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Comparative Study between Supervised and Unsupervised Exercise Program for Cervical Spondylosis

Ahmed Abdelmoniem Ibrahim[1,4]*, Ehab Mohamed Kamel[2,4]
Waleed Salah Eldin Mahmoud[3,5] and Mohamed Raffat Mohamed Atteya[2,4]

[1] *Department of Physiotherapy, Cairo University Hospitals, Cairo, Egypt*

[2] *Department of Physical Therapy, El Helal Hospital, Cairo, Egypt*
[3] *Department of Basic Sciences, Faculty of Physical Therapy, Cairo University, Cairo, Egypt*

[4] *Department of Physical Therapy, College of Applied Medical Sciences, University of Hail, Ha'il, Saudi Arabia*

[5] *Department of Physical Therapy and Health Rehabilitation, College of Applied Medical Sciences, Prince Sattam bin Abdulaziz University, Al-Kharj, Saudi Arabia*

**Corresponding e-mail: boodytwo48@gmail.com*

ABSTRACT

Background: *Cervical spondylosis (CS) is a degenerative disease for zygapophysial (facet) joints of the vertebra. Pain, stiffness, and dysfunction are the most common symptoms.* ***Study design:*** *A randomized controlled trial was conducted which included 30 female patients with cervical spondylosis.* ***Objectives:*** *Comparing the effect of dynamic and isometric neck exercise under the supervision and without supervision (home-based).* ***Methods:*** *Total 30 female patients with cervical spondylosis were assigned equally into two groups: Group A (n=15) and Group B (n=15). Neck exercises were performed under the supervision of the physiotherapist for Group A and home-based exercises for Group B, respectively. T-test and paired t-test were used for comparison of the outcome measurements which included pain, neck disability index (NDI) and range of motion (ROM).* ***Results:*** *Patients after 8-weeks of cervical strengthening program (supervised or unsupervised) had a significant reduction in the average cervical pain, dysfunction and improvement of ROM within the group of patients. However, the results of Group A were more significant as compared to Group B for pain reduction, flexion, extension and right rotation ROM, but no difference in other parameters for NDI, right and left lateral flexion as well as left rotation ROM.* ***Conclusion:*** *Supervised exercises have proved to be more effective than unsupervised neck exercises in the treatment of patients with chronic neck pain due to cervical spondylosis in spite of all outcomes has improved within the groups.*

Keywords: Cervical spondylosis, Neck pain, Supervised exercises, Unsupervised exercises

INTRODUCTION

Cervical spondylosis (CS) is a degenerative disease for zygapophysial (facet) joints of the vertebra [1]. Its symptoms vary within the subjects in the form of severe pain in neck, shoulder, and may be referred to back, paresthesia, and weakness of muscles in limbs [2]. CS may also cause dysfunction as spinal cord compression, myelopathy, as well as vertebrobasilar insufficiency [3].

However, CS is pervasive in the populace at any age, particularly with an older population. Also, asymptomatic CS was approved radiologically, within the age of 40 years the incidence reaches up to 50%, while within the age of 60 years the incidence reached to 85%. With the expanding pattern of frequency of CS, it has been a well-being concern featured all around [4].

On the other hand, the management for CS has different approaches, including physiotherapy, manipulative therapy, osteopathic therapy, decompressive and spinal fixation operations. Physiotherapy showed superior significance in a range of motion maintenance, preserve soft tissue lengthening, strengthen weak muscles and improve spinal stabilization [5].

Exercise is the most appropriate tool in the process of rehabilitation for cervical pain patients, as they help in improving the neuromuscular control, and the flexibility which is required for soft tissue proliferation and to improve daily activities [6]. Neck pain management exercises are affected by many factors including intensity, frequency, and types of exercise. Strengthening exercises in the form of isometric and isotonic exercises approved to have significant effects on the outcomes in some previous studies [7].

A systematic review was conducted by Fredin, et al., which showed the types, mode of exercises or dosages which has no significant effect and there is no favor on the other for pain reduction, as well as to improve the function in the mechanical cervical pain [8]. Exercises including strength training which showed good results were supervised and administrated in three types: full, partial, or initial [9]. Supervised management needs certain and available resources, time and costs which may be sometimes not applied in clinical settings [10]. Adherence to recommended exercise ought to be considered in assessments of activity intercessions. Regulated or individualized mediations and self-administration procedures may improve practice adherence [11].

