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Original Article

Effects of Active and Passive Lower Extremity Neural Mobilization on Pain and Functional Level in Patients with Lumber Radiculopathy

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Abstract

Background: There is increasing evidence of effectiveness of neural mobilzation in mangement of lumber radiculopathy but definite conclusion of effects of active versus passive nerve mobilzation in relieving pain and improving functional level are still uncertain.
Objective: To compare the effects of active versus passive lower extremity neural mobilizations to reduce pain improving the disability and Straight Leg Raise (SLR) in patients with lumbar radiculopathy.
Study type, settings & duration: This experimental trail (NCT-04581239) was conducted at Physiotherapy Department of Shalimar Hospital, Lahore from September 2019 to February 2020.
Methodology: A sample of 26 patients of either gender with lumbar radiculopathy were included in the study and were assigned to two treatment groups; Active neural mobilization (Group A) and Passive neural mobilization (Group B). Both treatment groups received lumbar traction and mobilization along with group specific treatment. Outcome was reported in terms of Numeric Pain Rating Scale (NPRS), Oswestry Disability Index (ODI) and Straight Leg Raise (SLR) at the start and end of treatment. Data was entered and analyzed using SPSS Version 25.
Results: The result of across the group comparison showed no significant difference in NPRS and ODI (p value > 0.05) at baseline and post treatment measurement except for SLR (p value < 0.05). Within the group analysis revealed significant difference across each of the treatment group for NPRS and ODI (p value < 0.05) except for SLR (p value > 0.05) which showed non-significant improvement with active neural mobilization only.
Conclusion: Active and passive neural mobilization are equally effective in improving disability, and reducing pain in patients with lumbar radiculopathy expect for straight leg raise which improved with passive neural mobilization only.
Key words: Neural mobilization, lumbar radiculopathy, traction, mobilization.

Introduction

Low back pain is one the chief musculoskeletal problem with which the patients consult their physical therapist. Life time prevalence of low back pain is 60-80%.[1] It may or may not be associated with lumber radiculopathy commonly called sciatica. Lumber radiculopathy is mainly referred to back originated leg pain and is due to irritation of the sciatic nerve root secondary to disc herniation, compromised musculoskeletal or neurological structures in lumbosacral region i.e. L4, L5, S1.[2] The most common presenting complain in lumber radiculopathy is sharp radiating pain from lower back area down to the leg with either numbness, tingling or both.[3] Any mechanical compression to the nerve root causes the structural damage , blockage of axoplasmic flow and increased mechanosensitivity, that ultimately affects neurodynamics of nerve resulting in radiating pain and disability.[4,5]

Conservative physical therapy intervention is commonly being practiced in clinical setting and included corset, immobilization, electrotherapy, lumber mobilization, lumber traction for the management of lumbar radiculopathy.[6-8] Now a

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Authors Contribution

AR & BA conceptualized the project. AR did the data collection. ANM & RN did the literature search. Statistical analysis, drafting, revision & writing of manuscript were done by DH & ANM.

days one of the most common intervention used to treat lumber radiculopathy is neural mobilization.[9] Neural mobilization of lower limb as described by Butler could be achieved through active or passive technique (straight leg raising (SLR) with dorsiflexion of ankle). Nerve sliding technique is frequently used and found to be more effective to increase nerve excursion with minimum stress.[10] Gurpreet et al in his study found that passive sciatic nerve mobilization is very helpful to improve the patient pain, disability and range of motion in acute cases of radiculopathy and passive straight leg raise is selective in improving sciatic nerve excursion.[11] Ui-Cheol Jeong concluded that self-mobilization is an effective mean to reduce radiculopathy pain and to improve functional outcomes of daily living.[12]

Active and passive neural mobilization both are done on sciatic nerve. No sufficient evidence is available that compare the outcomes of active or passive neural mobilization to conclude that which is more effective or superior for improving sciatic nerve mobility.[11] So the main purpose of this study was to compare the effects of active versus passive lower extremity neural mobilizations to reduce pain improving the disability and SLR in patients with lumbar radiculopathy.

Methodology

This study was a qusai experimental study (NCT 04581239) conducted at Physiotherapy Department of Shalimar Hospital, Lahore from June 2019 to February 2020. A minimum sample size of 24 patients was calculated by using G power analysis with significance level 0.05, power of study 0.9.[13] All research procedures conducted in this study were in accordance with principals set forth in the Helsinki Declaration.

