P2.02: IN VIVO VISUALISATION AND RECONSTRUCTION OF THE MOUSE CEREBRAL VASCULATURE USING CONTRAST ENHANCED MICRO-CT

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Atherosclerotic plaques can rupture leading to stroke (ApoE-/-Fbn1C1039G+/- mouse). However, a novel method to visualize the cerebral vasculature.

Methods: In this feasibility study, a female ApoE-/-Fbn1C1039G+/- and an ApoE-/- mouse (stable plaques) were fed a western-type diet for up to 20 weeks. At week 10, 15 and 20 after the start of the diet, CT-scans were performed before and after injection of a gold-nanoparticle contrast agent (Aurovist®). These images were acquired by applanation tonometry and transcranial Doppler respectively. Aortic BP waveforms were synthesized from the radial waveform using a validated transfer function (Sphygmocor®). CCP was estimated using the relationship between BP and FV waveforms by both linear regression (LR) and the first harmonic (H1) in Fourier decomposition. The difference between the two models was quantified if the BP waveform input signal was radial or aortic and compared by Student’s paired t-test.

Conclusions: Aortic, but not radial pressure gave a model independent estimate of CCP. However, estimated CCP within a model was significantly different depending on whether radial or aortic pressure was used.

P2.03
AORTIC, BUT NOT RADIAL PRESSURE GIVES A MODEL INDEPENDENT ESTIMATE OF CEREBRAL ARTERY CRITICAL CLOSING PRESSURE
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Objective: Cerebral artery critical closing pressure (CCP) is an estimated parameter with no single accepted method of calculation. Variation between methods could be significant. This study investigates two models to estimate CCP using arterial blood pressure (BP) and middle cerebral artery flow velocity (FV) waveforms, quantifying the difference between radial and aortic BP as the BP input signal.

Methods: Suspected and untreated hypertensive subjects (n=445, 203 female, 50±10 years, range 21 to 73 years old), referred to Ruijin Hospital in Shanghai, China, for 24-hour BP monitoring, were recruited. Radial BP and FV waveforms were acquired by applanation tonometry and transcranial Doppler respectively. Aortic BP waveforms were synthesized from the radial waveform using a validated transfer function (Sphygmocor®). CCP was estimated using the relationship between BP and FV waveforms by both linear regression (LR), and the first harmonic (H1) in Fourier decomposition. The difference between the two models was quantified if the BP waveform input signal was radial or aortic and compared by Student’s paired t-test.

Results: Use of aortic instead of radial BP resulted in a 29% increase in estimated CCP using the LR model, and 25% increase using the H1 model (Figure, p<0.001). Radial BP resulted in variation between the models (3%, p<0.001). Aortic BP did not cause this variation (0.6%, p=0.49).

Conclusions: Aortic, but not radial pressure gave a model independent estimate of CCP. However, estimated CCP within a model was significantly different depending on whether radial or aortic pressure was used.

P2.04
ASSESSMENT OF BRACHIAL ARTERY REACTIVITY USING THE ENDOCHECK: REPEATABILITY, REPRODUCIBILITY AND PRELIMINARY COMPARISON WITH ULTRASOUND
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Objective: The Endocheck, embedded within the Vicorder device, uses cuff-based, pulse volume (PV) displacement to record brachial PV waveforms at baseline, and during reactive hyperaemia. The aim of this study was to assess the utility of the Endocheck method.

Methods: The study consisted of two parts. Part 1: Healthy volunteers (n=9) were studied twice, separated by 24 hours. Each visit consisted of two studies, 30min apart, where, after 10min supine rest, brachial BP was assessed and PV waveforms recorded for 10sec (baseline). A cuff placed distally around the forearm was then inflated to 200mmHg for 5min. Following cuff-release, PV waveforms were recorded for 3min. The square root of the ratio of peak:baseline PV during hyperaemia (V2/V1) was calculated. Part 2: Healthy volunteers (n=16) were studied once. Brachial artery responses were assessed simultaneously in both arms, using ultrasound (right arm) and Endocheck (left arm), following a similar protocol as above.