



Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

Journal Home Page: <https://www.atlantis-press.com/journals/artres>

P10.1: ARTERIAL STIFFNESS AND THE “PHENOTYPE” METABOLIC SYNDROME: A CROSS-COUNTRY STUDY. THE MARE CONSORTIUM

A. Scuteri, P. Cunha, J. Cockcroft, F. Cucca, S. Laurent, F. Raso, M. Muiesan, E. Rietzschel, L. Ryliskyte, C. Vlachopoulos, P. Nilsson, E. Lakatta

To cite this article: A. Scuteri, P. Cunha, J. Cockcroft, F. Cucca, S. Laurent, F. Raso, M. Muiesan, E. Rietzschel, L. Ryliskyte, C. Vlachopoulos, P. Nilsson, E. Lakatta (2014) P10.1: ARTERIAL STIFFNESS AND THE “PHENOTYPE” METABOLIC SYNDROME: A CROSS-COUNTRY STUDY. THE MARE CONSORTIUM, Artery Research 8:4, 157–158, DOI: <https://doi.org/10.1016/j.artres.2014.09.204>

To link to this article: <https://doi.org/10.1016/j.artres.2014.09.204>

Published online: 7 December 2019

nocturnal arterial pressure may induce changes throughout the vascular tree, including the retinal microvasculature. We therefore explored the relationship between retinal vessel calibre and dipping status in a cohort of African and Caucasian teachers.

Methods: 68 African and 81 Caucasian men were selected from those taking part in the follow-up phase of the SAPBA study. 24hr Ambulatory blood pressure measurements and dipping status were determined. The percentage mean arterial pressure (% MAP) dipping was calculated as: (diurnal MAP - nocturnal MAP)/diurnal MAP x 100. Retinal images were captured and the central retinal artery equivalent, central retinal vein equivalent (CRVE) and subsequent arteriolar-venular ratio (AVR) determined.

Results: African men demonstrated higher 24hr MAP and poorer % MAP dipping compared to Caucasian men. When sub-divided into non-dippers and dippers, African non-dippers demonstrated a reduced AVR and an increased CRVE ($p < 0.001$) compared to their dipper counterparts. The AVR was positively ($R^2 = 0.34$, $\beta = 0.38$; $p = 0.001$) while the CRVE was negatively ($R^2 = 0.24$, $\beta = -0.50$; $p < 0.001$) associated with % MAP during dipping. CRVE maintained a negative association with dipping status (non-dipper, yes/no) ($R^2 = 0.21$, $\beta = -0.38$; $p = 0.001$). These associations were independent of 24hr MAP. No associations were observed in the Caucasian men.

Conclusion: In this group of African men, a non-dipping blood pressure profile was associated with a reduced AVR and larger CRVE, reflecting microvascular deterioration as a result of prolonged periods of increased arterial pressure.

P9.13

A STUDY ON AMBULATORY MEASUREMENT OF CENTRAL HEMODYNAMICS ON HEALTHY INDIVIDUALS WITH NO CARDIOVASCULAR RISK FACTORS

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Introduction /Aim: Central blood pressure (BP) parameters arise as a novel tool in clinical practice. Mounting evidence demonstrates that central systolic BP has a closer correlation with target organ damage and a stronger value for predicting cardiovascular events. However, data regarding ambulatory measurement of central BP parameters and pulse wave velocity (PWV) are scarce including both healthy individuals and patients at risk for cardiovascular disease. In the latter group, a recent study has shown that central BP falls during night but less compared to peripheral BP. We sought to investigate whether this phenomenon is also observed in healthy individuals.

Methods: We recruited 50 healthy volunteers and performed 24h ambulatory measurement of PWV and central systolic BP using the validated Mobil-O-graph device.

Results: As expected, PWV correlated with 24 hour mean peripheral and central BP. However the strongest correlation presented between day PWV and day systolic BP ($r = 0.441$, $p = 0.001$). In addition, PWV decreased significantly during night following both peripheral and central BP ($p < 0.001$). We also observed that central systolic BP exhibits a similar dipping profile compared to peripheral systolic BP but to a significant lesser degree ($p = 0.001$).

