



A comparative study between neural mobilisation techniques versus nerve flossing technique in patients with acute sciatica

Himani Sanjay Vartak¹, Dr. Rhucha Rajapurkar², Dr. Tushar Palekar³, Dr. Seema Saini⁴,
Dr. Abha Khisty⁵

¹Intern, Department of Physiotherapy, Dr. D.Y. Patil College of Physiotherapy, Pimpri, Pune 411018, Maharashtra, India.

²Assistant Professor, Department of Physiotherapy, Dr. D.Y. Patil College of Physiotherapy, Pimpri, Pune 411018, Maharashtra, India.

³Principal, Department of Physiotherapy, Dr. D. Y. Patil College of Physiotherapy, Pimpri, Pune, 411018, Maharashtra, India.

⁴Professor, Department of Physiotherapy, Dr. D.Y. Patil College of Physiotherapy, Pimpri, Pune 411018, Maharashtra, India.

⁵Assistant Professor, Department of Physiotherapy, Dr. D.Y. Patil College of Physiotherapy, Pimpri, Pune 411018, Maharashtra, India.

Abstract

Background: Acute Sciatica is one of the most common problem affecting adult population annually. Along with Medical management, Physiotherapy also helps in manually treating the patients with Acute Sciatica. There are Manual Therapy techniques like Neural Mobilisation technique and Nerve Flossing Technique which helps in reducing the symptoms of Acute Sciatica. But it is yet to be investigated whether which of these treatment is best in reducing pain and improving Hip Flexion ROM. **Aim:** This study was therefore conducted to investigate the comparison of effectiveness between Neural Mobilisation Technique (NMT) and Nerve Flossing Technique (NFT) in patients with Acute Sciatica. **Methods:** A pre-test and post-test experimental study design, involving 30 participants from Dr. D. Y. Patil Hospital and Medical College were diagnosed with Acute Sciatica with the help of special test – Straight Leg Raise Test were randomly assigned into two groups by ballot method; Group A received NMT combined with conventional treatment and Group B received NFT combined with conventional treatment. The outcome measures of the study were assessed using Numerical Pain Rating Scale (NPRS) and Passive Straight Leg Raise (PSLR). **Results:** The result of this study revealed that when compared within the group, both the groups were found to have highly significance in NPRS and improving Hip flexion ROM with P value= 0.000. But when compared between each other to know which group is more effective, Nerve Flossing Technique showed highly significance in increasing Hip flexion ROM with P value=0.000 whereas in reducing pain no significant difference was seen in between both the groups with Pvalue= 0.067. **Conclusion:** Nerve Flossing Technique when combined with conventional treatment is more effective in reducing the symptoms of Acute Sciatica.

Keywords: Acute Sciatica, Neural Mobilisation Technique, Nerve Flossing Technique, Numerical Pain Rating Scale (NPRS), Passive Straight Leg Raise (PSLR).



Introduction

Sciatic Nerve is the thickest nerve and is the largest branch of the sacral plexus in the body with root value L_4, L_5, S_1, S_2, S_3 .^[1] It begins in the pelvis and terminates at the superior angle of the popliteal fossa by dividing into the tibial and common peroneal nerves. It enters the gluteal region through the greater sciatic foramen below the piriformis, runs downwards between the greater trochanter and the ischial tuberosity and then enters the back of the thigh at the lower border of the gluteus maximus.^[1] Sciatic Nerve contains two types of branches-Articular branches and Muscular branches. Articular branches to the hip joint arise in the gluteal region whereas in Muscular branches the tibial part of the sciatic nerve supplies the Semitendinosus, the Semimembranosus, the long head of the Biceps femoris, the ischial head of the Adductor magnus from its medial side and the common peroneal part supplies only the short head of the Biceps femoris.^[1] Any irritation or compression of sciatic nerve is known as SCIATICA.^[2]

