THE CHILDREN'S MEMORIAL HEALTH INSTITUTE

Heamodynamic phenotypes of primary hypertension in adolescents

L. Obrycki, A. Niemirska, J. Sarnecki, M. Litwin

Department of Nephrology, Kidney Transplantations and Hypertension, Children`s Memorial Health Institute, Warsaw (Poland)

- In many studies isolated systolic hypertension (ISH) is a dominant form of hypertension in adolescents and young adults.

- One of the primary mechanisms of ISH in adults is increased arterial stiffness caused by atherosclerotic vascular disease. Because atherosclerosis in children is unlikely to be sufficiently advanced to cause increased arterial stiffness, different mechanism must be involved in the pathogenesis of the ISH.

- Some evidence suggest a role of hyperkinetic circulation [elevated stroke volume (SV), cardiac index (CI) and lower total peripheral resistance (TPR)] in the early stages of primary hypertension.

- Aim of our study was description of hemodynamic phenotypes in adolescents referred for further diagnosis and treatment because of primary hypertension.

Patients and methods

- 285 children (61 girls; 15.0 ±2.5 years) referred because of diagnosis of arterial hypertension in whom secondary hypertension was excluded.

- None of patients (pts) received antihypertensive drugs.

- All pts underwent full diagnostic process according to recently published guidelines and in all pts assessment of 24 hour ABPM, left ventricular mass index (LVMi), carotid intima-media thickness (carotid IMT), pulse wave velocity (PWV), cSBP, cPP, CI, TPR were done.

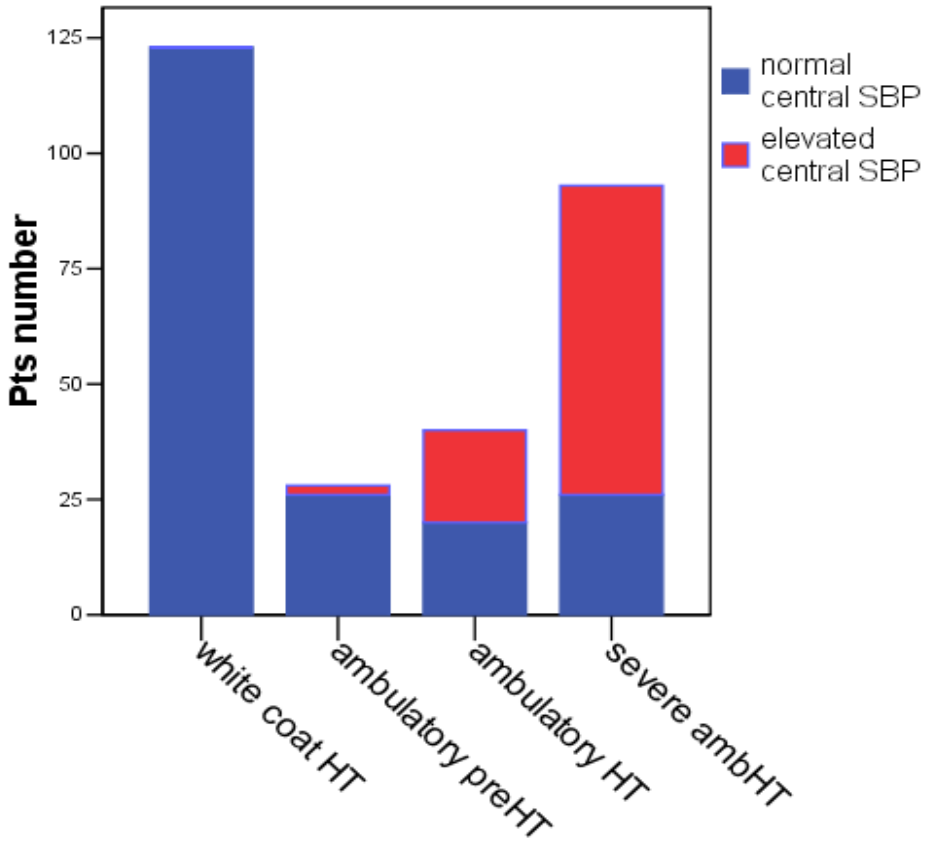
- PWV and PWA parameters were assessed using oscillometric device (Vicorder®).

- Exclusion criteria were diagnosis of secondary hypertension and/or anatomical abnormalities of arterial tree (e.g. coarctation of aorta, mid-aortic syndrome or stenosis of subclavian arteries), acute infection in preceding 6 weeks and any chronic condition other than PH.

