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### **P3.16: CARDIO ANKLE VASCULAR INDEX (CAVI) IS AN INDEPENDENT PREDICTOR OF CARDIOVASCULAR EVENTS IN 1000 PATIENTS**

Satoh Yuta, Nagayama Daiji, Imamura Haruki, Ban Noriko, Kawana Hidetoshi, Nagumo Ayako, Yamaguchi Takashi, Ohira Masahiro, Saiki Atsuto, Shirai Kohji, Tatsuno Ichiro

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after adjustment for age, sex and BMI (Table). Other ethnic differences in arterial waveform parameters and morphologies will be reported, including those derived from reservoir wave analysis. In conclusion, arterial function varies across ethnic groups. Longitudinal analyses will be carried out after 4 years follow-up to determine if arterial waveform measures predict cardiovascular disease incidence.

**Funding:** Health Research Council of New Zealand

### P3.12 PULSE WAVE VELOCITY AND DIABETES DURATION IN TYPE 2 DIABETES MELLITUS

D. Agnoletti<sup>1,2</sup>, S. Millaesau<sup>3</sup>, A. Salah-Mansour<sup>4</sup>, A. D. Protogerou<sup>5</sup>, Y. Zhang<sup>6</sup>, C. Borghi<sup>2</sup>, J. Blacher<sup>1</sup>, M. Safar<sup>1</sup>

<sup>1</sup>Paris Descartes University, APHP Hotel Dieu, Diagnosis and therapeutic center, Paris, France

<sup>2</sup>dpt of internal Medicine, University of Bologna, Bologna, Italy

<sup>3</sup>Pulse Wave Consulting, Saint Leu la Foret, France

<sup>4</sup>Dpt of Internal Medicine or Tizi Ouzou Hospital, Tizi Ouzou, Algeria

<sup>5</sup>Dpt of Internal Medicine, Medical School, University of Maastricht, Maastricht, Netherlands

<sup>6</sup>Dpt of Cardiology, Shanghai Tenth People's Hospital, Tongji University School of Medicine, Shanghai, China

Type 2 diabetes mellitus (T2DM) duration is related to early vascular aging and diabetic complications. Aortic stiffness is considered an integrated marker of the combined effect of cardiovascular risk factors, and could represent one of the links between diabetes and cardiovascular disease. To our knowledge, no study has been carried out to specially look at the relationship between aortic stiffness and T2DM duration. 618 patients (259 men) attending the Department of Internal Medicine of Tizi Ouzou Hospital (Algeria) underwent medical examination. Anthropometric, clinical and biological data were sampled; brachial blood pressure was measured, and aortic stiffness assessed from pulse wave velocity (PWV) was obtained. Diabetes duration collected from date of 1<sup>st</sup> diagnostic and analyzed by tertiles (<2 years; 2-9 years; >9 years). From lower to higher tertile of diabetes duration, age, brachial blood pressure and PWV increased, while diabetes control and renal function worsened (all  $p < 0.01$ ). After adjustment for age and blood pressure, microalbuminuria or insulin therapy, PWV was still higher in the higher duration tertile compare to the other 2. However the difference in PWV was negligible after adjustment between the 2 lowest duration tertile. Diabetes duration is an important and independent determinant of PWV in type 2 diabetics. This is mainly true for higher durations, reflecting diabetes specific contributions to accelerated vascular stiffening. Furthermore, with aging, physiopathology of arterial stiffness involves other mechanisms that overwhelm diabetes duration.

### P3.13 ASSOCIATIONS OF CENTRAL AND PERIPHERAL PULSE PRESSURE WITH HEART STRUCTURE, SYSTOLIC AND DIASTOLIC FUNCTION IN ADOLESCENCE: FINDINGS FROM A GENERAL POPULATION COHORT

D. L. Santos Ferreira<sup>1</sup>, A. Fraser<sup>1</sup>, L. D. Howe<sup>1</sup>, S. Jones<sup>2</sup>, R. Tapp<sup>2</sup>, D. A. Lawlor<sup>1</sup>, A. Ness<sup>1</sup>, G. D. Smith<sup>1</sup>, N. Chaturvedi<sup>2</sup>, A. D. Hughes<sup>2</sup>

<sup>1</sup>University of Bristol, Bristol, United Kingdom

<sup>2</sup>Imperial College London, London, United Kingdom

**Background:** In adults central blood pressure has stronger associations with cardiovascular outcomes than peripheral blood pressure, with some evidence that this difference is greater in mid- than older-aged adults. The relationship of central blood pressure to cardiovascular structure and function in adolescence is unclear.

