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EFFECTIVENESS OF NEURODYNAMICS IN COMPARISON TO MANUAL TRACTION IN THE MANAGEMENT OF CERVICAL RADICULOPATHY

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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 aimof 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. GroupA 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 andpaired 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.

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INTRODUCTION

Cervical radiculopathy is a syndrome of pain or sensorimotor insufficienciesbecause 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 personnel. 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 spondylosis. Furthermore, itmighteven occur when no reason is obvious [4].Thedermatomesupply of pain may not always exist andprecisesiteand form of pain vary extensively. Related motor or sensoryinsufficiencies are not permanentlypresent. Usually the symptoms shown by afflicted persons are feebleness, tingling, numbness and pain on the extremity which frequentlyend in considerabledisability 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 spondylosis.TheC6 root is involvedin 25% of cases andC7 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-inflammatorydrugs and physical therapy. A huge range of therapies have been recommended to be effective in management of cervical radiculopathy, includingcervical collars for temporary immobilization, manipulation, cervical traction, TENS and therapeutic exercises, cervical traction. Neurodynamic mobilization techniques (NMTs) are advised in the managementofcervical radiculopathy because of their fast pain relieving effects[8]. Cervical traction is assigned to relieve pain by increasing the cervical neural foramina and alleviating theintra-discalforce. 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 radiculopathywere 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, paresthesisa) 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, subjectswho refusedto sign the consent form, red flag signs such as intraspinal or extraspinal tumors,metabolic diesease,osteoprosis, 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,shoulderabduction,elbow extension, shoulder medial rotation and forearm pronation,wrist,finger and thumb flexion,wrist ulnar deviation and finally contralateral side flexion. Forulnar 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 convertedinto percentage. Each exercise was repeated 5 times in each session for 4 weeks.

RESULTS

Data was computed and analysed by SPSSversion 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:

Within group analysis (neurodynamics group)

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

Within group analysis (manual traction group):

Manual traction group		Mean	SD	p-value
NPRS Scores n=40	NPRS Pre Score	6.50	.816	<0.01*
	NPRS Post Score	2.68	.526	
NDI Scores n=40	NDI Pre Score	56.78	16.199	<0.01*
	NDI Post Score	36.84	13.994	
*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
Neurodynamic	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					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Neurodynamic	Pair 1	Pre_NDI - Post_NDI	48.792	13.736	3.071	42.363	55.221	15.886	19	.000
Traction	Pair 1	Pre_NDI - Post_NDI	19.939	3.672	.821	18.220	21.657	24.281	19	.000

