

# Effectiveness of Interferential Therapy with Hip Muscle Strengthening Exercises and Ultrasound Therapy with Hip Muscle Strengthening Exercises for Piriformis Syndrome

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## Abstract

**Background:** Sciatic nerve irritation caused by the piriformis muscle, which results in Buttock pain, sciatica, or both is known as piriformis syndrome. The prevalence of PS with sciatic nerve piercing is 17% and 81% respectively, while it was present in 17.2% suffering from low back discomfort.

**Purpose:** The purpose of this study is to find the effectiveness of interferential therapy with hip muscle strengthening exercises and ultrasound therapy with hip muscle strengthening exercises for piriformis syndrome.

**Materials and Methods:** About 220 participants were selected by using FAIR test and visual analogue scale on inclusion and exclusion criteria. Written informed consent was collected before the commencement of the study. The 220 participants were allocated into 2 groups. Interferential therapy group (n=110) and ultrasound therapy group (n=110). Interferential therapy group were given interferential therapy with hip muscle strengthening exercises and the ultrasound therapy group were given ultrasound therapy with hip muscle strengthening exercises. The intervention was given 5 times a week for a total duration of 2 weeks. Study Period: October 2022-June 2023.

**Results:** The collected data was statistically analyzed using paired and unpaired t test, when comparing the Interferential therapy group to the ultrasound therapy, the Interferential therapy group indicates significant effects  $P < 0.0001$  in piriformis syndrome, as assessed by VAS.

**Conclusion:** This study concluded that the Interferential therapy group was found to be more effective than the ultrasound therapy group in patients with Piriformis Syndrome.

**Key Word:** Sciatic nerve, VAS, Buttock Pain, Stretching, FAIR test.

## Introduction

Sciatic nerve irritation caused by the piriformis muscle, which results in buttock pain, sciatica, or

both, is known as piriformis syndrome. Intimate connections exist between the sciatic nerve and the piriformis muscle, with the sciatic nerve typically

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emerging from the pelvis below the muscle at the greater sciatic notch<sup>1</sup>. The causes of piriformis syndrome includes sciatic nerve compression, microtrauma, injury, swelling, muscle spasm, local ischemia<sup>2</sup>.

In addition to piriformis tenderness, and a positive straight leg raise sign, the symptoms also include weakness and gluteal atrophy<sup>3</sup>. Patients commonly report greater pain after sitting for more than 15 to 20 minutes<sup>4</sup>. In a general population survey, it was discovered that PS happens 12.2-27% of the time over the course of a lifetime and 2.2-19.5% of the time over the course of a year. Three times more Women than men experience piriformis syndrome. The prevalence of PS with sciatic nerve piercing is 17% and 81%, respectively, while it was present in 17.2% suffering from low back discomfort<sup>5</sup>.

The diagnosis of piriformis syndrome was made using the Flexion Adduction Internal Rotation (FAIR) test<sup>6</sup>.

The two therapeutic modalities that are most frequently employed are ultrasound and interferential therapy.

Electrotherapy in the form of interferential therapy completes a nerve block, helping to retrain the pain receptors and reduce the muscle spasm. Two medium-frequency currents with marginally different frequencies interfere with one another to provide the therapeutic effects of interferential treatment. Circuits A and B, -which conduct current at 4000 Hz and 3980 Hz respectively, provide a low frequency of 20 Hz, which is very helpful in pain modulation<sup>7</sup>.

In order to minimize edema and inflammation in a particular location, ultrasound therapy aids in improving the blood flow to that area. High-frequency sound waves, such as ultrasound, have a frequency between one and three MHz<sup>8</sup>.