Conclusion: The 24h ambulatory measurement of central hemodynamics provides important information regarding central BP and PWV. Central systolic BP decreases similarly, though at a smaller scale, compared with peripheral BP throughout the night, a phenomenon observed in both healthy individuals and patients at cardiovascular risk. Whether this phenomenon is a physiological response or an index of vascular pathology remains to be further investigated.

P9.14

INCREASED CAROTID ARTERY STIFFNESS DECREASES MEASURED CAROTID-FEMORAL PULSE WAVE VELOCITY AND EFFECTS THE ESTIMATION OF AGE DEPENDENCY OF AORTIC STIFFNESS

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Carotid-femoral pulse wave velocity (PWV_{cf}) is promoted as a clinical marker of aortic stiffness and is a measure utilising two sites where the pulse can be obtained non-invasively. PWV_{cf} calculation requires subtraction of the heart-to-carotid pulse transit time from the heart-to-femoral pulse transit time. This implies that an independent increase in carotid stiffness (PWV_c) will decrease PWV_{cf}. This study aims to quantify the effect of age dependent increase in PWV_c on PWV_{cf} compared to the age dependent increase in aortic stiffness, determined as aortic PWV (PWV_a). Comparison was made by using data from previous studies reporting increase in stiffness with age of the

carotid artery¹ (PWV_c = $0.0009 \times \text{age}^2 - 0.0465 \times \text{age} + 6.2$ m/s), femoral artery² (PWV_f = $0.0443 \times \text{age} + 7.18$ m/s), and PWV_{cf}³ (PWV_{cf} = $0.001 \times \text{age}^2 - 0.017 \times \text{age} + 5.49$ m/s). Using these values and average distances for aortic, carotid, and femoral arterial lengths, PWV_a was calculated as a function of age (PWV_a = $0.0016 \times \text{age}^2 - 0.0711 \times \text{age} + 5.43$ m/s). Comparison of PWV_a and PWV_{cf} demonstrates that the age dependency of PWV (m/s/year) is not the same when determined from PWV_{cf} and PWV_a. From 20 to 55 years, PWV_{cf} overestimates the age dependency of PWV_a by an average of 29%. From 55 to 90 years, PWV_{cf} underestimates age dependency of PWV_a by an average of 17%. These findings suggest that increased carotid stiffness can compromise the potential prognostic power of PWV_{cf} measurements.

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P9.15

THE ROLE OF LUNG FUNCTION ON ADOLESCENTS' BLOOD PRESSURE TRAJECTORIES IN A MULTI-ETHNIC COHORT: THE DETERMINANTS OF ADOLESCENTS SOCIAL WELLBEING AND HEALTH (DASH) STUDY

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Objectives: To investigate the relationship between baseline lung function (LF) and changes in blood pressure (BP) in multi-ethnic adolescent schoolchildren.

Methods: A multi-ethnic cohort (the DASH study) of 2525 children (80% ethnic minorities), aged 11-13y at baseline, were followed-up two years later (14-16y). Demographic details of ethnicity, socio-economic position and smoking were collected via self-completed questionnaires. Trained nurses measured BP (mean of last 2 of 3 readings) and anthropometry at both waves and spirometry (interpreted using Global Lungs Initiative reference equations) at baseline only. Associations between change in systolic and diastolic BP (Δ sBP, Δ dBp in mmHg) and lung function (LF) z-scores were assessed in multivariable linear regression models. The influence of correlates (age, room temperature, ethnicity, change in Z-scores of: body mass index, height, trunk length) on the LF-BP relationship was investigated.

Results: In males, adjusted for age and room temperature, one Z-score increase in FEV1 was associated with lower BP change between 11-13y and 14-16y (Δ sBP -1.09 ($p < 0.001$) and Δ dBp -0.46 ($p = 0.03$)); FVC was associated with Δ sBP only (-0.475, $p = 0.004$). In females, similar patterns were seen for FEV1, with FVC associated with Δ dBp only. Adjustment for FEV1 (and to a lesser extent FVC) attenuated ethnic differences in BP changes for some groups (e.g. abolishing differences for Black Africans compared to Whites), but not others (e.g. South Asians), while other covariates did not.

