



Evaluation of Cervical Endurance by Craniocervical Flexion Test in Patients with Subacromial Impingement Syndrome: A Preliminary Study

Subakromiyal Sıkışma Sendromlu Hastalarda Servikal Dayanıklılığın Kranioservikal Fleksiyon Testi ile Değerlendirilmesi: Ön Çalışma

Tuba Zoroglu¹, Selda Basar²

¹Karabuk University, Vocational School of Health Services, Department of Medical Services and Techniques, Karabuk, Turkey

²Gazi University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara, Turkey

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Abstract

Aim: The aim of the study is to evaluate deep cervical flexor endurance in patients with subacromial impingement syndrome (SIS) and compare it with norm values proven in the literature in asymptomatic individuals.

Materials and Methods: The patients' age, weight, height, duration of complaints and dominant side information were recorded. 35 patients (25 female, 10 male) diagnosed with SIS by physicians participated in the study. Pain intensity was evaluated by numerical rating scale at rest, during elevation and at night. Craniocervical flexion test (CFT) is used for evaluating cervical endurance. "Stabilizer Pressure Biofeedback" device is used for this test. Two types of points are obtained as a result of this test. One is the CFT activation score, which expresses the activation level of the deep cervical muscles, and the other is the CFT performance index, which expresses the endurance of the deep cervical muscles.

Results: Both the activation score (3.9 ± 1.9) and the performance index (31.4 ± 14.2) of CFT were significantly different in patients with SIS when compared with those of asymptomatic individuals.

Conclusion: Cervical endurance is reduced in patients with SIS. Treatments including cervical stabilization should be planned in these patients.

Keywords: Cervical endurance, craniocervical flexion test, subacromial impingement syndrome, subacromial pain, cervical stabilization

Öz

Amaç: Çalışmanın amacı, subakromiyal sıkışma sendromu (SSS) olan hastalarda derin servikal fleksör dayanıklılığı değerlendirmek ve literatürde asemptomatik bireylerde kanıtlanmış norm değerlerle karşılaştırmaktır.

Materyal ve Metod: Hastaların yaşı, kilosu, boyu, şikayet süresi ve dominant taraf bilgileri kaydedildi. Çalışmaya hekimler tarafından SSS tanısı konulan 35 hasta (25 kadın, 10 erkek) katıldı. İstirahatte, gece ve elevasyon sırasındaki ağrı yoğunluğu sayısal derecelendirme ölçeği ile değerlendirildi. Servikal dayanıklılığı değerlendirmek için kranioservikal fleksiyon testi (KFT) kullanılır. Bu test için "Stabilizer Basınç Biofeedback" cihazı kullanılmaktadır. Bu test sonucunda iki tür puan elde edilir. Biri derin servikal kasların aktivasyon seviyesini ifade eden KFT aktivasyon skoru, diğeri ise derin servikal kasların dayanıklılığını ifade eden KFT performans indeksidir.

Bulgular: SSS'li hastalarda KFT'nin hem aktivasyon skoru ($3,9 \pm 1,9$) hem de performans indeksi ($31,4 \pm 14,2$) asemptomatik bireylerinki ile karşılaştırıldığında anlamlı olarak farklıydı.

Sonuç: SSS'li hastalarda servikal endurans azalır. Bu hastalarda servikal stabilizasyonu içeren tedaviler planlanmalıdır. araştırılmalı, FM'nin kardiyovasküler riske katkısını azaltmak için farmakolojik ve nonfarmakolojik tedavi yöntemleri uygulanmalıdır.

Anahtar Kelimeler: Servikal endurans, kranioservikal fleksiyon testi, subakromiyal sıkışma sendromu, subakromiyal ağrı, servikal stabilizasyon

Received: 07.07.2022 Accepted: 22.07.2022

Corresponding Author: Tuba Zoroglu, Karabuk University, Vocational School of Health Services, Department of Medical Services and Techniques, Karabuk, Turkey **E-mail:** tubazoroglu@karabuk.edu.tr

INTRODUCTION

Subacromial impingement syndrome (SIS) is one of the most common problems of the shoulder, caused by mechanical compression of the rotator cuff and biceps long head tendons in the subacromial space. Compression occurs during the 60-120 degrees elevation of the arm which is defined as the painful arc (1). Pain around the shoulder joint, painful arc during shoulder elevation, crepitation, limitation of joint movement, muscle weakness, scapular dyskinesis and functional disability are the common symptoms of SIS (2,3).

