(RV) lead impedance also did not maintain any consistent relationship to changes in right-sided filling pressures as CF-LVAD speed was increased.

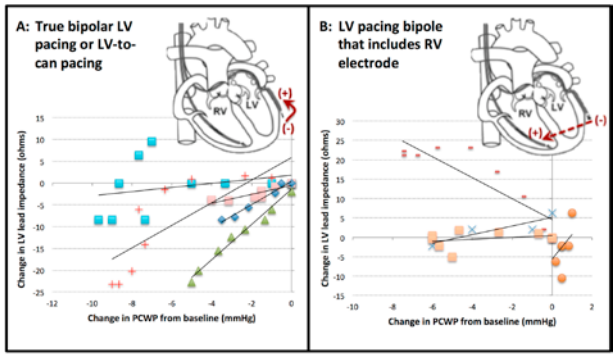


Figure 1: Relationship of changes in LV lead impedance to changes in PCWP

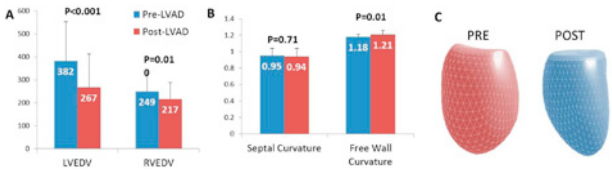
Conclusion: In patients with a biventricular ICD and CF-LVAD, a change in true bipolar LV pacing impedance may serve as a noninvasive surrogate for change in left sided filling pressures.

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Assessment of Ventricular Remodeling Post-LVAD with 3D Echocardiography and Surface Analysis

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Purpose: Reverse remodeling of the left ventricle (LV) following LV assist device (LVAD) is well described while little is known about changes in right ventricle (RV) following implantation. This study aims to use 3D echocardiography (3DE) and surface analysis to investigate the structural changes of the RV and LV in response to LVAD therapy.
Methods: Consecutive candidates for LVAD were prospectively enrolled. Patients had 2D and 3DE with surface analysis immediately before and one month after LVAD implantation. LV and RV volumes, RV free wall and septal curvature, and LV shape (sphericity/conicity) were compared prior to and following LVAD.
Results: 35 patients were enrolled, mean age 55 ± 16, 77% were male and 80% were destination therapy. LV end-diastolic volume (LVEDV) improved from 382 ± 171 mL to 267 ± 145 mL (p<0.001) and the RV end-diastolic volume (RVEDV) trended towards a reduction in size from 249 ± 84 mL to 217 ± 71 mL (p=0.10;Figure 1A,1C). LV ejection fraction (LVEF) and RV ejection fraction (RVEF) remained stable (p=0.68 and 0.82, respectively). RV free wall longitudinal strain worsened from -7 ± 3% to -4 ± 2% (p=0.001), while LV global longitudinal strain was unchanged (p=0.13). Surface analysis revealed no change in LV sphericity or conicity following LVAD implant (p=0.32 and 0.39, respectively). Curvature of the interventricular septum was unchanged but the curvature of the RV free wall increased from 1.18 ± 0.03 to 1.21 ± 0.05 (p=0.01), indicating an increase in convexity (Figure 1B).
Conclusion: Post-LVAD, LVEDV decreases with no change in the LVEF or LV shape, similar RVEDV and RVEF were unchanged. RV free wall curvature increase with LVAD implantation. Further research is needed into the impact of these changes on outcomes.



