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Effectiveness of Neural Mobilisation and Intermittent Cervical Traction in Cervical Radiculopathy Patients : A Randomised Clinical Trial

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Problems
This study investigated the effectiveness of intermittent cervical traction and neural mobilisation in cervical radiculopathy subjects.

Experimental approach
Earlier different multimodal treatment approaches was used for subjects with radiculopathy, therefore the purpose of the study was to compare between the effectiveness of cervical traction and neural mobilization on neck range of motion and neck disability index in cervical radiculopathy subjects.The study population comprised 30 subjects with history of neck pain radiating upto fingers since 2 weeks.Subjects were distributed randomly into two equal groups. Group I with a mean age 33.4 years received intermittent cervical traction. Group II with a mean age 47.66 years received neural mobilisation. Subjects were evaluated before and after treatment for neck range of motion and neck disability index. In both groups strengthening exercises of the deep neck flexors and scapulothoracic muscles were given followed by either neural mobilisation or traction.

Findings
Within group analysis and between group analysis was done for the subjects.within group analysis showed statistically significant results but between group analysis showed no significant results.

Conclusion
This study show a relevant improvement in neck range of motion and decrease in neck disability index within two therapeutic interventions that is intermittent cervical traction combined with neck strengthening exercises and neural mobilisation combined with neck strengthening exercises. However between group findings does not give a clear idea about which treatment approach is superior to another treatment approach.
***Keywords*:** Cervical radiculopathy; intermittent cervical traction; neural mobilisation; neck disability

Introduction

Cervical radiculopathy is a common disorder characterized by neck pain radiating to the arm and fingers corresponding to the dermatome involved.[1] It is a pathologic process which has been defined as pain in the distribution of specific cervical nerve root caused by nerve root compression.[2]

The diagnosis is made primarily on clinical grounds. Magnetic resonance imaging of cervical spine usually shows the cause of radiculopathy, which is usually spondylarthosis or herniated disc. However, as pain is often excruciating during the first weeks to months, treatment to accelerate the improvement of pain and function would be highly valuable.[1]

In management of cervical radiculopathy many multimodal treatment approaches are beneficial which includes postural correction, stabilization exercises and neural mobilization neurodynamics, traction, neck strengthening, stretching,manipulation,modalities[3,4] . However outcome studies using consistent treatment approaches on well-defined samples of patients are lacking.

For decades cervical traction has been applied widely for pain relief of neck muscles spasm or nerve root compression. Spinal elongation through an increase of intervertebral space and relaxation of spinal muscles is assumed to be the most important of the proposed mechanisms by which traction could be effective. Neural mobilization is emerging in the field of physiotherapy for radiculopathy. The rationale in treating patients with nervous system mobilization is an attempt to improve axonal transport and by this mechanism to improve nerve conduction. [29,30]

The neural mobilization technique is used to regain the movement and elasticity of the nervous system, with the objective of improving neurodynamics and re-establishing axoplasmic flow, thus restoring nerve tissue homeostasis, which promotes the return to its normal functions.[42]

Strengthening exercise was used as an adjunct in cases with radiculopathy.Strengthening mainly focusing the deep neck flexors and scapulathoracic muscles regardless of their strength levels are prescribed for cervical radiculopathy subjects .[3,31]

As multimodal treatment approaches was used for subjects with radiculopathy, therefore the purpose of the study was to compare between effectiveness of cervical traction and neural mobilization in cervical radiculopathy patients.

Materials and Methods

The study population comprised 30 subjects (19 males and 11 females) with mean age of 45.15 years.
Subjects were recruited from the department of physiotherapy, Central Referral hospital.
Subjects with history of neck pain radiating upto fingers since 2 week,Spurling test positive,
Cervical distraction test positive,Upper neurodynamic test positive were included.
subjects with Space occupying lesion,Fractures,Metabolic diseases,Rheumatoid arthritis,
Benign paroxysmal Positional vertigoBilateral upper extremity symptoms,
Congenital deformitiesVertebro basilar artery insufficiency,Cervicogenic headache,
thoracic outlet syndrome ,Peripheral nerve entrapment, history of recent neck surgery were excluded
Instrumentation used were .

