



MYOCARDIAL ISCHEMIA AND INFARCTION

INTRAAORTIC BALLOON PUMP COUNTERPULSATION AUGMENTS THE BENEFITS OF REPERFUSION ON LEFT VENTRICULAR MECHANOENERGETICS - EXPERIMENTAL STUDY

ACC Poster Contributions

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Background: Despite the favorable hemodynamic effect of intraaortic balloon pump (IABP) support on acute heart failure, little is known about the direct effect of IABP on left ventricular (LV) contractility, relaxation and energy consumption, during the different phases of ischemia and reperfusion. We examined the effects of IABP support on LV mechanoenergetics in a porcine ischemia-reperfusion model.

Methods: In 12 anesthetized, open chest pigs, instrumented with Millar pressure catheter and sonomicrometry crystals, cardiogenic shock was induced by ligation of the proximal LAD for 1 hour followed by reperfusion for 2 hours. Indices of contractility, relaxation rate and energy consumption as well as traditional hemodynamics are presented without and after 5 minutes of IABP support both during ischemia and reperfusion.

Results: Both during ischemia and reperfusion, IABP support provided mechanical unloading of the LV, manifested as a significant decrease in end-diastolic arterial pressure, systolic arterial pressure and LV end-diastolic pressure (EDP). In addition, IABP support optimized LV energetic performance by inducing a significant decrease in cardiac energy consumption (stroke work-SW) in conjunction with an increase in mechanical performance (Ejection Fraction, Stroke Volume, Cardiac Output). More importantly, during reperfusion exclusively, IABP support significantly improved active relaxation (τ) and compared to ischemia induced a relative increase in contractility (E_{max}) ($9.5\pm 30\%$ vs $-7.5\pm 29\%$, $p=0.04$) and a more profound decrease in SW ($-11.9\pm 16\%$ vs $-4.9\pm 8\%$, $p=0.04$) and LVEDP ($-9.5\pm 8\%$ vs $-4.6\pm 10\%$, $p=0.03$).

Conclusion: During both ischemia and reperfusion IABP decreases cardiac energy consumption and optimizes performance by LV unloading. During reperfusion exclusively, IABP also improves contractility and active relaxation, possibly due to a synergistic effect of unloading and augmentation of coronary blood flow.