

Comparison between Manual Traction, Manual Opening technique and Combination in Patients with cervical radiculopathy: Randomized Control Trial

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Abstract

Objective: To compare the effects of manual traction, manual intervertebral foramen opening technique and combination of the two techniques in patients with cervical radiculopathy.

Methods: The single-blind randomised control trial was conducted at Fauji Foundation Hospital, Rawalpindi, Pakistan, from July 2017 to January 2018, and comprised patients of either gender having unilateral upper extremity pain, paresthesia or numbness. The subjects were placed into groups I, II and III using sealed envelope method. Group I was treated with the opening of intervertebral foramen technique, while group II received manual traction of cervical spine, and group III received both techniques. Three sessions were conducted per week for 3 weeks. The outcome measures were neck disability index, Numeric pain rating scale, patient-specific functional scale, and range of motions of cervical spine. SPSS 21 was used for data analysis

Results: Of the 40 patients, 17(30%) were males and 23(70%) were females. There were 13(32.5%) patients each in groups I and II, while group III had 14(35%). Mean age in group I was 42.41±6.86 years, in group II 40.95±7.32 years and in group III 42.50±5.77 years. There was no statistically significant difference among the three groups with respect to any parameter ($p>0.05$). Individual group analysis showed significant improvement ($p<0.05$) in all parameters.

Conclusion: Manual intervertebral foramen opening technique, manual traction, and combination of both techniques were equally effective in decreasing pain, level of disability and improved cervical mobility in patients with cervical radiculopathy.

Keywords: Cervical, Radiculopathy, Neck pain intervertebral foramen, Manual opening, Traction.

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Introduction

Neck pain is the most prevalent cause of musculoskeletal disability and carries an exorbitant for a society. Population-based data suggests that cervical radiculopathy is one of the top five musculoskeletal disorders and the fourth primary cause of year living with disability behind arthralgia's, back pain and depression.¹ It is a common musculoskeletal disorder with annual incidence of around 83 per 100,000; therefore it constitutes a large percentage of those seeking primary healthcare globally.² Cervical radiculopathy is a neurological condition characterised by neck and upper extremity pain in a dermatomal pattern with reflex changes, sensory and motor deficits in the affected nerve root distribution.³ Most patients present with restricted range of motions

(ROMs) in cervical spine, joint stiffness, muscular tightness and postural abnormalities.⁴⁻⁶ Secondary to these, other musculoskeletal problems, such as capsular restrictions accompanied by foramina encroachment of spinal nerves due to multiple factors including decreased disc height, degenerative changes in uncovertebral joints anteriorly and zygapophyseal joints posteriorly.⁷⁻⁹ An important clinical test is Spurling's manoeuvre in which symptoms can be reproduced with lateral flexion, extension and rotation of the neck on the affected side¹⁰ Neck pain is classified into acute and chronic types according to severity, aetiology and duration. Pain that persists less than 6 weeks is characterised as acute, 3 months is labelled as sub-acute and more than 3 months is known as chronic pain.^{11,12} Exercise therapy along with manual traction and manual therapy intervertebral foramen opening technique decreases joint stiffness, pain and improves ROMs.¹³ Emerging evidence suggests that multimodal treatment

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approach may benefit patients with cervical problem both in acute and chronic conditions.¹⁴

The current study was planned to compare the effects of manual therapy intervertebral foramen opening technique, cervical traction, and a combination of both techniques on pain, disability level and cervical mobility in patients with cervical radiculopathy.

Patients and Methods

The single-blind randomised control trial (RCT) was conducted at Fauji Foundation Hospital, Rawalpindi, Pakistan, from July 2017 to January 2018, and comprised patients of either gender having unilateral upper extremity pain, paresthesia or numbness. After obtaining approval from the ethics committees of Riphah College of Rehabilitation Sciences, Riphah International University, Islamabad, and the Fauji Foundation Hospital, Rawalpindi, the sample size was calculated using Open-Epi version 3 with 95% confidence interval (CI), and 80% power, based on the primary outcome measure, the Neck Disability Index (NDI).¹³ The subjects were recruited using non-probability purposive sampling technique and were divided into groups I, II and III using the sealed envelope method. All participants were briefed about the study and informed consent was obtained. Patients with diagnosed magnetic resonance imaging (MRI) cervical radiculopathy were assigned to interventional groups on the basis of inclusion criteria which stipulated patients of either gender age 30-50 years, unilateral upper-extremity pain, paresthesia, or numbness, and who had 3 out of 4 tests of clinical prediction rule being positive: Spurling test, Distraction test, Upper-Limb Tension Test 1, Ipsilateral cervical rotation $<60^{\circ}$. Only patients not taking any medicines were included in order to determine the effects of manual techniques. Those taking medicines or refused to volunteer for the study were excluded.

