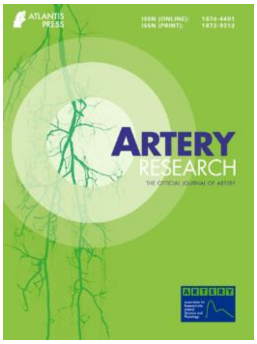

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P1.40: DETERMINATION OF PRESSURE INDEPENDENT ARTERIAL STIFFNESS BY CORRECTING PULSE WAVE VELOCITY FOR PRESSURE-AREA RELATIONSHIP

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Germany). The obtained PTT values (74.86 ± 8.63 ms) were compared with PTT evaluated on the same subjects by means of applanation tonometry applied simultaneously on the same locations (75.85 ± 8.61 ms). The two techniques were very well correlated ($r=0.89$, $P<0.001$, Spearman rho 0.88) and values were not statistically different ($p=0.377$). Our preliminary results demonstrate that laser-based non-contact measurement of pulse transit time is feasible in young healthy volunteers, and yields values that are equivalent to those measured using arterial applanation tonometry. Clinical application of this appealing non-invasive method can overcome practical and technical limitations inherent to currently used methods such as arterial applanation tonometry, ultrasound, plethysmography, requiring physical contact of the probe with the patient.

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P1.37
NON-INVASIVE QUANTITATIVE ASSESSMENT OF ATHEROSCLEROSIS WITH THE PULSE WAVE VELOCITY

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Arterial stiffness is a predictor of atherosclerosis. This study was conducted to develop a method of coronary atherosclerosis severity assessment by means of brachial-ankle pulse wave velocity (baPWV). MATERIALS AND METHODS. We measured baPWV in 126 males (age 56,2±8,9) who received coronary angiographic examination (CAG). baPWV was measured by Vasera VS-1000 (Fukuda Denshi). RESULTS The patients were categorized into 3 groups according to the number of major coronary arteries having stenosis, that is, 1 vessel disease (1VD) group, 2VD group and 3VD group. The baPWV value was significantly greater in 2VD (n = 46, baPWV= 13,82±2,40 m/sec, p=0,049) and 3VD groups (n = 44, baPWV =14,38±2,97 m/sec, p=0,0028) than that in 1VD group (n = 36, baPWV= 12,49±2,17 m/sec). No significant difference was observed between PWV value in 2VD and 3VD groups. To further investigate the relationship between baPWV values and CAG findings, we assessed the severity of stenosis (1 group - less than 75% stenosis, 2gr. - 75 to 99% stenosis, and 3gr. - complete occlusion, respectively). The baPWV value was significantly greater in 2 (n = 56, baPWV= 13,84±2,25 m/sec, p=0,025) and 3 groups (n = 45, baPWV= 14,16±3,32 m/sec, p=0,007) than that in 1 group (n = 25, baPWV= 12,23±1,42m/sec). No significant difference was observed between baPWV value in 2 and 3 groups. CONCLUSION. baPWV significantly increases with the number of affected vessels and severity of stenosis which indicates that it is a powerful diagnostic instrument for determining coronary artery atherosclerosis in males.

