



COMPARISON OF EFFECTIVENESS OF NEURODYNAMIC TREATMENT AND COVENTIONAL TREATMENT IN CERVICAL RADICULOPATHY

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ABSTRACT

*Cervical radiculopathy is a disease of the cervical spinal nerve root and is most commonly caused by a cervical disc herniation or other space occupying lesion. Neural tissue management uses the specific position and movements of neck and arm to reduce nerve mechanosensitivity, resolve symptoms and restore function and a few studies have shown that neural mobilization provides immediate benefits without harmful effects. **OBJECTIVES**-To compare the effectiveness of neurodynamic treatment and conventional treatment in cervical radiculopathy. **METHODOLOGY**-Fifty subjects aged 18-70 years, both gender with unilateral upper extremity pain, paresthesia or numbness were recruited for this interventional study. Selected subjects were equally divided and randomly allocated into two experimental groups, group A and group B. The group A received conventional therapy while group B received Neurodynamic treatment (NDT) and strengthening exercise. The subjects in both groups were assessed by using Neck disability index and Numerical Pain Rating Scale before treatment and after one week of treatment. **RESULTS**- Analysis with paired and unpaired t test showed a highly significant difference ($p < 0.05$) between two groups, i.e., neurodynamic treatment had a significantly better effect than conventional treatment. **CONCLUSION**-NDT along with MFR and strengthening was more effective in management of cervical radiculopathy in reducing pain and improvement in neck function.*

KEY WORDS

Cervical radiculopathy, Intermittent cervical traction, Neck disability index, Neurodynamic treatment.

INTRODUCTION

Cervical radiculopathy is a clinical diagnosis based on a sclerotomal distribution of motor and/or sensory changes or complaints. Any process that causes impingement of exiting cervical nerve roots can lead to a radicular disorder which may be brought about by acute pathologic changes or by degenerative changes consistent with cervical spondylosis [1]. A peak age of presentation for cervical radiculopathy is reported in fourth and fifth decade of life in which 2.1 cases per 1000 for this age group was reported [2,3].

Myofascial release is a soft tissue mobilization technique defined as "the facilitation of mechanical,

neural and psycho physiological adaptive potential as interfaced via the myofascial system and also muscles are an important innervated tissue as they can become locally active when a nerve displays a mechanosensitivity [4].

The Neck Disability Index (NDI) and NPRS are reliable and valid scales used for measuring neck disability and pain in patients with neck pain [5].

The analgesic effect of both cervical traction and neurodynamic treatment has been explored and recognized in many RCT studies with these in turn being analysed in systematic reviews and both cervical traction and neural mobilization techniques have been

advocated in the management of CR due to their immediate analgesic effect.

In addition Butler,2000; Coppieters and Butler, 2008 found that neurodynamic treatment are widely used to normalize cervical nerve structure and function via possible reduction of nerve adherence and decreased neural mechano sensitivity ^[6]

A case report done by Savva et al describes the effect of cervical traction combined with neural mobilization on pain and disability in cervical radiculopathy and found that application of cervical traction combined with neural mobilization can produce significant improvement in terms of pain and disability in cervical radiculopathy ^[7].

One experimental study compared the effectiveness of both neurodynamic treatment and cervical traction and results showed that both nerve mobilization and cervical traction are effective treatment option in treatment of cervical radiculopathy in which nerve mobilization is more effective ^[8].

But only one study has directly compared the two different treatment procedure and has seen the effect of nerve mobilization in comparison to conventional therapy.

The purpose of this study is to compare effectiveness of neurodynamic treatment (Shacklock concept) with conventional treatment for cervical radiculopathy.

MATERIALS AND METHODS

The interventional study was conducted during the period May 2017 to May 2018. It was conducted in patients of cervical radiculopathy fulfilling the inclusion and exclusion criteria, referred for physiotherapy by orthopaedic specialists in an urban tertiary hospital. Convenience sampling was used to recruit subjects. The study protocol was approved by the Institutional Ethical Committee (AJ Institute of Medical Sciences and Research Centre).

We included subjects of 18-70 years of age diagnosed with cervical radiculopathy who have tested positive in four test: - positive spurling test and distraction test, any of ULTT test positive and ipsilateral cervical rotation <60degree) and positive valsava manoeuvre and shoulder abduction test. Exclusion criteria were bilateral symptoms, any history of cervical & thoracic surgery, history of trauma, any infectious and inflammatory disease of spine, any congenital deformity of spine, vertebro basilar insufficiency, signs or

symptoms of upper motor neuron disease, medical "red flags", cervical spine injections (steroidal) in the past 2-week, current use of steroidal medication prescribed for radiculopathy symptoms.

