A new porcine model of congestive heart failure

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Argomento: Trauma e arresto cardiaco

Acute heart failure (AHF) is a common cause of pulmonary edema and respiratory distress. Over the years, several animal models have been employed, but none of them were able to replicate the clinical conditions of AHF.

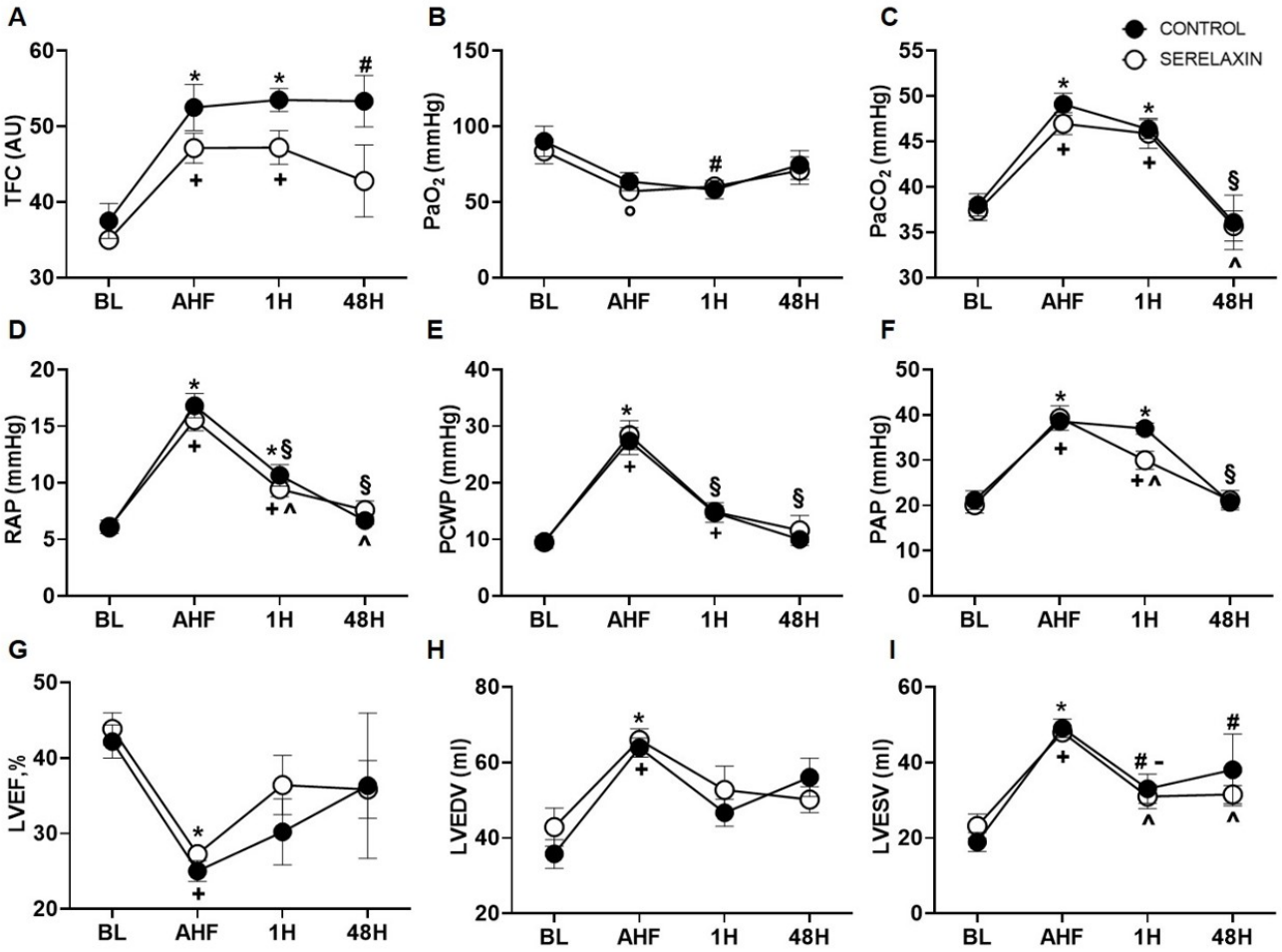
The present study aimed at setting up a novel, highly reproducible and preclinical swine model of AHF.

Myocardial infarction was induced in 17 pig by left anterior descending coronary artery (CA) occlusion. Two weeks later, a second myocardial infarction was achieved occluding the circumflex CA in survived animals (n=15). Intravenous infusion of crystalloids was performed in order to obtain volume overload, while phenylephrine infusion was used to cause an acute arterial crisis. The animal was considered in AHF when the following conditions occurred concurrently: (a) left ventricular ejection fraction (LVEF) < 30%; (b) increases in thoracic fluid content (TFC) > 25% from baseline; (c) and a pulmonary capillary wedge pressure (PCWP) > 30 mmHg.

In order to test the accuracy of the model, animals were divided to receive continuous intravenous infusion of serelaxin (n=9) or saline placebo (n=6) over 48 hours.

TFC significantly increased, with presence of pulmonary edema, at the onset of AHF and such a increase persisted until the sacrifice. Arterial blood gases showed the conventional modifications occurring in AHF patients clinically with significantly decreased PaO2 and increased PaCO2. Pulmonary arterial pressure (PAP) , PCWP and right arterial pressures (RAP) significantly increased, while LVEF decreased during AHF induction, and left ventricle end-diastolic (LVEDV) and end-systolic volumes (LVESV) increased. Importantly, after 48 ours the recovery of cardiac function was incomplete. Serelaxin, however ameliorated the severity of AHF.

In conclusion, our model was able to replicate preclinically the condition of AHF and the response to therapies.



Sidak intra group multiple comparisons test. # p<0.05 vs BL control; * p<0.01 vs BL control;- p <0.05 vs AHF control; § p<0.01 vs AHF control; ° p<0.05 vs BL serelaxin; + p<0.01 vs BL serelaxin; ^ p<0.01 vs AHF Serelaxin .