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### **P6.01: WALL-TO-LUMEN RATIO OF RETINAL ARTERIOLES IS RELATED TO ALTERATIONS OF AORTIC PULSE WAVE IN PATIENTS WITH A HISTORY OF A CEREBROVASCULAR EVENT**

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and in children following treatment for acute lymphoblastic leukemia (ALL) in comparison with healthy controls (HC). RHI was further correlated with anthropometric and biochemical parameters.

**Research design and methods:** 35 eligible study participants were enrolled in the study (14 T1DM (16±2.2yrs) and 11 ALL patients (14.7±2.2yrs), matched with 10 HC (16±1.7yrs)). As part of new non-invasive plethysmographic technique, an Endo-PAT2000® recorder was used for the determination of RHI by measuring postocclusive endothelium-dependent changes in vascular tone (PAT) in subjects fingertips.

**Results:** Significantly lower RHI were revealed in T1DM patients in comparison with HC (1.50±0.56, 1.99±0.68;  $p < 0.05$  respectively), implying impaired endothelial-dependent dilation. ALL subjects tended to have lower RHI compared with HC (1.58±0.48, 1.99±0.68;  $p > 0.05$  respectively), although this difference was statistically insignificant. No association was revealed between RHI and anthropometric parameters, arterial blood pressure or glycated haemoglobin in both T1DM and ALL groups.

**Conclusion:** Detection of endothelial dysfunction using RHI in T1DM children is in concordance with results of previously published studies. Our study demonstrated that a non-invasive method such as RHI is a promising future prospect for the assessment of EF in children with high risk of premature atherosclerosis.

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#### P5.06

##### DIABETES MELLITUS (DM) (II TYPE) AGGRAVATES THE ENDOTHELIAL DYSFUNCTION (ED) AND INCREASES THE ARTERIAL STIFFNESS IN PATIENTS WITH LACUNAR INFARCTION (LI)

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The aim was to study endothelial function (EF) and the arterial wall (AW) stiffness in patients with DM and LI.

**Methods:** Nine patients with DM and LI as defined by clinical characteristics and MRI findings were compared with 35 age and gender-matched patients with LI without DM. EF was assessed using the brachial flow-mediated vasodilatation (FMD) on the first day after stroke onset in both groups. Carotid stiffness index  $\beta$  was calculated as follows:  $\ln(\text{systolic}/\text{diastolic blood pressure})/[(\text{Dmax}-\text{Dmin})/\text{Dmin}]$ , where Dmax/Dmin are maximum and minimum common carotid lumen diameters measured by carotid ultrasound. Carotid intima-media thickness (IMT) was also measured. FMD was categorized according to ROC analysis and ED was defined as  $\text{FMD} \leq 6.0\%$ .

**Results:** Eight patients (89%) in the first group and twenty-two (63%) in the second had ED ( $p=0.006$ ). Seven patients (78%) in the first group and none in the second had a distinctive feature – the presence of the additional hyperechogenic layer in the AW. Carotid stiffness was higher in first group (17.3±3.4 versus 10.5±2.2,  $p=0.04$ ), while FMD was lower (3.4±1.5% versus 6.1±2.5%,  $p=0.03$ ). There was no significant difference in IMT between two groups (0.95±0.15 in the first group versus 0.91±0.17). Moderate correlation was observed between stiffness and IMT ( $r=0.33$ ,  $p=0.01$ ). No correlations were found between FMD and IMT, FMD and stiffness.

**Conclusion:** Patients with DM and LI are characterized by the marked impairment of the structural-and-functional properties of the AW and they have a distinctive feature (additional hyperechogenic layer in the AW). The IMT thickening influences the arterial stiffness.

#### P5.07

##### MAXIMUM-IMT, PLAQUE SCORE, PLAQUE NUMBER AND PERCENT AREA STENOSIS ARE HIGHER AMONG ADULT PATIENTS WITH FAMILIAL HYPERCHOLESTEROLEMIA THAN THEIR ADULT FIRST-DEGREE RELATIVES

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**Backgrounds and aim:** Familial hypercholesterolemia (FH) is associated with not only severe coronary-artery disease but with accelerated carotid atherosclerosis. We compared the severity of carotid atherosclerosis at adult patients with FH and their adult first-degree relatives using high-resolution ultrasound methods.