Due to the weakening of the hip abductor and extensor muscle group, the piriformis muscle is overloaded, which causes it to shorten and finally compress the sciatic nerve. It is therefore necessary to strengthen such muscles in order to lessen the strain on the piriformis muscle. The exercises which include, hip abductor strengthening exercises are

side lying leg raise, step up to knee raise, banded jumping jacks, bridge with banded abduction, Hip extensor strengthening exercises are glute bridge, jump squat, walking lunge, standing hip extensor exercise<sup>9</sup>. The Visual Analogue Scale (VAS), a method for quantifying pain, is used to assess pain intensity. Before, during, and after the course of treatment, the scores were recorded. With 10 points, the Visual analogue scale (VAS) has a range of 0 to 10. On a scale of 0 to 10, where 0 is no pain, 10 is considered the worst possible pain<sup>10</sup>.

### Aim

To find the effectiveness of interferential therapy with hip muscle strengthening exercises and ultrasound therapy with hip muscle strengthening exercises for piriformis syndrome

### Materials and Method

- Interferential therapy
- Ultrasound therapy
- Theraband
- Yoga Mat

This study was conducted in the saicharan physio centre, Murugappa street, Arakkonam, tamilnadu-631001 for piriformis syndrome patients. About 220 participants were selected based on inclusion and exclusion criteria. This study includes both male and female, age groups from 30-60 years. Written informed consent was obtained. Participants willing to participate were split into two groups: Interferential therapy group and ultrasound therapy group.

### Inclusion criteria

- Subjects with age group of 30-60 years
- Both male and female are included
- Gluteal pain with or without radiation through sciatic nerve pathway
- Lumbosacral radiculopathy

### Exclusion criteria

- Previous surgical history involving lumbar and or hip region
- History of buttocks or hip infection
- Malignancy

- Diabetic neuropathy
- Vascular disease

### Outcome measure

- VAS (Visual Analogue Scale)

### Procedure

The study was conducted in the saicharan physio centre, Murugappa street, Arakkonam, tamilnadu - 631001 for piriformis syndrome patients. About 220 participants were selected based on inclusion and exclusion criteria. This study includes both male and female, age groups from 30-60 years. Written informed consent was obtained. Participants willing to participate were randomly allotted into two groups Interferential therapy group and ultrasound therapy group. Participants underwent Visual Analogue Scale (VAS) scores will be assessed before the initiation of the treatment and after the two weeks of treatment.

#### A. Modality:

- **Interferential therapy Group**

The patient was positioned Prone lying and carefully inspected. The Power duration and dose were both set to zero before turning on. Furthermore, the patients were instructed to report any discomfort of 20Hz was administered for ten minutes. Treatment was administered three times a week.

- **Ultrasound therapy group:**

The patient was positioned Prone lying and carefully inspected. The Power duration and dose were both set to zero before turning on. Furthermore, the patients were instructed to report any discomfort or extreme heat ultrasound therapy of 3MHz (approximately 1.5 intensity) was administered for ten minutes. Treatment was administered three times a week.

#### B. Exercises:

#### Hip muscle strengthening Exercises for both the groups

- **Hip abductor strengthening exercises are:**

##### 1. Step up to knee raise:

The participant was asked to step on the foot stool using their right foot drive their left knee up

towards their chest and up to hip height, then the participant asked to step onto the foot stool with right foot then step the right foot to ground and return to starting position after bringing their left foot back to the ground under control. The exercise is performed for 10 reps for 3 sets<sup>11</sup>.

##### 2. Side lying leg raise:

The participant was instructed to lay on his left side with the legs straightened out and used his left hand to hold the head high and then advised to lift the leg for 45 degrees and let it down. That is one repetition. patient advice 10 times on the other side also<sup>11</sup>.

##### 3. Banded jumping jacks:

The participant asked to wrap his ankles with a little band. and his feet should be around hip , and while standing in a quarter-squat stance, their hands should be at their chest. Participants advised to jump the feet out and back in landing each time with a gentle foot. Exercise repeated for 10 times<sup>11</sup>.

