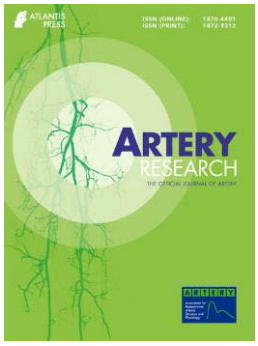

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P1.20: ASSOCIATION BETWEEN LOW-GRADE ALBUMINURIA AND ARTERIAL STIFFNESS IN HYPERTENSIVE SUBJECTS

M.Y. Rhee, Y.S. Kim, S.H. Na, Y.K. Kim, M.M. Lee, D.Y. Na, J.H. Bae, H.Y. Kim

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generalized arterial disease proposing a score that incorporates intima-media thickness (IMT) from the carotid and femoral arteries.
Methods: 56 consecutive non diabetic patients (mean age: 58±12 yrs) affected by non-psychogenic and non-hormonal ED were evaluated for penile vascular disease severity by penile Doppler ultrasound. The mean systolic velocity (PSV) shows the greatest flow velocity detectable in an artery throughout the systole. Ultrasonographic assessments of IMT, lumen diameter and plaques in the carotid and femoral arteries were evaluated and a score was developed.
Results: Patients with high score (n=26) compared with subjects with low score were older (59 vs 54 yrs, P=0.06), had decreased mean PSV (25.3 vs 33.1 cm/s, figure) and longer duration of ED (3.8 vs 2 yrs, P<0.05), whereas these two groups did not differ regarding systolic pressure, metabolic profile and smoking status. Analysis of covariance revealed that PSV values of penile arteries were significantly different between the two groups after adjustment for confounders (P<0.05). Moreover, in the entire population, mean PSV exhibited a negative correlation with femoral (r=-0.34, P<0.05) and carotid IMT (r=-0.29, P<0.05).
Conclusions: Ultrasound findings of penile vasculature and duration of ED correlate significantly with increasing severity of carotid and femoral artery wall thickness and atherosclerotic lesions. These data suggest a close interrelationship between progression of vasculogenic ED and early atherosclerosis.

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P1.16
HIGHER ORDER NON-LINEARITY IN ARTERIAL WALL DISTENSIBILITY IS PRESENT IN ONE-THIRD OF PATIENTS WITH CARDIOVASCULAR DISEASE

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Background: It is generally accepted that arterial cross-section is an exponential function of pressure. We hypothesized that the order of non-linearity varies substantially between individuals.
Methods: We obtained simultaneously intra-arterial pressure waveforms and common carotid artery (CCA) diameter waveforms by ultrasound in 10 patients (age 70±8 yrs) undergoing coronary catheterisation. We extracted beat-to-beat diastolic (D), systolic (S), and dicrotic notch (N) values from both pressure and diameter waveforms by an automated algorithm. We reconstructed pressure-cross-section curves of each patient by fitting the $p=p_d\cdot\exp(a(A-A_d)/A_d))$ model to D, S, and N; with: pressure (p), diastolic pressure (p_d), artery cross-section (A), and diastolic cross-section (A_d). Based on a we recalculated systolic blood pressure (p_s).
Results: Eight patients had systolic hypertension and two were normotensive. P_s was 144±25 (mean±SD), p_d was 75±12, and pulse pressure was 69±25 mmHg. In 7/10 the exponential model (a=9.4±3.9) fitted the three point data well ($r^2>0.99$, difference in $p_s=0\pm1$ mmHg), but in 3/10 (one normotensive) the fit was less good because the non-linearity was of a higher order than contained in the model. In those particular patients, the model underestimated real p_s by 4 to 10 mmHg.
Conclusions: Non-invasive methods to estimate local pulse pressure or characterize arterial stiffness based on the above exponential model are less suitable in 30% of patients with cardiovascular disease due to the presence of a higher order non-linearity in arterial wall distensibility.

