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Original Research Article

Effect of slump stretching on pain and disability in non-radicular low back pain

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Abstract

Introduction: Non-radicular back pain is defined as pain, muscle tension, or stiffness in lumbosacral region; without leg pain (sciatica). Non-radicular symptoms lack the nerve root involvement. Slump test which is used for an assessment of altered neurodynamics is recently suggested as an intervention to potentially resolve sites of neural compression, excessive friction or tension, antidromically evoked impulses within nervous system.

Objective: The study was aimed to find the effect of slump stretching on pain, disability in non-radicular low back pain.

Material and methods: A quasi-experimental study was conducted at College of Physiotherapy, Ahmedabad. 60 patients with non-radicular low back pain, aged 20-50 years with positive slump test and negative straight leg rise (SLR) test were invited to take part in this study and a written consent was taken. While patients with positive neurological sign or symptoms, positive SLR test, spinal condition like infection, tumor, osteoporosis, fracture, previous spinal surgery, pregnancy were excluded. Then the patients were divided into two groups: Experimental group; which received hot pack, slump stretching and exercises and Control group; which received hot pack and exercises. Total 6 sessions were given. The outcome measures: NPRS (numerical pain rating scale), MODI (modified oswestry disability index), AKE (active knee extension test) were taken pre and post treatment.

Results: Wilcoxon test was applied for within group analysis. There was significant difference pre and post intervention within both case and control group. Values for group A NPRS, MODI, AKE/R, AKE/L are W=4.794, 4.802, 4.360, 4.589, p=<0.001, group B W=4.802, 4.132, 3.508, 3.372, p=<0.001 respectively. While Mann-Whitney U test was applied for in between group analysis there is a significant difference, values for NPRS, MODI, AKE/R, AKE/L are U=65.0, 103.0, 30.0, 37.0,p=<0.001.

Conclusion: Slump stretching has an additional effect on pain, disability and range of knee extension motion in patients with non- radicular back pain along with exercises and hot pack.

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Key words

Non-radicular low back pain, Slump stretching, Pain, Disability.

Introduction

Disability associated with low back pain (LBP) continues to rise; prevalence of low back pain is 23.09% in Indian population [1]. Lumbar conditions are divided into non-radicular and radicular conditions with the former being defined as pain, muscle tension, or stiffness localized below the costal margin and above the inferior gluteal folds in the lumbosacral region; without leg pain (sciatica) [2]. 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 [2]. Neurologic signs or symptoms suggestive of nerve root involvement (diminished upper or lower extremity reflexes, sensation to sharp and dull, or strength) [2].

One subgroup that has not been readily examined is patients whose symptoms are not improved with specific directional exercises (i.e. flexion- or extension-oriented exercise). These patients are commonly thought to be experiencing altered neurodynamics, the interaction between nervous system mechanics and physiology. "Adverse mechanical tension in the nervous system'' has been defined as an abnormal physiological or mechanical response produced when structures of the nervous system exceed their normal range of movement. It has been theorized that adverse mechanical tension in the nervous system can generate pain when decreased neural mobility occurs with movement [1].

A number of neurodynamic tests have been purported to assess the mechanosensitivity of neurogenic structures [3, 4, 5]. Cyriax (1942) originally used neurodynamic testing, specifically the straight-leg-raise (SLR), to identify the presence of perineuritis. Maitland (1985) further refined the technique and described the slump test, which incorporated cervical flexion and ankle dorsiflexion which was believed to assess the mechanosensitivity of the neuromeningeal structures within the vertebral canal [2]. The slump test has been proposed as a test of adverse mechanical tension in the lower quarter, flexion of the cervical, thoracic, and lumbar regions of the spine lengthen the vertebral canal and are associated with stretching of the spinal dura mater and lumbosacral nerve roots. However, it should be noted that other anatomical structures, in addition to nerve tissue, are stressed by components of the slump test.

When a patient with lower-quarter symptoms is tested using the slump test, the clinician can systematically assess how the movement of distal body parts (i.e., cervical motion) affects the patient's range of motion or symptoms. A positive slump test has been defined as one that decreases a patient's range of motion available in the lower extremity or one that reproduces a patient's lower-quarter symptoms. Philip, et al. [6] found that the slump test demonstrated high inter-rater reliability among the physical therapists with varying levels of experience.

