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COMPARATIVE EVALUATION OF LABORATORY-FUNCTIONAL PARAMETERS IN THE CHILDREN WITH PRIMARY ARTERIAL HYPERTENSION

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Introduction

Primary Arterial Hypertension (PAH) contain 90-95% of the arterial hypertension in children. 66.0% of people with hypertension have atherogenic changes in lipid profile, characterized by increased levels of total cholesterol, triglycerides, and a have parallel decrease in fractions antiatherogenic HDL cholesterol. Arterial hypertension in the children characterized by a large prevalence and has not only medical but also social importance. Cince this disease is a major cause of morbidity and mortality of the adult population [1, 2, 3] .

Objective

To analyze the clinical and paraclinical parameters in the children with PAH and identify correlative interrelationships based on the study of individual links of homeostasis.

Materials and methods

Clinical characteristic, laboratory (clinical and biochemical blood tests, ELISA contents of interleukins (1, 6) in the blood serum, determine levels of hormones T4, TSH, micro and makrooelements (phosphorus, potassium, calcium, sodium and chlorine) in the blood serum, statistics methods.

Results

We investigated child's contingent with PAH from the Zakarpattya region (68 children, middle age 14,68±0,84 years). The control group consisted of 30 healthy children, middle age 13,52±0,22 years. Were considered clinical manifestations of PAH in children.

Table 1

Clinical characteristics of symptoms in children with PAH

Parameters	Children with PAH (n = 68)	
	Abs.	%
Headache (increased to the end of the day)	24	30,77±5,26
Fatigue	21	21,79±4,70
Irritability	17	21,79±4,70
Visual impairment	12	15,38±4,11
Palpitation	34	43,59±5,65
Pain in the heart area of short duration	22	28,21±5,13
Dizziness (orthostatic)	21	26,92±5,05

As can be seen from Table 1 is particularly representational signs in children with PAH there were Palpitation (43,59±5,65%), Headache (increased to the end of the day) (30,77±5,26%), Pain in the heart area of short duration (28,21±5,13%), Dizziness (orthostatic) (26,92±5,05%).

We obtained the following dates in the study of blood pressure in the children with PAH

Table 2

Characteristic of blood pressure

Parameters	Children with PAH (n=78)	Control groupe (n=30)
SAP mmHg. century	125,12 º ±0,73	114,73 ±0,58
DAP mmHg. century	77,59±0,61	70,90 ±1,1

Note. P– liability of the data in the case of the Children with PAH and control groupe .
° - p <0,05

Dates SAP significantly differed in the studied children's contingent (125,12 ±0,73 to 114,73 ±0,58, p <0,05). Systolic hypertension in 3-8 times prevails over diastolic in the children according to the literature dates. The prevalence of systolic hypertension in adolescence observed in all subgroups regardless of race, age and gender was found . This applies mainly to the PAG.

We also conducted biochemichal blood serum tests.

Table 3

Biochemichal tests of venous blood of the children with PAH

Parameters	Children with PAH	Control groupe
	(n=59)	(n=20)
Total Cholesterol (mmol /l)	4,44±0,10	2,94±0,17**
HDL Cholesterol (mmol /l)	1,2±0,31▪	1,69±0,01
LDL Cholesterol (mmol /l)	2,35±0,18**	0,84±0,03
IA	2,67	0,90
Calcium (mmol /l)	2,18±0,02	2,31±0,02*
Bilirubinum total (mmol /l)	11,51±0,49	8,23±1,02
Triglycerides (mmol /l)	1,96±0,04	1,49±0,04
Bilirubinum direkt(mkmol /l)	4,57±0,13	4,45±0,14
Creatinine (mkmol /l)	94,57±3,36▪	80,05±1,87
Urea (mmol /l)	4,57±0,13	4,28±0,16
Glucose (mmol /l)	4,95±0,11	4,53±0,21
Uric acid (mmol /l)	0,26±0,02	0,19±0,01▪
Urykuriya (mmol / day)	3,28±0,08	2,24±0,02▪

Note. P– liability of the dates in the case of the Children with PAH and control groupe . ▪- p<0,001, *- p<0,05, ** -p<0,001

