How can ambulatory blood pressure monitoring help in the management of patients with uncontrolled or variable hypertension?

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Abstract

The study aim was to compare clinic and 24-hour ambulatory blood pressure monitoring, and to determine the influence of the latter on the management of a group of patients with variable or uncontrolled blood pressure. A retrospective data analysis was carried out on patients selected from out-patient clinics at New Cross Hospital. One hundred and seventy-one patients with uncontrolled or variable blood pressure underwent 24-hour ambulatory blood pressure monitoring and 153 results were analysed.

Following ambulatory blood pressure monitoring, 56% of the patients had their treatment regimens either decreased, unaltered or did not require antihypertensive therapy. The study found 24-hour ambulatory blood pressure monitoring helps in the assessment of overall 24-hour blood pressure control of patients and may also help in the better management of difficult groups of patients.

Key words: ambulatory blood pressure monitoring, hypertension, white coat hypertension.

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Introduction

Uncontrolled hypertension is associated with cardiac disease, stroke and renal failure. Cross-sectional studies have generally shown that 24-hour ambulatory blood pressure monitoring (24h ABPM) is a better predictor of target organ damage than clinic measurement but longitudinal data are lacking. Studies of 24h ABPM have found that blood pressure (BP) shows large variations over 24 hours and that, in many subjects, clinic BP readings are a poor guide to BP levels at other times.[1] Many of the BP variations observed during the day are attributable to factors such as physical activity, the sleep-wakefulness cycle and mental stress. In general, hypertensive patients show patterns of change similar to normotensive patients, but their diurnal profiles of pressure are set at a higher level.[1]

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Table 1. Suggested target blood pressures during antihypertensive treatment

	Clinic BP (mmHg)		Mean daytime ABPM or home BP	
	No diabetes	Diabetes	No diabetes	Diabetes
Optimal BP	< 140/85	< 140/80	< 130/80	< 130/75
Audit standard	< 150/90	< 140/85	< 140/85	< 140/80

Key: BP = blood pressure; ABPM = ambulatory blood pressure monitoring

Adapted from Ramsay *et al*.[3]

Recent studies have confirmed that mean BP levels recorded during ambulatory monitoring are lower than the levels measured by the standard cuff method, possibly due to the 'white coat effect', which affects as many as 25–30% of the hypertensive population.[2] The latest guidelines by the third working party of the British Hypertension society (BHS)[3] suggest an optimal mean daytime ABPM of < 130/80 mmHg in non-diabetics and < 130/75 mmHg in diabetics (table 1).

In patients where clinic BP is variable or where patients may have 'white coat hypertension', or where clinic BP is high despite being on treatment, decisions about starting or altering antihypertensive therapy are difficult. The introduction of ABPM may help in these situations. It might also facilitate the study of effectiveness of various antihypertensive medications and 24-hour BP control.

Methods

A total of 171 patients referred with hypertension underwent 24h ABPM over a 26-month period. This obtained 192 readings since 21 patients had more than one test. 24h ABPM BP and the influence of BP and antihypertensive treatment were analysed retrospectively. Data on 39 patients could not be analysed mainly due to unsatisfactory or unreliable BP readings or patients not reattending the out-patient's clinic. Thus 153 tests were identified where a treatment decision could be made on the basis of 24h ABPM. The age range was 18 to 79 years, (mean 53 years,

Table 2. Differences between mean clinic BP and mean daytime ABPM readings, and the influence of ABPM on therapeutic decisions

Patients	Therapeutic decisions	Number of patients	Clinic BP (mmHg)	Mean ABPM daytime (mmHg)	Difference (mmHg)
Whole group		153	179/101	148/87	31/14
Group 1	Antihypertensive not commenced	13 (8.4%)	155/88	137/80	18/8
Group 2	Antihypertensive unchanged or decreased	73 (47.7%)	177/98	136/80	41/18
Group 3	Antihypertensive increased or commenced	67 (43.7%)	185/106	160/95	25/11

median 55 years). Eighty two per cent of patients were on treatment before the test – 27% of patients were taking one antihypertensive drug, 32% two drugs, and 41% were taking three or more drugs. Indications for the test were:

- patients whose BP was uncontrolled on treatment, n=107 (60%)
- patients with variable BP either on or off treatment, n=54 (31%) – so called 'white coat syndrome'
- patients with symptoms, which could be attributed to hypotension, n=16 (9%).

Clinic records were reviewed to determine treatment decisions following 24h ABPM. (The equipment used for ABPM was Acutracker II [ScanMed, Gloucestershire, UK]). BP was recorded hourly and randomly during the day. Night-time readings were recorded but were not analysed as a part of this study.

The data were analysed by a computer-based programme which gave a graphical presentation of ambulatory blood pressure profiles. Clinic and mean daytime (0900-2200 hours) ambulatory blood pressures were also compared. The clinic BP was the reading at which the decision was made to perform ABPM. Clinicians then used these results to determine whether to initiate or change antihypertensive treatment.

The treatment decisions made according to the outcome of ABPM divided patients into the following groups:

- group 1: patients who did not require commencement of antihypertensive treatment
- group 2: patients whose treatment was either unchanged or decreased
- group 3: patients where treatment was either increased or commenced.

Initiation or change of treatment was at the discretion of the clinician; fixed protocols for antihypertensive treatment were not used. ABPM readings were analysed in two ways – both as the whole group and on the basis of clinician treatment decision.

Results

Differences in mean clinic BP, mean daytime ABPM readings and the influence on treatment are shown in table 2. Decisions to start treatment were taken if the mean daytime BP was greater than 140/90 mmHg.