A total of 153 subjects were screened and 50 subjects who met the inclusion criteria were selected for the study. Subjects were then randomly allocated into two groups, group A and group B by chit pick method. Prior to starting the procedure, subjects was informed about the examination and treatment procedure and consent was obtained. Patient with reports of unilateral upper extremity pain, numbness, paraesthesia was screened by examiner for study eligibility.

After initial assessment group A was given upper quadrant neurodynamic treatment, myofascial release and strengthening to deep flexor muscles of neck and scapula-thoracic muscles and group B was given Intermittent cervical traction with myofascial release, strengthening to deep flexors of neck and scapulo-thoracic muscles.

The Neurodynamic sequence given to group A according to the procedure given by include

- Step 1: Remote sequence, remote slider; slider using unaffected joints and affected area is placed in neutral/symptom free position
- Step 2: Remote sequence, remote slider; slider using unaffected joints, affected area is placed in some ROM, but with or without minimal symptoms.
- Step 3: Remote sequence, local sliders; move affected area + any other area, but with or without minimal symptoms.
- Step 4: Standard sequence, local sliders; with or without minimal symptoms.
- Step 5: Standard sequence, tensioners; with or without minimal symptoms (preferably 1 joint tensioner)
- Step 6: Sliders; Level 3a/3b with or without minimal symptoms (preferably 2 ended sliders)
- Step 7: Tensioners; Level 3/3b with or without minimal symptoms (preferably 2 ended tensioners ^[12]

3C for Closing Dysfunctions

Step 1-5 was given same as above

Then Step 6: Dynamic opener + Nerve Tensioner- relax both structures

Step 7: Dynamic closer+ Nerve Tensioner- Relax both structures

3 sets of 10 repetition in each set at moderate pace for one minute and 2-minute rest was given

Cervical traction was given to group B using the following method: Each patient was positioned supine with cervical spine placed at an angle of approximately 15 degrees of flexion. The traction force was started at 10% of body weight. The on/off cycle was set at 60/10 for 15min^[9].

Deep transverse friction was given for 10 minutes followed by myofascial stretching of upper trapezius muscle for 3 times, each holding for 90 seconds. With the patient in comfortable sitting position on an armless chair and both feet firmly planted on the floor, gradual friction was applied to the primary trigger point using the right thumb with the left thumb reinforcing it from the top. Then myofascial release was given to the upper trapezius with using ulnar border of both palms of the therapist^[4]

Strengthening Exercise

Subjects were instructed to perform deep flexor strengthening exercise without the use of biofeedback described by Peterse^[10]. Subjects were instructed to lie down supine with cervical spine in neutral. Then they were instructed to flatten the curve of neck by nodding the head and holding in that position for 10 seconds and repeated for 10 times.

Scapulo-thoracic exercise include serratus anterior and both middle and lower trapezius muscle strengthening as described by Flynn et al^[11]

• Lower and middle trapezius strengthening

The patients were instructed to be in prone position and were instructed to horizontally

abduct the shoulder with scapular depression, adduction and upward rotation with approximately 120-135-degree abduction for lower trapezius muscle re-education and approximately 90 degree of abduction for middle trapezius muscle re-education. Shoulder should be externally rotated so that thumbs points up towards the ceiling with scapula stabilized by the examiner

• Serratus Anterior strengthening

Part 1: The subject should stand at the wall with arms approximately shoulder width apart

Part2: The subjects then performed a push up with a plus exercise by pushing away from the wall until elbow is fully extended and scapulae are protracted as far as possible.

