

CIRCADIAN AND CIRCASEPTAN COMPONENTS OF BLOOD PRESSURE AND HEART RATE DURING DEPRESSION

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A b s t r a c t

Associations between blood pressure and heart rate on the one hand and mood and sleep/wakefulness on the other hand are examined herein. For this purpose, a longitudinal record from a patient with bipolar II disorder is analyzed by chronobiologic methods with focus on the about-daily (circadian) and on the about-weekly (circaseptan) components.

Key words

circadian rhythm, circaseptan rhythm, blood pressure, heart rate

Abbreviations

MESOR midline-estimating statistic of rhythm, 2A - double amplitude (measure of the extent of predictable change within a cycle)

INTRODUCTION

Circadian desynchronization of urinary 17-ketosteroid excretion has been reported in bipolar alternating mania and depression (1, 2). A desynchronization of the sleep/wake cycle, body temperature, and cortisol, has also been reported (3). Light treatment as a means to advance the circadian sleep/wake cycle has been useful as an anti-depressant (3). *Kripke et al.* (4) have also reviewed the effect of anti-depressant drugs from the viewpoint of a putative circadian pacemaker, which may well act upon the adrenal, in part via a multiple interaction including three or more rhythmic entities (feedsideways) (5). A longitudinal approach was appealing to separate effects upon the phase and/or period of the circadian system and to check on other spectral components, notably the about-monthly (circatrigintan) and the about-weekly (circaseptan) components. Circaseptans are often found in relation to the pineal gland (6), which in turn is thought to play a major role in depression (7).

In this study, blood pressure (BP) and heart rate (HR) were used as physiological markers, since these variables are easily monitored automatically

around the clock over prolonged spans. Alterations in the phase relation between these two variables had been observed in association with an episode of depression in an otherwise clinically healthy woman studied in isolation from society (8, 9). The latter study also revealed that a lengthening of the sleep/wake cycle preceded the episode of depression (8, 9). Furthermore, a link between the circatrigintan and circaseptan components was suggested (9).

SUBJECT AND METHODS

A 41-year-old woman diagnosed at 35 years of age with bipolar II disorder, and treated mostly with lithium, nardil, and exposure to full-spectrum light, automatically measured her systolic (S) and diastolic (D) BP and HR around-the-clock at 30-min intervals with an ambulatory monitor (ABPM-630 from Colin Medical Instruments, Komaki, Japan). She also self-rated her mood several times a day and recorded her sleep/wake schedule. Her record covering the span from September 29 to December 2, 1997, was analyzed by chronobiologic serial section, least-squares spectrum and other rhythmometric procedures (10, 11). Circadian characteristics of BP and HR were estimated daily, including the MESOR (midline-estimating statistic of rhythm), a rhythm-adjusted mean; the double amplitude (a measure of the extent of predictable change within a day), and the acrophase (a measure of the timing of overall high values recurring each day). These circadian characteristics were linearly regressed with mood and sleep duration (12).

RESULTS

As illustrated for SBP and HR in *Figs. 1 and 2*, respectively, a circadian rhythm is almost invariably demonstrated. Although the circaseptan component is not as prominent as the circadian variation, this component can also be determined with statistical significance for large portions of the monitoring span, as shown in *Figs. 3 and 4* for SBP and HR, respectively. It can be seen from *Figs. 3 and 4* that BP usually peaks around mid-week, whereas the circaseptan acrophase of HR tends to occur earlier and earlier throughout the recording span, suggesting that HR may free-run with a period slightly shorter than 7 days.

In keeping with earlier literature reports, the sleep duration was longer when mood ratings were lower ($r=-0.439$; $P=0.001$). Larger mood swings (gauged by the standard deviation) were also associated with lower mood ratings ($r=-0.442$; $P=0.001$). The MESOR of BP was found to be lower when mood ratings were lower (SBP: $r=0.563$; $P<0.001$; DBP: $r=0.491$; $P<0.001$). A delay in the circadian acrophase of both BP and HR tended to be associated with lower mood ratings (SBP: $r=0.264$; $P=0.053$; DBP: $r=0.233$; $P=0.089$; HR: $r=0.263$; $P=0.055$) and with a longer sleep duration (SBP: $r=-0.329$; $P=0.017$; DBP: $r=-0.326$; $P=0.018$; HR: $r=-0.416$; $P=0.002$).

