

Ambulatory blood pressure measurement in general practice

UNTIL recently, ambulatory blood pressure measurement was largely the preserve of physicians working in specialized centres. The reasons for this included the fact that the first devices recorded blood pressure invasively and were associated with some risk and were therefore of limited clinical application. The early semi-automated non-invasive devices of the 1960s had to be fitted by trained personnel and thus their application was confined to research. With the advent of more user friendly and less expensive automated devices, this technique has become a more attractive proposition to the general practitioner. The issues of what constitutes a normal result in ambulatory blood pressure measurement, the role of ambulatory blood pressure monitoring in clinical practice and the prognostic importance of the technique are becoming more clearly defined.¹

Clearly, if the equipment used for the procedure does not measure blood pressure accurately, it has no place in the diagnosis and management of hypertension. Thus, the major initial consideration to be taken into account by the general practitioner in selecting an ambulatory blood pressure system is its accuracy and reliability. Although increasing numbers of ambulatory blood pressure monitors come on the market each year, there is at present no obligation on manufacturers to comply with the few recommended standards that are available for these systems.² There is no standard for automated blood pressure devices in the United Kingdom, although the British Hypertension Society has published a protocol for evaluating automated devices with special reference to ambulatory monitoring systems.³ In the United States of America, the Association for the Advancement of Medical Instrumentation has produced a detailed standard for automated and semi-automated devices⁴ which is shortly to be updated.

In most subjects, mean 24 hour ambulatory blood pressure values are lower than blood pressure values measured in the clinic and the difference appears to be greater with increasing blood pressure levels measured in the clinic.⁵ In the past, ambulatory blood pressure levels were studied in relatively small groups of 'normal' subjects who were often selected from blood pressure clinics on the basis of blood pressure readings on conventional measurement and were not, therefore, representative of the population. For this reason, the Allied Irish Bank study was set up at Beaumont Hospital, Dublin with the object of establishing reference values for ambulatory blood pressure levels in a sample of 815 healthy bank employees aged 17 to 79 years.⁶

Mean 24 hour ambulatory blood pressure averaged 118/72 mmHg (systolic/diastolic) while the mean daytime and night-time levels averaged 124/78 mmHg and 106/61 mmHg respectively. Taking the mean and two standard deviations as the upper limit of normal yielded an upper limit of 24 hour ambulatory blood pressure of 139/87 mmHg, and of daytime and night-time blood pressures of 147/94 mmHg and 127/76 mmHg respectively. A review of studies on non-invasive ambulatory blood pressure monitoring in healthy and apparently normotensive subjects produced broadly similar results.⁷ Although the exact relevance of these reference values to end organ effects, morbidity and mortality is not clear, they are nonetheless of practical use in the interpretation of ambulatory blood pressure results and represent an important step forward in the development of the clinical application of the technique.

The evaluation and management of hypertension in general practice is generally along the guidelines published by the British Hypertension Society⁸ and the World Health Organization,⁹ neither of which advise on the clinical use of ambulatory blood pressure measurement. Thus, there is a need for guidelines on the diagnosis and treatment of hypertension based on ambulatory blood pressure measurement, similar to those for blood pressure measurement in the clinic. As this is a relatively expensive investigation, priority should be given to those cases where the procedure is most likely to alter the doctor's management of the patient. In the context of general practice, this will mainly be in the area of diagnosis and evaluation of mild to moderate hypertension and to a lesser extent in the follow up of treatment.

In the majority of hypertensive patients the only abnormal finding is an elevation of blood pressure with no evidence of target organ damage as determined by physical examination, urinalysis, fundoscopy, electrocardiograph or echocardiograph. Management is largely determined by what is regarded as the patient's 'true' blood pressure. At present, patients in whom diastolic pressures remain greater than 100 mmHg on repeated measurement (perhaps every two weeks) over three to four months are offered treatment on the basis that the discrimination of a high risk group can be improved by repeated measurements of blood pressure in the clinic.⁸ This is because patients diagnosed as having hypertension on measurement in the clinic have a tendency for blood pressure to fall to normal levels on repeated measurement. Since this phenomenon does not occur with ambulatory blood pressure measurement,¹⁰ the subject's 'true' blood pressure level can be established on the basis of a single 24 hour recording, thereby obviating the need for multiple surgery visits over a prolonged period.

