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P2.02: PREDICTION OF CARDIOVASCULAR EVENTS: A COMPARISON OF BRACHIAL-ANKLE PULSE WAVE VELOCITY AND CARDIO-ANKLE VASCULAR INDEX

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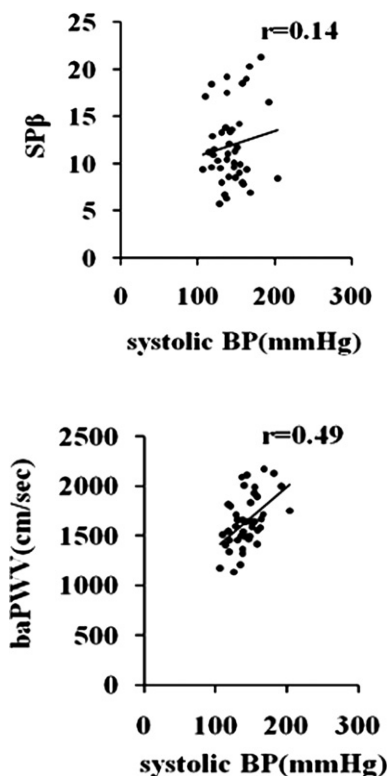
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Recently, SP β , an index of vascular elasticity, become easy to measure. SP β is adjusted by BP, thus it is less affected by occasional BP. In this study, we examined differences between SP β and baPWV.

Methods: SP β and PWV were measured in 26 HD and 16 non-HD patients. SP β was calculated from BP and the diameter of common carotid artery measured by ultrasound examination.

Results: Nevertheless age, gender and BP were matched in two groups, SP β in HD patients was significantly higher ($p=0.004$). Also in this study, there was no correlation between SP β and systolic BP.

Conclusions: These results suggest that SP β reflects elastic properties of arteries without influence of occasional BP, and that arteriosclerotic change is accelerated in HD population.



P1.13

COMPARISON OF TWO NON-INVASIVE DEVICES (SPHYGMOCOR® VS. A-PULSE®) FOR MEASUREMENT OF CENTRAL HAEMODYNAMICS WITH INVASIVE MEASUREMENT DURING CARDIAC CATHETERIZATION

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Objective: The estimation of central haemodynamics is discussed to assess more precisely the pressure load on the cardiovascular system in hypertension. In addition to SphygmoCor® (Atcor Medical, Sydney Australia), a new device for non-invasive assessment of central haemodynamics (BPro® device with A-Pulse®, HealthSTATS, Singapore) was approved by FDA.

Design and Method: Patients (N=52) undergoing invasive elective cardiac evaluation were tagged prior to the cardiac catheterization with a standard oscillometric blood pressure device and the BPro® device at the same arm. Immediately after the invasive measurement of central haemodynamics, radial artery waveforms were sampled by two non-invasive techniques, the B-Pro® with A-Pulse® and with the SphygmoCor® System. Thereafter, central haemodynamics was measured invasively for a second time.

Results: There was a high agreement between the invasively recorded central systolic blood pressure (cSBP) (137 ± 27 mmHg) and both non-invasively assessed cSBP by B-Pro® (136 ± 21 mmHg, $p=0.627$ vs. invasive cSBP) and by SphygmoCor® (136 ± 23 mmHg, $p=0.694$ vs. invasive cSBP). Moreover, there was a high correlation of cSBP between invasively recorded and both non-invasively assessed cSBP by B-Pro® ($r=0.893$, $p<0.001$) and by SphygmoCor® ($r=0.860$, $p<0.001$). Given in absolute values, cSBP differed only in

0.1 ± 6 mmHg ($p=0.913$) between the two non-invasive devices. However, only SphygmoCor® showed an acceptable assessment of heart rate. **Conclusions:** Both non-invasive devices showed an accurate agreement in cSBP compared with invasively measured cSBP. However, only SphygmoCor® showed an acceptable assessment of heart rate in contrast to B-Pro® compared to invasive recording.

Methodology and Pathophysiology

P2.01

CONTINUOUS NONINVASIVE ESTIMATION OF BLOOD PRESSURE IN THE COMMON CAROTID ARTERY USING MEASUREMENTS IN THE FINGER ARTERY

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Myocardial infarction and stroke are two leading causes of mortality. The primary trigger for these clinical events is destabilization of atherosclerotic plaques. Plaques can be identified based on their elastic properties, derived from stress and strain in the plaque. Strain can be measured noninvasively using ultrasound [1] and the corresponding stress can be derived from the blood pressure waveform.

In 7 healthy subjects we measured the pressure waveform in the right common carotid artery using two methods. The pressure waveform obtained by applanation tonometry was scaled directly to brachial blood pressure. The carotid artery diameter waveform obtained using ultrasound echotracking was scaled to pressure based on the diastolic and mean blood pressure continuously measured in the finger artery (Finapres®). The resulting pressure waveforms were characterized by their systolic, diastolic and pulse pressure.

The shape of the pressure waveforms obtained by the two methods correlated well (Pearson correlation: $0.87-0.99$, $p<0.05$). There was a significant bias in the systolic (mean \pm se: 15.6 ± 2.3 mmHg) and diastolic pressure (12.6 ± 1.7 mmHg) between the two methods (Bland-Altman, $p<0.05$). The pulse pressure did not have a significant bias (3.0 ± 1.6 mmHg).

These results suggest that the pressure waveform derived from the diameter waveform and finger blood pressure systematically underestimates mean pressure but appropriately describes pressure changes over time. Consequently ultrasound data can be used for simultaneous estimation of stress and strain in the carotid artery, which makes it possible to determine the elastic properties of plaques.

