The Burden of Total Artificial Heart Patients and Complications After Heart Transplantation

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Abstract

Background: Left ventricular assist device (LVAD) and total artificial heart (TAH) patients undergoing heart transplantation are known to have increased perioperative risk. In addition, TAH patients have reported poor outcome following heart transplantation. It has not been clear if this increased risk has effects in terms of perioperative heart transplantation surgical outcomes in a high volume center. Therefore, we reviewed our TAH and LVAD patients for perioperative complications.

Methods: Between November 2010 and May 2018, we assessed 46 TAH patients bridged to transplant and compared them to 85 LVAD patients bridged to transplant. Post-transplant outcomes included total number of blood transfusions perioperatively (units of packed red blood cells, fresh frozen plasma, platelets, cryoprecipitate), time in the operating room (OR), intensive care unit (ICS) days immediate post-transplant, freedom from take backs to the OR for bleeding, freedom from primary graft dysfunction (PGD), and 1-year freedom from temporary dialysis. In addition, 1-year outcomes including survival, freedom from cardiac allograft vasculopathy (CAV), freedom from non-fatal major adverse cardiac events (NF-MACE: myocardial infarction, new congestive heart failure, percutaneous coronary intervention, implantable cardioverter defibrillator/pacemaker implant, stroke), and freedom from first year rejection (any treated rejection (ATR), acute cellular rejection (ACR), antibody mediated rejection (AMR)).

Results: TAH patients appeared to require more perioperative blood transfusions, and had decreased freedom from take backs to the OR for bleeding, temporary dialysis, and NF-MACE. There were no differences between groups forb time in the OR, ICU days post-transplant, and freedom from PGD, survival, CAV, and rejection compared to LVAD patients.

Conclusion: TAH patients appear to have increased perioperative risk following heart transplantation, although they have comparable outcomes to LVAD patients in terms of survival, CAV, and rejection. In a high volume center, expertise and experience can result in acceptable post-transplant outcomes in TAH patients.

Background

- Left ventricular assist device (LVAD) and total artificial heart (TAH) patients undergoing heart transplantation are known to have increased perioperative risk.
- In addition, TAH patients have reported poor outcome following heart transplantation.
- It has not been clear if this increased risk has effects in terms of perioperative heart transplant surgical outcomes in a high volume center.

Purpose

To assess our TAH and LVAD patients who undergo heart transplantation for perioperative complications.

Methods

- Between November 2010 and May 2018, we assessed 46 TAH patients bridged to transplant and compared them to 85 LVAD patients bridged to transplant.
- Post-transplant outcomes included:
  - total number of blood transfusions perioperatively (units of packed red blood cells, fresh frozen plasma, platelets, cryoprecipitate)
  - time in the operating room (OR)
  - intensive care unit (ICS) days immediate post-transplant
  - freedom from take backs to the OR for bleeding
  - freedom from primary graft dysfunction (PGD)
  - 1-year freedom from temporary dialysis.
- In addition, 1-year outcomes included:
  - Survival
  - Freedom from cardiac allograft vasculopathy (CAV)
  - Freedom from non-fatal major adverse cardiac events (NF-MACE: myocardial infarction, new congestive heart failure, percutaneous coronary intervention, implantable cardioverter defibrillator/pacemaker implant, stroke)
  - Freedom from first year rejection: any treated rejection (ATR), acute cellular rejection (ACR), and antibody mediated rejection (AMR).

Demographics

Demographics	TAH (n=46)	LVAD (n=85)	P-value
Mean Recipient Age, Years ± SD	50.1 ± 12.7	53.3 ± 11.5	0.145
Mean Donor Age, Years ± SD	29.1 ± 11.0	33.1 ± 10.7	0.048
Body Mass Index, Mean ± SD	26.1 ± 4.8	27.6 ± 4.7	0.077
Female (%)	17.8%	19.3%	1.000
Previous Pregnancy in Females (%)	100.0%	75.0%	0.262
Ischemic Time, Mean Mins ± SD	168.1 ± 61.2	170.2 ± 47.2	0.820
Primary Reason For Transplant, Underlying Diagnosis of CAD (%)	17.4%	32.2%	0.100
Status 1 at Transplant (%)	84.8%	76.7%	0.366
Cytomegalovirus Mismatch (%)	13.0%	19.8%	0.471
Diabetes Mellitus (%)	34.8%	44.8%	0.275
Treated Hypertension (%)	60.9%	59.3%	1.00
Prior Blood Transfusion (%)	87.0%	80.2%	0.471
Pre-Transplant PRA ≥ 10% (%)	33.3%	36.0%	0.848
Pre-Transplant Creatinine, Mean ± SD	2.09 ± 1.4	1.24 ± 0.7	<0.0001
ATG Induction Therapy (%)	67.4%	52.3%	0.101

Outcomes

Endpoints	TAH (n=46)	LVAD (n=85)	P-value
Perioperative Blood Transfusions (total units)	31.5 ± 12.9	25.4 ± 14.4	0.017
Time in OR (minutes)	553.8 ± 120.3	572.7 ± 151.3	0.466
ICU days	11.3 ± 11.5	8.9 ± 10.6	0.222
Freedom from take backs to OR	82.6%	93.1%	0.049
Freedom from PGD	91.3%	83.9%	0.237
1-Year Freedom from temporary dialysis	73.9%	87.4%	0.031
1-Year Survival	89.1%	93.0%	0.430
1-Year Freedom from CAV	95.7%	94.3%	0.774
1-Year Freedom from NF-MACE	78.3%	92.0%	0.024
1-Year Freedom from ATR	84.8%	87.4%	0.653
1-Year Freedom from ACR	97.8%	95.4%	0.505
1-Year Freedom from AMR	95.7%	97.7%	0.500

Results Summary

- TAH patients appeared to require more perioperative blood transfusions and had decreased freedom from take backs to the OR for bleeding, temporary dialysis, and NF-MACE.
- There were no differences between groups in terms of time in the OR, ICU days post-transplant, and freedom from PGD, survival, CAV, and rejection compared to LVAD patients.

Conclusion

- TAH patients appear to have increased perioperative risk following heart transplantation, although they have comparable outcomes to LVAD patients in terms of survival, CAV, and rejection.
- In a high volume center, expertise and experience can result in acceptable post-transplant outcomes in TAH patients.

Author Disclosures

D Ramzy has received honoraria from Abiomed, Cardiac Assist Inc, Medtronic Vascular Inc, and Zoll Services LLC and is a consultant/speaker for Abbott Laboratories, Baxter Healthcare, and Intuitive Surgical Inc. J Kobashigawa has received research grants and/or honoraria from CareDx, Inc., Sanofi-Genzyme, CSL-Behringer and One Lambda Inc. and is part of the advisory committee for TransMedics. O Seguchi, JC Youn, D Geft, R Cole, A Shen, K Nishihara, S Mersola, C Runyan, and J Hajj have no financial relationships to disclose.