**Subjects and methods:** The study included 32 patients with FH (mean±SD age, 35,44±9,9 years) and 21 their first-degree relatives (32,24±11,22 years). All patient were not older than 53. The level of the total cholesterol and LDL-cholesterol was significantly higher among FH patients than their relatives (9,98±2,93 mmol/l vs 5,08±0,89 mmol/l,  $p < 0,001$  and 7,07±3,07

mmol/l vs 3,14±0.87 mmol/l,  $p < 0,001$  respectively). Carotid atherosclerosis was evaluated by the following indices: mean-IMT, maximum-IMT, plaque score, plaque number and percent area stenosis.

**Results:** Mean-IMT have not differed in groups. Maximum-IMT, plaque score, plaque number and percent area stenosis were significantly higher among FH patients than their relatives.

**Conclusions:** Carotid atherosclerosis in adult patients with familial hypercholesterolemia is more severe than in their adult first-degree relatives.

Subjects (mean±SD)	First-degree relatives (n=21)	Patients with FH (n=32)	p value
Age, years	32,24±11,22	35,44± 9,9	0,158
Mean-IMT, mm	0,577±0,125	0,635±0,183	0,349
Maximum-IMT, mm	0,757±0,193	0,988±0,348	0,006
Plaque number	1,1±1,9	3,2±2,6	0,0009
Plaque score, mm	1,57±3,1	5,14±4,97	0,001
Percent area stenosis, %	11,9±19,6	37,6±22,4	0,0004

#### P5.08

##### INVESTIGATING THE DETERMINANTS OF IMPAIRED DIASTOLIC FILLING IN ELDERLY FEMALE HYPERTENSIVES

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**Background:** Impaired diastolic filling is an important problem among elderly female hypertensives (EFH) which can lead to overt heart failure. High afterload may impair rapid relaxation of the left ventricle (LV) which delays LV filling. Over time, remodelling (LV hypertrophy, altered repolarisation) may add to the problem. We studied the determinants of impaired filling in EFH.

**Methods:** 17 stable EFH without clinical heart failure (age [mean ± SD] 66 ± 10 years; blood pressure [BP] 158±16 / 85±9 mmHg) underwent wave intensity analysis (WIA; NA: negative area produced by returning wave reflections during systole; Aloka SSD-5500, Tokyo, Japan), ECG (QTc: QT-interval indexed for heart rate [Bazett's formula]; QRS-T angle: angle between QRS and T-wave axes in the frontal plane), and echocardiography (EDT: E-deceleration time, an index of LV filling; e': tissue Doppler early diastolic lengthening at mitral annulus, an index of LV relaxation [averaged septal and lateral]).

**Results:** Subjects with delayed EDT had larger NA ( $r=-0.62$ ,  $p=0.01$ ), higher systolic BP ( $r=-0.51$ ,  $p=0.038$ ), higher heart rate ( $r=0.68$ ,  $p=0.004$ ), impaired relaxation ( $e'$ :  $r=-0.50$ ,  $p=0.049$ ), wider QRS-T angle ( $r=0.59$ ,  $p=0.021$ ) and longer QTc (0.53,  $p=0.042$ ). Multivariable analysis showed that NA ( $\beta=-0.71$ ,  $p < 0.001$ ) and  $e'$  ( $\beta=-0.42$ ,  $p=0.02$ ) predicted delayed EDT, but not systolic BP ( $p=0.62$ ) nor heart rate ( $p=0.82$ ).

**Conclusion:** After adjusting for intrinsic impairment of relaxation ( $e'$ ), NA remains a strong predictor of delayed diastolic filling in EHF. This underscores the importance of optimising systolic wave reflections in this group and suggests that WIA should be tried for monitoring of treatment effects.

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#### P6.01

##### WALL-TO-LUMEN RATIO OF RETINAL ARTERIOLES IS RELATED TO ALTERATIONS OF AORTIC PULSE WAVE IN PATIENTS WITH A HISTORY OF A CEREBROVASCULAR EVENT

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**Objective:** Wall-to-lumen ratio of retinal arterioles represents a potential future parameter for vascular damage. We hypothesized that changes in wall-to-lumen ratio of retinal arterioles is associated with alterations of aortic pulse wave in patients with a history of a cerebrovascular event.

