of external equipment of BVAD systems may be obstructive during daily activities.

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3D Surface Analysis of RV and LV Shapes as Predictors of Post-LVAD RV Failure

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Purpose: Right ventricular failure (RVF) occurs in up to 40% of patients following left ventricular assist device (LVAD) implantation, and is associated with morbidity and mortality. Prediction of RVF combines 2D echocardiography, hemodynamics and clinical variables. This study aims to investigate the use of 3D echocardiography and surface analysis for predicting post-LVAD RVF.
Methods: In this prospective study, patients underwent 2D and 3D echocardiography with surface analysis prior to LVAD implantation. RVF was defined as requirement of more than two weeks of inotropes post LVAD implantation or the use of RVAD. 2D and 3D parameters were compared between patients with and without post-LVAD RVF.
Results: 33 consecutive patients were enrolled. Mean age was 57 ± 15, 76% were male and 82% were destination therapy. 10 patients (30%) suffered RVF. The pre-LVAD echo characteristics of patients with and without post-LVAD RVF are shown in the Table. In the RVF group, RV volume was significantly larger (286 ± 72 mL vs. 223 ± 90 mL;p=0.04), and there was a trend towards reduced RV free wall strain (-5 ± 2% vs. -7 ± 3%;p=0.09), but no difference in RVEF (30 ± 8% vs. 28 ± 11%;p=0.59). RV shape, measured by free wall and septal curvature, was similar between the two groups. There was no difference in LV volume (p=0.87) or function, measured either by LVEF (p=0.53) or global longitudinal strain (p=0.17). LV shape, measured by sphericity (p=0.68) and conicity (p=0.68), was also similar between the two groups.
Conclusion: Patients who developed RV failure had larger pre-LVAD RV volumes and a trend towards reduced RV free wall longitudinal strain rates. LV size, function and shape were similar in patients who did or did not subsequently develop RVF. Our findings suggest that LV geometry does not significantly influence the risk of RV failure post-LVAD.

	RV Failure (N=10)	No RV Failure (N=23)	P
RV volume (mL)	286 ± 72	223 ± 90	0.04
RVEF (%)	30 ± 8	28 ± 11	0.59
RV free wall longitudinal strain (%)	-5 ± 2	-7 ± 3	0.09
RV free wall curvature	1.09 ± 0.09	1.09 ± 0.12	0.95
Interventricular septal curvature	0.25 ± 0.32	0.39 ± 0.48	0.33
LV volume (mL)	362 ± 143	371 ± 135	0.87
LVEF (%)	16 ± 8	18 ± 5	0.53
LV global longitudinal strain (%)	-5 ± 2	-6 ± 2	0.17
LV Sphericity	0.72 ± 0.05	0.71 ± 0.04	0.68
LV Conicity	0.74 ± 0.02	0.75 ± 0.02	0.68

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Vascular Reactivity Analysis in Patients with Continuous Flow Left Ventricular Assist Devices (CF-LVADs) - The Role of Endothelial Function in Continuous Flow Physiology

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Purpose: Endothelial dysfunction associated with CF-LVAD placement and a loss of pulsatility could result in complications such as GI bleeding. Reports using both brachial reactivity and EndoPAT® machines have shown mixed results of endothelial dysfunction when compared to pulsatile LVAD. Both tests rely on physical pulse volume and might be impacted by the mere loss of pulsatility. Hence, we set out to analyze endothelial function utilizing thermal digital monitoring (VENDYS) in patients with CF-LVADs.
Methods: Stable patients were recruited and we performed the VENDYS and determined aortic valve opening with a portable echo. Patients were classified based on parameters of vascular reactivity index (VRI) described in normal populations: poor (<1) intermediate (1 - 2) and good VRI (2 - 3) with higher VRI correlated with better endothelial function, hence better outcomes. Pearsons correlation and T-test were performed, P-values < 0.05 were considered significant.
Results: 81% of the patients had aortic valve opening at the time of endothelial function assessment. Only 19% had a poor VRI, while majority had an intermediate VRI. Older patients had worse endothelial function. Correlation between VRI and VAD flow (r= -0.2766 P value= 0.08) and high Doppler blood pressure (r= -0.2656 P value=0.09) showed no significance. However, 50% of the patients with a poor VRI had adverse events while only 23% of those with good endothelial function. The 2 patients with poor VRI who had a GI bleed had 5 episodes while the 3 patients with good VRI had 4 episodes.
Conclusion: In a cohort of CF-LVAD patients where the majority had open aortic valves, endothelial function was poor in only a few. It is not clear if endothelial dysfunction contributes to any of the adverse events for CF-LVAD patients but there seems to be a higher recurrence of GI bleeding in patients who had a poor endothelial function.

Table 1

	Total	<1	1 to 2	2 to 3	p value
N	42 (100%)	8 (19%)	21 (50%)	13 (31%)	
VENDYS score	1.71±0.78	0.45±0.35	1.69±0.28	2.5±0.35	
Age	57±12.8	60.3±7.5	59.6±10.1	50.2±16.7	0.073
Male	34 (81%)	5 (62.5%)	19 (90%)	10 (77%)	0.2082
Caucasian	17 (40%)	2 (25%)	9 (43%)	6 (46%)	0.6009
DT	31 (74%)	6 (75%)	17 (81%)	8 (61%)	0.45
AV opened	34 (81%)	7 (87%)	17 (81%)	10 (77%)	0.835
Days under support	585±567	244±276	672±586	497±582	0.17
BUN	275.47±282.4	25.25±16.47	24.8±7.23	20.6±7.54	0.41
Hgb	11.06±2.22	9.77±1.47	11.56±2.45	11.04±2.01	0.15
Flow	5.49±1.34	6.4±1.47	5.21±1.51	5.37±0.51	0.098
Patients with events	17 (100%)	4 (23%)	10 (59%)	3 (18%)	0.3
GIB	10 (58%)	2	5	3	0.99
Infections	4 (23%)	1	3	0	0.36
Arrhythmia	1 (6%)	0	1	0	0.59
ADHF	3 (18%)	0	3	0	0.19
Death	3 (14%)	1	2	0	0.46

VENDYS score: Endothelial function based thermal vascular reactivity.
DT: Destination Therapy. AV: Aortic valve. GIB: Gastrointestinal bleeding. ADHF: Acute decompensated heart failure

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Pump Speed Increase Improves Submaximal Exercise Tolerance in Continuous-Flow Left Ventricular Assist Device (CF-LVAD) Patients-A Double Blind Randomized Trial

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Purpose: Fixed CF-LVAD pump speed provides inadequate circulatory support during maximal exercise but manually increasing pump speed improves peak oxygen uptake. The effect of pump speed increase on submaximal exercise tolerance - corresponding to activities of daily living (ADLs) - is unknown. The aim of this study was to examine the clinical relevance of increased pump speed during exercise at a submaximal level chosen below anaerobic threshold (AT).
Methods: Patients each completed three exercise sessions on an ergometer cycle. On day 1, a maximal exercise test was performed to determine workload at AT (RER>1). On a subsequent day, two submaximal tests at a fixed workload below AT were undertaken; one at fixed baseline pump speed (TestSub-), the other with baseline pump speed + 800 rpm (TestSub+). The submaximal protocol was set to increase resistance by +10W/min until reaching the predefined, patient specific load (AT load-10 W) followed by no