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Scapular Stabilization Exercise versus Neck Stabilization Exercise in Females with Chronic Mechanical Neck Pain

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Abstract

Background: Neck pain is a common musculoskeletal problem and reported to be a major health problem worldwide that affects the quality of life. Neck pain is a common phenomenon related to Muscle deterioration and scapular dysfunction with higher prevalence in females than males.

Aim of Study: This study was conducted to compare the efficacy of scapular stabilization exercise to neck stabilization exercise on chronic mechanical neck pain.

Subjects and Methods: Forty-five female patients with history of chronic neck pain participated in this study. The patients were randomly assigned into three equal groups. Group A (control group) received hot packs, ultrasound, stretching exercises. Group B (Scapular stabilization) received scapular stabilization exercise plus the same control group program. Group C (Neck stabilization) received neck stabilization exercise plus the same control group program. The treatment sessions were conducted three times per week every other day for six successive weeks. All subjects assessed for pain using visual analogue scale (VAS) and for functional activity using Neck disability index (NDI) and Cervical range of motion device (CROM) before and after treatment.

Results: VAS, CROM and NDI parameters improved with all modalities. Post treatment results revealed that there was a significantly superior improvement in pain intensity, disability and functional mobility in the neck stabilization group.

Conclusion: Exercise and conventional physical therapy treatment are significantly effective in treating chronic neck pain with superiority of neck stabilization exercise.

Key Words: *Neck pain – Scapular stabilization exercise – Neck disability index.*

Introduction

MECHANICAL neck pain has a number of anatomical and functional characteristics. In individuals with neck pain, prolonged overuse of the superficial cervical muscles has been observed to promote muscle fatigability and a loss in muscle strength and endurance, joint position awareness, and range of motion (ROM). Furthermore, in patients with neck pain, impairment of the nearby area, the thoracic spine and shoulder girdle, has been found, with scapular function impairment being particularly notable [1].

Women have a 22% higher prevalence of neck pain than men 16%. Neck pain is associated with persistent pain, disability, and motor dysfunction. Patients with Chronic Neck Pain have reported muscle weakness, weariness, and morphological abnormalities [2]. Certain muscles in the cervical spine have been discovered to weaken as a result of neck pain, the most prevalent of which are the deep and anterior cervical flexors [3].

Muscle deterioration is a well-known aspect of painful neck conditions. The scapula and the neck share common muscular attachments, and it's been suggested that poor scapular muscle function may lead to neck pain caused by aberrant cervical spine loading [4].

Stabilization training, which consists of a sequence of strengthening exercises, is a means to improve muscular balance, which aids in keeping appropriate posture when working or doing other daily activities. A series of stability exercises can improve flexibility, relieve discomfort, and lessen the risk of re-injury [5].

Scapular stabilizing exercises target the muscles that attach to the scapula and arise from the skull and vertebrae, such as the trapezius rhomboid and serratus anterior [6]. Neck stabilization exercises have been developed as a rehabilitation program that can reduce neck pain, maximize cervical functions, and avoid injuries. They are a means of treating neck pain caused to postural instability [7].

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Subjects, Material and Methods

The study was designed as a prospective, randomized, controlled trial.

Subjects:

Sixty women with chronic mechanical neck pain participated in this study. Women were randomly selected from Outpatient Clinic of Physical Therapy Department in Agouza Police Hospital in March 2021. Subjects who were included in the study were of age ranging from 30 to 40, female subjects with neck pain more than 3 months, decreased cervical range of motion due to pain, with Body Mass Index (BMI) 25-35.

Forty five female subjects were recruited; the patients were randomly assigned into 3 equal groups of equal number (control group and 2 study groups). Group A (control group) received hot packs for 15 minutes, ultrasound for 8 minutes, stretching exercises in the directions of right side neck stretch, left side neck stretch and posterior neck stretch. Performing movements slowly, simply holding extreme position 20 seconds, 3-5 repetitions. Group B (Scapular stabilization) received scapular stabilization exercise; scapular elevation-depression, protraction-retraction and clockwise rotation plus the same control group program. Group C (Neck stabilization) received neck stabilization exercise (cervical flexion, extension, rotation and side-bending) and Craniocervical flexion exercises (CCFEs) plus the same control group program. The treatment sessions were conducted three times per week every other day for six successive weeks.

Patients who were excluded from the study where any patient who had any recent cervical surgery, recent cervical whiplash injury, sever comorbid diseases, neurologic diseases, recent cervical vertebrae fracture, patients with discogenic problems, patients with neoplasm, osteoporotic patients or vertebral basal insufficiency.

