



Combined Heart-Kidney Transplantation: Vasoplegia is Associated with Poorer Post-Kidney Transplant Outcomes

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Purpose

- Patient selection for multi-organ transplants should include evaluation for acceptable postoperative function of all transplanted organs.
- In combined heart-kidney transplant (CHKT) risk factors for renal graft dysfunction may include vasoplegia and perioperative vasopressor need in spite of good cardiac graft function.

Aims:

1. Identify risk factors for vasoplegia after CHKT
2. Assess the impact of vasoplegia on postoperative complications and renal allograft outcomes.

Methods

A retrospective review was conducted on **58** consecutive patients who underwent **CHKT** between 1996 and 2019. CHKT recipients matched in 1:1 ratio with isolated heart transplant (IHT) recipients based on demographics, cause of heart disease, and LVAD as bridge to transplant (BTT).

Primary Outcomes:

- Survival
- Delayed Renal Graft Function (DGF)

Secondary Outcomes:

- Renal Graft Survival
- Post-operative Complications

Vasoplegia was defined as¹:

1. Need for vasopressors* to maintain a MAP > 70 mmHg
2. Ejection fraction (EF) > 55% or a cardiac index > 2.0 L/min/m²
3. Onset within 48 hours of transplantation

*Vasopressin, epinephrine, norepinephrine

Table 1: CHKT Patient Characteristics

Parameter	Vasoplegia	No Vasoplegia	P-value
Age – yrs	59.8 ±16.9	56.9 ± 13.5	0.18
Gender – male	18 (90.0%)	22 (59.5%)	0.02
Donor Age - yrs	27.7 ± 18.8	25.8 ± 16.4	0.78
Prior sternotomy	19 (95.0%)	23 (62.1%)	0.007
Etiology Heart Disease*			0.52
ICM	8 (40.0%)	16 (43.2%)	
DCM	6 (30.0%)	12 (32.4%)	
RCM	2 (10.0%)	7 (18.9%)	
HCM	2 (10.0%)	1 (2.7%)	
Other	2 (10.0%)	1 (2.7%)	
Etiology Renal Disease			0.76
Cardiorenal	11 (55.0%)	24 (64.9%)	
Amyloidosis	2 (10.0%)	2 (5.4%)	
CNI Toxicity	2 (10.0%)	3 (8.1%)	
Other	5 (25.0%)	8 (21.6%)	
Pre-op Dialysis	7 (35.0%)	15 (40.5%)	0.68
Pre-op EF	22.5 ± 32.4	22.5 ± 26.0	0.43
LVAD as BTT	10 (50.0%)	7 (18.9%)	0.01
DGF (renal)	13 (72.2%)	7 (19.4%)	< 0.0001
Discharge Cr	1.95 (1.59)	1.26 (0.71)	0.03

*ICM: ischemic cardiomyopathy, DCM: dilated cardiomyopathy, RCM: restrictive cardiomyopathy, HCM: hypertrophic cardiomyopathy, CNI: calcineurin inhibitor

Results: Vasoplegia

Preoperative Risk Factors for Vasoplegia

- LVAD as BTT was significantly different between those with and without vasoplegia (table 1):
 - 50% with vasoplegia had LVAD as BTT
 - 18.9% of those without vasoplegia had LVAD as BTT
 - 59% with LVAD as BTT had vasoplegia

Vasoplegia and Renal Function:

- Vasoplegia patients had:
 - Higher rates of DGF: 72.2% vs 19.4%, p<0.0001
 - Higher creatinine at discharge
 - Higher rate of early renal graft failure
- Median renal graft survival was 16.4 years in both groups (p=0.12)

Patient Survival:

