

STRESS AND CARDIOVASCULAR DISEASE

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Current state of knowledge

The World Health Organization (WHO) defines the Stress Syndrome as the set of physiological reactions that activate an individual's biological survival system, preparing it for action. It notes that during the COVID-19 pandemic, there was a 25% increase in the prevalence of the General Adaptive Stress Syndrome in the global population¹.

This phenomenon is determined by the escalation of environmental and physiological stressors, as well as individually perceived threatening conditions. When these surpass the adaptive capacity of the organism, it leads to the loss of homeostasis and the onset of pathological states².

The well-documented effects of acute and chronic stress serve as contributing factors in the precipitation of cardiovascular events, such as arrhythmias, acute myocardial infarction, and hypertension, through the brain-heart axis connection³.

Physiological manifestations due to stress result from a complex response involving various systems such as the central nervous system, autonomic nervous system, endocrine system, and immune system. If stressors are excessively intense, frequent, or persist for extended periods, the adaptive capacity becomes saturated, causing a dysregulation of organic homeostasis with a clinical impact on health³. Sustained stress states that exceed the regulation and adaptability of the organism lead to oxidative stress, producing reactive oxygen species that activate the inflammatory process. This modifies gene methylation, alters protein transcription, affecting metabolic response, neuroendocrine feedback, and collaborates in the long term with the presence of disorders such as atherosclerosis, insulin resistance, endothelial dysfunction, ultimately resulting in cardiovascular, renal, and metabolic diseases as complications⁴.

Risks

Psychosocial factors and stress have been significantly linked to the risk of major cardiovascular events, which is

why they have recently been included along with mental disorders and depression within the group of "cardiovascular risk modifying factors". that can increase the cardiovascular risk of patients beyond the classic risk factors.

- Chronic stress can lead to greater progression of the atherosclerosis process, probably due to excessive activation of the sympathetic nervous system, expressing an exaggerated response in heart rate and blood pressure, as well as endothelial dysfunction through activation of pro-inflammatory mediators⁴.

- Even when there are no significant lesions in the coronary arteries, in the face of intense physical or mental stress, large amounts of catecholamines are released, which can cause changes in vascular tone, peripheral vasoconstriction, arterial hypertension, alterations in coronary circulation or coronary spasm, and even cause Takotsubo syndrome or stress cardiomyopathy⁵.

- The heightened activity of the sympathetic system in response to stress can cause, over the long term, dysfunction of the vascular endothelium, increased platelet aggregation and favor a prothrombotic state, structural changes at the level of the myocardium such as left ventricular hypertrophy, increased of myocardial oxygen consumption, and alterations in coronary circulation. An increased activation of the renin angiotensin aldosterone system, greater insulin resistance and lipid alterations are also described^{6,7}.

- High demands at work that generate stress significantly increase the risk of death from cardiovascular disease⁸. A meta-analysis pooled the results of five observational studies in which patients with chronic coronary heart disease (n = 555) were analyzed in a laboratory to detect myocardial ischemia induced by mental stress. Subsequently, these patients were followed prospectively. The risk of subsequent events of coronary artery disease (e.g., myocardial infarction or unstable angina) or mortality was twice as high in patients with myocardial ischemia induced by mental stress⁹.

Recommendations

Programs that provide tools for managing stress are aimed at improving people's overall lifestyle and include

strategies adapted to everyone: eating plan, physical exercises, and physical relaxation techniques (respiratory exercises, yoga), interventions with mental health professionals, improvement of Quality of sleep and practicing meditation constitute the bases of non-pharmacological treatment.

Undoubtedly, transcendental meditation and the practice of Yoga contribute to controlling the impact of traumatic stress and the dysregulation of the body's homeostasis. However, maintaining a proper diet and engaging in exercise with an increased heart rate for 30 minutes are efficient and influential in gene demethylation, reducing oxidative stress, controlling the inflammatory process, limiting endothelial damage-essential factors in proteome production and determinants in the generation of the metabolome. These elements have a significant impact on the overall association with mortality and death from cardiovascular diseases^{10,11}.

Regarding meditation, it has its origins in Eastern philosophies such as Vedanta and Buddhism, with techniques centered on directing attention inward by fully focusing on respiratory movements, words, or some form of visualization and bodily perception. Mindfulness, a practice centered on present-focused attention, stands out as one of the most extensively studied techniques. Within this approach, every thought, feeling, or sensation that emerges in the attentional field is acknowledged without engaging in analysis, all the while fostering a state of bodily relaxation¹². A recent meta-analysis concludes that these interventions may yield a favorable impact on patients with high blood pressure, demonstrating a significant reduction in blood pressure. They are considered as an additional beneficial effect alongside standard pharmacological treatment for managing these patients¹³.

Transcendental meditation is a technique worth considering for stress reduction, as studies indicate reductions in both systolic and diastolic blood pressure. It is currently viewed as an additional resource to lower blood pressure, complementing pharmacological treatment¹⁴⁻¹⁶. Concerning the benefits of these techniques, it's noteworthy that they require minimal prior training, are cost-effective, and are simple to perform.

They are practiced with the individual seated, with the back resting on the back of the seat, with the body relaxed and eyes closed. No other external conditions are necessary, just knowing the technique and setting the time for completion. Meditation can be considered as a complement to cardiovascular risk reduction interventions that are currently used according to treatment guidelines and recommendations in this regard¹⁷.

On the other hand, in terms of secondary prevention, meditation could potentially increase physical and mental

relaxation, which would lead to better outcomes after a cardiovascular event¹⁸.

Doctors should keep in mind during the evaluation of the patient, the type of personality based on the anamnesis and history, with identification of stressful situations to provide appropriate and broader care that includes relaxation therapies, meditation and corresponding referral to mental health professionals if required to provide a comprehensive approach.

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