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P1.38
CONVERSION BETWEEN DEFINITIONS OF PULSE WAVE VELOCITY

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Background: Different methodologies for determination of carotid-femoral pulse wave velocity (PWV) exist. Distance (L) can be measured from carotid-femoral measurement sites (L_{direct}) or obtained by subtracting carotid-sternum from sternum-femoral distances ($L_{subtracted}$). Transit times are usually obtained either by detection of the maximal upstroke ($\Delta t_{maximal\ upstroke}$) or the foot ($\Delta t_{intersecting\ tangent}$) of the waveform at the measurement sites. This study investigates conversion factors between PWV methodologies.
Methods: 3043 subjects in which both distance measurements were available were divided into model and validation groups (1502/1541 subjects, respectively). In the model population the main determinants of the $ratio_{distance} = L_{subtracted}/L_{direct}$ were determined and a multivariate model was constructed. Estimated $ratio_{distance,est}$ was used to convert from PWV_{direct} to $PWV_{subtracted,est}$ in the validation population. $PWV_{subtracted,est}$ was compared to measured $PWV_{subtracted}$. Ninety three subjects in which both transit times were available were divided into model and validation groups (46/47 subjects, respectively). In the model population a model for estimation of $\Delta t_{maximal\ upstroke,est}$ from $\Delta t_{intersecting\ tangent}$ was constructed and used to estimate $\Delta t_{maximal\ upstroke,est}$ in the validation population. $\Delta t_{maximal\ upstroke,est}$ was compared to measured $\Delta t_{maximal\ upstroke}$. Data are presented as mean(stdev).
Results: The main determinants of $ratio_{distance}$ were age ($R^2=0.17$) and BMI ($R^2=0.15$) (combined: $R^2=0.27$, all $P<0.001$). $PWV_{subtracted,est}$ correlated well with $PWV_{subtracted}$ ($R=0.97$, $P<0.001$) with mean difference of 0.0007 (0.40) m/s. $\Delta t_{maximal\ upstroke,est}$ correlated well with $\Delta t_{maximal\ upstroke,est}$ ($R=0.82$, $P<0.001$) and mean difference of 0.58 (1.03) m/s.
Conclusions: Differences in absolute PWV values are important to compensate for in order to compare between studies. The models proposed allow for such conversion.

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P1.39
AORTIC PULSE WAVE VELOCITY: SHOULD THE CAROTID – FEMORAL DISTANCE BE MEASURED ON BODY SURFACE OR ESTIMATED FROM BODY HEIGHT?

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Objective: Aortic pulse wave velocity (PWV) can be biased by the measurement of carotid – femoral (c-f) distance on body surface. We wondered whether the estimation of distance according to body height could be used.
Methods: Three cohorts of altogether 598 subjects (mean age 58,9 years) were studied. PWV was measured by Sphygmocor device. The c-f distance was 1. measured by tape, 2. estimated: height was multiplied by 0,27 (= median ratio of measured c-f distance to body height).
Results: Difference in PWV calculated by the two methods (measured minus estimated) increased with PWV: it was -0.2 m/s for PWV 5 m/s and +1.8 m/s for PWV 15 m/s. In multiple regression analysis, this difference depended highly significantly ($p<0.0001$) on PWV, weight (positive associations) and height (negative association); there were weak positive associations ($p<0.05$) with male gender, high LDL level and presence of cardiovascular disease and no associations with age, smoking, hypertension or diabetes.
Conclusions: When PWV is estimated from body height, the highest PWV values show regression to the mean. Besides PWV, anthropometric parameters are major determinants of the differences between the two methods. Estimation of c-f distance from body height would simplify the procedure and bias due to obesity and body disproportion would probably be minimized. For future use of aortic PWV, the best method of the distance assessment should be studied in larger cohorts with known cardiovascular morbidity/mortality endpoints.

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P1.40
DETERMINATION OF PRESSURE INDEPENDENT ARTERIAL STIFFNESS BY CORRECTING PULSE WAVE VELOCITY FOR PRESSURE-AREA RELATIONSHIP

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Background: Intrinsic (pressure independent) arterial stiffness is becoming increasingly important as treatment target in hypertensive patients but is still difficult to assess non-invasively. We measured pulse wave velocity (PWV) and the pressure-area (p-A) relation to determine both apparent and intrinsic stiffness.
Method: Non-invasive PWV (nPWV) was measured by multiple-M-mode ultrasound in a phantom. The incisura of the diameter waveforms was used as time-reference point for calculating nPWV. A catheter was placed in the phantom to measure the pressure waveform simultaneously. Additionally, in hypertensive patients carrying a baroreceptor stimulator, finger-pressure and nPWV at the common carotid artery were measured simultanously. For both phantom and subject studies, intrinsic PWV (PWV_{int}) was derived employing the Bramwell-Hill equation with the incremental distensibility, dA/(A*dp), based on either a linear or exponential p-A relation.
Results: In the phantom setup, nPWV (12.3±0.8 m/s) increased with increasing pressure ($r=0.67$, $p<0.0001$). Because a linear p-A relation was observed, intrinsic PWV was calculated as $PWV_{int}^2 = A_{int}/A*nPWV^2$ and will be independent of pressure ($r=-0.001$). During baroreceptor stimulation MAP decreased from 138±22 to 109±1 mmHg and nPWV decreased from 10.5±1.5 to 6.6±1.3 m/s ($p=0.03$). In these patients the observed p-A relation was exponential and PWV_{int} was therefore calculated using $PWV_{int}^2 = p_{int}/p*nPWV^2$. PWV_{int} did not decrease upon stimulation ($p=0.23$).
Conclusion: Commonly apparent PWV is measured. Intrinsic stiffness can be calculated using nPWV and assuming a linear or exponential p-A relation. An

