

## Summary

There is increasing amount of new knowledge in neuropsychiatric research, partially as a result of application of new neurophysiological methods of quantitative electroencephalography. This is because these techniques have good temporal resolution, are relatively non-invasive and economical. Different experimental paradigms and electroencephalographical analytical techniques are reviewed, with their potential applications in the assessment of psychiatric disorders. In the theoretical part the principles of some methods of quantitative electroencephalography, especially are described: EEG coherences, QEEG cordance and LORETA. Next chapter contains basic information about panic disorder and major depressive disorder followed by findings in functional imaging studies which are associated with the selected psychiatric disorders. Separate section is devoted to the prediction of antidepressant response. The empirical part of the thesis consists of a set of the five original papers about application of QEEG methods in a population of psychiatric patients (Bareš et al., 2010; Kopeček et al., 2008; Kopřivová et al., 2009; Šoš et al., 2008; Šoš et al., 2013). In Study 1, we followed the localization of EEG sources by means of brain electromagnetic tomography with low resolution (LORETA) in patients with panic disorder compared to healthy volunteers. Patients with panic disorder showed higher activity in the beta frequency band (12.5 to 21.5 Hz) in the lateral prefrontal cortex with a strong right-sided predominance. Study 2 is case study of depressed patient whose decrease in prefrontal theta QEEG cordance after week of treatment (at a time when there were no overt signs of clinical improvement) was followed by the clinical response. Durability of the response was confirmed by the trend of increasing and expanding theta activity (4-8 Hz) power in the dorsal cingulate according to LORETA. The results of the Study 2 were subsequently verified in the study 3 within the cohort of 18 treatment-resistant depressive patients. The primary finding of the study was a decrease in prefrontal QEEG cordance in the theta frequency band after one week of treatment with norepinephrine and dopamine reuptake inhibitor (bupropion). Cordance decline predicted clinical response after four weeks of treatment with the 71% of positive predictive value. Study 4 is a case study that confirms the predictive value of decline in prefrontal theta QEEG cordance in bipolar depressive disorder patient during the switch to hypomania/mania. We detected changes in prefrontal theta QEEG cordance after a single subanesthetic dose of ketamine in the study 5 (randomized, double-blind, placebo-controlled clinical trial). Cordance decrease after 24 hours correlated with clinical antidepressant response ( $\geq 50\%$  decrease in MADRS) after four days of the ketamine application. Our preliminary studies with the application of QEEG techniques hold the promise of improving psychiatric patient care by means of improving diagnostic precision and/or predicting treatment response. Large multicentric studies are needed to retest and validate our results for their application in clinical practise.

Key words: Quantitative Electroencephalography (QEEG), Cordance, Coherence, LORETA, Major Depressive Disorder, Panic Disorder.