The etiology of SIS is multifactorial. These factors can be divided into intrinsic and extrinsic factors. Intrinsic factors include changes in bony structures, muscle degeneration and anatomical anomalies. Extrinsic factors are related to muscle imbalance, abnormal scapulohumeral kinematics, tightness of soft tissues and postural problems (1).

Postural problems in the upper body such as forward head posture, rounded shoulders and thoracic kyphosis have been suggested as a possible etiologic component in the development of SIS. In the presence of these problems, forward and downward rotation of the scapula may cause depression of the acromion and change the orientation of the glenoid fossa. As a result of this change compression may occur during elevation (4).

Deep cervical muscles play an essential role in maintaining upper body posture. The decrease in the strength and endurance of these muscles causes reduction of stability of the spine (5,6). The spine is in direct relationship with the shoulder by its muscle, tendon, and fascial connections. Because of this relationship, care should be taken to spinal dysfunctions to prevent injuries and ensure full functionality of the shoulder (4).

It has been reported that the activity of the scapular muscles decreases with the change of cervical posture in some cervical problems (7-9). For this reason, in addition to the decrease in the activation of the scapular muscles in SIS, the stability of the cervical region may also be negatively affected due to the relationship of the shoulder and spine.

For a correct treatment approach, it should be determined whether the problem in SIS is directly related to the shoulder or the spine. To determine this, cervical endurance, which is an important criterion for the cervical region, was evaluated in our study.

The aim of the study is to evaluate deep cervical flexor endurance in patients with SIS and compare it with norm values proven in the literature in asymptomatic individuals.

MATERIAL AND METHOD

This study was approved by Karabuk University Faculty of Medicine Non-Interventional Clinical Research Ethical Board numbered 77192459-050.99-E10731 at October 2019. 35 patients (25 female, 10 male) diagnosed with SIS in the orthopedics and physical medicine outpatient

clinic participated in the study. The procedure of the study was explained to all participants, and they signed an informed consent form. Inclusion criteria were presence of shoulder pain limiting activity for more than 6 weeks and diagnosed with Stage 1 or 2 SIS in the shoulder. Exclusion criteria were cervical radiculopathy, a history of surgical intervention or degenerative joint disease of the shoulder joint complex, any diagnosed rheumatic, systemic or neurological diseases. Also, people with heart attack and using pacemakers, a history of shoulder dislocation or fracture, and passive joint movement limitation (frozen shoulder) are excluded.

The patients' age, weight, height, duration of complaints and dominant side information were recorded.

Pain intensity was evaluated by numerical rating scale at rest, during elevation and night. In this scale, patients are asked to mark the number that determines their pain intensity on a scale numbered between 0-10 (0 no pain, 10 severe pain) (10).

Craniocervical flexion test (CFT) is used for evaluating cervical endurance. "Stabilizer Pressure Biofeedback" device is used for this test. This device consists of three compartment pressure cell, manometer, and pressure pin. In the evaluation, the upper limit of the pressure cell is placed to the lower border of the occiput without being inflated. At a neutral starting position in supine hook lying, the pressure cell is inflated to 20 mmHg without increasing cervical lordosis. Then, the patient is asked to push her/his chin towards her neck (head nodding) enough to create a pressure of 2 mmHg and to maintain this position for 10 seconds. It consists of 5 progressive stages (22, 24, 26, 28, and 30 mm Hg). At each stage, cervical flexion is repeated for 10 seconds and 10 repetitions. Two types of points are obtained as a result of this test. One is the CFT activation score, which expresses the activation level of the deep cervical muscles, and the other is the CFT performance index, which expresses the endurance of the deep cervical muscles. Activation score is the pressure level that the patient can maintain for 10 seconds with 10 repetitions. For the CFT performance index, the pressure level at which the patient could not maintain it for 10 seconds was taken as the criterion. The CFT performance index is calculated by multiplying the pressure level with the duration that the patient can maintain the pressure. The performance score is calculated by multiplying the pressure level with the duration that the patient can maintain the pressure (11,12).

Statistical Analysis

The analysis of the data obtained from the patients was performed with the Statistical Package for Social Sciences (SPSS) Version 21.0 statistical analysis program. The normality of the variables was determined by the skewness and kurtosis coefficients. The skewness and kurtosis coefficients in the range of -1 to 1 indicate that the data are normally distributed (13). One-sample t-test was used

to compare CFT scores of patients with the norm value obtained from previous studies (11,12,14).

