



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2022; 8(2): 554-557
www.allresearchjournal.com
Received: 08-12-2021
Accepted: 12-01-2022

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Effectiveness of sciatic nerve mobilization on hamstring flexibility and gait performance in patients with chronic stroke

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Abstract

Background and Purpose: This study was designed to find the effectiveness of Sciatic Nerve mobilization on hamstring flexibility and gait performance on patients with chronic stroke.

Subjects: Sixteen patients with chronic stroke were selected for the study.

Methods: This study was quasi experimental in nature. Sixteen samples were selected using simple random sampling technique. Pretest assessment for hamstring flexibility and gait performance was taken by using passive 90/90 test and 10 meter walk test respectively. After the pretest assessment the experimental group received sciatic nerve mobilization for 30 minutes a day, 3 days a week, 15 sessions for 5 weeks. The Posttest measurement was taken after 5 weeks in a similar manner as that of pretest measurement.

Results: Sciatic Nerve Mobilization is significantly effective in improving Hamstring Flexibility and gait performance on Patients with Chronic Stroke.

Conclusion and Discussion: The obtained results reveal that subjects were benefitted from Sciatic Nerve Mobilization is significantly effective in improving Hamstring Flexibility and Gait Performance on Patients with Chronic Stroke. The improvement may be as the result of the technique which helps in the restoring the balance between the movement of neural tissues and adjacent mechanical borders, which is allowing reduced intrinsic pressures on the neural tissue, thus stimulating optimum physiologic functions.

Keywords: Sciatic nerve mobilisation, hamstring flexibility, gait, stroke, cerebral haemorrhage, cerebral infarction

Introduction

Majority of the patients with chronic stroke experience neurological deficits in their limbs, and the functional recovery of the impaired limbs are often poor. The neurological deficits that occur in stroke patients result in many activity limitations, including paralysis, muscle weakness, limited range of motion, contracture, and misalignment of the neurological system. Sequentially, functional limb problems appear more significant in their gait pattern. Therefore, gait restoration is one of the main goals of stroke rehabilitation.

The hamstring muscle is an essential element in adjusting knee joint extension, which is related to gait performance. Shortening of the hamstring muscle may reduce the range of motion of the knee joint and affect the physiological movement of the lumbo pelvic system, causing gait problems with asymmetric weight bearing and pelvic inclination ^[1]. For example, a reduction in the flexibility of the hamstring muscles while using the hip extensors predominantly leads to the overuse of the hamstring as well as insufficient activation of the gluteus maximus and abdominal muscles. This results in a variety of compensatory mechanisms that lead to instability of the trunk muscles in stroke patients.

Nerve mobilization involves the stretching and relaxing of the nerves in order to maintain normal muscle tone and ensure a desirable range of motion. The main theoretical objective of this technique is the restoration of the balance between the movement of neural tissues and adjacent mechanical borders, allowing reduced intrinsic pressures on the neural tissue, thus stimulating optimum physiologic function ^[2]. Recently, there has been a shift away from a mechanical rationale in order to comprise physiological concepts such as structure and function of the nervous system.

Nerve mobilization is now a more recognized terminology that refers to the cooperative physiological, biomechanical and morphological functions of the nervous system.

Need for the study

The aim of the study was to find out the effectiveness of Sciatic Nerve Mobilization on hamstring flexibility and gait performance on patients with chronic stroke. Though a variety of techniques like therapeutic massage, myofascial release, range of motion (ROM) exercises, stretching and strengthening exercises, have been used for the functional improvement of the impaired limb of stroke patients, the effective treatments for improving lower limb functions among central nervous system disorders were lacking.

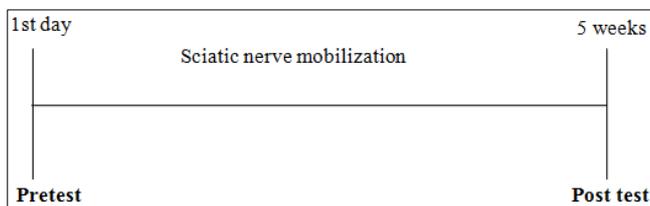
The result of the study will provide a useful information for physiotherapists to explore additional therapeutic options for improving motor function of the lower limb during chronic stroke rehabilitation.

