Apical cannulation: a step forward from a simple unloading tool

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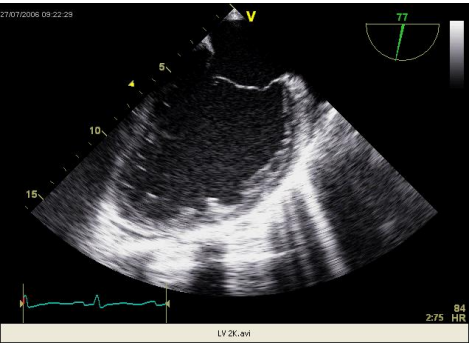
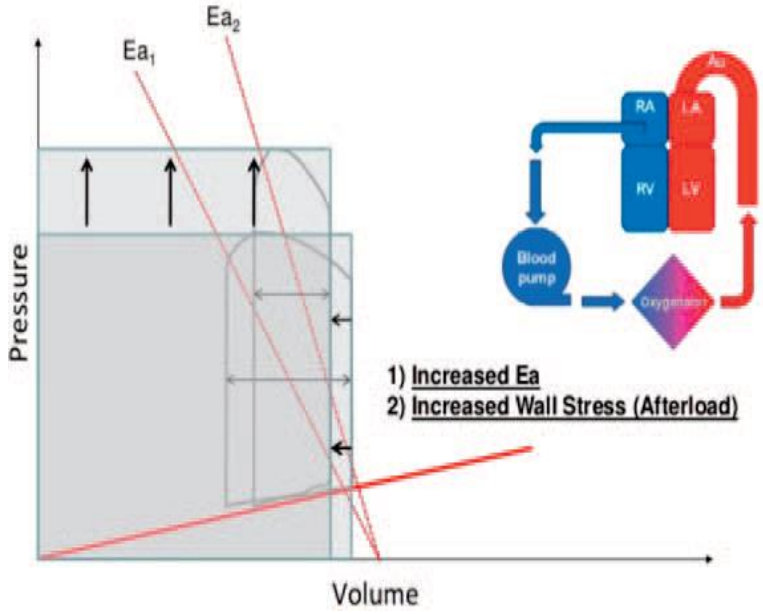
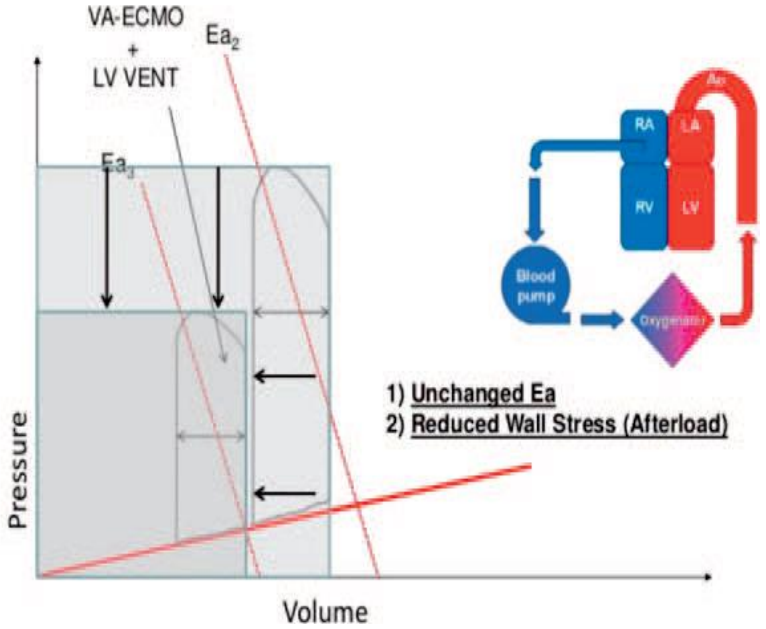


VA ECMO Kills the Heart

Veno-Arterial ECMO



Rationale for Venting the LV with VA-ECMO



Unloading of the Left Ventricle

Immediate Mechanical Effects (minutes...)

Less myocardial oxygen demand

More myocardial Oxygen supply (subendocardial reperfusion)

Long-term Byochimical Effects (hours-days…)

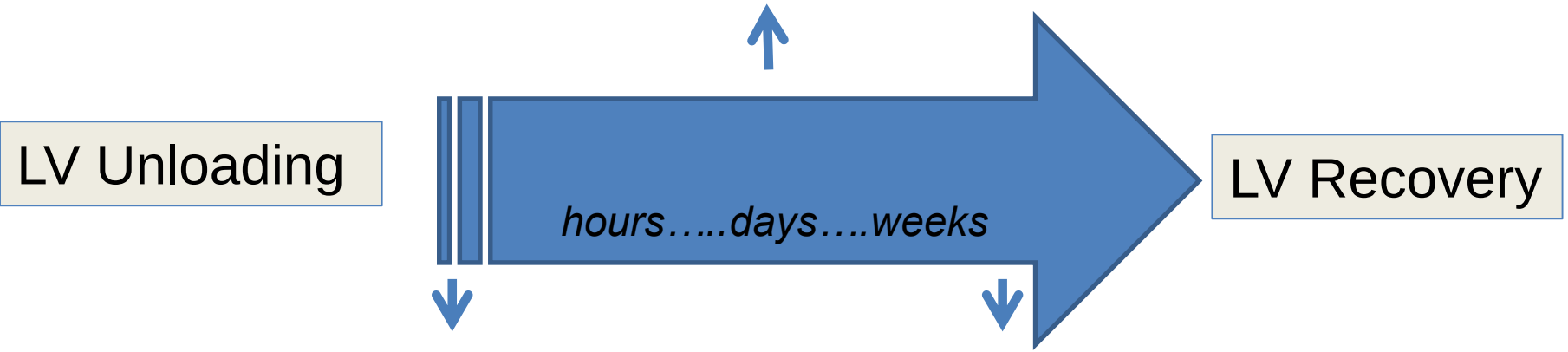
Inactivation of pro-apoptotic pathways

Preserve mytocondrial integrity

Reduce AMI area and size

Early Unloading of the Left Ventricle

changes in expression of genes involved in the regulation of **vascular organization and migration**



reverse adrenergic remodeling
up regulation B1 receptors, density and influence on gene expression

