The study of liver tissues state in obstructive jaundice by optical spectroscopic methods

Ksenia Y. Kandurova[a], Dmitry S. Sumin[a,b], Andrian V. Mamoshin[a,b], Elena V. Potapova[a]

[a]Research and Development Center of Biomedical Photonics, Orel State University, Orel, Russia
[b]Orel Regional Clinical Hospital, Orel, Russia

Obstructive jaundice remains one of the widespread hepatopancreoduodenal pathologies. To determine the further treatment and predict the course of the disease, it is important to understand the structural and functional changes occurring in the liver. Currently, clinical and biochemical parameters, prognostic scales and systems are used to assess the severity of hepatic dysfunction. However, these criteria give approximate indirect results. One of the promising directions is *in vivo* assessment of tissue condition using fluorescence spectroscopy (FS) and diffuse reflectance spectroscopy (DRS) methods. Thus, the aim of the work was the *in vivo* study of the optical properties of the liver parenchyma in the case of obstructive jaundice by the FS and DRS methods

Optical measurements were performed in 8 patients (58±19 years) during percutaneous decompression of the biliary tract with the custom developed optical biopsy setup including FS (365 and 450 nm excitation) and DRS channels as well as the specially designed needle optical probe compatible with 17.5 G needles. The diffuse reflectance spectra were used to calculate tissue saturation values. Processing of fluorescence spectra included non-linear curve-fitting for searching the combinations of Gaussian spectral functions representing the emission of characteristic liver tissue fluorophores. The analyzed parameters included peak heights, areas under Gaussian curves of NADH, flavins, bilirubin and their relative contribution to total spectra curves. The predominance of flavins and bilirubin peaks contribution was observed both in 365 and 450 nm spectra. The data revealed the changes in parameters of patients with different blood bilirubin content, values according to MELD and Child-Pugh scores, obstructive jaundice etiology and duration.

The approach seems promising for both further studies with a larger set of samples involved and multimodal research with joint application of *in vitro* optical methods for analyzing bile samples.

The study was supported by the Russian Science Foundation under the project № 21-15-00325.