HRV in Isolated Rabbit Hearts and In Vivo Rabbit Hearts

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BACKGROUND There is evidence that heart rate variability persists in denervated hearts. However, the mechanism of HRV in isolated heart is not known. Only a few studies have been published on this topic, mainly because presence of heart rate variability in conditions of completely denervated heart can be studied only at patients with transplanted heart. In this study HRV parameters in isolated rabbit hearts were compared with those from heart in vivo, which might help clarify the origin of HRV in denervated hearts.

METHODS Seven isolated New Zealand rabbit hearts were perfused at Langendorff setup. ECG signals were recorded by three orthogonal leads positioned around the heart. Leads were situated at borders of small bath, where the heart was placed. It allows touch-less recording of ECG. Signals were amplified and digitized with sampling rate 2 kHz by 16-bit AD converter. Signals were further analyzed by time, frequency and non-linear HRV methods by Kubios HRV software.

RESULTS Twenty six standard HRV parameters have been used for evaluation of differences between HRV of Langendorff-hearts and in vivo hearts. In the isolated, denervated heart HRV showed a broadband fluctuation, different from the well-known oscillation peaks at specific frequencies in in vivo hearts. Most significant difference was in mean RR - 491.0$\pm$13.4ms in the Langendorff hearts and 284.6$\pm$5.1ms in in vivo hearts.

CONCLUSIONS There are attempts to use HRV in the assessment of brain death and/or depth of sedation. Detailed analysis in this area may bring significant contribution to diagnostic possibilities. Our data provide evidence for the presence of HRV in isolated, denerved rabbit hearts. It was shown that intracardiac mechanisms regulating heart function affect the main parameters of heart rate variability. Variability of the rhythm of Langendorff-perfused isolated rabbit hearts is significantly different from that of in vivo hearts.