ABSTRACT

Background: Cervical radiculopathy is a condition of pain and sensorimotor deficits due to cervical nerve root compression. The symptoms may include weakness, tingling, numbness and pain. C6, C7 nerve roots are most involved in cervical radiculopathy. Various modalities and therapeutic interventions are used and recommended for management of cervical radiculopathy including cervical collars, immobilization, manipulation, cervical traction TENS and therapeutic exercises. The aim of this study is to evaluate the efficacy of neurodynamics in comparison to manual traction in the management of cervical radiculopathy.

Method: An Interventional research was performed in the Department of Physiotherapy, Mayo hospital Lahore, Pakistan. 40 subjects aged between 18-60 years participated in the study. They were divided into two groups namely Group A and Group B with 20 subjects in each group. The duration of the study was 4 weeks with 4 sessions per week. Group A received neurodynamics along with strengthening exercises while Group B received manual traction along with strengthening exercises. Neck Disability Index (NDI) scale was used as an outcome measure and paired sample t-test was used for statistical analysis.

Results: A significant improvement was found in both neurodynamics group and manual traction group for pain and functional status with p value < 0.05.

Conclusion: This study concluded that the treatment techniques, neurodynamics and manual traction were effective in alleviating the symptoms associated with cervical radiculopathy in terms of decreasing pain intensity, increasing ranges of motion and improving functional capacity.

Keywords: cervical radiculopathy, neurodynamics, manual traction, NPRS, NDI, neck pain.

Received 08th April 2016, revised 29th May 2016, accepted 06th June 2016

CORRESPONDING AUTHOR

*Mamoona Anwar

Physical Therapist, School of physiotherapy, King Edward medical University, Lahore, Pakistan.
INTRODUCTION

Cervical radiculopathy is a syndrome of pain or sensorimotor insufficiencies because of compression in the cervical nerve root. Appreciation of this condition is vital for quick treatment and diagnosis, thereby enabling patient to get back to their steady activity and retrieval[1]. The middling yearly prevalence of cervical radiculopathy is 83.2/100,000 persons, whereas the mean occurrence is 3.5/1000 person. Acute cervical radiculopathies have 75% rate of impulsive progress with a self-limiting sequence [2,3]. It is a pathological procedure including the nerve root halting from cervical disc herniation, benign or malignant tumours and trauma, thereby creating nerve root avulsion or cervical spondylodesis. Furthermore, it might occur when no reason is obvious [4]. The dermatomesupply of pain may not always exist and precisiseitand form of pain vary extensively. Related motor or sensory insufficiencies are not permanently present. Usually the symptoms shown by afflicted persons are feebleness, tingling, numbness and pain on the extremity which frequentlyend in considerable disability and functional restriction [5]. Commonly, nerve roots that are typically involved in cervical radiculopathy are sixth and seventh cervical roots that are produced by fifth or sixth cervical disc herniation or spondylodesis. The C6 root is involved in 25% of cases and C7 root is involved in 60% of cases [6,7]. The compression of eighth cervical root is less common [8]. The preliminary treatment includes rest, analgesics, immobilization of cervical spine, anti-inflammatory drugs and physical therapy. A huge range of therapies have been recommended to be effective in management of cervical radiculopathy, including cervical collars for temporary immobilization, manipulation, cervical traction, TENS and therapeutic exercises, cervical traction. Neurodynamic mobilization techniques (NMTs) are advised in the management of cervical radiculopathy because of their fast pain relieving effects [8]. Cervical traction is assigned to relieve pain by increasing the cervical neural foramina and alleviating the intra-discal force. Furthermore, NMTs are used for modifying the structure of the cervical nerve root and function enabling the nerve to glide freely [9]. The purpose of the study is to evaluate the effectiveness of neurodynamics in comparison to manual traction in management of cervical radiculopathy.

