European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 07, Issue 03, 2020

Characteristic Of The Cardiovascular System In Children And Adolescents At Obesity In Accompanience Of Arterial Hypertension

Lilya Garifulina

Maksuda Ashurova

Nargiza Goyibova

Samarkand State Medical Institute. Samarkand. Uzbekistan

E-mail: ms.garifulina77@mail.ru

Abstract: 62 children and adolescents with obesity accompanied by arterial hypertension were examined. It was revealed that the development of myocardial hypertrophy is affected by body weight, blood pressure, vasoconstriction processes, as well as insulin resistance and atherogenic dyslipidemia. These parameters serve as early markers of myocardial hypertrophy.

Keywords: obesity, arterial hypertension, left ventricular myocardial hypertrophy, adolescents.

The urgency of the problem. Left ventricular hypertrophy is an independent risk factor for the development of cardiovascular diseases and mortality in adults, as evidenced by recent studies [2,4]. It should be noted that there are not enough studies that determine the effect of obesity on the myocardium in children and adolescents. According to the authors, in children with borderline arterial hypertension and obesity, the formation of eccentric LVH occurs earlier [1,2], while they confirm the early development of signs of left ventricular remodeling in patients with insulin resistance [3,5].

In this regard, we set ourselves the goal of the work: to determine the influence of individual factors in the development of early signs of myocardial remodeling and left ventricular myocardial hypertrophy in children with exogenous constitutional obesity.

Materials and methods: 62 children and adolescents aged from 12 to 17 years old with exogenous constitutional obesity were examined. The selection criterion for patients was the

ISSN 2515-8260 Volume 07, Issue 03, 2020

definition of BMI in children and adolescents with identified overweight and / or obesity, which was compared with percentile charts developed by WHO for children aged 5 to 19 years (WHO Growth Reference, 2007). Also, OT was determined, which was compared with percentile tables for a specific age and gender according to the recommendations of the VNOK (2009), and the ratio of waist to hip (OT / Hip). The study included 28 girls (45%) and 34 (55%) boys, whose average age was 15.32 ± 0.24 years.

Children with exogenous constitutional obesity were divided according to the presence of abdominal (visceral) obesity and the presence of hypertension. In group I there were 20 people (16.83%) with a uniform type of obesity, with OT 80.12 ± 1.31, OT / OB 0.88 ± 0.01 cm. Group II consisted of 42 children with AO, while OT was 99.87 ± 1.28 cm; FROM / OB 0.93 ± 0.009. 24 of them had normal blood pressure (IIA group) and 18 children had a confirmed diagnosis of hypertension (IIB group). Differences in the ratio of OT / OT in groups I and II were significant (P <0.05). BMI in group I patients was within the SDS range from □ + 1.0 to +2.0 and reached values of 29.81 ± 0.50 kg / m2; in group II, BMI was within the SDS range from +2.0 to □ + 3.0, the mean values of which were 36.08 ± 0.61 kg / m2 (P <0.01).

The comparison group consisted of 20 children without obesity, aged 14.31 ± 0.63 years, with OT 64 ± 1.51 cm, OT / OV 0.81 ± 0.02 cm, with the difference in OT / OV ratio was significant with group I (P <0.01) and group II (P <0.001). There were 9 girls and 11 boys. This contingent was selected in the city family polyclinics of Samarkand. All children were assigned to health group I. The average BMI in the comparison group was within the SDS range from -1.0 to +1.0 and amounted to 19.44 ± 0.47 kg / m2, with a range of values from 18.2 to 20.4 kg / m2. The difference in BMI value with the observation group is significant (P <0.001).

Arterial hypertension was diagnosed in accordance with the criteria developed by the Committee of Experts of the All-Russian Scientific Society of Cardiology and the Association of Pediatric Cardiologists of Russia (Moscow, 2009) [4]. Morphometric parameters of the myocardium (myocardial mass - LVMM, myocardial mass index - LVMI, thickness of the interventricular septum - TMZhP, thickness of the posterior wall of the left ventricle - TZSLZH)

were evaluated by ultrasound echocardiography on an Aloka Alpha-7 ultrasound scanner with a cardiological package.

ISSN 2515-8260 Volume 07, Issue 03, 2020

Research results: in accordance with the set goal, we determined the relationship between the degree of BMI and the level of systolic and diastolic pressure in adolescents. The results of the study showed that the level of systolic and diastolic blood pressure for all time intervals was significantly higher in adolescents of group 3 (138.1 ± 8.7 mm Hg, $p < 0.05$ and $p < 0.05$) compared with values of adolescents with obesity of 1 and 2 degrees (117.2 ± 7.4 and 123.2 ± 6.7 mm Hg) At the same time, the revealed direct correlation relationship between BMI and systolic pressure, diastolic pressure and average blood pressure per day ($r = 0.601$; $r = 591$ and $r = 0.604$, respectively, $p < 0.01$ for all indicators).

