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### 14.4: A POSITIVE FAMILY HISTORY OF DIABETES IS ASSOCIATED WITH ARTERIAL STIFFNESS: THE MALMO DIET CANCER STUDY

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**Methods:** Non-invasive central blood pressure and flow were obtained by carotid tonometry and Doppler sonography respectively in a total of 329 women at first visit (mean SD, age  $58 \pm 8$  years) and a follow-up visit approximately five years later (mean age  $63 \pm 8$  years). Aortic root pulse wave velocity and reflection index (the ratio of the peak of the backward pressure wave over that of the forward pressure wave) were computed from the pressure and flow waves.

**Results:** Over the five year follow-up period, pulse pressure increased by 9.2%, from  $43.7 \pm 7.3$  to  $47.7 \pm 0.78$  mmHg (means SE,  $P < 0.001$ ), PWV increased by 18.5 % from  $4.01 \pm 0.08$  m/s at first visit ( $P < 0.001$ ), the maximum value of flow velocity tended to increase (from  $1.13 \pm 0.01$  to  $1.15 \pm 0.01$  m/s) but reflection index decreased from  $0.38 \pm 0.01$  to  $0.32 \pm 0.01$  ( $P < 0.001$ ).

**Conclusions:** These results suggest that the increase of pulse pressure is related mainly to an increase in arterial stiffening rather than to an increase in pressure wave reflection.

#### 14.2 LONGITUDINAL CHANGE IN VASCULAR STRUCTURE AND FUNCTION OVER A 5 YEAR PERIOD IN TWINS UK COHORT

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**Background:** Vascular aging is characterised by structural changes: wall thickening and an increase in lumen diameter, together with a functional increase in arterial stiffness. We investigated the longitudinal structural and functional changes that occur in the aortic wall over a 5 year follow-up period.

**Methods:** Subjects were 472 female twins (mean ageSD,  $57.9 \pm 8.6$  years at baseline). Measures of diameter and intima-media thickness (IMT), averaged from the carotid and femoral artery, and carotid-to-femoral pulse wave velocity (PWV) were made at two time-points, first between 2008-2014 and then on a second occasion an average of  $4.7 \pm 3.0$  years later. Young's incremental elastic modulus was estimated from the simplified Moens-Korteweg equation:  $PWV = \sqrt{Eh/D}$ , where  $h$  is the wall thickness and  $D$  is diameter.

**Results:** There was a significant increase in intima-media thickness ( $0.064 \pm 0.01$  cm at baseline and  $0.070 \pm 0.01$  cm at follow-up,  $P < 0.0001$ ), diameter ( $0.75 \pm 0.06$  cm at baseline and  $0.76 \pm 0.07$  cm at follow-up,  $P < 0.0001$ ) and PWV ( $9.15 \pm 1.8$  at baseline and  $9.75 \pm 1.8$  m/sec at follow-up,  $P < 0.0001$ ), over the five-year follow-up period. The influence of the estimated increase in elastic modulus ( $10.2 \pm 4.0$  and  $10.7 \pm 4.1$   $10^9$  dynes/cm<sup>2</sup>, at visit one and two respectively,  $P = 0.001$ ) on PWV was amplified by intima-media thickness increasing more than arterial diameter (10.5% versus 2.2%).

**Conclusion:** In our cohort of middle age to older women, increase in aortic wall thickness to lumen diameter was the most marked structural change and could potentially amplify the increase in PWV produced by intrinsic stiffening of the aortic wall.

#### 14.3 IDEAL CARDIOVASCULAR HEALTH IS INVERSELY ASSOCIATED WITH INCREASED CAROTID-FEMORAL PULSE WAVE VELOCITY IN ITALIAN ADOLESCENTS. THE MACISTE STUDY

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**Objective:** Ideal cardiovascular health (ICH) among adolescents is defined as the optimal levels of three CV risk factors (SBP/DBP, fasting glucose, total cholesterol) and four behaviours (BMI, not smoking, healthy diet, physical activity)<sup>1</sup>. We investigated the burden of ICH among Italian adolescents, and its association with arterial stiffness (carotid-femoral pulse wave velocity, cfPWV).

