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The Effects of Muscle Trapezius Latent Trigger Point Vibration on Vertical Standing in Romberg Test.

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ABSTRACT

It has been generally accepted that the neck afferents play a major role in postural adjustment. Our research was conducted to evaluate the effects of short-term vibration of latent myogenic trigger points of m. trapezius on balance. 41 subjects aged 18 to 25 years (12 men, 28 women) participated in the study: 32 individuals with revealed latent cervical trigger points of trapezoid muscle, 9 individuals with healthy neck muscles. Romberg posturography test was used to analyze balance control. Trapezius muscle vibration was performed once within 1 minute with vibration frequency 100Hz. Romberg test conducted twice: both previous and after vibrational irritation. According to Romberg rate results population was ranged on 3 subgroups: within normal rates, above and below the norm. It was shown that vertical posture doesn't relate to neck myogenic trigger points. Romberg rate had tend to growth if initial point is decreased meanwhile population with rate above the norm showed insignificant reduction up to normal. It was shown that vibration activates senso-motor integrations regardless of myogenic trigger points and as a result improves Romberg rate.

Keywords: neck muscle vibration, posturography, Romberg test.

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INTRODUCTION

Cervical vertigo is defined as nonspecific sense of positioning change in the space. It can be caused by pathological afferentation from the strained neck muscle and joint proprioceptors, which are combined with vestibular and visual inputs in the CNS, disorienting the postural control system [1, 2]. One of the factors causing pain is myofascial trigger points (MTP) of the cervical muscles. MTP is defined as a tender point in discrete taut bands of hardened muscle or in the muscle fascia, which produces local and reflected pain [3]. Latent MTZ is an trigger spot which may have all the other clinical characteristics of an active TrP, but clinically asymptomatic in relation to spontaneous pain, it always has a taut band that increases muscle tension and restricts range of motion and can be painful only on palpation [3,4]. Patients with cervical vertigo complaint on a sensation of disorientation in space and the subjective sense of unsteadiness that occurs spontaneously and lasts from minutes to several hours. Vertigo intensifies with neck movement and/or increased pain in the neck. The mechanisms underlying these processes have not been sufficiently studied yet, but the dependence on the activity of proprioceptors is a distinctive sign of these sensomotor disorders [5]. The correlation between proprioceptive stimulation, resulting in abnormal afferent input and sensory-motor response in patients with neck pain was revealed [6]. It was shown that the activation of neck proprioceptive systems with continuous vibration or tonic deviation of the head has a significant effect on postural stability [7], the walk trajectory [8, 9] and spatial orientation [10, 11]. It is assumed that cervical dizziness should be closely related to the cervical pain syndrome, trauma or other pathology of neck, and, consequently, reducing the severity of neck pain is expected to be accompanied by cervical vertigo symptoms relief [8]. Thus, Muceli et al (2009) showed that short-term vibration of the neck muscles increases postural stability in subjects with complaints on neck pain [12]. However, in a number of studies the rapid disruption of the sensorimotor function as a result of vibrational stimulation of the neck muscles in healthy subjects has been described [13].

PURPOSE OF THE STUDY

The aim of this study was to determine the effect of vibration myogenic trigger points of the trapezius muscle on postural stability in the Romberg test.

RESEARCH METHODS

The study included 41 subjects aged 18 to 25 years (12 men, 28 women), of whom 31 people - with latent MTP trapezius muscles, 9 - the control group (without MTP). All stages of the study were conducted with the voluntary informed consent of the subjects.

Prior to the study, medical assessment was conducted, including otoneurological survey, general somatic and neurological examination. The inclusion criteria were the following: the presence of latent MTZ trapezius muscles unilaterally; the exclusion criteria: neck injury, any musculoskeletal pathology, patients complain of pain in the neck that occurs in the last six months, neurological disease, episodes of dizziness in the anamnesis, receiving antipsychotics, anxiolytics, antidepressants and sedatives. During the examination latent trigger zones of trapezius muscles were revealed. The pain intensity of these areas was assessed subjectively by visual analogue scale (VAS) before and after vibration exposure. The effects of vibration on the MTP of the trapezius muscle (horizontal portion) was carried out using the unilateral vibration with frequency 100 Hz and 1 minute duration.

