

Originals

# Present Status of Blood Pressure Control in a Group of Hypertensive Patients Followed-up in a Cardiovascular Outpatient Clinic

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## SUMMARY

Information on blood pressure control in treated hypertensive patients attending hospital clinics is very scarce in Japan. We investigated the present status of blood pressure control in a large group of 946 consecutive hypertensive patients attending the cardiovascular out-patient clinic of our hospital during a period of a month between 1 April and 30 April 2001. The average blood pressure during the patient's past three visits to the out-patient clinic was 138/83 mm Hg. Patients were divided into 5 age groups. Diastolic blood pressure significantly decreased with age and pulse pressure significantly increased with age, while systolic blood pressure did not differ significantly among the 5 age groups. With regard to blood pressure control, 50% of these patients achieved blood pressure levels less than 140/90 mm Hg, and only 23% achieved blood pressure levels less than 130/85 mm Hg. The achievement rate of blood pressure less than 140/90 mm Hg was the lowest in the group of patients aged less than 50 years among the 5 age groups. The achievement rates of diastolic blood pressure less than 90 mm Hg, 85 mm Hg, and 80 mm Hg were also the lowest in the group of patients aged less than 50 years. The achievement rate of systolic blood pressure less than 140 mm Hg was the lowest in the group of patients aged 80 years or more, although this was not significant. Calcium antagonists were the most prescribed drugs irrespective of age. The prescription rate of calcium antagonists increased with age, while that of  $\beta$  blockers tended to decrease with age. It could be concluded that more efforts should be made to control diastolic blood pressure especially in patients aged less than 50 years as well as to control systolic blood pressure in elderly patients.

**Key Words** : blood pressure, young, elderly, antihypertensive drugs, hypertension

## INTRODUCTION

Hypertension is a major risk factor for cardiovascular diseases such as cerebrovascular disease, heart disease, and renal disease. The goal of antihypertensive treatment is the reduction and abolition of the excess cardiovascular risk associated with chronically elevated blood pressure.

Although pharmacological treatment of hypertension has become frequent in Japan, it is suggested that the present state of hypertensive treatments is hardly satisfactory<sup>1,2)</sup>. Insufficient reduction of blood pressure may be a major reason why there is still no significant reduction in cardiovascular diseases in Japan, but only a few investigations have been done to assess the prevalence of satisfactory blood pressure control in Japan. The aim of the present study was to investigate the present status of blood pressure control in a large group of hypertensive patients followed up in the cardiovascular outpatient clinic of Dokkyo University Hospital.

Received February 24, 2004 ; accepted March 16, 2004

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Table 1 Patient Characteristics

	All patients n = 946	< 50 years n = 105	50 ~ 59 years n = 233	60 ~ 69 years n = 305	70 ~ 79 years n = 233	≤ 80 years n = 70
Men (%)	58	67	61	58	54	46
Age (years)	63 ± 12	42 ± 7	55 ± 3	64 ± 3	74 ± 3	83 ± 2
Concomitant diseases						
CVD (%)	9	1	9	9	10	11
Heart disease (%)	34	10	31	34	44	47
Non-ischemic (%)	12	8	13	12	15	13
Ischemic (%)	22	2	18	23	29	34
Renal disease (%)	16	30	16	15	14	13
Non-diabetic (%)	12	27	12	10	8	11
Diabetic (%)	4	3	4	5	6	1
PVD (%)	3	0	1	3	4	7
Diabetes (%)	21	14	22	24	21	17
Hyperlipidemia (%)	39	29	41	45	35	30
Obesity (%)	33	52	35	34	27	9
Hyperuricemia (%)	10	17	9	10	10	9

Data are expressed as a percent or mean ± SD. CVD : cerebrovascular disease, PVD : peripheral vascular disease.

