

Indicators of the External Respiratory System and Cardiac Activity in Adolescents with Vegetative Dysfunctions, Depending on Gender and Presence of Perinatal Pathology

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ABSTRACT

This work is based on the results of clinical and functional studies of the cardiovascular and respiratory systems in adolescents with ADS, depending on the presence of perinatal pathology. In order to identify the features of the state of the respiratory system and cardiac activity in children with autonomic dysfunctions, depending on gender. We examined 243 adolescents 12-18 years old with clinically and laboratory-instrumental confirmed dysfunction of the autonomic nervous system - autonomic dystonia syndrome. It was found that signs of cardiac dysfunction are more often observed in adolescents with ADS with a history of perinatal pathology, mostly in males. The risk of developing violations of bronchial patency was identified in adolescents with ADS with a history of perinatal pathology, to a greater extent in females.

KEYWORDS: Adolescents, autonomic disorders, perinatal pathology.

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RELEVANCE

Vegetative disorders in children occur in 25 - 80% of cases, and in 17 - 20% of cases they progress, transforming into diseases such as ischemic heart disease, hypo- and hypertension, bronchial asthma, gastric ulcer and duodenal ulcer [3]. The prevalence of this pathology among non-communicable diseases of childhood and adolescence ranges from 29.1 to 75% of cases [4].

The leading role of the autonomic nervous system in the formation of pathology of the cardiovascular system in children has been proven, and dysfunction of the autonomic nervous system is considered as a disease of adaptation, breakdown of neuroendocrine autonomic regulation of the heart and blood vessels [2]. In cases where the active factor exceeds the adaptive capabilities of the cardiovascular system, a pathological process occurs, including both functional and structural disorders. The cardiovascular and respiratory systems, due to their "indicator" advantages, are given a priority role in assessing the adaptive capabilities of the whole organism [1,5].

PURPOSE OF THE STUDY

Reveal the features of the state of the respiratory system and cardiac activity in children with autonomic dysfunctions, depending on gender.

MATERIAL AND RESEARCH METHODS

This work is based on the results of clinical and functional studies of the cardiovascular and respiratory systems in adolescents with ADS, depending on the presence of perinatal pathology. We examined 243 adolescents 12-18 years old with clinically and laboratory-instrumental confirmed dysfunction of the autonomic nervous system - autonomic dystonia syndrome (ADS). The average age of the clinical manifestation of ADS in girls was 12.2 ± 1.8 years, in boys - 13.5 ± 2.1 years.

In the course of the study, groups of adolescents with ADS were formed, depending on gender and a history of perinatal nervous system pathology (PNSP), group 1 consisted of 53 (21.8%) adolescent boys with PNSP, Group 2 - 34 (14.0%) adolescent boys without PNSP, 3 groups comprised 107 (44.0%) adolescent girls with PNSP and group 4 - 49 (20.2%) adolescent girls without PNSP. (Table 1)

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Table 1. Distribution of patients with ADS into groups depending on the presence of a history of PNSP.

Groups		n	%
I group	adolescent boys with PNSP	53	21,81%
II group	adolescent boys without PNSP	34	13,99%
III group	teenage girls with PNSP	107	44,03%
IV group	teenage girls without PNSP	49	20,16%
Total		243	100,00%

Note: ADS - autonomic dystonia syndrome.

PNSP -perinatal lesions of the nervous system.

The ECG was recorded on a 6-TEK-3 apparatus (2003) in 12 conventional leads, at a paper speed of 50 mm / s, the ECG was recorded at rest, in the supine position.

The assessment of the function of external respiration was carried out on the hardware - software complex "Valenta". The following indicators were investigated:

- Vital capacity of the lungs (VCL) consisting of the reserve volume of inspiration, reserve volume of expiration, tidal volume, in liters.

- Forced vital capacity of the lungs (FVCL) - the amount of air that can be exhaled during forced exhalation within 1 s after maximum inhalation, in percentage. - FEV1 - forced expiratory volume in one second - expired air volume in one second of forced expiration

- Typhno index - forced expiratory volume in 1 s as a percentage of the proper VCL.

