

Novel Technique to Reduce Warm Ischemic Time During Cardiac Implantation

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Purpose

Primary Graft Dysfunction (PGD) remains the leading cause of death in the first 30 days post heart transplantation according to ISHLT registry data.

We investigated a novel technique of continuous antegrade cold perfusion in reducing the warm ischemic time (WIT) during heart transplant implantation and the effect on PGD and mortality in our institution.

Methods and Technique

*Once the donor heart has arrived in theatre it is removed from cold static storage and put in an ice slush basin.

*A small aortic cross clamp is applied to the distal part of the donor ascending aorta and a 12 Ch cardioplegia cannula is secured to the aorta with a purse-string suture. An infusion of antegrade cold oxygenated blood at 4-6 °C, maintaining a mean aortic root pressure of 60-70 mmHg with flows of 200-300 ml /min employing a constant pressure-variable CPB flow pump with an in situ leucocyte depleting filter. This continuous antegrade perfusion is maintained whilst the left atrium is being anastomosed with a LV vent in situ.

*With the completion of the aortic anastomosis, a warm cardioplegia hotshot infused into the aortic root followed by removal of the recipient aortic cross-clamp and systemic perfusion with continued aortic root and LV venting. The remaining anastomoses are carried out in the usual fashion sequentially with pulmonary artery, inferior vena cava and superior vena cava with normothermic systemic perfusion and ventricular pacing.

*A retrospective analysis of 32 patients using this technique was performed comparing retrospective local cohort and national UK cohort data. Chi-squared test & 1-way (ANOVA) were used for statistical comparison.

Results

	National UK 2012-16 Standard Implant (n=613)	Local cohort 2010-15 Standard Implant (n=68)	Local cohort 2015-17 Continuous Antegrade Perfusion – CAP (n=32)	P value
Donor Age (Mean ± SD)	39 ± 12.5	41 ± 11.7	36.8 ± 11.4	0.254
Recipient Age (Mean ± SD)	49.1 ± 13.5	46.3 ± 12.4	48.9 ± 11.6	0.259
Warm Ischemic Time (mins) (Mean ± SD)	68.7 ± 24.7	58.4 ± 28.8	7 ± 2	<0.05
PGD %	38	48.5	9.3	<0.05
Mortality 30 day	9.6	19.1	3.1	<0.05
Mortality 1yr	16.5	23.5	3.1	<0.05

Conclusion

Protecting the donor heart with immediate continuous cold blood antegrade perfusion during heart implantation maintains asystolic arrest, myocardial hypothermia, washout of metabolites and a significant reduction in WIT, PGD and short term mortality post heart transplantation in our institution. We believe that this novel technique is safe, effective and reproducible.

The authors declare no conflict of interest