2.1: ETHNIC DIFFERENCES IN ASSOCIATIONS BETWEEN CAROTID IMT, CORONARY ARTERY CALCIFICATION AND CEREBROVASCULAR DISEASE. A POPULATION-BASED STUDY OF EUROPEANS, SOUTH ASIANS AND AFRICAN CARIBBEANS

T. Tillin, K. March, J. Heasman, C. Park, N. Beauchamp, D. Shibata, A. Wright, A. Hughes, N. Chaturvedi

Table 1 (AUC = area under the curve)

Parameter	AUC	p Value
FCW/FEW	0.881	<0.001*
LA area	0.846	0.001*
E/A	0.412	0.398
E/E'	0.884	<0.001*
Dec time	0.380	0.247

1.3

SPATIAL INHOMOGENEITIES IN INTIMA-MEDIA THICKNESS OF THE COMMON CAROTID ARTERY ARE ASSOCIATED WITH THE DEGREE OF STENOSIS IN THE INTERNAL CAROTID ARTERY

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Objectives. Inhomogeneities of wall characteristics may relate to plaques in a nearby vessel. The aim of the present study is to investigate the association between spatial inhomogeneities of intima-media thickness (IMT) of the common carotid artery (CCA) and plaques in the internal carotid artery.
Methods. Longitudinal B-mode ultrasound examinations of CCA were performed bilaterally on 48 patients with a recent cerebrovascular accident. IMT of CCA and its IMT inhomogeneity, defined as IMT standard deviation along the artery segment, were extracted from the ultrasound images by use of semi-automated B-mode vessel wall tracking program. Degree of stenosis was categorised in three groups: less than 30%, 30—50% and 50—70% stenosis in the internal carotid artery.
Results. In total 88 arteries were examined (Table 1). Three patients and two arteries were excluded (incomplete data, extreme moving artery). Mean values and standard deviations of IMT and IMT inhomogeneity are shown in Table 1. There was no significant difference within groups in IMT and IMT inhomogeneity between both sides (Student t-test, p-value >0.05). However, a significant difference was found in the IMT inhomogeneity between the group with less than 30% stenosis and the group with 50—70% stenosis (ANOVA Bonferroni adjusted, p-value 0.016), whereas no significant difference was found in IMT between those groups.
Conclusion. Spatial IMT inhomogeneity of the CCA, but not mean IMT, is associated with the degree of stenosis in the ipsilateral internal carotid artery.
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Table 1 Mean values ± standard deviations of IMT and IMT inhomogeneity.

Degree of stenosis	N	Age	IMT [μm]	Inhomogeneity IMT [μm]
<30%	26	67 ± 9	967 ± 177	135 ± 64
30—50%	39	68 ± 8	1003 ± 188	166 ± 100
50—70%	23	71 ± 8	1127 ± 399	235 ± 189

1.4

BLOOD PRESSURE LEVELS ARE THE SOLE DETERMINANT OF DIFFUSE MYOCARDIAL FIBROSIS IN HYPERTENSIVE PATIENTS

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Objectives. Myocardial fibrosis occurs early in hypertension and plays a major role in CV disease. Our goal was to assess the mutual influence of blood pressure (BP) and cardiovascular (CV) risk factors on diffuse myocardial fibrosis, as assessed non-invasively from Cardiovascular Magnetic Resonance (CMR) T1 mapping images in a population of non-diabetic hypertensive patients in primary prevention.
Methods. CMR MOLLI T1 mapping sequence was acquired on a median LV slice pre-contrast and then at 5, 10 and 15 minutes after a bolus injection of Gadolinium (0.2 mml/kg). After T1 estimation in myocardium and LV cavity, myocardial ECV was calculated as $= (1 - \text{hematocrit}) \times (1/\text{T1post} - 1/\text{T1pre})\,\text{myo}\,/\,(1/\text{T1post} - 1/\text{T1pre})\,\text{blood}$. Patients also underwent routine clinical and biological assessments and BP levels were determined using 3 days home measurements (hBP).
Results. 37 patients (median age 57, range 31 to 71, 54% males) were included. Population characteristics are summarized in table 1. Mean ECV remained unchanged at 5, 10 and 15 minutes (0.21 ± 0.04). In univariate analysis, ECV was significantly associated with systolic hBP ($r = 0.48$, $p = 0.017$) but not with other risk factors (LDL-C, Hba1c, smoking status). This association remained significant after adjustment for age and hBP remained the only significant determinant of changes in ECV.
Conclusion. In hypertensive patients, home BP levels were found to be the sole significant and independent determinant of myocardial fibrosis.