After the ethical committee of the institute accepted the research proposal, a notice was circulated to Department of Physiotherapy and to the Department of Orthopedics of Central Referral Hospital. The notice informed about the study and requested to refer patients with neck pain to the investigator. Thus, the sources of participants were from physiotherapy and orthopedic department of Central Referral Hospital who volunteered to take part in this study.
Thereafter the participants were explained about the study and informed consent forms were taken. Convenience sampling was done and randomization into 2 groups was done by chit system. A day before the commencement of the study, the participants were evaluated for the dependent variables prior to the commencement of treatment. Range of motion measurement was done by Fluid Bubble inclinometer and disability level by Neck Disability Index .Thereafter the subjects were divided into two groups.

Group I : The subjects in group I consisted of 6 males and 9 females aged between (35-55 years) with mean age of 43.4 years were given cervical intermittent traction Prior to intervention, subject's body weight was measured (Tension up to $1/8^{th}$ of bodyweight was calculated)[43]. The duration of the procedure was for 20 minutes with 20 seconds of hold time and 10 seconds of rest time. The total session of treatment was for 10 sessions. Subjects were advised not get up suddenly after the treatment procedure.

Group II : The subjects in group II consisted of 13 males and 2 females aged between (36-55 years) with mean age of 47.66 years were given neural mobilisation .First Neural dynamic test was done

to know the nerve bias then Subject's were treated in neurodynamic position accordingly .Ulnar nerve bias (ULTT3) and Median nerve bias (ULTT2a) was positive in most of the subjects. Oscillation for less than 10 seconds with 1 or 2 repetition of technique was done. Session for 5 days a week for a total of 10 sessions.[38]

In both groups strengthening exercises of the deep neck flexors and scapulothoracic muscles were given followed by either neural mobilisation or traction. Strengthening was done with hold for 10 sec and repeated for 10 times. Patient was asked to do home exercises twice daily.

Data was obtained on pre, post 5^{th} session and 10^{th} session

Results and Discussions

WITHIN GROUP COMPARISON

NDI

1st Session			5th Session		10th Session			
Group	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**F**	**P**
Group I	51.7±9.7	46.3-57.1	46.4±8.7	41.5-51.2	32.5±5.3	29.5-35.5	22.1	.000
Group II	48.8±9.6	43.4-54.1	44.6±10.1	39.0-50.2	30.13±7.3	26.6-34.1	17.3	.000

Table.1

Table 1: The neck disability mean value in group 1and disability mean value in group 2 .

