P4.19: CARDIOVASCULAR RISK FACTORS AND LEFT VENTRICULAR HYPERTROPHY IN CHILDREN WITH CHRONIC KIDNEY DISEASE

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P4.16 BLOOD PRESSURE, BODY MASS INDEX AND ARTERIAL ELASTIC PROPERTIES IN YOUNG PEOPLE

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Pulse wave velocity (PWV) is widely used for arterial stiffness assessment. Increased arterial stiffness is a predictor of cardiovascular risk in adults. There are limited data on PWV and its determinants in young people. Study was performed to compare PWV and its association with blood pressure (BP) and body mass index (BMI) in healthy high school and university students.

Methods: First group – 42 high school students (22 males) 14-15 years (14.8±0.3 years), the second group – 38 university students (18 males) aged 17-21 years (18.8±1.1 years). To study velocities in elastic (Ve) and muscular (Vm) arteries sphygmomanometry was performed on carotid, femoral and radial arteries.

Results: Older students had higher BMI 22.2±2.8 vs 20.06±2.05 kg/m² (p=0.002) and trend to higher systolic BP (126.2±16.6 vs 119.6±10.2 mm Hg; p=0.07) No difference between groups in Vm was found (7.28±1.18 m/s in 1st group; 7.09±1.14 m/s in 2nd). Ve was higher in older group (6.24±1.06 vs 5.57±0.67 m/s in younger group; p=0.001). No gender difference was found in Ve or Vm in either group. Correlation analysis performed in both groups revealed that Ve significantly correlated with age (r=0.26), BMI (r=0.34), systolic (r=0.29), diastolic (r=0.30) and mean BP (r=0.33), Vm correlated only with height (r=0.28). Pulse BP did not correlate with Ve or Vm. Multiple regression found only BMI as independent factor associated with Ve (β=0.27; p=0.04).

Conclusions: Elastic arteries stiffness increased with age in young people with no gender difference. It depends on BP and BMI. The main determinant of Ve is BMI.

P4.17 ARTERIAL STIFFNESS IN YOUNG PATIENTS WITH PERIPHERAL ARTERIAL DISEASE

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Increased arterial stiffness occurs in older patients with peripheral arterial disease (PAD). In this study we compared arterial stiffness and central hemodynamic parameters in young (<60 years of age) PAD patients and controls. In 31 PAD patients with an ankle-brachial index (ABI≤0.9) and 42 controls, aortic pulse wave velocity (aPWV), Augmentation Index corrected for heart rate (AIx@75HR), aortic Pulse Pressure (aPP), Pulse Pressure Amplification (PPA), were measured using the Sphygmocor device. In young PAD patients aPWV and AIx@75HR were similar (p=0.10) (p=0.58) With respect to controls but aortic PP was higher (p=0.02) and the PP amplification ratio was lower (p=0.005). PAD in young subjects is associated with central hemodynamic alterations but not with degenerative stiffness of the large arteries.

P4.18 THE ASSUMPTION THAT BLOOD PRESSURE DECREASES OVER CONSECUTIVE MEASUREMENTS IS FALSE: MAJOR IMPLICATIONS FOR HYPERTENSION DIAGNOSIS AND GUIDELINES

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Background: There is anecdotal belief that clinic blood pressure (BP) drops over consecutive measurements. This has led to guideline recommendations to discard the first BP reading, or take only one reading if systolic BP (SBP) <140 mmHg. However, the magnitude and direction of change in SBP over consecutive measurements is not clear, and the effect of age and BP level on this change in SBP is unknown. We investigated these issues, and their effect on hypertension diagnosis.

Methods: Duplicate BP (or triplicate if large BP differences) was recorded by oscillometry among 20,752 participants (aged 45[95CI; 45,46] years; males 53%) from the 2011-13 Australian Health Survey. SBP change was defined as the difference between measurements. Results: SBP decreased between the first two measures in only 56%, whereas it increased in 37% and did not change in 7% of the population. There was a strong, age-dependent, J-curved relationship between SBP change and SBP level (p<0.001), with the smallest SBP change corresponding to controlled SBP (100 – 140 mmHg). The age-dependent SBP changes resulted in significant diagnostic reclassification compared with the approach of discarding the first reading; 63% and 35% reclassified from hypertension to normal BP, and 4% and 13% reclassified from normal to hypertension among those aged >50 years and >50 years respectively.

