

## Herzfrequenzvariabilität und therapeutische Ansätze bei MODS-Patienten

*Heart rate variability and therapeutic consequences in MODS patients*

### Summary

**Background.** The multiple organ dysfunction syndrome (MODS), a subsequent failure of two or more vital organs, is the endstage of initial trigger events, such as acute coronary syndrome or sepsis. The mortality is high - up to sixty percent. We have recently shown that a decrease in heart rate variability ([HRV], HRV variable  $\ln VLF$ ) can identify a subgroup of MODS with a worse prognosis. Parasympathetic stimulation can depress inflammation and might thus improve survival. The aim of the present study was to detect whether  $\beta$ -blockers as mainly indirect but also direct parasympathetic modulators have a positive impact on outcome.

**Methods.** We retrospectively analysed the data of 120 consecutively admitted ICU patients with MODS. HRV was measured according to the international standards using a 24-hour-ECG. All patients were checked for  $\beta$ -blocker treatment and followed up for 28-day-survival. We calculated a cutpoint (maximum of sensitivity  $\times$  specificity in ROC analysis) for the HRV parameter  $\ln VLF$  which predicted 28-day-survival best. The APACHE II score (APII) was calculated to characterize the severity of illness; a MODS was defined as a APII  $\geq$  20 points.

**Results.** The demographic data of the patients were as follows: age  $59.9 \pm 13$  y, weight  $76.6 \pm 14.9$ , height  $170.4 \pm 10.0$  cm, APACHE II score  $26.9 \pm 7.6$ . 56 of the 120 included patients received  $\beta$ -blockers during the ICU stay. Patients with  $\beta$ -blockers had a significantly higher HRV at admission than patients without  $\beta$ -blockers ( $3.4$  vs.  $4.5 \ln ms^2$ ,  $p < 0.0001$ ). Dividing the cohort of patients into four subgroups we found that patients with  $\beta$ -blocker treatment and a high HRV on admission had the best survival compared with 1) patients with low HRV and  $\beta$ -blocker-treatment (log rank [LR] of Kaplan-Meier-Analysis= $3.9$ ,  $p=0.047$ ), 2) patient with high HRV but without  $\beta$ -blockers (LR= $4.6$ ,  $p=0.03$ ) and 3) patients with low HRV and without  $\beta$ -blockers (LR=  $13.4$ ,  $p=0.0003$ ).

**Conclusion.**  $\beta$ -blocker treatment could improve survival in MODS patients. This favourable effect might be mediated by a restoration of blunted HRV which could yield depression of the overwhelming inflammation seen in MODS.