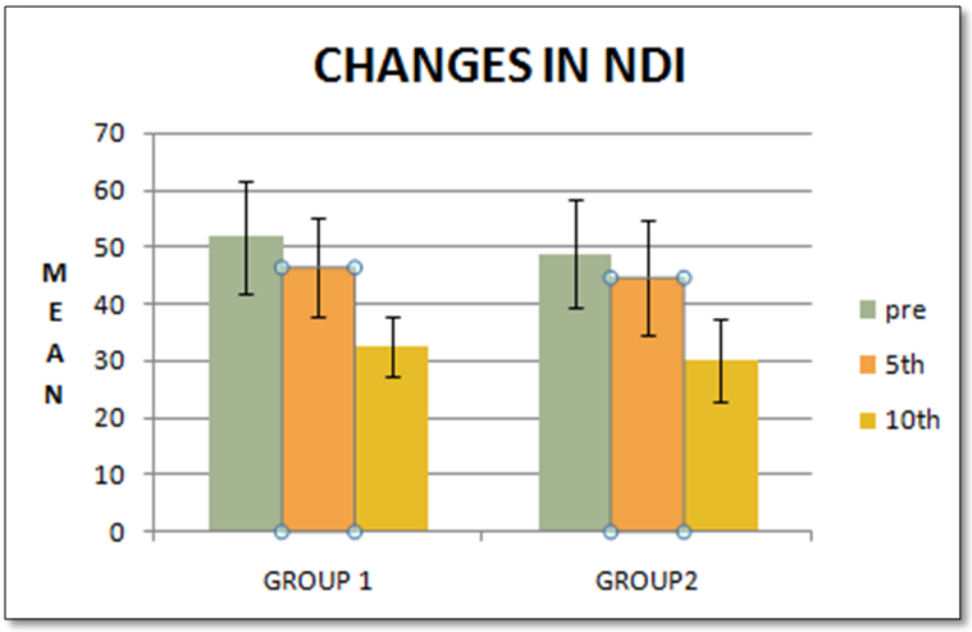

Fig 1.shows mean changes in NDI between group 1 and group 2 during 1st, 5th and 10th session.

FLEXION

1st Session			5th Session		10th Session			
Group	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**F**	**P**
Group I	77.3±5.3	74.3-80.2	81.3±3.5	79.3-83.2	84.0±2.8	82.4-85.5	10.4	.000
Group II	79.0±5.7	75.8-82.1	82.3±3.1	80.5-84.1	84.6±2.9	83.0-86.3	7.0	.002

Table.2.

Table 2:The flexion ROM mean value in group 1 and group 2

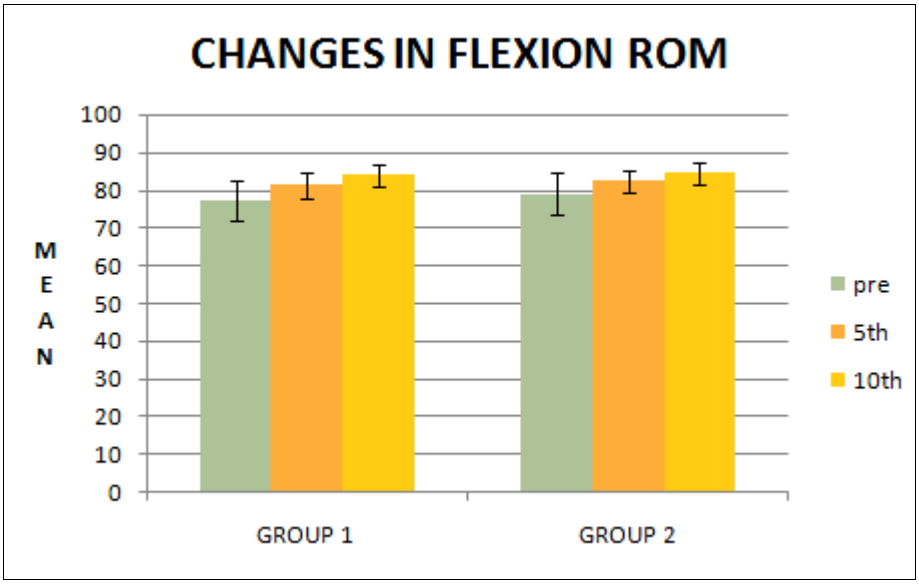

Fig 2.shows flexion range of motion in group 1 and group 2 during 1st, 5th and 10th session.

EXTENSION

1st Session			5th Session		10th Session			
Group	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**F**	**P**
Group I	63.6±4.8	61.0-66.3	67.0±2.5	65.5-68.4	68.3±2.4	66.9-69.6	7.3	.002
Group II	62.3±3.1	60.5-64.1	66.3±2.9	64.6-67.9	68.0±2.5	66.5-69.4	14.9	.000