## METHOD

Nine hundred and forty-six consecutive hypertensive patients attending the cardiovascular outpatient clinic of Dokkyo University Hospital during a period of a month between 1 April and 30 April 2001 were included in the survey. All these patients had been regularly followed up by the same medical team for a period of at least six months. Hypertension was defined as systolic blood pressure  $\geq 140$  mm Hg and/or a diastolic blood pressure  $\geq 90$  mm Hg, or a patient's currently receiving antihypertensive treatment. Diabetes mellitus was diagnosed when the fasting plasma glucose concentration was  $\geq 126$  mg/dL or when the patient was receiving an oral hypoglycemic agent or insulin. Hyperlipidemia was diagnosed when the serum total cholesterol concentration was  $\geq 220$  mg/dL, the serum triglyceride concentration  $\geq 150$  mg/dL, or both. Hyperlipidemia was also diagnosed if the patient was taking an antihyperlipidemic agent. Obesity was defined as body mass index  $\geq 25.0$  kg/m<sup>2</sup>. Hyperuricemia was defined as the serum uric acid  $\geq 7.0$  mg/dL or treatment with a uric acid-lowering agent. In the present study, the patients were classified into five groups according to their age : the group aged less than 50 years, the group aged from 50 to 59 years, the group aged from 60 to 69 years, the group aged from 70 to 79 years, and the

group aged 80 years or more.

Blood pressure was measured in the out-patient clinic by a doctor during a routine visit with a mercury sphygmomanometer (1st and 5th phases of Korotkoff sounds taken as systolic and diastolic values, respectively) after a 5 – 10 minute rest in the sitting position, during the morning (9 – 12 a.m.). The average blood pressure measures during the patient's past three visits to the out-patient clinic were used for analysis.

### Statistical Analysis

Data are expressed as means ± SD. Comparisons among different age groups were performed with analysis of variance (ANOVA) or  $\chi^2$  test. When a significant overall effect was detected by ANOVA, Scheffe's F test was used for the comparison of two variables. Values of  $p < 0.05$  were considered to indicate statistical significance.

## RESULTS

### Patients' Characteristics

Of the 946 hypertensive patients who were included in the survey, 546 (58%) were men and 400 were women (Table 1). The average age was 63 ± 12 years. With regard to concomitant diseases, 9%, 34% and 16% of the patients reported cerebrovascular disease, heart dis-

Table 2 Present Status of Blood Pressure Control

	All patients n = 946	< 50 years n = 105	50 ~ 59 years n = 233	60 ~ 69 years n = 305	70 ~ 79 years n = 233	≤ 80 years n = 70	P for trend
SBP (mmHg)	138 ± 14	138 ± 14	136 ± 14	139 ± 13	138 ± 14	141 ± 13	0.06
DBP (mmHg)	83 ± 10	90 ± 10	86 ± 8	83 ± 9	79 ± 9	76 ± 8 <sup>a)</sup>	< 0.0001
PP (mmHg)	55 ± 13	48 ± 14	50 ± 11	56 ± 12	59 ± 14	65 ± 14 <sup>a)</sup>	< 0.0001
SBP < 140 mmHg (%)	60	58	66	57	61	49	0.07
SBP < 130 mmHg (%)	29	30	35	27	28	20	0.12
DBP < 90 mmHg (%)	74	38 <sup>a)</sup>	65	78	87	97	< 0.0001
DBP < 85 mmHg (%)	58	27 <sup>a)</sup>	42	60	78	87	< 0.0001
DBP < 80 mmHg (%)	36	13 <sup>a)</sup>	19	35	55	70	< 0.0001
SBP/DBP < 140/90 mmHg (%)	50	29 <sup>a)</sup>	52	50	59	49	< 0.0001
SBP/DBP < 130/85 mmHg (%)	23	15	25	24	26	19	0.19
SBP/DBP < 130/80 mmHg (%)	16	8 <sup>b)</sup>	12	16	21	17	0.01

Data are expressed as the mean ± SD or percent. SBP : systolic blood pressure, DBP : diastolic blood pressure, PP : pulse pressure.

ease, and renal disease, respectively. Moreover, 21 %, 39 % and 10 % had diabetes mellitus, hyperlipidemia, and hyperuricemia, respectively, and 33 % were obese.

