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P1.31

INCREASED VASCULAR AGE IN TREATED HYPERTENSIVE PATIENTS WITH ELEVATED AUGMENTATION INDEX

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Objective: To identify clinical and vascular parameters associated with increased augmentation index (Aix) in treated hypertensive patients.

Methods: Hypertensive patients, aged 30–74 years, were evaluated using high-resolution ultrasonography for brachial flow-mediated dilation (FMD), EndoPat 2000 for peripheral arterial tonometry and Sphygmocor to obtain central hemodynamic parameters. Vascular age was calculated after estimating Framingham risk score. Patients (n=177) were distributed into three equal groups (n=59 each) according to Aix values: 1st tertile (T1) Aix<28%, 2nd tertile (T2) Aix 28–37%, 3rd tertile (T3) Aix>37%.

Results: The mean age was not different among the groups (55±11 vs 57±10 vs 58±8 years). T3 group presented significant increase in brachial SBP (139±17 vs 145±17 vs 151±22 mmHg, p=0.006), aortic SBP (126±16 vs 138±17 vs 148±24 mmHg, p<0.001), and aortic pulse pressure (41±10 vs 49±14 vs 60±21 mmHg, p<0.001). Aix obtained by EndoPat (14±13 vs 30±19 vs 30±18 %, p<0.001) and vascular age (71±16 vs 77±13 vs 78±12 years, p=0.019) were significantly greater in T2 and T3 comparing to T1. There was no significant differences in endothelial function evaluated by brachial FMD (7.5±5.1 vs 8.9±5.5 vs 9.2±6.7 %) and through reactive hyperemia index by EndoPat (1.9±0.5 vs 2.2±0.7 vs 1.9±0.4 units). Aix was not correlated to age, but was significantly correlated to vascular age (r=0.22, p=0.005), brachial SBP (r=0.21, p=0.006) and to aortic SBP (r=0.40, p<0.001).

Conclusion: In this population of treated hypertension, increased vascular stiffness characterized by an elevated augmentation index was associated to increased vascular age but not with worse endothelial function.

P1.32

GENDER DIFFERENCES RELATED TO INCREASED VASCULAR AGE IN HYPERTENSIVE PATIENTS

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Objective: To characterize gender differences in clinical and vascular parameters in treated hypertensive patients with increased vascular age.

Methods: Hypertensive patients, both genders, aged 30–74 years, were included. Brachial flow-mediated dilation (FMD) and carotid-femoral pulse wave velocity (cfPWV) were evaluated, cfPWV was normalized by mean BP (cfPWV-N). Vascular age was calculated according to Framingham Heart Study. The median of vascular age was 76 years, and subjects were divided into four groups: women with lower vascular age (LVA, <76 years, n=50) or higher vascular age (HVA, ≥76 years, n=82), men with LVA (n=26) or HVA (n=27).

Results: LVA men presented greater systolic BP (143±15 vs 132±16 mmHg, p<0.01) compared to LVA women, but no difference between gender was observed in HVA groups (154±15 vs 152±17 mmHg) and diastolic BP was similar in LVA (88±10 vs 88±13 mmHg) and in HVA (89±10 vs 92±14 mmHg) groups. Men with HVA presented greater cfPWV (12±2 vs 10±2 m/s, p<0.05), cfPWV-N (11±2 vs 9±2 m/s, p<0.05) compared to HVA women. FMD was significantly reduced in women when compared LVA and HVA groups (11±7 vs 6±5 %, p=0.003), but no significant difference was noted in men due to reduced values even in LVA group (8±5 vs 6±5 %, p=0.766).

Conclusion: In this population of treated hypertensive patients, endothelial dysfunction developed earlier in men than in women, and vascular stiffness was more exacerbated in men with higher vascular age, showing more premature and advanced vascular disease in this gender.

P1.33

PREDICTORS OF ARTERIAL MARKERS IN METABOLIC SYNDROME PATIENTS: ARTERIAL HYPERTENSION AND GENDER OUTBID DYSLIPIDEMIA

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Background and aim: Metabolic syndrome (MetS) patients are at increased cardiovascular risk, but the exact mediation of the risk remains a matter

of controversy. Various clusters of the metabolic syndrome components and other risk factors, such as advanced glycation end-products (AGE) and glycated hemoglobin (HbA1c), are considered, but large-scale studies are lacking. Therefore we aimed to investigate predictive value of MetS components and other factors on the arterial markers as a surrogate endpoint of cardiovascular risk.

Methods: A cross-sectional study of 3168 MetS subjects (aged 55±5, 69% women) was carried out by assessing various traditional and nontraditional cardiovascular risk factors and variety of arterial markers: intima media thickness (IMT), carotid, radial-femoral and aortic stiffness, ankle-brachial stiffness index (CAVI), endothelial function in brachial artery, finger and skin.

Results: The most common determinants of arterial markers by multiple linear and logistic regression analysis (p<0.05) were arterial hypertension (AH) and gender. Significant predictors of endothelial function in microcirculation predominantly were AH and glycemia-related parameters: AGE and HbA1c in finger, and fasting glucose in skin. In the brachial artery, endothelial function was predicted by age, AH and gender. Gender, AH, obesity markers, and glucose abnormalities were significant predictors of IMT and various arterial stiffness parameters. However, typical dyslipidemia remained a significant predictor of only 2 out of 14 arterial parameters assessed, namely, of IMT and CAVI.

