



Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

Journal Home Page: <https://www.atlantis-press.com/journals/artres>

P.022: COMPARISON OF COMPLIOR, SPHYGMOCOR AND ARTERIOGRAPH FOR ASSESSMENT OF AORTIC PULSE WAVE VELOCITY IN PATIENTS WITH ARTERIAL HYPERTENSION

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To cite this article: M.W. Rajzer, M. Klocek, W. Wojciechowska, I. Palka, M. Brzozowska-Kiszka, K.L. Kawecka-Jaszcz (2007) P.022: COMPARISON OF COMPLIOR, SPHYGMOCOR AND ARTERIOGRAPH FOR ASSESSMENT OF AORTIC PULSE WAVE VELOCITY IN PATIENTS WITH ARTERIAL HYPERTENSION, Artery Research 1:2, 57–58, DOI: <https://doi.org/10.1016/j.artres.2007.07.079>

To link to this article: <https://doi.org/10.1016/j.artres.2007.07.079>

Published online: 21 December 2019

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Background: As already known in ancient times, cardiovascular disease can be traced by analyzing arterial (pressure) waveforms, for these can be attributed to cardiovascular properties like arterial geometry and elasticity. Consequently, we hypothesize that an abdominal aortic aneurysm (AAA) will influence arterial wave reflection and waveforms because it entails an arterial dilation accompanied by a change in arterial elasticity.

Methods: An experimental and numerical model, relying on an AAA-geometry reconstructed from patient CT-images, was designed. A silicon rubber AAA was inserted into a hydraulic bench model of the systemic circulation. Pressure and flow waves were simultaneously measured with and without aneurysm. The nature of the waves was determined with wave intensity analysis and the reflection coefficient. With the numerical model, arterial waves were simulated at the same locations. Results were verified in a preliminary study in 3 patients before and after AAA-repair.

Results and discussion: Both models demonstrated that AAA changed the nature of the reflected waves. A healthy arterial tree is characterized by positive reflections due to tapering and progressive stiffening, as was confirmed experimentally and numerically. An aortic dilation causes the opposite effect: we observed negative reflections in the upper aorta. A numerical parameter study showed that larger and more compliant AAA generated stronger negative reflections. The reflection coefficient measured in vivo increased after AAA-repair in all 3 patients, conforming the model findings.

Conclusions: Both models proved the impact of AAA on arterial waveforms elsewhere in the arterial system. These effects also appear measurable in humans.

P.019

CAROTID-RADIAL PULSE WAVE VELOCITY DURING THE TESTS ON REACTIVE HYPEREMIA IN PATIENTS WITH ISOLATED SYSTOLIC AND SYSTOLIC-DIASTOLIC ARTERIAL HYPERTENSION

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Purpose: To evaluate the influence of tests on reactive hyperemia on peripheral vessel's elasticity in patients with isolated systolic (ISH) and systolic-diastolic arterial hypertension (SDH).

Methods: Patients with ISH (n=67) and SDH (n=75) similar in sex and age were examined. Two tests on reactive hyperemia were conducted. The first test included 5-minute cuff occlusion (CO), the second one – sublingual taking of 0.5 mg Nitroglycerin (NG). Carotid-radial pulse wave velocity (PWV-cr, "PulseTracePWV", Great Britain) was measured before and after the cuff decompression or 5 minutes after Nitroglycerin taking in CO and NG tests respectively. The PWV-cr dynamics was assessed by Wilcoxon criteria.

Results: The initial PWV-cr was significantly higher in patients with SDH in relation to ISH (10.3 and 9.8 m/s respectively; p<0.05). The PWV-cr dynamics during the functional tests is presented in the table below.

	PWV-cr medians (m/s)					
	CO test			NG test		
	Before	After	%	Before	After	%
ISH	9.8	9.7*	-1	9.8	9.3	ns
SDH	10.3	10.0**	-2.9	10.6	9.8*	-7.6

* p<0.01.

