

Original Article

Effect of a cervical support pillow on sternocleidomastoid activity and satisfaction in asymptomatic participants

MIN-HYEOK CHOI, PT^{1)a}, JIN-HWA JUNG, OT^{2)a}, JONG-HOON MOON, OT³⁾, JIN-WON YOO, PT⁴⁾, SUK-CHAN HAHM, PhD, PT^{5)*}, HWI-YOUNG CHO, PhD, PT^{6)*}

¹⁾ Department of Physical Therapy, Graduate School, Gachon University, Republic of Korea

²⁾ Department of Occupational Therapy, Semyung University, Republic of Korea

³⁾ Department of Occupational Therapy, Graduate School, Gachon University, Republic of Korea

⁴⁾ Department of Physical Therapy, Sahmyook University, Republic of Korea

⁵⁾ Graduate School of Integrative Medicine, CHA University: 355 Pangyo-ro, Bundang-gu, Seongnam, Kyonggi-do 13488, Republic of Korea

⁶⁾ Department of Physical Therapy, Gachon University: 191 Hambangmoe-ro, Yeonsu-gu, Incheon 406-799, Republic of Korea

Abstract. [Purpose] The aim of this study was to examine the changes in sternocleidomastoid muscle (SCM) activity when using a cervical support pillow (CSP) and to determine the pillow's effect on satisfaction in asymptomatic participants. [Subjects and Methods] This study followed a cross-over design and the order of the measurements was counterbalanced. Twenty asymptomatic participants were positioned supine for 5 minutes by using either a CSP or a general pillow (GP) while the activity of the SCM was measured using surface electromyography. [Results] The CSP significantly decreased the activity of the SCM compared with the GP, and satisfaction after use of the CSP was significantly greater than that after use of the GP. [Conclusion] This study suggests that the CSP may be effective in preventing unnecessary neck muscle activation during sleep in asymptomatic people.

Key words: Cervical support pillow, Muscle activation, Sternocleidomastoid

(This article was submitted Dec. 28, 2017, and was accepted Mar. 15, 2018)

INTRODUCTION

The development of good pillows for deep sleep is one of the important tasks of modern society¹⁾. The use of a body-fit pillow reduces neck-shoulder pain and headache²⁾.

A previous study has reported that the optimum pillow height is one that maintains optimal head and neck alignment³⁾. Recently, a pillow with a B-curve shape has been proposed⁴⁾. This pillow type can induce an optimal resting state for the neck joints and muscles. However, other studies have reported no significant differences in neck pain and sleep quality between a cervical support pillow (CSP) and a general pillow (GP)⁵⁾. The results of previous studies on the effects of various pillow types have been inconsistent^{4, 5)}. The aim of the present study was to investigate the changes in sternocleidomastoid (SCM) activity and the satisfaction level when using a CSP compared to a GP in asymptomatic people.

^aThese two authors contributed equally to this study as co-first author. *These authors contributed equally to this work as corresponding authors. *Corresponding authors. Suk-Chan Hahm (E-mail: schahm@cha.ac.kr); Hwi-young Cho (E-mail: hwiyoung@gachon.ac.kr)

©2018 The Society of Physical Therapy Science. Published by IPEC Inc.



This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (by-nc-nd) License. (CC-BY-NC-ND 4.0: <https://creativecommons.org/licenses/by-nc-nd/4.0/>)

SUBJECTS AND METHODS

This study used a cross-over study design and the order of the measurements was counterbalanced. Twenty asymptomatic people participated in this study and the general characteristics are presented in Table 1. The inclusion criteria were people with no sleep problems. Participants were excluded if they had sleep problems, neck pain, a history of spinal surgery, or experience of using a CSP. The participants were informed about the experiment and voluntarily agreed to participate. This study was approved by the Gachon University Institutional Review Board (1044396–201708-HR-134-01).

The participants were placed in a supine position by using each pillow for 5 minutes while measurements were taken. The CSP and GP were applied respectively with a 10-minute rest interval. The CSP was designed to support the curve of the neck and reduce the burden on the neck during sleeping (Sylph pillow, Balancecord, Korea). The CSP was applied to the neck and shoulders of the participant in a comfortable position. The height of the CSP was approximately 10 cm. It was made with Illite stone and the cover was organic cotton. The GP was a 10-cm high pillow as described by Lavin et al².

The activity of the SCM was analyzed using surface electromyography. Before the experiment, the skin surface was cleaned to minimize noise. Two electrodes were attached at the midpoint of the muscle belly in the direction of the SCM muscle fibers⁷. A band pass filter set to 20–350 Hz was used and smoothing was performed; root mean square values were also calculated. Analysis of mean and maximum values from the surface electromyography was performed by a blinded examiner. The Visual Analog Satisfaction Scale (VASS) was used to evaluate the participant's satisfaction after the use of each pillow. Higher VASS scores corresponded to greater satisfaction⁶.

