



## Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

Journal Home Page: <https://www.atlantis-press.com/journals/artres>

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### **P.008: THE EFFECT OF RAMIPRIL AND VALSARTAN ON AORTIC STIFFNESS AND WAVE REFLECTIONS IN PATIENTS WITH SUCCESSFUL COARCTATION REPAIR**

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**To cite this article:** S. Brili, N. Alexopoulos\*, I. Dima, N. Ioakeimidis, C. Vlachopoulos, C. Aggeli, D. Tousoulis, C. Stefanadis (2006) P.008: THE EFFECT OF RAMIPRIL AND VALSARTAN ON AORTIC STIFFNESS AND WAVE REFLECTIONS IN PATIENTS WITH SUCCESSFUL COARCTATION REPAIR, Artery Research 1:S1, S29–S30, DOI: [https://doi.org/10.1016/S1872-9312\(07\)70031-5](https://doi.org/10.1016/S1872-9312(07)70031-5)

**To link to this article:** [https://doi.org/10.1016/S1872-9312\(07\)70031-5](https://doi.org/10.1016/S1872-9312(07)70031-5)

Published online: 21 December 2019

**Methods:** We examined 178 healthy subjects (mean age 40.8 years) with no cardiovascular risk factors or disease, except for smoking. Chocolate intake was quantified with a dietary questionnaire, and subjects were assigned in groups of non-consumers, low consumers (<12 g/day - median value) or high consumers ( $\geq$ 12 g/day). Carotid-femoral pulse wave velocity (PWV) was measured as an index of aortic stiffness. Aortic augmentation index (Alx) and aortic BP were assessed using applanation tonometry of the radial artery.

**Results:** Increasing chocolate consumption was associated with decreased central systolic BP ( $P < 0.05$ ) and central PP, but not central diastolic or peripheral (brachial) BPs. There was an inverse relation of chocolate consumption with Alx and PWV. Alx was significantly lower in subjects with high chocolate consumption (Bonferroni  $P < 0.01$ ), whereas both low and high consumers had decreased PWV values ( $P < 0.05$  and  $P < 0.01$ ) compared with non-consumers. In multivariate analysis, increasing chocolate intake was an independent determinant of low PWV values (ANCOVA  $P < 0.01$ ) and low Alx ( $P < 0.01$ ), after controlling for potential confounders.

**Conclusions:** Habitual chocolate consumption of more than 12 gr per day is associated with improved arterial elastic properties and aortic hemodynamics in healthy individuals.

#### P.005

##### THE ASSOCIATION OF COFFEE CONSUMPTION WITH WAVE REFLECTIONS IN HYPERTENSIVE PATIENTS

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**Introduction:** Wave reflections are important markers and prognosticators of cardiovascular risk, and have been implicated in the pathogenesis of systolic hypertension. Caffeine increases acutely wave reflections. Furthermore, chronic coffee consumption is associated with increased wave reflections in normotensive subjects. In the present study we aimed to assess the association between chronic coffee consumption and wave reflections in hypertensive patients.

**Methods:** We examined 228 never treated hypertensives (age  $50.7 \pm 11.9$  years, 143 males) under any medication. Frequency of coffee consumption was assessed using a validated food frequency questionnaire. According to the distribution of coffee consumption, we categorized daily coffee consumption as: (1) none, (2) low (<200 ml/day), (3) moderate (200-450 ml/day) and (4) high (>450 ml/day). Augmentation Index (Alx) was measured non-invasively as an index of wave reflections, using SphygmoCor®. Analysis of covariance (ANCOVA) was applied to evaluate the association between Alx and coffee intake after adjusting for several potential confounders.

**Results:** Alx was found to be increased with increasing degree of daily coffee consumption when adjusted for gender, age, height, smoking status, heart rate, mean pressure, HDL cholesterol and hsCRP ( $p < 0.02$ ). Systolic, diastolic, pulse and mean pressures were not different among the 4 groups of daily coffee consumption.

**Conclusions:** Increased daily coffee consumption is associated with enhanced wave reflections in hypertensive patients. This finding may have important implications for the management of these patients.

#### P.006

##### THE ACUTE EFFECT OF GREEN TEA ON ENDOTHELIAL FUNCTION IN HEALTHY INDIVIDUALS

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**Introduction:** The effect of tea consumption on cardiovascular risk has not been defined yet, although there is evidence of a beneficial effect attributed to its flavonoid content. Endothelial dysfunction is a key event in the pathogenesis of atherosclerosis. The aim of the study was to evaluate the effect of green tea on endothelial function.