METHODOLOGY

An Interventional study was conducted in the Department of Physiotherapy Mayo hospital Lahore, Pakistan. 40 subjects diagnosed with cervical radiculopathy were included in the study based on the inclusive criteria. Simple random sampling was used to randomize patients. Inclusion criteria for the participants were pain and paresthesia in the upper extremity radiating to arm and hand, at least one of the signs of nerve root compression (numbness, tingling, paresthesia) but without spinal fractures or injuries. Patients aged between 18 to 60 years were included. At least three of the following diagnostic tests were required to be positive which include “Spurling’s compression test”, “distraction test”, “upper limb tension test”, and “cervical flexion rotation test” . The perceived level of pain according to Numeric Pain Rating Scale of less than 2 with duration of more than 12 weeks were included.

Subjects below the age of 18 years or above the age of 60 years, subjects who refused to sign the consent form, red flag signs such as intraspinal or extraspinal tumors, metabolic disease, osteoporosis, spinal compression, fracture of spine or upper limb and prolonged history of use of steroids were excluded from the study.

Subjects in Group A were given hot pack for 10 minutes, strengthening exercises (cervical isometrics exercises and shoulder isometrics exercises) and Neurodynamics, while in Group B patients were treated with hot pack for 10 minutes, strengthening exercises (cervical isometrics exercises and shoulder isometrics exercises) and manual traction. Manual traction was given to subjects in supine lying position with cervical spine placed at an angle of 15 degree of flexion. The parameters for traction force was 10% of subject’s body weight but can be increased according to their tolerance level. The duration of traction was 15 minutes per session and the frequency was 4 days per week for 4 weeks. The ratio of hold relax was 4:1. Neurodynamics was given under some principles and application of neurodynamics required to position the trunk and extremity at the point of tension (symptoms just begin) then either passively or having the patient moving joint in such a pattern as to stretch and then release the tension. The intensity recommended for stretch force was 15 to 20 seconds, released and then repeated several times according to patient capacity and symptoms.

For median nerve involvement, the subject was lying supine, the maximum stretch to median nerve included shoulder girdle depression, shoulder abduction, elbow extension, shoulder external rotation, supination of the forearm, wrist finger, thumb extension and finally contralateral cervical side flexion. For radial nerve involvement, the subject was lying supine, the maximum stretch on radial nerve included shoulder girdle depression, shoulder abduction, elbow extension, shoulder medial rotation and forearm pronation, wrist, finger and thumb flexion, wrist ulnar deviation and finally contralateral side flexion. For ulnar nerve involvement, the patient was lying supine and maximum stretch on ulnar nerve includes shoulder girdle depression, shoulder external rotation and abduction, elbow flexion, forearm supination and wrist extension and finally contralateral cervical side flexion with a hold of 15-20 seconds followed by release and then repeated several times according to the subject's tolerance, over 4 weeks duration and four sessions per week. Numeric pain rating scale (NPRS) is considered as a reliable and valid instrument for pain assessment. Subjects will also complete the neck disability index for perceived disability measure. The NDI scored from 0 to 50, greater score corresponds to more disability. The score will be increased by two and converted into percentage. Each exercise was repeated 5 times in each session for 4 weeks.
RESULTS

Data was computed and analysed by SPSS version 16. Quantitative elements were provided under the form of mean standard deviation along range (max-min). T-test implemented to contest the quantitative variables p-value<0.05 was considered substantial.

In neurodynamic group the mean value of NPRS was 6.50+0.816 before the treatment and after the treatment it was reduced to 1.68+0.526. The mean paired difference was 2.82+0.931. In the manual traction group, the mean value of NPRS was 6.50+0.816 before the treatment and after the treatment, it was reduced to 2.68+0.526. The mean paired difference is 3.82+0.991 which is less than that of neurodynamic group, value of p<0.005 shows both treatment techniques are significant (Table 1,2). In group A (neurodynamic) the mean score of NDI was 59.12+17.724 before the treatment and after the treatment, it was reduced to 10.33+5.936. The mean paired difference was 48.792+13.736 which is greater than the mean paired difference of manual traction group. In group B (manual traction) the mean score of neck disability index was 56.78+16.199 before the treatment and after the treatment, the score was reduced to 36.84+13.994. The mean paired difference is 19.939+3.672. (Table 3,4)

