



## THE EFFECT OF SCAPULAR STABILIZATION EXERCISES ON CHRONIC NECK PAIN

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### Abstract

**Background:** Pain in the neck or scapular region is one of the most frequent symptoms in cervical radiculopathy, which is commonly caused by degenerative process in the spine. Purpose: To determine the effect of scapular stabilization exercises in the treatment of chronic neck pain regarding pain and disability and limitation in the range of motion. Patients and methods: Thirty male and female patients with chronic neck pain were involved. Aged between 30-50 years old. They were randomly assigned into two groups. In group (A), patients received physical therapy program in the form of infrared, transcutaneous electrical nerve stimulation (TENS), Stretching and cervical stabilization exercises. In group (B), patients received scapular stabilization exercises in addition to the same physical therapy program .Treatment was given 3 times a week for 4 weeks. Range of motion of the cervical spine, range of motion of the scapula, neck pain and disability were assessed before and after treatment. Results: There was significant improvement in both groups (A and B) in cervical range of motion, pain and disability. Group (B) showed more significant improvement than group (A) in cervical range of motion and pain and disability .There were no significant improvement in both groups in scapular range of motion. Conclusion: Scapular stabilization exercises should be used as an integral part in the rehabilitation program for patients with chronic neck pain. Key words: Neck pain, Neck stabilization exercises, Scapular stabilization exercises.

### Introduction

Neck pain can negatively affect patient quality of life. It may result in a lot of medical consumption and time lost from

work and disability (korthals et al., 2003).

The treatments of chronic neck pain, which are non-surgical, appear to be the most beneficial for patients (**Haldeman et al.,**

**2008**). Neck pain is an experience that most people can expect to deal with at some point in their lives, although the majority will not have it interfering with the normal activities of their daily living (Haldeman et al., 2008).

Neck pain is multifactorial in etiology, with numerous risk factors. Some risk factors are nonmodifiable and these include age, gender and genetics (Haldeman et al., 2008). Neck pain has the potential to originate from a variety of sources as bone, discs, ligaments, joints; muscles and fascia are all innervated by pain fibers which are called nociceptors (White and Panjabi, 1990). There is not a single cause for neck pain but rather a combination of factors that cause it, with pain being a symptom of these factors (**Smit, 2009**).

Many of the involved muscles are multi joint muscles, changes in the lengths of muscles such as levator scapula, trapezius, pectoralis major and minor or rhomboids have profound effects on the shoulder complex and cervical spine. Changes in the strength of these scapular stabilizers also alter the resting posture of the neck (**Brody and Hall, 2011**). It was found that the patients had a history of neck pain of over a 12 month and demonstrated poor scapular posture on the symptomatic side of their

neck in a relaxed standing posture. The resting position was visually assessed by the primary investigator with a poor posture being considered a deviation from the mid position between all available ranges of the scapular motion upward / downward rotation and medial / lateral rotation (**Wegner et al., 2010**).

## **Materials and Methods**

### *Design*

The study was designed as a randomized, Pre –post- test controlled trial.

### *Participants*

Thirty subjects participated in this study and their age ranged from 30 to 50 years diagnosed with spondylosis degenerative neck pain with referred pain to scapula. Patients were assigned randomly into two groups of equal number, each consisted of 15 patients.

**Group A (Control group):** This group consisted of fifteen patients who received physical therapy program in the form of infrared, stretching, transcutaneous electrical nerve stimulation (TENS) and neck stabilization exercises only for 12 sessions over four weeks period. Patients received three sessions per week, one hour per session.

**Group B (Experimental group):** This group consisted of fifteen patients who received the same physical therapy program in addition to scapular stabilization exercises for 12 sessions over four weeks. Patients received three sessions per week, one hour per session.

### **Randomization**

The participants were randomly assigned into two groups by a blinded and an independent research assistant who opened sealed envelopes that contained a computer generated randomization card. No subjects dropped out of the study after randomization.

### ***Ethical approval***

Approval of the study was obtained from the ethical committee of the Faculty of Physical Therapy, Cairo University.

### **Instrumentation**

Tape measure was used to assess cervical range of motion. It is inexpensive, available and widely used in physical therapy (Reynolds et al., 2009). According to De Koning et al. (2008) tape measure had Pearson correlation coefficient and a statistic measure for intra- and interobserver

reliability. - Tape measure was used to assess scapular displacement in the lateral scapular sliding test and this test has been shown to be reliable in assessing the bilateral position of the scapula in relation to a fixed point on the spine as varying loads are placed on the supporting scapular musculature. (Kibler and McMullen, 2003)

- Infra-red ray (of 200v, 400 w, 50 HZ, model 4004/2n. Verre et Quartz Dixell ) France, has been used with the patients.
- TENS (Elektra 2, medical Italia) was administered at a frequency of 80 HZ with 10-30 mA intensity for 30 min. Four surface electrodes, 5 x 5cm each were over the painful area in the neck region (Dusuncil, 2009). (Fig .9)

### **Outcome measure:**

#### **Intervention:**

Thirty male and female patients were randomly assigned into two groups of equal numbers. Group A ( $n = 15$ ) received the traditional physical therapy program in the form of infrared, cools exercises Stretching exercises, scapular exercise and anterior and posterior mobilization of the shoulder joint. Group B ( $n = 15$ ) received the traditional physical therapy program in addition to core stability exercises. Patients had been included in this study if they had positive

Neer test and positive Hawakins sign. The AHD was measured before and after treatment for each patient of the two groups.

