



Salvage of Severe Primary Graft Dysfunction Following Cardiac Transplantation with Extracorporeal Life Support

^aSamuel Jacob, MD; ^bBrian Lima, MD; ^bGonzalo V. Gonzalez-Stawinski, MD; ^cParag Patel, MD; ^aErol V Belli, MD; ^aMagdy M El-Sayed Ahmed, MBBCh; ^aIan A Makey, MD; ^aMathew Thomas, MD; ^aKevin Landolfo, MD; ^cJuan Leoni-Moreno, MD; ^cDaniel Yip, MD; ^aSi Pham, MD

^aDepartment of Cardiothoracic Surgery, Mayo Clinic, Jacksonville, Florida, USA;
^bDepartment of Cardiothoracic Surgery, Baylor University Medical Center, Dallas, TX, USA;
^cDepartment of transplantation, Mayo Clinic, Jacksonville, Florida, USA

Background

Severe primary graft dysfunction (PGD) is the leading cause of early mortality after heart transplantation.

Aim

To examine the outcome of heart transplant recipients who received veno-arterial extracorporeal membrane oxygenation (VA-ECMO) support for severe (PGD) following cardiac transplantation.

Methods

We reviewed the records of 1030 consecutive patients who received heart transplant from 2005 to 2015 at 2 major U.S institutions. We defined severe PGD according to the ISHLT consensus criteria. The paired t-test was used for normally distributed continuous variables. Data were expressed as mean ± SD and a P values <0.05 was considered significant.

Results

Between 2005 and 2015, 1030 adult patients underwent heart transplantation at both institutions. Of these patients, 31 (3%) experienced severe PGD that requiring VA-ECMO support. The mean age was 51 ± 18 years (range 33-69 years). Indications for transplantation were ischemic or nonischemic cardiomyopathy in 29 (93%) and rejection of prior graft in 2 (6%). Fifteen (50%) had prior sternotomy and 10 (33%) had a left ventricular assist device (LVAD) as bridge to transplant. The mean donor cold ischemic time was 220 ± 30 min (range, 180 – 251 min) vs 200 ± 20 and cardiopulmonary bypass time was 198 ± 19 vs 170+15 min in comparison with patients who did not receive VA-ECMO. Severe PGD manifested as failure to wean from cardiopulmonary bypass in 17 patients (65%), severe hemodynamic instability in the immediate postoperative period in 10 patients (32%), including cardiac arrest in three patients (9%) and rupture of left ventricle free wall in one (3%). The timing of VA ECMO initiation varied, with the majority (21 patients, 63%) performed prior to leaving the operating room. Among the 31 VA-ECMO patients, 25 (80%) were successfully weaned of ECMO and 18 (58%) were discharged from the hospital, while 13 (40%) did not survive the hospital stay. Of those who survived ECMO, postoperative echocardiography showed the average LV ejection fraction was 45 ± 20% (range, 25-65%).