Table.3

Table3:The extension ROM mean value in group 1 and group 2

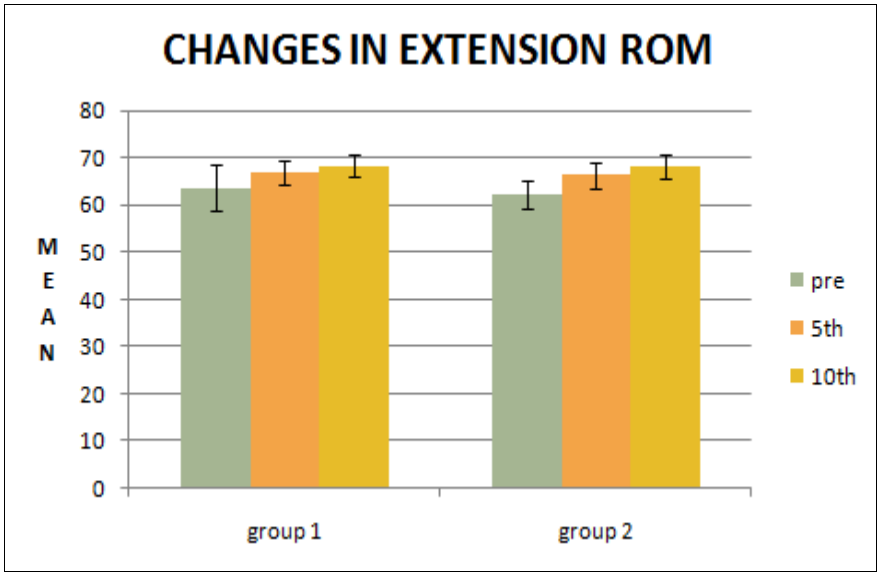

Fig 3.shows extension range of motion in group 1 and group 2 during 1st, 5th and 10th session.

ROTATION TO LEFT

1st Session			5th Session		10th Session			
Group	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**F**	**P**
Group I	63.0±6.4	59.4-66.5	70.6±6.5	67.0-74.2	79.3±5.3	76.3-82.2	26.6	.000
Group II	74.3±7.2	70.2-78.3	82.0±7.2	77.9-86.0	85.6±4.5	83.1-88.2	11.8	.000

Table.4

Table 4: The rotation to left ROM mean value in group 1 and group 2

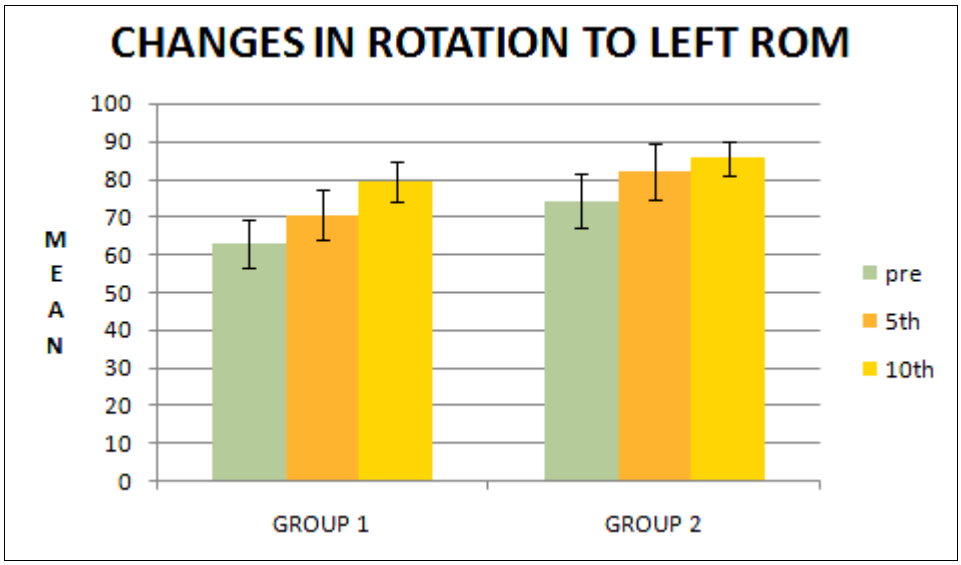

Fig 4.shows rotation to left range of motion in group 1 and group 2 during 1st, 5th and 10th session.