Methodology

Research design

This study is quasi experimental in nature. Sixteen samples were selected using simple random sampling technique. Pretest assessment for hamstring flexibility and gait performance was taken by using passive 90/90 test and 10 meter walk test respectively. After the pretest assessment the experimental group received sciatic nerve mobilization for 30 minutes a day, 3 days a week, 15 sessions for 5 weeks. The Posttest measurement was taken after 5 weeks in a similar manner as that of pretest measurement.

Experimental group



Criteria for selection

Inclusion criteria

- 1) Patients diagnosed with cerebral infarction or cerebral haemorrhage
- 2) Patients who were classified as \geq grade 3 (fair) as per the manual muscle test of the affected lower limb muscle
- 3) Patients with no pain in the lower limbs for at least 6 months
- 4) Patients with adequate cognitive function
- 5) Patients performing gait over 10 meters independently, with or without an assistive device
- 6) Patients with Berg Balance Scale score less than 41
- 7) Patients with a functional ambulation category score over 3

Exclusion criteria

- 1) Patients with Contracture of the lower limb joint
- 2) Patients with having undergone a surgery of the lower limb
- 3) Patients with orthopaedic injury to the lower limbs
- 4) Patients with history or present diagnosis of additional musculoskeletal diseases

- 5) Patients with hemineglect, visual problems, or other pains

Population

All the patients who satisfied the selection criteria were the population for the study.

Sample size and method of selection

Sixteen patients were selected randomly from the population using simple random sampling procedure.

Variables used in the study

- Independent variables : sciatic nerve mobilization
- Dependent variable : hamstring flexibility, gait performance

Validity and reliability of the tools used

Passive 90/90 test and 10 meter walking test has been proved to be a valid and reliable tool to measure hamstring flexibility and gait performance respectively.

Setting

This study was conducted at department of physiotherapy in Vinayaka Mission's Medical College and Hospital, Salem. Sixteen samples were selected from the population using simple random sampling technique. The group underwent a pre-test assessment of hamstring flexibility and gait performance as follows.

Hamstring flexibility

The subjects were asked to lie supine with the contralateral lower extremity in relaxed position and flexed their dominant knee and hip to 90 degrees. The researcher monitored the position of the femur with his right hand and instructs the patient to extend his leg as far as possible, keeping his foot relaxed, and hold the position for 5 sec. each participants performed a single repetition of the movement to familiarize themselves with the action. A second repetition was performed and at the end of the 5 sec holding period the angle of knee extension was measured using a standard goniometer. The lateral epicondyle was palpated and, and the goniometer was centred over it. The lateral malleolus of the tibia and the greater trochanter of the femur were then marked. The arms of the goniometer were aligned with the proximal and distal land marks. The goniometer measurement was taken at the end range of knee extension and recorded.

Gait performance

Gait performance was assessed using the 10-meter walk test. The patients were instructed to walk a total of 14 meters in order to minimize the acceleration and deceleration values. The test was repeated 3 times, and the average value was used for analysis. One-minute break times between measurements alleviated fatigue.

Procedure

After the pre-test assessment the samples were subjected to sciatic nerve mobilization for 5 weeks as follows.

Sciatic nerve mobilization

The sciatic nerve mobilization technique consisted of four components for relaxation of the sciatic nerve. First the patient was positioned in a supine position and with the neck

and trunk in neutral position, the researcher fixed the lower limb on the unaffected side in order to make them immobile. Then the researcher place the lower limb on the affected side in full straight leg raise (SLR) for 20 seconds. Secondly, ankle joint dorsiflexion was accompanied with the performance of the SLR by the researcher. Thirdly, the researcher applied hip joint adduction and internal rotation for 40 seconds. Fourth, in order to promote tension of the sciatic nerve and enable it to reach the maximum level, cervical flexion was sequentially applied by the researcher. This process was sequentially repeated for 10 minutes and done for 3 sets.

