Revealing of central lung cancer (CLC) at the pre-invasive and micro-invasive stages as the most curable ones, is an important problem of the present-day oncopulmonology. Meanwhile, the chances of its detection by the conventional X-ray or endoscopy methods are notably limited because of small dimensions of the lesions. The autofluorescence bronchoscopy (AFB) is considered currently like the most promising diagnosis modality for revealing of small intraepithelial lesions. According to the results of various researchers, the sensitivity of AFB exceeds 90%, while its specificity is rather low [1]. The number of false-positive results can be reduced by the combination of autofluorescence imaging and in vivo local fluorescence spectroscopy (LFS) [2,3]. LFS is a sensitive method that makes it possible to measure tissue fluorescence spectra using a fiber-optic probe scanning in contact with the tissue surface. The main advantage of LFS is noninvasive real-time collecting of quantitative information on the intensity and spectral features of the tissue fluorescence emission.

This study presents application of the LFS to recording and analyzing of laser-induced autofluorescence emission spectra from normal and pathological bronchial epithelium in vivo. The aim was to reveal quantitative spectral characteristics, which analysis in the course of in vivo recording of autofluorescence emission spectra allows improving the detection accuracy of AFB for CLC lesions.

A spectral fluorescence detection system (Spectr-Cluster, Cluster Ltd, Russia) was used for LFS examinations under 532 nm excitation (DPPS laser, 5 mW). In order to deliver the excitation light to the tissue and the collected fluorescence response to the photodetector, this system is equipped with an Y-shaped fiberoptic probe that is 1.4 mm in diameter and could be inserted in the modern autofluorescence bronchoscope’s biopsy channel. The autofluorescence emission spectra were recorded within the range of 550-750 nm, with the spectral resolution <5 nm. Data sets of laser induced AF spectra of bronchial epithelium have been collected in accordance with the confirmed histopathological status (morphological diagnosis). A complex of nine basic spectral characteristics that characterize main features of the magnitude and shape of spectra for reliable differentiation between healthy and malignant bronchial epithelium have been analyzed. Comparative analysis of the nine studied characteristics shown that the diagnostically informative ones for CLC detection purposes under 532 nm excitation are the two magnitude characteristics and, additionally, four characteristics of shape.

Real-time monitoring and assessment of the complex of all these diagnostically informative characteristics in the course of in vivo LFS examinations can reduce the required number of forceps biopsies and promote eliminating of false-positive results of the AFB for CLC.

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References