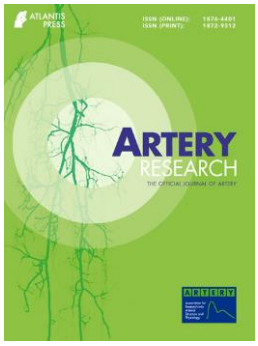

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P2.17: THE REPRODUCIBILITY OF ARTERIAL STIFFNESS IN COPD

A. Albarrati, N.S. Gale, S. Enright, M. Munnery, I. Munnery, D.J. Shale, J.R. Cockcroft

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P2.14
NON-INVASIVE DETERMINATION OF AORTIC COMPLIANCE DISTRIBUTION IN THE HUMAN

N. Westerhof [1], N. Saouti [1], J. T. Marcus [2], A. Vonk-Noordegraaf [1]
[1]*Department of Pulmonary Diseases, ICaR-VU, VU University Medical Center, Amsterdam, Netherlands*
[2]*Department of Physics and Medical Technology, ICaR-VU, VU University Medical Center, Amsterdam, Netherlands*

Total arterial compliance is a main determinant of pulse pressure. For most part it resides in the aorta, where also major changes take place, which may differ locally. To follow local changes in aortic compliance, as in aging, noninvasive determination compliance distribution would be of great value. Using MRI aortic diameters (area change deltaA) and flow were determined at 6 aortic locations. Simultaneously brachial blood pressure (BP) was measured with cuff. Aortic arch pressure AAP was calculated by setting diastolic and mean pressures equal [1]. Regional aortic pressures were estimated from AAP using (averaged) literature data on aortic pressure transfer [2,3]. Regional aortic compliance was then calculated in two ways, the pulse pressure method [4] and local area compliance (deltaA/deltaP) times segment length.
Studies were carried out in 7 healthy volunteers. The PPM of the AA includes head vessels while the area method does not, thus allowing compliance calculation of head vessels. Of the total arterial compliance, ascending to distal arch contributes (segments 1-3) 40%, descending aorta (segments 4&5) 25%, head/arms 15%, legs 20%.
Regional aortic compliance can be obtained non-invasively and thus allows following changes in local compliance (e.g., age effects). Compliance from local Pulse Wave Velocity should be compared but requires diameter information.

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P2.15
VALIDATION OF CENTRON CBP301 VERSUS SPHYGMOCOR WITH A MODIFIED ESH-IP 2010 PROTOCOL

D. Agnoletti [1], S. Millasseau [2], J. Topouchian [1], M. E. Safar [1], J. Blacher [1]
[1]*Paris Descartes University; AP-HP; Diagnosis and Therapeutic Center, Hôtel-Dieu, Paris, France*
[2]*Pulse Wave Consulting, Paris, France*

Centron cBP301 (Centron Diagnostics, UK) is a new cuff-based central blood pressure meter.
It estimates central systolic pressure (cSBP) from the oscillometric brachial cuff waveforms with a specific generalized transfer function [1]. To date, there is no specific international protocol to validate non-invasive central pressure measurements. So we modified the internationally recognized ESH-IP2010 protocol for electronic arm cuff-based device to validate the Centron cBP301[2]. We used SphygmoCor (AtCor, Australia) as reference.
Radial tonometric SphygmoCor measurements were done 4 times alternated with 3 Centron cBP301 measurements. Each Centron recordings were compared with the most favorable SphygmoCor recordings done immediately before or after and calibrated with Centron peripheral SBP and DBP measurements.
40 subjects (25 men, 15 women) from the Centre de Diagnostic et de Thérapeutique (Hotel-Dieu, Paris) were recruited. Seventeen had a peripheral DBP $\leq$79 mmHg, 17 between 80-100mmHg and 6 with a DBP $\geq$101 mmHg. Eleven had a peripheral SBP $\leq$129 mmHg, 16 between 130 and 160mmHg and 13 with SBP$\geq$161mmHg. Central SBP varied between 86 and 176 mmHg (mean$\pm$SD: 131$\pm$23). Mean heart rate was 70 $\pm$16 bpm. Mean error on central SPB was 0.91$\pm$3.10 mmHg with 87.5% of the measurements falling within 5mmHg and 100% within 10mmHg.
Despite the fact that 4 subjects with DBP above 101 mmHg are missing for the accomplishment of the ESH-IP BP recruitment criteria, the Centron cBP301 device fulfills the pass criteria for estimating central SBP.

