

Focal Seizures and EEG: Prognostic Considerations
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ABSTRACT

The goal of this study was to determine whether the EEG could predict if patients with focal seizures would eventually be uncontrolled (U), more than two seizures per month, or be controlled (C), fewer than two seizures per year. Using these latter criteria, U and C patients were randomly selected from our files, 150 in each of these two groups; 804 EEGs were found in the U and 674 in the C group. Excluded were patients with generalized epilepsy and also the benign epilepsies of childhood. Age was an important factor since patients 5-18 yrs old were more often under good control (C group), and those 21-48 yrs of age were more often under poor control (U group). With rare exceptions, focal spikes and focal slow waves in every area were much more often seen in U patients than C patients. No spikes or rare spikes appeared especially in the controlled patients, and many or very many spikes in the uncontrolled patients, mainly on the first or second EEG. No slow waves or a mild degree of slowing was seen especially in the C patients, while greater degrees of slow wave abnormalities were noted much more often in the U patients.

For conditions to identify the C group, the best predictors were no spikes or rare spikes, especially on the first or second EEG, properly identifying two-thirds of the C patients and misidentifying only one-fourth of the U group. To identify the U patients on any EEG, many or very many spikes at any location or frontal spikes correctly designated a U patient in 84%, but incorrectly predicted a C patient as uncontrolled in 29%. For the first or second EEG, these values were 61% and 21%. Thus, the EEG, especially by its first or second record, can predict well the probable future of the uncontrolled patient, so that extraordinary means may be instituted early to avoid a deteriorating condition. When complete EEGs are done with sleep records and the results are quantified, reasonable prediction of eventual outcome can usually occur that is much more timely than waiting over 9 yrs, using only clinical data.

Effects of Stimulus Modality and Response
Mode on the P300 Event-Related Potential
Differentiation of Young and Elderly Adults
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ABSTRACT

The P300 event-related brain potential (ERP) was examined in 14 young (20 - 29 years of age) and 16 elderly (60 - 82 years of age) adult subjects during the performance of auditory and visual discrimination tasks requiring silent counting or key pressing in response to target stimuli. P300 latencies were longer in elderly (vs young) adults and in visual (vs auditory) tasks, and visual tasks elicited larger P300 amplitudes than auditory tasks in both age groups. Neither stimulus modality nor response mode affected P300 differentiation of young and elderly subjects. Steeper P300 anterior-posterior scalp amplitude gradients were seen in the young (vs elderly) adults, regardless of stimulus or response type. Examination of inter-subject variability with the coefficient of variation (CV) statistic found the lowest (i.e., best) CV values to be exhibited in the visual task requiring the counting of target stimuli. Implications of the findings are discussed in relation to P300 applications in the clinical assessment of dementia and aging-associated cognitive alterations.

Olfactory Event-Related Potentials in Normal
Subjects and Patients with Smell Disorders
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ABSTRACT

We developed a device to record olfactory event-related potentials (OERP) from the human scalp. Methylcyclopentenolone was used as the odorant element. A total of 50 stimuli were delivered. Each stimulus lasted 0.5 sec and was delivered once every three inspirations. Normal OERPs were obtained with this device. The positive peak latencies were approximately 350 msec (P1) and 700 msec (P2), respectively. OERPs were also recorded in 40 patients with smell disorders. A positive response at about 300-400 msec was recorded in 7 patients (all females, 15-59 years

old). The other 33 patients showed no response. The high potential area of this positive peak was located in the centro-occipital region of the scalp. The latency and the high potential area of this peak were similar to P1 recorded in normal subjects. The source of this peak was considered identical to that of P1. This may be a response to the trigeminal nerve during odor administration. P2 was not recorded in the patients with smell disorders. P2 may therefore be a response to the olfactory nerve.

Apneic Seizures in Infants: Role of
Continuous EEG Monitoring
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ABSTRACT

Respiratory compromise is not uncommon in epileptic seizures. However, pure apneic seizures are rare. In this study, we report 10 children who presented with pure apneic seizures. All the children were admitted because of apneic events. Seizures were also considered in the differential diagnosis. Six patients had nonspecific findings consisting of multifocal interictal epileptiform activity with no event correlation. Continuous 24-72 hours electroencephalogram (EEG) was performed in all patients to rule out apneic seizures. Ictal EEG showed high correlation with the apneic episodes, confirming the diagnosis of apneic seizures. Our study suggests that continuous EEG monitoring is essential in the diagnosis and treatment of apneic seizures.