#### Blood Pressure Control

In all patients, the average blood pressure during the patient's past three visits to the out-patient clinic was 138 ± 14/83 ± 10 mm Hg (Table 2). Diastolic blood pressure significantly decreased with age and pulse pressure significantly increased with age, whereas systolic blood pressure did not differ significantly between the 5 age groups. In all patients, systolic blood pressure was less than 140 mm Hg and less than 130 mm Hg in 564 patients (60 %), and 274 patients (29 %), respectively. Diastolic blood pressure was less than 90 mm Hg, less than 85 mm Hg, and less than 80 mm Hg in 700 patients (74 %), 552 patients (58 %), and 343 patients (36 %), respectively. Blood pressure was less than 140/90 mm Hg, and less than 130/85 mm Hg, and 130/80 mm Hg in 475 patients (50 %), 220 patients (23 %), and 148 patients (16 %), respectively. The achievement rate of systolic blood pressure less than 140 mm Hg was the lowest in the group of patients aged 80 years or more, although this was not significant. The achievement rates of diastolic blood pressure less than 90 mm Hg, 85 mm Hg, and 80 mm Hg were all the lowest in the group of patients aged less than 50 years. The achievement rate of blood pressure less than 140/90 mm Hg was the lowest in the group of patients aged less than 50 years. The

achievement rate of blood pressure less than 130/85 mm Hg was also the lowest in the group of patients aged less than 50 years, although this was not significant. Moreover, the achievement rate of blood pressure less than 130/80 mm Hg was the lowest in the group of patients aged less than 50 years.

With regard to blood pressure control and concomitant diseases, systolic blood pressure was significantly higher in patients with cerebrovascular disease than in those without it (Table 3). Diastolic blood pressure was significantly lower in patients with heart disease than in those without it. This finding was true not only of patients with non-ischemic heart disease but also of those with ischemic heart disease. Diastolic blood pressure was significantly higher in patients with non-diabetic renal disease than in those without it. Systolic blood pressure was significantly higher and diastolic blood pressure significantly lower in patients with diabetic renal disease than in those without it. Also, systolic blood pressure was significantly higher and diastolic blood pressure significantly lower in patients with diabetes than in those without it. Diastolic blood pressure was significantly higher in obese patients than in non-obese patients.

#### Antihypertensive Medication

The average number of antihypertensive drugs was 1.8 ± 1.0 (Table 4). Only 46 patients (6 % ; 32 men and 14 women ; mean age : 60 ± 15 years old) were treated without drugs, although life style modifications of

**Table 3** Concomitant Diseases and Blood Pressure Control

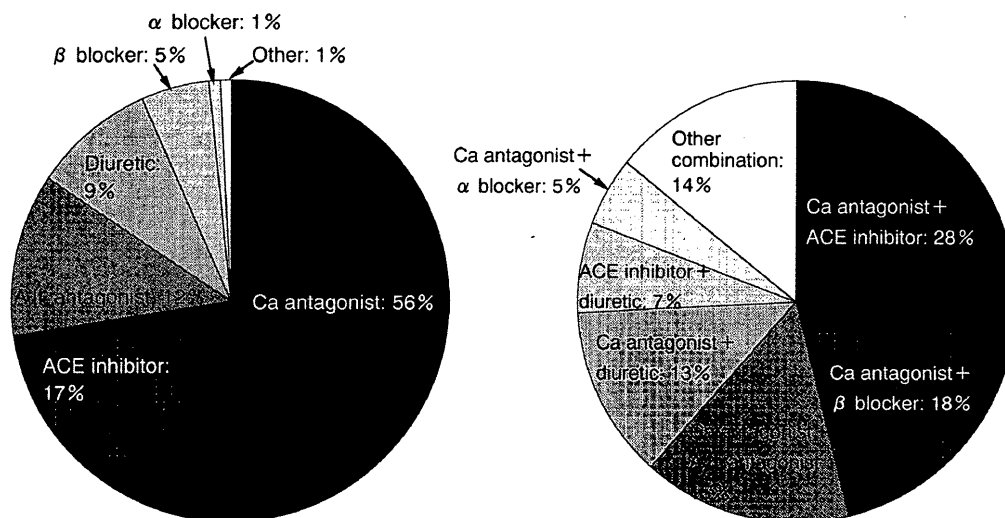
	number	SBP (mmHg)	DBP (mmHg)	Age (year)
CVD (+)	82	142 ± 13 <sup>b)</sup>	83 ± 9	66 ± 10 <sup>a)</sup>
CVD (-)	864	138 ± 14	83 ± 10	63 ± 12
Heart disease (+)	322	137 ± 14	80 ± 9 <sup>d)</sup>	67 ± 10 <sup>d)</sup>
Heart disease (-)	624	139 ± 13	85 ± 9	61 ± 12
Non-ischemic (+)	116	136 ± 14	79 ± 10 <sup>d)</sup>	65 ± 12
Non-ischemic (-)	830	138 ± 13	84 ± 9	63 ± 12
Ischemic (+)	206	137 ± 14	81 ± 9 <sup>d)</sup>	68 ± 9 <sup>d)</sup>
Ischemic (-)	740	138 ± 14	84 ± 10	62 ± 12
Renal disease (+)	155	138 ± 14	84 ± 10	60 ± 13 <sup>c)</sup>
Renal disease (-)	791	138 ± 13	83 ± 9	64 ± 11
Non-diabetic (+)	113	136 ± 13	85 ± 10 <sup>b)</sup>	59 ± 13 <sup>d)</sup>
Non-diabetic (-)	833	138 ± 14	83 ± 9	64 ± 11
Diabetic (+)	42	144 ± 16 <sup>b)</sup>	79 ± 9 <sup>b)</sup>	64 ± 11
Diabetic (-)	904	138 ± 13	83 ± 10	63 ± 12
PVD (+)	26	135 ± 17	76 ± 12 <sup>c)</sup>	72 ± 8 <sup>c)</sup>
PVD (-)	920	138 ± 13	83 ± 9	63 ± 12
Diabetes (+)	198	140 ± 14 <sup>a)</sup>	81 ± 9 <sup>c)</sup>	64 ± 10
Diabetes (-)	748	137 ± 13	84 ± 10	63 ± 12
Hyperlipidemia (+)	365	139 ± 13	83 ± 9	63 ± 10
Hyperlipidemia (-)	581	138 ± 14	83 ± 10	63 ± 13
Obesity (+)	307	137 ± 13	85 ± 9 <sup>d)</sup>	60 ± 12 <sup>c)</sup>
Obesity (-)	639	138 ± 14	82 ± 9	65 ± 11
Hyperuricemia (+)	98	139 ± 15	83 ± 11	61 ± 14 <sup>a)</sup>
Hyperuricemia (-)	848	138 ± 13	83 ± 9	64 ± 12

