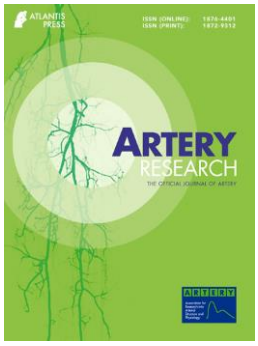

Artery Research

ISSN (Online): 1876-4401 **ISSN (Print): 1872-9312**
Journal Home Page: https://www.atlantis-press.com/journals/artres

1.3: CENTRAL BLOOD PRESSURE: EFFECTS OF CARDIOVASCULAR RISK FACTORS OR PRESENCE OF METABOLIC SYNDROME (ON BEHALF OF THE REFERENCE VALUES FOR ARTERIAL MEASUREMENTS COLLABORATION)

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To cite this article: A. Herbert (2012) 1.3: CENTRAL BLOOD PRESSURE: EFFECTS OF CARDIOVASCULAR RISK FACTORS OR PRESENCE OF METABOLIC SYNDROME (ON BEHALF OF THE REFERENCE VALUES FOR ARTERIAL MEASUREMENTS COLLABORATION), Artery Research6:4, 141–142, DOI: https://doi.org/10.1016/j.artres.2012.09.009

To link to this article: https://doi.org/10.1016/j.artres.2012.09.009

Published online: 21 December 2019

Artery Research (2012) 6, 141—150

Available online at www.sciencedirect.com

SciVerse ScienceDirect

journal homepage: www.elsevier.com/locate/artres

Oral Presentation Abstracts

Oral session 1
Young Investigator Oral Presentations
In association with the ESC Working Group on Peripheral Circulation

1.1
REFERENCE INTERVALS FOR CAROTID STIFFNESS

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Non-invasive measures of common carotid artery properties, such as diameter, distension and local pulse pressure, have been widely used to determine carotid stiffness (CS), which is associated with cardiovascular disease (CVD). The interpretation of CS values measured across different age, sex and risk groups has been hampered by the absence of reference values, however. We therefore aimed to establish reference intervals of CS (obtained by echotracking) to help interpretation of these measures both in research and clinical settings.
We combined CS data on 10,749 individuals (53% men; age range 15-99 years) from 13 research centres worldwide. Individuals without CVD, cardiovascular risk factors and who were not on blood pressure- and/or lipid-lowering medication constituted the 'normal' healthy sub-population (n=2,281), which will be used to establish equations for percentiles of CS across age. With these equations we further plan to generate CS Z-scores in different sub-populations thereby allowing for a standardized comparison between observed and predicted (normal) values from individuals of the same age. The independent associations of known cardiovascular risk factors will then be assessed with multiple linear regression analyses, using these Z-scores as outcome variables.
The exact results are expected by the time of Artery 12. We hope to estimate age-specific percentiles of CS in a healthy population and to assess the associations of cardiovascular risk factors with CS Z-scores, which will enable comparison of CS values for (patient) groups with different cardiovascular risk profiles, helping interpretation of such measures when obtained both in research and clinical settings.

1.2
NORMAL AND REFERENCE VALUES OF BARORECEPTOR SENSITIVITY: THE PPS3 STUDY

L. Zanoli [1,2], P. Boutouyrie [2], J. P. Empana [2], N. Estrugo [2], G. Escriou [2], H. Ketthab [2], J. F. Pruny [2], D. Laude [2], F. Thomas [2], B. Pannier [2], P. Castellino [1], X. Jouven [2], S. Laurent [2]
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Aims: Dysfunction of autonomic control of heart rate is associated with increased mortality. Routine measurement of baroreceptor sensitivity (BRS) for clinical patient evaluation needs a standardized technique and established reference values. The recent use of carotid distension rate instead of blood pressure (BP) has permitted to study the neural path of the baroreflex after fully controlling for the vascular component. We took advantage of a representative sample of the European general population and of the gold standard method for measuring arterial parameters to establish reference and normal values for BRS.
Methods: From the PPS3 study, a large epidemiological survey of working people of age 50-75, were selected the first 2992 individuals free from overt cardiovascular disease, non-diabetic, non-smokers and untreated by either anti-hypertensive or lipid-lowering drugs that constituted the reference value population, of which the subset with optimal/normal BP (n=200) is the normal value population. Subjects were categorized by age quintile and further subdivided according to BP categories.
Results: BRS decreased with age and BP category. The distribution of BRS with age and BP category is described and reference values for BRS are established. Normal values are proposed based on the BRS values observed in the non-hypertensive subpopulation without additional CV risk factors.
Conclusion: A standardization of the technique and established reference and normal values for BRS were proposed.

