(ISSN: 0973-7049(P))

The Bioscan AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES 21(2): S.I (2), 22110-22115, 2026 www.thebioscan.co

EFFECT OF NEURAL TISSUE MOBILIZATION VERSUS MANUAL CERVICAL TRACTION COMBINED WITH STRENGTHENING EXERCISE ON PAIN INTENSITY IN CERVICAL RADICULOPATHY: A COMPARATIVE STUDY

[1]Ekta Hemnani, [2]Dr. Shubham Menaria PT, [3]Dr. Payal Sharma PT, [4]Dr. Jafar Khan PT

[1]MPT Research Scholar, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India

[2]Associate Professor, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
[3]Assistant Professor (Co-Guide), Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
[4]Dean & HOD, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India
Corresponding author: Ekta Hemnani — ***[ektahemanig@gmail.com]***
DOI:https://doi.org/10.63001/tbs.2026.v21.i02.S.I(2).pp22110-22115

KEYWORDS

Cervical radiculopathy, Neural tissue mobilization of neural tissue, Manual cervical traction, Numeric Pain Rating Scale (NPRS), Strengthening exercise.

Article Info
Received: 14.03.2026

Accepted: 04.04.2026

Published: 12.04.2026

Abstract

Background: Cervical radiculopathy is a condition that occurs when a cervical nerve root is compressed or irritated, and is the most common cause of neck and radiating arm pain in working age and older individuals. Although pain is the predominant reason patients seek treatment, there s still no clear consensus on whether neurodynamic therapy or conventional joint based treatment, when combined with active strengthening exercises offers greater immediate pain relief.
Objective: i) To evaluate the effectiveness of manual cervical traction combined with a specific strengthening programme reducing pain intensity in cervical radiculopathy; ii) To assess the effectiveness of neural tissue mobilization combined with the same strengthening programme reducing pain intensity in cervical radiculopathy iii) To compare the two approaches for their effect on pain reduction at 6 weeks.
Methods: Sixty patients with cervical radiculopathy, diagnosed with MRI and positive neural provocation testing, were randomized equally into two groups. Group A (n=30) given manual cervical traction combined with strengthening exercise and Group B (n=30) given neural tissue mobilization combined with strengthening exercise. Treatment was given five days a week for a period of six weeks. The Numeric Pain Rating Scale (NPRS) was used to determine pain at baseline and at 6 weeks.
Results: There was a statistically significant decrease in NPRS score within each group ($p<0.05$). Group A improved from a mean of 7.03±0.76 to 6.03±0.70, while Group B improved from 7.03±0.76 to 3.57±0.82. The difference between the groups at 6 weeks was in favour of Group B (mean difference 2.46 points, $t=3.05$, $df=58$, $p=0.005$).
Conclusion: Both neural tissue mobilization and strengthening exercise were clinically effective; however, neural tissue mobilization with strengthening exercise resulted in a significant decrease in pain intensity compared with cervical manual traction with strengthening exercise in patients with cervical radiculopathy.

INTRODUCTION

Cervical radiculopathy is a neuromusculoskeletal disorder resulting from compression or mechanical irritation of one of the cervical nerves (most commonly at C6–7), and manifests with a combination of any of the following: radiating pain, sensory disturbance, motor weakness, and decreased reflexes[1,2]. It is not rare presentation in physiotherapy or spine practice: In a population-based study of Rochester, Minnesota over 15 years, found an average age-adjusted annual

incidence was 83.2 per 100,000 population, with a peak occurrence in the 50-54 age group of 202.9 per 100,000 population; the most commonly involved nerve root was C7, followed by C6[23]. This is usually insidious rather than traumatic — in that same cohort, a clear history of physical exertion or trauma leading to onset of symptoms was only evident in a small minority of cases[23] — which has practical implication for how patients present to physiotherapy as many arrive without an obvious inciting event and the diagnosis can be made on pattern recognition, noticing the history and clinical examination than a clear mechanism of injury.

