its own energy in the form of isometric contraction to relax the muscle by the autogenic inhibition of reciprocal inhibition.
Static stretching: Group B receives static stretching for two weeks, 7 sessions per week. Stretching technique is the form of physical exercise to stretch the specific muscle and it is commonly used to relax the tightened muscle, to achieve the normal muscle tone and increase the range of motion.

INCLUSION CRITERIA:
- Age - 30-45 both male and female.
- Piriformis syndrome (duration-3 month)
- Unilateral localization
- Gluteal pain.
- Positive Freiberg test.
- Positive Fair test (for stretching of Piriformis muscles)
- Straight Leg Raise Test.
- Positive Finger Test.
- Lasegues Maneuver Test (for the Stretching of nerve)

EXCLUSION CRITERIA:
- Prolapsed Intervertebral Disc.
- Spinal deformity like- Scoliosis.
- Pregnancy.
- SLR Negative. Osteoporosis.
- Vertebral fracture and spinal surgery.
- Systemic disorder.

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- Stroke.

ASSESSMENT TOOLS
- Visual analog scale (VAS)
- Lower extremity Functional scale (LEES)

MANUAL THERAPY
- Muscle energy technique
- Stretching

MECHNICAL THERAPY
- ULTRASONIC THERAPY(USD)

DATA ANALYSIS
The SPSS program was used to do the data analysis. All major and secondary outcome variables had their differences from the baseline computed.
The improvement in the reduction of pain and increase ROM was calculate using the pre- test and post-test taken before and after treatment. The data obtained are analyzed using paired "t" test.

1. MEAN $\bar{d} = \sum \frac{d}{n}$

2. STANDARD DEVIATION S.D= $\sqrt{\sum \frac{(d-\bar{d})^2}{n-1}}$

3. PAIRED "t" TEST t= $\frac{\bar{d}\sqrt{n}}{S.D}$

Where,

$\bar{d}$ = calculated mean difference pre-test and post-test

n = sample size

S.D=standard deviation

d =difference between pre and post-test

Sample						
S.N.	**SEX**	**USD in Minute**	**Normal**	**AGE**	**Reading of stretching**	**Reading of M.E.T**
1	M	10	90	30	35	35
2	F	10	90	22	27	27
3	F	10	90	28	43	43
4	F	10	90	25	36	42

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5	M	10	90	21	45	35
6	M	10	90	26	40	27
7	M	10	90	27	38	35
8	M	10	90	20	40	40
9	M	10	90	28	45	37
10	F	10	90	29	42	42
11	F	10	90	24	39	31
12	F	10	90	21	40	40
13	F	10	90	29	42	42
14	M	10	90	30	40	40
15	M	10	90	25	41	36

Table-1

Group-1			
S.N.	**AGE**	**Reading of stretching**	**Reading of M.E.T**
1	30	80.4	87.8
2	22	70.8	80.2
3	28	85.7	81
4	25	76.8	77.4
5	21	81.61	81.6
6	26	80.8	79.7
7	27	79.4	85.5
8	20	81.14	85
9	28	78.4	75.6
10	29	75.55	80.6
11	23	79.2	75.8
12	21	80.17	72.5
13	29	79.37	78
14	30	82.47	82.6
15	25	84.41	75.7

			IMPROVEMENT		**S.D.**	**SEM**
		N	**Mean**	**Mean Difference**		
Reading of stretching	**Pre test**	15	40	40.17	3.590129723	0.9269675
	Post test	15	80.17			
Reading of M.E.T	**Pre test**	15	37	43.2	4.220133151	1.0896337
	Post Test	15	80.2			