**Methods:** Thirteen apparently healthy subjects (age  $32 \pm 3$  years) with no risk factors for cardiovascular disease (except from 6 smokers) were studied at 3 sessions: (i) one with 6 gram of green tea, (ii) one with 125 mg of caffeine (the content of caffeine in green tea preparation) and (iii) one after placebo (hot water). Flow-mediated dilatation of the brachial artery was examined, using ultrasonography at baseline, at 30 min (peak plasma concentration of caffeine) and at 90 and 120 min (peak plasma concentration of flavonoids) after each intervention.

**Results:** The effect of green tea (or caffeine) on each variable is better described as changes in the response of each variable, where response is defined as net green tea (or caffeine) minus placebo values at each time point. Resting and hyperemic diameter of the brachial artery did not change

significantly either with green tea or caffeine. Flow-mediated dilatation was significantly increased with green tea (by 2.46%,  $p < 0.02$ ) but not with caffeine.

**Conclusions:** Green tea has an acute beneficial effect on endothelial function in healthy individuals. This may, at least partly, contribute to the beneficial effect of tea on cardiovascular risk.

#### P.007

##### EVALUATION OF AORTIC STIFFNESS AND WAVE REFLECTIONS IN PATIENTS AFTER SUCCESSFUL COARCTATION REPAIR

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**Introduction:** We have previously shown that normotensive patients with successful coarctation repair (SCR) have decreased distensibility of the upper body and increased distensibility of the lower body arteries. Aortic stiffness and wave reflections are implicated in the pathogenesis of hypertension. In this study we aimed at assessing whether aortic stiffness and wave reflections are influenced in this category of patients.

**Methods:** 19 normotensive, asymptomatic patients  $26 \pm 7$  years old, and age at surgery  $15 \pm 9$  years with SCR and gradient  $< 25$  mmHg, and 19 age, gender, height, weight, smoking status, lipid profile adjusted controls were studied. Carotid-femoral pulse wave velocity (PWV) was measured as an index of the stiffness of the whole aorta using a validated non-invasive device (Complior®). Wave reflections resulting from the whole body were studied using a validated system (SphygmoCor®) that employs high-fidelity arterial tonometry for the non-invasive registration of radial pulse waveform and appropriate computer software for pulse wave analysis. Aortic pressure waveform was synthesized from the radial waveform using a generalized transfer function. Augmentation index (Alx) was measured as an index of wave reflections.

**Results:** SCR patients had higher systolic, pulse and mean pressure than controls, while diastolic pressures did not differ. PWV and Alx were not different among the two groups (table).

	Postcoarctectomy pts	Controls	P value
Age, years	$26.5 \pm 7.3$	$27.5 \pm 5.8$	NS
SP, mmHg	$130.6 \pm 14.9$	$116.9 \pm 14.6$	$< 0.01$
DP, mmHg	$71.7 \pm 8.7$	$68.6 \pm 8.3$	NS
PP, mmHg	$58.9 \pm 13.2$	$48.3 \pm 10.4$	$< 0.01$
Mean P, mmHg	$90.7 \pm 10.0$	$83.4 \pm 10.2$	$< 0.05$
Heart rate, bpm	$70.5 \pm 11.1$	$70.7 \pm 11.2$	NS
PWV, m/s	$5.2 \pm 0.9$	$5.5 \pm 0.9$	NS
Alx, %	$11.1 \pm 13.7$	$9.3 \pm 9.2$	NS

**Conclusions:** Despite the fact that SCR patients had higher systolic and pulse pressures, PWV and Alx were not different than controls, possibly because these indices are influenced by the elastic properties of both the pre- and post-coarctation part of the arterial tree.

#### P.008

##### THE EFFECT OF RAMIPRIL AND VALSARTAN ON AORTIC STIFFNESS AND WAVE REFLECTIONS IN PATIENTS WITH SUCCESSFUL COARCTATION REPAIR

S. Brili, N. Alexopoulos\*, I. Dima, N. Ioakeimidis, C. Vlachopoulos, C. Aggeli, D. Tousoulis, C. Stefanadis. *Athens Medical School, Hippokratia Hospital, Athens, Greece*

**Introduction:** Patients after successful coarctation repair (SCR) have increased incidence of cardiovascular complications due to relapse of hypertension, which is mainly attributed to impaired elastic properties of the upper body arteries. Angiotensin converting enzyme inhibitors and angiotensin receptor antagonists reduce aortic stiffness and wave reflections; however their effect on arterial stiffness in postcoarctectomy patients has not been studied yet.

