Usefulness of the Postural Correction Program in Treatment of Chronic Mechanical Neck Pain

Ibrahim Magdy Elnaggar, Ph.D.*, Salwa Fadle Abdelmajeed, Ph.D.*, Abdelaziz Elsingergy, M.D. and Remon Wadie Adly, B.Sc.***
Department of Orthopedic Physical Therapy, Faculty of Physical Therapy, Cairo University*.
Department of Orthopedic Surgery, Faculty of Medicine, Cairo University.**

ABSTRACT

Purpose: *The purpose of this study was to compare between the efficacy of the postural correction rehabilitation program combined with the traditionally used program versus the traditionally used program on neck pain severity and total head excursion angle in treatment of chronic mechanical neck pain. Subjects. Forty male patients diagnosed as chronic mechanical neck pain participated in this study. Methods: Patients were distributed randomly into two groups: the first group consisted of 20 patients with a mean age of 33.60 (± 5.60) years treated with the traditional physical therapy program, the second group consisted of 20 patients with a mean age of 31.30 (± 7.10) years treated with the postural correction rehabilitation program combined with the traditional program. Each patient received 18 treatment sessions, 3 sessions per week for 6 weeks. Patients were assessed before treatment, in the midtreatment and after treatment by using visual analogue scale to determine neck pain severity and postural analyzing digitizing system (PADS) to measure the total head excursion angle.* ***Results:*** *Patients who were treated by the traditional physical therapy program had a significant reduction of neck pain severity but had no significant increase of the total head excursion angle. On the other hand, patients who were treated by the postural correction rehabilitation program combined with the traditional program had a significant reduction of neck pain severity and a significant increase of the total head excursion angle. A significant negative correlation was found between neck pain severity and total head excursion angle in the midtreatment and posttreatment in patients who were treated by the postural correction program combined with the traditional program.* ***Conclusion:*** *The combination of the postural correction rehabilitation program and the traditionally used program is more effective than the traditionally used program in treatment of chronic mechanical neck pain patients.*

Keywords: *Mechanical neck pain, postural correction program, neck pain severity, total head excursion angle.*

INTRODUCTION

Neck pain is extremely common in the general population particularly in women. Almost 85% of all neck pain results from acute or repetitive neck injuries or chronic stress and strain[11]. It is costly in terms of treatment of individual suffering, and time lost from work[21]. Chronic mechanical neck pain originates of the cervical spine results from internal or external forces. The external forces are the faulty musculoskeletal activities[28]. The incidence of mechanical neck pain increases in subjects with more severe postural abnormalities and the pain is the result of the cumulative effects of constant or repeated mild stress over a long period of time[12].

In normal head position the angle between a horizontal line transecting the seventh cervical vertebra (C_7) and the second line connecting the tragus of the ear with the spinous process of C_7 is called total head excursion angle and is approximately 50^{o7}. This position provides balanced muscular

force and structural alignment, if this skeletal and muscular balance is disturbed pain of the neck occurs or increases[7]. Normal subjects have a significantly greater range of total head excursion angle than do patients with neck pain[16]. Muscle guarding which is secondary to pain may partially account for the reduced total head excursion angle in patients and the joint hypomobility of the cervical spine could also be a contributory factor in reducing this angle[16]. Deviations from the normal resting head position as in chronic postural head placement anterior to the standard plumb line produces forward head and decreases the total head excursion angle which has been suggested as a component in the etiology of mechanical neck pain[15].

Forward head posture is one of the most common and preventable postural problems which results from repetitive positions the persons assume while using computers, watching television, doing desk work and even wearing a backpack, therefore holding the head forward out of alignment puts an extraordinary strain on the neck and upper back muscles. When the postural malalignment lasts for a long time, significant load is applied to spinal tissue and sustained overtime, the tissue experiences creep deformation and plastic tissue changes which are responsible for producing neck pain[6,10].

The goals of treating neck pain are to decrease pain, to restore motion if bio-mechanically possible and if there is no evidence of structural changes, and to improve strength and function. The neck pain arising from repetitive starin is best treated by correcting the underlying mechanics that caused the strain and the treatment of chronic mechanical neck pain must include postural reeduction and teaching the proper body mechanics to the patients[11] in order to restore muscle balance and decrease pain by restoring normal alignment[29].

