EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUES ON DEEP NECK FLEXORS IN CHRONIC NONSPECIFIC NECK PAIN

[1]Dr. T. Madhavi, [2]Dr. Rajput Deepthi Singh

[1] Assistant Professor, [2]Assistant professor

[1,2]Physiotherapy Department,

[1]Durgabai Deshmukh College of Physiotherapy, [2]Yashoda college of Physiotherapy, Hyderabad, India.

Abstract:

Background:

Muscle Energy Techniques (MET) are used to treat dysfunctions of both the spine and extremities. MET is a form of manipulative treatment which may be used to decrease pain, stretch tight structures muscle and fascia, reduce muscle tone, improve local circulation, strengthen weak musculature and mobilize joint restriction. There have been no published empirical studies on the effectiveness of MET over deep neck flexors (DNF), although descriptive and theoretical articles were found.

Objective:

To determine the effect of MET on deep neck flexors in patients with chronic nonspecific neck pain to compare with isometric neck exercises

Methodology:

30 subjects with chronic nonspecific neck pain who met inclusion criteria and signed the informed consent were assigned to 1 of 2 groups: Muscle energy techniques along with isometric neck exercises and isometric neck exercises alone for 3 times /week/ 4 weeks. VAS, NDI and muscle strength using pressure biofeedback unit (PBU) (Chattanooga Group, Hixson, TN, USA) were measured to assess the differences between the groups.

Results:

Both the groups with MET along with isometric exercises and isometric exercises alone has shown a significant difference in decreasing pain, increasing muscle strength of deep neck flexors and improving disability following 4 weeks of exercise program. Group –A which received MET along with isometric exercises show a significant improvement (p- value <0.05) when compared to Group B which received isometric exercise.

Conclusion:

The results conclude that MET help in strengthening DNF, thus providing beneficial effects in decreasing pain, improving strength and decreasing disability.

Index Terms - Muscle Energy Technique, Deep neck flexors, Chronic nonspecific neck pain, Pressure biofeedback.

I. INTRODUCTION

Chronic Neck Pain (CNP) is a prevalent concern in the society. Estimations indicate that 67% of individuals suffer from neck pain at some stage throughout their life. [1,2]

Non-specific neck pain is defined as pain that is presented without a specific, identifiable etiology (i.e. infection, inflammatory disease), but which could be reproduced by neck movement or provocation tests.[3] Usually neck pain is regarded as chronic when it lasts for more than 3 to 6 months.[4]

In the cervical spine, segmental stability is provided by deep neck flexors (DNF) particularly in the mid-range position. Without this stability, the superficial neck muscles become overactive and there is an increase in the cervical lordosis. Therefore, DNF demonstrate lesser but continued activity and have a major role in postural stability.[5] Possible causes of impairment in DNF include autogenic inhibition and reflex inhibition.[6,7]

In isometric neck exercises there is increase in tension/load in the muscle without any appreciable change in the length of the muscle. The percentage of motor unit activation in a muscle during an isometric contraction is significantly higher than during eccentric/concentric contractions.[8]

Muscle Energy Technique (MET) are employed in the treatment of musculoskeletal dysfunctions as a manual medicine treatment procedure which involves the voluntary contraction of muscle in a precisely controlled direction at varying levels of intensity, against a distinctly executed counter force.[9,10,11]

Effectiveness of MET and its therapeutic mechanisms lacks high quality research but recent evolving researches support the clinical use of this technique.

II. AIM OF THE STUDY

To study the effect of MET in treating pain, disability and improving strength of DNF in patients with chronic nonspecific neck pain.

III. METHODOLOGY

3.1 SUBJECTS

Thirty (n=30) patients presenting to the outpatient physiotherapy department of Durgabai Deshmukh College of Physiotherapy, Hyderabad. Prior to their participation to the study, Written consent was taken from subjects who volunteered to participate in the study.

3.2 SELECTION CRITERIA

Inclusion Criteria -

1. Neck pain for more than 3 months.
2. Age from 18 - 45 years.
3. Neck Disability Index scored <15/50.
4. Poor performance in the craniocervical flexion test (CCFT) – unable to control more than the second stage (24mmHg for 10seonds) of the test.

