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Original Article

Correlation among scapular asymmetry, neck pain, and neck disability index (NDI) in young women with slight neck pain

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Abstract. [Purpose] This study aimed to investigate the correlations among scapular asymmetry, neck pain, and neck disability index in women in their 20s with slight neck pain. [Subjects and Methods] A total of 60 female students at U university in Gyeongsangbuk-do, South Korea, participated in this study. The lateral scapular slide test, which measures the distance between the thorax and scapula, was used to analyze the scapular asymmetry. The lateral scapular slide test was performed in three positions. The visual analogue scale and neck disability index were used to measure neck pain. [Results] In the lateral scapular slide test in position 3 (shoulder abduction at 90 degrees), the scapular left-right asymmetry and VAS showed a moderate positive linear relationship, with r=0.344. The VAS and NDI showed a moderate positive linear relationship, with r = 0.632. [Conclusion] Scapular asymmetry indicates imbalance of surrounding muscles of the scapula and is related to neck pain based on the results of measuring the distance from the thorax to the scapula.

Key words: Lateral scapular slide test, Visual analog scale, Neck disability index

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INTRODUCTION

Nowadays, many people tend to maintain a position that causes fatigue in the neck and shoulder. When the position is maintained for a long period, particular muscles related to maintaining the position suffer from loading and fatigue[1)]. The practice of repeatedly maintaining a bad position causes an increase in muscle length and subsequently structural weakness of muscles. Janda described this as upper-crossed syndrome and reported that this kind of vicious circle causes round shoulder, forward head posture (FHP), etc[2)].

Round shoulder or FHP may have bad effects on the alignment of surrounding body parts[3)]. In particular, the scapula may be affected by abnormal alignment of surrounding body parts or by muscle damage because it is not connected directly to the trunk but is fixed to the trunk mainly by muscles[4, 5)]. Scapular asymmetry also has a bad influence on the alignment of cervical joints, causing neck pain. Furthermore, women have relatively more abnormal body alignment and scapular asymmetry because of their relatively weaker muscles. Therefore, this study chose women in their 20s as subjects. The purpose of this study was to examine the correlations among scapular asymmetry, neck pain, and neck pain and neck disability index.

SUBJECTS AND METHODS

This study was conducted with 60 female students attending U university in Gyeongsangbuk-do, South Korea. Thier average age, height, and weight were 20.7 ± 1.0, 160.6 ± 5.2 cm, and 57.1 ± 8.9 kg. The selection criteria for the subjects were

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as follows: slight pain in the neck but no disease that might affect conduct of the tests. Those who had visual impairments, hearing damage, or nervous system or vestibular organ problems or were unable to understand the nature of the experiment were excluded. All subjects provided written informed consent prior to participation in the study in accordance with the ethical standards of the Declaration of Helsinki.

The visual analogue scale (VAS) was used to rate the subjects' neck pain, and the neck disability index (NDI) was used to measure functional disorder in the neck. The lateral scapular slide test (LSST) was performed to measure scapular asymmetry[6]. The distance from the inferior angle (IA) to the T8 spinous process was measured with a tape measure (shoulder abduction at 0 degrees, shoulder abduction at 45 degrees and shoulder abduction at 90 degrees). The subjects had sufficient palpation practice before the test, and each position was examined three times. All measurements are presented as the mean value ± standard deviation.

IBM SPSS Statistics for Windows (version 20.0) was used to analyze the data. Pearson correlation coefficients were used to examine the correlations among the LSST, VAS, and NDI. The statistical significance level was set to α=0.05.

RESULTS

In the LSST with positions 1 (shoulder abduction at 0 degrees) and 2 (shoulder abduction at 45 degrees; LSST-1 and LSST-2, respectively), scapular asymmetry showed no significant correlation with the VAS and NDI ($p>0.05$). In the LSST with position 3 (shoulder abduction at 90 degrees; LSST-3), scapular asymmetry showed moderate positive correlation with the VAS ($r=0.344$; $p<0.05$). Furthermore, the VAS and NDI showed moderate positive correlation ($r=0.632$; $p<0.05$) (Table 1).

DISCUSSION

The muscles attached to the scapula are balanced such that they work together so that the scapula can move correctly with respect to the thorax during upper extremity movement[4]. Losing the balance among these muscles causes inappropriate muscle action and decreases the stabilizing musculature[5]. Kibler reported that a decrease in the stabilizing musculature causes large scapular asymmetry[6]. The muscles attached to the scapula are connected to other surrounding bones. The decrease in stability due to inappropriate action of these muscles causes pain in surrounding body parts or bad postures[5]. The LSST, which measures the distance between the scapula and thorax, was used to evaluate scapular asymmetry in this study[6, 7]. There was correlation between the scapular asymmetry and the VAS only in LSST-3 (shoulder abduction at 90 degrees). The reasons for this result were as follows; First, since LSST-1 (shoulder abduction at 0 degree) was a static position and LSST-2 (shoulder abduction at 45 degrees) generated relatively smaller motion than LSST-3, the degree of dependence upon muscles in terms of scapular stability increased in LSST-3, as it generated a larger motion. In this regard, great asymmetry indicates that the muscle length difference between the muscles on the left and right sides grows, and this indicates a disturbance in the balance of power between the muscles on the left and right sides and a bad position. Therefore, scapular asymmetry showed a correlation with pain in LSST-3. Second, since the scapular asymmetry of the subjects was not severe, as they had only slight neck pain, scapular asymmetry showed no correlations with pain in LSST-1 and LSST-2. There was moderate positive correlation between the VAS and NDI with $r = 0.632$. This result is consistent with a previous study indicating that neck pain may cause moderate functional restriction in the neck[8].

In conclusion, scapular asymmetry based on the left-right difference in distance between the thorax and scapula indicated imbalance of muscles and was related to pain in the neck, which is one of the surrounding body part. A limitation of this study was that the subjects had only slight neck pain, so there were no left-right asymmetry results for people with severe neck pain. People with severe neck pain and asymmetry should also be investigated in a further study.

Table 1. Correlations among the LSST, VAS, and NDI

		VAS	NDI
LSST-P1 (mm)	7.2 ± 5.8	−0.256	−0.014
LSST-P2 (mm)	7.1 ± 4.8	−0.041	−0.033
LSST-P3 (mm)	7.3 ± 5.7	0.344**	0.046
VAS (score)	2.0 ± 2.2		0.632**
NDI (score)	2.8 ± 2.9	0.632**	

*p<0.05; **p<0.01. LSST: lateral scapular slide test; VAS: visual analogue scale; NDI: neck disability index; LSST-1: LSST with shoulder abduction at 0 degrees; LSST-2: LSST with shoulder abduction at 45 degrees; LSST-3: LSST with shoulder abduction at 90 degrees

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