34) Differences between SHR and WKY in Circadian Variability of BP, Heart Rate and Activity.

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To assess the effects of age and genetic strain on circadian characteristics of BP, HR and activity in spontaneously hypertensive rats (SHR) and in Wistar Kyoto rats (WKY). Eight-weeks old male SHR ($n=5$, $wt.=214\pm16g$) and WKY ($n=5$, $wt.=206\pm11g$) were studied using an implanted radio-telemetry device (Multipuls, Dataquest IV, Data Science Inc, U.S.A.). The catheter and pressure sensor were inserted into the descending aorta and the battery powered implant was left in the intraperitoneal cavity. BP, HR and activity were monitored for 7 weeks continuously every 5 min, and were analyzed using conventional statistical methods and the cosinor method. The circadian amplitude was calculated as half the difference between the highest and the lowest point in the circadian rhythm defined by a cosinor model. The acrophase was calculated as the timing of the highest point in the circadian rhythm obtained from cosinor analysis. Rats were allowed to recover for 1 week after the operation. Rats were studied in a quiet testing room under fluorescent light between 06:00 and 18:00 hours.

BP, HR and activity were higher during the night time than during the daytime in both strains of rats except at 9 weeks of age. In some rats, BP showed a circaseptan (about weekly variation) rhythm. BP, HR and activity level showed a similar circadian variation. Activity level correlated with BP and HR. Systolic BP (SBP), Diastolic BP (DBP), HR and activity were significantly higher in SHR than in WKY. With aging in SHR, SBP, DBP and activity significantly increased, and HR significantly decreased. Whereas in WKY, SBP, DBP and HR were significantly decreased with aging. Circadian amplitude of SBP was higher in SHR than in WKY after 13 weeks. There were no significant differences in circadian peak in these parameters between SHR and WKY.

Aging caused no phase lag of circadian BP rhythm in SHR or WKY. 24-hour mean BP elevation preceded the increase of circadian amplitude of BP in SHR.

When the activity level was compared to BP and HR, a similar variation was observed. Circadian variation of Activity level correlated with BP and HR. The circadian blood pressure rhythms are determined by exogenous factors (physical activity) and endogenous factors (endocrine hormones). Activity has a potent hypertensor effect, but its effect lasts only for a short time. On the other hand, hormones have a less potent hypertensor effect but this effect lasts throughout the day. In the active night time, BP is strongly affected by activity and becomes higher than the levels during sleep. Because activity level was significantly higher in SHR than in WKY, BP was significantly higher in SHR than in WKY.

Conclusions: The evaluation of the BP data requires consideration of the both short and long term variability. It is necessary to monitor BP chronically using telemetry method. This method is superior to the other methods for the identification of cardiovascular risk and for evaluation of antihypertensive treatment.