



## Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

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

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### **P41: INCREASED STIFFNESS IN THE DIGITAL ARTERIES OF ESSENTIAL HYPERTENSIVE WOMEN: THE FUCHSIA STUDY**

Rosa Maria Bruno, Nicole Di Lascio, Saverio Vitali, Piercarlo Rossi, Rachele Gherardini, Stefano Taddei, Francesco Faita, Davide Caramella, Lorenzo Ghiadoni

**To cite this article:** Rosa Maria Bruno, Nicole Di Lascio, Saverio Vitali, Piercarlo Rossi, Rachele Gherardini, Stefano Taddei, Francesco Faita, Davide Caramella, Lorenzo Ghiadoni (2018) P41: INCREASED STIFFNESS IN THE DIGITAL ARTERIES OF ESSENTIAL HYPERTENSIVE WOMEN: THE FUCHSIA STUDY, Artery Research 24:C, 90–90, DOI: <https://doi.org/10.1016/j.artres.2018.10.094>

**To link to this article:** <https://doi.org/10.1016/j.artres.2018.10.094>

Published online: 7 December 2019

historical and contemporaneous values of PP and MAP as well as age and heart rate, PWV was significantly associated with  $PP_C$ ,  $MAP_C$  and  $PP_H$  but not with  $MAP_H$ . In the sub-study in which historical values of PWV were available, PWV increased by  $0.75 \pm 1.42$  m/s, over an average of  $5.5 \pm 1.7$  years. The change in PWV was associated with  $MAP_C$  and with  $PP_H$  ( $\beta = 0.144$ ,  $p < 0.001$ ).

**Conclusions:** These results are consistent with strong dependence of PWV on contemporaneous BP but also historical values of pulse pressure which may drive arterial stiffening.

### P38

#### DIFFERENCES IN FORM FACTOR CALCULATED FROM OSCILLOMETRIC OR WAVEFORM MEAN ARTERIAL PRESSURE

Chloe Park, Therese Tillin, Nish Chaturvedi, Alun Hughes  
MRC Unit for Lifelong Health and Ageing at UCL, Department of Population Science & Experimental Medicine, Institute of Cardiovascular Science, Faculty of Population Health Sciences, UCL, London, UK

**Background:** Oscillometric mean arterial pressure (MAP) agrees closely with invasive MAP, [1] but most devices do not report MAP and it is usually estimated by a form factor (FF). However, blood pressure (BP) measurement errors will affect FF, its correlations with exposures, and introduce errors into MAP estimated from the BP waveform.

**Methods:** Brachial BP was measured using a PulseCor device in 1,112 participants in the Southall and Brent Revisited study ( $68.8 \pm 6.1$  y; 78.2% male; 47.4% White-European; 38.3% South-Asian; 14.3% African-Caribbean). Form factors (FF<sub>osc</sub> and FF<sub>wave</sub>) were calculated as (MAP-diastolic BP)/(systolic BP-diastolic BP) by oscillometry (MAP<sub>osc</sub>) or from the BP waveform (MAP<sub>wave</sub>). **Results:** FF<sub>osc</sub> and FF<sub>wave</sub> differed ( $0.28$  (SD = 0.02) vs.  $0.36$  (SD = 0.04));  $p < 0.001$  and were negligibly correlated ( $r = 0.07$ ). Neither FF<sub>osc</sub> nor FF<sub>wave</sub> were associated with ethnicity, prevalent cardiovascular disease or current smoking status, and neither showed significant correlations with age, total- or HDL-cholesterol, or physical activity. Both FF<sub>osc</sub> and FF<sub>wave</sub> were lower in men (difference ( $\Delta$ ) =  $-0.005$  (95% CI =  $-0.007$ ,  $-0.002$ ) vs.  $-0.015$  (95% CI =  $-0.020$ ,  $0.009$ ) respectively) and were negatively correlated with height ( $r = -0.14$  both), but only FF<sub>wave</sub> correlated with body mass index ( $r = 0.02$  vs  $r = 0.10$ ) and heart rate ( $r = -0.06$  vs  $r = 0.20$ ).  $\Delta$ MAP<sub>osc</sub>-MAP<sub>wave</sub> correlated with age ( $r = 0.10$ ), height ( $r = 0.15$ ) and heart rate ( $r = 0.17$ ) and was greater in women ( $0.9$  (95% CI =  $0.5$ ,  $1.3$ ) mmHg).

