P43: MASKED HYPERTENSION AND RETINAL VESSEL STRUCTURE AND FUNCTION IN YOUNG HEALTHY ADULTS: THE AFRICAN-PREDICT STUDY

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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.

References

P41 INCREASED STIFFNESS IN THE DIGITAL ARTERIES OF ESSENTIAL HYPERTENSIVE WOMEN: THE FUCHSIA STUDY
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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 mm, easily accessible by ultrahigh frequency ultrasound.

Methods: 24 hypertensive women (HT) and 37 healthy controls (C) were recruited. 5’ videoscops of left palmar digital arteries were obtained by YevomD (FUJIFILM, VisualSonics, Toronto, Canada), by means of a 70 MHz probe (axial-lateral resolution 30-65 mm). An automatic system (Cuviste, Quipu srl, Pisa, Italy) was used to measure intima-media thickness (IMT) and diameter. Densitability and stiffness were then calculated using left branchial pulse pressure (PP - oscillometric) and airflow.

Results: HT and C had similar age (57 ± 11 vs 53 ± 11 years, p = 0.22), BMI (24.9 ± 4.6 vs 24.5 ± 4.2 vs kg/m², p = 0.80) and mean blood pressure (BP, 95 ± 12 vs 91 ± 12 mmHg, p = 0.24); HT showed slightly higher PP (54 ± 14 vs 47 ± 10, p = 0.07). Palmar digital lumen tended to be higher in HT (604 ± 201 vs 696 ± 191 mm, p = 0.10), while IMT was similar (120 ± 23 vs 125 ± 36 mm, p = 0.81). Densitability was reduced (21.4 ± 18.2 vs 29.0 ± 18.8 kPa⁻¹, p < 0.05), while stiffness was increased (7.95 ± 2.22 vs 6.72 ± 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 mm of essential hypertensive women. These findings suggest that increased hemodynamic load characterizing hypertension lead to a different vascular phenotype in each arterial segment.
Background: Masked hypertension (MH) is prevalent in young adults and is associated with similar vascular complications as sustained hypertension, but whether this is already evident in young adults is unclear. We therefore compared retinal vessel calibres and function in response to flicker light induced provocations (FLIP) in young healthy adults stratified by MH status and explored associations between these parameters.

Methods: We used data from the first 566 participants (aged 20–30 years) taking part in the African-PREDICT study. Participants were clinically normotensive (70% valid readings) were measured and MH status determined. The central retinal artery (CRAE) and vein equivalent (CRVE) were calculated from fundus images and retinal vessel dilation responses to FLIP determined.

Results: MH showed a prevalence of 16%. MH+ had a lower CRAE (155 ± 10 MU vs. 160 ± 12 MU, p = 0.002), but similar CRVE and vessel dilation in response to FLIP when compared to normotensives. The latter findings remained consistent upon adjustment for sex, ethnicity, age and body mass index. Multivariate regression analysis demonstrated an independent association between CRAE and the presence of MH (R2 = 0.07, β = -0.10 (-0.20; -0.01)). No further associations existed between retinal vessel parameters and MH status.

Conclusion: Already at a young age, healthy adults with MH show slight adverse changes in the retinal microvasculature. Considering the prevalence of MH in young adults, and the predictive value of reduced CRAE, our data emphasize the early identification of altered 24 hr blood pressure patterns.

Figure 1. Relative volume, normalized for the reference value at 80mmHg, as a function of pressure during systole, calculated before and after considering the axial extension of the aorta.

References

Background and Aims: Arterial volume compliance is a major determinant of cardiac afterload. More than 50% of the arterial volume compliance resides in the proximal aorta. Researchers often use area compliance for the estimation of volume compliance, assuming an invariant vessel length over pressure changes. Recent studies have provided evidence to question this simplification, showing that the extension of the proximal aorta along its long axis during systole produces significant longitudinal strain, which could lead to erroneous estimation of arterial stiffness. The aim of the present study was to test this hypothesis in a computational environment.

Methods: The 3-D proximal aortic geometry of a healthy young male was reconstructed and meshed and the original zero-pressure geometry was restored. Material behavior was approximated based on the model of 1. Viscelastic support conditions were introduced along the aortic wall and aortic root motion, estimated from the cardiac-gated CT data of a healthy subject, was enforced at the proximal boundary. The simulation was run for an input pressure ranging from 80-110mmHg. Volume compliance of the vessel as obtained by integrating the area compliance over the centerline length (both variable and inviable) was subsequently compared to the ground truth (which was imposed by the material stiffness).

Results: Integration of the area compliance over an invariable centerline length led to an underestimated average distensibility by -68%. After taking into account the elongation, the error was improved to -25% (Figure 1).

Conclusion: The elongation of the aorta during cardiac cycle was found to affect significantly the estimation of arterial compliance.

Poster session I — Models, methodologies and imaging technology I

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IMPEDANCE CARDIOGRAPHY EVALUATION IN ELDERLY HYPERTENSIVE PATIENTS

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Objectives: Vascular aging results from endothelial dysfunction and increased arterial stiffness, a independent determinant of cardiovascular (CV) events, that is amplified by the presence and progression of arterial hyper tension (AH). Age related changes in hemodynamic variables may predict negative vascular outcomes.2 In this study, we evaluate hemodynamic variables in elderly hypertensive patients with impedance cardiography (IC) in order to infer opportunities for therapeutic optimization.

Methods: We retrospectively analysed hypertensive patients that were pur posed for IC evaluation. The selected 75 patients were divided into two groups, above or below 65 years old, matched by anthropometric and blood pressure (BP) values. (Table 1) Antihypertensive therapy wasn’t considered. For each group the mean of IC variables was obtained, and statistical analysis was performed by a T-student test.

Results: From the patients included, 25 have ≥65 years and 50 <65 years. In the elderly group mean age was 71 years, 52% were female and mean BMI 28.6 Kg/m². Mean BP was 142 mmHg vs 135 mmHg for systolic and 74 mmHg vs 83 mmHg for diastolic BP, heart rate 63 bpm vs 69 bpm in elderly and younger group respectively. Mean IC results showed statistically significant differences for cardiac output, cardiac index, systemic compliance, left ventricular ejection time, velocity index and acceleration index between the groups. (Table 2)

Conclusions: BP determination and control may not signify adequate hemodynamic state. With this study, elderly hypertensive patients present different hemodynamic behaviour, compared with younger ones, in variables of blood flow, resistance and contractility. These data could have potential implications on the pharmacological optimization of BP treatment.