increased microvascular density

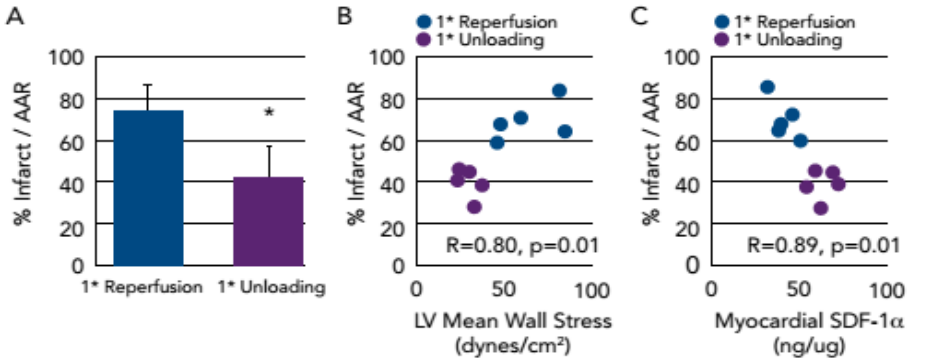
Primary Left Ventricular Unloading

JACC

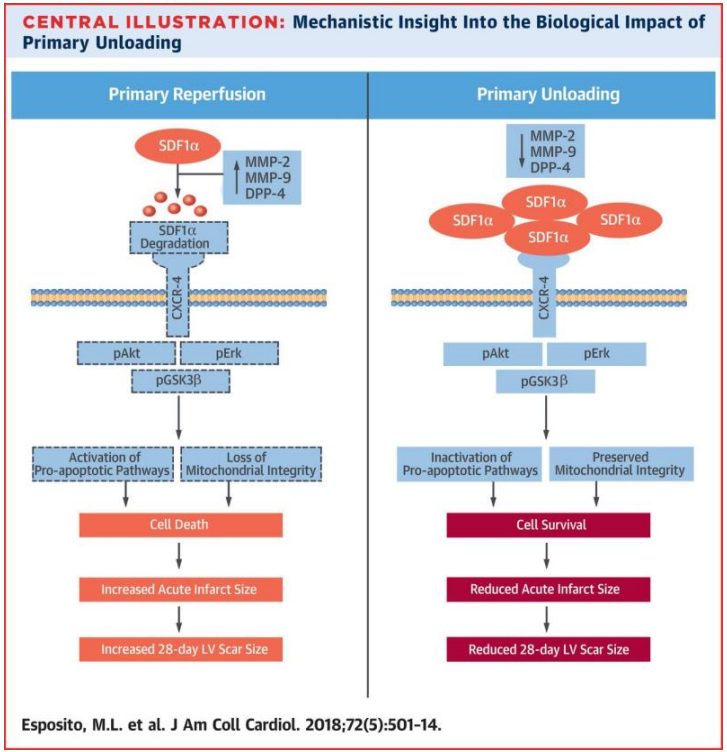
Left Ventricular Unloading Before Reperfusion Promotes Functional Recovery After Acute Myocardial Infarction

Michele L. Esposito, Yali Zhang, Xiaoying Qiao et al.

Figure 2: Effect of Mechanical Circulatory Support Before Reperfusion in Acute Myocardial Infarction



Source: Kapur et al, 2015.[9] AAR = assessment of the area at risk; LV = left ventricular; SDF-1 = stromal cell-derived factor 1

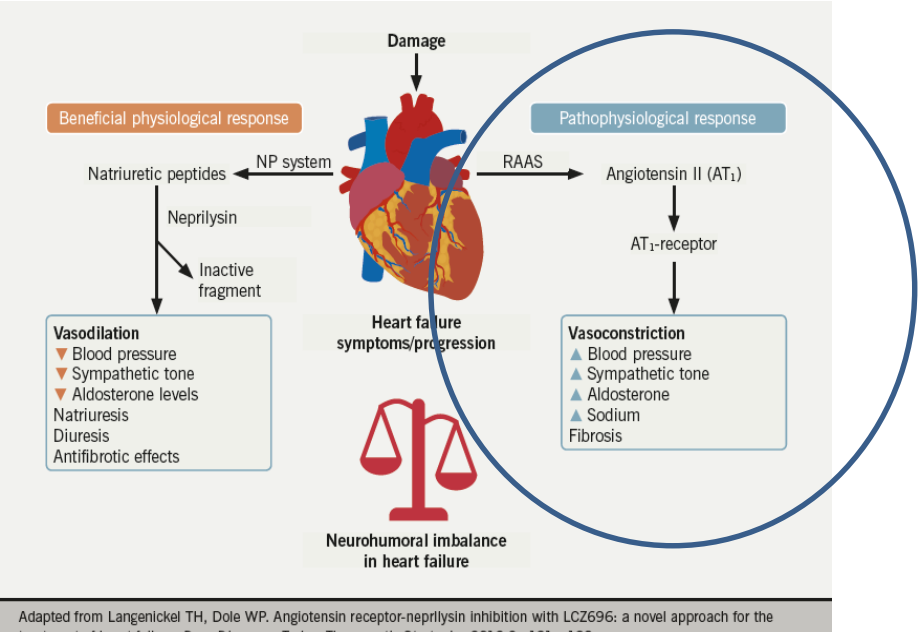


Left Ventricular Reverse Remodelling

Left ventricular assist device unloading effects on myocardial structure and function: current status of the field and call for action

