

Efficacy of Contraction Uncoupling by 2,3-Butanedione Monoxime during Initial Reperfusion versus Cardioplegic Arrest for Protection of Isolated Hearts

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Abstract

The efficacy of 2,3-butanedione monoxime (BDM) as additive to St. Thomas Hospital II solution (STH) as compared to initial BDM reperfusion with regard to myocardial ischaemia/reperfusion injury was investigated in isolated guinea pig hearts.

Isolated guinea pig hearts were perfused with Krebs-Henseleit buffer in the Langendorff technique at constant pressure of 55 mmHg. After cardioplegic arrest with STH solution, global ischaemia was induced for 50 min and recovery of myocardial function was monitored during 30 min reperfusion. Control hearts (n = 8) received no further treatment. In BDM_{CP} hearts (n = 8), 20 mM BDM were added to STH only. BDM_{REP} hearts (n = 8) were treated with 20 mM BDM during the initial 20 min of reperfusion. BDM_{CP/REP} hearts (n = 8) received BDM during cardioplegic arrest as well as during initial reperfusion.

Left ventricular systolic function as assessed by developed pressure (LVDP) was depressed to 47 ± 3% of pre-ischaemic baseline in control. Only initial BDM reperfusion (BDM_{REP}) resulted in improved recovery of LVDP to 66 ± 5 %. Similar data were obtained for dP/dt_{max} and dP/dt_{min}. Reperfusion contracture was attenuated in both groups receiving initial BDM reperfusion (BDM_{REP} and BDM_{CP/REP}). BDM in STH did not protect hearts from cellular injury as assessed by release of lactate dehydrogenase (LDH) during reperfusion. In contrast, no increase in LDH release occurred during initial BDM reperfusion in BDM_{REP} and BDM_{CP/REP} hearts, followed by a mild rebound after washout of the drug.

Addition of BDM to the cardioplegic STH solution did not protect isolated hearts from cellular injury or depression of post-ischaemic function. In contrast, initial BDM reperfusion alone attenuated reperfusion contracture, prevented LDH release, and improved recovery of systolic and diastolic myocardial function. The combination of BDM treatment during cardioplegic arrest with initial BDM reperfusion provides no additional protection from reperfusion injury.

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