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PREVALENCE OF PREMATURE VENTRICULAR EXCITATION SYNDROME IN SCHOOL-AGED CHILDREN

I.T. Abdurakhmonov,
A.T. Arifkhuzhaev,
R.M. Abdulkhakova,
M.G.Djuraev.
Andijan State Medical Institute

ABSTRACT: The clinical significance of PVES is determined by the fact that almost 80.0% of patients sooner or later develop tachyarrhythmic attacks, which under certain conditions are transformed into atrial and ventricular fibrillation, posing a threat to the patient's life. Objective. To study the prevalence of various forms of premature ventricular excitation of the heart in school-age children. To establish the frequency and structure of premature ventricular excitation of the heart in school-age children. Material and methods. To identify cases of PVES in school-age children, 1733 children aged 7-14 years (827 girls, 906 boys) were examined. Results. Summarizing the results of the study and clinical observation of children with PVES, it can be stated that the manifestations of the latter are not a rare pathology for children in our region. PVES have a number of clinical and electrocardiographic features associated with the health and pre- and postnatal development of children, they have impaired electrophysiological features of the myocardium, asynchronism of the depolarization phases of the atria and ventricles, disproportion in the ECG intervals of de- and repolarization of the ventricles, which leads to inhibition of the contractility of the myocardium with the development of hypertrophy of the heart, an increase in the risk of developing supraventricular tachyarrhythmias. Conclusion. For early diagnostics and prevention of life-threatening arrhythmias caused by premature ventricular excitation (PVES), it is recommended to conduct systematic targeted preventive examinations among school-age children. Clinical, anamnestic and ECG criteria for PVE syndromes and phenomena, their types WPW, CLC, Mahaim are presented. Additional information characterizing the electromechanical activity of the atria is presented for doctors.

Keywords: rhythm and conduction disturbances; premature ventricular excitation; additional impulse conduction pathways; prevalence.

РАСПРОСТРАНЕНОСТЬ СИНДРОМ ПРЕЖДЕВРЕМЕННОГО ВОЗБУЖДЕНИЯ ЖЕЛУДОЧКОВ СЕРДЦА У ДЕТЕЙ ШКОЛЬНОГО ВОЗРАСТА

И.Т. Абдурахмонов,
А.Т. Арифхужаев,
Р.М. Абдулхакова,
М.Г.Джураев.
Андижанский Государственный Медицинский Институт

Резюме: Клиническое значение ПВЖ определяется тем, что почти у 80,0% больных рано

или поздно развиваются тахиаритмические приступы, которые при определенных условиях трансформируются в фибрилляции предсердий и желудочков, представляющие угрозу для жизни больного. Цель. Исследовать распространенность различных форм ПВЖ сердца у детей школьного возраста в аспекте дополнительных диагностических возможностей электрокардиографии и выявить распределение синдромов и феноменов ПВЖ в зависимости от места выявления от возраста и пола. Оценить анамнестические данные матерей больных детей с ПВЖ, с акцентом на течение беременности и родов, изучить соматического развития больных детей с ПВЖ. Материал и методы. По выявлению случаев ПВЖ у детей школьного возраста было обследовано 1733 детей в возрасте 7-14 лет (девочек - 827, мальчиков - 906). Результаты. Обобщая результаты исследования и клинического наблюдения детей с ПВЖ можно утверждать, что проявления последнего не является редкой патологией для детей нашего региона. ПВЖ имеют целый ряд клинико-электрокардиографических особенностей, связанных со здоровьем и пре- и постнатальным развитием детей, у них нарушены электрофизиологические особенности миокарда, выявляются асинхронизм фаз деполяризации предсердий и желудочков, несоразмерность в ЭКГ интервалах де- и реполяризации желудочков, что приводит к угнетению сократительной способности миокарда с развитием гипертрофии отделов сердца, увеличению риска развития наджелудочковых тахиаритмий. Заключение. Для ранней диагностики и профилактики жизнеугрожаемых аритмий обусловленных преждевременным возбуждением желудочков (ПВЖ), рекомендуется проводить систематические целенаправленные профилактические осмотры среди детей школьного возраст, представлены клинико-анамнестические и ЭКГ критерии синдромов и феноменов ПВЖ, их типов WPW, CLC, Махайма. Для врачей представлены дополнительные сведения, характеризующие электромеханическую активность предсердий.

Ключевые слова: нарушение ритма и проводимости; преждевременное возбуждение желудочков; дополнительные пути проведения импульса; распространенность.

