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Diagnosis and correction of cognitive impairment in preschool children with epilepsy

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Diagnosis and correction of cognitive impairment in preschool age children with epilepsy

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The aim of the study was to investigate cognitive impairment and the efficacy of hopantenic acid (pantogam) in children aged 4 to 7 years suffering from epilepsy combined with cognitive impairment. **Material and methods.** The study involved 40 children with epilepsy who took pantogam (the main group) and 23 children with epilepsy who did not take pantogam (the comparison group). All children had two main diagnoses: cryptogenic epilepsy and symptomatic epilepsy. The paper presents the main results of the clinical examination of the children, which included routine EEG, video-EEG monitoring and MRI of the brain. Analysis of cognitive impairment in children of the comparison group and the main group before and after taking pantogam was carried out using the Luscher color test, the "playing the piano" test, the "three" and "the fourth is extra" tests. **Results and conclusion.** A reliable reduction in various cognitive impairments was established in children of the main group after taking pantogam in relation to the comparison group, as well as age-related normalization and improvement of EEG after 2 months of taking pantogam in 15% of cases. All children with epilepsy showed good tolerance of the drug without an increase in seizure frequency.

Key words: childhood epilepsy, cognitive impairment, hopantenic acid (pantogam).

Objective. To study cognitive impairment and the efficacy of hopantenic acid (pantogam) in children, aged from 4 to 7 years, with epilepsy and cognitive impairment. **Materials and methods.** The study included 40 children with epilepsy treated with pantogam (the main group) and 23 children with epilepsy who did not receive pantogam (the comparison group). All children were diagnosed with cryptogenic epilepsy and symptomatic epilepsy. We presented the main results of the clinical examination including routine EEG, video-EEG monitoring and brain MRI. An analysis of cognitive impairment in children of the comparison group and in the main group before and after treatment with pantogam was performed using a set of neurocognitive tests (the Luscher Color Test, "Piano playing test", "Three word test" and "Four is redundant test"). **Results and conclusion.** There were a significant decrease in cognitive impairment in children of the main group compared to the comparison group as well as age normalization and improvement of EEG after 2 months of treatment in 15% of the patients. The good tolerance of the drug and no increase in the frequency of seizures were observed.

Keywords: children epilepsy, cognitive impairment, hopantenic acid (pantogam).

In children with epilepsy, underestimation and ignoring cognitive impairment, especially in the early stages of the disease, can lead to a deterioration in the quality of life. At the same time, in practical medicine, cognitive disorders in patients with epilepsy include any behavioral and personality traits not associated with the disease itself. Recommendations for the diagnosis and, especially, for the treatment of cognitive impairment in children with epilepsy are few and contradictory. Therefore, this problem requires consideration and clarification, in

memory and mental activity, and also increase the body's resistance to external influences, however, many of them have an adverse effect on the course of the underlying disease - epilepsy. The first-line nootropic drug for patients with epilepsy is hopantenic acid (pantogam), the mechanism of action of which is associated with the presence of gamma-aminobutyric acid (GABA) in its structure [1-3].

including in the aspect of therapy.

In the context of correction of cognitive impairments, nootropic drugs occupy a significant place, which have a positive effect on learning processes, improve

The drug is approved for use in children from the first months of life, and the main indications for its use include the presence of cognitive impairment in organic brain damage and epilepsy.

The aim of the study is to investigate cognitive impairment and the effectiveness of hopantenic acid.

(pantogam) in children aged 4 to 7 years suffering from severe forms of epilepsy in combination with cognitive violations.

Material and methods

During the study, 2 groups of children with epilepsy were formed. The main group included 40 children who took pantogam at a dose of 20-30 mg/kg per day. The comparison group consisted of 23 children who were not prescribed the drug. The study included the main

nom somatically healthy children.

