P.074: EFFECT OF SMOKING ON ARTERIAL STIFFNESS IN PATIENTS WITH WHITE COAT HYPERTENSION

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Arterial stiffness is an independent predictor of cardiovascular morbidity and mortality in hemodialysis (HD) patients. Determinants of arterial stiffness and its change during HD are not well characterized, and it is not known if parameters of calcium-phosphate metabolism predict arterial wall properties.

We measured carotid-femoral pulse wave velocity (PWV) and carotid augmentation index (AI) before and after HD in 96 chronic HD patients using the PulsePen device. Detailed medical history was taken and blood drawn for routine biochemistry before and after HD. Determinants of PWV and AI and their corresponding changes during HD were assessed by stepwise forward multivariate linear regression models.

Mean pre- and postdialysis PWV was 11.0 ± 2.9 and 11.6 ± 2.9 m/s (P=0.004) respectively. Mean pre- and postdialysis AI was 23.5 ± 12.2 and $22.1 \pm 12.4\%$ (P=NS). Significant and independent predictors of predialysis PWV (R for the whole model =0.79) were higher age, systolic blood pressure and CRP level, lower serum sodium level, and the presence of peripheral artery disease. Predictors of predialysis AI (R=0.42) were higher systolic blood pressure and higher time averaged creatinine value. The increase in PWV during dialysis was independently associated (R=0.53) with lower predialysis PWV, higher baseline heart rate, higher urea level and systolic blood pressure change during dialysis. Change in AI during dialysis was significantly and negatively associated (R=0.55) with predialysis AI and the heart rate change during dialysis.

Our results confirm previously described predictors of PWV and AI. Parameters of calcium-phosphate metabolism do not seem to influence arterial stiffness before or after dialysis. The relation of serum sodium level to predialysis PWV may imply volume overload that is to be explored.

P.071
METABOLIC SYNDROME DEFINITIONS AND VASCULAR PHENOTYPE

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Background: The increasing prevalence of obesity has recently become a major public health concern. Controversy has arisen regarding how best to characterise this risk with several definitions of a ''metabolic syndrome'' (MS) proposed to identify those at greatest risk. Controversy has arisen regarding the ability of these definitions to predict cardiovascular risk. We assessed the relationship between MS criteria and arterial phenotype in a large population based cohort.
Methods: 3437 British civil servants aged 51-74 who were free from clinical cardiovascular disease and diabetes mellitus were studied (Whitehall II study). RFs were measured and carotid intima-media thickness (cIMT) assessed. Participants were categorised into 3 groups according to IDF and ATP$_{III}$ criteria; Groups 1 (no MS; n=2712); 2 (MS by IDF criteria only; n=349); 3 (MS by ATP$_{III}$ only or both ATP$_{III}$ and IDF criteria; n=376).
Results: cIMT was increased in groups 2 and 3 compared to controls (both p<0.001). These differences remained after adjusting for other RFs. Groups 2 and 3 had similar cIMT. In addition, non obese participants with one or more MS risk factors (defined by IDF criteria) had significantly greater cIMT compared to controls (p<0.001), an association that remained after further adjustment for RFs.
Conclusion: MS, defined by both ATP$_{III}$ and the recent IDF criteria, identifies a population with increased cIMT. However, we also show that restricting the diagnosis of MS to those with abdominal obesity, as recommended by the IDF, may miss an important population with MS risk factors who have an adverse vascular phenotype.

P.072
PARENTAL SMOKING AND VASCULAR DAMAGE IN YOUNG ADULT OFFSPRING: IS EARLY LIFE EXPOSURE CRITICAL? THE ATHEROSCLEROSIS RISK IN YOUNG ADULTS STUDY

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Background: little is known of the consequences of tobacco smoking in pregnancy for cardiovascular risk in offspring.

Objectives: To estimate the association between foetal tobacco smoke exposure and vascular damage in young adulthood.
Participants: A birth cohort of 732 young adults born between 1970-1973.
Measures: Registered pregnancy and birth data, anthropometry and cardiovascular risk profiles in young adulthood, including ultrasound measurement of common carotid artery intima-media thickness (CIMT). Pregnancy and current smoking habits data of parents were obtained by standardized questionnaires.
Results: Twenty nine percent of the mothers reported to have smoked during their pregnancy. Adult offspring of mothers who smoked had 13.4 μm thicker CIMT (95% CI: 5.5, 21.3; p=0.001) than offspring of mothers who did not smoke in pregnancy. Adjustment for known CIMT risk factors (participant's age, gender, BMI, pulse pressure, and LDL-cholesterol) did not abolish this estimate (9,4 μm, 95% CI: 1.9, 16.3; p=0.01). Similarly, adjustment for current smoking of parents did not change the association (10.6 μm, 95% CI: 0.4, 20.8; p=0.04) nor did adjustment for participants' current smoking (yes/no) and pack-years (11.5 μm, 95% CI: 3.5, 19.4; p=0.004). Offspring of parents who both smoked in pregnancy had thicker CIMT than offspring with one or no smoking parent (p $_{linear\ trend}$ <0.0001), and offspring of particularly mothers who smoked an above median number of cigarettes in pregnancy had thicker CIMT than those smoking less than median or no cigarettes (p $_{linear\ trend}$ <0.0001).
Conclusion: Permanent vascular damage due to tobacco smoke exposure is initiated in gestation.