### **Physical therapy program for group (A)**

These include a combination of neck stabilization exercises, stretching exercises, conventional transcutaneous electrical nerve stimulation and Infra-red radiation.

1-Infra red radiation the patient was in sitting position. Patient was instructed not to touch the lamp. The lamp was away at a distance of 50 cm. The patients felt mild comfortable heat. (Kandeel, 2008). The infrared radiation was applied for 15-20 minutes / session (Fig.1).



Fig.1 Infrared application

### **2-TENS**

The patient was in a sitting position, resting his head on the treatment table. Two channels were used, one on the cervical region the other was on the scapular region on the most painful sites. TENS was

applied for 20 minutes / session. (Fathy, 2006). (Fig. 2)

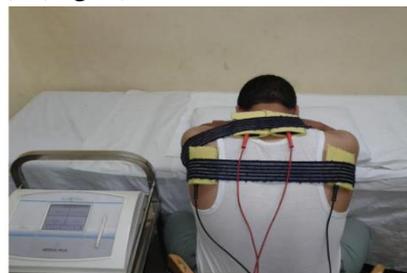


Fig.2 TENS application

### **Group A:**

The patient was in quadruped position, with mouth closed, He was instructed to raise one leg behind as high as possible without losing stability then relaxed and the patient repeated the exercise with the other leg



Fig.3 quadruped position

### **2-Cross crawl**

The patient was in quadruped position. He was instructed to raise one arm and the opposite leg as high as possible at the same



time without losing the stability. The arm and the leg were then relaxed and the other arm and leg would be raised in the same manner . The patient made 20 repetitions

Fig.4 cross crawl

#### **Quadruped book balance**

A small hardcover book was placed on the back of the patient head. He must balance it . The patient maintained the quadruped position and proper cervical, scapula and lumbar stability. The patient held the position until losing stability or up to 30 seconds. The patient made 20 repetitions per session



Fig.5 quadruped book balance position

#### **Group B:**

. Physical therapy program for group (B) For group (B) patient received the same program as group (A) plus the scapular stabilization exercises. Scapular stabilization exercises Scapular stabilization prescription began with isometric or closed chain exercises. Prescribing closed chain exercises is recommended early in rehabilitation as the best exercise mode to improve scapular motion pattern. (kilber et al.,2001)

#### **1-Scapular neuromuscular control exercises**

The patient was in side lying position. His hand was placed on the table creating a closed kinetic chain (90 degree flexion shoulder and 90 degree flexion elbow) and the therapist applied pressure to the scapula in a random direction (Fig.17). The patient moved the scapula isotonicly against the direction of resistance (30 seconds exercise and 30 seconds rest) applying 20 repetitions per session 5 for each direction. According to Salem (2006)

#### **2-Scapular clock exercises**

The patient placed his hand on a ball on a plinth (Fig.24A). The patient then moved the shoulder in the direction of clock wise

direction, which facilitate elevation, retraction, depression and protraction of the scapula respectively. The patient made 20 repetitions.



**3-Towel slide**

The patient stood near a plinth with the hand of one arm on the towel on the plinth at the side (Fig.25A). Instructing patient to forward flex at the hip while keeping the thoracic spine in extension. Then patient was instructed to straighten up and extend shoulder with pinching the 44 scapula together to facilitate rhomboids and lower trapezius. The patient made 20 repetitions per session



**4-lawnmower exercise**

The patient was standing carrying a dumbbell in his hand of the affected side and began the exercise by leaning his trunk forward at the starting of the exercise then

backward with retraction of the scapula. The patient made 20 repetitions. Progressed the exercise by increasing the weight of the dumbbell and decrease the forward leaning.

**Statistical analysis:**

MANOVA test was used to compare



between groups at base line measurements pre and post treatment. For the analysis of each dependant variable, the univariate test was conducted using a Bonferroni adjusted alpha level of 0.005. There was no significant difference between both groups in their ages where their t and P-values were (0.08, 0.93) as shown in table (1)

1. According to the data we accept the null hypotheses which said that, there is no

Table (11) scapular displacement shoulder abducted: differences within and between groups.

