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Contralateral Neurodynamic Technique Versus Passive Accessory Intervertebral Movements on Pain and Range of Motion in Subjects with Sciatica

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Abstract

Background: Low backache with sciatica is a highly prevalent disease among world population causing the high physical limitation and economic burden of low backache with sciatica. CND helps to mobilize the nerve and PAIVMs have an effect on tissue interface.

Methods: The study was conducted among 30 subjects Group A (n=15) was received the contralateral neurodynamic technique and therapeutic ultrasound. Group B (n=15) received passive accessory intervertebral movements and therapeutic ultrasound for continuous 6 days. After 6days the pain and the ROM were compared. In Group A the mean of the knee ROM improved from 67.20 to 82.90 and the mean VAS score improved from 5.66 to 4.00 which are statistically significant ($p<0.05$). In Group B the mean knee ROM improved from 71.40 to 77.06 and VAS score improved from 5.45 to 2.33($p<0.05$) which are statistically significant as well.

Conclusion: Both the treatment techniques are equally effective in improving the Knee ROM. However, CNDT has shown more significant results than the PAIVMs in increasing knee ROM in subjects with sciatica and Passive accessory intervertebral movement technique is more effective in reducing the pain.

Key words: *Sciatica, Contralateral Neurodynamic Technique, Passive Accessory Intervertebral Movements, Pain, Range of Motion*

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Introduction

Low back ache is an extremely frequent hassle that affecting up to 80% of the population at some point in their life.[1] Low returned pain is properly documented to be an extraordinarily frequent fitness problem. However, its burden is frequently viewed trivial. Low back pain is the main cause of exercise dilemma and work absence during a great deal of the

world, and it motives an widespread economic burden on individuals, families, communities, enterprise and governments.[2,3]

Prevalence rates differ drastically across studies, with lifetime prevalence ranging from 12.2% to 43%, period occurrence from 2.2% to 34% and point occurrence from 1.5% to 13.4%. Although sciatica may also or might also now not be associated with low again pain (LBP), it is idea that 90% of instances of sciatica are precipitated through a lumbar herniated disc with subsequent nerve root compression. Even-though usually regarded to have a appropriate prognosis (often improving inside 2–4weeks with or barring treatment, sciatica is associated with a greater self-report of disability, loss of function and pain than LBP besides sciatica[4]. The entrapment might also result in similarly closure of the foramen by using activities like unexpected trunk forward bending and straighteningwithtwisting.[5] According to T. Sturmer et al, the ache intensity throughout the preceding 24hours as assessed via VAS was independently associated with high degrees of High sensitivity C reactive proteins in sufferers with acute sciatic pain but now not in persistent low returned pain. Pain severity in sufferers with acute sciatic pain is more due to inflammatory changes[6]

This find out about focuses on the ST, which is less expensive and has been shown to be reliable.[7]The Seated Slump Test is thinking to examine the sensitivity of neural buildings which includes meningeal tissues, nerve roots and the sciatic and tibial nerves. The test involves the patient sitting on the side of the examination plinth in a slumped or slouched position, flexion of the thoracic and lumbar backbone and a posterior pelvic tilt, flexion of the cervical backbone with gentle guide overpressure, and passive extension of the subject's knee, while the ankle is dorsiflexed.[8] During the hunch test, the change of regular evoked sensations or medical symptoms with cervical actions does no longer differentiate normal from abnormal. Instead, in both situations, such as a exchange offers guide for a neuromechanical mechanism because, on account of anatomical connectivity, cervical flexion/ extension produces anxiety changes in the lumbar neural tissues, which hyperlinks the exchange in evoked sensations or medical signs and symptoms to the neural system.[9]

Neurodynamic strategies can be categorized as methods that aim to mobilize the buildings that encompass the fearful system or strategies that goal to mobilize the anxious gadget itself. Tensioning and sliding techniques are techniques that aim to mobilize the apprehensive machine itself.[10] According to Szlezak multi-level mobilisations expanded neurodynamics of the posterior decrease limb in the immediately term, compared to stretching and control groups.[14] According to Perry and Green, grade III zygapophyseal mobilisations (large amplitude into resistance) at L4-L5 have been proven to induce sympathetic worried machine adjustments in the lower limb.[15] According to Paul Chesterton et al, mobilizing the lumbar 4/5 zygapophyseal joint is tremendous on growing the hamstring extensibility.[16]