Exclusion Criteria -

1. Inflammatory, malignant and neurological conditions, metabolic disease
2. Neck pain radiating into arms and upper extremity
3. Neck pain associated with headaches or facial pain
4. Recent major trauma or fracture of the cervical spine
5. Subjects who underwent surgical treatment
6. Subjects who are receiving medications
7. Central cervical canal stenosis
8. History of cervical degenerative joint disease
9. Physical therapy treatments in the past 6 months prior to baseline assessment

3.3 OUTCOME MEASURES

Visual analogue scale (VAS)
Muscle strength using pressure biofeedback unit (PBU) (Chattanooga Group, Hixson, TN, USA)
Neck disability index (NDI)

3.4 PROCEDURE

Subjects who met the inclusion criteria were assigned into two groups based on simple random sampling.
The duration of the treatment procedure was 3 sessions /week/ 4 weeks.
Group A (n=15)– MET for deep neck flexor muscles along with isomeric exercises for neck muscles.
Group B (n=15)– isometric exercises only for neck muscles.

Hot pack/hydro collateral pack is applied prior to the treatment in both groups to assist muscle relaxation and for the preparedness of activity.

GROUP A - The subjects of this group received *Muscle energy techniques along with isometric exercises***.** Muscle Energy Techniques (MET) is aimed to activate the deep flexor muscles of neck. For MET each subject was asked to lie supine.
The practitioner stands at the head of the table and supports the neck with one hand which is placed just below the occiput so that it supports the sub occipital and upper neck region. The other hand is on the patient's forehead. The patient is asked to 'tuck your chin in' (to activate the deep neck flexors) and this additional flexion is 'locked in' by the practitioner's hand on the forehead. The patient is then asked to resist the effort the practitioner will make to extend the neck over his hand, slowly. The procedure for performing isometric exercises is similar to that done in Group B, and is explained in the further paragraphs.

GROUP B - The subjects of this group received *Isometric neck exercises.* Isometric neck exercises were performed in all directions forward, obliquely toward right and left and directly backward.
For *Isometric neck extension* exercise, the subjects were asked to push their head against their hands placed behind their head in a sitting position and against the wall in the supine position.
For *Isometric neck flexion* exercise, the subjects were asked to push their head against their hands place on their forehead in a sitting position.
For *Isometric neck rotation* exercise, the subjects were asked to push their head against their hands which is placed just superior and lateral to the eye as if attempting to turn the head to look over the shoulder but not allowing the motion.
For *Isometric neck side flexion* exercise, the subjects were asked to push their head against their hands placed on the side of the head.

Subjects were instructed to report immediately if any discomfort is felt while performing the exercise. Once exercise was performed correctly; a rest period of 30 seconds was given between each repetition and a 2-minute rest period between each set. Subjects were also instructed not to involve in any vigorous activities for a period of 4 weeks till the study gets over.

IV. RESULTS AND DISCUSSION

4.1 STATISTICAL ANALYSIS

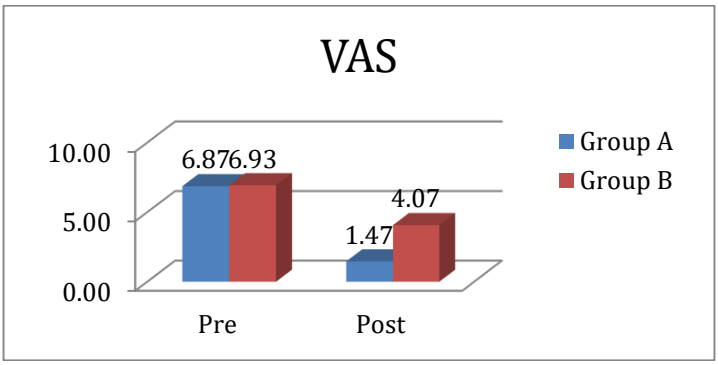
Statistical analysis was done using Primer software with level of significance $p<0.05$
The paired and unpaired t-test was done to analyze the results.