ROTATION TO RIGHT

1st Session			5th Session		10th Session			
Group	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**F**	**P**
Group I	70.3±6.3	66.7-73.8	77.3±6.2	73.8-80.7	83.6±4.4	81.2-86.1	20.1	.000
Group II	72.0±6.2	68.5-75.4	79.3±6.5	75.7-82.9	85.0±4.2	82.6-87.3	19.3	.000

Table.5

Table5: The mean value in group 1 and group 2

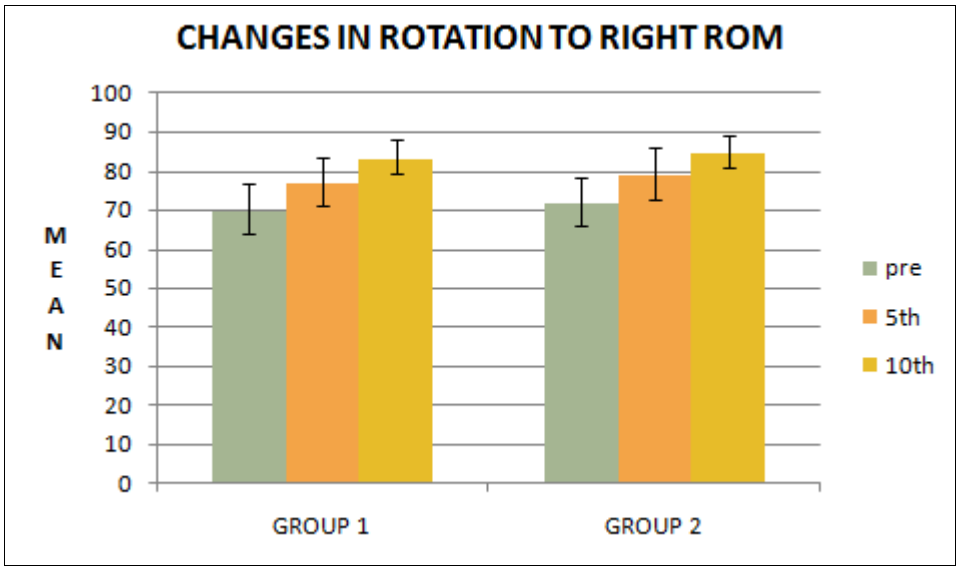

Fig 5.shows rotation to right range of motion in group 1 and group 2 during 1st, 5th and 10th session.

LATERAL FLEXION TO LEFT

1st Session			5th Session		10th Session			
Group	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**F**	**P**
Group I	34.3±5.3	31.3-37.2	39.0±4.3	36.6-41.3	42.0±2.5	40.5-43.4	12.6	.000
Group II	36.3±3.9	34.1-38.5	40.3±2.9	38.6-41.9	43.6±2.2	42.3-44.9	20.2	.000

