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Effect of neurodynamic mobilization on pain and function in subjects with lumbo-sacral radiculopathy

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Abstract

Neurodynamic mobilization is a set of techniques designed to restore the plasticity of the nervous system and the ability of neural tissue to stretch and tension along with pain alleviation and functional improvement.The study aimed to determine the effect of neurodynamic mobilization on pain and function in subjects with lumbo-sacral radiculopathy.24 males and females between 25-50 years of age having low back pain radiating to any one lower limb since more than 3 weeks were randomly allocated into two groups.Group A received neural mobilization and conventional treatment.Group B received conventional treatment alone.Intervention was given for 6 sessions on 6 days/week.Pain and function were measured using Numerical Pain Rating Scale(NPRS) and Modified Oswestry Disability Index (MODI) respectively.Location of symptoms was also recorded using a body diagram.There was a significant difference in pain at rest and pain during activitywithin each group, but only group B showed significant difference in function. Pain during activity showed significant difference in group A over groupB(U=-1.47;p=0.04) along with function(U=-1.52;p=0.02). Compared to conventional treatment, there is significant decrease in pain during activity and improvement in function following neurodynamic mobilization,however there is no significant improvement pain at rest.

Keywords: Straight leg raise, function, pain, neurodynamic, lumbo-sacral radiculopathy

Introduction

Low back pain (LBP) is the most common health issue ranking fifth among disease categories in the cost of hospital care and accounts for higher costs resulting in absenteeism from work and disability. Lifetime prevalence of LBP has been reported to be 60-85%. Lumbo-sacral radiculopathy is a mechanical compression of dorsal lumbar and/or sacral nerve roots, resulting in radiating pain in lower extremity often with tingling, numbness, paresthesia, and/or muscle weakness. It has a multi-factorial etiology ranging from herniated disc, spinal canal stenosis, buckled ligamentum flavum, osteophyte formation. Surgery has been reserved for those who do not respond to clinical rehabilitation approaches which commonly employ bed rest, lumbar corsets, physical modalities, manual therapy and exercises.

Radiculopathy is pathology of neural tissues in which the physiological property of the nerve is altered to mechanical stresses.

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Neural mobilization is a set of techniques designed to restore the plasticity of the nervous system defined as the ability of nerve-surrounding structures to shift in relation to other such structures. Neural mobilization was described by Maitland in 1985, Elvey in 1986 and Butler refined it in 1991 as an adjunct to assessment and treatment of neural pain syndromes including radicular low back pain. Michael Shacklock [1] in 1995 described that neurodynamic mobilization contributes to restoring the ability of the nervous tissue itself to stress and tension, and stimulates the reconstruction of normal physiological function of nerve cells along with pain alleviation and functional improvement. A study by Ghadam Ali [2] concluded that abnormal neurodynamic responses and consequently symptoms in patients with chronic radiculopathy may be due to a pathomechanic problem and deficiency in neural adjustment for movement and tension transfer. Neuromobilization techniques can increasingly useful in treatment of abnormal neural tensions and removing chronic radiculopathy symptoms. However, this research was a case study and lacks good quality evidence. Owing to the prevalence of LBP and lumbo-sacral radiculopathy in India, and the amount of physiological and psychological stress it induces, there is a need to determine the efficacy of interventions which aid in LBP and its associated symptoms. A wide range of physical therapy interventions have been proposed to be effective,

however the efficacy of neurodynamic mobilization is still undermined in developing countries like India [3].

Hence, the aim of the study was to determine the effect of neurodynamic mobilization in subjects with LBP along with lumbo-sacral radiculopathy.

Material and methods

A quasi experimental study was conducted at the physiotherapy department of General Hospital.24 males and females between 25-50 years of age having low back pain radiating to any one lower limb since more than 3 weeks, Straight Leg Raise(SLR) test with structural differentiation positive for neural involvement, were randomly allocated into two groups [4]. Individuals were excluded if they had other forms of arthritis,acute inflammation,traumatic spinal or lower limb injury,serious spinal condition such as infection, tumors, osteoporosis,spinal fracture, history of spinal surgery,had taken corticosteroids, epidural injections,sedatives or opioids within the previous 3 months; or had any major limiting cardiovascular and neurological deficits. Nature and purpose of the study was explained and informed written consent was obtained in their understandable language.