acute reduction of blood pressure by baroreceptor stimulation lowers apparent but not intrinsic stiffness in hypertensives.

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P1.41

COULD MEASUREMENT OF ARTERIAL STIFFNESS PROVIDE BETTER APPROACH IN RISK ASSESSMENT THAN THE CONVENTIONAL RISK FACTOR-BASED STRATIFICATION?

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Although traditional risk factors may account for 90% of the attributable cardiovascular risk their prediction of CVD is weak based on SCORE Chart. We need to find new established risk factors and to detect subclinical arterial disease to predict future coronary events. Stiffening of the aorta is one of the earliest surrogate marker of vascular damage and measurement of arterial stiffness has a growing interest in risk assessment. *Aim*: Authors investigated the correlation between the high risk state characterized by SCORE >=5% and elevated aortic pulse wave velocity (PWVao, increased arterial stiffness) measured by arteriograph.
Subject and Methods: 2243 adults were included to the analysis in which SCORE could be calculated. Sensitivity, specificity and predictive values of SCORE in detecting increased PWVao were calculated by SPSS software.
Results: Elevated PWVao (>9,62 m/s) was detected in 38% of patient population but sensitivity of SCORE high risk category (>=5%) to detect elevated PWV was poor (33%) despite high specificity (88%) while false negative cases were in 26%. Sensitivity of SCORE was a little bit better in males (65%) but much poorer in females (17%). 10% of males and 36% of females are underestimated by SCORE assessment. The ROC curve of SCORE at the cut-off value of 5% has shown 33% sensitivity but 89% specificity.
Conclusions: If PWVao is a good surrogate of preclinical atherosclerosis SCORE risk assessment seems to be quiet acceptible in men but not in women because it markedly underestimates females CV risk.

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P1.42

PRECLINICAL ATHEROSCLEROTIC DISEASE: IS IT A MARKER OF RISK OF CARDIOVASCULAR EVENTS?

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Aim: We compared the severity of vascular disease (VD)by ultrasonography in patients (p.) with and without cardiovascular events (CVE), to detect high risk asymptomatic individuals.
Methods: We did in the same procedure 1) CIMT 2) Plaques characterization, 3) PWV and 4) FMD with a strict quality control. We set a score (VS) from 0 to 5 according to the severity of the VD. The CV Risk using Framingham score (FS) was also obtained from medical records.
Results: We performed a cross sectional, observational study on 581 p. (75 with CVE (AMI, Stroke, TIA, vascular thrombotic events) 62 + 10 y.o., 73 % males and 506 non CVE controls 52 + 14 y.o. p .001, 64% males p NS).FS was high (>20%)for 216p.(30,8%),moderate (10-20%)for 204p.(29%), and low (<10%)for 282p.(40,2%).

Parameter	CVE (n= 75)	No CVE (n= 506)	p
SBP (mmHg)	139 ± 17	140 ± 17	NS
DBP (mmHg)	82 + 11	85 ± 10	.03
HR (bpm)	69 ± 11	70 ± 10	NS
Left IMT(mm)	0.87 ± 0.20	0.74 ± 0.19	< 001
Right IMT (mm)	0.82 ± 0.17	0.71 ± 0.18	< 001
% abnormal IMT	32	27	NS
% Plaques	77	49	< 001
%Abnormal FMD	32	36	NS
PWV (mts / sec)	12 ± 6	10 ± 4	.02
%Abnormal PWV	34	37	NS
FS (mean)	24 ± 9	13 ± 11	< 001
VS (mean)	3,2 ± 1,3	2,3 ± 1,4	< 001

