

# Effect Of Neural Tissue Mobilization In Combination With Ultrasonic Therapy Verses Ultrasonic Therapy In Deep Gluteal Syndrome-A Comparative Study.

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## ABSTRACT

The familiar name of deep Gluteal syndrome is piriformis syndrome. The deep Gluteal syndrome most of the times goes undiagnosed and unidentified though being a most common cause of non disc originated cause of sciatica. Female preponderance to male is higher in the falling prey to deep gluteal syndrome associated with pain, restricted range of motion and disability. Hence is the need to seek the appropriate treatment regimen for the same. In this study an intervention is carried out to compare the conventional treatments like piriformis stretching and ultrasound with neural tissue mobilization of sciatic nerve along with ultrasound and piriformis stretching. The 30 patients, male and female fulfilling the study criteria were divide in to group A and B with simple random sampling. Group A was given the neural mobilization along with ultrasonic therapy and piriformis stretching and the control group B received ultrasonic therapy with piriformis stretching. Both groups received treatment of 45 minutes daily/5 session/week for 2 months. The paired and unpaired t tests were used by SPSS to analyse the intra and intergroup comparison. The results reflected that the outcome measures VAS, RMBQ ( Roland Morris Back Questionnaire) and SLR improved with very significant improvements in group A than in group B. This suggests the importance of addition of neural tissue mobilisation in deep gluteal syndrome.

KEY WORDS: deep gluteal syndrome, piriformis syndrome, neural tissue mobilization, piriformis stretching, ultrasonic therapy, Roland Morris Back Questionnaire, Visual Analogue Scale, Straight Leg Raising.

## INTRODUCTION

Piriformis syndrome is inflammation of branch of sciatic nerve resulting due to the pressure of the spasmodic or inflammed. Injured piriformis muscle<sup>1</sup>. It is also known as "Deep gluteal syndrome"<sup>2</sup>. Piriformis syndrome frequently goes unidentified or misdiagnosed in routine clinical practice. The piriformis muscle originates anteriorly from S2-4 vertebrae. It ends at the greater trochanter. The position of sciatic nerve is in close proximity of piriformis muscle . Rather 7% to 21% studies have evidenced that the sciatic nerve, actually pierces the muscle<sup>3, 4</sup>.

It is most common condition of sciatica of non- disc origin. The condition is more prevalent in female than male with ratio of 6:1 respectively. The more incidence in female is possibly due to wider q angle<sup>5</sup>.

The piriformis syndrome is mainly categorized in two types. The first type is called "primary piriformis syndrome". The possible reason could be the anatomical variation between, sciatic nerve course and the muscle. Prevalence of 1<sup>st</sup> type is less i.e. 15%.<sup>7, 10</sup> It s most commonly affects runners, IT worker, cyclists, farmer and women etc. The second and most common type is secondary piriformis syndrome. It the results due to macro trauma, micro trauma, generalized ischemia or local ischemia<sup>6, 7, 8</sup>.

The frequent symptoms of piriformis syndrome include algesia, tingling like sensation and reduced sensations at posterior side of hip along with sciatic nerve route. Crossed leg sitting or ambulation worsen the symptoms<sup>4</sup>.

On physical examination tenderness is perceived. Tonic external rotations of the hip, SLR, pace sign, FAIR test elicit positive<sup>11</sup>. CT, MRI, EMG etc help in confirming the piriformis syndrome. Therapeutically sciatic pain is managed by short wave diathermy, ultrasonic therapy, interferential therapy, transcutaneous electrical nerve stimulation, traction and exercises.

Stretching is a form of exercise in which a specific muscle or tendon is lengthened within the elastic limit in order to achieve normal muscle length. With this there is resultant increased flexibility, improved circulation, decreased muscle tension, muscle pain is relatively released, injury is prevented and athletic performance is improved<sup>12 13 14 15</sup>.

Neural tissue mobilization is one of the common methods of soft tissue mobilization mostly neural tissue and tissue surrounding the nervous system. Neural tissue mobilization is a set of group of movements designed to restore plasticity of the nervous system. It is defined as the ability of nerve surrounding structure to shift in relation to other such structure. The technique accelerates the healing process, relieves the effects of compression and improves the normal physiological function of nerve cells<sup>16</sup>. Some physiological effects of neural tissue mobilization are increasing intra neural mobility, blood flow, improving axoplasmic blood flow, sensitization of mechanoreceptors and eventually relieving pain and inflammation.

