*Med. J. Cairo Univ., Vol. 87, No. 7, December: 4651-4659, 2019*
*www.medicaljournalofcairouniversity.net*

# Cervical Sagittal Balance as a Predictor for the Outcome of Multimodal Treatment Program for Non Specific Neck Pain

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## Abstract

*Background:* Sagittal balance represents the position of the occiput to the thoracic inlet. Sagittal balance keep normal lordotic curve in cervical region so any disturbance in cervical balance lead to pain and disability. Also it an important concept in spinal reconstruction and cervical sagittal imbalance has been linked to poor health-related quality of life scores due to disabling symptoms of neck pain and neurological deficit.

*Aim of Study:* The purpose of this study was to investigate the influence of cervical balance as predictor for the outcome measures of multimodal treatment program in patient with non specific neck pain.

*Patients and Methods:* Forty patients with non specific neck pain participated in this study. Patients were subdivided into two groups, twenty in each group. The first group was the group A with cervical sagittal imbalance, and the second group was the group B with cervical sagittal balance. Both groups received multimodal treatment (cervicothoracic stabilization training designed to restore cervical muscle endurance and coordination, relaxation training to reduce unnecessary muscle tension, behavioral support to reduce anxiety and fear of pain, eye fixation exercises to prevent dizziness and seated wobble-board training to improve postural control). We measured pain by Visual Analogue Scale (VAS), neck function by Neck Disability Index (NDI) and cervical Range of Motion (ROM) by cervical goniometer.

*Results:* Within-group analysis there was a significant difference of, NDI and ROM (flexion, extension, RT rotation and LT rotation) pre-treatment at groups A, B ($p$=0.0001). There was no significant difference of VAS, LT bending and RT bending pre-treatment ($p$-value >0.05). Between group analyses there was significant difference of NDI and ROM (flexion, extension, RT bending, LT bending, RT rotation and LT rotation) in two groups post-treatment as $p$-value <0.05 except VAS.

SVA (Sagittal Vertical Axis) contribute to interpretation of changes in ROM NDI except VAS.

*Conclusion:* Cervical sagittal balance is effective in predicting multimodal treatment outcome measures (ROM and neck function) in Nonspecific Neck Pain (NSNP). Patients with cervical sagittal balance have better outcome measures (improving ROM and improving neck function) than patients with cervical sagittal imbalance in case of non specific neck pain.

***Key Words:*** *Cervical – Sagittal balance – Multimodal – Treatment.*

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## Introduction

**NECK** pain is one of the most common and painful musculoskeletal conditions. Point prevalence ranges from 6% to 22% and up to 38% of the elderly population, while lifetime prevalence ranges from 14,2% to 71% [1]. For the majority of the neck disorders there is an absence of an identifiable underlying disease or abnormal anatomical structure. As aconsequence they are classified as 'non-specific' [2].

This creates a lack of a “gold standard” assessment for NS-NP. From this perspective NS-NP is mainly 'diagnosed' on the basis of clinical grounds, provided there are no features to suggest a specific or more serious condition [2].

Sagittal alignment, misunderstood as sagittal balance, describes the ideal alignment in the sagittal plane, resulting from the interplay between various organic factors. Any pathology that changes this equilibrium instigates sagittal malalignment and its compensatory mechanisms. As a result, sagittal malalignment is not limited to adult spinal deformity; its pervasiveness extends through most spinal disorders [3].

Sagittal balance alignment is the anteroposterior position of cranial spinal elements with respect to caudal elements. Sagittal balance is an impotant concept in spinal reconstruction [4] and cervical sagittal imbalance has been linked to poor health-related quality of life scores due to disabling symptoms of neck pain and neurological deficit and causes morphological changes in the spinal cord that lead to microvasculopathy, neuronal degeneration, and impairment of function [5]. So, recently the role of sagittal balance in cervical spine disorders and on the possible role of imbalance in predicting clinical and functional outcomes has become a focus of attention.

A forward position of the head relative to shoulder (Forward Head Posture [FHP]) is a measure of cervical sagittal [6]. So global spinal imbalance in the sagittal plane leads to development of clinical symptoms (non specific neck pain) and degenerative disease, which require additional perioperative care of treated patients [7].

We measured cervical sagittal balance by by c2-c7sagittal vertical axis as it is more accurate than measuring the angular orientation of the occiput relative to the thoracic inlet. In this study we give attention to how cervical balance affects outcome measures of multimodal treatment in NS Np patients [8].

