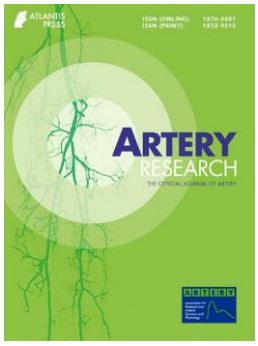

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P1.05: ASSESSMENT OF ARTERIAL STIFFNESS IN HYPERTENSION: COMPARISON OF OSCILLOMETRIC (ARTERIOGRAPH), PIEZO-ELECTRONIC (COMPLIOR), AND TONOMETRIC (SPHYGMOCOR) TECHNIQUES

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study was the comparison of modern standard fluid filled catheters using a pressure transducer (Sensis, Siemens) against a high fidelity (frequency response flat from 0-25 Hz) guidewire based pressure sensor (Pressure Wire®, Radi medical), with focus on AP and AIx.

Design and Methods: Pressure curves were recorded at the level of the ascending aorta simultaneously using a 6 French fluid filled catheter and a Pressure Wire® for about 20 seconds in 12 patients undergoing invasive assessment of coronary artery lesion severity. Fluid filled catheters were carefully used to avoid bubbles so as to obtain frequency response > 10 Hz and damping coefficient around 0.2. The recorded sequences were analysed with Fourier analysis (modulus and phase shift) in the frequency domain as well as by the means of time domain analysis for inflection pressure determination (2nd respectively 4th derivative in time).

Results: The mean correlation of the wave forms was R = 0.998. The mean difference for AIx was 5.79 % with a standard deviation of 7.69 %. The mean difference in AP was 3.74 mmHg with a standard deviation of 4.63 mmHg. For modulus and phase we found negligible differences in amplifications and shifts in the range from 1-10 Hz.

Perspective: The preliminary results of this small study provide evidence that modern transducer systems with carefully prepared fluid-filled tubing and connections can deliver useful information for pulse wave analysis and should be investigated more intensively.

P1.05

ASSESSMENT OF ARTERIAL STIFFNESS IN HYPERTENSION: COMPARISON OF OSCILLOMETRIC (ARTERIOGRAPH), PIEZO-ELECTRONIC (COMPLIOR), AND TONOMETRIC (SPHYGMOCOR) TECHNIQUES

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Arterial stiffness, measured as aortic pulse wave velocity (PWV), and wave reflection, measured as augmentation index (AIx) are independent predictors, for total and cardiovascular morbidity and mortality. The aim of this study was to compare a new device, based on oscillometric pressure curves (Arteriograph) which simultaneously measures PWV and AIx to standard techniques for measuring PWV (Complior) and AIx (SphygmoCor) in untreated hypertensive subjects.

We compared PWV and AIx measured using the Arteriograph with corresponding Complior and SphygmoCor measurements in 254 untreated hypertensive patients, age 48 ± 14 (mean ± SD) [17 to 85 years].

Arteriograph PWV and AIx were closely related with Complior ($r = 0.60$, $P < 0.001$), and SphygmoCor ($r = 0.89$, $P < 0.001$) respectively. Using stepwise regression analysis, the independent determinants of Arteriograph PWV were age, mean arterial pressure (MAP), heart rate (HR) and gender ($R^2 = 0.44$ $p < 0.0001$) and for AIx; age, weight, MAP, HR and gender ($R^2 = 0.65$, $p < 0.0001$). The bias between the different techniques was determined by age and gender for PWV and age, body weight, gender, HR and MAP for AIx. Bland-Altman Plots showed that while the techniques were closely related, the limits of agreement were wide.

While Arteriograph values and the determinants of PWV and AIx are in close agreement with corresponding parameters obtained by Complior and SphygmoCor respectively, the techniques are not interchangeable.

P1.06

THE ACCURACY OF CENTRAL SYSTOLIC BLOOD PRESSURE DETERMINED FROM THE SECOND SYSTOLIC PEAK OF THE PERIPHERAL PRESSURE WAVEFORM

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Central blood pressure may be a better predictor of cardiovascular risk than peripheral blood pressure. The central systolic blood pressure (cSBP) can be estimated from the late systolic shoulder of the radial pulse waveform ($pSBP_2$). We compared $pSBP_2$ with cSBP derived by a generalized transfer function in a large cohort of subjects, across a wide age-range. We also compared $pSBP_2$ with true central SBP (cSBPi) measured by cardiac catheterization.

