

How Do We Measure Stress as a Risk Factor?

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Cardiovascular cause of death is the most important everywhere, except the places where infections are not defeated. Cardiovascular (CV) risk factors have their role in producing the atherothrombotic pathology of the vessels.

The SCORE tables are the most popular way to work on the main CV risk factors. They were first developed by the European Society of Cardiology in 2003 and then redesigned several times (1). The tables include five main risk fac-

tors (age, sex, smoking, blood pressure and cholesterol), and the risk of cardiovascular death is estimated for the next 10 years. They are addressed to the general population not having a previous CV attack. Diabetes is not taken into account, because it is a much stronger risk factor and diabetic patients are included into the category of secondary prevention, assuming that they have already had a cardiovascular attack. At that moment, European countries were divided into two groups: countries with low risk (generally from the Mediterranean Sea region, where those risk factors are weaker) and the rest of the continent, where the risk factors have a stronger impact on 10-year CV death at the same values. The difference is made by the fact that, traditionally, people living in Southern European countries have a healthier general lifestyle, including Mediterranean diet, outdoor exercise and other local habits.

Among the five risk factors there are two fixed ones, including age and sex, and only the remaining three are modifiable. Stress has been mentioned as a risk factor, but it was not measured or included in the main group.

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Later on, obesity and the increased LDL-C at young age (under 50 years) were considered as main CV risk factors, but have been not included into tabels. Diabetes was considered to be a very strong factor, increasing 10-fold the risk for CV events (2).

The relationship between CV mortality and stress began to be detailed more and more. Several chronic stress factors were individualized (3, 5), including psychosocial factors, lack of control of one's own life, childhood psychological experiences, depression, stress at work, family stress, and financial stress.

These factors are named „stressors“ and they produce „distress“. Each person has an individual „stress reaction“, which is differently elicited by each stressor. The genetics of each individual has certainly a role for this type of reaction, and it is not sharply defined. The future personalized medicine will for sure take this into account.

The physiopathology of the deployment of aggressive components to the vessels during different forms of stress are described. The brain amigdala is hyperactive during stress (2). The dorsal anterior cingulate cortex is also more active during high activity of stressors (2). The physiopathology mechanism progresses by the hypothalamic-pituitary-adrenal way. Some products which can be measured and are aggressive to the vessels have increased levels and produce endothelial dysfunction, inflammation and a prothrombotic state.

Measurements of stress intensity used different approaches, which were not easily implementable in large studies and not systematically applied in randomized studies. Here are three examples of stress measurements used to date:

- external questionnaire (the ESC uses a very simple one, with only two questions);
- self-reporting (the mobile mHealth will enhance this kind of monitoring);
- simple biochemical measurements (cortisol in saliva, sweat, hair, etc) (2, 5).

Until now, the exact measurement of stress intensity could not be used in large studies. However, some studies (not many) were dedicated to the role of stress as a cardiovascular risk factor. The most elaborated one was the INTERHEART clinical study (6), which included a total of 15152 cases and 14820 controls in 52 countries from all inhabited continents. Dia-

betes, arterial hypertension (HT), apolipoprotein A, overweight, physical activity, diet, alcohol and psychosocial factors were studied in the moment a patient developed an acute myocardial infarction. For each patient, a control with similar characteristics but without infarction was matched. The studied risk factors had the following likelihood to develop a myocardial infarction: 2.87 for smoking, 3.35 for raised ApoB/ApoA1, 1.91 for history of HT, 2.37 for diabetes, 1.12 for medium obesity and 2.67 for psychosocial factors. Physical activity, fruit- and vegetable-based diet and alcohol consumption had all a significant influence, but with a power influence factor under 1.

However, this is an important study because the influence of different risk factors is different from that found in other giant prevention studies, and noteworthy, the power of psychosocial factors to act as CV risk factors was similar to that of the other major CV risk factors.

ENRICH (7) and SADHART (8) were two other notable clinical studies, which had positive but less conclusive results (9).

The following problems arise: 1) are any of the (about seven) cited stress/psychological factors more powerful than the others regarding their ability to act as CV risk factors?; 2) does any of those factors influence CV mortality?; and 3) does therapy have a positive effect?

Some authors believe that depression and childhood psychological experiences are the most important factors in this category. They may influence the development of chronic cardiovascular disease (2, 3, 5). Treatment with sertraline and similars have definitely a positive effect (5), but to date, it was not demonstrated to significantly influence cardiovascular mortality.

The impact of acute stressor on developing an acute heart attack is well known. Takotsubo syndrome (broken heart syndrome) is the most known example. But there are some studies showing that acute stressors lead to a two-fold increase in the numbers of acute myocardial infarctions after an important negative result in soccer for England or Germany as examples (2, 3). The numbers of infarctions declined to normal in two days.

As a summary of the present discussion, stress is a powerful cardiovascular risk factor. Some authors consider it as powerful as HT or high cholesterol (6). The components of stress are nume-

rous and each one may have a different role. Some of them, including depression and childhood psychological experiences, have a role in chronic development of cardiovascular disease. Therapy is beneficial, but to date it has not been

shown to reduce cardiovascular mortality. New modalities of measuring stress, such as those applicable on mHealth or checking cortisone in saliva or hair, could be tested on large randomized trials in the future. □



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