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Biochemical changes in the hippocampus and the medial nucleus of the septum before and after the destruction of dorsal amigdalofugal ways

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Abstract — The method of recording the electrical activity study the impact of various nuclei of the hypothalamus, amygdala, reticular formation, the medial nucleus of the septum and hippocampus on dynamic characteristic EEG dorsal (CA_1 and CA_3), ventral hippocampus, dentate gyrus and medial nucleus of the septum, recorded before and after the destruction of the dorsal and ventral amigdalofugal ways. It was shown that the electrolytic destruction of dorsal amigdalofugal way, unlike the ventral leads to a complete and irreversible blockampal theta rhythm. To elucidate the reasons for these changes were produced biochemical research in the dorsal, ventral hippocampus and the medial nucleus of the septum before and after electrolytic destruction of the dorsal amigdalofugal way.

Keywords - dorsal amigdalofugal way, protein fraction, hippocampus, septum.

I. Introduction

In spite of the huge amount of works carried out over the years until the present time, the problem of the theta rhythm of the hippocampus is one of the most controversial in electrophysiology and gives rise tremendous amount of research. Most of the fibers in the composition of the ascending medial forebrain bundle, interrupted on neurons of the medial septal nucleus, where it comes from the hippocampus. These nuclei assigned the role peysmekkera of hippocampal theta rhythm [1,2]. However, considerable importance in the generation of of hippocampal theta rhythm is given stem-diencephalic strukrures: reticular formation [3, 4] the nuclei of the thalamus [5], hypothalamus [6], locus cereleus [7], nucleus raphe [8, 9], subikulyum [10] . Our previous studies had shown a full and the irreversible depression of electrical activity of the hippocampus in conditions of destruction of the dorsal amigdalofugal pathway [11]. In these conditions electrical and chemical stimulation of the medial septal area, one of the main regulation links hippocampal activity do not lead to the restoration of the EEG in the hippocampus. To elucidate the reasons of so profound change in this paper we investigated changes in protein spectra of different regions of the hippocampus before and after the destruction of the dorsal amigdalofugal way

II. Methods

Experiments were conducted on 10 rabbits breeds "Chinchilla". Disc electrophoresis of brain proteins was carried out in the apparatus firm «Reanal» (Hungary) in a vertical type apparatus in tubules of 6 mm diameter and 10 cm length by the method of Ornstein and Davis [12] with the use of gels № 1:4%-tion concentrating (pH 6.7) and 7.5% separating (pH 8.9) PAAG. Electrophoresis was performed in Tris-glycine buffer pH 8.3 for 120 minutes at a current intensity 2 mA at the passage macroporous gel and then 3 mA per tube during passage through running gel. Into each tube 0.1 mm was applied gomogenezat brain. Protein spectrum was studied after staining gels amidovogo black 10 B and their destained in 7% acetic acid solution.

III. Results and discussion

Studies have shown that up to destruction of dorsal amigdalofugal way in the dorsal hippocampus allocated 8 fractions, 7 fractions in the ventral and medial nucleus of the septum - 9 fractions. The peaks were constructed each of the obtained fractions by densitometry (Fig. 1, 2, 3). On the basis of this method was given percentage of each protein fraction compared to with common proteins. Revealed that before the destruction of dorsal amigdalofugal way in the dorsal hippocampus albumins constitute 8.58%, in the ventral hippocampal region - 6.91%, and in the medial nucleus of the septum albumins constitute 32.6%. Quantity of albumin depends upon the age and species of animal and the conditions of the experiment. Prealbumin in the dorsal hippocampus up - 1.42%, ventral his department - 5.06%, and in the medial nucleus of the septum - 3.52%. Later fractions neyroglobulins. It was found that in the normal state neyroglobuliny are: in the dorsal hippocampus α-neyroglobulins – 38.1%, β- neyroglobulins - 37.34%, γ-neyroglobulins up 14.6%, in the ventral hippocampus α -

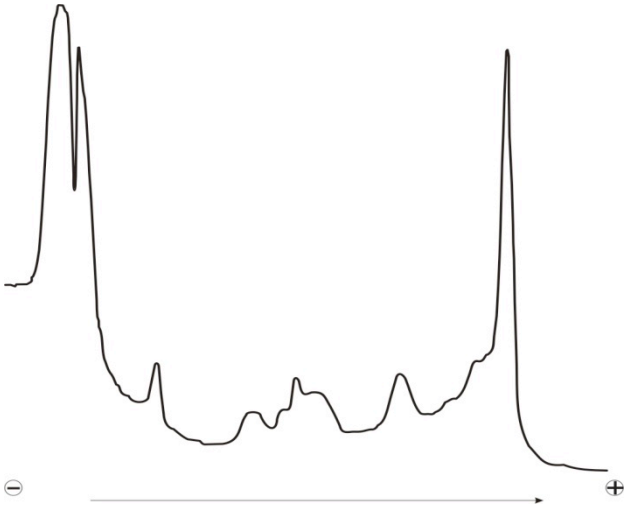

Fig. 1. Densitometry of the dorsal hippocampus before the destruction of the dorsal amigdalofugal way

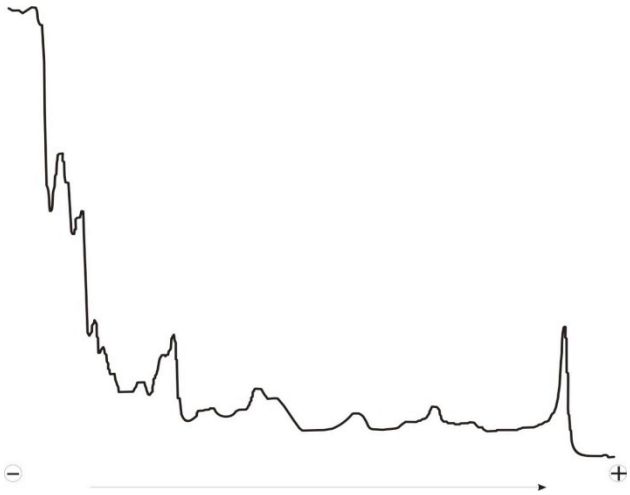

Fig. 2. Densitometry of the ventral hippocampus before the destruction of the dorsal amigdalofugal way.

