

## **IMPACT OF NEURODYNAMIC MOBILIZATION AND STRETCHING EXERCISES IN CERVICAL RADICULOPATHY: RCT**

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### **Introduction**

When one or more cervical nerve roots malfunction, it causes cervical radiculopathy, which manifests as radiating pain, numbness, paresthesia, and even upper limb motor weakness [1]. Usually brought on by cervical disc herniation, osteophyte growth, or foraminal encroachment particularly affecting the C6 and C7 roots—it typically develops as a result of mechanical compression or irritation of nerve tissue [1,2]. These alterations may cause severe arm and neck pain, which could hinder everyday tasks and lower quality of life. For the majority of patients, conservative treatment is still the primary choice of treatment, even though surgery may be required in cases of growing neurological deficiency or refractory symptoms [3]. The safety and effectiveness of manual therapy and therapeutic exercises, particularly neurodynamic mobilization and stretching, in reducing symptoms and enhancing function are becoming more widely acknowledged among conservative approaches [4]. The mechanical and physiological properties of neural tissue and its interfaces are the focus of neurodynamic mobilization, sometimes referred to as neural mobilization or nerve gliding. In order to increase vascular and axoplasmic flow, lower intraneural pressure, and restore neuronal sliding and mobility, this approach uses movements like tension-slack cycling along nerve pathways [5]. The theoretical underpinnings include improving nerve gliding, lowering intraneural edema, and decreasing mechanosensitive—elements that may be able to relieve radicular symptoms without the need for surgery [3,5]. Numerous randomized controlled trials (RCTs) have verified neural mobilization's clinical efficacy. For instance, Rafiq et al. (2022) showed that, in patients with cervical radiculopathy, combining neural mobilization with cervical isometric exercises greatly improved

pain relief and decreased disability as assessed by NPRS and NDI when compared to conventional exercise alone [6]. Trials that combined neural mobilization and cervical traction revealed similar results, including increased deep neck flexor endurance, range of motion (ROM), discomfort, and impairment [7]. According to reviews, a systematic examination of these RCTs indicates that there is moderate-quality evidence that neural mobilization is more effective than no treatment for pain and improving range of motion. Its role in a multimodal regimen rather than as a stand-alone intervention is highlighted by the fact that the benefit as compared to other active therapies is yet unclear [5]. Stretching exercises are frequently utilized in rehabilitation protocols to address muscle tightness, joint stiffness, and decreased mobility—all of which contribute to neck and upper limb dysfunction in addition to neural mobilization [8]. Restoring flexibility and getting the musculoskeletal system ready to support long-term structural and functional repair need stretching. When paired with endurance-focused workouts that target the deep neck flexors, it is particularly helpful at reducing pain and disability scores [6]. Nevertheless, prior studies suffer from heterogeneity variations in techniques, duration, patient demographics, and outcome measures hindering definitive conclusions and limiting protocol standardization [5]. Furthermore, interpretation and generalizability are hampered by methodological flaws such inadequate long-term follow-up, restricted blinding, and a lack of objective neurological measurements [5,7]. Comparing the combined benefits of stretching exercises and neurodynamic mobilization in the treatment of cervical radiculopathy is not well supported by research. To assess their combined and individual effects on pain, function, and quality of life, this study is required.

### Literature Review

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## Research Methodology

### Study Design

A Randomized controlled trial with parallel groups was conducted. Participants were randomly allocated to one of two groups: Control group or Neurodynamic mobilization group.

### Participants

The outpatient department of Madhav Physiotherapy College and Hospital was used to recruit 60 patients with cervical radiculopathy (35 men and 25 women; mean age  $48.7 \pm 9.2$  years). Clinical presentation and magnetic resonance imaging (MRI) results supported the diagnosis. Inclusion criteria. (1) Age between 25 and 55 years old (2) radiating neck pain, numbness, or tingling along a dermatomal pattern in the upper limb were the (3) Pain lasting longer than four weeks. (4) A significant disability is indicated by an NDI score of 20% to 70%. Exclusion criteria (1) Recent trauma (fracture/dislocation) or cervical spine surgery were among the exclusion criteria. (2) Symptoms of myelopathy (3) Recognized systemic neurological conditions, such as Parkinson's disease and multiple sclerosis. (4) The existence of red flag conditions, such as inflammatory arthritis, infection, or cancer.

