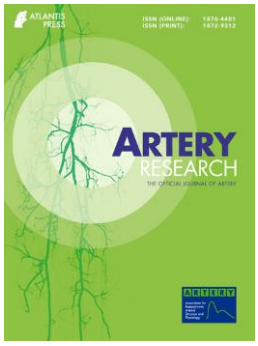

Artery Research

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

P6.05: ARTERIAL STIFFNESS AND CARDIAC DAMAGE PROGRESSION ARE ASSOCIATED IN ESSENTIAL HYPERTENSION PATIENTS

F. Cesana, T. Mauri, M. Alloni, M. Betelli, S. Nava, A. Maloberti, M. Stucchi, M. Corciulo, E. Montemerlo, E. Scanziani, P. Campadello, A. Capra, C. Giannattasio, G. Mancia

To cite this article: F. Cesana, T. Mauri, M. Alloni, M. Betelli, S. Nava, A. Maloberti, M. Stucchi, M. Corciulo, E. Montemerlo, E. Scanziani, P. Campadello, A. Capra, C. Giannattasio, G. Mancia (2010) P6.05: ARTERIAL STIFFNESS AND CARDIAC DAMAGE PROGRESSION ARE ASSOCIATED IN ESSENTIAL HYPERTENSION PATIENTS, Artery Research 4:4, 166–167, DOI: https://doi.org/10.1016/j.artres.2010.10.075

To link to this article: https://doi.org/10.1016/j.artres.2010.10.075

Published online: 21 December 2019

79.1±11 mmHg and a history of a cerebrovascular event have been enrolled. Wall-to-lumen ratio of retinal arterioles was assessed *in vivo* using scanning laser Doppler flowmetry (Heidelberg Retina Flowmetry, Heidelberg, Germany). Pulse wave analysis to determine aortic augmentation index and aortic augmentation pressure were performed *in vivo* using applanation tonometry (SphygmoCor, AtCor Medical PtyLtd, NSW 2114, Australia).
Results: Pulse pressure ($r=0.593$, $p=0.025$), but not systolic, diastolic or mean arterial pressure was related to wall-to-lumen ratio of retinal arterioles. Age, body mass index, waist circumference as well as parameters of glucose and lipid profile did not reveal a relation to wall-to-lumen ratio of retinal arterioles. Aortic augmentation index ($r=0.546$, $p=0.043$) and aortic augmentation pressure ($r=0.559$, $p=0.038$) were both related to wall-to-lumen ratio of retinal arterioles even when aortic augmentation index and aortic augmentation pressure were corrected for a mean heart rate of 75 bpm ($r=0.572$, $p=0.032$ and $r=0.616$, $p=0.019$; respectively).
Conclusion: In our cohort of patients with a history of a cerebrovascular event wall-to-lumen ratio of retinal arterioles was related to alterations of aortic pulse wave thereby indicating parallel vascular changes in the micro- and macrovasculature.

P6.02
INCREASED ARTERIAL STIFFNESS IS ASSOCIATED WITH SYSTOLIC BLOOD PRESSURE VARIABILITY IN OLDER INDIVIDUALS

J. C. Smith, Y. Yasmin, L. A. Tomlinson, C. M. McEniery, I. B. Wilkinson
University of Cambridge, Cambridge, United Kingdom

Background: The prognostic significance of the variability in systolic blood pressure (sBP) for cardiovascular events has been highlighted recently. Although increased arterial stiffness has been proposed as a potential mechanism, the relationship between sBP variability and arterial stiffness has not been examined directly. Therefore, the aim of the current study was to determine whether increased arterial stiffness is associated with increased blood pressure variability based on 24hour ambulatory blood pressure monitoring (ABPM) in a subset of older individuals from the Anglo-Cardiff Collaborative Trial.
Methods: Aortic stiffness was assessed by measuring the carotid-femoral pulse wave velocity (aPWV) in individuals aged over 50 years. Subjects also underwent 24 hour ABPM.
Results: Data concerning 24 hour ABPM and arterial stiffness were available in 204 individuals with an average age of 67±6years. When individuals were grouped according to tertiles of aPWV there was a significant increase in the variability of day sBP from the lowest to highest tertile (12.52±3.72 v 14.23±3.99, $P<0.001$). However, this relationship was not apparent for night sBP (11.86±4.49 v 12.16±4.61, $P=0.4$). In stepwise linear regression analyses, aPWV was independently associated with day sBP variability after adjustment for age, gender, mean day sBP and medication. However, only mean night sBP was associated with night time sBP variability.
Conclusion: These data support the hypothesis that individuals with increased sBP variability have elevated arterial stiffness. These data require confirmation in a large population, with outcome data.