There are some studies which supported the use of postural correction exercises for mechanical neck pain patients[17,26,33] but none of these previous studies compared between the postural correction program and the traditional physical therapy program on neck pain severity and total head excursion angle. Measuring of total head excursion angle determines the importance of postural correction program which is used by physical therapists to manage the posture related disorders as mechanical neck pain. By measuring total head excursion angle we can determine day to day change which can be caused by postural correction program[13]. Therefore this current study was conducted to study the efficacy of postural correction program combined with the traditional physical therapy program versus the traditional physical therapy program in treatment of chronic mechanical neck pain.

SUBJECTS AND METHODS

Subjects

Forty male patients ranged in age from 20 to 40 years old diagnosed as chronic mechanical neck pain participated in this study. The duration of illness ranged from 3 months to 12 months. Patients were distributed randomly into 2 groups, group (A) which consisted of 20 patients with mean age of 33. 60 (± 5.60) years treated with the traditional physical therapy program; and group (B) which consisted of 20 patients with mean age of 31.30 (± 7.10) years treated with the traditional program combined with the postural correction program. This study was conducted in the orthopedic outpatient clinic of the faculty of physical therapy, Cairo University.

Instrumentations

1- Visual analogue scale (VAS).
2- Postural analyzing digitizing system (PADS).
3- Infrared apparatus made in Hungary by Die Vahen company, with infrared rays of 250 watts.
4- Ultrasonic equipment, model DT-20, manufactured by Nia De Nicola, Italy.
5- Mechanical traction unit, model ATP8, manufactured by HNE, Akron, England.

Assessment Procedure

Patients were evaluated before treatment, in the midtreatment and at the end of the study. Assessment included the following:

1- Pain severity: Neck pain severity was assessed by using visual analogue scale (VAS). Pain was represented by a horizontal line of 100 mm where 0 = no pain and 100 mm = worst pain. The patient was instructed to place a mark on that line to show his pain severity[8].
2- Total head excursion angle was assessed by the postural analyzing digitizing system (PADS) which consists of a 35-70 mm. camera which was mounted on a tripod to photograph the patient from lateral view. This camera was placed at a distance of one meter from the patient who was instructed to sit comfortably into a chair. The patient was instructed to focus always on a plastic landmark which was mounted to the wall at the eye level at a distance of 3 meters. The C7 and the tragus of the ear were identified and marked.

The patient was instructed to move head forward (protraction) and backward (retraction) as far as he could keeping his head level. The head position was photographed during protraction and retraction and the photos were scanned by a scanner into the computer. Using Adobe photoshop software program, version 6, a triangle was designed based on the vertical and horizontal coordinates of C7 and the tragus of the ear. This was followed by calculating the total head excursion angle (X) by using the formulae:

Tan X = Vertical distance / Horizontal distance and $x = \frac{1}{TanX}$

Treatment Procedure

Each patient of both groups received 18 treatment sessions, 3 sessions per week for 6 weeks.

(1) Traditional physical therapy group (Group A)

The treatment of this group consisted of infrared radiation for 10 minutes, pulsed ultrasonic with an intensity of 1.0 w/cm^2 with a frequency 3 MHz for 5 minutes. This was followed by sustained mechanical traction with a weight of 5 to 9 Kg for 10 to 20 minutes according to the patient's response and tolerance. This group also received isometric neck exercises for neck flexors, extensors, lateral flexors and rotators of both sides. Each of these exercises was done for 10 repetitions. Each repetition was held for 5 seconds followed by a relaxation for 3 seconds. All treatments of this group were given while the patient was in the sitting position[11,21].

(2) Postural correction program group (Group B)

This group received the same treatment given to group (A) in addition to the postural correction exercises which consisted of active and passive stretching of cervical spine extensors, upper trapezius, sternocledio-mastoid, pectoralis minor and shoulder adductors. Each stretching exercise was done for 10 repetitions and each repetition was held for 10 seconds followed by a relaxation for 5 seconds. In addition to that strengthening exercises were given to the upper back

extensors, middle and lower trapezius. Furthermore, neck active and passive mobilization exercises and postural exercises with graduations and instructions were given to these patients[5,11,21,23].

