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Research Article

COMPARATIVE STUDY ON IMMEDIATE EFFECT OF TWO DIFFERENT NEURAL MOBILISATION TECHNIQUES ON PAIN AND KNEE EXTENSION RANGE IN PATIENTS WITH LUMBOSACRAL RADICULOPATHY

Dharti Hingarajia*, Ridhiben Chaklashiya and Priya Munjani

Department of Physiotherapy, SPB Physiotherapy College, Surat, Gujarat, India

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ABSTRACT

Background and purpose: Different neurodynamic techniques are commonly used to reduce radicular pain in patients with lumbosacral radiculopathy. However few studies compared the effect of two different neurodynamic techniques in this population. The purpose of this study was to compare the immediate effect of slider technique and nerve flossing technique on pain and lower quadrant flexibility in patients with lumbosacral radiculopathy.

Method: forty subjects more than 25 years of age diagnosed with lumbosacral radiculopathy were randomly allocated into two groups. Group A received Slider technique and Group B received Neural Flossing Technique (NFT). Both the group received 5 sets of 15 repetitions with 2 min rest in between the sets.

Outcome measures: Numerical Pain rating Scale (NPRS) and Knee extension range of motion in slump position were measured before and immediately after intervention.

Result: Paired t test was applied for intra-group comparison and post intervention measures showed that there was significant difference in NPRS and knee extension ROM compared to pre intervention measures in both the groups. Independent t test was applied for inter-group comparison and result showed that both the groups showed no statistical significant difference in NPRS and knee extension ROM.

Conclusion: This study concludes that both the techniques used in the present study i.e. Slider neurodynamic and Nerve flossing technique are equally effective for improving pain and increasing knee extension ROM immediately.

INTRODUCTION

Lumbar spine disorders rank fifth among disease categories in the cost of the hospital care and account for higher cost resulting in absent from work and disability than any other category. [1] Lumber radiculopathy is a set of symptoms including radiating pain in lumber or sacral spinal nerve root dermatome caused by general compression or irritation of one more of five sciatic spinal nerve roots in one or both lower limbs. Lumber radiculopathy is used interchangeably with several other terms. Including sciatica, radicular pain, nerve root pain and nerve root entrapment [2, 3]

In India lifetime incidence of lumber radiculopathy varies from 13% to 40% and annual incidence from 9.9%to 25% [4,5] In 90% of the cases, herniated disc is the major cause [6,7,8] Lumber radiculopathy occurs as a result of compression and inflammation of the nerve root by protruded disc as it contains an acidic, chemical irritant leading to neural ischemic, oedema which in turn leads to chronic inflammation, scaring and perineural fibrosis and that leads to pain, numbness, tingling and muscle weakness.

The SLR test and knee extension ROM in slump test are frequently used in the assessment of patients presenting with lumbar spine dysfunction to identify the degree of impairment due to lumbosacral radiculopathy. [9]

Neurodynamics concepts are based on the biomechanical structure of peripheral nerves, neurodynamic is a set of techniques designed to restore plasticity of the nervous system, defined as the ability of nerve-surrounding structures to shift in relation to other such structures. Moreover, it contributes to restoring the ability of neural tissue itself to stretch and tension, and stimulates the reconstruction of normal physiological function of nerve cells [10] Neural mobilization is a neurodynamic technique, which is passive and therapist based technique to reduce mechanical interferences with the principle

Corresponding author:* **Dharti Hingarajia
Department of Physiotherapy, SPB Physiotherapy College, Surat, Gujarat, India

of biomechanics of peripheral nerve and mobilization of the nerve throughout the available range of motion resulting efficacy in both mechanically and physiologically. [11]

Nerve flossing technique (NFT) is a neurodynamic technique, which is actively performed by the patient. NFT as proposed by Michael Shacklock [12] is an active procedure which is mechanically and physiologically beneficial conservative treatment option [13] NFT moves the nerve through the tissues proximally and distally to the maximum possible extent by moving every joint and body part that the nerve crosses. The process is similar to stretching a cord at one end while the other is slack and then switching the direction. When the sciatic nerve becomes trapped, scar tissue builds up along the nerve fibre causing the nerve to grate along the muscle and bones. NFT puts tension on the tissue actively lengthens it and breaks scar tissue bonds, release tension in the nerve and improves mobility. [14]

