



Clinical commentary

The effect of depression on sleep quality and the circadian rhythm of ambulatory blood pressure in older patients with hypertension



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ABSTRACT

Objective: To explore the effect of depression on the sleep quality, and the circadian rhythm of ambulatory blood pressure in patients with essential hypertension.

Methods: A total of 73 older patients with hypertension were screened for depression and divided into two groups. The Pittsburgh Sleep Quality Index (PSQI) and the circadian rhythm of ambulatory blood pressure were compared between the non-depressed (control) and depressed (case) group.

Results: In the case group, 24 h ambulatory SBP and DBP, and nocturnal SBP and DBP were higher than in the control group, and the circadian rhythm of non-dipper was higher (67.22% vs 40.13%, $P < 0.01$). There was a positive correlation between PSQI and depression ($r = 0.432$, $P < 0.01$).

Conclusion: There was a significant correlation between sleep quality and depression in older patients with hypertension. Depression increases the circadian rhythm of non-dipper in older patients with hypertension.

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1. Introduction

Hypertension is a chronic disease that has serious health consequences in older patients. The prognosis of hypertension is related to psychological factors. Depression reduces the quality of life, and also negatively affects the rehabilitation and prognosis of patients [1,2]. Emotion and hypertension are closely related, and changes in mood can cause fluctuations in blood pressure. Some studies indicate that the incidence of hypertension is higher among individuals with depressive symptoms [3,4]. A longitudinal study of 2,656 older people in China found that the incidence of depression was significantly higher in those with elevated blood pressure [5]. Quality of sleep is lower in patients with hypertension, and the circadian rhythm of blood pressure, as assessed by ambulatory blood pressure monitoring (ABPM), is prompter than clinic visits for evaluating the prognosis [6,7]. The aim of this study was to explore the relationship between sleep quality and depression, and the effect of depression on blood pressure circadian rhythm in older patients with hypertension.

2. Materials and methods

2.1. Participants

This study enrolled 73 patients aged 60–90 years old (mean age 67.21 ± 9.27 years) with hypertension at the Xuanwu Hospital Capital Medical University between August 2008 and October 2009. Standardized clinical assessments included medical history, physical and neurological examinations, the Hamilton Rating Scale for Depression (HAM-D), the Pittsburgh Sleep Quality Index (PSQI) and ABPM. All data were collected on standardized study forms according to documented procedures by uniformly trained physicians. Exclusion criteria were as follows: secondary hypertension; malignant tumors; significant suicidal risk; unstable physical disorders; dementia; Parkinson's disease; a family history of mental illness; and taking antipsychotic medication. Eligible patients were divided into two groups: hypertension with depression (case group, $n = 28$) and hypertension without depression (control group, $n = 45$). Informed consent was obtained from all participants prior to study. This clinical investigation was approved by the Ethics Committee of Xuanwu Hospital Capital Medical University, China.

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2.2. Blood pressure

Blood pressure was measured in a quiet environment by trained doctors. Two seated blood pressure readings were taken from the right arm after 5 min of physical inactivity. Systolic and diastolic blood pressure were measured by Korotkoff I and V, respectively, and an average was taken of the two values. Hypertension was defined as systolic blood pressure (SBP) \geq 140 mmHg and/or diastolic blood pressure (DBP) \geq 90 mmHg, current treatment with antihypertensive medication, or self-reported diagnosis of hypertension.

Using a noninvasive blood pressure detection instrument, 24 h ABPM was performed from 8:00 until 8:00 the following morning, with daytime provisions from 6:00 to 22:00 and nighttime from 22:00 to 6:00 the next day. The effective ABPM data were more than 24 h and the effective reading was more than 80%. SBP and DBP were also recorded over 24 h. A percentage decline in nocturnal blood pressure (daytime blood pressure mean and nighttime blood pressure mean/daytime blood pressure mean * 100%) of \geq 10% for circadian rhythm was defined as dippers, and a <10% decline in circadian rhythm was defined as non-dippers.

