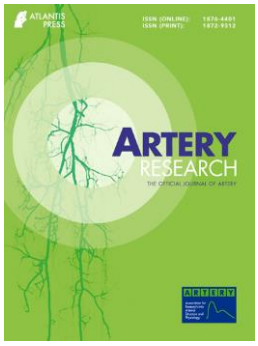

Artery Research

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

P8.2: PROGRESSION OF CAROTID ARTERY REMODELING AND STIFFNESS IN HYPERTENSIVE PATIENTS WITH OR WITHOUT DIABETES MELLITUS: A COHORT PROSPECTIVE STUDY

R. Bruno, M. Barzacchi, G. Cartoni, G. Penno, S. Taddei, S. Del Prato, L. Ghiadoni

To cite this article: R. Bruno, M. Barzacchi, G. Cartoni, G. Penno, S. Taddei, S. Del Prato, L. Ghiadoni (2014) P8.2: PROGRESSION OF CAROTID ARTERY REMODELING AND STIFFNESS IN HYPERTENSIVE PATIENTS WITH OR WITHOUT DIABETES MELLITUS: A COHORT PROSPECTIVE STUDY, Artery Research 8:4, 151–152, DOI: https://doi.org/10.1016/j.artres.2014.09.177

To link to this article: https://doi.org/10.1016/j.artres.2014.09.177

Published online: 7 December 2019

Results: Compared to normal TT levels, TD patients (n=19) were older (59± 8vs 52±10 years, P<0.05) with higher BMI (28.6± 4.0 kg/m^2 vs 27.0±4 kg/m^2, P<0.05). They had lower EF, SV and inversely, higher EA/ELV compared to subjects with normal TT. TD was also associated to a higher mitral E/E' and PWVc-f. The association remained significant in multivariate analysis after adjustment for age and cardiovascular risk factors.
Conclusion: Testosterone deficiency associates to an unfavorable LV performance as well to central arterial stiffness, with an adverse outcome on cardiac energetic. This information adds clinical value on hormone lower level, in both cardiovascular risk assessment and stratification of future preventive strategies.

P7.12
CIRCULATING VASCULAR GROWTH FACTORS AND AORTIC INDICES IN GHANAIANS WITH DIABETES AND HYPERTENSION

K. Yeboah [a], D. Antwi [a], B. Gyan [b], V. Govoni [c], J. K. Cruickshank [c], A. Amoah [a,d]
[a]*University of Ghana Medical School, Accra, Ghana*
[b]*University of Ghana, Accra, Ghana*
[c]*King's College, London, London, UK*
[d]*National Diabetes Management and Research Centre, Accra, Ghana*

Objectives: Impaired angiogenesis may be one mechanism linking large artery stiffness to organ damage. We investigated the relationship between arterial stiffness and regulators of angiogenesis as circulating vascular growth factors: vascular endothelial growth factor (VEGF), angiopoietin (Ang)-1, Ang-2, which together with endogenous VEGF induces proliferation and the sprouting of new blood vessels, in Ghanaians with type 2 diabetes (T2DM) and hypertension (HTN).
Methods: 63 T2DM plus HTN patients, 44 patients with T2DM only, 54 patients with HTN only and 39 subjects without T2DM nor HTN were included in the study. Aortic pulse wave velocity (PWVao) and aortic systolic pressure (SBPao), augmentation index (AIx) and aortic pulse pressure (PPao) were measured with Tensiomed's Arteriograph. Fasting blood samples were measured for blood glucose, lipid profile, Ang-1, Ang-2 & VEGF.
Results: T2DM plus HTN patients had higher levels of Ang-1 (44.3 vs 36.1 and 36.3 ng/ml; p=0.004) & Ang-2 (875.65 vs. 764.4 and 710.35 pg/ml; p=0.009) than T2DM only and HTN only patients respectively. Ang-2 levels were positively associated with PWVao (r=0.17, p=0.03), SBPao (r=0.28, p<0.01), and AIx (r=0.22, p<0.01). When all the vascular growth factors were forced into multiple regression analysis, adjusting for age, BMI, systolic BP and fasting glucose, only Ang-2 emerged significantly related to PWVao (β=0.027, p=0.02), SBPao (β=0.54, p<0.01), AIx (β=0.3, p<0.01).
Conclusion: Vascular growth factors were related to arterial stiffness indices, Ang-2 independently, in Ghanaians, and higher in patients with both diabetes and hypertension than with either condition alone.

