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P7.03: MARATHON RUNNERS HAVE INCREASED AORTIC STIFFNESS

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P3.11

INCREASED CAROTID PLAQUE OCCURRENCE IN MEN WITH THE FIBRILLIN-1 2-3 GENOTYPE

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Background: Fibrillin-1 is an important constituent of the vascular wall and earlier studies have indicated an effect of the fibrillin-1 2-3 genotype on blood pressure as well as aortic stiffness. The aim was to determine if the Fibrillin-1 2-3 genotype is associated with increased cardiovascular morbidity/mortality in middle-aged individuals.

Method: The fibrillin-1 genotype was characterized by PCR in 5765 individuals (2424 men, 3341 women 45-69 yrs) recruited from the Cardiovascular Cohort in Malmö Diet and Cancer-study. The intima media thickness (IMT) of the common carotid artery (CCA) was visualised by B-mode ultrasound. The follow up on the number of cardiovascular events (myocardial infarction and stroke) as well as all cause mortality was monitored during 1991 to 2001.

Results: The most common genotypes were 2-2, 2-3 and 2-4 which accounted for 92.2% (n = 5317) of the individuals. There were no differences between the three genotypes regarding age, blood pressures, smoking, glucose, lipids, CCA diameter and IMT.

Regarding the occurrence of plaque in the CCA the men with the 2-3 genotype had more plaque than the 2-2 and 2-4 genotypes, (54% vs 46% and 50%, p = .007). The follow up (mean 8.55 yrs) of cardiovascular events and mortality did however not differ between the genotypes.

Conclusions: The increased plaque occurrence in the carotid artery of middle-aged men with fibrillin-1 2-3 genotype indicates a pathologic arterial wall remodelling with a more pronounced atherosclerotic burden. The effect of the 2-3 genotype on cardiovascular events and mortality seems however to be minor.

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P7.01

CAROTID ATHEROSCLEROSIS AND ENDOTHELIAL DYSFUNCTION IN YOUNG AND MIDDLE-AGED MEN WITH CORONARY ARTERY DISEASE

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Objective: To determine whether the structural status of carotid arteries and abnormal flow-mediated dilatation (FMD) in the brachial artery identify young and middle-aged men with coronary artery disease (CAD).

Methods: A total of 78 men aged 28 to 50 (mean 43 ± 5) years underwent carotid ultrasound and endothelial function measurements. Angiographically documented CAD was present in 49 patients. Those with arterial hypertension, diabetes mellitus or marked hypercholesterolemia (level of LDL cholesterol ≥ 4.9 mmol/l) were excluded from the study.

Results: Patients with CAD more often were smokers, had a history of premature CAD and low level of HDL cholesterol. The mean carotid intima-media thickness (IMT) was 0.88 ± 0.23 mm for patients with CAD and 0.76 ± 0.18 mm for patients without CAD (p = 0.01). The presence of a carotid IMT ≥ 0.9 mm was not significantly differing in both groups. Carotid plaques were present in 45 (91.8%) patients with CAD and in 8 (27.6%) patients without CAD (p < 0.001). Patients with CAD more often had multiple plaques (86.7% vs 13.8%, p < 0.001). Mean brachial artery FMD was less in patients with CAD (4.5 ± 2.8% vs 5.8 ± 2.2%, p = 0.03), but the occurrence of abnormal FMD was the same in both groups.

Conclusion: The presence of carotid plaques in young and middle-aged men is associated with the risk of occurrence of CAD and may be

considered as a more powerful surrogate marker for coronary atherosclerosis than the presence of impaired brachial artery FMD and increase in carotid IMT.

P7.02

BEYOND BLOOD PRESSURE: IS ARTERIAL STIFFNESS MEASUREMENT THE FUTURE FOR PRIMARY CARE? A PILOT STUDY

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Background

In primary care, much effort goes into risk factor management. Early recognition of vascular dysfunction in patients should inform intervention to reduce vascular risk. Very few studies have looked at the application of augmentation index (AI) measurement in primary care, particularly in those with impaired glucose handling (IGH) and type 2 diabetes, who have a higher than usual risk of cardiovascular disease.

Arterial stiffness assessed via AI, with much less variation than BP, increases inexorably with age and is a potential marker for cardiovascular risk. AI is measured by applanation tonometry and is a non-invasive measure of arterial stiffness.