In this study, it was studied whether piriformis stretching and neural tissue mobilization add to the additional therapeutic effects when applied along with conventional treatment for piriformis syndrome.

#### **NEED FOR STUDY**

Piriformis syndrome is one of the most common causes of sciatica of non disc origin. The ill effects of piriformis syndrome have huge impact on the daily routine activities and functions of the individual. In a routine basis, the treatment of piriformis syndrome is generally limited to the application of hot fomentation, IFT, TENS, Ultrasonic therapy, SWD and stretching exercise. Many isolated studies have been done to analyze the effect of neural tissue mobilization in treatment of sciatica. Isolated piriformis stretching is effective in relieving the compressive effect and symptoms of sciatic nerve.

Still there is paucity of literature on combined effect of Piriformis stretching and neural tissue mobilization in piriformis syndrome when applied in conjunction with conventional treatment. The alleviation of symptoms with correction of root cause, is a necessity for long term relief in any condition. Hence to analyze the effect of combination treatment, this study has been undertaken.

#### **AIMS AND OBJECTIVE OF THE STUDY**

##### **Aim:-**

- ✓ To assess the combined effect of piriformis stretching along with neural tissue mobilization and conventional therapy on piriformis syndrome.

##### **Objectives:-**

- ✓ To assess pre and post session disability and functional outcome in patients with piriformis syndrome.
- ✓ To assess the range of hip flexion
- ✓ To assess the intensity of pain

- ✓ To determine the effect of piriformis stretching and neural tissue mobilization, HMP and ultrasonic therapy on piriformis syndrome.

## **METHODOLOGY**

This experimental study was conducted in patients of piriformis syndrome fulfilling the criteria, diagnosed by the orthopaedician in outpatient department (OPD) of Shalinitai Meghe Hospital and Research Center, Nagpur (SMHRC) .

Study protocol was approved by Institutional Ethics Committee. The study population was selected by simple random sampling method and allocated into group A and group B by simple random sampling method. The study was conducted over a period of six months.

Inclusion criteria for the study were:

- Subjects with age group between 15-50 years.
- Both genders
- Gluteal pain is radiating through the posterior of thigh and lower limb
- subjects with straight leg raise positive i.e. below 60 degree
- Diagnosed sub acute or chronic piriformis syndrome.

Subjects were excluded if having history or presenting chief complaints of :

- Intermittent vascular claudication
- Sensory disturbances lumbar region and lower limb.
- Degenerative spine disorders like lumbar spondylosis, canal stenosis, spondylolisthesis, neural compressions due to intervertebral disc lesions
- Any vertebral or hip fracture
- Myofascitis
  
- History of spinal surgery, TB spine, osteo arthritis, rheumatoid disease, Leprosy.

This study involved minimal equipment (Data collection sheet, plinth, goniometer,ultrasound, hot moist pack.)

## **PROCEDURE:**

Ethical clearance was taken from institutional ethical committee. Subjects selected OPD of SMHRC. Each subject was screened as per inclusion and exclusion criteria. Subjects were briefed about the study and intervention. Informed consent was taken from subjects. Subjects were selected by simple random sampling and divided into two groups A and B.

For each group there is pre interventional data were collected with help of following outcome measures.

Group A was experimental group and received treatment with following techniques

- Piriformis stretching

- Ultrasound
- Neural tissue mobilization

Group B was conventional group and following treatment protocol was followed

- Piriformis stretching
- Ultrasound



Figure 4.1 Piriformis stretching

**Subject position:** Supine

**Procedure:** patient lie on the back (supine) with both feet flat on the floor and both knee bent. Rest the ankle of right leg over the knee of the left leg. Pull the left thigh toward the chest and hold the stretch.

**Dosage:**

**Hold time** – 30 sec (3 to 5 repetitions)



Figure 4.2 Neural tissue mobilization

**Subject position:** side lying.

**Therapist position:** walk standing.

**Procedure:** hold the ankle of patient and ask to patient chin tuck while therapist dorsi - flexes ankle, extends knee and flexes hip.

**Dosage:**

30 sec hold and 1 minute rest (4 to 5 repetition)

**Subject position:** prone

Subject is asked to lie prone and place the hot moist pack on lower back and gluteal region by the Therapist.