1.5

EFFECTS OF ACUTE BOUTS OF ENDURANCE EXERCISE ON RETINAL VESSEL DIAMETERS

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Objectives. Retinal vessel diameters are a valid tissue biomarker for cardiovascular risk assessment. We aimed to assess the acute effects of different exercise intensities on retinal vessel diameters, and whether these effects differ between seniors and young adults.
Methods. In this cross-over study, 17 seniors (mean (SD) age 67 (5) years) and 15 young adults (mean (SD) age 26 (4) years) first performed a maximal treadmill test (MTT) followed by a submaximal 2-km treadmill test (SMTT) and a control condition in randomised order. We measured central retinal arteriolar (CRAE, μm) and venular (CRVE, μm) equivalent before as well as 5 (t_5) and 40 (t_{40}) minutes after exercise cessation using a Static Retinal Vessel Analyser.
Results. Relative to the control condition, both MTT and SMTT led to a statistically significant dilatation in CRAE and CRVE. At t_{40}, the dilatation was greater for MTT compared to SMTT (CRAE: 1.7 (95% CI -0.1, 3.6; $P = 0.061$); CRVE: 2.2 (95% CI 0.4, 4.1; $P = 0.019$)). In seniors, average CRAE and CRVE at t_5 were higher for MTT compared to SMTT. In young adults, both parameters were lower for MTT compared to SMTT. The estimated difference between seniors and young adults in the cross-over difference comparing MTT and SMTT was 5.3 (95% CI 2.0, 8.5; $P = 0.002$) for CRAE and 4.1 (95% CI -0.4, 8.6; $P = 0.076$) for CRVE.
Conclusions. Acute bouts of endurance exercise lead to an increase in retinal vessel diameters. The regulatory mechanisms following acute bouts of exercise may differ according to age.

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2.1

ETHNIC DIFFERENCES IN ASSOCIATIONS BETWEEN CAROTID IMT, CORONARY ARTERY CALCIFICATION AND CEREBROVASCULAR DISEASE. A POPULATION-BASED STUDY OF EUROPEANS, SOUTH ASIANS AND AFRICAN CARIBBEANS

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Aims. We compared associations between common carotid intima-media thickness(IMT)) and coronary artery calcification(CAC)) and measures of cerebrovascular disease (CVD) in 3 ethnic groups.
Methods. A community-based sample of 1331 men and women (47%White European (WE), 36% South Asian (SA) and 16% African Caribbean (AfC)) living in west London (1988-91). At 20 year follow-up (mean age 69.7 ± 6.2), CAC was quantified using CT, carotid IMT was quantified using ultrasound. Cerebral infarcts and white matter hyperintensities (WMH) were identified using

MRI. Strokes were identified from primary care record review and hospital discharge data.

Results. Stroke was most frequent in AfC. Prevalence of infarcts was similar in all ethnic groups while WMH were most frequent in AfC. Mean carotid IMT(excluding those with plaque) was greatest in AfC. (Table) CAC was greater in WE and SA. In WE, associations between carotid IMT and presence of stroke, infarcts or WMH was strong, even after adjustment for Framingham risk factors and CAC (fully adjusted odds ratio (OR(95%CI)) for a 1 SD increase in IMT:1.34(1.10, 1.64)). However, in SA and AfC there was little association between IMT and CVD (fully adjusted ORs: 1.12(0.87, 1.44), 0.74 (0.51, 1.08) respectively (ethnicity x IMT interactions: $P = 0.32$ and 0.028 respectively). CAC was independently associated with CVD in WE (fully adjusted OR for 10 unit increment:1.003(1.0004, 1.001), but less so in SA (1.002(1.00, 1.005) or AfC (1.00(0.99, 1.006).

Conclusion. Neither carotid IMT nor CAC were independently associated with presence of clinical and subclinical cerebrovascular disease in South Asians or African Caribbeans. In Europeans, IMT was more strongly associated than CAC.

*Median (IQR)	White Europeans	South Asians	African Caribbeans
Number	630	484	217
Male	77%	86%	52%
Smoking (never/ex/current)	38/54/8%	78/18/4%	66/28/6%
Treated hypertension	56%	76%	79%
Total cholesterol: HDL ratio*	3.5(2.9, 4.2)	3.4(2.8, 4.2)	3.2(2.6, 3.8)
Waist:hip ratio*	0.97 (0.93, 1.02)	1.00 (0.96, 1.04)	28.4 (25.6, 31.9)
CAC, AU*	97(6,384)	92(7,410)	0.95 (0.90, 1.01)
CIMT, mm*	0.88 (0.76,1.04)	0.89 (0.79,1.02)	0.92 (0.81,1.04)
Carotid lumen diameter, mm	6.61 ± 0.87	6.44 ± 0.76	6.20 ± 0.78
Stroke	4%	5%	9%
Brain infarcts, any (MRI	21%	20%	22%
White matter hyperintensities	33%	30%	42%
Presence of any stroke, infarcts, WMH	37%	37%	47%

