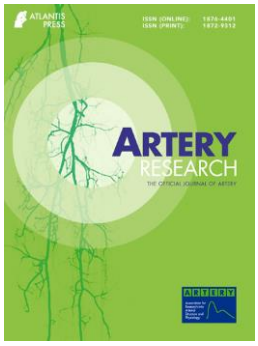

Artery Research

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

P12.03: RELATIONSHIP OF COMMON CAROTID ARTERY WAVE INTENSITY WITH AGE AND SEX IN HEALTHY NORMOTENSIVE PEOPLE

C.M. Park, J.E. Davies, S. Curtis, S.A.M. Thom, J. Mayet, K.H. Parker, A.D. Hughes

To cite this article: C.M. Park, J.E. Davies, S. Curtis, S.A.M. Thom, J. Mayet, K.H. Parker, A.D. Hughes (2010) P12.03: RELATIONSHIP OF COMMON CAROTID ARTERY WAVE INTENSITY WITH AGE AND SEX IN HEALTHY NORMOTENSIVE PEOPLE, Artery Research 4:4, 181–182, DOI: https://doi.org/10.1016/j.artres.2010.10.126

To link to this article: https://doi.org/10.1016/j.artres.2010.10.126

Published online: 21 December 2019

(*continued*)

	PPEP	PNP	P
C WK (ml mmHg^{-1})	1.28±0.42	1.40±0.45	0.239
C PPM (ml mmHg^{-1})	1.03±0.33	1.14±0.30	0.104
Ea (mmHg ml^{-1})	1.45±0.39	1.27±0.28	0.004
Amplitude Forward Wave (Pf; mmHg)	36±9	30±6	0.001
Amplitude Backward Wave (Pb; mmHg)	22±8	19±4	0.017
Reflection magnitude (Pb/Pf)	0.60±0.13	0.64±0.13	0.145

Mean±SD. $p<0.05$ (unpaired t-test). WK = C obtained using windkessel model fit; PPM= pulse pressure method.

P11.10
ARTERIAL STRUCTURE AND FUNCTION ARE INFLUENCED BY ANTIRETROVIRAL THERAPY AND BY THE PRESENCE OF RENAL DAMAGE IN HIV POSITIVE PATIENTS

F. Cesana [1], A. Maloberti [1], M. Pozzi [1], M. Corciulo [1], G. Grosso [1], D. Dozio [1], F. Citterio [1], M. Alloni [1], S. Nava [1], M. Stucchi [1], A. Capra [1,2], C. Giannattasio [1,2], G. Mancia [1,2]
[1]*University of Milan Bicocca, Department of Clinical Medicine and Prevention, Monza, Italy*
[2]*Clinica Medica, San Gerardo Hospital, Monza, Italy*

Purpose: Antiretroviral therapy (ART) has dramatically reduced AIDS—related mortality, but it has been associated to an increased cardiovascular risk, even in absence of hypertension. The aim of this study was to describe the influence of renal damage (RD) and ART on arterial function and structure.
Methods: We studied 4 groups of normotensive, normocholesterolemic, euglycemic patients; one of HIV+ on ART with RD (A; n=25; age 50.2±10.4 years; means±SD), one of HIV+ on ART without RD (B; n=25; 49.4±6.2 years), one of HIV+ not on ART and without RD (C; n=13; 40±8.3 years) and one of healthy controls (D; n=25; 50±6.8 years). RD was defined by microalbuminuria and/or eGFR < 60 ml/min. Arterial stiffness was measured by aorto-femoral Pulse Wave Velocity (PWV), central BP by tonometry (Sphygmocor), carotid IMT and distensibility were measured by semi-automatic echotracking.
Results: Group A showed higher aortic SBP and PP than other groups and their aortic SBP was not significantly different from systemic one. PWV was higher in both therapy groups compared to others. Aortic distensibility was significantly impaired in A compared to B and C groups (no data for D group). IMT didn't show any difference among groups.
Conclusions: HIV+ patients are characterized by arterial functional abnormality that might account for their increased cardiovascular risk due to either ART and/or presence of RD.