Numerous studies have proven the man or woman effectiveness of contralateral neurodynamic technique and PAIVMs in improving the extensibility of hamstring muscle and decreasing Pain in asymptomatics. But there is a dearth of literature that shows the superiority of one method with respect to the different in low returned ache with sciatica patients. Therefore, the need arises to find out the efficacy of contralateral neurodynamic technique versus passive accessory intervertebral moves on lowback ache and knee range of motion in subjects with sciatica.

Objectives of the Study

· To determine the effect of contralateral neurodynamic technique on pain and range of motion in subjects with sciatica.

· To determine the effect of passive accessory intervertebral movements on pain and range of motion in subjects with sciatica.

· To compare the effect of contralateral neurodynamic technique versus passive accessory intervertebral movements on pain and range of motion in subjects with sciatica

Methodology

7.1 Source of Data

· ESI Hospital, Rajajinagar, Bangalore.

· Padmashree Physiotherapy Clinic and Rehabilitation Centre. NGEF layout, Bangalore.

· Padmashree Diagnostic, Vijayanagar, Bangalore.

7.2 Method of collection of data:

· Population: Subjects with sciatica.

· Sampling Procedure: Simple Random Sampling

· Study Design: Experimental- pre to posttest design.

· Sample Size: 30

· Duration of Study: 6 months

Inclusion criteria:

· Age group is 24 – 55 years

· Subjects who are diagnosed with sciatica by an orthopedician

· MRI report which confirms disc prolapse and nerve compression at L4-L5 level

· Subjects with unilateral radiating pain below knee with less than 8 weeks

· Both gender will be included in the study

Exclusion criteria:

· Subjects with caudaequina syndrome, bilateral leg pain

· Subjects with previous surgery in the lumbar spine or in the symptomatic leg

· Subjects with other knee and hip pathology like tendinitis, bursitis, OA, fracture or malignancy

· Intra articular steroids therapy within last 6 months

· Any peripheral vascular disorders

Material used:

· Universal goniometer

· Ultrasound machine

· Aquasonic gel

· Treatment couch

· Pen and paper

Procedure:

Subjects fulfilling the inclusion and exclusion were enrolled in the study Informed consent was taken from the subjects and baseline data is recorded .Thirty symptomatic subjects (24-55 years of age, 14 men, 16 women) were included. Subjects were asked to indicate their position of pain and to rate their severity on a visual analogue scale (VAS) between 0 and 10.

Group A: contralateral neurodynamic technique + US

Group B: Passive accessory intervertebral movements + US

Group A (n=15) CNDT

The subject was in a sitting position and the slump test was performed on the contralateral asymptomatic leg. The topic carried out a slumped examination with dorsiflexion on the ankle. The therapist passively extended the knee, preserving the ankle dorsiflexion. The knee was extended until the patient felt that the symptoms improved along the course of the nerve and were bearable. The therapist sat at the end spot for 30 seconds. Twelve repetitions were performed and were divided into three sets (4 repetitions per set). Each set was interspersed with 1 minute rest period for 6 days. After the 6days the pain using the VAS scale and the knee ROM using the goniometer were taken.

Therapeutic Ultrasound therapy was given in continuous mode 1 MHz, 1 W/cm2 in a circular manner for 5 minutes at the L4-L5 level after the CNDT.

Group B (N=15) PAIVMs

Group B obtained passive intervertebral accessory gestures and clinical ultrasound. Subjects were lying in a prone position. Therapist conducted Grade III passive intervertebral accessory movements (postero-anterior mobilisation) using thumbs at the L4 / L5 stage of the symptomatic side facet of radiating pain for 1 minute and repeated for 3 times each interspersed with 1 minute rest period between each set daily for 6 days. After 6 days, pain and ROM of the knee were assessed and compared.

