

Hypertension

JOURNAL OF THE AMERICAN HEART ASSOCIATION



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Hypertension 2008;52:e137-e138; originally published online Sep 29, 2008;

DOI: 10.1161/HYPERTENSIONAHA.108.121723

Hypertension is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75214

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To the Editor:

With great interest we read the article by O'Brien,¹ comprehensively reviewing implementation of out-of-office blood pressure (BP) measurement, ie, ambulatory BP measurement and self-BP measurement (SBPM), for more precise evaluation and management of hypertension. Clearly, ambulatory BP measurement provides a greater amount of BP information and, thus, can be more sensitive than SBPM. However, ambulatory BP measurement is more expensive and may cause discomfort, interfering with subjects' normal activity, which limit its routine use.² Here, we introduce our investigation of the diurnal BP pattern and its determining factors by implementing a multiple SBPM strategy.

A total of 5009 hypertension patients in 500 primary care clinics in Korea, whose recent BP during the last 2 visits was stable without change in medication, were enrolled. This study was performed by multicenter, prospective, observational design. To minimize possible confounding factors and to compare the differential effect of various classes of antihypertensive agents, 2 strategies were used. First, enrolled patients were prescribed with only 1 kind and 1 tablet dose of antihypertensive agents, including a fixed-dose combination. Second, enrollment was performed by continuous registration method, which means that, after initiation of the study, 8 consecutive patients with essential hypertension in each clinic were enrolled.

Two office BP values that were measured before and after 7 days of SBPM, which were duplicated daily in the morning and in the evening as recommended,³ were evaluated. SBPM was standardized by using the unified electronic devices from Omron (Omron M5).

Of 5009 patients initially enrolled, acceptable SBPM values, recorded >10 times of a total 14 times of scheduled measurement, were acquired in 4435 patients. The means±SDs of the values of SBPM were 4.6±2.8 mm Hg in systolic BP and 3.6±1.9 mm Hg in diastolic BP.

For all of the patients (mean age: 57.1±10.7 years; male: 48.8%), the mean systolic/diastolic BP values were 131.4/80.7 mm Hg for the office BP, 131.0/80.7 mm Hg for the morning home BP, and 128.9/78.5 mm Hg for the evening home BP, respectively. The morning home BP was nearly identical to the office BP (0.4±10.6/−0.8±7.9 mm Hg) but was significantly higher than the evening home BP by 2.1±6.1/1.2±4.3 mm Hg ($P<0.001$).

Masked hypertension, defined by an elevated home BP of >135/85 mm Hg despite a controlled office BP <140/90 mm Hg, was observed in 940 patients (21.2%). Male gender (odds ratio: 1.35; $P=0.049$), old age (odds ratio: 1.56 fourth quartile versus first quartile; $P=0.004$), and smoking (odds ratio: 1.28; $P=0.014$) were significant risk factors for masked hypertension found in multivariable logistic regressions, whereas there were no significant correlation with obesity, diabetes mellitus, metabolic syndrome, or family

history of cardiovascular diseases. Regarding diurnal pattern, morning hypertension was more linked to the masked hypertension than evening hypertension.

Interestingly, there were significant differences in diurnal BP pattern according to the antihypertensive classes prescribed. Among 3290 patients whose office BPs were controlled, the office BP values were comparable among 6 antihypertensive classes, including angiotensin receptor blocker (ARB)/diuretic fixed combinations, and ranged from 125.2±8.3/77.6±6.1 mm Hg of β -blocker users to 127.7±7.3/78.5±5.8 mm Hg of calcium channel blocker users. However, patients treated with angiotensin-converting enzyme inhibitors showed the significantly higher morning home BP compared with the evening home BP (by 3.6±7.9/3.1±5.3 mm Hg) and with the office BP (by 3.3±10.5/1.7±7.8 mm Hg), of which differences were significantly larger than those observed in ARB users (1.7±5.8/1.8±4.0 mm Hg and 1.1±7.3/0.8±9.4 mm Hg, respectively) or those with calcium channel blocker users (2.1±6.1/2.0±4.1 mm Hg and 1.2±9.2/1.1±6.9 mm Hg, respectively). Likewise, patients treated with β -blockers similarly showed greater BP fluctuation over ARBs or calcium channel blockers, whereas patients with ARB-diuretic fixed combinations showed the least BP fluctuation. The numbers of patients treated with diuretics were too small (14 patients) for the comparison. As a result, patients treated with angiotensin-converting enzyme inhibitors or those with β -blockers had more risk of masked hypertension compared with those with ARBs (odds ratio: 1.2, respectively; $P<0.001$), with those with calcium channel blockers (odds ratio: 1.2, respectively; $P<0.001$), or with those with ARB-diuretic fixed combinations (odds ratio: 1.5, respectively; $P<0.001$).

In summary, as excellently reviewed by O'Brien,¹ out-of-office BP measurement provided valuable data on circadian variations of BP and, therefore, revealed the patients with masked hypertension, having increased cardiovascular risk,⁴ which could not be diagnosed by office BP measurement. Remarkably, a substantial difference in diurnal BP pattern among various antihypertensive classes was observed through out-of-office BP measurement. In this regard, ambulatory BP measurement, as well as SBPM, if measured after a proper training process, could be widely used in future clinical trials focusing on the efficacy of antihypertensive agents in high-risk patients, as well as in the high-risk circadian period.

Sources of Funding

This work was supported by a research grant for Korean Epidemiology Study on Hypertension II (KEY II) from Glaxo-SmithKline Pharmaceuticals Korea.

Disclosures

None.

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