LASER OPTICAL DIFFERENTIAL DIAGNOSTIC BRAIN STRUCTURES AND TUMORS

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Objective: to develop the parameters of laser-optical structures and differential diagnosis of tumors of the brain for non-recognition of their histological structures.

Materials and methods. The study used the device for express optical diagnosis of cancer (Institute of Physics, National Academy of Sciences of Belarus), which includes recording unit spectral and temporal characteristics of the fluorescence (temporal resolution of 50 ps, the spectral range 330-850 nm) and recording unit spectra diffusely scattered light (wavelength range 350 to 1100 nm).

The studies were conducted on samples of human pituitary adenomas, taken immediately after surgery and normal pituitary tissue taken from the corpse. Excitation and detection of fluorescence and diffusely scattered light via fiber optic probe, which is at a distance of 2-5 mm from the surface of the sample immersed in two-thirds of normal saline. By means of this device were measured intrinsic fluorescence decay kinetics adenoma and normal pituitary tissue when excited by ultraviolet radiation having a wavelength of 342 nm, and registration in the wavelength range of 380-600 nm in steps of 20 nm, and the diffusely scattered light spectra

Results. We studied 23 samples, including 12 samples of pituitary adenomas and 11 samples of healthy pituitary tissue. The average duration of autofluorescence patterns of pituitary adenomas during registration in the blue region of the spectrum is 5.2 ns, and as we move to the red region of the spectrum gradually decreases to a value of 3.5 ns. At the same time, the average length of sample autofluorescence healthy pituitary tissue in the blue region of the spectrum is 4.6 ns, and with the transition to the green region of the spectrum gradually increases to 5.5 ns and then decreases in the red region of the spectrum to a value of 4.9 ns.

Thus, it was found that the average lifetime of fluorescence of the samples of normal and tumor tissue are significantly different at check-kinetics in the wavelength range 500-600 nm. Characteristics of diffusely scattered light samples of normal tissue and pituitary adenomas have distinct differences in shape and intensity of the spectrum in the wavelength range 650-900 nm. The intensity of the diffusely scattered light samples of healthy tissue is much less than samples pituitary adenoma. Spectrum of diffusely scattered light patterns of pituitary adenoma has a pronounced maximum near 690 nm, which is not observed in the spectra of healthy samples.

Discussion. Using parameters such as the average duration of tissue autofluorescence in the wavelength range 500-600 nm and the intensity of diffusely reflected light in the wavelength range of 650-900 nm will allow for laser-optical structures and differential diagnosis of tumors of the brain. Application of the technology being developed contactless laser-optical differential diagnosis of tumors express and its subsequent introduction into medical practice will greatly reduce the time and economic costs of postmortem diagnosis, increase the complete resection of brain tumors and reduce the damaged area of normal brain tissue.

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