

Sequential Follow-Up Evaluation of Morning Surge and Pulse Wave Velocity in White-Coat Hypertensive Patients with Normal Nighttime Blood Pressure

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Abstract

Prognosis and damage or cardiovascular (CV) target organ of white-coat hypertension (WCH) is a subject of controversy. We evaluated at baseline (BL) and between 37 - 150 months of follow-up (FU) a cohort of 452 outpatients non-diabetics free of previous CV events including normotensives (NT, n = 101, 50 ± 11 yrs, 60% female, office BP < 140/90 mmHg and normal daytime BP (< 135/85 mm Hg) and nighttime BP < 120/70 mm Hg), untreated WCHT (n = 254, 45 ± 14 yrs, 62% female, normal daytime and nighttime BP) and hypertensives HT (n = 97, 54 ± 7 yrs, 58% female) the morning BP surge and the aortic stiffness (pulse wave velocity - PWV) as markers of organ damage and CV prognosis. At BL office and 24h BP (mm Hg) were respectively in NT 126/82 + 9/10 and 24h 118/73 + 7/6, in WCHT 150/91 + 8/8 and 24h 120/74 + 5/6 and in HT 152/97 + 11/9 and 24h 135/83 mm Hg. CV event rates per 100 patients-years were 0.61 in WCH, 0.66 in NT and 2.2 in HT groups with a relative risk of 4.12 (CI 95% 2.99 - 6.69) in HTs than in WCH and NT. At BL and at the end of the FU morning surge of BP (mm Hg) was higher (p < 0.01) in the HT group (BL 34 ± 20; FU 35 ± 21) than NT (BL 22 ± 10; FU 26 ± 11) and WCH (BL 25 ± 12; FU 27 ± 12). PWV (m/s) was similar at both phases between NT (9.6 ± 1.9) and WCH (9.7 ± 2.2) but significantly higher (p < 0.01) in HT (10.9 ± 3.2) vs NT and WCH. We conclude that WCH with normal nighttime BP has a relative benign prognosis and similar target organ damage vs normotensives. Thus, nighttime BP should be included in the WCHT definition and in its prognostic stratification.

Keywords: White-Coat Hypertension; Normal Nighttime Blood Pressure, Transition to Sustained Hypertension

Introduction

The prognostic impact of prognosis and the damage or cardiovascular (CV) target organ of white-coat hypertension (WCH) is a subject of debate and controversy [1-3].

That may be related at least in part with different 24h ambulatory blood pressure (ABPM) limits used in its definition and on ageing of comparative groups. In contrast to the majority of previous studies in which WCH was defined by daytime BP < 135/85 mm hg it has been proposed [4] to also include normal nighttime BP values on WCH definition since nocturnal BP is strongly related with cardiovascular prognosis [5]. In recent studies [6] we found in subjects with WCH defined by normal daytime and nocturnal BP (NBP) values, that the risk of cardiovascular events after 7.6 years was significantly lower than that of sustained hypertensives (HT) and similar to that of normotensives (NT).

Aim of the Study

In the present study we aimed to evaluate in a sample these three populations the morning BP surge and the aortic stiffness known as important markers of target organ damage and cardiovascular prognosis [7,8].

Methods

We performed a prospective, observational study in a cohort of 452 outpatients non-diabetics free of previous CV events who were referred to three University Hospitals for ABPM evaluation between 1991 and 2008. Subjects were divided into three groups: normotension (NT, clinic BP < 140/90, awake BP < 135/85 and nighttime < 120/70 mmHg), sustained hypertension (HT) and WCH this one defined as office BP of at least 140/or 90 mmHg, daytime BP less than 135/85 mmHg and NBP less than 120/70 mmHg under no treatment. Recruitment selection and exclusions criteria, evaluation of CV events were earlier described [6] as well the technique of office and ABPM (Spacelabs 90207, SpaceLabs Inc., Redmond, Washington, USA)[®]. The median follow-up was 7.6 years. Either before and at the end of the follow-up all subjects were submitted to ABPM, BP morning surge was calculated as described [9] and to evaluation of aortic stiffness by measuring carotid-femoral pulse wave velocity (PWV) as described [9].