** p<0.05.

During the functional tests PWV-cr exhibited a regular decrease in both groups due to the vessel's relaxation. But in cases of ISH it decreased to a lesser extent.

Conclusion: So we can suggest that ISH as compared with SDH was characterized by lesser tonus and depressed reactivity of upper-limb peripheral arteries.

P.020

INTERRELATIONS BETWEEN CAROTID-RADIAL PULSE WAVE VELOCITY AND BLOOD PRESSURE MONITORING DATA IN PATIENTS WITH ISOLATED SYSTOLIC HYPERTENSION

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Purpose: To investigate the interrelations of carotid-radial PWV (PWV-cr) and its dynamics in occlusion test with 24-h BP-monitoring (ABPM) parameters in patients with isolated systolic arterial hypertension (ISH).

Methods: 112 ISH patients were exposed to ABPM. PWV-cr ("PulseTracePWV", Great Britain) was measured along with its dynamics (%) after a 5-min forearm cuff occlusion and the second measurement. According to the results of the occlusion test the patients formed two subgroups, in one of which PWV-cr decreased (n=66, 58.9%), while in the second group (n=46, 41.1%) it did not change or increased. In both groups mean parameters of ABPM were compared. Correlation and logistic regression analyses were applied.

Results: Initial PWV-cr of all patients correlated directly to diurnal diastolic BP (DBP) (r=0.40, p<0.0001). Inverse correlation was revealed between PWV-cr and low systolic BP (SBP) and DBP loads. The subgroups were similar in gender, age and 24-h SBP and DBP levels. At the same time the first subgroup nighttime SBP and DBP dipping indices were lower (p=0.0005 and 0.003) and nighttime DBP and SBP were higher (p=0.005 and 0.007) than those of the second group. Regression analysis showed that PWV-cr decrease is associated with non-dipping SBP and DBP patterns (OR=3.4, p=0.002 and OR=3.8, p=0.007).

Conclusion: In ISH patients the growth of peripheral arteries elasticity is followed by arterial hypotension prolongation during a day. PWV-cr dynamics in the occlusion test can have the predictive value in BP circadian rhythm disturbances assessment.

P.021

DYNAMICS OF CAROTID-RADIAL PULSE WAVE VELOCITY IN OCCLUSION TEST IS RELATED TO THE TARGET-ORGANS DAMAGE IN ESSENTIAL ARTERIAL HYPERTENSION

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Purpose: To evaluate the importance of carotid-radial PWV (PWV-cr) dynamics in cuff occlusion test in heart, vessels and kidneys damage assessment in patients with essential arterial hypertension (AH).

Methods: 204 patients with AH (mean age 72.6 ± 7.2 years) were examined. PWV-cr ("PulseTracePWV", Great Britain) was measured before and after a 5-min forearm cuff occlusion. According to the results of the occlusion test the patients formed two subgroups, in one of which PWV-cr decreased (n=122), while in the second group (n=82) it did not change or increased. The cases of previous myocardial infarction (MI) were taken into account. Ankle-brachial index (ABI) and glomerular filtration rate (GFR) by MDRD formula were revealed. For criteria of peripheral artery disease (PAD) we used the ABI value<1.0, while for chronic kidney disease (CKD) it was GFR/1.73 m²<60 ml/min. The incidence of previous MI, PAD and CKD were compared in both subgroups. To estimate relationships we used logistic regression analysis.

Results: The two subgroups of patients were similar in age, gender and PAD incidence. Previous MI and CKD occurred more often in the second subgroup compared with the first (28.9% vs. 13.9%, $\chi^2=6.9$, p=0.009 and 65.4% vs. 43.7%, $\chi^2=9.1$, p=0.003, respectively). Logistic regression analysis also proved that the lack of PWV-cr fall in occlusion test is associated with more frequent MI (OR=2.6, p=0.008) and CKD (OR=2.4, p=0.002) development.