### Randomization and Blinding

Draw method used for randomization. The randomization procedure was carried out by a separate research coordinator who was not involved in participant recruiting or evaluation.

Outcome assessors were blinded to group assignment; however, participants and therapists could not be completely blinded because of the nature of the therapies.

### **Interventions**

All participants received treatment four times per week for 4 weeks, with each 45 minutes.

**Control group (n=30)** Transcutaneous Electrical Nerve Stimulation (TENS), which uses a traditional high-frequency mode to relieve pain through sensory-level stimulation, was administered to the cervical paraspinal region for 10 minutes to start the treatment session. In order to encourage muscular relaxation and improve local blood circulation, a hot pack was applied across the cervical spine and upper trapezius muscles for an additional ten minutes. Following the treatments, patients engaged in a series of cervical spine active range of motion (AROM) exercises, which included rotation, side bending, flexion, and extension. Each exercise was completed ten times. Static stretching exercises for often tense muscles, including the levator scapulae, pectoralis major/minor, and upper trapezius, were then performed. Each stretch was held for 20–30 seconds and performed three times. Isometric neck strengthening exercises were conducted in all directions (flexion, extension, and lateral flexion) to enhance the cervical spine's muscle support. Each contraction was sustained for 5–10 seconds and repeated ten times.

**Neurodynamic mobilization group (n=30)** Patients were treated with conventional treatment. The median nerve, which is frequently impacted in cervical radiculopathy, was the primary target of the neurodynamic mobilization procedures given to the patients. In order to mobilize the nerve in gliding pattern, the therapist used controlled movements while the patient was in a supine position. These movements included shoulder abduction, external rotation, forearm supination, wrist and finger extension, and elbow extension, along with contralateral cervical side flexion. Depending on the patient's tolerance and symptom response, mobilizations were applied in three sets of ten repetitions with mild oscillations and 30-second rest periods in between sets. The upper trapezius, levator scapulae, scalenes, and pectoralis muscles are important muscle groups that contribute to cervical dysfunction. Static stretching exercises were also performed in addition to neurodynamic work. The goal was to increase flexibility and decrease myofascial tension by holding each stretch for 20 to 30 seconds and doing it three times. Similar to the

control group, this was followed by isometric neck strengthening and active range of motion (AROM) exercises that encouraged muscle activation and postural correction.

### Outcome Measures

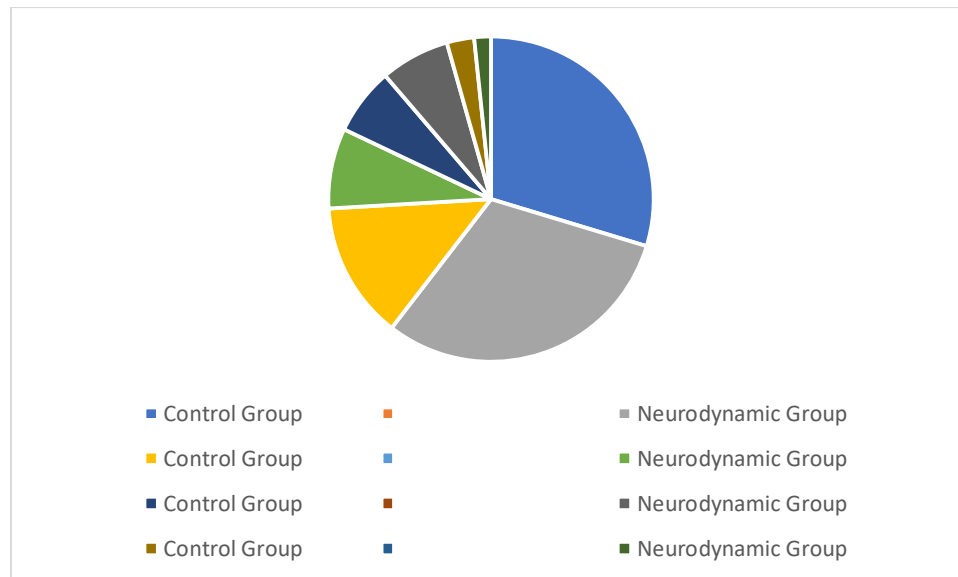
VAS (Visual Analog Scale) for pain intensity (0-10, 10 indicating worse pain and 0 indicating no pain)