P7.13
DOES CAROTID ARTERY APPLANATION TONOMETRY CAUSE BAROREFLEX ACTIVATION?

B. Spronck, T. Delhaas, K. Reesink
University Medical Centre, Maastricht, The Netherlands

Introduction: Carotid artery applanation tonometry is widely used to assess carotid-femoral pulse wave velocity and the local carotid artery pressure waveform. However, the substantial pressure applied locally to the carotid artery with applanation tonometry, might evoke a baroreceptor response. This response would lead to changes in heart rate (HR) and blood pressure waveforms, influencing the intended measurements. In this study, we assessed whether carotid applanation tonometry has an influence on HR.
Methods: In 22 hypertensive subjects, HR was assessed during carotid as well as femoral applanation tonometry by continuous finger pulse waveform recording (Nexfin). Subjects were in supine position. Both carotid and femoral acquisitions were measured in alternation and in triplicate. Median averaging over the three measurements was used to obtain a subject's median HR during carotid as well as femoral tonometry.
Results: HR during carotid tonometry and femoral tonometry was 64.0±9.3bpm and 64.6±9.0bpm, respectively. Difference (carotid-femoral) was -0.7±2.4bpm (p=0.198, two-sided t-test, 95% CI: [-1.7,0.4]bpm). Given a power (1-β) of 0.8 and α=0.05, our study was powered to statistically detect a 1.4bpm HR difference.
Conclusion: We conclude that carotid artery tonometry influences HR by at most 1.4bpm, which appears clinically insignificant.

P8.1
FEASIBILITY OF 24-HOUR CENTRAL BLOOD PRESSURE MEASUREMENTS—THE ISAR HEMODIALYSIS STUDY

M. Baumann [a], M. Bauhofer [a], S. Wassertheurer [b], S. Tholen [a], C. Hauser [a], Y. Suttmann [a], A.-L. Hasenau [a], U. Heemann [a], C. Schmaderer [a]
[a]*Universität München, Munich, Germany*
[b]*AIT Austrian Institute of Technology, Vienna, Austria*

Background: Calculation of central blood pressure (BP) values using oscillometric systems at brachial level obtain feasible office values, but also allow a 24-hour determination of 24-hour central BP. We were interested in the feasibility of the determination of 24-hour central BP measurements in end-stage renal disease patients.
Methods: In the ISAR hemodialysis study 556 chronic hemodialysis patients were investigated. 24-hour central BP was measured using the mobil-o-graph (IEM, Germany). Measurement started after a short dialysis interval prior to dialysis and lasted for 24-hours. In a preliminary analysis we describe the results of the first 327 patients with respect to feasibility of central BP measurements.
Results: The mean age of the patients was 65.0±15.1 years. 224 patients were male (69%), 103 patients were female (31%). Out ofIn these 327 patients 16.948 measurements were performed, reflecting an average of 52 measurements per patient. The mean number of measurements was >70% for the whole cohort. Out of the 16.948 measurements 13.069 measurements had a "high quality" and 3.879 had an "acceptable" quality" reflecting a ratio of 3.4. In younger patients <40 years more "high quality" measurements were present (ratio 9.8). This ratio reduced with age (2.6).
Discussion: We examined the feasibility of 24-hour central BP measurement in chronic hemodialysis patients. With >70% performed central BP measurement throughout the 24-hours period this method offers acceptable results for further investigation. The role of different qualities of the determined central measurement needs further investigation especially whether quality of measurements plays a role in the prediction of cardiovascular events.

