Clin Investig Arterioscler. 2017;29(3):127–128

Sociedad Española de Arteriosclerosis

CLÍNICA E INVESTIGACIÓN EN ARTERIOSCLEROSIS

www.elsevier.es/arterio

EDITORIAL

Nitric oxide: A possible new biomarker in heart failure? Relationship with pulmonary hypertension secondary to left heart failure☆

Óxido nítrico: ¿un posible nuevo biomarcador en insuficiencia cardíaca? Relación con hipertensión pulmonar secundaria a insuficiencia cardíaca izquierda

Vicente Lahera

Departamento de Fisiología, Facultad de Medicina, Universidad Complutense de Madrid, Madrid, Spain

Heart failure (HF) is currently one of the most prevalent cardiovascular diseases because of its high incidence and its significant medical and socio-economic repercussions for the healthcare industry. Therefore, research and the search for biomarkers to improve diagnosis and prognosis are of particular interest in order to facilitate the prediction and prevention of HF. Traditionally, a series of indicators have been considered regarding the development and progression of HF, related to the pathophysiology of the systems involved in the neurohumoral response of HF: the sympathetic nervous system, renin–angiotensin–aldosterone system, vasopressin, cardiac natriuretic peptides or endothelium-derived peptides (e.g. endothelin 1). In addition to these, some inflammatory, oxidative and extracellular matrix development markers have also been used as biomarkers for the diagnosis and progression of HF.

In this issue of Clínica e Investigación en Arteriosclerosis, Bonafede et al.[1] wrote an article entitled ''Nitric oxide: a possible new biomarker in heart failure? Correlation with pulmonary hypertension secondary to left-sided heart failure''. In this paper, the authors' objective was to evaluate the possible role of nitric oxide (NO) in chronic HF by determining its final metabolic products, nitrates and nitrites. Furthermore, given the important relationship between NO and reactive oxygen species, as well as the physiological and pathophysiological relevance of both, they determined two relevant reactive oxygen species, hydroxyl and superoxide anions, and two enzymatic activities, NADPH oxidase and superoxide dismutase (SOD), related to the production of these anions and their clearance, respectively. This approach is based on documented evidence showing that patients with chronic HF present arterial endothelial dysfunction, a condition most likely associated with increased oxidative stress and inflammatory agents. With this concept, the authors hypothesise the probable predictive utility of NO metabolites in patients with chronic HF. In the study, the potential differences between patients with and without secondary pulmonary hypertension (SPH) were also studied, and hypertensive patients were considered to have a worse prognosis than normotensive patients. The study was carried out at Mendoza Central Hospital (Argentina). It included 30

DOI of original article:
http://dx.doi.org/10.1016/j.arteri.2017.04.001

☆ Please cite this article as: Lahera V. Óxido nítrico: ¿un posible nuevo biomarcador en insuficiencia cardíaca? Relación con hipertensión pulmonar secundaria a insuficiencia cardíaca izquierda. Clin Invest Arterioscler. 2017;29:127–128.

E-mail address: vlahera@med.ucm.es

patients (53 ± 7.43 years; 7 women (23%) and 23 men (77%) who were distributed according to their pulmonary systolic pressure values as measured by Doppler echocardiography: group A, with a PSP ≥ 40 mmHg (13 patients, 43%) and group B, with a PSP < 40 mmHg (17 patients, 57%). A decrease in plasma nitrite, nitrate and SOD levels was demonstrated, along with increased values of reactive oxygen species and NADPH. These results are consistent with the pathophysiological changes characteristic of HF, that is to say, a decrease in the availability of NO with consequences for arterial endothelial function. This condition could complicate the status of patients with HF, because it would involve an increase in the total peripheral resistance, which would further compromise heart function and minute volume.[2,3] The study also showed that patients with HF and SPH had lower plasma levels of nitrites, nitrates and SOD compared to patients with HF but without SPH; in patients with HF and SPH, the oxidative stress markers also increased. These findings coincide with the increase in complications for patients with HF and SPH compared to those without SPH. The authors conclude that NO metabolites, SOD, NADPH oxidase and oxidative stress markers may be considered as potential markers in the development of chronic HF, which may also characterise patients with SPH. These findings are backed by several facts that support the relevance of NO in pulmonary circulation. It is known that inhaled NO in these patients causes pulmonary arteriolar vasodilation that leads to improved oxygenation. Phosphodiesterase-5 (an enzyme that breaks down cGMP, a mediator of NO's relaxing effect on vascular smooth muscle) inhibitors have shown benefits in patients with pulmonary hypertension. Further, nitric oxide donors such as sodium nitroprusside, nitroglycerin, isosorbide mononitrates and dinitrates, or S-nitrosothiols, have been shown to benefit pulmonary circulation.

Therefore, although they acknowledge the methodological and design-related limitations of the study, the authors suggest that the NO metabolites, SOD, NADPH oxidase and oxidative-stress indicators might be considered useful as possible markers that are easy to measure and economically feasible in chronic HF, which would also facilitate the characterisation of patients with SPH.

References

1. Bonafede RJ, Calvo JP, Valeria Fausti JM, Puebla S, Gambarte AJ, Manucha W. Óxido nítrico: ¿un posible nuevo biomarcador en insuficiencia cardíaca? Relación con hipertensión pulmonar secundaria a insuficiencia cardíaca izquierda. Clin Investig Arterioscler. 2017;29:120–6.
2. Braunwald E. Biomarkers in heart failure. N Engl J Med. 2008;358:2148–59.
3. Trachtenberg BH, Hare JM. Biomarkers of oxidative stress inheart failure. Heart Fail Clin. 2009;5:561–77.