P6.03
EVOLUTION OF ARTERIAL STIFFNESS AFTER KIDNEY TRANSPLANTATION IN PATIENTS WITH END-STAGE RENAL DISEASE

C. Bachelet-Rousseau [1,3], A. Kearney-Schwartz [2,3], L. Frimat [1,3], M. Kessler [1,3], A. Benetos [2,3]
[1]*Department of Nephrology, Brabois Hospital, University of Nancy, Nancy, France*
[2]*Department of Geriatrics, Brabois Hospital, University of Nancy and INSERM U961, Nancy, France*
[3]*Center of Clinical Investigation, Institut Lorrain du Coeur et des Vaisseaux Louis Mathieu, Nancy, France*

Background: Increased arterial stiffness (AS) is a major determinant of cardiovascular complications in end-stage renal disease (ESRD) patients. Little is known about AS evolution after renal transplantation. The aim of the study was to characterize the evolution of AS after renal transplantation in a population of ESRD patients, in comparison to those patients remaining in dialysis.
Material and methods: One hundred patients were recruited from the waiting list of the Transplant Unit of the University Hospital of Nancy. Two vascular evaluations were performed at one-year interval. AS was assessed by carotid/femoral pulse wave velocity (PWV). During this interval, thirty-nine patients were transplanted and forty-nine remained on dialysis.
Results: At baseline PWV value was 10.6 ± 3.7 m/s. No difference was found between the two groups at the first and second visit. Mean arterial pressure (MAP) decreased in the transplant group (101 ± 14 vs. 95 ± 10 mmHg, $p<0.01$ respectively) at one-year follow up. Multivariate analysis showed that PWV changes depended on changes in MAP and baseline PWV.
Conclusion: Although no difference in the one-year PWV evolution was found, the lower MAP value in the transplanted group could result in a better long term evolution of arterial stiffness in this group, leading to a better cardiovascular prognosis after renal transplantation.

P6.04
EFFECT OF CAROTID BARORECEPTOR ACTIVATION ON AORTIC STIFFNESS

P. Segers [1], J. Kips [1], S. J. Vermeersch [1], D. Georgakopoulos [2]
[1]*Ghent University, Gent, Belgium*
[2]*CVRx Inc., Minneapolis, MN, United States of America*

Background: Previous research in acute animal models demonstrated strong effects of electrical carotid baroreceptor activation (CBA) on central hemodynamics. Data indicated arterial tone relaxation, which we could indirectly demonstrate at the level of the renal artery with a reduced impedance with CBA. The aim of this study was to assess effects of CBA on the elastic properties of the aorta.
Methods: The following data were invasively recorded in 7 anaesthetized dogs at baseline (BL) and during CBA intended to produce a moderate reduction in mean arterial pressure: (i) upper thoracic pressure (Pao; hi-fi pressure sensor) and flow (transonic flow probe) providing reflection magnitude Pb/Pf; (ii) Pao and diameter (ultrasonic crystals) providing local aortic distensibility (DC); PWV from simultaneous pressure recordings distance 21 cm (PWV-thoracic) and 51 cm (PWV-aorta) apart.
Results: see Table (mean (stdev)); P: paired t-test.