All children were examined for epilepsy at the Clinic of Nervous Diseases of the St. Petersburg State Pediatric Medical University, and they were diagnosed with two main conditions: cryptogenic epilepsy and symptomatic epilepsy [4]. The distribution of children depending on age, gender, diagnosis, as well as the significance of differences between groups using Fisher's exact method [5] are presented in Table 1.

No significant differences by gender, age and diagnosis
There was no difference between the main group and the comparison group.
During the clinical examination of patients, the medical history was studied, the neurological and somatic status was assessed, the types of attacks and the form of the disease were determined.

Pregnancy in mothers of examined children with epilepsy of the main group and comparison group in most cases (51.28%) was the first, complicated course of pregnancy was noted in 46.15% of mothers, in most cases these were the threat of termination of pregnancy (55.56%) and toxicosis (27.78%), a combination of these complications was in 27.78% of cases. A significant number of mothers of examined children were primiparous (48.71%), normal course of labor was in 35.90% of cases. Among complications of labor it is necessary to note a high percentage of application of labor stimulation (20%), in 24% of cases a combination of several factors was noted.

The number of children in the main group with normal development up to the age of 1 year and before the onset of epileptic seizures differed slightly - 75 and 70%, respectively; there were no differences in the comparison group.

Most children in the main group and the comparison group did not show focal neurological symptoms (67.5 and 73.91%, respectively).

In 34.92% of cases, children in both groups experienced generalized seizures, which in 77.27% of cases were

tonic-clonic. In 26.09% of cases, a combination of generalized seizures with other types of seizures was observed. Absences were detected in 7.94%, partial seizures - in 22.22% of children. Atypical seizures were observed only in 1 (1.59%) child.

Epileptic seizures in most children in both groups occurred spontaneously; in 17.46% of cases, a connection with sleep was revealed (when falling asleep, during sleep, during sleep deprivation); among other factors provoking epileptic seizures, photostimulation, hyperventilation, emotional stress were noted; in 3.17% of cases, seizures were provoked by injections.

Single attacks were observed in 24 (38.10%) children, rare attacks in 22 (34.92%), and frequent attacks in 17 (26.98%) children.

Instrumental methods of clinical examination of children included routine electroencephalography (EEG) and video-EEG monitoring [6], magnetic resonance imaging (MRI) of the brain.

Based on EEG data, epileptiform changes were found in 40 (63.49%) children, and based on video EEG monitoring data, in a significantly larger number of children - 61 (96.83%, p=0.00000113). EEG was performed

again before and after the course of therapy.

MRI of the brain was performed in 49 (77.78%) children and revealed the absence of organic changes in 12 (24.49%) of them. Subarachnoid space expansion was found in 12 (24.49%) children, ventriculomegaly — in 1 (1.59%) child of the main group, a combination of subarachnoid space expansion, ventriculomegaly with other developmental defects was noted in 10 (20.41%), other developmental defects of the brain were detected in 14 (28.57%) children.

Laboratory diagnostic methods, which included the study of clinical parameters of blood and urine, as well as biochemical parameters of blood, did not reveal any significant deviations.

Treatment of epilepsy in the majority of children - 36 (57.14%) - was carried out with depakine at a dose of 5 to 50 mg/kg per day, in 13 (20.63%) children - topamax at a dose of 1.9 to 12 mg/kg per day, in 9 (14.28%) - finlepsin at a dose of 4 to 22.7 mg/kg per day, in 3 (4.76%) - convulex at a dose of 15 to 36.4 mg/kg per day, in 2 (3.17%) - trileptal at doses of 15 and 24 mg/kg per day.

In children of the main group, the degree of cognitive impairment was assessed before taking pantogam and 2 months after completing its course. Analysis of cognitive impairment in children of the main group and the comparison group before and after

Table 1. Characteristics of the groups of children examined

Indicator	Main group (n=40)	Comparison group (n=23)	r
Floor			
boys	23	14	0.203
girls	17	9	0.203
Age, years			
4	7	6	0,180
5	13	6	0.198
6	12	7	0.223
7	8	4	0.255
Diagnosis			
cryptogenic epilepsy	17	9	0.203
symptomatic epilepsy	23	14	0.203

2 months after taking pantogam, the Luscher color test, the "playing the piano" test, the "three" and "the fourth is extra" tests were performed.

