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AMBULATORY BLOOD PRESSURE MONITORING: THE NEED OF 7-DAY RECORD

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A b s t r a c t

The need for systematic around-the-clock self-measurements of blood pressure (BP) and heart rate (HR), or preferably for automatic monitoring as the need arises and can be met by inexpensive tools, is illustrated in two case reports. Miniaturized unobtrusive, as yet unavailable instrumentation for the automatic measurement of BP and HR should be a high priority for both government and industry. Automatic ambulatorily functioning monitors already represent great progress, enabling us to introduce the concept of eventually continuous or, as yet, intermittent home ABPM. On BP and HR records, gliding spectra aligned with global spectra visualize the changing dynamics involved in health and disease, and can be part of an eventually automated system of therapy adjusted to the ever-present variability of BP. In the interim, with tools already available, chronomics on self- or automatic measurements can be considered, with analyses provided by the Halberg Chronobiology Center, as an alternative to "flying blind", as an editor put it. Chronomics assessing variability has to be considered.

K e y w o r d s

Blood pressure, Ambulatory monitoring, Antihypertensive therapy

INTRODUCTION

Physiological genomics becomes chronomics, as soon as time-unqualified spot checks are replaced by properly analysed time series. Time structures rather than spot checks of clocks may be better related to the details of the genome. The mapping of our psychology reveals different spectral prominences for our good and bad mood (*1*). There remains the urgent question whether much longer cycles of a half-year or a year and even longer ones of decades differ in their length or in their time course as a function in part of extrinsic factors. An effect of the cosmos upon us has been long claimed but is difficult to rigorously document, e.g., by the study of marriages and divorces (*2*), that lead to clues of the mechanisms of the "good and bad" of society. BIOCOS (*3*) endeavours to resolve and then integrate what we do

NEED FOR LONG-TERM SURVEILLANCE:
TREATMENT CHANGES SYSTOLIC (S) CHAT*
INTO TRANSIENT S-CHAT**
WHICH LATTER APPEARS AFTER A WEEK

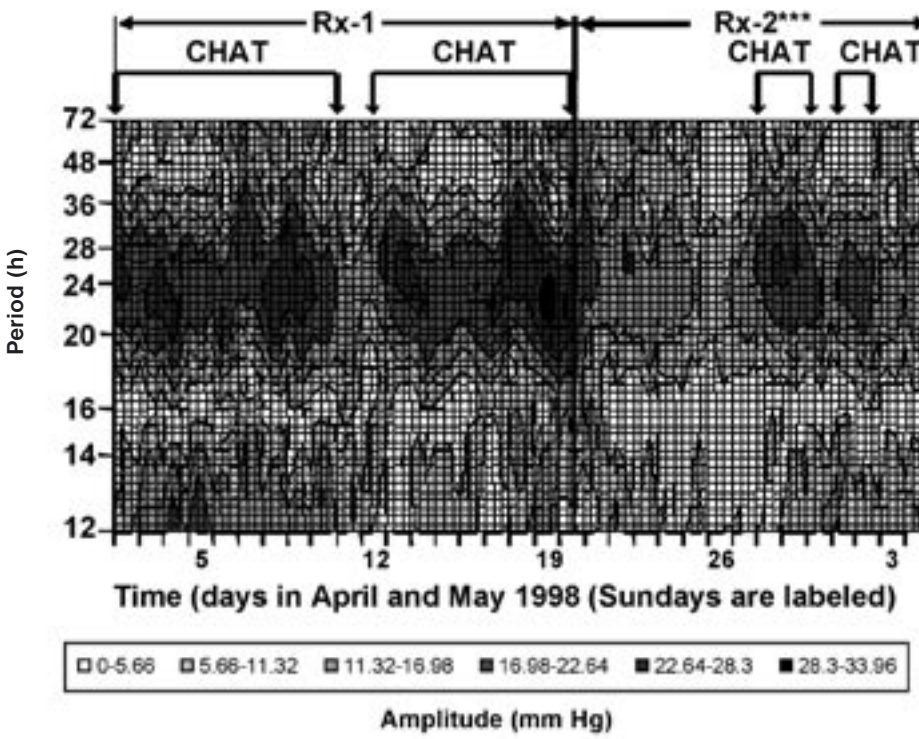

Fig. 1

*CHAT: Circadian Hyper-Amplitude Tension,
**In GK, 72-year old man, whose blood pressure was measured at mostly 30-minute intervals, and analyzed as a moving spectrum in separate 48-hour intervals, displaced in 8-hour increments through the data set.
***Rx-1: Nifedipine 2 x 10 mg at 8 a.m. and 8 p.m.; Rx-2: Diltiazem 3 x 90 mg at 10 a.m., 3 p.m. and 8 p.m.

