

Electroencephalography in assessing the effectiveness of the combined method  
acupuncture in patients with dysmenorrhea N.V.

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In the International Classification of Diseases, painful menstruation is designated by the term "dysmenorrhea", which means a cyclically recurring pain syndrome caused by a complex of neurovegetative, metabolic and behavioral disorders accompanying menstrual endometrial rejection [5, 16, 18].

Clinicians noted that primary algodismenorrhea often affects women of a certain constitutional type and mental make-up, namely asthenic physique with low body weight, easily excitable, emotionally labile, prone to fainting. These patients often have symptoms of vegetative-vascular dystonia or asthenoneurotic syndrome [11, 23].

In patients with dysmenorrhea, insufficiency of the ergonomic influences of the reticular formation of the midbrain is often revealed. Clinical manifestations of the latter, in addition to pain, are neurovegetative and psychosomatic symptoms (intense migraine-type headache, fever with chills or internal tremors, a feeling of heat, the appearance of red spots on the neck in the form of a "vascular necklace", pain in the heart and palpitations, intestinal colic due to spasm of arterioles, constipation, increased urination) caused by an increase in the release of norepinephrine with increased utilization of serotonin [4, 14, 22].

Currently, there are many definitions of pain. One, given by the International Association for the Study of Pain, defines pain as an unpleasant sensation and emotional experience that arises in connection with a present or potential threat of tissue damage (Bogduk, 1994). This definition does not assess the nature and origin of the painful stimulus, but equally indicates both its affective connotations and conscious interpretation [8].

Neurophysiologists believe that pain information enters the spinal cord and brain stem structures from three main classes of receptors: monomodal mechanical nociceptors, bimodal mechanical and thermal nociceptors, and polymodal nociceptors [7, 8].

The reticular formation of the brainstem occupies one of the leading places in the central mechanisms of nociception. It contains an extensive neural system, extending from the caudal end of the medulla oblongata to the mesodiencephalic formation. The nuclei of the ventrobasal complex and the nuclei of the posterior group of the thalamus form projections to the primary (S1) and secondary (S2) sensorimotor areas of the cortex [3, 17, 21, 27].

The involvement of the primary and secondary regions of the somatosensory cortex is different in

response to pain stimulus: zone S<sub>2</sub> plays a role in pain perception, zone S<sub>1</sub> - in the regulation of motor act in response to pain [8,13]. Thus, there is no "pain center" in the brain, and perception and response to pain is a function of the central nervous system as a whole. It has been observed that people of different ethnic groups differ in their perception of pain: patients of European descent report less intense pain than American Negroes or Hispanics. Any chronic illness or malaise accompanied by pain affects the emotions and behavior of the individual [7].

Chronic pain is characterized by the development of additional neurophysiological reactions, a sharp increase in the influence of psychological factors. According to many pathophysiologists and clinicians, chronic pain is an independent disease with a primary process in the somatic sphere and secondary dysfunction in the peripheral and central nervous system with the participation of personality-psychological mechanisms [22, 9, 15, 19].

The fight against chronic pain continues to be one of the urgent and extremely difficult problems in biology and medicine. One of the directions of its solution is the search for new pain relievers, the effectiveness of which is largely determined by the level of fundamental research on the mechanisms of pain.

However, existing and newly synthesized agents for the treatment of dysmenorrhea often have a number of properties and disadvantages, the main of which are the ability to cause side reactions, the presence of drug intolerance in patients, and a decrease in effectiveness during treatment [26].

Another direction in the creation of a rational therapy for pain in dysmenorrhea may be further progress in the understanding and scientifically based application of various methods of non-drug therapy, and, in particular, acupuncture. Acupuncture, as one of the oldest methods of dealing with pain, is now widespread due to its reliability and sufficient effectiveness [13].

During acupuncture treatment, there is a decrease in the positive phase of the potentials of the sensorimotor cortex, suppression of the most highly integrated emotional-behavioral manifestations of pain. In addition, it causes a change in the background impulse activity of neurons of the giant cell nucleus of the reticular formation, which have connections with the centromedial nucleus of the thalamus [2, 6, 25]. Stimulation of acupuncture points leads to activation of the antinociceptive system and is accompanied by the release of endogenous morphine-like oligopeptides, leading to an increase in the pain sensitivity threshold [24].

In the uterus, as in any other organ, there are peripheral endings of the centripetal nerves that perceive chemical, physical and mechanical stimuli. Impulses from uterine interoreceptors, entering the central nervous system and reaching the cerebral cortex, signal the state of the uterus at any given moment [6, 10, 12]

Our task was to study changes in the biocurrents of the cerebral cortex in patients with dysmenorrhea (during their treatment with the combined method of acupuncture) and in women who do not complain of painful menstruation.

