

Effectiveness of Neural Mobilization Technique in Subjects with Lumbar Radiculopathy: A Randomized Controlled Trial

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ABSTRACT

BACKGROUND AND OBJECTIVE:

Radicular low back pain is a disorder involving the dysfunction of the lumbosacral nerve roots. Clinical rehabilitation approaches for Radicular LBA include kinesiotherapy, and physical therapy procedures: rest, heat, ultrasound, TENS, but evidences regarding their effectiveness are lacking. Previous studies found that neural mobilization is more effective in reducing pain. The aim of the study is to determine the effectiveness of Neural Mobilization on pain in subjects with lumbar radiculopathy.

METHODS: 30 subjects were selected by simple random sampling and assigned into Experimental group (n=15) & Control group (n=15). The subjects in Experimental group were given Neural Mobilization in addition to traditional therapy and control group were given traditional therapy alone. All the participants were assessed with NPRS.

RESULTS: After the analysis, the results were found to be effective in improvement of pain in both groups NPRS score ($p < 0.0001$). But there is a high significance in Experimental group when compared to control group.

CONCLUSION: This study concluded that Neural Mobilization along with traditional therapy is more effective in reducing pain in subjects with lumbar radiculopathy.

KEYWORDS: Neural Mobilization, Low back ache, Numerical pain rating scale.

INTRODUCTION

Lumbar radiculopathy can be described as low back pain radiating to one or both lower extremities. ⁽¹⁾ It is a syndrome of radiating pain in a lumbar nerve root distribution that may also include motor weakness and sensory disturbance. Lumbar radiculopathy also referred to as sciatica. ⁽²⁾ There are two types of Sciatica: Acute and Chronic Sciatica. ⁽³⁾

Acute Sciatica may be present between four to eight weeks, the symptoms can be reduced with the use of 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⁾

In 21st century life has become more sedentary and computerized, giving rise to less bodywork and more sitting jobs. ⁽⁴⁾

Out of 12.9% incidence of radicular LBA complaints within working population, 11% is due to lumbar Radiculopathy. ⁽²⁾ The annual prevalence of Radicular low back pain varies from 9.9% to 25%. ⁽⁵⁾ The most common underlying cause of radiculopathy is irritation of a particular nerve, which can occur at any point along the nerve and is most often result of compressive force. ⁽²⁾ Other various causes of low back pain with

radiculopathy like herniated intervertebral disc, degenerative disc disease, lumbar canal stenosis and piriformis syndrome. ⁽⁴⁾

Patients with lumbar radiculopathy typically present with complaints of pain, paresthesia, weakness and numbness. The patient may experience the radiating pain as sharp, dull, piercing, throbbing or burning. ⁽⁶⁾ Symptoms typically begin in midlife, with men often affected in the 40s while women are affected in the 50s and 60s. ⁽⁷⁾

There are few primary risk factors for sciatica- age, smoking, mental stress, strenuous physical activity like frequent lifting, driving, bending and twisting. ⁽⁸⁾ Secondary to the degenerative process within the spinal column. ⁽⁹⁾

Lumbar radiculopathy is mainly diagnosed by history taking and physical examination. Physical examination depends on neurological testing. ⁽³⁾ The most common clinical diagnostic tests are Passive Straight Leg Raising Test (between 300 to 700), tests for tendon reflexes and signs of motor weakness and sensory deficits. ⁽¹⁰⁾

Lumbar radiculopathy 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. ⁽¹¹⁾ 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. ⁽¹²⁾ 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. There are some manual therapy techniques like Neural Mobilisation Technique and Nerve Flossing Technique

which produce a rapid improvement in patients with Sciatica when combined with traditional therapy. ⁽¹³⁾