Sciatica is a set of symptoms which includes radiating pain, tingling sensation, numbness and weakness along the distribution of the sciatic nerve, that may be caused by compression or irritation of one or more of the five sciatic spinal nerve roots in one or both lower limbs.^[2] The most important symptom of sciatica is lumbosacral radicular leg pain that follows a dermatomal pattern radiating below the knee and into the foot and toes. Patients may report with sensory symptoms, limited forward flexion of the lumbar spine, gait deformity and unilateral spasm of the paraspinal muscles.^[3] There are two types of Sciatica: Acute Sciatica and Chronic Sciatica. Acute Sciatica may be foregoing between four to eight weeks; the symptoms can be reduced with the use of accessible over-the-counter painkillers combined with exercise whereas Chronic Sciatica persists for longer period of time. It may require physical therapy which may include exercises, applied heat and other techniques. In rare cases, surgery may be required.^[3] Sciatica can be caused due to Herniated Intervertebral Disc (posterolateral), Lumbar Canal Stenosis, Spondylolisthesis, Spinal Tumors, Trauma, Piriformis Syndrome, Cyst of the Hip/ Lumbar, Vascular Malformations, Intra-pelvic aneurysm, Obesity associated with Osteoarthritis, Osteoporosis, Rheumatoid Arthritis.^[2,3] There are few risk factors responsible for Acute Sciatica- age, increasing risk with height, smoking, mental stress, strenuous physical activity like frequent lifting, bending and twisting, driving, including vibration of whole body.^[4] Sciatica is mainly diagnosed by history taking and physical examination. Patients of Sciatica complain about radiating pain in the leg. Patients may also report sensory symptoms.^[3] Physical examination largely depends on neurological testing. The confirmation of Sciatica is mainly done by Passive Straight Leg Raising Test (between 30^0-70^0) or Lasegue's sign. If this test is positive, then Sciatica thus can be confirmed.^[3]

Sciatica can be treated medically as well as by physiotherapy. Conservative treatment for Acute Sciatica is primarily aimed at pain reduction, either by analgesics or by reducing pressure on the nerve root.^[4] Medical treatment includes Analgesics like Tramadol which help in relieving the pain; Non-steroidal anti-inflammatory drugs like Aspirin, Ibuprofen are used to reduce inflammation and relieve from pain; Muscle relaxants such as Diazepam, Baclofen are used to treat pain associated with muscle spasms. Epidural steroid injections are given to reduce the swelling and inflammation of the nerve.^[3,4] Physiotherapy for Acute Sciatica includes cold therapy, bed rest, manual therapy (spinal manipulation and soft tissue mobilization), electrotherapy and other



forms of management include aerobic conditioning, core muscle strengthening, stretching of tight structures, mechanical traction and corsets.^[2] There are some manual therapy techniques like Neural Mobilisation Technique and Nerve Flossing Technique which produce a rapid improvement in patients with Acute Sciatica when combined with conventional therapy.^[2]

In Neural Mobilisation Technique, position of the trunk and extremity is at the point of tension, moving one or several joints in such a manner that elongation of nerve bed occurs by increasing tension on the nerve thus putting more strain on the nerve.^[8] A tensioning technique may reduce intraneural swelling and circulatory compromise via fluctuating effects on intraneural pressure.^[8]

Nerve Flossing Technique is an alternation of combined movements of atleast two joints in which one movement lengthens the nerve bed thus increasing tension in the nerve while the other movement simultaneously decreases the length of the nerve bed which unloads the nerve.^[8] As this technique has various effects like physiological effects (in removal of intraneural oedema), central effects (reduction of dorsal horn and supraspinal sensitization) and mechanical effects like enhanced nerve excursion.^[2]

As Sciatica can be the common problem for patients which causes them difficulties in performing the day to day activities. So the purpose of the study is to compare the effectiveness of Neural Mobilisation Technique and Nerve Flossing Technique in Acute Sciatica patients which will further help physiotherapists to treat the patients with maximum benefit and help them restore their normal lifestyle. So the main aim of this study is to compare the effectiveness of Neural Mobilisation Technique versus Nerve Flossing Technique in patients with Acute Sciatica. The objectives of this study are to assess NPRS and Passive SLR on the effectiveness of Neural Mobilisation Technique combined with conventional treatment for Acute Sciatica patients; to assess NPRS and Passive SLR on the effectiveness of Nerve Flossing Technique combined with conventional treatment for Acute Sciatica patients and also to compare the effectiveness of Neural Mobilisation Technique versus Nerve Flossing Technique combined with conventional treatment in patients with Acute Sciatica on the basis of NPRS and Passive SLR.

