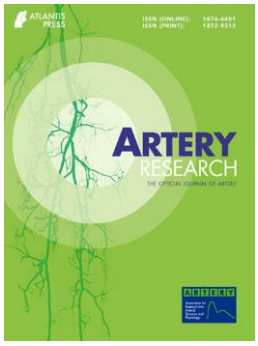

Artery Research

ISSN (Online): 1876-4401 ISSN (Print): 1872-9312
Journal Home Page: https://www.atlantis-press.com/journals/artres

P8.14: ELASTIC MODULUS OF HUMAN AORTAS AS A MEASURE OF STIFFNESS

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To cite this article: Kathleen Connolly*, Ashraf Khir, Ye Li, Yasmin Yasmin, Ian Wilkinson (2015) P8.14: ELASTIC MODULUS OF HUMAN AORTAS AS A MEASURE OF STIFFNESS, Artery Research 12:C, 37–37, DOI: https://doi.org/10.1016/j.artres.2015.10.336

To link to this article: https://doi.org/10.1016/j.artres.2015.10.336

Published online: 7 December 2019

P8.12
CAROTID ARTERY WAVE INTENSITY ANALYSIS IN HEALTHY HUMANS DURING EXERCISE

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Background: The study of wave reflections in the carotid artery may reveal the vasoactive response of the cerebral circulation to exercise, which is not yet fully characterised. Therefore, we aim to examine the effect of exercise on wave intensity parameters measured in the carotid artery of healthy humans, using non-invasive wave intensity analysis.
Methods: Ultrasound measurements of right common carotid diameter and flow velocity were obtained from 8 healthy male athletes (27 ± 4 y). Two measurements were taken at rest, followed by measurements during 5-min incremental steps of cycling at 0%, 20%, 40%, 60% and 70% of the subjects' peak workload, then eight measurements during post-exercise recovery. Wave speed (c) and the intensity peaks and energies of Forward Compression (FCW), Backward Compression (BCW) and Forward Expansion (FEW) waves were determined and compared between the three stages. The reflection index (RI) is calculated as RI=BCW/FCW.
Results: All parameters increased, following the increase of workload. At end of recovery, all parameters returned to rest values. During exercise, c increased by 200%. The intensity of FCW, BCW and FEW increased by 600%, 1100% and 600% during exercise; likewise the energy increased by 450%, 500% and 800%, respectively. Also, RI increased during exercise by 170%.
Conclusions: RI results indicate that cerebral resistance increases with increased workload. Also, the increase of FEW magnitude suggests that an increase in exercise workload is associated with a greater cardiac muscle speed of deceleration in late systole.

P8.13
THE ROLE OF HYALURONAN IN AORTIC STIFFENING IN PATIENTS WITH RHEUMATOID ARTHRITIS

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Growing evidence shows that patients with rheumatoid arthritis (RA) have up to twice the risk of developing cardiovascular disease (CVD) compared to those without RA. Generally, these RA patients have higher levels of inflammation in their bodies, and this inflammation is thought to be the link between RA and CVD, but the mechanism is poorly understood. One possibility is through the overproduction of hyaluronan (HA) in the extracellular matrix, which is associated with stiffening of the arterial wall in animal models. Results of this study show that RA patients had higher serum HA (54.8±67.5 vs. 17.5±17.6 ng/mL, $p<0.0001$) and aortic pulse wave velocity (aPWV) compared to non-RA controls. In regression analysis HA was independently associated with aPWV. Eight weeks of anti-inflammatory anti-TNF-α therapy lead to a significant reduction of aPWV (8.99±1.83 vs 8.30±1.51m/s, $p<0.0001$), with a trend towards HA reduction (93.5±134.8 vs 78.6±82.1 ng/ml, $p=0.3$), but this trend did not reach statistical significance. However, rat aortas successfully treated with hyaluronidase (21.5±15.8 vs 0.00±0.00 ng/mL, $p<0.0001$) showed no reduction in mechanical stiffness (Em at 100mmHg: 2151±239 vs 2149±488 kPa, $p=0.9$) after HA removal. Together, these data suggest that while HA is associated with arterial stiffening in RA patients and may be reduced by anti-inflammatory treatment, HA itself may not have a direct influence on the mechanical properties of the arterial wall.