Traditional therapy approach with include back strengthening exercises helps in relieving the compression of nerve by increasing the space of intervertebral foramen so this therapy emphasizes with management of centralized pain than peripheral pain. So, there is a need to manage both centralized & peripheral aspects of pain which if left untreated leads to chance of recurrence. ⁽¹⁴⁾ Neural mobilization improves pain and function in groups of patients with nerve-related LBP and nerve-related neck and arm pain. ⁽¹⁴⁾ Neural mobilization is the technique in which it includes the Slider and tensioner exercises. A slider is a neural mobilization exercise that produces a sliding movement of neural tissue relative to neighbouring tissue, in which a longitudinal force is applied at one end of the nerve while tension is released at the other. A tensioner is an exercise that increases tension in the neural tissue, in which a longitudinal force is applied to increase the distance between each end of the nerve. ⁽¹⁴⁾ The difference between slider and tensioner exercises in the application method may result in different responses. Sliders may be more useful to reduce pain and improve excursion of the nerves, whereas tensioners may be used to improve the viscoelastic and physiological functions of neural structures. ^(15-18,13)

Although Neural mobilization followed by traditional therapy has been proven to be effective in managing sciatica; existing literature suggests that neural mobilization alone was less effective than McKenzie techniques in the treatment of sciatica. ⁽¹⁴⁾ So, the aim of to the study is to evaluate the effectiveness of neural mobilization on traditional therapy in subjects with lumbar radiculopathy.

NEED OF THE STUDY

Radicular low back pain is a health problem with high impact on both the quality of life of an individual as well as a nation's

economy. Both sexes are equally affected between the ages of 25 and 60 by radicular low back pain. It is a condition affecting 60-80% of the world's population at some point in life and chronic it can lead to disability.

Individuals with lumbar radiculopathy present with radiating pain, reduced ROM of lumbo-sacral spine as a consequence of compression of nerve roots or bulge of intervertebral discs. Neural mobilization technique produces movement of nerves through sliders and tensioners which may improve the symptoms associated with lumbar radiculopathy. The need of the study is to determine the effectiveness of neural mobilization techniques in subjects with lumbar radiculopathy.

RESEARCH AND METHODOLOGY

Study Sample: A total number of 30 subjects, both male and female of age 20 to 50 years with Radicular low back pain are taken. All the 30 subjects who had met the criteria are included after getting consent forms from the 30 subjects, then they were divided into 2 groups by simple random sampling. Group A: Neural mobilization along with traditional therapy, Group B: Traditional therapy alone.

Sample design: Simple Random Sampling

Study Design: Randomised controlled trial.

Study Population: Subjects with Radicular low back pain

Study Setting: The study is conducted in outpatient department, department of physiotherapy, GEMS Medical College and Hospital, Ragolu, Srikakulam.

Treatment Duration: 3 sessions per week for 4 weeks with 30 mins duration Per session. Study Duration: The total duration of the study is 6 months.

Duration of intervention: 4 weeks

Materials Used: Paper, Pencil/Pen, Bed, Drape sheet, Pillow, Swiss ball.

Outcome Measure: NUMERICAL PAIN RATING SCALE (NPRS): The measurement of pain intensity was done by using the NPRS scale. It is 10 points scale. It is reliable and valid. Subjects were explained

about the scale and they were instructed to “indicate the intensity of current, best and worst pain” on a scale of zero (no pain) to 10 (unbearable pain). The measurements were taken at pre – intervention and post – intervention after the end of 4 weeks of intervention.

SAMPLE SELECTION:

INCLUSION CRITERIA

- Patients diagnosed with Lumbar Radiculopathy.
- Patients having any one or two of these i.e., L4, L5, S1, S2, S3 nerve roots involvements.
- Patients with SLRT +vet.
- Symptoms having more than 3 months.
- Male and female individuals within the age of 20-50 years.

EXCLUSION CRITERIA

- Patients having infections and/or open wounds.
- Patients with Pott's spine.
- Patients with a history of spinal surgeries.
- History of vertebral fracture.
- Patients with history of direct trauma and dislocation of spine.
- Uncooperative patients.

PROCEDURE

A total number of thirty subjects will be taken into the study. They will be divided into two groups as Group A (n=15) and Group B(n=15). The intervention of neural mobilization and traditional exercises will be given to Group A (Experimental Group). The Group B will be under traditional exercises (Controlled Group). GROUP A [EXPERIMENTAL GROUP] Subjects within group A received neural mobilization in addition to traditional therapy.

