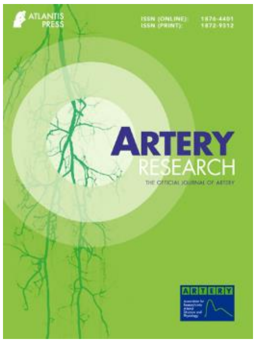

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P53: ZERO FLOW PRESSURE (PINFINITY) IS LARGER THAN MEAN CIRCULATORY FILLING PRESSURE. A SYSTEMATIC REVIEW AND META-ANALYSIS

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ZERO FLOW PRESSURE (PINFINITY) IS LARGER THAN MEAN CIRCULATORY FILLING PRESSURE. A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Zero flow pressure ($P\infty$), the steady-state pressure following cardiac arrest or cessation of flow is often assumed to equal mean circulatory filling pressure (MCFP). [1] However, this assumes complete equilibration of circulatory pressures, which may not occur if there is a 'critical closing pressure' or 'Waterfall' in the circulation. We undertook a systematic review and meta-analysis to obtain robust estimates of $P\infty$ and compared this with MCFP measured in the same studies.
Methods: A literature search was performed using PubMed and was limited to full articles in English using the search terms "mean circulatory filling pressure" OR "critical closing" OR "zero-flow". Only data relating to measurements of pressure following cardiac arrest or cessation of blood flow were included. Other exclusions were: individual case-reports, pregnancy, non-adult animals, not mammalian, or any non-human models of disease. Meta-analysis was performed using a random effects model in Stata 15.1. Data are mean (95% confidence intervals).
Results: A total of 1082 unique publications were identified; 1062 were excluded during screening. The remaining 20 studies with $P\infty$ data were used to perform a meta-analysis. These included data from dog, rat, pig and human; 8 of these articles also provided data on MCFP. From this analysis $P\infty = 26.5(23.4, 29.5)$ mmHg ($n = 20$) and the difference between $P\infty$ and MCFP was 15.1(12.0, 18.3) mmHg ($n = 8$).
Conclusions: $P\infty$ and MCFP differ substantially, indicating non-equilibration of pressures in the circulation following cessation of flow at least in the short-term (seconds to minutes).

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A MACHINE LEARNING SYSTEM FOR CAROTID PLAQUE VULNERABILITY ASSESSMENT BASED ON ULTRASOUND IMAGES

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Purpose/Background/Objectives: Carotid plaque vulnerability assessment is essential for the identification of high-risk patients. A specific mouse model for the study of carotid atherosclerosis has been recently developed. Aim of this study was to develop a predictive mathematical model for carotid plaque vulnerability assessment based on the post processing of micro-Ultrasound (μUS) images only.
Methods: 17 ApoE-/- male mice (16 weeks) were employed. After three weeks of high-fat diet, a tapered cast, designed to induce the formation of an unstable plaque upstream from the cast and a stable one downstream from it, was surgically placed around the right common carotid. μUS examination was repeated before the surgical procedure and after three months from it. Color-Doppler, B-mode and Pulsed-wave Doppler images were acquired to assess morphological, functional and hemodynamic parameters. In particular, texture analysis was applied on both the atherosclerotic lesions post-processing B-mode images. Peak velocity (Vp), Relative Turbolence Intensity (rTI) and velocity range (rangevel) were assessed from PW-Doppler images. Relative Distension (relD) and Pulse Wave Velocity (PWV) were evaluated for both the regions. All the μUS indexes underwent a feature reduction process and were used to train different machine learning approaches.
Results: The downstream region presented higher PWV values than the upstream one; furthermore, it was characterized by higher values of rTI and rangevel. The weighted kNN classifier supplied the best providing 92.6% accuracy, 91% sensitivity and 94% specificity.
Conclusions: The mathematical predictive model could represent a valid approach to be translated in the clinical field and easily employed in clinical practice.

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EFFECTS OF CAROTID PRESSURE WAVEFORM OBTAINED IN DIFFERENT WAYS ON THE RESULTS OF WAVE SEPARATION, WAVE INTENSITY AND RESERVOIR PRESSURE ANALYSIS

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Purpose/Background/Objectives: Recently great attention has been placed on innovative cardiovascular biomarkers obtained from wave separation (WS), wave intensity analysis (WIA) and the reservoir-wave (RW) concept. Pressure waveforms needed to implement these techniques can be obtained in different ways. Aim of this study was to evaluate differences in WS, WIA and RW parameters obtained deriving pressure curves in different ways.
Methods: Twenty-two individuals (49 ± 17 years, 59% males) were examined. Common carotid blood flow waveforms were obtained from Pulsed-Wave Doppler images. Carotid pressure waveforms were obtained in four different ways: 1) standard method, i.e., with applanation tonometry; 2) linear scaling from ultrasound (US)-derived diameter curve; 3) exponential scaling from US-derived diameter curve; 4) linear scaling from an accelerometric-derived diameter signal. In each case, reflection magnitude (RM) and reflection index (RI) were obtained from WS. The amplitude of the first positive peak (W1), of the second positive peak (W2) and of the negative one (Wb) were calculated from WIA; the maximum of the reservoir (maxPr) and the excess (maxPex) pressure were achieved from RW.
Results: According to the intra-class coefficient values, the agreement between the standard method and all the others was excellent in case of RM, RI, maxPrand maxPex(0.82—0.97), while reached only a fair/good level in case of W1, W2and Wb(0.44—0.82).
Conclusions: The use of alternative carotid pressure waveforms does not influence the cardiovascular parameters obtained by WS and RW, while those derived by WIA are affected by the carotid pressure curve employed.

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CENTRAL PULSE PRESSURE IS ASSOCIATED WITH RETINAL ARTERIOLAR WALL THICKNESS AND WALL CROSS SECTIONAL AREA AS EVALUATED BY ADAPTIVE OPTICS

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Introduction: In 1991 Baumbach et al demonstrated taht pulse pressure (PP) but not mean arterial pressure (MAP) was correlated with pial arterioles wall cross-sectional area (WCSA)in rats. Adaptive optics (AO) allows a near-