Physiopathology 6
P12.01
LOCAL CAROTID STIFFNESS VERSUS CAROTID-FEMORAL PULSE WAVE VELOCITY IN NORMAL SUBJECTS AND PATIENTS WITH RISK FACTORS

G. Bini [1], C. Morizzo [1], N. Guraschi [2], E. Malshi [1], M. Kozakova [1], C. Palombo [1]
[1]*Department of Internal Medicine, University of Pisa, Pisa, Italy*
[2]*Esaote SpA, Florence, Italy*

Aim of this study was to compare a local carotid pulse wave velocity (C-PWV) measured by high resolution radiofrequency (RF) ultrasound (Q-AS®, Esaote) with carotid-femoral PWV (CF-PWV, Complior), and their relationships with age and BP in normal subjects and in patients (ABN) with risk factors and/or atherosclerotic clinical disease (CVD).
We studied 64 subjects (37 men and 27 women, mean age 49 ±15, BP 124±19/73±9 mmHg), including 33 NL and 31 ABN. Arterial distension curves were obtained by averaging 15 parallel RF-lines obtained with a 10 MHz linear probe through a 1-cm long ROI in CCA. Local carotid stiffness index was calculated after introducing BP values, and C-PWV was obtained by Bramwell-Hill's equation.
Results: C-PWV in both sides and CF-PWV obtained in the overall population and separately in NL and ABN are shown in Table:

	Carotid PWV (right) (m/s)	Carotid (left) PWV (m/s)	CF-PWV (m/s)
ALL SUBJECTS	7.6±2.1	7.5±2.0	8.5±1.6*
NORMALS	6.2±1.1	6.2±1.0	7.9±1.5*
ABNORMALS	8.5±1.1	8.8±1.8	9.1±1.6

*: $p< 0.01$ for CF-PWV vs local C-PWV.

In the whole population, C-PWV and CF-PWV correlated directly ($p<0.0001$) with age (r=0.82 and r=0.61 respectlvey) and SBP (r=0.72 and r=0.64). In multivariate analysis age was the strongest independent predictor of C-PWV (partial R2 = 0.67), followed by SBP (cumulative R2 = 0.82). By contrast, SBP was the best predictor of CF-PWV (partial R2= 0.41), followed by age (cumulative R2 =0.55). Similar results were obtained after introducing sex, risk factors and CVD as covariates. Conclusions: compared to CF-PWV, local C-PWV shows a stronger association with age and results significantly lower in normal subjects but not in patients with risk factors or CVD.

P12.02
RELATIONSHIP BETWEEN IMPAIRED LUNG FUNCTION AND CARDIAC FUNCTION IN OLDER INDIVIDUALS

B. J. McDonnell [1], I. Munnery [2], M. Munnery [2], C. Bolton [2], I. B. Wilkinson [3], C. M. McEniery [3], J. R. Cockcroft [2]
[1]*Cardiff School of Health Sciences, University of Wales Institute,Cardiff, Cardiff, United Kingdom*
[2]*Wales Heart Research Institute, Cardiff University, Cardiff, United Kingdom*
[3]*Clinical pharmacology Unit, University of Cambridge, Cambridge, United Kingdom*