So we hypothesis that patients with cervical sagittal balance have better outcome measures than patients with cervical sagittal imbalance in case of non specific neck pain.

A lot of studies use sagittal balance as prediction for surgical treatment like Radcliff who explained the importance of cervical balance in spinal reconstruction.

Also no one in physical therapy field use it in multimodal treatment so the aim of the study is to investigate the influence of cervical balance as predictor for the outcome measures of multimodal treatment program in patient with non specific neck pain.

## Material and Methods

A- *Subjects:*

The cases diagnosed by neurosurgeon and referred to me at Damanhur Medical National Institute and. The subjects signed the institutionally approved consent form preceded the data collection for participation on study. Measurements were conducted prior to and after the course of treatment. Treatment was done 3 times/week for 10-12 weeks (began this treatment at 5 May 2018 and finished at 5 August 2018), 40 patients with non specific neck pain will be randomly assigned into 2 groups. And both group receive multimodal treatment.

*Group A:* Non specific neck pain patient with cervical sagittal imbalance while Group B: Non specific neck pain patient with cervical sagittal balance.

Patient to be admitted to the study should have the following inclusive criteria: Their age ranged from 25-40 years old, history of non specific neck pain for greater than 3 month, impairement of function and physical disability.

The exclusion criteria were as follow: Pregnant women. Nerve root entrapment, spinal cord compression, malignancy, acute infection and refusal to cooperate, diseases preventing physical loading, presence of vertbro basilar insufficiency, history of cervicalsurgery, patient with psychological disturbances, severe osteoporosis and fresh fractures and postural deformities (kyphosis-scoliosis).

I- *Instrumentation and scales for assessment:*

Patients were assessed before, after the treatment program. The assessment procedures included the following items:

1-*Functional disability index:* Functional disability of each patient was assessed by Arabic Neck Disability Index (NDI). It is valid and reliable tool [9]. It is consists of 10 multiple choice questions for neck pain, where the patient selects one sentence out of six that best describes their function, higher score 5 indicate great loss of function and lower score 0 indicate no disability.

The questions are measured on a 6-point scale from 0 (no disability) to 5 (full disability). The numeric response for each item was summed for score varying from 0 to 50 [10]. And percentage of disability scores was calculated. Scores of 10-28% was considered mild disability, 30-48% was moderate, 50-68% was sever and 72% or more was complete disability [11].

2- *Visual analogue scale:* VAS consisted of a line, usually 10cm long, the patient was instructed to place a vertical mark on to determine his pain, ranging from no pain or discomfort (0), to the worst pain [10] that the patient could feel [12].

3- *Cervical active range of motion:* The CROM (deluxe version-Performance Attainment Associates, Roseville, MN, USA, 2016; http://www.spineproducts.com) measures the cervical range of motion for flexion, extension, lateral flexion, and rotation using separate inclinometers. These inclinometers are attached to a frame similar to that for eyeglasses: One in the sagittal plane for flexion-extension. A second in the frontal plane for lateral flexion and a third in the horizontal plane for rotation. Two of these inclinometers have a gravity-dependent needle (in the sagittal and frontal planes) and the other has a magnetic needle (in the horizontal plane). A magnetic neck brace was worn by the patient. Measurements were expressed in degrees with high degree of validity and reliability **[13]**.

Studies have declared it superior to the universal goniometer and visual estimation and superior to a single inclinometer **[13]**.

4- *X-ray:* Mainly using anterior posterior view and lateral view to determine the sagittal alignment of the cervical (model: Dura diagnost which is digital radiographs system and manufactured by Philips company).

Sagittal Vertical Axis (cSVA.) was defined as the horizontal distance from the C2 plumb line to the C7 plumb line. The C2 sagittal plumb line is drawn with a lateral gravity plumb line from the center of C2; the center of C2 was noted by the intersection of crossing diagonals of the vertebral body of C2 on the lateral radiograph.

The C7 sagittal plumb line is drawn with a lateral gravity plumb line from the center of C7; the center was noted similar to C2. The distance between the plumb lines was measured as the shortest perpendicular distance between the 2 lines **[14]**.

2- *Evaluation procedure:*

- *Pain intensity assessment:* The patient was being in a relaxed position then gave him the appendix which contains VAS. The patients instructed to place a vertical mark on to indicate his pain, ranging from no pain or discomfort (0), to the worst pain that could possibly feel.

Fig. (1): Sagittal vertical axis C2-C7.

