

Ambulatory blood pressure measurement

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Twenty-four hour ambulatory recording of blood pressure has now come of age as a useful clinical technique in diagnosis, management and stroke prediction in hypertension. Of particular interest are the circadian and sleep variants observed. Drug therapy can be more accurately monitored using this technique but its greatest use may be in reducing the number of patients diagnosed as suffering from hypertension.

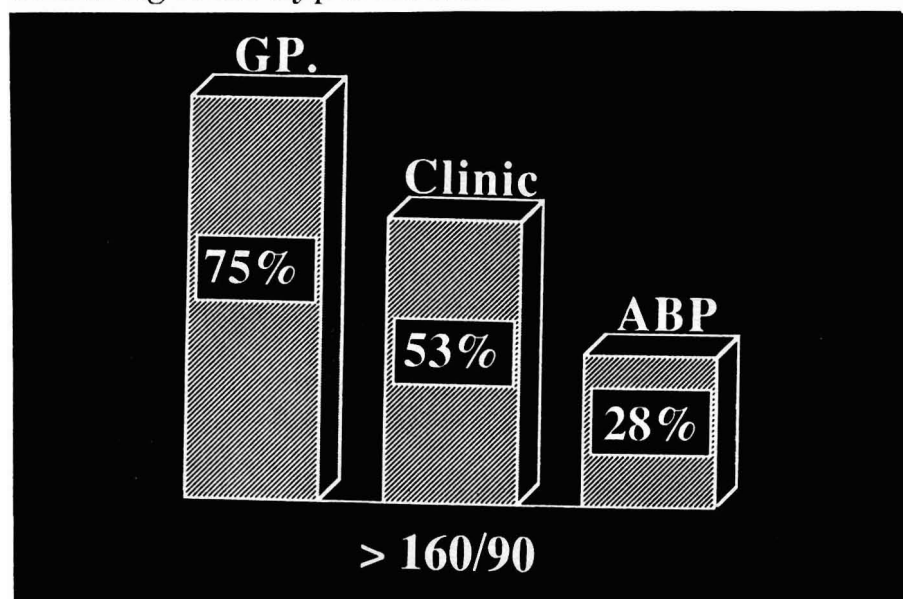


Figure 1. Diagnosis of BP.

Ambulatory blood pressure measurement, after 20 years of being confined to research laboratories, has now come of age as a valuable investigation in the clinical diagnosis and management of hypertension.

The first ambulatory recordings of blood pressure over a 24 hour period were made with a device that recorded the intra-arterial pressure. This necessitated leaving a fine catheter in the brachial artery throughout the day, and obviously this technique was confined to only a few research centres. However, the information obtained from ambulatory measurement with these devices was so revelatory that manufacturers were prepared to invest in the development of devices that would record ambulatory blood pressure non-invasively without the need for an intra-arterial catheter.

Day-time ambulatory blood pressure (ABP)

The first non-invasive device to be developed was known as the Remler. It was accurate and could

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when sleep disturbance complicates depression



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one or two 50mg capsules nocte trimipramine



simplifies treatment

Indications: Depressive illness, especially if accompanied by sleep disturbance, anxiety or agitation. **Contra-indications:** Recent myocardial infarction; heart block; cardiac arrhythmia; mania; severe liver disease; breast feeding. **Precautions:** Narrow angle glaucoma; prostatic hypertrophy; epilepsy; high suicidal risk patients; anaesthesia; use in pregnancy not recommended unless essential; withdrawal symptoms on abrupt cessation of treatment. **Side effects:** Sedation; dry mouth; impaired accommodation; tachycardia; constipation; micturition disturbance; potentiation of alcohol; sweating; postural hypotension; tremor; skin rash; impaired sexual function. Rarely, blood dyscrasia; cholestatic jaundice; hypomania; convulsions; peripheral neuropathy. **Dosage:** Mild/moderate depression — 75mg evenings or individual dose. Increase if necessary to 150-300mg/day. Reduce to normal maintenance level of 50-150mg/day. Elderly — initially 30-75mg in divided doses; increase cautiously. Half dosage usually sufficient. **Presentation:** 10mg to 25mg tablets, 50mg capsules. **PA:** 40/27. Surmontil is a trade mark of May & Baker Ltd. Further information is available from: May & Baker Ireland Ltd., 21 Cookstown Industrial Estate, Tallaght, Dublin 24. Tel: 01-510033. Telex: 30242 MANB EI.

