Correlation between muscle tone and pain of the upper trapezius

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Abstract. The purpose of this study was to investigate the correlation between muscle tone and pain of the upper trapezius muscle. The subjects were composed of 46 young college students (M = 20, F = 26) with mild pain in upper trapezius. The subjects were measured pain (VAS), muscle tone of the trapezius in resting supine position. Statistical analysis was performed using Pearson’s correlation test. There was a weak positive correlation between neck pain and muscle tone (P<0.05), Although there is a correlation between mild pain and muscle tone, later studies will need to investigate muscle tone in severe pain.

Keywords: Muscle tone, Myotonometer, Upper trapezius

1. Introduction

Trapezius myalgia is a common musculoskeletal disorder, characterized by pain, stiffness and tightness of the upper trapezius muscle. It is often work-related and results from prolonged static and repetitive work tasks[1]. Use of a smartphone for a long time is also included here, which can cause changes in cervical and lumbar posture and also in the inherent proprioceptors of the cervical spine[2]. And, postural abnormalities can cause more pain in the neck[3], for these reasons, chronic nontraumatic neck pain were shown to have a more forward head posture than matched pain-free participants[4]. These chronic pain leads to changes in the muscle tone of the shoulders and trunk muscles[5]. Increasing stiffness in the upper trapezius muscle may contribute to imbalance of scapular motion, and result in shoulder and neck discomfort during shoulder flexion[6]. Recent studies used the myotonometer to measure muscle tone[1][7], this device is a feasible tool to quantify upper trapezius stiffness as well as changes in muscle stiffness[6]. Therefore, in this study, we investigate to compare the muscle tone of younger adults with or without pain in upper trapezius muscle.

2. METHODS

2.1 Subjects

The subjects were college students from Shinsung University in Dangjin, Chungnam, South Korea. The subjects were 46 young college students (M = 20, F = 26). Among the study subjects were either orthopedic disease or upper trapezius with pain greater than or equal to VAS 6 were excluded. Also excluded are subjects taking physical therapy or medication due to neck or shoulder pain. The subjects of the study were asked to explain and consent to the protection of personal information, to explain the experimental method, purpose, and safety issues and agreed in writing to participate voluntarily.

2.2 Intervention

The subjects used the 10 point visual analogue scale(VAS) as one of the commonly used pain assessment scales clinically in order to measure the degree of trapezius pain, and we used the myotonometer to measure the muscle tone of the upper trapezius by group. The measurement posture was made as comfortable as possible in the supine position.

2.3 Measurement of the muscle tone and stiffness

For this study, MyotonPRO(MyotonAS, Estonia) was used as a myotonometer. The myotonometer consists of a main body with a measurement probe, and that is to measure the muscle tone for in vivo non-invasive measurement of soft biological tissues. MyotonPRO was based on
exerting a damped mechanical oscillation of soft biological tissue by using and exterior, light, quick-release mechanical impulse under constant pre-load. The muscle tone were measured by natural oscillation frequency (Hz). The interrater and intrarater reliability test of the measurement was referred to as over the r=.97[9].

To measure the muscle tone of upper trapezius, subjects is in a comfortable supine posture, and a mark was placed on the highest muscle belly of the upper trapezius on preference side. And the probe of myotonometer was placed vertically(Fig. 1). The average value of three trials was used as data.

![Figure 1. muscle tone and stiffness measurement posture](image)

2.4 Statistical processing
As a statistical analysis was performed using correlation analysis was performed to analyze the correlation between variables on SPSS 24.0 version. Statistical significance was 0.05.

3. Results

3.1 Subject characteristics
Of the 46 subjects, the average age of subjects was 21.1±1.1 years, the average height was 163.2±5.8 cm, and the average weight was 60.4±13.5 kg (Table 1).

| Table 1. General characteristics of the subjects (N=46) |
|-----------------------------------------------|-----------------|
| groups                                       | total(N=90)     |
| age(years)                                  | 21.1±1.1        |
| height(cm)                                  | 163.2±5.8       |
| weight(kg)                                  | 60.4±13.5       |

M±SD

3.1 Correlation analysis between pain and muscle tone
As a result of analyzed the correlation between pain and stiffness of the upper trapezius, there was a weak positive correlation between muscle tone and mild pain(correlation coefficient=0.229, p<0.05), Table 2 and Figure 2 show the correlation and scatter plot of each variables.

| Table 2. Correlation analysis between pain, muscle tone and stiffness (N=46) |
|-----------------------------------------------|-----------------|
| muscle tone                                 | pain(VAS)       |
| Pearson                                      | 1.000           |
| P-value                                      | 0.229           |
|                                              | 0.039*          |
4. Discussion

Musculoskeletal pain conditions including myofacial pain syndrome are some of the most important chronic problems that arise in clinical practice[10]. This study began with questions about how young college students in their 20s usually have neck and shoulder pain, and selected the upper trapezius muscle, which frequently complained myalgia and was relatively easy to measure [11]. Even with low-levels muscle activity of trapezius, a longer period can be a risk of neck pain. Ahlgren[12] suggested that the pain was found to be transient and the pain ratings decreased to pre-test level within 24h. Our study was based on the fact that the students in their twenties were exposed to the use environment of various smart devices, Unexpectedly, only about 50% had trapezius pain, this is not because of long-term use of high-intensity muscles, and probably because of the young age group. VAS was used to measure the degree of pain. VAS has been used extensively in research and many researchers have adopted millimeter precision to measure acute and chronic pain intensity [13]. VAS score is interpreted marking 1/4, 1/2, 3/4 positions on a VAS, corresponding to mild (25 mm), moderate (50 mm), and severe (75 mm), Sharma et al.[14] was the result of a survey average of 3.5 points to 15 subjects in the VAS score in the upper trapezius, but this study, the mean value of the remaining 45 patients, excluding 45 patients with a VAS value of 0, was 2 because the pain was so severe that normal conditions were measured except for subjects receiving other therapeutic interventions. For this study, MyotonPRO(MyotonAS, Estonia) was used as a myotonometer. MyotonPRO had very high within-day and high between-day reliability[12]. Because of this high reliability, many recent studies related to the measurement of muscle tone use this device. It is used to measure the degree of spasticity in patients with neurological disorders such as stroke[13], as well as measuring the degree of muscle stiffness of subjects with myalgia[14]. This result is the same as the results of this study, in which the degree of pain is not related to muscle stiffness. However, it is in contrast to our study that there was a correlation between muscle tone and pain.

5. Conclusion

of this study was to investigate the correlation between muscle tone and pain of the upper trapezius muscle. Therefore, the correlation in muscle tone due to pain was showed a weak
relationship. In the future, the relationship between more severe pain and muscle tone will be needed.

References