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P2.16
PRECISION AND REPRODUCIBILITY OF VICORDER-ESTIMATED PULSE WAVE VELOCITY IN HEALTHY VOLUNTEERS

S. Al-Ansari, T. G. Robinson, A. K. Mistri
University of Leicester, Leicester, United Kingdom

Background: Arterial stiffness is a risk factor for cardiovascular disease. Carotid-femoral pulse wave velocity (cfPWV), the 'gold standard' measurement, is traditionally assessed using applanation tonometry. The Vicorder is a novel apparatus that estimates PWV, using non-invasive oscillometric assessment of the pulse waveform, at two arterial sites simultaneously. There is limited data on precision, and no data on visit-to-visit reproducibility of Vicorder-assessed PWV.
Methods: We measured *precision* [intravisit within-subject variability, quantified using coefficient of variation (CoV) and intraclass correlation coefficient (ICC)], and *reproducibility* (visit-to-visit differences assessed by Bland-Altman method). Both parameters were estimated in triplicate by a single investigator, using a standardised Vicorder protocol. Some volunteers had repeat assessment at 7$\pm$2 days.
Results: In 48 volunteers (age:62$\pm$8), single visit variability was smaller for bfPWV versus cfPWV (CoV 3.19% and 8.19%; ICC 0.99 and 0.84, respectively), and comparable with heart rate variability (CoV 2.57, ICC 0.99). In 11 volunteers with repeat measurements (age:54$\pm$10), the mean difference (limits of agreement) between visits was low for cfPWV and bfPWV [0.1 (-0.64 to 0.84), and 0.3 (-2.38 to 2.98), respectively].
Conclusions: We report slightly higher single-visit variability compared to previous studies (CoV-2.8%-Hickson-2009, 2.67%-Everett-2012), possibly a reflection of our older population. Nonetheless, Vicorder PWV estimates are precise (low CoV, high ICC), and cfPWV (range:5.15-8.60) shows good visit-to-visit reproducibility (narrow limits of agreement $<$1.5m/s). Despite higher precision/lower variability, bfPWV was less reproducible, having wider limits of agreement. Further studies are warranted to establish validity, reliability and clinical applicability of Vicorder-PWV measurements in different populations.

P2.17
THE REPRODUCIBILITY OF ARTERIAL STIFFNESS IN COPD

A. Albarrati [1], N. S. Gale [1], S. Enright [2], M. Munnery [1], I. Munnery [1], D. J. Shale [1], J. R. Cockcroft [1]
[1]*Wales Heart Research Institute, Cardiff University, Cardiff, United Kingdom*
[2]*Department of Physiotherapy, Cardiff University, Cardiff, United Kingdom*

Introduction: Chronic obstructive pulmonary disease (COPD) is a risk factor for cardiovascular disease (CVD). Increased arterial stiffness is one proposed mechanism linking COPD to CVD. Carotid-femoral pulse wave velocity (cf-PWV) is a non-invasive measure for assessing arterial stiffness. However, its reliability has not been established in COPD. We aimed to assess the between day reproducibility of cf-PWV in stable patients with COPD.
Method: The Assessment of Risk in Chronic Airways Disease Evaluation (ARCADE) is a longitudinal study of up to 1500 patients with COPD confirmed with spirometry. Thirty patients free from CVD underwent height and weight measurements before assessing the arterial stiffness using the SphygmoCor device (AtCor medical). This was repeated after mean (range) 7(1) days.
Results: Carotid-femoral PWV was measured on two visits. Mean $\pm$ SD age was 67$\pm$8 years, BMI 27.2$\pm$4.7 kg/m2. Mean cf-PWV at visit 1 was 9.7$\pm$2.2 m/s and 9.7$\pm$2.2 m/s on the second visit. Repeated measures ANOVA showed no significant difference between subject measurements ($F=1.00$ and $p=0.326$). The interclass correlation coefficient (ICC) was 0.93. The Bland and Altman plot showed a mean difference of 0.01 m/s and an upper limit of +1.62 m/s and a lower limit of -1.62 m/s. The plot revealed no systematic bias with slight random error and two clear outliers. (Figure1)
Conclusion: Carotid-femoral PWV is a reproducible measure using the SphygmoCor machine in patients with COPD. This may be used as a useful measure to assess cardiovascular risk and monitor therapy in clinical practice.