1.3
CENTRAL BLOOD PRESSURE: EFFECTS OF CARDIOVASCULAR RISK FACTORS OR PRESENCE OF METABOLIC SYNDROME (ON BEHALF OF THE REFERENCE VALUES FOR ARTERIAL MEASUREMENTS COLLABORATION)

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Background & Objective: 87,481 data between 54 centres were combined, to establish reference values for central systolic blood pressure (cSBP). Although cardiovascular risk factors (CVRFs) are associated with cSBP, the individual strengths of their relationships are weak and the combination of some CVRFs into metabolic syndrome (MetS) could have a stronger association.
Methods: We selected 8,057 subjects untreated for hypertension, dyslipidemia or diabetes, and devoid of known CV disease, whereby all required variables were available. CVRFs, CV disease and MetS were defined according to the 2007 ESH-ESC Hypertension Guidelines. We used multivariable regression analysis of cSBP according to the number of CVRFs and the presence of MetS.
Results: The median number of CVRFs was 2 (IQR: 2-3, range: 0-5). Number of CVRFs was strongly linked to cSBP, increasing by 7 mmHg per CVRF, though there was less of an increase when the analysis was stratified by those having brachial BP >= 130/85mmHg ('high normal' and above) and those not (beta coefficients = 4.0 and 1.5, respectively). The presence of MetS was related to cSBP to a lower extent (beta coefficient = 2.5) with insufficient evidence for an association when the analysis was adjusted according to BP status (beta coefficients = −1.8 and 0.4 within low and high BP groups, respectively).

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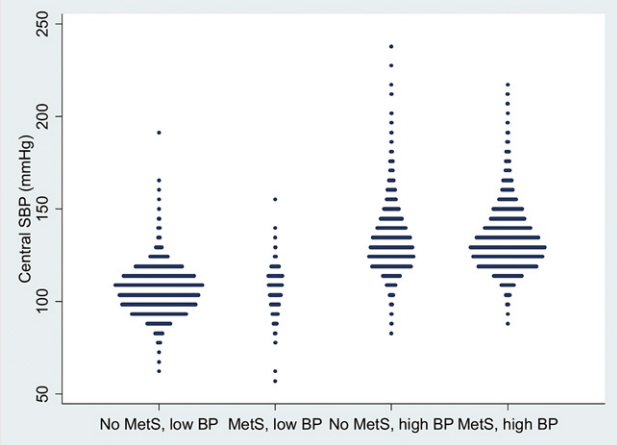
Table 1 cSBP values stratified by metabolic syndrome and brachial BP status



Conclusions: In these subjects, when adjusting for high normal BP, cSBP is still strongly influenced by the cumulative number of CVRFs. The association between MetS and cSBP is mainly driven by the inclusion of high normal BP in its definition.

1.4
ASSOCIATION OF 24 HOUR AORTIC AMBULATORY BLOOD PRESSURE MONITORING WITH LEFT VENTRICULAR MASS

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Introduction: There is evidence suggesting the superiority of office aortic blood pressure (BP) over office brachial in the management of arterial hypertension. The 24 hour ambulatory blood pressure monitoring (ABPM) is regarded as the optimal method for assessing BP profile; the non-invasive 24 hour aortic ABPM is now feasible.
Objective: To investigate the association and possible superiority of 24h aortic BP over 24h brachial and office BP (aortic or brachial) in the assessment of target organ damage. Non-invasive 24h aortic and brachial ABPM was performed using Mobilo-O-Graph, IEM, a validated brachial cuff based oscillometric device which calibrates the obtained brachial pressure waveform either using SBP and DBP (calib 1) or MBP and DBP (calib 2).
Design and methods: 184 subjects (mean age 55±14 years, 54% male, 48% hypertensives) underwent office brachial (b) and aortic (a) (SphygmoCor) BP assessment, 24h brachial and aortic ABPM and cardiac ultrasound.
Results: The correlation of BP indices with left ventricular mass indexed for body surface area as well as the R square values from multivariate analysis are provided in the table. Using Fisher's z-transformation it was shown that among all SBP parameters only aSBP 24 calib2 had significantly higher correlation coefficient with LVMass compared to office brachial SBP; aSBP calib2 tended to have marginally significantly closer correlation with LVMass than aSBP calib1 ($p=0.055$).
Conclusion: In the present study 24h aortic SBP calibrated with MBP and DBP seems to be the best alternative to office brachial SBP to assess the association between BP and LVMass.