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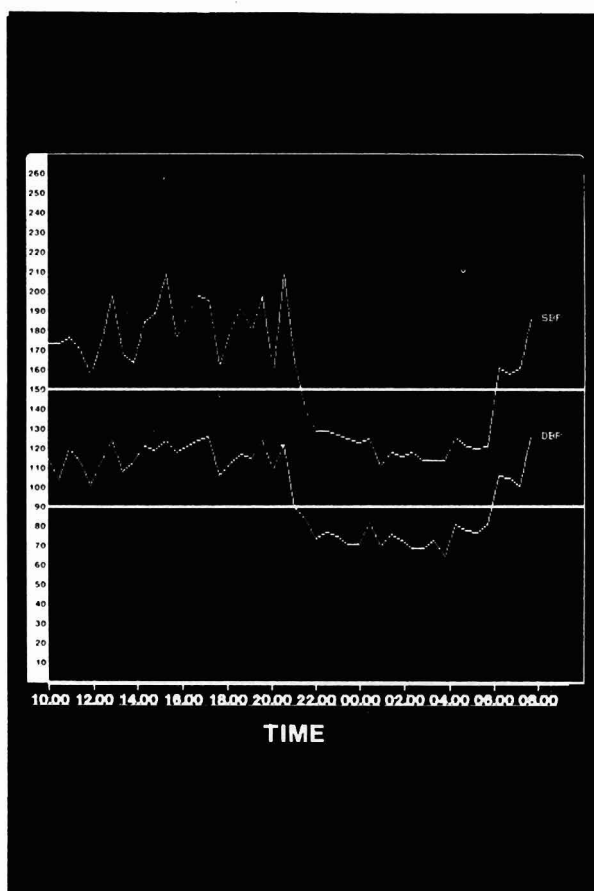


Figure 2.
Ambulatory Record.

measure pressures half-hourly during waking hours but as it depended on cuff-inflation by the patient it could not give night-time pressures.

We were so impressed by the additional information obtained with the Remler in hypertensive patients that we established the Ambulatory Blood Pressure Laboratory, staffed by a research sister and an engineer. This laboratory, which has been in existence for 10 years has tested eight ambulatory measurement systems for accuracy and we are presently analysing nearly 3,000 recordings of ABP in the computer data base – one of the largest series of ABP recordings in the world.

24 hour ABP

The next step in the development of ABP was the production of a fully automated device capable of automatically inflating the cuff so as to

provide night-time as well as day-time pressures. A variety of systems are now available for doing this and the additional information provides a much more detailed assessment of blood pressure behaviour in the hypertensive patient. Because we believe that night-time pressure is at least as important as day-time pressure we now record ABP over 24 hours in all patients.

In practice the patient comes to the Ambulatory Blood Pressure Laboratory between 9.00 and 10.00 a.m. The device is fitted, checked for accuracy, and the patient is given a few simple instructions by the laboratory sister and provided with a diary card in which to note activity at the time of recording. The patient leaves the hospital to return to work or home, and the device records blood pressure automatically every thirty minutes throughout the 24 hours. The

patient takes the device off the next morning and returns it to the laboratory where it is decoded by computer and a printout is obtained plotting the systolic and diastolic pressures over 24 hours, as well as providing statistical data on the mean day-time and night-time pressures, the highest pressures and the lowest pressures.

The value of ABP

ABP is radically changing the standard approach to the diagnosis and management of hypertension for one fundamental reason: it is not logical to make recommendations – often life-long – on casual blood pressure measurement obtained under, what many patients perceive to be stressful circumstances. Even when pressure measurements are repeated by the doctor it is often not possible to remove the anxiety induced element of measurement that the Americans so aptly called “white coat hypertension”. ABP is of the greatest value in the following circumstances:

Diagnosis of hypertension:

We are all familiar with the patient, often young, who has borderline elevation of blood pressure – 160/90mmHg one day, 135/80mmHg, the next. Such people are often anxious and if a job, or mortgage, depends on the outcome of the examination a vicious circle is established whereby further anxiety further raises the blood pressure. ABP quickly resolves this problem. Characteristically the first few readings of the day from such a patient show borderline elevation of blood pressure similar to that seen with routine measurement, but once the subject has become accustomed to the device, pressures quickly settle to the normal range, and the overall mean pressures for the 24-hour period are normal.

