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### **P5.05: INTERICTAL ARTERIAL WALL PARAMETERS IN WOMEN WITH MIGRAINE**

K. Ryliškiene, D. Jatuzis, L. Ryliškyte, M. Kovaite, A. Marcijonienė, A. Laučevičius

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**Conclusions:** PR improves the haemodynamic profile of subjects with COPD. Longer term CV effects of PR should now be investigated.

Mean (SD)	Control	COPD - Pre PR	COPD - Post PR
Aortic PWV (m/sec)	8.5 (1.4)	9.82 (3.0)†	9.26 (2.7)*
Systolic BP (mmHg)§	130.0 (15.9)	137.6 (20.0)	127.9 (23.6)**
Diastolic BP (mmHg)§	78.7 (8.4)	82.8 (9.5)	78.4 (11.8)**
MAP (mmHg)§	96.0 (10.0)	100.9 (11.9)	94.9 (14.1)**
Heart Rate (bpm)	67.8 (11.0)	76.1 (12.1)††	75.9 (14.1)
Cholesterol (mmol/L)	5.2 (1.2)	5.6 (1.2)	5.4 (1.2)*
Glucose (mmol/L)	5.2 (0.5)	5.0 (0.7)	4.8 (0.8)
ISWT (m)	-	190.4 (69.8)	273.6 (75.5)**

§ Peripheral pressures; †p < 0.05; ††p < 0.001 difference from controls.  
\*p < 0.05; \*\*p < 0.001 difference with PR.

## P5.02

### EFFECT OF ACUTE INTENSE EXERCISE ON ARTERIAL STIFFNESS

D. Kardara, C. Vlachopoulos, A. Anastasakis, K. Baou, I. Dima, D. Terentes-Printzios, G. Antoniou, A. Gravos, G. Angelidis, C. Stefanadis  
*Hippokraton General Hospital of Athens, Athens, Greece*

**Purpose:** Aortic stiffness and wave reflections are determinants of left ventricular performance and independent predictors of cardiovascular risk. Though it is well recognized that regular aerobic exercise can affect arterial stiffness and wave reflections, the acute effect of intense aerobic exercise has not been defined. In this study we examined the acute effect of the extreme exertion of marathon race on the arterial elastic properties in highly trained athletes.

**Methods:** We studied 20 healthy, regularly trained ( $5 \pm 2.5$  hours/week for  $12.4 \pm 7.4$  years) marathon runners (mean age:  $36 \pm 10$  yrs, 16 M/4F) before and after the race. Aortic stiffness was evaluated with pulse wave velocity (PWV) and wave reflections with augmentation index (Alx) of the aortic pressure waveform.

**Results:** Marathon race led to a significant fall in Alx corrected for the heart rate ( $6.96 \pm 13.3$  vs.  $0.04 \pm 10.9$ ,  $P = 0.01$ ) indicating reduced heart afterload. Mean pressure ( $94 \pm 14$  vs.  $85 \pm 9$ ,  $P < 0.05$ ), systolic brachial ( $127 \pm 16$  vs.  $122 \pm 11$ ,  $P < 0.05$ ), systolic aortic pressure ( $113 \pm 16$  vs.  $102 \pm 10$ ,  $P = 0.01$ ), as well as diastolic brachial ( $78 \pm 12$  vs.  $70 \pm 8$ ,  $P < 0.01$ ), diastolic aortic pressures ( $79 \pm 12$  vs.  $73 \pm 8$ ,  $P < 0.05$ ), were also decreased, whereas heart rate was significantly increased ( $62 \pm 9$  vs.  $90 \pm 9$ ,  $P < 0.01$ ). PWV did not differ before and after marathon race ( $6.65 \pm 0.9$  vs.  $6.74 \pm 1.2$   $P = NS$ ).

**Conclusions:** Our findings demonstrate that marathon race results in an acute decrease of wave reflections. This indicates reduced afterload that facilitates left ventricular performance. Since there is no effect on PWV, it is caused most likely by peripheral vasodilation. These findings elucidate the interrelations between biophysical properties of the arteries and exercise capacity.