P8.2
PROGRESSION OF CAROTID ARTERY REMODELING AND STIFFNESS IN HYPERTENSIVE PATIENTS WITH OR WITHOUT DIABETES MELLITUS: A COHORT PROSPECTIVE STUDY

R. Bruno [a], M. Barzacchi [b], G. Cartoni [b], G. Penno [b], S. Taddei [b], S. Del Prato [b], L. Ghiadoni [b]
[a]*Institute of Clinical Physiology - CNR, Pisa, Italy*
[b]*University of Pisa, Pisa, Italy*

Aim: To evaluate the progression over time of carotid and aortic stiffness and carotid remodeling in hypertensive patients, according to the presence of diabetes mellitus.
Methods: In this prospective observational study, 124 hypertensive patients (32 with Type 2 diabetes —HTDM -, 92 without - HT) were evaluated at Visit 0 (V0) and after a 3.4±1.0-year follow-up (V1). Carotid-femoral pulse wave velocity (PWV), carotid intima-media thickness (cIMT), carotid stiffness (CS) and circumferential wall stress (CWS) were assessed.
Results: In HT BP was unchanged, due to increased antihypertensive drugs (1.3±1 to 1.7±0.8, p=0.001); in HTDM there was a decrease in DBP (82.5±9.1 to 76.2±8.6mmHg, p=0.006) and an improvement of metabolic control (blood glucose 168±45 to 147±31mg/dl; LDL 104±34 to 82±24mg/dl, p≤0.05). At V0 PWV, cIMT and CS were significantly higher in HTDM than in HT (10.9±2.1 vs 8.6±1.5m/s, p<0.0001; 808±125 vs 731±151μm, p=0.01; 7.23±1.25 vs 6.69±1.21m/s, p=0.03 respectively). These variables were unchanged during follow-up. Conversely carotid diameter, which was similar in the two groups at V0, increased in HT (7.47±1.11 to 7.8±0.8mm, p=0.01) but not in HTDM (7.7±0.9 to 7.7±0.8mm, p=0.83) as well as CWS (HT 55±12 to 59±17kPa, p=0.03; HTDM 52±13 to 54±21kPa, p=0.53).
Conclusions: In a cohort of hypertensive patients, followed-up for about 3 years and treated according to routine clinical practice, aortic and carotid stiffness, as well as cIMT did not change over time. Interestingly, in non-diabetic hypertensive patients there was a progression of carotid artery

maladaptive remodeling, suggesting lower efficacy of conventional treatment on this vascular feature.

P8.3
AORTIC FLOW ALTERATIONS IN DILATED AND HYPERTROPHIC CARDIOMYOPATHY: NEW INSIGHT FROM QUANTITATIVE FLOW MRI

I. Bargiotas [a], E. Bollache [a], A. De Cesare [a], L. Besson-Hajji [b], S. Tavolaro [b], A. Redheuil [a,c], E. Mousseaux [b], N. Kachenoura [a]
[a]*UPMC University Paris 06, Paris, France*
[b]*Hôpital Européen Georges Pompidou, Paris, France*
[c]*Imaging Core Lab, Paris, France*