Statistical data processing was carried out using the "STATISTICA" 6.0 application package (StatSoft Inc., USA).

For the studied parameters, the following indicators were determined: mean value (M), standard error

of the mean (m); if necessary, the median (Me) and interquartile range (25% percentile and 75% percentile) of the trait are indicated. To compare the quantitative characteristics of two independent groups, a nonparametric method was used - the calculation of the Mann-Whitney U-test, for 3 or more groups - the Kruskal-Wallis ANOVA method. The assessment of qualitative parameters was carried out in absolute and relative values (%), to compare qualitative characteristics in two independent groups, the χ^2 test was used, for small samples - Fisher's exact test, for multiple comparisons - Cochran's Q test. Differences with a 95% ($p < 0.05$) significance level were considered statistically significant.

RESEARCH RESULTS

In order to study the state of cardiac activity in children with autonomic disorders, electrocardiographic indicators were studied in adolescents with ADS. Of the total number of adolescents studied, 79 (32.5%) had sinus bradycardia, the second most common was an increase in the T wave - in 30.5% of cases.

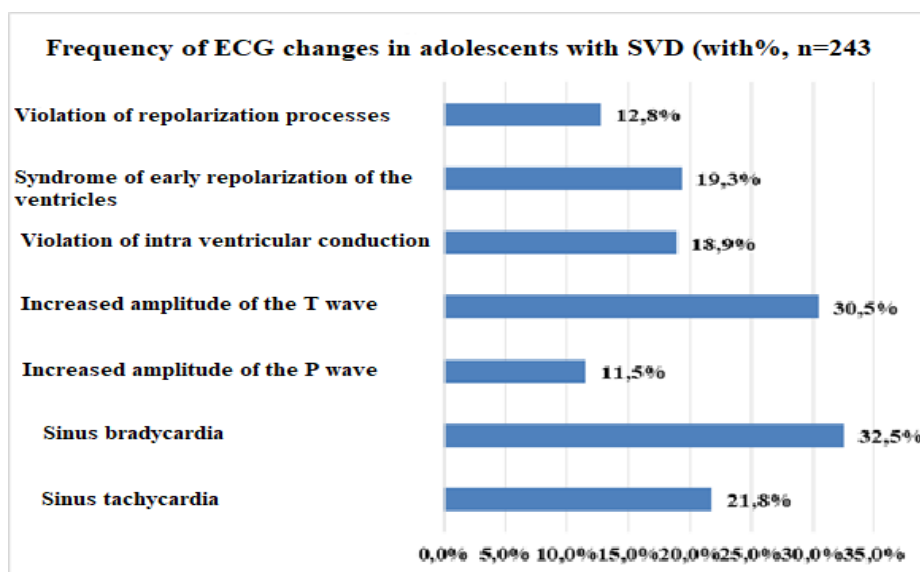


Figure 1. Frequency of ECG changes in adolescents with ADS.

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Sinus bradycardia in adolescents in groups I and III was more common than in groups II and IV (22.6% and 25.2% versus 14.7% and 18.4%, respectively).

At the same time, an increase in the T wave was observed in 22 (41.5%) adolescents in group I compared with group II - 5 (14.7%); $p1 < 0.001$. Rhythm disturbances in the form of sinus tachycardia were observed in 27

(25.2%) patients in group III and in 12 (22.6%) patients in group I.

A greater percentage of patients with impaired intraventricular conduction was observed in group III - 28 (26.2%), in group II this symptom was found in 17.0% of cases. In group III, there was an increase in the PQ interval (atrioventricular block of the 1st degree), high and pointed T waves.

Table 2. The frequency of ECG changes in adolescents with ADS depending on gender and a history of perinatal pathology.