Age, body mass index (BMI), duration of complaints, pain intensity and CFT scores are given as mean and standard deviation values. Dominant and affected side shoulder information is expressed as frequency.

Post-hoc power analysis was performed on 35 individuals using the G*Power 3.1 program. In the post-hoc power analysis based on the CFT Activation score data, the power of the study was found to be 99%, with an effect size of 1.82 and an error score of 0.05 (15).

RESULTS

35 patients (25 female, 10 male) with SIS included in the study. All the patients' dominant side were right. The affected arm of 29 (%82.9) patients were on the dominant side and 6 (%17.1) of them were non-dominant side. Descriptive and clinical data of the patients are presented in Table 1.

Table 1. Descriptive and clinical data of the patients (n=35)

	X±SD (min-max)
Age	43.86±12.71(25.0-65.0)
BMI	27.57±5.49(16.65-37.78)
Duration of complaints (m)	6.09±2.81(3.0-12.0)
Pain at rest	1.86±2.24(0.0-5.0)
Pain at elevation	4.71±2.50(0.0-10.0)
Pain at night	5.34±2.57(0.0-10.0)

X: Mean; SD: Standard deviation; BMI: Body mass index; m: months

CFT activation score and CFT performance index were compared between patients with SIS and norm values of asymptomatic individuals. Significant difference was found (p=0.00). Comparison results are given in Table 2.

Table 2. Comparison of CFT scores between patient with SIS and asymptomatic individuals

	Patients with SIS X ± SD	Asymptomatic Individuals X ± SD	skewness	kurtosis	p
Activation score	3.9±1.9	7.6±2.1	-0.724±0.398	-0.362±0.778	0.00
Performance index	31.4±14.2	65.8±27.5	0.781±0.398	-0.044±0.778	0.00

X: Mean; SD: Standard deviation; SIS: Subacromial impingement syndrome

DISCUSSION

It was aimed to investigate if there was any difference in the endurance of deep cervical muscles between patients with SIS and asymptomatic subjects by using CFT in this study. And it was found that deep cervical endurance was reduced in patients with SIS. Both the activation score (3.9±1.9) and the performance index (31.4±14.2) of CFT were significantly different compared to asymptomatics (respectively 7.6±2.1; 65.8±27.5) (p=0.00).

One of the important structures that provide cervical postural alignment is the deep cervical flexor muscles. Inadequate endurance in deep cervical flexors can lead to impairment of spine and upper body posture (1,16). Based on this idea, Zedan et al. used cervical stabilization exercises in individuals with SIS. They applied only shoulder stabilization exercises to control group and shoulder and cervical stabilization exercises to the experiment group. They evaluated shoulder proprioception and concluded that shoulder proprioception developed in the experimental group (17). On the other hand, Lee et al. investigated the effect of cervical stabilization exercises on the activity of shoulder stabilizer muscles in their study. They showed that there was a significant increase in activity of the upper trapezius, lower trapezius, and serratus anterior muscles in the cervical stabilization exercises group (18). Pheasant used cervical retraction exercises in the case

study, he presented and suggested that shoulder muscle pathologies in individuals with SIS may be related to the cervical spine (16).

These studies, which proved the effect of cervical stabilization exercises in patients with SIS, did not evaluate the endurance or strength of the deep flexor muscles (16-18).

CONCLUSION

In conclusion, it was determined in our study that cervical endurance decreased in patients with SIS compared to asymptomatics. This preliminary study demonstrated the need for cervical stabilization due to decreased endurance in these patients. For this reason, the authors planned a study in which cervical stabilization exercises will be performed in these patients.

The study is the first to evaluate cervical endurance in patients with SIS. However, the weakness of our study is that only flexor endurance was evaluated. Comprehensive studies are needed to evaluate extensor endurance.

Studies involving the evaluation and treatment of the cervical region in SIS are needed in the literature.

Financial disclosures: The authors declared that this study hasn't received no financial support.

Conflict of Interest: The authors declare that they have no competing

interest.

Ethical approval: This study was approved by Karabuk University Faculty of Medicine Non-Interventional Clinical Research Ethical Board numbered 77192459-050.99-E10731 at October 2019.

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