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ELECTROCARDIOGRAPHIC (AMPLITUDE – INTERVAL) CHARACTERISTICS OF SICK CHILDREN WITH PREMATURE VENTRICULAR AROUSAL.

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Annotation: The literature emphasizes that [1, 3, 6, 16], that many cardiac arrhythmias are based on re–entry mechanisms due to the presence of a DPP pulse, the ECG expression of which are varieties of LVH (syndromes and phenomena: WPW, CLC, Mahaima – Levy). DPP is quite common in the pediatric population (up to 0.5 – 0.8%), but they do not always transform into life-threatening arrhythmias [2, 5, 7]. Many factors are important in the stabilization and manifestation of DPP, the leading of which are disorders of the postnatal development of the child, including the conductive structures of the heart, the role of the initial electrophysiological features of the myocardium is important (myocardial instability) [1, 4, 13, 17].

Key words: arrhythmia, additional pathways, pre-excitation of the ventricles of the heart, children.

Introduction: Arrhythmias due to the presence of DPP in children can be detected both with organic lesions of the heart and blood vessels, and in the absence of such, being in most cases the cause of diagnostic errors (carditis, MVP, myocardial infarction, etc.). There is no reliable information in the literature on the spread of arrhythmias due to DPP in children [3]. Unlike adults, rhythm disturbances associated with DPP in children are often asymptomatic and, in 40.0 – 60.0%, are an accidental finding [9, 12, 15]. Doctors' ignorance about the types of arrhythmias and clinical and electrocardiographic factors can lead to their late detection when an arsenal of therapeutic measures (including surgical ones) are not able to prevent the development of complications and an unfavorable (fatal) prognosis [7].

The purpose of the study. Electrocardiographic (ECG) characteristics of sick children with manifestations of LVH were (will be) discussed by us in the aspect of studying the amplitude–interval values of the atrial and ventricular complex, electrical activity and stability of the heart, planimetric indicators of atrial and ventricular de– and repolarization. To study and provide general clinical characteristics of sick children with various forms of PVH in school-age children in terms of additional diagnostic capabilities of electrocardiography.

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Materials and methods of research: The work uses an epidemiological approach to the selection and analysis of material for the identification of cases of PVH in school-age children. 1733 children aged 7-14 years were examined (827 girls, 906 boys). They were selected from the general population of schoolchildren (17,330 children) by simple randomization (A – girls, B – boys). The 10% sample of secondary school students for the detection of cases of PVH was examined with the maximum coverage (90.2% girls, 91.1% boys) of the children included in it. The examination was carried out as soon as possible (2-3 months) to eliminate the time factor for the studied ECG parameters.

Research results and discussion. Some amplitude parameters of the P wave and its interval values in healthy and sick children with LVH are presented in Tables 4.1 and 4.2.

Table 4.1

INDICATORS OF ATRIAL ELECTRICAL ACTIVITY IN PATIENTS WITH LVH AT THE AGE OF 7-10 YEARS (M±M).

№	Indicators	Healthy n=50	WPW Syndrome n=4	The WPW phenomenon n=7	Syndrome CLC n=9	Phenomenon CLC n=11	The Mahaim phenomenon n=4
1	Amplitude P, мм	0,65±0,029	0,55±0,08	0,62±0,11	0,54±0,08	0,48±0,05*	0,52±0,05*
2	Duration P, сек.	0,065±0,001	0,062±0,011	0,063±0,01	0,064±0,01	0,058±0,06	0,064±0,01
3	ÂP	35,7±2,92	40,1±7,38	39,2±3,31	42,3±4,48	38,4±2,36	32,7±9,04
4	Triangle coefficient (cont.units)	0,200±0,006	0,153±0,039	0,201±0,026	0,159±0,019*	0,166±0,013*	0,225±0,043
5	Index Makruz	0,905±0,029	2,385±0,15*	1,575±0,13*	1,939±0,09*	1,184±0,08*	0,778±0,04*
6	Index SSPLP, V 1 (mm/sec)	0,0101±0,002	0,0231±0,002*	0,0187±0,0012*	0,0237±0,002*	0,0195±0,001*	0,0226±0,002*
7	VVOPP, $V_{1.2}$, sec	0,011±0,002	0,012±0,002	0,014±0,002	0,013±0,001	0,012±0,001	0,012±0,003

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8	**VVOLP, V5.6, sec**	0,032±0,001	0,035±0,09	0,034±0,003	0,039±0,002*	0,041±0,003*	0,036±0,003
9	**Speed rise P mm/0.01sec**	0,197±0,006	0,177±0,012	0,194±0,016	0,169±0,014	0,166±0,010*	0,163±0,015*

Note:

1. SSPLP - the strength of the ratio of the area of the left and right atrium.

2. VVOPP and VVOLP - right and left atrial internal deviation, respectively.

3. Data except those marked *(p<0.05-0.001) are not reliable in all cases (p>0.05).

marked - *(p<0.05-0.001) in all cases not significant (p>0.05).

