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LARGE INCREMENTAL CHANGES IN PUMP SPEED ARE REQUIRED IN ORDER TO SEE MEANINGFUL CHANGES IN INVASIVELY MEASURED HEMODYNAMICS IN PATIENTS WITH HEARTMATE II CONTINUOUS FLOW LEFT VENTRICULAR ASSIST DEVICES (CF-LVADS)

Poster Contributions
Poster Hall B1
Saturday, March 14, 2015, 10:00 a.m.-10:45 a.m.

Session Title: Stage D and Beyond: Advanced Heart Failure, Mechanical Circulatory Support and Transplantation
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Normalization of invasive hemodynamics in patients on CF-LVADs has been documented. However, a paucity of literature exists to describe the hemodynamic changes expected with incremental changes in pump speed. We conducted this prospective study in order to better understand these changes.

Simultaneous echocardiography and invasive hemodynamics were performed in 40 patients supported by the HeartMateII CF-LVAD referred for clinically indicated right heart catheterization. Changes in echocardiographic and hemodynamic parameters were determined for each incremental change of 1, 2, and 3,000rpm using ANOVA testing.

No significant difference in invasive hemodynamic or echocardiographic parameters was observed when comparing pump speeds that differed only by an increment of 1,000 rpm (see Table 1). With increases of 2-3,000rpm, invasive parameters of cardiac output (CO), cardiac index (CI), pulmonary capillary wedge pressure, and pulmonary arterial pressure showed a significant change, as did echocardiographic parameters of CO, CI, and left ventricular end diastolic diameter. Right atrial pressures remained similar at all pump speeds.

A substantial change in pump speed of 2-3,000rpm above the previous setting is needed to significantly alter instantaneous hemodynamics in patients on CF-LVAD. Echocardiographic surrogates of LV unloading are similarly affected only with these larger degrees of adjustment. This may be clinically important when acute hemodynamic changes are desired.

Echocardiographic parameters and hemodynamics at varying pump speeds

	8000rpm	9000rpm	10000rpm	11000rpm	p-value	8 vs 9k	9 vs 10k	8 vs 10k	10 vs 11k	9 vs 11k	8 vs 11k
	n=40										
LAVi	35.3 ± 20.5	32.8 ± 16.1	32.5 ± 16.2	33.0 ± 16.5	0.9	ns	ns	ns	ns	ns	ns
E	88.5 ± 31.7	88.3 ± 33.6	81.6 ± 31.0	80.9 ± 26.3	0.6	ns	ns	ns	ns	ns	ns
A	62.1 ± 31.5	61.0 ± 31.0	60.2 ± 26.2	57.2 ± 23.6	0.9	ns	ns	ns	ns	ns	ns
E/A	1.7 ± 1.0	1.8 ± 1.1	1.6 ± 0.9	1.6 ± 0.8	0.8	ns	ns	ns	ns	ns	ns
RAP	10.0 ± 5.2	10.2 ± 5.3	10.6 ± 6.1	10.8 ± 5.8	0.9	ns	ns	ns	ns	ns	ns
DT	162.7 ± 35.7	179.0 ± 46.4	217.9 ± 55.7	250.6 ± 69.4	<0.001	ns	*	**	ns	***	****
E' lat	7.7 ± 3.0	7.6 ± 3.0	8.1 ± 2.6	7.7 ± 2.4	0.8	ns	ns	ns	ns	ns	ns
E' sep	5.8 ± 2.4	5.6 ± 2.2	5.9 ± 2.3	5.7 ± 2.1	0.7	ns	ns	ns	ns	ns	ns
Avg. E	6.8 ± 2.3	6.7 ± 2.4	7.1 ± 2.2	6.8 ± 2.1	0.8	ns	ns	ns	ns	ns	ns
E/E'	14.5 ± 7.8	14.5 ± 7.5	13.5 ± 7.0	13.1 ± 5.6	0.8	ns	ns	ns	ns	ns	ns
FS	15.1 ± 8.5	16.3 ± 8.7	19.4 ± 9.1	21.9 ± 10.5	0.01	ns	ns	ns	ns	*	*
CO	3.9 ± 0.9	4.2 ± 1.0	4.7 ± 1.3	5.1 ± 1.4	<0.0001	ns	ns	**	ns	**	****
CI	1.9 ± 0.5	2.1 ± 0.6	2.3 ± 0.7	2.5 ± 0.8	0.0002	ns	ns	*	ns	*	***
LVIDd	5.5 ± 1.0	5.3 ± 1.1	4.9 ± 1.1	4.5 ± 1.0	0.0009	ns	ns	ns	ns	*	***
AV opening duration (ms)	146.1 ± 79.4	107.3 ± 86.2	25.4 ± 68.7	0	<0.0001	ns	***	****	ns	****	****
MRAP	10.3 ± 6.0	10.0 ± 6.1	9.4 ± 5.9	9.4 ± 6.1	0.8	ns	ns	ns	ns	ns	ns
SPAP	40.8 ± 14.4	38.6 ± 14.3	34.7 ± 12.6	32.7 ± 12.8	0.05	ns	ns	ns	ns	ns	ns
DPAP	18.2 ± 7.9	16.5 ± 8.0	14.1 ± 6.9	12.1 ± 6.7	0.004	ns	ns	ns	ns	ns	**
MPAP	26.3 ± 9.6	24.2 ± 10.0	21.2 ± 8.7	18.8 ± 8.3	0.004	ns	ns	ns	ns	ns	**
PCWP	16.8 ± 8.5	13.8 ± 7.7	10.9 ± 7.5	8.4 ± 5.4	<0.0001	ns	ns	**	ns	*	****
CO	4.8 ± 1.0	5.2 ± 0.8	5.7 ± 0.9	6.1 ± 1.2	<0.0001	ns	ns	***	ns	***	****
CI	2.3 ± 0.4	2.5 ± 0.4	2.8 ± 0.4	2.9 ± 0.5	<0.0001	ns	ns	*	****	ns	***	****
PVR (WU)	1.8 ± 0.6	2.4 ± 2.1	2.7 ± 1.4	3.2 ± 2.1	0.004	ns	ns	ns	ns	ns	ns	**

ns: not significant, * <0.05, **< 0.01, ***<0.001, ****<0.0001