

## ORIGINAL ARTICLE

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## THE COMBINED EFFICACY OF NEURAL MOBILIZATION WITH TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS) VERSUS NEURAL MOBILIZATION ALONE FOR THE MANAGEMENT OF CERVICAL RADICULOPATHY

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## ABSTRACT

**Background:** Cervical radiculopathy occurs annually in 85 out of 100,000 people. It is very disabling and interferes with the ADL of the patients. Many studies had shown the effectiveness of neural mobilization and TENS in reduction of pain and disability in patients with cervical Radiculopathy. But there are less documented studies that had shown the combined effect of neural mobilization and TENS and effectiveness of both over only neural mobilization in patients with cervical radiculopathy.

**Methods:** 30 male and female subjects were assessed as cervical radiculopathy and selected for the study. This includes unilateral cervical radiculopathy. They were categorized randomly into two groups as group receiving neural mobilization and TENS (experimental group I) and group receiving only neural mobilization (experimental group II) with 15 patients in each group. Assessment was taken using VAS and NDI prior to treatment. Treatment was continued for 14 days and at the end of 14 days patients were reassessed using the same scales.

**Results:** Group 1 receiving both the treatments had shown more significant reduction in pain and disability compared to Group 2 receiving only neural mobilization after 14 days of treatment.

**Conclusion:** Both neural mobilization and TENS are effective in reduction of pain and disability in patients with cervical radiculopathy. And when compared, combined treatment is more effective than only neural mobilization.

**Keywords:** Cervical radiculopathy, neural mobilization, TENS, VAS, NDI

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## INTRODUCTION

Cervical radiculopathy is compression and inflammation of the nerve root or roots at or near the neural foramen. It affects 85 out of 100,000 people every year. Etiology for radiculopathy are herniation of cervical disc progressing to spondylosis, intraspinal or extra spinal tumors, nerve root avulsion, synovial and meningeal cysts, dural arteriovenous fistulae, or tortuous vertebral arteries. Cervical radiculopathy can be idiopathic also. Differential diagnosis, are upper extremity nerve entrapment, shoulder disease, brachial plexus disorders, and peripheral neuropathies [1]. Radiculopathy can be divided into acute, subacute and chronic. The location and pattern of symptoms will vary depending on nerve root level affected and can include sensory and motor alterations if the dorsal and/or ventral root is involved [2]. Cervical radiculopathy primarily presents with unilateral motor and sensory symptoms into the upper limb with muscle weakness (myotome), sensory alteration (dermatome), reflex hypoactivity and sometimes focal activity being the primary sign. Patients usually present with complaints of pain, numbness, tingling and weakness in the upper extremity which often result in significant functional limitations and disability [3]. Henderson et al. reviewed the clinical presentations of cervical radiculopathy in more than 800 patients and found arm pain in 99.4%, sensory deficits in 85.2%, neck pain in 79.7%, reflex deficits in 71.2%, motor deficits in 68%, scapular pain in 52.5%, anterior chest pain in 17.8%, headaches in 9.7%. The type and location of the radicular symptoms are determined by the level at which the cervical nerve root compression occurs.

Mechanical irritation of neurons due to repetitive compression, tensile, friction, and vibration forces can occur. Intra-neural circulation will compromise after nerve injury. Release of inflammatory substances can chemically irritate neural tissues. peripheral nerve and its associated DRG may develop the ability to repeatedly generate their own impulses due to injury. Endoneurial edema is seen due to perineurial diffusion barrier which will block the escape of inflammatory substances. Persistent endoneurial edema will compromise viscoelastic properties of neural connective tissues and intra-neural fibrosis. The injured segment of neural tissue will have impact on the target tissue it innervates [4,5].

Neural tissue mobilization techniques are passive or active movements that focus on restoring the ability of the nervous system to tolerate the normal compressive, friction, and tensile forces associated with daily and sport activities. The nerve gliding exercises induce sliding of the nerve relative to its surrounding structures by performing joint movements that elongate the nerve bed. Lengthening of the nerve bed also elongates the nerve which increases nerve tension and intra-neural pressure. Whereas sustained elevated intra-neural fluid pressure reduces intra-neural blood flow in oedematous neuropathies, a dynamic variation in intra-neural pressure when correctly applied may facilitate evacuation of intra-neural oedema and reduce oedema and

reduce symptoms [6].

Transcutaneous electrical nerve stimulation (TENS) has been increasingly used in physical therapy for the relief of acute and chronic pain. TENS is particularly suited for the treatment of pain of neurogenic origin, including peripheral nerve injury, radiculopathies etc. The analgesic effect of TENS may be modulated by the endogenous opiate system through the release of endorphinergic substances [7,8].

## MATERIALS AND METHODS

This study was a comparative study with pre and post test design. 30 subjects who met the inclusion criteria which includes age 25-68 years of either sex, Unilateral Cervical radiculopathy over a 10 months period as per diagnosed by orthopaedician or neurophysician, presence of three positive examination findings in the subjects like Upper limb tension test, Spurling's test and Cervical distraction test with simple random sampling were taken in to the study. Subjects with presence of any contraindication for TENS and neural mobilization, patients on medications for cervical radiculopathy, upper extremity symptoms due to cord compression and CNS cause, thoracic outlet syndrome were excluded from the study.