**Aim:** To compare associations of central and peripheral pulse pressure (PP) with cardiac structure and left ventricular function in a general population of adolescents.

**Methods:** 1,421 (17y; 45% males) participants in the Avon Longitudinal Study of Parents and Children had measurements of peripheral and central blood pressure using Omron705 IT and Sphygmocor devices and echocardiography using a HDI 5000 ultrasound system.

**Results:** Central to peripheral amplification was 21 mmHg (95% CI: 20, 21). Central and peripheral PP were positively associated with left ventricular mass index (LVMI), mitral E/A ratio, left atrial size and inversely associated with  $s'$  even when adjusting for age, sex, DEXA determined fat mass and physical activity (Table 1); with consistently greater associations noted

for cPP. Neither central nor peripheral PP were associated with relative wall thickness, midwall fractional shortening, ejection fraction  $e'$  or  $E/e'$ . **Conclusions:** Central PP is more strongly associated with measures of cardiac structure and function than peripheral PP in adolescence. Previous studies are likely to have underestimated the effect of PP on cardiac structure and function in children and adolescents based on peripheral measurements.

### P3.14 Withdrawn by author

### P3.15 ARTERIAL STIFFNESS IN NON-HYPERTENSIVE GHANAIA SUBJECTS WITH TYPE 2 DIABETES

K. Yeboah<sup>1</sup>, A. G.B Amoah<sup>2,3</sup>, D.A Antwi<sup>1</sup>, B. Gyan<sup>4</sup>, V. Govoni<sup>5</sup>, J. K. Cruickshank<sup>5</sup>

<sup>1</sup>Department of Physiology, University of Ghana Medical School, Accra, Ghana

<sup>2</sup>Department of Medicine and Therapeutics, University of Ghana Medical School, Accra, Ghana

<sup>3</sup>National Diabetes Management and Research Centre, Korle Bu Teaching Hospital, Korle Bu, Ghana

<sup>4</sup>Noguchi Memorial Institute for Medical Research, University of Ghana, Legon, Ghana

<sup>5</sup>King's College London, London, United Kingdom

**Background:** Limited data exists on arterial stiffness in sub-Saharan Africa where diabetes and cardiovascular diseases are increasing rapidly. We aimed to compare the indices of arterial stiffness among type 2 diabetes (T2DM) and non-diabetes subjects (NDM), without hypertension, in Ghana. **Method:** Thirty eight T2DM patients and 34 NDM volunteers (as screened by OGTT), between the ages of 40-70 years, were randomly recruited, with no history of antihypertensive medication and supine blood pressure (BP) < 140/90 mmHg. Weight, height and waist circumference (WC) were measured. Indices of arterial stiffness, pulse wave velocity (PWV), aortic systolic blood pressure (ASBP), and aortic augmentation index (AAIx) were measured with Arteriograph (Tensiomed, Hungary). The Cardio-Ankle Vascular Index (CAVI) & derived PWV were measured with the 4-cuff Vasera 1500 (Fukuda-Denshi, Tokyo, Japan) supine after 10 minutes rest in a temperature-controlled room.