Studies have proved that the efficacy of 'neural flossing' in neural mobilization has an impressive result than simply neural tension. Because many studies have shown the peripheral nerves in upper limb and lower limb has greater excursions e.g. median nerve. [15, 16]

Nerve sliding technique which is based on the neural excursion [17, 18] that is almost similar to neural flossing technique, but it is not an active releasing technique and is therapist dependent. In vivo studies, and neural mobilization study of different nerves concluded that excursion of nerves along the course has a beneficial effect reducing the radicular sign and symptoms. Literature says slider neuro dynamic technique reduces pain and increases knee extension range in patient with lumbosacral radiculopathy.

Nerve Flossing Technique and Nerve Slider technique both are effective in reducing pain in patients with lumbosacral radiculopathy. Out of these two neural mobilisations technique which is more effective is missing in the literature. Hence the purpose of present study was to compare the immediate effect of nerve flossing technique and slider technique on pain and lower quadrant flexibility in patients with lumbosacral radiculopathy.

Aims and Objectives

1. To check the immediate effect of slider technique on pain and lower quadrant flexibility in patients with lumbosacral radiculopathy.
2. To check the immediate effect of nerve flossing technique on pain and lower quadrant flexibility in patients with lumbosacral radiculopathy.
3. To compare the immediate effect of slider technique and nerve flossing technique on pain and lower quadrant flexibility in patients with lumbosacral radiculopathy.

Hypothesis

Null Hypothesis: There will be no significant difference between the effect of slider technique and nerve flossing technique on pain and lower quadrant flexibility in patients with lumbosacral radiculopathy.

Alternate Hypothesis: There will be significant difference between the effect of slider technique and nerve flossing technique on pain and lower quadrant flexibility in patients with lumbosacral radiculopathy.

METHODOLOGY

- **Study design:** Experimental study
- **Sample size:** 40
- **Study duration:** 6 months
- **Sample selection:** Purposive sampling technique
- **Study setting:** Physiotherapy OPDs of SPB Physiotherapy College, Surat
- **Population**: Patient with Lumbosacral radiculopathy

Inclusion Criteria

1. Patients diagnosed with lumbosacral radiculopathy with unilateral radiating pain by an orthopedician
2. Age ≥ 25 years
3. Positive neurodynamic test i.e. level 2 neurodynamic SLR test and Slump test.

Exclusion Criteria

1. Patients having Somatic referred pain,
2. Upper motor neuron lesion or peripheral neuropathy and
3. Those who had taken epidural steroids in the past six months.

Materials and Tools

1. Informed Consent Form
2. Screening form
3. Data Recording Sheet
4. Universal Goniometer
5. Plinth
6. Pen

Outcome measures

- Numerical pain Rating Scale (NPRS) [19]
- Knee Extension ROM [20]

NPRS was taken for measurement of pain intensity. It is taken by asking the patient to mark his/her pain On a scale of 0 to 10, with 0 being no pain at all and 10 being the worst pain imaginable, how would you rate your pain RIGHT NOW. [19]

0	1	2	3	4	5	6	7	8	9	10
No Pain										Worst Pain Imaginable

Knee Extention Range of Motion was measured using a universal goiniometer in slump position keeping the ankle joint in full dorsiflexion. The patient was asked to extend the knee in slump position keeping the neck in maximum cervical flexion and ankle in dorsiflexion. The patient was instructed to stop at the point where he starts having reproduction of symptoms .This range of motion was measured with universal goniometer. [20]

Procedure

An experimental study design was utilized. Sample size was calculated by conducting a pilot study. Power of the study was kept at 80%. It came out to be 14 in each group. Subjects will be preliminary screened based on the inclusion and exclusion

criteria the purpose of the study will be explained and a written informed consent and demographic details will be obtained from all the subjects. Based on inclusion-exclusion criteria 30 patients were selected for the study from Out-patients department of S.P.B Physiotherapy College, Surat. They were allocated to any of the two groups of equal sizes using random method by tossing a coin.