In recent years, neurodynamic test procedures have been used as interventions to potentially resolve abnormal physiology within the nervous system. The full spectrum of clinical 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 [2]. However, limited evidence exists to support effectiveness

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of using the slump test as a treatment approach and has only been presented in the form of case reports, case series [7], or a small sample clinical pilot study, 1 RCT [8].

Therefore, in an effort to provide a more comprehensive treatment program, the purpose of this study was to study the effect of slump stretching on pain and disability in non-radicular low back pain and to compare it with control group.

Material and methods

A quasi experimental study was conducted at the S.B.B. College of Physiotherapy, V.S Hospital, Ahmedabad for 6 sessions. Using purposive sampling 30 patients calculated by power analysis in each group were selected. Participants were between 20 to 50 years of age with a chief complaint of LBP referred to physical therapy. Patients were required to have negative straight leg rise (SLR) test, reproduction of the patient's symptoms with slump testing, no change in symptoms with lumbar flexion or extension, Patients with ''red flags'' for a serious spinal condition (e.g. infection, tumors, osteoporosis, spinal fracture, etc.) were excluded. Individuals who were pregnant, had a history of spinal surgery, positive neurologic signs or symptoms suggestive of nerve root involvement (diminished upper or lower extremity reflexes, sensation to sharp and dull, or strength), osteoporosis.

The slump test was performed as described by Maitland (1985) [5] and is outlined below.

- Patient was instructed to sit erect with knee 90degree of flexion. The presence and absence of symptoms was recorded.
- Patients were instructed to "slump" shoulder and lower back while maintaining the cervical spine in neutral. The presence and absence of symptoms was recorded.
- While maintaining the position described in step 2 the patients was instructed to tuck chin to chest and clinician applied overpressure into cervical flexion. The presence and absence of symptoms was recorded.
- While maintaining overpressure into cervical flexion the patient was instructed to extend the knee. The presence and absence of symptoms was recorded.
- Position 4 was maintained while patient was instructed to actively dorsiflex the ankle. The presence and absence of symptoms was recorded.
- Overpressure of the cervical spine was released and patients were instructed to return the neck to neutral. The presence and absence of symptoms was recorded. **(Figure – 1)**

Figure – 1: Slump testing.

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For the purpose of this study, the slump test was considered positive if the patient's clinical symptoms were reproduced during the performance of the slump test and these symptoms improved with structural differentiation, in this case, release of neck flexion. The inter examiner reliability of detecting a positive slump test has been shown to be high [6].

Outcome measures, NPRS (Numerical pain rating scale) for pain, MODI (Modified oswestry disability index) for disability, AKE (Active knee extension range) were taken pre and post treatment.

The 11-point NPRS ranges from 0 (''no pain'') to 10 (''worst pain imaginable'') and was used to indicate the intensity of current pain and at its best and worst level over the last 24 hours [9]. These 3 ratings were averaged to arrive at an overall pain score. The scale has been shown to have adequate reliability, validity, and responsiveness in patients with LBP when the 3 scores are averaged [10]. The modified oswestry disability index- MODI was used to measure disability and consists of 10 questions. Each question is scored from 0 to 5, with higher scores indicating greater disability. The test–retest reliability of the modified ODI has been shown to be high (ICC ¼ .90), Active knee extension test (AKE) have been recommended to measure hamstrings muscle extensibility. Subjects were positioned in supine without a pillow underneath the head. The participant's hip was flexed and stabilized to 90 degree, then the fulcrum of the goniometer was centered over the lateral condyle of the femur, proximal arm was aligned with long axis of femur using greater trochanter as a reference, distal arm was aligned with the lower leg using lateral malleolus as a reference, patient was then asked to slowly extend their knee until they felt the first stretch sensation, and angle was measured (**Figure – 2**).

Figure – 2: Knee extension range measurement.

