Pulmonary vascular resistances among heart transplant candidates: are we looking to the right player?

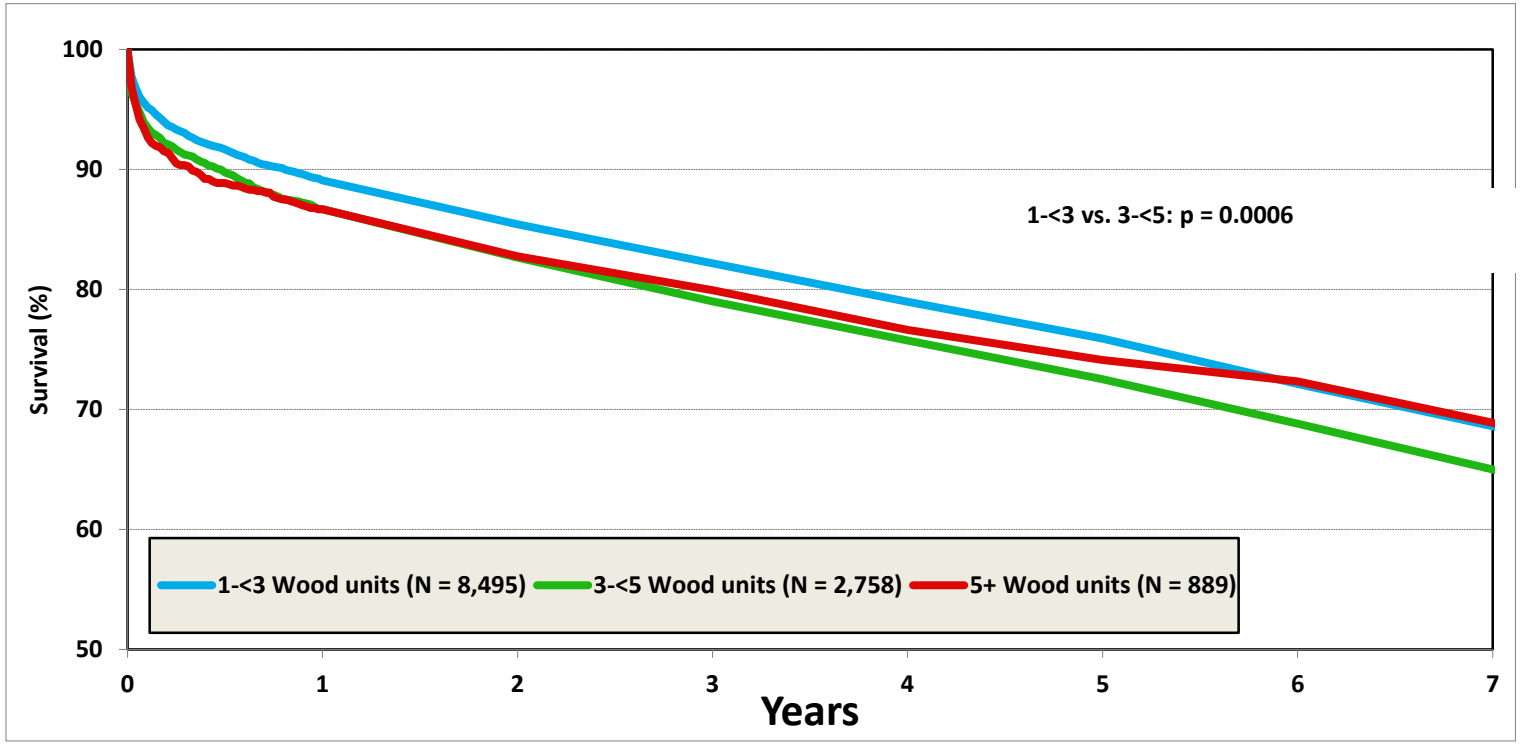
Masetti M, *MD, PhD, Moretta A, Sabatino M, Russo A, Martin Suarez S, Loforte A, Galiè N, Potena L*

Heart Failure and Heart Transplant Program, Cardiovascular Department, University of Bologna, Italy

ISHLT Meeting 2020

Pulmonary hypertension in advanced HF

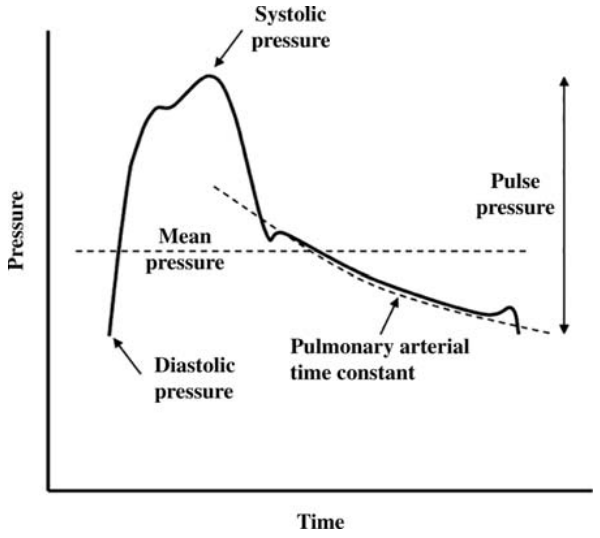
- The assessment of pulmonary circulation is crucial among HT candidates



