



## Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

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

---

### **OR-05: SEX DIFFERENCES IN VASCULAR STRUCTURE AND FUNCTION IN INDIVIDUALS WITH MULTIPLE SCLEROSIS AND HEALTHY CONTROLS**

Thessa Hilgenkamp, Garrett Griffith, Robert W. Motl, Tracy Baynard, Bo Fernhall

**To cite this article:** Thessa Hilgenkamp, Garrett Griffith, Robert W. Motl, Tracy Baynard, Bo Fernhall (2016) OR-05: SEX DIFFERENCES IN VASCULAR STRUCTURE AND FUNCTION IN INDIVIDUALS WITH MULTIPLE SCLEROSIS AND HEALTHY CONTROLS, Artery Research 16:C, 102–103, DOI: <https://doi.org/10.1016/j.artres.2016.08.007>

**To link to this article:** <https://doi.org/10.1016/j.artres.2016.08.007>

Published online: 7 December 2019

## OR-04

## DECREASED AORTIC INERTANCE INCREASES SUSCEPTIBILITY OF LATE-SYSTOLIC LEFT VENTRICULAR EJECTION TO ARTERIAL WAVE REFLECTIONS

Timothy S. Phan<sup>1,2</sup>, John K.-J. Li<sup>2</sup>, Amer Ahmed Syed<sup>1</sup>, Harry G. Oldland<sup>1,3</sup>, Uzma Kewan<sup>3</sup>, Scott R. Akers<sup>1,3</sup>, Julio A. Chirinos<sup>1,3,4</sup>

<sup>1</sup>University of Pennsylvania, Philadelphia, PA, United States

<sup>2</sup>Rutgers University, New Brunswick, NJ, United States

<sup>3</sup>Corporal Michael J. Cresenz Veterans Affairs Medical Center, Philadelphia, PA, United States

<sup>4</sup>Ghent University, Ghent, Belgium

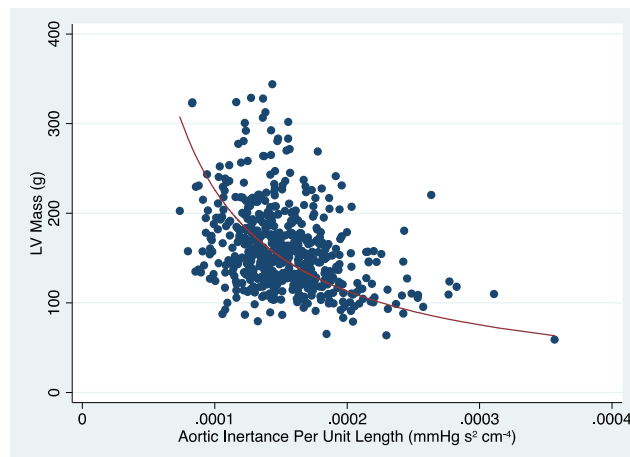
**Background:** Left ventricular (LV) afterload patterns consisting of late-systolic loading has been linked to LV remodeling and fibrosis in a number of studies. The contributions from arterial wave reflections (WR) has therefore garnered much interest. Aortic dilation may facilitate the adverse effects of WRs through its effect on aortic inertance. Decreased aortic inertance from aortic dilation is particularly important in late-systole, when the LV-aortic pressure gradient generally reverses and ejection decelerates until time of aortic valve closure.

**Hypothesis:** Decreased aortic inertance from aortic dilation is associated with LV hypertrophy.

**Methods:** We measured carotid-femoral pulse wave velocity (PWV; a measure of arterial stiffness) and LV mass (LVM) with SSFP-MRI in 409 subjects (mean age = 61 years). Aortic geometry was measured using SSFP-MRI, with a novel 3D aortic analyzer (Medical Imaging Applications, Coralville, Iowa). We computed compliance and inertance from PWV and geometric measurements. Reflection magnitude (RM) was calculated from pressure-flow analysis of calibrated carotid tonometry and aortic flow (PC-MRI).

**Results:** A non-linear relationship between inertance and LVM was found, with a more pronounced slope at lower inertance values (Figure). After log-transformation of LVM and adjusting for age, height, weight, sex, and area compliance of the thoracic aorta, decreased aortic inertance was independently associated with increased LVM (standardized  $\beta = -0.382$ ;  $P < 0.001$ ). Aortic inertance was the strongest predictor of LVM in this model, whereas area compliance was not predictive. There was significant interaction between inertance and RM ( $P = 0.029$ ) such that the negative relationship between inertance and LVM was stronger for greater RM.

**Conclusions:** Reduced inertance from aortic dilation is independently associated with LV hypertrophy. This is consistent with the principle that reduced inertance diminishes the buffer between pressure gradient transients and aortic flow. In late-systole, augmentation of the negative LV-aortic pressure gradient by WRs imposes a greater deceleration force on LV ejection.



