

## Intraventricular balloon-induced load effects on ischaemia-induced arrhythmias in the rat Langendorff preparation

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The rat Langendorff preparation is used to study drug effects on rhythm and function, but rarely both in a single experiment. Evidence suggests that load, exerted by inflation of an intraventricular balloon (IVB) to measure function, may facilitate ischaemia-induced arrhythmias in pig hearts *in vitro* in which baseline arrhythmia susceptibility is low and ventricular fibrillation (VF) infrequent (Coronel et al., 2002). We examined this in rat hearts in which such VF is more frequent.

Typical ischaemic zones (IZ) in Langendorff-perfused rat hearts (mean 42% ventricular wt) give VF in  $\cong 100\%$  of controls (Curtis & Hearse 1989). Here, IZ was set lower than the typical ( $36\pm 2\%$  measured by dye) to generate a moderate (50%) baseline incidence (%) of VF in 'no IVB' hearts, to compare with two groups of hearts with an IVB set to minimum inflation ( $<0.01$  ml), or inflated to near the top of the Starling curve ( $\cong 0.12$  ml) in a randomized study with blinded analysis (n=12/group). Coronary ligation was maintained for 120 min and arrhythmias evaluated postligation in 0-10, 10-30, 30-60 and 60-120 min time intervals. Diastolic (Dia) and developed (Dev) pressures in mmHg were recorded 1 min before (-1), and at 10 and 120 min after the start of ischaemia.

Group	Dia-1	Dia10	Dia120	Dev-1	Dev10	Dev120	VT %	VF %	score
No IVB	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0	0 $\pm$ 0	100	50	4.00 $\pm$ 0.12
<0.01 ml	0 $\pm$ 0.6	1 $\pm$ 0.5	2 $\pm$ 0.4	35 $\pm$ 3	29 $\pm$ 3	27 $\pm$ 2	100	42	3.67 $\pm$ 0.22
0.12 ml	3 $\pm$ 0.5*	5 $\pm$ 0.3*	6 $\pm$ 0.6*	96 $\pm$ 5*	67 $\pm$ 5*	54 $\pm$ 3*	100	17	3.25 $\pm$ 0.17

All hearts had VT, but the IVB and its inflation tended (non-significantly) to reduce VF% and a 5-point arrhythmia score during 120 min ischaemia (Table). IVB inflation increased Dia and Dev (\* $P < 0.05$  vs '<0.01 ml') and ischaemia lowered Dev (Table). During 0-10 min ischaemia, higher incidences (\*\* $P < 0.05$  vs no IBV) of less severe arrhythmias (e.g., salvos) occurred in the '0.12ml' (83%\*\*) and '<0.01ml' group (42%) vs no IVB (8%) with differences lost at 10-30 min (100, 100 and 100% respectively) but reappearing at 30-90 min (100\*, 100\* and 33%, respectively). PR, QT, heart rate and coronary flow variations were unremarkable. In conclusion, when IZ is suboptimal, mechanical load makes ischaemia-induced minor arrhythmias occur sooner and last longer in the rat heart *in vitro*, as seen in pig heart *in vitro* (Coronel et al., 2002), whereas ischaemic VF was paradoxically inhibited as a non-significant trend. The effects of load on ischaemia-induced VF and the less severe arrhythmias appear to differ. The model relevance requires further examination.

*References*

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