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ORIGINAL ARTICLE **OPEN ACCESS**

A Study to Compare the Effect of Neural Mobilization During Intermittent Cervical Traction and Intermittent Cervical Traction Followed by Neural Mobilization on Neck Disability Index and Pain In Subjects Having Sub-Acute or Chronic Cervical Radiculopathy-An Interventional Study

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ABSTRACT

Background: Cervical radiculopathy is a dysfunction of a nerve root in the cervical spine which has several mechanisms of pathology and it can affect people of any age, with peak prominence between the ages of 40-50 years. Neural mobilization will use some specific positions and movements of the neck and arm to reduce nerve mechanosensitivity in order to resolve the symptoms and restore the function. Method: This study was experimental study, where 40 subjects with subacute and chronic cervical radiculopathy with age group 30-55 years were selected by inclusion and exclusion criteria. Subjects who were willing to participate in the study were requested to fill the consent form. Group-A which received neural mobilization during intermittent cervical traction and Group-B, received neural mobilization after intermittent cervical traction. Neural Mobilization of Median Nerve was given for 6 sets of 7 repetitions and cervical traction for 10 minutes. Neck disability index and NPRS were taken before the intervention and after intervention. Conclusion: Neural mobilization during intermittent cervical traction and neural mobilization after cervical traction are equally effective in reducing NDI and Pain.

Keywords: *Cervical Radiculopathy (CR), MNM (Median Nerve Mobilization), Intermittent Cervical Traction (ICT), NDI (Neck Disability Index), NPRS(Numeric Pain Rating Scale)*

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INTRODUCTION

Cervical radiculopathy is a common function-limiting clinical condition which is classified as a disorder of a nerve root as a result of a compressive or inflammatory pathology from a space- occupying lesion like a disc herniation, spondylitic spur, cervical osteophyte, and ligamentum flavum hypertrophy that's leads to nerve root impingement, inflammation or both leading to physical, psychological, occupational disability[1][2] The typical symptoms of cervical radiculopathy are unilateral neck pain, paresthesia and radiating pain[3]. Pain is usually myotomal. There would be motor weakness and diminished deep tendon reflexes[4]. The location and pattern of symptoms would be varying according to the nerve root level affected. Acute radiculopathy is associated with disc herniation whereas chronic type is more related to Spondylosis[5]. It would precipitate due to poor posture, occupational stress, trauma, weakness of cervical muscles. If any condition lasts up to 7 to 10 days than it is considered as an acute condition. The conditions present for 10 days to 7 weeks are considered as conditions present for longer than 7 weeks will be considered as and chronic[6]. Median nerve is found most commonly affected in cervical radiculopathy. Various diagnostic procedures are used to confirm cervical radiculopathy like imaging (Radiographs, CT scan, Magnetic Resonance Imaging,etc.) and electrophysiological tests (Nerve Conduction Velocity Studies, Electromyography).Special tests like Spurling's test, Upper limb tension test, Cervical distraction test, cervical compression test,etc can also be used for clinical diagnosis[7].

There are several physical therapy intervention strategies that can be commonly used in the management of cervical radiculopathy such as range of motion exercises, proprioceptive exercises, strengthening and stretching exercises and passive treatment such as massage, thermotherapy, cervical traction, low level laser therapy, Transcutaneous Electrical Nerve Stimulation (TENS), Interferential therapy (IFT), Ultrasound (US), cervical traction, Short Wave Diathermy (SWD) and cervical collar, cold therapy and manual therapy approaches like mobilization, manipulations etc[8][9].Mechanical traction can be applied to the lumbar or cervical spine. The Electrical mechanical traction units can apply static or intermittent traction having varying force in which the static traction applies the same amount of force for throughout the session and intermittent traction alternates the traction force between two set points every few seconds throughout the treatment session.The intermittent traction is used for treatment of a disc problem which has longer hold times like approximately 60 seconds and shorter relax times approximately 20 seconds are recommended. If the traction is used to treat a spinal joint problem a shorter hold and relax time of approximately 15 seconds each have been recommended[10].