Radiating pain is caused by a combination of mechanical compression and inflammation at the nerve root and dorsal root ganglion level, so it is not always possible to draw a clear distinction between the severity of the symptoms and the level of structural narrowing seen on imaging [3]. This is clinically relevant fact to remember is that the MRI findings do not reliably predict the severity of the patient's pain level, and the more clinicians use the MRI imaging to predict the prognosis or the urgency of the patient's presentation, the more likely they are to be misled. The vast majority of cases are due to foraminal narrowing caused by cervical spondylosis, uncovertebral joint hypertrophy and loss of disc height, while true disc herniation is relatively uncommon compared with the lumbar spine[4,5]. This multifactorial, degenerative pathophysiology also accounts for the age of onset of most cervical radiculopathy cases in adult life, and the fact that the natural history of most cases is favourable but rarely immediate — a comprehensive clinical review of cervical radiculopathy emphasized that a most cases can be managed non surgically, thorough correlation of the patient's reported symptom pattern, neurological examination and imaging would benefit the diagnostic workup and treatment selection, rather than a single data point in isolation[24].Diagnosis in physiotherapy practice is predominantly clinical rather than purely radiological. A diagnostic accuracy study found 34 individual clinical examination items to be more accurate than electrodiagnostic reference standards tests and found that a cluster of multiple items – the combination of Spurling's test, cervical distraction, the upper-limb neurodynamic test for the median nerve, and reduced cervical rotation range of motion toward the symptomatic side had a combined effect on increasing diagnostic confidence when multiple items were positive[25]. This is relevant to the present study because it highlights the importance of cervical distraction and foraminal compression testing not only as

part of the inclusion criteria in addition to MRI confirmation, but as an evidence-based approach to diagnosis based on factors other than imaging alone.

The presentation of pain is the most likely symptom brings people with cervical radiculopathy to seek physiotherapy care and a patient's willingness to continue a rehabilitation programme is heavily reliant on their initial degrees of pain in the first few weeks of treatment[6]. This should be emphasized clinically, as patients are often not aware of the level of their disability or strength from session to session, but Pain intensity is the outcomes patients notice immediately; so if a programme does not produce an early perceptible reduction in pain then patient engagement could be lost before any structural or functional benefit is identified. There is a variety of conservative techniques that have been reported to reduce radicular pain, including mechanical and manual traction, joint mobilization, neurodynamic techniques, and therapeutic exercise, but there is limited head-to-head comparative evidence to support the use of any specific technique[7,8]. Most of the existing published literature reports a single intervention compared to a passive or minimal treatment control that shows efficacy but only provides limited guidance to clinician when two active and plausible interventions are available and both are potential viable treatment options for a particular patient.

The clinical use of traction includes separation of the vertebral bodies, the zygapophyseal joints, and the widening of the intervertebral foramen, as well as an analgesic effect due to stimulation of mechanoreceptors and reflex inhibition of paraspinal muscle guarding;[9]. Manual cervical traction is performed directly with the therapist's hands, not a mechanical device, and is not necessarily as tolerated by the patient as mechanical traction, but is generally more tolerated during the initial more painful stages of treatment; it also involves physical strain on the therapist during repeated session[10],[11]. Based on comparative studies, manual and mechanical traction can produce similar analgesic effects when used in conjunction with exercise[12],[13] and surveys of practising physiotherapists confirms that traction in all forms continues to be a routinely used modality in the treatment of cervical radiculopathy despite these debates about the incremental value of traction over exercise alone[14]. A randomized trial comparing manual therapy, exercise and mechanical traction with exercise alone also found that the combined treatment arm showed significant improvement, and that traction still has a defensible place in conservative care while its effectiveness

remains widely debated,the extent of its benefits is still uncertain[26].

Neural tissue mobilization, on the other hand, focuses on the nervous system, rather than the surrounding joint. The conceptual basis for this approach was formalised in the mid-1990s, when the mechanics and physiology of neural tissue movement from gliding, tension and neural interaction with the surrounding musculoskeletal interface during movement of the limbs and spine were brought together and first integrated into a coherent clinical framework as an assembly of provocation tests[27]. Building on that framework, neural tissue mobilization is designed to restore the normal sliding, gliding and tensile capacity of neural structures in relation to adjacent tissue interfaces, thereby reducing intraneural pressure, better axoplasmic flow and desensitization of the mechanically irritated nerve root[15],[16]. Several trials have demonstrated clinically significant pain relief is achieved with neurodynamic techniques applied to the median, radial and ulnar nerve as compared to traction-based techniques in patients with cervical radiculopathy, often superior to traction-based protocols[17],[18],[19]. A randomized trial compared neural mobilization to standard conservative treatment, which revealed that neural mobilization was more effective for pain intensity and disability[20], and nerve mobilization was also more effective than conventional physiotherapy in smaller comparative trials[21].