Table 1: Pre and post values for Numeric pain rating scale and NDI in neurodynamic group:

| Study group | Mean | SD | p-value |
|-------------|------|----|---------|
| NPRS Scores n=40 | | | |
| NDI Scores n=40 | | | |
| Neurodynamics Group | | | |
| NPRS Pre Score | 6.50 | .816 | <0.01* |
| NPRS Post Score | 1.68 | .526 | <0.01* |
| NDI Pre Score | 59.12 | 17.724 | <0.01* |
| NDI Post Score | 10.33 | 5.936 | <0.01* |

*p<0.05 considered significant using paired sample t-test

Table 2: Pre and post values for Numeric pain rating scale and NDI in Manual traction group:

| Study group | Mean | SD | p-value |
|-------------|------|----|---------|
| NPRS Scores n=40 | | | |
| NDI Scores n=40 | | | |
| Manual traction group | | | |
| NPRS Pre Score | 6.50 | .816 | <0.01* |
| NPRS Post Score | 2.68 | .526 | <0.01* |
| NDI Pre Score | 56.78 | 16.199 | <0.01* |
| NDI Post Score | 36.84 | 13.994 | <0.01* |

*p<0.05 considered significant using paired sample t-test

Table 3: Pre and post values for mean and standard deviation of neck disability index

| Study group | Mean | N | Std. Deviation | Std. Error Mean |
|-------------|------|---|---------------|-----------------|
| NDI Pair 1  | | | | |
| Pre_NDI     | 59.12 | 20 | 17.724        | 3.963           |
| Post_NDI    | 10.33 | 20 | 5.936         | 1.327           |
| Traction Pair 1 | | | | |
| Pre_NDI     | 56.78 | 20 | 16.199        | 3.622           |
| Post_NDI    | 36.84 | 20 | 13.944        | 3.118           |

Table 4: Values for sample T test for neurodynamics and traction

| Study group | Paired Differences | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | t | df | Sig (2-tailed) |
|-------------|-------------------|------|---------------|-----------------|------------------------------------------|---|----|-------------|
| Neurodynamics Pair 1 | Pre_NDI - Post_NDI | 48.792 | 13.736 | 3.071 | 2.363 | 5.221 | 15.886 | 19 | .000 |
| Traction Pair 1 | Pre_NDI - Post_NDI | 18.939 | 3.672 | 2.821 | 18.220 | 21.657 | 24.261 | 19 | .000 |

Table 5: Pre and post values for neck ROM

| Study group | N | Mean | Std. Deviation | Std. Error Mean |
|-------------|---|------|---------------|-----------------|
| Pre_Neck_r | 20 | 3.425 | 12.994 | 2.885 |
| Post_Neck_r | 20 | 3.375 | 12.863 | 2.876 |
| Pre_Neck_l | 20 | 10.50 | 3.432 | .767 |
| Post_Neck_l | 20 | 56.50 | 7.964 | 1.781 |
| Pre_Neck_e | 20 | 10.50 | 3.432 | .767 |
| Post_Neck_e | 20 | 13.00 | 4.702 | 1.051 |
| Pre_Neck_r | 20 | 3.25 | 2.236 | 1.051 |
| Post_Neck_r | 20 | 35.25 | 4.064 | .909 |
| Pre_Neck_l | 20 | 80.75 | 5.911 | 1.322 |
| Post_Neck_l | 20 | 57.00 | 9.921 | 2.535 |
| Pre_Neck_e | 20 | 23.75 | 4.552 | 1.018 |
| Post_Neck_e | 20 | 37.50 | 12.513 | 2.798 |
| Pre_Neck_r | 20 | 31.25 | 8.091 | 1.809 |
| Post_Neck_r | 20 | 44.50 | 4.840 | 1.082 |
| Pre_Neck_l | 20 | 45.50 | 6.669 | 1.491 |
| Post_Neck_l | 20 | 25.50 | 8.472 | 1.894 |
| Pre_Neck_e | 20 | 42.75 | 2.552 | .571 |
| Post_Neck_e | 20 | 35.00 | 7.434 | 1.662 |

