

Temporal Predictors of Late Right Heart Failure After Left Ventricular Assist Device Implantation



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BACKGROUND

Late right heart failure (LRHF) following left ventricular assist device (LVAD) implantation is associated with increased mortality but predictors are not well known.

RESEARCH AIM

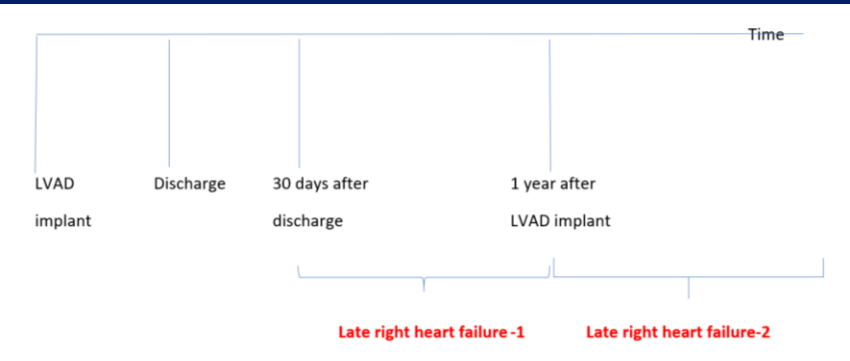
Predictors of LRHF occurring <1 year after LVAD implantation (LRHF-1) may differ from predictors of LRHF occurring >1 year after LVAD implantation (LRHF-2).

METHODS: Overview

- We studied 197 patients implanted with an axial continuous-flow LVAD for the first time at the University of Rochester, NY between 2008-2016 and who survived >30 days after discharge.
- Patients were supported by a LVAD for a mean of 2.9 ± 1.6 years after LVAD implantation.
- The University of Rochester LVAD Database, created using medical record and INTERMACS data, was used for this study.

METHODS: Right Heart Failure

- Right Heart Failure (RHF): First RHF event of any severity >30 days after initial discharge post LVAD implantation was defined by INTERMACS criteria (documentation and manifestation of elevated central venous pressure which may be accompanied by readmission for RHF, inotrope use, RVAD, or death secondary to RHF).
- LRHF-1: Greater than 30 days after discharge to 1 year after LVAD implant date
- LRHF-2: Greater than 1 year after LVAD implant date
- Cox proportional hazards models were used to examine the association between preoperative characteristics, including those listed in the below tables, and LRHF-1 and LRHF-2



RESULTS: Preoperative Characteristics

Preoperative Characteristics of Patients by Presence of Late Right Heart Failure-1*

Variable	No LRHF-1 (n=171)	LRHF-1 (n=26)	p value
Age (years)	55.8	60.3	0.091
Male	80%	88%	0.423
Destination Therapy	30%	50%	0.048
INTERMACS 1 or 2	59%	58%	0.895
Ischemic etiology of HF	56%	54%	0.870
RVAD (prior to initial discharge)	15%	4%	0.215
Diabetes	32%	54%	0.026
Atrial fibrillation	34%	58%	0.019
Hypertension	49%	54%	0.654
Ejection fraction (%)	17.6	22.4	0.009
RA pressure (mmHg)	12.1	11.5	0.467
Mean PA pressure (mmHg)	37.2	35.9	0.353
BUN (mg/dL)	26.0	35.4	0.012
Creatinine (mg/dL)	1.26	1.36	0.108

*All patients survived >30 days after initial discharge post LVAD implant.

