Risk modelling/stratification in healthcare

The Hungarian Ministry of Health follows the aim of the WHO: a reduction of 25% in NCD mortality by 2025…

Non-communicable diseases (NCD) represent a worldwide problem today. From these, cardiovascular (CV) diseases are responsible for approximately 50% of cases. In Hungary, the facts are shocking and sad, as the mortality rate caused by stroke is 150% of the European average, while ischemic heart disease is 250%. At the same time the mortality due to breast cancer matches the European average, it is 'only' 109%.[1] If the clinical care is supposed to provide the same quality for all types of disease, we could conclude that the difference in the outcome of certain illnesses must be found in the phase before treatment, so the steps leading to improvement and cure should be taken earlier. In Hungary the screening for cancerous diseases is institutionalised, well-known, and well communicated. At the same time there is no nationwide cardiovascular screening, and no primary and secondary prevention based on it.

In accordance with the public health chapter of the Semmelweis Project of the Ministry of Health for establishing a wholesome CV prevention a paradigm shift is needed, new characteristics are worth involving and measuring, new screening and communication methods should be applied to motivate patients to take active cooperation in attaining good health.

Newly recognised risk factors in cardiovascular risk assessment – individual risk evaluation

The traditional cardiovascular prevention uses a statistical analysis of well-defined risk factors. The efficiency of this method is inadequate due to the facts that these parameters fail to determine individual risk and their communication value is weak to achieve the efficient patient collaboration.

CV risk assessment is usually based on traditional risk factors: age, gender, lifestyle, smoking, diabetes and some measurable characteristics: blood pressure (BP), blood cholesterol levels, CRP. Researchers in recent years have determined other easily recognisable biological markers that need to be taken into account, those that are more exact and reliable to define individual risk.

Scientific forums now focus on arterial function and stiffness. The last guidelines of hypertensive care define arterial wall characteristics as ultimate markers of organ damage.

The term 'arterial stiffness' once referred only to the loss of compliance in the large arteries, now it is encompassing the characteristics of the entire arterial system, including the biochemical, structural and mechanical changes in the small and large arteries, as well as the comparative pressures.

Pulse Wave Velocity (PWV) – The arterial wall tissue structure of the aorta is the key for its function, maintaining the continuous blood flow. The loss of elasticity due to environmental factors or ageing puts extra load on the arterial system. The PWV, describing the degree of the damage is a strong and independent predictor of CV mortality in both the general and elderly populations, and its measurement is strongly recommended by the European Guidelines.[2,3]

Augmentation Index (Aix) – The small vessels inner layer, the endothelium is a functional organ. These cells are responsible for adaptation to prompt and long-term environmental changes, and when are damaged by several risk factors, lead to higher vasotone all over the body – this condition can be characterised by the Aix. This increased tone involves higher pressure at the heart (afterload) that increases the risk of CV events.[4]

Central blood pressure and pulse pressure – in a healthy arterial system the blood pressure near the heart is lower than at the upper arm, where it is usually measured. The central blood pressure is proven to be a better predictor of cardiovascular diseases, and it is in a closer correlation with carotid hypertrophy and the extent of atherosclerosis than the brachial pressure.[5]

Arterial age – the concept of EVA and ADAM

Professor Peter Nilsson introduces a special aspect of risk assessment, mean BP, glycaemia and lipids are fluctuating in the follow-up of patients, and can change within time, so these circulating biomarkers measured at a certain time may give only a snapshot and not the whole history of arterial wall damage. However, arterial stiffness reflects the true arterial wall damage, it is a cumulative measurement of the damaging effects of CV risk factors on the arterial wall with ageing.

In certain individuals arterial wall damage may develop faster than biological ageing would dispose. In proportion to general population data, this is called 'early vascular ageing' (EVA). Its interpretation is easily understandable for patients, furthermore the relevant parameters have stronger predictive value than the traditional risk factors.[6]

In these cases the only solution seems to be the use of medication reducing atherosclerotic processes (aggressive decrease of atherosclerosis modifiers, so the answer to EVA is ADAM), hence the course is slowed down and the occurrence of CV events is delayed.