Few studies have supported physical therapy intervention in the workplace, which was more effective when compared to home-exercise programs [12,13]. Jakobsen, et al., study showed that the effectiveness of physiotherapy exercises on musculoskeletal pain did not rely upon whether the practices were led at the working environment or at home [14]. Moreover, Kuukkanen, et al., suggested that directed home exercises prompt to decrease the lower back pain and these constructive outcomes held on for over 5 years after the activity program was finished [15].

Numerous studies investigate the effectiveness of home-based exercise programs for chronic musculoskeletal pain patients [16,17]. Moreover, no studies have access cervical pain management which uses home-based exercise alone as an intervention. The purpose of this study was to compare the intervention of dynamic and isometric neck exercise under the supervision and without the supervision (home-based) for the treatment of patients with cervical spondylosis.

PATIENTS AND METHODS

Subjects and Settings

The study was conducted among patients of King Khalid Hospital, Hail City, Kingdom of Saudi Arabian between January 2018 to March of 2018. Around 30 female participants fulfilled the eligibility criteria assigned equally into two groups, Group A (n=15) and Group B (n=15), neck exercises were performed under the supervision of the physiotherapist for Group A and home-based exercises for Group B, respectively.

The study was approved by the Research Ethics Committee of the Hail University. All subjects were informed about the aim and content of the study and were provided written consent.

Inclusion Criteria

Patients of both groups who were aged <60 years of age, having a body mass index of less than 32 kg/m^2, and who were having cervical spondylosis and chronic stage neck pain (above 7 weeks) were included in the study.

Exclusion Criteria

Exclusion criteria were acute neurological and orthopedic diseases, acute pain and inflammation, recent fractures, chronic heart disease, vertigo, vertebrobasilar insufficiency, torticollis, and pregnancy.

The Exercise Intervention Program

Dynamic neck exercises: From a supine position, cervical flexion through lifting head up with the chin in. From a prone position, cervical extension through lifting head backwards, from side lying position, for cervical side flexion through lifting head sideways from pillow this also was repeated for the other side and finally, for cervical rotation lifting the head off from the bed and rotating to one side, repeating both sides [18]. These exercises were done on the base of 8-10 repetitions and duration 3 times a week on alternate days for 8 weeks.

Isometric neck exercises: Cervical isometric exercises were performed by using theraband (with yellow color). The patients assumed the sitting position, for cervical flexion, the band was held directly forward, for a cervical extension, backward, for neck side flexion and rotation, obliquely towards the right and left and by crossing over the band, respectively [19]. All these were done for about 5-10 repetitions with a hold time of 6 seconds at 75% of elongation with the 1.1 kg resistance offered by the band for 3 sessions per week for 8 weeks [20].

Before initiating the home-exercise program, Group B underwent exercises practice under physiotherapist supervision and were explained the suitable ergonomics and correct techniques before sending back to home.

Assessment

Assessments were done before sessions (baseline) and at the end of 8th week.

Pain severity (intensity)

Pain intensity was assessed in the cervical by using a 10 cm VAS (the VAS scale assess pain level, where 0 represented no pain, and 10 cm represents severe pain) [21].

Neck Dysfunction

Neck dysfunction was measured using the English version of the NDI (neck disability index). The NDI covers ten items affected by cervical pain, pain intensity, personal care, lifting, sleeping, driving, recreation, headache, concentration, reading, and work. The items are scored from 0 (no limitations) to 5 (major limitations) and summed to create a total score reflecting degree of disability: 0-4=none; 5-14=mild; 15-24=moderate; 25-34=severe; and over 34=complete [22].

Range of Motion

Cervical movements (ROM) were assessed by two-degree increments with a cervical measurement system [23]. This system comprises of a plastic protective cap fitted with two soul levels to judge and control the situation of the head, two gravity goniometers, and a compass to gauge flexion, extension, lateral flexion, and rotation. The sitting position was assumed by patients with low back support, head and shoulders were in a neutral position, the hands lied on their thighs, and the feet on the floor. The subject was requested to do a full ROM once in each direction.