	Pre-treatment mean value Mean (±SD)	Post treatment mean value Mean (±SD)	F- value	P- value	Sig
Group A	10.48(± 0.87)	10.72(±0.72)	2.44	0.14)	NS
Group B	10.53(± 0.67)	10.32(±0.83)	1.09	0.31	NS
F	0.03	1.97			
P	0.85	0.17			
SIG	NS	NS			

SD: standard deviation, S: significant, NS: Non significant

significant difference between scapular stabilization exercises plus conventional

physical therapy program and conventional physical therapy program alone on scapular 70 displacement with upper limb abducted in patients with chronic neck pain.

2. According to the data we accept the null hypotheses which said that, Scapular stabilization exercises plus conventional physical therapy program have no significant effect on scapular displacement with upper limb abducted in patients with chronic neck pain.

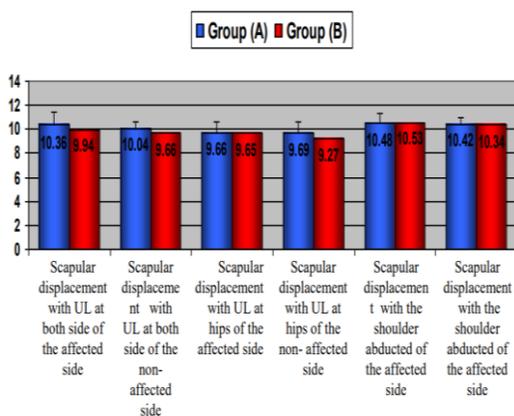
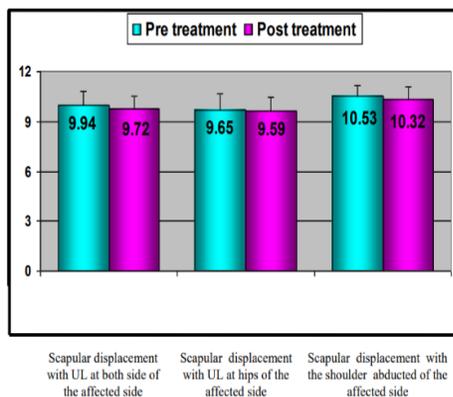
3. According to the data we accept the null hypotheses which said that; conventional physical therapy program has no significant effect on scapular displacement with upper limb abducted in patients with chronic neck pain.

## RESULTS

The purpose of the study was to clarify the efficiency of the scapular stabilization exercises combined with the physical therapy program in the treatment of chronic neck pain. Thirty patients with chronic neck pain from both sexes were involved.

Aged between 30-50 years old. They were randomly assigned into two equal groups. In group (A) patients received traditional physical therapy program in form of infrared, transcutaneous electrical nerve stimulation (TENS), stretching and cervical stabilization exercises. In group (B) patients received scapular stabilization exercises in addition to traditional physical therapy program in form of infrared, transcutaneous electrical nerve stimulation (TENS), Stretching and cervical stabilization exercises.

Treatment was done 3 times a week for 4 weeks. Range of motion and neck pain and disability were measured in addition to range of motion of scapula before and after treatment. Treatment outcome was determined from the score of (NPAD) scale. There was improvement in both group: group (A) and (B) in cervical range of motion and pain and disability but the improvement in group B more than group A. There was no improvement in both groups in scapular range of motion.



## DISCUSSION

The neck stabilization exercises have been proven to be effective in decreasing pain intensity and functional disability in patient with chronic neck pain. This result came in

agreement with several authors who investigated the effect of cervical stabilization with chronic neck pain. Strong evidence supported the positive effect of cervical stabilization with chronic neck pain (**Fathy , 2000 ; Marlon 2002; Dusunceli et al., 2009** ).

74 Similar to our results, neck stabilization exercises significantly reduced pain intensity and functional disabilities compared with isometric, stretching exercises and physical therapy agents for the management of neck pain ( **Dusunceli et al. , 2009**).

The result also came in agreement with Marlon (2002) who investigated the changes in cervical spine flexibility and degree of pain following four weeks of cervical stabilization exercises. He concluded that spinal stabilization exercise intervention improved cervical spinal flexibility and it decreased pain.

Fathy (2000) also concluded that adding cervical stabilization exercises to the traditional physical therapy program is more effective than traditional physical therapy program in reducing neck pain and functional disability and is more effective in increasing cervical range of motion and is recommended for treating patient with chronic neck pain.

TENS has been proven to be effective in decreasing pain intensity and functional disability in the treatment of chronic neck pain. this came in agreement with Maayah and Al Jaraah (2010) who found that TENS is an effective treatment for neck pain due to musculoskeletal disorders and Chiu et al. (2005) who showed that after the six-weeks of treatment, patients who received TENS and exercises had a better and a clinical improvement in disability and pain. All the improvements in the intervention groups were maintained at the six-month follow-up. On the other hand there were contradictive results.

The results of Yoshimizu et al. (2012) who offered preliminary evidence that TENS was ineffective in relieving neck pain in adults. For the infrared effect, our results are supported by a study done by Chen et al. (2013) about therapeutic effects of infrared therapy on 75 chronic neck pain who found a significant decrease in pain intensity scores after receiving infrared

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