Hypertension Research (2022) 45:1134–1135
https://doi.org/10.1038/s41440-022-00938-9

COMMENT

Special Issue: Current evidence and perspectives for hypertension management in Asia

Plasma B-type natriuretic peptide level as a possible predictor of dietary salt intake

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Received: 4 April 2022 / Revised: 15 April 2022 / Accepted: 20 April 2022 / Published online: 18 May 2022

B-type natriuretic peptide (BNP) is synthesized and released in response to an increase in ventricular filling pressure or volume. Hence, it is closely associated with both the severity and prognosis of heart failure [1, 2]. The release of BNP causes natriuresis and vasodilation, suppresses the renin-angiotensin-aldosterone system and inhibits cardiac muscle cell hypertrophy and fibrogenesis. Thus, it protects the cardiovascular system [1]. Although circulating BNP levels are an excellent biomarker for the diagnosis and monitoring of left ventricular dysfunction, careful interpretation of the peptide level is necessary in clinical settings. First, the BNP level is critically affected by numerous factors, including sex, age, kidney function, anemia and obesity [3]. Second, values over the upper normal limit for BNP (18.4 pg/ml) do not necessarily indicate the presence of heart failure. The Japanese Heart Failure Society set a cutoff value for plasma BNP concentrations at 40 pg/ml to identify patients who are susceptible to heart failure, and they recommend a detailed examination for individuals with BNP levels of 100 pg/ml or more [4].

The present study by Ohashi et al. [5] demonstrated a significant positive association between annual changes in plasma BNP levels and dietary salt intake in subjects without hypertension or electrocardiogram abnormalities. They previously observed a positive correlation between BNP and daily salt intake levels in a cross-sectional study [6], and in the present study, they reinforced their fundamental concept that increased salt intake increases BNP secretion independently of its effects on blood pressure. The median and interquartile range of BNP levels in their study were 12.9 and 6.9–22.6 pg/ml, respectively, indicating that even BNP levels that are lower than the clinical decision limit for heart failure (cutoff point recommended by the Japanese Heart Failure Society [4]) have important clinical significance. Moreover, dietary salt intake should be noted as a factor that crucially affects plasma BNP levels.

Excessive salt consumption is one of the most important factors in developing hypertension, which leads to cardiovascular diseases. Moreover, salt restriction reduces blood pressure regardless of the hypertension status [7]. Furthermore, excessive salt intake is an independent risk factor for cardiovascular events [8, 9]. Thus, salt restriction is an important strategy to reduce cardiovascular morbidity and mortality in the general population as well as in patients with hypertension. Effective instruction aimed at salt restriction should be followed after the measurement of dietary salt intake. However, estimating individual salt intake is often difficult because 24 h urine collection is necessary for the accurate measurement of daily sodium excretion. Investigating plasma BNP levels may help to estimate dietary salt intake, or at least, it may estimate changes in salt intake in individuals.

The mechanisms underlying the association between dietary salt and BNP secretion were not elucidated in the present study. Excess dietary salt increases blood pressure through an increase in circulating blood volume or other mechanisms [10] (Fig. 1). Chronic elevation in blood pressure increases the left ventricular filling pressure, which is possibly due to an impairment of left ventricular diastolic function. It also produces left ventricular hypertrophy, leading to the production and secretion of BNP. Alternatively, increased blood volume causes BNP secretion through the stretching of left ventricular myocytes without increasing blood pressure. An increase in blood pressure per se may also stimulate the secretion of BNP [11]. Indeed, subjects in the present study were without left ventricular hypertrophy, and the association of BNP with salt intake was evident after adjustment for blood pressure. Because the biological half-life of BNP is very short, ~20 min, BNP levels may reflect proximate salt intake. This is especially

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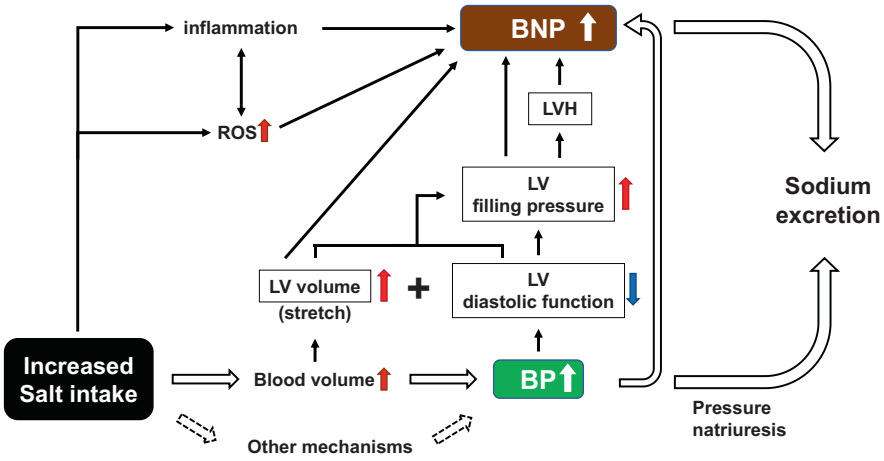

Fig. 1 Possible mechanisms underlying the link between salt intake and B-type natriuretic peptide (BNP) secretion. LVH left ventricular hypertrophy, ROS reactive oxygen species, BP blood pressure

true in individuals without hypertension or left ventricular hypertrophy. Excessive salt intake also induces inflammation, the production of reactive oxygen species [10] and the activation of transcription of mineralocorticoid receptor-dependent genes [12], which can increase circulating BNP levels. Increased circulating plasma BNP levels and/or increased blood pressure then activate sodium excretion and counteract excessive salt intake (Fig. 1).

As described in the Discussion, a reduction in BNP levels by salt restriction may help prevent the development of cardiovascular disease in individuals without hypertension or left ventricular hypertrophy. In line with this speculation, a previous study demonstrated that relatively low levels of BNP are also associated with death and various cardiovascular diseases [13]. However, further investigations are necessary to draw a definite conclusion.

Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

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