We aimed to evaluate the endothelial function by combining RHI measurements and specific biochemical markers in the children with possible risk of premature manifestation of atherosclerosis and in the control group of healthy children. In all, 124 children (of which 106 patients divided into five groups according to diagnosis - type 1 diabetes mellitus, Crohn's disease, cystic fibrosis, familial hypercholesterolemia and acute lymphoblastic leukemia and 18 healthy controls) were enrolled in the study. During the study, we measured RHI using a new plethysmographic method and further evaluated biochemical markers of endothelial dysfunction (ADMA, E-selectin, hsCRP and VCAM) and lipidogram in individual groups of children.

The primary objective of our study was the determination of RHI and biochemical parameters in healthy subjects and in selected risk groups of children (type 1 diabetes mellitus, Crohn's disease, cystic fibrosis, familial hypercholesterolemia and children after successful treatment of acute lymphoblastic leukemia). At the same time, we compared patients from individual groups with the control group. We found significantly elevated RHI values in groups of children with type 1 diabetes, Crohn's disease, cystic fibrosis, and children after successful treatment of acute lymphoblastic leukemia. Increased RHI values were observed also in the familial hypercholesterolemia group. In terms of biochemical parameters, we also observed a tendency towards higher values in individual risk groups. These markers can be associated with ED in the preclinical phase of atherosclerosis. Due to the absence of cut-off values for RHI and biochemical parameters for childhood, we tried to determine optimal cut-off for each group of RHI, ADMA, sVCAM, E-selectin and hsCRP for each group.

The secondary aim of the thesis was to find the correlation of RHI values with biochemical endothelial dysfunction markers in individual patient groups and to verify whether the combination of RHI measurements and specific biochemical parameters can be a suitable method for the detection of endothelial dysfunction in risk groups of children. In the study, we demonstrated an increase in specificity and sensitivity using a combination of RHI measurement methods and individual biochemical markers, and thus more accurate results when using the combined method than using only one of the methods.

During our study, we encountered several limitations. One of the limitations was the absence of cut-off values for RHI and biochemical markers for child patients. We are also aware of the low number of children in our control group. However, the RHI score in our

control group agrees with previously published data from extensive studies in healthy children, which significantly increases the strength of the results in our study. Another limitation of the study was the size of the sensors that are unified and the minimum and maximum thickness of the finger on which the sensor can be used is not given by the manufacturer. Based on available data published previously, we chose a set of healthy controls to match the patients' ages, and we set the age limit of the measured children at 12 years.

Our findings point to the possible occurrence of endothelial dysfunction in children with chronic autoimmune, inflammatory and metabolic diseases. In our opinion, the results also show the need to actively look at and monitor the risk groups of children. RHI measurement has numerous technical advantages in evaluating ED over the previously used non-invasive methods. Similarly, laboratory examination of biochemical markers of endothelial dysfunction can be performed during the laboratory examination within regular medical check-ups of children and therefore no higher invasive procedures are required. We believe that the combination of RHI measurements and specific biochemical parameters could be a suitable method for ED detection and stratification of individual cardiovascular risk in the long-term follow-up of these patients. However, this is the first study of this type focused on children, and verification will require longer-term follow-up of these groups of children and further extensive studies.