Computerised posturography were conducted. Romberg test was conducted to estimate upright stance with open and closed eyes (study with eyes open for 20 seconds, with the eyes closed for 20 seconds). Romberg test was evaluated twice for each individual: previous to vibration and after it. Romberg rate (RR) was assessed to calculate the ratio of stance ellipse with open and closed eyes. Normally RR ranges from 100 to 250%.

Statistic procession was performed by the OriginPro2016 software using nonparametric analysis of Wilcoxon and Mann-Whitney. The difference is considered to be statistically significant at p-value less than 0,05.

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FINDINGS

According to the Romberg rate all subjects in both groups (with/without MTPs) were divided into 3 subgroups: individuals with initially normal RR (1) exceeded normal range (2) or was less than normal (3). In the group of subjects with MTP of the trapezius muscle the proportion of individuals with a normal rate in the Romberg test was 50%, subnormal was 13%, exceeding this value was 37%. In the control group respondents were distributed equally - 33% for each group respectively (Fig.1). The analysis of changes in RR after vibrational stimulation in the control group is shown in Figure 2. As can be seen from Fig. 2 subjects with initially subnormal Romberg rate had shown RR an increase by 176% (Fig. 2A, $p > 0.05$). In individuals with initially normal RR a significant increase in this rate after vibrostimulation by 100% ($p<0.05$) was noted (Fig. 2B). In subjects whose RR was above the normal ranges a decline by 110% was noted and measured up to the range of normal values ($p>0.05$), (Fig.2B).

After trapezius muscle vibration in individuals with myofascial trigger points, in the subgroup with subnormal Romberg rate, noted its significant increase by 139 % ($p<0.05$), (Fig. 3A). In individuals with initially normal RR an increase in this indicator after vibrostimulation 77 % had been noted ($p>0.05$). In subjects with myofascial trigger points, whose RR was higher than normal, its decrease by 61% and approximate to the range of normal values ($p>0.05$) had been shown (Fig. 3B).

Moreover, the effect of subjective reduction of pain intensity in the area of myofascial trigger point on Romberg rate in individuals with latent MTP was assessed. Both patients who reported a subjective reduction of pain syndrome by visual analogue scale and individuals who did not notice any alteration in pain intensity had not shown any significant change in the Romberg rate.

Short-term effects of unilateral vibration stimulation of trapezius neck muscles in individuals with latent myogenic trigger points in these muscles and in the control group had been studied. The evaluation of the effect was based on the results of Romberg's test. In our previous study [14], we did not reveal a reliable correlation between the presence of MTP of the neck muscles and postural balance decrease. However taking into account the trend of changes in the posturography parameters, we assumed that the vibration effect on the neck muscles might increase postural stability. This is related to the fact that cervical proprioception is a powerful tool of body space orientation during both the motion and stance [15]. Our results demonstrated improvements in postural stability in subjects with MTP and in the control group, whose RR level was initially subnormal, what confirms the effect of proprioceptive stimulation on the ability to perceive the position of the head in space relatively to the body. It is believed that vibration of neck muscles in patients serves as the countermeasure of the disrupted perception of head position [6]. It is well known that there is a close relationship of the cervical spine and postural control. In healthy people, noted an increase in postural stability during vibration of neck muscles [13, 16]. In addition, it is shown that fatigue of the neck muscles can lead to an increase of the Romberg rate [17, 18]. In patients with neck pain, the majority of studies reported the violation of posture in comparison with healthy subjects [19, 20]. Thus, the vibration stimulation of the neck muscles can become a tool in the treatment and rehabilitation of patients with vestibular disorders by improving their postural stability. In the future it will be important to consider the delayed effects on the postural stability of vibratory stimulation of the neck muscles.

