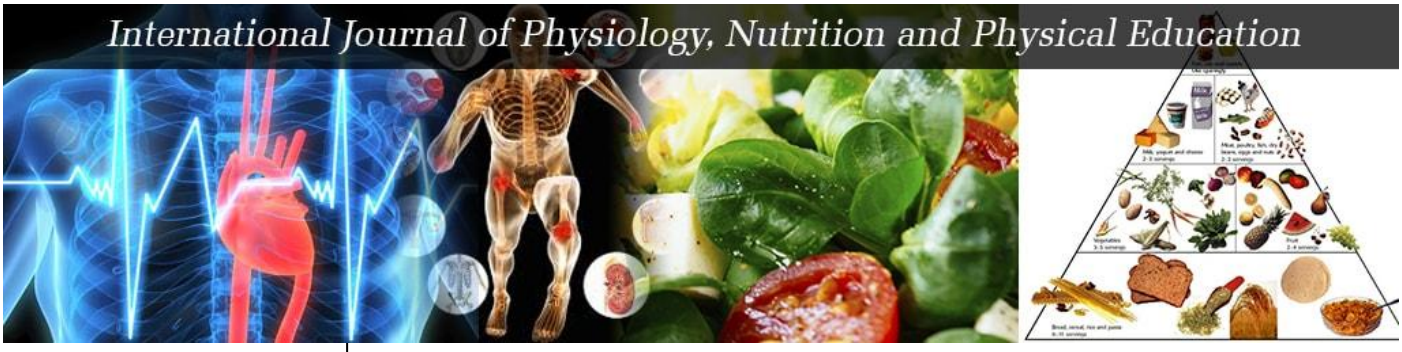

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A comparative study on effects of two different techniques of neural tissue mobilization in subjects with lumbosacral radiculopathy

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Abstract
Background and purpose: Chronic low back pain is a common problem in the present time. It is commonly associated with altered mechanical tension in the peripheral nerves as tested by straight leg raising or slump tests. The purpose of this study is to compare the two treatment techniques of neural tissue mobilization in subjects with lumbo-sacral radiculopathy.
Method: An experimental study with randomised controlled design was conducted, having 30 subjects with lumbosacral radiculopathy which were divided into two equal groups by simple random technique. Before the treatment pre-test measurement was taken using NPRS (numerical pain rating scale) and modified oswestry disability index (MODI) scale. Group A received straight leg raising technique with conventional treatment for 6 times per week (6 sessions) and group B received slump stretching technique with conventional treatment for same. Both the group received treatment for 1 week. At the end of 6 sessions again the outcomes were measured.
Statistical analysis: Paired t-test was used for within group analysis of pain and function. Unpaired t-test followed by post was employed for between group comparisons.
Result: Overall subjects in both groups improved over the 1 week. But statistically significant improvements were found in slump stretching technique group than straight leg raising group.
Conclusion: Slump stretching is better than straight leg raise stretching in improving pain and function in lumbosacral radiculopathy.

Keywords: Low back pain, neural mobilization, straight leg raise, slump

Introduction
Low back pain (LBP) is still one of the most severe health problems in all developed societies despite of the increasing knowledge related to spinal diseases. The importance of the problem was attributed to its psychological and socioeconomic effects and the lack of the effective treatments that have been suggested [1, 2, 3]. Disability associated with low back pain (LBP) continues to rise; prevalence of low back pain 23.09% in Indian population [4]. Lumbar conditions are divided into non radicular & radicular conditions [5]. Non-radicular symptoms lack nerve root involvement. The clinical diagnosis of non-radicular low back pain (NRLBP) is made by ruling out hard neurological involvement [5]. Low back pain (LBP) is commonly categorized into acute, subacute and chronic. It is often self-limiting so many resolve with or without treatment [6]. Low back pain is defined as chronic after 3 months because most of normal connective tissue heals within 6-12 weeks unless patho-anatomic instability persists. The intervertebral disc is the common cause of back pain and the most common cause of radiculopathy [7] In approximately 90% of the cases of radiculopathy is caused by herniated disc with associated nerve root compression but lumbar stenosis and less frequently tumours are the possible causes [8]. Chronic low back pain with radiculopathy occurs in approximately 3-5% of the population, and men and women are affected equally, although men are most commonly affected in their 40s and women are affected commonly between ages 50-60, of those who have this condition [9].
Several treatment modalities have been recognized to date. There are various interventions available for this which includes Transcutaneous Electrical nerve stimulation, Traction, Therapeutic ultrasound, Thermotherapy, EMG Biofeedback, Spinal manipulations,