##### 4. Banded bridge abduction:

The participant instructed to looping a mini band or tying an exercise band around their thighs just above the knee, the participant advised to Keep their heels planted on the ground at roughly shoulder distance apart and then advised to lift the pelvis to bridge the body and to contract the glutes. keep the spine neutral and core braced.at the peak of the movement the participants advised to spread the knees apart while keeping the heels planted to stretch the band and then slowly asked to come back to neutral and lower the pelvis<sup>11</sup>.

- Hip extensor strengthening exercises are:

##### 1. Jump squat:

The participant instructed to place the feet hip distance apart as their stand and the toes facing forward, hold a sandbag in front of their chest with both hands. The participant advised to bend the knees and push the hip back until thighs are parallel to the floor while maintaining a flat back and an upright posture. When they delicately touch the ground, quickly squat down to start the next repetition<sup>11</sup>.

## 2. Glute bridge:

The participant instructed to supine lying and advise the patient to bend the legs and arms. The feet should be apart by hip-width. Holding the dumbbell across the hip increase 12 to 16 inches should separate the feet from their butt. Squeeze the glutes, stabilize the core, and drive into heels to lift the pelvis. Lift body high enough for knees to meet the shoulders in a straight line. After holding for 30 seconds, return hips to the ground. One repetition equals this finish 2-3 sets of 10 repetitions<sup>11</sup>.

## 3. Walking lunge:

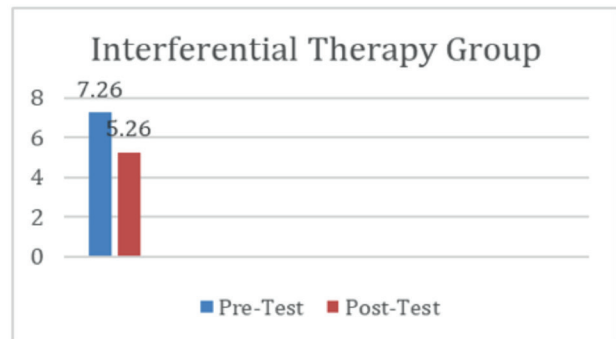
The participant instructed to hold two dumbbells at arm's length by sides, take a tall stance with the feet hip-width apart as much as possible, move forward with their right foot, bending both knees until the front thigh is parallel to the ground and the knee is 90 degrees bent. Stop for a moment. In order to step into the subsequent lunge, push through the left foot. Make sure the participant performs an equal number of steps or repetitions on each leg, continue rotating legs with each step<sup>11</sup>.

## 4. Standing hip extensor exercise:

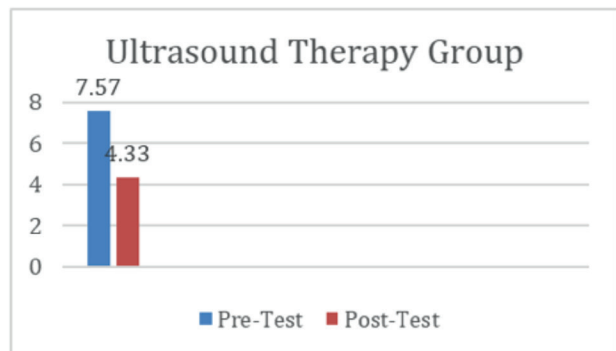
The participant instructed to stand with the heels together and toes slightly turned out, stand tall with hands on the hips. Reposition the right foot so that the big toe is gently on the ground, the participant heel is somewhat inward. Squeezing their right glute, elevate their right leg as high as. The participant advised to maintain a tall torso. Resuming where left off, softly tap their right foot's toes on the ground, then repeat. Equalize the repetitions on both sides<sup>11</sup>.

