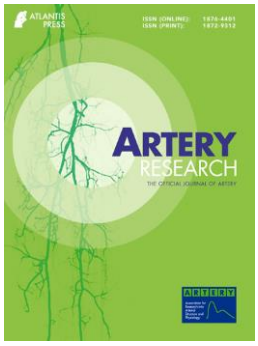

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P7.13: RELATION OF PARAMETERS OF VASCULAR STIFFNESS TO CARDIAC STRUCTURE AND FUNCTION IN PATIENTS AT RISK OF OR WITH TYPE 2 DIABETES

Luca Faconti*, Charlotte E. Mills, Virginia Govoni, Maria L. Casagrande, Andrew J. Webb, Kennedy J. Cruickshank

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P7.10
MULTI-SITE ULTRASOUND ASSESSMENT OF ARTERIAL REMODELING AND DISTENSIBILITY IN MARATHON RUNNERS

Rosa Maria Bruno [1,2,*], Elisabetta Bianchini [1,2], Nicole Di Lascio [1,2], Francesco Stea [1,2], Kristian Ujka [1,2], Alberto Marabotti [1,2], Erik Stroeken [2,3], Lorenzo Ghiadoni [1,2], Lorenza Pratali [1,2]
[1]*Institute of Clinical Physiology, CNR, Pisa, Italy*
[2]*University of Pisa, Pisa, Italy*
[3]*Radboud University, Nijmegen, The Netherlands*

Objective: to investigate features of arterial remodeling and distensibility in marathon runners by a multi-site, non-invasive approach.
Methods: 46 marathon runners (M) and 15 age-sex- and BMI matched sedentary (S) individuals were recruited (men 70 vs 67%, p=0.83; age 44±7 vs 43±6 years, p=0.62; BMI 23±2 vs 23±3, p=0.65; brachial BP 127±12/76±9 vs 123±10/74±8 mmHg, p=0.29 and 0.30; HR 53±14 vs 64±8 bpm, p=0.004). The following measurements were performed: brachial blood pressure (BP — oscillometric method), carotid and femoral BP, aortic BP (applanation tonometry+transfer function), carotid-femoral pulse wave velocity (PWV), ultrasound assessment of abdominal aorta, common carotid, common femoral and brachial artery. For each arterial site mean diameter (MD) and local distensibility coefficient (DC) were assessed.
Results: M in comparison with S had increased Aortic MD (15.8±2.0 vs 13.1±1.1 mm, p=0.0001) and reduced DC (30.3 ±15.2 vs 38.5±10.5, p=0.05), with similar carotid and brachial MD (7.16±0.59 vs 7.04±0.77mm and 4.05±0.56 vs 3.99±0.82mm, p=ns) and DC (38.0±9.3 vs 40.2±11.5 and 9.9±6.6 vs 8.9±5.6, p=ns). Furthermore, femoral MD was increased (9.8±1.0 vs 8.8±1.4, p=0.01), whereas DC was similar (29.0±12.5 vs 33.1±16.1, p=ns). Carotid, femoral and aortic BP, carotid and femoral IMT, as well as carotid-femoral PWV (6.6±1.5 vs 6.7±0.9 m/s, p=0.86), were similar in M and S.
Conclusions: Marathon runners present remodeling of aorta and femoral arteries and reduced abdominal aortic distensibility. Multi-site assessment of local arterial distensibility might be more useful than assessment of regional arterial stiffness to identify specific patterns of vascular structure and function in athletes.

