



Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

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

P3.5: TYPE 2 DIABETES EXACERBATES CAROTID ARTERY ECHOGENICITY AND CENTRAL ARTERY STIFFNESS IN MIDDLE-AGED AND OLDER INDIVIDUALS

Kunihiko Aizawa*, Francesco Casanova, Dave Mawson, Salim Elyas, Damilola Adingupu, Kim Gooding, David Strain, Angela Shore, Phillip Gates

To cite this article: Kunihiko Aizawa*, Francesco Casanova, Dave Mawson, Salim Elyas, Damilola Adingupu, Kim Gooding, David Strain, Angela Shore, Phillip Gates (2015) P3.5: TYPE 2 DIABETES EXACERBATES CAROTID ARTERY ECHOGENICITY AND CENTRAL ARTERY STIFFNESS IN MIDDLE-AGED AND OLDER INDIVIDUALS, Artery Research 12:C, 11–12, DOI: <https://doi.org/10.1016/j.artres.2015.10.230>

To link to this article: <https://doi.org/10.1016/j.artres.2015.10.230>

Published online: 7 December 2019

relative work (low-fitness) (154 ± 22 vs. 133 ± 15 mmHg, $p < 0.001$). The high-fitness group had greater stroke volume, lower heart rate and LV longitudinal strain compared to the low-fitness group (72 ± 18 vs. 59 ± 15 ml, 61 ± 9 vs. 68 ± 9 bpm, -18 ± 4 vs. $-20 \pm 3\%$, $p < 0.05$ for all). Exercise systolic BP was associated with LV mass index independent of resting BP, age and sex in the low-fitness group during stage one of the PWC170 ($\beta = 0.13$, 95% CI = 0.01-0.3) but not in the high-fitness group at any stage.

Conclusions: Sub-maximal exercise systolic BP independently relates to LV mass index in those with low, early stage-relative aerobic capacity. BP measured during submaximal exercise testing (light-intensity) may reveal early changes in hypertension-related organ damage that are more evident in people with low-fitness.

P3.2

ROGOZA INDEX IN HEALTHY VOLUNTEERS AS A FUNCTION OF AGE

Igor Posokhov

Hemodynamic Laboratory Ltd, Nizhny Novgorod, Russia

Background: Recently, prof Anatoly N Rogoza proposed a new vascular index calculated from one-channel volume sphygmography of brachial artery, Rogoza's Index or Rogoza Index. It may be useful as a new indicator of asymptomatic vascular damage associated with cardiovascular risk in patients with hypertension.

Objective: This study provides just an idea about the Rogoza Index in healthy volunteers as a function of age and sex.

Methods: The object of the study was the set of 120 bpw-files (BPLab format) with oscillometric ambulatory (24-h) blood pressure readings in age-matched group of 60 male and 60 female healthy volunteers. Rogoza Index (ms/cm) was calculated as $RWTT/L$ where RWTT is reflected wave transit time (ms) and L is height (cm).

Results: Averaged 24-h Rogoza Index was $1.1885 - 0.0063 \cdot \text{Age}$ ($r = -0.30$) for men and $0.93276 - 0.0025 \cdot \text{Age}$ ($r = -0.27$) for women; averaged daytime Rogoza Index was $1.2054 - 0.0067 \cdot \text{Age}$ ($r = -0.32$) and $0.90598 - 0.0022 \cdot \text{Age}$ ($r = -0.22$) and nighttime $1.1412 - 0.0049 \cdot \text{Age}$ ($r = -0.24$) and $1.0076 - 0.0033 \cdot \text{Age}$ ($r = -0.31$) accordingly. All correlations are significant, $p < 0.05$.

There was also a significant difference between Rogoza Indices in male and female subgroups: for 24-h period Rogoza Index was of 0.88 vs 0.80 ms/cm (mean, $p = 0.002$); for daytime of 0.79 vs 0.87 ms/cm ($p = 0.001$); and for nighttime of 0.84 vs 0.90 ms/cm ($p = 0.002$).

Conclusions: Rogoza Index is sex- and age- dependent like other surrogate indices of arterial stiffness.