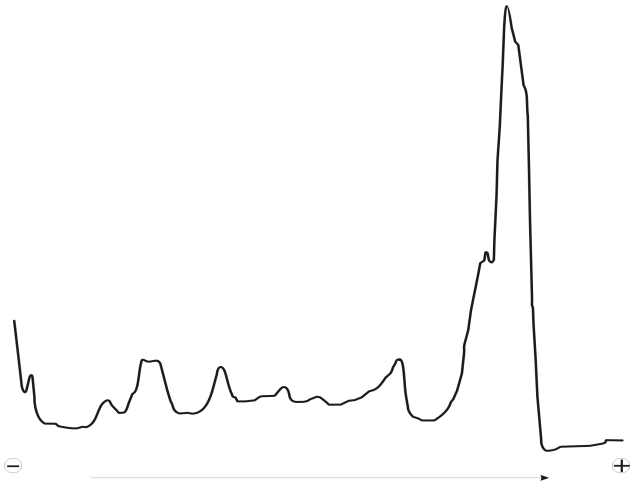

Fig.3.. Densitometry the medial nucleus of the septum before the destruction the dorsal amigdalofugal way.

neyroglobulins – 24.28%, β-neyroglobuliny – 34,95%, γ-neyroglobuliny – 28.97%:, and in the media in the medial nucleus of the septum α -neyroglobuliny - 19.78%, β-neyroglobuliny - 39,4% up - γ-neyroglobuliny 4,8% of total proteins.

Biochemical studies have shown that the destruction of dorsal amigdalofugal way leads to irreversible changes in the protein spectra of dorsal, ventral hippocampus and the medial nucleus of the septum: in none of the investigated areas were not received any protein fraction produced after the destruction of dorsal amigdalofugal way. In Figure 4. shows the changes in protein spectra of the dorsal, ventral hippocampus and of the medial nucleus of the septum before and after the destruction of the dorsal amigdalofugal way. As seen from the figure 4, none of the regions investigated was not received any protein fractions.

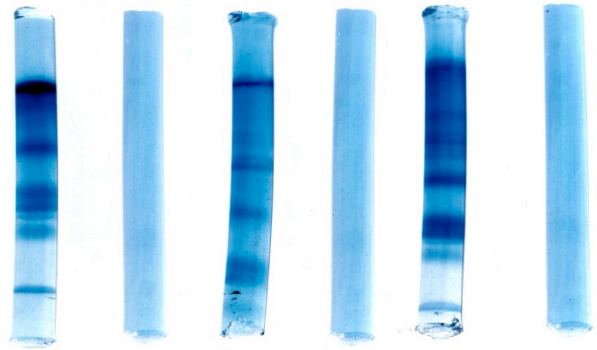

Fig. 4. Electrophoregram of dorsal, ventral hippocampus and the medial nucleus of the septum before and after the destruction of the DAW. 1,3,5 - dorsal, ventral hippocampus and medial nucleus of the dorsal amigdalofugal way

Based on the above it can be concluded that the change of water-soluble proteins in the synthesis of the dorsal (CA_1, CA_3) and the ventral hippocampus, medial septum nucleus reflected in lowering the excitability of the brain structure and there is apparently influenced by disorders of the pituitary-adrenal system resulting produced by the destruction of dorsal amigdalofugal way.

Existing data in the literature suggest that the change in protein synthesis in the amygdala, hippocampus, hypothalamus, and has a value in the mechanism of changes in excitability of the brain structures under the influence of hormones of pituitary-adrenal system [13]. As is known, corticosteroids mediates many pathological effects arising from prolonged stress, ischemia and aging [14]. His destructive action corticosteroid hormones is largely carried out through glucocorticoid receptors. The hippocampus is the most studied in this respect the structure. Corticosteroid hormones cause the death of hippocampal pyramidal cells, which causes a cascade of events leading to physiological imbalance and further cell death [15]. Its fast effects hormones realize on membranes, changing their electrical excitability and processes that can be recorded in a few seconds. Hormone molecules passing

through the membrane, can be built into their bilayer structure and changing its stiffness through appropriate conformational rearrangements. Because of this changes the permeability of membranes and the passage therethrough mediators as well as neurotransmitters converted interaction with its own receptors, their effects implement transmembrane mechanisms [5]. Now more and more to the opinion that the neuronal membranes themselves are endowed with corticosteroid receptors, the ability to transform vnegenomnye effects of hormones on effector cells. Now more and more to the opinion that the neuronal membranes themselves are endowed with corticosteroid receptors, the ability to transform vnegenomnye effects of hormones on effector cells immunologically. Thus, the results of this series of studies revealed profound biochemical changes in neurons of different regions of the hippocampus and the medial nucleus of the septum, indicating that the metabolism disorder in these areas of the brain, apparently associated with impaired functional activity of the hypothalamic-pituitary neurosecretory system as a result of destruction dorsal amigdalofugalnogo path, leading to a decrease in neuronal vozbulimosti septo-hippocampal system.

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