Neural mobilization

With the subjects in supine lying, this technique was performed by alternating hip flexion, knee flexion and ankle dorsiflexion with hip extension, knee extension and ankle plantar flexion while the subjects cervical and thoracic spine were maintained in

flexion. Neural mobilization was given for approximately 10 min per session including 30 sec hold and 1 min rest. The treatment was given for 3 sessions per week for 4 weeks for a total duration of 30 mins per day. Traditional exercises

Traditional exercises (back strengthening protocol) include cat and camel exercise, leg gliders, pelvic bridging, straight leg raises, cobra pose, superman pose, superman pose with Swiss ball, lunges. Each exercise was given for 30 secs with a resting period of 1 minute between each exercise; the total exercise and resting periods were 3 minutes and 6 minutes respectively. The treatment was done 3 sessions every week following neural mobilization.

GROUP B [CONTROL GROUP] Subjects within group B received traditional therapy alone.

Traditional exercises

Traditional exercises (back strengthening protocol) include cat and camel exercise, leg gliders, pelvic bridging, straight leg raises, cobra pose, superman pose, superman pose with Swiss ball, lunges. Each exercise was given for 30 secs with a resting period of 1 minute between each exercise; the total exercise and resting periods were 3 minutes and 6 minutes respectively. The treatment was done 3 sessions every week following neural mobilization in group A and traditional therapy alone was given to group B.

RESULTS

TABLE 1: Analysis of Pre and Post test Means of NPRS score in group A

GROUP A	MEAN	SD	t VALUE	P VALUE	INFERENCE
PRE	7.4	1.242	14.929	P < 0.0001	EXTREMELY SIGNIFICANT
POST	4.933	1.162			

The two- tailed P value is < 0.0001, considered extremely significant

T = 14. 929 with 14 degrees of freedom

Mean difference= 2.4667 (mean of paired differences)

95% of confidence interval of the difference = 2.1123 to 2.8211 Correlation coefficient= 0.86042

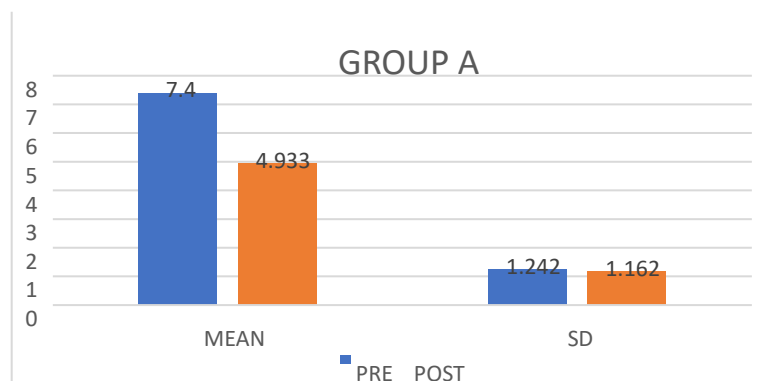


TABLE 2: Analysis of Pre and Post test Means of NPRS score in group B

GROUP B	MEAN	SD	t VALUE	P VALUE	INFERENCE
PRE	7.7333	1.1629	3.6761	P = 0.0025	SIGNIFICANT
POST	6.4667	1.4075			

The two- tailed P value is 0.0025, considered significant

T = 3. 6761 with 14 degrees of freedom

Mean difference= 1.2667 (mean of paired differences)

95% of confidence interval of the difference = 0.52763 to 2.0057 Correlation coefficient= 0.47422

