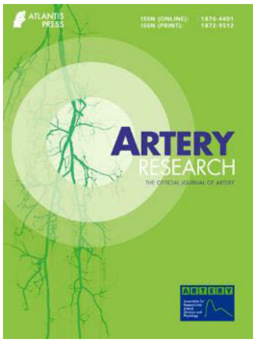

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P129: DETERMINATION OF THE DIASTOLIC PRESSURE DECAY CONSTANT (TAU) FROM RADIAL TONOMETRY: DEMOGRAPHIC AND HEMODYNAMIC ASSOCIATIONS IN NORMAL AND HYPERTENSIVE INDIVIDUALS

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Results: The manual approach provided intra-operator CV of 6.6% and 3.9% for DD and 6.5% and 6.6% for IMT (first and second operator). The automatic approach provided CV equal to 6.6%, 5.4%, 4.5% and 3%, respectively. Inter-operator CV were 11.3% for DD and 3.9% for IMT (manual), and 10.9% and 5.8% (automatic). Bland-Altman analysis provided non-significant bias for both IMT and DD measurements comparing manual and automatic approach. In the whole population, radial IMT was correlated with age ($r = 0.35$, $p = 0.02$) and pulse pressure ($r = 0.41$, $p = 0.008$), not with BMI ($r = 0.05$, $p = 0.76$) and mean blood pressure ($r = 0.17$, $p = 0.28$). No sex differences were observed.
Conclusions: We obtained good CV values for both the intra- and inter-operator reproducibility; furthermore, the manual and the automatic approach provided similar results. Radial IMT increases with age and pulse pressure.

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DETERMINATION OF THE DIASTOLIC PRESSURE DECAY CONSTANT (TAU) FROM RADIAL TONOMETRY: DEMOGRAPHIC AND HEMODYNAMIC ASSOCIATIONS IN NORMAL AND HYPERTENSIVE INDIVIDUALS

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Introduction: The feasibility of measuring the diastolic pressure-decay constant (tau) in normal and hypertensive humans is not established and the clinical and physiological relevance of tau is not known.
Methods: Studies were performed in the non-invasive cardiac laboratory in subjects who had been supine for at least 30 minutes. Measurements included standard oscillometric cuff BP, echocardiography (stroke volume [SV] and systemic vascular resistance [SVR]), pulse wave velocity (PWV, both aortic [heart-femoral] and peripheral [femoral-ankle]), and radial tonometry (Sphygmocor). Tau was estimated by photo-digitizing the pulse contour (Webplot digitizer) and modeling the terminal diastolic component according to the formula: $P = A + (SBP-A)*exp(-(t-t0)/tau)$, where P is pressure, A is the modeled diastolic BP, and t0 is the start of the mono-exponential diastolic pressure decay.
Results: Full data were available In 76 individuals (mean age 55 years, weight 84 kg, BP 138/79 mmHg, resting HR 67; 45% female). Using simple Pearson correlations, tau was positively correlated with age, female gender and SVR, but negatively correlated with HR (all $p < 0.05$). Tau was unrelated to blood pressure (systolic, diastolic, mean or pulse pressure) or to peripheral or central PWV. In a forward stepwise multiple regression model of tau that included various hemodynamic indicators, only SVR survived, whereas BP, HR, SV, and PWV were excluded.
Conclusions: Tau can be estimated from radial tonometry and is most closely related to SVR, age, and female gender. Further application of tau (e.g. in the study of circulatory models) also seems feasible.

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COMPARISON BETWEEN PWV MEASURED FROM CUTANEOUS LENGTH BY SPHYGMOCOR AND BY MRI LENGTH TRACED ALONG THE WHOLE AORTA

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Background: Accuracy of non-invasive PWV as m/sec is impeded by crude surface estimates of aortic length. We compared PWV measured using the Sphygmocor via surface length measurements with PWV measured using MRI with distance traced more precisely along the whole imaged aortic length.
Methods: Magnetic resonance imaging (MRI) was performed in 74 asymptomatic women aged between 51—80 years of age. Carotid-femoral PWV was measured using Sphygmocor. The path distance between the carotid and femoral sites was estimated from the distance between the sternal notch and femoral artery at the point of applanation. Phase-contrast MRI was performed at the level of the aortic arch and distal to the aortic bifurcation to obtain aortic flow. Aortic distance was measured by tracing the centre of the aorta from a black-blood MRI sequence.
Results: Mean (±SD) carotid-femoral transit time (TT) measured by Sphygmocor (58 ± 11 ms) was 2.9 [95% confidence interval (CI) 0.85—5.0]ms higher than aortic TT measured by MRI (54 ± 12 ms). The carotid-femoral surface distance estimate (552 ± 33 mm) was 15 [142—162]mm higher than the aortic length estimate (399 ± 32 mm). Corresponding PWVs estimated with Sphygmocor and MRI were 9.87 ± 2.1 and 7.63 ± 1.9 ($P < 0.001$) m/s, respectively. PWV differences between Sphygmocor and MRI decreased to 0.50 (0.13—0.86)m/s when Sphygmocor PWV was calculated using the MRI path length.
Conclusion: In these older women, the PWV difference between Sphygmocor and MRI is reduced when MRI length estimates are used. The difference between PWV measured by Sphygmocor and MRI is in part due to the accuracy of distance measurements.

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UTERINE ARTERIES EVALUATION DURING PREGNANCY: MODELING AND COMPUTATIONAL FLUID DYNAMICS CALCULATIONS

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Preeclampsia (PE) affects pregnancy, being one of the main causes of prenatal maternal mortality and morbidity (1). Recent studies show that PE is characterized by a significant reduction on maternal cardiac output and increased peripheral resistance. However, studies on the maternal hemodynamic adaptation during PE and the available information about central maternal hemodynamics are scarce. Our purpose is to develop a computational model to obtain relevant hemodynamic parameters of the maternal circulation, formed by the common iliac (CI), the internal (II) and the external iliac (EI) and the uterine arteries (UA). Model construction requires many approximations and generalizations to optimize numerical calculation of hemodynamic parameters by Computational Fluid Dynamics (CFD), however this is the best representation of maternal circulatory system. Four different models were created to simulate non-pregnant women and 21, 30 and 36 weeks of pregnancy (2). Numerical simulations performed by ANSYS®-Fluent software correlate blood flow, velocity and arterial pressure, with the variation of uterine morphological data. Calculated flow values on CI and UA to different geometries represent the evolution of arterial system during pregnancy. As the UA suffers higher geometrical transformations during pregnancy, there are a greater increase on blood velocity; blood velocity on the EI increases, remaining almost constant in the CI arteries.The growth on blood flow due to pregnancy development is associated to an augmentation on the arteries' diameter, which allows the maintenance of blood pressure on UA.This model is suitable to compare wall shear, velocity or flow values associated to PE, measured in clinical context.

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CONTINUOUS MEASUREMENTS OF CENTRAL BLOOD PRESSURE DURING MENTAL STRESS MONITORING

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