Background: Impaired lung function is associated with increased cardiovascular (CV) risk although the underlying mechanisms remain unclear. We have previously shown that lung function is inversely related to arterial stiffness in older men, and that patients with chronic obstructive pulmonary disease (COPD) have increased arterial stiffness. Furthermore, arterial stiffness is associated with impaired diastolic function in individuals with COPD. Our aim was therefore to examine the relationship between cardiac function and lung function in a population-based cross-sectional study.
Methods: Data from 1026 individuals, aged between 50-92 years, from the Anglo Cardiff Collaborative Trial, were available for the current analyses. Spirometry was performed (Vitalograph) to assess the degree of airways obstruction by measuring forced expiratory volume in 1 second: forced vital capacity ratio (FEV1:FVC). Peripheral blood pressure was recorded (Omron 711) in the supine position according to BHS guidelines. Cardiac function was assessed by measuring stroke volume (SV), using a non-invasive, inert gas re-breathing technique (InnoCor, Innovision A/S, Denmark).
Results: After entering all confounding factors of FEV1:FVC ratio (age, height, gender, smoking status, body surface area, heart rate, peripheral vascular resistance and mean arterial pressure) into a stepwise multivariate linear regression model, SV remained independently related to lung function (R=0.28, P=0.025).
Discussion: Stroke volume is independently associated with impaired lung function in this population based study, suggesting a mechanism whereby impaired lung function may increase CV risk. Increased arterial stiffness, which is associated with impaired lung function, may be an important mechanism mediating the relationship between cardiac function and lung function.

P12.03
RELATIONSHIP OF COMMON CAROTID ARTERY WAVE INTENSITY WITH AGE AND SEX IN HEALTHY NORMOTENSIVE PEOPLE

C. M. Park, J. E. Davies, S. Curtis, S. A. M. Thom, J. Mayet, K. H. Parker, A. D. Hughes
Imperial College London, London, United Kingdom

Background: Wave intensity analysis (WIA) is a time domain-based approach [1] that provides useful insights into arterial haemodynamics. We assessed the relationship between the major waves identified by WIA and age and sex in healthy individuals.
Methods: 65 healthy people (age 21 — 78yr; 43 male) participated. WIA was performed using carotid artery tonometry and Doppler ultrasound. Linear regression or fractional polynomial regression was used to fit data after log transformation if appropriate.
Results: The initial compression wave (S wave) accompanying ejection declined non-linearly with age (adjusted r^2 for age and sex = 0.43; $p < 0.001$) and was significantly lower in women ($p = 0.01$). The decompression wave in protodiastole (D wave) showed a curvilinear relationship with age (adjusted r^2 for age 0.12; $p = 0.001$), but did not differ by gender. The peak intensity of the reflected wave from the head was higher in men ($p = 0.002$) but declined with age more markedly in men than women. Wave reflection from the head fell with age (beta (95% CI) = -0.01 (-0.02, -0.00); $p = 0.01$ (log transformed)) but did not differ significantly by gender.

Carotid wave speed was higher in men ($p = 0.03$) and increased with age in both sexes although the rise was more marked in women.
Conclusions: Cardiac wave intensity falls with age in healthy individuals and is lower in women. Wave reflections from the head are reduced in healthy older people.
1. Hughes & Parker Med Biol Eng Comput. 2009;47:207-10.

P12.04
THE ROLE OF OXIDATIVE STRESS IN ACETYLCHOLINE-INDUCED RELAXATION OF DEENDOTHELIZED ARTERIES

S. Cacanyiova [1], F. Kristek [1], I. Dovinova [1], W. Boecker [2], V. E. Samoilova [2], I. B. Buchwalow [2]
[1]*Institute of Normal and Pathological Physiology, Slovak Academy of Sciences, Bratislava, Slovakia*
[2]*Gerhard Domagk Institute of Pathology, University of Muenster, Muenster, Germany*