Therapeutic Ultrasound therapy was given in continuous mode 1 MHz, 1 W/cm2 in a circular manner for 5 minutes at the L4-L5 level after the PAIVMs.

Outcome measures:

Pain - Visual Analog Scale

Knee Range of Motion - Universal Goniometer

Fig: 1 Subject Performing Slump Test

2. Subject receiving Ultrasonic Therapy

3. Subject receiving PAIVMs

Results

Table-1: Range, mean and SD of age of the subjects with sciatica in both the groups

Sl.No	Variable	Group-A		Group-B		Unpaired t-test
		Range	Mean ± SD	Range	Mean ± SD	
1	Age in years	28-53	41.06±8.68	26-53	38.13±9.31	t=0.892, p>0.05, NS

In Group A, the mean age is 41.06 with SD of 8.68 and in Group B the mean age is 38.13 with the SD of 9.31. The difference in mean age of Group A and B was not significant. Thus the demographic variables are homogenous in both the groups ie., p>0.05

Table-2: Range, mean and SD of pain and knee ROM of subjects with sciatica in Group A

S.No	Outcome measures	Group-A				t-test/ Wilcoxon	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	Radiating pain	3-8	5.66±1.34	2-5	4.00±0.84	z=3.126*	p<0.001
2	Knee ROM	45-85	67.20±11.28	70-90	82.90±7.27	t=5.67*	p<0.001

Note; * denotes –Significant.

In Group A, pre score for mean of total knee ROM was 67.20 with SD of 11.28 and the post score for mean of total Knee ROM was 82.90 and SD of 7.27. The parametric test was performed to compare the pre and post score for Knee ROM and it showed significant improvement with p value.($p<0.001$).

The pre score for mean of total VAS was 5.66 with SD of 1.34 and the post score for mean of total VAS was 4 with the SD of 0.84. The non-parametric test was performed to compare the pre and post values and it showed significant improvement with p value. $p<0.001$.

Table-3: Range, mean and SD of pain and knee ROM scores among subjects with sciatica in Group B

S.No	Outcome measures	Group-B				t-test/ Wilcoxon	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	Radiating pain	3-7	5.45±1.08	0-5	2.33±1.71	z=3.432	p<0.001
2	Knee ROM	50-85	71.40±9.44	50-90	77.06±10.67	t=4.690	p<0.001

In Group B, pre score for mean of total knee ROM was 71.40 with SD of 9.44 and the post score for mean of total Knee ROM was 77.06 and SD of 10.67. The parametric test was performed to compare the pre and post score for Knee ROM and it showed significant improvement with p value. ($p<0.001$).

The pre score for mean of total VAS was 5.45 with SD of 1.08 and the post score for mean of total VAS was 2.33 with the SD of 1.71. The non-parametric test was performed to compare the pre and post values and it showed significant improvement with p value. $p<0.001$

Table-4: Comparison of pre and Post test pain and knee ROM of subjects with sciatica in between the groups.

Sl.No.	Outcome measures	Pre test		Post test	
		Group-A	Group-B	Group-A	Group-B
		Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
1	Pain (VAS)	5.66±1.34	5.45±1.08	4.00±0.84	2.33±1.71
2	Knee ROM	67.20±11.28	71.40±9.44	82.90±7.27	77.06±10.67
Between group comparison Mann- Whitney U test/ Unpaired t-test		· Pain: z=0.324, p>0.05, NS · ROM: t=1.22, p>0.05, NS		· Pain: z=2.922, p<0.05, S · ROM:: t=2.578, p<0.005, S	

In Group A the mean of the pre-test score of the pain was5.66 with the SD 1.34and in group B the mean was5.45 with the SD 1.08 for the same. In Group A the mean of the pre-test score of knee ROM was 67.20 with the SD of 11.28 and in Group B the mean score is 71.40 with the SD of 9.44. The data are statistically not significant in both the groups ($p>0.05$). It is evident that before the intervention the subjects with sciatica were similar in pain and ROM in both groups.