## Data Analysis

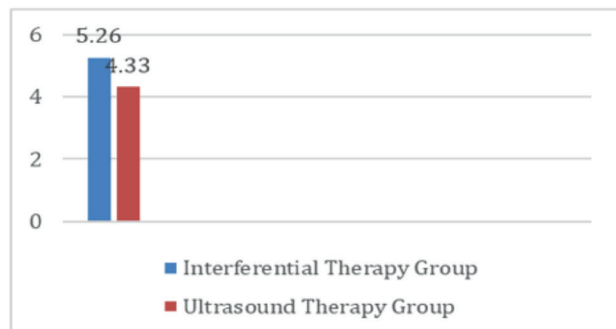
For this study, 220 participants with piriformis syndrome of male and female between the age of 30 to 60 were selected. The participants with pain measured by VAS before and after the treatment to provide pre-test and post-test values respectively.



**Graph-1: Comparison of pre-test and post-test values of VAS in Interferential therapy Group**



**Graph-2: Comparison of pre-test and post-test values of VAS in Ultrasound therapy Group**



**Graph-3: Mean value of VAS Comparison between interferential therapy with hip muscle strengthening exercises and ultrasound therapy with hip muscle strengthening exercises**

## Result

Visual Analogue Scale scores were assessed before the initiation of the treatment after the treatment for taking pre-test and post-test values respectively.

The VAS post-test mean value in the interferential therapy group was 5.26 (+1.19) while it was 4.33(+1.02) in the ultrasound therapy group. This indicates that the interferential group VSA Scores significantly

higher than the ultrasound therapy group, with a  $P < 0.0001$ . (Table-3)

Statistical analysis of the VAS post-test results revealed that the interferential therapy group and ultrasound therapy group showed similar statistically significant differences. As a result, the interferential therapy group is better than the ultrasound therapy group in relieving pain using the VAS scale.

### Discussion

The VAS post-test mean value in the interferential therapy group was 5.26 (+1.19) while it was 4.33(+1.02) in the ultrasound therapy group. This indicates that the interferential group VAS scores significantly higher than the ultrasound therapy group, with a P value of  $< 0.0001$ .

Based on the statistical analysis, both groups showed improvement in visual analogue scale (VAS). However, subjects in interferential therapy group who received interferential therapy with hip muscle strengthening exercise showed better improvement in VAS than the subjects in the ultrasound therapy group who received ultrasound therapy with hip muscle strengthening exercise. Similar results were found in previous studies.

Clipa Adriana et. al 2012 concluded that the optimal technique of treatment involved an individually designed physical programme based on the severity of functional lumbar deficit and level of lumbar discomfort. At the end of 11 days of treatment, they observed an improvement in the pain score for 70% of patients with a reduction of at least 2 points on the VAS, an improvement in articular mobility for the lumbar spine for 21 patients, and a negative result for the straight-leg raising test in 12 patients (63%) of the patients. They believe that physical therapy programmes are the first choice in terms of effectiveness and speed in reducing sciatica pain, despite the fact that this study only involved only a few patients, given the range of conditions that can cause it, the wide age differences between patients, and the different lengths of sciatica episodes<sup>12</sup>.

O Kenechi Nwaka et. al 2017 concluded that with no post-procedure problems, all 221 US-guided subgluteal sciatic nerve injections were technically successful. Patients who underwent follow-up

reported symptom alleviation in 68% of cases. Most individuals who saw no improvement had subpar preoperative screening<sup>13</sup>.

Ibrahim M Moustafa, Aliaa A Diab 2013 Concluded that the lumbar extension traction in addition to interferential therapy and hot packs showed more improvement with lumbosacral radiculopathy.<sup>14</sup>

### Conclusion

This study concludes that both the intervention with exercises used in the present study i.e., Interferential therapy with hip muscle strengthening exercises and ultrasound therapy with hip muscle strengthening exercises are effective in reducing pain, reducing disability. However, Interferential therapy with Hip muscle strengthening exercises is more beneficial than ultrasound therapy with hip muscle strengthening exercises in reducing pain and improving functional status of people with Piriformis syndrome.

**Ethical clearance:** Taken from Institutional ethical committee. ISRB number-03/056/2022/ISRB/SR/SCPT

**Funding:** Self

**Conflict of Interest:** Nil

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