There is general agreement that the decision to initiate drug treatment in a patient diagnosed as hypertensive on the basis of measurements taken in the clinic will be greatly strengthened if the level of the mean daytime blood pressure on ambulatory measurement also remains persistently outside the limits defined as normal for this technique.¹ However, a more difficult management problem is presented when a diagnosis of 'white coat' hypertension is made, that is where the elevation in blood pressure is transient and confined to the period while the patient is in the surgery or hospital setting.¹¹ The observation that blood pressure measurement may trigger an alerting reaction and a pressor response in a patient has been made by several workers.¹²⁻¹⁴ Julius and colleagues reported that about 30% of subjects with borderline hypertension had high blood pressure readings in the clinic but normal readings at home.¹⁵ Pickering and colleagues found that 22% of 292 patients in whom borderline hypertension had been diagnosed had normal ambulatory blood pressures.¹⁶

The technique of ambulatory blood pressure measurement will enable the general practitioner to identify many patients with white coat hypertension. While there are as yet no results from controlled prospective morbidity and mortality studies on which to base clear guidelines, it is generally agreed that these patients do not require treatment with antihypertensive drugs, at least in the early stages.¹ Although the benefits to the patient in terms of saved drug costs and lack of side effects from such an

approach are considerable, white coat hypertension may not be a harmless condition¹⁷ and such patients should be followed up with annual or biannual blood pressure measurements and ambulatory blood pressure measurements as indicated; usually this would not be necessary more than once a year. Other risk factors such as smoking and hypercholesterolaemia should be assiduously monitored and managed where indicated.

Ambulatory blood pressure measurement also has a role in the follow up of treatment. Patients without evidence of target organ damage who have been previously investigated for a secondary cause of hypertension and in whom blood pressure remains high despite being on multiple medication, those with so-called 'resistant' hypertension, pose a difficult management problem. Some of these patients will have resistant hypertension and some may be non-compliant with therapy. However, a number will have an exaggerated white coat hypertension effect.^{18,19} As management decisions will have been based on transiently elevated clinic measurements, these patients are at risk of over-treatment. Unfortunately, the true prevalence of this condition in a general practice population is not known, as studies to date have been hospital based.^{18,19}

Patients with a past history of cardiovascular disease in whom excessive reduction of blood pressure may be harmful also represent a management problem. Of special concern in this context is the possibility that excessive drug induced reduction of nighttime blood pressure might impair coronary artery perfusion in patients with ischaemic heart disease.²⁰ These considerations make a cogent argument in favour of repeat ambulatory blood pressure measurement after treatment has been commenced, especially where there is a history of ischaemic heart disease.

While a number of large scale clinical trials have shown that the treatment of mild hypertension is of benefit to a population at risk,^{8,9} from the point of view of the individual patients these results are somewhat disappointing.²¹ The ultimate test of the clinical usefulness of ambulatory blood pressure measurement will be the degree to which it can be used to assess the risk of cardiovascular morbidity in an individual patient. A number of studies have demonstrated that ambulatory blood pressures correlate more closely than clinic pressures with several indices of target organ damage,²² and one large scale prospective study has shown this technique to be complementary to clinic measurement in predicting cardiovascular morbidity and mortality.²³ There is a need for further controlled prospective studies to address this question.

In conclusion, ambulatory blood pressure measurement has moved from the realms of the specialist centre to the clinical arena. With the greater access of general practitioners to accurate, properly validated machines, it is only a matter of time before the use of this technique in general practice becomes more widespread. While ambulatory measurement is of benefit in the diagnosis and management of mild to moderate hypertension, research must, nonetheless, continue as to how best it can be utilized.

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