Given this body of evidence, few studies have directly compared manual cervical traction with neural tissue mobilization both combined with the same strengthening programme with pain intensity as the primary outcome. Clinically important, as traction and neurodynamic mobilization are proposed to have different mechanisms of action (mechanical decompression vs neural desensitisation), respectively, and clarifying which intervention produces a greater or quicker reduction in pain would enable therapists to sequence or optimally choose interventions in the early symptom-driven phase of rehabilitation. The strengthening component is kept constant between arms, as this is the only difference between groups, thereby allowing for any group difference in pain outcome to be considered as a result of the manual/neurodynamic technique itself rather than due to the different doses of exercise each group received.The present study was, therefore, designed to compare the effect of manual cervical traction with strengthening exercise with that of neural tissue mobilization with strengthening exercise on the intensity of pain as assessed using Numeric Pain Rating Scale in patients with cervical radiculopathy.

MATERIAL AND METHOD

Research Design: Comparative study.

Study Setting: Department of Physiotherapy , Pacific Medical College and Hospital, Bhilo Ka Bedla, Udaipur, Rajasthan.

Sample Design: Randomized sampling.

Study Population: Patients with cervical radiculopathy, both male and female.

Sample Size: 60 participants (30 per group), based on a standard sample size for comparative prevalence-based rehabilitation studies to ensure adequate statistical power.

Study Duration: 11 months.

Treatment Duration: 45 – 60 minutes, five days per week, for six weeks.

Selection Criteria

Inclusion criteria: Patients were included who meet the specific criteria

- Ages of 30 - 70 years
- Both male and female participants were included
- Complain of radiating pain down the neck to forearm or arm
- Positive special test (cervical distraction test, foraminal compression test)
- Diagnosis confirmed by MRI,
- Willing to give informed consent.

Exclusion criteria:

- Age less than 30 or more than 70 years.
- coexisting neurological disease or disorder.
- brachial plexus injury.
- congenital spinal deformity.

PROCEDURE

Ethical approval was obtained from the Institutional Ethics Committee of Pacific Medical College and Hospital, Pacific Medical University, Udaipur. Patients were referred from the outpatient departments of physiotherapy, orthopaedics and neurology, and were screened according to the inclusion and exclusion criteria, oriented to the study protocol and were enrolled after obtaining written informed consent. There were 60 eligible participants who were randomly divided into two equal groups.

Group A (n=30) — Manual cervical traction with strengthening exercise:

Manual traction was applied in supine position with the neck flexed to about 25°, and 10 sessions of manual traction were applied for each session in the same direction, 10 seconds traction and 5 seconds rest.

1. Deltoid strengthening
2. Scalene strengthening
3. Trapizeus, rhomboid, lattisimus or serretus anterior strengthening
4. Shoulder shrugs
5. Chin tuck exercise

Group B (n=30) — Neural tissue mobilization with strengthening exercise:

This group received the neurodynamic mobilization techniques on the median, radial, and ulnar nerves following the standard neurodynamic handling principles, combined with strengthening exercise.

1. Deltoid strengthening
2. Scalene strengthening
3. Trapizeus, rhomboid, lattisimus or serretus anterior strengthening
4. Shoulder shrugs
5. Chin tuc exercise

Outcome Measure: Numeric Pain Rating Scale (NPRS) — an 11-point scale from 0 (no pain) to 10 (worst pain imaginable) measured at baseline (0 week) and after 6 weeks. The NPRS has previously been shown to have good reliability and responsiveness in patients with mechanical neck pain[22].

Statistical Analysis: Data was presented as Mean ± Standard deviation. The paired t-test was used for within-group change from baseline to six weeks and the independent samples t-test was used for the between-group comparison at six weeks. A p-value<0.05 was considered statistically significant.