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P1.17
ARTERIAL STIFFNESS IS RELATED TO LEFT VENTRICULAR DIASTOLIC DYSFUNCTION IN DILATED CARDIOMYOPATHY

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Aim: . To evaluate the relationship between left ventricular (LV) diastolic and systolic function, arterial stiffness and endothelial function in patients with dilated cardiomyopathy (DCM)
Methods: In 54 patients with DCM (age 63±13 years, 10 females) and LV ejection fraction (EF)<45%, applanation tonometry (Sphygmocor®) was evaluated for determining augmentation index (AIx) and pulse pressure (PP) amplification (brachial PP / central PP%) by pulse wave analysis and carotid to femoral pulse wave velocity (PWV). Endothelium-dependent (flow-mediated dilation, FMD, after 5-minute of forearm ischemia) and independent (sublingual glycerol trinitrate, GTN, 25 μg) vasodilation were assessed by ultrasounds and computerized analysis of brachial artery diameter changes. A Doppler and echocardiographic study was also performed, for measurements of E/A ratio and E wave deceleration time (ETD).
Results: . Mean LV EF was 32±10%. AIx was related to E/A ratio (r=−0.51; p<0.01) and EDT (r=0.36; p<0.05). PP amplification correlated with E/A ratio (r=0.61; p<0.0001) and EDT (r=−0.36; p<0.05). PWV was associated with EDT (r=0.36; p<0.05). A significant correlation was found between PP amplification and LV EF (r=−0.33; p<0.05). No significant correlations were apparent between FMD, response to GTN and FMD/GTN ratio with respect to indexes of LV systolic and diastolic function.
Conclusions: In DCM patients, arterial stiffness is related to LV diastolic dysfunction, indicating that increased arterial stiffness is associated with either restrictive or pseudo-normal LV filling. Pulse wave amplification is directly related to diastolic parameters and inversely to systolic function, suggesting lesser central pressure augmentation rather than increased peripheral amplification.

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P1.18
AN HEMODYNAMIC STUDY OF THE LOWER LIMB ARTERIAL NETWORK AND ITS APPLICATION IN A MODEL FOR PREDICTIVE BYPASS SURGERY

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Vascular bypass surgery is commonly performed in the lower limb network in symptomatic patients presenting arterial occlusions. These bypasses can be performed with prosthetic material (PTFE/ polyester) of different diameters, or with autologous veins. Venous grafts have shown a better long-term patency (persisting graft function) than prosthetic ones (70% versus 40% at 4 years)(1). One hypothesis is an abnormal hemodynamic into the bypass leading to thrombosis or intimal hyperplasia. Nowadays, no objective tool is available to help the surgeon to predict the patient-specific hemodynamic performance of a bypass and choose its most adequate characteristics (material, diameter).
In order to analyse the hemodynamic parameters of the lower limb pathological arterial network before surgery, non-invasive measurement techniques are used: area, velocity and flow rate are recorded by doppler ultrasound; pressure and pulse wave velocity by SphygmoCorÒ. These measurements allow the evaluation of the outflow conditions of the leg (resistance and compliance) and their physiological behaviour related to the bypass. The hemodynamic modification due to the bypass is measured during surgery by invasive techniques: needle technique and Radi PressureWireÒ for the pressure waves and ultrasound flowprobes for the flow rate curves. These data are included in a numerical model which aim to predict the flow rate expected in the bypass depending on its characteristics of material and diameter. The results are compared to those of published studies describing velocity and flow rate data predictive of early graft failure (1).
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P1.20
ASSOCIATION BETWEEN LOW-GRADE ALBUMINURIA AND ARTERIAL STIFFNESS IN HYPERTENSIVE SUBJECTS