Level 2 neurodynamic SLR testing was done by flexing the hip joint keeping the knee in extention upto P1. Then, in the order to confirm to whether the symptoms are nerve related 'switch on' was done, i.e. ankle dorsiflexion for symptoms above the knee joint and hip joint adduction and internal rotation if the symptom were below the knee for structural differentiation.

Slump test was done in seated slump posture with hands kept behind the back then, the patient was instructed to flex the cervical and dorsal spine and therapist kept one hand over the occiput to make sure that patient doesn't extend the spine. Now, the ankle joint was passively taken into dorsiflexion and knee into extension upto the point where symptom were reproduced in the same area, i.e.P1. [5] Before giving the intervention the outcome measures were recorded

Intervention

Group A: Received 5 sets of slider technique. Two ended slider technique in supine lying position, because all patients selected had positive level two neuro-dynamic assessment. Hip joint was passively taken into flexion with knee flexion keeping the ankle in dorsiflexion, which was followed by hip extention and knee extention. Each oscillation was done for four seconds such that symptoms were just evoked but not provoked. Each set was of 2 minutes. A period of two minutes of relaxation was given in between two sets. [Figure-1 (A) and (B)]

Post – intervention outcome measures were taken immediately after the intervention.

Group B: NFT was performed actively by the subjects sitting on the chair or plinth. Subjects were instructed to bend knee backwards under the plinth and simultaneously move the head downwards. Then the subjects were instructed to straighten out the leg on the affected side and simultaneously move the head backward as if looking at ceiling. The subjects were instructed to lift the leg out and up in front until she/he experiences pain and should not push beyond that point .As the nerve became less sensitive; the stretching effect was increased by instructing the subjects to bring foot and toes in upward direction. NFT exercise were given 5 sets of 15 repetitions with 1 minute rest in between sets were given [Figure-2 (A) and (B)]

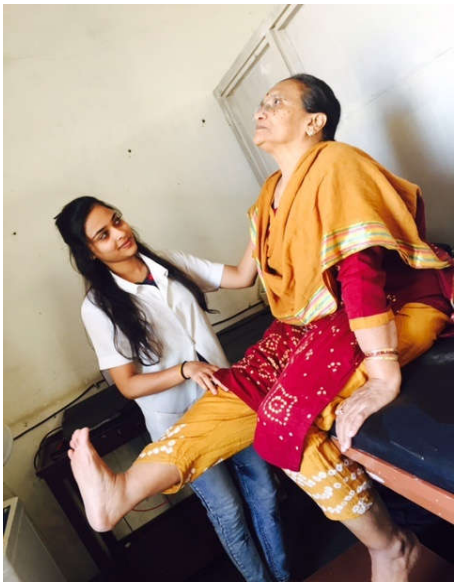
Post – intervention outcome measures were taken immediately after the intervention.

(A)

(B)

Figure-1 Slider Technique (A) hip knee extension (B) hip knee flexion

(A)



(B)

Figure 2 Neural Flossing Technique (A) Neck and knee flexion (B)neck and knee extension

Statistical Analysis

Statistical analysis was done using SPSS version 15.00 Software. This study included AGE, GENDER, BMI, NPRS, and Knee extension ROM as quantitative variables. Shapiro wilk test was applied to check the normality of data. All quantitative data of this study follow the normality ($p>0.05$). Baseline characteristics were compared to check homogeneity between intervention groups. Independent t-test was used for all the demographics and outcome measures like AGE, BMI, NPRS, and Knee extension ROM before the training.

Paired t-test was used to analyze the pre and post intervention differences within each group and independent t-test was used for between groups comparison. Confidence interval was kept 95% and the level of significance for all statistical data was set $\alpha = 0.05$.