Table.6

Table6:The mean value of lateral flexion left in group 1 and group 2

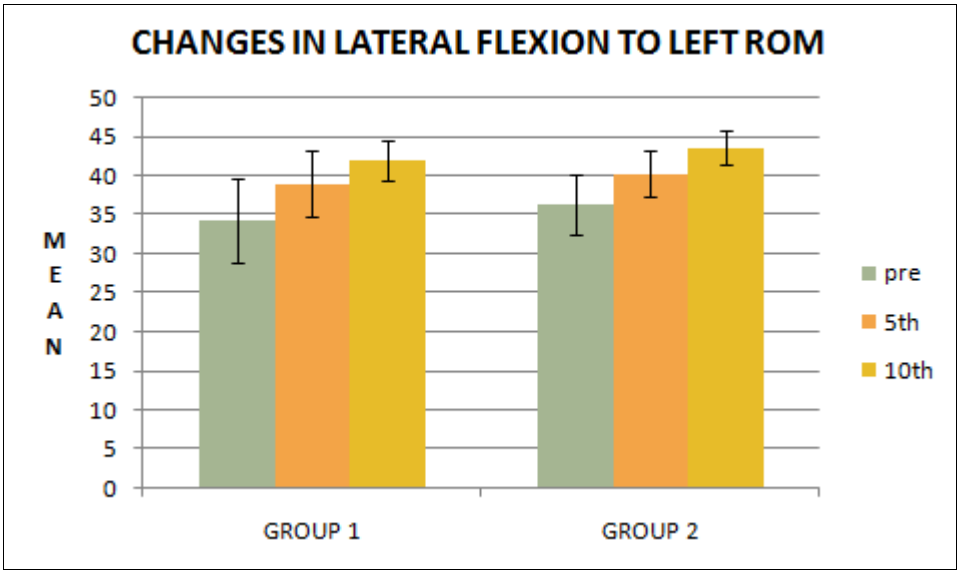

Fig 6.shows lateral flexion to left range of motion in group 1 and group 2 during 1st, 5th and 10th session.

LATERAL FLEXION TO RIGHT

1st Session			5th Session		10th Session			
Group	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**Mean ±SD**	**C.I**	**F**	**P**
Group I	33.6±3.9	31.4-35.8	40.0±3.2	38.1-41.8	43.3±2.4	41.9-44.6	33.2	.000
Group II	33.6±5.1	30.8-36.5	39.6±3.5	37.7-41.6	43.0±2.5	41.5-44.0	22.1	.000

Table.7

Table7: The mean value of lateral flexion to right in group 1 and group 2

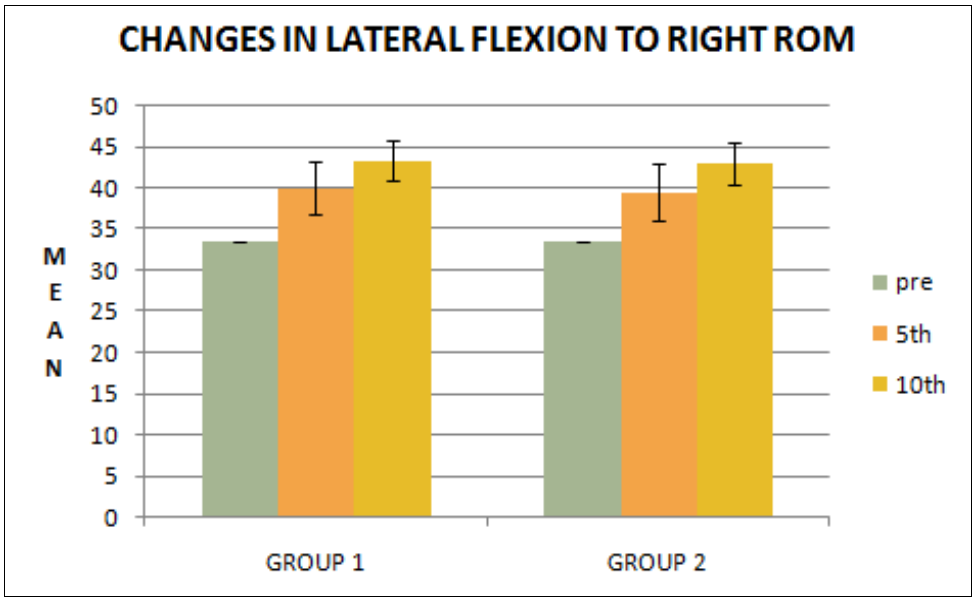

Fig 7.shows lateral flexion to right range of motion in group 1 and group 2 during 1st, 5th and 10th session.

COMPARISON BETWEEN THE GROUPS

NDI

	Group I	Group II		
Session	**Mean±SD**	**Mean±SD**	**f**	**P**
1st	51.7±9.7	48.8±9.6	.687	.414
5th	46.4±8.7	44.6±10.1	.253	.619
10th	32.5±5.3	30.13±7.3	1.050	.314

Table 8.shows comparison between groups for neck disability index in all sessions which is not statistically significant.