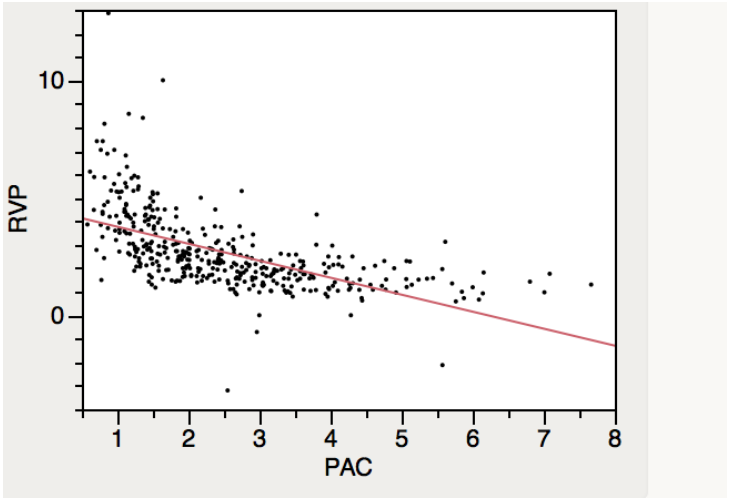
ISHLT Registry 2019

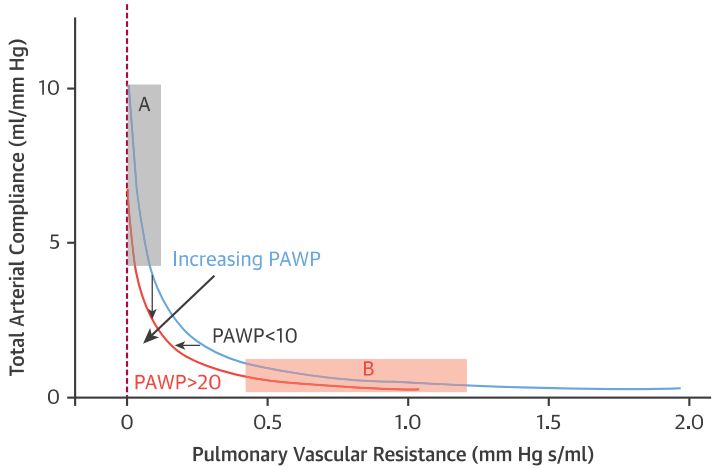
- Pulmonary vascular resistances (PVR) are informative about the resistive component of pulmonary circulation but they do not account for compliance and pulsatility

Pulsatile and resistive components of RV afterload: Pulmonary artery capacitance and elastance, PVR



Time constant=PAC x PVR





Tampakakis E et al. Circ Heart Fail. 2018

Pulsatile load

Pulmonary artery capacitance (PAC) = stroke volume / PA pulse pressure

change in volume associated to a change in pressure

PAPP= PAPs-PAPd

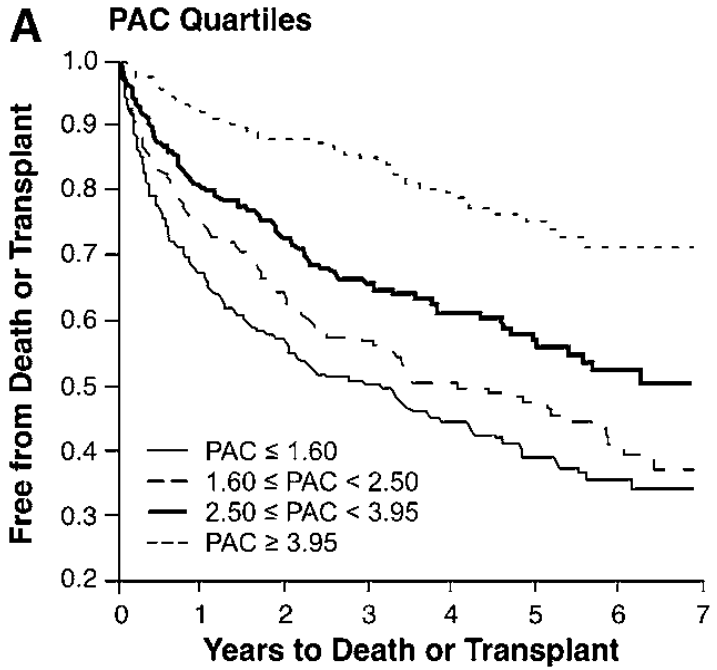
Elastance (Ea) = s PAP/ stroke volume

change in pressure for a given change in volume ("stiffness »)