- **Dosage:**
- **Treatment duration:** -12-15 minutes



Figure 4.4 Ultrasound

**Subject position:-** prone

**Dosage:**

**Mode:** continuous

**Duration:** 10 to 15 min.

**Intensity:** 2.3 to 2.5 Watt / cm<sup>2</sup>

Both groups received treatment of 45 minutes daily/5 session/week for 2 months.

Data analysis and result interpretation took 2 months and completion of paper writing was done in next 2 months. The total duration of study was of 6 months.

#### **OUTCOME MEASURE:**

- **VISUAL ANALOUGE SCALE (VAS):** 0-10 score levels with 0- no pain and 10- highest level of pain intolerable.
- **HIP FLEXION (SLR) ROM:** with the help of goniometry.
- **ROLAND MORRIS BACK QUESTIONNAIRE:**

Roland Morris back questionnaire is a self- administered disability measure. It is a 24 points scale depicting the higher disability with greater score and vice versa. The RMBQ has been shown to yield reliable measurements, which are valid for inferring the level of disability, and sensitive to change over time for group of patients with low back pain.

Clinical improvement over time can be graded based on the analysis of serial questionnaire scores.

- Materials used:-
- Goniometer

- Pen
- Questionnaire, data collection sheet.
- Ultrasonic therapy machine
- Couch
- Pillows
- Towel
- Gel