**Results:** There was no difference in the gender distribution ( $p=0.6$ ), mean age ( $p=0.2$ ), BMI ( $p=0.07$ ) and WC ( $p=0.4$ ) between T2DM and NDM subjects. Also, mean ( $\pm$ SD) brachial systolic (124.9 $\pm$ 9.6 vs. 121.9 $\pm$ 10.0,  $p=0.3$ ) and diastolic (74.3 $\pm$ 7.6 vs. 71.22 $\pm$ 9.7,  $p=0.6$ ) BP did not differ between T2DM and NDM, respectively. However, T2DM subjects had slightly higher PWV (8.2 $\pm$ 1.1 vs 7.1 $\pm$ 0.98,  $p=0.048$ ), CAVI (7.76 $\pm$ 1.12 vs. 6.73 $\pm$ 0.66,  $p=0.042$ , but lower AAIx (19.3 $\pm$ 10.4 vs. 27.7 $\pm$ 15.1,  $p=0.02$ ), respectively. There was no difference in ASBP between T2DM and NDM subjects (116.7 $\pm$ 11.7 vs. 117.5 $\pm$ 12,  $p=0.8$ ).

**Conclusion:** In the Ghanaian setting, T2DM may have a greater impact on indices of arterial stiffness in the absence of overt arterial hypertension.

### P3.16 CARDIO ANKLE VASCULAR INDEX (CAVI) IS AN INDEPENDENT PREDICTOR OF CARDIOVASCULAR EVENTS IN 1000 PATIENTS

Satoh Yuta, Nagayama Daiji, Imamura Haruki, Ban Noriko, Kawana Hidetoshi, Nagumo Ayako, Yamaguchi Takashi, Ohira Masahiro, Saiki Atsuto, Shirai Kohji, Tatsuno Ichiro

Center of Diabetes, Endocrine, Metabolism, Sakura Hospital, Chiba, Japan

**Objects:** Recently, a novel arterial stiffness parameter called cardio-ankle vascular index (CAVI) has been developed. This study was conducted in order to elucidate the predictive value of CAVI for future cardiovascular events in 1000 persons.

**Subjects and methods:** A total of 1,000 outpatients (513 males and 487 females, mean age 63 $\pm$ 11 years), who had the examination of CAVI between 2004 and 2006 at the center of diabetes, endocrinology and metabolism, Sakura hospital were included and followed up for 6.7 $\pm$ 1.6 years. Those had diabetes mellitus (51.0%), hypertension (52.4%) or/and dyslipidemia (62.5%). CAVI was measured using Vasela1500 (Fukuda Denshi. Co.LTD).

**Results:** New-onset cardiovascular events were observed in 9.0%. In subjects with cardiovascular events, lower HDL-C and higher CAVI (9.9 $\pm$ 2.0 vs. 9.2 $\pm$ 1.6), mean age, prevalence of hypertension, diabetes and smoking were observed. COX regression model revealed that CAVI independently increased the risk of cardio vascular events with OR of 1.13 (95% CI 1.007-

1.269,  $p=0.038$ ). Male, diabetes, hypertension, low HDL-C and smoking were also significant independent predictors of events.

**Conclusion:** CAVI is an independent predictor of cardiovascular events in subjects with coronary risks.

### P3.17 EFFECT OF HYPERTENSION ON ARTERIAL STIFFNESS IN GHANAIAN SUBJECTS WITH TYPE 2 DIABETES

K. Yeboah<sup>1</sup>, D. A. Antwi<sup>1</sup>, B. Gyan<sup>1</sup>, V. Govoni<sup>2</sup>, J. K. Cruickshank<sup>2</sup>, A. G. B. Amoah<sup>1,3</sup>

<sup>1</sup>University of Ghana, Accra, Ghana

<sup>2</sup>King's College, London, United Kingdom

<sup>3</sup>National Diabetes management Centre, Korle Bu Teaching Hospital, Accra, Ghana

**Background:** Hypertension exacerbates cardiovascular disease in type 2 diabetes (T2DM) but the ACCORD trial suggested limited impact on CVS events by hypertensive treatment. Our hypothesis is that arterial stiffness, measured as aortic pulse wave velocity (PWV) may underlie these events. Few data exist on arterial stiffness in hypertensive diabetes patients in sub-Saharan Africa, where the two conditions are becoming epidemic. We compared indices of arterial stiffness in T2DM subjects with (T2DM+HT), without (T2DM-HT) hypertension and normotensive non-diabetes (NDM).