Table 4.2

INDICATORS OF ATRIAL ELECTRICAL ACTIVITY IN PATIENT CHILDREN WITH PVH

AT AGE 11-14 YEARS (M±M).

№	**Indicators**	**Healthy n=50**	**Syndrome WPW n=5**	**Phenomenon WPW n=10**	**Syndrome CLC n=15**	**Phenomenon CLC n=9**	**Phenomenon Mahaima n=8**
1	**Amplitude P, mm**	0,54±0,02	0,62±0,11	0,64±0,08	0,58±0,05	0,61±0,08	0,52±0,07
2	**Duration P, sec.**	0,081±0,002	0,064±0,02	0,062±0,01	0,065±0,01	0,062±0,01	0,078±0,011
3	**ÂP**	45,4±2,12	49,2±4,68	50,5±6,09	52,3±6,28	48,3±6,67	46,5±6,88
4	**Triangle coefficient (cont.units)**	0,140±0,007	0,168±0,017	0,178±0,02	0,155±0,03	0,175±0,04	0,133±0,02
5	**The Macruz Index**	1,081±0,04	2,133±0,16*	1,476±0,15*	2,167±0,25*	1,419±0,19*	1,023±0,15

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6	**SSPLP indicator, V 1 (mm/sec)**	0,0205±0,001	0,0189±0,002	0,0259±0,003	0,0222±0,001	0,0228±0,002	0,0173±0,001*
7	**VVOPP, V1.2 sec**	0,019±0,001	0,022±0,002	0,016±0,002	0,015±0,001*	0,017±0,003	0,015±0,003
8	**VVOLP, V5.6 sec**	0,038±0,001	0,036±0,004	0,037±0,003	0,035±0,002	0,036±0,004	0,032±0,002
9	**Lifting speed P mm/0.01 sec**	0,134±0,005	0,194±0,07	0,206±0,04	0,176±0,02	0,188±0,03*	0,133±0,02

Note:

1. SSPLP - the strength of the ratio of the area of the left and right atrium.

2. VVOPP and VVOLP - right and left atrial internal deviation, respectively.

3. Data except those marked *(p<0.05-0.001) are not reliable in all cases (p>0.05).

marked - *(p<0.05-0.001) in all cases not significant (p>0.05).

As can be seen from the data in table. 4.1 and 4.2, the amplitude of the P wave - in the II standard lead in children aged 7 - 10 years is 0.65 ± 0.029 mm, with age (by 11 - 14 years) this value decreases (0.54 ± 0.02 mm. P <0.001), and the duration of the P wave increases over time from 0.065±0.001 sec to 0.081±0.002 sec, P<0.001).

It should be noted that the amplitude values of P in our studies were somewhat different from the literature data (0.75±0.18 sec). [76]. In our children, in standard lead II, higher R values were detected, respectively, at the ages of 7–10 years and 11–14 years (12.3±0.25 and 10.1±0.25 mm, p<0.01, p<0, 05), which also differs from the data of the above authors (7.30±2.0mm). Values of the R wave in standard lead II in sick children with the syndrome (9.5 and 8.25 mm) and the WPW phenomenon (8.83 and 7.4 mm), as well as with the Mahaheim phenomenon (9.0 and 6.57 mm) in the age periods of 7 – 10 and 11 – 14 years were reduced compared to the data of healthy children (12.3 and 10.1 mm), and as a result they had a low ratio of R - and P in this lead (from 14.2 to 17.3 versus 18.9 and 18.0 in healthy children). In sick children with the syndrome (13.8 and 11.1 mm) and the CLC phenomenon (15 and 13.7 mm), the amplitude of the RII wave is increased compared to healthy children and therefore they have a high ratio of R and P (25.6 and 19.1) and (31.3 and 22.5) in the age periods of 7 – 10 and 11 – 14 years.