Conclusion: PWV-cr dynamics in occlusion test reflecting peripheral arteries reactivity is associated with coronary heart and chronic kidney diseases occurrence and thus can have prognostic significance for target-organs affection.

P.022

COMPARISON OF COMPLIOR, SPHYGMOCOR AND ARTERIOGRAPH FOR ASSESSMENT OF AORTIC PULSE WAVE VELOCITY IN PATIENTS WITH ARTERIAL HYPERTENSION

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Background: Aortic pulse wave velocity (PWV) appears to be the "gold-standard" for evaluation of vascular changes in patients with arterial

hypertension (HT). The examination of arterial stiffness in this group has a chance to become a routine procedure. This indicates how important will be the choice of the optimal method for PWV measurement.

The aim of this study was to compare aortic PWV obtained in patients with primary HT using three different types of devices: Complior[®], SphygmoCor[®] and Arteriograph.

Method: In 64 pts with mild or moderate primary HT (age 54 ± 13.6 yrs), 39 males and 25 females we measured PWV using the three aforementioned devices at the same clinical visit.

Results: PWV obtained with Complior[®] (10.2 ± 2.3 m/s), SphygmoCor[®] (8.1 ± 1.2 m/s) and Arteriograph (8.6 ± 1.8 m/s) were significantly different (ANOVA, $p < 0.001$), due to higher Complior-PWV values than those obtained with the remaining devices. A comparison of such PWV determinants as traveled distance and transit time revealed a significant difference in distances between the methods, but no differences in transit times. The Bland-Altman analysis for each pair of devices indicated that PWV values were measured with similar accuracy when considering the mean of differences.

Conclusions: The methodological differences in traveled distance, but not in transit time measurement are responsible for higher pulse wave velocity obtained with the Complior than SphygmoCor and Arteriograph devices. Taking into account this differences, all devices are accurate and valuable for PWV measurement.

P.023

INCREASED CARDIOVASCULAR RISK IN FIRST-DEGREE RELATIVES (WITHOUT ABDOMINAL AORTIC ANEURYSM, AAA) TO AAA PATIENTS?

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Background: Patients affected by AAA have a tendency to generalized dilatation, increased vascular stiffness and cardiovascular risk. There is a pronounced genetic predisposition for AAA, but it is unknown whether first-degree relatives without AAA, have a generalized dilating diathesis, or defect arterial wall mechanics. The aim of the study was to investigate the arterial diameter and wall properties in first-degree relatives without AAA, and compare them with controls without a family history of AAA.

Methods: 71 non-smoking relatives to patients with AAA (41m/30f; 41-70years) and 66 age and sex-matched controls were included. The abdominal aorta, carotid, common femoral, and the popliteal artery were investigated by ultrasound.

Results: No arterial dilatation was found, but rather a tendency of narrowing. The relatives had higher heart rate (HR) ($P < .01$) and diastolic blood pressure (DBP) than controls. The males had also higher systolic blood pressure (SBP). After adjusting for HR, the difference in SBP in males disappeared but the DBP remained increased ($P < .05$), and MAP became increased in males ($P < .05$).

The distensibility coefficient (DC) and the compliance coefficient (CC) were decreased in all arteries in the males but only in the aorta in females ($P < .05$). After adjusting DC and CC for MAP and HR, stiffness was normalized.

Conclusion: No general arterial dilatation in AAA relatives without aortic aneurysmal disease can be found, supporting the hypothesis that the dilating diathesis is linked to the aneurysmal manifestation in the abdominal aorta. Although the threat of aneurysmal dilatation and rupture seems to be lacking, BP, HR and arterial stiffness are increased, indicating raised cardiovascular risk in this population.

P.024

CARDIAC FUNCTION, LARGE ARTERIES PROPERTIES AND MORTALITY IN OLDER PATIENTS WITH ATHEROSCLEROSIS

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Objective: We assessed predictive power of large arteries properties for mortality among older subjects with symptomatic atherosclerosis.