Recent studies by Lishman and Russell have revealed that cervical radiculopathy can also be accompanied by altered neurodynamics in the nerve trunk and in the mechanical interface. Mobilization of the nervous system was described by Maitland in 1985, Elvey in 1986, and was refined by Butler in 1991 as an adjunct to assessment and treatment of neural pain.[11].Neural mobilization is based on neurodynamics which involves a specific sequence of joint movements where the therapist lengthens the nerve at one joint and simultaneously reduces its length at an adjacent joint in order to produce sliding movement of the neural structures relative to adjacent tissues. These are known as sliders or gliding techniques.[12]

The Neck Disability Index (NDI) was developed in the late 1980's by Dr. Howard Vernon and was first published in the Journal of Manipulative and Physiological Therapeutics in 1991.It contains 10 items, in which 7 are related to activities of daily living, 1 is related to pain, 1 item is related to concentration and 1 item is related to recreation. Each item has to be scored from 0 to 5 and the total score is expressed as a percentage where the higher scores correspond to greater disability. The NDI has shown to be reliable and valid for patients with neck pain The test- retest reliability of NDI is good (ICC=0.89) but has demonstrated poor responsiveness in a group of patients with cervical radiculopathy. However, because patients with cervical radiculopathy also frequently present with neck pain as well as because no other outcomes tool has been shown to be superior to the NDI for use with patients with cervical radiculopathy the NDI is taken as one of the health outcomes assessment tools.[13]

NEED FOR THE STUDY

There are various studies available for on effect of cervical traction and neural mobilization in cervical radiculopathy patients. There have also been studies on the combined effect of cervical traction and neural mobilization. Also there are studies in which neural mobilization followed by cervical traction has been given to the patients and has been found to be effective. There have been studies in which neural mobilization during cervical traction has been done. But there have been very few studies that have been done to compare the effect of neural mobilization during cervical traction and neural mobilization after cervical traction. Thus the aim of the study was to find out whether neural mobilization during cervical traction is more effective or neural mobilization after cervical traction is more effective on NDI and Pain.

The aim of the study was to compare the effect of neural mobilization during intermittent cervical traction and intermittent cervical traction followed by neural mobilization on neck disability index and pain in patients having subacute or chronic Cervical Radiculopathy.

MATERIAL AND METHODS

STUDY DESIGN: An Interventional Study

SAMPLING TECHNIQUE: Convenient Sampling

STUDY SETTING: Shri K.K.Sheth Physiotherapy College

SAMPLE SIZE: Total 40 patients (Group A – 20 patients & Group B – 20 patients)

STUDY DURATION: The total duration of study was 1 week.

SELECTION CRITERIA:

The subjects of age group between 30-55 years,both male and female,of unilateral radiating symptoms in upper limb having symptoms from atleast 2 months (subacute and chronic) and with median nerve involvement i.e. having positive ULTT 1 for median nerve were included in the study. The subjects of trauma to upper limb and cervical spine, or undergone any recent surgeries in the neck, or having hypermobility, those having bilateral radiating pain,having cardiogenic left side upper limb pain and Vertebro-Basillar syndrome were excluded from the study

METHOD

A total number of 40 patients with cervical radiculopathy diagnosed by orthopedic or neurologist were selected for the study as per the selection criteria after getting an ethical approval.Mean age of the

subjects into group A was 41.55 years with the standard deviation of 7.00 years. While mean age of the subjects into group B was 45.45 years with the standard deviation of 6.61 years. Special tests for cervical radiculopathy were performed on each and every participant to confirm the diagnosis. After proper explanation about the purpose and procedure of the study patients who were found suitable and willing to participate in the study were requested to sign consent forms. The selection of subjects was done by convenient sampling and division of the participants into two groups done by random sampling method. Total 40 subjects were divided into two groups, Group-A had 20 subjects and Group-B had 20 subjects. This was a single blinded study as the participants were unaware about the group distribution. All the subjects were assessed according to assessment format of cervical radiculopathy. Neck Disability Index (NDI) Gujarati Version and numeric pain rating scale (NPRS) was measured before the treatment and after the treatment in both the groups.

