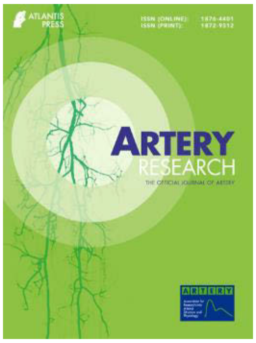

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PERIPHERAL BLOOD FLOW REGULATION IN RESPONSE TO SYMPATHETIC STIMULATION IN INDIVIDUALS WITH DOWN SYNDROME

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Background: Individuals with Down syndrome (DS) experience autonomic dysfunction, with reduced sympathetic and parasympathetic control. This results in alterations in resting heart rate and blood pressure and attenuated responses to sympathoexcitatory stimuli. It is unknown to what extent this impacts the regulation of peripheral blood flow in response to sympathetic stimuli, which is an important prerequisite to exercise and perform work.
Purpose: To investigate differences in peripheral blood flow regulation in response to lower body negative pressure (LBNP) between individuals with and without DS. Methods: Participants (n = 10 males with DS and n = 11 male controls, mean age 23.7 years ± 3.2) underwent 5 min of LBNP stimulations (−20 mmHg), after resting supine for 10 min. One minute steady state blood pressure and blood flow at baseline, LBNP, and 5 min recovery were obtained for analysis. Mean flow velocity and arterial diameters were recorded with ultrasonography; foreram blood flow (FBF), shear rate and forearm vascular conductance (FVC) were calculated using brachial blood pressure measured right before ultrasound recordings. Results: Participants with DS responded differently (consistent with reduced vasoconstrictive control) to the LBNP stimulus (significant ConditionxGroup interaction effect) for mean velocity (p = 0.003), FBF (p = 0.008), shear rate (p = 0.004) and FVC (p = 0.017), compared to participants without DS (see table).
Conclusion: Young males with DS exhibit reduced peripheral blood flow regulation of blood flow in response to LBNP compared to controls, indicating a blunted sympathetic control of blood flow. Further research is necessary to explore the impact of these findings on exercise and work capacity.
Baseline LBNP Recovery DS Control DS Control DS Control MAP 90 ± 13 88 ± 10 85 ± 12 87 ± 10 92 ± 11 85 ± 10 Diameter (cm) 0.36 ± 0.05 0.43 ± 0.05 0.37 ± 0.05 0.43 ± 0.7 0.37 ± 0.04 0.42 ± 0.06 Mean velocity (cm/sec) 13 ± 7 21 ± 10 15 ± 7 17 ± 5 16 ± 9 16 ± 8 FBF (ml/min) 91 ± 64 176 ± 80 104 ± 67 146 ± 47 114 ± 91 138 ± 74 Shear Rate (sec-1) 20 ± 12 35 ± ± 16 23 ± 12 29 ± 8 25 ± 17 28 ± 14 FVC (ml/min/100 mmHg) 101 ± 67 203 ± 95 124 ± 84 171 ± 63 125 ± 101 162 ± 81.

VALIDATION OF ULTRASOUND DETERMINATION OF LOCAL PULSE WAVE VELOCITY IN THE HUMAN ASCENDING AORTA AGAINST MRI MEASUREMENTS

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Background: Pulse Wave Velocity (PWV) is a measure of arterial stiffness which predicts cardiovascular risk independently of blood pressure. Local PWV can be measured non-invasively in the ascending aorta of adults by means of Ultrasound (US), using successive recordings of Diameter (D) and the velocity (U) [1].
Aim: To test US measurements of local PWV in the ascending aorta of human adults against MRI measurements of local PWV.
Methods: PWV in the ascending aorta of 8 healthy volunteers (age 22–34y, 3 females) was measured using a Siemens MAGNETOM Aera 1.5T MRI scanner as per standard protocols with cine and phase contrast imaging (sampling frequency 100 samples/cardiac cycle) and D and U were calculated using validated software [2]. US images were recorded using GE Vivid E95 scanner with a 1.5–4.5 MHz phased array transducer. PLAX was used for diameter recordings and A5CH for velocity. Measurements were recorded for 20s during a breath-hold. D and U waveforms were extracted from each imaging modality to calculate PWV using the ln(D)U-loops technique [3].
Results: Average results are summarised in Table 1. The mean difference in PWV between MRI and US was 2.8 ± 0.3%.
Conclusions: PWV measured by US shows excellent agreement with MRI in the ascending aorta of adults. Given US availability, this technique offers an easy, affordable and non-invasive means of determining PWV and mechanical properties of the ascending aorta; thus, providing a tool for screening studies.

Table 1. MRI and US measurements of D, U and PWV. Data are means ± standard deviations (n=8).

	Min D (cm)	Max D (cm)	Min U (m/s)	Max U (m/s)	PWV (m/s)
MRI	2.5±0.4	3.0±0.3	0.1±0.0	0.9±0.2	3.5±0.8
US	2.4±0.2	2.8±0.2	0.3±0.1	1.1±0.2	3.6±1.0

References
1. Madalina Negoita, Alun D Hughes, Kim H Parker, Ashraf W Khir, 'Non-invasive Technique for Determining Local Pulse Wave Velocity in Humans Ascending Aorta', Computing in Cardiology 2017, Volume 44:1-4.
2. A. De Cesare, A. Redheuil, A. Dogui, O. Jolivet, A. Lalande, F. Frouin, E. Mousseaux, A. Herment, 'ART-FUN: an Integrated Software for Functional Analysis of the Aorta', Journal of Cardiovascular Magnetic Resonance, 2009, 11(Suppll 1): P182.
3. J Feng and AW Khir. 'Determination of wave speed and wave separation in the arteries using diameter and velocity'. Journal of Biomechanics, 2010, 43(3):455-462.

https://doi.org/10.1016/j.artres.2018.10.006
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