Personalized cardiovascular disease prevention - the improving approach

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Background

Identification of persons at high/very high risk of CVD has been a crucial recommendation in patient management in European CVD prevention guidelines since 1994. The rationale for the risk assessment is to reduce a risk, with most benefit from risk reduction in patients at high/very high risk. To screeen all adults for CVD risk is not cost-effective. According to the latest European CVD Guidelines definition of risk categories (2016), reclassification of risk (calculated by SCORE-chart) is of most value when the individual's risk lies close to a decisional threshold, such as a SCORE risk of 5% (moderate risk). Many middle-aged subjects with multiple risk factors belong to this category. Nowadays, based on evidences, we have more sofisticated approach to improving personalized risk stratification, but modifiers of risk are still under the debate. While the contribution of genetic, organ-specific and biochemical markers to the existing methods of CV risk assessment is probably low, some imagine and functional tests are recommended for risk assessment (coronary artery calcium by CT, plaque on carotid ultrasound, ankle-brachial index –ABI).

Very high risk, subjects with any of the following:
Documented CVD, clinical or unequivocal on imaging. Documented clinical CVD (previous AMI, ACS, coronary revascularization and other arterial revascularization procedures, stroke and TIA, aortic aneurysm and PAD). Unequivocally documented CVD on imaging (plaque on coronary angiography or carotid USG). It does not include increase in intima-media thickness of the carotid artery.
DM with target organ damage such as proteinuria or with a major risk factor such as smoking or marked hypercholesterolaemia or marked hypertension.
Severe CKD (GFR <30 mL/min/1.73 m^2).
A calculated SCORE ≥10%.

High risk, subjects with:
Markedly elevated single risk factors, in particular cholesterol >8 mmol/L (>310 mg/dL) (e.g. in familial hypercholesterolaemia) or BP ≥180/110 mmHg.
Most other people with DM (with the exception of young people with type 1 DM and without major risk factors that may be at low or moderate risk).
Moderate CKD (GFR 30–59 mL/min/1.73 m2).
A calculated SCORE ≥ 5% and <10%.

Aims

The aim of our study (monocentric, cross-secional) was to assess:1) the association between classical CVD risk factors (RF) and some markers of subclinical atherosclerosis (AS) 2) to analyse the possiblity to improve the CVD risk stratification in population of Eastern Slovakia.

Subjects and Methods

198 subjects were selected to our study study after informed written consent (78 males, 120 females, old 35-50 yrs, without apparent signs of AS). We evaluated **medical history, clinical documentation, physical examination, ECG**, analyzed some biochemical parameters (**metabolic** RF: glucose, HbA_{1C}, plasma lipids, uric acid, glomerular filtration rate -GF; some **biochemical markers of subclinical AS**: hsCRP, fibrinogen-Fbg, lipoprotein(a)-Lp(a), proteinuria), calculated **10-yr fatal CVD risk** by Score-chart. **Functional and structural changes of the arterial wall** were evaluated by measurement of aortic **pulse wave velocity** -PWV, brachial artery **augmentation index** -AIx (TensioClinic Arteriograph), **flow mediated vasodilation** –FMD (Philips HD11 XE), **intima-media thickness** (IMT), presence of AS plaque of carotid and femoral artery (Philips HD11 XE) and **ankle-brachial index -ABI** (Microdop, Promelec).

Results

Baseline characteristics of the group

Parameters	Mean ± SD
Age (yrs)	45,44 ± 5,48
BMI (kg/m^2)	25,35 ± 4,06
Waist (cm)	87,71 ± 13,10
Total cholesterol (mmol/l)	5,46 ± 1,00
LDL-cholesterol(mmol/l)	3,24 ± 0,83
HDL- cholesterol (mmol/l)	1,50 ± 0,36
Triglycerides (mmol/l)	1,27 ± 0,83
Glycaemia	5,11 ± 1,10
HbAlC (DCCT) (%)	5,27 ± 0,39
E-glomerular filtration rate (ml/s)	1,15 ± 0,15
Uric acid (umol/l)	296,15 ± 84,14

Haemodynamic characteristics of the group

Parameter	Mean±SD (min-max)
Brachial SBP (mmHG)	124,7 ± 12,3 (100-170)
Brachial DBP (mmHg)	79,5 ± 9,5 (55-105)
Aortic SBP (mmHG)	122,4 ± 19,3 (67,0-180,6)
Heart rate (beats/m)	63 ± 8,7 (44-99)

