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Effect of Neurodynamic Sliding Technique on Hemiplegic Stroke Subjects with Hamstring Tightness

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Abstract

Aim and Objectives: To determine the effect of Neurodynamic Sliding Technique On Hemiplegic Stroke Subjects With Hamstring Tightness.

Methodology: Quasi Experimental study design was used in this study. Total 20 hemiplegic subjects with hamstring tightness were selected. Then pre intervention measurements was taken using goniometer by passive SLR test on affected side. Then all subjects underwent Neurodynamic sliding technique (NDST) for 20 repetitions and 3 sets. NDST was performed for 4 week. At the end of fourth week post test measurement was taken. Then pre and post intervention measurements were taken using goniometer as per pre intervention measurement. The values were tabulated and statistically analyzed.

Results: At the end of study data were analysed the mean score of Passive SLR for hamstring pre-intervention 56.30 and post-intervention 62.55. Finally there is significant change in mean value (p & lt; 0.00).Conclusion: NDST shows minimal observable significance in hemiplegic subjects. Hence this NDST should be practiced for long term effect.

Keywords: *Neurodynamic sliding technique, hamstring flexibility, passive SLR test, Goniometer,hemiplegia.*

Introduction

Stroke occurs when an interrupted blood flow to brain, without oxygen rich blood brain cells die. Stroke is one of the leading causes of death and disability in India. Incidence: 119-145/100000 based on recent population studies. Prevalence: 84-262/100000 in rural and 334-424/100000 in urban[1]. Hamstring muscles have an important role in the performance of daily activities such as controlled trunk movement, walking, and jumping[2]. Muscle tightness is one of the commonest motor system factor which affect the balance. Tightness of calf and hamstring may affect static, dynamic balance of body and mobility[3]. Poor hamstring flexibility appears to be one accepted factor causes of hamstring injuries[4], musculoskeletal disorders and reduction in physical performance[5]. Entire nervous system in the body is a continuous structure which slides as we move and the movement shows physiological processes such as blood flow to neuron. Nerve adhesions in the hamstring may alter neurodynamics causing abnormal mechanosensitivity of the sciatic nerve; which could influence hamstring flexibility[6]. This mechanosensitivity of the neural tissue could limit hamstring length in normal healthy individuals[7]. Before stroke the brain communicated through spinal cord to the muscle when to tighten and relax to control movement. After stroke the affected brain is not able to understand the signals from the affected muscle. The signals has been not transmitted to affected part of brain it undergo safe mode. Spinal cord send its own impulse to muscle in those limb to remain contracted or tight, so that muscle

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don't get overstretched and tight hamstring limits the movement of pelvis in relation to the legs. Hamstring pull the pelvis into backward tilt, rounding and putting strain over lower back.

Several stretching method have been used to improve muscle flexibility, including the static stretching, contract-relax stretching, ballistic stretching and neurodynamic sliding technique (NDST)[8-10]. Other conservative techniques robotics to provide physical assistance, virtual reality, extra corporeal shock wave therapy, bilateral training or irradiational therapy, constraints-induced therapy functional electrical stimulation with biofeedback[11]. Neurodynamic is a manual method of stretching in which force is applying to nerve structures through posture and multi-joint movement, aiming to produce a sliding movement of neural structures relative to their adjacent tissues[12]. Neurodynamic is thought to decrease neural mechanosensitivity and can be a beneficial technique in the management of hamstring flexibility[13]. Neurodynamics change in mobility of nervous system achieved through movement and stretching could modify such sensations. NDST interventions to decrease neural mechanosensitivity, this intervention could be beneficial in the hamstring flexibility[14]. Decreased hamstring flexibility as evidenced by limited range in the passive straight leg raise test (SLR) could be due to altered neurodynamics affecting the sciatic, tibial, and common fibular nerves[15]. Altered posterior lower extremity neurodynamics could arguably influence resting muscle length and lead to changes in the perception of stretch or pain[16]. Providing movement or stretching could lead to changes in the neurodynamics and modification of sensation and could help to explain the observed increase in flexibility.

Methodology

Participants: Patients were participate in this study was screened for inclusion subjects of both the gender within the age group of 60 years or more, physically independent, not currently engaged in a structural exercise program, Able to understand and follow simple verbal instructions, and exclusion criteria Physical or functional impairments, Dementia, Alzheimer's disease, Parkinson's disease, Any Musculoskeletal disorder 20 sample was selected using convenient sampling technique. They were explained about safety and simplicity of the procedure and informed consent was obtained. This study is conducted in Saveetha College of physiotherapy OPD Thandalam, Chennai India.

