Review Paper

24-Hour Blood Pressure Monitoring in the Evaluation of Supine Hypertension and Orthostatic Hypotension

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The presence of orthostatic hypotension has been shown to be a significant, independent predictor of all-cause mortality. Systolic and diastolic orthostatic hypotension, reversal of the circadian pattern, and postprandial hypotension are some of the hemodynamic factors that may contribute to the increased mortality seen in patients with orthostatic hypotension. The high variability of blood pressure in orthostatic hypotension cannot usually be adequately assessed by a one-time measurement. In this group of patients, 24-hour ambulatory blood pressure monitoring may be more useful. (J Clin Hypertens. 2007;9:952–955)

Orthostatic hypotension is present in a heterogeneous group of disease states that commonly present as lightheadedness and sensation of weakness; it is frequently associated with an abnormal blood pressure (BP) profile.[1] The prevalence of the coexistence of isolated supine hypertension and orthostatic hypotension (SHOH) in conjunction with its association with target organ damage, is being appreciated. The diagnosis of orthostatic hypotension is usually made on clinical suspicion and postural testing. A self-report questionnaire is a reliable and valid measure of the severity of symptoms of orthostatic hypotension. It can be useful as a brief screening device for orthostatic intolerance to aid physicians in identifying patients who may have orthostatic hypotension.[2] In addition, clinical tests of sympathetic adrenergic function, such as the BP response to an orthostatic stress (head-up tilt or standing) or to a Valsalva maneuver[3] are also used to study orthostatic hypotension. These tests, however, may not provide adequate information about the complex hemodynamic profile of these patients. In this article, we review the possible advantages of 24-hour ambulatory BP monitoring (ABPM) in the assessment of SHOH.

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THE SCOPE OF THE PROBLEM

Orthostatic hypotension is defined as a decrease in systolic BP of >20 mm Hg or a decrease in diastolic BP of >10 mm Hg after a person moves from a supine to a standing position.[4] Orthostatic hypotension is frequently encountered in the elderly and in people who are physically frail. The prevalence of orthostatic hypotension varies according to the population studied: 55% of patients in a general geriatric clinic[5]; 30% of the elderly, home-dwelling population[6]; and 10.4% to 17.3% of elderly patients with isolated systolic hypertension[7] have been reported to have orthostatic hypotension. Others have reported prevalence rates of 6.9% to 9.2% in an elderly minority population[8] to rates of 28% in an elderly European population.[9,10] It is also variably observed in chronic disease states; 42% of the patients with end-stage renal disease who were starting chronic hemodialysis[11] and

20% of patients with Parkinson disease have been reported to have orthostatic changes in BP.[12]

ASSOCIATION OF ORTHOSTATIC HYPOTENSION WITH MORTALITY

The presence of orthostatic hypotension has been reported to be a significant, independent predictor of all-cause mortality (relative risk [RR], 1.64; 95% confidence interval [CI], 1.19–2.26).[8] In addition, orthostatic hypotension has been identified as a significant independent predictor of 5-year incident coronary heart disease and coronary heart disease mortality (RR, 2.0 and 2.9, respectively),[8] as well as an indicator of stroke.[13] Orthostatic hypotension at the introductory phase of chronic maintenance hemodialysis has also been reported to be an independent predictor of all-cause mortality (RR, 2.04; 95% CI, 1.324–3.108).[11]

Systolic and diastolic orthostatic hypotension, reversal of circadian pattern (defined as a nocturnal BP level equal to or more than daytime BP level[1]) instead of a decrease of about 10% in nighttime BP, and postprandial hypotension (defined as a decrease in BP of 20 mm Hg within 75 minutes of eating[14]) are some of the hemodynamic factors that are associated with the increased mortality in patients with orthostatic hypotension. In a study of older diabetic patients, the presence of diastolic (diastolic BP measured 1 minute after standing up) or systolic hypotension (systolic BP measured 3 minutes after standing up) (20/10 mm Hg) was associated with a hazard ratio of vascular death of 3.69 (95% CI, 1.54–8.84) and 2.70 (95% CI, 1.16–6.29), respectively.[15] The absence or reversal of the circadian pattern of BP increases the risk of cardiovascular disease, most especially in elderly patients.[16,17] A linear dose-response association between postprandial change in systolic BP and mortality rate has been reported in older, low-level care residents.[18] It is perhaps not surprising that orthostatic hypotension is more prevalent in frail individuals, because frailty is the cumulative effect of age, disease, disuse, and reduction in various physiologic reserves. As noted, orthostatic hypotension and frailty are both predictors of earlier death.[19]

