Predicting Cardiac Structural and Functional Improvement Induced by Mechanical Unloading in Chronic Heart Failure: a Derivation-Validation Multicenter Study

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BACKGROUND

Predicting cardiac structural and functional improvement in advanced heart failure (HF) patients before durable left ventricular assist device (LVAD) implantation remains challenging.

OBJECTIVE

Identifying clinical predictors could improve patient selection and impact clinical management.

METHODS

Advanced chronic HF patients (N=652) supported with continuous-flow LVADs were evaluated.

Acute HF etiologies or inadequate post-LVAD follow up (<3 months) were exclusion criteria.

Patients were divided into an internal Derivation cohort (n=339, UTAH program) and an external Validation cohort (n=227, 4 US programs).

Responders (R): post-LVAD LVEF ≥40% and LVIDd ≤6.0cm within the 1st year post-implant.

Multivariate Cox regression was used to predict R, in the Derivation cohort, and the fit of the model was tested in the Validation cohort.

RESULTS

Variables	Responders (n=33)	Non Responders (n=192)	p-value
Age, yrs	49±4	58±1	0.0003
Male Sex, n (%)	24 (73)	172 (90)	0.008
BMI, Kg/m²	28±1	29±1	NS
Diabetes Mellitus, n (%)	10 (30)	76 (40)	NS
HF etiology			0.024
Ischemic CM, n (%)	9 (27)	93 (48)	
Non ischemic CM, n (%)	24 (73)	99 (52)	
Duration of HF symptoms, months	49±12	96±6	0.003
Previous cardiac surgery, n (%)	4 (12)	56 (29)	NS
Temporary MCS, n (%)	4 (12)	8 (4)	NS
Inotrope dependent, n (%)	25 (76)	120 (63)	0.05
VAD type			NS
HeartWare, n (%)	8 (24)	86 (45)	
HeartMate II, n (%)	21 (64)	75 (39)	
HeartMate 3, n (%)	3 (9)	9 (5)	
Jarvik, n (%)	1 (3)	17 (9)	
Hemoglobin, g/dL	12.0±0.4	12.4±0.2	NS
Sodium, mEq/L	134±1	135±0	NS
Blood Urea Nitrogen, mg/dL	27±3	32±1	NS
Creatinine, mg/dL	1.37±0.12	1.40±0.03	NS
Aspartate Aminotransferase, IU/L	65±14	44±4	0.002
Albumin, g/dL	3.6±0.1	3.7±0.0	0.046
Brain Natriuretic Peptide, pg/mL	1838±300	1251±88	0.03
LV ejection fraction, %	19±2	20±1	NS
LV end-diastolic diameter, cm	6.2±0.2	6.8±0.1	0.0008

No difference observed in baseline/LVAD implant:

- Heart Failure medications
- Hemodynamic parameters

RESULTS

10% (Derivation) of the LVAD patients were R.

Univariate analysis showed that R were:

- ↓ Age
- ↓ HF symptoms duration
- ↓ Diuretics
- ↓ LVEDD
- ↑ Acuity (vasoactive agents, BNP & AST)

The multivariate Cox regression (AUC=0.74; p<0.001) predicted R using 3 clinical parameters:

I. Age <50 years

II. HF duration <36 months

III. LVEDD <6.9 cm

The model's predictive accuracy was validated in the external Validation cohort (AUC=0.78; p<0.001).

CONCLUSIONS

Younger patients with less LV dilation and shorter duration of HF are more likely to improve their cardiac function during LVAD support.

DISCLOSURES

Stavros Drakos, MD, PhD: Consultant for Abbott Laboratories. None of the other authors have any relationship to disclose

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