



A NOVEL TECHNIQUE FOR PROLONGED ENDOTHELIAL AND MYOCARDIAL PRESERVATION OF THE DONOR HEART.

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Current heart preservation protocols employ hypothermic arrest and storage, using a variety of crystalloid based cardioplegic solutions. These preservation techniques are limited to 3-4 hour preservation period, subject the donor heart to periods of ischemia and reperfusion resulting in time-dependent myocardial injury and coronary vasomotor dysfunction thought to play a role in cardiac allograft vasculopathy. We **hypothesized** that continuous sanguineous perfusion of the donor heart in the beating working state should prolong and improve myocardial preservation and endothelial vasomotor function. Contractile, metabolic and vasomotor functions were monitored simultaneously in an isolated swine heart model continuously perfused with autologous blood in a perfusion apparatus developed in our laboratory. Metabolic function was assessed by myocardial tissue pH. Hearts were randomized into three Groups: I (n=5) cardioplegic arrest and 6hr storage @ 4 °C using University of Wisconsin solution, followed by 1hr sanguineous reperfusion in the working state, or II (n=5) 12hr continuous sanguineous perfusion in the beating working state. Vasomotor function was assessed in Groups I and II by generating dose responses of coronary vascular rings to bradykinin and nifedipine. Group III (n=5) served as coronary ring controls. **Results (m±SD):** LV developed pressure in Group II was higher than in Group I (85±5, 69±23 mmHg, p<0.0001), although the preservation period was twice as long in Group II than that of Group I. Likewise, **complete preservation of coronary vasomotor function** was observed in Group II compared to Group I as evidenced by the dose response relaxation of coronary vascular rings to 10-8M bradykinin (75 & 13% from baseline, p<0.0001) compared to control Group III (61% from baseline). Similar differences were seen with 10-6M nifedipine between Groups II & I (71 & 22%, p=0.0002). Significant myocardial acidosis was observed in Group I compared to II (pH 6.1 & 7.1 respectively, p<0.0001).

Conclusion: This new concept of donor heart preservation demonstrates the ability to prolong the current 6hr limit while avoiding ischemia and preserving both myocardial and endothelial vasomotor functions compared to present methods. Expanding the donor pool, increasing histocompatibility matching time, and potentially reducing the incidence of cardiac allograft vasculopathy are major clinical implications of this new concept.