P3.3

THE CKD273 URINARY PROTEOMIC BIOMARKER FOR EARLY DIAGNOSIS OF DIABETIC NEPHROPATHY DOES NOT INDICATE GENERALISED SUBCLINICAL VASCULAR DISEASE IN NORMOALBUMINURIC TYPE 2 DIABETIC PATIENTS

Gemma Currie ^{1,*}, Joanne Flynn ¹, Morten Lindhardt ², Harald Mischak ¹, Peter Rossing ², Christian Delles ¹

¹University of Glasgow, Glasgow, UK

²Steno Diabetes Center, Gentofte, Denmark

Background: Diabetic nephropathy (DN) is associated with cardiovascular disease. Microalbuminuria (MA), its traditional hallmark, reflects both renal and generalised vascular damage. We previously established a urinary proteomic classifier (CKD273) for early DN prediction that correlates with other biomarkers of renal function. Whether CKD273 only indicates renal damage or also generalised vascular disease remains unclear.

Methods: We recruited 80 patients with type 2 diabetes (age, 62 ± 7 years; blood pressure $138 \pm 11/79 \pm 8$ mmHg) free from cardiovascular complications with normal renal function (eGFR (88 ± 15 ml/min/1.73m²) and normoalbuminuria (albumin: creatinine ratio (UACR), 5 (2-16) mg/g). Participants underwent measurement of carotid-femoral pulse wave velocity (PWV; SphygmoCor) and carotid intima media thickness (cIMT; ultrasound). Urinary proteomic analysis was performed by capillary electrophoresis coupled to mass spectrometry.

Results: Mean CKD273 score (-0.234 ± 0.376) was well below the pre-established cut-off (0.343) for diagnosis of DN. There was a trend towards higher CKD273 score in patients with UACR above the median (-0.160 ± 0.372 vs -0.318 ± 0.368 ; $P = 0.061$). Median time from diabetes diagnosis was 11 (1-30) years; diabetes control was suboptimal (HbA1c, 62 (45-102) mmol/mol); and participants had subclinical vascular damage (PWV, 9.2 (6.4-12.5) m/s; cIMT, 0.850 (0.543-1.292) mm). As expected we saw a significant

correlation between PWV and systolic blood pressure ($r = 0.259$; $P = 0.024$). The CKD273 classifier did not correlate with PWV ($r = 0.174$; $P = 0.132$) or cIMT ($r = -0.096$; $P = 0.415$).

Conclusion: CKD273 is not a marker of subclinical macrovascular disease in normoalbuminuric type 2 diabetic patients without overt cardiovascular complications. Our data provide further evidence that CKD273 is a specific marker of renal damage.

P3.4

PULSE WAVE REFLECTIONS AND THEIR DIURNAL CHANGES IN PATIENTS WITH MARFAN SYNDROME COMPARED TO HEALTHY CONTROLS

Bernhard Hametner ^{1,*}, Matthias Hillebrand ², Ghazaleh Nouri ², Stephanie Parragh ^{1,5}, Jelena Köster ³, Kai Mortensen ³, Achim Schwarz ⁴, Yskert von Kodolitsch ², Siegfried Wassertheurer ¹

¹AIT Austrian Institute of Technology, Vienna, Austria

²Universitäres Herzzentrum Hamburg, Hamburg-Eppendorf, Germany

³Universitätsklinikum Schleswig-Holstein, Lübeck, Germany

⁴I.E.M. GmbH, Stolberg, Germany

⁵Vienna University of Technology, Vienna, Austria

Introduction: Patients with Marfan syndrome may suffer from a variety of symptoms, including changes of the cardiovascular system. The aim of this study was to perform ambulatory 24 hour blood pressure and pulse wave measurements in a group of Marfan patients and a group of healthy controls and to analyse wave reflections.

Methods: All measurements were obtained with the Mobil-O-Graph device. Reflection magnitude (RM) was calculated with the inbuilt ARCSolver algorithms and averaged during daytime and nighttime. The study included 27 patients with Marfan syndrome and 27 healthy controls. Matching criteria were age (39 years mean in both groups), sex (14 female) and daytime brachial systolic blood pressure (119 mmHg mean in both groups). Patients with Marfan syndrome were significantly taller than controls (190 cm vs. 174 cm).

