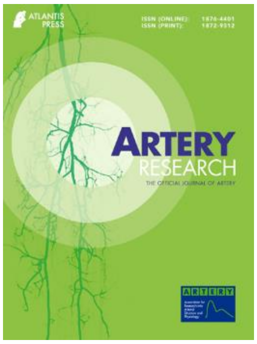


Artery Research

ISSN (Online): 1876-4401 ISSN (Print): 1872-9312
Journal Home Page: https://www.atlantis-press.com/journals/artres

P2.05: CAROTID PULSE WAVE VELOCITY CAN BE MEASURED USING MAGNETIC RESONANCE IMAGING IN PATIENTS WITH CAROTID ARTERY DISEASE

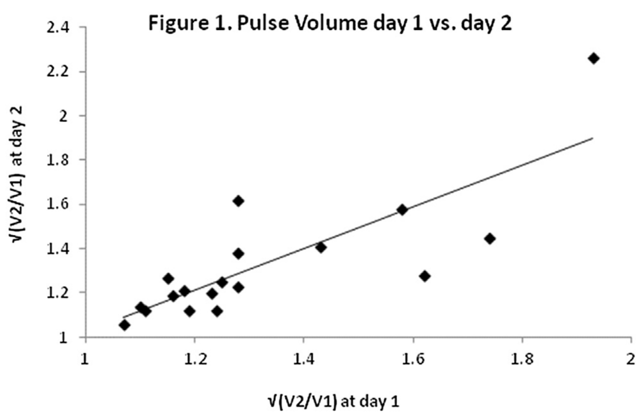
Y.P. Yong, N. Altaf, S.T. MacSweeney, D.P. Auer

To cite this article: Y.P. Yong, N. Altaf, S.T. MacSweeney, D.P. Auer (2013) P2.05: CAROTID PULSE WAVE VELOCITY CAN BE MEASURED USING MAGNETIC RESONANCE IMAGING IN PATIENTS WITH CAROTID ARTERY DISEASE, Artery Research 7:3_4, 120–120, DOI: https://doi.org/10.1016/j.artres.2013.10.067

To link to this article: https://doi.org/10.1016/j.artres.2013.10.067

Published online: 14 December 2019

Results: Part 1: An average change in PV of 74±82% was detected in response to forearm ischaemia (P=0.003). Within-visit repeatability was acceptable, with a mean (±SD) difference in √V2/V1 of 0.03±0.25 (P=0.6), and a high correlation between studies (r=0.64; P=0.004). Between-visit reproducibility was high, with a mean difference of 0.004±0.17 (P=0.9) and a strong correlation between readings (r=0.81; P<0.0001; Figure 1). Part 2: There was a modest association (r=0.14, P=NS) between hyperaemic responses assessed using the different methods.
Conclusion: The Endocheck can reliably assess changes in brachial PV during hyperaemia. Further studies are required to determine whether the observed changes reflect endothelial function.



P2.05
CAROTID PULSE WAVE VELOCITY CAN BE MEASURED USING MAGNETIC RESONANCE IMAGING IN PATIENTS WITH CAROTID ARTERY DISEASE

Y. P. Yong [1,2], N. Altaf [1,2], S. T. MacSweeney [2], D. P. Auer [1]
[1]*Department of Radiology and Imaging Sciences, University of Nottingham, Nottingham, United Kingdom*
[2]*Department of Vascular and Endovascular Surgery, Queen's Medical Centre, Nottingham, United Kingdom*

Objectives: Carotid artery stiffness has been suggested to alter local haemodynamic and arterial remodelling. It has also been shown to be associated with ischaemic stroke. The aim of this pilot study is to assess the feasibility of measuring carotid pulse wave velocity (cPWV) using magnetic resonance imaging (MRI) in patients with carotid stenosis.
Methods: Patients with stenosis (30-99%) at the carotid bifurcation on duplex ultrasonography were recruited. Non-segmented through-plane velocity was acquired perpendicular to the internal and common carotid arteries to maximise velocity acquisition. Flow images were analysed to convert signal intensity to velocity. The time delay between the pulse waves was determined by plotting the velocity-time curve. The distance travel by the pulse waves was measured on carotid artery time-of-flight images.
Results: 22 patients (14 men, mean age 73±8) with at least one carotid stenosis between 30% and 99% were assessed. Both the intra-class correlation for image acquisition reproducibility and flow data analysis were 0.99 (p<0.001). The median (range) cPWV was highest in 30-49% (7.56 m/s (range 4.49-10.64)) and 50-59% (6.47 m/s (range 4.71-19.74)) stenosis with mean path length of 46mm.
Conclusion: Carotid pulse wave velocity in patients with carotid artery stenosis is feasible to be measured using MRI. This method is highly reproducible with good intra-observer consistency. Further work is needed to explain the pathophysiology of cPWV in patients with mild and moderate carotid stenosis.