2.2

TRANSFER FUNCTION-DERIVED CENTRAL PRESSURE AND CARDIOVASCULAR EVENTS: THE FRAMINGHAM HEART STUDY

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Relations between central versus brachial blood pressure and major cardiovascular disease (CVD) events remain controversial. Central measures derived using radial tonometry and a generalized transfer function as implemented using the SphygmoCor device may better predict CVD risk compared to central pressures from carotid tonometry. We used proportional hazards models to examine relations of augmentation index, central systolic and pulse pressure, and central-to-peripheral pulse pressure amplification obtained using the Sphygmocor algorithm to first-onset major CVD events in 2183 participants (mean age 62 years, 58% women) in the Framingham Heart Study. During median follow-up of 7.8 (range 0.2 to 8.9) years, 149 participants (6.8%) had an incident event. Augmentation index ($P = 0.6$), central systolic pressure ($P = 0.20$), central pulse pressure ($P = 0.24$) and pulse pressure amplification ($P = 0.15$) were not related to outcomes in models that adjusted for age, sex, clinic systolic blood pressure, use of antihypertensive therapy, total and high density lipoprotein cholesterol concentrations, smoking, and presence of diabetes. When models were repeated using supine oscillometric systolic pressure recorded at the time of tonometry and excluding cases with tonometry pulse height variations >5%, pulse diastolic variation >5%, pulse shape variation >4% or an operator index <80, as recommended by SphygmoCor documentation ($N = 1262$, 64 events), central pulse pressure estimated using the SphygmoCor algorithm was inversely associated with events (HR=0.64, confidence limits 0.42 to 0.98; $P = 0.04$). After considering standard risk factors including brachial systolic pressure, higher central pressure derived using radial artery tonometry and a generalized transfer function was not associated with higher CVD risk.

2.3

PULSE WAVE VELOCIY IN A LARGE POPULATIONAL STUDY. PRELIMINARY RESULTS BRAZILIAN LONGITUDINAL STUDY OF ADULT HEALTH (ELSA-BRASIL)

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Large artery stiffening is widely accepted as a determinant of ISH in the population with a predictive power of CV events has been shown to be beyond traditional risk scores. However, its clinical role in is still limited perhaps due to the lack of established reference values and methodological uniformity. The aim of this prospective longitudinal study is to investigate the role of large artery stiffening as determinant of cardiovascular disease. ELSA-Brazil is a cohort study of 15,105 university servants, aged 35-74 years. The baseline examination was carried out from 2008 through 2010 and included interviews, clinical, anthropometric examinations, overnight urine, ECG, IMT, echocardiography, retinography, HR variability, and PWV (Complior). All centres were submitted to a central training and validation. A biologic sample was stored to allow investigation of biomarkers of CV risk. Values are mean ±SD. PWV measurements were obtained in 14,835 individuals (M:F; 6,780:8,055). PWV is strongly influenced by age and BP ($R^2 = 0.41$). HR and fasting glucose provides only additional 2% in R^2 change. Lipids were not correlated to PWV. Age and BP adjusted values in men are higher than in women (9,53 ± 1,89 vs 9,2 ± 1,88 m/s, $P < 0,001$), but the slope of correlation with age are not different. BP status does not change the correlation of BP and PWV. However adjusted PWV values are increased in Diabetic individuals (9,97 ± 2,3 vs 9,18 ± m/s,$P < 0,001$). The present study has a potential to clarify important questions regarding the role of PWV as a determinant of disease, favouring its routine inclusion in clinical practice.

2.4

SERUM BIOMARKERS AND RETINAL VESSEL DIAMETERS IN SCHOOL CHILDREN

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Objectives. Retinal vessel analysis is a valid diagnostic tool to detect subclinical signs of atherosclerosis in the cerebrovascular microcirculation as early as childhood. The aim of the study was to investigate the association between specific obesity-related biomarkers and retinal vessel diameters in school children.

Methods. We studied 381 children aged 10 to 13 years in a school-based setting. Anthropometric measurements and blood sampling were conducted using standard protocols for children. The serum biomarkers leptin, insulin, adiponectin and IL-6 were assessed and correlated with retinal arteriolar (CRAE) and venular (CRVE) diameters and the arteriolar-to- venular ratio