- *Neck function assessment:* We assessed the function of neck by Arabic NDI. Each question in questionnaire was explained in detail and the patients were asked to select one sentence out of six that best describes their neck function.

*Cervical range of motion assessment:* Each patient was instructed to sit in upright position and both hands rested on thigh. Hip and knee in flexion 90º, CROM was positioned on bridge of patient's nose and on ears as one would put on a pair of eyeglasses and strapped around head by Velcro straps, then measure range of motion for cervical region (flexion, extension, left side bending, right side bending, left rotation and right rotation).

Fig. (2): Neck extension.

Fig. (3): Neck flexion.

Fig. (4): Neck side bending.


Fig. (5): Neck rotation.

II- *Treatment procedures:*

*Stabilization exercises for the cervical region:*

Stabilization exercises begin in supine position and progress to sitting, sitting on a large gym ball, standing with the back supported against a wall, and finally standing without support next step in cervical stabilization is progression to standing on an unstable surface.

Fig. (6): Shoulder flexion 90 from supine position.

*Relaxation training:*

Relaxation training involves a reduction in muscle tension in the entire body or the region that is painful or restricted by conscious effort and thought. Training occcurs in a quiet environment with low lighting and soothing music or an auditory cue on which the patient may focus. The patient performs deep breathing exercises or visualizes a peaceful scene. When giving instructions the therapist uses a soft tone of voice **[15]**.

Fig. (7): Supine neutral head position.

*Eye fixation exercises (Gaze stability):*

A major benefit of some of these exercises is that they can be performed even when the patient has restrictions in neck movement due to pain or articular dysfunction, particularly the smooth pursuit movements. The exercises can be performed until some dizziness is provoked but not neck pain should be reproduced **[16]**.

The first goal is to train eye-following movements. Generally these exercise begin in sitting but if needed, the patient can be positioned in lying for more support.

These photos show lateral eye movements but remember that you want to train all directions of movement i.e up/down, left/right, circular and diagonal movements. In terms of dosage you can commence at 5-10 second bursts and build to 30 seconds, performed as frequently as 5 times a day **[17]**.

Fig. (8): Eye fixation from sitting position.

*Balance training:*

Childs et al., mentions that people with neck pain, postural balance,coordination of head movements and intersegmental coordination of the vertebrae of the cervical spine were impaired **[17]**.

They do balance exercises (single leg stance, tandem stance, and standing on a wobble board), balance training is very effective to counteract impaired joint position sense and neck pain of the cervical spine **[18]**.

Fig. (9): Single leg stance.

## Results

*General characteristics of the subjects:*

Comparing the general characteristics of the subjects of both groups revealed that there was no significance difference between both groups in the mean age, weight, height, or BMI ($p$>0.05).

*Comparison of cervical Sagittal Vertical Axis (SVA) between group A and B:*

The mean ± SD SVA of group A was 0.77±0.11 cm while in group B was 1.24±0.14cm. The mean difference between both groups was –0.47cm. There was a significant decrease in the SVA of group A compared with that of group B ($p$=0.0001).

Table (1): Descriptive statistics and $t$-test for comparing the mean age, weight, height and BMI of group A and B.

| | Group A $\bar{x}$ ± SD | Group B $\bar{x}$ ± SD | MD | $t$-value | $p$-value | Sign. |
|---|---|---|---|---|---|---|
| Age (years) | 33.8±5.8 | 31.6±4.88 | 2.2 | 1.29 | 0.2 | NS |
| Weight (kg) | 81.35±10.86 | 78.35±8.34 | 3 | 0.97 | 0.33 | NS |
| Height (cm) | 174.65±7.97 | 174±9.69 | 0.65 | 0.23 | 0.81 | NS |
| BMI (kg/m$^2$) | 26.66±3.17 | 25.93±2.67 | 0.73 | 0.79 | 0.43 | NS |

$\bar{x}$ : Mean.
SD : Standard Deviation.
MD : Mean Difference.
$t$-value : Unpaired $t$-value.
$p$-value : Probability value.
NS : Non Significant.

Table (2): $t$-test for comparison of mean value of SVA between group A and B.

| | Group A $\bar{x}$ ± SD | Group B $\bar{x}$ ± SD | MD | $t$-value | $p$-value | Sign. |
|---|---|---|---|---|---|---|
| SVA (cm) | 0.77±0.11 | 1.24±0.14 | –0.47 | –11.3 | 0.0001 | S |

$\bar{x}$ : Mean.
SD : Standard Deviation.
MD : Mean Difference.
$t$-value : Unpaired $t$-value.
$p$-value : Probability value.
S : Significant.