1. Hansen HHG, *et al.* IEEE Trans Med Imaging 2009.

P2.02

PREDICTION OF CARDIOVASCULAR EVENTS: A COMPARISON OF BRACHIAL-ANKLE PULSE WAVE VELOCITY AND CARDIO-ANKLE VASCULAR INDEX

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The cardio-ankle vascular index (CAVI) has been recently reported as a new index of aortic stiffness, which is less influenced by blood pressure than the previous standard, brachial-ankle pulse wave velocity (baPWV). Recent studies have shown that CAVI is a more accurate predictor of the current severity of atherosclerotic disease than baPWV. The AIM of this study was to establish which of the two parameters (baPWV or CAVI) has a higher predictive value for major adverse cardiovascular events (MACE) in men with Coronary Artery Disease (CAD). **METHODS AND RESULTS:** baPWV and CAVI measurement were performed on 224 men with CAD (mean age 56.2 ± 8.9). The examination measured body mass index, blood pressure, blood glucose and total cholesterol. During the 3.5-year follow-up period 38 patients experienced MACE (acute myocardial infarction, coronary intervention, or cardiac death). A receiver operating characteristic curve demonstrated that the best cut-off point for baPWV to predict MACE was 14.0 m/s (AUC=0.69, $p<0.001$) whereas for CAVI the value is 8.1 (AUC=0.61, $p=0.027$). Univariate Cox analyses demonstrated that baPWV had a significant risk ratio (RR) for MACE (RR=4.59, CI95%=2.43-8.67,

$p < 0.001$), while CAVI was not significantly associated with MACE (RR = 1.93, CI 95% = 0.99-3.39, $p = 0.055$). Multivariate Cox analyses demonstrated that independent of age, mean BP and other risk factors, baPWV was a predictor of MACE. The sensitivity of baPWV was 71%, and its specificity was 67%. CONCLUSIONS: baPWV is the only significant predictor of MACE for men with CAD, while CAVI does not independently relate to meaningful 3.5 year prognosis in this cohort.

P2.03

NON INVASIVE EVALUATION OF ATHEROSCLEROTIC PLAQUES BEHAVIOR IN HUMAN CAROTID ARTERIES: INDICATORS OF PLAQUE VULNERABILITY?

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Introduction: The arterial wall, like a filter, buffers pulsatility of pressure and flow generated by cardiac activity, minimizing mechanical damage to the arterial wall. Development and progression of vascular disease involve changes in the structure, viscosity (V) and elasticity (E) of arteries, the main determinants of arterial wall buffering capacity (BC). Specific changes in V, E and BC of Atheromatous plaques (AP) and the neighbouring wall have not been fully characterized.

Objectives: To characterize V, E and BC of human carotid arteries with AP.

Methods: We selected 7 subjects (63 ± 8 y.o.) with an echography of neck vessels (B mode and doppler, 10 mHz probe) similar baseline clinical and biochemical characteristics and AP in a common carotid artery (CCA). Five consecutive segments of the CCA, targeting the AP were evaluated (S1-S5 from proximal to distal, S3 the middle part of the plaque, S2 and S4 the proximal and distal shoulders). The instantaneous diameter and the signal of carotid pressure, calibrated with the brachial pressure (using a sphygmomanometer), were obtained and carotid Pressure / Diameter ratio, V, E and BC calculated.

Results: AP exhibited changes in V, E and BC. Biomechanical gradients were detected within the AP, being S3 the stiffer region (increased E, less V and BC, $p < 0,05$)

Conclusion: Carotid atheromatous plaques present characteristic changes in V, E and BC compared to the neighbouring wall (stiffer than weaker). Future studies of changes in plaques V, E, BC and vulnerability according to patient's clinical condition and plaque geometry and composition are needed.

P2.04

SINGLE-DOSE EFFECTS OF ISOSORBIDE MONONITRATE ALONE OR IN COMBINATION WITH LOSARTAN ON CENTRAL BLOOD PRESSURE

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Antihypertensive drugs can have different effects on central and brachial blood pressures and it has been suggested that these differences are relevant to outcomes. In particular, nitric oxide donors have marked acute effects on central blood pressure but have not been assessed when administered acutely with renin-angiotensin system blockade. Thirteen patients with high-normal to mild hypertension were randomized to a sequence of 5 single-dose treatments using a double-blind, balanced crossover study design. Treatments consisted of angiotensin receptor blocker (ARB) losartan 100 mg, isosorbide mononitrate (ISMN) 60 mg, losartan 100 mg + ISMN 15 mg, losartan 100 mg + ISMN 60 mg, and placebo. Central and brachial blood pressures were measured throughout 10 hours after the single-dose treatments. Treatment periods were separated by ≥ 4 days. Mean placebo-subtracted decrease from baseline in augmentation index (AIx), a parameter of central pressure, was approximately 1% for losartan 100 mg, 26% for ISMN 60 mg, 19% for losartan 100 mg + ISMN 15 mg, and 24% for losartan 100 mg + ISMN 60 mg. Whether administered with losartan 100 mg or alone, ISMN lowered mean AIx demonstrating that acute effects of a nitrate donor are much larger than those of an ARB even when administered with an ARB. Differences from placebo were statistically significant except for losartan 100 mg. A single dose of ISMN alone or when added to losartan 100 mg markedly lowered AIx indicating AIx is a good biomarker of acute hemodynamic effects of nitric oxide in patients with high-normal to mild hypertension.

P2.05

ARTERIAL WALL FUNCTION IN PATIENTS WITH CORONARY HEART DISEASE AND DYSLIPIDEMIA, COMPARATIVE EFFICACY OF EZETIMIBE, STATINS AND THEIR COMBINATION

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Purpose: The aim of this study was to compare efficacy of treatment by ezetimibe (EZ), starting doses of statins and their combination on lipids and