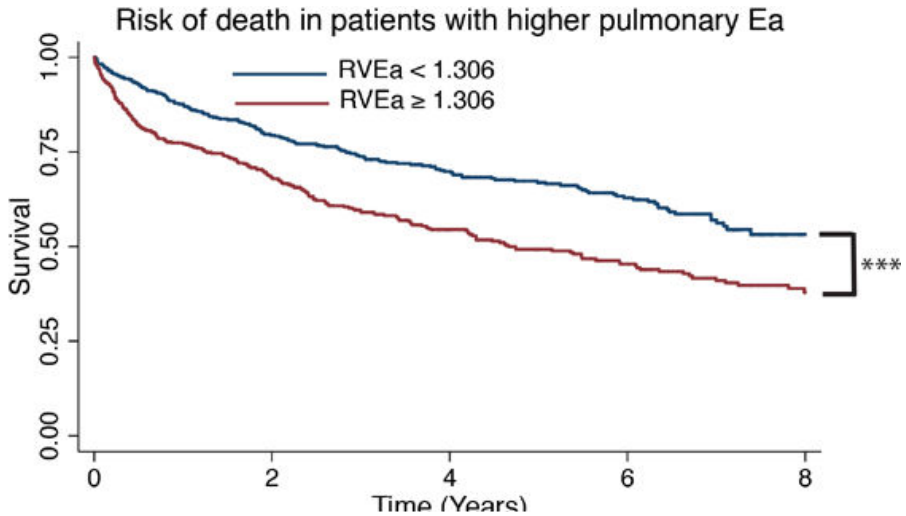
Resistive load

PVR = TPG/CO

PA compliance and elastance and prognosis in advanced HF



Dupont M et al, Circ Heart Fail . 2012;5:778–785.)



Tampakakis E et al. Circ Heart Fail. 2018

<u>Aim of the study:</u> to assess the prognostic role of parameters of resistive and pulsatile afterload of right ventricle (PVR ,PAC and Ea) together with left ventricle filling pressures and comorbidities in pts referred for HT.

Methods

- Retrospective longitudinal study approved by Ethical Committee
- Inclusion criteria: all pts undergoing to a RHC (2004-17) in our Center
- Exclusion criteria: age < 18 years
- Data collected (at first RHC) : demography, clinical and hemodynamic parameters
- End point: combined incidence of death or urgent heart transplantation at 2 years (survival rate)
- Follow up ended October 2019

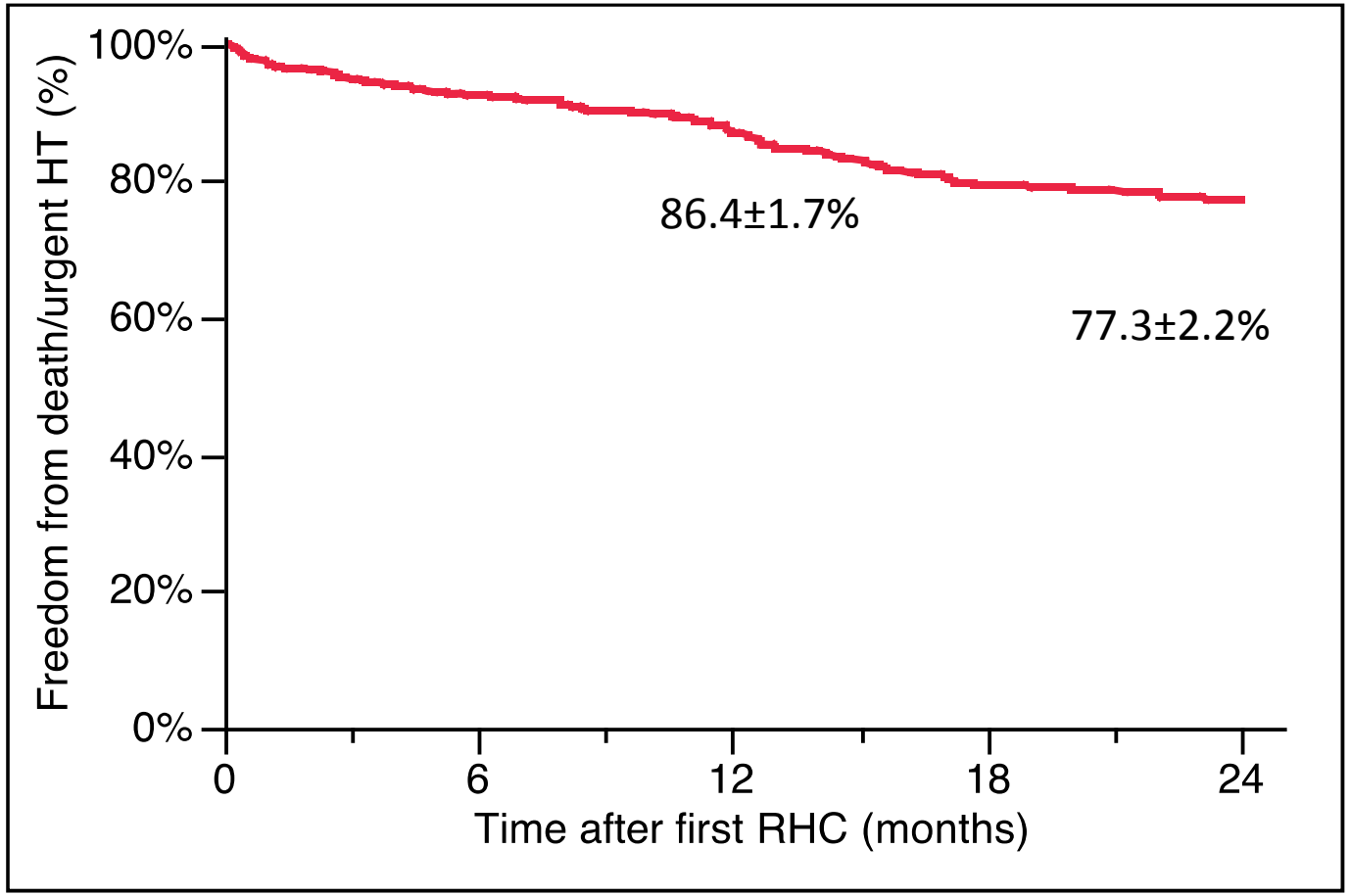
Study population:
clinical characteristics

