The Effect of a New Neck Support Tying Method Using Thera-Band on Cervical ROM and Shoulder Muscle Pain after Overhead Work

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Abstract. [Purpose] This study proposed a new neck support tying (NST) method using Thera-Band for the prevention of neck and shoulder pain in workers doing overhead work. The purpose of this study was to investigate the effect of the new NST method using Thera-Band on cervical ROM and shoulder pain after overhead work. [Subjects] Fourteen male subjects were recruited. [Methods] This study measured the cervical ROM and pressure pain threshold (PPT) of the upper and middle trapezius (UT and MT) muscles after the control and NST groups had performed overhead work. [Results] The cervical flexion, extension, and lateral flexion angles of the NST group were significantly larger than those of the control group. The PPTs of UT and MT of the NST group were significantly higher than those of the control group. [Conclusion] The NST prevented ROM reduction and pain in the cervical and shoulder regions.

Key words: Neck supporter, Overhead work, Thera-Band

INTRODUCTION

The head and neck posture of an individual can influence soft-tissue relationships in the cervical and shoulder region1, 2). A common concern in the modern workplace is upper extremity disorders arising from overhead work, which is associated with neck and shoulder disorders and pain3). Long-term overhead working postures result in strain and fatigue of the shoulder muscles because arm elevation is associated with shoulder muscle fatigue4, 5). Previous studies have focused on risk factor analysis and the development of therapeutic exercises for overhead work-related disorders rather than prevention6, 7). Some studies have been performed on postural ergonomic interventions including working techniques for overhead work6, 7). However, we found that few studies have focused on protective ergonomic devices for overhead workers. Therefore, this study investigated a new neck support tying (NST) method that used a Thera-Band for the prevention of neck and shoulder pain in workers performing overhead work. The new NST method supports the neck during hyperextension and prevents excessive upward rotation of the scapula during overhead work. The purpose of the present study was to investigate the effect of this NST method on cervical ROM and shoulder pain after overhead work.

SUBJECTS AND METHODS

The subjects were divided into two groups as follows: a control group consisting of 7 males without NST, and a NST group consisting of 7 males with NST. The initial cervical ROM and initial PPTs of the UT and MT were not significantly different between the two groups. The initial values of cervical flexion, extension, and right and left lateral flexion in the control group were 63.4±4.2, 72.8±6.0, 53.9±2.9, and 51.3±5.6 degrees, respectively. The initial values for cervical flexion, extension, and right and left lateral flexion in the NST group were 62.3±5.1, 72.5±3.9, 53.3±3.0, and 52.2±2.4 degrees, respectively. All participants gave their informed, written consent according to the protocol approved by the Human Ethics Committee of the Yonsei University Faculty of Health Science. This study examined a new NST method that uses a Thera-Band for the prevention of neck and shoulder pain in workers performing overhead work. For the NST method, we used the grey Thera-Band (60 cm length) which was applied as follows. The midpoint of the Thera-Band supported the posterior aspect of the neck, and both ends of the Thera-Band were passed under both axillae, and tied behind the back. The NST provided support for neck hyperextension and prevented excessive upward scapular rotation during overhead work. Cervical flexion, extension, and right and left lateral flexion were measured with a Cervical Range of Motion (CROM) instrument (Performance Attainment Associates, St. Paul, MN, USA) before and after the overhead work. A dolorimeter pressure algometer (Fabrication Enterprises, White Plains, NY, USA) was used to
measure the pressure pain threshold (PPT) of the right side upper trapezius (UT) and the lower trapezius (LT) muscles. A 1-cm² rubber plate delivers pressure from the probe to the body, and the pressure is read from a needle gauge. The clinical reliability of the measurements is greater than 80%. All subjects performed one trial of overhead work with their arms over their heads for 15 min. The overhead work was performed at a height of 25 cm above each subject’s head. The overhead work was a bolt and nut assembly task. Differences in cervical ROM and PPT between the NST and control groups after the overhead work were tested with the independent t-test using the SPSS statistical package (version 18.0; SPSS, Chicago, IL, USA). Significance was accepted for values of p<0.05.

RESULTS

The cervical flexion, extension, and lateral flexion angles of the NST group were significantly larger than those of the control group (p<0.05). The cervical flexion, extension, and right and left lateral flexion of control group were 50.4±8.2, 64.7±11.3, 41.7±7.9, 43.2±9.2 degrees, respectively. The cervical flexion, extension, and right and left lateral flexion of NST group were 61.5±11.2, 69.4±6.9, 48.7±5.6, 49.8±6.7 degrees, respectively. The PPT of UT of the NST group (5.8±1.4 lb) was significantly higher than those of the control group (6.3±2.0 lb) (p<0.05). The PPT of MT of the NST group (7.2±1.8 lb) was significantly higher than those of the control group (6.3±2.0 lb) (p<0.05). The cervical flexion, extension, and right and left lateral flexion angles of the NST group were significantly larger than those of the control group.

DISCUSSION

Repeated and sustained working with elevated arms is known to lead to neck and shoulder pain8). This study proposed a new neck support tying method using Thera-Band and investigated its effect on cervical ROM and shoulder pain after overhead work. Reductions in ROM have implications for the safety and efficiency of functional activities, and lead to a loss of corrective or protective reactions1, 9). ROM losses can occur from inactivity and structural changes of the tissues in the cervical spine, and result in an increase in connective-tissue density, shortening of collagen tissue, and muscle fibrosis1, 9). In this study, the cervical flexion, extension, and lateral flexion angles of the NST group were significantly larger than those of the control group. Shoulder forward flexion is associated with the trapezius muscles. Shoulder forward flexion with scapular upward rotation requires the activation of the upper trapezius, and overstretches the middle trapezius through scapular protraction3, 5, 7). The PPTs of the UT and MT were significantly lower in the NST group than those of the control group. These results indicate that the NST supported the neck and prevented excessive scapular elevation and upward rotation during overhead work. The Thera-Band, which provides varied resistance through the range of movement, has been used for rehabilitation in combination with therapeutic exercise10). It is light and portable, has low resistance, and can be adjusted to accommodate various situations11). The NST method prevented ROM reduction and pain in the cervical and shoulder regions. The NST method can be easily and simply applied using a Thera-Band and is also inexpensive. We suggest that industrial workers could use the NST method when performing overhead work.

REFERENCES