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

A. Razhev, I. Kornilovsky

To cite this version:
A. Razhev, I. Kornilovsky. About the possibility of reprofiling a cornea by low-intensity UV-laser radiation. Journal de Physique IV Colloque, 1994, 04 (C4), pp.C4-271-C4-271. <10.1051/jp4:1994464>. <jpa-00252727>

HAL Id: jpa-00252727
https://hal.archives-ouvertes.fr/jpa-00252727
Submitted on 1 Jan 1994

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
About the possibility of reprofiling a cornea by low-intensity UV-laser radiation

A.M. RAZHEV and I.M. KORNILOVSKY

Institute of Laser Physics of Siberian Branch of the Russian Academy of Sciences, 13/3 Acad. Lavrentyev Prosp., Novosibirsk 630090, Russia

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 \( 4.7 \text{ eV} \). 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 des epithelialized 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.