Table 1

Definition and classification of PGD after heart transplantation

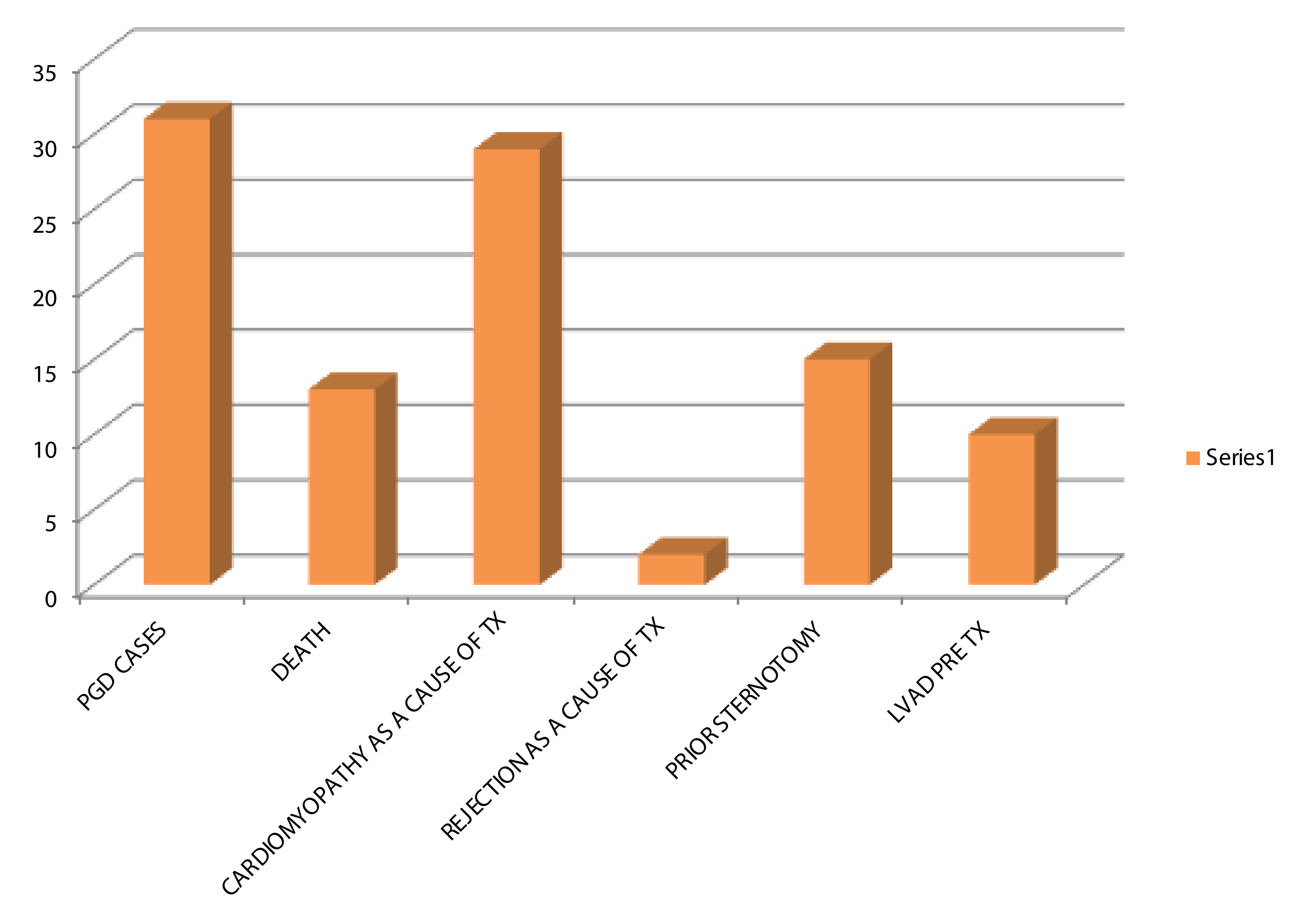
Side of PGD	Severity	Criteria*
PGD–LV	Mild	1. Echocardiography: LVEF < 40%
		OR
		2. Hemodynamics: CVP >15 mmHg, PCWP >20 mmHg, CI <2 l/min/m ² lasting for >1 hour and requiring low-dose inotropes
	Moderate	1. Echocardiography: LVEF < 40% or
		2. Hemodynamics: CVP >15 mmHg, PCWP >20 mmHg, CI <2 l/min/m ² , hypotension with MAP <70 mmHg
		AND
PGD-LV PGD-RV	Severe	3. Inotrope score >10 or intra-aortic balloon pump
		1. CVP >15 mmHg, PCWP <15 mmHg, CI <2 l/min/m ² and
		2. TPG <15 mmHg and/or SBP <50 mmHg
		OR
		3. Requirement of right circulatory assistance

Table 2

Pre-operative characteristics of patients with severe PGD (N=18)

Description	N (%) or Mean ± SD
Age (y)	51 ± 18
Male gender	27 (83)
Race	
White	21 (67)
African-American	10 (33)
BMI (kg/m2)	36 ± 13
Blood type	
A	15 (50)
B	7 (22)
O	6 (17)
AB	3 (11)
History	
Previous cardiac surgery	15 (83)
Previous stroke	4 (22)
Systemic arterial hypertension	5 (33)
Diabetes mellitus	7 (39)
Hemodynamic data	
Pulmonary systolic pressure (mmHg)	46 ± 20
Pulmonary vascular resistance (Wood units)	2.1 ± 0.9

Graph 1



Conclusions

VA-ECMO is a viable treatment option for severe PGD after heart transplantation, and has become our preferred modality for mechanical circulatory support for PGD. Additional studies, in larger cohorts of patients, will be necessary to define preventable risk factors for PGD following cardiac transplantation.

Conflicts of Interest

None

Funding Source

None