The mean of the post test scores of pain in Group A is 4.00 with the SD of 0.84 and in Group B the mean is 2.33 with the SD of 1.71. In group A, the mean of the post test score of knee ROM was 82.90 with the SD of 7.27 and in Group B the mean was 77.06 with the SD of 10.67 for the same.

But, while comparing of the post test scores of knee ROM in between groups, at 0.05 level ($p<0.05$) it is evident that there is a more significant improvement of ROM in Group A than the Group B.

Mann-Whitney U test was applied and it was statistically significant ($p<0.05$) and it is evident that the reduction of pain in Group-B is more significant than the reduction of pain observed in Group-A.

Discussion

The purpose of the study is to compare the efficacy of contralateral neurodynamic technique and passive intervertebral accessory movements in subjects with low back pain with sciatica. In this study, we found that sciatica causes pain and disability, and this is consistent with the study that stated that the most common cause of sciatica is lumbar disc herniation, which is associated with severe pain and disability. Chronic low back pain (CLBP) can lead to severe disability.

. In Group A, there were 6 male subjects and 9 female subjects. Similarly, there were 8 male subjects and 7 female subjects in group B. The mean age in Group A was 41.06 with SD 8.68 and the mean age in Group B with SD 8.68. and in group B the mean age was 38.13 with SD of 9.31.

In Group A, the mean ROM of the knee changed dramatically. In contrast to both groups , Group A demonstrated a large increase in versatility relative to Group B. In Group A, the mean pre-scoring score for the ROM knee is 67.20 with the SD of 11.28 and for Group B, the mean is 71.40 with the SD of 9.44. Post mean knee ROM for Group A was 82.90 with SD of 7.27 and in Group B was 77.06 with SD of 10.67 which was statistically important. The data in this analysis are consistent with a variety of other studies focused on NDT. There is excellent reliability with respect to the sensation of response to the slump test (Herrington 2008, Lew P 1997). All subjects reported sensations and symptoms (stretch in the posterior thigh and under the knee) (Herrington 2008) and all subjects reported changes in these reactions with cervical movements (Lew P 1997).

Neurodynamic techniques can be classified as techniques intended to mobilise systems that surround the nervous system or techniques intended to mobilise the nervous system itself. Tensioning and sliding techniques are techniques intended to mobilise the nervous system itself. By means of a tensioning procedure, nerve mobilisation is accomplished by rotating one or more joints to lengthen the nerve bed, forcing the nervous system to slide relative to its surrounding structures. As such, slipping and tensioning strategies can be indicated at various stages of the recovery programme (Coppieters 2015).

The lumbar nerve roots deviate from the spinal cord at an angle. This angle comprises two vector elements, horizontal and vertical. The vertical vector

is especially important because it is what causes the movements of the spinal cord that are required to minimise the stress in the contralateral nerve root. When the contralateral neurodynamic test is carried out, stresses penetrate the spinal cord through the contralateral nerve roots (M. Shacklock 2005).

However, when comparing the mean VAS scores, group B was more successful than group A in reducing the VAS score. In Group A, the mean for VAS pre-scoring was 5.66 with the SD of 1.34 and in Group B, the mean was 5.45 with the SD of 1.08. The post mean VAS score for Group A was 4.00 with SD of 0.84 and the post mean VAS score for Group B was 2.33 with SD of 1.71, which was statistically important. The data in this study showed that the unilaterally applied AP accessory mobilisation technique administered at a rate of 2 Hz to the L4-L5 segment resulted in a statistically significant reduction in the VAS score compared to the CNDT community. The results found in this study may be due to changes in the biomechanical or neurophysiological properties of the nervous tissue as a result of mobilisation of the l4-l5 zygapophyseal joint (Shacklock 2005).

