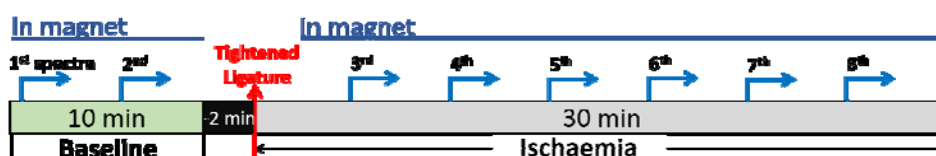


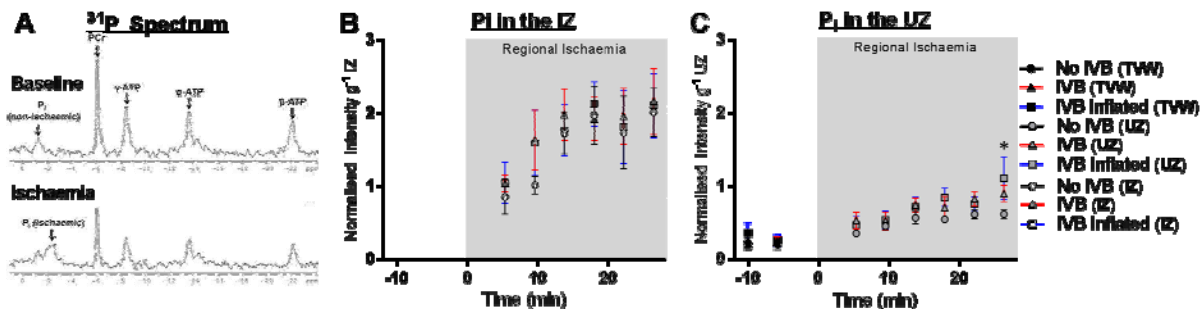
An Explanation For The Paradoxical Antiarrhythmic Effect of Intraventricular Balloon Inflation In The Regionally Ischaemic Rat Langendorff-Perfused Heart

We have shown that inflation of an intraventricular balloon (IVB) to measure cardiac contractile function in the rat *in vitro* Langendorff preparation inhibits ischaemia-induced ventricular fibrillation (VF) (1,2). Furthermore, IVB removal during ischaemia increases coronary effluent lactate (2). We hypothesise that IVB inflation plus coronary ligation causes endo/subendocardial ischaemia in the uninvolved region (UZ) adjacent to the ischaemic zone (IZ), sufficient to reduce the size of the arrhythmogenic interface between the UZ and IZ. To test this hypothesis, we repeated our previously used protocol (2) whilst measuring intracellular pH, inorganic phosphate (P_i), phosphocreatine (PCr) and ATP using ^{31}P phosphorus (^{31}P) nuclear magnetic resonance (NMR) spectroscopy.

Male Wistar rat (270-330g) hearts were perfused with phosphate-free Krebs' buffer (3mM K^+ ; 37°C) to enable measurement of P_i peaks. Perfusion pressure was maintained at 74 mmHg by a peristaltic pump controller feedback system. Hearts were randomised to one of three groups: 'no IVB', IVB minimally inflated (0.01 ml; 'IVB') to give a detectable developed pressure (~30 mmHg) or 'IVB inflated' (0.12 ml) to give a developed pressure >100 mmHg ($n = 5/\text{group}$). Regional ischaemia was induced by coronary ligation during brief removal of the perfused hearts from the NMR tube (centred within an RF $^1\text{H}/^{31}\text{P}$ dual tune coil within a microimaging probe inside a Bruker Avance III 400MHz wide-bore spectrometer). Protocol:



Regional ischaemia generated two P_i peaks (fig. 1A), allowing determination of intracellular pH in the UZ and IZ (3). P_i in the IZ rose to a peak at 20 min of ischaemia with no differences between groups (fig. 1B). P_i in the UZ rose to a peak at 20 min but to a lower maximum than in the IZ (fig. 1C). Moreover, by 25 min of ischaemia, P_i in the UZ was significantly greater in the IVB inflated hearts versus time-matched no IVB hearts. Thus, IVB inflation in the presence of regional ischaemia causes partial ischaemia in the UZ attributable to vascular compression. This would account for the VF suppression found previously (2).



1. Crook CDE and Curtis MJ (2012). *pa2 online* 10: abstract 183P. (<http://tinyurl.com/noduymx>)

2. Wilder CDE, *et al.* (2014). *pa2 online* 12: abstract 112P. (<http://tinyurl.com/nfyt96u>)

3. Sidell RJ *et al.* (2002). *Diabetes* **51**: 1110-1117.