Neural mobilizations, Exercises and various other manual therapy techniques. Neural mobilization are one of the manual therapy techniques used in spine care programs in an effort to decrease pain and to improve range of motion and activities of daily living. In recent years, neuro-dynamic test procedures have been used as interventions to potentially resolve abnormal physiology within the nervous system. The full spectrum of presentations likely to respond may not have been fully identified; however, Patients with LBP and that do not respond to directionally specific trunk exercises and who do not present with radiculopathy have responded to slump stretching as an intervention [5]. It is commonly associated with altered mechanical tension in the peripheral nerves as tested by straight leg raising or slump tests. These maneuvers are used for treatment of such disorders. Both the straight leg raise and slump stretching techniques have been found to be beneficial in the treatment of low back pain with distal symptoms.

A comparison of the two techniques will determine if one technique is better than the other. Also, it will add to the evidence for their effectiveness in managing symptoms in patients with low back pain. Measurement of parameters were taken by modified oswestry disability index. In which inluding parameters are pain, active mobility, function activity like 10 objects [10]. Total score of MODI is 100%. Test retest reliability of MODI is 0.83 to 0.99. Intra-class correlation coefficient of 0.84 to 0.94 [11]. The purpose of this study is to compare the two treatment techniques of neural tissue mobilization in subjects with lumbo-sacral radiculopathy Objective of this study is to evaluate the comparative effectiveness of straight leg raise and slump stretching on pain and range of passive straight leg raise in subjects with low back pain. The aim of this study to evaluate the comparative effects of straight leg raise and slump stretching on pain and functional activities in subjects with lumbosacral radiculopathy.

Methodology

The proposed study was simple randomised control trial. It was pretest, posttest experimental study. 30 subjects were selected by means of simple random sampling procedure. It was 1 week study. This study was conducted at Shree B. G. Patel College of Physiotherapy, Anand. Subjects with age groups of 18 to 60 years, having symptoms referred distal to the buttocks, reproducing symptoms with straight leg raise testing between 45° to 70°, having mild to moderate pain (2 to 6 on NPRS) & baseline modified Oswestry disability index score greater than 10% included in this study Patients with ‘‘red flags’’ for a serious spinal condition (e.g. infection, tumors, osteoporosis, spinal fracture, etc.), pregnant women, history of spinal surgery, osteoporosis, inability to hold the slump stretching position, reproduction of symptoms on neck flexion part of slump test, exhibited a straight leg raise (SLR) test of less than 45°, lumbar spine pathologies like spondylolisthesis, spondylolysis, spinal canal stenosis, spinal deformity, diabetes mellitus, infective or metabolic polyneuropathy, ankylosing spondylitis, systemic cause of backache were excluded from this study.

Thirty subjects with age group of 18 to 60 years having the lumbosacral radiculopathy syndrome were selected according to the baseline inclusion criteria. Patients consent was obtained and were allocated into two equal groups. Group 1 received 6 sessions of straight leg raising and conventional treatment. Group 2 received 6 sessions of slump stretching and conventional treatment. Pretest measurement were taken for pain by NPRS and function by modified oswestry disability index (ODI). By the end of the 1st week post test were taken as similar to the pretest measurement.

Technique

Group-1 (straight leg raise stretching and conventional treatment) received.

Straight leg raising technique

The subject was supine and relaxed in the center of the bed, with one pillow under the head. The trunk and pelvis was in neutral position. While the therapist was standing beside the affected side and raised the affected side perpendicular to the bed in standard straight leg raise test with one hand placed under the ankle joint and the other hand placed above the knee joints until either pain in the back or referred pain to the leg restricted the movement. Then the lower limb was taken down few degrees from this symptomatic point. The therapist stretched (mobilized) the sciatic nerve by a sequence of gentle oscillations toward ankle dorsiflexion and then reassessed the effect. The number of these sequences were repeated several times, through which the amplitude of the technique was increased according to the patient response. The technique was progressed to a point where symptoms were where resistance of the movement was encountered. As the pain was relieved, the therapist increased the range of motion until reaching the maximum range of straight leg raise with pain frees. The position was held for 30s. of 3-5 repetitions of stretches were performed in each session based on patient response [12, 13].