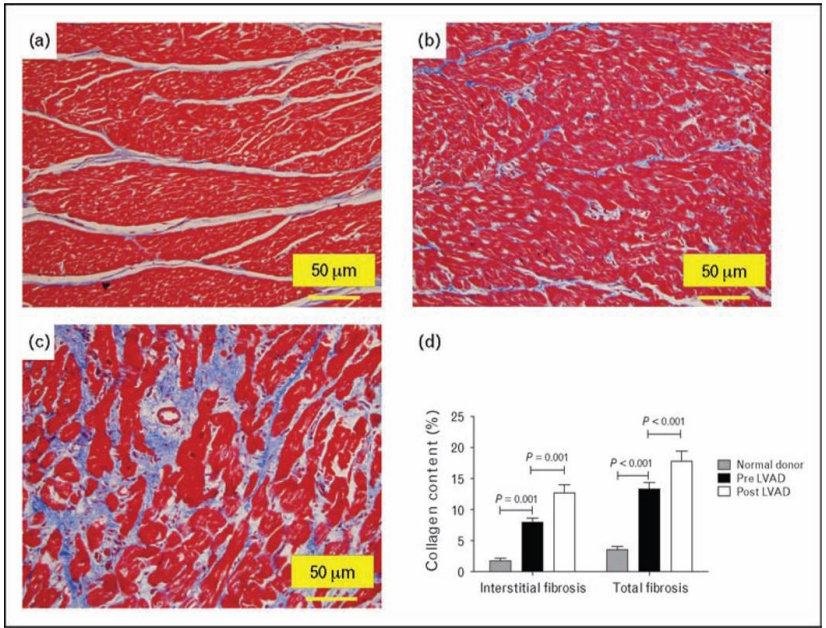
Stavros G. Drakos[a,b,c,d], **Abdallah G. Kfoury**[a,b,c], **Craig H. Selzman** et al.
[a]UTAH Cardiac Transplant Program

Reduced neurormonal response
RAAS (renine angiotensin aldosteron system)



Adapted from Langenickel TH, Dole WP. Angiotensin receptor-neprilysin inhibition with LCZ696: a novel approach for the

Reduced pro-fybrotic *and* pro hypertrophic factors

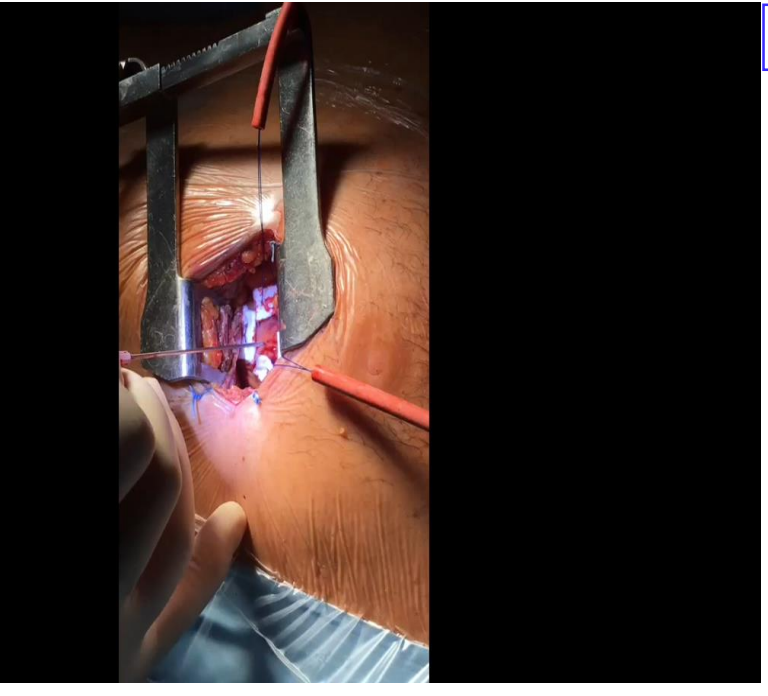


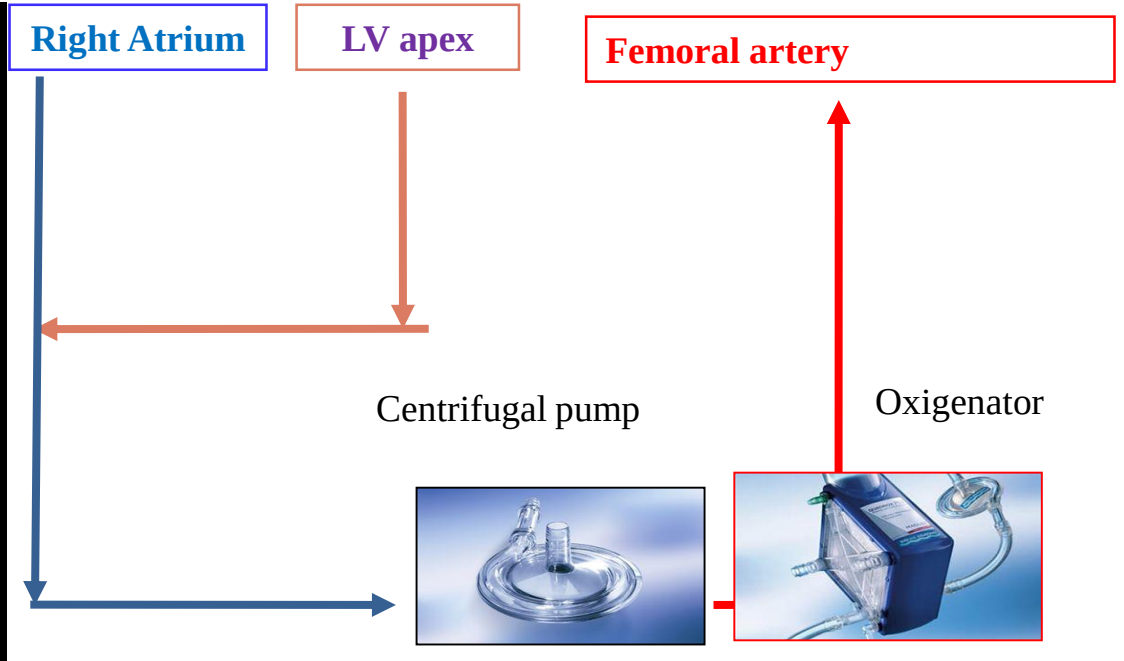
THE INTERNATIONAL SOCIETY FOR HEART & LUNG TRANSPLANTATION

A Society That Includes Basic Science, the Failing Heart, and Advanced Lung Disease.

