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Title: Intermittent antegrade cardioplegia: Implications for donor heart preservation.

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Purpose: The scarcity of donor hearts limits the growth of heart transplantation. Currently, donor heart preservation techniques allow for only 4-6 hours of ischemia. Prolongation of this time would allow procurement at greater distances, thus reducing wastage. Because pH is directly related to the degree of ischemia, we hypothesized that administration of cardioplegia to the isolated heart would improve microvascular perfusion.

Methods and Materials: Porcine hearts were excised, flushed with a ribose based cardioplegic solution and stored at 9.2 °C for 6.1 ±0.6 hours. Control hearts (Group 1, n = 9) were stored without receiving any additional perfusion, whereas experimental hearts (Group 2, n = 8) received an intermittent antegrade bolus (150 ml, q30 min, 150 ml/min). Ph probes were placed into the LV and RV myocardium for continuous measurement. At the end of the preservation, contrast enhanced, T-1 weighted MR imaging was performed in the short axis view. Peak contrast enhancement was used as a measurement of viable microvasculature. Wet/dry weight was then measured.

Results: In both groups, myocardial LV pH decreased exponentially in all hearts immediately following flushing. In Group 1 hearts, pH decreased to 6.2 ±0.2. As opposed to Group 2 hearts; pH at the end of 6 hours was 6.7 ±0.3. The mean pH difference was of 0.55 (p < .005). Ph measurements of the RV had a similar response to perfusion (p = .02). MR contrast imaging showed no differences in peak contrast enhancement in the 2 groups, Group 1 = 62%), Group 2 = 40% (p = .08). There was also no difference of the wet/dry weights.

Conclusions: Although microvascular perfusion was not significantly different between the two groups in this study; we demonstrated that intermittent perfusion maintains a significantly higher myocardial pH higher than conventional hypothermic storage. Use of intermittent perfusion, as opposed to a single antegrade dose may lead to improved preservation of the donor heart. This may have a favorable effect on the number of potential donors by allowing for longer distance procurement.