## P5.03

### ACUTE VASCULAR EFFECTS OF RECOMBINANT HUMAN TSH IN YOUNG SUBJECTS FROM CHERNOBYL AREA FOLLOWED-UP FOR PREVIOUS DIFFERENTIATED THYROID CANCER

L. Ghiadoni<sup>1</sup>, R. M. Bruno<sup>1</sup>, F. Faia<sup>2</sup>, E. Bianchini<sup>2</sup>, A. I. Corci<sup>2</sup>, E. Daghini<sup>1</sup>, L. Landini<sup>1</sup>, F. Stea<sup>1</sup>, P. Fallahi<sup>1</sup>, E. Picano<sup>2</sup>, A. Antonelli<sup>1</sup>

<sup>1</sup>University of Pisa, Pisa, Italy

<sup>2</sup>G. Monasterio Foundation, Institute of Clinical Physiology, National Research Council, Pisa, Italy

**Objectives:** To evaluate the effect of recombinant human TSH (rhTSH) on endothelial function, aortic and carotid stiffness, and wave reflection in a population living in the Chernobyl area at the time of 1986 blast, treated with thyroidectomy for thyroid cancer.

**Methods:** 23 subjects (age  $26 \pm 3$  years, 10 men) underwent evaluations at baseline and after rhTSH administration, 0.9 mg daily on 2 consecutive days. A real time contour tracking algorithm was applied to B-mode scans for assessing brachial artery endothelium-dependent (flow-mediated dilation, FMD), and -independent dilation (glycerol trinitrate, GTN,  $25 \mu\text{g}$  sublingual) and carotid stiffness (CS) by Bramwell-Hill equation. Carotid blood pressure (BP) waveform, augmentation index (Alx), and carotid-femoral PWV were assessed by applanation tonometry.

**Results:** rhTSH decreased diastolic BP (from  $79 \pm 11$  to  $72 \pm 9$  mmHg,  $p < 0.01$ ), but not systolic BP, increasing pulse pressure (from  $38 \pm 7$  to  $43 \pm 10$  mmHg,

$p < 0.01$ ). FMD tended to decrease (from  $9.0 \pm 4.4$  to  $6.9 \pm 2.2\%$ ,  $p = 0.09$ ), while GTN was unchanged (from  $10.5 \pm 4.0$  to  $10.6 \pm 3.4\%$ ,  $p = ns$ ). Aortic PWV tended to decrease (from  $5.78 \pm 1.32$  to  $5.44 \pm 1.02$  m/s,  $p = 0.057$ ); carotid stiffness (from  $5.07 \pm 0.73$  to  $5.20 \pm 0.82$  m/s,  $p = ns$ ) and Alx (from  $-5.5 \pm 11.0$  to  $-8.7 \pm 16.7$ ,  $p = ns$ ) were unchanged. Augmentation pressure (AP) decreased (from  $-2.7 \pm 4.7$  to  $-5.8 \pm 9.6$  mmHg,  $p < 0.05$ ), while time to wave reflection was unaffected (from  $164 \pm 22$  to  $167 \pm 21$  ms,  $p = ns$ ).

**Conclusions:** In a population of environmental radiation-exposed thyroidectomized young patients, rhTSH influences magnitude of wave reflection, possibly through microcirculatory vasodilation, as suggested by diastolic BP and AP decrease. A reduction of aortic stiffness and an impairment of endothelial function was also observed.

## P5.04

### RELATIONSHIP BETWEEN ENDOTHELIAL FUNCTION, INTIMA-MEDIA COMPLEX THICKNESS AND BILIRUBIN LEVELS IN PATIENTS WITH METABOLIC SYNDROME

O. A. Polikina, V. V. Vikentyev

*Moscow State University of Medicine and Dentistry, Moscow, Russian Federation*

Endothelial dysfunction (ED) and carotid artery intima-media complex thickening (IMT) are regarded as predictors for the progress of atherosclerosis. The anti-oxidant properties of bilirubin and its ability to prevent oxidation of lipids of low density lipoproteins, and thus, development of vascular atherosclerosis have also been described.

Our aim was to assess bilirubin levels in patients with metabolic syndrome and various levels of brachial artery flow-mediated dilatation (FMD) registered during reactive hyperaemia test and different carotid artery IMT. **Methods:** We examined 181 male subjects, age 31-52 years, with different levels of FMD and IMT, using standard protocol which included physical examination, ECG, carotid arteries ultrasound, brachial arteries ultrasound with reactive hyperaemia test, blood biochemistry tests.