During a 2-week episode of depression (November 8-22, 1997), the circaseptan component was amplified, as ascertained by parameter tests (13) in comparison with another comparable 2-week span (October 23-November 5, 1997), randomly picked during the span preceding the depression episode ($P<0.02$). Stable and consistent components with trial periods of about 735 hours (30.5 days) and of

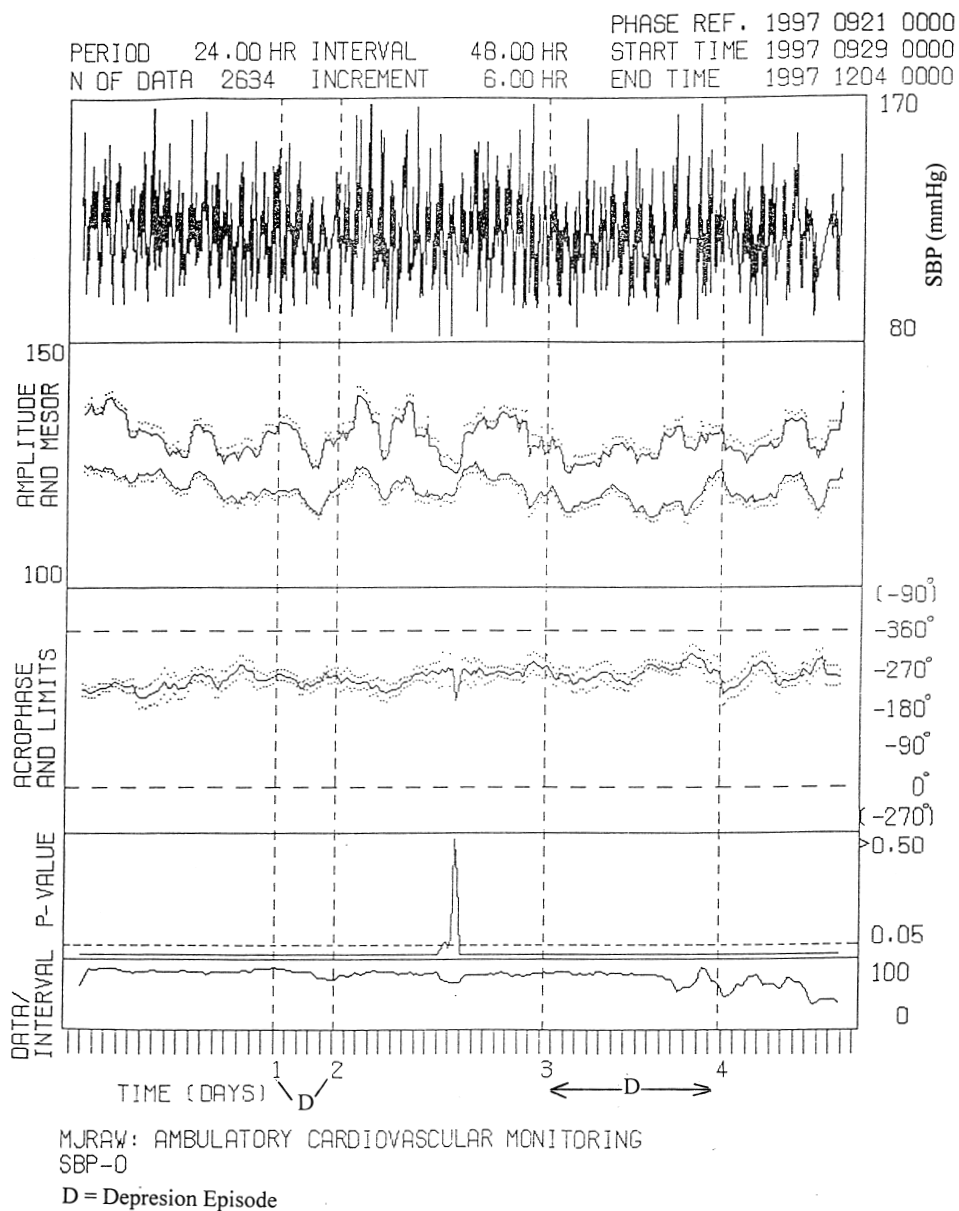


Fig. 1.
 Circadian rhythm of systolic blood pressure (SBP, mmHg)