P7.11
PREDICTIVE VALUE OF ENDOTHEL DYSFUNCTION ASSESSED BY FLOW MEDIATED VASODILATATION AND ARTERIAL STIFFNESS PARAMETERES IN THROMBOTIC EVENTS OF PRIMARY ANTIPHOSPHOLIPID SYNDROME

Agnes Dioszegi [*], Katalin Veres, Beata Kovacs, Viktor Banhegyi, Pal Soltesz
University of Debrecen, Clinical Center, Department of Internal Medicine, Division of Angiology, Debrecen, Hungary

Primary antiphosphplipid sydrome (APS) is characterized by recurrent arterial or venous thrombosis and/or fetal loss in the presence of antiphospholipd antibodies. The authors in a longitudinal (2005-2015) follow-up study examined how the angiological and metabolic parameters have changed during the follow up. The aim was to define if there is any association with the latter thrombotic events and the changing of examined parameters and if the parameters have any predictive values in APS specific events.
In 2005 49 primary APS patient were enrolled. In 2015 26 patient participated in the follow up measurments, but we obtained clinical history from all of the patients. Endothel function was decribed by flow mediated vasodilatation (FMD), stiffness parameters (augmentation index, pulse wave velocity), carotis intima-media thickness (cIMT) were examined, and metabolic parameteres were also determined.
During the follow-up 28 patient suffered thromboembolic events, in 21 patients did not have any kind of thrmboembolic events. In the trombotic group the onset cIMT was significantly higher (0,73 mm vs.0,63; p=0,014) than in patients without thrombotic events. As for the other onset angiological parameters there were no significant difference between the thrombotic and non-thrombotic group. In the thrombotic group significantly more patient smoked (p=0,015). In the non-thrmbotic group the endothel function significantly improved (p=0,019) while in the trombotic group the cIMT significantly increased (p=0,05) during the 10 year follow-up.
The improvement of endothel function with pharmalogical and non —pharmacological meaures has positive clinical benefit. The abnormal stiffness parameters do not correlate with the clinical outcome.

P7.12
PULSE PRESSURE AND INTIMA MEDIA THICKNESS IN RELATION TO SERUM VITAMIN D CONCENTRATION IN A SAMPLE OF GENERAL POPULATION

Agata Franczyk [1,*], Katarzyna Stolarz-Skrzypek [2], Agnieszka Olszanecka [2], Wiktoria Wojciechowska [2], Anna Wesołowska [1], Kalina Kawecka-Jaszcz [2], Danuta Czarnecka [2]
[1]*Department of Clinical Pharmacy, Jagiellonian University Medical College, Krakow, Poland*
[2]*Ist Department of Cardiology, Interventional Electrocardiology and Hypertension, Jagiellonian University Medical College, Krakow, Poland*

Objectives: Vitamin D regulates the renin-angiotensin-aldosterone system, inhibits proliferation of cardiomyocytes and vascular smooth muscles and has anti-inflammatory effects. We aimed to investigate the relation between serum vitamin D concentration and arterial structure and function in a sample of general population.
Methods: The study group included 303 subjects recruited from general population. Office BP was measured at 2 separate visits, 5 times at each visit. SpaceLabs90207 oscillometric monitors were programmed to measure ambulatory BP (ABP) each 15 min. daytime (6.00 — 22.00) and each 30 min. nighttime. Ultrasound examination of carotid arteries allowed to obtain the intima media thickness(IMT). Based on the ABP data, we calculated pulse pressure (PP) over 24h, daytime and nighttime. Vitamin D concentration was measured in serum. Database management and multivariate analyses were performed with SAS software (SAS Institute, Cary, NC, version9.3).
Results: The study group included 138 men and 165 women, mean age = 47 ± 16 years, 164 subjects had hypertension. Mean serum vitamin D level was 21.1±8.7 ng/ml. With adjustments applied for age, sex, body mass index, 24-hour systolic blood pressure and smoking, serum vitamin D negatively correlated with 24h PP (beta=-0,05±0,038, p=0,05) and daytime PP (beta=-0,035±0,027, p=0,05). We observed positive correlation between IMT and vitamin D in two subgroups: in younger population (mean age=34,8yrs, beta=0,01±0,019, p=0,03) and in male participants(beta=0,0012±0,052, p=0,03).
Conclusion: In that general population, vitamin D concentration was negatively associated with 24 h and daytime pulse pressure. Higher cholecalciferol was related to intima media thickness but only in men and in young individuals.