Procedure: As pre-test values was noted for all 20 hemiplegic subject using goniometer measuring passive SLR of hamstring muscle. A pair of examiners needed to measure the passive ROM of hamstring flexibility. The subjects would be in supine lying with wedge is placed under upper back for thorax and cervical flexion also landmark identified and labelled marker: ASIS, greater trochanter, lateral epicondyle of femur. One examiner has to perform passive SLR test by stabilising knee extension and ankle in neutral. Heavy dorsiflexion is avoided to prevent calf muscle stiffness. Another examiner has to place goniometer on axis of hip joint. The stable arm parallel to examine table and movable arm parallel to the measuring limb by performing the passive SLR until the patient get pain over hamstrings and note down the values. All 20 subjects received neurodynamic sliding techniqueand to produce the sliding movement of neural structures to relieve adjacent tissues. Cervical and thoracic spine should be in flexed position. Alternate hip flexion, knee flexion and dorsiflexion then hip extension, knee extension and plantar flexion was performed. NDST were performed for 15 repetitions and 3 sets5 days/week for 4 weeks. Post test measurement is done after intervention.

Result

The statistical analysis revealed significant difference ($P<0.0001$) between pretest and posttest values of hamstring ROM within the group. The pretest mean value is 56.30(SD=8.84) and posttest mean value 62.55(SD=8.87). This shows that hamstring ROM of test in posttest values were comparatively less than pretest value- $p<0.0001$ and t- value is 32.8564 (Table No. 1).

Table 1: Comparison of pre-test and post-test values of Hamstring ROM

Hamstring ROM	Mean	Standard Deviation	t-value	P- value
Pre test	56.30	8.84	32.8564	<0.0001
Post test	62.55	8.87		

Discussion

The results confirmed our initial hypothesis that an isolated neurodynamic sciatic sliding technique would provide a greater immediate improvement in hip flexion, assessed by passive SLR, than hamstring stretching or placebo. Very few studies have examined the effect of neurodynamic interventions on hamstring

flexibility[17,18]. The results of this study can be seen as adding further evidence for the potential role of neural tissue mechanosensitivity in limiting the SLR[19]. There are many approaches to treat the hamstring tightness in stroke like stretching, cryotherapy, Proprioceptive neuromuscular facilitation techniques are commonly provided treatments.

While some theories explaining the therapeutic effects of muscle stretching suggest there is alteration of the viscoelastic properties of muscles, studies have shown the importance of distinguishing between real and apparent increases in muscle flexibility[20]. The pretest measurement of hamstring ROM of stroke subjects were measured with the use of goniometer then NDST is performed to the patient and post measurement of hamstring ROM values are noted with the help of goniometer. In this study NDST shows hamstring flexibility in stroke patients. There is marked significant increase in mean value from pre test to post test mean value. When they added a neurodynamic slider technique they found greater mean increases of 62.55 in the hemiplegic SLR.

Limitations of this study only examined immediate effects of a single episode and the lack of longer term follow-up should be considered. It is not known how long the observed increase in hamstring flexibility might have lasted. Furthermore, it is not known if repetition and an appropriate dosage of the neurodynamic interventions over time might lead to longer lasting effects. Finally, we did not conduct any long-term follow-up to determine if the observed changes in flexibility might have resulted in any change in incidence of hamstring injuries in these subjects with short hamstring tightness in stroke subjects. Further recommendation of the study is long term intervention in neurodynamic sliding technique. And also relatedly with other techniques were included in future study.

Conclusion

These results show that the Neuro dynamic sliding is an acceptable and effective intervention for stroke to promote improvements in important aspects of hamstring flexibility and Range of motion in a sample of stroke subjects. NDST shows minimal observable significance in hemiplegic subjects .Since there is marked clinical outcomes with this immediate technique, Hence this NDST would be practiced for long term effect. Mean value of pre test and post test.

Ethical Consideration: The study was approved by Institutional Ethics committee (017/12/2018/IEC/SU on 27/12/2018) and was done in accordance with Ethical Guidance for the Human Participants. This study protocol was approved by institutional Ethical committee.

Conflict of Interest: Nil

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