**Results:** After initial examination patients were divided into two groups in regard to their FMD: 89 patients comprised the group with lower FMD (less than 5%) and 92 subjects who had normal FMD (more than 5%). Performing the ultrasound examination of the carotid arteries we found out that IMT was higher in patients with impaired FMD ( $p = 0.02$ ). On the contrary, in this group we found lower total bilirubin levels comparing to those with normal FMD ( $8.5 \pm 3.2$  vs.  $16.8 \pm 4.5$   $\mu\text{mol/L}$ ,  $p < 0.01$ , respectively).

**Conclusions:** Patients with metabolic syndrome and lower total bilirubin levels present higher IMT and lower FMD and more significant signs of vascular atherosclerosis (as seen in carotid arteries) comparing to those with higher bilirubin levels.

## P5.05

### INTERICTAL ARTERIAL WALL PARAMETERS IN WOMEN WITH MIGRAINE

K. Ryliskiene<sup>1</sup>, D. Jatuzis<sup>1</sup>, L. Ryliskyte<sup>2</sup>, M. Kovaite<sup>2</sup>, A. Marcijonienė<sup>3</sup>, A. Laucevičius<sup>2</sup>

<sup>1</sup>Vilnius University, Clinic of Neurology and Neurosurgery, Vilnius University Hospital Santariskiu Klinikos, Vilnius, Lithuania

<sup>2</sup>Vilnius University, Clinic of Cardiovascular Medicine, Vilnius University Hospital Santariskiu Klinikos, Vilnius, Lithuania

<sup>3</sup>Vilnius University, Clinic of Internal Medicine, General Practice and Oncology, Vilnius University Hospital Santariskiu Klinikos, Vilnius, Lithuania

**Objective:** According to data of epidemiological and clinical studies, migraine with aura (MA) is associated with cardiovascular disorders, and migraine without aura (M0) is linked to carotid artery dissection. The aim of this cross-sectional study was to evaluate and compare arterial wall parameters – intima-media thickness, distensibility and stiffness of common carotid artery (CCA), augmentation index and pulse wave velocity – in female patients with two types of migraine: MA and M0.

**Methods:** Arterial wall structural and functional properties were measured using echo-tracking method (Art.Lab system) and applanation tonometry (SphygmoCor device) in 63 patients with M0 (age  $35.32 \pm 7.83$  years, migraine duration  $17.25 \pm 8.44$  years), 37 with MA (age  $36.57 \pm 9.10$  years, migraine duration  $19.62 \pm 9.17$  years) and 50 age-matched controls. Groups were compared using one-way ANOVA test. To explore the relationship between arterial wall parameters and type of migraine stepwise linear regression was applied.

**Results:** MA patients had highest values of augmentation index ( $16.65 \pm 13.23\%$ ), comparing with M0 patients ( $15.41 \pm 10.62\%$ ) and controls ( $12.42 \pm 13.32\%$ ). Distensibility of CCA was lowest in M0 patients ( $443.78 \pm 106.99 \mu\text{m}$ ), comparing with MA patients ( $449.99 \pm 113.50 \mu\text{m}$ )

and controls ( $465.78 \pm 112.36 \mu\text{m}$ ). Differences of these parameters did not reach the level of significance. In regression analysis distensibility of CCA had inverse correlation with M0 ( $\beta = -0.172$ ,  $p = 0.015$ ). Other arterial wall parameters were similar between groups.

**Conclusions:** Distensibility of common carotid artery is impaired in migraine without aura.

#### P5.06

##### INCREASED ARTERIAL STIFFNESS AND SYSTOLIC BLOOD PRESSURE FOLLOWING SUBCLAVIAN FLAP REPAIR FOR AORTIC COARCTATION IN INFANCY

D. Kenny<sup>1</sup>, J. Polson<sup>2</sup>, J. R. Cockcroft<sup>3</sup>, R. Martin<sup>1</sup>, J. Paton<sup>3</sup>, A. Wolf<sup>4</sup>

<sup>1</sup>Bristol Congenital Heart Centre, Bristol, United Kingdom

<sup>2</sup>University of Cardiff, Cardiff, United Kingdom

<sup>3</sup>University of Bristol, Bristol, United Kingdom

<sup>4</sup>Bristol Royal Hospital for Children, Bristol, United Kingdom

**Objectives:** To compare the effect of Subclavian Flap Repair (SFR) versus end-to-end anastomosis (EEA) on arterial stiffness and systolic blood pressure in young children with aortic coarctation.