TRANSAPICAL LEFT VENTRICULAR INFLOW CANNULA (TLVIC) DURING VENO-ARTERIAL ECMO SUPPORT: A BRIDGE TO SOLUTION IN ACUTE CARDIOGENIC SHOCK

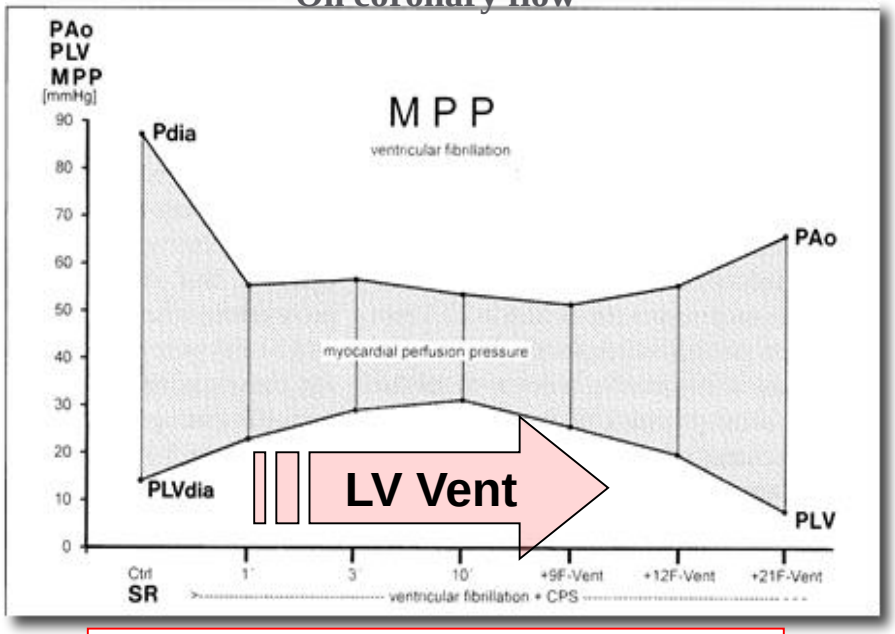
Centofanti P., Attisani M., La Torre M., Boffini M., Ricci D., Ribezzo M., Simonato E., Baronetto A., Rinaldi M.
Division of Cardiac Surgery, San Giovanni Battista Hospital 'Molinette', University of Turin, Turin, Italy