Scientific aims

The main aims are to describe the profile of augmentation index (AI) in patients at elevated cardiometabolic risk. Furthermore to assess its relation to central BP, body mass index (BMI) and HbA1C (type 2 diabetes only) in the age-matched normoglycaemic, IGH and type 2 diabetes participants.

Plan of investigation for pilot study

Using the established primary care register for individuals with IGH and type 2 diabetes in Central and Eastern Cheshire, age-matched consecutive attendees (between June and August 2009) at GP clinics in the area will undergo routine investigations. Central blood pressure and AI will be determined (Omron HEM-9000AI).

Potential impact of pilot study

To determine whether AI as a predictor of cardiovascular risk may be used to identify at risk individuals for more aggressive management.

Evidence to support the use in Primary Care of AI and central BP measurement in patients with IGH and type 2 diabetes.

To help GPs to understand the variation in AI by glucose tolerance status and to determine whether glycaemic control in type 2 diabetes is related to AI. In the next stage we will monitor prospectively the impact of targetted intensive management over time.

P7.03

MARATHON RUNNERS HAVE INCREASED AORTIC STIFFNESS

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Purpose: It is well known that regular moderate aerobic exercise has a beneficial effect on cardiovascular risk, although the impact of long-term intense aerobic training has not been defined. Aortic stiffness and wave reflections are independent predictors of cardiovascular risk. In this study we assessed the chronic effect of intense endurance training on the elastic properties of the large arteries.

Methods: The study population consisted of 49 healthy (mean age: 37 ± 5 yrs), regularly trained (5.8 ± 3.6 hours/week for 11.6 ± 9.1 years) marathon runners (mean age: 38 ± 9 yrs) and 46 controls matched for classical risk factors. Aortic stiffness was evaluated with carotid-femoral pulse wave velocity (PWV) and wave reflections with augmentation index (Aix) of the aortic pressure waveform.

Results: Marathon runners had significantly higher systolic pressure (aortic and brachial) (113 ± 15 vs. 102 ± 11, P < 0.01 and 126 ± 15 vs. 115 ± 12, P < 0.01, respectively) compared to controls. Aortic and brachial diastolic pressure- (79 ± 10 vs. 72 ± 9, P < 0.01 and 78 ± 10 vs. 71 ± 9, P < 0.01, respectively) and mean pressure (94 ± 12 vs. 86 ± 10, P = 0.01) were also increased compared to controls. PWV was increased in athletes compared to controls (6.9 ± 1 vs. 6.3 ± 1, P < 0.01), indicating increased aortic stiffness. Aix corrected for heart rate (8.2 ± 12.2 vs. 10.3 ± 9.5, P = NS) did not differ among the two groups. Years of exercise were associated with aortic pulse pressure (r = 0.304, P = 0.045) and Aix (r = 0.388, P = 0.009) in athletes.

Conclusions: Marathon runners have increased aortic stiffness, as well as central and peripheral haemodynamic parameters. These findings could contribute to precisely assess cardiovascular risk in marathon runners focusing on the proper training volumes, frequency and duration.

P7.04

PROGRESSIVE ARTERIAL STIFFENING IN RENAL TRANSPLANT RECIPIENTS + RESULTS OF 28-MONTH FOLLOW-UP

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Recent follow-up studies showed no change or even short-term improvement of arterial stiffness after kidney transplantation. Data from general population and end-stage renal disease patients suggest, that PWV increases with age of 0,07-0,08 m/s for each year of life. It was shown recently that reduced glomerular filtration rate (GFR) is associated with increased arterial stiffness in RTR. We investigated the change of PWV during follow-up and its relationship with graft function. Carotid-femoral PWV was measured at baseline (PWV1) and after 28 ± 3 (range 24-34) months of follow-up (PWV2) in 61 RTR aged 49 ± 12 years. Fasting blood was collected for serum creatinine, calcium (Ca), phosphorus (P), and high-sensitive C-reactive protein (hsCRP). GFR was calculated with MDRD formula (eGFR). ΔPWV was calculated as (PWV2-PWV1)/PWV1. Clinical and laboratory data were analysed to identify factors associated with ΔPWV. Results are shown as mean ± SD.