**Methods:** Pulse wave velocity (PWV) was measured using a pulse volume recording technique (Vicorder, Skidmore Medical, Bristol, UK) in the right arm and leg of 21 children following CoA repair without residual narrowing (SFR  $n = 11$ , EEA  $n = 10$ ) and 18 age-matched controls. Non-invasive cardiac output was recorded to evaluate its possible contribution to elevated systolic blood pressure. Spontaneous baroreceptor reflex sensitivity (sBRS) was measured to determine if increased arterial stiffness was associated with reduced aortic baroreflex sensitivity.

**Results:** SFR patients had significantly higher right arm systolic blood pressure ( $p = 0.03$ ) and PWV ( $p = 0.02$ ) than both EEA patients and controls ( $p = 0.03$ ). This difference was not seen when comparing the EEA group to controls. No statistical difference was noted between groups in lower limb PWV. There were no significant intergroup differences in stroke index or sBRS.

**Conclusions:** Young children with SFR have higher blood pressure and stiffer upper limb arteries compared to matched children with EEA. Surgical approach may influence upper body arterial compliance and systolic blood pressure control in young children leading to implications for longer-term cardiovascular outcomes.

	SFR	EEA	Control
Age at follow-up (yrs)	$5.4 \pm 0.2$	$5.4 \pm 0.1$	$5.3 \pm 0.1$
SBP (mmHg)	$108.2 \pm 3.5^{*†}$	$97.8 \pm 2.9$	$99.2 \pm 2.3$
Arm PWV (m/s)	$6.0 \pm 0.2^{*†}$	$5.2 \pm 0.2$	$5.5 \pm 0.1$
Leg PWV (m/s)	$5.9 \pm 0.4$	$5.8 \pm 0.3$	$5.5 \pm 0.2$
Stroke Index (mls/m <sup>2</sup> )	$43.3 \pm 4$	$42.1 \pm 2.3$	$46.7 \pm 2.2$
sBRS (ms/mmHg)	$11.2 \pm 1.4$	$9.4 \pm 1.0$	$9.7 \pm 0.9$

\* Indicates significance ( $p < 0.05$ )  $<>$  SFR and EEA.  $† <>$  SFR and Controls.

#### P5.07

##### LOCAL VASCULAR PROPERTIES AND AUTONOMIC NERVOUS REACTIVITY IN THE THIRD TRIMESTER OF PREGNANCY

N. Potocnik, K. Cankar, Z. Melik, V. Starc

*Institute of Physiology, Medical Faculty, University of Ljubljana, Ljubljana, Slovenia*

It is known that reproductive hormones influence both local vascular properties and autonomic nervous reactivity. The aim of our study was to measure the small artery compliance, cutaneous LD flux response to local cooling and heart rate variability in women in the third trimester of normal pregnancy (group A) and in nonpregnant women in the follicular (group Bf) and the luteal phase (group Bl) of menstrual cycle.

Experiments were performed on 19 pregnant women and in 12 age-matched non-pregnant females. A noninvasive method was used to determine finger artery compliance. Spectral analysis of RR intervals was performed using autoregression and the area under the power spectrum was evaluated using the standard frequency bands.

Our results revealed a decrease in parasympathetic and an increase in sympathetic activity during third trimester of pregnancy. The diastolic blood pressure in group A ( $60.6 \pm 2.5$  mmHg) was significantly lower than in both

subgroups Bf and Bl ( $74.3 \pm 3.0$  and  $76.3 \pm 4$ ,  $p < 0.01$ ), the heart rate (HR) was increased in group A ( $82.5 \pm 1.7$  bpm) compared to Bf ( $66.9 \pm 3.4$  bpm) and Bl ( $69.7 \pm 3.6$  bpm). In contrast there were no statistically significant differences in systolic blood pressure and finger artery compliance ( $1.35 \pm 0.26$  in A,  $1.55 \pm 0.24$  in Bf and  $1.40 \pm 0.11$  in Bl). During cooling arterial pressure and HR increased while CI decreased significant only in group A but not in subgroups Bf and Bl. LD flux decreased significantly less in group A compared to groups Bf and Bl.

Our findings suggest that reproductive hormones exert more influence on local vascular mechanisms than on central autonomic reactivity.

