



Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

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

P.095: THE DISPARATE EFFECTS OF MICROVASCULAR RAREFACTION AND REDUCED COMPLIANCE ON PROXIMAL HAEMODYNAMICS: INVESTIGATION WITH A MATHEMATICAL AND COMPUTATIONAL MODEL OF THE CIRCULATION

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To cite this article: G.A. Vaughan, M.K. Johnson, P.B. Mark, J.M.C. Connell, M.S. Olufsen, N.A. Hill, C.A.R. Sainsbury (2007) P.095: THE DISPARATE EFFECTS OF MICROVASCULAR RAREFACTION AND REDUCED COMPLIANCE ON PROXIMAL HAEMODYNAMICS: INVESTIGATION WITH A MATHEMATICAL AND COMPUTATIONAL MODEL OF THE CIRCULATION, Artery Research 1:2, 74–74, DOI: <https://doi.org/10.1016/j.artres.2007.07.029>

To link to this article: <https://doi.org/10.1016/j.artres.2007.07.029>

Published online: 21 December 2019

[95% CI: 20.9 to 22.5] versus 23.4 [22.6 to 24.2]; $p=0.004$), larger subendocardial viability index (SVI, 173.8 [171.2 to 176.5] versus 169.6 [166.8 to 172.4]; $p=0.033$) and no significant difference in aorta pulse pressure (APP). **Conclusions:** Regular aerobic-endurance exercise attenuates age-related reductions in central arterial compliance and increases the subendocardial blood flow. This may be two mechanisms by which habitual exercise could lower the risk of cardiovascular disease in this population.

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ROLE OF HEART FAILURE ETIOLOGY ON ARTERIAL WAVE REFLECTION IN HEART TRANSPLANT RECIPIENTS: RELATION WITH CIRCULATING C-REACTIVE PROTEIN

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Background: Aortic augmentation index (AI_a), a measure of arterial pressure wave reflection related to central and/or peripheral arterial stiffness, is elevated in many heart transplant recipients (HTRs). C-reactive protein (CRP), a marker of systemic inflammation associated with ischemic heart disease, is an independent predictor of cardiac allograft vasculopathy and death in HTRs. We hypothesized that arterial wave reflection would be higher in HTRs with ischemic compared with non-ischemic heart failure etiology and this would be associated with circulating CRP early after transplantation.

Methods: Two months after heart transplantation, 20 HTRs underwent non-invasive measurement of aortic pressure and wave reflection properties adjusted for heart rate (Sphygmocor, AtCor Medical) and plasma metabolic and inflammatory markers.

Results: Aortic AI_a was higher in HTRs with ischemic ($n=12$) compared with non-ischemic ($n=8$) heart failure (mean±SD; 22.5 ± 11.0 vs. $11.6 \pm 10.5\%$, $p<0.01$). Similarly, circulating CRP was higher in HTRs with ischemic compared with non-ischemic heart failure (5.4 ± 4.5 vs. 1.4 ± 1.1 mg/L, log transformed $p<0.05$). Moreover, there was a significant relation between logCRP and AI_a ($r=0.68$, $p<0.05$), roundtrip time of the reflected wave to the peripheral reflecting sites and back ($r=-0.62$, $p<0.01$), and left ventricular wasted energy ($r=0.55$, $p<0.01$). When adjusted for CRP, the difference in AI_a between groups was abolished suggesting that circulating CRP contributed in part to the group differences in wave reflection.

Conclusions: HTRs with ischemic heart failure etiology demonstrated increased arterial wave reflection compared with HTRs with non-ischemic heart failure early after transplantation and this was associated with higher circulating CRP.

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CAROTID ATHEROSCLEROSIS ASSOCIATED TO METABOLIC SYNDROME AND ISCHEMIC HEART DISEASE IN HYPERTENSIVE PATIENTS WITH LEFT VENTRICULAR HYPERTROPHY

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Metabolic syndrome (MS) is one of the numerous risk factors for some patients with cardiovascular diseases. Aims: 1. to prove the presence of MS at patients with hypertension and left ventricular hypertrophy (LVH) analyzing clinical parameters; 2. to estimate the impact of MS on patient prognosis.

Method: There have been analyzed 73 hypertensive patients (43 male), average age 56.3 ± 8.5 with echocardiographically proved LVH (average LVMI 163.5 ± 31.8 g/m²).

