

## **Heart rate variability is related to concomitant glucose fluctuation in longstanding type 1 diabetes**

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The presence of type 1 diabetes (DM1) affects the heart rate variability (HRV). However, there are conflicting data on the impact of hyper- and hypoglycaemia on the parameters of cardiovascular autonomic regulation.

### **The aim**

To investigate the possible association of glucose fluctuation with HRV in longstanding DM1.

### **Design and methods**

We examined 49 patients with longstanding (> 20 years) history of DM1 (without overt cardiovascular disease) and episodes of hyperglycaemia > 160 mg/dl during 24-hour continuous glucose monitoring (CGM). In all patients, simultaneous 24-hour CGM and Holter electrocardiographic recording were performed. Time- and frequency HRV parameters were used as indicators of cardiovascular autonomic regulation. Patients were divided into two groups: with and without hypoglycaemia < 50 mg/dl ( $n=22$  and  $n=27$ , respectively).

### **Results**

As compared to patients with hypoglycaemia, patients without hypoglycaemia had a significantly longer time of daily and early morning hyperglycemia > 160 mg/dl ( $P=0.001$  and  $P=0.038$ , respectively), as well as higher values of current and historical (mean values over the past 10 years) HbA1c levels ( $P=0.019$  and  $P=0.007$ , respectively). Patients without hypoglycaemia had significantly lower values of time- and frequency domain HRV parameters. SDANN was positively related to duration of hypoglycemic episodes ( $r=0.40$ ,  $P=0.004$ ) and negatively correlated with total time of hyperglycemic episodes ( $r=-0.41$ ,  $P=0.003$ ). Furthermore, daily HF% was negatively linked to hyperglycaemia episodes ( $r=-0.40$ ,  $P=0.038$ ), but not to hypoglycaemia ( $r=-0.08$ ,  $P>0.05$ ). Presence of diurnal hypoglycaemia influenced the direction of HRV parasympathetic component response to episodes of daily and early morning hyperglycaemia. In patients without hypoglycemic episodes, hyperglycaemia was associated with decrease in daily HF% ( $r=-0.40$ ,  $P=0.038$ ), whereas in patients with hypoglycemic episodes, hyperglycaemia was linked to increase in HF% during both day and night ( $r=0.45$ ,  $P=0.034$  and  $r=0.44$ ,  $P=0.043$ , respectively).

### **Conclusions**

In patients with longstanding DM1, HRV is related to concomitant glucose fluctuation. Our findings suggest interactive effect of hypoglycaemia and hyperglycaemia on cardiovascular autonomic regulation.

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