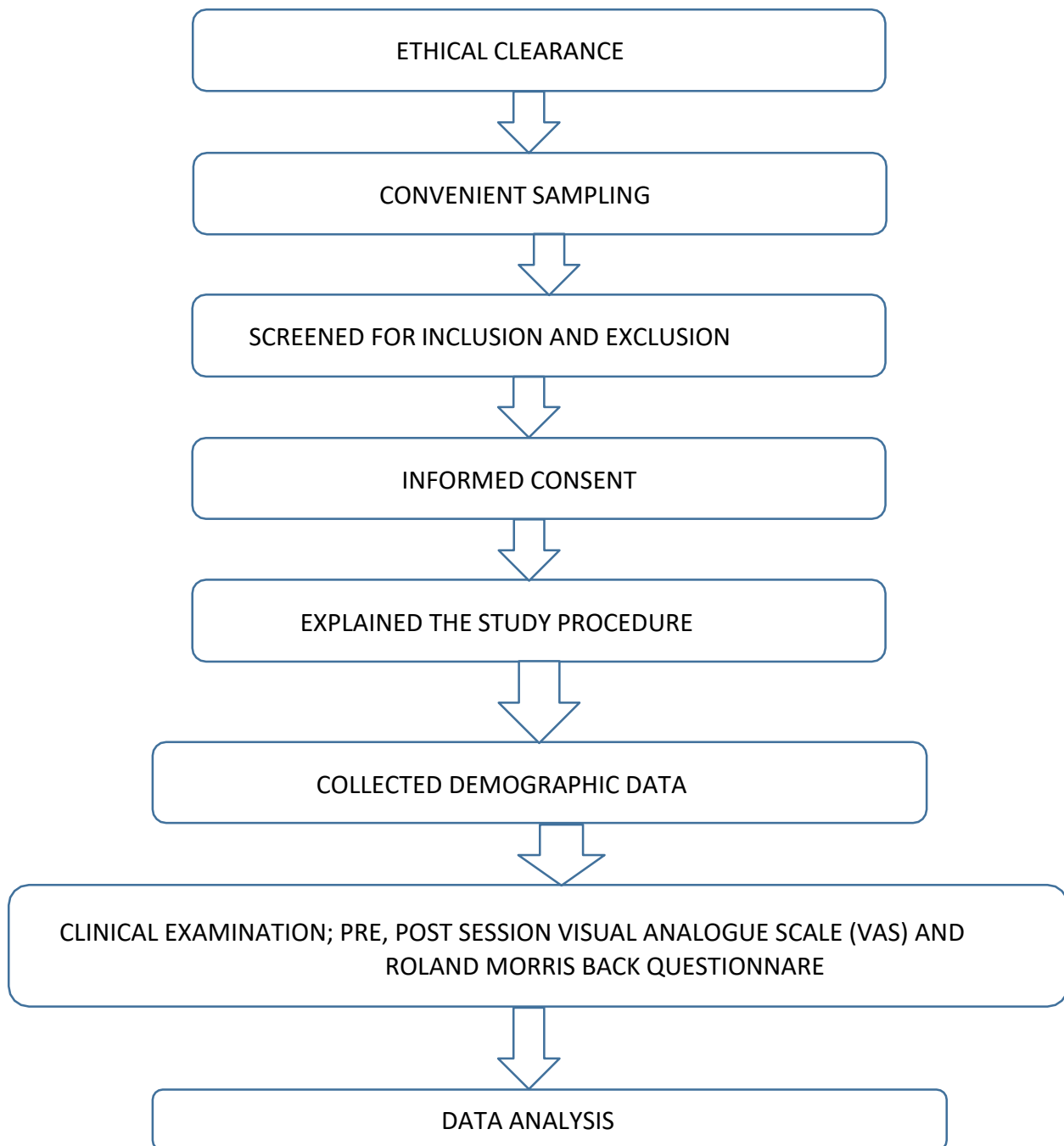


Figure 4. 6: Flow chart of study procedure

#### DATA ANALYSIS

Demographic data and variables studied the descriptive statics to find out the frequency, percentage, mean and standard deviation.

Microsoft office excel and analyzed by Statistical Package for Social Sciences (SPSS) version 17 was used to calculate the t tests. Paired t-test was used to find out the comparison of pre / post intervention within each group. The intergroup comparison was done using the unpaired-t test.

The significance was determined by P values:-

- P<0.05: significant difference.



- $P < 0.001$ : highly significant difference.

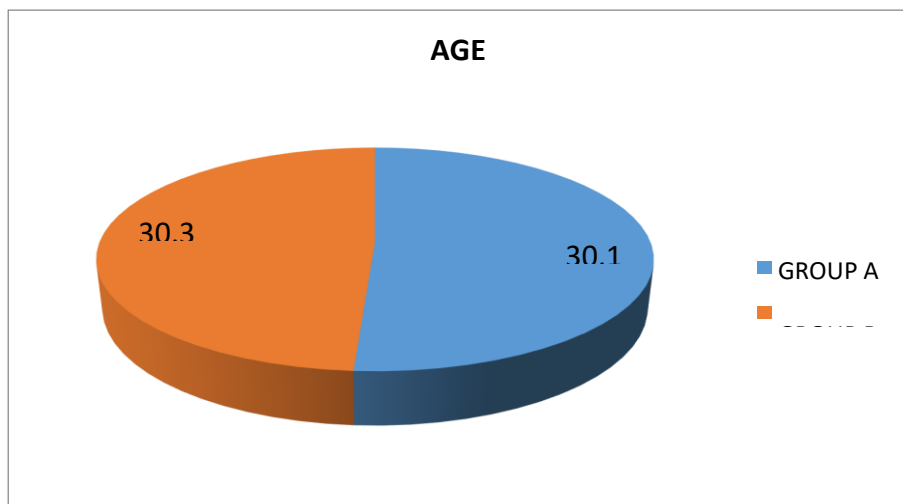
### RESULTS

#### AGE:-

participants aged 15 to 50 years volunteered the study. The mean age of the participants in group A and group B was 30.32 and 30.16 respectively. The difference in mean age of both the groups was statistically not significant ( $P = 0.4419$ ). Hence the two groups are matched with respect to age.