**Methods:** 307 healthy subjects (mean age  $17 \pm 2$  years, 55% men) attending the High School at Terni, Italy, were evaluated. Physical activity, dietary and smoking were assessed through self-reported questionnaires. Sodium consumption was estimated by second fasting urine. Smoking was confirmed by exhaled carbon-oxide. cfPWV was evaluated by arterial tonometry (SphygmoCor, subtracted distance). For each ICH metric, a score of 2 was also assigned if levels were ideal, 1 if intermediate, and 0 if poor.

**Results:** None had all 7 ICH metrics the majority (76%) had 4 or more ICH metrics. An inverse linear trend in cfPWV was observed over the number of ICH ( $p$  for linear trend  $< 0.01$ ). According to ICH score, after adjustment for age and sex, subjects in the lower tertile, compared to upper tertile, showed higher values of cf-PWV ( $5.1 \pm 1.3$  m/s vs  $4.6 \pm 1.8$  m/s,  $p < 0.01$ ), which remained significant after further adjustment for mean BP and other confounding factors ( $p = 0.02$ ).

**Conclusions:** ICH is relatively uncommon among Italian adolescents, and is inversely related to cf-PWV in females. The potential adverse effects of CV risk factors and unhealthy behaviours on arterial stiffness, an early marker of vascular damage, begins to develop at an early stage of lifespan.

#### References

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#### 14.4 A POSITIVE FAMILY HISTORY OF DIABETES IS ASSOCIATED WITH ARTERIAL STIFFNESS: THE MALMO DIET CANCER STUDY

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**Objective:** Arterial stiffness (AS) is known to be associated with a number of clinical conditions including hypertension, diabetes and dyslipidemia. AS may also be associated with lifestyle and early life factors, which are greatly affected by family history. The aim of this study was to investigate the association between self-reported family history (FH) and AS.

**Design and method:** The study population consists of 3056 individuals (mean age 72 years, 40% men) from the population-based Malmö Diet Cancer study, Sweden. Carotid-femoral pulse wave velocity (c-f PWV), a marker of AS, was measured with Sphygmocor<sup>®</sup>. Data on FH for diabetes, hypertension and cardiovascular (CV) events was retrieved from a questionnaire. Using multiple regression, adjustments were made for age, sex, mean arterial pressure (MAP) and heart rate (HR) in Model 1, and in Model 2 further adjustment made for diagnosed diabetes or hypertension, respectively.

**Results:** In an unadjusted model AS was associated with a FH of diabetes and CV events. These associations were significant after adjustment in Model 1 and Model 2.

**Conclusion:** The results indicate associations between AS and FH of both diabetes and CV-events. This shows that FH is a relevant marker of vascular ageing. There was no clear association between AS and FH for hypertension which could be explained by a lack of knowledge regarding this diagnosis even in close relatives. The associations between AS and FH will be compared to those of AS and Genetic Risk Scores (GRS) for diabetes and hypertension in ongoing analysis.

#### 14.5 LEVELS OF ANGIOPOIETIN-LIKE-2 ARE POSITIVELY ASSOCIATED WITH AORTIC STIFFNESS AND MORTALITY AFTER KIDNEY TRANSPLANTATION

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**Introduction:** Angiotensin-like-2 (angptl2) is a secreted glycoprotein with homology to the angiotensins. Through an autocrine/paracrine manner, it promotes endothelial dysfunction and atherosclerosis. Angptl2 is increased in chronic kidney disease (CKD), where the risk of cardiovascular disease (CVD) is amplified. The objectives of the present study were to 1) examine whether kidney transplantation (KTx) reduces angptl2 levels, 2) identify the determinants of angptl2 after KTx, 3) study the association of angptl2 with aortic stiffness and 4) assess the impact of angptl2 on mortality of KTx. **Methods:** In 75 subjects undergoing KTx, we evaluated clinical, biochemical and aortic stiffness before and 3 months after KTx. Angptl2 levels were determined by Elisa. Aortic stiffness was assessed by carotid-femoral pulse wave velocity (cf-PWV). Logistic and Cox regressions were used for data analysis.