Methods: We assessed 100 patients above 70 years of age with present atherosclerosis, stabilised at the time of assessment. Follow up averaged 31 months. Apart from standard clinical examination, echocardiography and assessment of large arteries by the Sphygmocor device were performed. The vital status of subjects was obtained from National health registry.

Results: During follow up 31 patients died. Survivors and non-survivors did not differ significantly in prevalence of standard risk factors, as well as in the arterial properties. Left heart insufficiency was more frequent in non-survivors.

	Survivors	Non-survivors	P value
Systolic Blood Pressure (mmHg)	141,3 ± 22,0	135,9 ± 21,5	0,4317
Pulse Wave Velocity (m.s ⁻¹)	13,2 ± 4,6	12,9 ± 3,5	0,7401
Peripheral Augmentation Index (%)	87,7 ± 15,2	77,7 ± 31,4	0,5899
Central Augmentation Index (%)	142,7 ± 21,0	133,2 ± 38,2	0,9951
Heart Failure	31 (44,9 %)	23 (74,2 %)	0,0197
Ejection Fraction of Left Ventricle (%)	61,9 ± 13,0	55,1 ± 14,9	0,0461

Summary: In patients with present atherosclerosis large arteries properties lost partially its prognostic value, as well as standard risk factors. Prognosis was mainly determined by the level of left ventricle dysfunction.

P.025

INCREASED ARTERIAL STIFFNESS AMONGST HEALTHY SOUTH ASIANS IN THE UNITED KINGDOM IN THE ABSENCE OF RAISED BLOOD PRESSURE

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Background: The pathophysiology of increased coronary heart disease (CHD) risk affecting South Asians(SA) living in Britain remains unclear. For a given blood pressure SA have a higher risk of CHD than the indigenous European Caucasian(EC). We hypothesised that measures of arterial stiffness would be greater amongst healthy SA compared to EC counterparts specifically ,in the absence of raised blood pressure and established CHD risk indices.

Methods: Arterial stiffness was measured by digital volume pulse photoplethysmography(Micromedicals PCA 2) in 90 healthy SA (and compared to age-gender matched 62 EC in a temperature controlled environment using a standard protocol.

Results: SA and EC's were comparable for CVD risk profile (Table 1). South Asians had an increased Stiffness Index compared to European Caucasians (9.43(0.22) vs. 8.53(0.23) m/s, $P = 0.007$). In linear regression waist hip ratio and mean blood pressure were independent predictors of arterial stiffness ($\beta = 0.26$, $P = 0.03$).

Conclusion: South Asians have an increased wave reflection and systemic arterial stiffness compared to European Caucasians. Pathophysiological differences in vessel wall characteristics in South Asians may explain their increased susceptibility to higher cardiovascular risk and further work is warranted.

Risk factor Mean (SD)	South Asian (n=90)	European Caucasian (n=62)	P Value
Mean age (years)	45.21(13.45)	46.76(11)	0.13
Body Mass Index(BMI)Kg/m ²	25.9(3.2)	27.4(4.5)	0.08
Waist Hip Ratio(WHR)	0.94(0.08)	0.93(0.08)	0.53
Systolic blood pressure(mmHg)	134.56(20.3)	135.31(15.33)	0.82
Diastolic blood pressure(mmHg)	83.64(12.35)	83.58(10.09)	0.97
Serum cholesterol (mmol/l)	4.45(1.4)	4.66(0.72)	0.94
Fasting blood sugar(mmol/l)	4.99(1.4)	4.56(0.92)	0.43

P values using unpaired ttest comparing two groups

P.026

CLINICAL AND VASCULAR EFFECTS OF SWITCHING PATIENTS WITH CORONARY ARTERY DISEASE TO NEBIVOLOL

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The problem of inadequate efficacy of standard antianginal therapy in patients with stable angina requires new pharmacotherapeutic solutions.