Conclusions: The assumption that SBP drops over consecutive measurements is false, and significant age-and BP-dependent reclassification of hypertension diagnosis will result if the first SBP is discarded. These findings highlight the need for change to some international hypertension guidelines.

P4.19 CARDIOVASCULAR RISK FACTORS AND LEFT VENTRICULAR HYPERTROPHY IN CHILDREN WITH CHRONIC KIDNEY DISEASE

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Cardiovascular diseases are substantial causes of mortality among patients with chronic kidney disease (CKD). The aim of the study was an assessment of the impact of cardiovascular risk factors on left ventricular hypertrophy (LVH) in children with CKD.

Material and methods: The study was conducted in a group of 71 children with mean age 11 years and CKD stage 1 to 5. Serum cystatin C, albumin...
levels, and lipids profile were measured. Ambulatory blood pressure measure-
ments and echocardiography were performed.

Results: LVH was detected in 34 out of 71 children. In children with LVH, signifi-
cantly higher values of BP were observed in 24-hour measurements:
systolic (119 vs. 109 mm Hg; p = 0.002), diastolic BP (73 vs. 65 mm Hg;
 p = 0.009) and MAP (89 vs. 81 mm Hg, p = 0.004). These significantly higher
BP values were observed within day and night. Increased cholesterol level
was found in 25, LDL in 12, TGL in 28, and a decreased HDL in 20
children.
In children with LVH higher BMI (18.6 vs. 16.7 kg/m²; p = 0.039) and lower
albumin (41.5 vs. 45.4 g/l; p = 0.013), HDL (1.14 vs. 1.5 mmol/l; p = 0.001) and
Ca levels (2.36 vs. 2.47 mmol/l; p = 0.03) were found. Obesity and low HDL
level were independent LVH risk factors. The results indicate a 3-fold in-
crease in the risk of LVH in children with hypertension (OR 3.18, p
= 0.002). Elevated BP values
were significantly different between WT_HF and OB/+_HF mice, while
no differences were found for WT_DS-OB/+_DS, WT_HF_OB/SD and OB/
+_HF/OB/SD comparisons.
The high-fat diet has effects on the microvasculature of both WT and OB/+_HF
mice. The two genotypes respond differently to the high-fat diet but not
to the standard one. Moreover, if treated with high-fat diet, WT and OB/+_HF
animals are not different from OB/SD mice (standard diet) in terms of
microcirculation.

P4.20

ASSESSMENT OF BODY COMPOSITION USING BIOELECTRICAL IMPEDANCE
ANALYSIS AND BLOOD PRESSURE IN HEALTHY SCHOOL CHILDREN

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Introduction: Bioimpedance analysis (BIA) is becoming more widely used in
clinical practice to measure water body compartments. BIA allows to cal-
culate: total body water (TBW), lean body mass (LBM), fat mass (FM), intra-
and extracellular water (ICW, ECW).

Aim: The aim of this study was to evaluate the influence of body composi-
tion, measured by electrical bioimpedance, on blood pressure (BP) in
children.

Methods: The study was performed in 72 children (32 girls and 40 boys) aged:
6-7 and 12-13 years. BIA measurements were taken using Nutriguard Data
Input device. Blood pressure was measured twice using oscilometric
method.

Results: 8 studied children had body weight <3rd percentile; 1 girl >97th
percentile. A statistically significant correlation between systolic BP and
TBW (r = 0.4023, p < 0.000), LBM (r = 0.3600, p = 0.002), FM (r =
0.4725, p < 0.000) ECW (r = 0.4598 p < 0.000) and BMI (r = 0.4089
<r 0.000) was found. Furthermore, diastolic BP significantly correlated with
TBW (r = 0.3056, p = 0.011), LBM (r = 0.2783, p = 0.021), TRV (r =
0.3956, p < 0.000) ECW (r = 0.3869 p = 0.001) and BMI (r = 0.3550, p
= 0.002). Elevated BP values >95th percentile for gender, age and height
were observed in 5 girls and 4 boys.

Conclusions: In the studied children systolic and diastolic BP values corre-
lated with body composition parameters. The problem of unrecognized hy-
pertension and malnutrition in children and adolescents is still underestimated
in the Polish population.

P4.21

MICROCIRCULATION EFFECTS OF OBESITY AND/OR DIET: A PRELIMINARY
STUDY IN MICE

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Obesity is becoming a global epidemic and is associated with cardiovascular
disease. Genetic factors play a significant role in the disease etiology but
less is known about the interaction between genes and diet composition.
This study is aimed to investigate the effect of diet and/or genotype on
microcirculation in mice.

