

## Summary

The routine diagnostic use of visual evoked potentials (VEPs) in CNS disorders has been so far oriented almost exclusively to pattern-related reactions (parvocellular subsystem) recorded from the occipital striate visual area. Since we believe that it is important to examine the visual pathway and visual information processing in a complex way, we use also moving visual stimuli, activating predominantly magnocellular subsystem of the visual pathway and associate temporo-parietal visual areas. In addition to standard pattern-reversal VEPs (R-VEPs), the motion-onset VEPs (M-VEPs) (activating mainly the magnocellular system of the visual pathway) are being used in our lab for about 15 years, since this combination provides higher sensitivity. Our data from VEPs examination show that parameters of both types of VEPs correlate only partially. In some diagnoses, one type of VEPs is distinctly preferable because of significantly higher involvement of either parvocellular or magnocellular system.

### **Electrophysiological findings in migraine**

There is abnormal cortical information processing in the migrenous brain between attacks according to recent evoked potential studies. A fundamental, probably protective, feature of brain processing (i.e. response habituation during stimulus repetition) is corrupted.

We examined visual evoked potentials (VEPs) and EEG spectral analysis in 26 patients suffering from migraine during attack-free period and in 27 normal subjects. Transient pattern-reversal (VEPs) and two variants of motion-onset (VEPs) did not display any significant differences between the migraine group and controls, perhaps because of the short examination duration. The recording time was under 1 minute for each VEPs examination, which was short to display the described habituation of the VEPs in normal subjects (maximal after 12 minutes). Migraine sufferers did not exhibit any correlation of the defect with EEG frequency spectrum parameters.

We have also studied event-related potentials (ERP) evoked by an oddball paradigm and emotional passive (ERP). No statistically significant differences in P300 latencies and peak-to-peak amplitudes were noted between migraineurs and controls in oddball paradigm tests. Only observed dissimilarity between groups was revealed for the emotional passive ERP. The control group exhibited significant reduction of non-target amplitude compared to the target one ( $p > 0.004$ ), however, there was no reduction presented ( $p > 0.2$ ) in migraineurs. This short time emotional passive ERP (2.4 min) examination suggests reduced habituation in higher cortical processes.

### **Meta-analysis of paraclinical tests (VEPs and MRI) in suspected Multiple Sclerosis**

The aim of this study was to verify a diagnostic value of our enlarged set of visual evoked potentials in patients with suspected Multiple Sclerosis (MS). 67 patients were included in whom simultaneously MRI examination was performed. VEPs examination used pattern-reversal and motion-onset stimuli. In 58% of patients who were referred for suspected MS, the diagnosis was later confirmed as clinically definite. In this subgroup MRI scans were abnormal in 79% of patients and VEPs in 69%. Pattern-reversal VEPs were abnormal in 25 patients (P100 latency in this subgroup was  $141 \pm 23$  ms). Motion-onset VEPs were abnormal in 16 patients (N160 latency =  $186 \pm 24$  ms). Although the sensitivity of MRI seems to be higher, in 4 patients with normal MRI, VEPs contributed to the diagnostics of MS (prolonged latency of VEPs). Normal MRI and VEPs in clinically definite MS were found in 4 cases (10%).

VEPs can be sensitive in early phase of MS, since there is quite frequent selective involvement of optic nerves at the beginning of this disease. Therefore, on the basis of this study, we support to include VEPs examination into the basic set of diagnostic tools in MS.

### **Electrophysiological findings in neuroborreliosis**

Despite a rapid increase in the number of patients with Lyme borreliosis, its neuro-pathological aspects are poorly understood so far. In our study we tried to find out, whether this damage can be revealed by visual evoked potentials (VEPs) and if so, which of the two main parallel streams of the visual pathway (magnocellular/parvocellular ones) is affected predominantly. In 100 adults with neuroborreliosis we investigated two types of VEPs – the motion-onset VEPs (M-VEPs) and the pattern-reversal VEPs (PREPs). 46 patients exhibited pathological results in M-VEPs (significantly prolonged latency of main N160 peak), which was accompanied by prolonged latency of the main peak of the PREPs (P100) in 14 cases only.

Our study supports the concept of demyelination, but in contrast to multiple sclerosis the Lyme borreliosis seems to affect predominantly the magnocellular visual pathway. For that reason, the M-VEPs might serve as a very appropriate tool for the optic nerve disorders testing in this disease.