Conclusions: FEV1, and to a lesser extent FVC, are correlates of BP changes in adolescence. Differences in adolescent LF may contribute to ethnic differences in BP trajectories during youth.

P10.1

ARTERIAL STIFFNESS AND THE "PHENOTYPE" METABOLIC SYNDROME: A CROSS-COUNTRY STUDY. THE MARE CONSORTIUM

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Specific clusters of metabolic syndrome (MetS) components impact differentially on arterial stiffness, indexed as pulse wave velocity (PWV). Of note,

in several population-based studies participating in the MARE (Metabolic syndrome and Arteries REsearch) Consortium the occurrence of specific clusters of MetS differed markedly across Europe and the US. The aim of the present study was to investigate whether specific clusters of MetS are consistently associated with stiffer arteries in different populations. We studied 20,570 subjects from 9 cohorts representing 8 different European countries and the US participating in the MARE Consortium. MetS was defined in accordance with NCEP ATP III criteria as the simultaneous alteration in ≥ 3 of the 5 components: abdominal obesity (W), high triglycerides (T), low HDL cholesterol (H), elevated blood pressure (B), and elevated fasting glucose (G). PWV measured in each cohort was "normalized" to account for different acquisition methods. MetS had an overall prevalence of 24.2% (4985 subjects). MetS accelerated the age-associated increase in PWV levels at any age, and similarly in men and women. MetS clusters TBW, GBW, and GTBW are consistently associated with significantly stiffer arteries to an extent similar or greater than observed in subjects with alteration in all the five MetS components-even after controlling for age, sex, smoking, cholesterol levels, and diabetes mellitus-in all the MARE cohorts. In conclusion, different component clusters of MetS showed varying associations with arterial stiffness (PWV)

P10.2

ARE INTERMEDIATE ANKLE-BRACHIAL INDEX VALUES IMPORTANT IN HYPERTENSION? INSIGHTS FROM A LARGE COHORT OF NEVER-TREATED HYPERTENSIVES

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Objective: Ankle brachial index (ABI) is a diagnostic tool for peripheral arterial disease; moreover it has a prognostic value for future events. However, the role of intermediate ABI values (0.9 to 1.3) is still unclear. We investigated the interplay of intermediate ABI values with indices of subclinical organ damage in a large cohort of newly diagnosed, never treated hypertensives.

Design and Method: 1,127 newly diagnosed, never-treated hypertensives were recruited. ABI was measured with the oscillometric method and subjects with ABI <0.9 or >1.3 were not included. cPWV, central BPs, Alx, left ventricular mass index (LVMI), CRP and eGFR were measured. The 10-year risk was calculated using the Framingham Risk Score.

Results: The cohort was young (age: 53 ± 12 years old), with mild-moderate hypertension (systolic BP: 151 ± 18 mmHg, diastolic BP: 90 ± 11 mmHg) and mean ABI value 1.15 ± 0.08 . 57.7% were men, 41.3% smoked and 5.9% were diabetics. Left ventricular hypertrophy was detected in 42.2% and the 10-year CVD risk was $15.9 \pm 9.6\%$. ABI correlated with cPWV, central systolic BP, Alx, LVMI and CRP (r : -0.182, -0.268, -0.195, -0.075, -0.152 respectively, $p < 0.01$ for all). The 10-year risk increased with lower ABI values ($r = -0.077$, $p < 0.01$). After adjusting for confounders, patients with LVH had higher ABI levels; lower ABI values were observed with worsening eGFR (Figure).

Conclusion: Intermediate ABI values carry prognostic information; they are related to large artery stiffness, impaired central hemodynamic indices, LVH, renal function impairment and 10-year risk of CVD. ABI measurements should be part of an integrated approach to hypertensive patients for both diagnostic and prognostic reasons.

P10.3

ARTERIAL STIFFNESS IS A BETTER PREDICTOR OF LEFT VENTRICULAR HYPERTROPHY THAN THE FRAMINGHAM RISK SCORE AND CENTRAL HEMODYNAMICS: INSIGHTS FROM 1,141 NEVER-TREATED HYPERTENSIVES

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Objective: Left ventricular hypertrophy (LVH) heralds target organ damage and calls for aggressive therapeutic approaches. We investigated the predictive ability of arterial stiffness, central hemodynamic indices and the Framingham Risk Score (FRS) for detecting LVH.