Table 5: Pre and post values of neck ROM

	Study group	N	Mean	Std. Deviation	Std. Error Mean
Pre_Neck_flexion	Neurodynamic	20	34.25	12.904	2.885
	Traction	20	33.75	12.863	2.876
Post_Neck_flexion	Neurodynamic	20	82.75	3.432	.767
	Traction	20	56.50	7.964	1.781
Pre_neck_extension	Neurodynamic	20	10.50	2.236	.500
	Traction	20	13.00	4.702	1.051
Post_Neck_extension	Neurodynamic	20	31.25	2.221	.497
	Traction	20	25.75	4.064	.909
Pre_Neck_right_rotation	Neurodynamic	20	28.00	6.366	1.423
	Traction	20	35.25	9.101	2.035
Post_neck_right_rotation	Neurodynamic	20	80.75	5.911	1.322
	Traction	20	57.00	9.921	2.218
Post_neck_left_rotation	Neurodynamic	20	83.50	8.127	1.817
	Traction	20	65.25	8.188	1.831
Pre_neck_left_rotation	Neurodynamic	20	23.75	4.552	1.018
	Traction	20	37.50	12.513	2.798
Pre_neck_right_sidebending	Neurodynamic	20	31.25	8.091	1.809
	Traction	20	19.50	4.840	1.082
Post_neck_right_sidebending	Neurodynamic	20	44.50	1.539	.344
	Traction	20	35.50	6.669	1.491
Pre_Neck_left_sidebending	Neurodynamic	20	25.50	10.625	2.376
	Traction	20	16.75	8.472	1.894
Post_Neck_left_sidebending	Neurodynamic	20	42.75	2.552	.571
	Traction	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_flexion	Neurodynamic	20	73.75	13.463	3.010
	Traction	20	65.00	18.425	4.120
Post_Shoulder_flexion	Neurodynamic	20	168.25	2.936	.656
	Traction	20	133.25	9.072	2.029
Pre_Shoulder_abduction	Neurodynamic	20	74.75	13.715	3.067
	Traction	20	56.75	14.534	3.250
Post_Shoulder_abduction	Neurodynamic	20	168.25	2.936	.656
	Traction	20	123.75	9.851	2.203
Pre_shoulder_extension	Neurodynamic	20	14.75	4.993	1.117
	Traction	20	8.50	3.663	.819
Post_shoulder_extension	Neurodynamic	20	42.50	4.136	.925
	Traction	20	30.50	4.560	1.020
Pre_shoulder_medial_rotation	Neurodynamic	20	35.00	12.460	2.786
	Traction	20	23.75	14.316	3.201
Post_shoulder_medial_rotation	Neurodynamic	20	78.00	4.702	1.051
	Traction	20	61.00	5.525	1.235
Pre_shoulder_lateral_rotation	Neurodynamic	20	25.50	8.414	1.881
	Traction	20	14.25	9.072	2.029
Post_shoulder_lateral_rotation	Neurodynamic	20	78.50	2.856	.639
	Traction	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	Neurodynamic	20	61.50	12.258	2.741
	Traction	20	37.75	14.371	3.213
Post_elbow_flexion	Neurodynamic	20	140.75	2.447	.547
	Traction	20	117.50	8.192	1.832
Pre_elbow_extenxion	Neurodynamic	20	21.45	8.703	1.946
	Traction	20	17.75	5.250	1.174
Post_elbow_extension	Neurodynamic	20	4.25	1.832	.410
	Traction	20	8.25	10.036	2.244
Pre_wrist_flexion	Neurodynamic	20	24.50	6.863	1.535
	Traction	20	19.00	8.675	1.940
Post_wrist_flexion	Neurodynamic	20	70.00	4.867	1.088
	Traction	20	56.25	5.821	1.302
Pre_wrist_extension	Neurodynamic	20	26.00	10.834	2.422
	Traction	20	22.75	9.662	2.161
Post_wrist_extension	Neurodynamic	20	69.75	3.796	.849
	Traction	20	56.25	5.821	1.302
pre_supination	Neurodynamic	20	35.75	13.502	3.019
	Traction	20	40.75	11.271	2.520
post_supination	Neurodynamic	20	74.50	4.560	1.020
	Traction	20	58.25	5.200	1.163
Pre_pronation	Neurodynamic	20	34.75	15.345	3.431
	Traction	20	39.50	9.854	2.203
Post_pronation	Neurodynamic	20	66.50	5.155	1.153
	Traction	20	53.00	410.4	.918

Table 6 and 7 illustrate that there is an increase in mean range of motion after treatment in both groups which shows that both the treatment techniques are effective.

DISCUSSION

A multitude of physical therapy interventions have been proposed to be effective in the management of cervical radiculopathy. However, outcome studies using consistent treatment approaches on a well-defined sample of patients are lacking [9].Cleland JA et al in 2005 did case series and the purpose of this case series is to describe the outcomes of a consecutive series of patients presenting to physical therapy with cervical radiculopathy and managed with the use of manual physical therapy, cervical traction, and strengthening exercises in which he concluded 10 of the 11 patients (91%) demonstrated a clinically meaningful improvement in pain and function following a mean of 7.1 (SD, 1.5) physical therapy visits and at the 6-month follow-up. However, because a cause-and-effect relationship cannot be inferred from a case series, follow-up randomized clinical trials should be performed to further investigate the effectiveness of manual physical therapy, cervical traction, and strengthening exercises in a homogeneous group of patients with cervical radiculopathy [10].

Ojoawo et.al, did a randomized control trial in 2013 about Therapeutic Efficacy of Cervical Traction in the Management of Cervical Radiculopathy and concluded that continuous cervical traction can significantly reduce pain intensity of patients with cervical radiculopathy.The present study demonstrated that the mean score of neck disability reduced after manual traction treatment [11].

The effectiveness of both neural mobilization and intermittent cervical traction (ICT) has been previously explored in some studies.Christos Savvadid 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.

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