



Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

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

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To cite this article: Eric Stöhr, Francesco Castagna, James Pearson, Laura Watkeys, Samuel Trocio, Oksana Zatvarska, Timothy Crimmins, Alberto Pinsino, Paolo Colombo, Melana Yuzefpolskaya, Reshad Garan, Veli Topkara, Hiroo Takayama, Koji Takeda, Yoshifumi Naka, John Cockcroft, (2017) 4.4: MIDDLE CEREBRAL ARTERY PULSATILITY IN HEART FAILURE AND PATIENTS WITH CONTINUOUS-FLOW LEFT VENTRICULAR ASSIST DEVICES, Artery Research 20:C, 57–57, DOI: <https://doi.org/10.1016/j.artres.2017.10.042>

To link to this article: <https://doi.org/10.1016/j.artres.2017.10.042>

Published online: 7 December 2019

4.4 MIDDLE CEREBRAL ARTERY PULSATILITY IN HEART FAILURE AND PATIENTS WITH CONTINUOUS-FLOW LEFT VENTRICULAR ASSIST DEVICES

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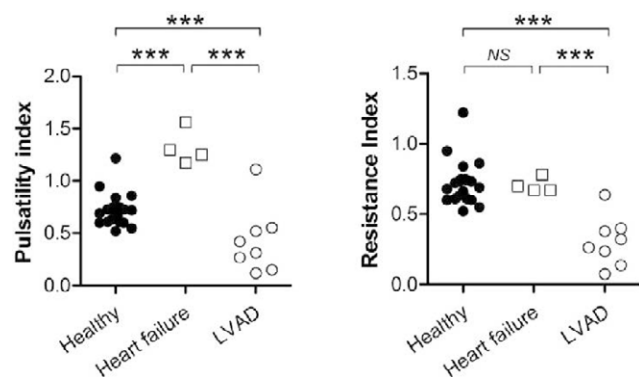
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Background: High pulsatility index (PI) in the cerebral circulation has been associated with increased prevalence of stroke (1). Interestingly, heart failure (HF) patients implanted with continuous-flow left ventricular assist devices (CF-LVADs) have increased rates of stroke despite presenting with dramatically lower pulse pressures compared with healthy individuals (20 mmHg vs. 30–40 mmHg). Characterising and understanding flow velocity profiles of the middle cerebral artery (MCA) may provide a useful and local marker of pulsatile energy transmitted into the brain of HF and CF-LVAD patients.

Methods: PI and resistance index (RI) were quantified from Duplex ultrasound images (2D and pulsed-wave Doppler) of the MCA obtained in four heart failure patients (HF; 68 ± 7 yrs), eight CF-LVAD patients (59 ± 4 yrs) and 20 healthy controls (51 ± 7 yrs).

Results: Compared with healthy controls, PI of the MCA was actually higher in the HF group (0.72 ± 0.16 vs. 1.32 ± 0.17, $P < 0.0001$), but markedly lower in patients on CF-LVAD (0.36 ± 0.21, $P < 0.0001$). However, RI was similar between healthy controls and HF patients ($P > 0.05$), and only lower in CF-LVAD patients ($P < 0.0001$).



Conclusions: PI in the MCA is significantly higher in HF but markedly lower in CF-LVAD patients, relative to healthy controls. The higher PI in HF does not appear to be associated with an altered RI. Future work should examine the cerebrovascular outcomes associated with varying levels of pulsatility and resistance in both HF and CF-LVAD patients.

Reference

1. Webb AJ, Simoni M, Mazzucco S, Kuker W, Schulz U, Rothwell PM. Increased cerebral arterial pulsatility in patients with leukoariosis: arterial stiffness enhances transmission of aortic pulsatility. *Stroke* 2012;43(10):2631–6.