Statistical Analysis

The statistical package for the social sciences (SPSS) version 22.0 was used for statistical analysis. Initially, descriptive statistics were performed, while the means and standard deviations of each measurement were calculated. A paired t-test was used to compare the results before and after the program intervention. A t-test was performed for examination of any differences between supervised and unsupervised groups. The significance level for all tests was set at $p<0.05$.

RESULTS

Total 30 participants were recruited into this study from the department of physiotherapy of King Khalid Hospital, Hail, KSA. The demographics of the participants of both the groups at baseline are summarized and compared in Table 1. No statistically significant difference was observed among both the groups (Figure 1).

Table 1 Demographics characteristic of the 2 groups at baseline

Variables	Group A (n=15)	Group B (n=15)	p-value
	Mean ± SD	Mean ± SD	
Age (Years)	41.2 ± 11.82	40.53 ± 11.65	0.44
Weight (kg)	74.73 ± 13.22	79.8 ± 12.01	0.14
Height (cm)	154.27 ± 10.03	155.27 ± 11.92	0.40
BMI (Kg/m^2)	31.92 ± 7.41	33.74 ± 7.57	0.25

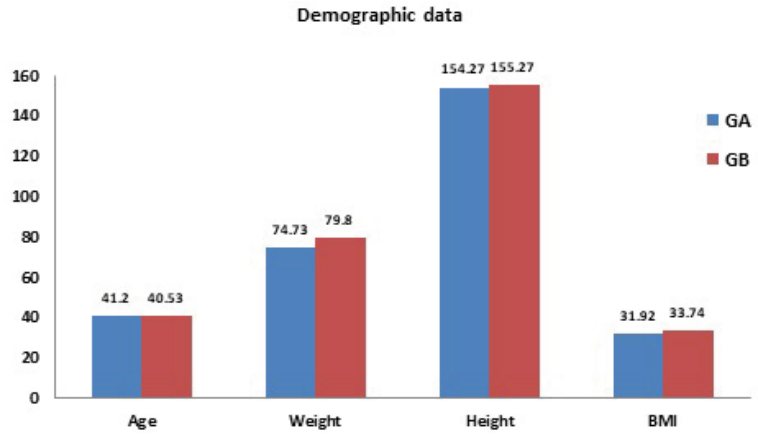

Figure 1 Showing the demographic characteristics of the 2 groups at baseline

Table 2 showed that at baseline there is no significant difference among NDI and VAS (mean ± SD and p-value were 19.2 ± 5.52, 5.9 ± 1.50, 0.89 and 18.92 ± 5.65, 6.1 ± 1.10, 0.68, respectively) for Group A and Group B, respectively. After 8 weeks of intervention with dynamic and isometric neck exercises, scores of the participants in both the groups had decreased insignificantly for NDI (mean ± SD and p-value were 11.74 ± 6.12, 15. 83 ± 5.99 and 0.07, respectively). On the other hand, a score of VAS in both groups had decreased significantly (mean ± SD and p-value were 3.5 ± 1.41, 4.8 ± 1.42 and 0.02*).

Table 2 Pre-intervention and post-intervention comparisons of VAS and NDI between and within the 2 groups

Variables	Group A (n=15)	Group B (n=15)	p-value
	Mean ± SD	Mean ± SD	
Neck disability index score (possible range, 0-50 points)			
Baseline	19.2 ± 5.52	18.92 ± 5.65	0.89
8th week	11.74 ± 6.12	15. 83 ± 5.99	0.07
p-value	0.002*	0.16	
Cervical VAS pain score (possible range, 0-10 cm)			
Baseline	5.9 ± 1.50	6.1 ± 1.10	0.68
8th week	3.5 ± 1.41	4.8 ± 1.42	0.02*
p-value	0.000*	0.0001*	

Within each group, there is a highly significant difference as NDI and VAS at baseline compared after the 8th week of intervention, except NDI of GB. The average VAS and NDI decrease in the supervised group were significantly greater than the unsupervised group after 8th week of intervention (Figures 1 and 2).