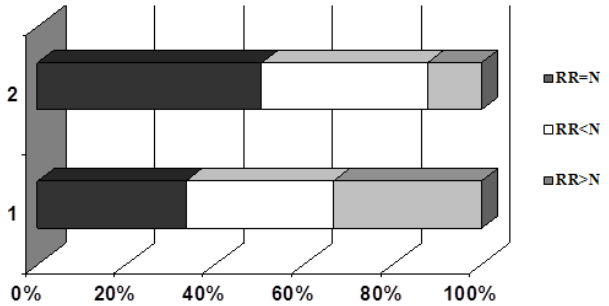

Fig 1: Share of respondents according to the Romberg rate in both groups: without latent MTP (1) and with latent MTP of trapezius muscle (2); *KP=N* - individuals with initially normal RR, *KP>N* – RR exceeded normal range, *KP<N* –RR was less than normal.

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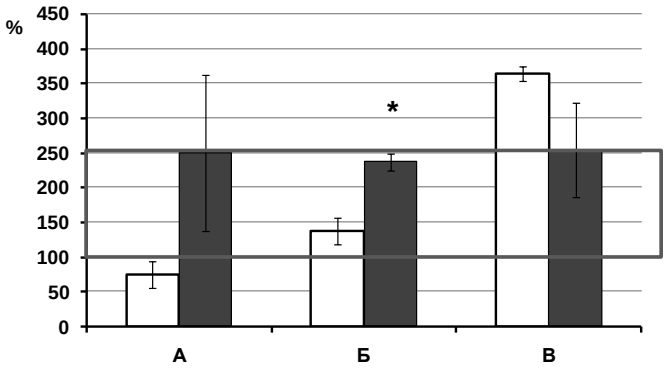

Fig 2. Romberg rate alteration after vibrational stimulation in individuals with trigger points with initially subnormal rate (А), normal rate (Б) and exceeding normal rate (В). White bars – previous to stimulation, grey bars – after stimulation, Y-direction – Romberg rate, rectangle shows normal range (100-250%), * - p<0.05.

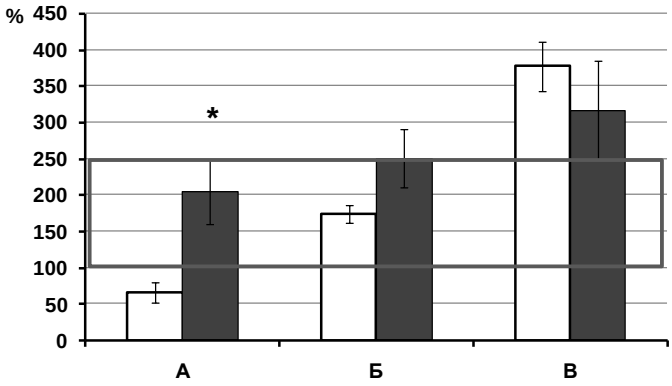

Fig 3: Romberg rate alteration after vibrational stimulation in individuals with trigger points with initially subnormal rate(А), normal rate(Б) and exceeding normal rate(В). White bars – previous to stimulation, grey bars – after stimulation, Y-direction – Romberg rate, rectangle shows normal range (100-250%), * - p<0.05.

CONCLUSION

1. The maintenance of the vertical posture doesn't rely on the presence of a trigger in the trapezius muscles in humans.

2. In persons with myofascial trigger zones in a trapezius muscle in a subgroup with an initially lowered Romberg rate, this index increases to a normal range.

3. Vibrational stimulation of the trapezius muscle activates muscle proprioceptors regardless of the presence of myogenic trigger zones in it resulting in the posturography's parameters improvement.

4. Our data shows that neck muscle vibration can be an effective tool in cervical vertigo treatment and rehabilitation of patients with vestibular disorders trough postural stability improving. However further investigation is demanded.

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