Influence of Antiepileptic Drugs on the basic characteristics of EEG

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Understanding the correlation between clinical and neurophysiological effects has been receiving much more appreciation in clinical epileptology more recently. Therefore electroencephalography is thought to be an efficient tool not only controlling the ongoing effectiveness of the treatment but also to be an efficient tool to predict potential clinical and psychocognitive adverse effects of the treatment. The drugs- Valproate acid (Depakine-D) and carbamazepine (CBZ) are amongst the most widely used Antiepileptic Drugs (AED). Although, the selection of antiepileptic drugs is highly determined by the type of seizures, the effect of these drugs on basic neurophysiological processes of CNS is not fully investigated. Therefore, the aim of the present study was to compare the effect of CBZ and D on those variables of EEG that assess both epileptic activity and overall functional state of the brain.

53 patients aged 3 to 9 years treated by D, 48 patients same aged- by CBZ. All patients underwent EEG recording for three- times: 1st visit, before the administration of AED, in a 3-4 months (2nd visit) and 6-8 months (3rd visit) after the initiation of treatment. EEG signals were digitally recorded using a set of 19 scalp electrodes, 10-15 fragments for EEG were performed for the evaluation of the specificity of the background activity as well as the spectral analysis was performed to calculate absolute value of power (AVP) EEG in different frequency spectra.

D revealed that the drugs from this class reduce the degree of disorganization of basic rhythmicity of EEG at the expense of reduction of high amplitude mono- and poly-morph waves in low frequency. It is considered as the sign of increased seizure readiness of CNS. D appears significantly reduce AVP spectra practically in all zones recorded from the brain surface especially occipital areas. During the treatment with CBZ deceleration of the background EEG activity and decrease in the mean frequency of the alpha rhythm find. Deceleration of AVP arises at the expense of the low frequency range, predominantly in the parietal and occipital zones.

The difference between D and CBZ effect on electrogenesis of the brain is mainly revealed in the low frequency spectra of EEG and for more typical epileptiform elements such as spike-wave. On the one hand, D markedly decreased the ratio of high amplitude waves of Delta and Theta range. Contrary, under CBZ there was significant increment of the given variables. Moreover, D was more efficient in eliminating spike-wave.

In summary, the difference in the effect of CBZ and D on bioelectrical activity of the brain could be related to region-specific differences within the loci of maximal neuropharmacological effect of these drugs: CBZ increases low wave activity within the AVP spectra, that is generated by mostly by neural mechanism of cortex.

D decreases the signs of exaggerated synchronization at the expense of reduction of low frequency spectra within the AVP. In addition, D appeared more efficient to suppress epileptic complex spike-wave with substrate in thalamus.