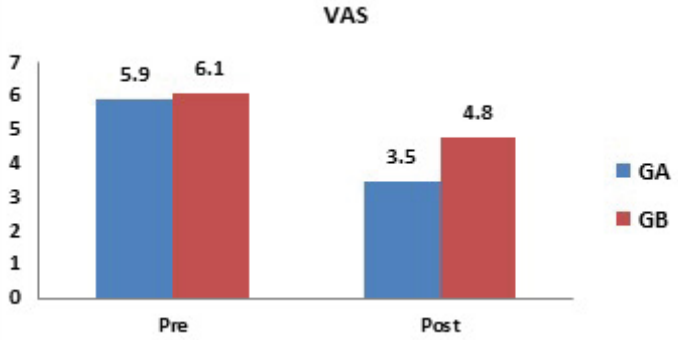

Figure 2 Showing pre-intervention and post-intervention comparisons of vas between and within the 2 groups

At baseline of two groups, there was no significant difference in all parameters (flexion, extension, left lateral flexion, right lateral flexion, left rotation and right rotation) of ROM. Table 3 showed the ROM measurements. There is a highly significant difference within each group when scores of participants at baseline were compared with the scores after the 8th week of intervention.

Table 3 Showing pre-intervention and post-intervention of CROM of both groups

Variables	Treatment	Group A (n=15)	Group B (n=15)	p-value
		Mean ± SD	Mean ± SD	
Flexion	Pre-treatment	27 ± 10.31	26.7 ± 7.12	0.92
	Post-treatment	38.3 ± 6.98	33 ± 6.21	0.04*
	p-value	0.000*	0.0008*	
Extension	Pre-treatment	30 ± 8.86	30.7 ± 10.67	0.85
	Post-treatment	43.4 ± 7.94	36 ± 10.04	0.03*
	p-value	0.000*	0.0013*	
Left Lateral Flexion	Pre-treatment	27.67 ± 7.04	28 ± 7.75	0.9
	Post-treatment	41 ± 6.6	36 ± 7.84	0.06
	p-value	0.000*	0.000*	
Right Lateral Flexion	Pre-treatment	26.7 ± 8.59	27.33 ± 8.84	0.84
	Post-treatment	40.3 ± 6.11	35.7 ± 8.2	0.08
	p-value	0.000*	0.000*	
Left Rotation	Pre-treatment	41 ± 11.83	39.67 ± 11.72	0.76
	Post-treatment	58.3 ± 9.6	51.67 ± 12.63	0.08
	p-value	0.000*	0.000*	
Right Rotation	Pre-treatment	42.33 ± 9.8	41.33 ± 9.54	0.78
	Post-treatment	58 ± 6.76	50.67 ± 10.83	0.03*
	p-value	0.000*	0.0002*	
*T-test one tail				

In comparison of the two groups at baseline and after 8th weeks of intervention, there was a significant difference in flexion, extension and right rotation (p-values were 0.04, 0.03 and 0.03, respectively), while left and right lateral flexion and left rotation showed no significant difference (p-values were 0.06, 0.08 and 0.08, respectively). There was a significant increase in ROM after two months of treatment (Figures 3-9).

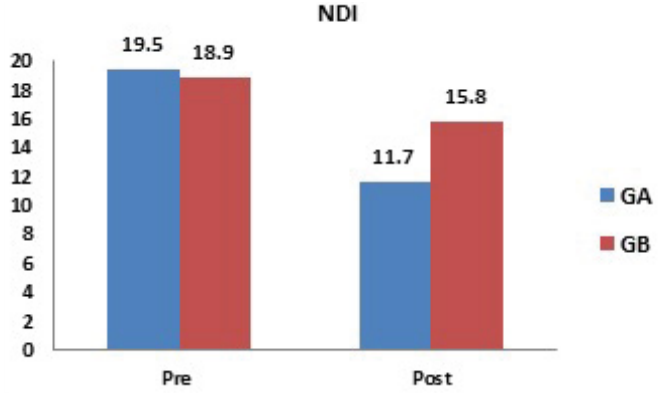

Figure 3 Showing pre-intervention and post-intervention comparisons of NDI between and within the 2 groups