Results: Reflection magnitude increased significantly during night in both groups (Marfan: 57.8 day, 66.6 night; controls: 58.6 day, 68.7 night). Differences between groups were not significant both day and night. Correlations between RM and body height were positive in Marfan patients ($R = 0.36$ day, $R = 0.33$ night) but negative in controls ($R = -0.47$ day, $R = -0.66$ night), showing a significantly different trend ($p < 0.01$).

Conclusions: There are similar levels and diurnal changes of reflection magnitude in patients with Marfan syndrome and healthy controls, but correlations of RM to body height are significantly different in Marfans and controls. This finding may relate to structural changes of the cardiovascular system associated with Marfan syndrome.

P3.5

TYPE 2 DIABETES EXACERBATES CAROTID ARTERY ECHOGENICITY AND CENTRAL ARTERY STIFFNESS IN MIDDLE-AGED AND OLDER INDIVIDUALS

Kunihiko Aizawa ^{1,2,*}, Francesco Casanova ^{1,2}, Dave Mawson ^{1,2}, Salim Elyas ^{1,2}, Damilola Adingupu ^{1,2}, Kim Gooding ^{1,2}, David Strain ^{1,2}, Angela Shore ^{1,2}, Phillip Gates ^{1,2}

¹University of Exeter Medical School, Exeter, UK

²NIHR Exeter Clinical Research Facility, Exeter, UK

Grey scale median of the common carotid artery intima-media complex (IM-GSM) characterizes the composition of the arterial wall and low IM-GSM reflects more generalized atherosclerotic vulnerability. However, it is unclear whether the presence of DM itself affects IM-GSM, similar to that observed with aortic stiffness. We measured IM-GSM and aortic stiffness in middle-aged and older individuals with and without DM. We included 264 individuals with DM (DM+; 67.0 ± 8.9 yrs, 83F) and 226 individuals without DM (DM-; 66.3 ± 9.3 yrs, 81F). Ultrasound images of the common carotid artery intima-media thickness (IMT) were obtained and IM-GSM was analysed using semi-automated edge-detection software. Aortic stiffness was assessed by carotid-femoral pulse wave velocity (cfPWV) using a SphygmoCor[®] device. IM-GSM was significantly lower in DM+ than DM- (103.6 ± 1.5 au vs 113.4 ± 1.6 au, $p < 0.05$) after adjustment for age and sex. Adjustments for cardiovascular disease (CVD), hypertension (HT), statin treatment and IMT did not change the finding. cfPWV was significantly higher in DM+ than DM- (10.2 ± 1.0 m/s vs 9.1 ± 1.0 m/s, $p < 0.05$) after adjustment for age, sex and mean arterial pressure. Adjustments for CVD, HT, statin treatment and heart rate did not change the finding. With further adjustment for HbA1c, cfPWV became similar between the groups, but IM-GSM remained lower in DM+ than DM- ($p < 0.05$). These results demonstrate that the presence of DM

unfavourably alters both IM-GSM and cfPWV in middle-aged and older individuals, and that impaired glycaemic control (HbA1c) only accounts for the difference in cfPWV. These findings suggest the presence of an additional factor(s) together with glycaemic control that influence IM-GSM in DM.

P3.6

EVALUATION OF DIFFERENT METHODS FOR DETERMINING THE TIME DELAY OF THE ARTERIAL PULSE WAVE: APPLICATION TO THE POPMETRE[®]

Hasan Obeid^{1,2,*}, Hakim Khettab¹, Magid Hallab^{3,4}, Pierre Boutouyrie^{1,2}, Stéphane Laurent^{1,2}

¹Inserm U970, Paris, France

²Paris Descartes University, Paris, France

³Department of gerontology, University hospital Nantes, Nantes, France

⁴Axelife, SAS, Nantes, France

Objective: Pulse Wave Velocity (PWV) can be measured between different sites. Here we used two different aspects to assess the PWV; the standard method Carotid-Femoral (CF) Sphygmocor (AtCorMedical – Australia) and the pOpmetre[®] (Axelife SAS – France) which uses the Finger to Toe (FT) signals. The aim of this study was to evaluate the agreement between FT-PWV and CF-PWV and to test the robustness of pOpmetre[®] build-in algorithm.