P7.13
RELATION OF PARAMETERS OF VASCULAR STIFFNESS TO CARDIAC STRUCTURE AND FUNCTION IN PATIENTS AT RISK OF OR WITH TYPE 2 DIABETES

Luca Faconti [1,3,*], Charlotte E. Mills [1,3], Virginia Govoni [1,3], Maria L. Casagrande [1,3], Andrew J. Webb [2,3], Kennedy J. Cruickshank [1,3]
[1]*King's College London, Division of Diabetes and Nutritional Sciences, London, UK*
[2]*King's College London, British Heart Foundation Centre, Cardiovascular Division, Department of Clinical Pharmacology, London, UK*
[3]*Guy's and St Thomas' NHS Foundation Trust, NIHR Biomedical Research Centre, London, UK*

Objective: To investigate the relationship between arterial function and cardiac, especially left ventricular (LV) diastolic, function, in people at risk of or with type 2 diabetes (T2DM).
Design and method: 64 patients (48% non-European) participated in the study. Cardiac indices were obtained by 2-dimensional echocardiography, aortic pulse wave velocity (PWV) and augmentation index (AIx) were measured with an Arteriograph, cardio ankle vascular index (CAVI), nominally independent of pressure, was obtained using a VaSera device.
Results: Mean age was 59 y, 83% with T2DM, 84% hypertension, 12% previous cardiovascular events. Regressions for AIx with LV mass index (mean 51.2 g/$m^{2.7}$) and left atrium volume index (β(SE)) were 0.52 (0.16) and 1.43 (0.4), $p<0.002$. Tissue Doppler indices (TDI) of diastolic function, E' septal and E' lateral waves were inversely related with AIx (-2.94 (0.9) and -2.14 (0.8)) as they were with CAVI (left, -0.2 (0.07) and -0.27 (0.05)) (all $p<0.01$), but the E/E' ratio was not. Similarly, TDI for systolic function, S', was related with AIx (-3.7 (1.1)) and with CAVI (0.21 (0.1))($p<0.05$). In multiple regression models these relationships were still significant, when including age, gender, BMI, diabetic status and ethnicity, for cardiac structure and function ($p<0.05$), as with CAVI measures ($p<0.05$). There was no relationship with aortic PWV.
Conclusion: In patients at risk of or with T2DM, pressure augmentation is related to cardiac remodeling and diastolic function while a mainly

pressure-independent index of stiffness of the aorta, femoral and tibial artery (CAVI) is associated with TDI of diastolic function.

P7.14

SERUM INFLAMMATORY MARKERS ARE POOR PREDICTORS OF VASCULAR INFLAMMATION AND VASCULAR INFLAMMATION DOES NOT DETERMINE AORTIC STIFFNESS IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Marie Fisk [1,*], Divya Mohan [4], Joseph Cheriyan [1], Julia Forman [1], Carmel M. McEniery [1], John R. Cockcroft [2], Ruth Tal-Singer [3], Michael I. Polkey [4], Ian B. Wilkinson [1]
[1]*University of Cambridge and Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK*
[2]*Wales Heart Research Institute, Cardiff University, Cardiff, UK*
[3]*GSK, PA, USA*
[4]*Imperial College and Royal Brompton & Harefield Hospital NHS Foundation Trust, London, UK*