Male and female patient's age ranging from 30 to 50 year complaining of mild to moderate back related leg pain for recent 6 months (NPRS > 4), disability on (Owestry disability index score > 30) with positive straight leg raise test were included. For the study lumber radiculopathy was defined as back pain radiating to back of leg and paresthesia in the sciatic nerve distribution. Clinical assessment and radiological findings were performed by radiologist in Radiology Department of Shalimar Hospital to confirm the diagnosis of lumber radiculopathy. Patients were excluded if they were having the history of any surgery or pathology of back leg and knee area, or patients showing any red flag signs such as fracture, tumor, metabolic or systemic disease. Informed consent was signed by the patients.

An 11-point numerical pain rating scale was used to document pain with minimum score of 0 (no pain) and maximum score of 10 (worst imaginable pain). A 2 point change is considered to be clinically meaningful in subjects with low back pain.[14] Oswestry Disability Index was used to measure disability associated with low back pain. It contains 10 sections with 6 questions in each scoring from 0 (No difficulty) to 5 (maximum difficulty). Higher scores indicate greater disability due to low back pain.[15] Goniometer was used to record the SLR angle.

The examiner fully extended the test limb with one arm of goniometer placed over lateral femoral condyle and other parallel to the plinth. The subject performed the leg raise and the mean of the three readings was recorded.[16]

Active longitudinal tension sciatic nerve mobilization in straight leg raise techniques was used with mobilization techniques to relax the sciatic nerves performed under the supervision of physical therapist by the patient.[12] Patients were instructed to follow the sequence of movement as extension at knee joint with the flexion at foot. Neck flexion was also added in the end to place maximum stretch on the nerves. All the steps were performed for 10 minutes including 30 sec oscillations and 1 min rest in each session.[17]

Series of oscillatory movements were applied by the therapist to mobilize the sciatic nerve with the patient lying supine and treated leg raised to the point till the pain in either back or leg limited the movement. The neural mobilization amplitude was increased as per the response of the patient and also by adding more tension to the sciatic nerve using ankle plantar flexion, foot eversion and hip medial rotation and adduction. Maximum possible range was gained of straight leg raise using this technique.

Both the groups received heating pad for 10 minutes followed by intermittent mechanical lumber traction with force of 26% of the patient's body weight was applied for 15 minutes. Then 15 to 20 repetitions of slow gentle segmental mobilization (Unilateral Posterior Anterior Glide) were applied in 3 sets at least on the first session, but may be modified based on response of the patient, or centralization and reduction of peripheral symptoms.

After signed the informed consent, patients were randomly allocated either of treatment group; active neural mobilization or passive neural mobilization using sealed envelope. Pre-treatment values for NPRS, ODI and SLR were recorded by assessor who was blinded to study objective. Each patient received two treatment sessions per week for 6 weeks as per their group assignment. Patients

were also blinded to the treatment the other group received and to ensure that blindness was maintained at the end of treatment patient's appointment were not scheduled on same day of two different treatments. All patients were assessed at base line and after 6 weeks of post treatment. Shapiro–Wilk test was used before data analysis to check the normality of data. As data was normally distributed (p >0.05) so parametric test were used with independent t test across the group, and paired sample t test within the groups comparison (baseline and post-treatment).

The Ethical approval was obtained from Institutional Review Committee of Riphah International University, Islamabad.

Results

Thirty subjects with lumbar radiculopathy participated in this study which were randomly allocated to two treatment groups after initial screening from 38 subjects. 4 patients (2 each group) were unable to complete the 6 weeks of treatment (Figure). Hence 26 patients were analyzed at the end of 6th week of treatment with their demographic detail mentioned in Table-1. Across the group comparison showed no significant difference in NPRS and ODI at baseline and post treatment measurement except for SLR (Table-2). Within the group analysis revealed significant