The experimental group received sciatic nerve mobilization for 30 minutes a day, 3 days a week, 15 sessions for 5 weeks. After the treatment post-test for pain was taken in a similar fashion as that of pre-test measurement.

A pilot study was conducted one month before the main study with 6 subjects to know the feasibility of the study.

Statistical analysis

The pre-test values and post-test values were recorded and subjected to statistical analysis using paired 't' test. Table 1

Experimental Group

Table 1: Effectiveness of sciatic nerve mobilization on hamstring flexibility (Paired 't' test)

Variable	't' cal value	't' tab value
Hamstring flexibility	10.22	2.262

The 't' calculated value was found to be 10.22

The 't' table value for 14 degrees of freedom at 5% level of significance is 2.262

The 't' calculated value was match with 't' table value.

The 't' calculated value was found to be greater than 't' table value.

The result of the statistical analysis showed that Sciatic Nerve Mobilization is significantly effective in improving Hamstring Flexibility on Patients with Chronic Stroke.

Table 2: Effectiveness of sciatic nerve mobilization on hamstring flexibility (Paired 't' test)

Variable	't' cal value	't' tab value
Gait performance	24.44	2.262

The 't' calculated value was found to be 24.44

The 't' table value for 14 degrees of freedom at 5% level of significance is 2.262

The 't' calculated value was match with 't' table value.

The 't' calculated value was found to be greater than 't' table value.

The result of the statistical analysis showed that Sciatic Nerve Mobilization is significantly effective in improving gait performance on Patients with Chronic Stroke.

Results

- Sciatic Nerve Mobilization is significantly effective in improving Hamstring Flexibility on Patients with Chronic Stroke.
- Sciatic Nerve Mobilization is significantly effective in improving Gait Performance on Patients with Chronic Stroke.
- Sciatic Nerve Mobilization is significantly effective in improving Hamstring Flexibility and gait performance on Patients with Chronic Stroke.

Discussion

Sciatic Nerve Mobilization is significantly effective in improving Hamstring Flexibility and gait performance on Patients with Chronic Stroke [5]. Nerve mobilization technique could be beneficial in maintenance of elasticity and extensibility of the nervous system, thereby assisting the muscular plasticity and the maintenance of joint range of motion and adaptive capacity of the nervous system during movement [6]. Nerve mobilization reduces intra-neural pressure, leading to increased blood flow to the nerves. Hence, this mechanism improves axoplasmic flow and nerve conduction [7]. It supports the belief that sciatic nerve mobilization techniques activate neurotransmission fibres related to motor function and sensory disorders, and improvement and motor abilities of the lower limbs⁹ (Cleland *et al*, 2006) [6]. Additionally, this technique is neuro physiologically attributable to accelerated quadriceps muscle-mediated hamstring relaxation, which is a function of the antagonistic muscle [10] (Fox, 2006) [9].

Study indicates muscle activity increases during the application of nerve mobilization technique (Boyd *et al*, 2009) [2] and muscle activation increases as a consequence of a spinal reflex response to the nociceptive input to avoid nerve injury (Hall *et al*, 1998) [11]. Additionally, the fact that sciatic nerve mobilization can contribute to the recovery of normal hamstring muscle length is thought to have caused the improvements in knee extensor strength. Thus, the sciatic nerve mobilization technique may account for the recovery of normal hamstring muscle length and gait performance in stroke patients.

Recommendations for further study

- The study can be carried out in larger population.
- A similar study can be conducted to find effectiveness of sciatic nerve mobilization in improving lower limb strength in peroneal nerve paralysis.
- A similar study can be conducted to find effectiveness of sciatic nerve mobilization in improving lower limb strength in stroke patients.