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A Retrospective Cohort Analysis of Chimney Graft Versus Percutaneous Perfusion Techniques for Veno-Arterial Extracorporeal Membrane Oxygenation in Patients with Refractory Cardiogenic Shock

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Purpose: This study was designed to evaluate vascular complications of patients with veno-arterial extracorporeal membrane oxygenation (VA-ECMO) support for refractory cardiogenic shock (RCS) and to compare the outcomes for ultrasound guided percutaneous femoral artery cannulation with distal perfusion (PC-DP) and arterial chimney greft perfusion (CGP) techniques.
Methods: We conducted a retrospective, observational cohort study of consequtive patients with RCS treated with VA-ECMO at single transplant center from March 2010 until August 2015. Overall, 148 patients underwent VA-ECMO for RCS (99 men, aged 61.6 ± 11.3 years, BSA, 1.85 ± 0.19). Outcomes were limb ischemia, limb loss, compartment syndrome, hyperperfusion syndrome, haematoma formation, bleeding and thrombosis.
Results: The median duration of VA-ECMO support was 5 days (range 1-80 days). There were no limb loss during follow-up. There was no difference between the groups regarding peripheral extremity ischemia [PC-DP group, n=4 (%5.4); CGP group, n=2 (%2,7); p=0,61]. However, hyperperfusion syndrome [PC-DP, 2 (%2.7) vs CGP, 22 (%30.1); p=0.001] and bleeding [PC-DP, 4 (%5.4) vs CGP, 18 (%24.7), p=0.001] were more common in CGP group. Furthermore, a significant difference was noted in primary and recurrent surgical interventions for vascular access between the groups, (p < 0.001).
Conclusion: From our experience, PC-DP technique for VA-ECMO support for RCS is a safe procedure and there were no additional major vascular complications when compared to CGP. The incidence of major vascular complications was similar in PC-DP and CGP techniques. However, we observed fewer minor vascular complications including bleeding, hyperperfusion syndrome, and haemotoma formation with PC-DP technique.
Key Words: Heart failure - Cardiogenic shock - Assisted circulation - Extracorporeal membrane oxygenation - Vascular Complications.

TABLE. Patient Demographic and Clinic Data.

Variables	Overall (n=148)	CGP group (n=73)	PC-DP group (n=75)	Pvalue
Age (yrs), mean±SD, median (min-max)	61.6± 11.3 65 (18-77)	61.8± 11.7 66 (18-77)	61.4± 10.9 63.5 (20-77)	0.56
Male gender, n (%)	99 (66.9)	50 (68.5)	49 (65.3)	0.64
Body surface area (kg/m2)	1.85 ± 0.19	1,85±0,19	1,87±0,2	0.61
History of peripheral vascular disease, n (%)	16(10.8)	9 (12.3)	7 (9.4)	0.54
Hypertension, n (%)	34(22.9)	15 (20.5)	19 (25.3)	0.23
Diabetes, n (%)	32(21.6)	17 (23.3)	15 (20)	0.77
Hypercholesterolemia, n (%)	40(27)	19 (26)	21 (28)	0.48
Current tobacco use, n (%)	42(28.4)	22 (30.1)	20 (26.7)	0.70
History of cardiac arrest, n (%)	5(3.4)	3 (4.1)	2 (2.7)	1.00
Previous hospital admission for HF, n (%)	38(25.7)	18(24.6)	20(26.7)	0.71
Previous stroke, n (%)	10(6.7)	4 (5.4)	6 (8)	1.00
COPD, n (%)	40 (27)	18 (24.7)	22 (29.3)	0.49
Serum creatinine (mg/dl)	1.43±0.75	1.49 ± 0.8	1.37 ± 0.68	1.00
Mean arterial pressure (mmHg)	52.9±9.1	52.5±7.9	52.7±10.1	0.41
Systolic PAP (mmHg)	48.9 ±9.9	48.5 ± 9.5	49.3 ± 10.4	0.86
LVEF, %	25.1±4.82	25.9 ± 5.12	24.3 ± 4.4	0.20
Previous IABP support	28 (19.0)	14 (19.2)	14 (18.7)	0.97
Multiorgan failure, n (%)	36 (24.3)	17 (23.3)	19 (25.3)	0.74
Indication forVA-ECMO, n(%)	8 (5.4)	4 (5.4)	4 (5.3)	
Acute myocardial infarction	39 (26.3)	18 (24.6)	21 (28)	
Decompensated chronic heart failure	3 (2)	2 (2.7)	1 (1.3)	
Posttransplant primary graft failure	9 (6.1)	6 (8.2)	3 (4)	
Sepsis	89 (60.1)	43 (58.9)	46 (61.3)	
Post-cardiotomy heart failure				