In Group-A mechanical cervical traction was given with the neural mobilization work of David Butler for median nerve. The position of the subject was supine lying with the head in 15^0 of flexion. The halter was attached to the spreader bar of the traction.Hold time of 40 Sec with rest time-10 Sec was set for the duration of 10 minutes.During the hold period median nerve mobilization was given.The sequence of mobilization was performed by depressing the shoulder; gentle flexing and extending the Elbow joint and wrist joint. After cervical traction and neural mobilization neck isometric exercises were given to the patient. (A set of 10 repetitions per day with hold time 10 second against near-maximal resistance). Treatment was given 5 days in 1 week.

In Group-B all subjects were given cervical traction in supine lying position with head 15^0 flexed was given for 10 minutes were hold time was 40 sec and rest time was 10 sec.After the completion of cervical traction,neural mobilization of Median Nerve based on the work of David Butler was given to all the subjectsThe position of the subject was supine lying.The mobilization was performed by first depressing the shoulder and abducting the shoulder from $0\text{-}110^0$ then extending the elbow joint and flexing the wrist joint into the range where the patient feels tension but no pain and then flexing the elbow joint and extending the wrist joint to the point where the patient feels no tension. Mobilization was given for 6 sets of 7 repetitions. This was followed by isometric neck exercises. (A set of 10 repetitions per day with hold time 10 second against near-maximal resistance).The treatment was given for 5 days a week.

STASTICAL ANALYSIS

The Whole statistical analysis was done by using SPSS 20.0 version for windows software. Mean and standard deviation were calculated as measure of central tendency and measure of dispersion respectively. Analysis of pre and post intervention in group A and group B were done by using paired student's t-test for NPRS while analysis of NDI was done by using Wilcoxen Sign Rank Test. Between groups comparisons of obtained values of NPRS were done by using unpaired student's t-test while between groups comparison of obtained values of neck disability index (NDI) score was done by using Mann Whitney U test.

RESULTS

In this study, total 40 subjects were included out of which in group A 40% were male and 60% were female. While into the experimental group 50% were male and 50% were female. Two groups were almost similar in terms of age (Group A: mean age 41.55±7.00 years; Group B: mean age 45.45± 6.61 years.) Also, at the beginning of study, the two groups were not significantly different in terms, Neck Disability Index score (Group A: mean score 18.5 ± 4.91; Group B: mean score 16.20 ± 6.41) and NPRS. So base line data in both the groups were almost homogenous.

TABLE : NDI Inter-group Analysis

NDI	MEAN± SD	p -VALUE	Z -VALUE	RESULT
Group A	7.4±4.81	>0.05	-0.761	Non Significant
Group B	7.55±3.84			

TABLE : NPRS during Rest of Group A and B

NPRS REST	MEAN± SD	p -VALUE	t –VALUE	df	RESULT
Group A	1.45±0.759	0.395	0.859	34.49	Not Significant
Group B	1.2±1.056				

TABLE : NPRS during Activity of Group A and B

NPRS REST	MEAN± SD	p -VALUE	t -VALUE	Df	RESULT
Group A	2.15±0.875	>0.05	0.471	35.84	Non Significant

DISCUSSION

The results of the present study shows that both the groups i.e. neural mobilization along with traction and neural mobilization after traction with conventional physiotherapy treatment is effective in reducing the score of Neck Disability Index and NPRS after intervention. But when comparison was done between them both the groups were equally effective in improving NDI and NPRS after intervention.

Cervical traction can significantly reduce the severity of pain and radiating symptoms the reason being that traction causes distraction of articular surfaces, unloads the components of the spine by stretching muscles, ligaments, reduces adhesions within the dural sleeve, relieves nerve root compression within the central foramina, decreases pressure within intervertebral discs, relieves tonic muscle contraction and improves vascular status within the epidural space and perineural structures[14]. Adesola O Ojoawo et al concluded that cervical traction is effective in relieving the radiating pain and its associated disability by spinal elongation through an increase of intervertebral space and relaxation of spinal muscles which is assumed to be the most important proposed mechanisms by which traction could be effective.[15] On the contrary Ian A Young et al suggested that that the addition of mechanical cervical traction to a multimodal treatment program of manual therapy and exercise yields no significant additional benefit to pain, function, or disability in patients with cervical radiculopathy.[16]

