Magnetic resonance imaging and spectroscopic imaging have proven to be useful to monitor a metabolism in the human brain. The thesis is concerned to repeatability and reproducibility of spectroscopic data measured on 1.5T and 3T scanners and to the development of a new method enabling the separation of pathologic and healthy tissues in patients with brain tumor using the combination of MR spectroscopic and diffusion measurements.

Evaluation of repeatability and reproducibility in white matter in the parieto-occipital region, in the hippocampus and in gray matter in the frontal lobe did not show significant differences in accuracy of measurements on 1.5T and 3T scanners, but showed a significant increase of signal-to-noise ratio on 3T

As a part of the thesis a program KORELACE has been developed. The program enables the evaluation of spectroscopic and diffusion data on the "pixel-by-pixel" basis in individual subjects. The existence of a statistically significant inverse correlation between the concentrations of choline and the diffusion trace values has been proven in glioblastoma, but no significant correlation has been found in a healthy tissue in volunteers. The correlation can be used to characterize borders of brain tumors and to identify the healthy tissue. Simulations confirmed the influence of partial volume effect to the observed correlation, but also proved that the existence of the inverse correlation is given by the changes in tumors.