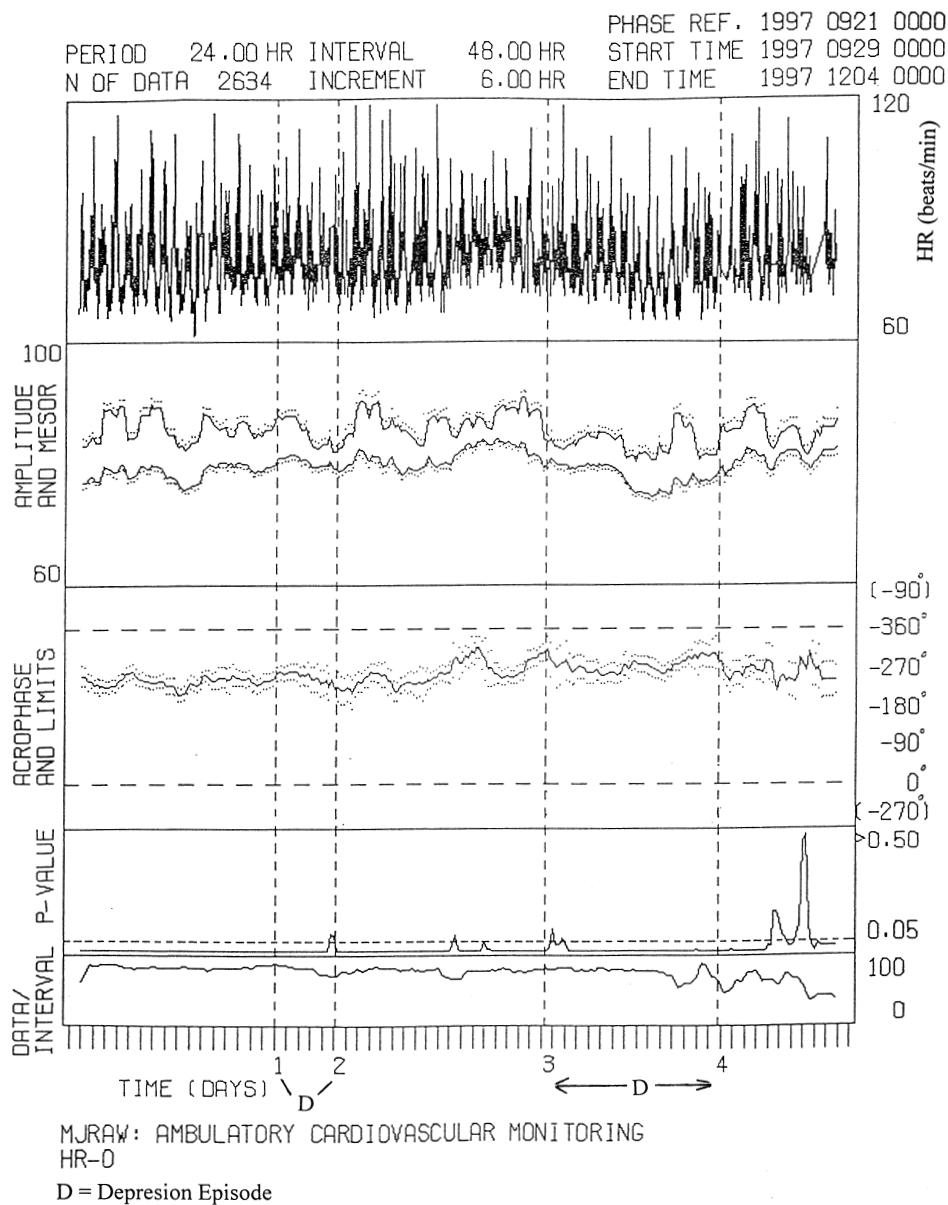
