Effect of Neurodynamic Slider Technique Combined with Conventional Therapy and Conventional Therapy Alone in Sciatica: A Comparative Study

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Abstract

Background: Functional activity is an important aspect of normal human function. Limited functional activities due to in sciatica have been shown to predispose a person to several restrictions in function and significantly affect the normal daily life.

Objective: To determine and compare the effectiveness of Neurodynamic Slider Technique (NST) with conventional therapy (CT) and conventional therapy alone in sciatica for improving functional ability and pain.

Method: 40 subjects with sciatica were allocated into two groups (20 subjects in each group). The outcome measure used was Oswestry Disability Index (ODI) and Visual Analogue Scale (VAS). Subjects of group A were treated with Conventional therapy only, whereas the subjects of group B were treated with Neurodynamic slider technique. For both the groups, the technique was performed three times a week for a total treatment period of four weeks.

Results: The results demonstrated significant improvement in functional ability for subjects of group B when compared with those of group A ($P<0.05$) at the end of four weeks.

Conclusion: The study shows that CT along with NST are efficient in the rehabilitation of sciatica patients reflecting the improvement of functional ability by reducing pain and considerably increase the physical performance of patients in their own aspects. Thus, Neurodynamic Slider technique along with Conventional therapy can be used in clinical practices for the treatment of sciatica.

Keywords: *Sciatica, Low Back Pain, Functional ability, Neurodynamic slider technique, Conventional therapy, VAS.*

Introduction

Sciatica is a non-specific term commonly used to describe symptoms of pain radiating downward from the buttock over the posterior or lateral side of the lower limb[1]. This condition is due to sciatic nerve compression, the most common cause being herniated disk. Other causes that can be cited are degenerative spine disease, infections, traumatic posterior hip dislocation, congenital anomalies, Piriformis syndrome and lumbar spinal canal stenosis.

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The symptoms include low back pain, pain along the nerve, sensorial disturbances and weakness of the lower limb muscles innervated by the sciatic nerve. Sciatica due to nerve compression, originating from a neurapraxic-type injury, is characterized by a decrease in nerve conductivity and causes selective atrophy of the muscle fibers innervated by compromised motor neurons[2].

World data reveals 40 % or more people have sciatica due to lumbar disc prolapse mostly in younger adults in association with 50-70% lifetime incidence of low back pain. The prevalence of sciatic symptoms reported in the literature varies considerably ranging from 1.6% in the general population to 43% in a selected working population[3].

Physical therapists utilize a wide range of treatment to treat sciatica like electro therapy modalities, general back strengthening or lumber stabilization and neural stretching techniques to treat altered neurodynamic of the neural structures which is been considered to be one of the predominating cause for low back pain[6]. One subgroup that has been examined by number of researches was the patients who had symptoms that are more distal and whose symptoms did not improve with specific directional exercises (flexion/extension exercises). These patients are commonly thought to be experienced due to altered neurodynamic i.e., interaction between nervous system mechanics and physiology[4].

NEURODYNAMIC conceptualized by Michael Shacklock, which refers to the integrated biomechanical, physiological and mechanical functions of the nervous system [5]. Clinical neurodynamic is essentially the clinical application of mechanics and physiology of the nervous system as they relate to each other and are integrated with musculoskeletal function[6]. Neurodynamic is a manual method of applying force to nerve structures through posture and multi-joint movement [7]. Based on the principle that the nervous system should be also stretched and contracted properly to maintain normal muscle tension and ensure range of motion[8], this technique is used for the recovery of soft tissue mobility [9]

"If it cannot move, glide and stretch, then the nervous system's cardinal function of conduction will be useless"[8]. For a peripheral nerve to function properly the nervous system must have the ability to move and slide, withstand stretch and compression. It is important to note that these features are interdependent therefore the Peripheral Nervous System must simultaneously cope with body movement and dissipate mechanical force by adapting to elongation and compression which allow independent movement in relation to its surrounding tissues. [10]

In this study SLR test was used to examine the sensitivity of the structure of sciatic nerve. Straight leg raising test (SLR) is widely used one of the primary diagnostic physical examination tests in patients who have low back pain or low back and leg pain. Slump test is actually a variant of SLR [12]. Maitland (1985) described that slump test can be used as an assessment tool for the identification of possible altered neurodynamic[11].

