COMMENTARY

Day-by-day home-measured blood pressure variability: another important factor in hypertension with diabetic nephropathy?

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The number of patients with diabetes is L increasing, and cardiovascular complications are the most common cause of death in these patients. Thus, it would be of considerable value to identify the mechanisms involved in the cardiovascular events associated with diabetes. Ambulatory blood pressure (BP) monitoring has allowed an easier and more accurate determination of the circadian rhythm of BP under different pathophysiological conditions. The circadian pattern of BP in patients with diabetes has been found to exhibit a blunted nocturnal decrease in BP, which is associated with autonomic neuropathy and nephropathy.1 The loss of nocturnal BP dipping has been considered a risk factor for the progression of nephropathy and of prognostic value with respect to target organ damage and cardiovascular morbidity in both diabetic and hypertensive patients.2-4

Ambulatory BP monitoring allows the acquisition of valuable information on not only the average 24-h BP but also the variations in the BP values that happen during the course of daily life. Previous studies on ambulatory BP monitoring have shown that BP variability is a complex phenomenon that involves both short- and long-lasting changes. Thus, the 24-h BP varies not only because of a reduction in BP during nighttime sleep and an increase in the morning, but also because of sudden, rapid and short-lasting changes that occur during the daytime and, to a lesser extent, at night. This phenomenon

of short-term BP variability has been shown to depend on sympathetic vascular modulation and on atherosclerotic vascular changes.⁵ Several previous animal studies have shown that exaggerated short-term BP variability without significant changes in mean BP induced chronic cardiovascular inflammation and remodeling (Figure 1).⁶ Short-term BP variability is also thought to be clinically relevant because hypertensive patients with similar 24-h mean BP values exhibit more severe organ damage when the short-term BP variability is greater.^{5,7–13}

Several clinical studies have provided epidemiological evidence of the greater accuracy of home BP monitoring compared with clinical BP monitoring for the prognosis of fatal and non-fatal cardiovascular disease in longterm follow-up surveys and in cross-sectional studies. There is a general consensus that home BP monitoring is more convenient, available and less costly than ambulatory BP monitoring, but the superiority of ambulatory BP monitoring for special clinical problems is also clearly recognized. These special clinical problems include (1) the detection of non-dippers or the need for sleep pressures in chronic renal disease, autonomic neuropathies and sleep apnea and (2) the estimation of short-term BP variability.14 Surveys of both physicians and patients suggest that home BP monitoring is both appreciated and recognized as a valuable strategy. Several experts in the field of hypertension research and care have published appeals to expand the use of home BP monitoring for routine care and to have it supported by health care systems.

In the current issue of *Hypertension Research*, Ushigome *et al.*¹⁵ evaluated the association of home-measured BP variability with overt nephropathy by a cross-sectional analysis in 858 Japanese patients with type 2 diabetes. The patients measured their BP three times every morning and three times every evening for 2 weeks. The homemeasured BP variability was expressed as the day-by-day BP variability calculated using the within individual coefficient of variation of all home BP values. The dayby-day BP variability in the morning and that in the evening were calculated separately. The authors showed that the day-by-day BP variability correlated with macroalbuminuria (urine albumin-to-creatinine ratio \geq 300 mg g⁻¹ creatinine) independent of the known risk factors in Japanese patients with type 2 diabetes. Concerning home-measured BP variability, a previous study showed that high day-by-day BP variability is associated with increases in total, cardiovascular and stroke mortality, independent of BP value and other cardiovascular risk factors in the general population of the Ohasama study.¹⁶ For type 2 diabetes, while high short-term BP variability during ambulatory BP monitoring is reported to be associated with atherosclerosis and proteinuria in hypertensive patients with type 2 diabetes,^{8,17,18} the study by Ushigome et al. adds further information about the clinical relevance of home-measured BP variability in the pathophysiology of diabetic nephropathy. Although the hypothesis that home-measured BP variability favors the development of nephropathy in type 2 diabetes is appealing, the cross-sectional nature of this study makes it impossible to evaluate the causal relationships between dayby-day BP variability and diabetic nephropathy, as acknowledged by the authors.¹⁵ Further studies, such as outcome studies focusing on whether a therapeutic intervention

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Figure 1 Schema showing the proposed effects of BP variability by various BP measures on the progression of vascular atherosclerosis and the development of target organ damage.

that reduces day-by-day BP variability also carries additional prognostic benefits through the concomitant suppression of the development of diabetic nephropathy, are warranted to confirm the prognostic value of homemeasured BP variability.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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