

## Oral Presentations

### INITIAL MYOCARDIAL EFFECTS OF AIRWAY PRESSURE ELEVATION AS REFLECTED BY SINGLE HEART CYCLE PRESSURE-VOLUME INDICES

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**Introduction.** We hypothesized that airway pressure elevation and lung inflation may cause changes in left ventricular contractile state. This study aimed to measure single beat left ventricular pressure-volume (LVPVR) derived parameters of systolic and diastolic function during rest and then immediately after the institution of a significant airway pressure elevation.

**Methods.** Eight healthy landrace pigs were anesthetized and instrumented with left ventricular combination tip manometry and conductance volumetry catheters. Paired measurements were made for left ventricular pressures and volumes during apnea at zero end-expiratory pressure (ZEEP) and directly after institution of continuous positive airway pressure (CPAP) 15 cm H<sub>2</sub>O. Interventions to pharmacologically alter contractile function included isoflurane 1% administration and adrenaline 0.3 mcg/kg/min infusion. Single heart cycle LVPVR events were analyzed for systolic and diastolic function.

**Results.** Isoflurane and adrenaline changes in contractile function were demonstrated (see Table). LVPVR parameters indicated that CPAP brought about increased systolic function and decreased diastolic compliance during control as well as during increased and decreased inotropic interventions.

	ZEEP	CPAP 15	Isoflurane ZEEP	Isoflurane CPAP 15	Adrenaline ZEEP	Adrenaline CPAP 15
E <sub>max</sub>	1.98 ± 0.3	2.28 ± 0.4*	1.22 ± 0.2 <sup>#</sup>	1.47 ± 0.2*	3.01 ± 0.7 <sup>#</sup>	3.88 ± 0.1*
SW/EDV	42 ± 4.5	46.1 ± 4.9*	25 ± 2.7 <sup>#</sup>	30 ± 3.1*	66.1 ± 7.5 <sup>#</sup>	73.1 ± 8.4*
dP/dt <sub>max</sub> /EDV	14.8 ± 2.0	15.3 ± 2.0	8.1 ± 1.2 <sup>#</sup>	8.7 ± 1.2*	37.4 ± 6.1 <sup>#</sup>	43.2 ± 7.2*
Power <sub>max</sub> /EDV	3.3 ± 0.6	3.6 ± 0.7*	2.0 ± 0.3 <sup>#</sup>	2.6 ± 0.4*	8.9 ± 2.2 <sup>#</sup>	11.5 ± 2.7*
EDP/EDV	0.12 ± 0.02	0.16 ± 0.03*	0.11 ± 0.02	0.13 ± 0.02*	0.10 ± 0.02	0.14 ± 0.02
t <sub>1/2</sub>	26.4 ± 1.6	28.9 ± 1.6*	25.8 ± 1.2	29.4 ± 0.9*	15.9 ± 0.1 <sup>#</sup>	18.5 ± 0.7*

**Table legend:** E<sub>max</sub> – maximal or end-systolic elastance (pressure/volume) (mm Hg•mL<sup>-1</sup>); SW- stroke work (mm Hg•mL); EDV- end-diastolic volume (ml); Power<sub>max</sub>- maximal instantaneous power (change in volume x pressure) (mm Hg•mL•s<sup>-1</sup>); EDP- end-diastolic pressure (mm Hg); t<sub>1/2</sub>- isovolumic relaxation pressure half-time. Data are presented as mean ± SEM, n=8. \* p less than 0.05 vs. control for ZEEP measurement. # p less than 0.05 vs. resting (ZEEP) for isoflurane (ZEEP) or adrenaline (ZEEP).

**Discussion.** The extremely rapid increases in myocardial contractile function following application of positive airway pressure were demonstrated with analysis of pressure-volume data for single heart cycles immediately after onset of airway pressure increased. The short onset time of this response suggested that it may be mediated by reflex activity in neurocirculatory control mechanisms. To confirm or refute this mechanism, further studies of the direct and indirect effects of increased airway pressure on myocardial contractile function are warranted.

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