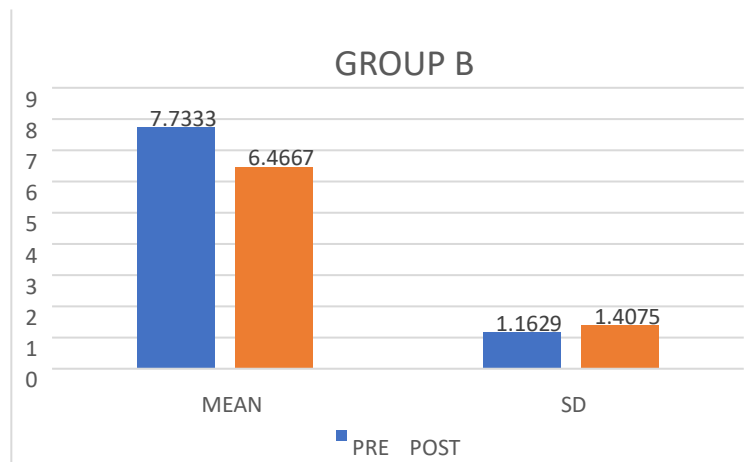


TABLE 3: Analysis of Pre-Means of NPRS score in group A and group B

GROUP	MEAN	SD	t VALUE	P VALUE	INFERENCE
GROUP A	7.4000	1.2421	0.75872	0.4544	NOT SIGNIFICANT
GROUP B	7.7333	1.1629			

The two- tailed P value is 0.4544 T= 0.75872 with 28 degrees of freedom.
 Mean difference= -0.33333 (mean of unpaired differences)
 95 % confidence interval of the differences = -1.2333 to 0.56661

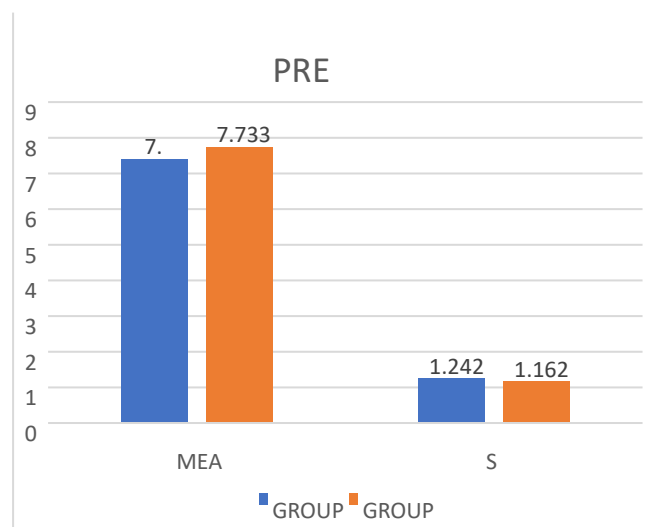
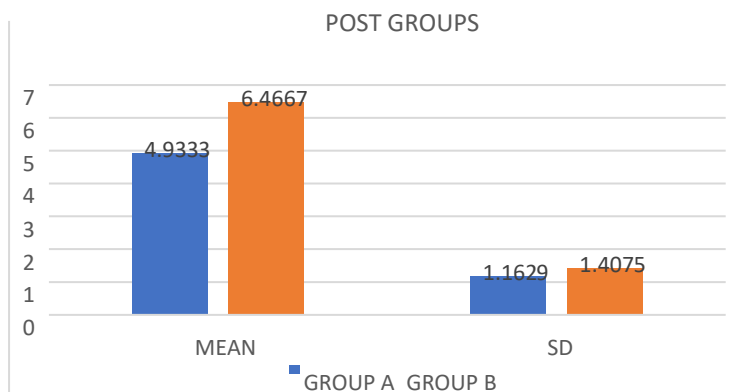


Table 4: Analysis of Post Means of NPRS score in group A and group B

GROUP	MEAN	SD	t VALUE	P VALUE	INFERENCE
GROUP A	4.9333	1.1629	3.2527	0.0030	SIGNIFICANT
GROUP B	6.4667	1.4075			

The two- tailed P value is 0.0030 T= 3.2527 with 28 degrees of freedom.
 Mean difference = -1.5333 (mean of paired difference)
 95% confidence interval of the differences= -2.4990 to -0.56770



The results were found to be statistically significant in both experimental and control groups, but there is a high significance in experimental group when compared to control group. Hence neural mobilization along traditional therapy have shown its impact on results of experimental group.

A total number of 30 participants were recruited. All the 30 subjects who had met the inclusion criteria have undergone baseline assessment and were randomized into 2 groups i.e., 15 subjects in neural mobilization along with traditional therapy in group A and traditional therapy alone in group B.