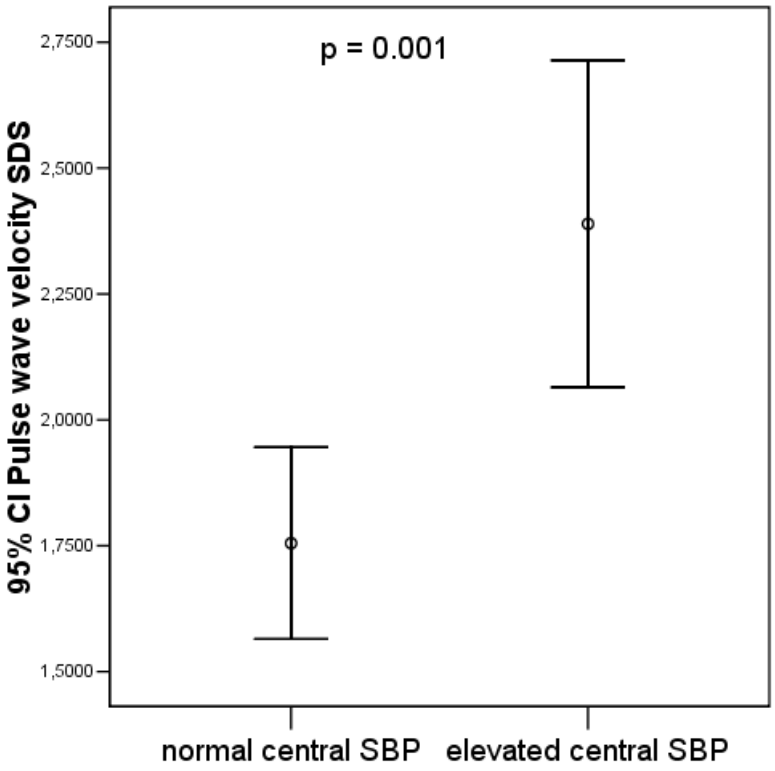
	Normal ABPM N = 121	Ambulatory prehypertension N = 28	Ambulatory hypertension N = 40	Severe ambulatory hypertension N = 91	P
Age	14.8 ±2.3	15.1 ±2.5	14.9 ±3.0	15.3 ±2.4	Ns
BMI	24.5 ±4.7	23.7 ±4.1	24.9 ±5.4	24.5 ±3.6	Ns
Waist (cm)	81 ±10	79 ±9	82 ±15	79 ±7	Ns
24hSBP (mmHg)	120 ±6	127 ±5	129 ±5	137 ±6	0.0001
24hDBP (mmHg)	68 ±4	72 ±4	74 ±5	76 ±7	0.0001
24hMAP (mmHg)	86 ±3	90 ±4	92 ±4	95 ±5	0.0001
PWV (m/s)	5.7 ±0.7	6.1 ±0.9	5.7 ±0.7	6.0 ±0.8	Normal ABP vs severe AMB: p = 0.03
cSBP (mmHg)	114 ±8	116 ±10	117 ±8	122 ±10	Normal and preHT vs severeAMB: p = 0.03
cPP (mmHg)	47 ±8	46 ±6	49 ±8	51 ±9	Normal and preHT vs severe AMB: p = 0.01
Augmentation pressure (mmHg)	3.5 ±2.8	3.0 ±1.5	4 ±2	4.2 ±3	Ns
Augmentation index	7.0 ±4.8	6.4 ±3.1	8.0 ±5.0	7.8 ±5.0	Ns
cIMT (mm)	0.44 ±0.03	0.45 ±0.03	0.44 ±0.03	0.46 ±0.04	Normal vs severeAMB: p = 0.005
LVMi (g/m height$^{2.7}$)	34.6 ±6.6	34.2 ±5.2	35.3 ±5.6	36.7 ±5.3	Ns