**Methods:** Forty eight T2DM+HT, 45 T2DM-HT and 34 NDM volunteers (as screened by OGTT), between the ages of 40-70 years, were randomly recruited. Weight, height and waist circumference (WC) were measured. Indices of arterial stiffness, pulse wave velocity (PWV), aortic systolic blood pressure (aSBP), and aortic augmentation index (aAIx) were measured with Arteriograph (Tensiomed, Hungary) and Cardio-Ankle Vascular Index (CAVI) with Vasera 1500 (Fukuda-Denshi, Tokyo, Japan) in supine subjects after 10 minutes rest in a temperature controlled room.

**Results:** In a univariate analysis, after adjusting for gender, age in decade, BMI and waist circumference, mean values of CAVI ( $8.43 \pm 1.31$  vs.  $7.4 \pm 1.05$  vs.  $7.00 \pm 0.87$ ;  $p < 0.001$ ), PWV ( $9.16 \pm 1.04$  vs.  $7.98 \pm 1.28$  vs.  $7.64 \pm 1.42$ ;  $p < 0.001$ ), aSBP ( $153.94 \pm 25.62$  vs.  $115.72 \pm 11.11$  vs.  $117.06 \pm 11.11$ ;  $p < 0.001$ ) and aAIx ( $28.53 \pm 12.43$  vs.  $19.18 \pm 11.47$  vs.  $26.21 \pm 14.08$ ;  $p = 0.026$ ) were higher in T2DM+HT than T2DM-HT, which was also higher than NDM. Contrast analysis showed no significant difference between aSBP between T2DM-HT and NDM.

**Conclusion:** Hypertension increases arterial stiffness in T2DM subjects in Ghana.

### P3.18 ENDOTHELIAL FUNCTION BUT NOT IN INTIMA-MEDIA THICKNESS RELATES TO RENIN STATUS IN A MULTI-ETHNIC GROUP OF YOUNG HEALTHY ADULTS

K. Connell<sup>1</sup>, J. K. Cruickshank<sup>2</sup>, P. Chowienzyk<sup>2</sup>

<sup>1</sup>University of the West Indies, Bridgetown, Barbados

<sup>2</sup>King's College London, London, United Kingdom

Subjects of African and African-Caribbean ethnicity have been reported to have lower plasma renin activity (PRA), decreased endothelium-dependent vasomotor function and increased intima-media thickening relative to white European subjects. We explored whether vascular structure and function might be associated with renin status, since both may be influenced by endothelium-derived nitric oxide (NO). Flow mediated dilation (FMD, a measure of endothelium-derived NO) of the brachial artery and common carotid intima-media thickness (CIMT) were measured using high resolution ultrasound in a multi-ethnic group of 143 subjects (mean  $\pm$  SD  $30 \pm 10$  years) including 84 black subjects of African or African-Caribbean self defined ethnicity; the remainder were of white European ethnicity. Subjects were additionally characterized by anthropometric and biochemical measurements including plasma renin activity (PRA) and underwent ambulatory blood pressure monitoring. PRA was lower ( $0.6 \pm 0.67$  vs.  $0.9 \pm 0.6$   $\text{ng ml}^{-1} \text{hr}^{-1}$ , medians  $\pm$  IQR,  $P < 0.092$ ) and IMT greater ( $0.47 \pm 0.09$  vs.  $0.43 \pm 0.08$  mm) in black compared to white subjects. FMD tended to be lower in black compared to white subjects but the difference was not significant. FMD was independently correlated with PRA after adjustment for age, ethnicity, sex and blood pressure (standardized regression coefficient 0.31,  $P < 0.005$ ). However, IMT was not significantly correlated with FMD nor with PRA. These results suggest that availability of endothelium-derived NO is closely associated with PRA but does not explain ethnic differences in CIMT.