The collected data was analyzed using SPSS 18. Comparison of the SCM activity and the VASS scores between the two pillow types was performed using the paired t-test. Statistical significance was set at =0.05.

RESULTS

The CSP significantly decreased the mean and maximum values of SCM activity compared to the GP ($p < 0.05$; Table 2). Satisfaction level of the CSP were significantly higher than those with the GP ($p < 0.05$; Table 3).

Table 1. General characteristics of the participants

Participants (n=20)	
Gender (women/men) ^a	12/8
Age (years) ^b	27.4 ± 2.7
BMI (kg/m ²) ^b	22.0 ± 2.6

BMI: Body Mass Index. Values are expressed as the number of participants^a or mean ± standard deviation (SD)^b.

Table 2. Comparison of sternocleidomastoid muscle activity between pillow types

		General pillow	Cervical support pillow
		Mean ± SD	Mean ± SD
SCM	Mean (μV)	3.62 ± 0.96*	3.42 ± 0.95
	Maximum (μV)	6.12 ± 1.19*	5.49 ± 1.10

SCM: Sternocleidomastoid.

* $p < 0.001$.

Table 3. Comparison of satisfaction between pillow types

	General pillow	Cervical support pillow
	Mean ± SD	Mean ± SD
VASS	8.21 ± 1.01	8.83 ± 1.15*

VASS: Visual Analog Satisfaction Scale.

* $p < 0.05$.

DISCUSSION

This study aimed to compare the effect of pillow type on the activity of the SCM and participant satisfaction. The researchers found that the activation of the SCM was significantly decreased with the CSP and that the participants were significantly more satisfied with the CSP.

Jull et al. reported that about 80% of the superficial neck muscles are recruited during neck flexion, and patients with neck pain have dysfunction of the deep neck muscles due to hyper-activation of the superficial neck muscles⁸). This indicates that superficial muscles compensate for the decreased activity of the deep muscles. An explanation for the lower SCM activity during use of the CSP may be that hyper-activation of this superficial neck flexor is reduced. Reduction in SCM activity may make people more comfortable. This may be why participants were significantly more satisfied with the CSP than the GP. Our results support the findings of previous studies on the effects of a CSP⁴).

The limitations of the current study are as follows. First, data was not collected during sleep. Second, the number of participants was small. Third, this study identified only the immediate effects of each pillow type.

In conclusion, this study suggests that the CSP may be useful to relax neck muscles. However, future studies with a larger sample size and a longer time period are needed.

ACKNOWLEDGEMENT

This paper was supported by a Semyung University Research Grant of 2016.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- 1) Lund HN, Pedersen IN: Pilot project: sound pillow treatment to improve sleep quality for patients with depression or bipolar diagnosis with sleeping problems. *Eur Psychiatry*, 2016, 33: 80–89. [[CrossRef](#)]
- 2) Lavin RA, Pappagallo M, Kuhlemeier KV: Cervical pain: a comparison of three pillows. *Arch Phys Med Rehabil*, 1997, 78: 193–198. [[Medline](#)] [[CrossRef](#)]
- 3) Kim HC, Jun HS, Kim JH, et al.: The effect of different pillow heights on the parameters of cervicothoracic spine segments. *Korean J Spine*, 2015, 12: 135–138. [[Medline](#)] [[CrossRef](#)]
- 4) Hur JG, Yang YA: The effect of ergonomic pillow in patient with chronic neck pain. *J Ergon Soc Korea*, 2006, 25: 17–25. [[CrossRef](#)]
- 5) Persson L: Neck pain and pillows—a blinded study of the effect of pillows on non-specific neck pain, headache and sleep. *Adv Physiother*, 2006, 8: 122–127. [[CrossRef](#)]
- 6) Singer AJ, Thode HC Jr: Determination of the minimal clinically significant difference on a patient visual analog satisfaction scale. *Acad Emerg Med*, 1998, 5: 1007–1011. [[Medline](#)] [[CrossRef](#)]
- 7) Falla D, Dall'Alba P, Rainoldi A, et al.: Location of innervation zones of sternocleidomastoid and scalene muscles--a basis for clinical and research electromyography applications. *Clin Neurophysiol*, 2002, 113: 57–63. [[Medline](#)] [[CrossRef](#)]
- 8) Jull GA, Falla D, Vicenzino B, et al.: The effect of therapeutic exercise on activation of the deep cervical flexor muscles in people with chronic neck pain. *Man Ther*, 2009, 14: 696–701. [[Medline](#)] [[CrossRef](#)]