Conventional treatment includes TENS and lumbar stabilization exercise. TENS was given for 10 minutes. Lumbar stabilization exercise for 6 sessions, 6days /week.

Group 2: (slump stretching and conventional treatment) received.

Slump stretching technique

Slump stretching was performed with the patient in the long sitting position with the patient’s feet against the wall. The therapist applied over pressure into cervical spine flexion and knee extension to the point where the patient’s symptoms were reproduced. The position was held for 30 seconds. 3-5 repetitions of stretches were performed in each session based on patient response [12, 13[.

Conventional treatment includes Tens and lumbar stabilization exercise. TENS was given for 10 minutes. Lumbar stabilization exercise for 6 sessions, 6days /week. After six sessions, both groups' final readings of the outcome measures were taken.

Result and statistical analysis

Group- 1: straight leg raising technique

Group- 2: slump stretching technique

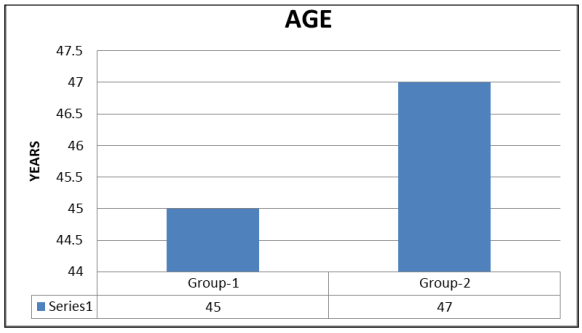

Fig 1: Demographic data (AGE)

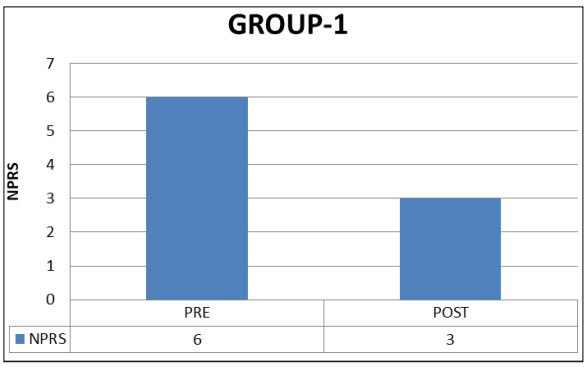

Fig 2: comparison of pre & post NPRS in group=1 by paired 't' test At 95% confidence interval = "1.345 to 16.45" -In this test 't' calculated value > 't' tabulated value.

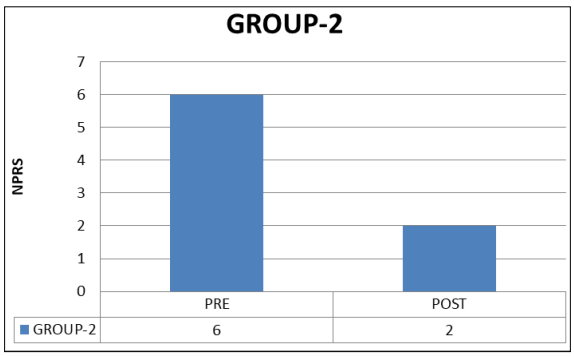

Fig 3: Comparision of pre & post NPRS in group=2 by paired 't' test At 95% confidence interval = "1.450 to 13.45"-In this test 't' calculated value > 't' tabulated value.