## PROCEDURE

The selected samples were randomly divided into two groups with a group receiving neural mobilization and TENS (experimental group I) and a group receiving only neural mobilization (experimental group II) with 15 patients in each group after taking informed consent. The study was carried out in three stages: a) Pre-intervention measurement b) Intervention c) Post-intervention measurement

(a) Pre-intervention measurement: Patients in both group I and group II were assessed before starting treatment. Pre treatment measurement was taken by using Visual analog scale (VAS) for pain and Neck Disability Index for functional outcome. VAS and NDI were carried out on the first day of treatment procedure (pre-treatment evaluation). (b) Intervention: Group I and group II subjects were assessed for nerve affection using upper limb tension tests: ULTT 1 for Median nerve, ULTT 2a for Median nerve, ULTT 2b for Radial nerve, ULTT 3 for Ulnar nerve. Depending on the affected nerve neural mobilization was given to both Group I and Group II. (1)TENS: Frequency of 40-70 Hertz, Intensity as per patient's tolerance, Pulse duration of 10- 50 Micro secs for 20 min. Electrode Placement is at the area of greatest intensity of pain[9]. The treatment consisted of 14 sessions 7 times/week, for 2 weeks. (2) Neural Mobilization[10]: Depending on the affected nerve neural mobilization was given. The treatment consisted of 14 sessions, 7times/week for 2 weeks. The patient was positioned in neurodynamic test position according to the involved nerve and required sliding or gliding techniques were used. Neurodynamic positions. (c) Post-intervention measurement: VAS and NDI were carried out again on the 14<sup>th</sup> day of treatment procedure (post-treatment evaluation) for all the patients.

## RESULTS

### Statistical analysis:

This study was done to determine the combined efficacy of neural mobilization with TENS versus neural mobilization alone. 30 male/female subjects between the ages 25-68 years with unilateral cervical radiculopathy took part in the study. They were divided into two groups with 15 subjects in each group. Group 1 was treated with both neural mobilization and TENS and group 2 was treated with only neural mobilization. Comparison was done by using student 't' test.

**TABLE – 1.1** Mean And SD values of Pre and Post Test NDI scores of subjects in Group 1 and 2

	GROUP1		P value	GROUP2		P value
	PRE TEST	POST TEST		PRE TEST	POST TEST	
MEAN + SD	17 + 4.85	6.33 + 3.24	<0.0001*	16.47 + 3.92	10 + 3.36	<0.0001*

### INTERPRETATION:

The mean of pre test and post test NDI scores for group 1 is 17 and 6.33 respectively. The mean of pre test and post test NDI scores for group 2 is 16.47 and 10 respectively. The SD value of pre test and post test NDI scores for group 1 is 4.85 and 3.24 respectively. The SD value of pre test and post test NDI scores for group 2 is 3.92 and 3.36 respectively. The value of 't' was found to be 0.89 and 0.86 for group 1 and group 2 respectively for the pre and post test values of NDI scores.. When compared to the tabulated value, the above 't' values were significant with  $p < 0.0001$ . Hence both neural mobilization and TENS and only neural mobilization, both were effective to reduce disability on NDI scores in patients with cervical radiculopathy.

**TABLE-1.2** Mean and SD values of Pre and Post test VAS scores of subjects in Group 1 and 2

	GROUP1		P value	GROUP2		P value
	PRE TEST	POST TEST		PRE TEST	POST TEST	
MEAN + SD	6.73 + 1.28	1.8 +1.52	<0.0001*	6.53 +1.30	3.93 +1.10	<0.0001*

### INTERPRETATION:

The mean of post test VAS scores of subjects in group 1 and 2 are 1.8 and 3.93 respectively. The SD value of VAS scores of subjects in group 1 and 2 are 1.52 and 1.10 respectively. The value of  $t = 193.50$  for post-test VAS. 'P' value = 0.0008. When compared to the tabulated value, the above 't' value was significant with  $p < 0.05$ . As the 't' value was significant with  $p < 0.05$ , it was concluded that neural mobilization and transcutaneous electric nerve stimulation was effective over only neural mobilization for VAS on cervical radiculopathy.

### DISCUSSION

In this study, 30 subjects within the age group of 25-68 years with unilateral cervical radiculopathy were selected.

Initially, all the patients were assessed for involvement of different nerves and their pain and disability was assessed using VAS and NDI scales respectively. All 30 subjects were divided into two groups having 15 subjects in each group. Group 1 subjects received both neural mobilization and TENS and group 2 subjects received only neural mobilization. Both the groups were reassessed after 14 sessions.

The mean and SD values of pre and post test scores of VAS and NDI were calculated. The statistical analysis of the values showed significant difference between group 1 and 2 in reduction of pain and disability status. And also on comparison between the groups, group 1 had more significant reduction in pain and disability than group 2. The outcomes of the study are supported by many literatures. "A prospective randomized controlled trial of neural mobilization and Mckenzie manipulation in cervical radiculopathy" by Kumar Sanjiv showed significant improvement in pain and disability in patients with cervical radiculopathy after getting neural mobilization. 'Exploring the evidence for using TENS to relieve pain' a double-blind peer review published on Nursing Times mentioned that TENS is very useful in reduction of pain as an additional method of pain management.

The neural mobilization techniques help in the reduction of pain by restoring the neurodynamic properties of the involved nerve while TENS helps in the reduction of pain by closing the pain gate. The significant improvement in pain and disability seen in group 1 subjects may be due to the additional effect of TENS along with neural mobilization. It shows that if TENS is used as an additional modality along with neural mobilization, it can provide additional benefits to the patients with pain and disability.

### CONCLUSION

In this study, it is evidentially concluded that both neural mobilization and TENS are effective in reduction of pain and disability in patient with cervical radiculopathy. Also, it is concluded that the reduction of pain and disability is more in the group receiving both the treatments compared to the group receiving only neural mobilization.

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