**Conclusions:** FF<sub>wave</sub> agrees poorly with FF<sub>osc</sub> probably due to measurement errors. This creates spurious associations between exposures and FF and causes systematic errors in estimated MAP<sub>wave</sub>. These errors have the potential to confound associations in epidemiological studies.

#### References

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### P39

#### ACUTE RESPONSES OF PULSE WAVE REFLECTION AFTER AEROBIC EXERCISE WITH DIFFERENT VOLUMES

Tainah Lima, Felipe Cunha, Wallace Monteiro, Paulo Farinatti, Mário Neves  
State of Rio de Janeiro University, Rio de Janeiro, Brazil

**Background:** Although Aerobic Exercise (AE) has been recognized for lowering Blood Pressure (BP), little is known about the alterations in aortic BP after exercise (1,2). **PURPOSE:** To investigate the acute pulse wave reflection responses induced by AE with different volumes in normotensive and hypertensive men.

**Methods:** We included 12 normotensives [aged:  $38.3 \pm 10.1$  years, body mass index (BMI):  $25.9 \pm 3.6$  kg/m<sup>2</sup>, maximal oxygen uptake (VO<sub>2</sub>max):  $31.4 \pm 6.9$  mL·kg<sup>-1</sup>·min<sup>-1</sup>, systolic/diastolic BP (SBP/DBP):  $121 \pm 6/74 \pm 4$  mmHg] and 7 hypertensive men [aged:  $39.1 \pm 6.0$  years, BMI:  $29.4 \pm 3.1$  kg/m<sup>2</sup>, VO<sub>2</sub>max:  $26.1 \pm 1.8$  mL·kg<sup>-1</sup>·min<sup>-1</sup>, SBP/DBP:  $140 \pm 8/88 \pm 7$  mmHg]. The participants were submitted to a maximal cardiopulmonary exercise test, a non-exercise control session (CTL), and two bouts of continuous cycling at 50% VO<sub>2</sub> reserve (150 vs. 300 kcal) in a randomized, counter-balanced order. Aortic systolic pressure, aortic pulse pressure, augmentation pressure, and augmentation index (Alx) were determined 10 min before and 70 min after the CTL and the two exercise bouts in a supine position by applanation tonometry (SphygmoCor v7).

**Results:** Central pressures and Alx were different between normotensive and hypertensive men after the two AE bouts as shown in table 1.

**Conclusion:** Although both AE were able to reduce pulse wave reflection in hypertensive men, only the major volume has attenuated the increase in central aortic BP observed in the control session.

Table 1. Mean  $\pm$  SD values for the pulse wave reflection indicators at baseline and post-CTL and AE bouts with 150 and 300 kcal

Variables	Conditions	Hypertensive			
		Baseline	Recovery	Baseline	Recovery
Aortic Systolic Pressure (mmHg)	CTL	96.84 $\pm$ 4.45	104.75 $\pm$ 7.81*	113.71 $\pm$ 14.82	124.06 $\pm$ 18.90*
	150 kcal	98.1* $\pm$ 6.21	99.08 $\pm$ 7.00	113.71 $\pm$ 11.11	124.13 $\pm$ 18.11*
	300 kcal	100.25 $\pm$ 2.24	100.00 $\pm$ 6.98	114.43 $\pm$ 14.14	119.57 $\pm$ 13.37*
Aortic Pulse Pressure (mmHg)	CTL	29.67 $\pm$ 3.72	26.67 $\pm$ 4.23	30.57 $\pm$ 7.88	33.29 $\pm$ 9.59
	150 kcal	28.00 $\pm$ 4.43	27.51 $\pm$ 3.46	31.20 $\pm$ 9.00	33.71 $\pm$ 4.09
	300 kcal	30.60 $\pm$ 3.21	27.75 $\pm$ 4.04	21.14 $\pm$ 7.75	22.29 $\pm$ 4.64
Aortic Augmentation Pressure (mmHg)	CTL	4.83 $\pm$ 4.42	3.73 $\pm$ 3.51	5.43 $\pm$ 3.22	7.30 $\pm$ 3.21
	150 kcal	3.67 $\pm$ 4.08	1.88 $\pm$ 1.60	4.47 $\pm$ 3.10	6.86 $\pm$ 4.42
	300 kcal	3.05 $\pm$ 4.33	1.83 $\pm$ 3.93	4.00 $\pm$ 6.13	4.43 $\pm$ 3.60
Augmentation Index (%)	CTL	13.33 $\pm$ 10.22	11.83 $\pm$ 12.34	10.43 $\pm$ 12.52	20.43 $\pm$ 10.51*
	150 kcal	10.75 $\pm$ 10.70	5.50 $\pm$ 12.91	14.29 $\pm$ 8.10	5.20 $\pm$ 12.91
	300 kcal	9.40 $\pm$ 13.84	6.74 $\pm$ 13.48	10.14 $\pm$ 13.60	8.78 $\pm$ 12.48