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Background: Microalbuminuria is an established risk factor for cardiovascular morbidity and mortality. Recently, the prognostic value of low-grade albuminuria for cardiovascular disease has been suggested. However, most studies were performed in heterogeneous population.
Methods: The association between urinary albumin excretion and arterial stiffness was evaluated in subjects with never treated hypertension and without diabetes and cardiovascular complications. Urinary albumin creatinine ratio (UACR) was measured with morning spot urine sample after overnight fasting. Arterial stiffness was measured with brachial-ankle pulse wave velocity (baPWV). Definition of low grade albuminuria was UACR <22 for men or <31 mg/g creatinine for women according to 2007 ESH/ESC

guideline. The 236 subjects (mean age 51 ± 11 years, range 26-77, 61% men) were analyzed.
Results: The linear regression analysis showed a significant correlation between UACR and baPWV (beta = 9.52; P < 0.0001), that was independent by multiple linear regression model including, as independent variables, age, gender, body mass index, mean arterial pressure, total cholesterol and smoking (beta = 5.66; p = 0.0115). Compared with those in the lowest UACR quartile, subjects in the highest quartile (UACR > 11.7 mg/g) showed higher baPWV (1492 ± 213 vs. 1655 ± 313 cm/sec) with general linear model adjusted for age, gender, body mass index, mean arterial pressure, total cholesterol and smoking (B=98.5; p = 0.0084).
Conclusion: Hypertensive subjects with urinary albumin excretion in the upper normal range were not free from target organ damage. The present study suggests that the current threshold of microalbuminuria should be lowered.

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P1.21
THE RISK OF HEART FAILURE IS INCREASED IN SUBJECTS WITH RAISED ARTERIAL STIFFNESS: THE ROTTERDAM STUDY

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Objective: The purpose of the present study is to investigate whether subjects with stiff arteries have an increased risk of heart failure.
Methods: The present study is performed within the framework of the Rotterdam study. Blood pressure, aortic pulse wave velocity and carotid distensibility measurements were obtained. Subjects with heart failure at baseline were excluded. We included 4121 subjects with blood pressure measurements, 3290 subjects with information on aortic pulse wave velocity and 2936 subjects with carotid distensibility measurements. Cox proportional hazard models, adjusted for cardiovascular risk factors, were performed to investigate the risk of heart failure associated with blood pressure and arterial stiffness.
Results: The mean age of the subjects was 72 years, 41,5 % was men. After a mean follow- up of 4.1 years 254 subjects had a heart failure. Hazard ratios and corresponding 95% CI of heart failure for systolic, diastolic, pulse and mean arterial pressure were 1.21 (1.08-1.36), 0.94 (0.83-1.06), 1.31 (1.17-1.46) and 1.08 (0.96-1.22), respectively.
After including both systolic and pulse pressure in one model, only the pulse pressure predicted incident heart failure; estimates for systolic and pulse pressure were 0.90(0.69-1.18) and 1.40(1.07-1.85), respectively. Aortic pulse wave velocity increased the risk of heart failure in subjects up to 70 years (HR 1.72;1.23-2.40), whereas the carotid distensibility did not.
Conclusions: The pulsatile components of blood pressure and aortic stiffness are associated with the risk heart failure in the general population.

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P1.22
POORER LUNG FUNCTION IS ASSOCIATED WITH GREATER PERIPHERAL ARTERIAL STIFFNESS IN YOUNG ADULTS: THE NORTHERN IRELAND YOUNG HEARTS PROJECT (NIYHP)