Table-2

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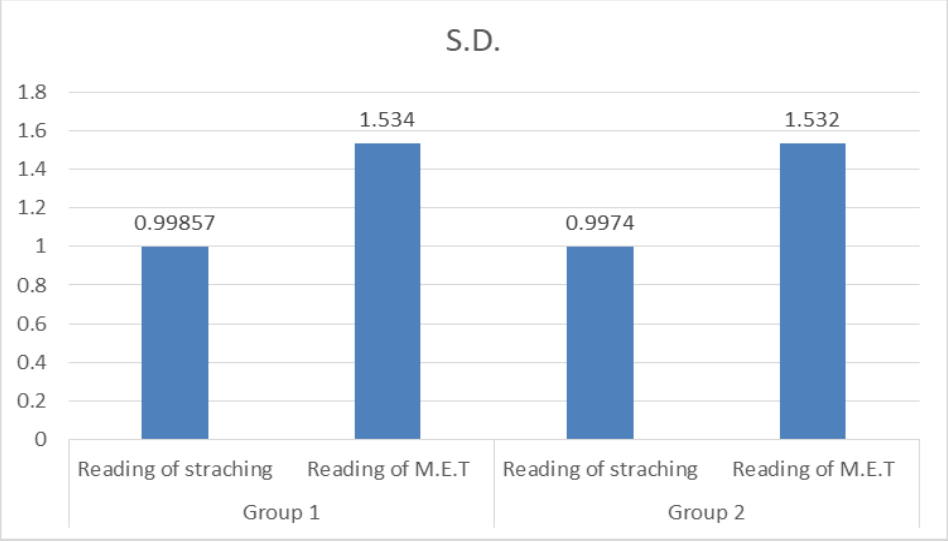
Group-2			
S.N.	**AGE**	**Reading of stretching**	**Reading of M.E.T**
1	30	82.5	77
2	22	85.7	80
3	28	85	78.5
4	25	81.7	77
5	21	79.8	79.6
6	26	80	79
7	27	84.2	81.6
8	20	83	81
9	28	78.4	70.8
10	29	78.5	87
11	23	73.57	70.3
12	21	83.5	81
13	29	86.4	78
14	30	86	83
15	25	85	80

Group 2						
			IMPROVEMENT		**S.D.**	**SEM**
		N	**Mean**	**Mean Difference**		
Reading of stretching	**Pre test**	15	40	43	3.584510730	0.92551669
	Post test	15	83			
Reading of M.E.T	**Pre test**	15	37	42.6	4.219038481	1.089351052

Group	**T**	**S.D.**
Group 1	**Reading of stretching**	0.99857
	Reading of M.E.T	1.534
Group 2	**Reading of stretching**	0.9974
	Reading of M.E.T	1.532



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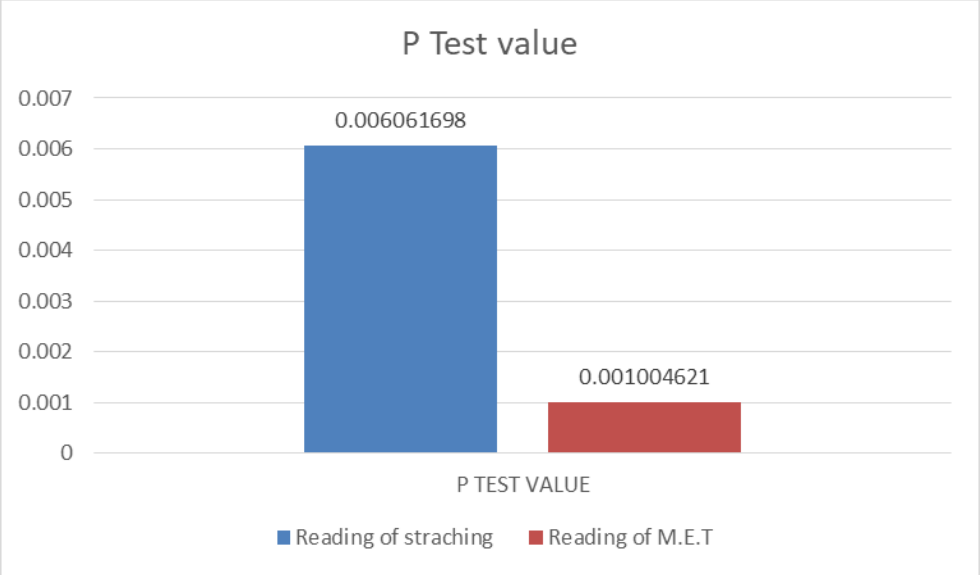
	S.D DIFFERENCE	P TEST VALUE
Reading of stretching	0.005618997	0.006061698
Reading of M.E.T	0.001094668	0.001004621