Patients in group I were treated through the opening of intervertebral foramen technique, while group II received manual traction of cervical spine and group III received both cervical traction and opening of intervertebral foramen techniques for 3 sessions per week. An experienced orthopaedic manual physical therapist conducted the sessions with patients of all three groups throughout the intervention period. Intervertebral foramen technique is a mobilisation with movement technique. The therapist's hand and fingers were used in pulling the neck to rotation at the restricted area of the

neck. At same time, movements were performed. By improving rotation with one hand pulling over the restricted area, the movement were performed into opening with 3 sets of 10 repetitions.⁹ In cervical traction, patients were asked to lie supine on the treatment table. Head was cradled by physiotherapist from chin and the occiput, then the physiotherapist applied traction force in 25 degree neck flexion. Traction was applied for 10 minutes in which pull for 10 sec and 5 sec rest were also applied. The traction force was equal to 10-15% of the body weight of each patient which was calculated prior to the intervention.^{13,15} Prior to applying these techniques, all patients received 15 minutes of hot pack at cervical spine. Total intervention period was 3 weeks with 3 sessions per week. The outcome measures used were Neck disability index (NDI), Numeric pain rating scale (NPRS), Patient-specific functional scale (PSFS) and Cervical ROMs were measured by inclinometer. Assessment was made at baseline and after completion of 3 consecutive weeks of intervention. There was no dropout in Group I and II, whereas Group III had 1 dropout.

SPSS 21 was used for data analysis. After checking normality of data by Shapiro Wilk test, one-way analysis of variance (ANOVA) with Scheffes Post-Hoc was applied for among group differences, and paired sample t test was used for within-group (pre vs. post) changes with 0.05 values of alpha level of significance. Data was presented in the form of mean \pm standard deviation (SD) along with p values.

Results

Of the 50 patients initially screened, 10(20%) were excluded. Of the 40(80%) patients who formed the sample, 17(30%) were males and 23(70%) were females. There were 13(32.5%) patients each in groups I and II, while group III had 14(35%) patients. In group III, there was 1(7%) dropout (Figure).

The mean age of participants in group I was 42.41 ± 6.86 years, in group II 40.95 ± 7.32 years and in group III 42.50 ± 5.77 years. In Group I, 8(60%) patients were complaining of sharp and shooting pain, 4(35%) burning and tingling and 1(5%) deep boring pain. In Group II, 7(56%) were complaining of sharp and shooting pain, and 6(46%) of participants had burning and tingling sensations. In Group III, 6(40%) patients complained of burning and shooting pain. Overall, 9(64%) participants complained of neck pain which was radiating to the right upper

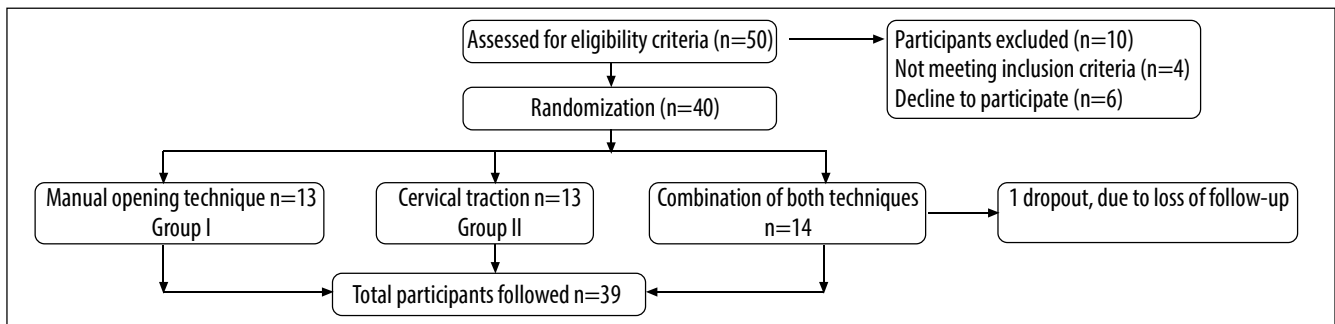


Figure: Consort Flowchart showing the flow of participants through each stage of randomized trial.