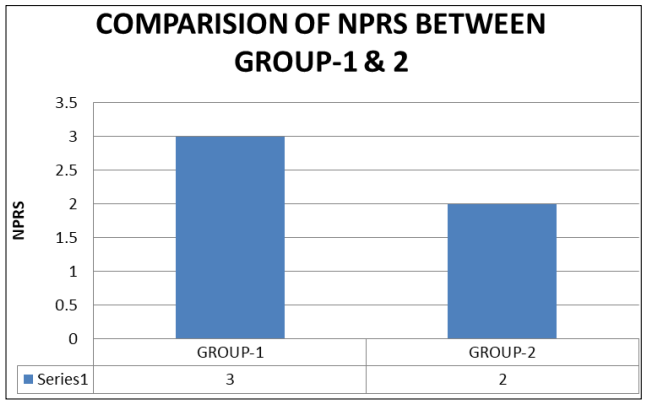

Fig 4: Comparision between Group-1 & Group-2 by unpaired 't' test. At 95% confidence interval = "-3.964 to 12.46" -In this test 't' calculated value > 't' tabulated value

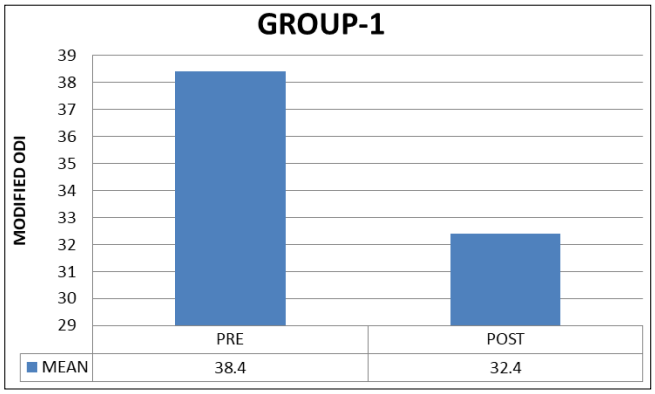

Fig 5: Comparision of pre & post Modified ODI in group=1 by paired 't' test At 95% confidence interval = "1.089 to 15.02" -In this test 't' calculated value > 't' tabulated value.

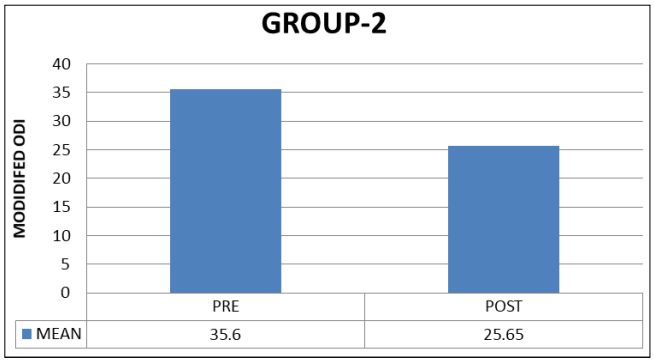

Fig 6: Comparision of pre & post Modified ODI in group=2 by paired 't' test At 95% confidence interval = "1.065 to 17.38" -In this test 't' calculated value > 't' tabulated value.

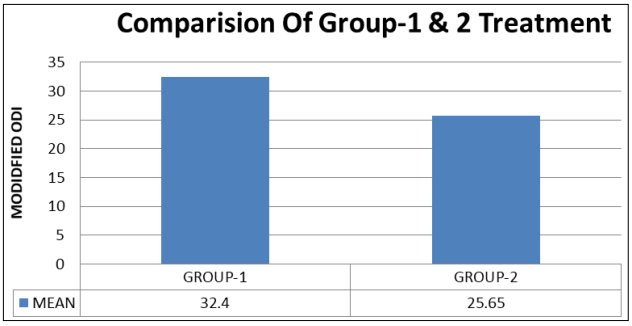

Fig 7: Comparision between Group-1 & Group-2 by unpaired 't' test. At 95% confidence interval = "-2.964 to 16.46" -In this test 't' calculated value > 't' tabulated value-So, null hypothesis is rejected and this study is significant.

From the statistical analysis

There was significant improvement in pain on NPRS and Modified Oswestry disability index in both the groups. However the reduction of pain and function is much greater in Group-2 when compared to Group-1.

Discussion

The results of present study showed that both the techniques are effective in improving radicular pain and functional mobility symptoms. However more improvement was found in slump stretching neural tissue mobilization technique with conventional therapy group compared to straight leg raising neural tissue mobilization technique with conventional therapy group. Demographic data of both the groups were found to be similar with exception of duration of symptoms. Base line clinical characteristics showed similarity in Modified ODI scale. Out of 30 subjects, 15 subjects were given straight leg raising neural tissue mobilization technique with conventional therapy and other 15 subjects were given slump stretching neural tissue mobilization technique with conventional therapy. Data of these subjects were analysed for intention to treat analysis. None of patients included in study reported of any kind of trauma or surgery. At baseline both the groups showed similarities with regards to Modified ODI scale. Then after treatment was given to both the groups for 1 week and post-test measurement was taken again by Modified ODI scale. The data were analysed with paired and unpaired 't' test with 95% of confidence interval. This indicates that the most beneficial effect can be achieved with slump stretching neural tissue mobilization technique.

