



Original Article

The effect of short-term upper thoracic self-mobilization using a Kaltenborn wedge on pain and cervical dysfunction in patients with neck pain

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Abstract. [Purpose] The aim of this study was to determine the effect of short-term self-joint mobilization of the upper spine using a Kaltenborn wedge on the pain and cervical dysfunction of patients with neck pain. [Subjects and Methods] Twenty-seven patients with neck pain were divided into two groups; the self-mobilization group (SMG, n=13) and the self-stretching group (SSG, n=14). The SMG performed upper thoracic self-mobilization and the SSG performed self-stretching exercises as a short-term intervention for a week. To assess the degree of neck pain, the visual analog scale (VAS) was utilized, and to measure the joint range of motion at the flexion-extension, it was compared and analyzed by using the goniometer. [Results] Both SMG and SSG show a significant decrease in the visual analog scale and a significant increase in joint range of motion within the group. In the comparison of groups, there was no significant difference, but it indicated effects on improving the range of motion of extension in SMG. [Conclusion] Self-mobilization of the upper spine, using a Kaltenborn wedge, was useful in alleviating pain in and dysfunction of the cervical spine, and in particular, in improving cervical spine extension in this study.

Key words: Neck pain, Self mobilization, Kaltenborn wedge

(This article was submitted Oct. 14, 2017, and was accepted Jan. 9, 2018)

INTRODUCTION

Chronic pain in the cervical spine region is commonly due to overuse or recurrent trauma, and may be due to instability of the spinal segments¹⁾. This causes restriction to the movement of the adjacent joints, leading to impaired functional movement of the cervical spine²⁾.

A relationship between the cervical and thoracic spine has been described as close and ergonomically related³⁾. From the functional viewpoint of the entire spine, since the movement of the cervical vertebrae includes the movement of the upper thoracic ('1th thoracic spine; T1' to '4th thoracic spine; T4')⁴⁾, hypomobility of the upper thoracic can cause pain in the cervical spine because of compensation, whereas hypermobility of the upper thoracic can induce incompetence of the upper thoracic⁵⁾. Lau et al.⁶⁾ reports that patients with dysfunctional cervical spine have excessive kyphosis compared to healthy normal persons, and kyphosis is closely related to pain around the neck.

Joint mobilization is often used in manual therapy. This method applies distraction and sliding techniques passively to the joint surfaces in order to maintain or recover joint mobility⁷⁾. Sandow demonstrates the need for joint mobilization in the thoracic due to the risk of cervical mobilization, which involves cervical rotation⁸⁾.

The application of joint mobilization to the upper thoracic spine has been reported to have a positive effect, sometimes immediately, on cervical spine dysfunction, in conjunction with the provision of pain relief^{9, 10)}. However, previous treat-

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ments, including joint mobilization, have been ineffective in a busy clinical setting because they involve the direct and passive intervention of therapists¹¹). Therefore, it was determined that a therapeutic joint mobilization intervention method that patients could easily administer themselves should be applied.

Thus, the study objective was to investigate the effect of short-term self-joint mobilization of the upper spine using a Kaltenborn wedge on the pain and cervical dysfunction of patients with neck pain.

SUBJECTS AND METHODS

This study was conducted on patients who presented at a hospital located in Andong, Gyeongbuk, South Korea, for neck pain treatment. Twenty-seven patients with cervical spine dysfunction and pain agreed to participate in the study. Written informed consent according to the ethical standards of the Declaration of Helsinki was provided by all subjects prior to participation, and all agreed to participate in this study. The patients were randomly divided into two groups; the self-mobilization group (SMG, n=13) and the self-stretching group (SSG, n=14), all of whom received conventional physical therapy (a hot pack and interferential current therapy). Thereafter, the two groups performed self-mobilization or self-stretching exercises for 20 minutes, three times a week, for one week only, to determine the effect of the short-term intervention.

The SMG performed self-mobilization exercises using the Kaltenborn wedge (Fig. 1). The size of the wedge used in the Kaltenborn concept is 20.3 cm long, 10.8 cm wide, and 6.4 cm high. Upper thoracic self-mobilization is a technique that is applied to the upper thoracic spine (the spine between C7 and T3), originally termed the Kaltenborn-Evjenth concept¹²). The groove of the Kaltenborn wedge is placed under the spinous process of the upper spine in a lying position with the knee bent. Rocking forward and backward mobilization of the upper spine joint is possible owing to gravity and body weight. The subjects in this position raised the hips upward into a bridging position until they felt pain, thereby increasing pressure on joint mobilization. The therapist guided the subjects from time to time to ensure that they recognized and transferred their position from the C7 to T3. The joint Range of Motion (ROM) is maintained by increasing pressure for 30 sec with 10 sec of rest while repeating the motion. Each set consists of three sets of 10 repetitions of motion. One min of rest was given between each set.

The SSG performed self-stretching exercises, applied to the levator scapulae muscle and the trapezius muscle using the contract-relax technique¹³). Each muscle was stretched for 30 sec followed by 10 sec of rest. The motion was applied 10 times on both sides.