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For this purpose, on the eve of the expected menstruation, we examined 27 women aged 16-35 years. 9 of them had previously undergone 3-4 courses of acupuncture treatment for dysmenorrhea against the background of chronic salpingo-oophoritis, had practically no complaints of painful regulation and made up the first (main) group. 10 patients applied for the first time and indicated painful menstruation and were included in group II (comparison). The women were worried about frequent pain. Painful aching, pulling, dull, constant or periodic, more often local - in the left iliac region, sometimes diffuse - in the lower abdomen, in the groin regions, in the sacrum, lower back, as a rule, aggravated by the influence of unfavorable factors (hypothermia, ARVI, intercurrent diseases, stressful situations, after physical and mental fatigue).

When assessing alpha activity in the comparison group, attention is drawn to the smoothness of the zonal gradient of 50% (versus 11% in the main group and 12.5% - in the control), in addition, only in this group (comparison) in one case there was a decrease in frequency to 7 Hz and amplitude - to 25  $\mu$ V. Disorganization of alpha activity was observed in 4 women (40%) in the second group, in one (11%) in the first and none in the third. In the comparison group, there were bilaterally synchronous flashes of the alpha range in 3 (30%) patients, alpha and theta range - also in 3 (30%) cases. Interhemispheric asymmetry in the alpha rhythm was detected in 2 (20%) women. In the control group, only bilaterally synchronous flashes of the alpha range were noted in one (11%) case, in the main group - flashes of the alpha and alpha and theta ranges - in two (22%).

In 6 (60%) patients with dysmenorrhea, a weakly expressed beta activity was observed and in 5 (50%) - a decrease in the gradient of its activity. In group III, a decrease in beta activity was noted in only one (12.5%) woman. In the group of treated patients, there was also one (11%), while a decrease in the gradient of beta activity - in 2 (22%). Low-frequency beta rhythm occurred in 3 (30%) patients of group II, in 1 (11%) - the main one, and was not observed in group III. Also, in 2 (20%) cases in patients with dysmenorrhea, an increase in the amplitude of beta activity of more than 15  $\mu$ V was revealed.

Theta activity was determined in 8 (80%) women with painful menstruation, and in 3 (30%) women it was represented by wave groups, and in 3 (30%) women their amplitude exceeded 30  $\mu$ V. In the control group, only 2 (25%) had a single theta activity with an amplitude of up to 20  $\mu$ V. In women treated with acupuncture, theta activity was determined in 4 (44%) cases, and single, with an amplitude of up to 25  $\mu$ V - in 3 (33%), and in the form of a group of waves - in 1 (11%) case.

On photostimulation, changes in the background EEG were observed only in the comparison group: disorganization occurred in 3 (30%) patients; increased outbreaks - in 4 (40%), paroxysmal activity appeared in one (10%) patient.

Hyperventilation was responded by disorganizing the background EEG of 3 (30%) women in the comparison group, paroxysmal activity was detected in 2 (20%) of this

group and 1 (11%) group I. In the comparison group, there was an increase in outbreaks in 4 (40%) cases, an increase and increased frequency of theta activity - in 1 (10%), interhemispheric asymmetry - in 1 (10%). In the main group, there was an increase in outbreaks in 2 (22%) women. In group III, no changes were observed.

In the control group, the normal type of organization was found in 5 (62.5%) women, mild regulatory changes - in 2 (25%), mild cerebral changes - in 1 (12.5%).

In the comparison group, the normal type of organization was not revealed in any patient, mild regulatory changes occurred in 3 (30%) women, moderate regulatory changes in 2 (20%), mild cerebral changes in 2 (20%), moderate cerebral changes - in 2 (20%), dysfunction of midline structures - in 4 (40%), disorganized type - in 3 (30%), interhemispheric asymmetry in alpha and theta activity - in 1 (11%), delayed alpha rhythm - in 1 (11%), interest in the mediobasal parts of the brain - in 1 (11%), increased seizure readiness of the brain - in 1 (11%).

In the main group, the normal type of organization was found in 3 (33%) patients, slight regulatory changes occurred in 2 (22%) women, moderate regulatory changes - in 1 (11%), mild cerebral changes - in 2 (22%), moderate cerebral changes - in 1 (11%), de-synchronous type - in 1 (11%), diencephalic structures dysfunction - in 1 (11%), signs of irritation of diencephalic-mesencephalic brain structures - in 1 (11%).

The analysis of EEG data indicates that women suffering from painful menstruation have pronounced certain disorders of the bioelectrical activity of the brain: 50% of women with dysmenorrhea had EEG changes indicating the presence of hypothalamic disorders, disorders of diencephalic structures, evidence of which changes in alpha, beta and theta activity, the presence of generalized paroxysmal outbreaks, single and group waves (mainly in the frontal-central leads) serve. In addition, after our examinations, we found that in women who have undergone acupuncture courses, the beta rhythm stabilizes, theta activity decreases, the alpha rhythm, which is the so-called optimal rhythm of arousal, and at rest is dominant in relation to others.

Thus, the presence of psychovegetative disorders due to painful menstruation causes disorganization of rhythmic processes in the body, including the biopotentials of the brain. From this point of view, an increase in the power of the main, leading alpha rhythm, the disappearance of bilaterally synchronous flashes and paroxysms during treatment with the combined method of acupuncture can be considered as a reflection of the optimal conditions for the rhythmic activity of the brain tissue, contributing to the normalization of impaired body functions.

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