ECG indicators	I group (n=53)		II group (n=34)		III. group (n=107)		IV group (n=49)	
	n	%	n	%	n	%	n	%
Sinus tachycardia	12	22,6%	5	14,7%	27	25,2%	9	18,4%
Sinus bradycardia	15	28,3%	7	20,6%	48	44,9%	9	18,4%
Increased amplitude of the P wave	6	11,3%	8	23,5%	4	3,7%	10	20,4%
Increased amplitude of the T wave	22	41,5%	5	14,7%	39	36,4%	8	16,3%
Violation of intra ventricular conduction	9	17,0%	3	8,8%	28	26,2%	6	12,2%
Syndrome of early repolarization of the ventricles	8	15,1%	2	5,9%	29	27,1%	8	16,3%
Violation of repolarization processes	7	13,2%	1	2,9%	22	20,6%	1	2,0%

The syndrome of early repolarization of the ventricles, represented by a scaphoid deformity of a segment with a slight displacement of its relative isoline, was detected in 29 (27.1%) in group III and in 15.1% of cases in group I, which may indicate the peculiarities of metabolic processes in the developing myocardium in this contingent children. The syndrome of early repolarization of the ventricles, represented by a scaphoid deformity of a segment with a slight displacement of its relative isoline, was detected in 29 (27.1%) in group III and in 15.1% of cases in group I, which may indicate the peculiarities of metabolic processes in the developing myocardium in this contingent children.

Respiratory function was assessed by spirometry. So, in group III, violations of bronchial patency were observed, as indicated by such indicators of spirometry as VCL, FVCL, FEV and Tiffno's index. These indicators were reduced and amounted to 63.7% and 61.4%, respectively, which is 1.2 times lower in comparison with these indicators of group II (73.4% and 71.6%, respectively); $p1 < 0.01$.

In group I, the VCL indicator (68.3%), although it differed from this indicator in group II (73.4%) ($p1 < 0.01$), however, it was lower than in group IV (70.1%) ($p < 0.01$). These violations were reflected in the FEV1, which was also the lowest in group III, 62.5%; $p1 < 0.001$, compared with group II - 72.7%. (Table 3).

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Table 3. Spirography indicators in adolescents with ADS, depending on gender. (Me [25q; 75q])

Indicators of FEV	I group (n=53)	p 1-2	II group (n=34)	p 2-3	III group (n=107)	p 3-4	IV group (n=49)	p 4-1	p 4-2	p 3-1
	1	≤	2	≤	3	≤	4	≤	≤	≤
VCL %	68,3 [68,0; 69,3]	0,01	73,4 [72,1; 75,3]	0,001	63,7 [61,7; 65,9]	0,001	70,1 [69,0; 71,3]	0,01	0,01	0,001
FEVL %	64,1 [64,0; 65,1]	0,01	71,6 [70,0; 73,1]	0,001	61,4 [60,8; 63,1]	0,01	65,9 [64,9; 67,1]	0,01	0,01	0,01
FEV 1 %	68,9 [67,2; 69,3]	0,01	72,7 [71,7; 73,9]	0,001	62,5 [61,3; 63,6]	0,01	69,1 [68,6; 69,7]	0,01	0,01	0,01
Tiffno's index	81,8 [80,9; 83,3]	0,01	85,3 [85,8; 87,5]	0,01	70,7 [70,5; 71,5]	0,001	81,2 [80,6; 82,4]	0,01	0,01	0,001

Note: p is the statistical significance of the difference in indicators.

The lowest Tiffno's index - an indicator of the ratio of the volume of air exhaled in the first second with the fastest expiration to the vital capacity of the lungs, was observed in patients of group III (70.7%) compared with group II (85.3%) (p1 <0.001) and with groups I and IV (81.8% and 81.2%) (p1 <0.001).

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CONCLUSION

Signs of cardiac dysfunction are more often observed in adolescents with ADS with a history of perinatal pathology, mostly in males. The risk of developing violations of bronchial patency was identified in adolescents with ADS with a history of perinatal pathology, to a greater extent in females.

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