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Background & Aims: Associations of poorer lung function (LF) with atherosclerosis and/or arterial stiffness (AS) have been suggested as potential mechanisms explaining the increased cardiovascular risk associated to poorer LF (e.g. in COPD patients but also in the general population). We have therefore examined, in a population of young adults, whether: 1) LF was inversely associated with stiffness of central (i.e. aorta) and peripheral (i.e. upper and lower limbs) arterial segments; 2) these associations were similar in smokers and non-smokers; and 3) low-grade inflammation played a mediating role.
Methods: Subjects were 286 young adults (mean age of 23 yrs), participating in the NIYHP. LF [i.e. forced expiratory volume in 1s (FEV1) and forced vital capacity (FVC), expressed in L] was measured by spirometry. AS was assessed by measuring pulse wave velocity (PWV, in m/s) in 3 arterial segments.
Results: After adjustment for sex, age, height, weight, MAP, smoking and asthma status, both FEV1 and FVC were inversely associated with PWV of all 3 arterial segments, but more strongly and significantly so with PWV of the lower limb segment only: [b=-0.23 (95%CI:-0.38; -0.08), p=0.004 and b=-0.22 (-0.41;-0.02), p=0.029, respectively]. No significant interactions with smoking status were observed. Further adjustment for markers of low-grade inflammation (i.e. CRP and fibrinogen) did not attenuate the associations of FEV1 [b=-0.24 (-0.38;-0.08) or FVC [b=-0.22 (-0.42;-0.03)] with PWV of the lower limb.
Conclusions: Young adults with poorer LF have increased peripheral AS. We found no evidence that low-grade inflammation underlies this association, and other mechanisms need to be explored.

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P1.23
BLOOD PRESSURE AND AUGMENTATION INDEX IN GENERAL POPULATION IN 5 YEARS FOLLOW-UP

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Objectives: The objective of the present study was to assess changes in blood pressure (BP) parameters and AI in general population after 5-years follow-up.
Methods: From the general population we recruited 197 members from random families (99 parent and 98 offspring (age at baseline: 51.4 and 25.5 years) who constituted 110 normotensives and 87 hypertensives). Initially and after 4.8±0.3 years we recorded the radial arterial waveform using the SphygmoCor device. We evaluated peripheral AI (pAI) and central AI (cAI).
Results: In both generations as well as in normo- and hypertensive groups we observed comparable increase in BMI and decrease in heart rate. We found higher increase in aortic SBP with lesser decrease in central DBP in offspring and in normotensives while cPP increase was higher in parent and in participants with initially diagnosed hypertension (p<0.005). We observed greater elevation of brachial SBP with simultaneous lesser reduction in DBP with similar increase in peripheral PP in offspring and in normotensives. Changes in pAI and cAI were more pronounced in younger generation and resulted respectively 4.4 vs 2.9(%); p=0.004 and 5.2 vs 3.7(%); p=0.001. Moreover we observed higher increase in pAI (4.6 vs 4.3(%); p=0.006) and in cAI (4.8 vs 4.6(%); p=0.005) in hypertensives.
Conclusions: Our findings indicate that AI increased in offspring and can be use as effective tool to detect the progressive increase in aortic stiffness in younger individuals. The aortic pulse pressure more effectively indicate age and blood pressure related changes in arterial wall stiffening than brachial pressure.

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P1.24
AORTIC PULSE WAVE VELOCITY IS NOT ASSOCIATED WITH ALL-CAUSE MORTALITY IN YOUNG, LOW RISK, FRENCH POPULATION

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Objective: To evaluate the association between aortic pulse wave velocity (PWV) and all-cause mortality in a low to moderate risk population.
Methods: 1952 subjects (1319 men, 633 women), who benefited from a standard health check-up at the IPC center (Paris) in 1992/1993, had also an aortic PWV measurement. Mean follow-up was 13.4 ± 1.2 years, and 61 men (4.6%) and 18 women (2.8%) died. The population was divided in two groups of age (<60 and >=60 years). Cox regression model, including age, gender, tobacco, cholesterol, heart rate, blood pressure, glycaemia, assessed the risk of all-cause mortality for an increase of 1 m/sec of PWV (Hazard Ratio (HR), 95% CI).
Results: Age was 45.0±9.3 years in young and 64.5±3.8 years in old subjects. In overall population, PWV was 9.6±2.2 m/sec, and increased with age: 9.2±2.0 m/sec in youngest and 11.0±2.2 m/sec in oldest. After