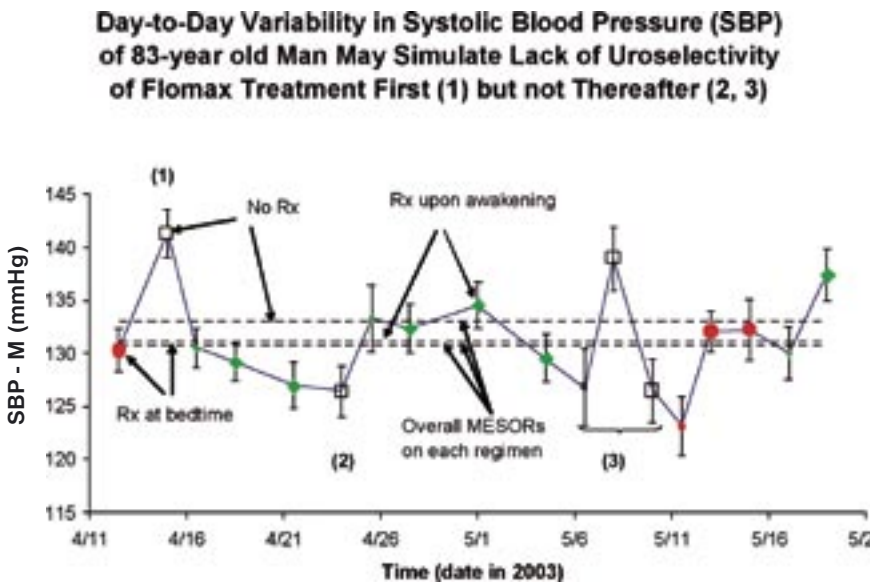

Fig. 2

Day-to-day variability in systolic blood pressure (SBP) of 83-year old man may simulate lack of uroselectivity of Flomax treatment first (1) but not thereafter (2,3)

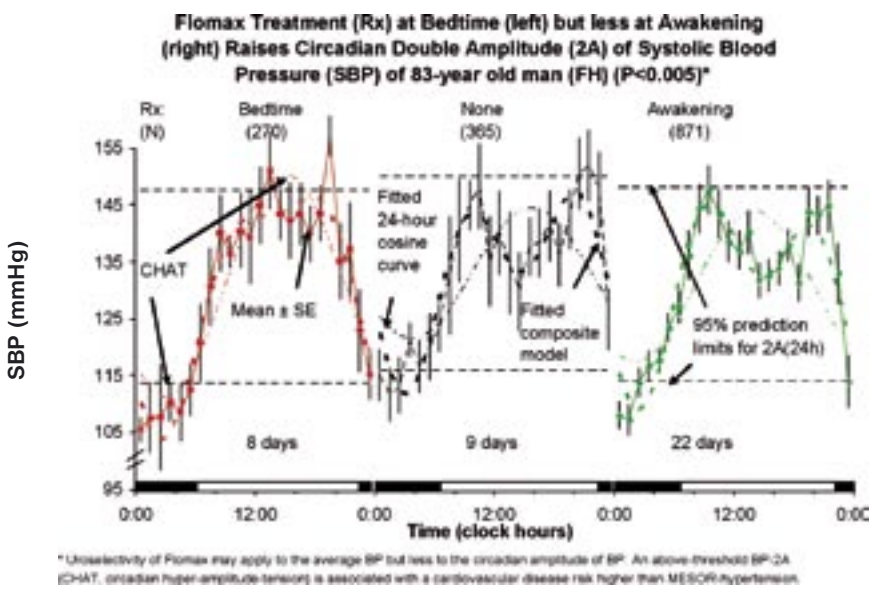

Fig. 3

Flomax treatment (Rx) at bedtime (left) but less at awakening (right) raises circadian double amplitude (2A) of systolic blood pressure (SBP) of 83-year old man (FH) (P<0.005)

within a day or within a week or within longer spans, as this is reflected in blood pressure, heart rate or the beat-to-beat ECG, and in mood rhythms. Thus we arrive at a much broader time horizon for treatment by the new science of chronomics (*4*). Only first halting steps, from timing aspirin (*5*) to combining it with other drugs (*6*), have been accomplished as yet.

MATERIALS AND METHODS

GK is a MESOR-hypertensive man with intermittent CHAT, brief for Circadian Hyper-Amplitude Tension, a condition characterized by an excessive circadian BP amplitude, representing a high vascular disease risk. He was 72 years of age at the start of monitoring. GK's record covers about 5 years during which anti-hypertensive medication was adjusted in view of about-weekly analyses of the data.