The Makruz index (see tables 4.1 and 4.2.) characterizing the ratio of the duration of the P wave to the P - Q segment in healthy schoolchildren aged 7 - 10 years averaged 0.905 ± 0.029 conventional units, and increased with age (1.081 ± 0.04 conventional unit p<0.001).

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These data are lower (1.620±0.48 conventional units) than those given in the literature [76]. The data in Tables 4.1 and 4.2 show that the Macruse index in the diagnosis of atrial myocardial hypertrophy in sick children with manifestations of PVH, except for the Mahaima phenomenon, does not have any clinical significance because with these types of PVH, the P–Q segment is significantly shortened (see below).

In WPW syndrome, the VTOL index was negatively correlated with the Erisman ($r=-0.482$ $p<0.05$), Brugsch ($r=-0.536$ $p<0.01$), and IMR ($r=-0.690$ $p<0.01$), VTOL indices with chest circumference ($r=-0.402$ $p<0.05$), Erisman index ($r=-0.419$ $p<0.05$), Brugsch ($r=-0.369$ $p<0.05$), IMR ($r=-0.484$ $p<0.05$). In the WPW phenomenon, the VVOPP index was positively correlated with body length ($r=0.469$ $p<0.01$), body weight ($r=0.385$ $p<0.05$), Varga index ($r=0.326$ $p<0.05$), APT ($r=0.306$ $p<0.05$), triangle coefficient with the Erisman index ($r=0.437$ $p<0.01$), Pinier ($r=0.329$).

These data may indicate that retarded children, according to anthropometric indicators and indices, are more susceptible to changes in the atria, especially in terms of VVOPP, VVOLP, which must be taken into account when interpreting ECG data.

ECG diagnosis of pathological processes in the atrial myocardium is based [46, 76], mainly on a separate study of the main parameters and architecture of P (duration, amplitude, shape). First of all, we note that the P wave, reflecting the process of depolarization of the right and left atrium, strongly depends on the position of the heart in the chest [105], therefore, when assessing the area of the P wave, we were guided by the average resulting vector P in the six-axis Bailey system. Thus, in healthy schoolchildren aged 7–10 years, the average P vector in this system was located at 35.7±2.92° (with a range from –5.6° to +76.9°), which is obviously associated with the low growth of children at this age stage than in children aged 11–14 years. In the latter, the average vector P in the frontal plane was slightly shifted to the right, forward and averaged 45.4±2.12° (from +15.4 to +75.4°).

In the chest leads, the average resulting P vector in children aged 7–10 years coincided with leads V2– and V4, and therefore in these leads higher values of P wave areas were revealed (<0.01–0.05) than in V5 and V6 .

In sick children with manifestations of PVH at the age of 7 - 10 years, the areas of the PI, PII, AVR, AVF waves and precordial leads V2 - V4 are increased ($P < 0.05$ - 0.001). In sick children with PVH with a lower heart rate, jaggedness was observed in leads I, II, AVL, AVF with a predominance of the second half of the P wave, which indicates the predominance of electrical activity of the left atrium. It should be noted that according to M.B. Kuberger M.B., (1983) double hump, jagged P wave in leads I, II, AVL and left precordial leads only symbolizes belonging to mitral disease (P - mitrale), but in fact this configuration of the P wave can occur in chronic carditis , as well as with obstructive processes in the lungs. In foreign literature, such P waves are referred to as “P – sinistrocardiale” or “P – sinistroatriale” (Romhilt.S., 1982). In this case, the role of frequent colds that our sick children suffered in early childhood is apparently important.

The above data allowed us to determine ECG signs of hyperfunction (“overvoltage”) in 12 (14.6%) children and left atrial hypertrophy in 5 (10.98% $p>0.05$) children. In our

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studies, we did not find any dependence of signs of hyperfunction and hypertrophy of the left atrium on the types of left atrium. It should be noted that we accepted as signs of hyperfunction or overstrain of the left atrium (strain) those cases where there are no reliable signs of hypertrophy noted above (>2γ) from age values, but there was a deviation of the average values from age values of more than >+1.0γ .

Thus, we have shown that healthy children in our region differ in the amplitude-interval values of the P wave, which must be taken into account in the daily work of electrocardiologists - pediatricians.

