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SOME PARTICULAR QUALITIES OF ONTOGENESIS OF THE CARDIOVASCULAR SYSTEM IN CONDITIONS OF THE HEARING DEPRIVATION

Abstract. The given publication mirrors some outcomes of a complex research of the psychophysiological and physiological peculiarities of people with the hearing defects.

The work reveals that ontogenesis of the cardiovascular system of such handicapped children and young people has both the age distinctions and the specific functional disorders.

Key words: cardiovascular system, hearing deprivation, electrocardiography, reovadography, adaptation potential, neuropsychic tension.

Introduction.

A study of indicators of the cardiovascular system activity at the hearing deprivation allows to reveal and estimate an efficiency of work of the compensatory mechanism, providing the adaptation in ontogenesis.

An active status of the central nervous system connected with the neuropsychic tension, which is a certain level of activation of those cerebral structures that realize formation, driving and inhibition of any functional system of the organism. The reactions of the cardiovascular system are tightly interrelated with the emotional states. Thus, centers of excitation in the cerebral cortex influence the vasomotor center of the medulla oblongata through diastaltic passages. (Mohrman, Heller, 1997).

The emotional tension is accompanied by excitement of sympathetic sections of the vegetative nervous system, and outburst of a large quantity of adrenaline in blood. It stimulates heart activity, stipulating an uneconomical regimen of the exchange processes and the abruptly increased excitability of the myokarda. The condition for the excitation of a parasympathetic section of the nervous system occurs simultaneously. It is connected not only with generalization of the excitement, but also with increase of the arterial pressure, which arouses a reflex excitement of Vagus-centers.

Hence, the changes of heart regulation at emotional loads reflect in such impartial indicators as frequency of heart contractions, AV-conducting, activity of the ectopy centers.

The same spectrum of pathologies, typical for the whole population, is applied to the deaf people, but series of diseases and functional disorders are found much more often. It can be partly accounted for a syndrome deafness, i.e. the deafness of a genetic origin and connected with other pathologies (Konigsmark, 1980); and partly for a

vegetative dysfunction against a background of the changes caused by deprivation (Iraprtyants, Gekht, Gulyaeva, 1992).

Material and Methods

The research was conducted on two age groups. The first group consisted of 42 persons - children with the hearing defect at the age of 7-10 (control group – 20 persons), the second group – deaf people and persons with the hearing disorders at the age of 19-21, 40 in number (control group – 20 persons).

The method of electrocardiography was used to study a transistance of heart. The state of the cerebrum vessels was examined by methods of RVG and ophthalmoscopy. The indicators of arterial pressure, frequency of heart contractions and indicators of the cardiovascular system activity, such as: the minute blood volume, the systolic blood volume, the economy coefficient of blood circulation, the Ruffie index, the Kerdo index, the adaptation potential, were also investigated. The obtained outcomes passed a statistical treatment.

Results

At the analysis of the data of electrocardiogram the following outcomes were discovered among the children with the hearing disorders (table 1).

Table 1

The average EKG indicators of children of 7-10 years old with the hearing defect

Groups	Duration of EKG intervals (mm)				
	Frequency of heart contractions	R – R'	PQ	QRS	QRST
Experimental	93,6	0,65	0,13	0,05	0,3
Control	94,1	0,136	0,136	0,052	0,316**

The note: the difference between parameters is authentic at P * = 0,95; P ** = 0,99

All experimental people had the sinusoidal heart-beat. The duration of R – R', P-Q and QRS intervals statistically do not differ for the children with the hearing disorders and for healthy children. The authentic distinctions were found in the duration of ST-interval (it is smaller for the experimental group), that testifies about the functional disorders of the excitement realization in heart.

The children's cardiovascular system has its specific peculiarities both in construction and activity. The heart grows slower than the vessels, lagging behind from the rates of increasing of the body mass and organism dimensions. Even at rest a respiratory arrhythmia is to be observed at such age; it disappears in 13 years old, than arises again in 16-18, and is not observed among the healthy adults.

The statistical distinctions are discovered at comparison of EKG indicators of children and youth with the hearing deprivation. In age groups there are no significant differences of the quantitative indicators, the same changes of the qualitative characteristics may be observed, though.

