EHF-puncture in the complex treatment of patients with pharmacoresistant epilepsy: clinical and neurophysiological analysis

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According to the WHO definition, epilepsy is a chronic brain disease characterized by recurrent seizures resulting from excessive neural activity and accompanied by various clinical and paraclinical manifestations (WHO definition).

Epilepsy and convulsive syndromes are among the most common diseases of the nervous system. The prevalence of epilepsy in the general population is 5-10 cases per 1000, while the prevalence of seizures is 17-20 cases per 1000 (Shorvon, 1995) [1].

The annual incidence of epilepsy, excluding febrile seizures and single paroxysms, varies from 20 to 120 / 100,000 cases per year, on average 70/100,000 (Shorvon, 1995) [1]; in 20-30% of patients, epileptic paroxysms are drug-resistant. In these cases, in order to obtain a stable anticonvulsant effect, it becomes necessary to use high doses of antiepileptic drugs, which often causes side reactions. In this regard, increasing importance at the present stage in treatment is given to complex therapy using new non-drug (non-traditional) methods of exposure, the most poorly studied of which is EHF-puncture. Extremely high frequency (EHF), or millimeter (MM), therapy is a new method of treatment, based on various biological effects of low-intensity electromagnetic radiation (EMP) of the millimeter wave range. EHF-puncture method - impact on BAP and reflexogenic zones with millimeter-wave waves. This method has been used for the first time in the treatment of epilepsy.

PURPOSE OF THE STUDY

The aim of this study was to study the effect of MM-wave puncture on the clinical course of idiopathic and symptomatic drug-resistant epilepsy and the bioelectric activity of the brain.

OBJECTS AND METHODS OF RESEARCH

We studied 31 patients with epilepsy, including 14 patients with post-traumatic symptomatic epilepsy and 17 patients with idiopathic epilepsy. Among patients with post-traumatic symptomatic epilepsy, there were 13 patients with simple partial, secondary generalized seizures and 1 patient with complex partial, secondary generalized seizures. With idiopathic epilepsy - 15 patients with isolated generalized seizures, 1 patient with the outcome of juvenile absence epilepsy with the addition of generalized tonic-clonic seizures, 1 patient with idiopathic photosensitive epilepsy. The control group consisted of 15

healthy volunteers.

The patients' age is from 20 to 49 years. The duration of the disease varied from 2 to 29 years. The onset of seizures in patients with post-traumatic epilepsy was noted 1-2 years after CCI; in the group with idiopathic epilepsy - from 9 to 18 years.

All patients received basic antiepileptic therapy, including depakine, clonazepam, finlepsin, phenobarbital, either as monotherapy or in combination.

All patients underwent magnetic resonance imaging of the brain. Post-traumatic cysts of the left hemispheric localization were revealed in two patients. In most patients, the MRI pattern of symptomatic post-traumatic epilepsy corresponded to moderate, internal and external, probably atrophic, hydrocephalus and internal asymmetric hydrocephalus.

A computerized electroencephalographic study of patients with epilepsy included spectral analysis of the EEG, determination of the localization of the source of discharge activity based on the dipole model.

The EEG was recorded under standard conditions - in a darkened room protected from interference, in a comfortable chair and in the sitting position of the subject with his eyes closed. A monopolar method of potential derivation was used with the placement of indifferent electrodes on the earlobes. 16 active electrodes were located in accordance with the international Jasper system "10-20", covering the main zones of the head surface corresponding to the following cortical zones: occipital, parietal, central, frontal, frontal pole, anterotemporal, mid-temporal and posterior temporal right and left hemispheres ... Active electrodes were installed at 16 points. Monopolar EEG recording was performed using ear electrodes, as well as bipolar recording. The EEG was recorded in a state of relaxed wakefulness. Functional tests were used: test with eye opening, test with hyperventilation for at least 3 minutes. Used 16-channel neurograph "MVN", operating on the basis of IBM-PC Pentium III with filters installed at 32 Hz and a time constant of 0.03.

Visual analysis assessed changes in the normal components of the EEG, as well as the presence of pathological forms of activity. The localization and severity of pathological changes, their reaction to functional tests were determined. When studying the influence of EHF-puncture exposure, EEG was recorded before exposure (control examination), after 10 sessions of EHF-puncture, 6 and 12 months after a single course of exposure. The primary EEG analysis was carried out using the appropriate programs. The software complex performed the following functions: input of a multichannel EEG into a computer and its visual editing; filtration, selection of artifacts and their elimination from the analyzed EEG segment; spectral and correlation analysis of EEG and statistical processing of the results. Visual analysis assessed changes in the normal components of the EEG, as well as the presence of pathological forms of activity. The localization, severity of pathological changes and their reaction to functional tests were determined (Zhirmunskaya EA, 1993) [2]. Along with the visual assessment of the EEG, a spectral analysis of its background activity was carried out.