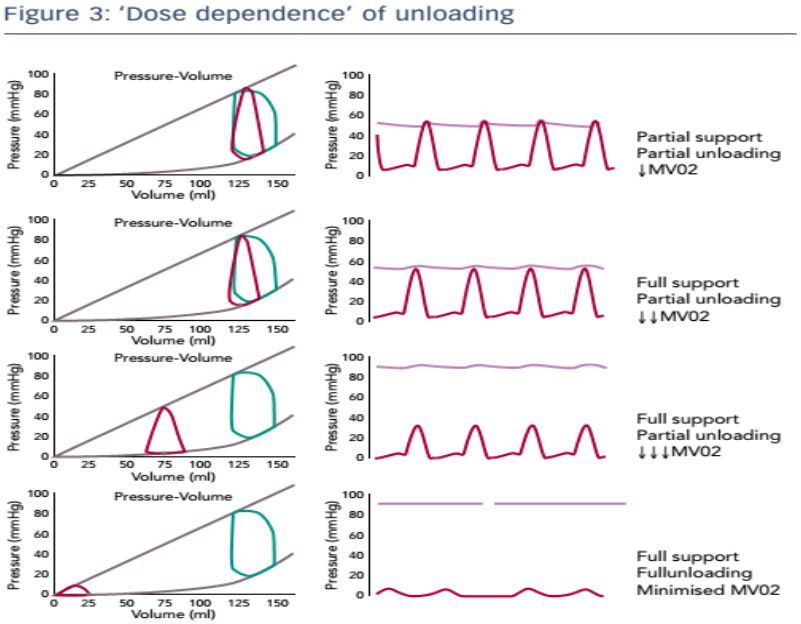


Unloading of the Left Ventricle

Effect of elevated LVEDP
On coronary flow



Myocardial perfusion pressure

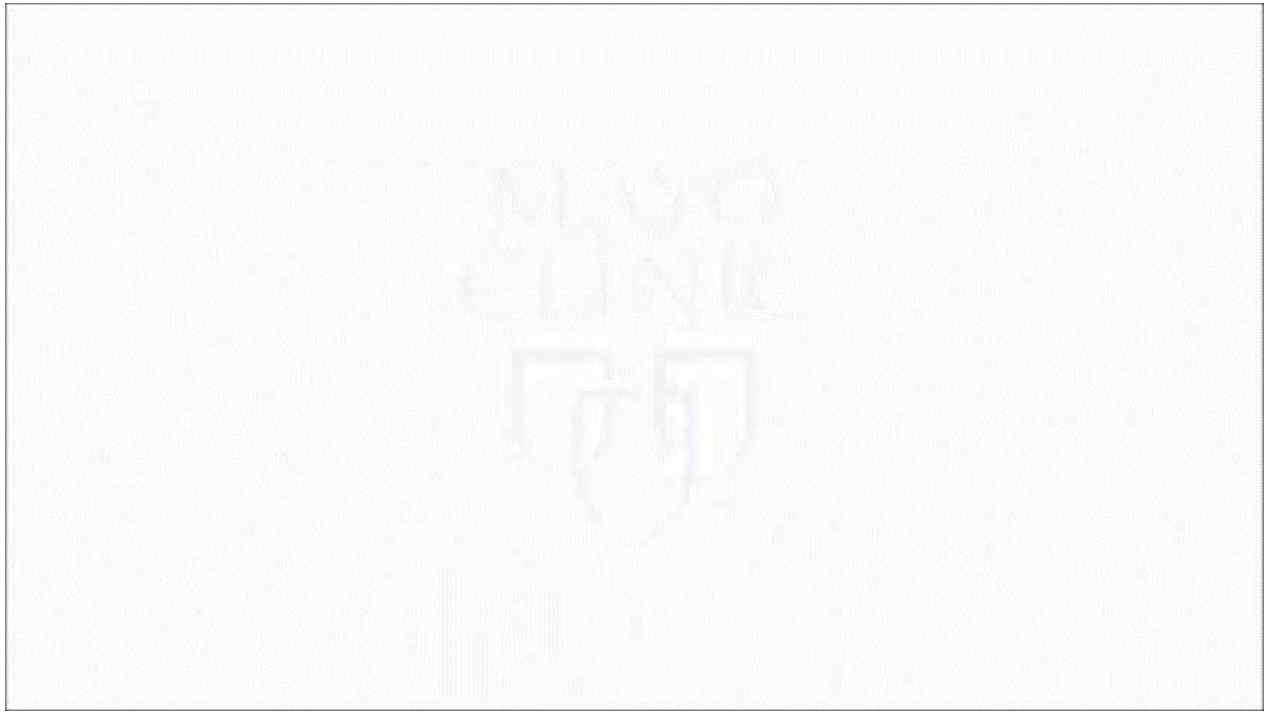


Rationale for UNLOAD the LV

LV overload

Pulmonary edema

Arlechin syndrome



Right Ventricular Function Evaluation

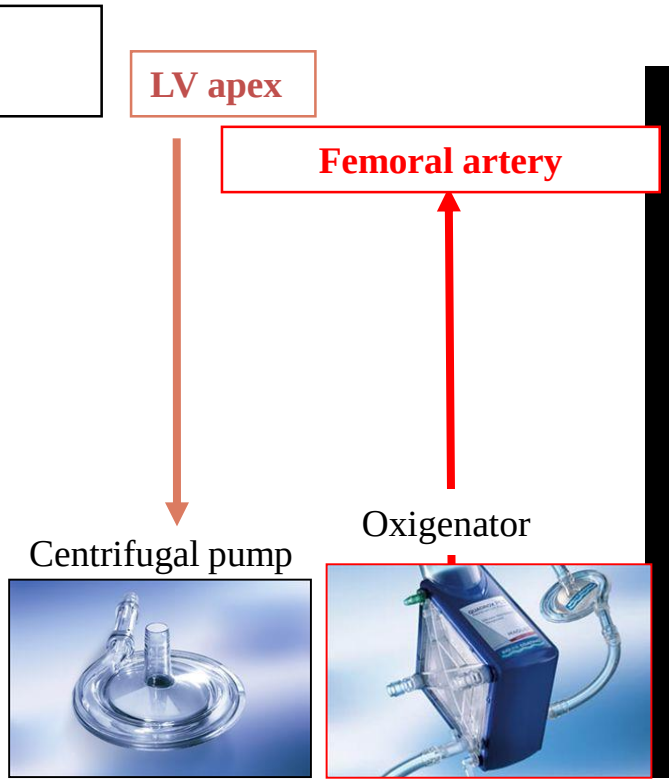
switch from V-A ECMO to LVAD

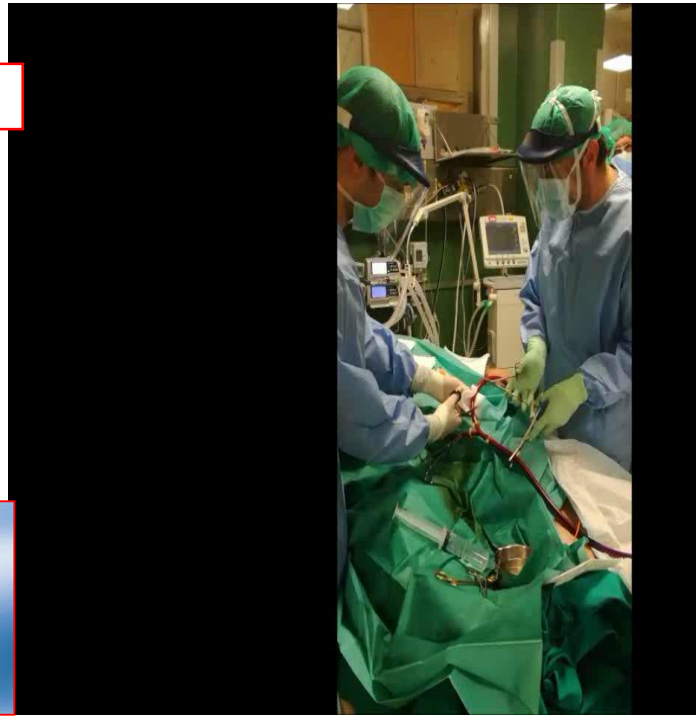
Right Ventricular Function Evaluation

CVP< 14 mmhg
PAPI > 2

C.I. > 1,8 l/min/m2 and/or LVAD flow > 2 l/min

PAM >55 mmhg
Good echo findings





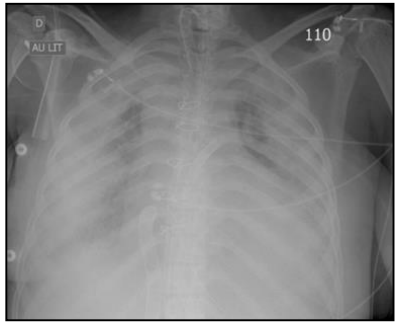
Pulmonary Function Evaluation

switch from V-A ECMO to A-A Centrifugal Pump

Right Atrium

LV apex

Femoral artery



Right Ventricular Function Evaluation

Ox[illegible]or

Centrifugal pump

Pulmonary Function Evaluation

BRIDGE TO BRIDGE Concept

FROM SHORT-TERM VAD TO LVAD