Sequential EEG Analysis During Intermittent Photic Stimulation in Never-Medicated Patients With Schizophrenia
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ABSTRACT

To investigate sequential changes in electroencephalograms (EEGs) during intermittent photic stimulation (IPS), quantitative EEG analysis for the alpha band (related to stimulus frequency) was performed in 18 drug-naïve schizophrenic patients and 18 sex- and age-matched control subjects. IPS consisted of white flickers at 10 flashes/sec, lasting 10 sec and repeated six times at 10 sec intervals. The differences between the two groups were assessed for two conditions (i.e., during photic stimulation (PS) and inter-PS). During stimulus, the absolute 9-11 Hz band power of the patient group was higher at the posterior than that at the anterior sites throughout the 10 sec periods. However, this difference between sites was not seen during the first 1 sec in the control group. During the nonstimulus period, posterior dominance of 9-11 Hz band power was prominent in the patient group throughout. In the control group, however, this difference was minor, especially during the latter half of the period. These results suggest that schizophrenic patients show fewer changes in posterior alpha activity during both stimulus and nonstimulus, and this continuity of posterior dominance may reflect hyperarousal, which counteracts any decrease in vigilance throughout the IPS.

Time Distribution of Seizures During
Long Term Video-EEG Monitoring
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ABSTRACT

The purpose of this study was to investigate the duration of monitoring, number of seizures recorded, and date and time of occurrence of seizures in different patient groups during video-EEG monitoring (VEEGM). Patients with partial or psychogenic seizures who were admitted to our VEEGM unit between September 1996 and March 2002 were retrospectively evaluated. Duration of monitoring, date and time of occurrence of seizures were identified in each patient. For practical reasons, a day was divided into 3 equal time periods (period I: 08-16; period II: 16-24 and period III: 24-08 hrs), and the period in which the seizure occurred was noted. Patients were classified in 5 groups: 1-temporal; 2-frontal; 3-parieto-occipital; 4-psychogenic and 5-unclassified. Duration of monitoring, the number of seizures recorded and time distribution of seizures were identified in each group and compared statistically. We evaluated 746 seizures in 209 patients. Seizures were more likely to occur in periods I and III in groups 1

($p=0.004$) and 5 ($p<0.001$). In group 4 they were more likely to occur in periods I and II ($p<0.001$). Duration of monitoring was not statistically different between the groups. However, the number of seizures recorded varied significantly ($p=0.006$). Patients in group 5 had the greatest number of seizures and were followed by groups 2, 4, 3 and 1, respectively. Groups also differed according to date of seizure occurrence ($p<0.001$). We conclude that the number of seizures recorded and time distribution of seizures during VEEGM are influenced by the lobe of onset of seizures.

Association between Quantitative EEG and Neurocognition in Methamphetamine Dependent Volunteers

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Objectives: Methamphetamine administration is associated with long-lasting reductions in markers for dopaminergic neurons in preclinical models and in humans. These changes may be associated with alterations in brain electrical activity and in cognition.

Methods: The sample included 11 methamphetamine dependent subjects and 11 non-drug using volunteers. Methamphetamine dependent subjects were hospitalized for 4 days to document abstinence; non-drug using volunteers were studied as outpatients. EEGs were recorded in the eyes-closed resting state, and absolute EEG power in each frequency band (0.5-4 Hz, 4-8 Hz, 8-12 Hz, and 12-20 Hz) was measured using a fast Fourier transform. EEG power was log-transformed prior to analysis. Cognition was measured using computerized reaction time tasks in 9 volunteers from the methamphetamine-dependent group and 10 from the control group; 3 participants declined to complete the cognitive tasks.

Results: Methamphetamine dependence was associated with increased EEG power in the delta and theta bands. Power in the alpha and beta bands did not differ between the groups. Within the methamphetamine dependent group, a majority of the conventional EEGs were abnormal (64%), compared to 18% in the non-methamphetamine using group. Within the methamphetamine-dependent group only, increased theta QEEG power correlated significantly with reaction time on tasks that were more difficult or that were degraded by fatigue. Increased theta QEEG power also correlated with reduced accuracy on a working memory task.

Conclusions: Increased QEEG power in the theta band is associated with worse performance on reaction time tasks in the methamphetamine dependent sample but not in the non-drug using volunteers. **Significance:** Methamphetamine dependence is associated with pathological alterations in brain electrical activity and in cognitive performance. QEEG appears to provide a sensitive measure of methamphetamine-associated alterations in brain function.

REFERENCE

1. Newton TF, et al. Quantitative EEG abnormalities in recently abstinent methamphetamine dependent individuals. *Clinical Neurophysiol* 2003; 114: 410-415.

The Transcranial Magnetic Stimulation for Diagnosing and Treating Patients in Coma and Vegetative State

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Introduction: Sometimes the cycle of sleeping and awakening can be recovered in patients in coma (C), and patients can open their eyes periodically. This situation can be referred to as the vegetative state (VS). We studied the possibilities of using TMS for diagnosis and treatment of patients in C and VS.