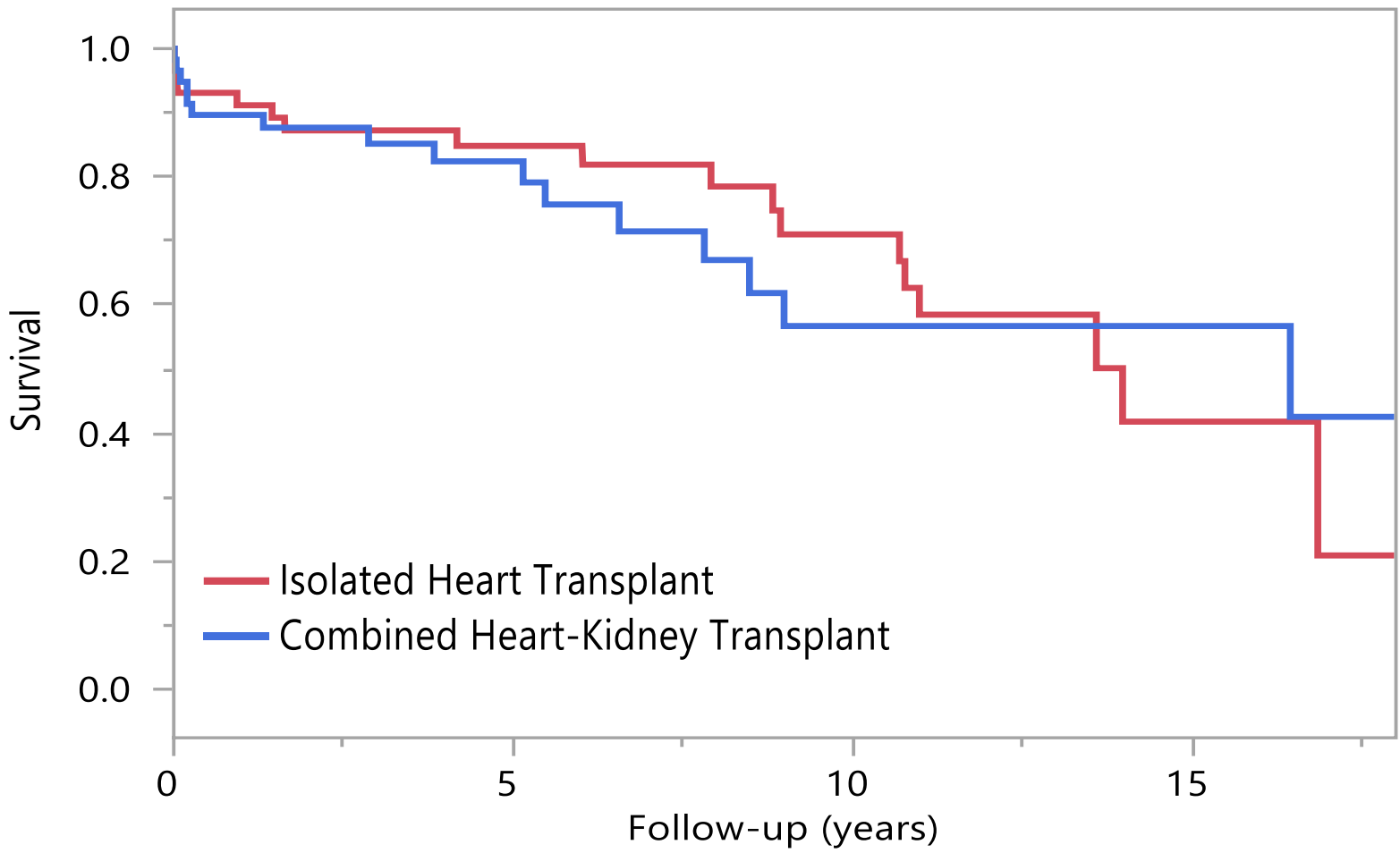
- Overall survival was not significantly different between vasoplegia groups (p=0.34). At 1 month, 1 year, 3 years, and 5 years, overall survival was:
 - Vasoplegia: 94.4%, 83.3%, 83.3% and 74.1%
 - No vasoplegia: 100%, 97.1%, 90.0% and 90.0%
- Operative mortality was higher in vasoplegia patients: 4 (20.0%) vs 1 (2.7%), p=0.03.

Results: Matched Cohorts

Overall Survival:

- 58 CHKT were performed at Mayo Clinic during the study period including 4 combined heart-liver-kidney transplants.
- Overall survival was not significantly different in CHKT and IHT recipients. At 1 month, 1 year, 5 years, and 10 years, overall survival
 - CHKT: 96.6%, 89.7%, 82.4%, and 56.7%
 - IHT: 93.1%, 91.1%, 84.8%, and 71.0% (p=0.89, figure 1)

Figure 1: Overall survival post-transplant



Renal Function:

- At last follow-up, 13 (22.4%) CHKT recipients and 7 (12.1%) IHT recipients developed end-stage kidney disease (ESKD) (p=0.2).
- Mean time to ESKD: 4.1 ± 6.1 years for CHKT patients and 5.5 ± 6.6 years for IHT patients (p=0.66).
- 2 CHKT recipients required repeat kidney transplant.
- 5 IHT recipients received or were listed for subsequent kidney transplant.

Conclusion

- CHKT and IHT recipients benefit from comparable long-term survival.
- Vasoplegia is associated with a higher risk of renal allograft dysfunction following CHKT
- Vasoplegia is more common in patients with LVAD as BTT and prior cardiac surgery. Identifying further risk factors associated with poor post-CHKT renal graft function could help define appropriate patient selection for CHKT.
- Reviewing CHKT allocation in high risk patient groups is warranted.

References

¹Chan *et al.* Vasoplegia after heart transplantation: outcomes at 1 year. *Interact Cardiovasc Thorac Surg.* 2017.