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Blood Product Utilization in Continuous Flow Left Ventricular Assist Devices: Single Institution Trends

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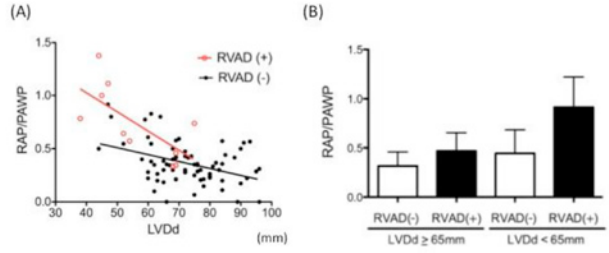
Purpose: Despite successful blood product (BPs) conservation in adult cardiac surgery, use of BPs remains high during Continuous Flow-Left Ventricular Assist Device (CF-LVAD) implantation. We examined trends in BPs utilization during implantation of CF-LVADS.
Methods: We reviewed the institutional Society of Thoracic Surgery (STS) database at an academic LVAD program from 2007 - 2015. Identified cohorts were: Destination (DT) or Bridge to Transplant (BTT), Heartware (HW) or Heartmate II (HM II), era of implantation (first 87 consecutive patients vs second 88 consecutive patients), and patients that received BPs intra or post-operatively (RBPs) or BPs naïve patients (BPN). Risk factors for BPs use were compared using the t-test or chi-square. Multivariate analysis was done with Cox PH regression. 5 year Kaplan-Meier survival curves were created and the log rank test was employed to compare groups.
Results: 176 patients underwent CF-LVAD implantation from 2007-2015. Cohorts were heterogeneous in preoperative variables. Multivariate analysis identified DT, HM II, early era, pre-operative hematocrit, and redo-sternotomies as significant independent risk factors for BPs use. 44 Patients (25% of CF-LVAD implantations) were managed without use of BPs. Surgical re-exploration for bleeding was 8 %. BPN patients had improved 30 day mortality (RBP 16.03% vs BPN 2.27%, p=0.047) and shorter ICU lengths of stay (RBP 249+/-215 hrs vs BPN 182+/-76 hrs, p=0.049). 5 year Kaplan-Meier curve trended towards improved survival for BPN patients but lacked significance (p=0.06). Index hospitalization hemoglobin nadir for RBP patients was 7.06+/-1.10 verse a nadir of 7.74+/-1.0 for BPN patients (p=<0.01).
Conclusion: BPs use declined at our institution over the CF-LVAD implantation experience. DT, HM II, early era patients, pre-op hematocrit and redo-sternotomies were risk factors for BPs use. CF-LVADs can be safely implanted without any use of BPs. BPN patients had shorter ICU lengths of stay, improved 30 day mortality and trended towards improved 5 year survival. Post operatively patients can be safely managed with a hemoglobin less than 8 with good outcomes.

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Considering LV Dimension Is Important in Assessing the Risk of Right Ventricular Failure after Left Ventricular Assist Device Implantation

