Relationship Between Nighttime Blood Pressure, the Renin-angiotensin System, and Melatonin

Relación entre la presión arterial nocturna, el sistema renina-angiotensina y la melatonina

To the Editor,

We have read with great interest the article on nighttime blood pressure (BP) and neurohumoral activation in patients with idiopathic atrial fibrillation in the Revista Española de Cardiología.1 According to the authors, nighttime BP values are directly associated with left atrial size and atrial and brain natriuretic peptides in patients with idiopathic atrial fibrillation. We think it may be of interest to discuss a number of issues related to nighttime BP and neurohumoral activation.

First, the authors do not mention the effect of another neurohormone, melanotin, on BP. Oscillations in physiological functions that occur over a 24-h period are known as circadian rhythms.2 During sleep, there is a decrease in BP in the cardiovascular system. Melatonin is one of the main hormones serving as an endocrine signal in the circadian rhythm. Its secretion is mainly controlled by light via the suprachiasmatic nucleus (biological clock), such that darkness stimulates its secretion and light inhibits it.3 Recently, our group demonstrated an association between an abnormal pattern of melatonin secretion and alterations in BP in healthy subjects.4 Second, the authors discuss from a physiological point of view the important role of nighttime BP in remodeling and growth of the left atrium, possibly mediated by activation of the renin-angiotensin system (RAS).4 Several articles have been published on the association between the RAS and melanotin.5-7 Angiotensinogen is the precursor of the RAS and has been identified in pineal glial cells and the receptors type AT1b in pinealocytes.5 Angiotensin II, as part of the RAS, acts on receptors type AT1b in pinealocytes to influence the synthesis and activity of tryptophan hydroxylase, an enzyme that limits melatonin production.6 The demonstration of a functional pineal RAS interfering with melanotin synthesis indicates that this may affect the modulation of circadian rhythms. In fact, the majority of published studies suggest that the relationship between angiotensin and melatonin synthesis in cardiovascular disease is antagonistic.7

Finally, the administration of low pharmacologic doses of melatonin (1 mg) reduces BP as a consequence of various mechanisms, such as a direct hypothalamic effect, a lowering of catecholamine levels, the relaxation of the smooth muscle wall and, above all, as a result of its antioxidant properties. There is evidence suggesting that melatonin may have a hypotensive effect, especially in non-dipper hypertensive patients.8 Thus, the interaction between the RAS and melanotin in relation to BP should be taken into account. From a clinical standpoint, more research is needed on the interaction between angiotensin and melanotin to further our understanding of the pathophysiology of cardiovascular disease, with a possible impact on chronotherapeutic strategies.

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Relationship Between Nighttime Blood Pressure, the Renin-angiotensin System and Melatonin. Response
Relación entre la presión arterial nocturna, el sistema renina-angiotensina y la melatonina. Respuesta

To the Editor,

We appreciate the interest of Drs. Domínguez-Rodríguez and Abreu-González in our article, as well as their comments, given their extensive experience in the role of melatonin in arterial blood pressure.

Although numerous epidemiological studies have demonstrated that the arterial blood pressure is the most important risk factor for atrial fibrillation,1–3 the underlying pathophysiological mechanisms are still unknown. As we indicate in our article, it has been suggested that, among other effects, the activation of the renin-angiotensin system induces changes in cardiac structure, such as left ventricular hypertrophy and/or increase in left atrial size, that act as an ideal substrate for the neurohormonal activation implicated in atrial fibrillation.1–5

The objective of our study was to evaluate the hypothesis that the arterial blood pressure values obtained by means of 24-h blood pressure monitoring are associated with structural changes in left atrium and with the neurohormonal markers involved in the development of idiopathic atrial fibrillation (IAF). Thus, said results should be encompassed in the context in which the study was carried out, in the attempt to search for new pathophysiological mechanisms that help to shed light on as yet unidentified causes of IAF.

In this respect, the contributions of Domínguez-Rodríguez and Abreu-González are highly interesting, as is the recent review by Campos et al.,6 which summarizes the accumulated evidence on the important role of angiotensin II and melatonin in the modulation of circadian rhythm, and their implication in cardiovascular disease. Undoubtedly, and in view of the results of our study, the analysis of the possible interaction of the renin-angiotensin system and the melatonin concentration with nocturnal arterial blood pressure values in individuals with IAF could contribute to the elucidation of another new pathophysiological mechanism implicated in the development of IAF. Unfortunately, in the design of the pilot study and the subsequent case-control study,7 we did not consider analyzing the melatonin concentration. Thus, with the present data, we are unable to respond to this unquestionably new and interesting pathophysiological hypothesis concerning the genesis of IAF.

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