CVD risk assessment

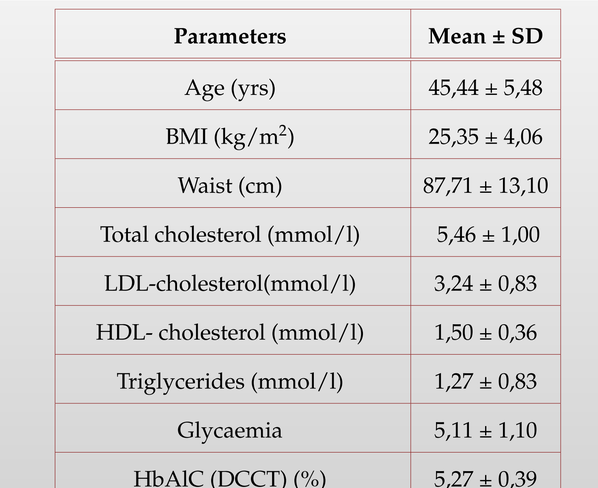
Parameters	Mean ± SD
Present risk factors (N) (min-max)	2,55 (0-6)
SCORE (%) 0,57 ± 0,85	0,57 ± 0,85
Car IMT mean (sin/dx) (mm)	0,55 ± 0,10 / 0,55 ± 0,10
Fem IMT mean (sin/dx) (mm)	0,56 ± 0,16 / 0,57 ± 0,17
AS plaque (carotid) (N)	12
AS plaque (femoral) (N)	5
PWV (m/s)	9,09 ± 2,49
Aix (%)	-8,26 ± 29,42
FMD (%)	5,20 ± 9,24
ABI (sin/dx)	1,19 ±0,15 /1,19 ± 0,15
Lipoprotein(a) mg/dl	33,04 ± 36,22
hsCRP (mg/l)	2,06 ± 2,42
Albuminuria (mg/l)	8,46 ± 21,62
Fibrinogen (g/l)	2,82 ± 0,59

Linear (logistic) regression analysis - main results

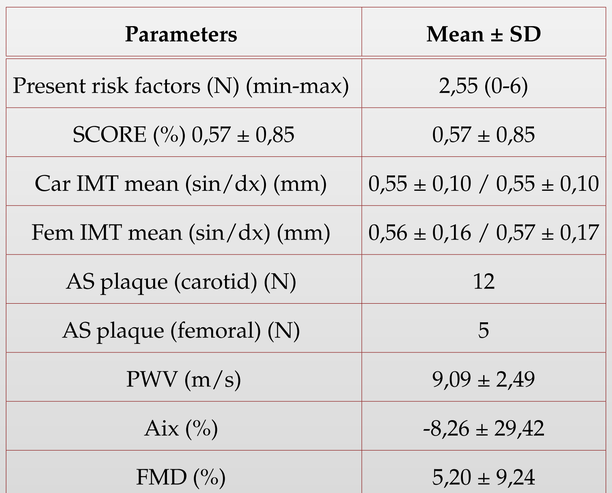
Risk factor	Koeficient (ß)	p
Arterial hypertension :PWV	0,36	<0,0005
Aix	0,29	<0,005
hsCRP	0,19	<0,05
Dyslipoproteinaemia: PWV	0,19	<0,05
Lp(a)	0,19	<0,05
C. obesity (waist): CIMT dx/sin	0,26/0,32	<0,01/0,05
FIMT dx/sin)	0,33/0,33	<0,0005/0,005
hsCRP	0,26	<0,01
Smoking: ABI dx	0,28	<0,01
Family history: CIMT sin	0,20	<0,05
Male sex: PWV	-0,35	<0,0005
Aix	-0,44	<0,000005
Fbg	-0,36	<0,0005
Age : CarAS plaque	3,65(Z); Exp(B) 3,23	=0,054
Glomerular filtration: hsCRP	-0,22	<0,05

Inconsistent correlations between main risk factors and humoral and functional /morphological signs of AS found in our study is probably a limitation of the study group.

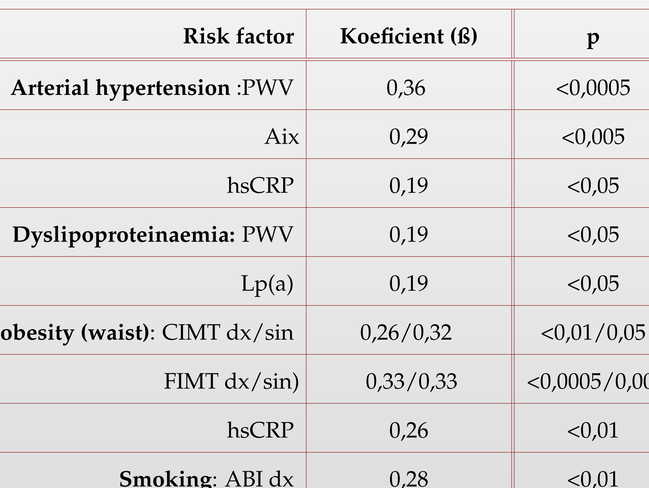
Results - Linear regressions and risk profile of the patients



Pic.1.: Linear regression between mean carotid IMT and central obesity



Pic. 2.: Linear regression between glomerular filration rate and hsCRP



Pic.3.: Risk profile of the patients

Conclusion

Randomised clinical trials are necessary to justify the most suitable vascular screening tool and to establish the appropriate management of patients with subclinical signs of AS.

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