RESULTS

Total 52 patients were assessed for eligibility. twelvw patients were excluded because they did not met inclusion Criteria. Forty patients were enrolled in the study and randomized to one of the treatment group (20 in Slider group and 20 in NFT group). There were 8 males and 12 females were in groups A and 6 males and 14 females in group B. Mean age of participants in Slider group was 51.30±12.70, and of NFT group was 45.65±6.69 in years.

The GROUP A receiving Slider technique with Mean age of (51.30±12.70), BMI score of (21.73±3.43), Pre NPRS (5.3±1.72) and Pre Knee extension ROM (5.3±1.22). GROUP B receiving NFT with mean age of (45.65±6.69), BMI score of (21.73±3.43), Pre NPRS (5.3±1.22) and Pre Knee extension ROM (4.7±1.03). All two groups were matched in term of AGE, Height, weight BMI, GENDER, VAS and SPADI, ROM. The baseline characteristics were equivalent across the intervention groups ($p>0.05$). (Table-1)

Table 1 Patient's Baseline characteristics

characteristics	Group A (Mean±SD)	Group B (Mean±SD)	t-Cal Value	P-Value
Age (years)	51.30±12.70	45.65±6.69	1.7603	0.0864
Height (Cm)	163±11.48	167.80±10.11	1.1985	0.2382
Weight (Kg)	60.40±8.838	58.00±9.94	0.8257	0.4142
BMI (Kg/m^2)	21.73±3.43	20.56±3.13	1.1268	0.2669
Pre-NPRS	5.3±1.72	5.8±1.11	1.0938	0.2809
Pre-Knee Extension ROM	5.3±1.22	4.7±1.03	1.6806	0.1011

Intra-group Comparisons was done using Paired t-test for pre intervention and post intervention outcome measures NPRS and Knee extension ROM. (Table-2 and Table-3) In GROUP A Mean±SD of Pre NPRS (5.3±1.72) and Post NPRS (2.2±1.70). In GROUP B Mean±SD of Pre NPRS (5.8±1.10) and Post NPRS (3.2±1.36). In GROUP A Mean±SD of Pre knee extension ROM 5.3±1.22) and Post knee extension ROM (2.6±1.90). In GROUP B Mean±SD of Pre knee extension ROM (4.7±1.03) and Post knee extension ROM (2.3±1.13). The result was Significant if $p<0.05$ at 95% of confidence interval. So we can say that there is significant difference between pre NPRS and post NPRS, pre knee extension ROM and post knee extension ROM in both the groups.

Table 2 Intragroup Comparision of Nprs By Using Paired T-Test

Groups	Pre intervation NPRS Mean±SD	Post intervation NPRS Mean±SD	t-Cal Value	P value
A	5.3±1.72	2.6±1.90	25.682	<0.0001
B	5.8±1.10	3.2±1.36	17.09	<0.0001

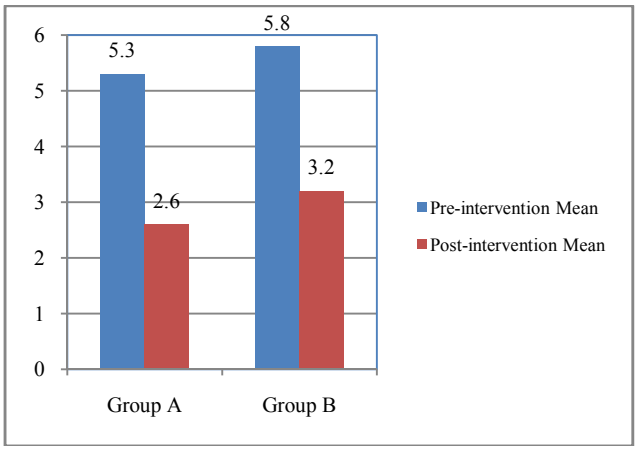
Table 3 Intragroup Comparision of Knee Extension Rom By Using Paired T-Test

Groups	Pre intervention knee extension ROM Mean±SD	Post intervention knee extension ROM Mean±SD	t-Cal Value	P value
A	5.3±1.22	2.2±1.70	11.9	<0.0001
B	4.7±1.03	2.3±1.13	10.26	<0.0001