The Luscher test is based on the psychological effects of color exposure and is used to identify emotional disorders. The subject was asked to choose one of 8 color cards, randomly arranged according to their subjective pleasantness. The study was conducted twice. Each color was assigned a number, and 2 groups of colors were identified - primary and additional. The test results were assessed

was conducted according to several parameters, depending on the order in which the subject selected the colors.

As a result of testing, the colors were arranged in the order of their choice in 8 positions, the first 2 of which indicated a clear preference, the 3rd and 4th - preference, the 5th and 6th - indifference to the color, the 7th and 8th - antipathy to the color. It is believed that, normally, the primary colors should be at the beginning of the preference row, i.e. perceived by the subject as pleasant. Additional colors should be in the second half of the row, i.e. perceived as indifferent or unpleasant. The appearance of any primary color in the last 3 places in the preference row indicates the presence of anxiety. The appearance of any additional (except violet) color in the first 3 places reveals the presence of compensations: forced, pretentious, self-protective behavior and corresponding experiences. For a conditional numerical assessment of the severity of compensations and anxiety, the following designations were proposed: ! — if the main color is in 6th place (additional in 3rd place); !! — if the main color is in 7th place (additional in 2nd place); !!! — if the main color is in 8th place (additional in 1st place).

The overall severity of compensations and anxieties is calculated as the sum of conditional points (!).

Comparison of the results of the Luscher test is carried out was determined for all the main indicators characterizing various disorders in children. In this case, the significance of differences in the number of children with a particular indicator in the main group before taking pantogam and the comparison group, as well as in the main group after taking pantogam, was determined.

togama and the comparison group.

The kinetic praxis test "Playing the piano" consisted of the subject having to alternately touch a surface, such as a table, with his fingers, then

sequence: right hand, left hand, with both hands, and then perform the same movements in the reverse order. The severity of the motor disorders in the subject was judged by the number of erroneous movements.

The "three" test consisted of repeating two different sets of three words to the subject three times. During the test, all children were offered two word options ("cold-frame-book"; "guest-risk-rain") to repeat. Between repetitions, the subject's attention was distracted. Normally, after the third repetition, all words should be remembered. The child's memory was assessed by the number of correctly remembered words.

The "fourth odd one out" test determines the ability to generalize, the ability to differentiate essential and non-essential features of objects. The subject was given 5 cards in a certain sequence with an image of a standardized set of

4 objects, one of which cannot be grouped with the others by a common essential feature and is superfluous. The subject's answers for each card were recorded, and each card was assessed for the correctness of the choice of the superfluous object. The child's level of development was determined by the number of correct answers.

All children were given 5 cards with images of 4 objects on each card with the following names and image order:

- a) 1 - turnip, 2 - apple, 3 - cucumber, 4 - beetroot;
- b) 1 - shorts, 2 - cap, 3 - boots, 4 - fur coat; _____
- c) 1 - pen, 2 - knife, 3 - book, 4 - pencil;
- d) 1 - wardrobe, 2 - chair, 3 - table, 4 - door; _____
- d) 1 - airplane, 2 - bus, 3 - ship, 4 - wheelbarrow. _____

Items that are not grouped with others by common essential feature and are redundant, are underlined in the list of names.

When analyzing the results of the "fourth odd one out" test, the number of correct/incorrect answers of children in the comparison group and the correct/incorrect answers of children in the main group before and after taking pantogam were compared, as well as the number of children giving incorrect answers to all points on the map in the comparison group and the main group before and after taking pantogam.

Fisher's exact method was used in statistical processing of the obtained data, which made it possible to substantiate the reliability of the research results.