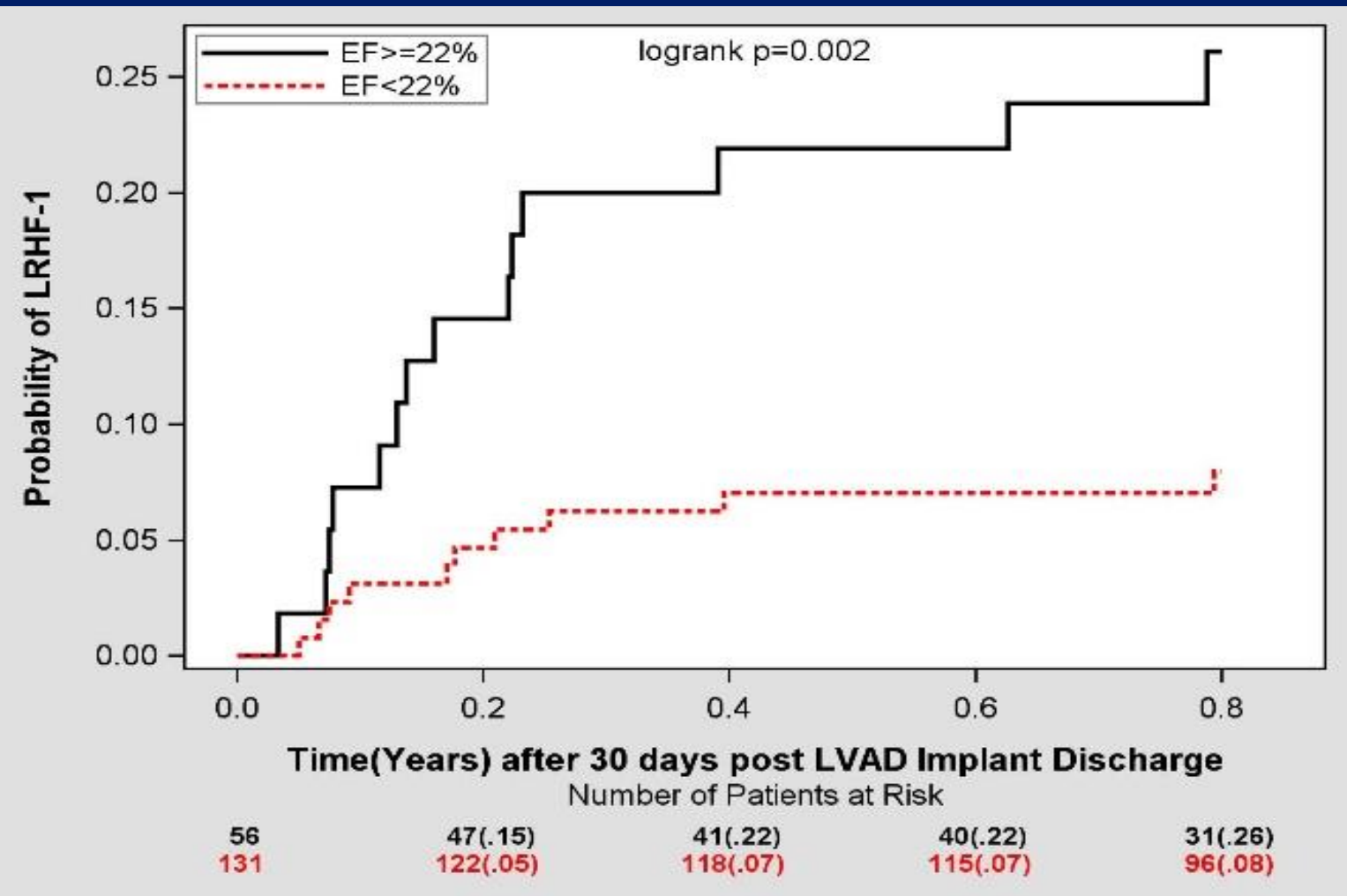
Preoperative Characteristics of Patients by Presence of Late Right Heart Failure-2*

Variable	No LRHF-2 (n=116)	LRHF-2 (n=35)	p value
Age (years)	55	57	0.488
Male	80%	89%	0.256
Destination Therapy	27%	31%	0.586
INTERMACS 1 or 2	62%	51%	0.261
Ischemic etiology of HF	54%	60%	0.553
RVAD (prior to initial discharge)	16%	9%	0.251
Diabetes	28%	37%	0.279
Atrial fibrillation	34%	29%	0.515
Hypertension	48%	54%	0.533
Ejection fraction (%)	17.1	17.9	0.992
RA pressure (mmHg)	12.0	12.8	0.255
Mean PA pressure (mmHg)	37.4	38.1	0.730
BUN (mg/dL)	25.1	27.3	0.412
Creatinine (mg/dL)	1.25	1.22	0.775

*All patients survived >1 year after LVAD implant. Patients with LRHF-1 were excluded.