An important aspect of the neurodynamic approach is that the healthy mechanics of nervous system enable pain-free posture and movement to be achieved[4,8]. Essentially, neural mobilization techniques have been developed from neurodynamic tests. Structural differentiation is performed with all the neurodynamic tests to gain information whether the neurodynamic events participate in the mechanism of symptoms. Neural mobilization techniques have been developed from neurodynamic test [,5,9]. Now that a growing body of evidence is emerging regarding the mechanical effects of neural mobilization techniques like the ipsi-lateral sliders, ipsi-lateral tensioner for different nerves in the body, it is important to find the

benefits of newer techniques like the slider techniques, so that they can be used in specific conditions of low back with radiating symptoms.

The purpose of the present study was to compare the effectiveness of Neurodynamic Slider technique combined with conventional therapy and conventional therapy alone in treatment of Sciatica. This study is being carried out to determine which treatment is better in addressing the dysfunctions. A comparison with the control group will help to further strengthen the available evidence on the effectiveness of Neurodynamic slider techniques.

Methodology

The study was conducted at Florence college of Physiotherapy clinic, Bangalore, India. Ethical clearance was obtained from institutional ethical committee, Florence College of Physiotherapy, Bangalore as per ethical guidelines for biomedical research on Human subjects, 2000 ICMR, New Delhi. The study design was a pre-post experimental study for duration of 6 months. Simple random sample of 40 participants with age ranging 30-55 years, both genders presenting sciatica with or without low backache of symptoms from 2 weeks to 3 months with leg pain greater than back pain in a radicular distribution and changes in symptoms with lumber flexion or extension. Patients should have positive Straight Leg Raise (SLR) of more than 35 degrees with radicular sign with persistent pain radiating to the lower limb and baseline of Visual Analogue Scale score greater than 4 and Oswestry Disability Index score greater than 10% were included in the study. Patients with history of severe trauma, spinal fracture, Infections, Tumors, Secondary Metastases, osteoporosis, Cauda Equina Syndrome, Spinal stenosis, Postoperative conditions in the back and hip, Positive neurological signs exhibited a SLR test of less than 35 degrees and History of a major psychiatric or systemic illness were excluded from the study. Prior to participation, a written informed consent was taken from all patients and were informed about study protocol. Standard full circle goniometer, High Couch, Visual Analogue Scale (VAS), Oswestry Disability Index scale (ODI), Interferential Therapy (IFT), Ultrasound Therapy (UST) were used for the study. All the patients were undergone a pre-treatment examination to assess pain and functional ability using VAS and ODI scale.

Procedure: Subjects willing to participate in the study were briefed about the treatment. After briefing, their written consent was taken. The assessment was performed and the initial Pain and Disability was measured using VAS and ODI scale. Assessment was taken on the 1st day of session and at the end of last session. Patients were given treatment 3 times a week on alternate days till 4 weeks. The subjects were randomly assigned into two groups of 20 each using a simple random distribution into 2 intervention groups. 40 subjects were taken conveniently first come first basis and divided 20 subjects into "Group A" where the treatment allotted to them was Conventional therapy only and 20 subjects into "Group B" and the treatment allotted to them was Conventional therapy along with Neurodynamic Slider Technique. Complete explanations were given to both the groups separately but the subjects were unaware to which group they belonged.

In group A, 20 patients were screened and assessment was performed and pre intervention score was calculated. Treatment was started first with Electrotherapy followed by Piriformis stretch and back strengthening Exercises once the pain had come down. Electrotherapy which included UST, IFT along the course of pain and/or at the Low back for 3