Statistical analysis: Values of continuous variables are presented as the mean ± SD or as percentages, and differences between the groups were evaluated by one-way analysis of variance. Continuous variables were compared using parametric (Student’s t-test) or non-parametric (Wilcoxon-Mann-Whitney test) tests. Chi square test was used for group comparisons for categorized data. Statistical significance was considered for a P value less than 0.05.

Results

Subjects were divided into three groups: normotension (NT) n = 101, 60% female; ageing 50 ± 11 years BMI 26 + 5 Kg/m², blood pressure (BP mm Hg) in office 126/82 + 9/109 and 24h 118/73 + 7/6), untreated WCHT (n = 254 45 +/- 14y, 62% female, BMI 26 + 4 Kg/m², BP in office 150/91 + 8/8 and 24h 120/74 + 5/6) and in 97 HT (age 54 +/- 7 years, 58% female, BMI 26 + 6 Kg/m², BP in office 152/97 + 11/9 and 24h 135/83 + 10/8 mm Hg). Evaluation was done at baseline and between 37-150 months during follow-up: 65 +/- 19 months in NT, 70 +/- 29 months in WCH and 60 +/- 17 in HT. Cardiovascular (CV) event rates per 100 patients-years were 0.61 in WCH, 0.66 in NT and 2.2 in HT groups. Figure 1 shows the values of morning surge of systolic BP and the pulse wave velocity in the 3 populations at baseline and at the end of the follow-up. Morning surge of BP was higher in the HT group than NT and WCH at baseline and at the end of the follow-up and it was higher in WCH than NT only at baseline. Pulse wave velocity was similar at both phases between NT and WCH but significantly higher in HT vs NT and WCH. The percentage of non-dippers (nighttime BP/daytime BP > 0.9) did not differ among groups. Regression analysis with adjustment for covariables (age, gender, BMI) shows that risk of cardiovascular events (patients/years) was significantly higher ((p < 0.001) and with a relative risk of 4.12 (CI 95% 2.99 - 6.69) in HTs than in those with WCH and with NT.

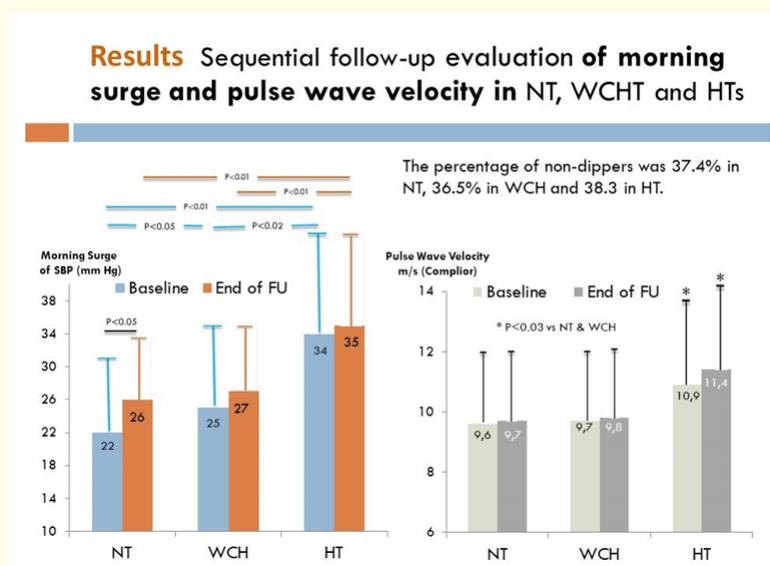


Figure 1: Sequential evaluation of systolic BP morning surge and of pulse wave velocity (PWV, m/s) of normotensive subjects (NT), WCHT subjects and hypertensives/HT).

Discussion

In WCH subjects with normal values of daytime and nighttime BP the risk of CV events was significantly lower than that of HT and not different from age-matched NT subjects. Also, at the end of the 7.6 years of follow-up both BP morning surge and pulse wave velocity value as an index of aortic stiffness, both of which has been associated with worse CV prognosis [7,8] were similar to that of NT subjects but clearly inferior to the HT group.

Conclusion

In conclusion, that may suggest that WCH with normal nighttime BP has a relative benign prognosis and that nighttime BP should be included in the WCHT definition and in its prognostic stratification.

Conflicts of Interest

There are no conflicts of interest.

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