There is an improvement in the neural examination of the upper limb with cervical mobilisation. The authors proposed that the change recorded may be due to mobilisation affecting the mechanical interface, thus increasing the movement of neural tissue. (Saranga 2003) Further clarification could be linked to participants altering perception by 'sensory theory' (Weppler and Magnusson,2010). Increases in neural extensibility can also be due to reduced neuromeningeal sensitivity. Without thrust mobilisation can attenuate alpha motoneuronal excitability leading to short-term inhibitory effects on the engine system (Dishman and Bulbulian, 2000). Side specific peripheral sympathetic nervous transition in the lower limb due to zygapophyseal mobilisation of L4-L5. They concluded that there are neurophysiological and anatomical inter-relationships in the lumbar region and that control can be accomplished by mobilisation (Perry and Green 2008).

Limitations

· The mechanism of injury/ occupation is not considered

· BMI of the subjects were not considered

Recommendations:

· Future studies are required to determine the long-term effects of contralateral neurodynamics and passive intervertebral accessory movements.

· Dosimetry of action requires future studies to assess the potential of PAIVMs.

Conflict of Interest: None

Conclusion

Both treatment methods are equally successful in raising the Knee ROM. However, CNDT has shown more substantial results than PAIVMs in increasing the ROM of the knee in subjects with sciatica and the Passive accessory intervertebral movement technique is more effective in reducing pain.

Ethical Clearance: The Institutional Ethical Committee of Padmashree Institute of Physiotherapy has reviewed the research proposal of Ms. J. M. Akila Gaweshika Rathnayake, MPT student, Padmashree Institute of Physiotherapy, Kommaghatta, Bangalore-60 and certifies that the research proposal is ethically satisfactory. *(Ref- Ethical Guidelines for Biomedical Research on Human Subjects- Indian Council of Medical Research- New Delhi- 2000)*

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References

1. Spijker-Huiges A, Groenhof F, Winters J, van Wijhe M, Groenier K, van der Meer K. Radiating low back pain in general practice: Incidence, prevalence, diagnosis, and long-term clinical course of illness. Scandinavian Journal of Primary Health Care. 2015; 33(1):27-32.
2. 2. Hoy D, Brooks P, Blyth F, Buchbinder R. The Epidemiology of low back pain. Best Practice & Research Clinical Rheumatology. 2010;24(6):769-781.
3. 3. Cook C, Taylor J, Wright A, Milosavljevic S, Goode A, Whitford M. Risk Factors for First Time Incidence Sciatica: A Systematic Review. Physiotherapy Research International. 2013;19(2):65-78.
4. Clinical Orthopedic Rehabilitation. Medicine & Science in Sports & Exercise. 2018;50(4):878.
5. Sturmer T. Pain and high sensitivity C reactive protein in patients with chronic low back pain and acute sciatic pain. Annals of the Rheumatic Diseases. 2005;64(6):921-925.
6. Butler D, Jones M. Mobilisation of the nervous system. Melbourne: Churchill Livingstone; 1991.
7. Davis D, Anderson I, Carson M, Elkins C, Stuckey L. Upper Limb Neural Tension and Seated Slump Tests: The False Positive Rate among Healthy Young Adults without Cervical or Lumbar Symptoms. Journal of Manual & Manipulative Therapy. 2008;16(3):136-141.
8. Shacklock M, Yee B, Van Hoof T, Foley R, Boddie K, Lacey E et al. Slump Test. SPINE. 2016;41(4):E205-E210.
9. Coppieters M, Andersen L, Johansen R, Giskegjerde P, Høivik M, Vestre S et al. Excursion of the Sciatic Nerve During Nerve Mobilization Exercises: An In Vivo Cross-sectional Study Using Dynamic Ultrasound Imaging. Journal of Orthopaedic & Sports Physical Therapy. 2015;45(10):731-737.
10. 10. Hutson M, Ellis R. Textbook of musculoskeletal medicine. Oxford: Oxford University Press; 2006.
11. Hoskins W, Pollard H. Hamstring injury management—Part 2: Treatment. Manual Therapy. 2005;10(3):180-190.
12. Szlezak A, Georgilopoulos P, Bullock-Saxton J, Steele M. The immediate effect of unilateral lumbar Z-joint mobilisation on posterior chain neurodynamics: A randomised controlled study. Manual Therapy. 2011;16(6):609-613.
13. Perry J, Green A. An investigation into the effects of a unilaterally applied lumbar mobilisation technique on peripheral sympathetic nervous system activity in the lower limbs. Manual Therapy. 2008;13(6):492-499.
14. Shadle I, Cacolice P. Eccentric Exercises Reduce Hamstring Strains in Elite Adult Male Soccer Players: A Critically Appraised Topic. Journal of Sport Rehabilitation. 2017;26(6):573-577.
15. Fishbain D, Gao J, Lewis J, Bruns D, Meyer L, Disorbio J. Prevalence Comparisons of Somatic and Psychiatric Symptoms Between Community Nonpatients Without Pain, Acute Pain Patients, and Chronic Pain Patients. Pain Medicine. 2015;16(1):37-50.
16. What is the normal response to structural differentiation within the slump and straight leg raise tests? [Internet]. SWOO. [cited 2021Nov9]. Available from: https://swoo.nl/literatuurzoeker/what-is-the-normal-response-to-structural-differentiation-within-the-slump-and-straight-leg-raise-tests/
17. Lew P, Briggs C. Relationship between the cervical component of the slump test and change