Outcome measures:

Visual analogue scale:

Visual analogue scale (VAS) is a line used to describe the subjective pain level. It is marked from 0 to 10, with 0 representing no pain and 10 standing for unbearable pain. The subjects were instructed to mark the level of pain that they were experiencing. It was performed for all the patients in all groups before and after the treatment.

Neck disability index:

The neck disability index (NDI) was assessed for all patients before and after the treatment. NDI was developed to measure self-perceived disability from neck pain. It is a 10-item scaled questionnaire, and the patients were asked to make a mark in each section which most closely described their problem. If a patient identified with 2 or more statements in any one section, they were asked to only mark the box which most closely described their problems. Each item was recorded out of 5 for a maximum total score of 50. The questionnaire was performed before and after treatment in all groups.

Cervical range of motion:

It was assessed for all the patients in all groups before participation in the study and after the end of the treatment. The CROM device was mounted over the patient's nose bridge and ears, then secured to the head with a Velcro strap each patient was instructed to move their head to the end point of their active range of motion for 4 of cervical spine movements, Cervical flexion and extension occurred in the sagittal plan and were measured by the inclinometer placed above the ear. During flexion, each patient was verbally instructed to bend their head forward as far as possible until feeling tightness or pain but without bringing their shoulders away from the chair's backrest; for extension patients were verbally instructed to lift the chin and bend their head back as far as possible until feeling tightness or pain but without putting extra pressure against the backrest with their shoulders, while right and left lateral bending occurred in the frontal plan and were measured by the inclinometer placed above the nose while the patient tilted their head as far as possible until feeling tightness or pain but without lifting the other shoulder.

Statistical analysis:

Data were normally distributed and there was homogeneity of variance. Descriptive statistics and ANOVA test was conducted for comparison of the subject characteristics between groups. Mixed MANOVA was conducted to compare the effect of time (pre versus post) and the effect of treatment (between groups), as well as the interaction between time and treatment on mean values of VAS, NDI and ROM. The level of significance for all statistical tests was set at $p<0.05$. Statistical analysis was performed through the statistical package for social studies (SPSS) version 25 for windows.

Results

Data obtained from the three groups prior and following the treatment program regarding the visual analogue scale (VAS), neck disability index (NDI) and cervical range of motion (CROM) were statistically analyzed and compared.

Table (1): Descriptive statistics and ANOVA test for comparison of the mean age, weight, height and BMI of the three groups.

	Group A	Group B	Group C	F-value	*p*-value	Sig.
	X ± SD	X ± SD	X ± SD			
Age (years)	34.66±3.13	34.6±2.77	33.73±2.86	0.47	0.62	NS
Weight (kg)	70.7±5.89	73.93±7.31	71.1±5.78	1.14	0.32	NS
Height (cm)	162±4.4	163.66±6.45	160.2±7.91	1.09	0.34	NS
BMI (kg/m^2)	26.91±1.86	27.69±1.73	27.68±2.31	0.77	0.46	NS

X : Mean. SD: Standard deviation. *p*-value: Probability value. NS: Non significant.

Effect of treatment on VAS:

Mixed MANOVA was conducted to investigate the effect of treatment on VAS, NDI and ROM. There was a significant interaction effect of treatment and time (p=0.0001). There was a significant main effect of treatment (p=0.03). There was a significant main effect time (p=0.0001) (Table 2).

Table (2): Mixed MANOVA for the effect of treatment on VAS, NDI and ROM.

	Mixed MANOVA			
	F-value	*p*-value	Partial Eta Squared	Observed power
Interaction effect (treatment * time)	5.92	0.0001	0.49	0.97
Effect of time	164.84	0.0001	0.96	0.94
Effect of treatment (group effect)	1.97	0.03	0.24	0.87

Comparison between groups:

There was a significant decrease in VAS of the group C compared with that of group A (p=0.0001) and group B (p=0.03). There was a significant decrease in VAS of the group B compared with that of group A (p=0.007) (Table 3).

Table (3): Effect of treatment on VAS.

	Between group comparison (group effect)		
	MD	*p*-value	Sig.
Pre:			
Group A vs Group B	0.2	0.85	NS
Group A vs Group C	0.4	0.91	NS
Group B vs Group C	0.2	0.88	NS
Post:			
Group A vs Group B	1.07	0.007	HS
Group A vs Group C	1.93	0.0001	HS
Group B vs Group C	0.86	0.03	S

Effect of treatment on NDI:

There was a significant decrease in NDI of the group C compared with that of group A (p=0.0001) and group B (p=0.03). There was a significant decrease in NDI of the group B compared with that of group A (p=0.005) (Table 4).

Table (4): Effect of treatment on NDI.