60 patients were divided into 2 groups; group A (Experimental group), group B (Control group) Group A Slump stretching: Slump stretching was performed with the patient in the long sitting position with the patient's feet against the wall to assure the ankle remained in 0 degree of dorsiflexion. The therapist applied over pressure into cervical spine flexion to the point where the patient's symptoms were reproduced (**Figure - 3**). The position was held for 30 second. 5 repetitions each for 30 second. Both the groups received Hot packs in prone lying position for 20 minutes (**Figure – 4**) and isometric exercises in form of Isometric flexion exercise in crook lying position: Patients were asked to tuck their abdomen in, without holding their breath and maintain it for 10 seconds. 10 repetitions of this exercise were given. Isometric back extension exercises were given in supine lying position and they were asked to push the mattress in downward direction with head and heel to produce isometric contraction of back extensors for 10 seconds. 10 repetitions of these exercises were given.

Obtained data was analyzed using SPSS V 16. Within group, analysis was done by applying

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Wilcoxon test. Between groups analysis was done by using Mann- Whitney test.

Figure – 3: Slump stretching.

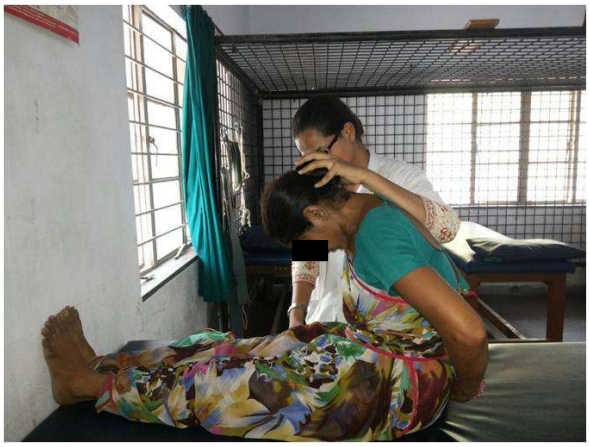

Figure – 4: Hot pack.

Results

Within group analysis (wilcoxon) and between group analysis (Mann Whitney) for NPRS, MODI, AKE Right, AKE Left showed significant improvement as per **Table – 1, Table – 2, Table – 3, Table – 4** and **Table - 5**.

Both group showed improvement, but experimental group showed better improvement than control group.

Discussion

The results of the present study suggest that when slump stretching is added to a treatment program, significant improvement in Non-radicular low back pain may occur.

The slump stretching was effective in reducing the patient's pain. It could be due to dispersing intraneural edema, thus restoring pressure gradients, relieving hypoxia and reducing associated symptoms [11]. Neurodynamic treatment technique results in changes of the mechanical or physiological function of nerve tissues. 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 [12]. 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 [13]. This accounted for the reduction of pain in slump stretching group. Cleland et al in their study of slump stretching in the management of non-radicular low back pain concluded that slump stretching is beneficial in improving long term disability, pain and centralization of symptoms. Nagrale et al in their study effect of slump stretching versus lumbar mobilization with exercises; randomized clinical trial further support the use of slump stretching along with mobization and stabilization exercises in treatment of Non-radicular low back pain.

Improvement in viscoelastic properties of the nerve, resolution of edema and restoration of normal physiological properties lead to reduction in pain which also reduces disability. There is lack of evidence on the effects of neurodynamic techniques on functional status or disability. But, it can be assumed that reduction in pain with neurodynamic technique obviously improves the functional status of the patients.

The slump stretching also involves the stretching of hamstrings along with the neural tissue which accounts for the increase in active knee extension range.

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Nadler, et al. proposed the mechanism of superficial heat for reduction of pain that it causes analgesia and decreased muscle tonicity [14]. Some of the benefits provided by the heat therapy may be mediated directly in the brain. Functional brain imaging research has revealed central effects of non-noxious skin warming with increased activation of the thalamus and posterior insula of the brain. In addition, innocuous tactile stimulation of the skin activates the thalamus and S2 region of the cerebral cortex. These direct effects on brain may mitigate the sensation of pain in the brain, thereby providing pain relief. But, these effects were observed for continuous 'low level heat wrap therapy', which necessitates the patient to use the hot pack for an extended period of time for nearly 8 hours. But, in the current study, hot packs were given for 20 minutes. This could be the possible cause for small improvement in pain intensity in the control group.