Patient characteristics	N=401
Male gender	81%
Age (years)	53±11
CAD	40.3%
DCM	44.4%
Other cardiomyopathies	15.3%
LVEF (%)	27±12
NYHA III-IV	58.4%
Hb (g/dL)	13.1±1.8
eGFR (MDRD mL/min/1,73m2)	66±2
Total bilirubin (mg/dL)	1.2±1.0
IABP	10.7%

Study population:
hemodynamic characteristics

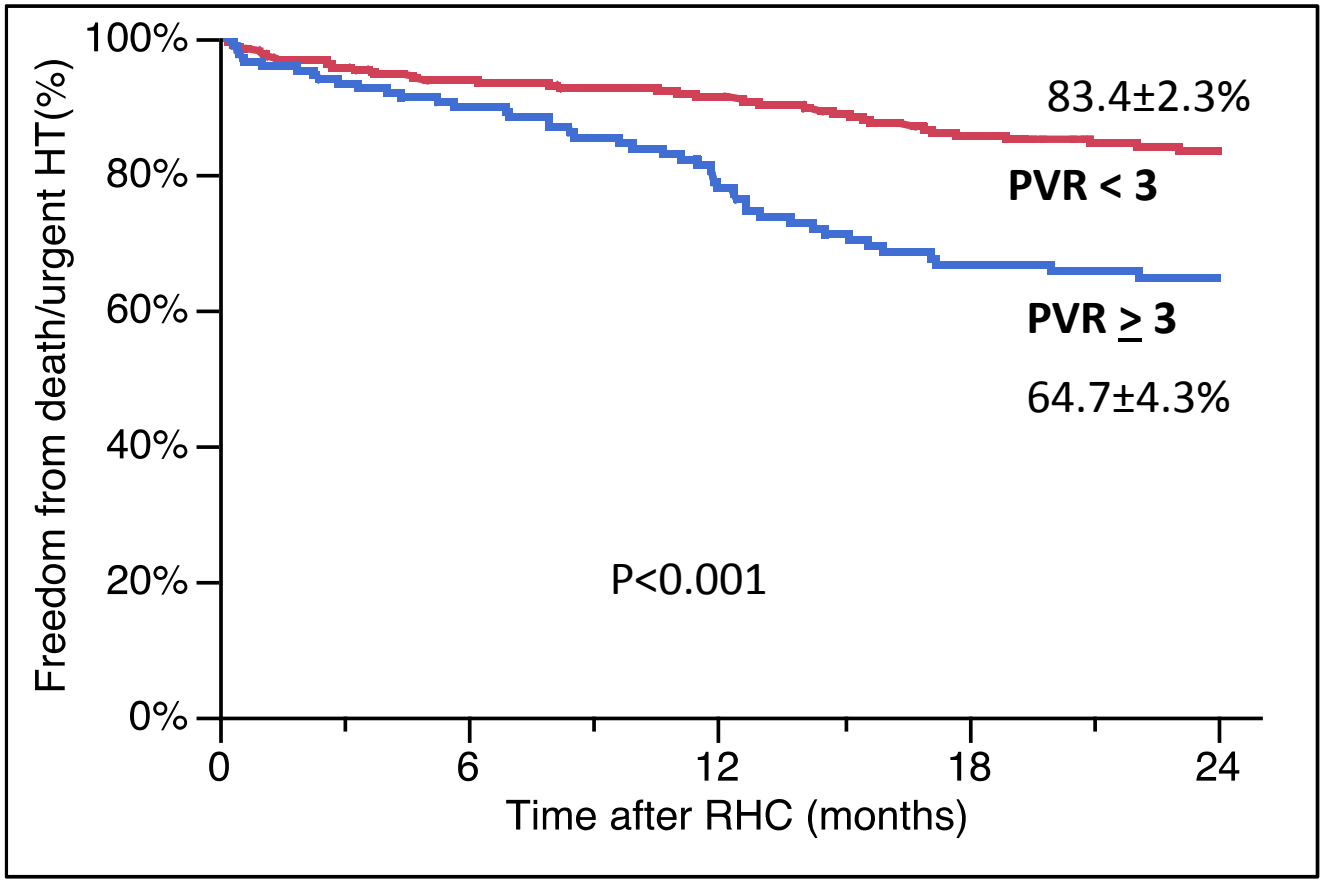
Patient characteristics	N=401
RAP (mmHg)	7±4
mPAP (mmHg)	28±11
PAWP (mmHg)	18±8
CO (l/min)	3.7±1.0
CI (l/min/mq)	1.9±0.6
PVR (WU)	2.6±1.5
PAC (ml/mmHg)	2.5±1.3
Ep (mmHg/ml)	0.95±0.52
PAP index	5.3±4.7