days a week till 4 weeks and exercise were made to do under supervision. UST was used for the duration of 6 minutes at the site of Piriformis muscle. IFT was used 10 minutes at the Lumbar region and/or along the course of pain. The exercise such as Piriformis Stretch was performed as patient was lying on the back with both feet flat on the couch and both knees were bent. Resting the ankle of the affected leg over the knee of the unaffected leg and asked the patient to pull their unaffected thigh toward the chest and hold the position for 15-30 seconds for 3 repetitions which results the stretch of Piriformis muscle on the affected side. Back Extension in prone was performed as patient was lying prone on the couch with palms facing upwards and toes touching the couch. Slowly raising the upper body off the ground by pulling shoulders back and lifting your legs up as far as they can come up. Looking straight ahead throughout the move and patient returned to starting position and repeated for 10 repetitions. Bird and Dog/Quadruped Exercise was done as this exercise begins on all fours with hands directly under shoulders and knees directly under hips. Patient pulls their abs in to the spine. Keeping back and pelvis still and stable, reaching their right arm forward and left leg back. Avoiding the pelvis to rock side to side as they move their leg behind them. Focus was on not letting the rib cage sag toward the floor. Patient reach through their left heel to engage the muscles in the back of the leg and their buttock. Return to the starting position, placing their hand and knee on the floor. Repeating on the other side to complete one rep. This exercise was done for 10 repetitions.

In group B, 20 patients were screened; assessment was performed and pre intervention score was calculated. These patients received Conventional Therapy along with Neurodynamic Slider technique for alternately 3 days a week up to 4 weeks duration. Conventional Therapy was applied same as group – A. Patient was treated with Neurodynamic slider techniques of sciatic nerve to the lower limb as explained by M. Shacklock [4] additional to CT. Neurodynamic Slider technique was given based on irritability and severity of the condition. Depending upon severity of pre intervention score i.e., VAS score >7, Off Loader Position was performed, i.e., in either side lying or supine lying, Hip flexion was below 70 degree, abducted, externally rotated; knee flexed and foot was in comfortable position. This position was maintained for about 2 minutes to relax the sciatic nerve and Piriformis muscle. One Ended Slider which was done distally by moving knee flexion to extension and/or ankle plantar flexion/inversion. The position was in side lying, painful side was uppermost, hips and knees were flexed to approximately 45°. The neck movements (both flexion and extension) were restricted to neutral position or was in relaxed position i.e., Neck in extension or generally performed to a comfortable range and, if this was satisfactory, the movements were progressed further into the next level i.e., Two ended sliders. The movements were on bilateral knee extension or ankle plantar flexion. The neck movements were restricted to one position. The movements were made by the therapist whilst the patient kept the neck stable. Two Ended Slider was performed by moving Neck neutral to extension and Knee flexion to extension for Distal Slider; Neck neutral to flexion and Knee extension to flexion for Proximal Slider. The position was in side lying, painful side uppermost, hips and knees were flexed to approximately 45°. The neck movements (both flexion and extension) were generally performed to a comfortable range and, if this was satisfactory, the movements were progressed further into the range. The movements were done as neck extension/ bilateral knee extension then neck flexion/bilateral knee flexion. The neck movements were generally performed by the therapist whilst the patient moved their knees. Dorsiflexion was optional. This slider techniques were also done in supine once the patient

was comfortable with side lying position can also be performed in the sitting position if this was more convenient.

Results

Comparative statistical analysis has been carried out in the present study. Out Come measurement functional disability and pain was measured using Oswestry Disability Index and Visual Analogue Scale respectively, and the analysis are presented as mean ± SD. Level of significance with p value <0.05 then this is considered as statistically significant.

Table-1: Distribution of subjects according to gender in both groups.

S.no.	Gender	GROUPS	
		GROUP A	GROUP B
1	Male	12(60%)	14(70%)
2	Female	8(40%)	6(30%)
		Chi-Square value=0.4396, df=1, p=0.507,NS	

NS-Not significant. i.e.>0.05

Table-2: Distribution of subjects according to age in both groups.

S.no.	Groups	Age in years		Unpaired t-test
		Range	Mean ± SD	
1	Group A	31-53	41.5±6.2	t=0.4879, p=0.314, NS
2	Group B	30-54	40.45±7.3	

NS-Not significant. i.e.>0.05.