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Purpose: Right ventricular failure (RVF) is a major issue in left ventricular assist device (LVAD) therapy for advanced heart failure. Some hemodynamic parameters have been reported to be predictive for RVF after LVAD implantation, however these sensitivity and specificity are not sufficient in clinical use.
Methods: We assessed the predictive indices for RVF, defined as the necessary for right ventricular assist device (RVAD), in 86 patients who received implantable LVAD insertion in Osaka University Hospital.
Results: RVAD support was needed in 10 patients after LVAD implantation. The patients with RVAD had higher right atrial pressure (RAP) and RAP to pulmonary artery wedge pressure ratio (RAP/PAWP), and smaller LV dimension at diastole (LVDd) than those in the patients without RVAD (12±4 mmHg vs. 7±5 mmHg, p<0.01 and 0.74±0.34 vs. 0.35±0.18, p<0.001, 56±13 mm vs. 73±12 mm, p<0.001, respectively). RAP/LVDd in the patients with RVAD was also significantly higher than that in the patients without RVAD (0.23±0.12 vs. 0.10±0.08, p<0.001), whereas PAWP/LVDd was not. RAP/PAWP inversely correlated with LVDd (r=0.50, p<0.001), and the correlations were significantly different in patients with and without RVAD (Fig A). RAP/PAWP in patients with RVAD and small LVDd (<65 mm) was significantly higher than those in the other groups (Fig B).
Conclusion: Smaller LV dimension is one of the risk factors for RVAD support and considering LV dimension is important in assessing the risk of RVAD with hemodynamic parameters.



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Incidence and Predictors of Left Ventricular Functional Recovery on Continuous-Flow Left Ventricular Assist Device (CF-LVAD) Support

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Purpose: Mechanical unloading with continuous-flow left ventricular assist devices (CF-LVAD) leads to improvements in the failing myocardium at structural and molecular levels. However device explantation for recovery is rare. We sought to investigate the incidence and predictors of LV functional recovery in patients on CF-LVAD support.
Methods: CF-LVAD patients with paired echocardiogram data before and after device implant at a large referral center were retrospectively reviewed. Patients were categorized into partial recovery and no recovery cohorts based on maximum LVEF achieved on device support. Cardiac function was categorized as severe (LVEF less than 20%), moderate (LVEF 20 - 39%), and mild to no LV dysfunction (LVEF greater than or equal to 40%).
Results: 2,942 echocardiography studies from 335 CF-LVAD patients implanted between 11/2006 and 05/2015 were identified. LVEF improved from 15.4% to 23.8% in the overall cohort (p<0.001). LVEF category worsened in 18 (5.4%), unchanged in 165 (59.3%), and improved in 152 (45.4%) patients. 22 (6.7%) patients exhibited LVEF improvement to greater than or equal to 40% at one point during CF-LVAD support. Factors associated with LVEF improvement included young age (50.9±14.7 vs. 59.1±13.4 years, p<0.001), female gender (40.9% vs. 17.4%, p<0.001), non-ischemic etiology (77.3% vs. 52.4%, p=0.024), smaller baseline LVEDD (6.0±1.3 vs. 7.0±1.0 cm, p=0.007), and absence of ICD at the time of LVAD implant (31.8% vs. 11.8%, p=0.007). LVEF improvement was 7.0% in patients supported with axial vs. 4.1% in those supported with centrifugal CF-LVAD (p=0.754).
Conclusion: 7% of patients experienced substantial improvement of LV function on contemporary CF-LVAD support. Systematic recovery assessment and optimization of reverse remodeling therapy may increase the incidence of successful device explantation in CF-LVAD patients.

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Can Patients with Restrictive Physiology Be Successfully Bridged to Transplant with Left Ventricular Support Alone Versus Biventricular Support?

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Purpose: Patients (pts) with decompensated heart failure due to non-dilated restrictive cardiomyopathy (RCM) pose unique challenges if mechanical circulatory support (MCS) is required as a bridge to transplant. The use of left ventricular assist devices (LVADs) in small or restricted left ventricular cavities may render them less effective and may be associated with complications (eg suction events, arrhythmias, low flow). We retrospectively compared outcomes between LVAD and durable biventricular or total artificial heart (TAH) support in pts with RCM.
Methods: Between 2009-15, we assessed 20 pts with RCM who required MCS. 12 pts received biventricular support (8-TAH, 2 biventricular HeartWare, 2 paracorporeal biventricular assist devices (PVADs)) and 8 pts had LVADs. Etiology of RCM, pre-implant echo parameters (left ventricular ejection fraction and end diastolic diameter (LVEDD), severity of mitral