	Between group comparison (group effect)		
	MD	*p*-value	Sig.
Pre:			
Group A vs Group B	0.13	0.79	NS
Group A vs Group C	1.68	0.96	NS
Group B vs Group C	1.55	0.99	NS
Post:			
Group A vs Group B	7.06	0.005	HS
Group A vs Group C	12.65	0.0001	HS
Group B vs Group C	5.59	0.03	S

Flexion ROM:

There was a significant increase in flexion ROM of the group C compared with that of group A (p=0.0001) and group B (p=0.02). There was a significant increase in flexion ROM of the group B compared with that of group A (p=0.03) (Table 5).

Table (5): Effect of treatment on flexion ROM.

	Between group comparison (group effect)		
	MD	*p*-value	Sig.
Pre:			
Group A vs Group B	1.86	0.91	NS
Group A vs Group C	1.13	0.94	NS
Group B vs Group C	–0.73	0.73	NS
Post:			
Group A vs Group B	–6.2	0.03	S
Group A vs Group C	–12.86	0.0001	HS
Group B vs Group C	–6.66	0.02	S

Extension ROM:

There was a significant increase in extension ROM of the group C compared with that of group A (p=0.0001) and group B (p=0.01). There was a significant increase in extension ROM of the group B compared with that of group A (p=0.02) (Table 6).

Table (6): Effect of treatment on extension ROM.

	Between group comparison (group effect)		
	MD	*p*-value	Sig.
Pre:			
Group A vs Group B	–0.73	0.94	NS
Group A vs Group C	1.14	0.92	NS
Group B vs Group C	1.87	0.95	NS
Post:			
Group A vs Group B	–6.13	0.02	S
Group A vs Group C	–12.6	0.0001	HS
Group B vs Group C	–6.47	0.01	S

Right bending ROM:

There was a significant increase in right bending ROM of the group C compared with that of group A (p=0.0001) and group B (p=0.003). There was a significant increase in right bending ROM of the group B compared with that of group A (p=0.02) (Table 7).

Table (7): Effect of treatment on right bending ROM.

	Between group comparison (group effect)		
	MD	*p*-value	Sig.
Pre:			
Group A vs Group B	–1.14	0.92	NS
Group A vs Group C	0.33	0.97	NS
Group B vs Group C	1.47	0.93	NS
Post:			
Group A vs Group B	–4.13	0.02	S
Group A vs Group C	–9.6	0.0001	HS
Group B vs Group C	–5.47	0.003	HS

Left bending ROM:

There was a significant increase in left bending ROM of the group C compared with that of group A (p=0.0001) and group B (p=0.002). There was a significant increase in left bending ROM of the group B compared with that of group A (p=0.001) (Table 8).

Table (8): Effect of treatment on left bending ROM.

	Between group comparison (group effect)		
	MD	*p*-value	Sig.
Pre:			
Group A vs Group B	0.53	0.89	NS
Group A vs Group C	0.06	0.88	NS
Group B vs Group C	–0.47	0.85	NS
Post:			
Group A vs Group B	–4.73	0.001	HS
Group A vs Group C	–9.33	0.0001	HS
Group B vs Group C	–4.6	0.002	HS

Discussion

Mechanical neck pain is a societal burden, with lifetime and point prevalence rates nearly as high as low back pain, resulting in significant impairment and expense [8]. In the general population, Neck pain has a diverse underlying etiology mechanical neck pain is predicted to have a point prevalence of 20% and a lifetime prevalence of 70%. Neck pain accounted for the fourth highest number of years lived with disability in the Global Burden of Disease Study. Despite the fact that the prognosis is generally favorable, 50% of people still have symptoms after a year. The underlying pathophysiology of neck pain is multifactorial [9].

The main purpose of this study is to compare the efficacy of scapular stabilization exercise to neck stabilization exercise on pain intensity, disability and cervical ROM in female patients with MND.

This study examined the effect of scapular stabilization exercises with neck stabilization exercises in conjunction with conventional physical therapy program. The outcome measures used in this study were VAS to assess pain intensity between groups, NDI and CROM to assess functional mobility.

Our results showed that stabilization exercises had a positive influence over function (CROM), disability and pain in female patients with chronic mechanical neck pain. All three groups improved in terms of function (CROM) and disability (NDI) and pain (VAS) following treatment. Improvement however, was significantly better in the neck stabilization group.

Exercise treatment has been shown to be effective for chronic non-specific neck pain, regardless of the type of exercise used, such as stabilization or isometric or isotonic neck strengthening or endurance activities. Stretching exercises, on the other hand, have been shown to have relatively minor benefits [10].