Neural tissue mobilization techniques focuses on restoring the ability of the nervous system to tolerate the normal compressive, friction, and tensile forces which are associated with daily and sport activities. The technique used in this study was sliding technique which is commonly used Neural Mobilization techniques. Sliding techniques during traction allows large range neurally non-aggressive movements. Clinically it is assumed that the sliding techniques would result in a larger longitudinal excursion of the nerve with a minimal increase in strain on impinged or tensed nerve. Nerve gliding is induced by elongation of the nerve bed which elongates the nerve, increases the nerve tension and intraneural pressure reducing the intraneural blood flow in the oedematous neuropathies. Dynamically altering intraneural pressure may result in a 'pumping action' or 'milking effect' with beneficial effects on nerve hydration as it facilitates evacuation of the intra neural oedema when correctly applied and hence brings about a reduction in symptoms.[14][15][16][17].Richard F.Ellis et al conducted a systemic review on neural mobilization which concluded that a majority of the studies there is a positive therapeutic benefit from using neural mobilization.[18]

Mechanical factors like tension, compression or traction of the neural tissue influence physiological responses in intraneural blood flow, axonal transport, mechanosensitivity and sympathetic activation. Tissue mobility, blood circulation and axonal transport, which are necessary for the functional and structural integrity of a neuron, were increased after the neural mobilization. This comes in agreement with Cleland et al. who mentioned that when the nerve root was compressed microcirculation was compromised and the pressure received by the nerve will affect the edema and the demyelination. Neural mobilization was sufficient to disperse the edema, thus alleviating the hypoxia and reducing the associated symptoms and increase the nerve conduction and significantly reduction in H-reflex latency after neural mobilization.[19] According to Bove et al. possible explanation can be that strong stretch of the connective tissues due to neural mobilization around the nerve roots activates sensory fibers in the related dorsal root[20].

Jaywant Nagulkar and Kalyani Nagulkar (2016)did a similar study to compare the effect of active neural mobilization during intermittent lumbar traction and intermittent lumbar traction followed by active neural mobilization in cases of lumbar radiculopathy which concluded that concluded that ANM during ILT gives more relief and yields better responses in patients of LBP with radiculopathy and may help person to resume his daily activities. They explain that ILT causes movement of the affected region which assists in circulation and may help in reducing stenosis from circulatory congestion, thus relieves pressure on dura, blood vessels and nerve root in inter vertebral foramina. This help in free movement of the nervous system during active neural mobilization. Thus when neural tissues moves freely there are normalization of pressure gradient around the nervous tissues and thus normalize the blood supply to the affected nerve[21].Isometric exercises, increase intramuscular coordination by enhancing motor unit activation, synchronization and firing rate within a given muscles. A static contraction generates higher level of tension than concentric contraction. This will lead to increase in muscle strength and improve mobility.[22]

The findings of this study for improvement in the Neck Disability Index are consistent with the findings of Katella Suneel Kumar et al who found that simultaneous application of mechanical cervical traction with neural mobilization is more effective in improving pain, functional disability and severity of radicular symptoms than mechanical cervical traction and neural mobilization alone for subjects with unilateral cervical radiculopathy.[17] Also Christos Savva et al studied the effectiveness of neural mobilization with intermittent cervical traction in the management of cervical radiculopathy and concluded that Neural mobilization with simultaneous ICT can improve, pain, function, disability, grip strength and cervical range of motion in people with cervical radiculopathy.[23-24] The additional findings of this study shows that female population was suffering more with cervical radiculopathy than men of age 30-55 years. It can be recommended further that this study with a larger sample size can be done including the longer duration to see the long-term effect.

LIMITATIONS

1. Sample Size was small
2. The male female ratio was unequal
3. Only one specific median nerve mobilization was given to the subjects.

CONCLUSION

From the results of the study it can be concluded that neural mobilization during cervical traction and neural mobilization after the cervical traction are both equally effective. And either of the techniques can be administered for the therapeutic purposes.

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