CONCLUSIONS

For the first time in the practice of a pediatrician, we studied ECG indicators characterizing the electromechanical activity of the atria in healthy and sick children with PVH, including a planimetric study of the ECG of the P wave. We identified some ECG features of sick children with PVH, indicating some delay in the biological inversion of the right atrium myocardium, hyperfunction left atrium, disturbances in the processes of atrial depolarization caused by disturbances in the rhythm and conduction of the heart due to hemodynamic overload. For general practitioners and pediatric cardiologists, additional information characterizing the electromechanical activity of the atria is presented: the triangle coefficient, the strength of the ratio of the area of the right and left atria in lead V1, the time of internal deviation of the right and left atrium (IROPP and IVOLP), the time of rise of P in II standard lead (mm/0.01 sec), angles , , , in the architecture of the P wave. Also given are the amplitude-interval ECG values, indicators of electrical activity of the heart and ventricles, planimetric ECG indicators of the de- and repolarization phases of the atria and ventricles, their axonometric indicators (vectors, angles) for topical diagnosis of types of PVH.

REFERENCES

1. **Huttin O., Brembilla-Perrot B.** Relationships between age and accessory pathway location in Wolff-Parkinson-White syndrome // Ann. Cardiol. Angeiol. (Paris). 2008. Vol. 57. P. 225–230.
2. **Белоконь Н.А., Школьникова М.А., Белозоров Ю.М. и др**. Проблемы внезапной смерти лиц молодого возраста. // Обзорная информация, Серия Педиатрия, Вып 2. М. –1990. – 77 стр.
3. **Lu C.-W., Wua M.-H., Chen H.-C. et al.** Epidemiological profile of Wolff–Parkinson–White syndrome in a general population younger than 50 years of age in an era of radiofrequency catheter ablation // International Journal of Cardiology. 2014. Vol. P. 530–534.
4. **Бокерия Л. А., Меликулов А. Х.** Синдром Вольфа – Паркинсона – Уайта // Анналы аритмологии. 2008. № 2. С. 5–19 [Bokerija L. A., Melikulov A. H. Sindrom Vol'fa – Parkinsona – Uajta // Annaly aritmologii. 2008. №2. S.5–19 (in Russian)].
5. **Centurion O.A.** Atrial Fibrillation in the Wolff-Parkinson-White syndrome // Journal of Atrial Fibrillation. 2011. Vol. 2(5). P. 899–915.
6. **Brembilla-Perrot B., Tatar C., C. Suty-Selton.** Risk factors of adverse presentation as the first arrhythmia in Wolff-Parkinson-White syndrome // PACE. Wiley Periodicals, Inc. September 2010. Vol. 33. P. 1074–1081.

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AMERICAN ACADEMIC PUBLISHER
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7. Задионченко В.С., Шехян Г.Г., Снеткова А.А., Щекота А.М., Ялымов А.А. // Роль дополнительных проводящих путей сердца в предвозбуждении желудочков. Справочник поликлинического врача. 2012 - №6. С. 46-49.
8. **Кельманьсон И.А.** Синдром внезапной смерти у грудных детей: факты, гипотезы, переспективы. // Росс. Вестник перинатологии и педиатрии. 1996. №2. С. 50 – 55.
9. **Ривин А.Е., Гордива М.В., Сокуренко Н.С., Медведев М.М.** К вопросу о свойствах дополнительных путей проведения. Вестник аритмологии. // 2015. №79. С. 70 - 72.
10. Нарушения сердечного ритма у детей и подростков. М.Л. Столина, М.Г. Шегеда, Э.Ю. Катенкова // ТМЖ. 2019. №4.
11. **Калинин Л.А., Школьникова М.А.** Жизнеугрожаемые аритмии у детей. Вестник аритмологии. // 2000. №18. С. 57- 58.
12. Школьникова М.А. Жизнеугрожаемые аритмии у детей. – М. «Медицина». 1999. – 230 стр.
13. Ташбаев О.С., Арзикулов А.Ш. Характер регуляции сердечного ритма у детей. // Респ. Научно – практическая конф. с международ. участием «Атеросклероз и ишемическая болезни сердца: профилактика и лечение». Андижан. -1998. С. 37.
14. Мусаджанова Л.Х. Характеристика адаптивных и пограничных состояний сердечно – сосудистой системы у детей. // Автореф. докт. мед. наук. Ташкент. 2001. 35с.