Non-invasive measurements were made by applanation tonometry using the SphygmoCor device. The aortic pressure waveform was derived from the radial waveform using a validated transfer function. cSBPi measurements were carried out in 38 subjects undergoing diagnostic cardiac angiography, and the radial artery pressure waveform was recorded simultaneously using the SphygmoCor device.

Data from 1,880 subjects aged 18-85 years, yielded 10,269 individual observations. There was a strong correlation ($r = 0.99$, $P < 0.001$) and good agreement between $pSBP_2$ and the derived cSBP (mean difference = 1 ± 4mmHg). However, at lower average values of cSBP and $pSBP_2$, there was a greater difference between these two variables suggesting bias in the data. There was also a strong correlation and good agreement between cSBPi and $pSBP_2$ ($r = 0.96$, $P < 0.001$, mean difference = 3 ± 4mmHg), and between the derived cSBP and cSBPi ($r = 0.74$, $P < 0.001$, mean difference = -3 ± 8mmHg).

$pSBP_2$ approximates cSBP in a large cohort, across a wide age-range, but this may be inaccurate at low systolic blood pressures. The reason for this bias has not yet been established, and further investigations are required. Until this is resolved, $pSBP_2$ should be used with caution, particularly in individuals with lower systolic blood pressures.

P1.07

MEASUREMENT OF CAROTID INTIMA-MEDIA THICKNESS IN HEALTHY PERSONS AND PATIENTS WITH TYPE 2 DIABETES - A REPRODUCIBILITY STUDY

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Background: Carotid intima-media thickness (IMT) measured by B-mode ultrasound is a sensitive and non-invasive method for detection of subclinical cardiovascular disease (CVD) and is often used as primary outcome measure in clinical trials as a surrogate marker of CVD. The purpose of the present study was to quantify the repeatability of this method between and within sonographers and readers. Furthermore we studied the day-to-day variation.

Methods: We used B-mode ultrasound and a computerized software programme (MIA vascular tools) for analysis of Carotid IMT (far wall of the common carotid artery). Measurement of Carotid IMT was done for 30 healthy persons and 28 T2D patients by two different sonographers and two different readers on two separate days.

Results: Comparisons of Carotid IMT between readers assessing the same picture (reader variability) resulted in limits of agreement on the relative scale from 0.92 to 1.07, i.e. there is a 95% probability that the reading of a given picture by a second reader gives a thickness between 0.92 and 1.07 of the first reading. Comparing different sonographers resulted in limits of agreement from 0.83 to 1.22

We found no differences between healthy persons and patients with T2D.

Conclusion: Measurement of carotid IMT has the same accuracy in both healthy persons and patients with T2D. The major sources of variation are the differences between sonographers and the day-to-day variation whereas the following reading of the recording using computerized software shows very little variation.

P1.08

COMPARING PROXIMAL AND DISTAL OCCLUSION FOR TESTING ENDOTHELIAL FUNCTION USING FOREARM ISCHEMIA ┼ HYPERAEMIA

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Introduction: There are several approaches to assess endothelial function using forearm ischemia - hyperaemia (FMD). The principal difference is whether flow is stopped in the root of the arm (proximal or P) or the wrist (distal or D). P induces ''non pulsatile ischemia'', and D, ''pulsatile ischemia'', and the choice based on tolerance.

Aim: Compare the efficacy and tolerability of two different FMD methods.

Methods: Seventeen pts., between 30 and 50 y.o, males, without CV disease or CV drugs were evaluated in the Vascular Lab. FMD was performed at the beginning and at the end of the vascular study (>30 minutes apart each one) in a randomized sequence using P or D occlusion and were recorded to be read blinded. Pts. were asked about the tolerance of each method.

Results: Mean age 39 + 7 y.o, BP 133,4 + 17 and 82,5 + 11 mmHg, normal IMT, Plaques (5 subjects, 29%), PWV 10,26 + 1,8 m/seg Aix b -25,7%, Aix Ao 20 %, Vascular score 2,53. Basal diameters humeral artery (mm): P: 3,44 + 0,5 D: 3,51 + 0,5 (pNS) Post ischemia diameters (mm): P: 3,63 + 0,4 D: 3,67 + 0,4 (p NS). Delta of diameter (%): P: 5,7% + 4,8 D: 4,7% + 5 (p. NS) (r 0,49 p.01, concordant according Bland & Altmann test). About 60% of FMDs were in the same sense and degree and P better tolerated than D.

Conclusions: Although P is better tolerated, there seems to be no significative differences between both methods.