Conclusion: Our study suggests that gender and hypertension, but not dyslipidemia, are the most common determinants of the variability of arterial parameters in subjects with MetS.

P1.34

A HYPERTENSIVE RESPONSE TO EXERCISE INDEPENDENTLY PREDICTS CARDIOVASCULAR EVENTS AND MORTALITY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: The prognostic relevance of a hypertensive response to exercise (HRE) is ill-defined in individuals undergoing exercise stress testing. The aim of this study was to conduct a systematic review and meta-analysis of published literature to determine the value of exercise BP (independent of office BP) for predicting cardiovascular (CV) events and mortality.

Methods: Online databases were searched for published longitudinal studies reporting exercise BP and CV event and mortality rates. Twelve longitudinal studies were identified for review with a total of 46,314 individuals free of significant coronary artery disease with total CV event and mortality rates recorded over a mean follow-up of 15.2 ± 4.0 years.

Results: After adjustment for age, office BP and CV risk factors, an HRE at moderate exercise intensity carried a 36% increased rate of CV events and mortality (95% CI: 1.02-1.83, p=0.039) compared to those with no HRE. Additionally, per 10 mmHg increase in exercise systolic BP at moderate intensity, there was a 4% increase in CV events and mortality, independent of office BP, age and CV risk factors (95% CI: 1.01-1.07, p=0.018). Systolic BP at maximal workload was not significantly associated with increased rate of CV outcomes, whether analysed as a categorical (HR=1.49, 95% CI: 0.90-2.46, p=0.118) or continuous (HR=1.01, 95% CI: 0.98-1.04, p=0.528) variable.

Conclusion: An HRE at moderate exercise intensity during exercise stress testing is an independent risk factor for CV events and mortality. This highlights the need to determine underlying pathophysiological mechanisms and appropriate management of patients with exercise hypertension.

P1.35

BLOOD PRESSURE VARIABILITY ASSOCIATES WITH CAROTID INTIMA-MEDIA THICKNESS BUT NOT CAROTID DISTENSIBILITY AND PULSE WAVE VELOCITY IN 1125 PARTICIPANTS

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Background: Controversy exists regarding the prognostic relevance of blood pressure variability. Recent evidence suggests that variability is involved in the development of atherosclerosis. We therefore investigated

the relationship of structural and functional markers of large arteries with blood pressure variability.

Methods: Our study sample consisted of 1125 randomly selected participants (mean age: 42.4 years; 49.3% women). One trained researcher conducted vascular measurements, including carotid intima-media thickness (IMT), carotid distensibility and carotid-femoral pulse wave velocity (PWV). Systolic blood pressure (SBP) was measured 5 times consecutively. We assessed within-subject variability independent of the mean (VIM).

Results: SBP and VIM averaged 127.9 mm Hg and 3.86 units, while the vascular measurements averaged 0.70 mm, 6.62 m/s and $24.7 \cdot 10^{-3}$ /kPa for IMT, PWV and carotid distensibility, respectively.

In single regression, IMT correlated with SBP ($r=0.27$, $p<0.0001$) and VIM ($r=0.22$; $p<0.0001$). Similarly, PWV and the carotid distensibility correlated with both SBP (PWV, $r=0.34$; $p<0.0001$; carotid distensibility, $r=-0.32$, $p<0.0001$) and VIM; however, the associations with VIM were weaker (PWV, $r=0.07$; $p=0.025$; carotid distensibility, $r=-0.09$, $p=0.003$). After adjusting for sex and age, and other covariables, the associations of IMT with SBP ($\beta=0.029$, $p<0.0001$) and VIM ($\beta=0.036$, $p<0.0001$) remained. However, those between PWV ($\beta=0.044$, $p=0.45$), carotid distensibility ($\beta=-0.53$, $p=0.28$) and VIM disappeared. PWV ($\beta=0.353$, $p<0.0001$) and carotid distensibility ($\beta=-2.92$, $p<0.0001$) remained associated with SBP.

Conclusion: In the FLEMENGHO cohort, blood pressure variability relates to carotid IMT, but not the indexes of arterial stiffness.

P1.36

ARTERIAL STIFFNESS AND MARKERS OF OXIDATIVE STRESS HAPTOGLOBIN AND HOMOCYSTEINE IN NEVER TREATED INCIDENT HYPERTENSIVE PATIENTS

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Introduction: Hypertension is a major risk factor for development of cardiovascular disease (CVD). Arterial stiffness is a risk predictor of CVD in this patient group. Oxidative stress has been implicated in the development of arterial stiffness. Haptoglobin (Hp) and homocysteine (Hcy) are well documented markers of oxidative stress. We hypothesized that Hp and Hcy are associated with arterial stiffness in never treated incident hypertensive patients.