As shown in the Table 5, the children with PAH are identified significantly higher specific biochemical parameters, including total bilirubin (11,51 ± 0,49 mmol / l to 8,29 ± 0,63 mmol / l in children from the control group ; p <0,001). Revealed significant differences identificated only in the levels of HDL (respectively 1,2 ± 0,31 mmmol / l to 1,69 ± 0,01 mmol / l ; p <0,001) by following dates. HDL is useful « antiatherogenic» factor which transferred of cholesterol from cells of peripheral organs (including arteries , arteries of the brain , etc.) to the liver where it will be excreted from the body in the form of bile acids. Elevated levels of total Cholesterol was determined in 18.76 % of patients - up to 6,12 ± 0,21 mmol / l. among children. These children have recorded violations in the increase of total cholesterol by fraction of LDL to 2,78 ± 0,42 mmol / l, when levels HDL fraction and TG were in the reference value. According to our investigation were found significant differences in the levels of cholesterol in children with PAH (2,35 ± 0,18 mmol / l to the control group - 0,84 ± 0,03 mmol / l). The rate of LDL more correlated with the risk of atherosclerosis than the total cholesterol level, that this fraction provides access of cholesterol to a blood vessels and organs. Determination of LDL is very informative for child organism. The deviations from the reference of this signs can indicate the risk of atherosclerosis and coronary heart disease in adulthood with high degree of probability. IA in 2.97 times higher in patients with PAH to the control group (2.67 and 0.90) according to our dates. Average values of uric acid (IC) in the blood (0,26 ± 0,02 mmol / l and 0,19 ± 0,01 mmol / L, respectively , p < 0.001) and urine (3,28 ± 0,08 mmol / day and 2,24 ± 0,02 mmol / day , respectively, p < 0.001) in children with PAH were significantly higher than those of children in the control group. Hiperurikemiya (HU > 0.32 mmol / l) was found in 2 girls - 4.80 % in boys, elevated levels of IC were found only in the one case - 2.50 %. We can say that the level of values fractions of cholesterol are the risk of disease, analysed of lipid metabolism, which are an indication for the possibility of correction. All these next biochemical tests in children with group observation were within the age norm.

Study of coagulation is an important test of the origin and development of PAH and potentially atherosclerosis and coronary heart disease too. We received the following dates as result of research. Changes in coagulation were indicated in 54.00 % of children. Major violations were characterized by reliable estimates an increase of activated recalcification time - a group of children with PAH and the control group (74,76 ± 5,06 s to 64,76 ± 2,04 s, p < 0.05) with increasing concentration of fibrinogen (17,53 ± 1,63 s to 11,32 ± 0,77 s, p < 0.001), which may presented a predisposition to thrombogenesis in children with PAH group. The growth of the concentration of fibrinogen in plasma correlated with an increased risk of complications of heart disease even within the reference values, according to the literature.

Investigated contingent we conducted a survey to identify disorders of mineral metabolism child's organism. These mineral metabolism are presented in Table 4.

Table 4

Mineral balance in the case of children with PAH

Parameters (mmol/l)	Children with PAH (n=34) M±m	Control group (n=41) M±m	P
Potassium	4,58±0,18	3,64±0,21	p>0,05
Sodium	133,90±1,72*	119,16±2,01	p<0,05
Chlorine	102,58±1,78	97,5±1,87	p>0,05

Note. P– liability of the data in the case of Children with PAH and Control group

The levels of all minerals were identified within reference values. Significant difference observed in the level of sodium in children with PAH and the control group (respectively 133,90 ± 1,72 mmol / l and 119,16 ± 2,01 mmol / l, p <0.001) But all numerical values were vary within a reference.

Investigation of hormonal levels, cytokine profile (IL-1, IL-6) in children with PAH presented in the Table 5.

Table 5

Hormonal levels, cytokine profile in children with primary arterial hypertension

Parameters	Children with PAH (n=28) M±m	Control group (n=20) M±m
IL-1 (пг/мл)	0,43±0,03*	0,64±0,05
IL-6 (пг/мл)	1,05±0,16	1,19±0,15
TTG (ммоль/мл)	1,22±0,08*	1,92±0,20
T4 (нмоль/л)	14,33±0,42	15,46±0,33
Kortizol (нмоль/л)	364,29±17,42*	246,80±22,49

Note. P– liability of the data in the case of Children with PAH and Control group
*-P<0,02

Endothelial cells are active producers of IL-1. Complect of different types of cells which have receptors to IL-1 are very large and distributed on the all organism systems. Growth stimulatory effect of IL -1 on the B cells is important for the development of the immune answer. The main effect of IL-6 is related to his participation as a cofactor in the differentiation of B lymphocytes and their maturation and transformation into plasmatic cells, which do immunoglobulin secretion. IL-6 is one of the most active cytokines which partitipated in the realisation of immune answer. These cytokines contribute to the development of endothelial inflammation by activating endothelial cells, macrophages, stimulating production of free radicals, proteolytic enzymes and a significant increase coahulation activity. According to our data, the levels of IL-1 and IL-6 were in the range of reference values with tendency to the lower level, especially IL-1. This fact indicates decrease of production of interleukines by child's organism in the patients with PAH what confirmed by the above described clinical and laboratory effects.