Flexion

	Group I	Group II		
Session	**Mean±SD**	**Mean±SD**	**f**	**P**
1st	77.3±5.3	79.0±5.7	.684	.415
5th	81.3±3.5	82.3±3.1	.663	.422
10th	84.0±2.8	84.6±2.9	.400	.532

Table 9.shows comparison between groups for flexion in all sessions which is not statistically significant.

Extension

	Group I	Group II		
Session	**Mean±SD**	**Mean±SD**	**f**	**P**
1st	63.6±4.8	62.3±3.1	.800	.379
5th	67.0±2.5	66.3±2.9	.438	.514
10th	68.3±2.4	68.0±2.5	.135	.716

Table 10.shows comparison between groups for extension in all sessions which is not statistically significant.

Rotation to left

	Group I	Group II		
Session	**Mean±SD**	**Mean±SD**	**f**	**P**
1st	63.0±6.4	74.3±7.2	.230	.134
5th	70.6±6.5	82.0±7.2	.230	.143
10th	79.3±5.3	85.6±4.5	.267	.122

Table 11.shows comparison between groups for rotation to left in all sessions which is statistically not significant.

Rotation to right

	Group I	Group II		
Session	**Mean±SD**	**Mean±SD**	**f**	**P**
1st	70.3±6.3	72.0±6.2	.524	.475
5th	77.3±6.2	79.3±6.5	.739	.397
10th	83.6±4.4	85.0±4.2	.713	.405

Table 12.shows comparison between groups for rotation to right in all sessions which is statistically not significant.

Lateral Flexion to left

	Group I	Group II		
Session	**Mean±SD**	**Mean±SD**	**f**	**P**
1st	34.3±5.3	36.3±3.9	1.362	.253
5th	39.0±4.3	40.3±2.9	.974	.332
10th	42.0±2.5	43.6±2.2	3.571	.069

Table 13.shows comparison between groups for lateral flexion to left in all sessions which is statistically not significant.

Lateral flexion to Right

	Group I	Group II		
Session	**Mean±SD**	**Mean±SD**	**f**	**P**
1st	33.6±3.9	33.6±5.1	.000	1.000
5th	40.0±3.2	39.6±3.5	.072	.790
10th	43.3±2.4	43.0±2.5	.135	.716

Table 14.shows comparison between groups for lateral flexion to right in all sessions which is statistically not significant.

The overall study proved that both cervical traction and neural mobilization is effective in improving range of motion and decreasing the disability level in cervical radiculopathy subjects. Data from this study provided support for contention that both traction as well as neural mobilization were beneficial for individuals with cervical radiculopathy . Furthermore, neck disability index and ROM data support the contention that both traction and neural mobilization can improve ROM and decrease disability level in individuals with cervical radiculopathy. Present study showed significant changes in disability level and range of motion measurements in both the intervention groups after the 5^{th} and 10^{th} session.

It was found that the differences in mean for neck disability index and range of motion for both the groups were statistically significant ($P<0.05$). Annova test for both the groups showed statistically significant results indicating decrease in disability level and improvement in range of motion in both the groups. Findings in this study are in accordance with other studies showing the effects of traction in cervical radiculopathy.

Present study showed statistically significant results for traction in both outcome variables of neck disability index as well as of neck range of motion which is in correlation with study done by Joshua et al (2005) where traction has been shown to decrease pain and perceived disability in individuals with cervical radiculopathy.