Aims: Aortic structural and hemodynamic alterations have deleterious effects on the left ventricle (LV). Our aims were to: 1) design indices of ascending aorta (AA) flow from MRI data and 2) assess changes in such indices in dilated (DCM) and hypertrophic (HCM) cardiomyopathies.
Methods: We studied 17 DCM (53±11years) and 15 HCM patients (56±16years) matched for age with 34 controls (53±10years). MRI AA through-plane velocities were automatically segmented to estimate flow curves throughout the cardiac cycle. Then, indices reflecting flow curves changes during the late systolic deceleration time interval (DT) were derived: a) $T_{1/2}$: the time interval required for flow deceleration to reach half of its systolic peak, in percentage of DT, and b) $DR_{1/2}$: the decrease in flow during half of DT, in percentage of systolic peak.
Results: $T_{1/2}$ was 56.3±6.6% and $DR_{1/2}$ was 43.5±6.5% in controls. AA flow waveform during late-systole changes significantly in cardiomyopathies. Indeed, while it tends to be steeper in HCM as reflected by significant ($p<0.001$) decrease in $T_{1/2}$ (43.1±17.3%) and increase in $DR_{1/2}$ (54.9±16.1%), it tends to be flat in DCM as reflected by significant ($p<0.001$) increase in $T_{1/2}$ (68.2±6.7%) and decrease in $DR_{1/2}$ (31.6±7.8%). Furthermore, such differences remained significant while accounting for gender, BMI and heart-rate (MANOVA).
Conclusion: We found significant changes in AA flow patterns in the presence of cardiomyopathies, reflecting changes in both LV contractile capacity and aortic cushioning. Such aortic indices might be of major usefulness in pathologies associating aortic stiffening with LV hypertrophy such as hypertension.

P8.4
NON-INVASIVE ASSESSMENT OF LOCAL PULSE WAVE VELOCITY USING ELECTROMECHANICAL SENSORS: FEASIBILITY STUDY IN A HEALTHY POPULATION

H. Pereira [a,b], T. Pereira [c], J. Maldonado [d], T. Pereira [a], V. Almeida [a], J. Simões [b,a], J. Cardoso [a], C. Correia [a]
[a]*University of Coimbra, Coimbra, Portugal*
[b]*ISA-Intelligent Sensing Anywhere, Coimbra, Portugal*
[c]*Escola Superior de Tecnologia da Saúde de Coimbra, Coimbra, Portugal*
[d]*Instituto de Investigação e Formação Cardiovascular, Coimbra, Portugal*

The assessment of local hemodynamics, namely in the carotid artery, has recently gained clinical relevance due to its significance in the development of coronary and cerebrovascular diseases. Local pulse wave velocity (PWV) constitutes one of the most important indices in carotid stiffness evaluation, but currently available devices require high technical expertise and specialized imaging technologies.
This paper proposes two novel electromechanical double headed probes for non-invasive measurement of local PWV. The PWV is assessed in a single location and implies the determination of the time delay between the signals acquired simultaneously by either two acoustic or two piezoelectric sensors, namely placed 11 mm and 15 mm apart, at the carotid site.
The acoustic probe (AP) and the piezoelectric probe (PZP) were tested in 20 healthy volunteers aged 22.12 ± 1.96 years. Carotid PWV along with other time-based hemodynamic parameters were estimated. The values were also compared with carotid-femoral PWV measurements using a Complior device.
The mean local PWVs obtained were lower than those achieved in other studies, exhibiting values of 3.05 ± 0.96 ms-1 for the AP and 3.01 ± 0.77 ms-1 for the PZP. These results demonstrated that AP and PZP PWVs were linearly correlated, presenting a significant and strong relationship ($R=0.76$, $p<0.01$). Contrarily, these values were non-statistically significant with Complior PWV, presenting negative and very weak relationships ($p>0.05$).
Although studies will be extended to a more significant number of patients to differentiate between ages and healthy/non-healthy groups, these probes appear to be promising alternatives to local PWV stand-alone devices.