P.073
LONGITUDINAL DEVELOPMENT OF WAIST AND HIP CIRCUMFERENCES: INDEPENDENT AND OPPOSITE ASSOCIATIONS WITH PRE-CLINICAL ATHEROSCLEROSIS. THE AMSTERDAM GROWTH AND HEALTH LONGITUDINAL STUDY

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Introduction: Anthropometric measures of body fat distribution have shown that waist (WC) and hip (HC) circumferences have opposite and independent associations with atherosclerotic risk factors and disease. However, this evidence is confined to cross-sectional studies only. How the development over time of these anthropometric measures impact on pre-clinical atherosclerosis is not known.
Methods: Longitudinal data on WC and HC were derived from the Amsterdam Growth and Health Longitudinal Study (n=372, 197 women; 3 follow-up measures at the ages of 27, 32 and 36 yrs). Carotid intima-media thickness (IMT), a marker of pre-clinical atherosclerosis, was assessed by non-invasive ultrasonography when subjects were 36-yrs-old. We used generalized estimating equations to compare the patterns of development of WC and HC (adjusted for each other and for potential confounders − i.e. physical fitness, alcohol and smoking habits) over the 9-yr follow-up period between those subjects with 'high' (highest sex-specific quartile) *vs.* 'normal' (lower 3 quartiles) of carotid IMT at the age of 36 yrs.
Results: In men, WC increased and HC decreased significantly between the ages of 27 and 36 (p<0.001), but no differences in these longitudinal patterns of development were found between those with 'high' vs. normal carotid IMT at age 36. In women, however, the increase in WC was 3.47 cm (0.98 to 5.96) greater in those with 'high' vs. 'normal' IMT; in addition, the HC decreased considerably more in those with 'high' vs. 'normal' IMT [-3.60 cm (-6.54 to -0.65].
Conclusion: The development of broader waist (possibly reflecting accumulation of abdominal fat throughout the years) and narrower hip circumferences (reflecting loss of peripheral fat and/or muscular mass) during young adulthood are independent determinants of pre-clinical atherosclerosis, particularly in women.

P.074
EFFECT OF SMOKING ON ARTERIAL STIFFNESS IN PATIENTS WITH WHITE COAT HYPERTENSION

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Background: Patients with essential hypertension have higher arterial stiffness indices, while smoking is related to a stiff vascular tree. However,

the effect of smoking on arterial stiffness in white coat hypertensive (WCH) patients has not been investigated yet.

Methods: The study comprised 375 WCH patients (mean age 52 years, 149 male). The diagnosis of WCH was confirmed by a 24h Ambulatory Blood Pressure Monitoring (ABPM) into normal range. The augmentation index (AIx), a measure of arterial wave reflections, was measured by applanation tonometry (SphygmoCor), while carotid-brachial Pulse Wave Velocity (PWVc-r) and carotid-femoral PWV (PWVc-f) were measured with Complior. AIx was corrected for heart rate (AIx_{75}). Current smoking status was assessed with a standardized questionnaire.

Results: The study cohort was divided in 129 smokers and 246 non-smokers, who did not differ in SBP, BMI, heart rate and total cholesterol (p=NS). In multivariate analysis after adjusting for age and gender, AIx_{75} was higher in smokers compared to non-smokers (26.8 vs 22.5, p<0.001). PWVc-r was also higher in smokers compared to non-smokers (8.3 ± 0.9 vs 8.0 ± 1.2, p<0.05), while no significant difference was noticed in PWVc-f. When we examined the correlation of smoking with the arterial stiffness indices, we noticed a significant correlation of AIx_{75} with pack-years (r=0.278, p<0.001), while the stronger correlation was noticed in years of smoking with PWVc-f (r=0.425, p<0.001) and with AIx_{75} (r=0.649, p<0.001). After adjusting for age and gender, the correlation of years of smoking with AIx_{75} remained significant (r=0.355, p<0.0001).

Conclusion: Smoking affects wave reflections and arterial stiffness in WCH patients. Specifically, intensity/duration of smoking affects both wave reflections and arterial stiffness whereas smoking duration is a burden only to wave reflections.

P.075
TISSUE CHARACTERIZATION OF CAROTID WALL IN MILDLY DISEASED ARTERIES: COMPARISON OF VIDEODENSITOMETRIC ANALYSIS AND INTEGRATED BACKSCATTER

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Background: Integrated backscatter analysis (IBS) is the reference technique for tissue characterization by ultrasound. However, this approach is equipment-dependent, so that its practical use on wide-scale basis is limited. By contrast, videodensitometric analysis (VDA) on 2D images can be performed on standard recordings.

Aim of the study: To compare results of VDA against IBS on common carotid artery wall (CCA) in a study population including normal subjects and patients with cardiovascular risk factors.