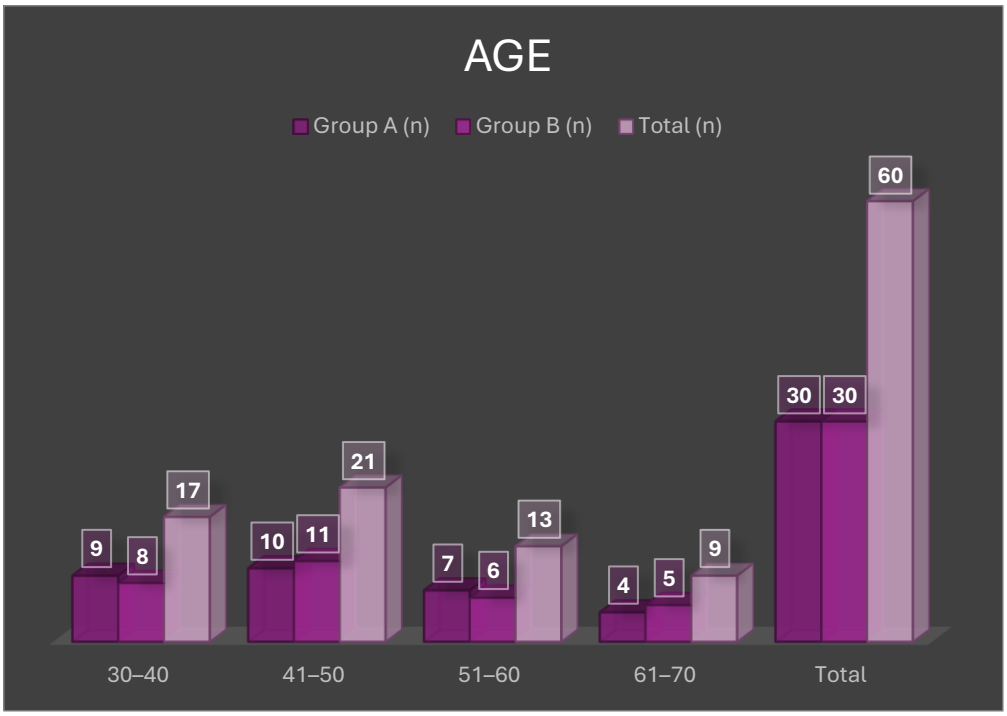
RESULT

Table 1: AGE DISTRIBUTION OF PARTICIPANTS

Age Group (Years)	Group A (n)	Group A (%)	Group B (n)	Group B (%)	Total (n)	Total (%)
30–40	9	15.00%	8	13.30%	17	28.30%
41–50	10	16.70%	11	18.30%	21	35.00%
51–60	7	11.70%	6	10.00%	13	21.70%

61–70	4	6.70%	5	8.30%	9	15.00%
Total	**30**	**50%**	**30**	**50%**	**60**	**100%**

GRAPH 1 AGE DISTRIBUTION OF PARTICIPANTS



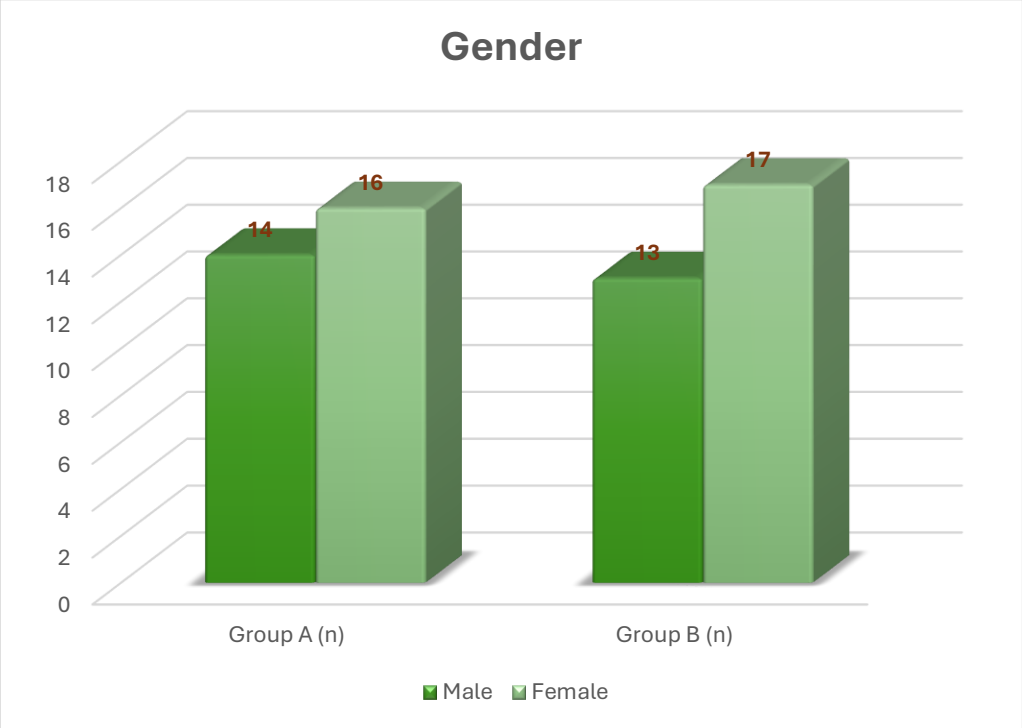
The majority of participants fell in the 41–50-year age band (35.0%), and the age distribution was closely matched between groups, indicating that age was unlikely to have confounded the between-group comparison.