*Effect of cervical balance and time on cervical ROM, NDI, VAS:*

Within-group analysis there was a significant difference of, NDI and ROM (flexion, extension, RT rotation and LT rotation) pre-treatment at groups A, B ($p$=0.0001). There was no significant difference of VAS, LT bending and RT bending pre-treatment ($p$-value >0.05 ). Between group analyses there was significant difference of NDI and ROM (flexion, extension, RT bending, LT bending, RT rotation and LT rotation) in two groups post-treatment as $p$-value <0.05 except VAS.

SVA (Sagittal Vertical Axis) contribute to interpretation of changes in ROM NDI except VAS.

*Effect of cervical balance and time on cervical ROM:*

Multiple pairwise comparison showed that there was a significant increase in the cervical flexion, extension, right rotation and left rotation ROM of group B compared with that of group A pre-treatment but no significance in right side bending and left side bending.

Also, there was a significant increase in the mean values of the cervical flexion, extension, right side bending, left side bending, right rotation and left rotation ROM of the group B post-treatment compared with that of group.

Table (3): Mean cervical flexion ROM pre and post-treatment of group A and B.

| Flexion ROM (degrees) | Pre X ± SD | Post X ± SD | MD | % of change | *p*-value | Sig. |
|---|---|---|---|---|---|---|
| Group A | 27.8±10.62 | 35.9±11.46 | –8.1 | 29.13 | 0.0001 | S |
| Group B | 41.3±10.02 | 50.85±11.64 | –9.55 | 23.12 | 0.0001 | S |
| MD | –13.5 | –14.95 | | | | |
| *p*-value | 0.0001 | 0.0001 | | | | |
| Sig. | S | S | | | | |

X : Mean. *p*-value : Probability value.
SD : Standard Deviation. S : Significant.
MD : Mean Difference.

Table (4): Mean cervical extension ROM pre and post-treatment of group A and B.

| Extension ROM (degrees) | Pre X ± SD | Post X ± SD | MD | % of change | *p*-value | Sig. |
|---|---|---|---|---|---|---|
| Group A | 27.65±9.28 | 36±8.07 | –8.35 | 30.19 | 0.0001 | S |
| Group B | 37.25±6.84 | 51.9±8.79 | –14.65 | 39.32 | 0.0001 | S |
| MD | –9.6 | –15.9 | | | | |
| *p*-value | 0.001 | 0.0001 | | | | |
| Sig. | S | S | | | | |

X : Mean. *p*-value : Probability value.
SD : Standard Deviation. S : Significant.
MD : Mean Difference.

Table (5): Mean cervical right bending ROM pre and post-treatment of group A and B.

| Right bending ROM (degrees) | Pre X ± SD | Post X ± SD | MD | % of change | *p*-value | Sig. |
|---|---|---|---|---|---|---|
| Group A | 25.55±9.55 | 31.65±9.61 | –6.1 | 23.87 | 0.001 | S |
| Group B | 29.45±9.86 | 40.35±8.76 | –10.9 | 37.01 | 0.0001 | S |
| MD | –3.9 | –8.7 | | | | |
| *p*-value | 0.21 | 0.005 | | | | |
| Sig. | NS | S | | | | |

X : Mean. *p*-value : Probability value.
SD : Standard Deviation. S : Significant.
MD : Mean Difference. NS : Non Significant.

Table (6): Mean cervical left bending ROM pre and post-treatment of group A and B.

| Left bending ROM (degrees) | Pre X ± SD | Post X ± SD | MD | % of change | *p*-value | Sig. |
|---|---|---|---|---|---|---|
| Group A | 26.6±8.96 | 33.1±9.06 | –6.5 | 24.43 | 0.0001 | S |
| Group B | 31.45±8.16 | 44.55±7.62 | –13.1 | 41.65 | 0.0001 | S |
| MD | –4.85 | –11.45 | | | | |
| *p*-value | 0.08 | 0.0001 | | | | |
| Sig. | NS | S | | | | |

X : Mean. *p*-value : Probability value.
SD : Standard Deviation. S : Significant.
MD : Mean Difference. NS : Non Significant.