Five groups of male mice (28 weeks) were examined using micro-ultrasound
(Vevo2100, VisualSonics): 5 wild type mice on standard diet (WT_DS), 7 wild
type mice on high-fat diet (WT_HF), 7 OB/+_mice on standard diet (OB/
+_SD), 5 OB/+_mice on high-fat diet (OB/+_HF) and 4 OB/SD mice
on standard diet (OB/SD). The high-fat diet (5%5 energy as fat) groups were
fed for 18 weeks before US scans. Infrarenal vasculature was imaged
using Power-Doppler mode and Pulse-Wave Doppler signals were acquired
at the segmental level; Resistivity Index (RI) and Pulsatility Index (PI) were
then assessed.

Both RI and PI were significantly lower in WT_DS than in WT_HF
(0.57 ± 0.03 vs. 0.67 ± 0.06 and 0.86 ± 0.04 vs. 0.10 ± 0.09,
respectively). The same result was found for the comparison between
OB/+_SD and OB/+_HF (0.63 ± 0.06 vs. 0.72 ± 0.04 and 1.01 ± 0.12
vs. 1.22 ± 0.09, respectively). RI and PI values were significantly different between WT_HF and OB/+_HF mice, while
no differences were found for WT_DS-OB/+_DS, WT_HF_OB/SD and OB/
+_HF/OB/SD comparisons.
The high-fat diet has effects on the microvasculature of both WT and OB/+_HF
mice. The two genotypes respond differently to the high-fat diet but not
to the standard one. Moreover, if treated with high-fat diet, WT and OB/+_HF
animals are not different from OB/SD mice (standard diet) in terms of
microcirculation.

P5.1

FROM AORTIC FLOW VELOCITY TO CENTRAL PRESSURE: A NON-INVASIVE
PROOF OF CONCEPT

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Estimation of aortic and left ventricular (LV) pressure usually requires
measurements that are difficult to acquire during the imaging required to
obtain concurrent LV dimensions essential for determination of LV mecha-
nical properties. We describe a novel method for deriving aortic pressure
from the aortic flow velocity. The target pressure waveform is divided into an
early systolic upstroke and a diastolic decay, interpolated by a late systolic
portion described by a second-order polynomial. Pulse wave velocity (PWV),
mean arterial pressure, diastolic pressure and diastolic decay are required
inputs for the algorithm. The algorithm was tested using a) pressure data
derived theoretically from pre-specified flow waveforms and properties of
the arterial tree using a single-tube 1-D model of the arterial tree and b) exper-
nmental data acquired from a pressure/Doppler flow velocity trans-
dercer placed in the ascending aorta (n = 18, mean ± SD, age: 63 ± 11 years,
aortic BP: 136 ± 23 / 73 ± 13 mmHg) at the time of cardiac catheterisation.
For experimental data, PWV was calculated from measured pressures/flows
and mean, diastolic pressures and diastolic decay were taken from measured
pressure. Pressure reconstructed from measured flow agreed well with
theoretical pressure: mean ± SD root mean square (RMS) error 0.77 ± 0.10
mmHg. Similarly, for experimental data, pressure reconstructed from
measured flow agreed well with measured pressure (mean RMS error
2.44 ± 1.00 mmHg). First systolic shoulder and systolic peak pressures were
also accurately rendered (mean ± SD difference 1.44 ± 2.00 mmHg for
systolic pressure). This is the first non-invasive derivation of aortic pressure
based on fluid dynamics (flow and wave speed) in the aorta itself.

P5.2

FROM THE WAVE PROPAGATION MODEL TO A TRANSFER FUNCTION: A
POSSIBILITY FOR PERSONALISATION

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Since aortic pressure cannot be measured noninvasively, pressure signals are
often measured at more superficial arteries and a transfer function is
applied to obtain a surrogate for the central pressure curve. These trans-
formations are usually derived from measurements in a specific group of
subjects and a generalised transfer function is calculated thereof.
In contrast, in this work a one-dimensional wave propagation model is used
to derive a patient-specific transfer function.
A model of the arterial tree is combined with the theory from Womersley
for blood flow in elastic vessels. This approach allows an explicit solution of the
wave equations. Thus the pressure at each location in the arterial tree can
be derived from measurements in a specific group of
subjects and a generalised transfer function is calculated thereof.
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