Nitric oxide (NO) produced by endothelium in response to vasorelaxants, such as acetylcholine, induces vasorelaxation of vascular smooth muscle cells (VSMC). It has been found that VSMC express NO-synthase, however, the principal question remained unanswered, if it is physiologically relevant. Because injury of endothelium triggers free-radical production which decreases NO availability we hypothesized that the destruction of arterial anatomical integrity by rubbing off endothelial layer made vessels insensitive to vasodilators as a consequence of oxidative stress. We examined acetylcholine-induced vasorelaxation in deendothelized thoracic aorta (TA), mesenteric artery (MA) and pulmonary artery (PA) of Wistar rats under protection against oxidative stress. Acetylcholine produced vasorelaxation in arteries with intact endothelium, whereas the relaxation in endothelium-denuded rings was inhibited. Pretreatment of TA, MA and PA denuded rings with tempol, free-radical scavenger, improved relaxation to acetylcholine compared to untreated rings. The improved relaxation in all denuded rings was inhibited when ODQ, an inhibitor of guanylate cyclase, or L-NAME, an inhibitor of NO-synthase, were administered contemporary with tempol. Chemiluminiscence method revealed that endothelial denudation of TA and PA increased the production of superoxides. Immunohistochemical staining confirmed expression of NOS3-isoform in both intimal and medial cells in all arteries. Results revealed that deendothelized arteries under protection against oxidative stress exerted relaxation to acetylcholine which was mediated by NO and cGMP. The study suggests that VSMC can release NO in amounts sufficient to account for the vasorelaxation. This finding challenges the concept of the exclusive role of endothelial cells in the relaxation of VSMC.

P12.05
IMPACT OF IGF-1 ON ARTERIAL STIFFNESS IN PATIENTS WITH ACROMEGALY: COMPARISON OF MEASURES OF APWV AND AASI

M. Banerjee, A. N. Paisley, M. Roberts, P. J. Trainer
Manchester University, Manchester, United Kingdom

Introduction: Acromegaly, caused by excess of growth hormone, has high cardiovascular mortality and morbidity. Aortic pulse wave velocity (aPWV) and Ambulatory arterial stiffness index (AASI) are known measures of arterial stiffness. We evaluated the factors influencing aPWV and AASI in patients with acromegaly.
Method: Patients with acromegaly at various stages in their disease were assessed for disease activity by IGF-1, presence of hypopituitarism, other co-morbidities, aPWV and measurement of 24 hour ambulatory blood pressure and thereby AASI.
Results: 55 patients (mean age: 52.8±14.0 years, aPWV:11.7±3.6m/sec, AASI: 0.31±0.27), 32.7% female, took part in the study. 36.4% had hypopituitarism. Their blood pressure was 126.0±16.7 / 78.1±11.8 mm Hg and 45.5% were dippers. The IGF-1 was in the age related normal range in 54.5% of patients. There were no significant differences in aPWV or AASI between patients with high or normal IGF-1. Multivariate analysis including pulse pressure, heart rate, gender, presence of hypopituitarism, nocturnal dipping of blood pressure, proteinuria, cigarette smoke exposure, diabetes and hypertension, identified Age (β: 0.25,95% CI of β 0.11 to 0.38, p = 0.002) and hyperlipidaemia (-4.9, -9.1 to -0.7,0.026) independently influenced aPWV, while IGF-1 (β: 0.001,95% CI of β: 0.0 to 0.002, p = 0.042) independently influenced AASI.
Conclusion: In patients with acromegaly, IGF-1 independently influences AASI but not aPWV which is affected by traditional cardiovascular risk factors, namely age and hyperlipidaemia. These findings suggest that IGF-1, by its effects on vascular smooth muscle cells, affects the stiffness of muscular arteries but not that of the elastic arteries.

P12.06
DOES A 6-MONTH MILITARY MISSION IN AFGHANISTAN HAVE AN IMPACT ON INFLAMMATION MARKERS, VITAMIN D LEVEL, AND ARTERIAL STIFFNESS?