	CTRL	CBA	P
MAP(mmHg)	85.5 (9.0)	61.4 (6.7)	0.0007
Pb/Pf	0.44 (0.02)	0.36 (0.06)	0.005
DC (%/10 mmHg)	4.29 (1.08)	4.12 (0.91)	0.765
PWV-thoracic (m/s)	4.85 (0.40)	4.42 (0.52)	0.007
PWV-aorta (m/s)	6.78 (0.47)	5.75 (0.39)	0.0001

Discussion and conclusion: CBA lowered Pb/Pf and PWV, the latter effect mainly confined to the abdominal (muscular) aorta, given (i) the more substantial decrease in aortic (−1 m/s) versus thoracic (-0.4 m/s) PWV, and (ii) the absence of any change in DC measured directly at the upper thoracic aorta despite the reduction. Based on these and previous findings, we conclude that CBA modulates arterial tone in muscular arteries including the muscular parts of the aorta.

P6.05
ARTERIAL STIFFNESS AND CARDIAC DAMAGE PROGRESSION ARE ASSOCIATED IN ESSENTIAL HYPERTENSION PATIENTS

F. Cesana [1], T. Mauri [2], M. Alloni [1], M. Betelli [1], S. Nava [1], A. Maloberti [1], M. Stucchi [1], M. Corciulo [1], E. Montemerlo [1], E. Scanziani [1], P. Campadello [1], A. Capra [1,3], C. Giannattasio [1,3], G. Mancia [1,3]
[1]*University of Milan Bicocca, Department of Clinical Medicine and Prevention, Monza, Italy*
[2]*University of Milan Bicocca, Department of Experimental Medicine, Monza, Italy*
[3]*Clinica Medica, Ospedale S.Gerardo, Monza, Italy*

Background: Arterial stiffness and cardiac hypertrophy are independent cardiovascular risk factors. Aim of this study was to describe the relationship between these organ damages in a large cohort of essential hypertensive (EH) treated patients.
Methods: We performed standard trans-thoracic echocardiography to measure anatomical (left ventricular mass indexed by body surface area [LVMI] and relative wall thickness [RWT]) and functional (ejection fraction, diastolic function [E/A] and deceleration time) cardiac parameters on 827 treated EH patients. Carotid-femoral pulse wave velocity (PWV) was used to estimate arterial stiffness. Data were analyzed by linear regressions or ANOVA and post-hoc Bonferroni test.
Results: Patients were 53±14 years old (Mean ± SD) and 50% were male. Their mean blood pressure values were 142.3±18.6/86.7±10.6 mmHg; cardiac structural and functional parameters were in the normal range, PWV was 10.7 m/sec. Geometry of left ventricle, as defined by LVMI and RWT (ESC guidelines), was normal in 336 (43%) patients, while in 163 (21%) we found concentric remodelling, concentric hypertrophy in 173 (22%) and eccentric hypertrophy in 109 (14%) patients. PWV was significantly different between the 4 subgroups ($p = 0.001$), with concentric and eccentric hypertrophy patients having

significantly higher PWV values (11.5±2.7 and 11.4±3 m/sec respectively) than patients with normal heart geometry (10.2±2.6 m/sec) ($p \leq 0.001$ for both).
Conclusions: In EH patients arterial stiffness is associated with the degree of cardiac damage. This may reflect a common pathway leading to these alterations caused by hypertension in different but tightly related organs such as heart and arteries.

P6.06
SYSTEMIC ARTERIAL PROPERTIES DURING NORMAL PREGNANCIES IN HEALTHY WOMEN

M. E. Estensen [1,5], E. W. Remme [2], A. Swillens [3], T. Henriksen [4], O. A. Smiseth [5], L. Gullestad [5], P. Segers [3], S. Aakhus [5]
[1]*National Resource Centre for Women's Health, Oslo University Hospital, Rikshospitalet, Oslo, Norway*
[2]*Institute for Surgical Research, Oslo University Hospital, Rikshospitalet, Oslo, Norway*
[3]*IBiTech, Ghent University, Ghent, Belgium*
[4]*Department of Obstetrics, Oslo University Hospital, Rikshospitalet, Oslo, Norway*
[5]*Department of Cardiology, Oslo University Hospital, Rikshospitalet, Oslo, Norway*