P2.06
A NOVEL INFLATION TEST TECHNIQUE AND OPTICAL FLOW ESTIMATION FOR IN VITRO DETERMINATION OF THE CROSS-SECTIONAL DEFORMATION OF ARTERY

C. Ooi, M. P. F. Sutcliffe
University of Cambridge, Cambridge, United Kingdom

Objectives: Determination of the cross-sectional mechanical properties of artery is crucial for correlating regional arterial stiffness with the biological components such as collagen, elastin, and deposited calcium. While ultrasound imaging has been used to determine these properties from the arterial deformation, the accuracy of the measurements is limited due to non-direct imaging on the arterial cross-section. Therefore, we designed a novel inflation test technique allowing this direct imaging.
Methods: The test system provides internal pressures to an artery ring using a pump connected to a pressure transducer and a balloon tube (Figure 1). The cross-sectional deformation of the artery is captured using a camera. The images are then analysed using optical flow estimation which determines the deformations from pixel motions. This optical flow technique has been validated with images of a ring structure undergoing known deformations.
Results: This test system has been tested with pig aortas. The regional strains of an aortic ring sample are shown in Figure 2.
Conclusions: This inflation test design and the optical flow estimation allow *in vitro* determination of arterial regional strains at physiological pressures. A finite element model will be developed to correlate the deformations between the experiments and models to determine the regional mechanical properties of the artery. This approach will be used to investigate the associations of ageing-induced arterial stiffening with regional structural changes such as calcium deposition and elastin fragmentation, promoting the determination of target biological components for drugs.

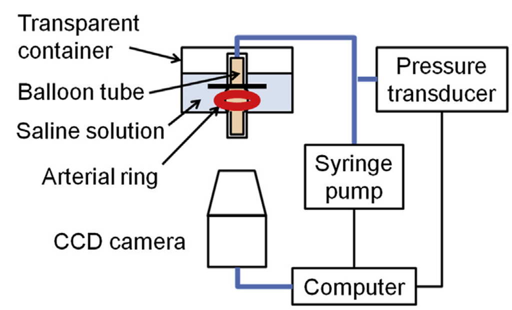


Figure 1 Inflation test system.

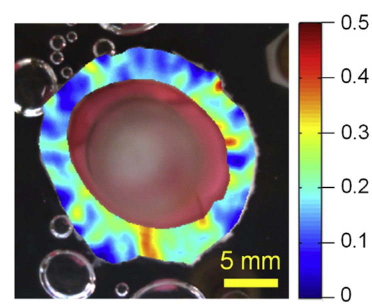


Figure 2 Calculated arterial strains.

P2.07
VALIDATION OF A NOVEL METHOD TO ASSESS ENDOTHELIAL FUNCTION

E. A. Ellins [1], K. New [2], S. Bundhoo [1], B. N. Datta [3], D. A. Rees [1], J. P. Halcox [1]
[1]*Cardiff University, Cardiff, United Kingdom*
[2]*University of Glamorgan, Pontypridd, United Kingdom*
[3]*Cardiff & Vale University Health Board, Cardiff, United Kingdom*

Objectives: Assessment of pulse wave velocity (PWV) is normally used as a measure of arterial stiffness. However, measurement of change in PWV before and after a period of reactive hyperaemia may enable the technique to be harnessed as a measure of endothelial function as flow-mediated slowing (FMS). The aim of this study was to validate this approach as a novel method of endothelial function assessment.
Methods: FMS and flow-mediated dilatation (FMD) of the brachio-radial arterial tract was assessed in 25 young healthy subjects on two separate occasions to assess reproducibility. To assess the ability of the technique to investigate acute vascular dysfunction FMS and FMD was assessed before and after a 20-minute period of ischaemia-reperfusion (IR) in 15 healthy subjects. Finally, 12 Familial Hypercholesterolaemia patients undergoing lipoprotein apheresis had FMS assessed pre and post treatment.