Primary endpoint

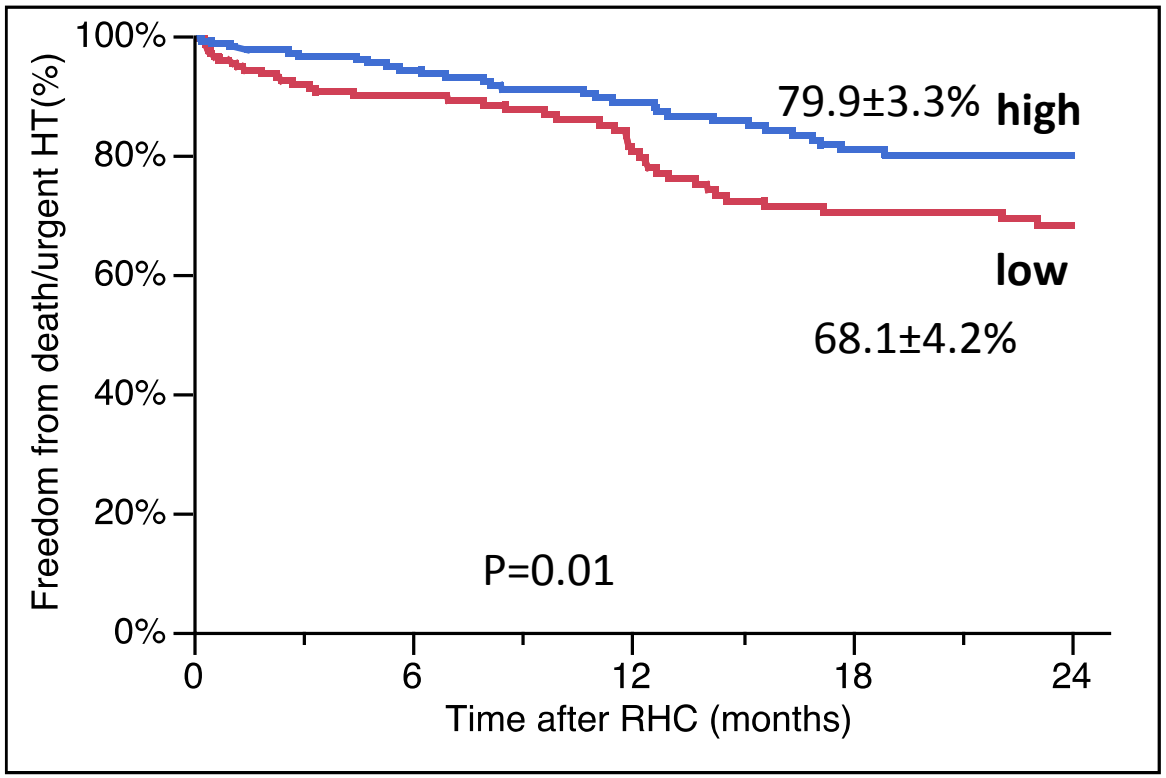


Role of PVR

No PH	42.3%
Ipc-ph	30.4%
CpC-PH	27.3%

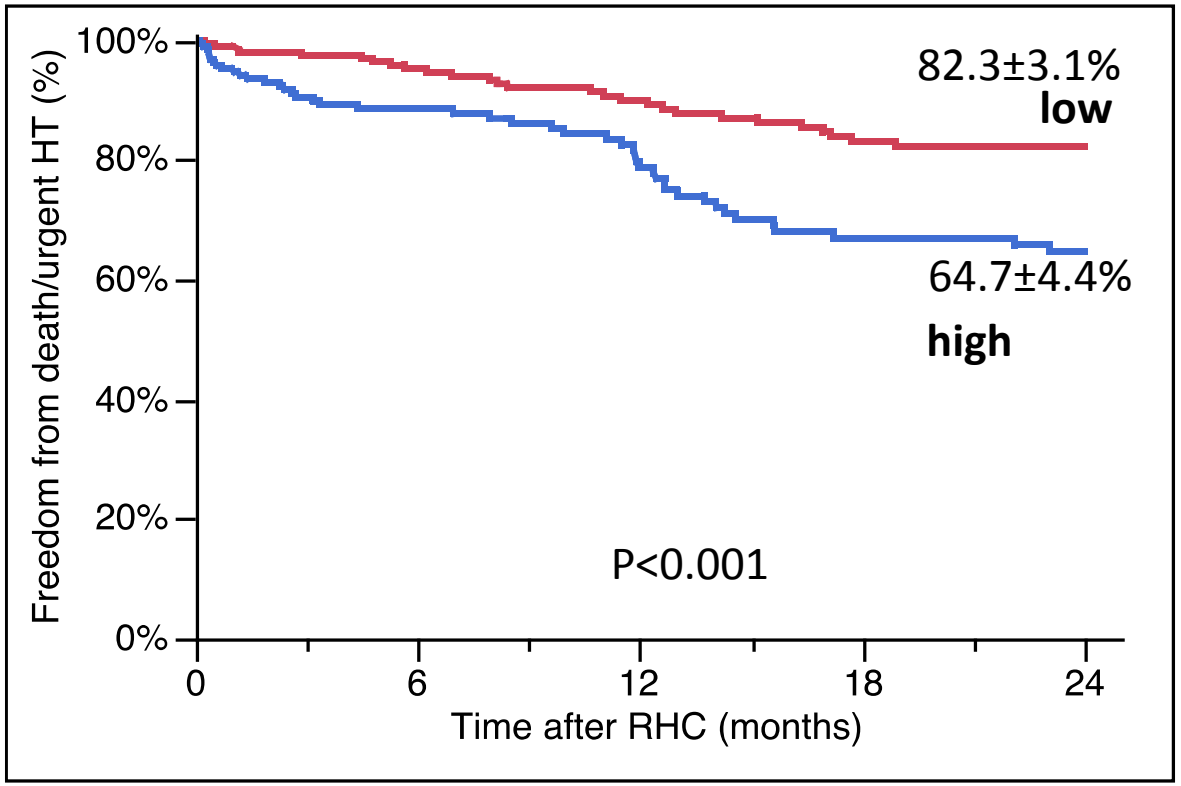


Role of PAC and Ea



PAC

(median value: 2.2 ml/mmHg)



Ea

(median value: 0.85 mmHg/ml)

Hemodynamic variables:
multivariate analysis

	HR	P
PA Elastance (every mmHg/ml increase)	1.02 (1.00-1.19)	**0.04**