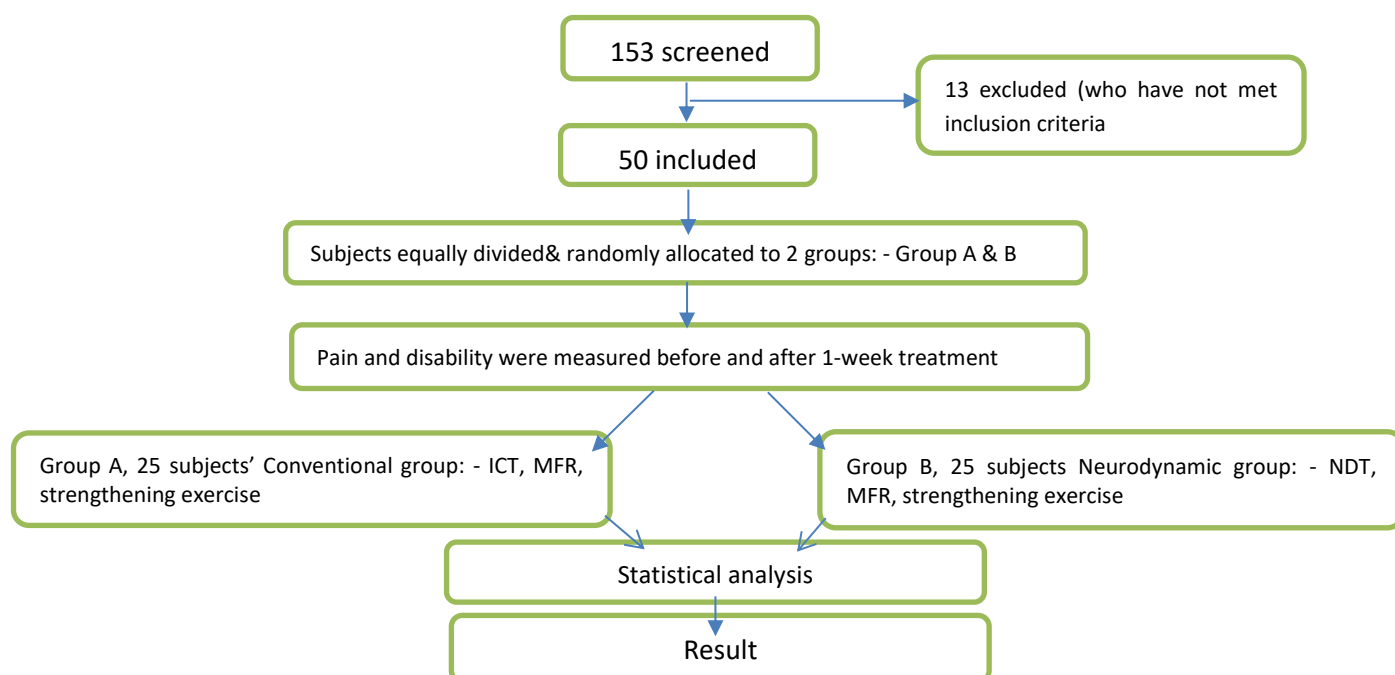
Education

In the initial visit, patients were educated on importance of correct postural alignment of the spine during sitting and standing activities. Necessary corrections will be made on subsequent visit if needed.

All patients were instructed to perform all strengthening exercise for repetitions at home twice daily.

The patients were assessed using numerical pain rating scale and NDI before starting the treatment and after one week of treatment. The scores were tabulated and subjected to statistical analysis.

Fig 1 flow chart showing progress of participation through the study.



RESULTS

A total number of 50 individuals formed the study population. Out of the 50 subjects studied, 29 were

female and 21 were male with a mean age of 47.34 ± 12.30 years. The descriptive statistics of age, gender, NPRS, and NDI scores are given in table 1

| Descriptive Statistics | | | | | |
|------------------------|----|---------|---------|---------|----------------|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| Age | 50 | 20.00 | 69.00 | 47.3400 | 12.30664 |
| Pre-NDI | 50 | 40.00 | 68.00 | 55.8000 | 7.26468 |
| Post-NDI | 50 | 20.00 | 56.00 | 38.7800 | 9.47454 |
| Pre-NPRS | 50 | 5.00 | 9.00 | 7.0600 | 1.09563 |
| Post-NPRS | 50 | 3.00 | 8.00 | 4.7600 | 1.25454 |
| Valid N (listwise) | 50 | | | | |

Table 1: Descriptive statistics of the study subjects.

| | | GROUP A | | | | GROUP B | | | |
|------|------|---------|-------|--------|------|---------|-------|--------|------|
| | | Mean | SD | T | Sig | Mean | SD | t | sig |
| NDI | Pre | 54.00 | 7.23 | 27.128 | 0.00 | 57.60 | 6.98 | 20.954 | 0.00 |
| | Post | 31.88 | 6.153 | | | 45.68 | 6.799 | | |
| NPRS | Pre | 7.12 | 1.30 | 7.742 | 0.00 | 7.20 | 0.91 | 22.249 | 0.00 |
| | Post | 3.84 | 0.80 | | | 5.76 | 0.88 | | |

Table 2: Pre- post difference in NDI and NPRS scores for Group A and Group B

The pre to post treatment comparison of both NPRS and NDI scores within the Neurodynamic group and Conventional group showed a p value < 0.001 that it is statistically highly significant reduction in reported rate of pain and disability after one week of treatment.

| | GROUP | MEAN | SD | T | Sig. |
|-----------|---------|-------|------|-------|-------|
| POST-NDI | GROUP A | 45.68 | 6.79 | 7.525 | 0.000 |
| | GROUP B | 31.88 | 6.15 | | |
| POST-NPRS | GROUP A | 5.68 | 0.90 | 7.640 | 0.000 |
| | GROUP B | 3.84 | 0.80 | | |

Table 3: Comparison of change in NDI and NPRS between the groups

The post treatment comparison between two groups revealed that Neurodynamic group fared better than Conventional group.