Design and method: CF and FT PWV was measured in 150 subjects. MatLab was used to calculate FT-PWV from pOpmetre[®] waveforms using four methods: maximum of second derivative (used by pOpmetre[®]), intersecting tangents, 10% threshold and the cross correlation method.

Results: Using built in algorithms, the comparisons of the PWVs and transit times showed a good agreement between the two methods. FT-PWV correlated with CF-PWV ($r^2=0.51$; $p<0.001$) and transit time ($r^2=0.62$; $p<0.001$). The best correlation between FT and CF was observed with the maximum of the second derivative algorithm (PWV: $r^2=0.56$; $p<0.001$), transit time ($r^2=0.61$; $p<0.001$). Other algorithms showed weaker correlations: for PWV, intersecting tangents, $r^2=0.37$, 10% upstroke, $r^2=0.35$, cross-correlation, $r^2=0.22$.

Conclusions: This study showed that pOpmetre[®] is well correlated with reference methods and the wave foot detection algorithm used by popmetre[®] gave the best correlation comparing to other algorithms. The FT-PWV technique has correct agreement with the reference technique, however further studies are needed to validate FT-PWV method in larger populations. Compared to CF-PWV, FT-PWV is faster, simpler to perform and more acceptable to patients.

P3.7

ARTERIAL STIFFNESS IS ASSOCIATED WITH LOWER PERFORMANCE ON THE COGNITIVE TESTS AT DIFFERENT DOMAINS IN HYPERTENSIVE PATIENTS

Henrique Muela¹, Valéria Costa-Hong¹, Michel Machado², Natalia Moraes³, Claudia Memoria³, Monica Yasuda², Ricardo Nogueira², Ayrton Massaro², Edson Shu², Ricardo Nitrini², Luiz Bortolotto^{1,*}

¹Heart Institute (Incor), University of São Paulo Medical School, São Paulo, São Paulo, Brazil

²Department of Neurology, University of São Paulo Medical School, São Paulo, São Paulo, Brazil

³Department of Psychology, University of São Paulo Medical School, São Paulo, São Paulo, Brazil

Background: Cognitive impairment and elevated arterial stiffness are described in patients with arterial hypertension (AH), but its correlations are not well studied.

Objectives: To study the cognitive function at different domains and arterial properties in patients with AH stage 1 to 3 compared to normotensives and to evaluate the correlations between these variables.

Methods: We evaluated 162 subjects, 42 normotensives (44.7±11yrs, 69% male, 88% white) and 120 patients with stage 1-3 AH (51±11yrs, 46% male, 69% white) under treatment. The global cognitive function was assessed by Mini Mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA). was done A validated comprehensive battery of neuropsychological tests assessed the following main cognitive areas: memory, language, visuo-perceptual and visuospatial, praxia, gnosis, executive function, attention, judgment. Pulse wave velocity (PWV) was measured by Complior[®] device. Carotid properties were assessed by radiofrequency ultrasound (WTS[®]). Central arterial pressure and augmentation index (Aix) were obtained using applanation tonometry (Sphygmocor[®]).

Results: Mean BP of the normotensive group (121.9±7/76.1±7 mmHg) was significantly lower than hypertensive patients (141.4±23/87.2±13 mmHg). Hypertensive group had worse performance in cognitive evaluation either by MMSE (27±2 vs. 28.6±1, $p<0.05$) or MoCA test (23.8±3 vs. 26.7±2, $p<0.05$). On the neuropsychological tests hypertensive patients had worse performance mainly in visuo-perceptual and visuospatial capacities and executive function. On the multivariate regression analysis, the following independent associations were observed: PWV-memory, executive function and attention parameters; IMT-memory and executive function; Aix-all neuropsychological domains except memory.

Conclusions: Cognitive impairment at different domains was more frequent in patients with different stages of AH. Arterial functional and structural properties were diversely associated with cognitive performance at different domains.