LV apex

Femoral artery

5.000 Euros

Centrifugal pump

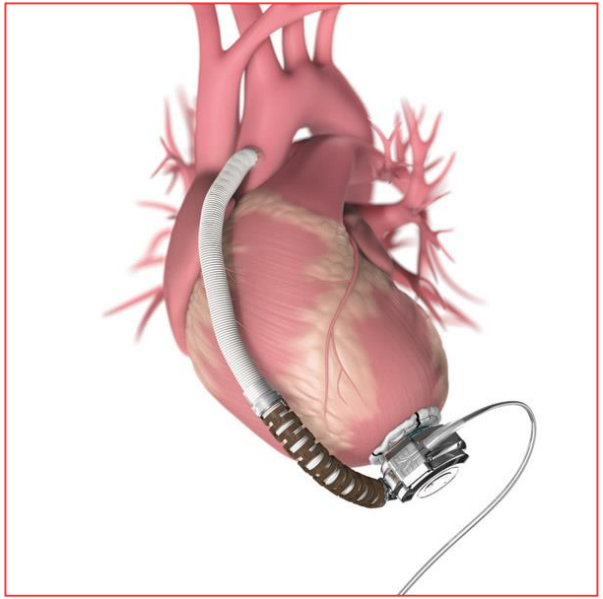
Bridge to Bridge

1 Neurological status

2 RV function optimization

3 End organ function recovery

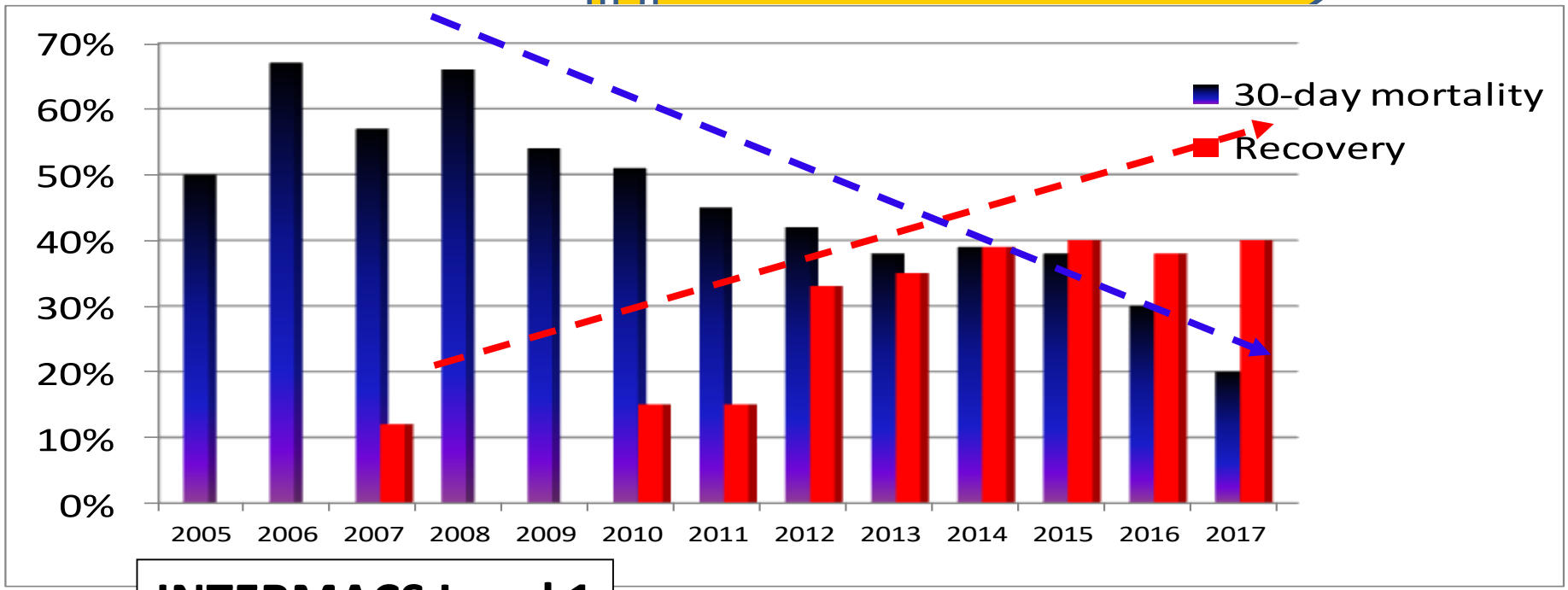
4 Compliance to VAD therapy



115.000 Euros

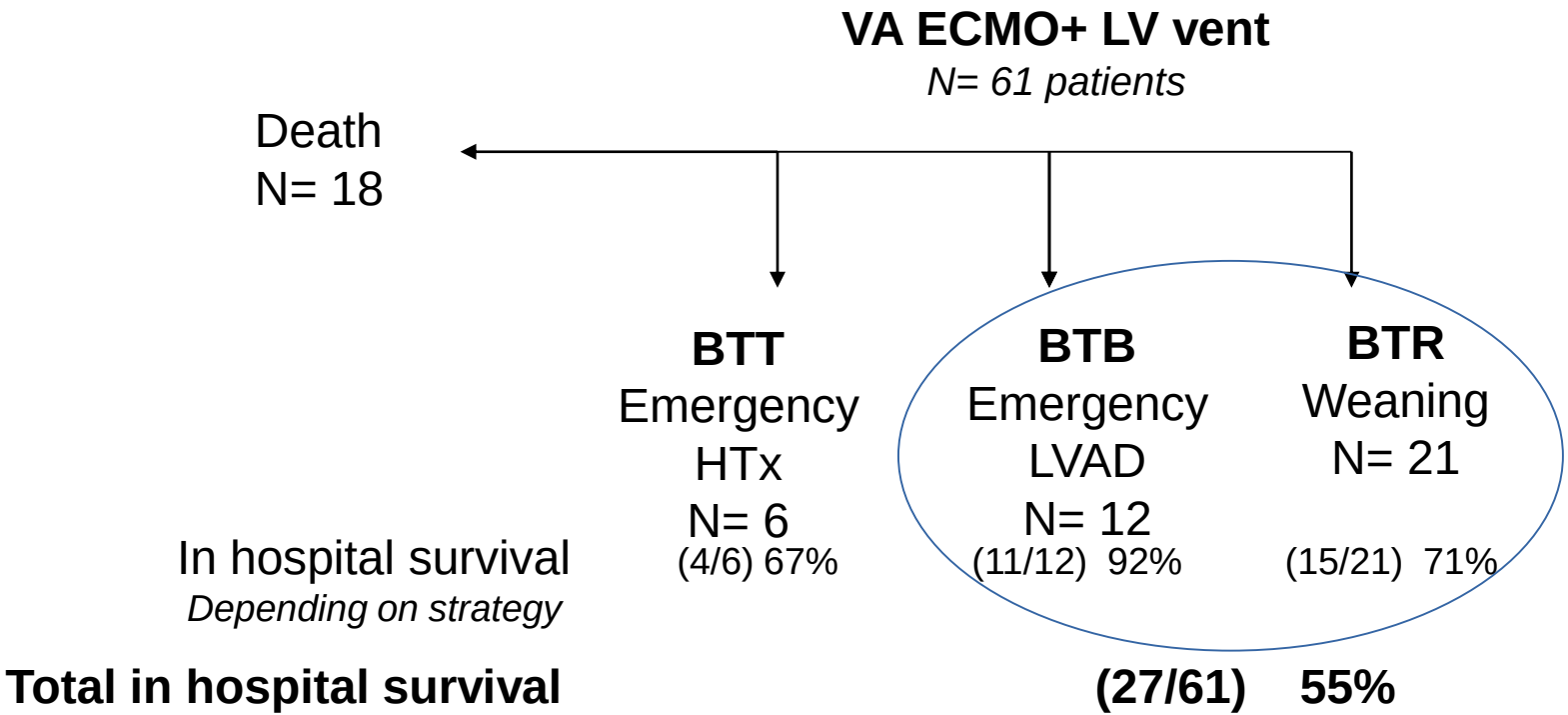
VADs/ECMO changing outcomes

- Early Referral
- Increasing Experience
- Systematic LV venting



INTERMACS Level 1

Turin Experience 2011- 2018



Turin Experience 2011- 2018

Outcomes *N= 61 patients*

Mean support time	5,8 days (2 – 31) days
Switch from VA ECMO to LVAD	79% (48/61)
Mean time from VA ECMO to LVAD	2,4 days (1- 6)
Mean time weaning from Oxygenator	5,2 days (3-14)
Mean time successfull weaning from LVAD	6,8 days (5- 31)
Bleeding complications related to LV cannulation	3% (2/61)
Hemolysis	11% (7/61)

Turin experience 2011-2018
VA ECMO+ LV vent N= 61 patients