RESULTS

(1) General characteristics of subjects

There was no significant difference between the two treatment groups before treatment regarding age, neck pain severity and total head excursion angle as shown in table (1).

Table (1): Comparison between groups before treatment.

Variable	Mean of traditional physical therapy group	Mean of postural correction group	t-value	P
Age	33.60 (± 5.60)	31.30 (± 7.10)	1.40	P>0.05(NS)
Neck pain severity	6.10 (± 1.24)	6.58 (± 0.68)	1.51	P>0.05(NS)
Total head excursion angle	43.95 (± 1.74)	44.63 (± 1.83)	1.97	P>0.05(NS)

(2) Changes in neck pain severity

(A) Within groups differences (pretreatment versus midtreatment)

Within the traditional physical therapy group, there was a significant reduction of neck pain severity between the pretreatment and the midtreatment assessment. The same finding was also found within the postural correction group. These results are shown in table (2).

Table (2): Changes in neck pain severity within groups (pretreatment versus midtreatment).

Groups	Pretreatment	Midtreatment	t-value	P
Traditional physical therapy group	6.10 (± 1.24)	5.17 (± 1.12)	10.24	P<0.001(S)
Postural correction rehabilitation group	6.58 (± 0.68)	4.64 (± 0.78)	11.74	P<0.001(S)

(B) Between groups difference in the midtreatment

Independent t-test revealed that there was no significant difference between the midtreatment neck pain severity of the traditional physical therapy group with a mean of 5.17 (± 1.12) and the midtreatment neck pain severity of the postural correction program with a mean of 4.64 (± 0.78) with ($t = 1.74$, $P > 0.05$).

(C) Within groups differences (pretreatment versus posttreatment)

Within the traditional physical therapy group, there was a significant reduction of neck pain severity between pretreatment and posttreatment assessment. The same finding was also found within the postural correction group. These results are shown in table (3).

Table (3): Changes in neck pain severity within groups (pretreatment versus posttreatment).

Groups	Pretreatment	Posttreatment	t-value	P
Traditional physical therapy group	6.10 (± 1.24)	4.35 (± 0.95)	12.69	P<0.001(S)
Postural correction rehabilitation group	6.58 (± 0.68)	3.20 (± 1.06)	14.57	P<0.001(S)

(D) Between groups difference posttreatment

Independent t- test revealed that there was a significant difference between posttreatment neck pain severity of the traditional physical therapy group with a mean of 4.35 (± 0.95) and the posttreatment neck pain severity of the postural correction program with a mean of 3.20 (± 1.06) with (t = 3.59, P < 0.001). This was in favor of the postural correction group.

(3) Changes in total head excursion angle

(A) Within groups differences (pretreatment versus midtreatment)

Within the traditional physical therapy group, there was no significant difference of total head excursion angle between pretreatment and midtreatment assessment while there was a significant increase of the total head excursion angle in the midtreatment of the postural correction group as shown in table (4).

Table (4): Changes in total head excursion angle within groups (pretreatment versus midtreatment).

Groups	Pretreatment	Midtreatment	t-value	P
Traditional physical therapy group	43.52 (± 1.75)	43.95 (± 1.79)	1.43	P>0.05(NS)
Postural correction rehabilitation group	44.64 (± 1.83)	46.35 (± 1.79)	8.83	P<0.001(S)

(B) Between groups difference in the midtreatment

Independent t-test revealed that there was a significant difference between midtreatment total head excursion angle of traditional physical therapy group with a mean of 43.95 (± 1.79) and midtreatment total head excursion angle of postural correction group with a mean of 46.35 (± 1.79) in favor of the postural correction group (t = 4.24, P < 0.001).

(C) Within groups differences (pretreatment versus posttreatment)

Within the traditional physical therapy group, there was no significant increase in the total head excursion angle between pretreatment and posttreatment assessment while there was a significant increase in the angle within the postural correction group between pretreatment and posttreatment assessment as shown in table (5).

Table (5): Changes in total head excursion angle within groups (pretreatment versus posttreatment).

