EUROMACS-RHF Risk Score and 3D Echocardiography as Predictors of Right Heart Failure after Left Ventricular Assist Device Implantation

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Background

- Right heart failure (RHF) after left ventricular assist device (LVAD) remains a leading cause of perioperative morbidity and mortality.[1]
- European Registry for Patients with Mechanical Circulatory Support (EUROMACS) has created a risk score for predicting RHF called EUROMACS-RHF.[2]
- EUROMACS-RHF is based on 5 variables – total of 9.5 points:
  - 2.5 Points: Use of ≥ 3 inotropes.
  - 2 Points: Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) class 1-3 (lower number indicates more severe heart failure).
  - 2 Points: Severe RV dysfunction seen on echocardiography.
  - 2 Points: Right atrial / pulmonary capillary wedge pressure > 0.54.
  - 1 Point: Hemoglobin ≤ 10 g/dL.

Hypothesis

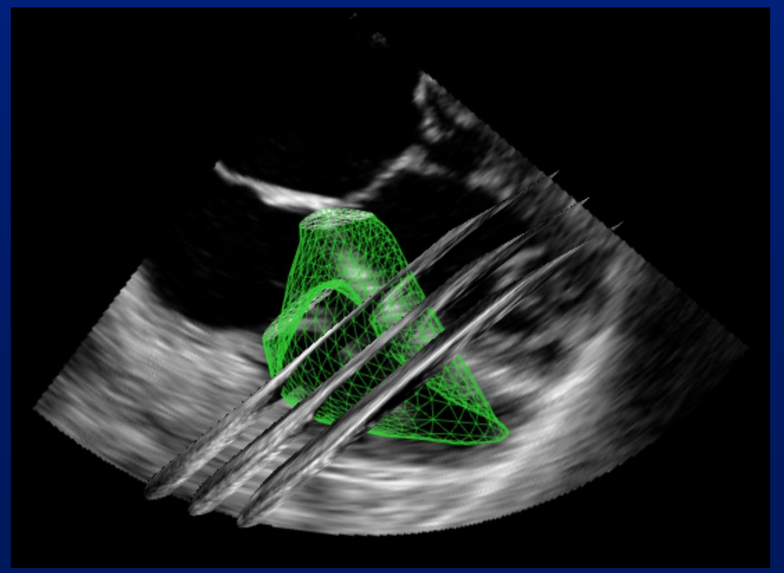
- Test the performance of EUROMACS-RHF score in our patients.
- Assess if 3D RV ejection fraction (EF) would predict early RHF.

References

1. Kormos, R. *et al.* 2010. J Thorac Cardiovasc Surg.139. P 1316-1324.
2. Soliman, O. *et al*. 2018. Circulation.137(9). P 891-906.

Variable	No RVF (n=84)	RVF (n=108)	p
Age	61.51±10.72	58.11±11.34	0.0216[1]
Gender (Male)	71 (84.52%)	82 (75.93%)	0.1418[3]
Race (Black or African American)	23 (27.38%)	49 (45.37%)	0.0106[3]
Body mass index	29.08±6.39	30.86±6.97	0.0711[2]
NICM	44 (52.38%)	64 (59.26%)	0.3405[3]
LVAD type			0.7488[3]
HM II	21 (25.00%)	31 (28.70%)	
HM III	35 (41.67%)	46 (42.59%)	
HVAD Heartware	28 (33.33%)	31 (28.70%)	
Pre- RA	11.15±5.07	14.28±5.95	0.0004[2]
Pre PAPI	2.88±2.64	2.62±2.49	0.1434[1]
Pre RA/PCWP	0.49±0.17	0.56±0.22	0.0159[2]
RV FAC	0.19±0.10	0.18±0.09	0.4499[1]
RV TAPSE	1.04±0.55	0.97±0.55	0.2952[1]
3D RV EF	25.32±9.26	27.31±9.67	0.3011[1]
3D EDV	125.72±42.14	146.80±54.39	0.0710[2]
Moderate or severe RV dysfunction	58 (69.05%)	88 (81.48%)	0.0452[3]
EUROMACS	3.21±1.64	3.56±1.57	0.1460[1]

EDV, end-diastolic volume; EF, ejection fraction; FAC, fractional area change;LVAD, left ventricular assist device; PAPI, pulmonary artery pulsatility index; PCWP, pulmonary capillary wedge pressure; RA, right atrium; RV, right ventricle; RVF, right ventricular failure; TAPSE, tricuspid annulus plane systolic excursion
Continuous variables: mean±standard deviation; Categorical variables: n (frequency).
[1]Wilcoxon Rank Sum Test; [2]Two Sample t Test; [3]Chi-Square Test.



Methods

- Single-center, retrospective study from 2015-2018.
- Adults implanted with durable LVAD.
- 3D RV EF assessed pre-implantation.
- Early RHF was defined as the following:
  - Need for right ventricular assist device.
  - Inotropic or inhaled pulmonary vasodilator for > 7 days postoperatively.
- Two-sample *t*-tests were performed for differences between RHF and no-RHF groups.
- Multivariable logistic regression analysis conducted to identify independent predictors of RHF.
- A subset analysis was performed on patients with 3D RV EF data.

Conclusions

- EUROMACS-RHF did not predict early RHF in our cohort.
- Of the 79 patients with 3D datasets, 3D EF did not predict early RHF.
- African American race & preoperative right atrial pressure independently predicted RHF.
- EUROMACS-RHF was derived from a cohort spanning 11 years where 40% received axial flow devices, possibly explaining its limited predictive capability in our patient cohort.