12.18: COMPARISON OF THE CENTRAL PRESSURE MEASURED WITH A BRACHIAL CUFF AND INVASIVELY MEASURED AORTIC PRESSURE

O. Korolkova, A. Lowe, J.E. Davies, A.D. Hughes, K.H. Parker, J.H. Siggers

P12.14

ADJUSTMENT FOR BLOOD PRESSURE WHEN MEASURING PULSE WAVE VELOCITY IN NEWLY DIAGNOSED UNTREATED HYPERTENSIVE PATIENTS

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Pulse wave velocity (PWV) is a valid and well-documented predictor of cardiovascular risk in hypertensive patients. It is essential to adjust for potential confounders, and especially age and blood pressure (BP) modulate the level of PWV. Both systolic BP and mean arterial pressure (MAP) have been used when adjusting in statistical models. However, in recent years MAP has been favoured for BP adjustment.

The aim was to investigate if MAP was superiorly correlated to PWV compared to systolic BP in newly diagnosed untreated hypertension.

We included 126 newly diagnosed untreated hypertensive patients. Twenty-four hour ambulatory BP measurement was performed and PWV was measured using the SphygmoCor device.

The cohort consisted of 61 men and 73 women with an average age of 50 ± 12 years. The mean systolic BP was 146 ± 12 mmHg and the mean MAP was 108 ± 9 mmHg with no significant difference between genders. The median PWV was 8.4 m/s (range 5.3 to 16.8) with no gender difference.

In a linear regression model age was highly positively correlated with PWV (ß $=.004$, $p<.001$). In an age-adjusted model, MAP was positively correlated with PWV (β$=.004$, p$=.02$) but systolic BP showed a higher positive correlation with PWV (ß$=.003$, p$=.008$).

PWV measurements must be corrected for BP levels as well as age. Adjusting for systolic BP may be superior to adjusting for MAP in newly diagnosed untreated hypertensive patients.

P12.15

ACCURACY OF OSCILLOMETRIC DETERMINATION OF THE ANKLE-BRACHIAL INDEX AS SCREENING METHOD FOR PERIPHERAL ARTERY DISEASE

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Aim: The ankle brachial index (ABI) is a non-invasive measure for the assessment of peripheral artery disease (PAD). Currently, its use is not sufficiently implemented in general practice, because it is time-consuming. An automated test may facilitate screening for PAD. In this study we assessed the accuracy and reliability of oscillometric ABI determination compared with Doppler.

Method: A total of 99 subjects, including 27 PAD patients, with various cardiovascular risk profiles (hypertension 45,9%; cardiovascular disease 29,6%; diabetes 24,5%; dyslipidemia 38,8%; smoking 21,4%), were recruited between January 2010 and February 2011 at the Department of Cardiology. Doppler with a handheld probe (Hadeco Bidop ES-100V3) and oscillometric measurements with a validated automated blood pressure system (Datascope Acutorr Plus) were performed in a randomized order. PAD was defined as ABI below 0.9.

Results: The Spearman correlation coefficient between the Doppler and oscillometric method was 0.71 (P< 0.001). The sensitivity and specificity for the oscillometric device for detecting PAD were resp. 80% and 97%, the positive and negative predictive values were resp. 89% and 95%. The average time for Doppler and oscillometric ABI determination significantly differed between both methods (resp. 11 minutes (min) 40 seconds (s) and 4min 29s; p< 0.001). The mean ABI measured with the oscillometric device was slightly higher than with Doppler (resp. 1.03 + 0.16 and 1.01 + 0.19; P<0.05 by paired t-test).

Conclusion: These results show that automated ABI determination is an accurate and reliable screening method for the detection of PAD.

P12.16

ATHEROSCLEROTIC PLAQUE EVALUATION BASED ON THE RESULTS OF ULTRASOUND DUPLEX SCANNING (DS), MULTISPECTRAL RESONANCE IMAGING (MRI), MULTISPIRAL COMPUTED TOMOGRAPHY (MSCT) AND

HISTOCHEMICAL ANALYSIS IN ASYMPTOMATIC PATIENTS WITH MARKED CAROTID ATHEROSCLEROSIS

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Aim: To evaluate morphological and functional characteristics of an atherosclerotic plaque (ASP) in patients with marked carotid atherosclerosis.

Materials and methods: Forty patients (25 males, age 68.9±6.6 years) with marked carotid atherosclerosis (stenosis $\geq$ 70%, based on ultrasound DS, MSCT and MRI data) were examined before carotid endarterectomy (16 cases with history of cerebral stroke, CS — Group 1; 24 cases without — Group2). All the patients were asymptomatic (no acute cerebrovascular events in the last 6 months). Histochemical examination of the excised carotid ASP was performed in 21 cases (9 cases in Group 1 and 12 cases in Group 2).

