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Changes Visual Systems at Patients with Essential Arterial Hypertension

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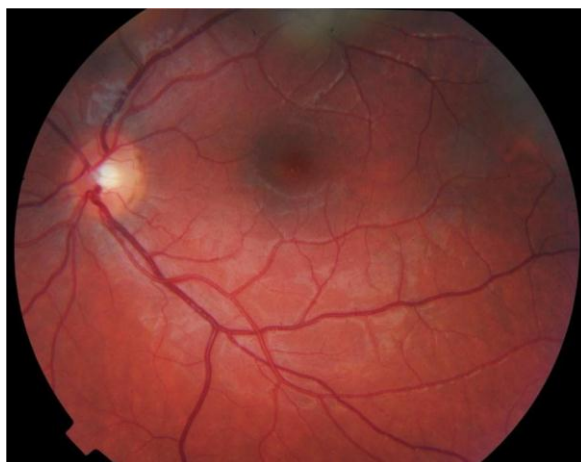
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Abstract: Pathological changes in the vessels of the retina, interstitial edema of the retinal tissue, intra - a - and subretinal hemorrhages against the background of hypertension are a common cause of irreversible vision loss in patients of mature age. Therefore, the real assumption is what structural and functional changes visual systems in children and adolescents with EAH may be predictors of more serious pathological processes in further, this is and determined relevance this stage of the study.

Key words: functional changes, determined relevance, subretinal hemorrhages, pathological decussation.

The study of the organ of vision in children and adolescents with EAH was started with an ophthalmoscopy of the fundus, its photographic recording with further expert evaluation. Pathological changes characteristic of the manifestations of classical hypertensive angioretinopathy : narrowing of the arteries, dilation of veins, increase corner discharge vessels, symptoms pathological decussation, etc., none of the 50 patients was detected, 5% had slight tortuosity of the vessels, which is not a pathognomonic sign of hypertensive angiopathy (Fig. 11, Table 4).



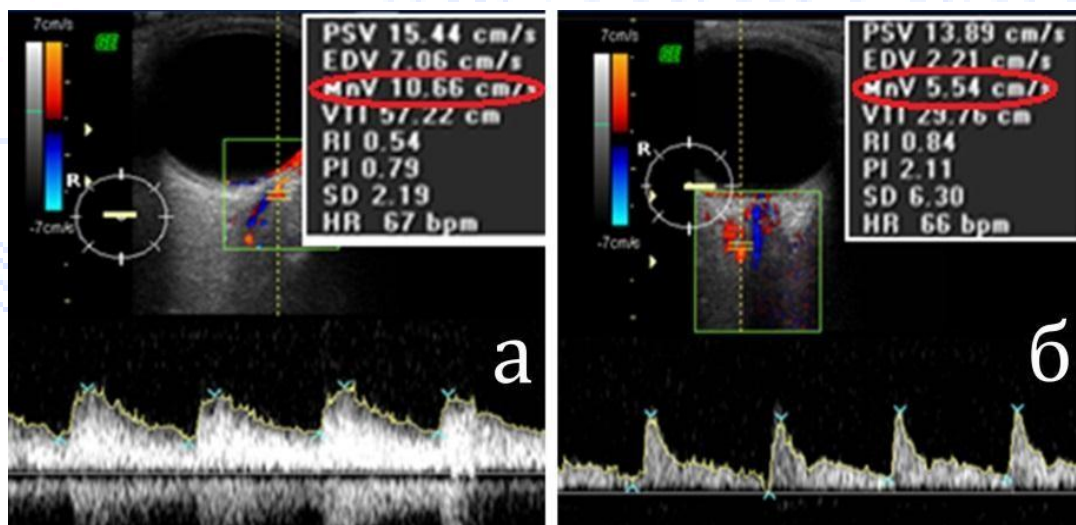
Picture eleven. Painting eye bottom patient FROM. With EAG, light tortuosity arteries second order

From the presented data it follows that significant changes in the severity vision, indicators computer perimetry revealed not It was, which indicates the absence of clinically significant changes in the retina and suggests that when using only these methods, it is not possible to detect significant changes in the organ of vision.

At the next stage, a study of regional hemodynamics was carried out using the method of color Doppler mapping of the orbital vessels with the study high-speed indicators and index resistance vascular walls in the posterior short ciliary arteries (SCCA), ophthalmic artery (GA), central artery (CAS) and retinal vein (RCV) . A 17% decrease in blood flow velocity in SCCA in patients with EAH due to the diastolic component indicates difficulty in perfusion. An increase in the speed hemodynamic parameters of the ophthalmic artery was revealed: blood flow velocity in systole exceeded indicators groups control on the 22% in diastole - by 30%, the average blood flow velocity was increased by 19%. An increase in systolic velocity by 10% compared with the norm was also noted in the CAS, which, apparently, is a compensatory reaction in response to a decrease in the velocity of linear blood flow in the PCCA. In addition, an increase in systolic velocity in the GA and in the CAS may be due to a discrepancy between the diameter of the vessel and the volumetric blood flow (Bernoulli effect).