**Methods:** In this pilot study 14 patients (5 female and 9 male patients) with a mean age of 60.2±9.8 years, mean blood pressure levels of 132±14/

79.1±11 mmHg and a history of a cerebrovascular event have been enrolled. Wall-to-lumen ratio of retinal arterioles was assessed *in vivo* using scanning laser Doppler flowmetry (Heidelberg Retina Flowmetry, Heidelberg, Germany). Pulse wave analysis to determine aortic augmentation index and aortic augmentation pressure were performed *in vivo* using applanation tonometry (SphygmoCor, AtCor Medical PtyLtd, NSW 2114, Australia).

**Results:** Pulse pressure ( $r=0.593$ ,  $p=0.025$ ), but not systolic, diastolic or mean arterial pressure was related to wall-to-lumen ratio of retinal arterioles. Age, body mass index, waist circumference as well as parameters of glucose and lipid profile did not reveal a relation to wall-to-lumen ratio of retinal arterioles. Aortic augmentation index ( $r=0.546$ ,  $p=0.043$ ) and aortic augmentation pressure ( $r=0.559$ ,  $p=0.038$ ) were both related to wall-to-lumen ratio of retinal arterioles even when aortic augmentation index and aortic augmentation pressure were corrected for a mean heart rate of 75 bpm ( $r=0.572$ ,  $p=0.032$  and  $r=0.616$ ,  $p=0.019$ ; respectively).

**Conclusion:** In our cohort of patients with a history of a cerebrovascular event wall-to-lumen ratio of retinal arterioles was related to alterations of aortic pulse wave thereby indicating parallel vascular changes in the micro- and macrovasculature.

#### P6.02

##### INCREASED ARTERIAL STIFFNESS IS ASSOCIATED WITH SYSTOLIC BLOOD PRESSURE VARIABILITY IN OLDER INDIVIDUALS

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**Background:** The prognostic significance of the variability in systolic blood pressure (sBP) for cardiovascular events has been highlighted recently. Although increased arterial stiffness has been proposed as a potential mechanism, the relationship between sBP variability and arterial stiffness has not been examined directly. Therefore, the aim of the current study was to determine whether increased arterial stiffness is associated with increased blood pressure variability based on 24-hour ambulatory blood pressure monitoring (ABPM) in a subset of older individuals from the Anglo-Cardiff Collaborative Trial.

**Methods:** Aortic stiffness was assessed by measuring the carotid-femoral pulse wave velocity (aPWV) in individuals aged over 50 years. Subjects also underwent 24-hour ABPM.

**Results:** Data concerning 24-hour ABPM and arterial stiffness were available in 204 individuals with an average age of 67±6 years. When individuals were grouped according to tertiles of aPWV there was a significant increase in the variability of day sBP from the lowest to highest tertile ( $12.52±3.72$  v  $14.23±3.99$ ,  $P<0.001$ ). However, this relationship was not apparent for night sBP ( $11.86±4.49$  v  $12.16±4.61$ ,  $P=0.4$ ). In stepwise linear regression analyses, aPWV was independently associated with day sBP variability after adjustment for age, gender, mean day sBP and medication. However, only mean night sBP was associated with night time sBP variability.

**Conclusion:** These data support the hypothesis that individuals with increased sBP variability have elevated arterial stiffness. These data require confirmation in a large population, with outcome data.

#### P6.03

##### EVOLUTION OF ARTERIAL STIFFNESS AFTER KIDNEY TRANSPLANTATION IN PATIENTS WITH END-STAGE RENAL DISEASE

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**Background:** Increased arterial stiffness (AS) is a major determinant of cardiovascular complications in end-stage renal disease (ESRD) patients. Little is known about AS evolution after renal transplantation. The aim of the study was to characterize the evolution of AS after renal transplantation in a population of ESRD patients, in comparison to those patients remaining in dialysis.

**Material and methods:** One hundred patients were recruited from the waiting list of the Transplant Unit of the University Hospital of Nancy. Two vascular evaluations were performed at one-year interval. AS was assessed by carotid/femoral pulse wave velocity (PWV). During this interval, thirty-nine patients were transplanted and forty-nine remained on dialysis.