In this study 15 subjects completed treatment program in group A and 15 subjects completed treatment in group B.

To observe the treatment impact before and after the treatment in the groups and between the groups, the analysis it was carried out by statistical tests and NPRS was used as outcome measure.

DISCUSSION

The aim of the study is to find out the effectiveness of neural mobilization technique in subjects with lumbar radiculopathy. Both neural mobilization and traditional therapy are effective in decreasing pain in subjects with lumbar radiculopathy, but previous studies found that neural mobilization along with traditional therapy will have more significant effect in lumbar radiculopathy symptoms. (13)

Lumbar radiculopathy 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.(19) To determine the effectiveness of Neural Mobilization technique with traditional therapy in subjects with lumbar radiculopathy. Based on the statistical analysis, the hypothesis stating that neural mobilization reduces pain in subjects with lumbar radiculopathy can be accepted and alternate hypothesis is rejected.

A total number of 30 subjects participated in the study and randomized into 15 subjects in the experimental group and 15 subjects in the control group. Subjects in the experimental group were given neural mobilization along with traditional therapy i.e., back strengthening exercises where as in the control group received traditional therapy alone i.e., back strengthening exercises.

Outcome Measures used in this study were NPRS measures the subjective intensity of pain. It is an 11point scale from 0-10 where 0 is “no pain” and 10 means unbearable pain. It is a valid and reliable scale. (20,13)

The purpose of this study was to find out which group of treatment was more effective in reducing pain on lumbar radiculopathy symptoms. The participants were assessed by the outcome measure: - NPRS.

Experimental group (Neural Mobilization along with Traditional therapy) and Control group (Traditional therapy alone) both have shown significant difference between pre and post values of NPRS. But the subjects in the experimental group shown statistically more significance compared to the control group.

Neural tissue mobilization is the commonest methods of soft tissue mobilization which is mostly neural tissue and tissue surrounding the nervous system. In this set of groups of movements are designed to restore plasticity of the nervous system. This helps to decrease pain and inflammation thus results in improvement of axoplasmic blood flow, intraneural mobility, mechano sensitivity and intra neural blood flow. (21,22)

Previous study found that back strengthening exercises protocol improves the stability of the injured lumbar segment so that the patient's ability to fulfil task performance is increased (reduced time to complete the tasks) and they are able to perform tasks more easily and comfortably. These findings are supported by Cholewicke and Mc Gills study which demonstrated an improvement in functional ability of the post vertebral muscles followed by an increase in lumbar stability after investigation of an exercise protocol. (21,23)

Neural mobilization along with traditional therapy, there is a highly significant improvement in decreasing pain, functional disability with improvement in pain free passive SLR. The underlying cause for this is due to neural flossing effect, that is ability to restore normal mobility and nerve micro circulation as well as influence on axoplasmic and lymphatic flow within the neural tissue. The nervous system's ability to tolerate tension associated with movement results from an intra neural and extra neural anatomic design. (24,25)

Internally, the nerve has designed with undulations of tortuous nature. The nerve's ability to unfold as length increases, was described by CLARK & BEARN. They described that, nerve is able to tolerate elongation through intra neural gliding, between individual nerve fibres and their surrounding endoneurium and the endoneurium surrounding each nerve fibre. The epineurium allows excursion to Occur between it and perineurium of each fascicle. Extraneural gliding provides attenuation of tension between perineurium and epineurium. Extraneural gliding or excursion

has been demonstrated in the central nervous system and in the peripheral nervous system. Movement of the nerve root is transmitted via the dural sheath and dentate ligaments and not directly to the rootlets⁽²⁶⁾.

The results confirm that Neural Mobilization with traditional therapy provide greater improvement in pain. Hence Neural mobilization in addition to traditional therapy showed significant results in the experimental group.

CONCLUSION

The study concluded that subjects with lumbar radiculopathy who underwent Neural Mobilization along with traditional therapy showed significant results in reducing pain than who underwent traditional therapy alone.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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