Groups	Pretreatment	Posttreatment	t-value	P
Traditional physical therapy group	43.52 (± 1.75)	44.11 (± 1.78)	1.98	P>0.05(NS)
Postural correction rehabilitation group	44.64 (± 1.83)	47.62 (± 1.77)	9.76	P<0.001(S)

(D) Between groups difference posttreatment

Independent t- test showed that there was a significant difference between posttreatment total head excursion angle of the traditional physical therapy group with a mean of 44.11 (± 1.78) and posttreatment total head excursion angle of the postural correction group with a mean of 47.62 (± 1.77) in favor of the postural correction group (t = 6.25, P < 0.001).

(4) Relationship between total head excursion angle and neck pain severity

(A) Relationship between total head excursion angle and neck pain severity of the traditional group

The pearson's correlation coefficient program was used in the midtreatment assessment and showed that there was a non significant correlation between these two variables with ($r = - 0.19$, $P > 0.05$). There was also non significant correlation between the posttreatment neck pain severity and posttreatment total head excursion angle with ($r = -0.17$, $P > 0.05$).

(B) Relationship between total head excursion angle and neck pain severity of the postural correction group

The Pearson's correlation coefficient program was used in the midtreatment assessment and showed that there was a significant negative correlation between these two variables with ($r = -0.56$, $P < 0.05$). There was also a significant negative correlation between the posttreatment neck pain severity and the posttreatment total head excursion angle with ($r = -0.65$, $P < 0.001$).

DISCUSSION

In spite of the availability of literature which supports the concept of treatment of the main cause of producing chronic mechanical neck pain[17,26,33], no previous studies, to our knowledge, compared between the traditional physical therapy program and the postural correction rehabilitation program combined with the traditionally used one for reduction of neck pain severity and increase of the total head excursion angle and this was the main objective of our work.

In this current study there was a significant decrease in neck pain severity of the traditional physical therapy program group in midtreatment and posttreatment. These findings are supported by previous research works[3,20,21,33,34]. Jordan et al.,[21] compared the effectiveness of intensive training, traditional physical therapy treatment and manipulation in chronic neck pain patients. They randomly assigned one hundred nineteen patients into three groups. The treatment included hot packs, pulsed ultrasonic and manual traction, neck pain severity was measured before and after treatment. It was found that the three groups demonstrated reduction of neck pain severity. Wright et al.,[33] also reported that neck pain severity can be relieved by different physical therapy modalities as TENS, electrical stimulation and manipulation.

Concerning neck pain severity in the postural correction rehabilitation group, there were significant differences between pretreatment and midtreatment as well as between pretreatment and posttreatment neck pain severity. These findings are supported by several previous studies[17,19,22,30]. Heller[19] reported that the neck pain which results from muscle imbalance can be reduced by restoring of muscle balance through postural correction exercises which is very important component of the program for reducing the pain severity. Karlberg et al.,[22] also explained the importance of postural correction exercises in reduction of neck pain severity which results from stress to the shortened structures and flexibility imbalance. They recommended maintaining of the gained muscle balance throughout the day by exercise and considereation of workstation ergonomic as a part of postural treatment. This report supports our results because the postural correction rehabilitation program included exercises to restore muscle balance and educational instructions to maintain this through dealing with daily activities as using computer, telephone and sitting in workstation area.

Comparing between the effect of the traditional physical therapy and the postural correction program in treatment of chronic mechanical neck pain, we found that the

postural correction rehabilitation program was more effective in reducing neck pain severity than the traditional physical therapy program. This finding was not surprising because some researchers[11,19,29] recommended the inclusion of postural correction rehabilitation program in treatment of chronic mechanical neck pain. They explained that postural correction program restores muscle balance and develops postural awareness which can maintain proper posture more easily which helps the neck to be in a balanced optimal alignment, with maximum support and full mobility available with minimum energy expenditure.

Regarding the total head excursion angle in the traditional physical therapy group, there was non significant increase of this angle either in the midtreatment or in the posttreatment. This was expected because the traditional physical therapy program does not aim at changing of this angle[12,16]. Hanten et al.,[16] mentioned the importance of inclusion of postural exercises program in the treatment of chronic mechanical neck pain because the traditional physical therapy program can relieve the pain only for a temporary period and it does not have an effect on the biomechanical alteration which is the main etiology of mechanical neck pain. Griegel et al.,[12] reported that it is obvious that traditional physical therapy program does not concentrate on restoring of normal biomechanics and restoring of total head excursion angle which changed with these postural abnormalities in mechanical neck pain patients.