TABLE 2 GENDER DISTRIBUTION OF PARTICIPANTS

Gender	Group A (n)	Group A (%)	Group B (n)	Group B (%)	Total (n)	Total (%)
Male	14	23.30%	13	21.70%	27	45.00%
Female	16	26.70%	17	28.30%	33	55.00%

	30	50%	30	50%	60	100%

GRAPH 2 GENDER DISTRIBUTION OF PARTICIPANTS



Female participants slightly outnumbered males overall (55.0% vs 45.0%), with a near-identical split between the two treatment groups.

TABLE 3: GROUP A (MANUAL CERVICAL TRACTION + STRENGTHENING) — NPRS, 0 WEEK VS 6 WEEKS

Timepoint	N	Minimum	Maximum	Mean	Std. Deviation	t-value	p-value	Result
0 Week	30	6	8	7.03	0.76	3.02	0.005	Significant
6 Week	30	5	7	6.03	0.70			

Timepoint	N	Minimum	Maximum	Mean	Std. Deviation	t-value	p-value	Result
Overall	60	5	8	6.53	0.88			

GRAPH 3: GROUP A – NPRS (0 WEEK VS 6 WEEKS

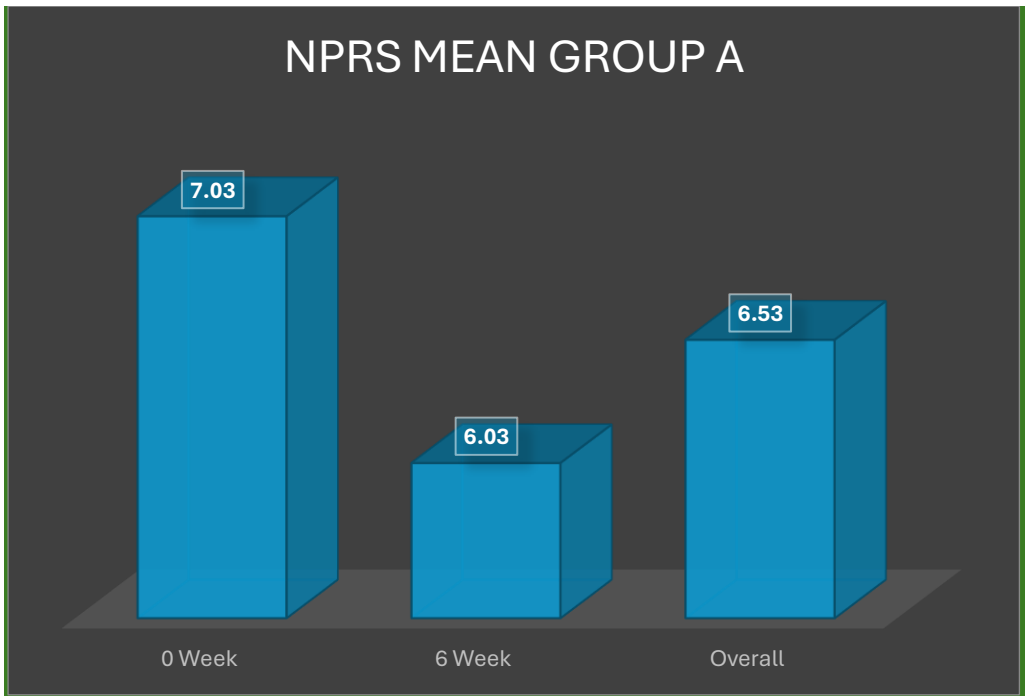
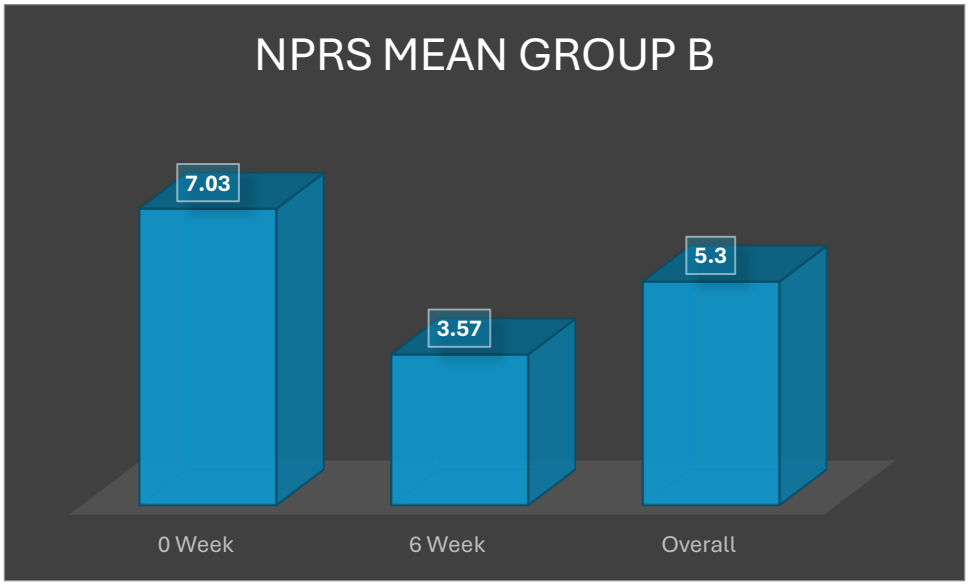


