01.01 Animal Model of Chronic, Pressure-Overload Right Ventricular Failure to Study Cardiac Failure and Recovery

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Introduction: Right ventricular (RV) failure remains a perplexing problem with poor clinical outcomes among patients with heart failure. While implantable left ventricular (LV) assist devices are successful for treating LV failure, there are few treatment options available for RV failure. Additionally, many patients experience recovery of RV function following implantation of left ventricular assist devices (LVAD) but others do not. It is unclear why some patients recover while others do not and predicting recovery is unreliable. Moreover, despite many robust animal models available for LV failure, animal models to evaluate RV failure are scarce. We, therefore, sought to develop a robust animal model of chronic pressure-overload RV failure to serve as a platform for morphologic, functional and molecular investigation of RV failure and its subsequent recovery to differentiate between a failing and failed RV.Methods: Adjustable pulmonary artery (PA) bands with implantable actuating chambers (for band adjustment) were implanted into two, New Zealand white rabbits. Anatomical and functional cardiac MRI was used to evaluate position of the PA bands and flow characteristics across the band. Transthoracic echocardiography (TTE) was used to evaluate the amount of PA constriction to determine the rate of PA constriction required to create pulmonary hypertension but not circulatory collapse. Results: Both animals underwent successful implantation of the adjustable PA band. Following recovery, MRI demonstrated correct positioning of the PA banding device and turbulent flow abnormalities across the device without undue device-related artifact. TTE demonstrated correct position and a pressure gradient across the device, which, increased with PA band tightening. Saline was injected into the actuating chamber to tighten the band. Reductions in PA diameter of 20 and 60% were well tolerated and resulted in a gradient across the band of 9.7 and 21.2 mmHg respectively. Further reductions in PA diameter, at one setting, resulted in cardiovascular collapse and death. Conclusions: An adjustable PA band with implantable actuating chamber can be placed around the main pulmonary artery through a left thoracotomy. Device position can be confirmed with either MRI or TTE. Turbulent flow disturbances across the PA band can be seen with MRI and pressure gradients can be measured with TTE. This model of adjustable PA banding allows creation of pulmonary arterial hypertension that can be reversed allowing study not only of RV failure but also recovery.