Conventional treatment remained common to each group and consisted of Hotpack application over low back region for 10 minutes in prone lying position followed by core stabilization exercises. Core stabilization was given for transverses abdominis muscle in crook lying position using manual palpatory technique. Set of 10 repetitions was performed. Isometric back exercises were also performed in a set of 10 repetitions each. Group A received neuro-dynamic mobilization1 additionally. SLR test was performed on day 0, and nerve bias was determined. Level of treatment was determined based on the location of symptoms and remote or local slider/tensioner technique was decided accordingly. Group B received conventional treatment alone. Intervention was given for 6 sessions on 6 days/week.Pain and function were measured using Numerical Pain Rating Scale(NPRS) and Modified Oswestry Disability Index(MODI) respectively at 0 week and 1 week [5,6]. Location of symptoms was also recorded using a body diagram by Wernicke Duration of symptoms was recorded in months. Movement bias was also determined [7].

Statistical analyses

Level of significance was set at 5%. Data was analyzed using SPSS version 20.00 by IBM. Variables were checked for normal distribution using Histogram. There were 11 males and 13 females with mean age of 38.50 + 5.73years in group A and 37.55 + 7.59 years in group B. baseline measures such body mass index (BMI), Location of Symptoms, Duration of symptoms, was checked for homogeneity. For NPRS at rest and during activity, Wilcoxon signed rank test was used for within the group analysis, and Mann Whitney U test for between the group analyses. For MODI, Wilcoxon signed rank test was used for within the group analysis and Mann Whitney U test for between the group analyses. There was a drop out of 1 subject in group A and 2 subjects in group B; single imputation analysis was used for their analyses.

Results

Age in group A(38.36+5.99) and group B(37.55+7.59) showed no difference (p=0.49). Other baseline measures between the groups were also similar (p>0.05), shown in table 1. Comparison of difference in mean NPRS at rest, NPRS at activity and MODI scores within group A and B is shown in tables 2, 3 and 4 respectively. There was a significant difference in pain at rest (z=-2.39; p=0.017), pain during activity (z=-3.08;p=0.002)and function(z=-2.33;p=0.020)within groupA.There was a significant difference in pain at rest(z=-2.00;p=0.046) and pain during activity(z=-2.88;p=0.004)but not in function(z=-0.74;p=0.461) within groupB. Differences in outcome measures between the group is shown in table 5. Pain during activity showed significant difference in group A over group B(U=30.90; p=0.012) along with function (U=37.00;p=0.033). Pain at rest showed no difference between the groups (U= 46.00; p=0.10).

Table 1. Baseline Measures in group A and B

No.	Variable	Group A	Group B	p Value
1.	Age (years)	38.50 + 5.73	37.55+7.59	0.49
2.	BMI (Kg/m2)	22.70 + 3.29	21.78 + 2.84	0.75
3.	LOS*	5.00 + 4.00	5.00 + 3.00	0.93
4.	DOS** (Months)	3.5 + 1.00	4.0 + 1.00	1.00
5.	NPRS at rest	2.58 + 1.00	2.42 + 1.24	0.69
6.	NPRS at activity	6.33 + 1.55	5.83 + 1.47	0.39
7.	MODI	41.67 + 2.67	41.33 + 3.23	0.70

*LOS: Location of Symptoms; **DOS: Duration of Symptoms

Table 2. Mean difference in NPRS at rest within the group

Group	Pre NPRS	Post NPRS	p Value	Z-value
A	2.58 + 1.00	1.45 + 0.50	0.017*	-2.39
B	2.42 + 1.24	2.08 + 1.00	0.046*	-2.00

*Significant

Table 3. Mean difference in NPRS during activity within the group

Group	Pre NPRS	Post NPRS	p Value	Z-value
A	6.34 + 1.16	3.64 +1.92	0.002	-3.08
B	5.83 + 1.47	4.70 + 1.13	0.004	-2.88

*Significant

Table 4. Mean difference in MODI within the group

Group	Pre MODI	Post MODI	p Value	Z-value
A	41.67 + 2.67	39.27 + 3.74	0.020*	-2.33
B	41.33 + 5.86	40.67 + 2.57	0.461	-0.74

*Significant

Discussion

Results of the present study showed significant difference in pain and function following neuro-dynamic mobilization in combination with conventional treatment. Conventional group also showed improvement, however, improvement in pain and function was more in neuro-dynamic group.

