Evaluation of a technique to measure heart rate variability in anaesthetised cats

ABSTRACT

Analysis of heart rate (HR) and heart rate variability (HRV) are powerful tools to investigate cardiac diseases, but current methods, including 24-h Holter monitoring, can be cumbersome and may be compromised by movement artefact. A commercially available data capture and analysis system was used in anaesthetised healthy cats to measure HR and HRV during pharmacological manipulation of HR. Seven healthy cats were subjected to a randomised crossover study design with a 7 day washout period between two treatment groups, placebo and atenolol (1 mg/kg, IV), with the efficacy of atenolol to inhibit ß1 adrenoreceptors challenged by epinephrine. Statistical significance for the epinephrine challenge was set at $P < 0.0027$ (Holmï Bonferroni correction), whereas a level of significance of $P < 0.05$ was set for other variables.

Analysis of the continuous electrocardiography (ECG) recordings showed that epinephrine challenge increased HR in the placebo group ($P = 0.0003$) but not in the atenolol group. The change in HR was greater in the placebo group than in the atenolol group ($P = 0.0004$). Therefore, compared to cats pre-treated with placebo, pre-treatment with atenolol significantly antagonised the tachycardia while not significantly affecting HRV. The increased HR in the placebo group following epinephrine challenge was consistent with a shift of the sympathovagal balance towards a predominantly sympathetic tone. However, the small (but not significant at the critical value) decrease in the normalised high-frequency component (HFnorm) in both groups of cats suggested that epinephrine induced a parasympathetic withdrawal in addition to sympathetic enhancement (increased normalised low frequency component or LFnorm). In conclusion, this model is a highly sensitive and repeatable model to investigate HRV in anaesthetised cats that would be useful in the laboratory setting for short-term investigation of cardiovascular disease and subtle responses to pharmacological agents in this species.

Keyword: Heart rate; Heart rate variability; Autonomic nervous system; Cat; Electrocardiography