Our patients who were treated by the postural correction rehabilitation program combined with the traditional physical therapy program showed significant increase in total head excursion angle which is supported by several investigators[5,24,26,30,31]. Blanc[5] studied the effect of postural correction exercises on reduction of forward head and restoration of normal total head excursion angle. It was found that there was significant increase of the total head excursion angle after application of postural exercises program associated with their beneficial effects on pain relief. The increase in total head excursion angle in the postural correction rehabilitation program combined with the traditionally used program was expected because this combination included exercises designed to restore muscle balance, normal alignment and normal biomechanics if there is no evidence of structural changes in the neck[19,29,30].

Concerning the relationship between neck pain severity and total head excursion angle in the postural correction rehabilitation group there was a significant negative relationship in midtreatment and posttreatment and this indicates that the more increase in the angle the less the pain severity. This finding is supported by the results of many authors[1,4,9,17,23,27,31,32]. On the other hand no significant relationship was found between these variables in the other group which was not treated by postural correction program.

In this current study, visual analogue scale was used to assess neck pain severity because it is reliable and the most applicable method in clinical settings[8]. Postural analyzing digitizing system was used to assess the total head extrusion angle. The measuring of total head excursion angle by postural analyzing digitizing system was used in different previous studies[2,23,25,28]. This is because the postural analysis digitizing system is sufficiently reliable and accurate for objective assessment of head excursion angle and no significant differences were found between two measurements taken on the same day nor on two separate occasions. In addition to that it is easily to be used and simple enough for unsophisticated computer users[2,25].

Our results that found significant differences between traditional physical therapy program and postural correction rehabilitation program are unique and unfortunately there are no similar studies that could be compared to our work concerning these particular findings. It is recommended that the postural correction rehabilitation program should be included as a main part of treatment for reduction of neck pain severity and increasing of total head excursion angle in chronic mechanical neck pain patients.

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الملخص العربى

فائدة برنامج التصحيح الوضعى فى علاج ألم العنق الميكانيكى المزمن

الغرض من هذه الدراسة هو مقارنة تأثير برنامج التصحيح الوضعى بالإضافة إلى برنامج العلاج الطبيعي التقليدى مقابل برنامج العلاج الطبيعى التقليدى فقط فى علاج ألم العنق الميكانيكى المزمن . أجريت هذه الدراسة على اربعين مريضاً تم توزيعهم عشوائياً إلى مجموعتين متساويتين . تم علاج المجموعة الأولى ببرنامج العلاج الطبيعى التقليدى بينما تم علاج المجموعة الثانية ببرنامج التصحيح الوضعى بالإضافة إلى برنامج العلاجى الطبيعى التقليدى . تم علاج كل مريض لمدة 18 جلسة خلال فترة ستة أسابيع وتم قياس شدة ألم العنق وزاوية الإزاحة الكلية للرأس قبل الدراسة وفى منتصفها وبعد نهايتها . أثبتت النتائج أن العلاج الطبيعى التقليدى أدى إلى انخفاض ملحوظ فى شدة الألم ولم يكن له تأثيراً يذكر على مقدار زاوية الإزاحة الكلية للرأس . وعلى الجانب الآخر وجد أن برنامج التصحيح الوضعى بالإضافة إلى برنامج العلاج الطبيعى التقليدى كان أكثر فاعلية فى تخفيف شدة ألم العنق وفى زيادة مقدار زاوية الإزاحة الكلية للرأس. كما أثبتت النتائج أيضاً وجود إرتباطاً عكسياً وثيقاً بين زيادة مقدار زاوية الإزاحة الكلية للرأس وانخفاض شدة ألم العنق.
الخلاصة : يستخلص من هذا البحث أهمية وفائدة إضافة البرنامج التصحيحى الوضعى إلى برنامج العلاج الطبيعى التقليدى فى علاج مرضى ألم العنق الميكانيكى المزمن .