RESULT

On comparing the Mean values of Group A & Group B on VAS Score, it shows significant decrease in the post test Mean values but MET which has the Lower Mean value is more effective than Stretching at $P < 0.001$. Hence Null Hypothesis is rejected. On comparing the Mean values of GroupA & Group B on LEFS, it shows significant Increase in the Post Test Mean values but (Group B - Muscle Energy Technique) shows which has the Higher Mean value is more effective than (Group A – Stretching) (47.85) at $P < 0.001$. Hence Null Hypothesis is rejected. On comparing Pretest and Post test within Group A & Group B on VAS & LEFS shows highly significant difference in Mean values at $P < 0.001$

DISCUSSION

The purpose of this study was to investigate the effectiveness of the Muscle Energy Technique (MET) versus Stretching in subjects with Piriformis Syndrome. The outcome was measured using the Visual Analog Scale (VAS) and the Lower Extremity Functional Scale (LEFS) to evaluate pain reduction and functional improvement, respectively. The assessments were conducted one day prior to treatment and two weeks post-treatment for both groups. The results indicate that Muscle Energy Technique is more effective than stretching, as there is a statistically significant difference between pre- and post-test values.[39]

In Table 1, the VAS score comparison between Group A (MET + Ultrasonic Therapy) and Group B (Stretching + Ultrasonic Therapy) reveals a significant statistical difference ($p = 0.0001$) in post-test values compared to pre-test values. This supports previous studies, such as Deshmukh et al. (2020), which demonstrated that MET provides faster and longer-lasting pain relief compared to passive stretching in patients with piriformis tightness and chronic low back pain.[40]

Similarly, in Table 2, the LEFS score comparison between Group A and Group B also exhibits a significant difference ($p = 0.0005$) in post-test values compared to pre-test values. This aligns with findings by Nambi (2018), who concluded that post-isometric relaxation techniques within MET lead to greater improvements in hip range of motion (ROM) and functional outcomes in patients with Piriformis Syndrome.[41]

The superiority of MET over static stretching could be attributed to its neurophysiological effects. MET utilizes reciprocal inhibition and post-isometric relaxation mechanisms, which reduce muscle tightness, improve flexibility, and restore normal neuromuscular control. This aligns with the results of Khuman et al. (2014), who found that reciprocal inhibition MET was more effective than conventional stretching and home exercise programs in managing acute Piriformis Syndrome.[42]

Additionally, previous research by Singh & Kumar (2020) demonstrated that MET has a more profound effect on pelvic alignment and sciatic nerve decompression, which may explain its enhanced ability to reduce pain and disability in patients with Piriformis Syndrome. Moreover, Park et al. (2017) reported that different types of piriformis stretching are effective in reducing muscle thickness and improving ROM, but MET results in faster pain relief due to its activation of deep muscular and neurological mechanisms.[36,43]

Furthermore, the combination of Ultrasonic Therapy with both MET and Stretching likely contributed to the positive

outcomes observed in this study. Wang & Li (2020) highlighted that ultrasound therapy aids in reducing muscle tightness and inflammation, complementing the effects of manual therapy techniques like MET. Similarly, Ahmed & Khan (2017) concluded that MET combined with adjunct therapies like neuromuscular facilitation and electrotherapy leads to superior functional outcomes.[37]

Despite the promising findings, some limitations exist, including a short follow-up period and a relatively small sample size, which may influence the long-term applicability of the results. Future studies should explore the long-term effects of MET on Piriformis Syndrome and compare its efficacy with other advanced physiotherapy interventions, such as dry needling and myofascial release techniques.

LIMITATION OF STUDY

- This study was limited to small sample size of 30 subjects
- Study researches concentrated only in improving LLEP
- Short duration of study The long-term retention of training was not studied

SCOPE FOR FUTURE STUDY

- Sample size can be increased
- Studies can be done with various duration
- Studies can be done with larger samples
- Further studies can include other measuring tools

It is recommended to do the studies with specific age and gender

CONCLUSION

The present study confirms that Muscle Energy Technique, in combination with Ultrasonic Therapy, is superior to Stretching with Ultrasonic Therapy in relieving pain and improving functional mobility in subjects with Piriformis Syndrome. These findings align with previous research, reinforcing the effectiveness of MET as a preferred intervention for reducing pain, improving ROM, and restoring neuromuscular function in individuals suffering from Piriformis Syndrome.

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