Changes in the mechanisms of microcirculation regulation during direct optical generation of singlet oxygen

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The work is devoted to the study of the effect of singlet oxygen (SO) during its direct optical generation on the parameters of the microcirculatory and its regulatory mechanisms. It is believed that SO is able to influence the changes in the vascular bed and rheological properties of blood, manifested in blood stasis and extravasation, vascular occlusion. However, studies of SO properties were previously conducted in the presence of photosensitizers (PS) that promote SO generation, which did not allow to reveal the exclusive influence of SO. Therefore, the optical generation of SO, which involves excitation of the triplet form of oxygen by laser radiation of the wavelength of maximum absorption (1267 nm) for the transition to the singlet state, seems promising.

To study the mechanisms of microcirculation regulation, which are activated during SC generation, we used a multifunctional laser research complex (LLC RPE "LAZMA"), combining the methods of laser Doppler flowmetry (LDF) and fluorescence spectroscopy. Measurements were made on the palm surface of the distal phalanx of the middle finger of the right hand (8 conditionally healthy volunteers, 4 repetitions each) before, during and after irradiation continuously for 30 min (10 min for each stage of the study). The nonparametric Mann-Whitney test was used to assess the reliability of the observed differences. Significantly significant differences of parameters were considered at $p<0.05$.

As a result of the study it was found that SO exposure leads to increase ($p<0.05$) in normalized amplitudes of blood flow oscillations of endothelial and myogenic genesis. Thus, we can say that SO leads to the release of endothelial vasoactive mediators and affects vascular smooth muscle, respectively, the work of musculo-elastic sphincters. The conclusion is made about prolonged influence of SO due to the predominance of blood flow rhythms after the end of laser exposure.

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