These changes may indicate difficulty in perfusion, which is typical for vessels located proximal to the zone of abnormally high hydrodynamic effect [1,16], what in my turn adversely affects capillary resistance vasculature and is reflected in a significant increase in the resistance index.

Thus, the identified changes allow us to state the hemodynamic imbalance in GA and in two major basic blood supply systems of the eyeball - CAS and PCCA (Fig. 12).



Picture 1. Medium speed blood flow in CACA in norm (a), at patient With EAG (b)

The presented data are consistent with the changes revealed during the formation of microcirculatory changes in the vessels of the brain and kidneys during promotion arterial pressure. AT norm resistive vessels organisms, which include arterioles and terminal arteries, are in a state of hypertonicity to ensure sufficient perfusion, and, consequently, the metabolic processes of organs and tissues . A prolonged increase in blood pressure is accompanied by a spasm of small peripheral vessels, which can be attributed to the vessels of the choroid . In turn, the state of constant spasm leads to hypertrophy of the vascular wall, a gradual narrowing of the lumen of the vessel, i.e., to remodeling of resistive arteries, an increase in their total peripheral resistance and, possibly, the development of ischemia .

Clinical electrophysiology has the potential for an early and objective study of visual dysfunctions. The specificity of changes in certain types of electroretinograms is determined by the pathophysiological mechanisms of the disease and the predominant inclusion in the pathological

process at different stages of its development of individual pools of photoreceptors, retinal ganglion cells and neuroconductive pathways. Results of electrophysiological research children and teenagers With EAG represented in table. 6.

Comparative analysis of data from electrophysiological studies allowed reveal at all children With EAG decline amplitude and deformation peaks of oscillatory potentials by an average of 65%, which characterizes the violation of neuronal relationships in the inner layers of the retina .

When registering a ganzfeld - ERG, it was diagnosed: a decrease in the amplitude of the a-wave by 19% and a decrease in the amplitude of the rhythmic ERG at 30 Hz by 34%, reflecting the functional depression of cone photoreceptors [47, 123]. A decrease in the amplitude of the ganzfeld -ERG b-wave by 26% indicates a disturbance in the activity of second-order neurons [167]. A significant decrease in the amplitude of the pattern-VEP on a small stimulus by 35% in patients with EAH confirms the interest in formation pathological macular changes zone and papillomacular bundle.

A significant decrease in the amplitude of the P50 components of the pattern ERG by 33%, the source generation which are photoreceptors macular area of the retina [123], also confirms the fact of its involvement in the pathological

process. Reduction component N95 pattern-erg on the 25% on comparison With the control group reflects a decrease in the functional activity of retinal ganglion cells and is consistent with the results of studies by C. Kaur [164, 165], who experimentally established their high sensitivity to ischemia and excitotoxicity .

In general, the results of the study suggest that a pronounced decrease in amplitude early oscillations generated in neurons related with the on -pathways of the rod system, an increase in the time of peak-to-peak latency and a decrease in the amplitude of late oscillations associated with the off -channel system of the cone system characterizes a violation of interneuronal relationships, reflecting the degree of their ischemia, which is consistent with the results of CFM (Fig. 15). Therefore, it can be assumed that the key pathophysiological mechanism triggering retinal changes in EAH is choroidal ischemia.

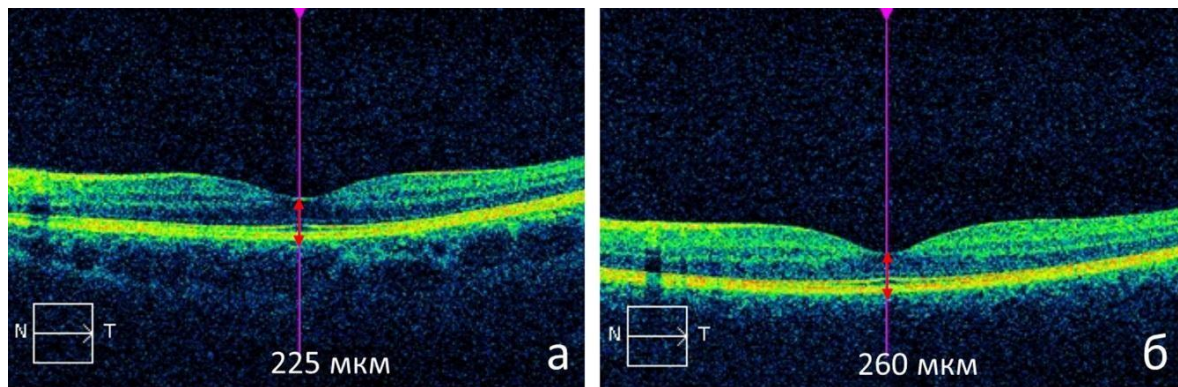
Perfection methods visualization allows on the new level to evaluate changes in the structural state of the retina and optic nerve starting from the early preclinical stages of the disease. For this purpose, the method of optical coherence tomography of the retina and optic nerve was used to obtain high-resolution images of longitudinal and transverse sections of retinal tissue (Table 1).