Rhee et al (2007) explained the mechanism of traction in radiculopathy is due to relieve in symptoms by enlarging the neuroforaminal space which lead to increase neck range of motion and decrease in disability level. Findings of this study correlates with study done by Nicola Peake et al. (2005) in subjects with cervical radiculopathy treated with intermittent cervical traction which showed decrease in neck

disability index. Traction was thought to mobilise the muscle and connective tissue, improve tissue–fluid exchange, and improve arterial, venous and lymphatic flow and psychological benefit to the patient. Overall improvement in subjects range of motion and disability level with traction is explained in a study done by Ibrahim M. Elnaggar et al.(2009) which showed decreased in neck and arm pain severity and improvement in neck mobility in patients with cervical radiculopathy .overall effect mcould be due to relief of muscle spasm and pain , decrease in electrical activity in the muscles producing relaxation, vertebral separation removing direct pressure from sensitized neural tissues and relieve the inflammatory reaction of nerve roots by improving the circulation to the tissues and reducing swelling of the tissues. Present study showed statistically significant results for neural mobilisation in both outcome variables of neck disability index as well as of neck range of motion.

Present study support Ronald Schenk et al. (2008) study in management of cervical radiculopathy where subject's scores on the neck disability index and range of motion improved and subject was discharged after four visits.

Individuals with cervical radiculopathy shows altered neurodynamics so neural mobilisation technique was used to improve altered neurodynamics. Richard et al (2008) did analysis of studies and concluded a positive benefit from using neural mobilization in the treatment of altered neurodynamics or neurodynamic dysfunction. Neural mobilisation restore the dynamic balance between the relative movement of neural tissues and surrounding mechanical interfaces allowing reduced intrinsic pressures on the neural tissue promoting optimum physiologic function. There is facilitation of nerve gliding, reduction of nerve adherence, dispersion of noxious fluids, increased neural vascularity and improvement of axoplasmic flow which reduces disability level and improves range of motion.

Improvement in present study can be explained by study done by Anke I Langenhorst (2009) to see the effect of neural mobilization where altered axoplasmic flow has been the underlying cause of symptoms in neck. Neural mobilization caused more improvement of symptoms which could be attributed to the fact that by neural mobilisation the internal faulty mechanical and physiological factors of the nerve were normalized. The above mentioned factors may be responsible for decreasing disability level and improving range of motion by neural mobilization technique in cervical radiculopathy subjects.

Identification of appropriate conservative management strategies appears to remain a clinical enigma(Joshua A et al 2005). Therefore in this study the use of cervical traction as well as neural mobilization is proved to be beneficial for individuals with cervical radiculopathy.

When comparison was done between two intervention groups there was no statistically significant result. When analysis of disability level in neck was done between both the intervention groups, it was not statistically significant(P>0.05).
Comparison of neck range of motion between traction and neural mobilization groups was also not statistically significant (P>0.05).

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The Limitation of this study was that the sample size was small in number and assessment of outcome measures were not done immediately after the intervention as it was done only after 5^{th} and 10^{th} session. Therefore, future studies can be done with larger sample size to compare the effectiveness between the two intervention groups in individuals with cervical radiculopathy.

conclusion

This study show a relevant improvement in neck range of motion and decrease in neck disability level within two therapeutic interventions that is intermittent cervical traction combined with neck strengthening exercises and neural mobilisation combined with neck strengthening exercises.
Thus Neural mobilisation combined with neck strengthening exercises as well as Intermittent cervical traction can be administered for individuals with cervical radiculopathy but between group findings does not give a clear idea about which treatment approach is superior to another treatment approach.

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APPENDIX I

Strengthening exercises were done during the treatment session as well as advised to do at home twice daily.

Fig :1 Deep flexors strengthening

Fig :2 Lower and upper trapezius strengthening

APPENDIX II

Range of motion measurement:

Fig: 1

APPENDIX III

For median neural mobilisation , subject was informed prior to the procedure if there was any kind of discomfort during the procedure. Session of slow oscillation for less than 10 seconds with 1 or 2 repetition of technique was done then external rotation/ supination to horizontal was done followed by wrist and finger into extension.

For Intermittent cervical traction subjects lying in supine position with hold time of 20 sec and rest time of 10 sec for 20 minutes

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