The post treatment comparison of NDI score between Neurodynamic group and Conventional group showed ($p < 0.001$) that it is statistically highly significant and showed highly significant reduction in disability rate after one week of treatment. The post treatment comparison between two groups revealed that Neurodynamic group fared better than the other group.

DISCUSSION

This experimental study investigated the effects of neurodynamic treatment and conventional treatment with addition of myofascial release and strengthening exercise on pain and disability in patients with cervical radiculopathy. The results indicated that both treatments showed that a significant effect after the treatment but the group who received neurodynamic

treatment showed a better effect than conventional therapy.

Coppeteres and Butler, 2008 and Dinz et al, 2010 found that neural mobilization can normalize the structure and function of cervical nerve root through the possible facilitation of nerve gliding, reduction of intraneural swelling, pressure and inflammation, improvement of axoplasmic flow and decreased neural mechanosensitivity. [6]

Studies by Liu et al and Jellad et al have revealed that cervical traction can increase intervertebral space leading to neural foramen elongation and reduction of intra discal pressure [12,13]. Czervionke et al also reported that the analgesic effect of cervical traction is a result of reduction in inflammation of the central nerve root system [14].

Myofascial release is a soft tissue mobilization technique defined as “the facilitation of mechanical, neural and psycho physiological adaptive potential as interfaced via the myofascial system and also muscles are an important innervated tissue as they can become locally active when a nerve displays a mechanosensitivity. The innervated tissues also provide the means to add tension into the neural system. They are, therefore, an important access point to treating the nervous tissue. Releasing a tight muscle distally may help reduce tension throughout the entire path of a mechanosensitive nerve ^[15].

The study by Chaudhary et al showed the effectiveness of MFR in pain and range of motion score ^[15]. When Myofascial Release is used on the trapezius, local chemistry changes due to blanching of the nodules followed by hyperaemia. This flushes out the muscle inflammatory exudates and pain metabolites, breaks down the scar tissue, desensitizes the nerve endings and reduces muscle tone. Thus Myofascial Release has essentially the same mechanism of action on the trigger point as the injection therapy. However Myofascial Release is a non-invasive technique that does not produces post treatment soreness or haemorrhage.

The exercise used in this study included strengthening to scapulothoracic muscles and deep neck flexors. The findings of study by Moeti and Marchetti who reported the outcomes in a group of patients with cervical intermittent traction, neck strengthening exercises, scapular muscle strengthening showed that there was a resolution of pain at the time of discharge ^[16]. The findings of this study were similar to those of by Moeti and Marchetti.

The present study showed that there was significant improvement in patients treated with cervical traction, myofascial release and strengthening exercise to deep neck flexors and scapulothoracic muscles. These findings were similar to the findings of case series done by Cleland et al who showed that patients who treated with multimodal treatment approach exhibited reduced pain and improved function at the end of treatment. The present study showed that application of neural mobilization combined with other conservative management can give a better result in treating cervical radiculopathy patients. This result was in accordance with work done by Donald Murphy et al showed that there was meaningful changes were seen in subject given nerve mobilization group ^[17]. The study done by Smati et al comparing the effect of nerve mobilization

and conventional therapy in cervical radiculopathy patients also stated in the study that nerve mobilization is more beneficial in improving pain in patients with cervical radiculopathy ^[8].

Though improvement was also seen in the other group who received cervical traction, the results from present study confirmed that nerve mobilization showed better result in treating cervical radiculopathy patients than giving cervical traction in comparison in reducing pain and improving disability of neck.

LIMITATIONS

The current study had a few the limitations such as short study period (one week) and a relatively small sample size. Blinding was not done for the evaluators. Further research should be conducted to determine whether neurodynamic treatment will give benefits in long term as the current study only focused on short term effect of neurodynamic treatment. Other draw back was lack of control groups and short term follow up.

CONCLUSION

The present study showed both Neurodynamic therapy and conventional treatment are effective therapeutic options in treatment of cervical radiculopathy. The study concluded that neurodynamic treatment is more effective than cervical traction in improving pain and disability in patients with cervical radiculopathy.

Conflict of interest: The authors agree that there was no conflict of interest.

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Ethical clearance: Ethical clearance was obtained from Institutional Ethical Committee of AJ Institute of Medical Sciences and Research Centre.

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