E. Salum [1,2,3], M. Zilmer [2,3], P. Kampus [1,2,3], J. Kals [2,3,4], E. Unt [5,6], M. Serg [1,2,3], M. Zagura [1,2,3], M. Blöndal [1], K. Zilmer [3], J. Eha [1,2]
[1]*Department of Cardiology, University of Tartu, Tartu, Estonia*
[2]*Endothelial Centre, University of Tartu, Tartu, Estonia*
[3]*Department of Biochemistry, Centre of Excellence for Translational Medicine, University of Tartu, Tartu, Estonia*
[4]*Department of Vascular Surgery, Tartu University Hospital, Tartu, Estonia*
[5]*Institute of Exercise Biology and Physiotherapy, University of Tartu, Tartu, Estonia*
[6]*Department of Sports Medicine and Rehabilitation, University of Tartu, Tartu, Estonia*

Background: Excessive workload may have transient detrimental effects on left ventricular function and arterial stiffness. Furthermore, heavy endurance physical exercise has been shown to induce short-term systemic inflammation response. Recently, vitamin D has attracted increased attention owing to its potential anti-inflammatory effects. The aim of this study was to investigate the impact of a 6-month military mission on arterial stiffness, inflammation, and vitamin D level.
Methods: Sixty-five soldiers (age 26±4 years) deployed to a peacekeeping mission in Afghanistan for 6 months were examined before and after the mission. We assessed arterial stiffness by carotid-femoral pulse wave velocity and pulse wave analysis using the Sphygmocor device. A set of inflammation-related markers was assessed in the blood using biochips. Serum 25-hydroxyvitamin D level was measured using a radioimmune assay.
Results: Arterial stiffness and brachial and central blood pressure did not differ significantly before and after the mission. Vitamin D level increased by 2.6 times (40±15 *vs* 104±24 (nmol/L), $p<0.001$). Significant increases were observed in high-sensitivity C-reactive protein (0.68±0.7 *vs* 1.47±3.55 (mg/L), $p=0.03$), leukocyte count 5.4±1.1 *vs* 6.3±1 ($x10^9$/L), $p<0.001$), as well as in various pro-inflammatory cytokines, including IL-1α (0.13±0.18 *vs* 0.2±0.23 (pg/mL), $p<0.001$), IFN-γ (2.6±2.4 *vs* 5.3±3.4 (pg/mL), $p<0.001$), and MCP-1 (151±61 *vs* 229±95 (pg/mL), $p<0.001$).
Conclusion: Arterial stiffness was not altered by arduous conditions during the deployment. However, there were significant changes in the spectrum of inflammation markers and vitamin D levels. We speculate that elevated vitamin D levels may have ameliorated the possible inflammation-induced changes in arterial stiffness.

P12.07
LACK OF RELATION BETWEEN ENDOTHELIAL FUNCTION AND CAROTID ARTERY STIFFNESS IN YOUNG, HEALTHY MALE SUBJECTS

A. Pintér, T. Horváth, M. Kollai
Institute of Human Physiology and Clinical Experimental Research, Budapest, Hungary

The endothelium was shown to reduce vascular stiffness of muscular arteries by producing vascular smooth muscle relaxing, vasodilatative factors. Stiffening of arteries with advancing age and risk factor exposure predominantly involves the elastic segments of the arterial tree. It is not known to what extent the stiffness of large elastic arteries is under endothelial control. This study was designed to investigate the relationship between endothelial function and stiffness of the carotid artery, a representative of central elastic arteries.
Conduit artery endothelial function was assessed in 58 subjects by measuring brachial artery flow mediated dilatation (FMD). Carotid artery elastic parameters were calculated from carotid pulse pressure measured by local tonometry and from pulsatile distension determined by echo wall-tracking. Systemic arterial stiffness was assessed by aorto-femoral pulse wave velocity (PWV). Relations between variables were determined by univariate correlation analysis.
All measured values fell within age related normal ranges. FMD was inversely related to age and DBP ($r = -0.49$ and -0.48, respectively; $p<0.01$ for both). FMD was also significantly and inversely related to PWV ($r = -0.46$; $p<0.05$), but was not related to any parameter of carotid artery elasticity.
We suggest that age-related impairment in large elastic vessel function may not be significantly influenced by the loss of vasodilatative capacity of the endothelium.