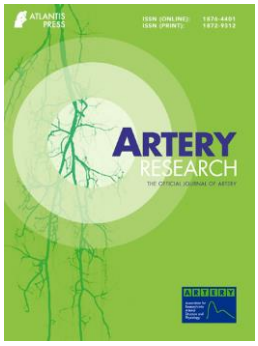

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P1.04: SYSTOLIC TIME INTERVALS DERIVED FROM CAROTID ARTERY DISTENSION WAVEFORMS FOR INTEGRATED CARDIOVASCULAR RISK ASSESSMENT

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Poster Presentation Abstracts

P1 – Populations Studies 1

P1.01
WHICH ONE IS MORE IMPORTANT IN PROGNOSIS BETWEEN CAROTID INTIMA-MEDIA THICKNESS AND CAROTID PLAQUE?

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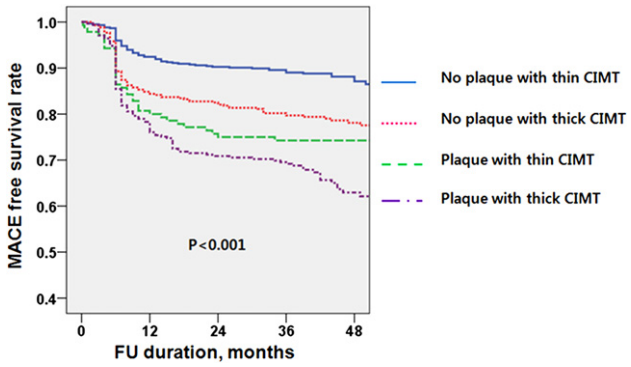
Background and Objectives: Carotid intima-media thickness (CIMT) and plaque are both important in primary prevention. However, it is still unclear which one is more important in prognosis in patients with coronary artery disease (CAD).
Subjects and Methods: The study population, consists of 1473 consecutive patients with CAD, was followed up for a mean of 40.7 months (maximum 126 months). Study population was divided into 4 groups according to the CIMT (≥0.79mm, median value) and the presence of carotid plaque.
Results: Patients with plaque and thick CIMT (n=309, 21.0%) were older and had higher prevalence of hypertension and diabetes mellitus than those with plaque and thin CIMT (n=140, 9.5%), those without plaque and thick CIMT (n=429, 29.1%) and those without plaque and thin CIMT (n=595, 40.4%). In univariate analysis, patients with plaque and thick CIMT had higher mortality (8.1% vs. 5.7%, 2.1% and 2.0%, respectively, p<0.001), restenosis (15.2% vs. 12.1%, 12.4% and 5.4%, respectively, p<0.001), hospitalization for congestive heart failure (4.5% vs. 2.1%, 2.3% and 1.0%, respectively, p=0.005) and total MACE (35.0% vs. 27.1%, 22.6% and 12.3%, respectively, p<0.001) than the other groups. Multivariate Cox regression analysis showed that the independent predictors of total MACE were carotid ultrasound findings (HR 1.4.6, 95% CI 1.276 to 1.549, p<0.001) and diabetes mellitus (HR 1.360, 95% CI 1.066 to 1.736, p=0.013).
Conclusion: Carotid ultrasound findings are important predictor in patients with CAD. Presence of carotid plaque is more important than CIMT in prognostic power.



P1.03
AORTIC STIFFNESS MEASUREMENT IMPROVES THE PREDICTION OF ASYMPTOMATIC CORONARY ARTERY DISEASE IN STROKE/TIA PATIENTS

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Background: Aortic stiffness is an independent predictor of coronary events. We assessed the predictive value of aortic stiffness for ≥50% asymptomatic coronary artery disease (CAD) in a stroke population.
Methods: From January 2006 to February 2009, 300 consecutive patients aged between 45 and 75 years with non disabling, non cardioembolic ischemic stroke or TIA, and no prior history of CAD were enrolled in the study. CAD was assessed with 64-section CT coronary angiography and all patients had a detailed cervicocephalic arterial work-up. Aortic stiffness was determined from carotid-femoral pulse wave velocity (PWV) using 12m/s as cut-off value. The predictive value of aortic stiffness was assessed by logistic regression and reclassification tables method after adjustment for the Framingham Risk Score (FRS) and the presence of cervicocephalic stenosis, which were previously shown to be independent predictors of ≥50% asymptomatic CAD.
Results: Among the 274 included patients who had CT coronary angiography, 26% (95% CI, 21%-32%) had an increased stiffness (PWV>12m/s) and 18% (14%-23%) had ≥50% asymptomatic CAD. Increased aortic stiffness was associated with the presence of ≥50% asymptomatic CAD, both in univariate (OR=3.4 [1.8-6.4]) and multivariate analyses (OR=2.3 [1.2-4.7]) after adjustment for FRS and presence of cervicocephalic stenosis. After PWV was added to the standard model including FRS and the presence of cervicocephalic stenosis, net reclassification improvement was 12.6% (p<0.005) and integrated discrimination index was 2.51% (p=0.025) and model fit was improved (likelihood ratio=4.99, p=0.025).
Conclusion: In stroke/TIA patients, aortic PWV improves risk prediction for the presence of ≥50% asymptomatic CAD.