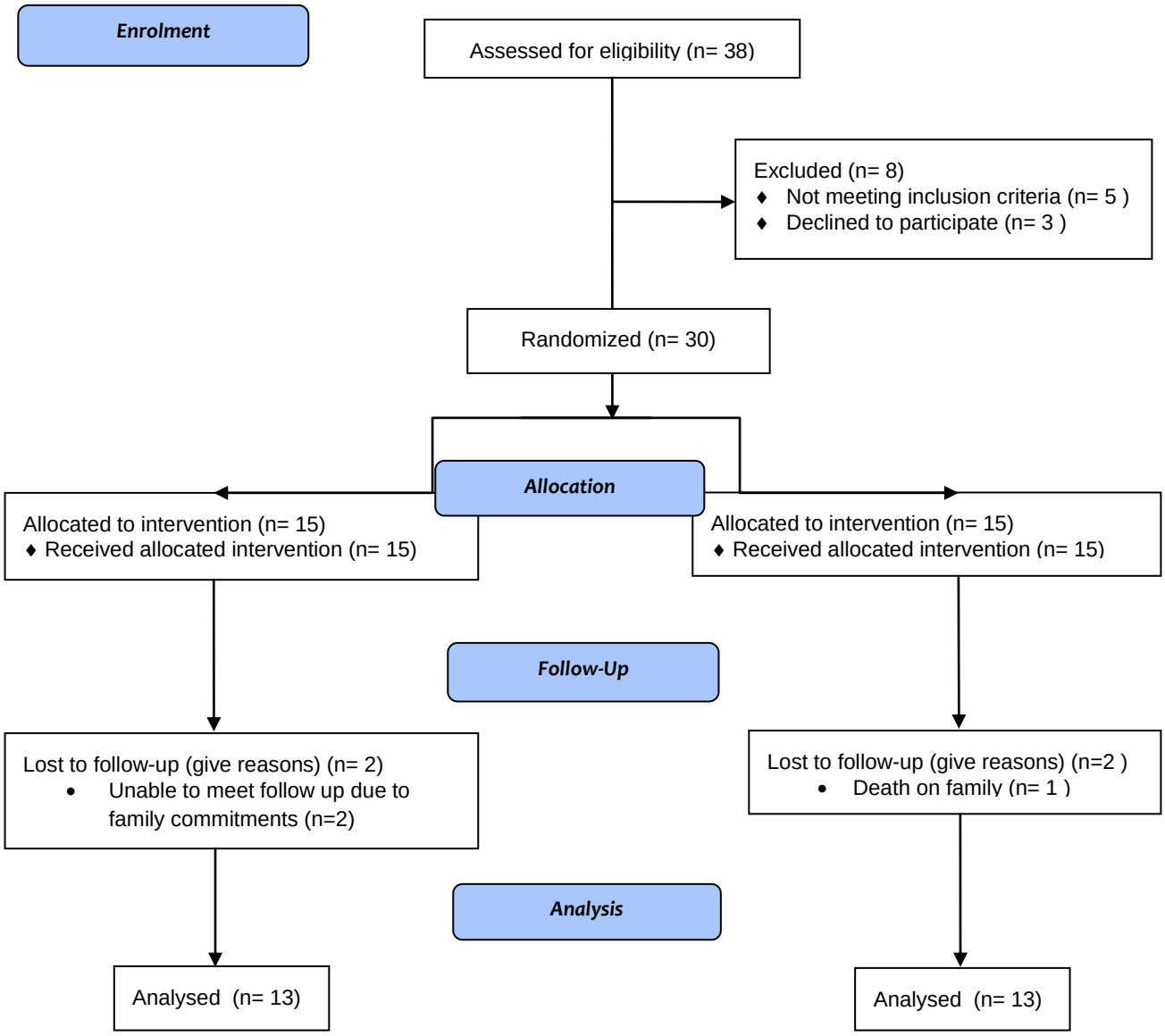

Figure: Consort flow sheet diagram of the research process.

Table 1: Demographic characteristic of the patients in two treatment groups.

		Treatment Groups		p value
		Active Neural Mobilization (n=13)	*Passive Neural Mobilization (n=13)*	
Age (Years) *(Mean ± SD)*		38.69 ± 0.53	39.81 ± 5.11	0.590[a]
BMI (kg/m^2) *(Mean ± SD)*		23.31 ± 3.21	27.92 ± 3.91	0.003[a]
Gender n (%)	Male	8 (61.5)	7 (60)	0.750[b]
	Female	5 (38.5)	6 (40)	

[a] Mann Whitney U Test, [b] Chi square Test of Independence

Table 2: Across and within the group comparison for NPRS, ODI and SLR for two treatment groups.