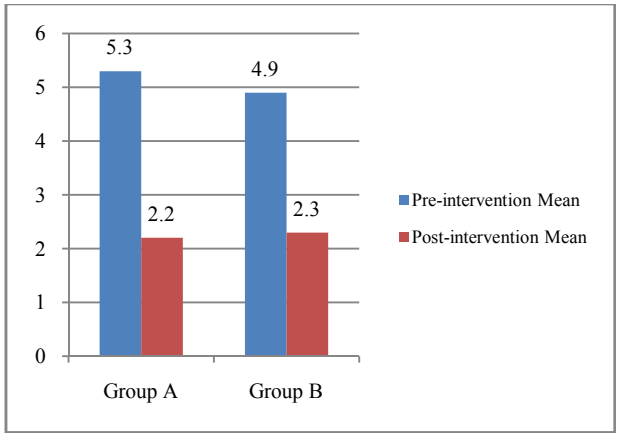
A comparison of the mean pre-post difference of NPRS and Knee extension ROM between two groups was done using independent t-test. (Table-5) It was carried out to analyze is there any significance difference between two groups. Mean difference of NPRS for GROUP A (2.7±0.47), and GROUP B (2.8±1.01), which shows no significance difference ($p>0.05$) between GROUP A and B. Mean difference of Knee extension ROM for GROUP A (3.1±1.17), and GROUP B (2.6±0.68), which shows no significance difference ($p>0.05$) between GROUP A and B.

Table 5 Intergroup Comparision of Nprs And Knee Extension Rom Using Independent T Test

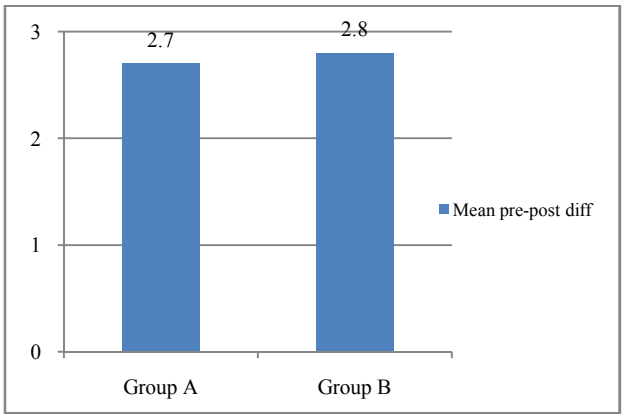
Groups	A	B	t-Cal Value	P value
Pre-post Difference of NPRS (Mean±SD)	2.7±0.47	2.8±1.01	0.40	0.69
Pre-post Difference of knee extenstion ROM (Mean±SD)	3.1±1.17	2.6±0.68	1.66	0.11



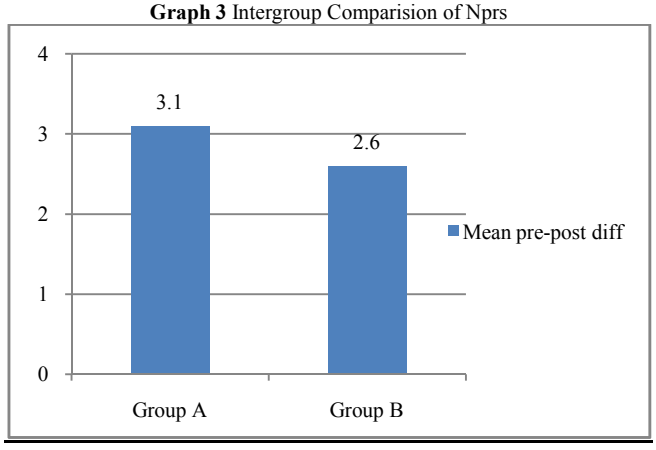
Graph 1 intragroup comparision of nprs



Graph 2 Intragroup Comparision of Knee Extension Rom



Graph 3 Intergroup Comparision of Nprs



Graph 4 Intergroup Comparision Of Knee Extension Rom

DISCUSSION

The current study was conducted to compare the immediate effect of slider technique and nerve flossing technique on pain and lower quadrant flexibility in patients with lumbosacral radiculopathy. In this study subjects were assessed for back pain by using Numerical Pain Rating Scale (NPRS) and lower quadrant flexibility by the means of knee extension ROM using Universal Goniometer.