P3.8

ARTERIAL STIFFNESS AND LEFT ATRIAL VOLUME IN HYPERTENSIVE AND NORMOTENSIVE SUBJECTS

Marta Rojek^{1,2}, Marek Rajzer^{1,*}, Danuta Czarnecka¹

¹Department of Cardiology, Interventional Electrophysiology and Hypertension, Jagiellonian University Medical College, Cracow, Poland

²Medical Faculty, Dresden University of Technology, Dresden, Germany

Aim: Investigation of relationship between arterial stiffness indices and LAVI in hypertensive and normotensive subjects.

Material and methods: Patients were recruited among Morawica town inhabitants. Study group (AH) consisted of 41 untreated hypertensives (20 men). Control group (NonAH) consisted of 60 normotensives (32 men). Anthropometric and demographic data were collected via questionnaire. Following examinations were performed: office blood pressure measurement (SBP, DBP) using Omron M5-I; arterial stiffness measurements i.e. carotid-femoral pulse wave velocity (PWV) and central blood pressure (cSBP, cDBP) using SphygmoCor[®] device; echocardiographic left atrium volume determination (LAV) using VIVID-7 GE device followed by LAVI calculation (LAVI = LAV/body surface area).

Results: AH group was older (56,9±6,9 vs 50,2±7,9 yrs, $p=0,0002$) exhibiting higher BMI (28,2±9,0 vs 26,3±5,9 kg/m², $p=0,03$) and higher office SBP (149,5±15,7 vs 138,6±20,1 mmHg, $p=0,04$) and DBP (91,1±8,4 vs 85,7±12,8, $p=0,02$). PWV did not differ in investigated groups, while cSBP (136,3±15,0 vs 126,8±20,0 mmHg, $p=0,02$) and cDBP (90,8±7,0 vs 84,9±12,3 mmHg, $p=0,01$) were higher in AH group. LAVI was significantly higher in AH group than in NonAH group (27,8±9,5 vs 24,3±6,6 ml/m², $p=0,003$). Among AH group LAVI correlated positively only with cSBP ($r=0,33$, $p=0,04$). Among NonAH group, LAVI correlated positively with age ($r=0,27$, $p=0,03$), BMI ($r=0,39$, $p=0,02$) and cSBP ($r=0,27$, $p=0,35$). **Conclusions:** Hypertensive subjects represent higher values of LAVI. In this group LAVI depends mainly on central systolic blood pressure, while in the group of normotensives LAVI is additionally determined by age and body mass index.

P3.9

PROGRESSION OF ARTERIAL STIFFNESS AND VASCULAR LESIONS ACCORDING TO THE DEGREE OF GLYCEMIC ABNORMALITIES. A WARNING IN PATIENTS WITH METABOLIC SYNDROME

Pedro Forcada^{1,*}, Carlos Castellaro^{1,3}, Jorge Chiabaut^{1,3},

Sergio Gonzalez^{1,3}, Carol Kotliar^{1,2}, Sebastian Obregon^{1,2}

¹Hospital Universitario Austral, Pilar, Buenos Aires, Argentina

²Santa Maria De La Salud, San Isidro, Buenos Aires, Argentina

³Centro Champagnat, Pilar, Buenos Aires, Argentina

Introduction: Metabolic Syndrome (MS), is postulated as intermediate stage in this way to overt DBT, and probably the degree of vascular compromise in this stage could explain the higher proportion of CV complications in diabetics. If so, it should deserve an intensive prevention in MS to reduce DBT complications.

Objective: To compare the vascular patterns in MS and DBT patients (p.).

Methods: From our Vascular Lab database (2007–2012) we selected 3297 p. in primary prevention, first evaluated with data of central BP (Arteriograph), IMT, plaques in carotid and femoral arteries (P), PWV (Complior) and forearm endothelial test. We compared 215 control (C) p. (normal BP, NO risk factors, evident CV disease or drugs), 91 p. with MS according to IDF (2014) and 193 type 2 diabetic p. (DBT2).

Results: DBT2 were older, less men and closer with MS p. in terms of BP, HR, PP, CAoP and Aix. Vascular patterns were quite similar between MS and DBT2 and significantly different from C. MS and DBT2 showed a higher proportion of P,