Table (7): Mean cervical right rotation ROM pre and post-treatment of group A and B.

| Right rotation ROM (degrees) | Pre X ± SD | Post X ± SD | MD | % of change | *p*-value | Sig. |
|---|---|---|---|---|---|---|
| Group A | 24.35±8.07 | 31.95±8.81 | –7.6 | 31.21 | 0.0001 | S |
| Group B | 32.65±7.76 | 41.6±6.98 | –8.95 | 27.41 | 0.0001 | S |
| MD | –8.3 | –9.65 | | | | |
| *p*-value | 0.002 | 0.0001 | | | | |
| Sig. | S | S | | | | |

X : Mean. *p*-value : Probability value.
SD : Standard Deviation. S : Significant.
MD : Mean Difference.

Table (8): Mean cervical left rotation ROM pre and post-treatment of group A and B.

| Left rotation ROM (degrees) | Pre X ± SD | Post X ± SD | MD | % of change | *p*-value | Sig. |
|---|---|---|---|---|---|---|
| Group A | 27.85±8.44 | 35.6±8.4 | –7.75 | 27.82 | 0.0001 | S |
| Group B | 34.85±6.43 | 43.9±9.36 | –9.05 | 25.96 | 0.0001 | S |
| MD | –7 | –8.3 | | | | |
| *p*-value | 0.005 | 0.005 | | | | |
| Sig. | S | S | | | | |

X : Mean. *p*-value : Probability value.
SD : Standard Deviation. S : Significant.
MD : Mean Difference.

Table (9): Mean cervical flexion ROM pre and post-treatment of group A and B.

| Flexion ROM (degrees) | Pre X ± SD | Post X ± SD | MD | % of change | *p*-value | Sig. |
|---|---|---|---|---|---|---|
| Group A | 27.8±10.62 | 35.9±11.46 | –8.1 | 29.13 | 0.0001 | S |
| Group B | 41.3±10.02 | 50.85±11.64 | –9.55 | 23.12 | 0.0001 | S |
| MD | –13.5 | –14.95 | | | | |
| *p*-value | 0.0001 | 0.0001 | | | | |
| Sig. | S | S | | | | |

X : Mean. *p*-value : Probability value.
SD : Standard Deviation. S : Significant.
MD : Mean Difference.

*Comparison between mean VAS pre and post-treatment of group A and B:*

Multiple pairwise comparison showed that there was no significant difference in the mean values of VAS pre-treatment between group A and B ($p$= 0.34). Also, there was no significant difference in VAS between group A and B post-treatment ($p$= 0.07).

*Comparison between mean NDI pre and post-treatment of group A and B:*

Multiple pairwise comparison showed that there was a significant decrease in the mean values of NDI of the group B pre-treatment compared with that of group A ($p$=0.003). Also, there was a significant decrease in the NDI of the group B post-treatment compared with that of group A ($p$= 0.0001).

Table (10): Mean VAS pre and post-treatment of group A and B.

| VAS | Pre $\bar{X} \pm SD$ | Post $\bar{X} \pm SD$ | MD | % of change | *p*-value | Sig. |
|---|---|---|---|---|---|---|
| Group A | 7.52±0.92 | 3.62±1.17 | 3.9 | 51.86 | 0.0001 | S |
| Group B | 7.22±1.04 | 2.92±1.23 | 4.3 | 59.55 | 0.0001 | S |
| MD | 0.3 | 0.7 | | | | |
| *p*-value | 0.34 | 0.07 | | | | |
| Sig. | NS | NS | | | | |

$\bar{x}$ : Mean.
SD : Standard Deviation.
MD : Mean Difference.
*p*-value : Probability value.
S : Significant.
NS : Non Significant.

Table (11): Mean NDI pre and post-treatment of group A and B.

| NDI | Pre $\bar{X} \pm SD$ | Post $\bar{X} \pm SD$ | MD | % of change | *p*-value | Sig. |
|---|---|---|---|---|---|---|
| Group A | 21.9±4.47 | 16.4±4.33 | 5.5 | 25.11 | 0.0001 | S |
| Group B | 17.4±4.42 | 10.1±4.05 | 7.3 | 41.95 | 0.0001 | S |
| MD | 4.5 | 6.3 | | | | |
| *p*-value | 0.003 | 0.0001 | | | | |
| Sig. | S | S | | | | |

$\bar{x}$ : Mean.
SD : Standard Deviation.
MD : Mean Difference.
*p*-value : Probability value.
S : Significant.

*The effect of sagittal vertical axis on pain, neck disability and range of motion after multimodal treatment:*

Sagittal vertical axis contribute in changes in ROM and NDI post-treatment except VAS.

The following are the results of the effect of SVA on ROM.