### P3.19 AORTIC PULSE PRESSURE BETTER PREDICTS INCREASES ARTERIAL STIFFNESS COMPARED TO BRACHIAL AND AMBULATORY MEASUREMENTS

D. Terentes-Printzios, C. Vlachopoulos, N. Ioakeimidis, K. Aznaouridis, P. Pietri, M. Abdelrassoul, P. Xaplanteris, A. Aggelakas, C. Stefanadis  
Peripheral Vessels Unit, 1st Cardiology Department, Hippokraton Hospital, Athens Medical School, Athens, Greece

**Objectives:** Hypertension is associated with increased arterial stiffness, which is an independent predictor of cardiovascular risk. Aortic systolic blood pressure (SBP) and/or pulse pressure (PP) better predicts cardiovascular events than peripheral blood pressure. The present study compared the discriminative ability for increased arterial stiffness of aortic BP with ambulatory peripheral BP, with reference to office brachial SBP or PP in never treated hypertensives.

**Methods:** We enrolled 619 consecutive essential hypertensives (mean age  $52.2 \pm 12.0$  years, 325 men). Arterial stiffness was determined with carotid-femoral pulse wave velocity (PWV) using the Complior<sup>®</sup> device. Aortic pressures were measured using the Sphygmocor<sup>®</sup> device and 24h ambulatory SBP and PP were obtained from 24h ambulatory blood pressure monitoring. We employed dichotomous outcome variable (PWV  $\geq 75$ th percentile [8.55 m/s]). Receiver operating characteristic (ROC) curves were generated to evaluate the ability of the pressures to discriminate subjects with and without significant arterial stiffness (PWV  $\geq 75$ th percentile [8.55 m/s]).

**Results:** All different types of blood pressure significantly discriminated subjects with significant arterial stiffness (all  $p < 0.001$ ). Aortic pulse pressure had the highest area under the curve (AUC=0.741) and 24h ambulatory SBP the lowest (AUC=0.655). (Figure, Table).

**Conclusions:** PP is more valuable than SBP pressure in the prediction of increased arterial stiffness. Moreover, aortic PP may better predict increased arterial stiffness than brachial or ambulatory BP measurements.

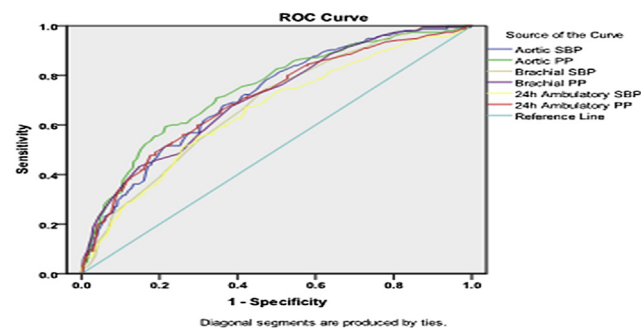
Variable	AUC	95% CI
Aortic pulse pressure	0.741*†‡	0.696–0.786
Aortic systolic blood pressure	0.717*†	0.672–0.762
Brachial pulse pressure	0.710*	0.664–0.756
Brachial systolic blood pressure	0.681*¶	0.634–0.727
24h ambulatory pulse pressure	0.705*†	0.657–0.753
24h ambulatory systolic blood pressure	0.655*#¶§	0.605–0.705

\*  $P < 0.001$  compared to the null hypothesis that the AUC is 0.5 and the examined variables cannot discriminate subjects with low or high pulse wave velocity values.†  $P < 0.05$  compared to 24h ambulatory systolic blood pressure#  $P < 0.05$  compared to 24h ambulatory pulse pressure.

‡  $P < 0.05$  compared to brachial systolic blood pressure.

¶  $P < 0.05$  compared to aortic pulse pressure.

§  $P < 0.05$  compared to aortic systolic blood pressure.



### P3.20 CLINICAL SIGNIFICANCE OF AMBULATORY ARTERIAL STIFFNESS INDEX (AASI) IN YOUNG STAGE 1 HYPERTENSIVE' S

F. Saladini<sup>1</sup>, E. Benetti<sup>1</sup>, C. Fania<sup>1</sup>, L. Mos<sup>2</sup>, P. Ballerini<sup>3</sup>, E. Cozzutti<sup>3</sup>, G. Garavelli<sup>4</sup>, S. Cozzio<sup>5</sup>, E. Casiglia<sup>1</sup>, P. Palatini<sup>1</sup>