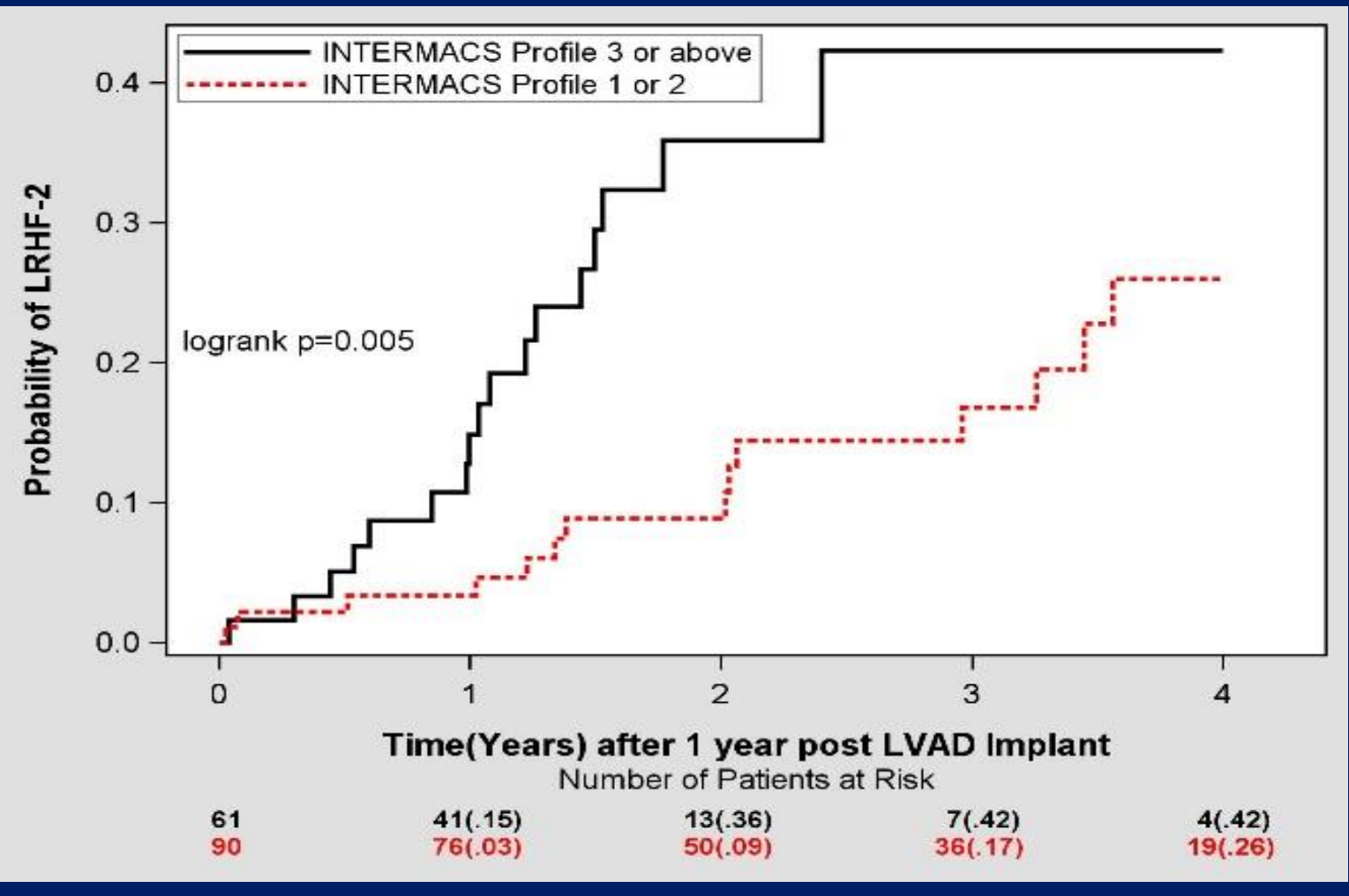
RESULTS: Predictors of Late Right Heart Failure

Preoperative Ejection Fraction and Risk of Late Right Heart Failure-1



- Higher preoperative EF (Hazard Ratio [HR] per 5% increase=1.36, $p=0.006$) and destination therapy designation (HR=2.25, $p=0.044$) were associated with significantly increased risk of LRHF-1.
- Approximately one year after LVAD implantation, patients with EF $\geq 22\%$ had a 3.3 times increased probability ($p=0.005$) of LRHF-1 compared to patients with EF $< 22\%$.

INTERMACS Profile and Risk of Late Right Heart Failure-2



- INTERMACS profile 1 or 2 (HR=0.37, $p=0.006$) was associated with a significantly decreased risk of LRHF-2.
- Three years after the 1 year post LVAD implant timepoint, patients with INTERMACS profile 3 or greater had a 2.5 times increased probability ($p=0.014$) of LRHF-2 compared to patients with INTERMACS profile 1 or 2.

CONCLUSIONS

- Most patients who required a RVAD during hospitalization for LVAD implant did not develop LRHF.
- Higher preoperative ejection fraction and destination therapy are predictors for LRHF < 1 year after LVAD implant.
- Higher INTERMACS profile predicts LRHF > 1 year after LVAD implant.
- These parameters could serve as useful risk markers for LRHF in LVAD patients.