3.4: EVALUATION OF THE MUTUAL RELATIONSHIPS AMONG THE DEVELOPMENT OF HYPERTENSION, ARTERIAL STIFFENING AND RENAL FUNCTION DECLINE BASED ON REPEATED LONGITUDINAL MEASUREMENTS

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be generated by elastic recoil of large arteries independent of pressure wave reflection and this effect dominates in human physiology.

3.3 AN EASY AND INTUITIVE WEB INTERFACE FOR THE ASSESSMENT OF MEASUREMENTS OF CAROTID-FEMORAL PULSE WAVE VELOCITY AND LOCAL ARTERIAL STIFFNESS RELATIVE TO THE REFERENCE VALUES DATABASE

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Objective: The use of different devices and methods still hampers the widespread clinical use of the reference values for arterial stiffness. The aim of this work was therefore to create a web-based application that allows easy assessment - for different methodological approaches - of a given measured value of arterial stiffness, with the application providing the percentile reference associated with that specific value.

Methods: Reference values of carotid-femoral pulse wave velocity (cf-PWV) (11,092 individuals; age range: 15–97 years, 49.8% men) and local carotid (22,708 individuals; age range 15–99 years; 54% men) and femoral (5,069 individuals; age range: 15–87 years; 49.5% men) arterial stiffness were obtained from The Reference Values for Arterial Stiffness’ Collaboration 2010 and the database of The Reference Values for Arterial Stiffness’ Collaboration. Data from healthy subpopulations were used to establish equations for percentiles of cf-PWV and sex-specific percentiles of carotid and femoral distensibility coefficient (DC) across age. Using these established equations, an application was created (in JavaScript) to provide the percentile reference value from routine parameters obtained in clinical practice.

Results: The tool can be found at: http://bit.do/referencevalues. The user selects the parameter to be determined (or standardized): carotid DC, femoral DC or cf-PWV. Subsequently, a number of inputs are required to calculate the selected parameter, the percentile and, when relevant, additional information. The tool also allows conversion of cf-PWV following different methods.

Conclusions: An easy and intuitive interface was created to assess a given measurement of arterial stiffness relative to known reference values.

3.4 EVALUATION OF THE MUTUAL RELATIONSHIPS AMONG THE DEVELOPMENT OF HYPERTENSION, ARTERIAL STIFFENING AND RENAL FUNCTION DECLINE BASED ON REPEATED LONGITUDINAL MEASUREMENTS

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Background: The mechanisms underlying the development of hypertension have not yet been fully clarified. The mutual relationships among the development of hypertension and the longitudinal changes of arterial stiffness and renal function, and also the effect of maintenance of a normal body weight on these relationships were evaluated by a linear mixed-effects regression model analysis (LMM). Furthermore, maintenance of a normal body weight may not be effective for interrupting this vicious cycle.

Methods: Reference values of carotid-femoral pulse wave velocity (cf-PWV) (11,092 individuals; age range: 15–97 years, 49.8% men) and local carotid (22,708 individuals; age range 15–99 years; 54% men) and femoral (5,069 individuals; age range: 15–87 years; 49.5% men) arterial stiffness were obtained from The Reference Values for Arterial Stiffness’ Collaboration 2010 and the database of The Reference Values for Arterial Stiffness’ Collaboration. Data from healthy subpopulations were used to establish equations for percentiles of cf-PWV and sex-specific percentiles of carotid and femoral distensibility coefficient (DC) across age. Using these established equations, an application was created (in JavaScript) to provide the percentile reference value from routine parameters obtained in clinical practice.

Results: The tool can be found at: http://bit.do/referencevalues. The user selects the parameter to be determined (or standardized): carotid DC, femoral DC or cf-PWV. Subsequently, a number of inputs are required to calculate the selected parameter, the percentile and, when relevant, additional information. The tool also allows conversion of cf-PWV following different methods.

Conclusions: An easy and intuitive interface was created to assess a given measurement of arterial stiffness relative to known reference values.

3.5 ASSOCIATION OF VASCULAR RISK FACTORS WITH BRAIN STRUCTURE AND FUNCTION

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Background: Vascular risk factors have been associated with brain aging. We aimed to determine the associations between blood pressure (BP), atherosclerosis, arterial stiffness and microvascular damage with both structural and functional measures of the brain.

Methods: A community-based sample of 1287 individuals (69 ± 6 years) underwent cognitive function testing and MRI to measure hippocampal brain volumes. Brachial and central systolic BP (SBP, cSBP) and pulse pressure (PP, cPP), diastolic BP (DBP), arterial stiffness (cfPWV), atherosclerosis (cIMT) and microvascular disease (composite from retinopathy, ACR and eGFR measures) were measured.

Results: After adjusting for age, sex and ethnicity hippocampal volume was significantly associated with SBP (β ± SE: −0.004 ± 0.002; p = 0.01), PP (β ± SE: −0.008 ± 0.002; p < 0.0001), cPP (β ± SE: −0.01 ± 0.003; p < 0.0001) and cfPWV (β ± SE: −0.02 ± 0.01; p = 0.04). Cognitive function (z-score) was significantly associated with PP (β ± SE: −0.004 ± 0.002; p = 0.003) and cPP (β ± SE: −0.005 ± 0.002; p = 0.02). After further adjustment for comitant risk factors (heart-rate, diabetes, hypertension, previous stroke, coronary artery disease, waist-to-hip ratio, years of education and smoking) only the associations with PP (Hippocampal volume β ± SE: −0.005 ± 0.002; p = 0.02, cognitive function β ± SE: −0.004 ± 0.001; p = 0.01) and cPP (Hippocampal volume β ± SE: −0.008 ± 0.003; p = 0.004, cognitive function β ± SE: −0.004 ± 0.002; p = 0.048) remained significant.

Conclusion: In this community based sample brachial and central PP were significantly associated with measures of brain structure and function, not explained by comitant risk factors.

3.6 AORTIC STIFFNESS IS RELATED TO CEREBRAL LESION GROWTH IN PATIENTS WITH ACUTE ISCHEMIC STROKE

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Objective: Cerebral lesion growth in acute ischemic stroke leads to secondary neurological deterioration and poor outcome. Whether cSBP and arterial stiffness are related to the early brain infarct growth in patients after ischemic stroke is unknown.

Methods: We enrolled 65 patients (42 males, age 62.9 ± 12.2 years, mean ± SD) with acute ischemic stroke (NIHSS at admission 6.0 ± 4.6 points). Carotid-femoral pulse wave velocity (CF-PWV), central systolic blood pressure (cSBP) and central augmentation index (cAlx) were measured (Sphygmocor®) within few (5 ± 2) days after stroke onset. Serial brain MRI were analysed. Cerebral lesion growth was assessed on diffusion-weighted imaging (DWI) by comparing baseline and follow-up scans. Marked cerebral lesion growth was determined as the highest tertile in a standardized measure of DWI lesion volume increase, and compared with the lowest tertile used as the reference group. Data were analysed with multivariate logistic regression.

Results: CF-PWV was higher in patients with marked cerebral lesion growth than that in patients of the reference group (10.9 ± 3.1 vs. 9.1 ± 1.9 m/s,