in hamstring muscle tension. Manual Therapy. 1997;2(2):98-105.

18. PHILIP K, LEW P, MATYAS T. The Inter-Therapist Reliability of the Slump Test. Australian Journal of Physiotherapy. 1989;35(2):89-94.
19. Bonser R, Hancock C, Hansberger B, Loutsch R, Stanford E, Zeigel A et al. Changes in Hamstring Range of Motion After Neurodynamic Sciatic Sliders: A Critically Appraised Topic. Journal of Sport Rehabilitation. 2017;26(4):311-315.
20. McHugh M, Johnson C, Morrison R. The role of neural tension in hamstring flexibility. Scandinavian Journal of Medicine & Science in Sports. 2010;22(2):164-169.
21. Ridehalgh C, Moore A, Hough A. Sciatic nerve excursion during a modified passive straight leg raise test in asymptomatic participants and participants with spinally referred leg pain. Manual Therapy. 2015;20(4):564-569.
22. Basson A, Olivier B, Ellis R, Coppieters M, Stewart A, Mudzi W. The Effectiveness of Neural Mobilization for Neuromusculoskeletal Conditions: A Systematic Review and Meta-analysis. Journal of Orthopaedic & Sports Physical Therapy. 2017;47(9):593-615.
23. Slaven E, Goode A, Coronado R, Poole C, Hegedus E. The relative effectiveness of segment specific level and non-specific level spinal joint mobilization on pain and range of motion: results of a systematic review and meta-analysis. Journal of Manual & Manipulative Therapy. 2013;21(1):7-17.
24. Chiradejnant A, Latimer J, Maher C, Stepkovitch N. Does the choice of spinal level treated during posteroanterior (PA) mobilisation affect treatment outcome?. Physiotherapy Theory and Practice. 2002;18(4):165-174.
25. Lee M, Esler M, Mildren J, Herbert R. Effect of extensor muscle activation on the response to lumbar posteroanterior forces. Clinical Biomechanics. 1993;8(3):115-119.
26. Subramanian D. PILATES AND PHYSIOTHERAPY ON HAMSTRING TIGHTNESS – AN EVIDENCE BASED CASE STUDY. World Journal of Pharmaceutical Research. 2017;:923-930.
27. Monro R, Bhardwaj A, Gupta R, Telles S, Allen B, Little P. Disc extrusions and bulges in nonspecific low back pain and sciatica: Exploratory randomised controlled trial comparing yoga therapy and normal medical treatment. Journal of Back and Musculoskeletal Rehabilitation. 2015;28(2):383-392.
28. Wegner I, Widyahening I, van Tulder M, Blomberg S, de Vet H, Brønfort G et al. Traction for low-back pain with or without sciatica. Cochrane Database of Systematic Reviews. 2013
29. Singh AK, Nagaraj S, Palikhe RM, Neupane B. Neurodynamic sliding versus PNF stretching on hamstring flexibility in collegiate students: a comparative study. Int J Phys Educ Sports Health. 2017;1(1):29-33.