

What is The Best Prognostic Determinant for Ambulatory Blood Pressure Monitoring: Nondipping or Morning Surge in Blood Pressure?

Katia Coelho Ortega e Décio Mion Júnior
Universidade de São Paulo - São Paulo, SP - Brazil

Nocturnal blood pressure fall was characterized by Staessen et al¹ in a large international database of hypertensives (n = 2,555) and normotensives (n = 4,765) at geographical locations worldwide by ambulatory blood pressure monitoring (ABPM), by subtracting awake blood pressure from sleep blood pressure so that the more negative the difference, the higher the nocturnal pressure fall.

Additionally, nocturnal fall was calculated through the correlation between awake/sleep blood pressure (nocturnal mean BP divided by awake mean BP multiplied by 100), to configure sleep blood pressure as a percentage of awake level. Lack of nocturnal pressure fall was represented by 100% ratio or higher. Both for systolic and diastolic BP, nocturnal pressure fall recordings and sleep/awake BP ratio showed considerable overlapping among normotensives and hypertensives; therefore, most individuals were reported as dippers.

Ohkubo et al², in their turn, have characterized individuals those presenting differences between the periods of awake and sleep pressure levels (mean of awake pressure – mean of sleep pressure divided by mean of awake pressure multiplied by 100) at or above 10% as dippers. Nondippers are those with differences between awake and sleep levels lower than 10%, whereas those with pressure increase during sleep are characterized as risers. Different authors have demonstrated that nondipping in essential hypertensives was correlated to lesions in target organs.^{3,4,5} Although few studies are available on normotensives, it has been demonstrated that nondippers have reported larger mass index of left ventricle.⁶

However, the cardiovascular system components that regulate blood pressure exhibit circadian rhythm. Therefore, variations in electrolytes excretion, sympathetic system activity, renin-angiotensin-aldosterone system, and

serum cortisol levels from night time to early morning contribute for blood pressure and heart rate increase in the early morning hours.⁷ Cardiovascular complications that occur in the time period between 6:00 a.m. and noon include sudden death, acute myocardial infarction (AMI), angina, silent ischemia, and CVA.⁸

Prognostic value of nondipping

In the PIUMA⁹ study, cardiovascular morbidity – expressed as the number of combined fatal and non-fatal cardiovascular events per 100 patients/year – was 1.79 for hypertensives reported as dippers, and 4.99 for hypertensives reported as nondippers. Therefore, nondippers with increased blood pressure mean values both for ABPM and at the doctor's office, as for those with pulse pressure > 53 mmHg, are classified as under high risk for cardiovascular events.¹⁰

The Syst-Eur¹¹ sub-study, in its turn, carried out with elderly patients with isolated systolic hypertension, confirmed the assumption of the inverse association between cardiovascular risk and nocturnal pressure fall. After the adjustment for the 24-hour BP and other risk factors, cardiovascular risk in the placebo group increased 41% for every 10% increase in the sleep/awake pressure ratio. Additionally, in the placebo group, blood pressure during sleep reported better correlation with major cardiovascular events, followed by 24-hour systolic pressure and awake systolic pressure.

Prognostic value of morning surge of blood pressure

It has been prospectively demonstrated¹² that in elderly hypertensive Japanese patients morning surge in blood

pressure over 55 mmHg – calculated by the difference between morning systolic pressure (average of measurements in the first 2 hours after waking up) and the lowest systolic pressure during sleep (mean of lowest pressure measurements and the measurements immediately before and after the lowest) – is associated to higher risk of cerebrovascular accidents irrespective of ambulatory blood pressure measurement, nocturnal pressure fall, and silent infarction. Therefore, despite the limitations imposed by the present study, blood pressure morning surge reduction may be a therapeutic target to prevent lesions of target organs and subsequent cardiovascular events.

Conclusion

Up to this point in time, the body of evidence suggests the best prognostic determinant for ABPM is nondipping during sleep. Prospective studies are made necessary to better determine the prognostic value of blood pressure morning surge.

REFERENCES

1. Staessen JA, Bieniaszewski L, O'Brien E. on behalf of the "Ad Hoc" Working Group. Nocturnal fall pressure on ambulatory monitoring in a large international database. *Hypertens* 1997; 29:30-9.
2. Ohkubo T, Hozawa A, Nagai K et al. Prediction of stroke by ambulatory blood pressure monitoring versus screening blood pressure measurements in a general population? the Ohasama study. *J Hypertens* 2000; 7:847-54.
3. Verdecchia P, Schillaci G, Borgioni C et al. Gender, Day-night blood pressure changes, and left ventricular mass in essential hypertension. Dippers and peakers. *Am J Hypertens* 1995; 8:193-6.
4. Bianchi S, Bigazzi R, Baldari G, Sgherri G, Campese VM. Diurnal variations of blood pressure and microalbuminuria in essential hypertension. *Am J Hypertens* 1994; 7:23-9.
5. Shimada K, Kawamoto A, Matsubayashi K et al. Diurnal blood pressure variations and silent cerebrovascular damage in elderly patients with hypertension. *J Hypertens* 1992; 10:875-8.
6. Hoshida S, Kario K, Hoshida Y et al. Associations between nondipping of nocturnal blood pressure decrease and cardiovascular target organ damage in strictly selected community-dwelling normotensives. *Am J Hypertens* 2003; 16:434-38.
7. White WB. Relevance of blood pressure variation in the circadian onset of cardiovascular events. *J Hypertens* 2003; 21(suppl 6):S9-S15.
8. Elliott WJ. Cyclic and circadian variations in cardiovascular events. *Am J Hypertens* 2001;14:291S-295S.
9. Verdecchia P, Porcellati C, Schillaci G et al. Ambulatory blood pressure An independent predictor of prognosis in essential hypertension. *Hypertens* 1994;24:793-801.
10. Verdecchia P. Prognostic Value of ambulatory blood pressure. Current evidence and clinical implications. *Hypertens* 2000; 35:844-51.
11. Staessen JA, Thijs L, Fagard R et al. for the Systolic Hypertension in Europe Trial Investigators. Predicting cardiovascular risk using conventional vs ambulatory blood pressure in older patients with systolic hypertension. *JAMA* 1999;282:539-46.
12. Kario K, Pickering TG, Umeda Y et al. Morning surge in blood pressure as a predictor of silent and clinical cerebrovascular disease in elderly hypertensives. A prospective study. *Circulation* 2003; 107:1401-06.