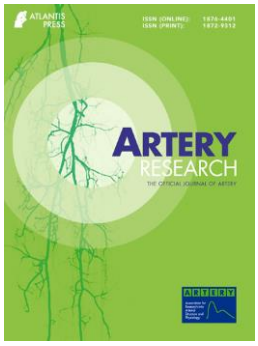

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2.5: COMPARISON OF NON-INVASIVE AND INVASIVE MEASUREMENTS OF CENTRAL BLOOD PRESSURE IN PATIENTS WITH CHRONIC KIDNEY DISEASE

R. Carlsen, C. Peters, D. Khatir, E. Laugesen, S. Winther, N. Buus

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The short resonance inside the sensor circuit crosses the frequency of the externally applied field and shifts the impedance measured at the excitation coil. As the distance between the two sensors is known the PWV can be determined. The stiffer or the narrower a vessel is the higher is the PWV. A model based approach determines out of the PWV signal the restenosis degree inside the implanted stent. All further measurements are referenced to the first initial value done after the stent implantation. This approach is robust and has mean cross dependences because no absolute pressure measurement is required.

2.3
LOCAL STIFFNESS OF THE CAROTID ARTERY IS ASSOCIATED WITH INCIDENT CARDIOVASCULAR EVENTS AND ALL-CAUSE MORTALITY—A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: It has been suggested that local carotid stiffness is independently associated with cardiovascular (CV) events and mortality. However, consistent evidence for such an association is lacking. We therefore performed a systematic review and meta-analysis of longitudinal studies on the association between local carotid stiffness, incident CV events and all-cause mortality.
Methods: Medline and Embase were searched for articles published up to June 1, 2014. All studies were included which evaluated the association between local carotid stiffness (as determined by ultrasonography) on the one hand and incident CV events and mortality on the other. We used random-effects models to calculate hazard ratios (HRs) and 95% confidence intervals (95%CIs) for pooled data.
Results: We included 10 studies with data for 19,919 participants and 177,136 person-years of follow-up. The pooled HRs (95%CIs) for one SD higher carotid elastic modulus were: for CV events (fatal and nonfatal combined) 1.19 (1.06-1.33; 10 studies, n=19,496); for CV mortality 1.34 (1.15-1.55; 4 studies, n=3,083) and for all-cause mortality 1.26 (1.14-1.40; 5 studies, n=3,501). All results were adjusted for age, sex, blood pressure (SBP and/or MAP), and CV factors. Results were qualitatively similar when HRs were pooled for lower carotid distensibility and compliance instead of higher elastic modulus.
Conclusion: The present meta-analysis shows a strong association between local carotid stiffness and incident CV events, CV mortality and all-cause mortality. In a next step, we will do an individual participant meta-analysis to evaluate whether the association between local carotid stiffness and CV events and mortality is independent of carotid-femoral pulse wave velocity.

2.4
RELATIONSHIP BETWEEN ADULT TRANSFER FUNCTION DERIVED CENTRAL AORTIC SYSTOLIC PRESSURE AND MEASURED SYSTOLIC PRESSURE IN THE HEALTHY CHILDREN POPULATION

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Background: A non-invasive method, that used a general transfer function (TF), has been shown to accurately predict central aortic pressure from peripheral tonometry measurements in the adult population. However applying the same TF to estimate central aortic systolic pressure (aSP) in children has not yet been fully evaluated. This study aimed to assess the usage of adult TF to estimate aSP in children (aSP_{est_ch}) by establishing and testing different linear single/multivariate regression models between the adult TF estimated aSP (aSP_{TF_ad}) and the measured aSP (aSP_{meas_ch}).
Methods: 218 healthy, pre-pubescent children aged 8 years (113 male) had tonometer measured radial and carotid arterial pressure waveform recorded using the SphygmoCor device. Central aSP_{TF_ad} was estimated from the radial pressure using the TF (SphygmoCor, AtCor Medical), and the carotid systolic pressure taken as a surrogate for central pressure (aSP_{meas_ch}). The study group was divided into two groups: one to estimate the models (n=50, 19 male); another to test the models (n=168, 94 male). Models 1 and 2 were two simple linear regression models, whilst models 3 and 4 were two multivariate regression models.
Results: In the tested group, the aSP_{est_ch} from all models showed high correlations and low average differences with aSPmeas_ch (model 1 $R^2=0.88$, difference=1.6+2.6 mmHg; model 2 $R^2=0.88$ difference=1.8+3.4 mmHg; model 3 $R^2=0.89$ difference=-0.7+2.5 mmHg; model 4 $R^2=0.89$ difference=-1.2+2.7 mmHg, all $p<0.0001$).
Conclusion: Central aSP in children can be estimated accurately using the adult TF from the radial pulse by incorporating the now defined linear relationship between aSP_{TF_ad} and aSP_{meas_ch}.