Table 6: Pre and post values for Shoulder ROM

| Study group | N | Mean | Std. Deviation | Std. Error Mean |
|-------------|---|------|---------------|-----------------|
| Pre_Shoulder | 20 | 73.75 | 13.463 | 3.010 |
| Post_Shoulder | 20 | 65.00 | 18.425 | 4.120 |
| Pre_Shoulder | 20 | 168.25 | 2.936 | .656 |
| Post_Shoulder | 20 | 133.25 | 9.072 | 2.029 |
| Pre_Shoulder | 20 | 74.75 | 13.715 | 3.067 |
| Post_Shoulder | 20 | 56.75 | 14.534 | 3.250 |
| Pre_Shoulder | 20 | 168.25 | 2.936 | .656 |
| Post_Shoulder | 20 | 123.75 | 9.851 | 2.023 |
| Pre_Shoulder | 20 | 14.75 | 4.993 | 1.117 |
| Post_Shoulder | 20 | 8.50 | 3.663 | .819 |
| Pre_Shoulder | 20 | 42.50 | 4.136 | 9.25 |
| Post_Shoulder | 20 | 30.50 | 4.560 | 1.020 |
| Pre_Shoulder | 20 | 35.00 | 12.460 | 2.786 |
| Post_Shoulder | 20 | 23.75 | 14.316 | 3.201 |
| Pre_Shoulder | 20 | 78.00 | 4.702 | 1.051 |
| Post_Shoulder | 20 | 61.00 | 5.525 | 1.235 |
| Pre_Shoulder | 20 | 25.50 | 8.414 | 1.881 |
| Post_Shoulder | 20 | 14.25 | 9.072 | 2.029 |
| Pre_Shoulder | 20 | 78.50 | 2.856 | .639 |
| Post_Shoulder | 20 | 56.75 | 4.940 | 1.105 |
Table 7: Pre and post values of ROM for elbow and wrist

| Study group            | N  | Mean   | Std. Deviation | Std. Error Mean |
|------------------------|----|--------|----------------|-----------------|
| Pre_elbow_flexion      | 20 | 61.50  | 12.258         | 2.741           |
| Traction               | 20 | 37.75  | 14.371         | 3.213           |
| Post_elbow_flexion     | 20 | 140.75 | 2.447          | 0.547           |
| Traction               | 20 | 117.50 | 8.192          | 1.832           |
| Pre_elbow_extension    | 20 | 21.45  | 8.703          | 1.946           |
| Traction               | 20 | 17.75  | 5.250          | 1.174           |
| Post_elbow_extension   | 20 | 4.25   | 1.832          | 0.410           |
| Traction               | 20 | 8.25   | 10.036         | 2.244           |
| Pre_wrist_flexion      | 20 | 24.50  | 6.863          | 1.535           |
| Traction               | 20 | 19.00  | 8.675          | 1.940           |
| Post_wrist_flexion     | 20 | 70.00  | 4.867          | 1.088           |
| Traction               | 20 | 56.25  | 5.821          | 1.302           |
| Pre_wrist_extension    | 20 | 26.00  | 10.834         | 2.422           |
| Traction               | 20 | 22.75  | 9.662          | 2.161           |
| Post_wrist_extension   | 20 | 69.75  | 3.796          | 0.849           |
| Traction               | 20 | 56.25  | 5.821          | 1.302           |
| pre_supination         | 20 | 35.75  | 13.502         | 3.019           |
| Traction               | 20 | 40.75  | 11.271         | 2.520           |
| post_supination        | 20 | 74.50  | 4.560          | 1.020           |
| Traction               | 20 | 58.25  | 5.200          | 1.163           |
| Pre_pronation          | 20 | 34.75  | 15.345         | 3.431           |
| Traction               | 20 | 39.50  | 9.854          | 2.203           |
| Post_pronation         | 20 | 66.50  | 5.155          | 1.153           |
| Traction               | 20 | 53.00  | 40.4           | 9.183           |