TABLE 4: GROUP B (NEURAL TISSUE MOBILIZATION + STRENGTHENING) — NPRS, 0 WEEK VS 6 WEEKS

Timepoint	N	Minimum	Maximum	Mean	Std. Deviation	t-value	p-value	Result
0 Week	30	6	8	7.03	0.76	4.12	0.005	Significant
6 Week	30	2	5	3.57	0.82			
Overall	60	2	8	5.30	1.98			

GRAPH 4: GROUP B – NPRS (0 WEEK VS 6 WEEKS)



Both groups showed a statistically significant fall in pain score over six weeks, but the magnitude of change was far greater in Group B (mean drop of 3.46 points) than in Group A (mean drop of 1.00 point).

Table 5: Between-group comparison — NPRS at 6 weeks

Group	N	Mean	Std. Deviation	Std. Error Mean
Group A	30	6.03	0.70	0.13
Group B	30	3.57	0.82	0.15

Independent Samples Test

t-test for Equality of Means

t-value	df	p-value	Mean Difference	Result
3.05	58	0.005	2.46	Significant

At six weeks, participants in Group B reported significantly lower pain than those in Group A, with a mean difference of 2.46 points favouring neural tissue mobilization.

DISCUSSION

The purpose of the present study was to compare the effect of manual cervical traction and neural tissue mobilization, with the same strengthening program, on pain intensity in cervical radiculopathy. Both interventions showed statistically significant reduction in pain within group, however, the neural mobilization group showed significantly greater reduction in pain and this difference was still significant after direct between group comparison at 6 weeks.

The pain relief observed with manual traction is consistent with the proposed mechanism of foraminal widening, stimulation of mechanoreceptors, and reflex decrease in paraspinal guarding[9]; similar studies comparing manual traction with exercise have reported that manual traction significantly decreases neck pain and radicular pain, although it does not completely alleviate structural compression[11,12]. The findings of the present study confirm previous comparative traction studies in which the effects of manual traction on pain relief were in the range previously reported, and where traction was shown to be a effective adjunct to exercise, but not a replacement for it[13],[14].

The larger reduction observed with neural tissue mobilization is consistent with the increasing evidence that neurodynamic techniques act directly on the mechanically sensitised nerve root and its surrounding interfaces, enhancing intraneural mobility and reducing mechanosensitivity that maintains radicular pain[15],[16]. Savva et al. found neural mobilization combined with intermittent cervical traction produced significant improvement in pain and function in cervical radiculopathy[17] and Efstathiou et al.'s critical review found neural mobilization to be consistently though modestly to moderately effective across spinal radiculopathies[18]. More directly comparable to the present findings, Rafiq et al found that neural mobilization, was significantly more effective than conservative treatment for pain reduction in cervical radiculopathy[20] and Sambyal and

Kumar, who also reported an advantage for neural mobilization over conventional physiotherapy for pain relief in the same population[21]. The same effect was reported by Basson et al. in their randomized trial, where nerve-related neck and arm pain was reduced immediately after neural mobilization without causing adverse effects[19].