Methods and Material: We examined 125 patients with newly diagnosed never treated hypertension. Patients had 24h ambulatory blood pressure (BP) measurement (Spacelabs Healthcare®, Hertford, UK) performed and were eligible if daytime BP was $\geq 135/85$ mmHg. Arterial stiffness expressed as carotid-femoral pulse wave velocity (cfPWV), augmentation index at heart rate 75 (Alx@75), and central systolic blood pressure (cenBP) were measured with the SphygmoCor® device (Atcor Medical®, Sydney, Australia). Hp and Hcy were determined using rate nephelometry (Beckmann IMMAGE™, DK).

Results: Patient baseline characteristics are shown in the Table. In a univariate correlation Hp showed a weak association with Alx@75 ($r=0.16$, $p=0.04$) which in an adjusted regression model remained significant ($r^2=0.45$, $p=0.02$). Hp was not associated with cfPWV or cenBP nor was there any association between Hcy and cfPWV, Alx@75, and cenBP.

Conclusion: Only Hp was associated with arterial stiffness (Alx@75) whereas no other associations were found. Thus, Hcy appear not to be associated with arterial stiffness in hypertension and further studies are warranted to elucidate the role of Hp as a risk marker in hypertension.

P1.37

RISK FACTORS FOR INTIMAL HYPERPLASIA DEVELOPMENT AFTER CAROTID ENDARTERECTOMY

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Background: Intimal hyperplasia is a common complication occurring after carotid endarterectomy (CEA), although pathological mechanisms leading to its progression are not totally clear.

Methods: In our study we assessed a role of various factors including age, gender, hypertension, history of smoking, hyperlipidaemia, diabetes mellitus, lesions characteristics, type of arteriotomy closure and regional flow dynamics affecting intima-media thickness (IMT) past CEA. We examined 1003 patients prior to and 1 year after carotid endarterectomy using standardized duplex ultrasound examination. The median age of patients was 60 ± 15 years. Univariate and multivariate regression analysis was used to identify major risk factors and possible correlations between them.

Results: Only 2 of systemic factors - elevated level of low-density lipoprotein and platelet aggregation were found to have a minor (although statistically significant) effect on IMT after CEA. Age, gender, hypertension, smoking were not significantly associated with the development of intimal hyperplasia past CEA. Complicated plaques showed a significant correlation with intimal hyperplasia. There were no significant differences in IMT between patients who have had eversion CEA versus CEA with patch. Of local factors, only shear stress demonstrated a negative correlation with IMT.

Conclusions: Our results demonstrate that multiple risk factors could be involved in the development of intimal thickening after CEA.

P1.38

RELATIONSHIP BETWEEN ANKLE BRACHIAL INDEX AND OTHER INDICES OF TARGET ORGAN DAMAGE IN HYPERTENSIVE PATIENTS

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Objective: Assessment of ankle brachial index (ABI) is a method of peripheral artery disease diagnosis. Its role has been established as a predictor of cardiovascular events. The role of ABI in the hypertensive patients without cardiovascular has not been studied. The aim of study was assessment of the relationship between ABI, target organ damage and ambulatory blood pressure in hypertensives.

Methods: 355 hypertensive patients (199 males, 56%) without history of renal or cardiovascular disease were examined. The ambulatory blood pressure (Spacelabs 90207), echocardiography (Vivid 7 Pro™), carotid intima-media thickness (IMT, ArtLab system), carotid-femoral pulse wave velocity (PWV) and central blood pressure (Sphygmocor) were measured. Ankle brachial index (blind Doppler), left ventricular mass index, and estimated glomerular filtration rate (eGFR, MDRD formula) were calculated.

Results: In the population ABI (mean 1.05 ± 0.11) was weakly related to central pulse pressure ($r=-0.12$; $p=0.02$), but not to central SBP ($r=0.04$; $p=NS$). ABI was not linked to 24-h SBP ($r=0.03$; $p=NS$), 24-h pulse pressure ($r=0.08$, $p=NS$), LVMI ($r=0.01$; $p=NS$), or eGFR ($r=0.10$; $p=NS$). There was no correlation between ABI and other indices of arterial wall properties: IMT ($r=0.06$; $p=NS$) or PWV ($r=0.03$; $p=NS$).

Conclusion: ABI is weakly related to central pulse pressure, but not to ambulatory or central blood pressure. ABI is not linked to other markers of cardiac and vascular damage in hypertensives without cardiovascular disease.

P1.39

LOW SHEAR STRESS INDUCES PROGRESSION OF INTIMAL HYPERPLASIA AFTER CAROTID ENDARTERECTOMY

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Background: The progression of intimal hyperplasia after carotid endarterectomy (CEA) is influenced by local hemodynamic factors. In our study we investigated associations between flow volume, velocity, shear stress and the intimal hyperplasia (IH) of the common carotid artery after CAE.

Methods: 1009 patients (60 ± 15 years, 86% of which were male) who had had CEA between 2001 and 2011 were included in our study. Blood velocity, internal diameter, flow volume and intima-media thickness were measured using standardized duplex ultrasound examination at 3, 6, 9 and 12 months after operation. Shear stress was calculated as blood viscosity multiplied by blood velocity divided by internal diameter.