	Baseline	Follow-up	P
PWV (m/s)	9,1 ± 1,7	9,8 ± 2,0	< 0,002
Body mass (kg)	73,7 ± 13,9	75,4 ± 13,6	< 0,001
SBP (mmHg)	132 ± 17	137 ± 19	= 0,05
DBP (mmHg)	83 ± 11	84 ± 10	NS
MAP (mmHg)	99 ± 12	102 ± 12	NS
PP (mmHg)	50 ± 11	53 ± 14	<0,05
eGFR (ml/min/1,73m2)	55 ± 16	56 ± 16	NS

Serum Ca, P, Ca x P product, hsCRP did not change during follow-up. Significant positive correlation was found between ΔPWV and serum phosphorus ($r = 0,27$; $p < 0,05$) and Ca x P product ($r = 0,25$; $p < 0,05$) but not with body mass, BMI, SBP, DBP, MAP, PP, Ca, eGFR, hsCRP. Arterial stiffness increased in renal transplant recipients despite stable graft function. Phosphorus metabolism disturbances might be involved in arterial stiffening in RTR.

P7.05

ASSOCIATION BETWEEN RENAL FUNCTION AND ARTERIAL STIFFNESS IN NEVER-TREATED HYPERTENSIVES

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Introduction: Hypertension and renal dysfunction are associated with increased arterial stiffness. Arterial stiffness is a marker of cardiovascular

disease and predictor of cardiovascular risk. We assessed the relationship between renal function and arterial stiffness in never-treated hypertensives.

Methods: We enrolled 388 consecutive essential hypertensives (mean age 52 ± 12 years), who had no established cardiovascular disease. Arterial elastic properties were evaluated with carotid-femoral pulse wave velocity (PWV). Renal function was evaluated with blood creatinine and estimated glomerular filtration rate, measured by the simplified Modification of Diet in Renal Disease (MDRD) formula and the Cockcroft-Gault formula.

Results: In multivariable regression analysis PWV significantly correlated with blood creatinine levels ($p < 0,05$, adjusted R^2 of model = 0.224) and estimated GFR by the Cockcroft-Gault formula ($p = 0,05$, adjusted R^2 of model = 0.222), as well as by the MDRD formula ($p < 0,05$, adjusted R^2 of model = 0.223). (Figure) The abovementioned correlations were independent of age, sex, body-mass index and mean blood pressure.

Conclusion: This is the first study in never-treated hypertensives that shows a weak but significant relationship between the degree of GFR loss and arterial stiffness, even in individuals with GFR values within the normal renal function range.

P7.06

CENTRAL BLOOD PRESSURE AND AUGMENTATION INDEX OF HEALTHY YOUTH

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Background: The clinical importance of central blood pressure (BP) and heart rate corrected augmentation index (AlxHR75) has been gradually increasing in recent years.

Objectives: We measured the peripheral and central BP, the AlxHR75 of healthy volunteers with special regard to diurnal variation (8 AM, 12 PM, 5 PM) and gender difference.

Methods: The measurements were carried out using the SphygmoCor (AtCor Medical, Australia) device.

Results: 52 young subjects (23 males, 29 females) were included in the study. The average age was 23.6 ± 2.1 years. The peripheral and central systolic and diastolic BP values did not show any significant diurnal variation either for males, or females. All BP values of the males were higher than that of females ($p < 0,001$). The peripheral systolic BP were higher than the central systolic pressure during all three times of measurement ($p < 0,001$). The differences for males were 14.3 ± 3.7 mmHg; 17.4 ± 3.6 mmHg, and 17.8 ± 3.1 mmHg ($p < 0,001$), while the amplification of systolic BP for females were 11.5 ± 3.4 mmHg; 12.7 ± 3.7 mmHg, and 12.9 ± 3.5 mmHg ($p < 0,001$), respectively. However, the values of the AlxHR75 were the highest in the morning, and it gradually decreased during the day for both genders ($p < 0,01$). The females AlxHR75 were higher than that of males ($p < 0,001$).

Conclusions: We suppose that it is important to determine central BP by non-invasive measurement, especially in young individuals, since the peripheral BP measured at the brachial artery does not reliably represent the actual central pressure conditions. Furthermore we conclude that the AlxHR75 shows a considerable diurnal variation and gender difference.