A plausible explanation for the superior analgesic response in the neural mobilization group is that unlike traction which mainly target the joint and surrounding soft tissue ,neurodynamic sliding and gliding techniques target the irritated neural structure itself rather than the joint and surrounding soft tissue. These techniques may decrease intraneural oedema and restore the normal mechanical relationship between the nerve root and adjacent tissues[15,16]. Consequently, they are likely to achieve a quicker and more targeted reduction in nociceptive drive from sensitised nerve root compared with a purely mechanical decompressive approach. Furthermore, the strengthening exercise performed by both groups may have produced a common baseline improvement, while the addition of neurodynamic mobilization provided further analgesic benefits beyond those achieved with traction alone.

The present results, together with the previous comparative trials, lend support to neural tissue mobilization being the most effective of the two techniques in the short-term control of pain in cervical radiculopathy as compared to manual traction, which has been shown to be inferior, but still clinically useful and well tolerated.

CONCLUSION

The present study compared the effects of manual cervical traction and neural tissue mobilization with the corresponding strengthening programme on pain intensity in 60 patients suffering from cervical radiculopathy during a six-week intervention period. Both interventions resulted in a statistically significant reduction in pain as measured on the Numeric Pain Rating Scale and indicate that structured conservative rehabilitation is effective in this patient group, irrespective of the type of manual technique.

However, the magnitude of pain reduction differed meaningfully between two methods. Neural tissue mobilization with strengthening exercise resulted in a significantly lower NPRS score compared to manual cervical traction with strengthening exercise directly compared at 6 weeks. This one indicates that the

techniques targeting the neural interface itself might be more effective in providing short term pain relief for nerve-root-mediated pain than techniques focused primarily on the joint.

Clinically, the findings suggest that in the acute-to-subacute phase of cervical radiculopathy, when pain is the predominant complaint, a physiotherapist can obtain greater analgesic benefits by focusing on neural tissue mobilization rather than manual traction when designing a strengthening-based rehabilitation programme. This does not exclude traction as a treatment option, since it remains effective and may be more tolerated or accessible where neurodynamic testing is not well tolerated or contraindicated, but it gives comparative evidence to inform technique selection when both options are indicated otherwise.

As these conclusions are based on the single centre study, the small number of participants, the timeframe of the six weeks follow-up and the lack of control group of no treatment, the results may not be generalized. Further studies, including multicentre studies, longer follow-up, and blinded outcome assessment should be conducted to validate that the pain benefit experienced after neural tissue mobilization is maintained beyond the immediate post-treatment period.

REFERENCES

1. Mansfield M, Smith T, Spahr N, Thacker M. Cervical spine radiculopathy epidemiology: a systematic review. Musculoskeletal Care. 2020 Dec;18(4):555-67.
2. Iyer S, Kim HJ. Cervical radiculopathy. Current reviews in musculoskeletal medicine. 2016 Sep;9:272-80.
3. Corey DL, Comeau D. Cervical radiculopathy. Medical Clinics. 2014 Jul 1;98(4):791-9.
4. Swartz EE, Floyd RT, Cendoma M. Cervical spine functional anatomy and the biomechanics of injury due to compressive loading. Journal of athletic training. 2005 Jul;40(3):155.
5. Abbed KM, Coumans JV. Cervical radiculopathy: pathophysiology, presentation, and clinical evaluation. Neurosurgery. 2007 Jan 1;60(suppl_1):S1-28.
6. Thoomes EJ, Scholten-Peeters W, Koes B, Falla D, Verhagen AP. The effectiveness of conservative treatment for patients with cervical radiculopathy: a systematic review. The Clinical journal of pain. 2013 Dec 1;29(12):1073-86.
7. Romeo A, Vanti C, Boldrini V, Ruggeri M, Guccione AA,

Pillastrini P, Bertozzi L. Cervical radiculopathy: effectiveness of adding traction to physical therapy—a systematic review and meta-analysis of randomized controlled trials. Physical Therapy. 2018 Apr;98(4):231-42.