FH is an 83-year-old man with coronary artery disease. The data examined herein cover the span between 11 April and 20 May 2003 during which the timing of 0.4 mg Flomax (tamsulosin HCl, an $1A^{-\alpha}$ adrenoceptor antagonist taken for treating benign prostatic enlargement) alternated between bedtime (BT) (8 days in 2 spans) and awakening (AW) (22 days in 3 spans). Monitoring was also carried out while abstaining from taking this medication (9 days in 3 spans).

Both men measured their BP and HR around the clock at 30-min intervals with an ambulatory monitor (TM-2421) from the A&D Company (Tokyo, Japan), with interruptions. The reliability of this monitor had been tested (*7*). The oscillometric readings were used for analysis. The data were analysed by cosinor (*8, 9*) and gliding spectra (*10, 11*). Parameter tests (*12*) were used to compare the cosinor-derived circadian parameters of BP and HR of FH among the three kinds of Flomax treatment.

RESULTS

Fig. 1 shows an about-monthly record of systolic BP from GK as a gliding spectral window. Along the amplitude scale, the three darkest shadings indicate the presence of CHAT. It can be seen that CHAT is nearly continuously present during the first part of the record, before treatment was changed. Whereas the change in treatment is followed by a respite, CHAT can be seen to occasionally occur thereafter. The combination of a gliding spectral window aligned with a global spectral window of another 2-month span presented elsewhere (*13*) supports the diagnosis of intermittent CHAT. Continued monitoring in such a case is recommended, so that treatment can be continuously adjusted as need be in view of the monitoring results.

A large day-to-day variability in circadian parameters notwithstanding (*Fig. 2*), a lack of an overall statistically significant difference exerted by the treatment with Flomax on the MESOR of BP is in keeping with the reported uroselectivity of Flomax (*14*). Flomax was found, however, to be associated with an increase in the circadian amplitude of BP when taken at bedtime (SBP: $P<0.005$; DBP: $P<0.05$), *Fig. 3.* Iatrogenic CHAT, posing a potential increase in cardiovascular disease risk in patients with an already large, albeit not necessarily excessive BP swing, was induced in the case of FH at a time of concern for the need of major surgery of a family member and during the immediate post-operative span of that family member. No overall difference in the circadian amplitude of BP was noted, however,

when Flomax was taken upon awakening, as compared to abstaining from taking Flomax (P>0.50), *Fig. 3*. During the years investigated, FH took an occasional tablet of 90 mg diltiazem hydrochloride to adjust his BP MESOR according to weekly sphygmochrons. Just as self-monitoring of blood glucose is considered mandatory for managing insulin therapy for diabetes (*15*), so is BP self-monitoring for adjustment of anti-hypertensive medication.

DISCUSSION

In view of the large variability in BP in health and MESOR-hypertension, not only within a day, but also from one day to another, monitoring for 7 days at the outset has been recommended, while continuous monitoring is preferred whenever possible, once the need for treatment is established and validated as-one-goes. Adjustments in treatment as well as in treatment timing can thus be implemented in a timely fashion in order to eliminate any abnormality in BP as well as in BP variability.

A c k n o w l e d g e m e n t

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AMBULANTNÍ MONITOROVÁNÍ KREVNÍHO TLAKU: POTŘEBA SEDMIDENNÍHO ZÁZNAMU

S o u h r n

Potřeba systematického měření krevního tlaku (TK) a srdeční frekvence (SF) na sobě dvacet čtyři hodin nebo lépe automatického monitorování krevního tlaku vzrůstá a může být i finančně málo náročná, jak ukazují dva příklady kazuistiky. Miniaturní neobtěžující, dosud nedostupné zařízení pro měření TK a SF by se mělo stát prioritou pro vlády a průmysl. Automaticky fungující ambulantní monitory, které znamenají velký pokrok, nám umožňují zavedení koncepce eventuálně kontinuálního nebo jako dosud intermitentního ambulantního domácího monitorování krevního tlaku. Klouzavá spektra ze záznamů TK a SF spolu s globálními spektry vizualizují měnící dynamiku, která se uplatňuje ve zdraví a nemoci, a mohou být součástí eventuálně automatického systému terapie upravené podle stále přítomné variability krevního tlaku. Mezi tím s nástroji, které jsou k dispozici, chronomika založená na měření na sobě nebo automatickém měření může být považována spolu s analýzami poskytovanými Halbergovým chronobiologickým centrem za alternativu k „letu do neznáma", jak dosavadní způsob charakterizoval jeden editor. Chronomiku hodnotící variabilitu je nutné vzít v úvahu.

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