Normothermic Myocardial Perfusion Reduces Cross-Clamp Time and Provides Equivalent Myocardial Protection Compared to Cardioplegia Cardiac Arrest in a Consecutive Series of Hybrid Stent-Grant Implants

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BACKGROUND

- The Thoraflex Hybrid device was recently approved in the United States and allows for a reproducible approach to the frozen elephant trunk procedure
- Aortic arch operations involve long cardiopulmonary bypass times with at least moderate hypothermia, contributing to time-dependent myocardial ischemia if the heart is arrested
- Normothermic myocardial perfusion reduces this myocardial ischemic period

OBJECTIVE

To compare the short-term outcomes and complications of normothermic myocardial perfusion versus cardioplegia in aortic arch reconstruction employing the Thoraflex Hybrid graft

METHODS

- All Thoraflex Hybrid graft implantation at a single center between July 2022 and October 2023
- **Groups**: Cardioplegia vs. Normothermic myocardial perfusion
- **Primary outcome**:
  - Stroke
  - Spinal cord ischemia
- **Secondary outcomes**:
  - 30-day mortality
  - Cardiopulmonary bypass and cross-clamp time
  - Total operative time
  - Length of stay (LOS)
  - New dialysis requirements
  - Left ventricular ejection fraction (LVEF)
- Median follow up was 140.5 days

RESULTS

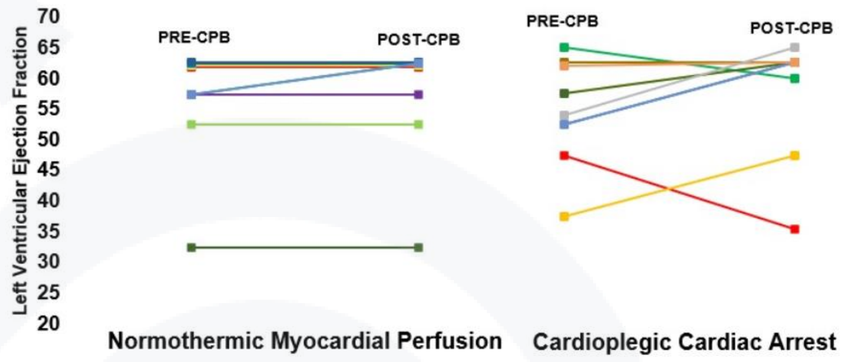

Figure 1: Pre-CPB vs post-CPB LVEF in normothermic myocardial perfusion vs cardioplegic arrest.

Outcomes	Cardioplegia (n=15)	Normothermic Myocardial Perfusion (n=14)	P-Value
Cross-clamp Time (median min [IQR])	150 [98-190]	48 [48-72.5]	< 0.05
Cardiopulmonary Bypass Time (median min [IQR])	229 [211-272]	217 [201.5-240.5]	0.23
Total Operative Time (median min [IQR])	495 [456-531]	463 [413.5-504]	0.17
Hospital Length of Stay (median days [IQR])	10 [8-14]	11 [8-23.5]	0.37
ICU Length of Stay (median days [IQR])	6 [5-7.5]	6 [4-10]	0.65

Figure 2: Short-term outcomes of normothermic myocardial perfusion vs cardioplegia arrest

Baseline Characteristics	Cardioplegia (n=15)	Normothermic Myocardial Perfusion (n=14)
Age (years)	63	59
% Men	66.7	69.2
% Previous Sternotomy	46.7	46.4
% Previous Stroke	20	0
% LVEF (mean)	48	52

Figure 3. Baseline characteristics of normothermic myocardial perfusion and cardioplegia cohorts.

- Surgical indications: chronic dissection (13, 46.4%), acute dissection (8, 28.6%), aneurysm (4, 14.3%), and rupture (3, 10.7%)
- Three strokes (20%) in the cardiac arrest cohort
- One stroke (7%) (acute on chronic) and one (7%) spinal cord ischemic injury (temporary) in the normothermic myocardial perfusion cohort
- There were three (20%) new dialysis patients in the cardiac arrest cohort and no new dialysis requirements in the normothermic myocardial perfusion cohort
- There were no in-hospital or 30-day mortalities in either group

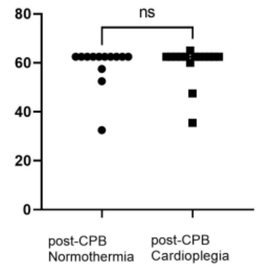

Figure 4. Comparing the post-CPB LVEF in normothermic myocardial perfusion vs. cardioplegic arrest

CONCLUSIONS

Hybrid aortic arch and frozen elephant trunk repair with the Thoraflex Hybrid graft using normothermic myocardial perfusion reduces cross-clamp times with equivalent neurological outcomes to cardioplegic arrest.