Stabilization exercises have also been shown to be particularly effective in lowering chronic neck pain and improving cervical functioning in previous studies. Specific stability exercises have become increasingly popular in recent years [11,12].

Wu et al., [13] stated that cervical stabilization exercises may be more effective in improving disability NDI and pain score for patients with neck pain than isometric and stretching exercises.

According to Seo et al., **[8]** Scapular stability is assumed to have a key role in reducing neck and shoulder pain and dysfunction. During scapular orientation, patients with MNP have altered dynamic scapular stability. Because of the intimate association between the neck and the scapula, scapular stabilization is becoming more popular among patients with NP.

Im et al., **[14]** in a study on effect of scapular stabilization exercise on neck pain and posture. Scapular stabilization exercises can help individuals with neck pain and forward head posture improves their head posture and pain. Scapular stabilization exercise enhances the patients' quality of life by controlling muscle activity.

And also Yildiz et al., **[15]** compared combined neck and scapula exercises with neck focused exercises only for patients with non-specific neck pain, pain intensity (VAS) and impairment levels (NDI) decreased in the cervical and cervical plus scapular exercises groups. There was no difference between groups; hence scapular stability exercise had no further effects on neck pain or impairment level.

Yesil et al., **[16]** investigated that the use of electrotherapies increase the effectiveness of neck stabilization exercises for improving pain, disability, mood, and quality of life in chronic neck pain. Where neck stabilization exercise, which includes craniocervical flexion exercises, becoming increasingly important in deep group muscle training. By engaging the stabilizing muscles and enhancing kinesthetic awareness, these exercise attempts to stabilize the spinal column and build and maintain good posture.

Chung and Jeong, **[17]** concluded that neck isometric exercise as well as craniocervical flexion improve neck pain and disability, and range of motion when the exercises have been done with progression or high intensity. Craniocervical flevion and neck isometric program produced decrease in pain and perceived disability on NDI.

Celenay et al., **[18]** compared the effects of stabilization exercises plus manual therapy to those of stabilization exercises alone on disability, pain, range of motion, and quality of life in patients with MNP. The findings of this study suggest that stabilization exercises combined with manual therapy may be more effective than stabilization exercises alone in reducing disability, pain intensity, cervical range of motion (flexion, extension, right lateral flexion, left lateral flexion) and quality of life in mechanical neck pain patients.

Conclusion:

It was concluded that stabilization exercises have beneficial effect on function, disability and pain for patients with chronic mechanical neck pain opposed to conventional physical therapy program. However neck stabilization exercises showed greater improvement on chronic mechanical neck pain.

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تأثير تمرينات تثبيت لوح الكتف مقابل تمرينات تثبيت العنق على آلام الرقبة الميكانيكية المزمنة فى السيدات

يهدف هذا البحث إلى دراسة تأثير تمرينات تثبيت لوح الكتف مقابل تمرينات تأثير العنق على آلام الرقبة الميكانيكية المزمنة عند الإناث. وتم اختيار ٥٠ بالغ من الإناث تتراوح أعمارهم من ٣٠ إلى ٤٠ سنة وتراوحت كتلة الجسم من ٢٥ إلى ٣٥ كجم / م٢ من العيادة الخارجية بقسم العلاج الطبيعى بمستشفى الشرطة بالعجوزة. تم تقسيم المرضى بشكل عشوائى إلى ثلاث مجموعات متساوية. المجموعة أ (المجموعة الحاكمة) تلقت كمادات ساخنة، الموجات فوق الصوتية، تمارين الاطالة. تلقت المجموعة ب (مجموعة الدراسة، تثبيت لوح الكتف) تمرين تثبيت لوح الكتف بالإضافة إلى نفس برنامج المجموعة الحاكمة. تلقت المجموعة ج (مجموعة الدراسة، تثبيت الرقبة) تمريناً لتثبيت الرقبة بالإضافة إلى نفس برنامج المجموعة الحاكمة. أجريت الجلسات العلاجية ثلاث مرات فى الأسبوع كل يومين لمدة ستة أسابيع متتالية. تم تقييم الألم لجميع الأشخاص بإستخدام مقياس شدة الألم البصرى والتنقل الوظيفى بإستخدام استبيان إعاقة آلام الرقبة وجهاز (كروم) لقياس مدى حركة للرقبة قبل العلاج وبعده.

النتائج: تم تحسين معلمات مقياس الألم البصرى استبيان إعاقة آلام الرقبة ومدى حركة الرقبة مع جميع الأساليب. أظهرت نتائج ما بعد العلاج أن هناك تحسناً ملحوظاً فى شدة الألم والحركة الوظيفية فى مجموعة تثبيت الرقبة.