Design and Method: 1,141 newly diagnosed, never-treated hypertensives were recruited. cPWV, aortic BPs and Alx were measured. Left ventricular mass index (LVMI) was calculated according to the Devereux formula. LVH was defined as LVMI >95 g/m² (women) and >115 g/m² (men). The 10-year risk for CVD was calculated using the FRS.

Results: The cohort was young (age: 53 ± 12 years), with mild-moderate hypertension (BP: $151 \pm 18 / 90 \pm 11$ mmHg). LVH was detected in 43% of patients and 10-year CVD risk was $16.1 \pm 9.7\%$. LVMI had a stronger correlation with cPWV ($r = 0.39$, $p < 0.001$) compared to aortic SBP ($r = 0.33$, $p < 0.001$), pulse pressure ($r = 0.306$, $p < 0.001$) and Alx ($r = 0.121$, $p < 0.001$). After adjusting for diabetes mellitus presence, eGFR, aortic SBP, cholesterol and 10-year CVD risk, cPWV remained an independent predictor of LVMI ($R^2 = 0.243$, $B = 1.60$, $p < 0.001$). In ROC analysis, cPWV emerged as a better predictor of LVH (AUC: 0.735, $p < 0.001$) compared to the FRS (AUC: 0.727, $p < 0.001$), aortic SBP (AUC: 0.687, $p < 0.001$), aortic pulse pressure (AUC: 0.705, $p < 0.001$) and Alx (AUC: 0.649, $p < 0.001$).

Conclusion: In newly diagnosed, never-treated hypertensives, cPWV is associated with LVMI and is a better predictor of LVH than the FRS, aortic BPs and Alx. High cPWV values signify target organ damage, which extends beyond large artery stiffness and herald LVH. This has implications for risk stratification and choice of antihypertensive therapy.

P10.4

EARLY LIFE PREDICTORS OF BLOOD PRESSURE IN AFRO-CARIBBEAN YOUNG ADULTS: THE JAMAICA 1986 BIRTH COHORT STUDY

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Objective: In this study we examined the effects of birth weight (BWT) and early life socioeconomic circumstances (SEC) on systolic and diastolic blood pressure (SBP, DBP) among Jamaican young adults.

Study Design and Setting: Longitudinal study of 364 men and 430 women from the Jamaica 1986 Birth Cohort Study. Information on maternal SEC at birth and BWT were linked to information collected at 18-20 years old. Sex-specific multilevel linear regression models were used to examine whether adult SBP and DBP were associated with BWT and maternal SEC.

Results: In unadjusted models, SBP was inversely related to BWT z-score in both men and women ($\beta = -0.82$ and -1.18 , respectively) but achieved statistical significance for women only. After adjustments for current age, current BMI, current height, maternal age and mother's occupation at child's birth, a one standard deviation (SD) unit increase in BWT was associated with 1.16 mmHg reduction in SBP among men (95%CI -2.15, -0.17; $p = 0.021$) and a 1.34 mmHg reduction in SBP among women (95%CI -2.21, -0.47; $p = 0.003$). High maternal occupational SEC at birth was consistently associated with lowest SBP across the standardized BWT distribution. SBP was 2-4 mmHg lower among those with high SEC mothers at birth than among those whose mothers were unemployed at birth.

Conclusion: SBP at 18-20 years-old was lowest among those whose mothers had high SEC at birth and was inversely related to BWT.

P10.5

WITHDRAWN

P10.6

ARTERIAL WAVEFORM MEASURES IN THE VITAMIN D ASSESSMENT (VIDA) STUDY: RELATIONSHIPS WITH LIFESTYLE AND CARDIOVASCULAR FACTORS

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Objectives: Identifying determinants of aortic waveform measures may help to define suitable strategies for improving arterial function. Our aim was to examine associations between lifestyle/cardiovascular risk factors variables and waveform measures as little is known about these.

Methods: Cross-sectional (baseline) analysis of 4830 adults aged 50-84 years participating in a vitamin D trial. Demographic and lifestyle variables were collected from questionnaires. Body mass index (BMI), cholesterol and brachial blood pressure (BP) were measured. Aortic systolic