P8.5
EVALUATION OF VALVULOARTERIAL IMPEDANCE IN AORTIC VALVE STENOSIS BY USING CARDIAC MAGNETIC RESONANCE AND CAROTID ARTERY TONOMETRY

G. Soulat [a,b], E. Bollache [c], F. Pontnau [a], L. Perdrix [a], V. Zhygalina [a], P. Achouh [a], N. Kachenoura [c], P. Boutouyrie [a,b], S. Laurent [a,b], E. Mousseaux [a,b]
[a]*European Hospital Georges Pompidou, Paris, France*
[b]*Paris Decartes University, Paris, France*
[c]*Pierre and Marie Curie University, Paris, France*

In aortic valve stenosis (AVS), valvuloarterial impedance (Zva), as left ventricle (LV) afterload estimation, has been proposed in echocardiography (TTE) to predict adverse outcome better than conventional parameters such as aortic valve area (AVA). However its calculation method differs from standard temporal arterial characteristic impedance (Zc) assessment. The aim of our study was to apply the Zc concept of measurements to estimate Zva by using phase contrast magnetic resonance (PC-MR) and carotid tonometry.
Methods: 40 patients (76±13 years, 21 males) underwent MR with carotid tonometry and TTE.
-Zva-TTE was assessed with brachial systolic arterial pressure, TTE transvalvular mean gradient and stroke volume index to body surface area.
-Zva-MR was assessed with pressure waveform from carotid tonometry, transvalvular pressure gradient and Flow waveform on LV outflow track from PC-MR.
These methods were evaluated by comparing their links with diastolic dysfunction estimated by TTE E/Ea ratio.
Results: Zva values were higher in symptomatic patients using both TTE and MR. In univariate analysis, only Zva-MR was correlated with E/Ea ($r=0,5$, $p=0,001$).
In multivariate analysis of determinants of E/Ea, a significant model including age, Mean blood pressure, LV ejection fraction, LV mass and AVA was obtained ($R2=0,41$; $p<0,01$).When Zva-MR was included, the overall significance of the model was higher ($R2=0,56$;$p<0,01$). Only Zva-MR and LV Mass remained independently correlated to E/Ea.
Conclusions: By using MR in association with carotid tonometry, the calculation of Zva is feasible and can improve LV afterload assessment in AVS. This new way to estimate Zva may be clinically useful in patients evaluation.

P8.6
COMPARISON OF TRANSIT TIME ESTIMATION METHODS FOR THE DETERMINATION OF PULSE WAVE VELOCITY

M. Bachler [a,b], B. Hametner [a,b], C. Mayer [a], T. Weber [c], B. Eber [c], S. Wassertheurer [a]
[a]*AIT Austrian Institute of Technology, Vienna, Austria*
[b]*Vienna University of Technology, Vienna, Austria*
[c]*Klinikum Wels-Grieskirchen, Vienna, Austria*

Pulse wave velocity (PWV) has been shown to be a reliable marker for arterial stiffness. Its accuracy depends heavily on the estimation of the transit time (TT) between proximally and distally measured pulse waveforms. Several methods of determining the TT exist, but no consensus for the standardization of one of them has been reached yet. In this work, various state-of-the-art TT estimation methods and the resulting PWV values are examined.
In total, 118 pair-wise measurements using applanation tonometry on the carotid and femoral arteries from 59 patients over a wide age range (21-88 years), recorded by the SphygmoCor system, were examined. For the TT estimation, two traditional methods based on intersecting tangents (IT) and the maximum systolic upstroke (MSU) were used. Furthermore, the two recently proposed methods "diastole-patching" (DP), which compares the region in the foot of the proximal waveform, and the cross correlation of the complete waveform (CC) were compared.
The resulting PWVs differed significantly ($p<0.05$, Bonferroni corrected paired T-test) between the various methods, with exception of MSU vs. DP. The means ± standard deviations were 8.2±1.8m/s using IT, 7.6±1.9m/s for the MSU, 7.8±2.2m/s using DP, and 9.9±6.7m/s by calculation of the CC. Comparisons of single measurements lead to differences of even more than 6m/s.
Although the 2013 ESH/ESC Guidelines for the management of arterial hypertension suggest a threshold of 10m/s as an estimate of alterations of aortic function, no evaluation method is mentioned. Our results suggest that an agreement on the optimal TT estimation may be useful.