**Methods:** 12 patients,  $25 \pm 6$  years with SCR at  $14 \pm 7$  years, normotensive at rest, were studied at 4 different occasions with a randomised, cross-over design: (i) at baseline and 4 weeks after ramipril 5 mg/day; (ii) at baseline and 4 weeks after valsartan 160 mg/day. Carotid-femoral pulse wave velocity (PWV) was measured as an index of aortic stiffness with Complior®. Augmentation index (Alx) was measured as an index of wave reflections using SphygmoCor®.

**Results:** Both ramipril and valsartan decreased peripheral blood pressure (systolic by  $7.6 \pm 9$  and  $5.9 \pm 7$  mmHg respectively,  $P < 0.05$  for both, diastolic by  $6.5 \pm 5$  and  $9.1 \pm 6$  mmHg respectively,  $P < 0.01$  for both). PWV and Alx

were also decreased with ramipril and valsartan (PWV by  $0.5 \pm 0.3$  and  $0.6 \pm 0.6$  m/s,  $P < 0.005$  and  $< 0.01$  respectively; Alx by  $5.2 \pm 4$  and  $5.8 \pm 4$  respectively,  $P < 0.005$  for both). When the effect of ramipril on systolic and diastolic pressure, PWV, and Alx was compared to that of valsartan, no difference was observed in any parameter.

**Conclusions:** Ramipril reduce aortic stiffness and wave reflections to the same degree as valsartan in patients after SCR. Their beneficial effects should be taken into account when treatment in SCR patients is considered.

#### P.009

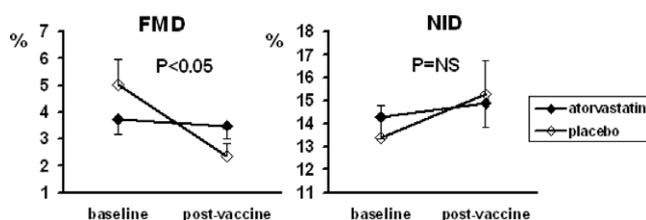
##### ATORVASTATIN ABROGATES THE DETERIORATION OF ENDOTHELIAL FUNCTION INDUCED BY ACUTE INFLAMMATION IN DYSLIPIDEMIC PATIENTS

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**Introduction:** Acute inflammation is associated with a deterioration of endothelial function. Statins reduce cardiovascular risk by lipid lowering and non-lipid pleiotropic effects. It has not been defined whether atorvastatin modifies the effects of acute inflammation on endothelial function in dyslipidemic patients.

**Methods:** We generated a transient systemic inflammation by Salmonella Typhi vaccination in 30 volunteers with mild dyslipidemia. They were studied 4 days after randomly taking atorvastatin 40 mg or placebo once daily at bedtime. Conduit artery endothelial performance was assessed before and 8 hours after vaccination. Flow-mediated dilation (FMD) of the brachial artery, an index of endothelial function, and the endothelium-independent nitrate-induced dilation (NID) were measured by using high resolution ultrasonography.

**Results:** There were no differences in all baseline characteristics among the two groups. In the placebo group, vaccination caused a significant decrease of FMD at 8 hours (by  $2.65 \pm 1.08\%$ ,  $P < 0.05$ , left figure), indicating an unfavourable effect of inflammation on endothelial function. In contrast, in the pretreated with atorvastatin group, the decrease of FMD after vaccination (by  $0.22 \pm 0.53\%$ ) was significantly smaller compared with placebo ( $P < 0.05$  by 2-way repeated-measures ANOVA, left figure), denoting that the adverse effect of inflammation on endothelial function is abrogated by atorvastatin. We did not observe any significant change of NID after vaccination in any group ( $P = NS$ , right figure).



**Conclusion:** In dyslipidemic patients, atorvastatin abrogates the deterioration of endothelial function caused by an acute inflammatory stimulus. This finding provides valuable insights into the protective effect of atorvastatin on arterial function and on the cardiovascular system overall.

#### P.010

##### DO PULSE WAVE VELOCITY AND AUGMENTATION INDEX MEASURE DIFFERENT MODES OF AORTIC STIFFNESS?

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**Introduction:** Aortic pulse wave velocity (aPWV) and augmentation index (Alx) are tools to assess aortic stiffness. This study examined the relationship between aPWV using a validated, direct method, results from pulse wave analysis (PWA), using the indirect method from tonometry at the radial artery (via the SphygmoCor).

**Methods:** aPWV was measured as the speed of aortic waveforms between a) the junctions of left subclavian and aortic arch and b) bifurcation of the abdominal aorta, using Doppler probes. PWA was undertaken immediately after aPWV measurement in all participants.