Conclusions: 1- The severity of the VD is higher in patients with CVE even when the cut off points of normality may need to be adjusted.2- The presence of a combination of vascular structural and functional disarrangements in asymptomatic subjects may suggest an increased risk of CVE. 3-A score of severity of VD

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P1.43

FRAMINGHAM SCORE UNDERDIAGNOSES VASCULAR DISEASE IN PATIENTS UNDER CARDIOVASCULAR PREVENTION

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Aim: Framingham score (FS) is used in clinical practice to estimate the CV risk of complications and is used as reference to evaluate new markers of CV risk. Recently ESH/ESC 07 guidelines stressed on the evaluation of subclinical vascular disease (VD). We analyzed, using an integrative ultrasound evaluation, the severity of VD according to increasing FS levels of risk.
Methods: We did in the same procedure 1) CIMT 2) Plaques characterization, 3) PWV and 4) FMD with a strict quality control. We set a score (VS) from 0 to 5 according to the severity of the VD. The FS was obtained from medical records.
Results: We performed a cross sectional, observational study on 702 p.(54 + 13y.o.,448(64%) males).FS was high(>20%)for 216p. (30,8%), moderate(10-20%)for 204p.(29%), and low (<10%)for 282p.(40,2%).

Parameter	FS Low	FS Moderate	FS High	p
Age	44 ± 12	57 ± 8	64 ± 9	< 001
Sex (% males)	53	68	74	< 001
SBP	134 ± 16	150 ± 15	145 ± 18	< 001
DBP	82 ± 10	85 ± 10	86 ± 10	< 001
Left IMT (mm)	0.66 ± 0.16	0.78 ± 0.17	0.87 ± 0.2	< 001
Right IMT (mm)	0.63 ± 0.13	0.75 ± 0.15	0.84 +v0.2	< 001
% Plaques	30	55	31	< 001
%Abnormal FMD	32	36	44	.02
PWV (mts / sec)	9 ± 3	10 ± 3	13 ± 6	< 001
Vascular Score (mean)	1,9 ± 1,3	2,5 ± 1,3	3,1 ± 1,3	< 001

Conclusions: 1- The higher the FS, the more the severity of the VD increases.2- Although, we have found 54,2% with a low FS with moderate to severe VS and 18% of pts. with severe VD classified as low to moderate clinical risk.

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P1.44

EARLY DETECTION OF ATHEROSCLEROTIC DISEASE IN MILD HYPERTENSIVE PATIENTS: A STRONG REASON TO REEVALUATE CARDIOVASCULAR RISK

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Aim: To analyze the incidence and severity of subclinical vascular disease (VD) using ultrasonography in patients (p.) with essential hypertension (HT).
Methods: We did in the same procedure 1) CIMT 2) Plaques characterization, 3) PWV and 4) FMD with a strict quality control. We set a score (VS) from 0 to 5 according to the severity of the VD. The CV Risk using Framingham score (FS) was also obtained from medical records.
Results: We did a cross sectional, observational study on 604 p. (479 with stage I-II HT (ESH 07) 53,2 + 13 y.o., 63% males and 125 normotensive NT controls 51,7 + 14 y.o. p.003, 62% males p NS)

Parameter	HT (n= 479)	NT (n= 125)	p
SBP (mmHg)	143 ± 16	128 ± 15	< 001
DBP (mmHg)	86 ± 9	77 ± 8	< 001
HR (bpm)	70 ± 10	69 ± 9	NS
Left CIMT (mm)	0.75 ± 0.19	0.72 ± 0.10	NS
Right CIMT (mm)	0.72 ± 0.19	0.70 ± 0.19	NS
% abnormal CIMT	29	19	.02
% Plaques	49	46	NS
%Abnormal FMD	39	26	.006
PWV (mts / sec)	10,5 ± 4,3	10 ± 4	< 001
%Abnormal PWV	34	42	NS
FS (mean)	12 ± 8	8 ± 6	.001
VS (mean)	2,4 ± 1,4	2,1 ± 1,4	< 001