	Univariate models: Pearson correlation coefficients	Multivariate models (age & gender): R square values
bSBP office (mmHg)	0.293**	0.204
aSBP office (mmHg)	0.286**	0.221
bSBP 24h (mmHg)	0.394**	0.292
aSBP 24h calib 1 (mmHg)	0.338**	0.266
aSBP 24h calib 2 (mmHg)	0.503**	0.347

(**$p<0.001$ for the provided correlation coefficients)

1.5
BLOOD PRESSURE-INDEPENDENT ASSOCIATION BETWEEN AORTIC CHARACTERISTIC IMPEDANCE AND LEFT VENTRICULAR MASS IN HYPERTENSION

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Background: It is uncertain whether pressure/flow ratio in the proximal aorta, namely aortic characteristic impedance (Z_c), is related to left ventricular (LV) mass independently of blood pressure (BP) level.
Methods: 435 never-treated subjects with uncomplicated essential hypertension free from overt cardiovascular disease (men 62%, age 48±11 years, BP 148/92±16/10 mmHg) underwent M-mode echocardiography and 24-hour BP monitoring. Aortic waveform was obtained from tonometric radial waveform with a validated generalized transfer function (SphygmoCor). Aortic Z_c and forward (P_f) and backward (P_b) wave amplitudes were calculated from central waveform using an aortic blood flow model based on higher-order Windkessel theory (ArcSolver), [Weber T et al, Hypertension EPub May 14, 2012].
Results: Patients with LV hypertrophy (LV mass >51 $g/m^{2.7}$) had a higher brachial systolic BP (SBP 153±18 vs 146±15 mmHg, $p<0.001$), central systolic BP (142±18 vs 133±16 mmHg, $p<0.001$), aortic Z_c (0.235±0.08 vs 0.211±0.06 AU, $p<0.001$), P_f (31.7±9 vs 28.6±7 mmHg, $p<0.001$), and P_b (19.8±7 vs 18.1±5 mmHg, $p=0.02$), while reflection magnitude (P_b/P_f) did not differ (0.62±0.10 vs 0.63±0.10, $p>0.3$). After controlling for age, sex, and mean arterial pressure as a measure of distending pressure, LV mass index maintained an independent association with Z_c (partial $r=0.14$, $p=0.002$), while the association of either P_b or P_f with LV mass became no longer significant. In a multiple linear regression model, Z_c independently predicted LV mass index ($\beta=0.116$, $p=0.005$) along with age, mean arterial pressure, and body mass index.
Conclusion: Aortic characteristic impedance has a significant, pressure-independent relationship with LV mass in human hypertension.

1.6
SPIRONOLACTONE REDUCES AORTIC STIFFNESS IN PEOPLE WITH A HYPERTENSIVE RESPONSE TO EXERCISE VIA THE BLOOD PRESSURE-DEPENDENT EFFECTS OF CANRENOATE

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Background: A hypertensive response to exercise (HRE) is associated with increased aortic stiffness. Spironolactone is thought to improve aortic stiffness via BP-independent (antifibrotic) effects, but the exact mechanisms are unknown. This study aimed to determine the underlying physiological actions of spironolactone in people with HRE.
Methods: 115 people with HRE (aged 54±9 years) were randomized to three months spironolactone (25mg/d) or placebo. Serum samples and physiological data including aortic stiffness (pulse wave velocity; PWV) and 24 hour ambulatory BP were recorded at baseline and three months. Liquid