2.5
COMPARISON OF NON-INVASIVE AND INVASIVE MEASUREMENTS OF CENTRAL BLOOD PRESSURE IN PATIENTS WITH CHRONIC KIDNEY DISEASE

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Background: The blood pressure (BP) in the ascending aorta can be estimated non-invasively by pulse wave analysis using commercially available devices such as the SphygmoCor. However, this device has not been validated for use in patients with chronic kidney disease (CKD).
Objectives: Comparison of non-invasively obtained estimates of central BP with invasively measured central BP in CKD patients.
Methods: Patients with stable CKD stage 3-5 corresponding to an estimated glomerular filtration rate (eGFR) under 60 ml/min undergoing elective coronary angiography were included. Central BP was estimated by the SphygmoCor using four different calibrations: Invasive aortic diastolic and mean BP (invasive), systolic and diastolic brachial BP (sys-dia), brachial diastolic and mean arterial BP (form factor 0.33) (ff-0.33), and brachial diastolic and mean arterial BP (form factor 0.4) (ff-0.4). Brachial artery BP was measured simultaneously with a validated oscillometric BP device.
Results: Forty-nine patients, 65% males, age 61±13 (mean±SD) with a median eGFR of 18 ml/min (range 5-59 ml/min) were enrolled. Invasive BP was 150.8±22/ 75.4±11 mmHg while brachial BP was 147.3±19 /86.0±10 mmHg (mean differences: -3.6±9.3/10.6±7.9 mmHg ($P<0.012$).
Mean differences (invasive minus estimated central BP) with the four calibrations used were: -5.9±6.1/1.3±1.0 mmHg, $P<0.001$ (invasive); -16.0±9.3/11.5±8.0 mmHg, $P<0.001$ (sys-dia); -17.5±10.5/11.5±7.9 mmHg, $P<0.001$ (ff-0.33); -7.5±10.2 /11.6±7.9 mmHg, $P<0.001$ (ff-0.4).
Conclusion: In CKD patients, we found a systematic difference between estimated and invasively measured central BP. Surprisingly, brachial systolic BP was very close to invasively measured central systolic BP and was even more accurate than estimates based on calibration with invasively obtained BP.

2.6
NON-INVASIVE ESTIMATION OF EXERCISE CENTRAL BLOOD PRESSURE BY RADIAL TONOMETRY MAY BE UNDERESTIMATED DUE TO BRACHIAL-TO-RADIAL-SYSTOLIC-BLOOD-PRESSURE-AMPLIFICATION AND IS RELATED TO UPPER LIMB BLOOD FLOW VELOCITY

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Objectives: Both central blood pressure (BP) and light-moderate exercise BP are independently associated with cardiovascular risk, and measuring central BP during exercise may have clinical relevance. Brachial-to-radial-systolic-blood-pressure-amplification (B-R-SBP_{AMP}) could influence the accuracy of central SBP estimation by radial tonometry during exercise. This study aimed to determine the influence of light-moderate exercise on B-R-SBP_{AMP} and consequent central SBP estimation. Independent correlates of B-R-SBP_{AMP} were also explored.
Methods: Sixty healthy participants (39±16 years, 50% male) underwent testing during light-moderate intensity (40W, 50RPM) semi-recumbent cycling. SBP was identified by brachial and radial ultrasound (1st Doppler flow inflection = 1st Korotkoff sound during cuff deflation). Haemodynamics were recorded by ultrasound and tonometry. Bra-Rad-SBP_{Amp} was defined as radial minus brachial SBP.
Result: Exercise radial SBP was significantly higher than brachial SBP (144±21 versus 134±17 mmHg; $p<0.001$). Exercise Bra-Rad-SBP_{Amp} was 10±11 mmHg and increased with advancing age ($r=0.360$, $p=0.005$). Exercise central SBP was significantly higher when radial tonometry was calibrated with radial SBP (accounting for Bra-Rad-SBP_{Amp}) versus brachial SBP (117±16 versus 110±13 mmHg, $p<0.001$). Low brachial peak flow velocity relative to radial velocity was negatively associated with exercise B-R-SBP_{Amp} ($r=-0.439$, $p=0.001$), independent of age, sex, heart rate and mean arterial pressure ($\beta=-0.389$, adjusted $R^2=0.273$, $p=0.003$).