Groups	Mean Age (Yrs)
Group (A)	30.32
Group (B)	30.16

Table 6.1 Distribution of Age



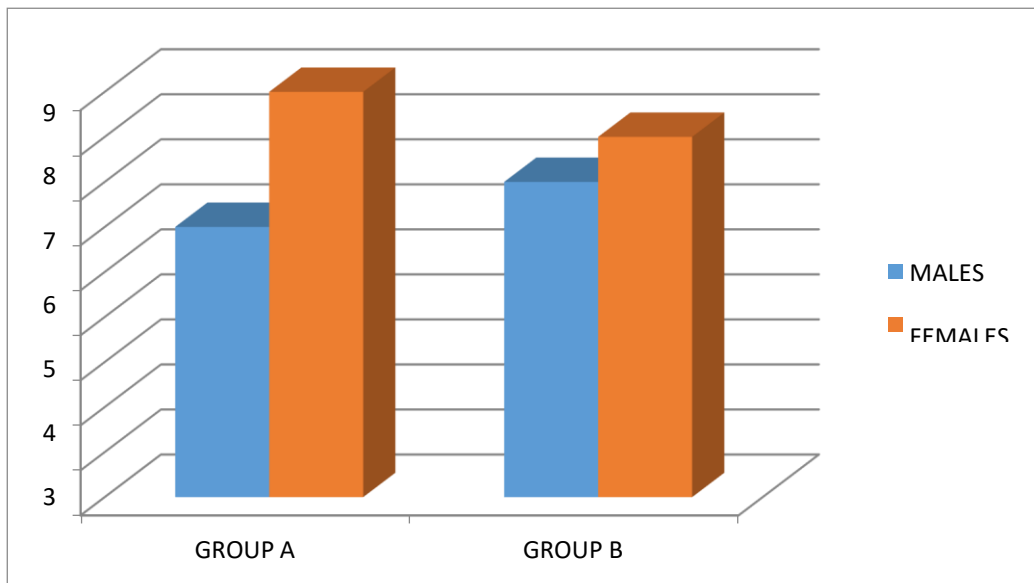
Graph 6.1: Age Distribution

#### GENDER:-

A total of 30 subjects were taken for study. Out of 30 subjects 14 were males and 16 were females.

Groups	Group A	Group B
Males	6	8
Females	9	7
Total	15	15

Table 6.2: Gender Distribution



Graph 6.2: Gender Distribution

**OUTCOME MEASURE**

**VAS - Intra Group comparison (within Group) using Paired t test.**

The table shows the comparison of mean and standard deviation of pre and post values of Group A and B. The P value by Paired t test for intragroup comparison in both the groups was found to be extremely significant ( $P < 0.0001$ ) stating that both the group treatments effectively treated the piriformis syndrome symptoms post treatment.

Groups	Pre-interventional Mean $\pm$ SD	Post-interventional Mean $\pm$ SD	P Value	Inference
Group (A)	9.56 $\pm$ 0.49	0.83 $\pm$ 0.70	<0.0001	extremely significant
Group (B)	9.63 $\pm$ 0.53	2.43 $\pm$ 0.87	<0.0001	extremely significant

Table 6.3: Comparison of pre and post VAS using Paired t test

- **VAS -Inter group ( between groups ) comparison using unpaired t test**

The pre interventional values of VAS score, when compared between the two groups using unpaired t test revealed that the difference was not statistical significant with p values of 0.8248. This eliminates the bias of the selection procedure and the pre treatment symptoms of pain of the patients were seminal in the group A and B. When unpaired t test was applied to post treatment VAS scores, it revealed that the VAS score improved extremely significant in group A as compared to group B with p values of <0.0001.

Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD
Group (A)	9.56 ± 0.49	0.83 ± 0.70
Group (B)	9.63 ± 0.53	2.43± 0.87
P Value	0.8248	<0.0001
Inference	Not significant	Extremely significant

Table 6.4: Comparison of pre and post VAS using unpaired t test

**ROM (HIP FLEXION) -  
Intra Group  
comparison (within  
Group) using Paired t  
test.**

The table also shows the comparison of mean and standard deviation of pre and post values of Group A and B. In both groups, the hip range (SLR) improved extremely significant with p value <0.0001.

Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD	P Value	Inference
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Group (A)	16.93 ± 2.71	54.2 ± 2.28	<0.0001	extremely significant
Group (B)	17.4 ± 2.49	38.63± 4.51	<0.0001	extremely significant

Table 6.5: Comparison of pre and post ROM (Hip Flexion) using paired t test

**ROM(Hip flexion) -Inter group ( between groups ) comparison using unpaired t test**

On applying the unpaired t test for intergroup comparison, there was no significant difference in pre values of Range of motion of Hip flexion (SLR) for group A and group B. (p=0.8252) where as the post treatment sessions values explained that the addition of neural tissue mobilization helped to improve SLR in group A as compared to group B with p<0.0001 .

Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD
Group (A)	16.93 ± 2.71	54.2 ± 2.28
Group (B)	17.4± 2.49	38.63 ± 4.51
<b>P Value</b>	0.8252	<0.0001
<b>Inference</b>	not significant	extremely significant

Table 6.6: Comparison of pre and post hip flexion (ROM) using unpaired t-test **Roland Morris back questionnaire: - Group A and Group B comparison using paired t- test.**

The RMBQ, score was total of 24. In both the groups after treatment, the score reduced extremely depicting the improvements in the back pain and activities as compared to before the interventions in each group. The values explained in the table are of mean score. Showing that both the group treatment techniques are effective in tapering down the score of RMBQ.

Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD	P Value	Inference
Group (A)	13.43 ± 1.28	1.6 ± 0.82	<0.0001	extremely significant
Group (B)	13.76 ± 1.17	4.4 ± 1.54	<0.0001	extremely significant

Table 6.7: Comparison of pre and post RMBQ using paired t test

**ROLAND MORRIS BACK QUESTIONNAIRE (RMBQ)-Inter group ( between groups) comparison using unpaired t test**

The intergroup comparison was done to evaluate the post treatment effects of treatments of both group A v/s B, elicited that the neural tissue mobilization has set an important technique in reducing the RMBQ score which created statistically significant difference with p values of < 0.0001.

Groups	Pre-interventional Mean ± SD	Post-interventional Mean ± SD
Group (A)	13.73 ± 1.28	1.6 ± 0.82
Group (B)	14.46 ± 1.18	4.4 ± 1.54
<b>P Value</b>	0.1150	<0.0001
<b>Inference</b>	Not significant	Extremely significant

Table 6.8: Comparison of pre and post RMBQ score using unpaired t test

**DISCUSSION**

Piriformis syndrome is an inflammation of the sciatic nerve by pressure of an injured or spasmodic piriformis muscle<sup>1</sup>. It is also known as “Deep gluteal syndrome”<sup>2</sup>. In routine clinical practice the piriformis syndrome is unrecognized or misdiagnosed. In about 7% to 21% of studied cases, the sciatic nerve, actually penetrate the muscle<sup>3, 4</sup>. This anatomical variation is often a cause of sciatica of non-disc origin. There are more women diagnosed with piriformis syndrome than men, with a female-to- male ration of 6:1. This ration can be explained by the wider Q angle in the os coxae of

women<sup>5</sup>.

In the current study the results show that all three outcome measures i.e. SLR, VAS score and RMBQ scores were improved in both the groups but addition of neural tissue mobilization in group A improved all three parameters significantly in group A. This emphasizes the importance of inclusion of neural tissue mobilization as a core treatment in the treatment of compressive neuropathies as well as in piriformis syndrome.

The possible mechanism behind improvements in the range, disabilities and reduction in pain quotient, could be as follows-

The physiological effects contributed by piriformis stretching in recovery could be the enrichment in muscle elasticity and thus gain back the normal muscle tone alleviating spasm. Further it helped to improve joint range of motion (flexibility), decrease muscle tension, improve circulation, free movements and thus reduce down the disability.

With neural tissue mobilization the sciatic nerve was mobilized by movement or by creation tension development this might have improved axoplasmic flow, intraneural flow, raising the pain threshold by mechanosensitivity development. The very reason could have tapered down the pain, reduced spasm of muscle and improved the range. Once the range is improved, disability keeps a backfoot.<sup>17</sup>

The contribution of ultrasound in the treatment could be the mobilization of inflammatory markers, enhancing the ionic exchange and thus relieving muscular spasm, improving neural and muscular suppleness and thus relieves pain spam and improve range.

The study is supported by many studies having similar results. Few have considered the effect of the treatment measures only on the impact on pain profile. Many have considered the only neural tissue mobilization as a sole treatment option for piriformis syndrome. But according to this study, sole involvement of neural tissue mobilization may cause reflex spasm in early sessions due to tension development as well as may cause pain to rise. Hence in this study all the 3 measures are combined in group A to nullify the side effects of stretching and neural mobilization. Where as in group B, patients did report some form of pain and discomfort in early sessions due to stretching. The duration of stretching is managed thereafter to small duration hold and less repetitions. (3-4 reps. with 10 sec. hold initially followed by 15 sec. hold.)

This study was done with relatively small sample size and less duration. The further studies should be carried out in consideration with other treatment measures and neural tissue mobilization with larger sample size and for extended period of time. Also the effect should be evaluated in the professional like tailors, carpenters etc having higher vulnerability to develop piriformis syndrome.

### **CONCLUSION**

Several conservative therapies are used for treating piriformis syndrome but the results of this study strongly propose that adding neural tissue mobilization technique along with piriformis stretching and ultrasonic therapy reduced the intensity of pain, improved Hip flexion (SLR) and tapered disability related to piriformis syndrome which led to faster recovery. Further studies can be taken to assess the specificity of electrical modalities like interferential therapy verses ultrasonic therapy in treating piriformis syndrome.

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