

Abstract

Type 1 diabetes (T1D), hypertension and obesity in juvenile patients significantly affect the dysfunction of the cardiovascular system, increasing vascular rigidity. Finding simple diagnostic tools would allow rapid identification of vascular lesions and could thus lead to early initiation of treatment. Non-invasive measurement of Central Blood Pressure together with the determination of Augmentation and Amplification indices may better reflect future cardiovascular risk than classical peripheral pressure measurement.

The study involved 100 children matched by age, weight, height and sex (average age 13 years). The control consisted of 20 healthy children (K:11; M:9). The study group included patients with DM1 suffering from short-term <5 years (K: 9, M: 12) and long > 5 years (K: 12, M: 13) as well as patients with obesity (K: 9, M: 10) and hypertension (K: 6, M: 9) patients of the Department of Paediatrics, Endocrinology and Diabetology University Children's Hospital of Białystok. In addition, on the basis of HbA1c levels, patients with T1D were divided into groups with good and insufficient metabolic control (HbA1c < or \geq 7.5%, respectively). 3 consecutive measurements were made at 5-minute intervals using the non-invasive cBP301 Centron Diagnostics system connected to the shoulder cuff. Peripheral and central systolic and diastolic pressure as well as vascular stiffness indices Augmentation index and Amplification index were determined, mean values were calculated. The statistical analysis was performed using Stat12.5 (student's t-test). To determine the relationship between the examined features, the Pearson correlation coefficient and the nonparametric test for the Spearman rank correlation coefficient were used. The results are presented in the form of a statistical mean and a standard deviation (mean \pm SD). Statistically significant results were considered at $p < 0.05$.

In both girls and boys with obesity and hypertension, statistically significantly higher central pressure and variability in AUG and PPA/AMP, indicating increased vascular rigidity,

were observed. In patients with T1D, there was a clear trend towards adverse variability in vascular stiffness indices (AUG and PPA/AMP) with no statistical significance between groups. Those suffering ≥ 5 years were characterized by a better AUG and AMP than the T1D group < 5 years regardless of gender. Also regardless of gender, CBP, AUG and PPA/AMP values in patients with HbA1c $< 7.5\%$ showed a statistically significantly better trend compared to children with less stable disease control. In obese children, the central pressure value correlated positively with the concentration of total cholesterol, and no significant correlations were observed between other lipid parameters and vascular stiffness exponents in this group.

Indicators of vascular stiffness of Augmentation and Aplification showed a more favorable trend in children with longer illness, mostly staying on insulin pumps with better metabolic compensation. The values of the examined parameters were higher in the T1D < 5 years group, perhaps as a remnant of ketoacidosis at diagnosis or a higher percentage of patients treated with pens in this group. Obesity and hypertension undoubtedly predispose to an increase in central pressure and may suggest the development of increased vascular rigidity in juvenile patients.