**Results:** High quality data were obtained from 33 postnatal, healthy women aged 22-44y, with mean systolic/diastolic blood pressure (SBP/DBP) of 109.9/66.2 mmHg (95% CI: 105.8-114/63.4-69.1). Correlation coefficients for aPWV and Alx (Augmentation Index), AP (augmentation pressure) were only 0.18 and 0.09, not 'significant'. Factors affecting these parameters were as follows: age (both), 2-hour glucose levels from the glucose tolerance

test (GTT) influenced AP ( $r = 0.67$ ,  $p = 0.047$ ) and SBP for aPWV ( $r = 0.39$ ,  $p = 0.027$ ).

**Conclusions:** Different factors affect aortic stiffness as assessed by these methods, young, healthy women in our study group.

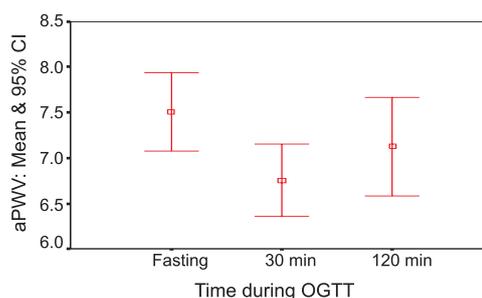
#### P.011

##### EFFECT OF GLUCOSE FLUX DURING OGTT ON AORTIC FUNCTION

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**Introduction:** Hyperglycaemia or related factors lead to micro and macrovascular complications. Our aim was to relate changes in aortic pulse wave velocity (aPWV) with glucose flux during a 75 g oral glucose tolerance test (OGTT). Our null hypothesis was that aPWV does not change significantly during the OGTT.

**Methods:** 72 pre-menopausal women (age 35.0, 33.5-36.5 years) underwent anthropometry and aPWV measurements at 0, 30 and 120 min of an OGTT. aPWV was measured as speed of the aortic flow waveform between the (a) junction of the left subclavian artery and arch of the aorta and (b) bifurcation of the abdominal aorta by using Doppler probes.



**Results:** aPWV decreased by 30 min during an OGTT by 8.6% (95% CI: 3.3-14.0%),  $p < 0.0001$ , but reverted by 2 hr ( $p = 0.16$ ). In regression analysis, 30 min aPWV was affected by age ( $\beta = -0.13$ ,  $p = 0.03$ ), day in cycle ( $\beta = -0.09$ ,  $p = 0.008$ ) and body fat percentage ( $\beta = -0.1$ ,  $p = 0.01$ ) but not independently by other variables below nor fasting or 2 hour glucose; the 120 min aPWV was affected by brachial pulse pressure ( $\beta = -0.91$ ,  $p = 0.03$ ) and smoking exposure ( $\beta = -0.24$ ,  $p = 0.045$ ), and the fall in aPWV between fasting and 30 min by age ( $\beta = -1.6$ ,  $p = 0.05$ ) and body fat percentage ( $\beta = -1.8$ ,  $p = 0.008$ ).

**Conclusions:** Aortic function as assessed by aPWV changes during an OGTT, and its degree of change is primarily affected by age and adiposity, but not glycaemia.

#### P.012

##### COMPARISON OF OSCILLOMETRIC AND TONOMETRIC DERIVED PULSE WAVE VELOCITY

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**Objective:** Measurements of the aortic pulse wave velocity (PWV) with applanation tonometry is broadly accepted, but investigator-dependent, time-consuming, and expensive. Recently a new method to determine PWV derived from oscillometric pressure curves with a simple upper arm cuff has been developed. The aim of the present study was to compare the PWV derived from two well established and clinically validated tonometric methods (SphygmoCor, Complior) with the oscillometric one (Arteriograph).

**Design and Method:** PWV was measured in 51 patients up to 5 times with SphygmoCor, Complior and Arteriograph, respectively. 36 patients were measured in a second session following the same protocol. We then compared the means of the PWVs for each patient per session ( $n = 87$ ).

**Results:** The correlations of the PWV assessed by Arteriograph compared to SphygmoCor was  $r = 0.67$  ( $p < 0.001$ ) and to Complior  $r = 0.069$  ( $p < 0.001$ ). SphygmoCor- and Complior-assessed PWVs showed a correlation of  $r = 0.87$ .

**Conclusions:** The new oscillometric method of assessing PWV is highly correlated to the tonometrically derived PWV. Further studies are necessary to define the clinical use of the oscillometrically derived PWV.