4.2 TABLES AND GRAPHS

Table/Graph 1: Comparing VAS pretest and posttest in Group A and Group B

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pre test	A	15	6.87	1.125	0.291
	B	15	6.93	1.033	0.267
Post test	A	15	1.47	0.99	0.256
	B	15	4.07	1.28	0.33

		t-test for Equality of Means			
		t	df	p-value	table value
Pre test	Equal variance assumed	-0.169	28	0.867	2.048
Post test	Equal variance assumed	-6.222	28	0	2.005

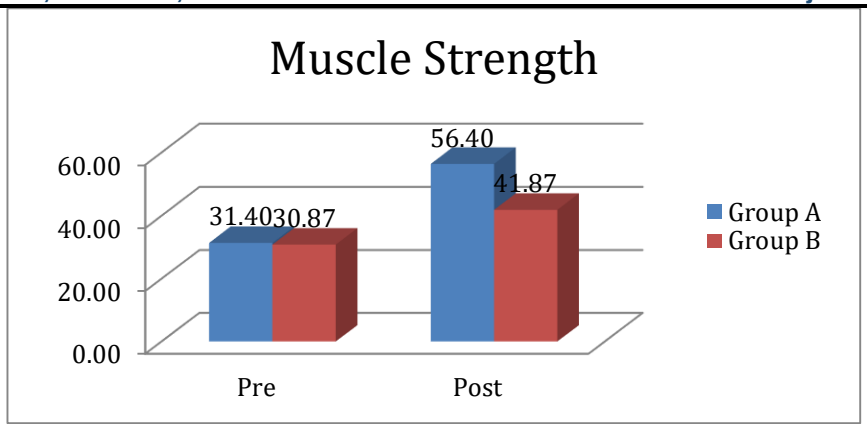


Table/Graph-1: From the table and graph we observe that pretest Group A average score is 6.87 & SD is 1.125 whereas Group B average score is 6.93 and SD is 1.033 and corresponding calculated_t' value is 0.169, p- value >0.05 and table value at 5% level of significance with 28 degree of freedom 2.048 here calculated value is less than table value it means there is no significant difference in group a and group b in pretest VAS scores.
Similarly in posttest Group A average score is 1.47 & SD is 0.990 whereas Group B average score is 4.07 and SD is 1.280 and corresponding calculated_t' value is 6.222, p- value <0.05 and table value at 5% level of significance with 28 degree of freedom is 2.048 here calculated value is greater than table value it means there is greater difference in both the Groups.
Improvement in both the groups is seen but Group A VAS shows significant difference than Group B.

Table/Graph 2: Comparing Muscle strength pretest and posttest in Group A and Group B

	Group	N	Mean	Std.Deviation	Std. Error Mean
Pre test	A	15	31.4	7.808	2.016
	B	15	30.87	4.809	1.242
Post test	A	15	56.4	7.989	2.063
	B	15	41.87	5.54	1.431

		t-test for Equality of Means			
		t	df	p-value	table value
Pre test	Equal variance assumed	0.225	28	0.823	2.048
Post test	Equal variance assumed	5.789	28	0	2.005