Immediately after intervention both the techniques are effective in reducing pain and increasing lower quadrant flexibility. Both the groups showed statistically significant improvement in NPRS score and knee extension ROM post intervention compared to pre intervention measures. When compared between group both the groups showed no statistically significancant difference in reducing pain and increasing lower quadrant flexibility.

Findings of present study are matched with previous studies done either on slider technique and/or NFT. Shah Mohit B *et al* found that slider neurodynamic technique has an immediate effect in improving lower quadrant flexibility in patients with back pain and lumbosacral radiculopathy. Bhatia sweta satishkumar *et al* found NFT in addition to conventional physiotherapy can be used in improving pain and passive ROM of hip flexion, reducing disability and FABs in patients with chronic lumbar radiculopathy due to IVDP. Anikwe EE *et al* [21] found improvement in pain and hip range of motion post 2 weeks of NFT in acute sciatica due to IVDP. Another study [22] determined the efficacy of NFT in the treatment of sub-acute sciatic patients due to IVDP and reported improvement of 6.62º in PSLR.

Colakovic H and Avdic D [23] also showed that the patients treated with neural mobilization and lumber stabilization exercises improved better than the patients treated with active range of motion exercises and lumber stabilization. Nagrale AM *et al* [24] showed more reducation in pain and FABs following neural mobilization technique in addition to stabilization exercises and lumber mobilization and showed reduction of 1.96 point in NPRS and 9.57 points in the FABQ compared to control group.

Sahar M. Adel (Journal of American Science, 2011) conducted a study on sixty chronic low back pain patients to compare the effect of neural mobilization and lumber stabilization exercises and found that neural mobilization, when given with lumber stabilization exercises is more effective than exercise given alone in reducing pain (NPRS), functional disabilities (Modified Oswestry Disability Index) and H-reflex latency. [25]

Relief in pain and improvement in sensory symptoms was observed in both the groups which might be attributed to mechanisms involved in slider technique and NFT. This involves movement with large amplitude attempting to take the nerve throughout the available range of motion which potentially affects the nerve both mechanically and physiologically. The technique involves dynamic variation in pressure that facilitates evacuation of intraneural edema and reduces pressure caused by intraneural and extraneural fibrosis. NFT also caused proximal sliding of lumber nerve roots with neck and knee flexion and causes distal sliding of lumber nerve roots with neck and knee extension that improves the actual

excursion of the nerves with the mechanical interface thereby decreasing adhesions and allowing the nerve to move freely with minimal increase in tension.

There was a statistically significant improvement in knee extension ROM in both the group. This was because both the techniques are given in such a way that there is development of tension at one end releasing the tension at other end by moving various joints. This causes cephalic and caudal sliding of the nerve which leads to reduction of symptoms arising due to adhesions of the nerve with its mechanical interface. This is in accordance with a study done by Herrington Lee in which slider and tensioner both were effective in improving knee extension ROM in slump position. [38] Furthermore the significant improvement in knee extension ROM may be due to reduction in pain and improvement in sensory symptoms of LR. The long term benefits of this treatment protocol should be established.

CONCLUSION

This study concludes that both the techniques used in the present study i.e. Slider neurodynamic and Nerve flossing technique are equally effective for improving pain and increasing knee extension ROM immediately.

Limitations

1. Small sample size
2. Follow up was taken only immediately after intervention so long term effect is not known

Future Scope

1. Future study can be carried out with large sample size
2. Future study can be carried out with Long term follow up

Clinical Significance

In present study immediate effect of two different neurodynamic techniques were compared to reduce pain and increase lower quadrant flexibility. Slider technique is performed passively by physiotherapist and Neural flossing technique is performed actively by the patient. Both the techniques showed similar immediate effect on both the outcome measures. Hence therapist can use any of this technique in patients with lumbar radiculopathy to reduce pain and increase lower quadrant flexibility.

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