Data are mean ± SD. <sup>a)</sup> P < 0.05, <sup>b)</sup> P < 0.01, <sup>c)</sup> P < 0.001, <sup>d)</sup> P < 0.0001 vs. (-).  
 SBP : systolic blood pressure, DBP : diastolic blood pressure, CVD : cerebrovascular disease, PVD : peripheral vascular disease.

**Table 4** Present Status of Antihypertensive Treatments

	All patients n = 946	< 50 years n = 105	50 ~ 59 years n = 233	60 ~ 69 years n = 305	70 ~ 79 years n = 233	≤ 80 years n = 70	P for trend
Number of drugs	1.8 ± 1.0	1.8 ± 1.2	1.8 ± 1.0	1.8 ± 1.0	1.8 ± 0.9	1.8 ± 1.0	0.93
0 drug (%)	5	11	3	5	3	4	
1 drug (%)	39	31	42	40	37	43	
2 drugs (%)	35	35	34	36	37	27	
3 drugs (%)	15	16	16	12	17	23	
4 drugs or more (%)	6	7	5	7	5	3	
Drug classes							
Ca antagonist (%)	68	58	66	66	73	79 <sup>a)</sup>	0.02
ACE inhibitor (%)	32	31	36	29	32	34	0.61
Diuretic (%)	27	25	23	27	32	30	0.24
β blocker (%)	20	27 <sup>b)</sup>	22	21	17	13	0.10
A II antagonist (%)	20	23	22	22	18	10	0.13
α blocker (%)	9	11	7	9	10	9	0.81

Data are expressed as a percent or mean ± SD. <sup>b)</sup> P < 0.01, <sup>c)</sup> P < 0.001, <sup>d)</sup> P < 0.0001 vs. (-). ACE : angiotensin converting enzyme, A II : angiotensin II.