INTRODUCTION

Every year, more than 2 million cases of death from arrhythmia are registered in the world. Heart rhythm disorders, in particular ventricular ones, are one of the most common causes of sudden death [1, 2, 7]. According to the American Heart Association, cardiac arrhythmias take from 300 to 600 thousand lives, which is one death per minute. Cardiovascular diseases are the leading causes of death in young people (25 to 64 years old). The main insidiousness of this group of diseases is that they are often asymptomatic, and a person learns that he has heart problems when he can no longer be helped.

The problem of heart rhythm disorders and complications associated with them has become especially relevant in pediatrics in recent years [3, 5, 9, 10]. There are a number of heart diseases, such as premature ventricular excitation syndrome (PVS), these cardiac arrhythmias are based on re-entry mechanisms caused by the presence of the AP impulse, the ECG expression of which are varieties of PVS (syndromes and phenomena: WPW, CLC, Mahaima-Levi). This pathology is the result of congenital disorders in the cardiac conduction system. WPW syndrome (Wolff-Parkinson-White syndrome) occurs in approximately 2% of the population, LGL syndrome (Lown-Ganong-Levine syndrome) in an average of 0.6% of the adult population. Approximately 30% of people with tachyarrhythmia have additional conduction pathways. Pathology can be observed at any age. APs are quite common in the pediatric population (up to 0.5-0.8%). [4, 5, 10]. Objective of the study. To study the prevalence of various forms of cardiac PVH in school-age children in terms of additional diagnostic capabilities of electrocardiography and to identify the distribution of PVH syndromes and phenomena depending on the place of detection, age and gender. To evaluate the anamnestic data of mothers of sick children with PVH, with an emphasis on the course of pregnancy and childbirth. Also, to study the somatic development of sick

children with PVH and timely diagnosis of rhythm and conduction disorders, conducting treatment and preventive measures aimed at preventing the transformation of PVH into life-threatening arrhythmias. Material and methods. In the course of the work, an epidemiological approach was used to select and analyze the material for identifying cases of PVH in school-age children. 1733 children aged 7-14 years (girls - 827, boys - 906) were examined. They were selected from the general population of schoolchildren (17,330 children) in the Izbaskent district of the Andijan region by simple randomization (A - girls, B - boys), which formed the basis of a 10% sample (Dvoyrin V.V., Klimenkov A.A. 1985). The compiled 10% sample of students of comprehensive schools to identify cases of PVZh were examined with maximum coverage (90.2% girls, 91.1% boys) of the children included in it. The examination was conducted in the shortest possible time (2 - 3 months) to eliminate the time factor for the studied ECG parameters. The examination program was carried out in two stages: Stage I was conducted according to the following program: 1. standard survey, objective examination of children, and standard survey of parents (Rose questionnaire) for the purpose of identifying attacks of tachyarrhythmia or its equivalents; 2. Study of blood pressure (three times), pulse counting; 3. Anthropometric studies and assessment of puberty of the examined children; 4. Electrocardiography (in 12 standard leads). To exclude random fluctuations in ECG parameters (P–R(Q), ORS, ST–T), the identified children with syndromes and phenomena of PVZ were again subjected to ECG examination for 2–4 weeks after the 1st stage of the examination. Children who had the same ECG changes, anamnestic data indicating a history of cardiac pathologies, were hospitalized and subjected to a more in-depth clinical and instrumental examination. This stage of the comprehensive study constituted the second observation period.

In the work, a selective statistical method was used by simple randomization of the school population. Klimenkov A.A. 1985). To determine the sample size, we used the formula n=t2p (100 – p)/2; where p is the proportion (in %); is the maximum size of the sampling error (=4%); t–confidence coefficient (t=2) with confidence probability (pt=0.95). The proportion of children with heart rhythm and conduction disorders according to literature data is on average 4.33%. Then according to the formula: P=224.33(100–4.33)/42=104. In order for the interval within which the prevalence of these types of pathology is within 4.33±4.0% (0.33%–8.33%), the required number of observations should be 104 children (82 with rhythm disorders and 22 with conduction disorders).Results and discussion. Cases of WPW were identified based on observation of sick children in stages I and II of the study. The criteria for diagnosing the WPW syndrome and phenomenon were: the presence of a shortened P-Q interval (<0.11-0.12 sec), prolongation of the ORS interval (>0.08-0.09 sec), -wave and secondary changes in the ST-T segment on the ECG. If shortening of the ECG interval (<0.11-0.12 sec) was detected, we diagnosed the CLC syndrome or phenomenon. The Mahaim phenomenon was diagnosed upon detection of -wave with widening of the QRS complex (>0.08-0.09 sec) with normal P-Q(R) values (>0.12 sec). If only -wave without widening of the QRS complex was detected in the ECG, we regarded this phenomenon as partial Mahaim phenomenon [11]. We identified (12 cases) cases of Mahaim phenomenon in 11 cases were assessed as partial, since the -wave was not combined with the widening of the QRS complex. We also analyzed ECG data of children who received treatment in the pediatric cardiology department of Andrei GosMI for cardiac and extracardiac pathology, where out of 30 cases (36.6%) of all identified cases of PVZ (82 cases), only in 5 cases (16.7%) were they assessed as primary pathology, and in 25 cases (83.3%) as a complication of the underlying disease. Distribution of syndromes and phenomena of PVZ depending on the place of detection (in hospital or professional examination) showed (Table 1) that 63.4% of children with syndrome and phenomenon of PVZ are detected for the first time during preventive examinations of schoolchildren and only in 36.6% of children ($p < 0.01$) in clinical conditions, more often against the background of other diseases.