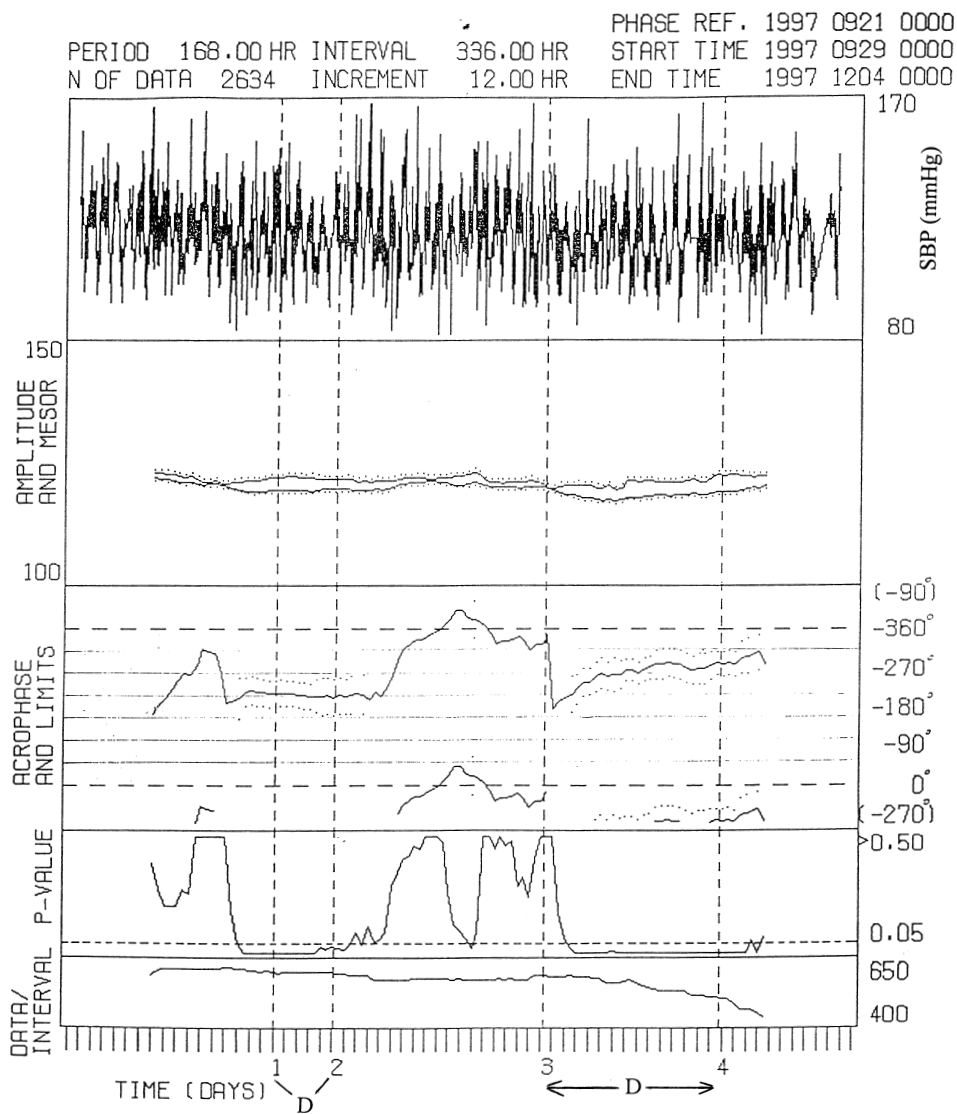