Table-3: Range, Mean, SD, ODI and pain measures in (GROUP A)

S.no	Variables	Pre test		Post test		Paired t-test and Wilcoxon test	p-value
		Range	Mean ±SD	Range	Mean ±SD		
1	ODI	32-60%	47%± 0.086	8-32%	21%± 0.065	Paired t-value=12.28*	p=0.00
2	VAS for pain	5-8	6.85± 0.933	1-4	2.65± 0.875	Z-value=3.919*	p=0.00

Note: * denote –Significant (p<0.05).

Table-4: Range, Mean, SD, ODI and pain measures in (GROUP B)

S.No.	Variables	Pre test		Post test		Paired t-test and Wilcoxon test	p-value
		Range	Mean ±SD	Range	Mean ±SD		
1	ODI	34-58%	47%± .071	8-22%	15%± .042	Paired t-value=18.71*	p=0.000
2	VAS for pain	6-8	7.1± 0.78	1-3	1.85± 0.67	Z-value=3.91*	p=0.000

Note: * denote –Significant (p<0.05)

Table-5: Comparison of post ODI and pain between (GROUP A) and (GROUP B)

S.no.	Variables	GROUP A	GROUP B	Unpaired t-test and Mann-Whitney U test	p-value
		Mean ±SD	Mean ±SD		
1	ODI	21%± 0.065	15%± .042	Unpaired t-value=3.72*	p=0.0003
2	VAS for pain	2.65± 0.875	1.85± 0.67	Z-value=2.73*	p=0.006

Note: * denotes–Significant (p<0.05); NS – Not significant (p>0.05)

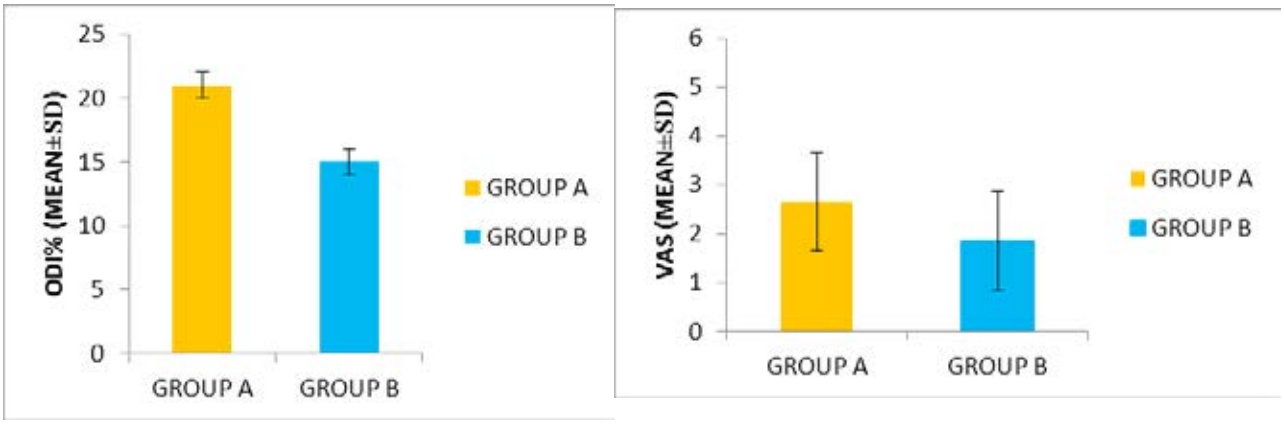

Fig.: Graphs between groups for ODI score and VAS score

Discussion

The Study was aimed to compare the effect of neurodynamic slider technique combined with conventional therapy and conventional therapy alone in 40 Sciatica patients (20 in each group) by means of Visual Analogue Scale (VAS) and Oswestry Disability Index scale (ODI).

The baseline demographic variables were homogeneous in nature in both the groups. In group A there were 12 male subjects and 8 female subjects. Similarly, in group B there were 14 male subjects and 6 female subjects. The mean age in group A, was 41.5 with SD of 6.2 and in group B the mean age was 40.45 with SD of 7.3.