ASSOCIATION OF ABPM FINDINGS WITH CARDIOVASCULAR RISKS

Twenty-four–hour ABPM is used clinically in the assessment of hypertension, suspected white coat hypertension, apparent drug resistance, hypotensive symptoms with antihypertensive medication, episodic hypertension, and autonomic dysfunction. BP profiles obtained by ABPM are similar to that of concomitant intra-arterial BP measurements[20]; it may be valuable in refining cardiovascular risk stratification in uncontrolled hypertension. Cardiovascular risk is directly and independently associated with observed ABPM variables, directly associated with the difference between the observed value of ABPM and that predicted from the office BP measurement, and inversely associated with the degree of nocturnal BP reduction.[21] A lack of a nocturnal decrease in BP has been associated with an abnormal pattern of autonomic activity with higher sympathetic and lower parasympathetic modulation,[22] left ventricular hypertrophy,[23] and a higher risk of cardiovascular complications such as myocardial infarction and cerebrovascular insult.[24] These are independent of the average value of ABPM during 24 hours.

SIMILARITIES IN ABPM FINDINGS IN ORTHOSTATIC HYPOTENSION DUE TO DIVERSE ETIOLOGIES

An important observation in patients with orthostatic hypotension is that, despite having conditions with different etiologies, they have similar ABPM findings. In a series of 100 consecutive patients presenting with orthostatic hypotension, the reversal of circadian pattern and postprandial hypotension were present in 93% and 100%, respectively.[1] The age- and sex-matched controls with hypertension had a lower incidence of reversal of circadian pattern (15%) and postprandial hypotension (2%). Nocturnal hypertension (average nocturnal BP >120/75 mm Hg) was present in 93% of the patients; 80% had daytime BP levels in the prehypertensive range, and 30% had stage 1 hypertension as classified by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High BP (JNC 7).[25] In comparison, only 5.5% of the patients in a large hypertension clinic and 24% of hospitalized geriatric patients (mean age, 78.8 years; 68% female) were noted to have orthostatic hypotension and hypertension, with reversal of the circadian pattern.[26] Similar ABPM findings were reported in patients with Parkinson's disease, in which reversal of circadian pattern (93%), postprandial hypotension (100%), and nocturnal hypertension (100%) were the prominent features.[27] Nocturnal hypertension and reversal of circadian pattern have also been reported in patients with hypertension and dysautonomia.[28]

In an ambulatory care setting, 83% of patients with orthostatic hypotension were shown to have asymptomatic postprandial hypotension by ABPM.[1]

Postprandial hypotension is rarely diagnosed despite clinical symptoms consistent with a high prevalence (67% alone; 37% in association with orthostatic hypotension), especially in a hospitalized geriatric population (patients are usually older than 70 years).[29] Symptoms are frequently subjective (lightheadedness, weakness[1]) and nonspecific; objective complaints (cardiac arrhythmias, abnormal BP levels) are rare; hence, investigations are often not pursued. This may result in adverse outcomes, as postprandial hypotension has been associated with an increased risk of mortality in older, low-level care residents in long-term health facilities. Postprandial hypotension and the severity of BP decrease were the strongest predictors of mortality in this cohort, with an all-cause mortality rate of 54% over 4.7 years. Absolute postprandial systolic BP <120 mm Hg has been associated with a higher risk of mortality (RR, 1.69; 95% CI, 1.04–2.78; *P*=.04).[18]

THE UTILIZATION OF ABPM IN SHOH

Neurogenic orthostatic hypotension results not from volume depletion but from perturbations of the delicate autonomic reflexes required for maintaining adequate upright BP. The BP in orthostatic hypotension is highly variable and reflects impaired BP regulatory mechanisms. ABPM provides data points to determine the dynamic changes of BP throughout a 24-hour period, daytime, nighttime, or hourly; allows assessment of BP variability and effectiveness of treatment; and may correlate closely with target organ damages.

It is accepted that high-risk patients should undergo office postural BP testing as a screening tool to detect orthostatic hypotension, but the importance of ambulatory BP monitoring to further investigate people with asymptomatic orthostatic hypotension is yet undetermined. In view of the fact that many patients with orthostatic hypotension have significant nocturnal hypertension and associated target organ damage and that ABPM predicts cardiovascular events better than clinic BP measurements, ABPM may prove to be a valuable clinical tool. A good predictor of cardiovascular risk is nocturnal hypertension,[30] present in many patients with orthostatic hypotension. This is, however, not always evaluated or treated because of the lack of clinical awareness. When one considers that awareness of the fluctuations in BP is a rather inconsistent and subjective phenomenon[31] and that asymptomatic nocturnal hypertension is a predictor of cardiovascular mortality, it may be useful to consider the use of ABPM in patients with suspected orthostatic hypotension.

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