#### P5.08

##### INDICES OF EARLY ATHEROSCLEROSIS AND ARTERIAL STIFFNESS AND CEREBRAL BLOOD FLOW VELOCITY

A. Kwater, J. Gąsowski, T. Grodzicki

*Department of Internal Medicine and Gerontology, Jagiellonian University, Cracow, Poland*

**Objective:** The aim of the study was to assess the relationship between structural (IMT- intima-media thickness) and functional (PWV - pulse wave velocity, SBP - systolic blood pressure, PP - pulse pressure) parameters of the large arterial damage and the mean blood flow velocity (CBFV) in middle cerebral artery (MCA).

**Design and Methods:** CBFV in (MCA) was measured bilaterally with transcranial Doppler (TCD). The early stage of vascular atherosclerosis was estimated with sonographic measurement of carotid IMT. We assessed large arterial stiffness using carotid-to-femoral PWV, brachial PP and SBP.

**Results:** The mean (SD) age of 165 analyzed subjects was 56.1 (11.8), age range: 22-86 years. We assessed the CBFV in thirds of respective distributions of IMT, PWV, PP and SBP and found that CBFV was less with advancing thirds of PWV and IMT (all  $p < 0.02$ ) but no such relation with PP and SBP (all  $p > 0.37$ ).

The within-tertile mean values and standard deviations are shown in table.

	Mean $\pm$ SD value of characteristic		
	I	II	III
SBP (mmHg)	$116.3 \pm 5.9$	$134.3 \pm 4.8$	$159.2 \pm 13.1$
PP (mmHg)	$36.4 \pm 5.0$	$49.2 \pm 1.9$	$65.5 \pm 9.3$
PWV (m/s)	$9.8 \pm 1.2$	$12.2 \pm 0.57$	$16.2 \pm 3.0$
IMT (mm)	$0.6 \pm 0.08$	$0.9 \pm 0.06$	$1.2 \pm 0.2$

**Conclusion:** Damage of large arteries expressed by increased IMT and PWV influences negatively the blood flow velocity in middle cerebral artery.

#### P5.09

##### LIGHT EXERCISE CENTRAL SYSTOLIC LOADING IS INCREASED IN PATIENTS WITH CYSTIC FIBROSIS RELATED DIABETES

J. H. Hull<sup>1</sup>, L. Ansley<sup>4</sup>, C. E. Bolton<sup>2</sup>, J. E. Sharman<sup>5</sup>, R. K. Knight<sup>3</sup>,

D. J. Shale<sup>2</sup>, J. R. Cockcroft<sup>2</sup>, R. Garrod<sup>1</sup>

<sup>1</sup>St George's, London, United Kingdom

<sup>2</sup>Cardiff University, Cardiff, United Kingdom

<sup>3</sup>Frimley Park Hospital, Surrey, United Kingdom

<sup>4</sup>University of Northumbria, Newcastle, United Kingdom

<sup>5</sup>University of Tasmania, Tasmania, Australia

**Background:** As survival in the common autosomal recessive condition Cystic Fibrosis (CF) improves, there is focus on extra-pulmonary complications. Patients with CF have increased augmentation index (Alx) at rest which is greatest in those with diabetes (CFRD). We evaluated haemodynamic response to exercise, at an intensity similar to daily life.

**Methods:** We studied 36 (25 male) adults ( $n = 11$ , CFRD) with stable CF, mean (range) age 28.9 (16-47) yrs and 25 age/gender/BMI matched controls. Central haemodynamic parameters; BP, Alx, augmented pressure (AP) and wasted LV pressure energy ( $\Delta E_w$ ) were determined by tonometry (SphygmoCor) at rest and 8 minutes into a 10 minute period of cycle ergometry at 60% age-predicted maximal HR. Serum IL-6 was measured.

**Results:** At rest, Alx was greater in both CFRD and non-CFRD patients than controls. During exercise, CFRD patients had greater MAP, AP, and  $\Delta E_w$  ( $p < 0.05$  for all) and a trend for greater Alx, whilst in non-CFRD patients were not different to controls (Table: at 8 minutes exercise).  $\text{Log}_{10}\text{IL-6}$  was increased in patients ( $p < 0.005$ ) and related to exercise  $\Delta E_w$  ( $r = 0.27$ ,  $p < 0.05$ ).