P8.14
ELASTIC MODULUS OF HUMAN AORTAS AS A MEASURE OF STIFFNESS

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Background: Although arterial stiffness is of clinical interest, data on the elastic modulus of the human aortic wall are scarce. The aim of this work is to directly measure the elastic modulus of human aorta ex vivo.
Methods: Using a standard tensiometer, we measured the elastic modulus (E) of human aortic rings (n=205). Wall thickness and diameter were measured, and the pulse wave velocity (PWV) for each aorta was calculated using Moens-Kortweg equations. The results were analysed based on age, gender and aortic site, then compared with data obtained in living subjects using MRI (n=160).
Results: At 100mmHg pressure, E of aortic rings increased with age, with a commiserate increase in PWV: under 30 years = 3.73±0.49; 30-39 years = 3.32±0.58; 40-49 years = 3.32±0.49; 50-59 years = 3.55±1.00; 60-69 years = 4.05±1.21; 70-79 years = 4.52±1.26; 80-89 years=5.59±0.39 m/s. There was no significant difference in either E or PWV between genders. There was also no significant difference in E or PWV based on aortic site, likely due to under-representation of most sites.
PWV measured in vivo using MRI was higher every age: under 30 years = 3.96±0.51; 30-39 years = 4.47±0.61; 40-49 years = 4.85±0.75; 50-59 years = 5.97±1.14; 60-69 years = 6.64±1,16; 70-79 years = 9.40±4.24 m/s. The difference between in vivo and ex vivo measurements increased with age.
Conclusions: PWV calculated from ex vivo E measurements reflect established physiological patterns, suggesting that direct elastic modulus measurement may be an acceptable method for analysing stiffness in aortic tissue.

P8.15
THE RELATION BETWEEN ARTERIAL STIFFNESS-RELATED, AND STEADY BLOOD PRESSURE COMPONENTS AND LEFT ATRIAL VOLUME IN THE CONTEXT OF LEFT VENTRICULAR MASS INDEX

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Objective: To check of relation between blood pressure (BP) and arterial stiffness parameters and measures of left atrial volume to verify whether it is the arterial stiffness-related BP parameters or mean arterial pressure (MAP)that could be responsible for increase in risk of atrial fibrillation.
Methods: Group of Cracow suburban area inhabitants (n=205, 66% women) was examined for: 24h(SBP24h, DBP24h, MAP24h, PP24h), central(cSBP, cDBP, cMAP, cPP) BPs, carotid-femoral pulse wave velocity (PWV), parameters of left ventricular mass (LVM, LVMI) and left atrial volume (LAV, LAVI). Anthropometric and clinical data were gathered via questionnaire. With division according to sex-stratified dichotomised LVMI (97g/m2 for women, 110g/m2 for men), correlation analysis was performed and further linear regression models were fitted to identify and assess respective value of steady and pulsatile BP components as factors related to left atrial volume measures.
Results: After subdivision of population, statistically significant correlations ($p < 0,05$) were identified only in persons below group-median value of LVMI. For LAV:SBP24h(r=0,26), MAP24h(r=0,16), PP24h(r=0,28), cSBP(r=0,33), cDBP(r=0,29), cMAP(r=0,34), cPP(r=0,2), PWV(r=0,25). For LAVI:SBP24h(r=0,24), PP24h(r=0,28), cSBP(r=0,34), cDBP(r=0,30), cMAP(r=0,32), cPP(r=0,25), PWV(r=0,28). In regression analysis, only MAP from 24h and pulse wave analysis, relates to left atrial volume, in persons below LVMI group-median value ($p< 0,05$). For LAV: cMAP(β=0,35), MAP24h(β=0,35). For LAVI:cMAP(β=0,13). In persons with increase in LVMI no relation between BP and PWV and left atrial volume was found.
Conclusions: Mean arterial pressure is associated with greater left atrial volumes. The fact that relation is blunted in persons with greater LVMI, itself related more to MAP, shows importance of this particular form of target organ damage in relation to LAV.

P8.16
WHITE MATTER LESIONS ARE ASSOCIATED WITH A SIGNIFICANT DECREASE IN THE METABOLISM OF THE BRAIN GREY-MATTER FROM OLDER HYPERTENSIVE PATIENTS

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White matter lesions, described as leukoaraiosis, are frequently documented in older hypertensive patients, but their consequence on brain metabolism remains debated. This study aimed at characterizing the changes in brain metabolism, assessed by [18F]-fluorodesoxyglucose Positron Emission Tomography (FDG-PET) imaging in relation to the severity of leukoaraiosis in older hypertensive patients.