Results: 36 patients (55 ± 8 years) fulfilled the criterion of MS. They had significantly higher glucose level, lower HDL cholesterol, higher triglycerides and higher body mass index (29.6 ± 3.8 vs. 27.8 ± 3 , $p<0.03$). This group of patients had more frequent complex VA and significantly lower values of HRV. After nine years of observation, four patients in this group had fatal CV events (3 CVI—3 deaths, 1 sudden death), while in the second group, two patients had two sudden deaths (ns).

The purpose of this study was to investigate the subclinical carotid atherosclerosis prevalence in different groups, with and without metabolic syndrome. ColourDuplex ultrasonography of the carotid arteries was performed on Acuson Sequia C236 with high-frequency linear probe with 8 MHz. The thickness of the intima-media complex in patients with MS was 1.03 ± 0.03 vs. 0.99 ± 0.02 mm in patients without MS. Twelve patients with MS (33%) had carotid plaques, and at 43% of patients had been diagnosed

coronary disease (3 IM, 2 PTCA with inbuilt stent, ten with angina pectoris and positive exercise tests), while 20% of patients with non MS had carotid plaques ($p<0.04$), and 9% had coronary disease (3 with angina pectoris and positive exercise tests) ($p<0.002$).

Conclusions: Results of our study showed that patients with LVH and MS had significantly greater prevalence of the carotid atherosclerosis and CAD, and high correlation between carotid artery disease and presence and severity of CAD.

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THE DISPARATE EFFECTS OF MICROVASCULAR RAREFACTION AND REDUCED COMPLIANCE ON PROXIMAL HAEMODYNAMICS: INVESTIGATION WITH A MATHEMATICAL AND COMPUTATIONAL MODEL OF THE CIRCULATION

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The fundamental haemodynamic interaction between large and small vessels is important and poorly understood. We aimed to investigate the effect of microvascular rarefaction (MR) and reduced small vessel compliance (SVC) using a mathematical and computational model of the systemic arterial circulation.

Systemic arteries are treated as a bifurcating tree of compliant and tapering vessels. Large and small vessels are treated separately. MR is modelled by altering the area ratio between parent and daughter vessels at bifurcations. Reduced SVC is modelled by altering the value for Young's modulus within structured trees. Aortic flow profiles (from MRI) of 7 healthy subjects (mean age 51.6y) were used as input to the model. Runs were made at baseline (normal parameters), with modelled MR (area ratio 1.08) and reduced SVC (20% reduction). Pressure and flow waveforms were generated at ascending aorta and radial artery.

Results expressed as change from baseline values. Radial artery (i) decreased compliance - SBP[+3.3%], DBP[-2.6%], pulse pressure (PP)[+13.3%] (i) rarefaction SBP[+12.7%], DBP[+21.1%], PP[-1.4%]. Ascending aorta (i) decreased compliance SBP[+3.3%], DBP[-2.6%], PP[+18.5%] (ii) rarefaction SBP[+10%], DBP[+19.3%], PP[-13.4%].

The predominant effect of decreasing SVC was an increase in pulse pressure with a small increase in peak pressure. Increased MR lead to an increase in both systolic and diastolic pressures with reduced central pulse pressure. These results represent modelled changes in small vessel properties only, with no changes made to large artery parameters. These results suggest that such model represents a useful tool in investigating haemodynamic mechanism, with multiple potential physiological and clinical applications.

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ROLE OF ARGINASE PATHWAY IN RESPONSE TO SHEAR STRESS: NEW POTENTIAL THERAPEUTIC TARGETS FOR ATHEROSCLEROSIS?

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Introduction: Alterations of wall shear stress can predispose the endothelium to the development of atherosclerotic plaques. Ample evidence indicates that arginase expression and/or activity correlates with several risk factors for cardiovascular disease including atherosclerosis.

Methods: To evaluate the regulation of arginases by different shear stress patterns without neuroendocrine factors, we perfused carotid arterial segments to unidirectional high and low shear stress, and oscillatory shear stress. After 3 days of flow exposure, vascular function, arginase expression and localization were analyzed. We compared these well-controlled measurements to an *in vivo* model of shear stress-induced atherogenesis. In brief, the carotid artery of ApoE^{-/-} mice, fed with high cholesterol diet, was exposed to similar hemodynamic conditions by the placement of a shear stress modifier for 9 weeks.

Results: Our results showed for the first time that exposure of carotid segments to high shear stress conditions (athero-protective) significantly