

## Summary

### MYOFASCIAL TRIGGER POINTS THERAPY OF THE SHOULDER AND NECK RIM MUSCLES AS A FACTOR MODIFYING THEIR BIOMECHANIC CHARACTERISTICS AND THE BIOCHEMICAL VARIABLES OF THE BLOOD IN MIGRAINE PATIENTS

The tension of the shoulder girdle muscles limits neck mobility and may contribute to migraine headache, thereby it can reduce the quality of life associated with daily functioning. It is assumed that muscle tension is caused by the formation of bundles of fiber as a result of chronic contraction of the sarcomers, which leads to the formation of Myofascial Trigger Points (MTrPs). Their increased number was found in the muscles of the shoulder girdle in people with migraine. The presence of MTrPs may contribute to muscle weakness, the reduction of muscle elasticity, proprioception disorder, appearance of stiffness and local increase in the concentration of calcitonin gene-related peptide (CGRP), substance P (SP) and pro-inflammatory cytokines, which causes pain, including migraine pain.

The treatment of migraine headaches is usually symptomatic and is not always effective. Poor tolerance of anti-migraine drugs or restrictions of the use of drugs during pregnancy necessitates the search for other treatments for headache attacks. Attempts have been made to use non-pharmacological methods, such as muscle relaxation techniques, e.g. alternating stressing and loosening of separate muscle groups, autogenic relaxation techniques through a conscious change in breathing rhythm, auto-instructions of the sensation of heat and heaviness in given body parts, or meditation. The above rehabilitation measures contribute to better pain tolerance and better quality of life in the event of migraine. Therefore, undertaking research on a non-pharmacological method of migraine treatment seems justified. Research results to date have shown that therapy by deactivating MTrPs causes a decrease in the concentration of SP and CGPR in the blood of healthy people. In addition, no direct effect of shoulder girdle and neck muscle therapy by deactivating MTrPs on individual aspects of headache has yet been demonstrated.

The goal of the doctoral dissertation was to examine whether shoulder girdle and neck muscle therapy (TOBS) by deactivating MTrPs modifies muscle biochemical parameters, blood biochemical markers and reduces headache in people with migraine. In addition, it was examined whether the improvement in health obtained as a result of rehabilitation resulted also in the improvement in the quality of life. The aim of the research was achieved by

finding answers to six research questions. They concerned the answers to the questions whether TOBS therapy causes a change in:

- 1) the range of mobility of the cervical spine,
- 2) biometric variables (stiffness, elasticity and tension) of selected muscles,
- 3) the concentration of selected biochemical factors (protein S100 beta, substance P (SP), calcitonin gene-related peptide (CGRP), brain-derived neurotrophic factor (BDNF)) in the serum of people with migraine,
- 4) sensations of headache,
- 5) pain of shoulder girdle muscles,
- 6) quality of life associated with health.

The following hypotheses were verified:

1. Inactivation of MTrPs through TOBS therapy improves the biomechanical properties of the cervical spine (increases the range of mobility of the cervical spine – lateral slope, rotation and forward tilt) in people with migraine.

2. Deactivation of MTrPs through TOBS therapy improves resting (base) biomechanical properties (reduction of tension, stiffness and increase of flexibility) of shoulder girdle muscles.

3. Deactivation of MTrPs through TOBS therapy causes a decrease in the concentration of biochemical markers in the blood associated with the severity of migraine pain.

4. TOBS therapy by deactivating MTrPs has a positive effect on biomechanical and biochemical variables, reducing the sensations of headache and muscle pain and improving the quality of life in people with migraine.

The study involved 57 women aged 25-55 and was completed by 53 of them. They were divided into 3 research groups by a diagnosed type of migraine:

- 1<sup>st</sup> group EMb - 31 patients with paroxysmal migraine without aura
- 2<sup>nd</sup> group EMa - 15 patients with migraine aura
- 3<sup>rd</sup> group CM - 7 patients with chronic migraine.

The study included patients diagnosed with migraine lasting at least 12 months. The type of migraine was diagnosed by a specialist neurologist according to international criteria (classification) headache disorders (beta ICHD-3) [47, 51].

The patients underwent TOBS therapy (7 interventions in the area of the shoulder girdle and neck muscles by deactivating trigger points performed every 2 or 3 days) according to the criteria described by Simons and Travell [94]. During the therapy, patients did not take painkillers (for headache). However, during the migraine attack they could undergo surgery and research measurements. Biomechanical measurements of cervical spine mobility, shoulder girdle muscle and biochemical blood properties were performed before, during (after the first, fourth and seventh intervention) and after completing a patient's therapy. Biomechanical measurements were repeated one month after the end of TOBS therapy. Measurements of cervical spine mobility were performed using Noraxon accelerometer sensors of the Myo Motion 18 apparatus (Noraxon, Scottsdale, USA), myometric measurements of muscle tension, stiffness and elasticity using the Myoton Pro apparatus (Tallinn, Estonia). The concentration of biochemical factors (SP, S100beta protein, CGRP, BDNF) was determined by immunochemical ELISA according to the instructions of the kit manufacturers (Biotechne, London UK). Before starting, after a therapy and a month after the last intervention, patients completed the WHOQoL-BREF health quality questionnaire regarding pain sensations by means of VAS (visual analogue scale) scale and the number of medications they took.

Study results show that TOBS therapy for shoulder girdle and neck muscles increases the range of motion of the cervical spine in all directions after 7 therapy sessions and lasts a month after the therapy in all migraine patients. In addition, TOBS therapy improves muscle properties (tension, flexibility and stiffness) mainly in the group of people with migraine without aura and chronic migraine. TOBS therapy resulted in the improvement of muscle flexibility, tension and reduction of their stiffness in case of patients with migraine without aura and chronic migraine. It was found that TOBS therapy reduced the level of S100 beta statistically, significantly in case of patients with EMA and CM. No changes in CGRP levels were observed (in all cases) during and after the treatment. Patients with migraine reported a reduction in muscle pain sensations during subsequent TOBS treatments. In addition, the therapy contributed to a significant reduction of headache during a migraine attack after the therapy.

The level of the quality of life research using a scale WHOQoL-BREF (WHO quality of life) showed an increase in health satisfaction and a significant increase in the somatic sphere, which determines the activities of everyday life in people with episodic migraine without aura and with aura. Subjects after therapy felt a significant improvement in well-being and reduced pain during migraine attacks, which was not such an obstacle when performing everyday activities as before TOBS therapy. In contrast, people with CM did not see any improvement or deterioration in health-related quality of life. One month after TOBS therapy, an increase in the number of people with episodic migraine who were not taking any medication was found. On the other hand, people with EMa and EMb receiving painkillers, one month after therapy, reduced both the number and frequency of their intake. No change was observed in people with CM. TOBS treatment is effective for people with episodic migraine.

**Key words:** headache, migraine, pain therapy, MTrPs, non-pharmacological treatment, migraine therapy, trigger point therapy, cervical spine