Conclusion

The study conclude that Sciatic Nerve Mobilization is significantly effective in improving Hamstring Flexibility and Gait Performance on Patients with Chronic Stroke.

Conflict of interest: NIL

Ethical clearance: Obtained from Vinayaka Mission College of Physiotherapy.

Source of funding: NIL

References

1. Bandy WD, Irion JM, Briggler M. The effect of static stretch and dynamic range of motion training on the flexibility of the hamstring muscles. *Journal of Orthopaedic & Sports Physical Therapy*. 1998 Apr;27(4):295-300.
2. Boyd BS, Wanek L, Gray AT, Topp KS. Mechanosensitivity of the lower extremity nervous system during straight-leg raise neurodynamic testing in healthy individuals. *Journal of orthopaedic & sports physical therapy*. 2009 Nov;39(11):780-90.

3. Butler DS, Jones MA. Mobilisation of the Nervous System. 1st ed. Melbourne: Churchill Livingstone. 1991, 68-69.
4. Castellote-Caballero Y, Valenza MC, Martín-Martín L, Cabrera-Martos I, Puenteadura EJ, Fernández-de-Las-Peñas C. Effects of a neurodynamic sliding technique on hamstring flexibility in healthy male soccer players. A pilot study. *Physical Therapy in Sport*. 2013 Aug 1;14(3):156-62.
5. Dalgas U, Severinsen K, Overgaard K. Relations between 6 minute walking distance and 10 meter walking speed in patients with multiple sclerosis and stroke. *Archives of physical medicine and rehabilitation*. 2012 Jul 1;93(7):1167-72.
6. Decoster LC, Cleland J, Altieri C, Russell P. The effects of hamstring stretching on range of motion: a systematic literature review. *Journal of Orthopaedic & Sports Physical Therapy*. 2005 Jun;35(6):377-87.
7. Duncan PW, Sullivan KJ, Behrman AL, Azen SP, Wu SS, Nadeau SE. Protocol for the Locomotor Experience Applied Post-stroke (LEAPS) trial: a randomized controlled trial. *BMC neurology*. 2007 Dec;7(1):1-23.
8. Fasan JM, O'Connor AM, Schwartz SL, Watson JO, Plastaras CT, Garvan CW. A randomized controlled trial of hamstring stretching: comparison of four techniques. *The Journal of Strength & Conditioning Research*. 2009 Mar 1;23(2):660-7.
9. Fox M. Effect on hamstring flexibility of hamstring stretching compared to hamstring stretching and sacroiliac joint manipulation. *Clinical Chiropractic*. 2006 Mar 1;9(1):21-32.
10. Gifford L, Pitt-Brooke J, Reid H, Lockwood J, editors. *Neurodynamics. Rehabilitation of Movement: Theoretical basis of clinical practice*. 1st ed. London: WB saunders. 1998.
11. Hall T, Zusman M, Elvey R. Adverse mechanical tension in the nervous system? Analysis of straight leg raise. *Man Ther*. 1998;3(3):140-146.
12. Jette DU, Latham NK, Smout RJ, Gassaway J, Slavin MD, Horn SD. Physical therapy interventions for patients with stroke in inpatient rehabilitation facilities. *Physical therapy*. 2005 Mar 1;85(3):238-48.
13. Mentiplay BF, Adair B, Bower KJ, Williams G, Tole G, Clark RA. Associations between lower limb strength and gait velocity following stroke: a systematic review. *Brain injury*. 2015 Mar 21;29(4):409-22.
14. Nee RJ, Butler D. Management of peripheral neuropathic pain: Integrating neurobiology, neurodynamics, and clinical evidence. *Physical Therapy in sport*. 2006 Feb 1;7(1):36-49.
15. Shacklock M. Neural mobilization: a systematic review of randomized controlled trials with an analysis of therapeutic efficacy. *The Journal of manual & manipulative therapy*. 2008;16(1):23.
16. Shumway-Cook A, Woollacott MH. *Motor control: translating research into clinical practice*. Lippincott Williams & Wilkins. 2007.