Methods: Sixty subjects (fifty males, age 49 ± 11) referred for diagnostic carotid scan, were studied by high resolution system (7.5 MHz linear probe) implemented with acoustic densitometry package for IBS assessment. Diastolic CCA images were acquired bilaterally in 2D mode and IBS. IBS and VDA were performed in regions of interest including the intima-media (IMT), one cm before the flow divider.

Results: On 120 arteries (average IMT 0.71 ± 0.29 mm), mean IBS value (dB) was directly related to mean gray levels (r = 0.357, p< 0.001). Mean gray levels and their standard deviation correlated each other (r =0.71, p<0.0001). A significant relation (p<0.05) with age was found for IMT (direct, r = 0.25) and mean IBS (inverse, r = -0.22), but not for mean gray levels.

Conclusion: VDA of CCA IMT may represent an acceptable surrogate estimate for tissue characterization, of possible interest for multicentre studies. The inverse relation of mean IBS value with age is in keeping with the hypothesis of an age-related atheromasic deposition. IBS may have higher sensitivity in differentiating early atherosclerosis from ''healthy'' arterial aging.

P.076
EFFECTS OF REGULAR TRAINING ON PERIPHERAL ARTERIAL COMPLIANCE IN YOUNG HEALTHY MALES

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Physical activity is known to have beneficial effects on prevention of cardiovascular disease. The regular aerobic exercise is associated with higher central arterial compliance, but its effect on peripheral arterial compliance is controversial. The aim of our study was to measure the small artery compliance and its changes provoked by 0.1Hz breathing and mental stress in young healthy males.

Experiments were performed on 21 healthy adults, 19-24 years old (12 physically trained - group A, 11 sedentary controls - group B). We measured ECG, arterial blood pressure and finger artery compliance at rest, 3 minutes during 0.1Hz breathing and 3 min during mental stress. A noninvasive method was used to measure finger artery compliance, compliance index (CI) was calculated. Baroreflex sensitivity (BRS) was determined using the sequential method.

Our results revealed elevated CI in group A compared to group B (3.42 ± 0.30 and 1.28 ± 0.31, p=0.004) at rest, but no significant differences in CI between groups during both physiological stimuli. CI decreased during 0.1Hz breathing (1.53 ± 0.20, p=0.003) and mental stress (0.87 ± 0.13, p=0.002) in group A, but only during mental stress in group B (0.59 ± 0.12, p=0.03). BRS did not differ between groups, but was significantly reduced in both groups during mental stress. There were no differences in heart rate, systolic and diastolic blood pressure between groups, neither at rest nor during stimuli.

We conclude that regular aerobic exercise increases peripheral arterial compliance. Surprisingly the increase was not associated with a greater BRS indicating that peripheral mechanisms govern peripheral arterial properties.

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IN VIVO VALIDATION OF A NON-INVASIVELY MEASURED LOCAL PULSE WAVE VELOCITY: IMPROVED PERFORMANCE USING AORTIC VALVE CLOSURE IN STEAD OF AORTIC VALVE OPENING

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Introduction: High resolution multiple M-line ultrasound can be used to obtain local pulse wave velocity, by tracking the propagation of characteristic time-points of the distension waveform over an arterial segment. Local PWV provides a direct estimate of the local arterial stiffness.

Method: The left and right CCA of 12 young subjects was measured with multiple M-line ultrasound, resulting in 14 diameter waveforms spaced over 16.4mm. The second derivative of the distension waveforms was calculated to identify aortic valve opening and closure (AVO and AVC). By performing linear regression on M-line positions versus time-points, the local PWV was estimated. Beats were accepted for further analysis if the regression coefficient exceeded 0.9. The DC was measured using brachial-PP and carotid-distension, giving a reference estimate of the PWV using the Bramwell-Hill equation: $PWV_{DC} = 1 / \sqrt{\rho DC}$

Results: PWV_{AVC} (mean=4.91m/s) showed a better intra-subject precision (0.46m/s) than PWV_{AVO} (mean=5.21m/s, precision=1.66m/s). The range of PWV_{DC} (2.8-7.9m/s) is comparable to PWV_{AVC} (3.5-7.3m/s) but not to PWV_{AVO} (2.4-13.2m/s). The correlation between PWV_{DC} and PWV_{AVC} was weak but significant (r=0.69, p<0.001). No correlation between PWV_{DC} and PWV_{AVO} exists.

Discussion: In contrast to PWV_{AVO}, PWV_{AVC} has an acceptable precision (coefficient of variation less than 10%) and correlates with PWV_{DC}. The poor correlation between PWV_{AVO} and PWV_{DC} estimates may be caused by interference of early arterial wave-reflections leading to a biased estimate of PWV_{AVO}. The correlation between PWV_{DC} and PWV_{AVC} is weak, although carotid-PP may improve DC calculation.

P.078
VALIDATION OF A NEW AUTOMATED REAL-TIME MEASURING SYSTEM FOR CAROTID INTIMA−MEDIA THICKNESS ASSESSMENT

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Increased carotid intima-media thickness (C-IMT) is a non-invasive marker of early arterial alterations which is associated with increased cardiovascular risk. The aim of this study is to validate a new real-time automatic system to measure C-IMT. Results are compared with the manual measurements, which are still largely accepted as the gold standard.