In the present study it was found that there is a statistically significant improvement in pain, functional mobility with slump stretching neural tissue mobilization technique with conventional therapy group. A number of physiological benefits have been found with neural mobilization that might be responsible for reducing pain. An appropriate explanation for the improvement of pain level and functional disability as by neural mobilization is that it affected the mechanical properties of peripheral nerves, and this alteration in nerve mechanics lead to direct effect on nerve physiology [14, 15] It has been reported that neural mobilization generated various amounts of longitudinal nerve excursion and strain [12, 14, 15]. Neural mobilization techniques helped in restoring the movement between the nerve and surrounding structures through the gliding movement. Therefore, the intrinsic pressures on the nervous tissue were decreased and consequently enhanced the nerve function [12, 19, 20, 21].

Compression of the nerve root because of disc herniations hindered the blood flow of the nerve root [22], this alteration of the microcirculation of the nerve lead to pain and release of inflammatory mediators [23]. Furthermore, block of neural conduction, edema, and mechanical sensitization resulted also from compression of nerve root [24, 25, 26]. Also, neural mobilization technique enhanced intraneural blood flow, axoplasmic flow, sympathetic activation. Furthermore, it help in dispersion of tissue fluid and diminishing intraneural oedema [16, 17, 21, 26].

These findings came in concurrent with Cleland *et al*. who reported that nerve root compression impede nerve root microcirculation leading to nerve edema and demyelination and application of neural mobilization technique alleviate and dissipate the edema [26]. In another study conducted by Brown *et al* found neural mobilization technique can reduce or prevent intraneural edema of the tibial nerve as result of increased fluid dispersion [27]. Neural mobilisation is considered to improve neurodynamics, axoplasmic flow, maintaining dynamic balance between neural tissue and surrounding mechanical interfaces and thus dampening the mechanosensitivity [19, 29]. With this conceptual knowledge, using neural mobilisation as an added component to stretching is though attracting much attention of professionals who aim at achieving better results on muscle flexibility, however, only few studies so far have been undertaken to scientifically substantiate the effects of neural tissue mobilization on muscle flexibility [29]. Webreight *et al*. compared the effects of 30 seconds of static stretching with 30 seconds of active stretching in neural slump position given twice daily for 6 weeks and they found both the interventions improved hamstring flexibility but not were significantly different when compared to each other [29]. Perhaps the slump stretching was effective in reducing the patients pain by dispersing intraneural edema, thus restoring pressure gradients, relieving hypoxia and reducing associated symptoms [30].

Slump stretching may also have resulted in improved outcomes by reducing antidromic impulses generated in C-fibers at the dysfunctional site which result in the release of neuropeptides and subsequent inflammation in the tissues supplied by the nerve [21]. Hence if normal neurodynamics are restored by alleviating any sites of neural compression, excessive friction or tension, antidromically evoked impulses may perhaps be eliminated. It is also possible that slump stretching may have resulted in a reduction of scar tissue, which had adhered to neural tissue and its associated connective tissue structures [31]. Although preliminary evidence exists in support of the validity of the slump test in identifying neural tissue involvement [18], the possibility that the source of pain was derived from structures other than the neural tissues cannot be eliminated. Therefore in present study the mechanisms behind the effectiveness of slump stretching technique is based on the neurophysiologic effect on pain reduction, correction of mechanical dysfunction and positional fault. Thus, promoting alleviation of pain, restoring ROM and earlier return to function.

Limitations of the study

Limited number of subjects and lack of long-term follow up is a limitation. There is a wide variation in the age of the subjects included in the study. Subjects from all professions and thus different activity levels were included.

Conclusion

From the results of the study, it can be concluded that slump stretching is better than straight leg raise stretching in improving pain and function in lumbosacral radiculopathy.

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