**Fig. 1** Of the patients on monotherapy, 56% were on calcium antagonists, 17% on ACE inhibitors, 12% on A II antagonists, 9% on diuretics, 5% on  $\beta$  blockers, and 1% on  $\alpha$  blockers (left panel). Of the patients who were taking two drugs, 28% were on calcium antagonists and ACE inhibitors, 18% on calcium antagonists and  $\beta$  blockers, 15% on calcium antagonists and A II antagonists, 13% on calcium antagonists and diuretics, 7% on ACE inhibitors and diuretics, and 5% on calcium antagonists and  $\alpha$  blockers (right panel).

salt reduction and improved exercise activity were strongly and unambiguously recommended to all. With regard to drug treatment, 370 patients (39%) were on monotherapy, 332 patients (35%) on two drugs, 146 patients (15%) on three drugs and 52 patients (5%) on four or more drugs. The number of drugs did not differ significantly among the 5 age groups.

In all patients, considering both monotherapy and combination therapy, 640 patients (68%) had been taking calcium antagonists, 304 patients (32%) angiotensin-converting enzyme (ACE) inhibitors, 256 patients (27%) diuretics, 193 patients (20%)  $\beta$  blockers, 190 patients (20%) angiotensin II (A II) antagonists, and 86 patients (9%)  $\alpha$  blockers, respectively. The prescription rate of calcium antagonists increased with age, while that of  $\beta$  blockers tended to decrease with age. Of the patients on monotherapy, 56% were on calcium antagonists, 17% on ACE inhibitors, 12% on A II antagonists, 9% on diuretics, 5% on  $\beta$  blockers, and 1% on  $\alpha$  blockers (Figure 1, left panel). Of the patients who were taking two drugs, 28% were on calcium antagonists and ACE inhibitors, 18% on calcium antagonists and  $\beta$  blockers, 15% on calcium antagonists and A II antagonists, 13% on calcium antagonists and diuretics, 7% on ACE inhibitors and diuretics, and 5% on calcium antagonists and  $\alpha$  blockers (Figure 1, right panel).

## DISCUSSION

We investigated the present status of blood pressure control in a large group of hypertensive patients followed up in the cardiovascular outpatient clinic of our hospital. The average blood pressure during the patient's past three visits to the out-patient clinic was 138/83 mm Hg. Diastolic blood pressure significantly decreased with age and pulse pressures significantly increased with age, while systolic blood pressure did not differ significantly among the 5 age groups.

The Japanese Society of Hypertension Guidelines for the Management of Hypertension (JSH 2000 guidelines)<sup>2)</sup> were published in 2000. The JSH 2000 guidelines recommend that blood pressure levels for young and middle-aged hypertensive patients and also for those with diabetes should be lowered to normal blood pressure below 130/85 mm Hg and maintained at this level as much as possible. We found that even in the out-patient clinic of a specialized center, only 50% of hypertensive patients achieved blood pressure levels less than 140/90 mm Hg and only 23% achieved blood pressure levels less than 130/85 mm Hg. The achievement rate of blood pressure less than 140/90 mm Hg was the lowest in the group of patients aged less than 50 years. This was because not systolic but diastolic blood pressure was less controlled in

this group than in any other group aged 50 years or more. In contrast, the achievement rate of systolic blood pressure less than 140 mm Hg was the lowest in the group of patients aged 80 years or more, although this was not significant. Therefore, it could be concluded that more efforts should be made to control diastolic blood pressure especially in patients aged less than 50 years as well as to control systolic blood pressure in elderly patients.

Among the patients attending our clinic, those with inadequate blood pressure control were the most frequent in the group of patients aged less than 50 years. In this group, diastolic blood pressure was significantly higher than that in any other group of patients aged 50 years or more, and the achievement rates of diastolic blood pressure less than 90 mm Hg, 85 mm Hg, and 80 mm Hg were the lowest among the 5 age groups. It is well recognized that systolic blood pressure rises with age, whereas diastolic levels typically start to fall beyond age 50<sup>3)</sup>. Therefore, it is generally thought that bringing systolic blood pressure to lower levels is difficult in elderly patients. In JSH 2000, different targets of blood pressure were set corresponding to the age group. JSH 2000 recommended that blood pressure levels be lowered to 140/90 mm Hg or lower for patients aged 60 – 69 years, and slightly higher target levels were set for patients aged 70 years or older. Nevertheless, in the present survey, systolic blood pressure did not differ significantly among the 5 age groups, suggesting that recent antihypertensive agents such as long-acting dihydropyridine calcium antagonists, ACE inhibitors, or A II antagonists have enabled physicians to control blood pressure even in elderly patients with systolic hypertension.

