LOCAL FLUORESCENCE SPECTROSCOPY FOR UROLOGY

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Local fluorescence spectroscopy (LIFS) is a noninvasive sensitive method that makes it possible to obtain quantitative data regarding local tissue fluorescence using a fiber-optic probe scanned in contact with the tissue surface or mucous of hollow organs. The method could be used for the detection of endogenous or exogenous fluorescence contrast between normal tissues and malignant lesion. For LFS examinations all-in-one remote probe fluorescence spectrometer “Spectr-Cluster” (“Cluster” Ltd, Russia) with built-in excitation lasers at blue, green and red spectral parts has been developed and applied. The report presents the main results of in vivo LFS application in urology obtained during last years.

A complex of main spectral parameters of autofluorescence emission spectra recorded in vivo from healthy urothelium and foci of superficial bladder cancer under 442 nm and 532 nm laser excitation were studied. The spectral parameters that characterize some features of the intensity and shape of autofluorescence spectra for reliable differentiation between healthy and neoplastic urothelium have been revealed.

LFS at 442 nm and 532 nm excitation was used in vivo to improve the predictive ability of photodynamic diagnosis (PDD) of superficial bladder cancer after intravesical instillation of Alasense (5-ALA-based agent). Two approaches for LFS data interpretation were developed and tested, which allowed for a significant increase the positive predictive value (PPV) of PDD [1]. The results suggest that the combination of fluorescence imaging with in vivo LFS may assumingly minimize false positive fluorescence cases and reduce the required number of biopsies from 5-ALA-induced red-fluorescence zones.

LFS at 638 nm excitation was applied for in vivo fluorescence detection of chlorine-based photosensitizer in normal urothelium and papillomas of bladder [2] as well as for ex vivo studying of its accumulation, distribution and clearance in hyperplastic tissues of human prostate [3]. The obtained results showed the possibility of PDT treatment with this photosensitizer and allowed optimizing the time interval after the intravenous injection.