The effectiveness of both neural mobilization and intermittent cervical traction (ICT) has been previously explored in some studies. Christos Savvidid a randomized control trial in 2016 to evaluate the effect of neural mobilization with simultaneously applied ICT (intermittent cervical traction) on pain, disability, function, grip strength and cervical range of motion in patients with CR and concluded that Neural mobilization with simultaneous ICT can improve, pain, function, disability, grip strength and cervical range of motion in people with CR. Further clinical trials comparing neural mobilization with cervical traction to other standard interventions are justified. In this study, it was found that both neurodynamics and manual traction were effective in alleviating the symptoms associated with cervical radiculopathy in terms of decreasing pain intensity, increasing ranges of motion and improving functional capacity [12].

CONCLUSION

This study concluded that the treatment techniques, neurodynamics and manual traction were effective in alleviating the symptoms associated with cervical radiculopathy in terms of decreasing pain intensity, increasing ranges of motion and improving functional capacity.

REFERENCES

[1] Angela Tao N et al., Effectiveness of cervical traction on pain and disability in cervical radiculopathy. *International Journal of Recent Scientific Research*. 2015;6(4): 3609-3611.

[2] Elnaggar IM, Hala RE. Influence of Spinal Traction in Treatment of Cervical Radiculopathy. *Egyptian Journal of Neurology, Psychiatry and Neurosurgery*. 2009; 46(2):455-461.

[3] Rhee JM, Yoon T, Riew KD. Cervical radiculopathy. *Journal of the American Academy of Orthopaedic Surgeons*. 2007;15(8):486-94.

[4] Ellenberg MR, Honet JC, Treanor WJ. Cervical radiculopathy. *Archives of physical medicine and rehabilitation*. 1999;75(3):342-52.

[5] Cleland JA, Whitman JM, Fritz JM, Palmer JA. Medical physical therapy, cervical traction, and strengthening exercises in patients with cervical radiculopathy: a case series. *Journal of Orthopaedic & Sports Physical Therapy*. 2005;35(12):802-11.

[6] Corey DL, Comeau D. Cervical radiculopathy. *Medical Clinics of North America*. 2014;98(4):791-9.

[7] Álvarez-Pinzón AM, Krill M. Review of the literature: cervical radiculopathy. An update. *Revista Colombiana de Enfermería*. 8(8): 131-145.

[8] Thoomes EJ, Scholten-Peeters GG, de Boer AJ, Olsthorn RA, Verkerk K, Lin C, et al. Lack of uniform diagnostic criteria for cervical radiculopathy in conservative intervention studies: a systematic review. *European Spine Journal*. 2012;21(8):1459-70.

[9] Borman P, Keskın D, Ekici B, Bodur H. The efficacy of intermittent cervical traction in patients with chronic neck pain. *Clin Rheumatol*. 2008, (10):1249-53.
[10] Cleland JA. Immediate effects of thoracic manipulation in patients with neck pain: a randomized clinical trial. Man Ther. 2005 May;10(2):127-35.

[11] Adesola O Ojoawo, Ayo Olabode, O Esan, Abiodun-Badru, Sunday Odejide, Bose Arilewola. Therapeutic efficacy of cervical traction in the management of cervical radiculopathy: a control trial. Rwanda j. health sci. 2013; 2(2):25-29.

[12] Savva C, Giakas G. The effect of cervical traction combined with neural mobilization on pain and disability in cervical radiculopathy. A case report. Manual therapy. 2013;18(5):443-446.

Citation
Anwar, M., Malik, S., Akhtar, M., Saeed, A., Minhas, A. J., Ehsan, S., Mubeen, I., & Khalid, S. (2016). EFFECTIVENESS OF NEURODYNAMICS IN COMPARISON TO MANUAL TRACTION IN THE MANAGEMENT OF CERVICAL RADICULOPATHY. International Journal of Physiotherapy, 3(3), 390-394.