4.5 THE EFFECT OF LUNG FUNCTION ON BLOOD PRESSURE AND VASCULAR INDICES FROM ADOLESCENCE TO EARLY ADULTHOOD IN A MULTI-ETHNIC COHORT

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Given the significance of lung function (LF) for vascular health in adulthood, there are surprisingly few studies that have examined the interrelationships of their developmental trajectories. Both develop and decline over the life course, though LF peaks in the 20s, and both predict cardiovascular events and mortality. We used the multi-ethnic Determinants of Adolescent Social well-being and Health (DASH) longitudinal study to test whether lung

function (LF) from early adolescence to young adulthood affected vascular indices. In 2002–3, 6643 11–13 y olds from 51 London schools participated at baseline, and 4785 were seen again at 14–16 y.

Recently 665 participated in pilot follow-up at 21–23 y. Regression models examined relationships between Forced Expiratory Volume (z-scores for zFEV₁ derived using Global Lung Initiative equations), blood pressure (BP), aortic pulse wave velocity (PWV) and augmentation index (AIx), the latter 2 measured only at 21–23 y. At 11–13 y, 1z-score zFEV₁ was associated with +1.90 mmHg (95% CI 1.11–2.68, $p < 0.001$) in systolic BP. In contrast at 21–13 y, a relationship between these measures was not evident.

Between 11–13 y and 21–23 y, 1z-score change in zFEV₁ was associated with +1.38 mmHg (0.25–1.51, $p < 0.05$) SBP, adjusted for age, sex, ethnicity, waist-height ratio, employment, and reported racism, smoking and alcohol use. zFEV₁ at 11–13 y or 21–23 y was not associated with PWV or central AIx (AIx_{ao}) at 21–23 y. These findings signal that whilst cross-sectionally LF is differently associated with SBP in early adolescence than in the 20s, longitudinal change in LF is positively associated with changes in SBP during this part of the life course.

4.6 HIPPOCAMPAL CEREBRAL BLOOD FLOW DEPENDS ON SYSTEMIC ENDOTHELIAL FUNCTION IN INDIVIDUALS WITH MILD COGNITIVE IMPAIRMENT: THE TRAIN THE BRAIN-MIND THE VESSEL STUDY

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Background: Dementia has been recently viewed as a predominantly vascular disorder. Indeed, reduced brain NO availability causes increased β -amyloid deposition by several mechanisms, including hypoperfusion.

Purpose: To investigate the relationship between cerebral blood flow in the hippocampal and parahippocampal regions (CBF-hipp and CBF-parahipp), crucial areas for memory and processing of non-verbal/spatial information, and systemic endothelial function in individuals with mild cognitive impairment (MCI), a subclinical condition predisposing to dementia.

Methods: CBF-hipp and CBF-parahipp were evaluated by magnetic resonance imaging (arterial spin labeling, GE HDxt 1.5 T Signa Neuro-optimized System) and systemic endothelial function by flow-mediated dilation (FMD) in the brachial artery.

Results: Complete data about CBF and FMD at enrollment were available for 66 individuals with MCI and 32 without (non-MCI). The two groups were matched for age (75 ± 5 vs 74 ± 5 years, $p = 0.22$), sex (men 45 vs 50%, $p = 0.18$) and mean BP (96 ± 10 vs 97 ± 9 mmHg, $p = 0.41$). FMD was significantly lower in MCI than in non-MCI (2.93 ± 2.18 vs 3.74 ± 2.03%, $p = 0.02$); CBF-hipp (64.3 ± 9.43 vs 69.5 ± 7.03 ml/100 gr/min, $p = 0.002$) and CBF-parahipp (66.3 ± 8.02 vs 70.0 ± 8.12 ml/100 gr/min, $p = 0.002$) were significantly lower in MCI as well. Among MCI, FMD was significantly correlated with CBF-parahipp ($r = 0.26$, $p = 0.03$) and CBF-hipp ($r = 0.32$, $p = 0.009$). In multiple regression models, including age, sex, mean BP, BMI, brachial artery diameter as confounders, FMD remained an independent determinant of CBF-parahipp (beta = 0.93, $r^2 = 0.063$, $p = 0.04$) and CBF-hipp (beta = 1.31, $r^2 = 0.089$, $p = 0.01$). Nor CBF-parahipp ($r = -0.13$, $p = 0.48$) neither CBF-hipp ($r = 0.05$, $p = 0.80$) were correlated with FMD in non-MCI group.