Methods: We studied 30 patients in C and 45 in VS. Patients in VS were treated by complex TMS and electric stimulation (ES) of median nerves. The stimulation was given for 3-6 hours every day (10 days). Induction of magnetic field was 1.6-2.2 Tl, frequency was 5-15/sec. Neurophysiological and clinical evaluations were performed by investigating changes of EEG, SSEP, VEP, BAEP, MEP, Glasgow Coma Scale and concentrations of catecholamines.

Results: After complex stimulation there were indications of decrease in latency and increase in amplitude of the P100 VEP, P23 SSEP, P300, MEP or their appearance (if they were absent before). The level of dopamine statistically

approached normal after complex stimulation. Glasgow's index after stimulation increased to 11.3+1.9 (before 8.8+1.6).

Conclusions: From this process we can evaluate the motor system by using TMS in patients in C and VS. Complex stimulation (TMS+ES) of patients in VS leads to positive changes in the sensorimotor, motor, and visual cortex and leads to changes in concentrations of dopamine in blood and an increase in the Glasgow's index.

The Prediction of Response to Treatment with Standard and New Antipsychotics

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Introduction: Several independent groups have reported a relationship between the increase of QEEG alpha activity during neuroleptic treatment and a favourable clinical response to the treatment with these drugs.¹ Our group found that changes in the slow alpha range, observed six hours after the administration of a single test dose of either haloperidol or clopenthixol, discriminated between R and NR, with an accuracy rate of 88.9% (91.3% in chronic and 84.6% in first episode patients).

Methods: More recently we used the test dose procedure to test the hypothesis that changes in the slow alpha range also predict the response to novel antipsychotics. Clozapine or risperidone were administered to 18 drug-free patients with DSM-IV schizophrenia.

Results: Three patients were responders and 5 were nonresponders to treatment with risperidone, while 5 were responders and 5 nonresponders to clozapine. QEEG findings indicate that, in line with what was observed with standard neuroleptics, changes in the slow alpha band discriminates responders from nonresponders to risperidone. For clozapine the same pattern of QEEG changes (increase of theta and decrease of fast alpha and beta activity) was observed in both responders and nonresponders.

Conclusions: The results confirm the validity of the test dose slow alpha changes in the prediction of response to treatment with standard neuroleptics and suggest its utility in the prediction of response to risperidone. Our preliminary findings seem to indicate that traditional parameters used by pharmaco-EEG studies are not useful in the prediction of response to clozapine.

REFERENCE

1. Galderisi S. *Methods Find Exp Clin Pharmacol* 2002; 24 (suppl. c): 85-89.

Emotional Processing in Subjects with Panic Disorder

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Introduction: Subjects with Panic Disorder (PD) have high scores on alexithymia, a tendency to interpret ambiguous stimuli as threatening and an attentional bias toward threat-related cues. Several findings suggest that a dysfunction of temporo-limbic regions, in particular those of the right hemisphere, involved in emotional processing, might underlie these characteristics.

Methods: Alexithymia was evaluated by the Toronto Alexithymia Scale in 17 drug-free patients with DSM-IV PD and matched healthy controls (HC). In all subjects ERPs were recorded from 30 channels during a visual target detection task, in which stimuli with different emotional valence (neutral, erotic, threat-related and phobic) were used as distractors. The Low Resolution Electromagnetic Tomography (LORETA) was used to identify cortical generators of the ERP P3a component for distractors.

Results: Alexithymia was more frequent in PD subjects than in HC. Comparison between erotic and neutral distractors revealed a different pattern of activation in HC and PD subjects: an activation of the anterior cingulate, insula and medial frontal areas was observed in HC, while a reduced activation of the right parieto-temporal regions was found in PD subjects. In HC no difference in activation patterns was found when comparing threat-related and neutral stimuli, while in PD subjects a reduced activation of right temporal regions was observed when the same comparison was performed. Conclusions: The results confirm the presence of a reduced activation of right hemisphere integrative areas during emotional stimuli processing in subjects with PD.

Mismatch Negativity: Basic Neurophysiology and Findings in Schizophrenia

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Mismatch negativity (MMN) is an event-related brain potential associated with the pre-attentive detection of stimulus deviance. Recently, MMN has been studied as a measure of echoic memory in schizophrenia. Interestingly, MMN appears to be normal during the early stages of schizophrenia and to get progressively worse. Hence, MMN may serve as a physiological index of brain changes in schizophrenia. The purpose of this symposium is to examine the basic electrophysiology of MMN, including techniques and paradigms, the putative brain generators of MMN, fMRI studies of MMN, and MMN findings in chronic and first-episode schizophrenia patients, with reference to underlying cortical generator volumes. The objectives of the course are to familiarize researchers with the current state of knowledge in MMN research, and to provide them with the ability to perform new studies of MMN.