Results and discussion

Repeated routine EEG in the main group of children 2 months after the course of pantogam showed that the number of children with general diffuse changes and delayed maturation of the basic rhythm decreased from 19 (47.5%) to 16 (40%), and 3 (7.5%) children had normal

indicators.

According to the Luscher test in the main group, before taking panto-gam, indicators of compensation were revealed in 12 (30%) children; indicators of unfavorable prognosis (unfavorable compensation) - in 36 (90%), and the most unfavorable prognosis was expressed by "!!!!!!" in 1 (2.63%) child, "!!!!!!" - in 2 (5.26%), "!!!!" - in 2 (5.26%), "!!!!" - in 16 (42.11%), "!!!" - in 8 (21.05%) and the least unfavorable prognosis - "!" - in 7 (18.42%) children. Indicators of anxiety were expressed in 22 (55%) children; indicators of anxiety intensity - in 38 (95%): in 3 (7.89%) they demonstrated the lowest intensity of stress and anxiety sources and were expressed as "!", in 5 (13.16%) - "!!", in 13 (34.21%) - "!!!", in 10 (26.32%) - "!!!!", in 7 (18.42%) it was

the highest degree of intensity of sources of stress and anxiety, expressed by "!!!!!!".

In the 1st color pair, 25 (62.5%) children had color combinations indicated the presence of strong negative emotions. In the 4th color pair, the color combinations in 39 (97.5%) children indicated a negative state.

Carrying out the Luscher test in children of the main group after taking pantogam, indicators of compensation were revealed in 1 (2.5%) child; indicators of an unfavorable prognosis (unfavorable compensation) were revealed in 26 (65%) children, with 1 (3.85%) child having the most unfavorable prognosis, expressed as "!!!!!!", 9 (34.62%) children having "!!!!", 10 (38.46%) having "!!!!" and the least unfavorable prognosis "!" in 6 (23.07%) children; indicators of anxiety were

were observed in 15 (37.5%) children, anxiety intensity indicators were observed in 31 (77.5%) children: in 9 (29.03%) they were demon- demonstrated the lowest intensity of sources of stress and anxiety and were expressed as "I", in 8 (25.81%) – "!!", in 14 (45.16%) children – showed the maximum degree of intensity of sources of stress and anxiety, expressed as "!!!!".

In the 1st color pair, 18 (45%) children had color combinations indicated the presence of strong negative emotions, in the 4th color pair, the color combinations in 35 (87.5%) children indicated a negative state.

The analysis of the Luscher test results in the comparison group showed the presence of compensation indicators in 10 (43.48%) children; indicators of unfavorable prognosis (unfavorable compensation) - in 19 (82.61%) children, with the most unfavorable prognosis, expressed by "!!!!", was in 3 (15.79%) children; "!!!!" - in 4 (21.05%); "!!!" - in 5 (26.32%); "!!" - in 5 (26.32%) and the least unfavorable prognosis "I" - in 2 (10.53%) children; anxiety indicators - in 15 (65.22%); anxiety intensity indicators - in all 23 (100%) children: in 10 (43.78%) they demonstrated the lowest intensity of stress and anxiety sources and were expressed by "!!", in 7 - "!!!!", in 3 - "!!!!" and in 3 children

showed the maximum degree of intensity of sources of stress and anxiety, being expressed as "!!!!!!".

In the 1st color pair, the color combinations of 15 children indicated the presence of strong negative emotions. In the 4th color pair, the color combinations of all 23 (100%) children indicated a negative state.

The results showed that the number of children with the compensation indicator (insufficiency of the optimal state), unfavorable prognosis (unfavorable compensation), anxiety indicators and anxiety intensity, as well as the number of children with strong negative

with negative emotions and a negative state, mainly the main group and the comparison group before taking pantogam did not differ significantly. The results of the examination in the main group after taking pantogam and in the comparison group are presented in **Table 2**.