Fig. 2.
 Circadian rhythm of heart rate (HR, b.p.m.)



MJRAW: AMBULATORY CARDIOVASCULAR MONITORING
 SBP-0

D = Depression Episode

Fig. 3.
 Circaseptan rhythm of systolic blood pressure (SBP, mmHg)

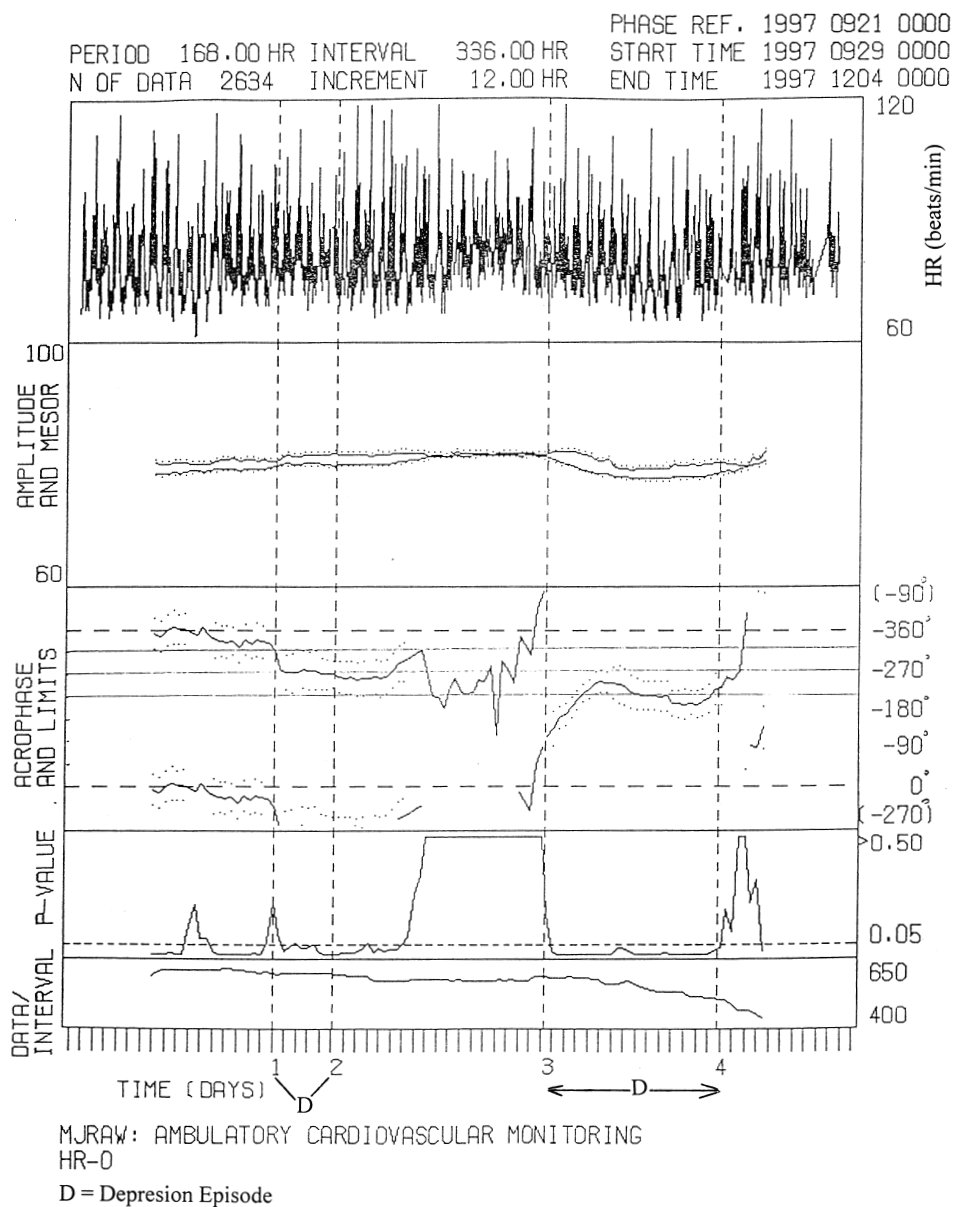


Fig. 4.
 Circaseptan rhythm of heart rate (HR, b.p.m.)

about 267.3 hours (11.2 days) are detected in the least-squares spectra of all 5 mood scales. These components are likely related to the subject's menstrual cycle. The about 11.5-day component of mood appears to gain in intensity around October 17 and again around November 8, times corresponding approximately to the beginning of depression episodes, while in the absence of depression, the anticipated circadian and circaseptan components gain in prominence, as revealed in a moving periodogram (not shown).

DISCUSSION

It has been postulated that the noradrenergic function may be altered in depressive illness, thereby contributing to a decreased pineal production of melatonin (14). A negative association has also been found between urinary melatonin and a depression score (7). The period is eminently circaseptan as well as circadian periodic (6). If the pineal is involved in mechanisms underlying depressive disorders, further attention to the circaseptan component of the chronome (time structure) may be warranted to further the understanding of the etiology of the disease and to optimize treatment schedules.

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CIRKADIÁNNÍ A CIRKASEPTÁNNÍ KOMPONENTA KREVŇÍHO TLAKU A SRDEČNÍ FREKVENCE U DEPRESE

S o u h r n

Studie je zaměřena na vyšetření vztahů mezi krevním tlakem a srdeční frekvencí na jedné straně a stavem psychiky a poruchami stavů spánku a bdění na druhé straně. Za tímto účelem je analyzován záznam u nemocného s bipolární poruchou II chronobiologickými metodami se zaměřením na cirkadiánní a cirkaseptánní rytmy.

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