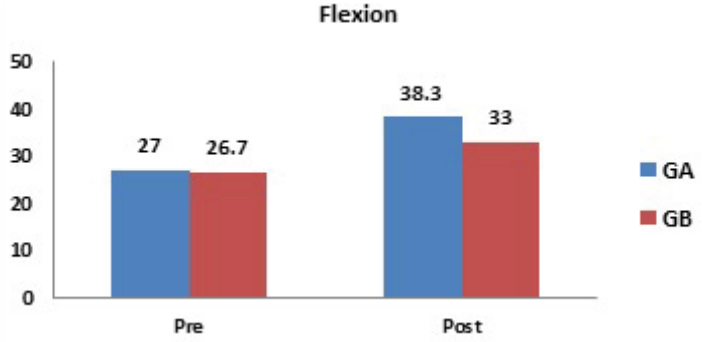

Figure 4 Showing pre-intervention and post-intervention of flexion for both groups

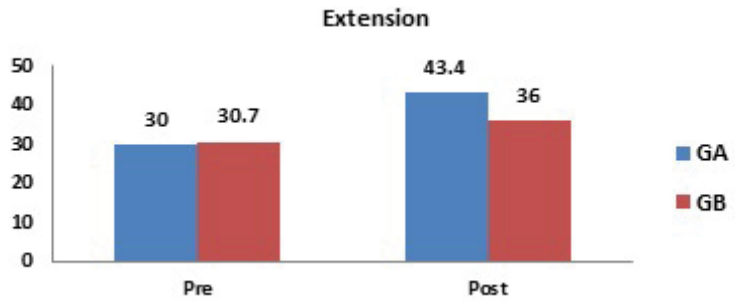

Figure 5 Showing pre-intervention and post-intervention of extension for both groups

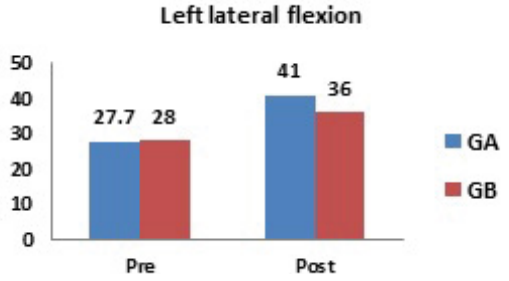

Figure 6 Showing pre-intervention and post-intervention of left lateral flexion for both groups

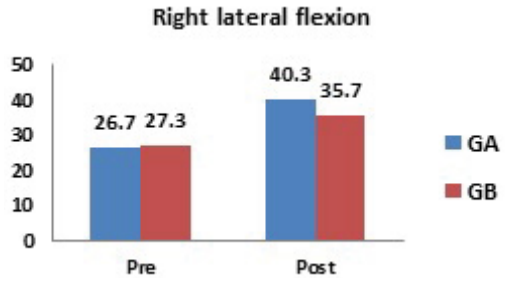

Figure 7 Showing pre-intervention and post-intervention of right lateral flexion for both groups

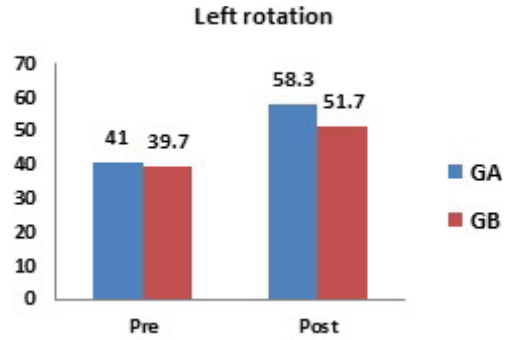

Figure 8 Showing pre-intervention and post-intervention of left rotation for both the groups

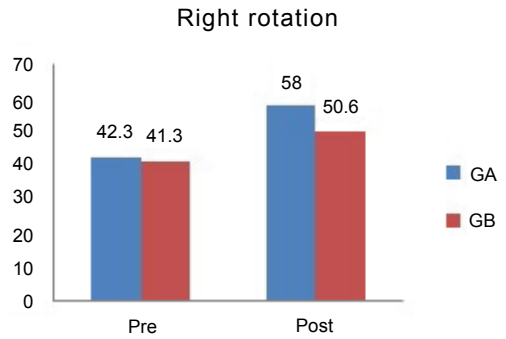

Figure 9 Showing pre-intervention and post-intervention of right rotation for both groups

DISCUSSION

The present study shows that the patients after 8-weeks of cervical strengthening program (supervised or unsupervised) have a significant reduction in the average cervical pain, dysfunction and improvement of ROM within the group of patients who performed dynamic and isometric neck exercises. However, the results of Group A were more significant as compared to Group B for pain reduction, flexion, extension and right rotation ROM. There was no significant difference in other parameters for NDI, right and left lateral flexion as well as left rotation ROM.