PAC	1.12 (0.8-1.49)	0.47
PVR > 3 WU	1.01 (0.8-1.2)	0.85
Cardiac output	0.89 (0.6-1.2)	0.99
PAWP	0.99 (0.95-1.03)	0.81

Clinical variables:
multivariate analysis

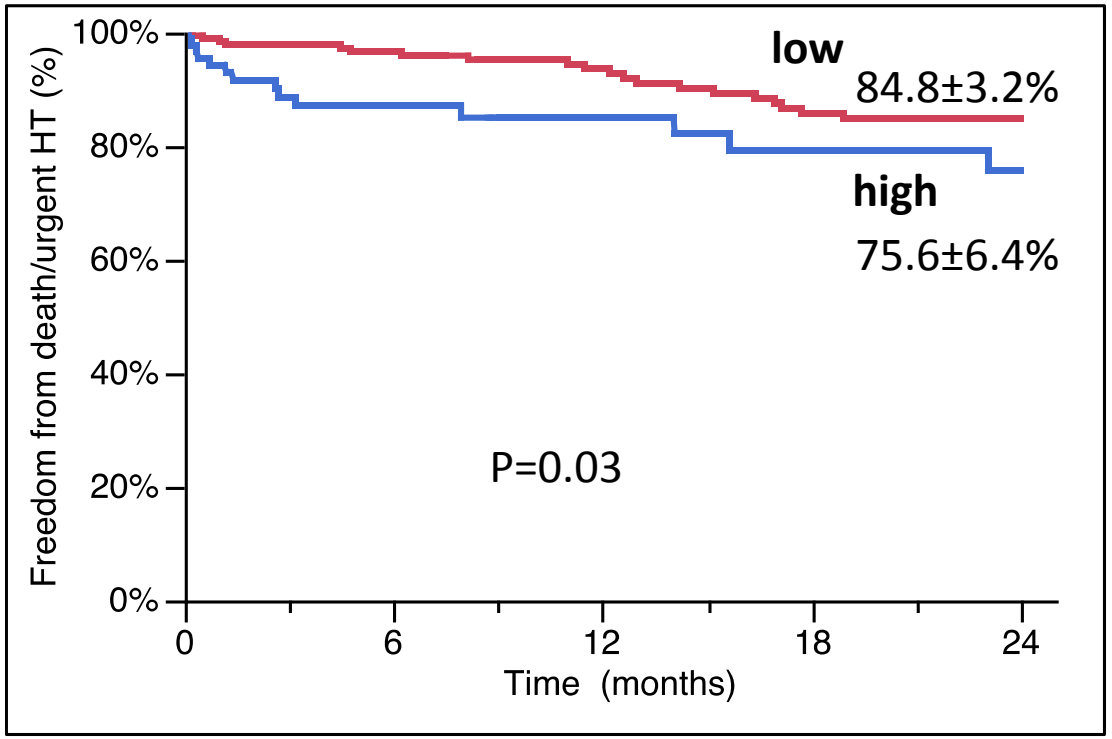
		P
SBP < 90 mmHg	2.6 (1.6-4.3)	<0.001
GFR < 60 ml/min	2.1 (1.3-3.3)	<0.01
Bilirubine > 1.2 mg/dl	2.2 (1.4-3.4)	<0.01
IABP	4.3 (2.6-7.0)	<0.001