Millimeter (MM) puncture therapy was carried out with the apparatus EHF "Artsakh" - 0.4. To study the effect of EHF-puncture on the bioelectrical activity of the brain in patients with symptomatic post-traumatic epilepsy, a mode of exposure was selected corresponding to the peak of frequencies of absorption lines of molecular oxygen in the atmosphere, 60 GHz. Exposure time - 20 min. MM-puncture therapy was carried out at the point of the collar zone (da-chzhui). The course of treatment was 15-20 sessions with a frequency of 2 times a week. To exclude the psychological effect of MM-puncture, a "zero-EHF effect" was carried out, which consisted in the imitation of the procedure.

RESULTS AND ITS DISCUSSION

When the da-chzhui point was exposed to millimeter waves with a frequency of 60 GHz in patients with both symptomatic post-traumatic epilepsy and idiopathic epilepsy, a significant clinical effect was observed in the form of a decrease in the frequency of seizures. Moreover, in patients with symptomatic post-traumatic epilepsy, the positive effect of EHF-puncture was more pronounced: both a decrease in the frequency of seizures and a change in their character were observed. The results are shown in the table below.

Influence of EHF-puncture on the frequency of seizures in patients with epilepsy

Epilepsy form	Seizure frequency (number per month)		
	Before treatment	6 months	12 months
Symptomatic post-traumatic epilepsy (n = 14)	6.3 ± 0.15	4 ± 0.18 *	3 ± 0.10 *
Idiopathic epilepsy (n = 17)	11 ± 0.10	9 ± 0.12 *	8 ± 0.14 *

* - p - 0.05

At comparative research spectral characteristics In the bioelectrical activity of the brain of patients with epilepsy and healthy subjects, significant differences were revealed in the form of a higher power of the spectra of the main rhythms compared with healthy subjects. However, in patients with post-traumatic epilepsy, the differences were more pronounced compared with patients with idiopathic epilepsy in the delta and theta ranges.

After the course of EHF-therapy in patients with symptomatic post-traumatic epilepsy, there was a tendency to a decrease in the basic rhythms, however, the differences in the power of the spectra before and after the course of treatment were not significant. In patients with idiopathic epilepsy, after a course of EHF-therapy, there was a significant increase in the power of the spectrum for all types of rhythms, mainly in the anterocentral leads.

At 6 months after a single course of treatment, the differences in the groups were similar; a decrease in the power of the spectra was noted: with symptomatic post-traumatic epilepsy - in the delta, theta, alpha ranges, with

idiopathic epilepsy - in the beta ranges.

12 months after a single course of EHF-therapy, the picture of the change in the power of the spectra in comparison with the picture after 6 months remained, but if 6 months after the course of treatment in patients with post-traumatic epilepsy the changes were expressed in the left hemisphere of the brain, which basically corresponded to the side of the focus epileptic activity, then after 12 months a decrease in the power of the spectra was recorded in all leads of both the right and left hemispheres of the brain in the delta, theta and alpha ranges.

The indices of the power spectra of the main rhythms of the electroencephalography of the brain of patients with idiopathic epilepsy after 12 months were lower in the delta-, alpha-, beta-1-ranges, and in the beta-2-range there was an increase in the anterofrontal-temporal leads (compared with the picture after 6 months).

One of the mechanisms of the influence of EHF-therapy is the ability of waves in the EHF-range to be excited in the form of so-called acoustoelectric waves in the bilayer lipid membranes of the cell, which can lead to corresponding changes in the informational synchronization of the work of cells and the cellular mechanism. The absorption of it by water molecules associated with MM radiation leads to a change in the cluster and hydration structure of water, and then to the transfer of microwave energy through the hydration mechanism to membrane receptor proteins, which ultimately improves the functional state of the cell membrane [4-12].

The above-described mechanisms of EHF action on cells in the zone of a biological active point lead to its activation and the launch of systemic mechanisms that cause changes in the processes of "inhibition - excitation", which is reflected in a change in the picture of the bioelectric activity of the brain.

The obtained data on the influence of EHF waves on the spectral analysis of EEG in patients with epilepsy indicate a two-phase nature of the changes: after a single exposure to EHF-therapy (Avakyan T.N., et al., 2003) [3], the power of the main types of EEG rhythms increases, then there is a gradual decrease in spectrum power indicators after the course, 6 months and more pronounced - after a year. This allows us to assume that during the course of EHF-therapy, adaptation-compensatory mechanisms are launched, which leads to a clinical decrease in seizures. However, a high degree of severity of both the clinical effect and encephalographic correlates in patients with symptomatic epilepsy may be associated with the presence of a local focus of paroxysmal brain activity. The fact that a positive effect was obtained (less pronounced, than in patients with symptomatic epilepsy) in patients with idiopathic epilepsy, which has a hereditary nature of the disease (genes of some forms of epilepsy are mapped and identified), suggests the effect of EHF on the structure of the cell genome. This is consistent with the hypothesis put forward earlier on the synchronization of acoustoelectric waves and pulsating electromagnetic radiation emanating from living cells (Zhukovsky AI et al., 1993) [13].

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