Table 1.

Distribution of syndromes and phenomena of PVZ in children
depending on the place of detection.

№	Синдром или феномен ПВЖ	Всего	При проф. осмотрах		В клинике	
			абс	%	Абс	%
1	Синдром WPW	9	5	55,5/6,09	4	44,4/2,38
2	Феномен WPW	17	6	35,3/7,52	11	64,7/13,4
3	Синдром CLC	24	18	75,0/21,9	6	25,0/7,32
4	Феномен CLC	20	11	55,0/13,4	9	45,0/10,9
5	Феномен Махайма	12	12	100,0/14,6	-	-
	Всего:	82	52	63,4+6,68	30	36,6+8,79

PVZ were detected more often during preventive examinations (63.4%±6.68%) than in a clinical setting (36.6%±8.79%). During preventive examinations, the most frequently detected were the Mahaim phenomenon (100%), CLC syndrome (75%), less frequently WPW syndrome (55.5%) and CLC phenomenon (55.0%). Among 30 children (36.6%) with PVZ syndromes and phenomena detected in a clinical setting, the WPW phenomenon was predominant (64.7%), less frequently CLC phenomenon (45.0%) and WPW syndrome (44.4%), and in one quarter of cases CLC syndrome (25.0%). Thus, in most cases, PVZ manifestations among school-age children are detected during preventive examinations, which necessitates dynamic dispensary examinations among them. In clinical settings, syndromes or phenomena of PVG are not recognized by pediatricians in a timely manner in most cases (83.4%), targeted diagnostic studies are not conducted (functional ECG, drug tests, etc.), which leads to missed opportunities for treatment correction in order to prevent complications of PVG (attacks of tachyarrhythmia, arrhythmogenic cardiomyopathy, etc.) [13]. The distribution of sick children with manifestations of PVG depending on gender and age showed (Table 2) that PVG is often found among boys - 58 (70.7%), than girls (29.3%), more often at the age of 11-14 years - 42 (51.2%), than at the age of 7-10 years (42.7%). PVG were detected often among boys aged 7-10 years - 23 (65.7%), and 11-14 years - 35 (74.5%), than in girls of similar ages (34.3% and 25.5%).

Table 2.

Distribution of sick children with syndromes and phenomena of PVZ depending on age and gender

№	**Контингент обследованных**	**7-10 лет**		**11-14 лет**		**Всего**	
		Д	**М**	**Д**	**М**	**Д**	**М**
1	Контрольная группа	25	25	25	25	50	50
2	Синдром WPW	1	3	1	4	2	7
3	Феномен WPW	1	6	2	8	3	14
4	Синдром CLC	4	5	5	10	9	15
5	Феномен CLC	6	5	4	5	10	10
6	Феномен Махайма	-	4	-	8	-	12
	Всего больных детей	**12**	**23**	**12**	**35**	**24**	**58**

We have assessed the anamnestic data of mothers of sick children with PVZh, with an emphasis on the course of pregnancy and childbirth (Table 3). Analyzing these complications of pregnancy and childbirth in mothers of sick children, it should be noted that the detection of a relatively low number of girls with PVZh syndrome (30.5%) versus boys (69.5%) is apparently not a random fact, in the latter, the ante- and intranatal periods are burdened by pathologies of pregnancy and childbirth on the part of their mothers [14].

Table 3.