Role of elastance according to clinical variables

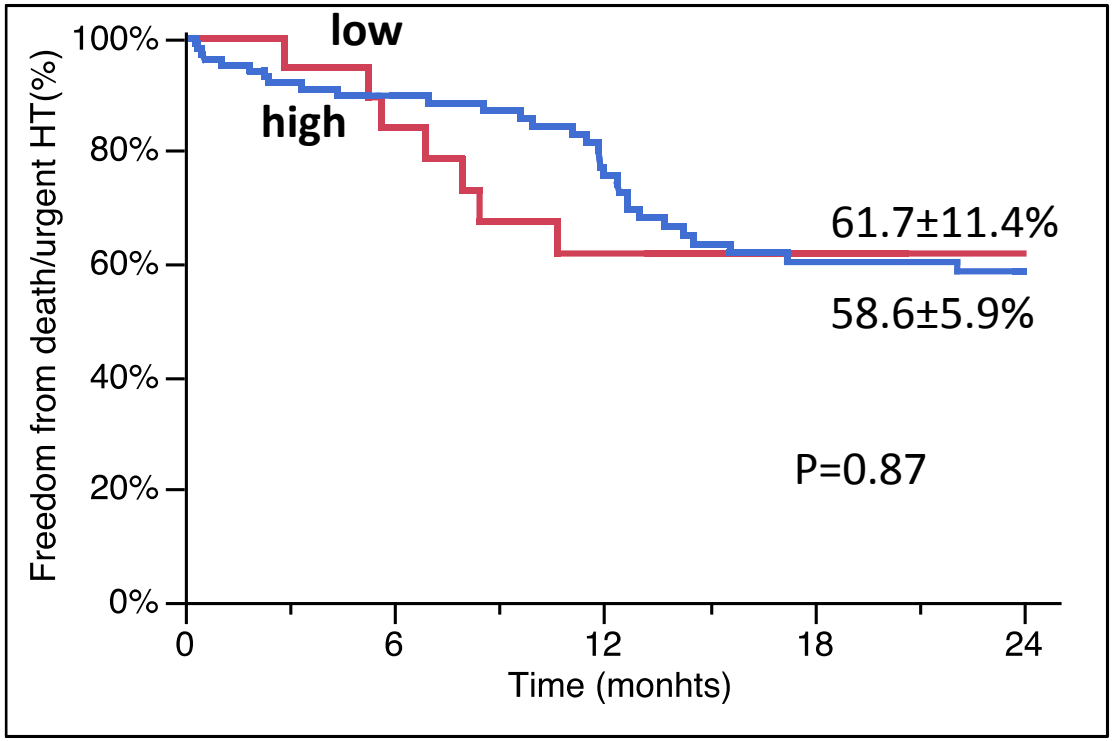
	HR (95% CI)	P
PA elastance (Ea) > 0.85 mmHg/ml)	1.9 (1.1-3.4)	0.02
SBP < 90 mmHg	2.0 (1.1-3.3)	0.01
GFR< 60 ml/min	1.9 (1.1-3.3)	0.01
Bilirubine > 1.2 mg/dl	2.0 (1.1-3.5)	0.01
IABP	5.3 (3.3-9.0)	<0.001

