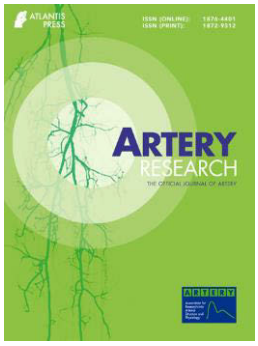

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P2.26: ASSESSING CHARACTERISTICS OF THE CARDIO-ANKLE VASCULAR INDEX (CAVI) AND ITS PWV FOR ARTERIAL FUNCTION – ARM-LEG DIFFERENCES AND REPEATABILITY

V. Govoni, M.L. Casagrande, F. Iqbal, K.J. Cruickshank

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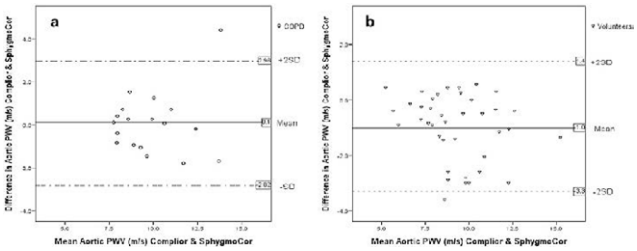

Figure 1 Bland-Altman plot comparing PWV by Complior and SphygmoCor in a) Patients with COPD b) Volunteers.

P2.25

ECHOCARDIOGRAPHIC VALIDATION OF A NOVEL METHOD FOR NONINVASIVE ESTIMATION OF CARDIAC OUTPUT BASED ON PULSE CONTOUR ANALYSIS

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Surgical or critically ill patients often require continuous assessment of cardiac output (CO) for diagnostic purposes or guiding therapeutic interventions. A new method of non-invasive estimation of CO, based on pressure wave analysis, has been recently developed, but its validity has been examined only *in silico*. Aim of this study was to evaluate the reproducibility, precision and accuracy of the "Systolic Volume Balance" method (SVB).

Methods: Twelve subjects underwent 2-D transthoracic echocardiography (Doppler) for CO measurement which was used as reference value. The application of SVB method required aortic pressure wave analysis and estimation of total arterial compliance (C_t). Aortic pulses were derived by mathematical transformation of radial pressure waves recorded by applanation tonometry (SphygmoCor). C_t was estimated by the "pulse pressure" method. The agreement, association, variability, bias and precision between the reference (Doppler) and estimated (SVB) values of CO were evaluated by Spearman correlation coefficient, intraclass correlation coefficient (ICC), coefficient of variation (CV), root mean square error (RPSE), mean difference, SD of differences (SDD), percentage error (PR) and Bland-Altman analysis.

Results: Both SVB and Doppler provided highly reproducible measures of CO when two repeated measurements were performed (ICC>0.9, SD of difference <0.4 L/min, CV<5%, PR<17%). CO estimation by the SVB method was comparable with the respective measure by Doppler indicating a good agreement and accuracy (Table).

Table. Accuracy and precision of CO estimation by the SVB method compared to the reference method (Doppler).

Parameter	Value
Mean difference (L/min)	0.780
Standard deviation of difference (L/min)	0.323
Limits of agreement (L/min)	0.15—1.41
Coefficient of variation (%)	13.0
Root mean squared error (L/min)	0.678
Spearman correlation coefficient	0.939
Intraclass correlation coefficient	0.797
Percentage error (%)	20

Conclusion: CO estimation by the SVB method is highly reproducible and accurate in comparison with the CO measurement by Doppler. Future studies, though, are required to assess the clinical utility of this method.

P2.26

ASSESSING CHARACTERISTICS OF THE CARDIO-ANKLE VASCULAR INDEX (CAVI) AND ITS PWV FOR ARTERIAL FUNCTION — ARM-LEG DIFFERENCES AND REPEATABILITY

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Background: Vasera is a machine developed to evaluate arterial stiffness by measuring pulse wave velocity (PWV) and cardio-ankle vascular index (CAVI), apparently independent of blood pressure (BP). The 4-cuff device measures right (R) and left (L) brachial and ankle BP, deriving the CAVI value and cardiac-ankle (ca)PWV. We assessed the operating characteristics of this novel technique in clinical practice.

