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CLINICAL VALUE OF AMBULATORY BLOOD PRESSURE MONITORING

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Introduction
Initially reserved for research purposes ambulatory blood pressure monitoring (ABPM) has gradually entered the standard medical practice and has now become a widely used clinical tool both for diagnostic purposes and for assessment of treatment efficacy.

Technical aspects
The number of devices available for ABPM continues to increase. Both devices based on auscultatory and devices based on oscillometric methods are available. In order to be acceptable for practical use, however, a device must have been validated according to international protocols (1, 2). One of these protocols has been described by the Working Group on ABPM of the European Society of Hypertension (3).

All ABPM devices available for practical use allow BP to be only intermittently sampled. Different sampling intervals can be adopted, although it is desirable not to exceed 20-30 minutes to avoid incorrect estimates of 24h, day or night time BP values (4). The common habit to make the sampling intervals longer at night than during the day to avoid disturbance of night sleep has little objective basis (5) and may lead to errors in estimating average night-time BP. Before starting the monitoring it is advisable to compare some values with those taken from the contra-lateral arm to ensure that differences do not exceed ±5 mmHg. Patients must also be instructed to avoid strenuous exercise and to keep note of unusual events and quiresty/duration of night sleep (6).

Diagnostic use
Evidence is available that 24h, day or night-time average BP values correlate with sub-clinical organ damage more closely than office values (7). Evidence is also available that 1) in populations and in hypertensive patients the same ambulatory values are more predictive of cardiovascular risk than office values (8-11) and 2) in hypertensive patients improvement of a clinically important organ damage (left ventricular hypertrophy) is more closely related to treatment-induced changes in average ambulatory than office BPs (12). This justified the increasing use of ABPM for diagnostic purposes (13). In doing so, however, it should be kept in mind that in the population ambulatory blood pressure values are much lower than the corresponding office values. Based on cross-sectional population studies (14) the upper normality limit for 24h average blood pressure (i.e. the value corresponding to office values of 140/90 mmHg), approximately correspond to 24h averages values 125/80 mmhg (15).

Isolated office (white coat) hypertension
Continued use of office and ambulatory blood pressure measurements has allowed to identify a condition characterized by a persistently elevated office blood pressure and a persistently normal ambulatory one (18). Most data indicate this condition (which occurs in about 10% (19) of the population) to represent a lesser cardiovascular risk than the condition characterized by both an office and an ambulatory blood pressure elevation. Conflicting data about prevalence of organ damage, cardiovascular risk and proneness to future hypertension make it still uncertain whether it represents a truly innocent phenomenon or not, however (19-33). This suggests that caution should be used when deciding whether these patients should or should not be treated. Non-drug treatment should always be implemented and drugs used in case of organ damage or an otherwise high risk profile. If treatment is not started a close follow-up is recommended. It is also recommended that patients having a 24h blood pressure greater than office blood pressure are identified because some studies suggest to be at high risk.

Masked hypertension (reverse white coat hypertension)
In reference to AMBP and home blood pressure measurement, it is possible to individualize patients whose BP values are abnormal in the office and normal outside the office. Recent epidemiological prospective studies suggest that this state might be an independent predictor of cardiovascular morbidity (30,34-39).

Clinical use of blood pressure values within the 24 hours
Several blood pressure values within the 24 hours have been given clinical importance.
Morning blood pressure use
Blood pressure shows a steep rise from the asleep to the awake state and its resumption of physical activity. The only evidence that this phenomenon has clinical importance stands on its association with a morning peak incidence of coronary heart disease and stroke (40), although in both instances a concomitant increase in platelet aggregability and reduction in fibrinolytic activity may play a role (41). It seems nevertheless advisable for the physician to ensure that antihypertensive treatment lower blood pressure after arousal with no escape from the reduction seen in the remaining 24h time.
Dipping and non-dipping
Blood pressure falls at night but more so in some subjects than in others. This has led to the subdivision of hypertensive patients into dippers and non-dippers, based on a nocturnal blood pressure fall greater or less than 10% of the daytime values, respectively (40, 41). This has drawbacks because the magnitude of night-time hypotension is poorly reproducible (42) (in relation to differences in sleep quality/depth) and a 10% cut off value is arbitrary (14).

Yet, several studies have shown night-time blood pressure to be related to organ damage and cardiovascular risk (43-51) and some have reported a superior prognostic value of nocturnal vs diurnal blood pressures (9). Although in most hypertensives day and night blood pressure values and changes with treatment are closely related (12, 42, 52, 53). In the clinical practice ambulatory blood pressure monitoring should definitely include the night period and treatment should ensure that both day and night time blood pressure values are reduced. Attention should be given to patients in which the night is associated with no reduction or even an increase in blood pressure because (provided that a sleepless night is excluded) this suggests the existence of a marked degree of vascular organ damage autonomic dysfunction and hypertension severity. Attention should also be given to subjects with a very pronounced reduction in night-time blood pressure (>20%, so-called extreme dippers) because of the possibility that this leads to brain under-perfusion, particularly if a further blood pressure fall is produced by treatment (54).

Blood pressure variability

Evidence is available that for a given increase in blood pressure, organ damage and prognosis are worse in the presence of a greater 24h blood pressure variability (56-59). However, this measure is still in a research phase and should not yet be used for classification of patients' risk and assessment of efficacy of treatment.

Efficacy of antihypertensive treatment

ABPM has drastically improved the ability to assess the efficacy of antihypertensive treatment both in clinical studies and in medical practice (60-62). In clinical trials advantages such as a greater reproducibility, the lack of placebo effect and the absence of an alerting-dependant pressure response (63) makes ABPM the ideal approach to quantify the antihypertensive effect of new antihypertensive drugs drug combination or non pharmacological measures. It makes also possible to study how suitable and consistent an antihypertensive effect is between two drug doses by indices such as the trough-to-peak ratio and the smoothness index (62-64). To some extent this is also possible in the medical practice if ABPM is performed before and during treatment. A limitation, however, is that the blood pressure values to be reached by treatment in relation to the office blood pressure targets with documented protective properties are still incompletely known.

Conclusions

ABPM has opened new horizons for hypertension research and its progressively large use has had a positive impact on clinical practice. Its adoption can thus be recommended when facilities are available. Further research is needed, however, to obtain information on issues still not clear: Among them ambulatory blood pressure variability and targets by treatment, clinical importance of isolated clinic or white coat hypertension and relative value of information obtainable by blood pressure patterns within the 24 hours.

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