The illustration shows that if we apply the WHO classification of hypertension as a pressure greater than 160/90mmHg there are re-

markable differences in the rate of diagnosis between doctor recorded pressures (family practitioner and hospital clinic) and pressures recorded by ABP. In 2000 patients, 75% would have been diagnosed hypertensive in the general practitioner's surgery, 53% in the hospital clinic, and only 28% if ABP is used for making the diagnosis (Figure 1). The implications of this finding in terms of overdiagnosis and treatment are obvious.

Assessing treatment:

ABP provides an assessment of the efficacy of drug treatment in hypertensive patients over 24 hours. Knowing the time of ingestion of the drug(s) it is a simple matter to judge how long it takes for the drug to become effective and how long the effect lasts. This information is helpful in deciding if treatment is being effective, and if it is needed once or more during the day.

We now know that most (but not all) patients with hypertension have a nocturnal fall in blood pressure as part of the circadian rhythm. This fall may be as much as 20mmHg for systolic pressure, and obviously in those patients with a marked nocturnal fall, we need only direct therapy to reducing day-time pressures. In fact, there is now some evidence that it may be dangerous in the face of a substantial nocturnal fall to reduce night-time pressure further with drug treatment.

Cost saving implications of ABP:

Considerable financial savings in drug prescribing may be made (i) if fewer patients are started on drug therapy, and (ii) if less drugs are needed for those patients who do require therapy. Moreover, the less drug administered, the fewer the adverse effects. Against such savings must be balanced the cost of ABP which has been very expensive during the research phase. However, cheaper recorders are now becoming available and the

cost will obviously decrease with wider use. ABP measurement at present costs IR£100 – IR£150 per recording. However, when this cost is balanced against the potential saving in drug costs, as well as the additional information obtained on the severity of the patient's blood pressure, its variability and circadian rhythm and the response to treatment, it may be seen as a reasonably priced investigation.

Prognostic value of ABP:

There is now good evidence that ABP is a better predictor of cardiovascular mortality than casual blood pressure measured in the surgery or clinic. The Blood Pressure Unit is participating in two multicenter European studies aimed at assessing the prognostic role of ABP.

In one study hypertensive patients of all ages will be randomly allocated to management by either office blood pressure or ABP and the morbidity of the two groups will be compared over a number of years. Of equal interest will be the differences in drug prescribing and the quality of life between the two groups. The second study – the SYSTEUR Study – will assess the role of ABP in elderly patients with systolic hypertension.

An analysis of 24 hours recordings from our data base shows that most patients with hypertension have a nocturnal fall or dip in blood pressure ("dippers") but about 20% of hypertensive patients do not have this fall ("non-dippers") (Figure 2). In these patients the incidence of stroke is higher than in the "dippers", and we are now attaching considerable importance to the night-time pressure as a possible predictor for stroke in hypertensive patients.

Research applications of ABP:

For the sake of completeness mention should be made of the many research application of ABP, of which the most important is the assessment of the efficacy of new antihypertensive drugs. ABP shows

the time of onset of drug effect and provides what was never possible with conventional measurement techniques, namely an assessment of the duration of drug effect.

In conclusion ABP has a number of applications in hypertension, but its greatest practical relevance is that it reduces the number of patients diagnosed as hypertensive and so the medication given to those needing treatment may be accurately assessed to ensure that excess drugs are not prescribed.

PRACTICAL POINTS

- Ambulatory blood pressure measurement has now come of age.
- ABP is radically changing the standard approach to the diagnosis and management of hypertension.
- There are remarkable differences in the rate of diagnosis between doctor recorded pressures and pressures recorded by ABP.
- ABP provides an assessment of the efficacy of drug treatment.
- It may be dangerous in the face of a substantial nocturnal fall to reduce night-time pressure further with drug treatment.
- ABP is a better predictor of cardiovascular mortality than casual blood pressure measured in the surgery or clinic.
- ABP provides what was never possible with conventional measurement techniques, namely an assessment of the duration of drug effect.