Materials and methods

Ice Pack, Goniometer, Wedge, Pillow, Plinth, Napkin, Screening form and Consent form were used. The study was a comparative study conducted at Dr. D. Y. Patil Hospital and Medical college and Research Centre and also at Dr. D.Y. Patil College of Physiotherapy OPD. Patients diagnosed with acute sciatica –episode persisting for less than 6 weeks due to intervertebral disc pathology. Participants with positive Passive Straight Leg Raise (PSLR) Test (30° - 70°) and who gave informed consent were included in the study. Convenient sampling method was used and sample size was 30. The outcome measures used in the study were NPRS and PSLR. Participants who have had lumbar spine surgery last 12 months, suffering from sciatica along with vascular disorders and diabetic neuropathy, sciatica due to tumor and fractures, cervical spine pathology such as fracture, acute ligament injury and Spondylolisthesis or participants with clinical situations where cryotherapy, TENS and back extension exercise were contraindicated or participants with psychological or psychosomatic disorders, infections of the spine, known congenital abnormality



of the nervous system and serious co-morbidity or indication for immediate surgical intervention were excluded.

Ethical clearance was obtained from institutional sub-ethical committee of Dr. D.Y.Patil College of Physiotherapy. Written informed consent was obtained from subjects. Subjects who had fulfilled the inclusion criteria were included in the study. Patients complaining with Sciatica symptoms were taken as sample from Dr. D. Y. Patil Hospital. Patients were informed about the purpose of the study. Subjects were randomly divided into 2 groups by chit method :- Group A and Group B. Group A (n=15) were treated with Neural Mobilisation Technique and Group B (n=15) were treated with Nerve Flossing Technique along with conventional treatment. Study was performed for 5 consecutive days. Along with Day 1; 3rd Day and 5th Day pre and post treatment assessment was taken.

On Day1, Day 3 and Day 5 pre and post treatment assessment was done by using the outcome measures-

1. Numerical Pain Rating Scale (NPRS)
2. Passive SLR (see figure 1)

Figure-1: Hip flexion range was measured with the help of goniometer as the leg was raised passively until the participant complaints of pain, tingling and numbness.



Group A

15 subjects were treated with Neural Mobilisation Technique combined with conventional therapy. Subjects were in supine position. This technique was performed by alternating hip flexion, knee flexion and ankle dorsiflexion with hip extension, knee extension and ankle plantarflexion while the subject's cervical and thoracic spine were maintained in flexion. This movements were performed for 180 seconds on the dominant leg. [9] 1 session was given on a daily basis for 5 consecutive days. (See figure 2)

Figure- 2: Alternating hip flexion, knee flexion and ankle dorsiflexion with hip extension, knee extension and ankle plantarflexion while the subject's cervical and thoracic spine were maintained in flexion.



Group B

15 subjects were treated with Nerve Flossing Technique along with conventional therapy. Nerve Flossing Technique was performed actively with the participant sitting on a chair. The participant will flex the knee of the target lower extremity backwards beside the chair, as far back as possible and flex the neck at the same time, holding both the flexed knee and neck in this position for 5 seconds. The participant in turn will extend the neck and the knee of the target lower extremity, abduct and then flex the hip until pain is felt and do not push beyond that point. This extended position was maintained for 5 seconds. The above procedure of Nerve Flossing Technique were repeated for 15 times, 3 sets with an interval of 5 minutes between each set. As the nerve becomes less sensitive, the participant can increase the stretching effect by dorsiflexing the ankle and extending the toes of the foot upward towards the shin.^[2] (See figure 3)



Figure-3

Starting position

(Flexion of knee and neck at the same time
and holding this position for 5 seconds)

Ending position

(Extension of neck and knee, hip is in
abduction and
flexion while the ankle is in dorsiflexion
and toes are extended. This extended
position was maintained for 5 seconds.)