Table-1: Pre and post analysis of different groups with Mean and standard deviation.

Variables	Group I		Group II		Group III	
	Pre Mean±SD	Post Mean±SD	Pre Mean±SD	Post Mean±SD	Pre Mean±SD	Post Mean±SD
NPRS	7.1±1.03	2.5±0.9	7.5±0.67	3.08±0.79	7.5±0.89	2.9±1.18
NDI	19.5±5.3	9.5±3.7	22.4±4.6	10.6±3.38	22.06±6.3	10.7±4.3
PSFS	5.9±1.08	8.8±0.4	5.8±1.15	8.31±1.20	6.13±1.23	8.3±0.76
Active extension	36.9±3.08	41.9±3.7	35.3±3.5	41.0±6.4	39.3±6.61	44.3±6.61
Active Flexion	45.9±4.4	52.3±3.7	47.08±3.0	53.4±2.5	44.6±4.3	51.3±4.2
Rt side bending	35.6±6.4	41.3±5.9	35.2±6.0	41.5±5.6	33.8±3.8	39.9±3.6
Lt side bending	34.6±6.9	40.3±5.7	39.2±4.6	44.6±3.8	33.1±5.5	38.1±5.2
Rt Rotation	58.0±6.9	61.0±7.5	55.3±4.1	63.0±5.1	56.2±8.5	61.6±6.3
Lt Rotation	55.4±6.8	60.1±5.1	60.5±5.1	65.1±4.1	56.3±9.7	63.0±8.7

NDI: Neck Disability Index, NPRS: Numeric Pain Rating Scale, PSFS: Patient specific functional scale, SD: Standard Deviation, Rt: Right, Lt: Left, P-value <0.05.

Table-2: One way analysis of variance (ANOVA) showing post treatment analyses of different variables.

VARIABLE	GROUP I Mean±SD	GROUP II Mean±SD	GROUP III Mean±SD	p-value
NPRS	2.58±0.90	3.08±0.79	2.94±1.18	0.45
PSFS	8.80±0.44	8.37±1.20	8.83±0.67	0.33
NDI	9.58±3.77	10.67±3.60	10.75±4.37	0.71
Active flexion	52.33±3.79	53.42±2.57	51.31±4.27	0.34
Active extension	41.92±3.75	41.08±6.43	44.38±6.61	0.31
Right side bending	41.33±5.92	41.50±5.60	39.94±3.58	0.66
Left side bending	40.33±5.74	44.67±3.82	38.88±5.18	0.01*
Right rotation	58.02±6.97	55.33±4.11	56.44±8.65	0.63
Left rotation	61.58±5.80	65.17±4.60	63.00±8.72	0.44

NDI: Neck Disability Index, NPRS: Numeric Pain Rating Scale, SD: Standard Deviation

Table-3: Comparison among Groups with p values.

Variables	Group I & II	Group I & III	Group II & III
NPRS	0.31	0.29	0.81
NDI	0.18	0.45	0.91
PSFS	0.24	0.82	0.26
Active Extension	0.71	0.22	0.19
Active Flexion	0.41	0.51	0.11
Right side bending	0.91	0.41	0.41
Left side bending	0.04**	0.46	0.02**
Right Rotation	0.41	0.81	0.51
Left Rotation	0.1	0.61	0.41

In pre and post analysis of different groups, all variables showed significant results (p<0.05) with regard to pain and ROM (Table 1). Outcome measures within each group were noted separately (Tables 2-3). Cervical left side bending showed significant improvement (p<0.05) in all three groups.