A device qualified to measure all parameters of arterial stiffness in one seat

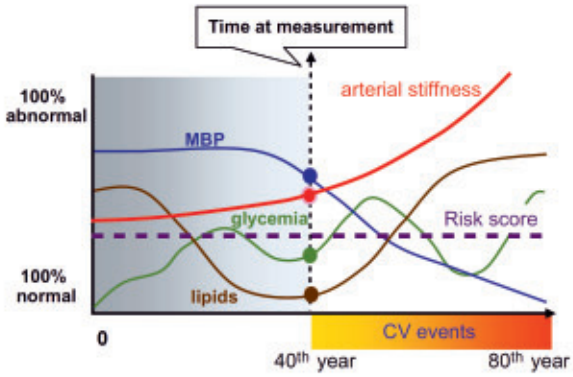
Arteriograph was born as a result of a collaboration of several research groups in 2004, supported by the first Széchenyi Plan of Hungary. The development created a fast, easy, non-invasive method that allows the simultaneous measurement of all characteristics describing arterial stiffness. Established studies have attested the reliability of the worldwide patented technique[7], and others have certified that compared to other similar devices Arteriograph necessarily shows multiple advantages.[8,9]

For the prevention of certain CV diseases, like stroke, other screening methods are also recommended, so is the ECG test for atrial fibrillation, an independent predictor of the disease.[10] In order to complete the CV prevention system, an ECG module has been added to the Arteriograph device, so atrial fibrillation can be recognised simultaneously.

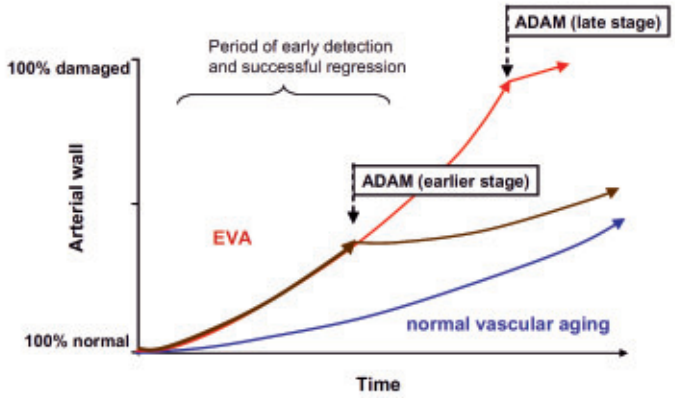
It is important to know that the examination can be performed by one assistant only, and needs no special circumstances or a doctor's office. The printed report shows the patient's data and measured values in a comprehensive form. These data can be used in the secondary prevention as well, in controlling the efficacy of the therapy or the follow-up of status improvement.

It is time to turn theory to practice

In the common thought heart attack and stroke are signless, inevitable fatal events. Furthermore, people put psychological and social obstacles against thinking about prevention. Its importance and cost-effectiveness must be thought of because it is impossible to change for the better without patient cooperation. They have to be interested in their own health and involved in treatment by comprehensive care and targeted communication, for better compliance.



Arterial stiffness is a cumulative measure of the damaging effects of CV risk factors on the arterial wall with ageing. The other CV risk factors may give only a snapshot and not the whole history of arterial wall damage[6]



Time course for the development of EVA and start of intervention with ADAM in patients at increased cardiovascular risk[6]

Now, the scientific evidence has approved extended, more complete methods for effective CV risk assessment. There must be an innovative prevention model providing complete individual risk assessment, including: software, equipment, education and communication. It focuses on early detection of all main known causes of cardiovascular disease, combining the different available methods. Screenings are followed by consultation and follow-up. The project includes the formation of the physicians as well, regarding report evaluation and technical background.

The Hungarian Ministry of Health develops a project on evidence based primary and secondary prevention with the support of national and EU resources, in order to achieve WHO goals: the reduction of 25% in NCD mortality by 2025. Our experts are open to serve this scientific collaboration aiming for common goals.

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