\* Significant difference compared baseline and recovery in the same condition, using paired t-test ( $P < 0.05$ )

† Significant difference compared baseline and recovery in the same condition, using paired t-test ( $P < 0.01$ )

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### P41

#### INCREASED STIFFNESS IN THE DIGITAL ARTERIES OF ESSENTIAL HYPERTENSIVE WOMEN: THE FUCHSIA STUDY

Rosa Maria Bruno<sup>1,2</sup>, Nicole Di Lascio<sup>3</sup>, Saverio Vitali<sup>4</sup>, Piercarlo Rossi<sup>4</sup>, Rachele Gherardini<sup>4</sup>, Stefano Taddei<sup>4</sup>, Francesco Faïta<sup>3</sup>, Davide Caramella<sup>4</sup>, Lorenzo Ghiadoni<sup>4</sup>

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

<sup>2</sup>INSERM U970, Paris, France

<sup>3</sup>Institute of Clinical Physiology, CNR, Pisa, Italy

<sup>4</sup>University of Pisa, Pisa, Italy

**Rationale and Aim:** Essential hypertension is characterized by extensive alterations of arterial geometry and mechanical properties: increased stiffness, dilation and wall of large arteries, increased thickness in muscular arteries, small artery remodeling. This study is aimed at exploring function and structure of the digital arteries of the hand, muscular arteries with an internal diameter of 500-1000  $\mu$ m, easily accessible by ultrahigh frequency ultrasound.

**Methods:** 24 hypertensive women (HT) and 37 healthy controls (C) were recruited. 5<sup>th</sup>-videoclips of left palmar digital arteries were obtained by VevoMD (FUJIFILM, VisualSonics, Toronto, Canada), by means of a 70 MHz probe (axial-lateral resolution 30-65  $\mu$ m). An automatic system (Cvsuite, Quiipu srl; Pisa, Italy) was used to measure intima-media thickness (IMT) and diameter. Distensibility and stiffness were then calculated using left brachial pulse pressure (PP - oscillometric)

**Results:** HT and C had similar age ( $57 \pm 11$  vs  $53 \pm 11$  years,  $p = 0.22$ ), BMI ( $24.9 \pm 4.6$  vs  $24.5 \pm 4.2$  vs kg/m<sup>2</sup>,  $p = 0.80$ ) and mean blood pressure (BP,  $95 \pm 12$  vs  $91 \pm 12$  mmHg,  $p = 0.24$ ); HT showed slightly higher PP ( $54 \pm 14$  vs  $47 \pm 10$ ,  $p = 0.07$ ). Palmar digital lumen tended to be higher in HT ( $804 \pm 201$  vs  $696 \pm 191$   $\mu$ m,  $p = 0.10$ ), while IMT was similar ( $120 \pm 23$  vs  $125 \pm 36$   $\mu$ m,  $p = 0.81$ ). Distensibility was reduced ( $21.4 \pm 18.2$  vs  $29.0 \pm 18.8$  kPa<sup>-1</sup>,  $p < 0.05$ ), while stiffness was increased ( $7.95 \pm 2.22$  vs  $6.72 \pm 2.11$  m/s,  $p < 0.005$ ).

**Conclusions:** This is the first report of the presence of altered mechanical properties (i.e. increased stiffness) in muscular arteries with lumen  $< 1000$   $\mu$ m of essential hypertensive women. These findings suggest that increased hemodynamic load characterizing hypertension lead to a different vascular phenotype in each arterial segment.

### P43

#### MASKED HYPERTENSION AND RETINAL VESSEL STRUCTURE AND FUNCTION IN YOUNG HEALTHY ADULTS: THE AFRICAN-PREDICT STUDY

Nthai Ramoshaba<sup>1</sup>, Hugo Huisman<sup>1,2</sup>, Leandi Lammertyn<sup>1,2</sup>, Konstantin Kotliar<sup>3</sup>, Aletta Schutte<sup>1,2</sup>, Wayne Smith<sup>1,2</sup>

<sup>1</sup>Hypertension in Africa Research Team (HART), North-West University, Potchefstroom, South Africa