Post the treatment of both the groups, conventional exercises were given:-

1. **Cryotherapy**^[2,3]
2. **Knee to chest exercise**- Lie on the back and gently pull the knees to chest.^[3]
3. **Abdominal Crunches**- Lie with your back on the floor, hands behind your head and knees bent. Press your lower back to the floor, lift your shoulders up about 10 inches off the floor, and then lower them. Repeat 10 to 20 times daily.^[2,3]
4. **Back Strengthening Exercises**
 - Lay in the face down position and clasp your hands behind the lower back, then raise the head and chest slightly against gravity while looking at the floor. Repeat 10 to 20 times daily.
 - In the above position with the head and chest lowered to the floor, lightly raise an arm and opposite leg slowly, with the knee locked, 2-3 inches from the floor. Repeat 10 to 20 times daily.^[3]
5. **Ergonomics Advice**
 - Practice Good Posture.
 - Exercise regularly.
 - Lift objects safely.
 - Avoid sitting or standing for extended periods.



-Use proper sleeping posture.

-Avoid wearing high heels.^[3]

Data was collected after which it was tested statistically to draw a conclusion.

Statistical analysis

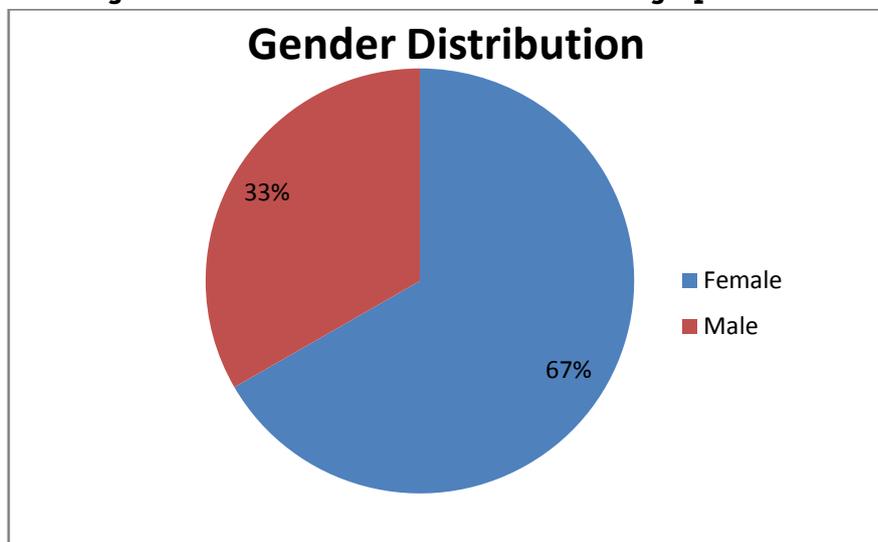
Primer Application (7th version) was used to analyse data. As the data was not normally distributed, Friedman's test was used to compare the pre-intervention of Day1 and post-intervention of Day 1, Day 3 and Day 5 changes in outcome measure variables in each group (Group A and B) whereas Man-Whitney test was used to compare outcome measure variables between Group A and Group B. Descriptive statistics of mean was used to summarize the result. Bar diagram was utilised for pictorial presentation of results.