There are a significant decrease in TTG and absolute decrease in the level of T4. Their influence on lipid metabolism caused by inhibition of synthesis and increased fat splitting with the release of glycerol and fatty acids and increase the concentration of cholesterol. These dates are consistent with our result (4,44 ± 0,10 mmol / l to 3,21 ± 0,26 mmol / l, p < 0.001). Cortisol has nonpresentive mineralocorticoid influence, but high maintenance caused by excessive sodium retention in the child organmism (133,90 ± 1,72 to the control groupe - 119,16 ± 2,01, mmol / L p < 0.001). There is a clear tendency of significant relationships although but our data vary within the reference values.

Correlation analysis of our study dates demonstrated a direct relationship between the value of IL -6 which correlated with the level of glucose, r = 0,65. SAT has a high degree of feedback to the level of T4. The value of IL-6 correlated in inverse proportion to the level of TTG, r = -0,31. TTG is also directly dependent from the levels of total protein, r = 0,79, which has negative relationship with sodium, r= -0,89. The level of calcium has negative relationship with the level of sodium, r = -0,85.

Conclusions

In patients with hypertension which PAH debuted in adolescence and have changes in lipid profile are formed pathological process in two ways: first way presented increase in total cholesterol associated with lower HDL cholesterol indicators , and other is an increase of Triglycerides with decreased levels of HDL cholesterol, according to date of Corenev M.M. and authors , 2010,2011 years. These changes in lipid profile is prognostically unfavorable signs of atherosclerosis which formated in the patients (1th way), in others – development of the metabolic syndrome in the young age (14,15 years) , which we observated in our research. Our data are relevant tendency also. In children with PAH increase Triglyceride levels (1,96 ± 0,04,mmol /l) assotiated with significant decrease of HDL cholesterol fractions (1,2±0,31mmol /l) which predicts development of the metabolic syndrome in the young age.

Comparative evaluation of laboratory-functional parameters in the children with primary arterial hypertension

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Summary.

We investigated child's contingent with primary arterial hypertension (PAH) from the Zakarpattya region, Ukraine (68 children, middle age 14,68±0,84 years). In patients with arterial hypertension which PAH debuted in adolescence and have changes in lipid profile are formed pathological process in two ways: first way presented increase in total cholesterol associated with lower HDL cholesterol indicators , and other is an increase in Triglycerides with decreased levels of HDL cholesterol, according to date of Corenev M.M. and authors , 2010,2011 years. These changes in lipid profile is prognostically unfavorable signs of atherosclerosis which formated in the patients (1th way), in others – development of the metabolic syndrome in the young age (14,15 years) , which we observated in our research. Our data are also relevant tendency. In children with PAH increase Triglyceride levels (1,96 ± 0,04,mmol /l) assotiated with significant decrease in HDL cholesterol fractions (1,2±0,31mmol /l) which predicts development of the metabolic syndrome in the young age.

Key words: children, primary arterial hypertension, links of homeostasis, comparative evaluation

Порівняльна оцінка лабораторно-функціональних параметрів у хворих із первинною артеріальною гіпертензією

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Резюме

Мета роботи: провести аналіз клініко-параклінічних параметрів у дітей з ПАГ та виявлення корелятивних взаємозв'язків на підставі вивчення окремих ланок гомеостазу.

Матеріали і методи. Загальноклінічні, лабораторні (клінічний і біохімічні аналізи крові, імуноферментний аналіз вмісту інтерлейкінів (1, 6) у сироватці крові; визначення рівнів гормонів T_4, ТТГ; мікро- та макрооелементів (фосфору, калію, кальцію, натрію та хлору) у сироватці крові, статистичні. Були розглянуті клінічні прояви первинної гіпертензії у дітей.

Результати досліджень. Було обстежено 68 дітей смт Великий Березний (49 дівчат та 19 хлопців, середній вік складав 14,68±0,84 року з попередньо встановленим діагнозом первинної артеріальної гіпертензії.

Висновки. У дітей з гірського району із наявним достовірним зниженням рівня показників фракції ЛПВЩ патологічний процес відповідає прогностично за формування ранніх атеросклеротичних процесів та презентує багаточисленні взаємозв'язки макро- та мікроелементів, зокрема рівня йоду з рівнями кортизолу, Іл-1, міддю та залізом, АФЛ(IgM) та рівня кальцію з рівнями загального білка, АФЛ(IgM), АФЛ(IgG), ІЛ-6, кортизолу.

Ключові слова: діти, первинна артеріальна гіпертензія, ланки гомеостазу, порівняльна характеристика.

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