	Mean time of recovery	In hospital mortality rate	
Fulminant myocarditis	3,9 days	0/10	0%
Acute Myocardial Infarction	5,7 days	9/23	39%
Hydiopathic CMP	6,5 days	6/12	50%
Post HTX	8,4 days	2/3	66%
Postcardiotomy	10,1 days	9/13	69%

	VA ECMO+ Impella	VA ECMO+ LV vent
Advantages	Endovascular system Partial or total unloading Antegrade flow on the aortic root	**LVAD+ Oxygenator** ***No Arlechin syndrome*** **Mid term temporary LVAD** **Low or stop anticoagulation** **No TEE or Cath Lab necessary** **Low cost (less than 500 euros)**
Disadvantages	**Displacement** **Hemolysis ++** **Cotraindication in peripheral vasculopathy** ***Arlechin Syndrome*** **High cost *(20000 euros)*** **TEE or Cath Lab scenarios**	External system Retrograde flow on the aortic root Bleeding (< 5%) Hemolysis + Cardiac surgeon

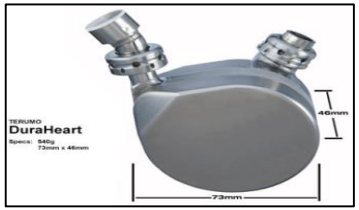
Largest to smallest ...in ten years...

