Charlotte Hadtstein
Dr.med.

Home and ambulatory blood pressure monitoring in the improved assessment of hypertension, circadian and ultradian blood pressure variability in children with chronic renal failure

Geboren am 07. Juni 1978 in Leverkusen
Bachelor of Medicine und Bachelor of Surgery am 23.12.2002 an der Universität Cambridge, England

Promotionsfach: Kinderheilkunde
Doktorvater: Prof. Dr. med. F. Schaefer

This study set out to investigate new perspectives on both home blood pressure measurement (HBP) and ambulatory blood pressure monitoring (ABPM) in the care of children with chronic renal failure (CRF).

Because previous studies in children have only addressed the question of the validity of HBP instruments, the actual precision and accuracy when used away from the supervision of a health-care professional was assessed in a large group of pediatric CRF patients. HBP showed a higher specificity than clinic BP (CBP) in detecting true hypertension and, unlike CBP, did not overestimate BP in the higher ranges. The accuracy and precision of HBP improved with the pooling of multiple measurements and remained consistent when used over an extended time period. However, a systematic mean difference to CBP and ABPM suggests that the use of specific reference values would be desirable, and might indeed improve the moderate sensitivity of HBP.

In order to evaluate the potential of Fourier analysis of ABPM in children with CRF, normative data was first established in a large cohort of healthy school children. The amplitude and acrophase were determined for the circadian and three ultradian rhythms which are calculated as harmonic cosine curves. The majority of controls showed a circadian rhythm, and one out of three additional ultradian rhythms could be identified in two thirds of healthy children. Ultradian rhythms were more pronounced than those found in adults. There was remarkable coupling between BP and HR rhythms of the same period length and among the amplitudes of the ultradian rhythms. Especially the ultradian rhythms underwent marked changes with the onset of puberty; this might relate to changes in both exogenous influences and the endogenous cardiovascular regulation during puberty.

Children with CRF displayed marked blunting of both the circadian and ultradian cardiovascular rhythms. The novel finding of disturbed ultradian BP amplitudes in disease and their correlation with indices of renal damage, together with their higher prevalence, suggests a link to physiological control mechanisms disturbed early on in CRF, such as the sympathetic nervous system. Children who displayed 24- or 12-hour cardiovascular rhythmicity had lower serum calcium levels than their peers who did not have significant rhythmicity; this might represent the influence of serum calcium on smooth-muscle excitability or the integrity of endogenous rhythmic control of serum calcium homeostasis. Changes in ultradian rhythms appeared to be independent of circadian changes and more conventional dipping parameters, neither of which correlated to renal function either. Therefore, the determination of ultradian rhythms in ABPM profiles might provide additional information about cardiovascular dysregulation in CRF that is not picked up by conventional analysis of BP and HR variability.