ELECTROPHYSIOLOGICAL ANALYSIS OF THE EXCITABILITY OF THE NERVE-MUSCULAR COMPLEX UNDER THE CONDITIONS OF THE METABOLIC SYNDROME IN YOUNG RATS

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Metabolic syndrome is a set of abnormalities, such as obesity, hypertension, high blood sugar, and cholesterol, which significantly increase the risk of developing cardiovascular disease, type 2 diabetes, and other diseases. It is not a disease, but a group of risk factors that often occur together, increasing the likelihood of severe diseases. There is increasing evidence that impaired glucose tolerance (IGT) or metabolic syndrome can lead to peripheral nerve damage, although the precise relationship between the conditions is still being established. There are animal models, epidemiologic, and clinical data that suggest a pathophysiologic link between neuropathy and metabolic syndrome and its components, including obesity, dyslipidemia, and insulin resistance. IGT and metabolic syndrome are associated with subclinical nerve damage or are typically painful and sensory, although autonomic nervous system involvement may also occur. Because small fiber damage is often predominant and nerve conduction studies may be relatively insensitive to confirm the diagnosis. Rats were divided into two groups. The first group is the control group and the experimental group with metabolic syndrome. Rats of the second group are young rats weighing 340-400 g. After that, the animals were involved in an acute experiment. For anesthesia, sodium thiopental was administered at a dose of 50 mg/kg of weight. The prepared sciatic nerve was placed on bipolar stimulating electrodes. Conduction of the action potential (AP) from the calf muscle, as well as its direct stimulation, was carried out with the help of two needle electrodes, which were inserted directly into the muscle. Such indicators of the excitability of the neuromuscular system as amplitude, latency period (LP), PD duration, threshold (P), and calf muscle chronaxia were analysed. The phenomenon of refractoriness was analysed by indirect stimulation with paired stimuli with an interval from 1 to 20 ms, a duration of 0.3 ms, and intensity of 2P. The research was carried out with the help of standard electrophysiological equipment (ECU-2 electro stimulator, UBP 2-03 amplifier, analog-digital device with registration and data processing on a computer). The obtained results were processed using statistical methods with a determination of the mean (İ), error of the mean (m), and root means square deviation (σ) for further analysis according to the Student's test with the determination of the level of reliability (p). Experiments with laboratory animals met the ethical requirements of the European Convention on the Use of Vertebrate Animals for Experiments. Research results. In the case of experimental metabolic syndrome, significant changes in the functioning of the neuromuscular complex were revealed, manifested in an increase in the excitation threshold under conditions of both direct and indirect stimulation of the calf muscle by 1.6 times, a decrease in LP by 0.17ms and a decrease chronaxia with indirect stimulation for 5 μs and an increase in PD amplitude by 1.17 times. Chronaxia with indirect stimulation reliably decreased, as well as in the case of direct stimulation, a significant decrease was found. Metabolic syndrome leads to changes in refractoriness phases.

Keywords: experimental metabolic syndrome, electrophysiological studies, action potential.

АНАЛІЗ УТВОРЕННЯ ПРОСТОРОВИХ КЛАСТЕРІВ АСТРОЦИТІВ У ТКАНИНІ ЧОРНОЇ СУБСТАНЦІЇ ГОЛОВНОГО МОЗКУ В УМОВАХ РОТЕНОНОВІЙ МОДЕЛІ ГЕМІПАРКІНСОНІЗМУ

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Хвороба Паркінсона (ХП) є багатофакторним захворюванням, роль одного з важливих патогенетичних факторів грає анормальне функціонування імунної системи. Астроцити, що є резидентними імуноцитами у тканині головного мозку, складають в ній приблизно 30% від загальної кількості клітин. Останні дані свідчать про те, що клітини цього типу беруть активну участь у патогенезі ХП. Досліджували просторові аспекти реактивного астрогліозу у компактній частині чорної субстанції (ЧСк) головного мозку щура, через 40 та 70 днів після внутришньомозкової інфузії ротенону в дозі 12 мкг. Результати показали, що інфузія призводила до збільшення щільності астроцитів в ураженій зоні ЧСк. Через 40 діб цей параметр зростав приблизно на 30%, а після цього