Complications of pregnancy and childbirth in mothers
of sick children with PVZh syndrome (%)

№	ВИДЫ ОСЛОЖНЕНИЙ	Контрольная группа		Дети с ПВЖ	
		Д n=50	М n=50	Д n-25	М n-57
1	Ранний токсикоз	6,0	4,00	12,0	10,3
2	Поздний токсикоз: Водянка Нефропатия Преэкламсия Эклампсия	 8,0 10,0 4,0 2,0	 6,0 8,0 2,0 2,0	 8,0 12,0 8,0 4,0	 12,3 14,04 12,3 3,51
3	Кровотечения в I и II-й половине беременности	4,0	2,0	4,0	3,51
4	Ph и АВО изосенсибилизация	2,0	-	-	3,51
5	Многоводие	8,0	2,0	12,0	12,3
6	Маловодие	6,0	2,0	4,0	7,02
7	Многоплодие	2,0	4,0	-	1,75
8	Тазовое и ножноя предлежание плода	-	2,0	4,0	8,77
9	Слабость родовой деятельности	2,0	10,0	12,0	12,3
10	Длительные роды	2,0	2,0	12,0	10,3
11	Стремительные роды	2,0	4,0	4,0	14,04
12	Патология плаценты и пуповины	6,0	4,0	8,0	8,77
13	Преждевременное излитие околоплодных вод	8,0	4,0	12,0	15,8
14	Акушерские пособия в родах	4,0	4,0	12,0	14,04
15	Гипоксия плода	4,0	12,0	8,0	12,3
16	Асфиксия новорожденных	16,0	14,0	28,0	29,8

The examined children with manifestations of PVZ presented a wide variety of complaints related to age, gender and had different vegetative coloring. Some clinical symptoms in sick children with PVZ are given in Table 4.

Table 4.

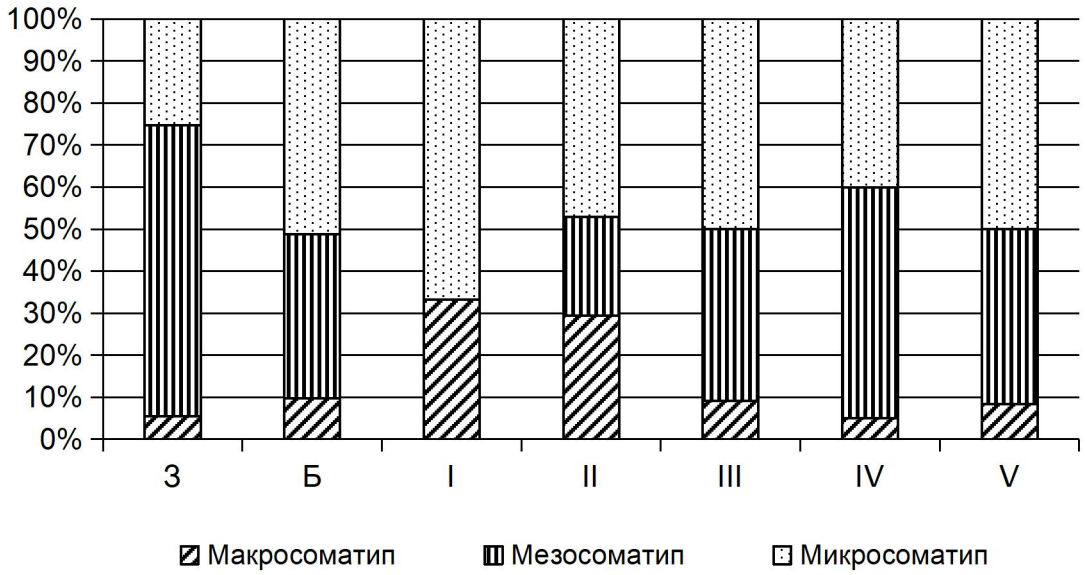
Some clinical symptoms in examined healthy and sick children with manifestations of PVZ (%)

№	Клинические симптомы	Девочки		Мальчики	
		Здоровые N=50	Больные n=25	Здоровые n=50	Больные N=57
1	Вялость	8,0	24,0*	14,0	7,02
2	Подвижность, тревожность	6,0	16,0	12,0	21,1
3	Увеличение щитовидной железы I-II степени	12,0	24,0	4,0	19,3*
4	Повышенная потливость конечностей, акроцианоз	14,0	20,0	6,0	26,3
5	Гиперемия лица, ладоней, подошв	8,0	12,0	6,0	8,77
6	Дермографизм красный Дермографизм белый	6,0 12,0	24,0* 16,0	6,0 8,0	17,5 19,3*
7	Усиленная пульсация шейных сосудов (визуально)	12,0	28,0*	12,0	24,6*
8	Симптом Хвостека I и II степени	8,0	24,0*	10,0	26,3
9	Гипотония мышц рук и ног	10,0	20,0	12,0	28,1*
10	Сухожильные рефлексы на руках: Повышено Понижено	 8,0 6,0	 24,0* 12,0	 2,0 12,0	 14,0* 16,5