P1.04
SYSTOLIC TIME INTERVALS DERIVED FROM CAROTID ARTERY DISTENSION WAVEFORMS FOR INTEGRATED CARDIOVASCULAR RISK ASSESSMENT

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Background: Circulatory biomechanics dictate that, with given arterial compliance and pulse pressure, left ventricular ejection and isovolumic-contraction durations (T_{ej} and T_{ic}) reflect systolic ventricular function. Cardiovascular risk assessment, therefore, may benefit from accessible and reproducible measurement of these systolic time intervals (STI). We recently developed a tool to extract STI from carotid artery distension

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waveforms. We used it here to investigate whether systolic ventricular function is different in patients requiring chronic beta-blockade (BB) compared to controls.

Methods and Results: In 81 patients on BB and 87 age- (61±7yrs) and sex-matched untreated controls, we obtained untreated STI and blood pressures. BB patients discontinued medication 1 day prior to measurements. Intra-session coefficients of variation for T_{ej} and T_{ic} were 0.8% and 6.8%; and inter-session 2.7% and 8.4% (i.e. $100\% \cdot SD_{intra/inter}$/mean).

T_{ej} and pulse pressure (PP), thus the $PP \cdot T_{ej}$ product reflecting ventricular stroke work, were significantly greater in (untreated) BB patients (all $p<0.002$). T_{ic} was not different between the groups. The T_{ic}/T_{ej} ratio was smaller for the BB group ($p=0.04$), indicating increased systolic ventricular function, likely matching the greater stroke work required.

	T_{ic} ms	T_{ej} ms	R-R int. ms	T_{ic}/T_{ej} %	DBP mmHg	SBP mmHg	PP mmHg	$PP \cdot T_{ej}$ mmHg · s
BB	34 ± 7	286 ± 27	908 ± 148	12 ± 3	75 ± 10	137 ± 19	61 ± 13	18 ± 5
Ctrls	35 ± 7	274 ± 22	885 ± 145	13 ± 3	77 ± 10	133 ± 17	56 ± 11	15 ± 3
*p-val.	0.36	0.0017	0.32	0.04	0.41	0.15	0.006	0.0005

*Paired t-test. Tic/Tej: approximate Tei index; $PP \cdot T_{ej}$, stroke work (pressure-time product).

Conclusions: Patients requiring chronic beta-blockade have longer ventricular ejection periods combined with greater pulse pressures, indicating greater ventricular stroke work and thus enhanced systolic function. Our findings readily demonstrate the accessibility and reproducibility of non-invasive STI measurement in a clinical population.

P1.05
EFFECT OF AGING ON THE ANNUAL CHANGES OF CENTRAL HEMODYNAMIC INDICES IN MIDDLE-AGED MEN: A PROSPECTIVE EVALUATION

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Objective: To examine the effects of aging on the annual changes of the pressure wave reflection (PWR) and central blood pressures (CBPs), prospectively. Background**:** Such prospective study has not been conducted.
Methods: In 1291 middle-aged men, the first and second peaks of the radial systolic pressure waveform (SBP1 and SBP2), the radial augmentation index (rAI), reflected wave transit time (RWTT) and the brachial-ankle pulse wave velocity (baPWV), were measured twice in a 3-years' interval.
Results: Subjects were divided into three groups {aged <40 years old (aged 30); <40 aged <50 years old (aged 40); and aged>50 years old (aged 50)}. The change of rAI was higher and that of RWTT was lower in aged 30 group than in aged 50 group ($p<0.01$), but that of SBP2 was similar among the groups. The change of RWTT, but not that of baPWV, had a significant inverse relationship with that of rAI in all groups ($p<0.01$). Stepwise multivariate analysis demonstrated that the accounting rate of change of SBP1, but not that of rAI, for the variance in that of SBP2 was increased in a phased manner along with age.
Conclusion: In middle-aged men, aging may differently affect PWR and CBPs. Aging may prolong the time of PWR and blunt that arterial stiffness increases PWR. These phenomena may contribute to the aging-related attenuation of annual increase of PWR. However, aging may not affect the annual elevations of CBPs, because the incident pressure wave may compensate the aging-related attenuation of their elevations by PWR.

