LA SER DIAGNOSTICS METHOD FOR EVALUATION OF PROPERTIES OF BLOOD FLOW OSCILLATIONS IN RHEUMATOLOGIC PATIENTS

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Microvascular system plays an important role in the transport of nutrient, hormone, oxygen, and the discharging of metabolic waste. Also this part of cardiovascular system is involved in the process of thermoregulation, and it possesses its own autoregulatory mechanisms. The study of skin microcirculation is receiving increasing interest as recent studies have suggested that it can mirror other systemic vascular conditions. Together with morphological changes of the microvascular structure its functional state, abnormality in vascular tone regulation appears under pathological conditions [1], for instance rheumatic diseases. The studying of properties of blood flow oscillations in rheumatologic diseases is important in assessing of the blood vessels functional state and the degree of their involvement into the pathological process in the background of the existing system disorganization of connective tissue.

To evaluate the differences in blood flow oscillations between health state and rheumatic diseases and the degree of blood vessels involvement into the pathological process the studies were conducted. 60 rheumatologic patients and 32 healthy volunteers were included in the study. Different optical noninvasive methods are applied to in vivo study of the microvascular system functional state. In this study Laser Doppler flowmetry (LDF) was used [2]. To assess the extent of violations, as well to identify the factors and mechanisms of their forming, an additional provocative influence in the form of a cold pressor test was used. LDF signal was measured in basal conditions, immediately after cooling and 20 min relaxation. Wavelet spectral analysis of LDF signals was performed for oscillation [3]. Wavelet coefficients were calculated for the frequency range 0.01-2 Hz with the logarithmic partitioning on the 50 frequency bands. For every frequency range under consideration energy distribution was obtained, then these distributions were compared for health and pathological groups. In the work the behavior of the spectral components of LDF signal associated with endothelium, adrenergic, intrinsic smooth muscle, respiratory and cardiac activities are discussed.

Perfusion analysis each of the three measurement stages showed that patients with rheumatic diseases had higher perfusion in basal conditions and after cooling and weaker response on the cold stimulation than healthy volunteers. This reaction of peripheral vascular system of rheumatic patients on the cooling indicates a violation of the processes of thermoregulation. Spectral properties of the LDF signal in health and disease had significant difference. In rheumatic group higher amplitudes of oscillation were observed in high frequency range associated with cardiac and respiratory activities. Response on the cold test in healthy and pathological conditions were quite different, namely high frequency bands (upper then 0.1 Hz) decreased in healthy subjects, on the contrary, in pathological conditions lower frequency pulsations became more evident.

Detailed analysis of the results obtained shown that the observed variation of peripheral circulation and more evident input of some vascular regulation tone mechanisms before and after cooling are explained by morphological abnormalities in microvascular systems evoked by pathological processes in rheumatic tissue. We assume, that the using this diagnostic method and pulse wave amplitude can be useful clinical method for diagnostics and treatment monitoring of the microvascular abnormalities in rheumatic disease. The study of correlation of microvascular morphological structure and functional state will be the issue of our future work, also mathematical modelling will help for deeper understanding of the processes.

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