4° Generation

100 grams

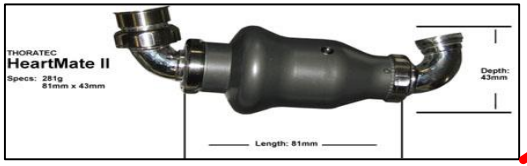
92 grams

3° Generation



500 grams

2° Generation



300 grams

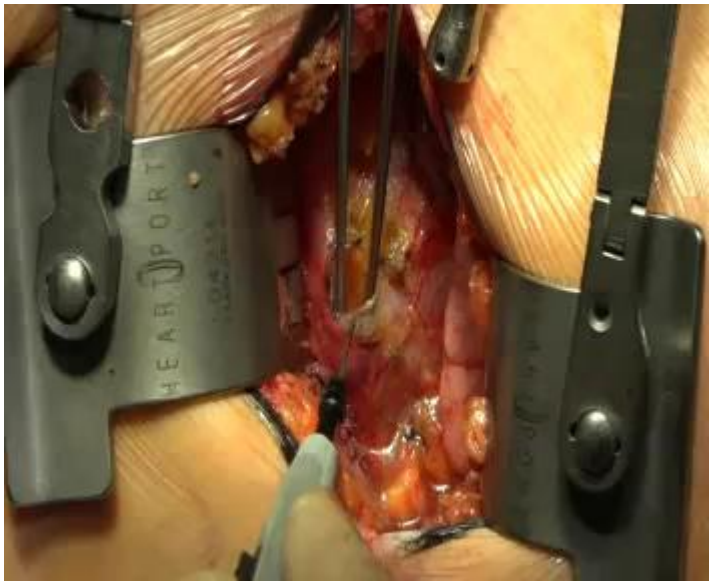
100 grams

1° Generation

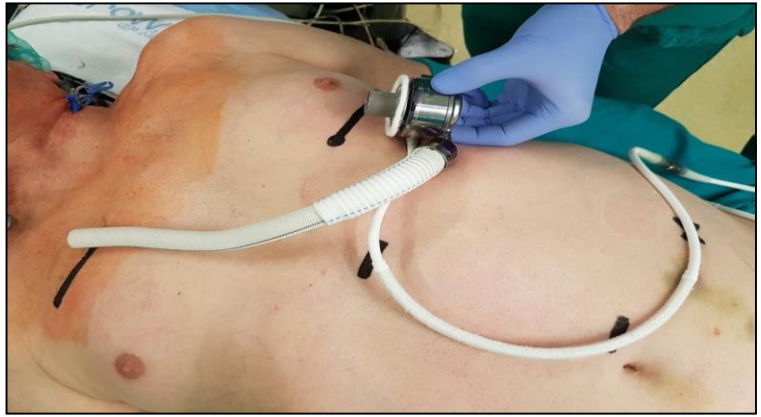
750 grams

1000 grams

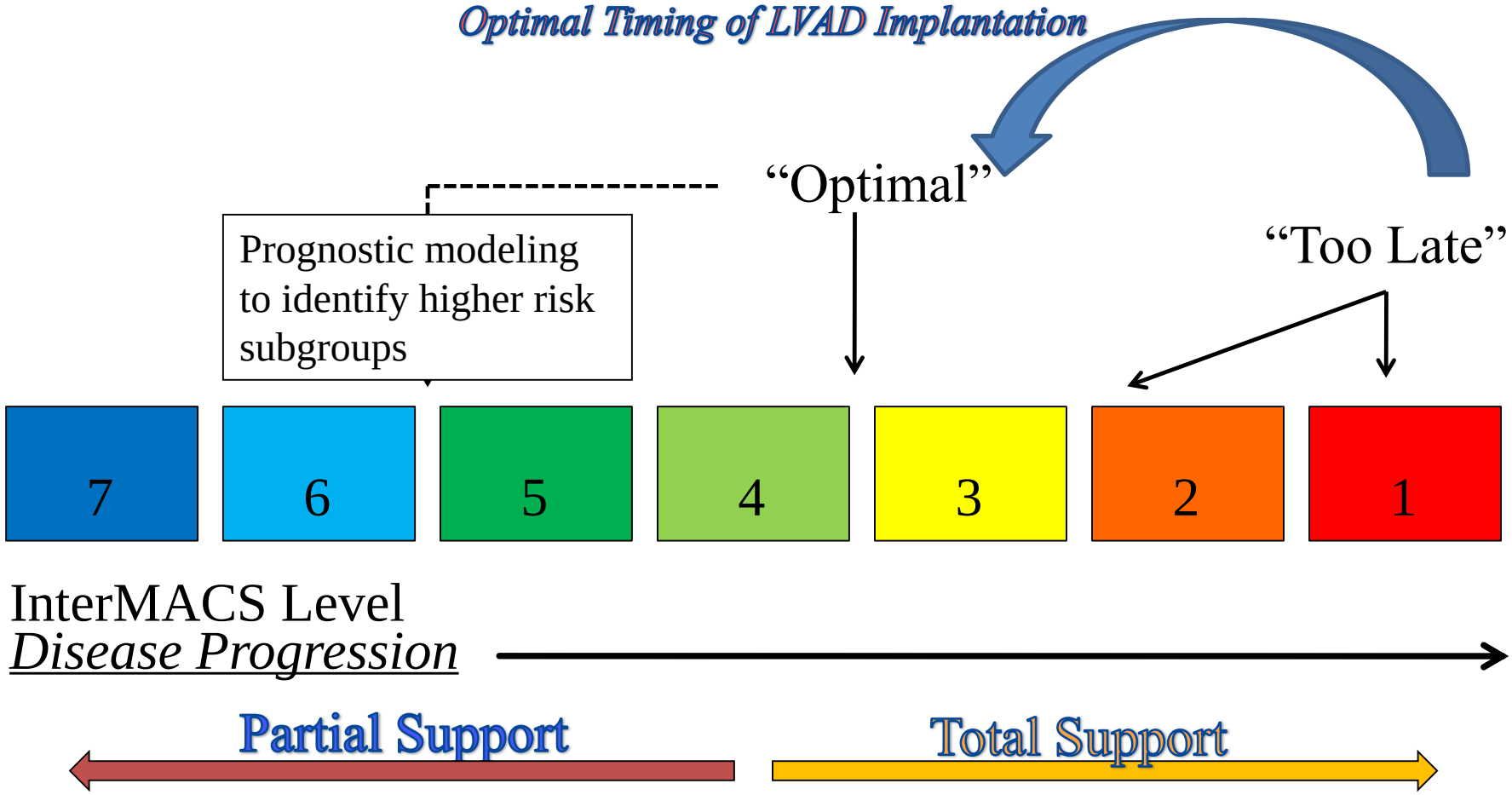
Minimally Invasive HM3 LVAD Implantation



Pre

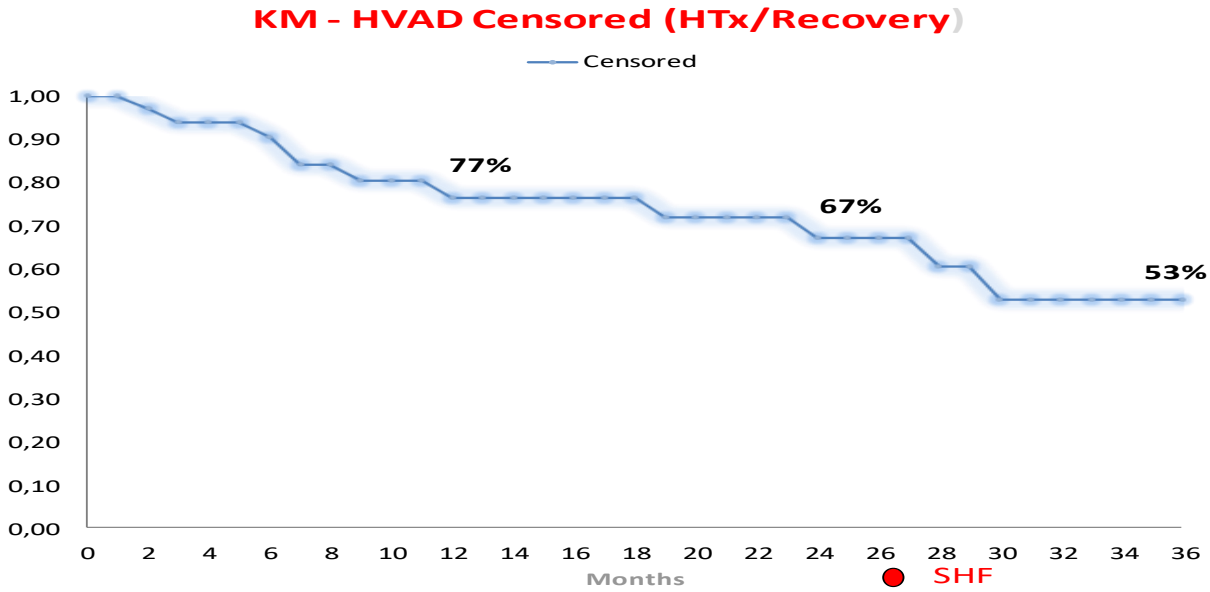


Post


Optimal Timing of LVAD Implantation
"Optimal"
"Too Late"
Prognostic modeling to identify higher risk subgroups
7
6
5
4
3
2
1
InterMACS Level
Disease Progression
Partial Support
Total Support

University of Turin - Regional Network Experience

12 bridge to bridge from ECMO to LVAD



LVAd implanted

8 HVAD
3 HM3
1 INCOR