Data analysis and interpretation

Table:1

Sex	Participants
Female	20
Male	10

Figure 4 shows Genderdistribution of demographic data



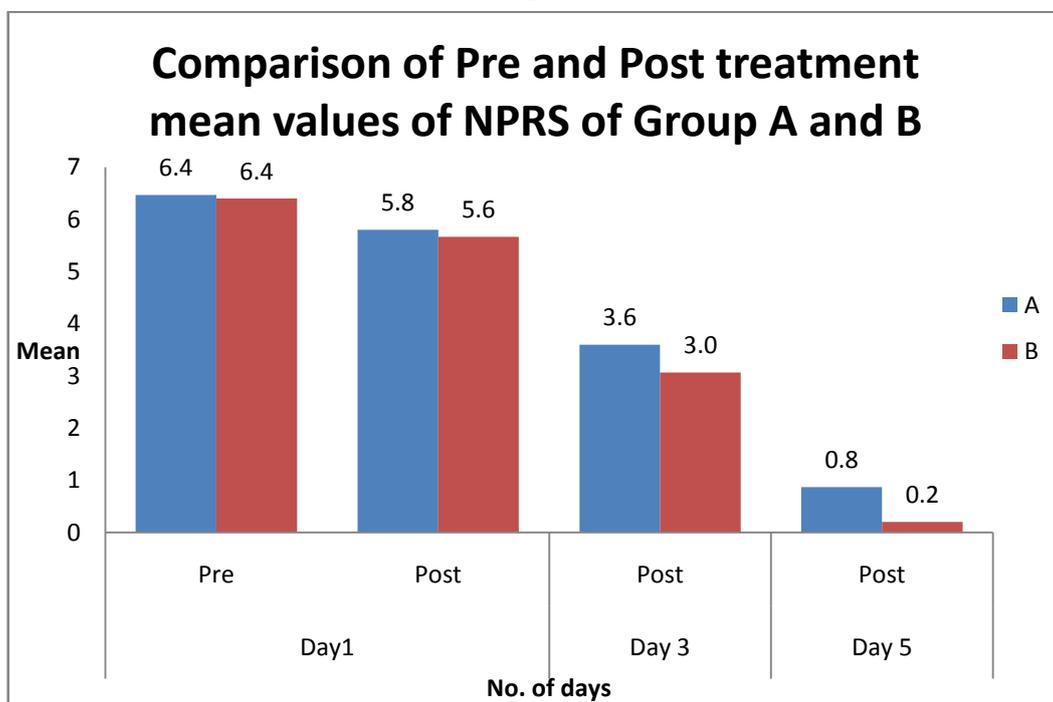
Interpretation: Out of the total samples collected , female patients participated in study were 67% and male patients were 33%.



Table: 2

Group	Day 1		Day 3	Day 5	P value	Result
	Pre	Post	Post	Post		
A	6.4	5.8	3.6	0.8	0.000	Highly Significant
B	6.4	5.6	3.0	0.2	0.000	

Figure 5 shows comparison of pre and post treatment mean values of NPRS of Group A and B