CSVA contribute to interpretation of change of about 22% flexion, 37.5% extension, 20% right side bending, 26.4% left side bending, 16% right rotation, 13% left rotation and 24.4% of NDI except VAS.

## Discussion

The result of this study demonstrate that the patient with cervical balance have better outcomes than cervical imbalance in case of non specific neck pain except VAS and smaller value of CSVA indicate worsening of clinical outcomes.

CSVA contribute to interpretation of change of about 22% flexion, 37.5% extension, 20% right side bending, 26.4% left side bending, 16% right rotation, 13% left rotation and 24.4% except VAS. Also illustrate increase in the cervical flexion, extension, right side bending, left side bending, right rotation and left rotation ROM of the group B post-treatment compared with that of group A, so sagittal balance affect mainly the outcomes of multimodal treatment in non specific neck pain patients.

Many studies support the importance of sagittal balance in reconstructive surgery of the spine and in healthy individuals **[19-24]**. Also measuring the radiographic spinopelvic parameters of sagittal balance to prevent functional disability is a routine part of many interventions for degenerative spinal diseases. Sagittal balance must be carefully considered before any surgery, limited or not, and especially at the lumbar level and, above all, if the L4-L5-S 1 levels the lordosis) are included in the fusion **[25]**. So surgical planning in sagittal imbalance is recognized as a key step of treatment to ensure good clinical results **[26]**.

Also kris radkliff supported this study and mention that cervical spine sagittal balance,was found to be related to outcome of cervical laminectomy and fusion **[4]**. Other authors contradict this study and have found no relationship between radiographic parameters and clinical outcome in cervical laminectomy and fusion **[27]**.

Many studies concentrate in assessing the prognostic factors as they help therapists to identify patients with a good prognosis or patients at risk. For those at risk, this would allow the treatment approach to be redirected to address their specific needs **[28]**.

There are different factors predicting response to a multimodal treatment program. A high Neck Disability Index (NDI) score, a high Numeric Rating Scale (NRS) score for pain in the upper extremities, a low Numeric Rating Scale (NRS) score for neck-pain, and a trauma in the patient's history decrease the odds of having a positive outcome after the given treatment program.

A higher age, presence of headache, low back pain, and having low levels of depression increase the odds to complete the multimodal treatment program. It is important to recognize and assess these factors clinically to be able to predict the outcome after the given treatment program. For those at risk, this would allow the treatment approach to be redirected to their specific needs for completing the treatment **[28]**.

It is the first study that demonstrates the relation between sagittal balance and outcome measures in cervical region mainly in physical therapy field.

Limitation of this study are small number of patient, long time of multimodal treatment program and no concentration in relation between whole spine curvtures.

We recommend further studies on regaining cervical balance and concentrate on further studies to be conducted to investigate the relation ship between age and cervical sagittal vertical axis and how age affect this angle and cervical balance.

*Conclusion:*

Cervical sagittal balance is effective in predicting multimodal treatment outcome measures (ROM and neck function) in Nonspecific Neck Pain (NSNP). Patients with cervical sagittal balance have better outcome measures (improving ROM, decrease pain intensity and improving neck function) than patients with cervical sagittal imbalance in case of non specific neck pain.

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# تآثير التوازن العنقى فى نتيجة البرنامج العلاجى لحالات آلام الرقبة الغير المحددة

آجريت هذه الرسالة على آربعين مريضاً يعانون من آلام الرقبة الغير محددة وكان متوسط العمر من الخامسة والعشرون إلى الآربعين سنة.

الطريقة: تم تعيين المرضى عشوائياً إلى مجحموعتين المجموعة (آ) مرضى يعانون من آلام الرقبة المحددة ولديهم عدم توازن عنقى وتم تنفيذ البرنامج العلاجى عليهم المجموعة (ب) مرضى يعانون من آلام الرقبة المحددة ولديهم توازن عنقى وتم تنفيذ البرنامج العلاجى.

النتايج: وآظهرت النتايج آن هناك فروق ذات دلالة إحصائية بعد العلاج فى المجموعتين (آ – ب) وبمقارنة المجموعتين وجدنا آن المرضى الذين يعانون من آلام الرقبة ولديهم توازن عنقى (ب) قد قل عندهم معامل إعاقة الرقبة وتحسن لديهم المدى الحركى عن المرضى الذين يعانون من آلام الرقبة ولديهم عدم توازن عنقى (آ) ولا يوجد إختلاف ف معدل الآلم بين المجموعتين طبقاً للتحليل الإحصائى.