Overall mean clinic BP for all 153 patients was 179/101 mmHg, while mean daytime BP on ABPM was 148/87 mmHg, (difference 31/14 mmHg).

Patients were divided into three groups as outlined above:

- group 1 comprised 13 patients (8.5%): mean clinic BP was 155/88 mmHg, and mean daytime ABPM was normal at 137/80 mmHg, a difference of 18/8 mmHg. These patients were not treated on the basis of both satisfactory BP control and no evidence of end organ damage (fundi and ECG) changes. While clinic readings in these patients suggested hypertension, ABPM showed that there was still some element of a 'white coat effect' and the mean BP was at a level that did not require treatment
- group 2 comprised 73 patients (47.8%) where treatment was unchanged (n=67) or decreased (n=6). Their mean clinic BP was 177/98 mmHg, and their mean daytime ABPM was normal at 136/80 mmHg, a difference of 41/18 mmHg
- group 3 comprised 67 patients (43.7%), where antihypertensive medication was either increased (n=52) or commenced (n=15). Mean clinic BP in this group was 185/106 mmHg and mean 24h ABPM daytime BP was 160/95 mmHg, a difference of 25/11 mmHg. Although ABPM was lower than the clinic reading, mean daytime ABPM indicated that treatment needed to be increased or commenced. Eighty one per cent had lower systolic and diastolic reading on ABPM measurements compared to in the clinic.

Higher ABPM readings compared to clinic readings were rarely observed. Systolic and diastolic BP was higher in only 7% compared with the clinic readings, a higher systolic reading but same or lower diastolic reading was seen in 7%, and 6% had the same or a low systolic reading but a high diastolic reading.

Conclusion and discussion

This study shows that in a group of hypertensive patients where clinic BP readings are variable, or where a patient's BP is difficult to control, ABPM shows lower readings of BP. This led to 56% of patients having their treatment regimen unchanged, decreased, or not requiring antihypertensive therapy. The fact that 41% of patients were taking three or more drugs, indicates that a significant effort had been made prior to 24h ABPM to control BP. The technique of ABPM distinguishes patients who have persistently elevated BP from those who have adequate BP control (normal

Key messages

- 24-hour ambulatory blood pressure monitoring (24h ABPM) helps in making therapeutic decisions in patients with uncontrolled or variable hypertension
- 24h ABPM can identify patients with 'white coat hypertension'
- With the use of 24h ABPM, more than half of the patients with uncontrolled or variable hypertension had their treatment regimen unchanged, decreased, or did not require antihypertensive therapy

ABPM) despite elevated clinic BP readings, i.e. 'white coat hypertension'. The 'white coat effect' has been reported in 7% of general population and 25–30% of the hypertensive population. It is also more common in women.[2] ABPM may help reduce the over treatment of these patients. It is also useful in the assessment of antihypertensive treatment – particularly where symptoms are suggestive of hypotension – avoiding unnecessary side effects of antihypertensive drugs.[4] Cost of equipment and running costs may be quickly offset by savings from reduced antihypertensive treatment.

Recent guidelines from the third working party of the British Hypertension Society,[3] advocate the use of ABPM in groups of patients where clinic BP is greater or equal to 160/100 mmHg, if there is no target organ damage or cardiovascular complications, and the 10-year coronary heart disease risk (CHD) is < 15%. In these cases, elevated BP is the only indication of a high CHD risk. If 24h ABPM in these cases suggests a 'white coat effect', then it can be argued that antihypertensive treatment is not indicated at this stage. Furthermore these guidelines suggest that ABPM is not indicated in patients with a high CHD/CVD (cerebrovascular disease) risk or in the routine management of hypertension. 24h ABPM can help determine whether target BP and full 24-hour control is achieved, although this was not formally assessed in this retrospective study. Patients left untreated on the basis of ABPM need to be followed up, with the reassessment of BP and cardiovascular risk.[3] This annual reassessment may require repeated ABPM since general practice/primary care or clinic measurements in hypertensive and normotensive patients are usually higher. Average difference between clinic and mean daytime BP by ABPM is reported to be approximately 12/7 mmHg[3] although our study shows that in patients prone to 'white coat hypertension', this can be as much as 41/18 mmHg. Treatment thresholds and targets should therefore be adjusted downwards when making a decision based on ABPM data.

ABPM removes all observer-based bias and provides repeated measurements outside the clinic setting, allowing characterisation of the diurnal BP profile, including nocturnal BPs.[5] There are now over 30 cross-sectional studies, which have linked ABPM to target organ damage, including left ventricular hypertrophy, microalbuminuria, retinal hypertensive changes and cerebrovascular disease.[6] At present, there is little evidence to support the routine use of ABPM in the assessment of all patients with raised BP levels, but we suggest it is a valuable tool in certain selected groups of patients, as in our group. One controlled trial treatment based on ABPM rather than clinic or surgery readings also resulted in less drug treatment.[7]

In this study, treatment decisions were taken if 24-hour mean daytime ABPM was 140/90 mmHg or higher. This target would have been lower if the study had been performed after the Hypertension Optimal Treatment (HOT) study had reported,[8] and the third working party of the BHS had given their recommendations, which now include an optimal and audit standards for 24h ABPM which are lower than previous recommendations available at the time of this study (table 1).

We believe 24h ABPM has improved the management of difficult groups where BP is variable or uncontrolled despite treatment. In our centre it is now routinely used for these groups of patients. Future studies are needed to confirm the superiority of 24h ABPM over clinic BP readings in the correlation between BP and cardiovascular mortality.

Conflict of interest

None.

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