Our findings are well in agreement with the recent survey conducted by Yamamoto et al.<sup>4)</sup>. They investigated 907 treated hypertensive patients (mean age, 67 years) in 22 hospitals and private practices and found that there were no significant differences in systolic blood pressure among the age groups, whereas diastolic blood pressure decreased with increasing age. In their survey, only 17% of patients aged less than 60 years achieved target blood pressure levels less than 140/90 mm Hg, but this percentage increased with age and 65% of patients aged 80 years or more achieved the target blood pressure, also demonstrating that blood pressure was better controlled in elderly patients than in younger patients.

So far, a number of studies have investigated diastolic

hypertension as a risk factor for cardiovascular diseases. Fang et al.<sup>5)</sup> followed up 1,560 middle-aged subjects with diastolic hypertension, and demonstrated that the risk of acute myocardial infarction was significantly higher in subjects with systolic-diastolic hypertension than in those with diastolic hypertension. Petrovitch et al.<sup>6)</sup> followed up 7,590 Japanese-American men among the general population of Hawaii and showed that, for middle-aged persons, the risk of a first symptomatic stroke was lower in subjects with diastolic hypertension or normotension than in subjects with systolic hypertension or systolic-diastolic hypertension. Recently, in a longitudinal observation of a representative sample of the general population of a rural Japanese community, Hozawa et al.<sup>7)</sup> also found that diastolic hypertension, as assessed by home blood pressure measurements, carried a low risk of cardiovascular mortality, similar to that found in subjects with normotension, while subjects with systolic hypertension or systolic-diastolic hypertension had a significantly higher risk of cardiovascular mortality than normotensive subjects. They also found that these findings were observed both in treated and untreated subjects, in young and elderly subjects, and in men and women. Taking these observations together, it is suggested that antihypertensive treatment should focus on systolic rather than on diastolic blood pressure, although further large-scale clinical studies are needed to confirm this.

With regard to antihypertensive medication, considering both monotherapy and combination therapy, calcium antagonists were the most prescribed drugs with a prescription rate of 68%, and ACE inhibitors the second most prescribed drugs with a prescription rate of 32%. In addition, the prescription rate of calcium antagonists increased significantly with age. These findings are almost in line with the reports by other Japanese investigators<sup>2, 4, 8, 9)</sup>. As there had been only 3 years of experience in the use of A II receptor blockers in Japan at the time of our survey, the prescription rate of these drugs was lower than those of calcium antagonists, ACE inhibitors and diuretics. But, nowadays, A II receptor blockers have become one of the most prescribed drugs in Japan<sup>10)</sup>.

Our study had a number of limitations that should be mentioned. Of course, it is very difficult to compare blood pressure control in the general population, in general practice and in hospital clinics. It would be expected, on

one hand, that treatment is more intensive and successful in specialized clinics, but, on the other hand, it is likely that more severe and complicated, and therefore more resistant, hypertensive patients attend hospital clinics. With these limitations in mind, it seems meaningful to evaluate the status of blood pressure control in a large group of hypertensive patients followed up in the outpatient clinic of a specialized center. Therapeutic management of hypertensive patients in specialized centers may represent an important approach in the effort to improve blood pressure control.

Information on blood pressure control in treated hypertensive clinics is very scarce in Japan. Although several investigators evaluated the status of blood pressure control in treated hypertensive patients, most of their surveys were performed as a multi-center study<sup>4)</sup>. In the present study, we evaluated blood pressure management in a large number of treated hypertensive patients followed up in the single cardiovascular outpatient clinic of our university. We performed the present survey on the basis of the same clinical settings.

In conclusion, our survey indicates that in the cardiovascular outpatient clinic of our hospital, only 50% of hypertensive patients achieved blood pressure levels less than 140/90 mm Hg and only 23% achieved blood pressure levels less than 130/85 mm Hg. Further efforts are needed to control diastolic blood pressure in young hypertensive patients as well as to control systolic blood pressure in elderly hypertensive patients.

*Acknowledgment.* The authors gratefully acknowledge Drs. Shigeo Horinaka, Toshio Nishikimi, Koichi Tamano, Atsushi Numabe, Naohiko Kobayashi, Hidehiko Ono, Masaki Takahashi and Koichi Kono of the Department of Hypertension and Cardiorenal Medicine, Dokkyo University School of Medicine, for their assistance.

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