In youth group with the hearing blemish for 79% of the girls the duration of PQ-interval amounted to 0,15 sec was typical, i.e. the number of heart contractions was equal to 80 beats/min. For 90% of the boys and 21% of the girls the duration of PQ-interval amounted to 0,16 sec (frequency of heart contractions was equal to 70 beats/min). For the majority of the girls the amount of heart contractions after physical load has risen. The depression of ST-segment with respect to TP-interval also appeared,

that is explained by appearance of tachycardia and sympatheticotonia. 3% of the boys had a dilation of complex QRS >12 s, and in the abstractions V5, aVL – wide jag S. Such modifications of EKG occur during a blockade of the right stalk of the Giss bunch.

During the qualitative analysis it was discovered, that because of one or another vegetative program 80% of the children were provoked for:

- sympatheticotonia (tachycardia; rise of the amplitude of the jag R in I and III standard abstraction; the jag T – in I and II abstraction; V4 –V6 is flat, diphasic or negative; the interval ST is dislodged below the isoline);
- vagotonia (bradycardia; sine arrhythmia; non-differentiability of the jag P; the interval P-Q is elongated to AV blockade; the jag T in I, II and V5 abstractions is high; the interval ST is dislodged above the isoline).

The ophthalmology research of blood vessels of the eye-ground has revealed that in both experimental groups 80% of the girls and 62% of the boys had the functional disorder – angiopathia of retina. The narrow crimped arteries along all extent (sometimes the arteries are wide - the Twist symptom); wide, saturated, crimped veins define it. The certain vascular loops and aneurysm of vascular wall are to be observed. Sometimes there is a correlation of veins and arteries 1:4, that does not correspond to the norm.

It was discovered at the analysis of REG-curves that 90% of the children and 97% of the youth with the hearing defect had angiodystonia of the cerebrum vessels. The results are figured in tables 2, 3.

Table2

The average parameters of the cerebral hemodynamics young people at the analysis of REG-curves (M ± m)

Parameters	Experimental (n = 110)		Control group (n = 80)	
	Right hemisphere	Left hemisphere	Right hemisphere	Left hemisphere
Carotid system				
B/A, %	81,9±1,7***	83,3±1,7	91,3±1,8	87,7±1,6
I/A, %	73,9±1,8***	74,7±1,8	81,6±1,8	76,6±1,6
D/A, %	82,9±1,5**	80,4±1,8	87,9±1,7	82,1±1,4
BOA,%	0,12±0,01***	0,14±0,01**	0,19±0,05	0,17±0,01
A Om/c	28,9±1,6***	21,1±2,2*	13,1±2,3	15,0±1,8
F Om/c	0,28±0,01***	0,30±0,02**	0,43±0,02	0,37±0,02
Vertebra-basilar system				
B/A, %	77,2±1,5***	78,3±1,6**	85,0±1,4	82,9±1,1
I/A, %	70,3±1,7**	72,7±1,7	75,6±1,5	74,0±1,2
D/A, %	81,0±1,4**	81,6±1,5	85,2±1,2	81,6±1,2
BOA,%	0,11±0,01***	0,12±0,01**	0,15±0,01	0,14±0,01
A Om/c	24,2±0,9	23,6±1,2	23,5±1,9	26,7±2,1
F Om/c	0,26±0,01***	0,26±0,01*	0,33±0,01	0,30±0,01

The note: A - hemofilling an arterial channel; B/A - a parameter of peripheric resistance of vessels; I/A - a dicrotic index; D/A - a diastolic index; BOA - a parameter of venous outflow from the given area; F - rate volumetric hemodynamics

The difference between parameters is authentic at P * = 0,95; P ** =0,99

For both age groups the indicators in the carotid basin are higher, than in the vertebra-basilar basin. The right cerebral hemisphere prevails more distinctly for the adults, it is explained by the fact of an adaptation process realization in the very right hemisphere, where both the activity and the vegetative regulations from the side of hypothalamus are expressed more obviously.

