

Poincaré Plot in Ischemic Rabbit Hearts

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BACKGROUND Heart rate variability may be evaluated by Poincaré plot. Its parameter SD1 describes short-term variability which is mainly caused by respiratory sinus arrhythmia, whereas long-term variability is described by SD2. Ischemia is believed to influence non-autonomic mechanism of the heart control and consequently HRV. Moreover, ischemia affects both SD1 and SD2 parameters significantly even in isolated denervated hearts.

METHODS Seven isolated New Zealand rabbit hearts were perfused at Langendorff setup. After control perfusion (15 min), each heart underwent three 15-minutes long episodes of coronary artery occlusion, followed by three reperfusion periods of the same duration. These six periods were compared to control. ECG signals were recorded by three orthogonal leads positioned orthogonally around the heart. Signals were amplified and digitized with sampling rate 2 kHz by 16-bit AD converter. Signals were further analysed by non-linear HRV parameters SD1 and SD2 by Kubios HRV software. The differences among control, ischemic and reperfusion periods have been evaluated, because this approach allows comparing results from all examined rabbit hearts.

RESULTS The Poincaré plot indexes measured from control periods were smaller than those measured during ischemic periods. The Poincaré plot of the reperfusion periods exhibited greater dispersion of points than that of the ischemic periods. Parameter SD1 was set-up at 100% at control period. SD1 showed 584%, 439% and 220% decrease against control at three ischemic periods. There were 678%, 590% and 1150% changes against control in three reperfusion periods. Parameter SD2 exhibited 550%, 552% and 543% change against control period at three ischemic periods. There were 1170%, 1096% and 1023% changes against control period in three reperfusion periods.

CONCLUSIONS Ischemia significantly influences HRV even in isolated hearts.