Results: Incidence of unstable carotid ASP in groups with and without history of CS was respectively: 50% vs. 23%, p=0.02 (DS data); 25% and 25%, p>0.5 (MRI). Patients with and without history of CS have respectively: ischemic heart disease, IHD (43.5% vs. 68.8% of cases, p=0.03); history of myocardial infarction, MI (25.1% vs. 8.7%; p=0.01). Carotid ASP was unstable in 71.4% of cases (n=16) and stable — in 28.6% (n=6) based on histochemical examination data. As compared to histochemical examination data (conventional "gold standard") sensitivity and specificity were respectively: 67% and 83% for DS; 93% and 67% for MRI.

Conclusions: Asymptomatic patients with marked carotid atherosclerosis have unstable ASP (detected by DS), IHD and history of MI significantly more often in cases with history of CS than without it. Compared with histochemical examination data MRI was the most sensitive method of unstable carotid plaque detection, while DS was the most specific one.

P12.17

SYSTOLIC AMBULATORY BLOOD PRESSURE IS MORE CLOSELY RELATED TO LEFT VENTRICULAR HYPERTROPHY THAN CENTRAL AORTIC AND BRACHIAL BLOOD PRESSURE IN NEVER TREATED HYPERTENSIVE PATIENTS

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Background: Our purpose was to assess the relationship between left ventricular mass (LVM) and three different ways to measure blood pressure in hypertensive patients.

Methods: Cross-sectional study that included non-diabetic, untreated hypertensive patients. Central aortic pressure (CAP), derived from pulse wave analysis (SphygmoCor-System), office brachial blood pressure (oBBP) and ambulatory 24-hour blood pressure (ABP) were obtained. LVM was determined by standard echocardiography (cut-off values for left ventricular hypertrophy (LVH) were 125 g/m^2 for men and 110 g/m^2 for women).

Results: The study population comprised 418 (229 men, with mean age, 49±13 years). Of the participants, 126 (30%) had LVH. Patients with LVH were older [52(13) vs. 47(12) years; p<0.001], had higher values of systolic oBBP [151(18) vs. 143 (16) mm Hg ;p=0.001], CAP [141(18) vs. 132 (16) mm Hg;p=0.03], and systolic ABP [139(14) vs. 131 (9) mm Hg ;p=0.001].

Stepwise regression analysis corrected by age, gender and presence of metabolic syndrome, revealed that systolic BP (β= 0,0001, *p*<0,001), systolic CAP (β= 0,002, *p*<0,001), and systolic ABP (β= 0,001, *p*<0,001) were all significantly related to LVH.

In a logistic multivariate regression analysis, dividing LV mass in tertiles, systolic CAP (OR: 2,1;95% CI,1,2-3,7; p= 0,01), and systolic ABPM-values (OR:3,21;95% CI,1,8-5,7; p=0,001), but not brachial BP, were associated with LVH.

Conclusions: In untreated hypertensives, LVH is closer related to CAP than to office brachial BP, but systolic ABP-values show the best association to the prevalence of LVH.

Key Words: arterial stiffness, central aortic pressure, left ventricular hypertrophy.

P12.18

COMPARISON OF THE CENTRAL PRESSURE MEASURED WITH A BRACHIAL CUFF AND INVASIVELY MEASURED AORTIC PRESSURE

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Central aortic pressure is a better predictor for cardiovascular events than brachial pressure[1]. There are a number of devices on the market that find a continuous measurement of pressure in the arm, and from it estimate the central aortic pressure[2]. In this study we focus on one such device, the PulseCor 6.5 Monitor (PulseCor, Auckland, New Zealand) [3]. We compare its output (central aortic pressure waveforms) with an ensemble average of the aortic pressure waveforms measured invasively using a pressure catheter (ComboWire XT GuideWire, Volcano Corporation, Belgium). The results show that the central aortic pressure waveforms have a qualitatively and quantitatively similar shape to the invasively measured waveforms (R=0.9505) (a typical result is shown in figure). The average differences in the systolic and diastolic readings of the device with the invasive measurements are 6.75 mmHg with range [-13.09, 32.0] and 18.15 mmHg with range [-8.45, 86.38], respectively (N=8). We conclude that although the non-invasively measured systolic and diastolic pressures do not match exactly to the invasive measured ones, the waveforms of both measurements are similar.

Aortic Pressure vs Central Pressure
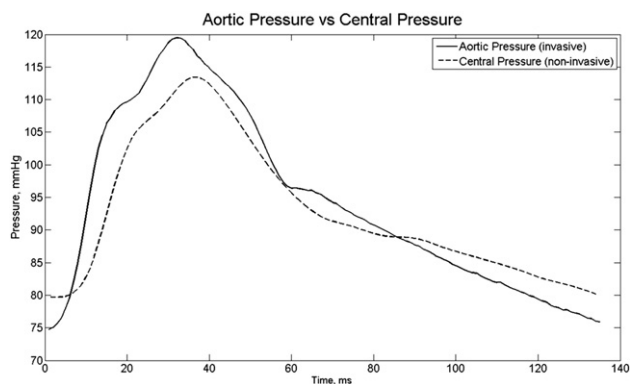
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P12.19