A study conducted by Randlov, et al., on "intensive dynamic training for females with chronic neck pain" revealed that this intervention has a significant enhancement in all the outcomes for patients enduring from chronic cervical pain [24]. As well as, Berg, et al., study support the hypothesis as their strengthening training exercises could improve strength and decrease pain in the workers with cervical pain disorders [25].

Another study on dynamic cervical strength training was performed on the cervical muscles which use the flexors, extensors and the rotators for 12 minutes and was continued for 8-weeks. All patients reported a reduction of cervical pain after supervised training. On the other hand, studies showed that dynamic and isometric cervical strength training improve neck muscles strength as well as the cervical pain was reduced. A study by Portero, et al., proved that the effect of strengthening the program in the form of isometric resistance exercises builds the neck muscle strength and increase its size and strength during lateral flexion and reduce the superficial muscles fatigability of the cervical area [26].

A study by Viljanen, et al., was performed to see the efficacy of dynamic muscle exercise, relaxation techniques and usual activity for chronic cervical pain. They approved that all these exercises have no effect on cervical pain as compared with daily living activities [27]. However, some authors prefer kannen as distributed in the section "adaptations to exercise training" that either eccentric or concentric muscle contractions may be a piece of the dynamic protection practice program [28].

As per the study conducted by Carrie, et al., showed that isometric exercise can enhance the performance of the muscles [29]. In spite, there is no motion in the joints. Isometric exercise is viewed as practical on the grounds that it gives a quality base to dynamic exercise. Additionally, there are numerous benefits for dynamic exercise, as there is an increase in ROM. This will act to increase capsular, ligament and muscular lengthening and enhance the nutrition of the cartilage. Muscle reinforcing happens in every single joint range accomplished within the activity and results in the practice of more productive muscle-joint complex.

On the other hand, Ylinen, et al., showed that isometric training has a superior effect on their outcomes objectively reflecting that the method is valuable in the enhancement of function levels [30]. Topp, et al., conducted another study on active cervical muscles exercise for the management of chronic neck pain in the females, they mentioned that, both endurance exercise (dynamic cervical training) and strengthening exercises (isometric cervical training) were useful interventions in reducing the pain and dysfunction in females with chronic pain for non-specified disorder [31].

Supervised exercises with physiotherapist were more effective in the management of patients with cervical spondylosis as compared with home-based (unsupervised) exercise for certain parameters especially pain. It was believed that supervision plays an important role in the pain perception and central sensitization. This can also increase the motivation of the patients for performing exercises as well as for increasing the positive cognitive and behavioral attitude [32-34].

Avoidance behavior has been reported in the patients with chronic musculoskeletal pain, which can be manifested itself in many different ways, as well as, the patient's attitude and his beliefs can cause series development and maintenance of chronic pain-related disability. On the other hand, peoples who are suffering from long-lasting pain were facing no beneficial support from their surrounding environment [35,36]. Thus, the supervision of physiotherapist is an important factor for improving the outcome of pain measurements for patients with cervical spondylosis.

Finally, we can have concluded that both the interventions were effective but the supervision with physiotherapist was more effective in the treatment of patients with cervical spondylosis.

CONCLUSION

The results of this study showed that the supervised exercises proved to be more effective method than unsupervised neck exercises in the treatment of patients with chronic neck pain due to cervical spondylosis in spite of all outcomes has improved within groups. On the other hand, achievements for cervical pain improvement need more researches to understand the mechanisms of central pain process and its underlying etiology, and the economic issues.

DECLARATIONS

Conflict of Interest

The authors have disclosed no conflict of interest, financial or otherwise.

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