The evaluation of central pain mechanisms in patients with microvascular angina

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In patients with microvascular angina (MVA) besides of chest pain, a high neuronal activity of certain parts of the head (right anterior insula cortex) was revealed, which is not observed in the control in patients with coronary heart disease with coronary atherosclerosis. There is an opinion that the abnormal sensation of pain is caused not by myocardial ischemia, but by a violation of neuronal regulation. Functional MRI (fMRI) is currently a widely used method of functional mapping of the brain. The principle of the method is to register a BOLD signal (blood oxygen level-depended) from voxels (volumetric points) when examining the brain in response to the fulfillment of a task (paradigm).

In response to the activation of a particular region of the brain, hemodynamic parameters change in it, which leads to a decrease in the level of deoxyhemoglobin and an increase in the level of oxyhemoglobin. With neuroimaging, this phenomenon is characterized by an increase in signal intensity in a series of T2 * images, the quantitative assessment of which allows indirectly determining the degree of neuronal activation.

The study included 11 patients with MVA (3 men, 8 women). The average age of the patients was 61.45 ± 7.80 years. MVA was proved classic criteria and microvascular disorders (perfusion abnormalities) by cardiac PET. Neuroimaging examination included positron emission tomography scanning using 18-fluoro deoxyglucose (18F-FDG PET) and functional magnetic resonance imaging (fMRI) scanning using the GO / NOGO two-stimulus experimental paradigm. Throughout the study, fMRI and PET data were obtained for 11 patients with MVA and 20 healthy volunteers (control group).

Results: In patients with MVA, a decrease in neuronal activity was detected during the execution of actions ("GO" tests) compared with the norm in some brain structures: bilateral anterior and middle cingulate gyrus, additional motor region, postcentral gyrus, left in the islet cortex, on the right in the supramarginal gyrus. When ignoring the second stimulus ("P-P ignore."). A decrease compared with the norm was found bilaterally in the anterior and posterior cingulate cortex, the wedge, on the right in the cortex of the rolandic operculum and supramarginal gyrus. The detected clusters of decreased neuronal activity when performing actions and ignoring the second stimulus intersect bilaterally in the middle and anterior cingulate cortex, in the left paracentral lobe, and the right supramarginal gyrus. When suppressing actions ("NOGO samples"), no significant differences were found. According to PET, no significant changes in the level of glucose metabolism in patients with MVA compared with the control group were found.

Conclusion: In patients with MVA, a decrease in neuronal activity was found when performing actions compared to the norm in some brain structures.