Table3

The average parameters of the cerebral hemodynamics children of the primary school at the analysis of REG-curves ($M \pm m$)

Parameters	Experimental (n = 95)		Control group (n = 100)	
	Right hemisphere	Left hemisphere	Right hemisphere	Left hemisphere
Carotid system				
B/A, %	88,48±1,28	87,21±1,21	87,98±1,38	88,08±1,31
I/A, %	78,35±1,25	77,33±1,14	77,60±1,22	78,94±1,38
D/A, %	81,56±1,21	82,66±1,21	83,59±1,22 **	84,03±1,31
BOA,%	9,32±0,71	7,65±0,60	12,74±0,85 **	8,94±0,77
A Om/c	0,22±0,01	0,21±0,01	0,22±0,00	0,21±0,00
F Om/c	0,48±0,02	0,46±0,02	0,48±0,01	0,46±0,02
Vertebra-basilar system				
B/A, %	88,09±1,03	86,28±1,21	90,95±1,38	89,76±1,72
I/A, %	77,07±1,06	76,03±1,22	77,4±2,08	79,29±1,76
D/A, %	82,46±0,89	79,63±1,15	88,37±1,32 **	84,29±1,77 **
BOA,%	10,05±0,58	13,28±1,08	11,46±0,84	15,11±1,46
A Om/c	0,25±0,01	0,21±0,01	0,23±0,01 **	0,22±0,01
F Om/c	0,64±0,02	0,51±0,02	0,61±0,02***	0,96±0,28**

The note: A - hemofilling an arterial channel; B/A - a parameter of peripheric resistance of vessels; I/A - a dicrotic index; D/A - a diastolic index; BOA - a parameter of venous outflow from the given area; F - rate volumetric hemodynamics

The difference between parameters is authentic at $P^* = 0,95$; $P^{**} = 0,99$

During the research of hemodynamics there were discovered the acceleration of heart contractions for the children (70 %) and the adults (67%); the lowering of the systolic arterial pressure (children - 57 %, adults – 60%); the lowering of the diastolic pressure (children - 55 %, adults – 50%). A satisfactory coefficient of blood circulation had 7% of the children and 6% of the adults, the rest had a fast development of tiredness owing to insufficiency of the compensation mechanism.

The satisfactory indicators of the systolic blood volume had 72% of the children and 80 % of the adults; the high indicators were observed for 68 % of the children; the low indicators were characteristic for 12% of the children and for 16% of the adults. 40% of the children and 66% of the adults had the minute blood volume within the limits of norm; 15% of the children and the adults had the rise of the minute blood volume; 45% of the children and 19% of the adults had the lowering. The increase of the minute blood volume in both groups testifies that the compensating processes of the cardiovascular system realize due to increase of frequency of heart contractions, but not due to the systolic volume. It is the evidence of the low effectiveness of the adaptation processes.

The Kerdo index (an indicator of the vegetative balance) serves as the integrative indicator of an interaction between the nervous and the cardiovascular systems. For 8% of the children and 16% of the adults vagotonia is characteristic, and for 69% of the children and 78% of the adults – sympathicotonia.

Discussion and Conclusions

The cardiovascular system endures a whole series of quantitative and qualitative modifications in the process of ontogenesis. We revealed that both children and adults with the hearing defects have various functional disorders along with the age alterations, which are to be found more frequently than among healthy people. The conducted researches (V.Matveev, 1987, I.Samoylova, L.Lysenko, 1998, N.Vaydman, 1992) testify about correlation of state of the cardiovascular system with the neuropsychic tension, which is developed as a result of deprivation. Blood vessels are subjected to the influence of the vegetative nervous system in a greater degree than the heart.

Changes of separate indices of the cerebral hemodynamics within children of the primary school and young people age with hearing deprivation lead more often to changes of general cerebral blood flow, than within children with normal hearing.

The influence of sympatho-chromaffinus system on heart and vessels dominates among the people with the sensory defect, that becomes apparent in the form of the functional disorders of anglopathia of retina and angiodystonia of the cerebrum vessels.

The adaptation of the cardiovascular system to physical and psychological loads for the given contingent occurs due to increase of frequency of heart contractions, but not due to the systolic volume.

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АНОТАЦІЯ

Ця публікація відображає деякі результати комплексного дослідження особливостей системного та церебрального кровообігу у людей з вадами слуху.

Показано, що онтогенез серцево-судинної системи у депривованих дітей та молоді має не тільки вікові особливості, а і специфічні функціональні порушення.

АННОТАЦИЯ

Данная публикация отражает некоторые результаты комплексного исследования особенностей системной и церебральной гемодинамики людей со слуховой депривацией.

Показано, что онтогенез сердечно-сосудистой системы у депривованных детей и молодежи имеет не только возрастные особенности, но и специфические функциональные нарушения.