## OR-05

## SEX DIFFERENCES IN VASCULAR STRUCTURE AND FUNCTION IN INDIVIDUALS WITH MULTIPLE SCLEROSIS AND HEALTHY CONTROLS

Thessa Hilgenkamp<sup>1</sup>, Garrett Griffith<sup>1</sup>, Robert W. Motl<sup>2</sup>, Tracy Baynard<sup>1</sup>, Bo Fernhall<sup>1</sup>

<sup>1</sup>Integrative Physiology Laboratory, University of Illinois at Chicago, Chicago, IL, United States

<sup>2</sup>Exercise Neuroscience Research Laboratory, University of Illinois at Urbana-Champaign, Champaign, IL, United States

**Objectives:** Cardiovascular disease is a leading cause of death in multiple sclerosis (MS), and recent data showed that subclinical markers of atherosclerosis are higher in MS as well. Prevalence of MS in men is much lower than in women, but their prognosis is much worse. Men with MS also have higher rates of hypertension and diabetes than women with MS. Whether vascular function and structure differs in men than in women with MS, and whether potential sex differences are similar to those in healthy controls, is unknown.

**Aim:** To compare vascular function and structure between men and women in a group with MS and in healthy controls.

**Methods:** After a 10 minute rest in the supine position, resting heart rate (HR) and brachial blood pressure (BP) were collected. Augmentation index

	Control		MS		p-values factors <sup>#</sup>		
	Female (n=21)	Male (n=18)	Female (n=52)	Male (n=18)	Group	Sex	Inter-action
Age	49 ± 10	41 ± 9	48 ± 12	48 ± 13	0.228	0.126	0.109
Height (cm)	164 ± 6	177 ± 5	163 ± 7	179 ± 6	0.867	< 0.001**	0.264
Weight (kg)	69 ± 10	89 ± 13	73 ± 14	88 ± 17	0.679	< 0.001**	0.431
BMI	26 ± 4	28 ± 5	28 ± 6	28 ± 6	0.579	0.218	0.243
HR rest	59 ± 9	60 ± 12	65 ± 8	66 ± 12	0.004**	0.582	0.739
SBP rest	120 ± 12	128 ± 8	119 ± 16	125 ± 12	0.440	0.015*	0.672
DBP rest	76 ± 9	76 ± 11	72 ± 10	77 ± 8	0.429	0.269	0.341
MAP rest	91 ± 10	94 ± 10	88 ± 11	93 ± 9	0.410	0.081	0.688
AIX	31 ± 10	10 ± 15	27 ± 12	17 ± 12	0.510	< 0.001**	0.038*
AIX@HR75	23 ± 8	3 ± 16	22 ± 11	13 ± 9	0.074	< 0.001**	0.018*
PWVc	6 ± 1	7 ± 1	7 ± 2	7 ± 2	0.058	0.695	0.675
PWVc/MAP	0.07 ± 0.01	0.07 ± 0.01	0.08 ± 0.02	0.08 ± 0.02	0.013*	0.525	0.445
IMT	0.45 ± 0.08	0.51 ± 0.11	0.53 ± 0.12	0.6 ± 0.13	0.001**	0.010*	0.985
Beta	7.04 ± 2.21	6.64 ± 2.04	7.25 ± 2.03	8.07 ± 3.57	0.104	0.675	0.227
FBF Baseline	3.1 ± 1.3	3.7 ± 1	1.9 ± 0.9	2 ± 0.9	< 0.001**	0.099	0.203
FBF Peak	20.6 ± 7.1	27.2 ± 7	15.6 ± 5.8	20.5 ± 6.6	< 0.001**	< 0.001**	0.533
FBF AUC	70 ± 23.3	94 ± 27.7	58 ± 22.2	68 ± 26.6	< 0.001**	0.001**	0.160

<sup>#</sup> two-way independent ANOVA with Group, Sex and Group\*Sex as factors.

\* p < 0.05.

\*\* p < 0.01.

(AIX), HR normalized AIX (AIX@HR75) and pulse wave velocity were measured with applanation tonometry. Carotid intima-media thickness (IMT) and beta-stiffness were measured with carotid ultrasound, and Fore-arm Blood Flow (Baseline, Peak and Area Under the Curve) was measured with strain gauge plethysmography. Data were analyzed with a two-way independent ANOVA for factors group, sex and group\*sex.

**Results:** In both groups, men were taller and heavier than the women, had higher SBP, lower AIX and AIX@HR75, larger IMT and higher baseline and peak

FBF. Different patterns were observed in the sex differences for AIX and AIX@HR75 (in women similar in MS and controls, in men higher in MS than in controls).

**Conclusions:** People with MS demonstrate a vascular profile consistent with a higher cardiovascular risk compared to controls. Sex differences were similar in subjects with and without MS, except for the significantly higher AIX and AIX@HR75 in men with MS vs male controls, suggesting males with MS may be particularly at risk for cardiovascular disease.