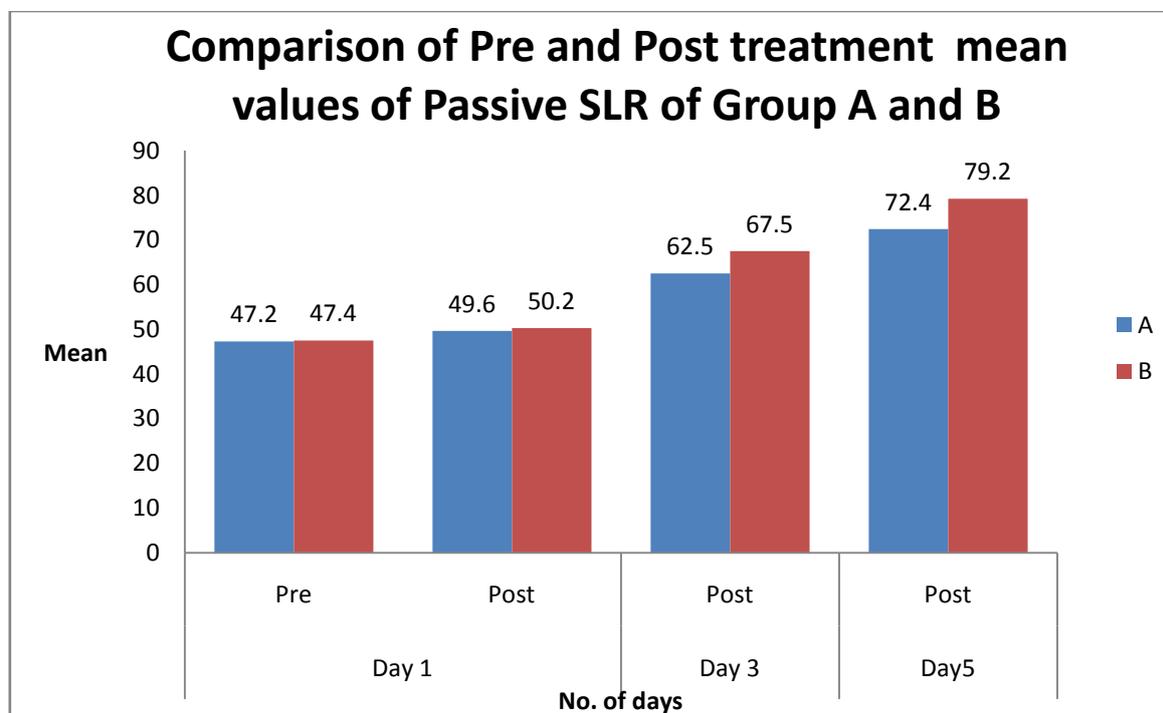
Interpretation: Figure 5 signifies mean value of NPRS of Group A on Day 1 pre and post treatment scores are 6.4 and 5.8 respectively, Day 3 post treatment score is 3.6 and Day 5 post treatment score is 0.8. The P value is 0.000, which means it is statistically highly significant. Similarly, mean value of NPRS of Group B on Day 1 pre and post treatment scores are 6.4 and 5.6 respectively, Day 3 post treatment score is 3.0 and Day 5 post treatment score is 0.2. The P value is 0.000, which means it is statistically highly significant.



Table:3

Group	Day 1		Day 3	Day 5	P value	Result
	Pre	Post	Post	Post		
A	47.2	49.6	62.5	72.4	0.000	Highly Significant
B	47.4	50.2	67.5	79.2	0.000	

Figure 6 shows comparison of pre and post treatment mean values of Passive SLR of Group A and B



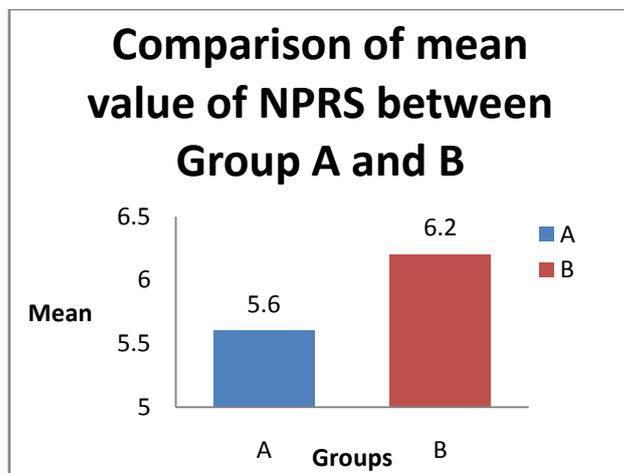
Interpretation: Figure 6 signifies mean value of Passive SLR of Group A on Day 1 pre and post treatment scores are 47.2 and 49.6 respectively, Day 3 post treatment score is 62.5 and Day 5 post treatment score is 72.4. The P value is 0.000, which means it is statistically highly significant. Similarly, mean value of Passive SLR of Group B on Day 1 pre and post treatment scores are 47.4 and 50.2 respectively, Day 3 post treatment score is 67.5 and Day 5 post treatment score is 79.2. The P Value is 0.000. It is statistically highly significant.