In group A, the mean ODI have improved significantly. Possible explanation for the improved quality of life, functional ability for the subject in group A could be because of viscoelastic nature of the Piriformis muscle, and also Knott. M. and Voss. D. (1968) proposed that the Golgi tendon organ is a nerve receptor found in tendons. This receptors fires when tension increases in the tendon, this tension can be due to stretch or contracting muscle when the Golgi tendon organ fires a signal is sent to the spinal cord causing the agonist muscle to relax [13]. Another reason also could be the placebo effect that has been reported to account for 5% to 72% of the treatment effect [14]. A recent trial found significant positive outcomes for postoperative orthopedic knee surgery patients treated with home IFT versus placebo IFT, providing the first evidence for the efficacy of this modality for musculoskeletal conditions [15]. Thus, future researchers investigating the efficacy of IFT for sciatica or LBP should include an adequate control or placebo group [16].

In group A, the mean VAS score has showed significant improvement. It could may be the stretching of Piriformis muscle and increasing the pain threshold level. This is in accordance to the study by Cristina Bretichwerdt and colleagues found that stretching of the hamstring muscles, either unilateral or bilateral, exerts an immediate hypoalgesic effect, i.e., increase in pressure pain threshold levels. The mechanism behind this is that muscle stretching also activates descending inhibitory pathways [17].

In group B, the mean ODI have improved significantly. This is in accordance to the absolute sciatic nerve excursion during sliding technique [13]. Méndez-Sánchez et all.[18] applied a neurodynamic sliding technique to the hamstrings of healthy male soccer players, observing a greater improvement in ROM than that after general stretching, and Castellote-Caballero et all [19] also applied a neurodynamic sliding technique to 28 healthy football players, with a significant increase in ROM demonstrated using the passive SLR test. These findings were consistent with the results of this study. These findings can be explained as follows: If tension is applied to the nervous system while applying neurodynamics, the reduction of the cross-sectional area and increase in pressure in the nerve result in extension and movement of the sciatic nerve together with the hamstring and compliance of the nerve, resulting in increased flexibility [20,21].

When applying neurodynamics, tension occurs in the nervous system, and pressure within the nerve increases due to the decrease of the cross-sectional area, and the axonal transport system lengthens the sciatic nerve after shortening because of the influence of the surrounding related structures and hamstring flexibility [22]. After extension of the nerve and muscle, muscle performance is improved because of increases in the number of muscle fibre segments and cross-sectional area of muscle fibres[23]. Neurodynamics increases the activity of muscles more significantly than that observed at rest[24,25]. Previous studies reported reductions of muscle tone and muscle spasticity, suppression of hyper tonus, improvement

of grip, recovery of median nerve function [26,27], and pain relief after the application of neurodynamics. After applying a neurodynamic sciatic nerve sliding technique in this study, significant differences were observed in functional ability, quality of life, and range measuring hamstring flexibility by the means of SLR test.

The mean VAS score showed the significant improvement in group B which could be explained due to involvement of central and peripheral modulatory mechanisms, such as activation of muscle[24,26] and joint mechanoreceptors that involve centrally mediated pathways, like the periaqueductal grey in the midbrain, or non-opioid serotonergic and noradrenergic descending inhibitory pathway [28].

Hence based on the analysis and findings, the present study found that with 4 weeks of NST along with conventional therapy showed better result with P value <0.05. So NST along with conventional therapy is a good choice of treatment for people with sciatica. Thus, NST can be used in the treatment of people with sciatica to get improvement in functional ability and pain within a shorter period of time.

Conclusion

This study was intended to compare the effect of Neurodynamic slider technique along with conventional therapy versus conventional therapy alone in sciatica. Taking into the consideration the parameters of pain using VAS and functional disability using Oswestry Disability Index Questionnaire in case of effect of NST with CT versus CT alone in sciatica with or without back pain. The study can be concluded by taking mean scores that effect of NST with CT versus CT alone are efficient in and useful in the rehabilitation of the patients with sciatica. They improve the functional ability, relieve pain mainly in personal care, sleeping, walking, standing aspects of ODI and considerably improve the physical performance of the patients in their own aspects.

Ethical Clearance- Taken from Institutional Ethical Committee of Florence Institute of Physiotherapy

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Conflict of Interest - Nil

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