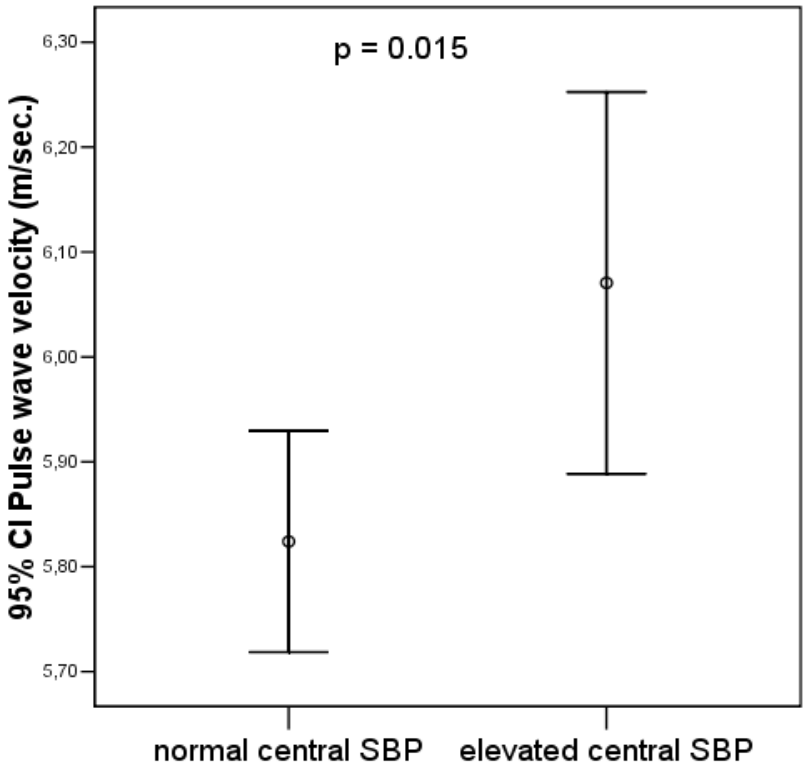
Number of patients with normal and elevated central systolic blood pressure (central SBP) in different blood pressure status

white coat HT – white coat hypertension
ambulatory preHT – ambulatory prehypertension
ambultory HT – ambulatory hypertension
severe AmbHT- severe ambulatory hypertension

