

AORTIC PRESSURE POSITIVELY AFFECTS LEFT VENTRICULAR PRESSURE IN ISOLATED, LANGENDORFF-PERFUSED GUINEA PIG AND RAT HEARTS

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The Langendorff-perfused isolated heart is a commonly used cardiovascular experimental model. Previously, we proved that, contrary to popular belief, the left ventricle is loaded and ejects in this model, similarly to physiological conditions. However, it is unclear how aortic (column) pressure affects left ventricular pressure and ejection.

We recorded the left ventricular pressure, aortic pressure and aortic flow in Langendorff-perfused, isolated guinea pig (n=33) and rat (n=29) hearts. The hearts were randomly assigned into one of three predetermined aortic pressure groups: 60, 70, or 80 mmHg.

Elevating aortic pressure increased left ventricular pressures (max. left ventricular pressure in guinea pig hearts [mean±SE]: 71.0±1.4 mmHg, 87.8±1.1 mmHg, 97.9±1.5 mmHg in 60, 70, and 80 mmHg group, respectively, p<0.05; max. left ventricular pressure in rat hearts: 71.8±2.1 mmHg, 79.0±2.7 mmHg, 91.7±3.5 mmHg in 60, 70, and 80 mmHg group, respectively, p<0.05). In guinea pig hearts, elevating aortic pressure increased stroke volume and cardiac output (stroke volume: 6.6±2.1 µl, 21.0±4.6 µl, 29.4±8.1 µl in 60, 70, and 80 mmHg group, respectively, p<0.05; cardiac output: 1.39±0.44 ml/min, 4.04±0.79 ml/min, 6.19±1.53 ml/min in 60, 70, and 80 mmHg group, respectively, p<0.05). On the contrary, aortic pressure did not affect stroke volume or cardiac output in rat hearts.

In Langendorff-perfused guinea pig and rat hearts, aortic pressure positively affects left ventricular pressure. In guinea pig hearts, elevating aortic pressure increases stroke volume and cardiac output, whereas aortic pressure does not affect these parameters in rat hearts indicating an interspecies difference.

Keywords: Langendorff-perfused hearts, aortic pressure, left ventricular pressure, stroke volume, cardiac output.