Neck Disability index Each item is scored out of five (with the no disability response given a score of 0) giving a total score for the questionnaire out of 50. Higher scores represent greater disability.

### Statistical Analysis

Measure	Group	Mean	Sig. (2-tailed)	Std. Deviation
Pre NDI	Control Group	35.7586	0.005	1.88329
	Neurodynamic Group	37.1034	0.005	1.26335
Post NDI	Control Group	16.4138	0.000	2.70604
	Neurodynamic Group	9.6207	0.000	1.69903
Pre VAS	Control Group	8.0345	0.212	0.82301
	Neurodynamic Group	8.3103	0.212	0.66027
Post VAS	Control Group	3.2759	0.000	0.75103
	Neurodynamic Group	2.0000	0.000	0.70711

- VAS – Visual Analogue Scale
- NDI – Neck Disability Test



The Neurodynamic group had a little higher baseline neck-related disability than the Control group, as evidenced by their higher mean NDI score (37.10) before to the intervention. The statistical significance of the difference between the groups ( $p = 0.005$ ) confirmed that the Neurodynamic group's early symptoms were more severe. Following the intervention, there was a noticeable improvement in both groups. With a mean post-NDI of 9.62 as opposed to 16.41 in the Control group, the Neurodynamic group showed a more noticeable decrease. Both groups showed a highly significant improvement ( $p = 0.000$ ), indicating successful treatment results. The additional advantage of neurodynamic mobilization is supported by the larger decrease in NDI for the neurodynamic group. Both groups experienced a substantial drop in pain levels after treatment, with the Neurodynamic group once more demonstrating a larger reduction in pain (mean = 2.00) than the Control group (mean = 3.28). It was confirmed that the Neurodynamic intervention was more successful in reducing pain because this difference was statistically significant ( $p = 0.000$ ).

**Result** The intervention's outcomes unequivocally show that there were notable improvements in neck impairment and pain reduction for both the Control and Neurodynamic groups. The Neurodynamic group, however, produced better results. This group demonstrated a bigger reduction in disability after therapy, although beginning with somewhat higher baseline disability levels, as seen by their higher pre-treatment NDI scores. Both reductions were statistically significant ( $p = 0.000$ ), with the Neurodynamic group seeing a more significant decrease in the post-intervention NDI score (mean = 9.62) than the Control group (mean = 16.41). In a similar vein, both groups' VAS-measured pain levels dramatically decreased; however, the Neurodynamic group's decrease was more noticeable (mean = 2.00 vs. 3.28), and the improvement was statistically significant ( $p = 0.000$ ). According to these results, individuals with cervical dysfunction benefit more from neurodynamic mobilization in conjunction with traditional physiotherapy than from conventional physiotherapy alone, even if both treatment approaches were successful.

### **Conclusion**

The Neurodynamic group demonstrated better results in both functional disability (NDI) and pain reduction (VAS), even though both groups benefited from their individual therapies. The Neurodynamic group showed more improvements after treatment, even if their baseline symptoms were a little worse. When compared to traditional physiotherapy alone, neurodynamic mobilization is a more successful treatment technique for cervical dysfunction, as evidenced by the statistical significance of the post-intervention differences.

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