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LASER APPLICATIONS IN MEDICINE: SURGERY, THERAPY, DIAGNOSTICS

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Currently, there is no branch of medicine that does not use lasers for diagnosis, treatment or prophylaxis. Laser medicine has made huge advances in medical science, as well as the development of the latest laser technologies: the creation of new laser medical devices, their mastery by doctors and wide introduction into the practice of health care.

It should be taken into consideration that the penetration of radiation into bio tissue is highly dependent on radiation wavelength: red and near infrared (IR) bands (630-2,700 nm) penetrate best because it is less absorbed and dissipated by biota. Radiation of green (630-650nm) and violet ($\lambda < 405\text{nm}$) spectral ranges are well absorbed by blood, and in the ultraviolet range (200-340nm) lie the absorption bands of many proteins. Middle and far infrared bands are the water absorption ones, and respectively, soft bio tissue.

The unique properties of laser radiation – mono-chromaticity, coherence, high degree of polarization, low divergence, wide range of time parameters and correspondingly the large range of radiation power provides wide application of lasers in various fields of medicine. Low-intensity red radiation from the helium-neon laser has been found to have bio-stimulating properties and is widely used to treat many pathologies such as dermatosis, trophic ulcers, purulent wounds, burns, etc. At present, low-intensity radiation of red and near IR semiconductor lasers are also used for this purpose. The impulse radiation of solid-state lasers on ruby is practiced in ophthalmology in the bloodless surgery of the retina (ruptured blood vessels, etc.), as well as in microsurgery of the anterior section of the eye. The correction of myopia is considered to be the most common laser operation.

Well absorbed by the cornea radiation of ultraviolet lasers is used in correcting the corneal curvature. Infrared continuous radiation of medium-power gas CO₂ lasers, which allows both for the cutting of tissues to the definite depth and coagulating them with the ability to ensure biological welding of tissues, along with vessel wall welding is applied in soft tissue surgery. Laser examination with average power is directly exploited to remove tumors, especially surface localization. Laser radiation is also used for effecting intracavity walls and mucous membranes of hollow organs and even the vessels by means of endoscopic techniques. Depending on the object and purpose of the action lasers of different spectral ranges and capacities are put into practice in cosmetology.

Laser technologies allow for an increase in the efficiency of diagnosis and treatment of diseases, therefore their further development is relevant.