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INFLUENCE OF LOCAL PRESSURE ON THE OSCILLATIONS OF CUTANEOUS BLOOD FLOW

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ABSTRACT

Vascular reactivity has been used in a number of studies to characterize mechanisms involved in the regulation of skin blood flow, to detect functional abnormalities associated with the development of pathologies, as well as to evaluate the effectiveness of treatment. Laser Doppler flowmetry (LDF) together with wavelet analyses is a commonly used technique to study the regulatory mechanisms of cutaneous microcirculation.

The aim of this study was to study the oscillating components of blood flow registered by the LDF under different external pressure.

For this purpose we have developed an original optical probe capable of regulating the applied pressure. Six young volunteers (three males and three females) 20±2 years old were included in this preliminary study. The measurements have been conducted on a skin pad (palmar surface) of the right middle finger of healthy volunteers. The developed protocol included six sequential records of the blood perfusion at pressure within the range of 0 to 200 mmHg with unloading at the last stage. The LDF-records were subjected to wavelet analysis using the original algorithm based on the Morlet wavelet.

The protocol was repeated five times for each volunteer. The pressure influence on the perfusion and the redistribution of the power spectral densities of LDF flow in each stage of the protocol was been evaluated. As expected, the LDF signal increased at weak pressure (30 mmHg), higher pressure (90 mmHg) caused decrease of perfusion. High probe pressure on the skin causes rising of the endothelial activity. After the local pressure was removed, a reaction in blood flow was observed similar to reactive hyperemia in large vessels. The results obtained can be used as a basis for clinical instrumentation to assess microvascular reactivity.

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