Neck pain was measured using the Visual Analog Scale (VAS). Dysfunction of the cervical spine was measured with a joint ROM device, i.e., Myrin™ OB Goniometer (Kineman Enterprises, Norway), to establish ROM in the cervical spine in terms of flexion and extension within the sagittal plane. The subjects took a neutral position in the static chair while crossing their hands and fixing them on the shoulders. The measurements were taken while fixing the movement of the thoracic as much as possible. The angles of the motions started at 0 degrees and each of the movements was repeated three times in order to record a mean value. Both the SMG and the SSG had the same treatment time (25 min) for each session and were measured twice; once prior to the intervention and once following the third treatment session (also the last).

This study used SPSS 18.0 for Windows to conduct the data analysis. A paired t-test was used to test the within-group level of pain and joint ROM before and after the experiment. An independent t-test was conducted to explain the between-group difference. The significance level α was set at 0.05 for all statistical analyses.

RESULTS

No significant difference was observed between the two groups in terms of the general characteristics of the research subjects ($p>0.05$) (Table 1). When comparing the VAS, both the SMG and the SSG showed a significant within-group decreases ($p<0.01$). However, there was no significant between-group difference ($p>0.05$). In the comparison of cervical angles, there were significant intragroup increases in the flexion and extension in both the SMG and the SSG ($p<0.01$), and there were significant intergroup increases in extension angles ($p<0.05$) (Table 2).

DISCUSSION

This study examined the effects of self-joint mobilization of the upper spine using a Kaltenborn wedge for a short duration on the pain and cervical dysfunction of patients with neck pain.

Although the current study finding of a significant decrease in pain in the cervical spine, observed in both the SMG and the SSG, is consistent with that of previous studies^{14, 15}) in which it was indicated that both joint mobilization and stretching exercises were effective in reducing pain, we found it difficult to identify distinct differences in reducing pain between the groups owing to the short study duration (one week).

In the comparison of cervical functional movement on the sagittal plane, there were significant intragroup increases in the flexion and extension in both the SMG group and the SSG group after the experiment, and there were significant intergroup increases in extension angles. This finding is consistent with those of previous papers^{16, 17}): self mobilization is effective for the functional improvement of the cervical spine. A study by Kim et al.¹⁸) demonstrates that joint mobilization in the upper

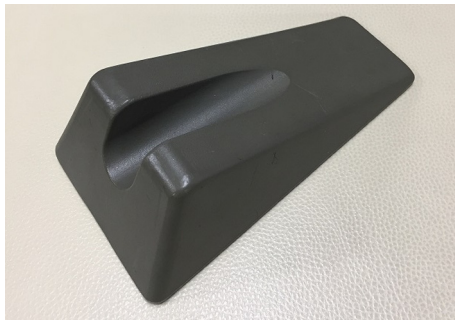


Fig. 1. Kaltenborn wedge.

Table 1 . The general characteristics of the subjects

	SSG (n=14)	SMG (n=13)
Age (yrs)	38.9 ± 6.8	36.1 ± 6.1
Height (cm)	165.1 ± 9.7	167.8 ± 9.4
Weight (kg)	61.1 ± 8.9	62.7 ± 10.4

Mean ± SD. SSG: self-stretching group; SMG: self-mobilization group.

Table 2. Comparison of within and between two groups

Group		Before	After	Change
SSG	VAS (scores)	4.4 ± 0.9	3.1 ± 1.0**	-1.3 ± 0.7
	Cervical angle (°)			
	Flexion	27.1 ± 7.5	30.6 ± 6.4**	3.5 ± 2.8
	Extension	46.7 ± 9.7	50.0 ± 9.8**	3.2 ± 2.0
SMG	VAS (score)	4.9 ± 1.3	3.2 ± 1.2**	-1.7 ± 0.9
	Cervical angle (°)			
	Flexion	29.8 ± 8.8	33.0 ± 8.4**	3.2 ± 1.6
	Extension	48.1 ± 8.7	56.7 ± 6.7**	8.6 ± 4.2†

Mean ± SD. **p<0.01, *p<0.05, †Significant difference between groups (p<0.05). SSG: self-stretching group; SMG: self-mobilization group; VAS: visual analogue scale.

thoracic shows significant improvement in terms of pain and joint ROM. Kim et al. also state that joint mobilization is more effective although statistically significant results were not revealed than the control group, which is a self-stretching group in contrast with the result of the present study. This implies that mobility of the thoracic plays an important role in disability around the neck. The improvement of functioning around the neck, which is due to therapy on the upper thoracic, supports the concept of regional interdependence¹⁹). This study applies joint mobilization to the upper thoracic without giving direct therapeutic intervention to patients with neck pain, which is also considered to be applying indirect therapeutic intervention. Hwangbo²⁰) conducted a study on thoracic mobilization and self-stretching exercises in chronic neck pain patients. Joint mobilization was reported to have had a greater positive impact on extension than on flexion of the thoracic spine. This finding is consistent with that of the current study. In addition, it is likely that the structural shape of the wedge facilitated the extension gliding movements more so than it did flexion during the self-mobilization exercises in the current study.

There were limitations to this study. Firstly, the effect of the movements was only measured in the sagittal plane when the angles of the cervical spine were being determined. Secondly, the intervention was performed over a very short period.

In conclusion, the results of the present study demonstrated that self-mobilization of the upper spine, using a Kaltenborn wedge, was useful in alleviating pain in and dysfunction of the cervical spine, and in particular, in improving cervical spine extension in this study.

Conflict of interest

None.

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