ESTIMATION OF CENTRAL SYSTOLIC BLOOD PRESSURE FROM ARM CUFF PRESSURE: COMPARISON WITH THE SPHYGMOCOR SYSTEM

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Objective: Central systolic blood pressure (cSBP) is usually estimated by application of a transfer function (TF) to a peripheral arterial waveform. These waveforms are usually calibrated by using either mean (MAP) and diastolic (DBP) blood pressure or systolic blood pressure (SBP) and DBP obtained from an arm cuff. The aim of the present study was to determine whether cSBP derived from upper arm cuff pressure is as accurate as that obtained from radial tonometry.
Methods: We compared estimates of cSBP obtained by application of a TF to arm cuff pressure waveforms with those obtained using a SphygmoCor device (Atcor Medical, Australia) on 42 subjects (20 women, aged 48 ± 17 years). Waveforms were calibrated using oscillometric values of MAP and DBP and SBP and DBP.
Results: Irrespective of the calibration, there was a close agreement between estimated values from the arm cuff waveforms and radial tonometry: mean difference (SD) -0.46 (4.15) mmHg for MAP and DBP calibration and 2.16 (4.38) mmHg for SBP and DBP calibration.
Conclusion: These results suggest that cSBP can potentially be determined directly from an upper arm blood pressure cuff with similar accuracy to that obtained using the current methods.

P12.20

ANKLE-BRACHIAL INDEX AND INFLAMMATION IN RELATION TO BLOOD PRESSURE CLASSIFICATION: UPS AND DOWNS

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Background: Hypertension is associated with ankle-brachial index (ABI) and C-reactive protein (CRP), which are both predictors of cardiovascular risk. We investigated the differences in ABI and inflammation between the subgroups of the blood pressure (BP) classification (optimal to grade III hypertension), which was proposed by the European 2007 guidelines for the management of hypertension.
Method: 1225 never treated consecutive subjects (53±12 years, 728 males), with no known cardiovascular disease were divided into six subgroups according to the classification of the 2007 European guidelines: optimal (n=29), normal (n=71), high normal (n=162), grade I hypertension (n=552), grade II hypertension (n=308), grade III hypertension (n=103). ABI was calculated for each leg with the higher of the 2 ankle pressures in relation to the higher of the left or right brachial systolic BP.
Results: ABI decreased from the subgroup with optimal BP to that with the higher brachial BP level (p<0.001), and this result remained significant even after adjustment for age, gender, BMI, blood glucose, mean BP, smoking status and heart rate (p<0.001, Figure). CRP increased from the subgroup with optimal control to that with the higher BP level (p<0.001), however, this result did not remain significant after adjustment for the abovementioned confounders (p=0.175, Figure). The between groups comparisons adjusted for the abovementioned confounders are presented in the Figure.
Conclusions: This study shows the gradual decrease of ABI and increase of CRP, according to the European BP classification, even in patients with normal BP. These findings provide further insights into the role of ABI and inflammation in assessment of cardiovascular risk in hypertension.
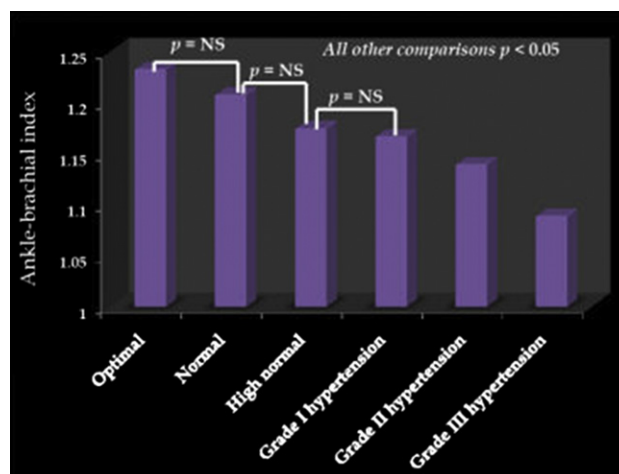
P12.21

MEASUREMENT OF PULSE WAVE VELOCITY IN HEALTHY YOUNGSTERS − REFERENCE VALUES AND COMPARISON OF THREE DEVICES

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Carotid-femoral pulse wave velocity (cfPWV) is an established method for characterizing aortic stiffness. Normal PWV values for the paediatric population derived from large data collection have yet to be available.
Our aim was to create a database and to assess the factors determining PWV (a) and to evaluate the comparability of cfPWV measured by oscillometry (Vicorder) with applanation tonometry (PulsePen, Sphygmocor) (b)
Patients and methods: Reference tables from cfPWV obtained in 1008 healthy subjects were generated by LMS method. Effect of anthropometric data on PWV was established. cfPWV of 98 youngsters (17.2 (5.3) years) with the three devices.
Results: Reference tables for gender, age and height were generated. By multiple regression, age, height and blood pressure remained major predictors of PWV. (a) PWV by Vicorder was significantly lower than by