It should be noted that according to the results of a study of blood pressure among adolescents with overweight and obesity, "white coat hypertension" was revealed in 27.4% of cases, labile hypertension in 16.1%, and stable hypertension in 12.9%. At the same time, the stable form was significantly more often detected in obesity of the 3rd degree (22.2%) compared with obesity of the 1st degree and obesity of the 2nd degree (10.0% and 8.3%, respectively).

Echocardiographic study was characterized by the fact that, with obesity in combination with arterial hypertension, a structural and geometric reconstruction of the left ventricular myocardium occurs. In this case, first of all, the wall thickness increases. We found a statistically significant relationship between BMI and the thickness of the posterior wall of the left ventricle ($r = 0.587$; $p < 0.01$), as well as the thickness of the interventricular septum ($r = 0.503$; $p < 0.05$). It should be noted that hypertrophy of the walls of the left ventricle is formed initially as an adaptive response of the myocardium to pressure load and ensures that the contractile function of the left ventricle corresponds to the increased load.

The main indicators characterizing left ventricular myocardial hypertrophy are myocardial mass and left ventricular myocardial mass index. Our data showed that the incidence of left ventricular hypertrophy was 45.0% in group 1, 54.1% in group 2, and 61.1% in group 3. At the same time, when analyzing the mass index of the left ventricular myocardium, depending on the variant of arterial hypertension, no significant differences were found. With white coat hypertension - 35.6 ± 3.2 g / m2.7, with labile hypertension - 35.8 ± 4.6 g / m2.7, and with stable hypertension - 36.5 ± 4.5 g / m2, 7. This fact suggests that it is obesity that makes a significant contribution to the degree of increase in left ventricular mass.

Reconstruction of the geometry of the left ventricle was found in almost 1/3 of adolescents with obesity, while in group 1 - 30.0%, in group 2 - 37.5% and in group 3 -

33.3%. Eccentric left ventricular hypertrophy was diagnosed in 16.3% of patients, concentric remodeling in 11.4%. It should be noted that concentric left ventricular hypertrophy is associated with the maximum risk of cardiovascular complications; in our studies it was found in 4.9% of cases and only in the group of adolescents with grade 3 obesity.

Structural and geometric reconstruction included a change in the geometry of not only the left ventricle, but also the left atrium. Thus, the difference in the mean values of the left atrium size was revealed between all observation groups (31.4 ± 1.2 mm; 31.8 ± 0.8 mm and 34.5 ± 1.4 mm in groups 1, 2, and 3, respectively). Also, there was a statistically significant correlation between the size of the left atrium and BMI ($r = 0.608$; $p < 0.01$). Changes in the structure of the left atrium are most likely the earliest stage of myocardial remodeling.

The compensatory response of the cardiovascular system in response to obesity was also related to central hemodynamics. This changed the volume of circulating blood and the total peripheral vascular resistance. The minute volume of blood circulation gradually increased with the progression of obesity (5.5 ± 1.1 l / min, 5.8 ± 0.9 l / min and 6.2 ± 1.1 l / min, respectively, in groups 1, 2, and 3) , which indirectly indicates an increase in the volume of circulating blood. The increase in minute volume was accompanied by a decrease in the total peripheral vascular resistance with increasing body weight (1318.8 ± 289.1 dynes / cm / s-5; 1299.9 ± 274.3 dynes / cm / s-5 and 1287.4 ± 284 , 1 dyne / cm / s-5, respectively, in groups 1, 2 and 3) Also, the total peripheral resistance depended on the type of arterial hypertension, so with labile arterial hypertension this indicator was 1287.8 ± 250.7 dynes / cm / s-5 , and at a stable 1325.6 ± 301.5 dynes / cm / s-5, which characterized the depletion of the adaptive capabilities of the organism and an increase in the total peripheral vascular resistance.

Conclusions: the development of myocardial hypertrophy is influenced by body weight, blood pressure, vasoconstriction processes, these parameters can serve as early markers of myocardial hypertrophy.

References

[1] Bekezin V.V., Kozlova L.V. Arterial hypertension in children and adolescents with obesity and metabolic syndrome according to the data of daily monitoring of blood pressure. Bulletin of VolGMU 2006, No. 1, p. 45-49.

ISSN 2515-8260 Volume 07, Issue 03, 2020

[2] Bokova T.A. Lukina E.V. Arterial hypertension in children and adolescents with obesity: modern approaches to prevention and treatment // Journal of Practice of a Pediatrician. 2015, -№6, - pp. 16-20.

[3] The influence of biomedical factors on the development of early signs of myocardial remodeling and left ventricular hypertrophy in children with constitutionally exogenous obesity. / T.A. Nikitina, R.R. Shilyaev, O. Yu. Fadeeva, A.V. Zavyalova, E.G. Kuznetsova // Journal "Zemsky doctor", - 2012, - №4 (15), - pp. 61-62.

[4] Diagnosis, treatment and prevention of arterial hypertension in children and adolescents. Methodological recommendations of experts of VNOK and the Association of Pediatric Cardiologists of Russia (II revision). M., 2009.

[5] Strogiy V.V., Abrosimova N.N. The functional state of the heart in children with arterial hypertension and obesity // Modern Pediatrics. 2009.Vol. 1 (23). P. 117-120