**Results:** At baseline PWV value was  $10.6 ± 3.7$  m/s. No difference was found between the two groups at the first and second visit. Mean arterial pressure (MAP) decreased in the transplant group ( $101 ± 14$  vs.  $95 ± 10$  mmHg,

$p<0.01$  respectively) at one-year follow up. Multivariate analysis showed that PWV changes depended on changes in MAP and baseline PWV.

**Conclusion:** Although no difference in the one-year PWV evolution was found, the lower MAP value in the transplanted group could result in a better long term evolution of arterial stiffness in this group, leading to a better cardiovascular prognosis after renal transplantation.

#### P6.04

##### EFFECT OF CAROTID BARORECEPTOR ACTIVATION ON AORTIC STIFFNESS

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**Background:** Previous research in acute animal models demonstrated strong effects of electrical carotid baroreceptor activation (CBA) on central hemodynamics. Data indicated arterial tone relaxation, which we could indirectly demonstrate at the level of the renal artery with a reduced impedance with CBA. The aim of this study was to assess effects of CBA on the elastic properties of the aorta.

**Methods:** The following data were invasively recorded in 7 anaesthetized dogs at baseline (BL) and during CBA intended to produce a moderate reduction in mean arterial pressure: (i) upper thoracic pressure (Pao; hi-fi pressure sensor) and flow (transonic flow probe) providing reflection magnitude Pb/Pf; (ii) Pao and diameter (ultrasonic crystals) providing local aortic distensibility (DC); PWV from simultaneous pressure recordings distance 21 cm (PWV-thoracic) and 51 cm (PWV-aorta) apart.

**Results:** see Table (mean (stdev)); P: paired t-test.

	CTRL	CBA	P
MAP(mmHg)	85.5 (9.0)	61.4 (6.7)	0.0007
Pb/Pf	0.44 (0.02)	0.36 (0.06)	0.005
DC (%/10 mmHg)	4.29 (1.08)	4.12 (0.91)	0.765
PWV-thoracic (m/s)	4.85 (0.40)	4.42 (0.52)	0.007
PWV-aorta (m/s)	6.78 (0.47)	5.75 (0.39)	0.0001

**Discussion and conclusion:** CBA lowered Pb/Pf and PWV, the latter effect mainly confined to the abdominal (muscular) aorta, given (i) the more substantial decrease in aortic (-1 m/s) versus thoracic (-0.4 m/s) PWV, and (ii) the absence of any change in DC measured directly at the upper thoracic aorta despite the reduction. Based on these and previous findings, we conclude that CBA modulates arterial tone in muscular arteries including the muscular parts of the aorta.

#### P6.05

##### ARTERIAL STIFFNESS AND CARDIAC DAMAGE PROGRESSION ARE ASSOCIATED IN ESSENTIAL HYPERTENSION PATIENTS

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**Background:** Arterial stiffness and cardiac hypertrophy are independent cardiovascular risk factors. Aim of this study was to describe the relationship between these organ damages in a large cohort of essential hypertensive (EH) treated patients.

**Methods:** We performed standard trans-thoracic echocardiography to measure anatomical (left ventricular mass indexed by body surface area [LVMI] and relative wall thickness [RWT]) and functional (ejection fraction, diastolic function [E/A] and deceleration time) cardiac parameters on 827 treated EH patients. Carotid-femoral pulse wave velocity (PWV) was used to estimate arterial stiffness. Data were analyzed by linear regressions or ANOVA and post-hoc Bonferroni test.

**Results:** Patients were 53±14 years old (Mean ± SD) and 50% were male. Their mean blood pressure values were 142.3±18.6/86.7±10.6 mmHg; cardiac structural and functional parameters were in the normal range, PWV was 10.7 m/sec. Geometry of left ventricle, as defined by LVMI and RWT (ESC guidelines), was normal in 336 (43%) patients, while in 163 (21%) we found concentric remodeling, concentric hypertrophy in 173 (22%) and eccentric hypertrophy in 109 (14%) patients. PWV was significantly different between the 4 subgroups ( $p = 0.001$ ), with concentric and eccentric hypertrophy patients having