McCracking et al. tested the long-term effects of neurodynamic treatment technique for a patient with non-specific low back pain (LBP) and lower extremity (LE) [8]. They concluded that slump stretching, was shown to be effective in the management of patients with non-radicular LBP when combined with lumbar mobilization and exercise. Similarly, in the present study, neuro-dynamic mobilization when combined with conventional exercises was found to be better than conventional exercises alone.

Cleland et al and Gladson et al mentioned that when the nerve root was compressed and microcirculation was compromised; and the pressure received by the nerve will affect the edema and the demyelination, neurodynamic techniques consists of short oscillatory movements and was sufficient to disperse the edema, thus alleviating the hypoxia and reducing the associated symptoms [9,10]. It could also be directly associated with the immobilization reduction in the neurogenic inflammation. In addition, there is the hypothesis that nerve movement within pain-free variations can help to reduce nerve compression, friction and tension, therefore decreasing its mechanosensitivity. Therefore, a neurodynamic technique seems to be a better form of treatment when compared to passive stretching alone.

McGill stated that if the nerve root is impinged and cannot slide, instead of moving, the pain was elicited along the nerve trunk [11]. The concept of nerve gliding plays a major role in formulating a treatment plan for nerve mobilization. Blood circulation and axonal transport, which are necessary for the functional and structural integrity of a neuron, will recover after the removal of the pressure by neurodynamic techniques was performed for reducing pressure caused by intraneural and extraneural fibrosis, increasing vascular and axoplasmic flow, and restoring tissue mobility.

Neural mobilization (Leseague) along with conventional treatment was found out to be more effective in relieving low back pain as well as improving the range of SLR than conventional treatment alone by Sharma V et al.[12]. Outcome measures were recorded after 0, 3rd, 6th, 9th session. At the end of 6th session improvement was noted in pain, SLR ROM. Much in line with this, after 6 sessions if neuro-dynamic mobilization, significant improvement was noted in pain at activity and function compared to conventional treatment alone.

Neural mobilization by Butler and Jones was shown to result in significant improvement in pain and short term disability as concluded by Sahar Adel et al. [13]. It also resulted in promoting centralization of symptoms in a group of patients with low back dysfunctions.

Pallipamula K et al utilized nerve flossing technique with other modalities in the treatment of sub-acute sciatic patients due to prolapsed and extruded disc [14]. Total 5 sets were given for six consecutive days. This technique is similar to step 6 (i.e two ended sliders) of neuro-dynamic mobilization. Even in asymptomatic subjects, neural mobilization is known to improve range of motion, strength and agility in a study reported by Tejashree D et al. [15]. They investigated the immediate and carryover mechanical effects of neural mobilization and concluded that neural mobilization using sliding technique had an immediate effect on ROM, strength and agility. They compared neural mobilization with sham control intervention and suggested that the mechanistic effects of experimental group are potentially related to anatomical positions that specifically stress neural and/or vascular tissues, rather than nonspecific effects.

The nervous system as a whole is a mechanically and physiologically continuous structure from the brain to the distal ends of the peripheral nerves. This means that mechanical or physiological changes anywhere in the CNS can have an impact on the entire nervous system. This concept of mechanical and physiological continuity is applicable between the CNS and Peripheral Nervous System (PNS), and must be taken into account when assessing patients with pain.

Long term follow up of the subjects was not taken and medications were not taken into consideration. Future studies considering these two parameters can be done. A similar study can be undertaken with lumbar stabilization exercises using pressure biofeedback to enable higher objectivity.

Conclusion

There is improvement in pain and function following neuro-dynamic mobilization. Pain reduces following conventional treatment, but there is no improvement in function. Compared to conventional treatment, pain during activity and function improves following neuro-dynamic mobilization; however, there is no significant improvement pain at rest.

Conflict of interest

Authors declare that there is no conflict of interest regarding the publication of this paper.

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