Outcome Measure	Treatment Groups		*Mean Difference [c] [95% CI]*
	Active Neural Mobilization (Mean ± SD)	*Passive Neural Mobilization (Mean ± SD)*	
Baseline NPRS	8.07 ± 0.85	7.92 ± 0.83	0.15 [-0.54,0.85]
Post Treatment NPRS	3.76 ± 0.83	4.07 ± 0.82	0.30 [-0.99, 0.37]
Mean Difference [b] [95% CI]	4.30** [3.40, 5.21]	3.84** [3.03, 4.61]	
Baseline ODI	48.08 ± 6.85	51.92 ± 9.37	3.84 [2.79, 10.48]
Post Treatment ODI	32.23 ± 3.72	29.92 ± 3.72	2.30 [0.70, 5.32]
Mean Difference [b] [95% CI]	15.84** [10.98, 20.72]	22.00** [15.47, 28.52]	
Baseline SLR	32.30 ± 2.59	35.38 ± 3.79	3.07* [0.44, 5.70]
Post Treatment SLR	31.00 ± 5.40	33.84 ±7.63	8.84* [2.01, 15.67]
Mean Difference [d] [95% CI]	2.69 [0.71,6.09]	8.46* [3.03, 13.89]	

[c] Across the group difference – Independent sample T test , [d] Within the Group difference – Paired Sample T test , Numeric pain rating Scale (NPRS), Oswestry Disability Index (ODI), Straight Leg Raise (SLR), * *p* value < 0.05, ** *p* value <0.001

difference across each of the treatment group for NPRS and ODI except for SLR which showed non-significant improvement with active neural mobilization only (Table-2).

Discussion

The main purpose of this study was to determine the effects of active or passive sciatic nerve mobilization along with lumber traction and lumber mobilization in reducing pain and disability and increasing SLR in patient with lumber radiculopathy after six weeks of treatment. Findings of this study showed that both interventions were equally effective in reducing pain and disability. However, passive neural mobilization was more effective in improving straight leg raise compared active neural mobilization. Similar findings were also stated in previous studies [17] where the combination of intermittent lumber traction and neural mobilization to mobilize lower extremity nervous structure decreased low back pain, increase SLR and functional abilities of patients with radiculopathy.

Passive neural mobilization was also found effective in term of improving pain and disability passive SLR neural mobilization was found only during acute phase of radiculopathy.[11] Although he patients included in the current study were both acute and chronic, passive neural mobilization was equally effective for both contrary to the previous finding. Degenerative changes due to growing age, spinal range of motion reduces and limits neural excursion as well.[18] Hence when the spinal mobilization is combined with the neural mobilization in lumber radiculopathy, it improve the restriction, increase the ROM, decreases the mechanical stress on neuronal tissue and lowers the pain by reducing the sensitivity over the nerve.[19] Spinal Mobilization with Leg Movement (SMWLW) is another technique where mobilization is performed by the assisting therapist while patient actively performs active leg movement.[20] Previous studies have reported that SMWLW as an adjunct to the passive neural mobilization used with or without conventional therapy in improving pain and functional disability. These finding also supports the used of spinal mobilization and lumbar traction, when used in conjunction with neural mobilization techniques results in better outcome in lumbar radiculopathy.[21,22]

So current study also shows the similar result that neural mobilization is an effective intervention in lumber radiculopathy in term of reducing pain improving SLR and ODI. Literature is available regarding the efficacy of active and passive neural mobilization to the best knowledge of researcher no study is available which is comparing the benefits of active versus passive sciatic nerve mobilization along with lumber traction and lumber mobilization. Active neural mobilization may be self-administered but passive neural mobilization

requires therapist or assistant and more effective in improving SLR. Passive neural mobilization is also found to be more easy to administer in patient with acute radiculopathy pain than active neural mobilization which at times aggravates the symptoms.

Active and passive neural mobilization along with lumber traction and lumber spinal mobilization are effective in term of improving pain and disability in lumber radiculopathy patients. However passive neural mobilization is more effective than active neural mobilization in improving straight leg raise.

Conflict of interest: None declared.

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