2.3. Neuropsychological testing

For neuropsychological testing, the HAM-D questionnaire was administered to patients in the presence of two physicians using the generally accepted method of conversation and observation. Total HAM-D scores reflect the severity of depression, with a lower score corresponding to less severe disease and vice versa. A total score of <7 points is defined as normal, 7–17 points as possible depression, 17–24 points as depression, and >24 points as severe depression. Patients with depression met the criteria for major depressive disorder, as diagnosed by a structured clinical interview based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition-Patient Edition.

2.4. Sleep quality

Sleep quality was measured by PSQI. The PSQI consists of 23 items that are divided into seven items as follows: subjective sleep quality, time to sleep, sleep duration, sleep efficiency, sleep disorders, anti-insomnia drugs, and the influence of sleep quality on daytime function. Each component was graded on a scale of 0–4, and the total PSQI score was obtained from the seven components. Poor sleep quality was defined as a PSQI total score >7, with higher scores indicative of worse sleep quality.

2.5 Statistical analysis

An unpaired T test was conducted using SPSS for Windows (version 12.0). Data were expressed as means \pm SEM. The Rank Sum Test method was used for data that were not distributed normally. Differences with a *P* value <0.05 was considered statistically significant.

3. Results

3.1. Comparison of common factors between the two groups

Among the 73 patients with hypertension, 28 patients were diagnosed with major depressive disorder. Table 1 shows comparisons between the two groups in terms of gender, age, duration of hypertension and body mass index. There were no differences in the above variables between the two groups (*P* > 0.05), which indicates that the two groups were comparable.

3.2. Ambulatory blood pressure

The case group had higher 24 h ambulatory SBP and DBP, and nocturnal SBP and DBP than the control group (*P* < 0.05; Table 2).

3.3. Sleep quality

Compared with the control group, subjective sleep quality, time to sleep, sleep duration, sleep efficiency, sleep disorders and anti-insomnia drugs were worse in the case group, and total PSQI scores were higher in the case group (Table 3).

3.4. Non-dipper blood pressure

The incidence of non-dipper blood pressure was higher in the case group than the control group (67.22% vs 40.13%, *P* < 0.01) (Fig. 1).

3.5. The relationship between sleep quality and depression in patients with hypertension

The total PSQI score correlated positively with depression (*r* = 0.432, *P* < 0.01).

4. Discussion

This study showed that older hypertensive patients with depression had higher 24 h ambulatory SBP and DBP, and nocturnal SBP and DBP than those without depression. The circadian rhythm of blood pressure is influenced by secretion of adrenaline and other neural mediators, suggesting that the sympathetic nervous system may be a key factor that modulates blood pressure [8]. The decline in blood pressure during the night is due to reduced sympathetic nerve tension and increased vagal nerve tension during sleep. Older patients with hypertension and depression at night have a higher blood pressure loading value and the nocturnal blood pressure decline is not obvious. Reasons for the lack of nocturnal decline in blood pressure may be that depression causes dysfunction of the autonomic nervous system and activity of the sympathetic nervous system function, leading to an increased heart rate, stronger myocardial contractility and higher cardiac output. This also induces contraction of the smaller arteries linked to recipient vessels, which increases peripheral resistance, causing blood pressure to rise. Another reason may be that patients with depression tend to have sleep disorders, characterized by difficulty

Table 1
Comparison of common factors between the two groups.

Group	<i>n</i>	Gender [Male (%)]	Age (years old)	Duration of hypertension (years)	BMI (kg/m ²)
EH + DEP	28	18 (64.29)	66.54 \pm 8.34	17.56 \pm 3.32	24.3 \pm 3.3
EH	45	25 (55.56)	67.63 \pm 9.91	16.92 \pm 4.21	24.9 \pm 3.7

Abbreviations: BMI: body mass index. EH: Essential hypertension without depression group (control group). EH + DEP: Essential hypertension with depression group (case group).

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