Purpose: During normal pregnancy (NP), the cardiovascular system adapts to the metabolic needs of mother and foetus with increased cardiac output (CO) and reduced vascular resistance. In NP blood pressure is not increased despite an increase of CO due to vasodilation of the resistance vessels. It is unknown whether this is also modulated by changes in the properties of the large arteries.
Methods: 65 (33±1 years) with NP were investigated at gestational weeks 14-16, 22-24, 36 and 6 months postpartum (PP). Aortic root pressure and flow were obtained by calibrated right subclavian artery pulse trace, and aortic annular Doppler flow recordings. Systemic arterial properties were described by total arterial compliance(C), arterial elastance (Ea), characteristic impedance (Z_0), and peripheral arterial resistance (R). Wave reflection was assessed as the ratio of the magnitude of the backward (Pb) to forward (Pf) pressure wave. Parameters were estimated by Fourier analysis of central aortic pressure and flow data and methods based on the 2-element windkessel model.
Results: (Table) During NP, CO increased due to increased heart rate and stroke volume, whereas, blood pressures were lower as compared to 6 months PP. R was significantly reduced accompanied by a marginally lowered Ea and $Z_{0,}$ whereas C was unchanged. The forward and backward pressure wave-amplitudes were significantly reduced, and reflection magnitude trended lower in mid to late pregnancy.
Conclusions: During NP profound alterations of systemic hemodynamics occur, with increased cardiac output and reduced blood pressures, where the latter is related mainly to reduction in peripheral arterial resistance.

	14-16 weeks	22-24 weeks	36 weeks	6 months PP	ANOVA P
Mean arterial pressure (mmHg)	82.8 ± 6.6	80.0 ± 6.2#	84.8 ± 7.1#¤	88.0 ± 7.3¤	<0.001
Heart rate (min^{-1})	71 ± 7	74 ± 8#	77 ± 10#¤	66 ± 7 #¤§	<0.001
Cardiac output (l min^{-1})	6.1 ± 1.1	6.1 ± 1.1	5.8 ± 1.0	4.9 ± 0.9 #¤§	<0.001
R (mmHg ml^{-1} s^{-1})	0.85 ± 0.18	0.81 ± 0.16	0.92 ± 0.23¤	1.10 ± 0.29#¤§	<0.001
Z_0 (10^3–mmHg ml^{-1} s^{-1})	43 ± 18	51 ± 36	45 ± 23	55 ± 21	0.168
C WK (ml $mmHg^{-1}$)	1.45 ± 0.33	1.56 ± 0.45	1.55 ± 0.46	1.40 ± 0.45	0.220
C PPM (ml $mmHg^{-1}$)	1.25 ± 0.26	1.23 ± 0.28	1.22 ± 0.33	1.14 ± 0.30	0.454
Ea (mmHg ml^{-1})	1.0 ± 0.25	1.02 ± 0.24	1.19 ± 0.28¤	1.27 ± 0.28#¤	<0.001
Amplitude Forward Wave (Pf; mmHg)	31 ± 6	30 ± 9	28 ± 5#	30 ± 6	0.013
Amplitude Backward Wave (Pb; mmHg)	20 ± 3	17 ± 4#	17 ± 4#	19 ± 4§	<0.001
Reflection magnitude (Pb/Pf)	0.64 ± 0.13	0.59 ± 0.15	0.61 ± 0.13	0.64 ± 0.13	0.051

Mean ± SD. p< 0.05 vs #14-16 w, ¤22-24 w, §36 w. WK = C obtained using windkessel model fit; PPM= pulse pressure method.