Table: 4

Group	Mean of NPRS	P value	Result
A	5.6	0.067	Non-Significant
B	6.2		

Figure 7 shows the comparison of mean value of NPRS between Group A and B



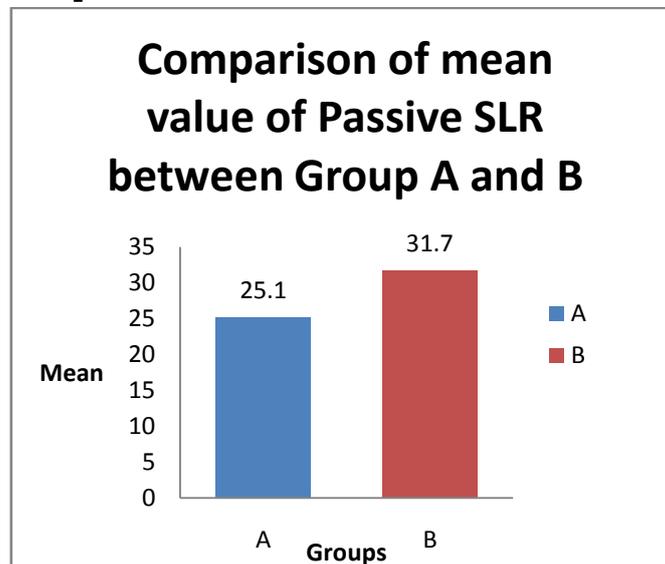
Interpretation: Figure 7 signifies the comparison between the mean value of NPRS of Group A is 5.6 and Group B is 6.2. The P value is 0.067. Statistically it is non-significant.

Table: 5

Group	Mean of Passive SLR	P value	Result
A	25.1	0.000	Highly Significant
B	31.7		



Figure 8 shows comparison of mean value of Passive SLR between Group A and B



Interpretation: Figure 8 signifies the comparison between the mean value of Passive SLR of Group A and Group B are 25.1 and 31.7 respectively. The P value is 0.000. Statistically it is highly significant.

Result

Figure 4 shows Out of the total samples collected, female patients participated in study were 67% and male patients were 33%.

Figure 5 signifies mean value of NPRS of Group A on Day 1 pre and post treatment scores are 6.4 and 5.8 respectively, Day 3 post treatment score is 3.6 and Day 5 post treatment score is 0.8. The P value is 0.000, which means it is statistically highly significant. Similarly, mean value of NPRS of Group B on Day 1 pre and post treatment scores are 6.4 and 5.6 respectively, Day 3 post treatment score is 3.0 and Day 5 post treatment score is 0.2. The P value is 0.000, which means it is statistically highly significant whereas **Figure 6** signifies mean value of Passive SLR of Group A on Day 1 pre and post treatment scores are 47.2 and 49.6 respectively, Day 3 post treatment score is 62.5 and Day 5 post treatment score is 72.4. The P value is 0.000, which means it is statistically highly significant. Similarly, mean value of Passive SLR of Group B on Day 1 pre and post treatment scores are 47.4 and 50.2 respectively, Day 3 post treatment score is 67.5 and Day 5 post treatment score is 79.2. The P value is 0.000. It is statistically highly significant.

Figure 7 signifies the comparison between the mean value of NPRS of Group A is 5.6 and Group B is 6.2. The P value is 0.067. Statistically it is non-significant. Similarly, **Figure 8** signifies the comparison between the mean value of Passive SLR of Group A and Group B are 25.1 and 31.7 respectively. The P value is 0.000. Statistically it is highly significant.



Discussion

Sciatica can cause radiating pain below the knee and into the foot and toes associated with tingling sensation, numbness and weakness. This pain and tingling sensation may occur due to compression of Sciatic Nerve. The study was aimed to compare the effectiveness of Neural Mobilisation Technique versus Nerve Flossing Technique in patients with Acute Sciatica.

A comparative study was carried out in 30 samples. The samples were divided into 2 groups by chit method i.e. Group A (Neural Mobilisation Technique) and Group B (Nerve Flossing Technique) and along with these techniques conventional treatment was also given. The participants were assessed on the basis of outcome measures:- NPRS and Passive SLR . After the completion of their treatment immediately they were assessed for the same. Day 1, Day 3 and Day 5 pre and post intervention assessment were taken.