Background: COPD is independently associated with increased cardiovascular events. Arterial stiffening and systemic inflammation are postulated aetiological factors. We hypothesised that vascular inflammation links systemic inflammation with vascular stiffening and sought to test this in a cohort of COPD subjects undergoing baseline FDG PET/CT either as part of the EVOLVE observational study or EVOLUTION trial (NCT 01541852).
Methods: 85 COPD subjects underwent assessments including spirometry, arterial stiffness (aortic pulse wave velocity (aPWV)), inflammatory biomarkers (fibrinogen and hsCRP) and FDG PET/CT imaging (lungs, aorta and carotids) to evaluate inflammation and aortic calcification.
Results: 66% of the cohort were male, median age was 68 (IQR 63-73) years, 87% were ex-smokers. Mean aPWV was 9.9 (SEM 0.2) m/s, aortic calcification volume 7156 (1461) mm^3, hsCRP 5.2 (0.8) mg/dl, fibrinogen 3.4 (0.08) g/l.
Log hsCRP correlated only with carotid FDG uptake ($R=0.23$, $p=0.04$) and log fibrinogen did not correlate with FDG uptake in any vascular region. Systemic inflammatory markers were positively associated with aortic inflammation but only weakly. The estimated change in FDG uptake was 0.2 (95% CI 0.11-0.29) and 0.07 (0.06-0.08), for each log unit change in fibrinogen and hsCRP respectively.
Aortic inflammation was not a significant determinant of aPWV, but aortic calcification was, adjusted for age, supine HR, MAP and years smoked ($p=0.02$, $\beta=0.26$).
Conclusion: HsCRP and fibrinogen are weak predictors of vascular inflammation and therefore likely unsuitable stratification biomarkers of vascular inflammation in COPD. Calcification rather than inflammation appears to be the dominant pathophysiological mechanism underlying arterial stiffness in COPD.

P7.15

REACTIVE HYPEREMIA INDEX AND FLOW MEDIATED DILATION WITH UPPER- AND LOWER-ARM CUFF OCCLUSION: ARE THEY MEASURING THE SAME?

Lorenzo Ghiadoni [1,*], Rosa Maria Bruno [2], Francesco Regoli [1], Giuseppe Penno [1], Stefano Taddei [1]
[1]*University of Pisa, Pisa, Italy*
[2]*Institute of Clinical Physiology, CNR, Pisa, Italy*

Objective: Methodological issues are major reasons preventing the use of endothelial function testing in clinical practice This study aimed to address the relationship between two non-invasive techniques, brachial artery flow-mediated dilation (FMD) and as reactive hyperemia index (RHI), comparing also lower (forearm, L) and upper (arm, U) cuff occlusion.
Methods: In 17 young healthy subjects (9 males, age 29±4 years) FMD (Cardiovascular Suite, Quipu s.r.l., Pisa, Italy). and RHI (EndoPAT 2000, Itamar Medical, Israel) were measured simultaneously in two separate occasions using 5 minutes of L- or U-ischemia. Baseline and Hyperemic Shear rate (SR) were also computed.
Results: L-FMD (7.32±4.87%) and L-RHI (0,61±0.29%) were significantly lower ($p<0.05$ and $p<0.01$, respectively) as compared to U-FMD (10.48±5.67%) and U-RHI (0.86±0.23%). L-RHI and U-RHI tended to be related ($r=0.49$; $p=0.06$), while L-FMD and U-FMD were not ($r=0.39$; $p=0.12$),
L-FMD was significantly related to L-SR ($r=0.62$; $p<0.01$), but not to L-RHI ($r=0.17$; $p=0.54$). L-RHI was not significantly correlated with L-SR ($r=0.24$; $p=0,38$). U-RHI was related to U-FMD ($r=0.50$; $p<0.05$) and to U-SR ($r=0.50$, $p<0.04$). In multiple regression analysis (full model: $r2=0.23$) U-FMD but not U-SR was associated with U-RHI ($r2=0.20$; $p=0.05$).
Conclusions: In healthy subjects, the assessment of FMD and RHI with lower and upper cuff occlusion is not equivalent. L-FMD, but not U-FMD is related to SR increase, thus possibly representing a better marker for conduit artery endothelial function. U-RHI and U-FMD possibly provide similar information on vascular reactivity. Caution is deemed in interpreting studies conducted with different methodologies.