Discussion

Cervical radiculopathy causes severe disability and its incidence seems to be at peak in fourth and fifth decades of life.¹⁶ For the rehabilitation of those having significant incapacities related to cervical radiculopathy, control trials need to be urgently done to define ideal interventional

extremity, 5(35%) had pain in the left upper extremity. In Group I, 4(31%) patients had constant pain and 9(69%) had intermittent pain. In Group II, 12(93%) were complaining of intermittent pain and 1(7%) had constant symptoms. In Group III, 6(43%) has constant pain and 8(57%) were complaining of intermittent pain. Most common, nerve root involvement was C6-C7 in 15(38%) participants, 11(27.5%) had C5-C6 nerve root involvement, 9(22.5%) had multi-segmental involvement, 3(7.5%) had C4-C5, and 2(5%) had C7-C8 nerve root involvement.

approaches. There is a lack of clinical trials accurately explaining the effectiveness of best rehabilitation approach for cervical radiculopathy.¹⁷ The results of the current study highlights that there was improvement in mean and standard deviation from baseline to the end of intervention in NPRS, NDI, PSFS and cervical spine ROMs in patients after the application of manual techniques on cervical spine. The results demonstrated that both pain and cervical ROM were improved with combination of techniques. This fact is being supported by many studies that no single technique is effective in reducing cervical radicular problems.¹⁸ The results of the current study depicts that cervical radiculopathy is best treated with multimodal treatment approach that includes combination of techniques.

A general consensus exists that using manual traction, manual intervertebral foramen opening technique in conjunction with exercise therapy is effective in improving function, active ROM, and in decreasing the level of pain and disability.¹⁹ Based on the results, the findings have shown that individual techniques were as effective as the combination, but patients showed better outcomes in ROMs of cervical spine when treated with cervical traction technique and manual intervertebral foramen opening technique. It was noted that all three groups demonstrated statistically significant improvements in NPRS pain scores after three weeks of intervention ($p < 0.01$) as well as in NDI scores.²⁰ The study found that combination group showed less improvement compared to the other two groups. There is scarce data on the effectiveness of intervertebral foramen opening technique in decreasing pain and functional limitations associated with cervical radiculopathy.²¹ A double-blind RCT was conducted at physiotherapy clinics in Quebec City, Canada, to determine the effect of mobilisation and intervertebral foramen opening technique in cervical radiculopathy.²² The primary objective of this study was to evaluate, primary outcomes in terms of pain and disability in cervical patients. The study concluded that nerve root symptoms were considerably decreased and patient's neck movements were enhanced. Similar findings were observed in the current study.

Individual group analyses showed highly favourable outcomes in terms of pain, disability, and patient-perceived improvement, suggesting that in this population the combination of manual therapy is an effective approach. This also suggests that there are no limitations to using

traction and intervertebral foramen opening technique that are specific to the level of the radiculopathy in acute or sub-acute patients with cervical radiculopathy, given that no adverse event was observed following the rehabilitation programmes and that the compliance was excellent regardless of the approach used.

Many studies have proved that cervical traction and intervertebral foramen opening technique brings promising results in cervical radiculopathy.²³ Both techniques alleviate pressure on nerve roots and soft tissues, enlarges intervertebral foramen. These therapeutic approaches help in freeing entrapped nerve roots and decrease joint stiffness. Similar findings were reported in the study under discussion. Another study observed the effects of manual physiotherapy, exercise therapy and traction on pain, disability and function of patients with cervical radiculopathy, and stated that nerve root symptoms diminished after application of these therapies, patients showed statistically significant difference on NDI, PSFS and NPRS.²⁴ The results of this study may help to establish best clinical practice guidelines for this patient population.

The limitations of the current study were short intervention time with small sample size and the fact that patients of both acute and chronic conditions were treated. A study with prolonged intervention time and large sample size is recommended, and effectiveness of single technique on one type of population should be evaluated.

Conclusion

Manual intervertebral foramen opening technique, manual traction, and combination of both techniques were equally effective in decreasing pain, level of disability and improved cervical mobility in patients with cervical radiculopathy.

Disclaimer: RCT number could not be obtained by the institution.

Conflict of Interest: None.

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