Role of elastance according to RVP groups

	PVR > 3 WU	PVR < 3 WU	
High Ep	85%	33%	<0.001

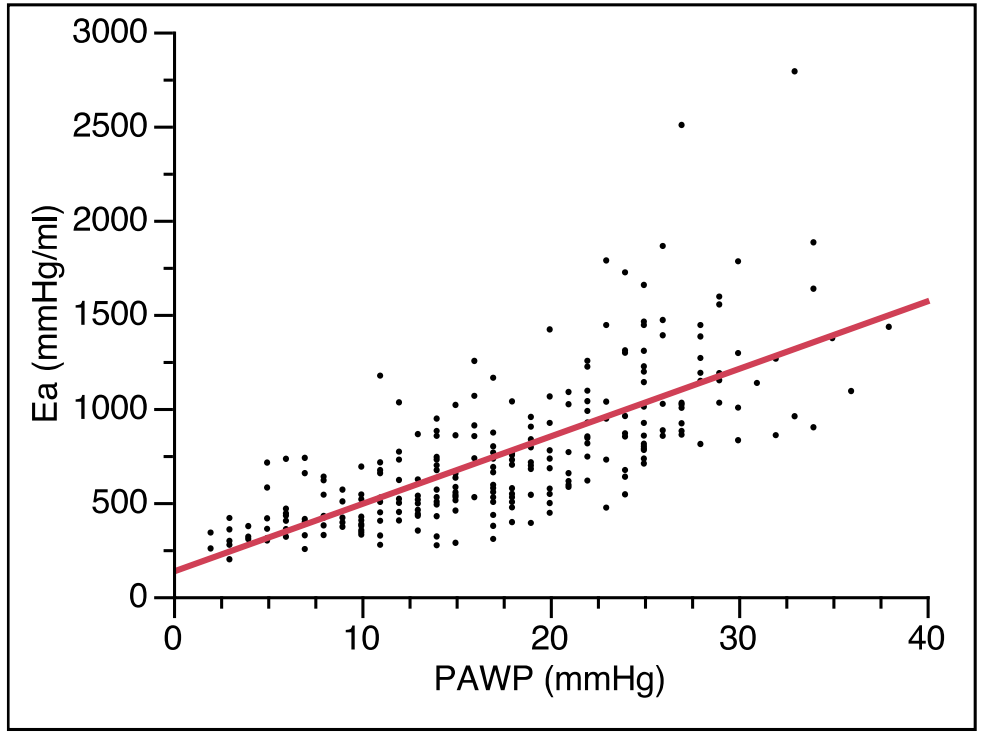


PVR < 3

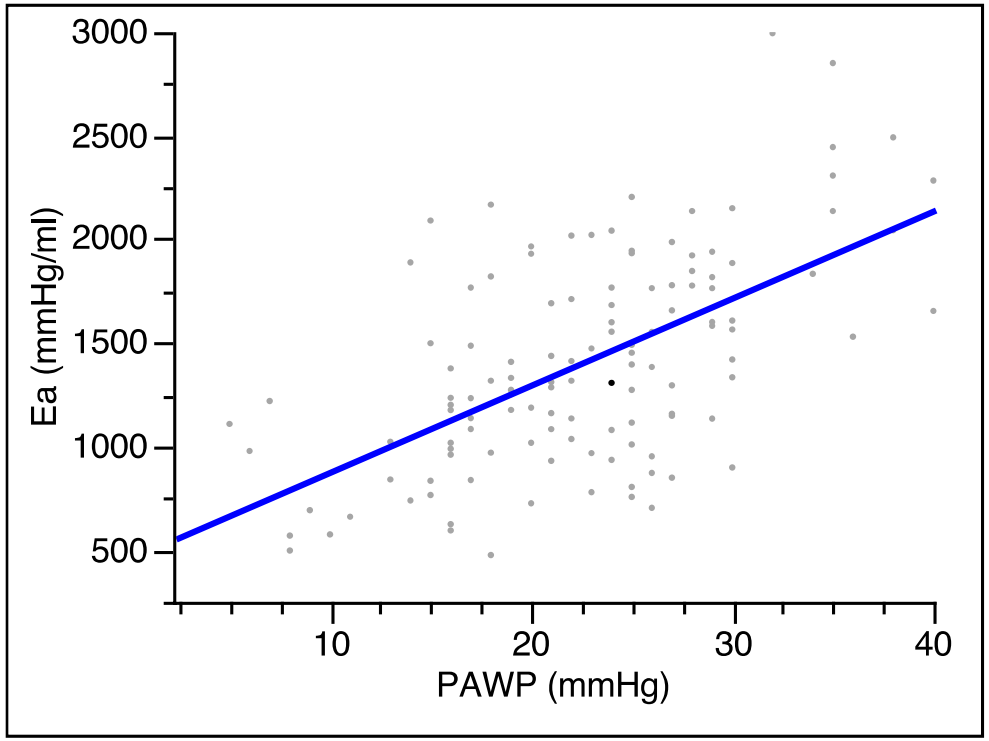


PVR ≥ 3

Ea reduction according to PAWP reduction



PVR < 3



PVR ≥ 3

Conclusions

- Limits: monocentric, retrospective
- The assessment of right ventricular afterload through the evaluation of pulmonary artery elastance seems to better stratify than PVR the need of urgent HT in patients with severe HFrEF.
- The prognostic role of Ea is more pronounced in patients without CpC-PH
- Treatments directed to a reduction of PAWP can significantly modify elastance, especially in patients with high resistive RV afterload
- The combined assessment of both resistive and pulsatile components of RV afterload, together with the other clinical variables indicative of advanced HF, allows to better stratify the need of a rare resource like HT.