Table 1

indicator , micron	Control n=18 (36 eye)	Patients With EAH n =50 (100 eyes)	Manna Whitney , p
OCT thickness in center MZ	225.00±27.74	260.37±19.46	0.0008
OCT mz S	280.50±14.71	282.12±15.06	0.83
OCT mz I	266.00±14.33	271.34±23.75	0.66
OCT mz N	295.00±16.37	298.90±29.63	0.79
OCT mz T	264.50±11.79	270.77±16.52	0.46
cube Volume	10.00±0.36	10.32±0.47	0.19
OCT ONH S	307.00±9.91	256.18±77.77	0.36
OCT ONH I	309.50±2.12	260.08±72.78	0.34
OCT ONH N	260.50±6.36	226.13±83.60	0.57

OCT ONH T	308.00±2.83	246.22±97.57	0.38
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Analysis results optical coherent tomography retina revealed increase thickness retinal fabrics in the center macular zones by 15% compared with the control group (Fig. 16). That is, chorioretinal ischemia and metabolic disorders in patients with EAH are accompanied by structural changes in the reti



Picture 16. Thickness retina in center: in norm (a), at patient With EAG (b)

It can be seen that the most informative biochemical criteria for discrimination between patients with essential arterial hypertension and those in the control group were serum levels of total cholesterol, triglycerides, lipoproteins very low density and glucose, what how has already been shown by us earlier, indicates the presence of proatherogenic and prodiabetogenic changes in the metabolic profile in boys with AH already in the early stages of this disease.

At the stage of inclusion of patients in this study, we conducted a directed diagnostic search to exclude chronic renal disease in them. pathology, which could would to be cause raise level HELL. Although none of our patients was diagnosed with kidney disease, serum level creatinine , despite on the individually normal its value turned out to be one of the significant factors of discrimination between patients with hypertension and healthy adolescents. This fact may reflect the early deterioration of renal function due to arterial hypertension in combination with elevated levels of uric acid.

The relatively lower levels of total calcium in the blood serum of boys with AH that we have identified do not have an unambiguous interpretation, but, according to the literature, may be associated with insufficient activation of the endothelial NO- synthases and fall concentration generated nitric oxide enzyme (+2), which, in turn, may affect the balance of hypo- and hypertensive factors in favor of the latter [63].

Significant characteristics that determined the differences between boys with AH and healthy children were the indicators of the pulse index and the index of resistance of the vascular wall in SCCA, the change of which indicates about violation of choroidal perfusion, which, possibly, causes ischemia retina, aggravates process endothelial dysfunction in choroidal vessels and finds his reflection in form inclusion in the equation the canonical value of the ischemia coefficient and the index of retinal sensitivity.

Further, in order to determine the coordinated changes in the somatic and ophthalmological status patients was held correlational analysis according to Pearson, demonstrating the fact that the variability of one trait is in accordance with the variability of another, and also allowing assess the closeness of the agreed relationships regarding the group of related indicators, which form correlation galaxy.

The assessment of the reliability of correlations depending on the number of observations was carried out using the appropriate tables (Zaks L., 1976). The significant correlation coefficient, taking into account the sample, exceeded critical value equal to 0.3. The strength, degree, or tightness of the correlation connection was determined by the absolute value of the correlation coefficient and not depended on its focus. With a coefficient $r > 0.70$, the relationship was considered high, at $0.30 < r < 0.70$ – medium [41, 80].

When analyzing the obtained correlations, the presence of 132 significant correlations. It was revealed that each indicator has one or several relationships with other indicators. At the same time, positive relationships were identified when, with an increase in one parameter, an increase in another, and negative - with an increase in one parameter there is a decrease in the other.

From the entire set of correlations obtained, the indicators with the highest correlations $r > 0.70$ were selected. In addition, separately a study of correlations between indicators characterizing somatic condition patients and them ophthalmic status.

The data obtained indicate that the formation of a pathological process, caused by an increase in blood pressure and a violation of lipid metabolism and tissue metabolism, primarily affects the structural and functional changes central avascular zones retina on the against the background of a significant decrease in blood flow in the PCCA system and is accompanied by inhibition of electrogenesis , neuroconductivity and an increase in the thickness of retinal tissue in the macular region, which generally indicates the formation at children and teenagers With EAG syndrome chorioretinal ischemia.

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