Method: A total of 108 patients, (13 healthy controls, 76 hypertensive, 19 with type 2 diabetes) aged 18-80 years, were measured with the Vasera 1500 (Fukuda-Denshi, Tokyo, Japan) after 10 minutes rest in a temperature controlled room. Patients with known vessel disease were excluded. Repeat visits were made after about 2 weeks.

Results: Mean±SD BMI and age were 29.6±6.1kg/m^2 and 50.8±16.1y respectively. Within-visit R and L CAVI were 7.8±1.5, and 7.8±1.7 units, and R and L PWV 8.1±1.5 and 8.1±1.6 m/sec. The difference between brachial systolic R and L BP, 2.5±7mmHg, correlated with both R-PWV and L-PWV (r=0.29 for both, p=0.009). No significant correlation was seen between brachial or ankle R and L systolic and diastolic BP differences and R/L-CAVI, nor was there significant correlation between ankle R/ L systolic and diastolic BP difference and R-PWV or L-PWV. In 24 patients, between-visit differences in CAVI (R) were 0.14 (95%CI -0.4 to 0.6, not significant, NS) and in caPWV 0.5 (-0.3 to 1) m/sec — NS.

Conclusion: Between-visit repeatability for both CAVI & caPWV was good. The correlation between difference in arm BP and caPWV suggests possible subclinical subclavian or aortic stiffness /disease.

P2.27

A ROBUST METHOD FOR AUTOMATIC MEASUREMENTS OF DIAMETER, DISTENSION AND IMT IN HUMANS AND SMALL ANIMALS

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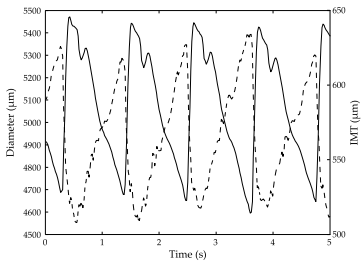
ARTIC is a new segmentation-based tracking algorithm used to automatically measure diameter, distension and intima media thickness (IMT) in arteries using B-mode ultrasound. ARTIC is initiated with a mark in the center of lumen and can then perform automatic measurements in about 1000 frames/second. To show the robustness and versatility of ARTIC evaluations were made with four different ultrasound scanners, Philips HDI5000, Philips iU22, VisualSonics Vevo 2100 and ULA-OP (Florence University) with different file-formats, including DICOM. The repeatability of automatic measurements of diameter, distension and IMT was evaluated in a) the carotid artery in humans of various age and health and b) the aorta in premature rabbit-pups having a diameter of less than 1 mm. Further the measurements of ARTIC were compared to those of a previously phantom validated method. Finally, differences in measured diameter, distension and IMT when using different scanners were evaluated. The mean diameter of the measurement ranged from 5771-6604 μm (humans) and 768 μm (rabbit pups), the mean distension



Type of evaluation		CV(%)
iU22 Carotid artery	Diam.	0.7
20 subjects Age 21-62	Dist.	4.1
Healthy Normotensive	IMT	2.3
ARTIC vs Validated method	Diam.	0.4
20 subjects Age 25-57 years	Dist.	2.4
Healthy Normotensive	IMT	1.9
HDI5000 Carotid artery	Diam.	1.8
10 subjects Age 23-39 years	Dist.	4.2
Healthy Normotensive	IMT	4.2
ULA-OP Carotid artery	Diam.	1.4
10 subjects Age 23-39 years	Dist.	6.4
Healthy Normotensive	IMT	5.8
HDI5000 Carotid artery	Diam.	1.4
12 subjects Age 60-76 years	Dist.	8.8
Healthy Normotensive	IMT	6.6
ULA-OP Carotid artery	Diam.	2.0
20 subjects Age 65-86 years	Dist.	8.7
Various Health	IMT	3.6
HDI5000 vs ULA-OP	Diam.	1.8
10 subjects Age 23-39 years	Dist.	8.5
Healthy Normotensive	IMT	9.1
Vevo 2100 Aorta	Diam.	1.9
10 premature rabbit pups	Dist.	13.0
	IMT	6.1