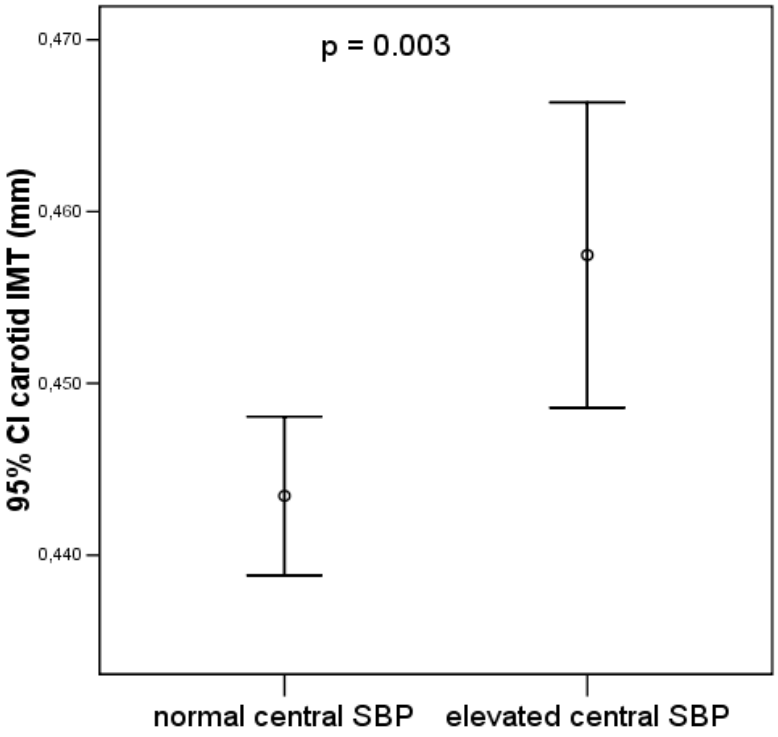


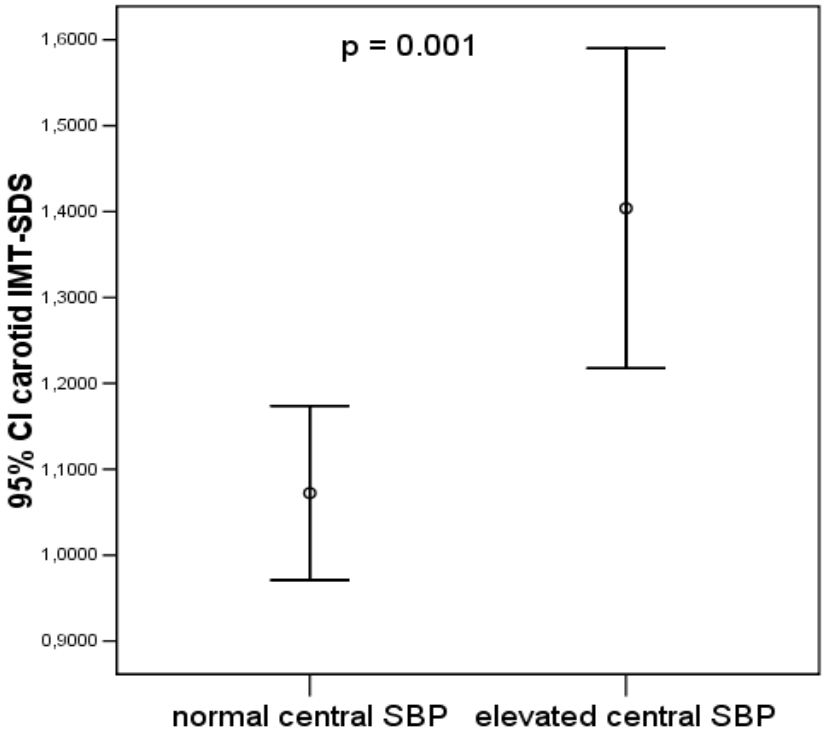
Comparison of pulse wave velocity (PWV) and PWV-sds in children with normal central SBP and in children with elevated central SBP



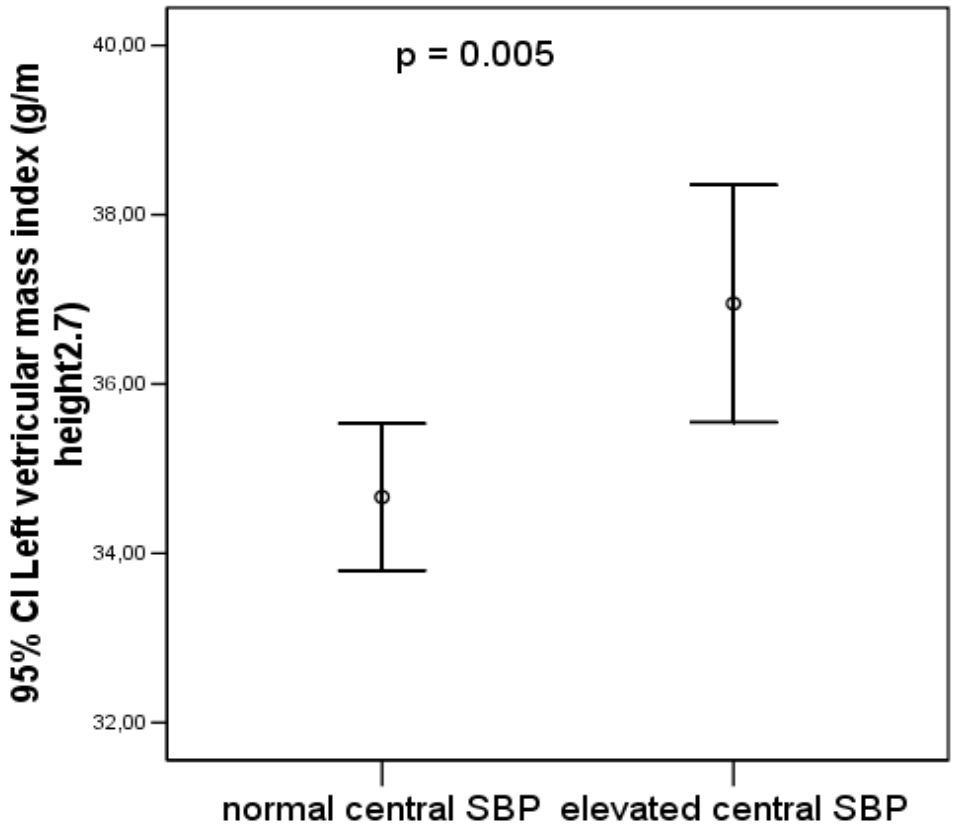


Comparison of carotid intima media thickness (carotid IMT) and carotid IMT-sds in children with normal central SBP and in children with elevated central SBP