After the course of pantogam, the number of children with indicators of compensation (insufficiency of the optimal state), unfavorable prognosis (unfavorable compensation), anxiety, anxiety intensity, as well as the number of children with strong

negative emotions and negative state compared to the number of children with similar indicators in the comparison group.

In the study of kinetic praxis in the "playing the piano" test, children in the comparison group made 29 (21.01%) erroneous movements out of 138, children in the main group before taking pantogam - 50 (20.83%), and after taking pantogam - 40 (16.67%) erroneous movements out of 240.

Comparison of the number of children making mistakes in the main group before taking pantogam and in the comparison group The analysis showed that there was no significant difference between them. The number of children making mistakes in the main group after taking pantogam was 65%, which was less than in the comparison group - 82.61% (p=0.079).

Therefore, according to the results of the kinetic study, Based on the results of clinical praxis, it can be concluded that after taking pantogam, the motor abilities of children with epilepsy improve.

When studying the performance of the "three" test, children from the comparison group made 68 (49.28%) mistakes out of 138 possible, children from the main group before taking pantogam - 108 (45%), and after taking pantogam - 97 (40.42%) mistakes out of 240.

When analyzing the results of the "troika" test, the number of children making a large number of errors (from 4 to 6) when memorizing words in the comparison group and the main group before and after taking pantogam was compared. The number of children making both less than 3 errors and 4-6 errors when memorizing words in the main group before

taking pantogam and the comparison group did not differ significantly. After taking pantogam, the difference between the main group and the comparison group turned out to be significant. we.

Thus, taking pantogam leads to a decrease in the number of errors associated with memorizing words, i.e. an improvement in memory was noted.

When analyzing the results of the "fourth extra" test, children in the main group gave 67 (33.5%) correct answers and 133 (66.5%) incorrect answers before taking pantogam, and 83 (41.5%) correct answers and 117 (58.5%) incorrect answers after taking pantogam. Children in the comparison group gave 38 (33.04%) correct answers and 77 (66.96%) incorrect answers.

The obtained data indicate that children in the main group and the comparison group had a higher level of There were no significant differences in the number of correct answers to questions and in the number of children giving incorrect answers to all points on the map. In children of the main group after taking pantogam and the comparison group, there were no differences in the number of correct answers to questions and in the number of

Table 2. Results of the Luscher test in the main group after taking pantogam and in the comparison group

Luscher test index	The main group after taking pantogam (n=40)	Comparison group (n=23)
Insufficiency of the optimal state (compensation indicators)	1	10
Unfavorable compensation (unfavorable prognosis)	26	19
Anxiety	15	15
Intensity of anxiety	31	23
Interpretation of the 1st color pair (the presence of strong negative emotions and negative states)	18	15
Interpretation of the 2nd color pair (the presence of strong negative emotions and negative states)	35	23

The differences between children giving incorrect answers to all points on the map are significant ($p=0.032$ and $p=0.0474$, respectively). Thus, as a result of taking pantogam, the ability to generalize and the ability of children to differentiate between essential and non-essential features of objects are improved.

Conclusion

The effectiveness of hopantenic acid (pantogam) in cognitive impairment in children with epilepsy has been established. Studies conducted using the Luscher test, the "playing the piano" kinetic praxis test, the "three" test, and the "fourth odd one out" test showed

whether there was a reliable reduction in various cognitive impairments in children of the main group after taking pantogam in relation to the comparison group.

After taking pantogam for 2 months, age-related normalization of EEG was observed: a decrease in diffuse changes and delayed maturation of the basic rhythm in 7.5% of children, and in another 7.5% of children, the EEG began to correspond to the age norm.

It should be emphasized that, along with the effectiveness of the use of hopantenic acid (pantogam) for the correction of cognitive and speech disorders in children with epilepsy, its good tolerability was noted, and no complications or increased frequency of seizures were observed.

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