Differences in Regional Myocardial Perfusion, Metabolism, MVO₂, and Edema After Coronary Sinus Machine Perfusion Preservation of Canine Hearts

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Machine perfusion improves solid organ preservation for transplantation. We have demonstrated that antegrade perfusion preservation of hearts is superior to cold storage but may be limited by aortic valve incompetence. We hypothesized that retrograde perfusion (RP) through the coronary sinus may provide more reliable perfusate delivery to the heart. This study was designed to determine the optimal perfusion parameters and evaluate regional flow after RP of canine hearts. After donor cardiectomy, canine hearts (n == 6) were established in a perfusion device (LifeCradle, Organ Transport Systems, Inc., Frisco, TX) through a coronary sinus catheter. Hearts were perfused at 5°C over flow rates from 10 to 35 ml/100 g myocardium/min for 20 minutes at each flow rate. Colored microspheres were used to quantify tissue perfusion. Oxygen consumption (MVO₂) and perfusion parameters were measured. At end-perfusion, tissue was collected for proton magnetic resonance spectroscopy (1H MRS), microsphere analysis, and determination of myocardial edema. MVO₂ increased up to flow rates of 20 ml/100 g/min. Right ventricular (RV) perfusion was reduced at all flow rates. Increased lactate/alanine ratios by 1H MRS and reduced myocardial water content were noted in RV samples. RP results in excellent left ventricular (LV) perfusion. RV perfusion is reduced and oxidative metabolism in the right ventricle may not be maintained by RP. Further studies to evaluate effects of reduced RV perfusion by RP on functional recovery after transplantation are warranted.

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