P7.16

VALIDATION OF AN OSCILLOMETRIC BRACHIAL CUFF METHOD TO DERIVE CENTRAL BLOOD PRESSURE USING DIFFERENT CALIBRATION MODES

Martin Schultz [1,*], Ahmad Qasem [2], Xiaoqing Peng [1], Dean Picone [1], J. Andrew Black [3], Nathan Dwyer [3], Phillip Roberts-Thomson [3], James Sharman [1]
[1]*Menzies Institute for Medical Research, University of Tasmania, Hobart, Australia*
[2]*University of New South Wales, Sydney, Australia*
[3]*Royal Hobart Hospital, Hobart, Australia*

Background: There is interest in measuring central blood pressure (BP) from non-invasive upper-arm cuff devices, the accuracy of which may be influenced by different calibration modes. The aim of this study was to determine the validity of an upper-arm cuff oscillometric device to estimate central BP by comparison to invasively acquired aortic BP, using different calibration modes.
Methods: 122 patients (mean age 63±13 years) undergoing coronary angiography had simultaneous measurement of ascending aortic BP (via fluid-filled catheter) and non-invasive upper-arm cuff oscillometry (Sphygmocor Xcel) to estimate central BP. A 'derivation' cohort ($n=60$, 117 simultaneous measures) was randomly selected to produce different calibration modes to estimate central systolic BP. These different calibration modes were then applied to the remaining 'validation' cohort ($n=62$, 119 simultaneous measures).
Results: Conventional calibration with brachial systolic and diastolic BP underestimated central systolic BP (mean difference -7.2±9.6 mmHg) with evidence of bias at higher BP values ($r=-0.50$; $p<0.001$). The same was observed for oscillometric mean arterial pressure and diastolic BP calibration, but with greater underestimation (mean difference -19.6±11.9 mmHg) and bias ($r=-0.72$; $p<0.001$). A refined calibration mode significantly improved central systolic BP estimation (mean difference 1.0±11.0 mmHg) and removed all bias ($r=0.07$; $p=0.45$). Moreover, this method had greater sensitivity (79.5%) and specificity (80.0%) for predicting central hypertension (invasive aortic systolic BP $\geq$130 mmHg) compared to other methods.
Conclusions: Significant improvements in accuracy for estimating central BP are achieved through refinement of standard, non-invasive calibration modes using an oscillometric brachial cuff device.

P7.17

DISASSOCIATION OF BLOOD PRESSURE FROM AORTIC RESERVOIR CHARACTERISTICS BETWEEN THE AORTA AND RADIAL ARTERIES

Xiaoqing Peng [1,*], Martin Schultz [1], Justin Davies [2], Dean Picone [1], Andrew Black [3], Nathan Dwyer [3], Phil Roberts-Thomson [3], James Sharman [1]
[1]*Menzies Institute for Medical Research, University of Tasmania, Hobart, TAS, Australia*
[2]*International Centre for Circulatory Health, Imperial College, London, W2 1LA, UK*
[3]*Royal Hobart Hospital, Hobart, TAS, Australia*

Background: Aortic reservoir pressure (RP) and excess pressure (XSP) predict cardiovascular events independent of clinic blood pressure (BP). It is unknown whether RP and XSP change in magnitude from the central to peripheral large arteries where conventional BP is measured. This information has implications for understanding the arterial pathophysiology. This study aimed to determine the change in RP and XSP from the aorta to the brachial and radial arteries, as well as associations of these indices with BP.
Methods: 23 participants (aged 65±9 years, 70% male) undergoing clinically indicated cardiac angiography had intra-arterial pressure waveforms measured via fluid-filled catheter in the ascending aorta, brachial (mid-humorous) and radial arteries (wrist) by catheter pull-back. RP and XSP (using previously published algorithms), and BP were derived from pressure waveforms at each location.
Results: There was a non-significant decrease in RP from the aorta to the brachial and radial arteries (112±22, 109±18, 103±17 mmHg respectively,