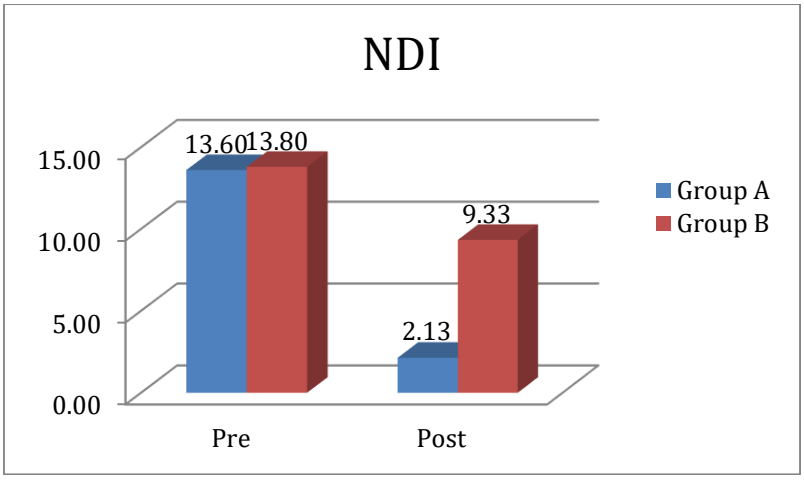


Table/Graph-2: From the table and graph we observe that pretest Group A average score is 31.40 & SD is 7.808 whereas Group B average score is 30.87 and SD is 4.809 and corresponding calculated_t' value is 0.225, p- value >0.05 and table value at 5% level of significance with 28 degree of freedom 2.048 here calculated value is less than table value it means there is no significant difference in Group A and Group B in pretest muscle strength scores.
Similarly in posttest Group A average score is 56.40 & SD is 7.989 whereas Group B average score is 41.87 and SD is 5.540 and corresponding calculated't' value is 5.789, p- value <0.05 and table value at 5% level of significance with 28 degree of freedom is 2.048 here calculated value is greater than table value it means there is greater difference in both the Groups.
Improvement in both the groups is seen but Group A muscle strength shows significant difference than Group B.

Table/Graph 3: Comparing NDI pretest and posttest in Group A and Group B

	Group	N	Mean	Std.Deviation	Std. Error Mean
Pre test	A	15	13.6	1.121	0.289
	B	15	13.8	0.941	0.243
Post test	A	15	2.13	0.915	0.236
	B	15	9.33	1.759	0.454

		t-test for Equality of Means			
		t	df	p-value	table value
Pre test	Equal variance assumed	0.529	28	0.601	2.048
Post test	Equal variance assumed	14.06	28	0	2.005



Table/Graph 3: From the table and graph we observe that pretest Group A average score is 13.60 & SD is 1.121 whereas Group B average score is 13.80 and SD is 0.941 and corresponding calculated _t' value is 0.529, p- value >0.05 and table value at 5% level of significance with 28 degree of freedom 2.048 here calculated value is less than table value it means there is no significant difference in Group A and Group B in pretest NDI scores.
Similarly in posttest Group A average score is 2.13 & SD is 0.915 whereas Group B average score is 9.33 and SD is 1.759 and corresponding calculated't' value is 14.060, p- value <0.05 and table value at 5% level of significance with 28 degree of freedom is 2.048 here calculated value is greater than table value it means there is greater difference in both the Groups.
Improvement in both the groups is seen but Group A NDI shows significant difference than Group B.

V. DISCUSSION

In this study, statistical analysis shows improvements in both the groups following 4 weeks of treatment. The reason for this is according to the pattern of presentation that is described by **Punjabi [1998]**, with a stabilizing system of the spine involving active passive and neural control subsystems. When joints of the symptomatic region are dysfunctional (the passive subsystem), muscular component (the active subsystem) must compensate for the loss of integrity of the passive structures.

The active subsystem responds to changes in load and is responsible for controlling motion within the ―neutral zone. If these muscles are dysfunctional this can contribute to limited control and has the potentials to compound symptoms. If there is a limited ability to hold and control a low level of contraction of DNF, this will affect the individual 's ability to hold static postures and to control functional movements.

In chronic neck pain there is decrease activity of DNF muscles when compared to superficial muscles of neck causing postural changes such as forward head posture because of muscle imbalances. According to EMG studies, there is greater activation of superficial neck muscles, compared to deep neck muscles; when an isometric exercise is performed thus proving isometric exercises help in strengthening superficial neck muscles. In this study MET along with isometric exercises were used and the treatment technique in Group A showed a significant difference in chronic neck pain when compared to Group B, this may be because of the added effect of MET which act on DNF.

This study focused to find the effect of motor control exercises on pain and functional disability in patients with chronic nonspecific neck pain. The improvements in all the outcome measures of (Group A) MET along with isometric exercises were significantly more than (Group B) isometric exercises alone. Hence strengthening the deep neck flexor through MET along with isometric exercises are highly effective and has a significant effect on the chronic nonspecific neck pain.

VI. CONCLUSION

Both the groups with MET along with isometric exercises and isometric exercises alone has shown a significant difference in decreasing pain, increasing muscle strength and improving disability following 4 weeks of exercise program. Both groups showed improvements in the parameters selected for the study and reached ceiling level by 4 weeks.
Group A showed a significant difference compared to Group B.
Hence it proves that Group- A with good significance towards MET help in strengthening DNF, thus providing beneficial effects in decreasing pain, improving strength and disability.

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