P6.07
AORTIC STIFFNESS IS AN INDEPENDENT PREDICTOR OF NEW ONSET ATRIAL FIBRILLATION IN CHRONIC HEART FAILURE PATIENTS WITH REDUCED SYSTOLIC FUNCTION

S. Bonapace [1], A. Rossi [2], M. A. Cicoira [2], G. Arcaro [3], F. Valbusa [3], E. Barbieri [1], C. Vassanelli [2]
[1]*Division of Cardiology, Sacro Cuore Hospital, Negrar-Verona, Italy*
[2]*Division of Cardiology, University of Verona, Verona, Italy*
[3]*Division of Medicine, sacro Cuore Hospital, Negrar-Verona, Italy*

Background: Atrial fibrillation (AF) is the commonest supraventricular arrhythmia in chronic heart failure (CHF) with impaired left ventricular (LV) systolic function, The causes of its high incidence and prevalence in CHF are only partially understood.
Aim: To analyze the hemodynamic determinants of incident atrial fibrillation in CHF patients. Particulary, whether indexes of arterial stiffness might identify patients at risk for new onset AF.
Methods: 77 patients (mean age 62.8±9.3 years, ejection fraction 34.5±8.3%, male 80%) were enrolled. All patients underwent a complete echocardiographic-Doppler evaluation. Aortic-pulse wave velocity (PWV) was determined by Doppler flow recordings as previously reported. Effective arterial elastance (Ea) was estimated as end-systolic pressure/stroke volume (SV). Total arterial compliance (SAC) was calculated as SV/PP.
Results: 15 (19.5%) patients developed AF during the follow up. There were no differences in age, SBP, DBP, PP, LV-EF, left atrial volume, plasma neurohormones and procollagens. Those with AF had higher aortic-PWV (7.0±2.5 vs 5.3±1.9 m/sec, p= 0.004), higher Ea (1.68±0.46 vs 1.35±0.47 mmHg/mL, p=0.03), lower SAC (1.57±0.55 vs 1.96±0.53 mL/mmHg, p=0.02), higher time difference between pulmonary vein Ar-wave and mitral A-wave duration (PV-Ar-A) (43.5±44.2 vs 10±34.7 ms, p=0.02) and mitral E-wave velocity (0.76±0.23 vs 0.59±0.24 m/s, p=0.02). In bivariate logistic regression models aortic-PWV predicted always independently incident AF:

Variables	OR	95% CI	p-value
Aortic-PWV	1.4	1.07-1.94	0.01
SAC	0.3	0.07-0.96	0.04
Aortic-PWV	1.5	1.09-1.97	0.01
Ea	2.9	0.95-8.9	0.06
Aortic-PWV	1.9	1.2-3.0	0.003
PV-Ar-A	1.04	1.0-1.07	0.01

Conclusion: Aortic stiffness independently predicts incident AF in CHF with impaired LV-systolic function.

Experimental Studies
P7.01
EFFECTS OF OMEGA 3 SUPPLEMENTATION ON ARTERIAL STIFFNESS IN RAT EXPERIMENTAL MENOPAUSE

P. Losurdo, E. Panizon, M. Jevnikar, L. Macaluso, B. Fabris, B. Toffoli, M. Bardelli, F. Fischetti, G. Biolo, M. Zanetti, S. Mazzucco, G. Gortan Capellari, R. Carretta
Clinical Depart. of Medical, Technological, Translational Sciences of Trieste University, Trieste, Italy

Aim: To investigate the effects of omega-3 (Ω3) dietary supplementation on large artery mechanics and vascular oxidative stress (VOS), in a rat model of surgical menopause.
Materials and methods: Thirty, 6-months-old, Wistar-Kyoto rats were equally divided into 3 groups: a) control: sham surgery - normal diet (CTRL)-, b) ovariectomy, - normal diet (OVX) -and c) ovariectomy, + Ω3 supplementation (0,8g/Kg/day - daily gavages administration-) (OVX+Ω3). Two months after surgery, carotid-femoral Pulse Wave Velocity (c-f PWV) and arterial pressure were directly measured, by aortic and femoral catheter. VOS was assessed by superoxide anion generation, in aorta rings, (SOD-inhibitable cytochrome C reduction assay). Erythrocytes membrane Ω3 index was measured by gas-chromatography.