Outcome Measures used in this study were **NPRS** measures the subjective intensity of pain . It is an 11 point scale from 0-10 where 0 is “no pain” and 10 means unbearable pain. It is a valid and reliable scale.^[2] **Passive SLR test** (Hip Flexion range) is done passively and the hip flexion range was measured with the help of goniometer as the leg was raised passively until the participant complains of pain, tingling and numbness.^[7,10,11]

The **purpose of this study** was to find out which group of treatment was more effective in reducing pain and improving hip flexion ROM thus by reducing symptoms of Sciatica.

Neural Mobilisation technique helps in reducing intraneural swelling and circulatory compromise via fluctuating effects on intraneural pressure.^[8] It helps to restore normal mobility and length relationship, blood flow and axonal transport dynamics in compromised neural tissue. This technique is very effective in breaking up adhesions.^[6]

Nerve Flossing Technique, when performed dynamically, the pumping effect facilitates venous return, oedema dispersal and decrease of pressure inside the perineurium.^[8] It reduces sensitivity and restores function, thus by easing the threat value of injury. This would minimize the potential for ion channel upgradation in dorsal root ganglia and the central nervous system and also limit the potential for dorsal and brain changes.

The comparison of NPRS between the Groups A and B shows that P value is 0.067. Statistically it is non-significant .As the mean value of NPRS of Group B is more than Group A ; which means Group B is clinically more effective.

The underlying reason is the restoration of neural physiology following Nerve Flossing Technique which causes a dynamic variation in neural pressure (by stretching at one end and relaxing at the other end), hence leading to evacuation of intraneural edema which might be present in Acute Sciatica. The significant decrease in pain intensity may be due to movement of nerve that helps to control pain at the level of the central nervous system. This technique helps in oxygenation of the nerve thus decreasing the ischemic pain.^[10] In the Gate Control Theory, stimulation of mechanoreceptors within the joint capsule and surrounding tissue causes an inhibition of pain at the spinal cord. It could also be directly associated with cryotherapy induced reduction in the neurogenic inflammation. As this causes increase in blood flow thereby increasing circulation, axonal transport and nutrition.^[8] In addition, it is hypothesized that the movement of nerve within painfree variations can help reduce nerve compression, tension and friction therefore decreasing its mechanosensitivity.^[2]



The comparison of Passive SLR between the Groups A and B shows that P value is 0.000. It is highly significant statistically. As the mean value of Passive SLR of Group B is more than Group A; which means Group B is clinically more effective.

The clinical implication is that, the hip range of motion in patients who received Nerve Flossing Technique with conventional treatment improved significantly. The improvement in hip ROM is due to increase in the length of Hamstring musculature, which might have resulted from repeated knee extension. It might have been due to decrease in pain intensity which possibly prevented the patients from achieving the desired ROM.^[2]

Conventional Exercises also played a major role in treating the symptoms of Acute Sciatica. Cryotherapy induces reduction in the neurogenic inflammation.^[2] Knee to chest Exercises helped in stretching the structures like Hamstrings, Gluteus and Dorsolumbar Fascia. Abdominal crunches were given to strengthen the core muscles that help to support your lower back. Back Strengthening and stretching exercises were also given as it improves flexibility and helps to prevent age-related degenerative changes in your back.^[3]

Thus, Nerve Flossing technique aims to mobilise a nerve with a minimal increase in tension.^[8] This Technique when combined with conventional treatment can be a better treatment option in decreasing pain, improving hip ROM and reducing the symptoms of Acute Sciatica.

Conclusion

Based on the findings of this study, it was concluded that the difference between the two groups of participants was as a result that no statistically significant difference occurred between the two groups in decreasing the pain. But, Nerve Flossing Technique is more effective than Neural Mobilisation Technique in improving Hip Flexion range of motion and is a better treatment option in the management of Acute Sciatica.

Future scope

- Use of Home-Based Protocol.
- In future, we can do comparison of these techniques for Ulnar, Median and Radial Nerve.

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