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About the possibility of reprofiling a cornea by low-intensity UV-laser radiation

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The purpose of the work has been to investigate the possibilities of reprofiling the cornea surface by low-intensity UV-radiation of excimer laser with subablation energy densities for the correction of myopia, hyperopia, astigmatism and corneal pathologies.

Investigations on 50 model samples of some polymer materials and cornea substances have been carried out. Radiations of excimer lasers with the wavelength of 193, 223, 248, and 308 nm have been used. Preliminary, energy densities laying below the ablation threshold of an investigated sample had been determined.

Slackening of the mechanical properties and change of optical characteristics of cornea substance depending on a wavelength and energy density of low-intensity UV-laser radiation have been revealed.

A theoretical prerequisite for refractive reprofiling by subablation doses of UV-laser radiation is a dissociation of a AB macromolecule into two fragments, A and B, when absorbing a photon with the energy of 3-7 eV. A theoretical model of this process is presented in the paper.

The possibility of changing biomechanical properties of a cornea by low-intensity UV-laser radiation has been experimentally shown. For example, when 10x4 mm size deepithelialized cornea sample was affected by 248 nm-radiation with the energy density of 30 mJ/cm² and the dose of 12 J, the decrease of strength index by 28% and modulus of elasticity by 24% was obtained.