8. Kang KC, Lee HS, Lee JH. Cervical radiculopathy focus on characteristics and differential diagnosis. Asian spine journal. 2020 Dec 22;14(6):921.
9. Rakbamrung P, Puekkong J, Thepnuan P. Students' understanding physics concept of traction therapy. Procedia-Social and Behavioral Sciences. 2015 Jul 25;197:135-9.
10. Agarwal S, Patel VD, Prabhakar AJ, Eapen C. Use of cervical traction for managing neck pain: A cross-sectional survey of physiotherapists in India. Journal of Bodywork and Movement Therapies. 2024 Jul 1;39:476-82.
11. Afzal R, Ghous M, Shakil Ur Rehman S, Masood T. Comparison between manual traction, manual opening technique and combination in patients with cervical radiculopathy: randomized control trial. J Pak Med Assoc. 2019 Sep;69(9):1237-41.
12. Bukhari SR, Shakil-ur-Rehman S, Ahmad S, Naeem A. Comparison between effectiveness of Mechanical and Manual Traction combined with mobilization and exercise therapy in Patients with Cervical Radiculopathy. Pakistan journal of medical sciences. 2016 Jan;32(1):31.
13. Madson TJ, Hollman JH. Cervical traction for managing neck pain: a survey of physical therapists in the United States. journal of orthopaedic & sports physical therapy. 2017 Mar;47(3):200-8.
14. Rinke M. The Effect of Manual Cervical Traction Versus Mechanical Cervical Traction in the Treatment of Chronic Neck Pain. University of Johannesburg (South Africa); 2013.
15. Hall T, Elvey RL. Neural tissue evaluation and treatment. Physical therapy of the shoulder. 2011 Mar 16:131-45.
16. Tsimerakis AF, Lytras D, Kottaras A, Iakovidis P, Kottaras IJ. The effect of neural tissue mobilization techniques on pain, functioning and health in patients with median nerve entrapment in mild to moderate carpal tunnel syndrome: A narrative review. International Journal of

Physical Education, Sports and Health. 2021 Mar 1;8(2):186-90.

17. Savva C, Korakakis V, Efstathiou M, Karagiannis C. Cervical traction combined with neural mobilization for patients with cervical radiculopathy: A randomized controlled trial. Journal of Bodywork and Movement Therapies. 2021 Apr 1;26:279-89.
18. Efstathiou MA, Stefanakis M, Savva C, Giakas G. Effectiveness of neural mobilization in patients with spinal radiculopathy: a critical review. Journal of bodywork and movement therapies. 2015 Apr 1;19(2):205-12.
19. Basson CA, Stewart A, Mudzi W, Musenge E. Effect of neural mobilization on nerve-related neck and arm pain: A randomized controlled trial. Physiotherapy Canada. 2020 Nov 1;72(4):408-19.
20. Rafiq S, Zafar H, Gillani SA, Waqas MS, Zia A, Liaqat S, Rafiq Y. Comparison of neural mobilization and conservative treatment on pain, range of motion, and disability in cervical radiculopathy: A randomized controlled trial. Plos one. 2022 Dec 6;17(12):e0278177.
21. Sambyal S, Kumar S. Comparison between nerve mobilization and conventional physiotherapy in patients with cervical radiculopathy. Int J Innov Res Dev. 2013 Aug;2(8):442-5.
22. Young IA, Dunning J, Butts R, Mourad F, Cleland JA. Reliability, construct validity, and responsiveness of the neck disability index and numeric pain rating scale in patients with mechanical neck pain without upper extremity symptoms. Physiotherapy theory and practice. 2019 Dec 2;35(12):1328-35.
23. Radhakrishnan K, Litchy WJ, O'Fallon WM, Kurland LT. Epidemiology of cervical radiculopathy: a population-based study from Rochester, Minnesota, 1976 through 1990. Brain. 1994 Apr;117(Pt 2):325-35.
24. Carette S, Fehlings MG. Clinical practice. Cervical radiculopathy. N Engl J Med. 2005 Jul 28;353(4):392-9.
25. Wainner RS, Fritz JM, Irrgang JJ, Boninger ML, Delitto A, Allison S. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. Spine (Phila Pa 1976). 2003 Jan 1;28(1):52-62.
26. Young IA, Michener LA, Cleland JA, Aguilera AJ, Snyder AR. Manual therapy, exercise, and

traction for patients with cervical radiculopathy: a randomized clinical trial. Phys Ther. 2009 Jul;89(7):632-42.

27. Shacklock M. Neurodynamics. Physiotherapy. 1995;81(1):9-16.