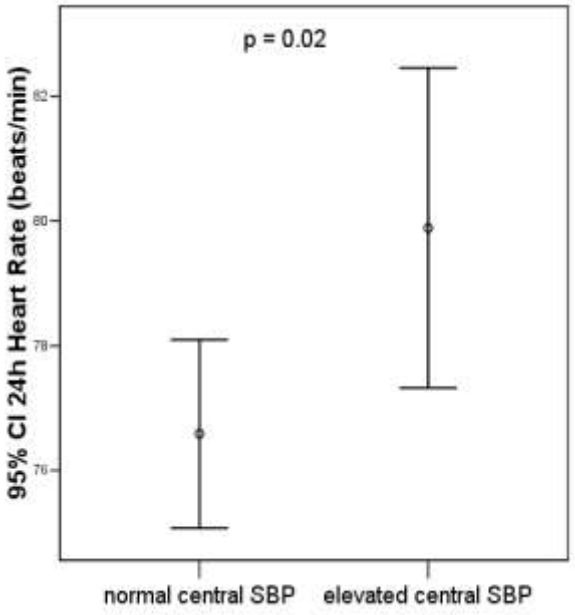


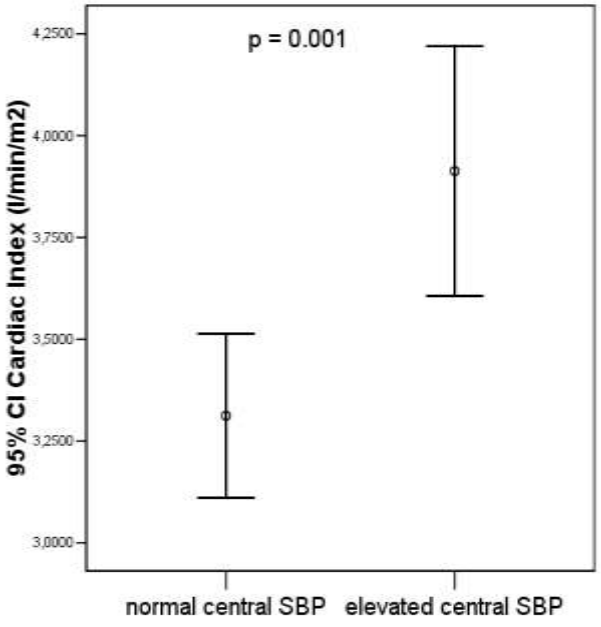


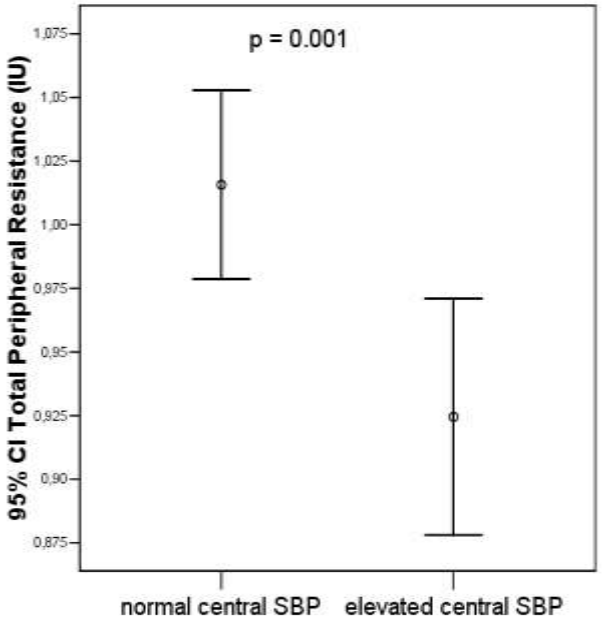
Comparison of left ventricular mass index (LVMI) in children with normal central SBP and in children with elevated central SBP



Comparison of parameters of hyperkinetic circulation [heart rate(HR), cardiac index (CI) and total peripheral resistance (TPR)] in children with normal central SBP and in children with elevated central SBP







Conclusions

- HR and CI increased and TPR decreased with increasing BP status from normotension to SevAmbHT. However, when elevated cSBP was taken into account, there were significant differences only between pts with SevAmbHT and elevated cSBP and normotensive pts.

- Hypertensive pts who had also elevated cSBP had significantly faster PWV and thicker cIMT in comparison with normotensives whereas prehypertensive and hypertensive pts with normal cSBP did not differ in terms of PWV and cIMT in comparison with normotensive pts.

Conclusions

- cSBP measurement should be a part of routine diagnostic procces with adolescents with primary hypertension. In our study, we showed that it allows to distinguish the group of patients with hypertensive target organ damage in the early stages of hypertension.