Superficial heat may provide short-term relief of pain over 24 hours. Long-term relief is questionable because there are very few studies determining its efficacy over long term results. Moreover, the penetration depth of superficial heat is only 1-2 cm and the effect begins to dissipate after the removal of modality.

However the improvement in the function can also be attributed to the supervised isometric exercises which may have improved the strength of muscles. Lumbar spine muscles need to contract statically in most of the activities of daily living and isometric exercises improve this static work. This is consistent with the findings of a systemic review conducted by French SD, et al. which concluded that there is moderate evidence in small number trials that the addition of exercise to superficial heat further reduces pain and improve function [15].

But, although statically significant, improvement in MODI score post treatment in the control group is minimum compared to the experimental group. As the pain decreases, the patient will take its knee to further range, which accounts for increase in active knee extension in the control group.

This subset of subjects who demonstrate a positive slump test but who do not have specific neurologic deficits consistent with a radiculopathy seem to benefit from a technique purported to enhance dural movement, perhaps enhancing the physiology of the nerve itself. It should be stated that a lack of hard neurologic signs does not preclude the possibility of the presence of a radiculopathy since lower grade radiculopathy may not present with neurologic signs and the diagnostic accuracy of special testing for nerve root involvement is uncertain. On the contrary, the large effect observed in this study would suggest potential nervous tissue involvement.

George SZ, in a case series, used the slump stretch as the only treatment which showed promise for six subjects [7]. Turl and George 29 found that 57% of rugby players with a history of grade 1 hamstring strains had positive slump tests compared to no positive slump tests in the injury-free control group [13]. This difference was not attributed to a lack of hamstring flexibility, as there was no difference in hamstring length between the injured and the non-injured players or between those with positive and negative slump tests. In a nonrandomized study, Kornberg and Lew 20 investigated the effect of using the slump test position as a treatment for grade 1 hamstring strains in Australian Rules Football (ARF) players. The results of this study suggest that slump stretching and traditional treatment may be more effective than traditional treatment alone

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for returning ARF player to sports [16, 17, 18, 19].

Conclusion

Thus it can be concluded from the study that addition of slump stretching to exercise protocol in patients of NRLBP show significant improvement in pain, disability and knee extension range of motion.

Further studies

Further studies should examine whether these benefits are maintained at a longer follow-up.

Clinical implication

Patients with non-radicular low back pain can enormously benefit from slump stretching because of improvement in pain, disability.

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Table – 1: Comparison of means of NPRS pre and post treatment.

Group	Mean±SD (PRE)	Mean±SD (POST)	Wilcoxon value	p Value
A (Experimental)	26±0.78	1.0±4.2	-4.79	<0.001
B (Control)	26±1.02	1.9±0.90	-4.80	<0.001

Table – 2: Comparison of means of MODI pre and post treatment.

Group	Mean±SD (PRE)	Mean±SD (POST)	Wilcoxon value	p Value
A (Experimental)	15.3±4.36	8.97±3.13	-4.80	<0.001
B (Control)	15.63±6.07	13.47±6.15	-4.13	<0.001

Table – 3: Comparison of means of AKE/R pre and post treatment.

Group	Mean±SD (PRE)	Mean±SD (POST)	Wilcoxon value	p Value
A (Experimental)	22.7±5.83	17.8±5.12	-4.36	<0.001
B (Control)	23.1±6.11	21.8±5.95	-3.50	<0.001

Table – 4: Comparison of means of AKE/L pre and post treatment.

Group	Mean±SD (PRE)	Mean±SD (POST)	Wilcoxon value	p Value
A (Experimental)	22.6±5.8	17.5±4.74	-4.58	<0.001
B (Control)	25.03±6.6	23.9±6.42	-3.37	0.001

Table – 5: Between group analysis.

Outcome measures	Group A (Mean±SD)	Group B (Mean±SD)	U Value	p Value
NPRS	1.59±0.6	0.64±0.3	65.00	<0.001
AKE(R)	4.90±2.2	1.23±1.3	30.00	<0.001
AKE(L)	5.13±2.2	1.13±1.3	37.00	<0.001
MODI	6.33±2.7	2.17±2.1	103.00	<0.001