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Research Article

Impact of masked hypertension on diabetic nephropathy in patients with type II diabetes: a KAMOGAWA-HBP study

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Abstract

The prognostic significance of masked hypertension (MH) on the progression of diabetic nephropathy among patients with type II diabetes is not well documented. We examined the relationship between clinic systolic blood pressure (SBP) and morning home SBP measurements and progression to macroalbuminuria in patients with type II diabetes. We analyzed prospective cohort study data from 712 patients with type II diabetes. We classified the patients into the following four groups

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according to their clinic (130 mm Hg) and home (125 mm Hg) SBP measurements: controlled blood pressure group, white-coat hypertension group, MH group, and sustained hypertension (SH) group. The patients were instructed to perform triplicate morning and evening blood pressure measurements for 14 consecutive days. During the 2-year follow-up period, 23 patients progressed to macroalbuminuria. The unadjusted odds ratio (95% confidence interval) for progression to macroalbuminuria among the patients with MH was significantly higher than that among the patients with controlled blood pressure (8.89 [1.06–74.88]). No significant relationship was observed between white-coat hypertension or SH and progression to macroalbuminuria. In analyses adjusted for various potential confounders, the adjusted odds ratio for progression to macroalbuminuria in the MH group was more than 8-fold higher than that in the controlled blood pressure group. MH might be a predictor of progression to macroalbuminuria among patients with type II diabetes. This rate of progression is comparable with or greater than the results reported for patients with SH. J Am Soc Hypertens 2018;■(■):1–8.

Keywords: Home blood pressure monitoring; multicenter study; morning home SBP.

Introduction

Current guidelines recommend blood pressure (BP) measurements in nonclinical settings as the standard for diagnosing or managing hypertension.[1,2] The self-measurement of home blood pressure (HBP) is more reliable than clinic BP measurements because HBP has better prognostic value for predicting mortality and cardiovascular events.[3,4] HBP measurements are useful for the diagnosis of white-coat hypertension (WCH) and masked hypertension (MH). Diagnoses for WCH and MH are not possible with only clinic BP measurements. The risk of target organ damage among patients with MH is significantly higher than that among patients with controlled BP or WCH. Similar findings have been reported for patients with sustained hypertension (SH).[5,6]

Diabetic nephropathy is the leading cause of end-stage renal disease[7] and is associated with a high risk of morbidity and mortality.[8] The earliest clinical marker for the development of diabetic nephropathy is albuminuria, and the most significant risk factor for albuminuria is systolic blood pressure (SBP).[9] Therefore, adequate BP control is important for preventing renal and cardiovascular events in patients with diabetes.[10]

We previously reported that the prevalence of diabetic nephropathy was significantly higher among patients with type II diabetes and MH or SH than among patients with controlled BP.[11] In the present study, we used clinic SBP and morning home SBP data to investigate the relationship between BP and progression to macroalbuminuria among patients with type II diabetes.

Materials and Methods

Study Design

The details of the study project have been previously reported.[12,13] This prospective 2-year cohort study was based on data from an HBP cohort of patients with type II diabetes who regularly attended the diabetes outpatient clinic at the Kyoto Prefectural University of Medicine Hospital or one of four other general hospitals, all of which are located in the Kansai area in Japan (KAMOGAWA-HBP study). We sequentially recruited 1414 patients with type II diabetes who regularly attended the facilities from March 2008 to October 2014. No BP level criterion was used for study inclusion. The flow diagram for the KAMOGAWA-HBP cohort is shown in Figure 1. We excluded patients without adequate clinic BP and HBP data, including HBP measurements for less than 7 days, patients whose data regarding urinary albumin excretion (UAE) were not available at the time of or 2 years after the HBP measurements, patients who were newly prescribed or stopped renin-angiotensin system inhibitors during the 2-year follow-up, and patients whose UAE at the time of study entry was greater than 300 mg per gram of creatinine. A change from normoalbuminuria or microalbuminuria levels to macroalbuminuria within 2 years was defined as progression to macroalbuminuria in this study. Finally, we included a total of 712 patients in the study population (395 males and 317 females). The diagnosis of type II diabetes was based on the American Diabetes Association criteria.[14] All procedures were approved by the local research ethics committee and were conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all patients.

BP Measurements

HBP was self-measured using a validated, automatic oscillometric device (Omron model HEM-70801C; Omron Healthcare Co, Ltd, Kyoto, Japan)[15] equipped with memory to store the date, time, and readings. We used electronic readouts from the device for our study analysis. The patients were instructed to perform triplicate morning and evening BP measurements with at least 1 minute between recordings for 14 consecutive days according to the 2014 Japanese Society of Hypertension guidelines for the management of hypertension.[1] BP was to be self-measured within 1 hour of awakening in the morning (after urinating,