11	Сухожильные рефлексы на ногах: Повышено Понижено	 4,0 8,0	 24,0 20,0	 14,0 4,0	 21,1 15,8
12	Брюшные рефлексы вызываются Вызываются слабо	84,0 16,0	76,0 14,0	80,0 20,0	80,7 19,3
13	Границы сердца расширены (перкуторно)	6	16,0	10,0	12,3
14	Тоны сердца приглушены: на верхушке На основании	 4,0 2,0	 16,0* 12,0*	 2,0 10,0	 12,3* 19,3
15	Тоны сердца усилены: на верхушке на аорте и V-точке	 6,0 6,0	 16,0 12,0	 10,0 8,0	 17,5 12,3
16	Тоны сердца расщеплены: на верхушке На основании	 8,0 4,0	 24,0* 12,0	 12,0 6,0	 15,8 8,77
17	Систолический шум: на верхушке на основании, V-точке	 12,0 6,0	 20,0 8,0	 14,0 8,0	 17,5 10,6
18	Разлитая болезненность в эпигастрии, вокруг пупка, по ходу толстого кишечника	10,0	16,0	12,0	24,6*

Note: * According to Fisher's exact method p<0.05-0.01.

It was shown that these clinical symptoms depended on the initial vegetative tone and more often had a vagotonic orientation, more pronounced in girls than in boys. [7, 8].
Taking into account the literature data, it should be noted that retardation and disharmony in the anthropometric indicators of children closely depend on their somatic development. We studied the distribution of cases of normal (meso-), advanced (macro-) and retardated (microsomatotype) development of sick children in a comparative aspect with healthy ones (Fig. 1).
Figure 1.
Distribution of somatic types among healthy and sick children with PVZh.



Note: 3 – healthy B – general group of sick children, I-V respectively WPW: WPW syndrome (I), WPW phenomenon (II), CLC syndrome (III), CLC phenomenon (IV) and Mahaim phenomenon (V).

The data in Fig. 1. show that among children with WPW, the proportion of the mesosomatic type of development is significantly reduced (39.0+5.38%) and the proportion of the microsomatic, i.e. retarded type of development is increased (51.2+5.52%). In terms of severity, cases of the microsomatic type in the structure of WPW predominate over cases of WPW syndrome (66.7+5.2%), Mahaim phenomenon (50.0+5.52%), WPW phenomenon (47.1+5.51%), than CLC syndrome (45.8+5.50%) and CLC phenomenon (40.0+5.41%).

Thus, the analysis of the obtained materials on the study of the physical development of children with PVH allows us to say that the latter are significantly behind in many anthropometric indicators, and their rates of biological maturation are reduced [15]. It has been shown that the somatic immaturity of children with PVH is mediated by their pre- and perinatal periods of development) and a burdened heredity for diseases of trophotropic orientation than ergotropic genesis.

CONCLUSION

1. Syndrome of premature ventricular excitation (PVH) in school-age children is significantly more often detected during targeted preventive examinations (63.4%) than in a clinical setting (36.6%).
2. The population frequency of PVH is on average 0.47 per 1000 examined, and is significantly more often detected in boys (0.69) than in girls (0.26). The proportion of this syndrome and phenomenon among sick children with cardiac pathologies is 1.47%, and 7.42% of all cases of heart rhythm and conduction disorders.
3. The main structure of PVZ is syndrome (29.3%), CLC phenomenon (24.4%) and WPW phenomenon (20.7%), than Mahaim phenomenon (14.6%) and WPW syndrome (11.0%).
4. Sick children with PVZ are significantly retarded and disharmonious in general somatic development - in 51.2% of cases their development corresponds to the microsomatic type of development, often detected in PVZ by the WPW type (66.6%). Somatic immaturity of children with PVG is often associated with immaturity of the myocardium of the atria and ventricles, mediated by their pre- and perinatal periods of development and a burdened heredity for diseases more often of trophotropic than ergotropic orientation.
5. PVG syndrome significantly determines the development of central hemodynamic disorders, characterized by the cardiac type of self-regulation (42.7%), and a prehypertensive state of the cardiac type (26.8%), the development of "phase syndrome of hyperdynamics" - an increase in the volumetric ejection rate (IEV, ml / kg / min), external work of the heart (IA kgm), the power of cardiac contractions (PCC, Bt).

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