P1.06
BLOOD PRESSURE VARIABILITY IN RELATION TO AUTONOMIC NERVOUS SYSTEM DYSREGULATION: THE X-CELLENT STUDY

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To investigate the association of autonomic nervous system dysregulation with blood pressure variability. Of 2370 participants in the X-CELLENT study, 577 patients (59.0±10.2 years) were randomly selected to participate in an ambulatory blood pressure monitoring ancillary study. We proposed a novel autonomic nervous system regulation index termed dSBP/dHR, which was defined as the steepness of the slope of the relationship between 24h systolic blood pressure and heart rate for each participant. Within-subject standard deviation of systolic blood pressure, weighted for the time interval between consecutive validated readings from 24h ambulatory blood pressure monitoring, was used to evaluate blood pressure variability. When dSBP/dHR was divided into tertiles, from tertile 1 to tertile 3, we observed a progressive increase in daytime systolic blood pressure, a progressive decrease in nighttime systolic blood pressure, and consequently a progressive increase in day-night systolic blood pressure gradient ($P<0.001$). On the contrary, standard deviation of both daytime and nighttime systolic blood pressure were consistently and significantly increased from tertile 1 to tertile 3 ($P<0.01$). Both before and after adjustment for age, gender and 24h mean blood pressure, all of these increasing or decreasing trends reached statistical significance ($P<0.01$). Furthermore, in our sensitivity analysis, when men and women were considered separately, the present finding remained unaltered. In summary, autonomic nervous system dysfunction was associated with the enlarged day-night systolic blood pressure gradient and more variable systolic blood pressure in 24 hours in patients with essential hypertension.

P1.07
CAROTID FUNCTION AND BARORECEPTOR SENSITIVITY IN MODERATE CHRONIC KIDNEY DISEASE: THE EPP3 STUDY

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Introduction: Short-term variation of blood pressure (BP) is largely controlled by autonomic function though the baroreflex. Carotid distension rate was recently introduced instead of BP to evaluate the carotid function and neural component of the baroreflex in small populations. Autonomic dysfunction and arterial stiffness occurs in patients with severe chronic kidney disease (CKD) but little is known in moderate CKD.
Aims: To study the baroreflex and to analyse the link with the carotid function in moderate CKD.
Methods: From the EPP3 cohort, 123 patients with moderate CKD (Stage 3A) and 615 controls with GFR≥60ml/min1.73m^2, matched for age, gender and body surface area were enrolled (age 64±6 years). Carotid measurements were performed by a high-resolution echotracking device. Spontaneous BRS was calculated with the fast Fourier transform of carotid distension rate and R-R interval in the low-frequency (LF) range (0.04-0.15 Hz).
Results: Internal diastolic diameter, intima-media thickness, circumferential wall stress, carotid pulse pressure, R-R interval and BRS were comparable between the two groups. Carotid strain and distensibility were significantly reduced, elastic incremental modulus and carotid stiffness were significantly increased in CKD.
Neural baroreflex appeared very sensitive to vascular component since carotid strain was the strongest determinants of BRS in both groups (Fig-1). The explained BRS variability was higher in patients with CKD ($R^2=0.31$) than in controls ($R^2=0.14$).
Conclusions: In moderate CKD we detected carotid dysfunction and no changes in neural baroreflex. The role of carotid strain, as a determinant of neural baroreflex, is confirmed in moderate CKD and in controls.

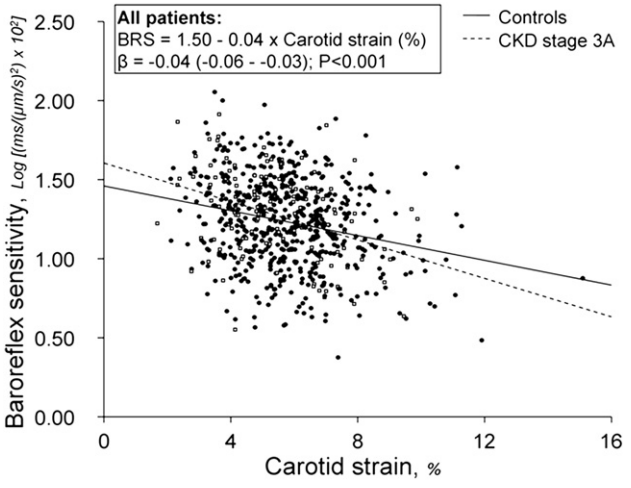

Fig -1