



SESSIONE 1

LO SHOCK CARDIOGENO: UNA SFIDA CONTINUA

ECPELLA: IN QUALI PAZIENTI E PERCHÉ?

ANNA MARA SCANDROGLIO, MD

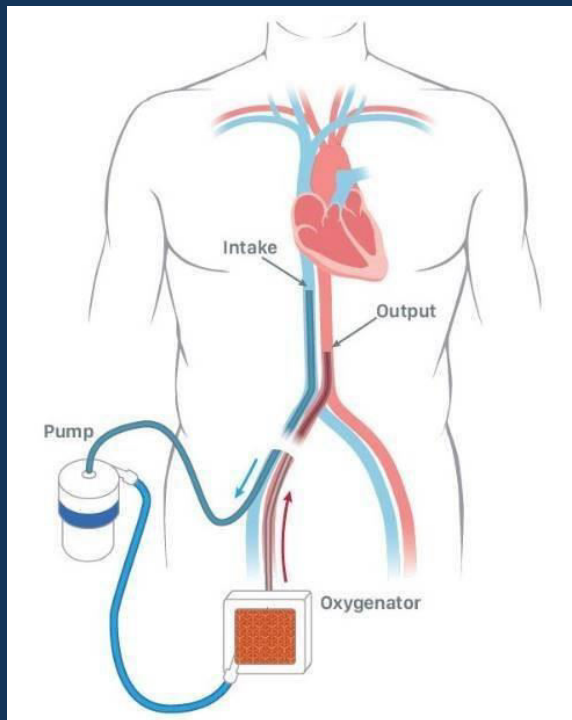
**HEAD OF ADVANCED HEART FAILURE AND MECHANICAL CIRCULATORY SUPPORT
PROGRAM**

HEAD OF CARDIAC INTENSIVE CARE UNITS

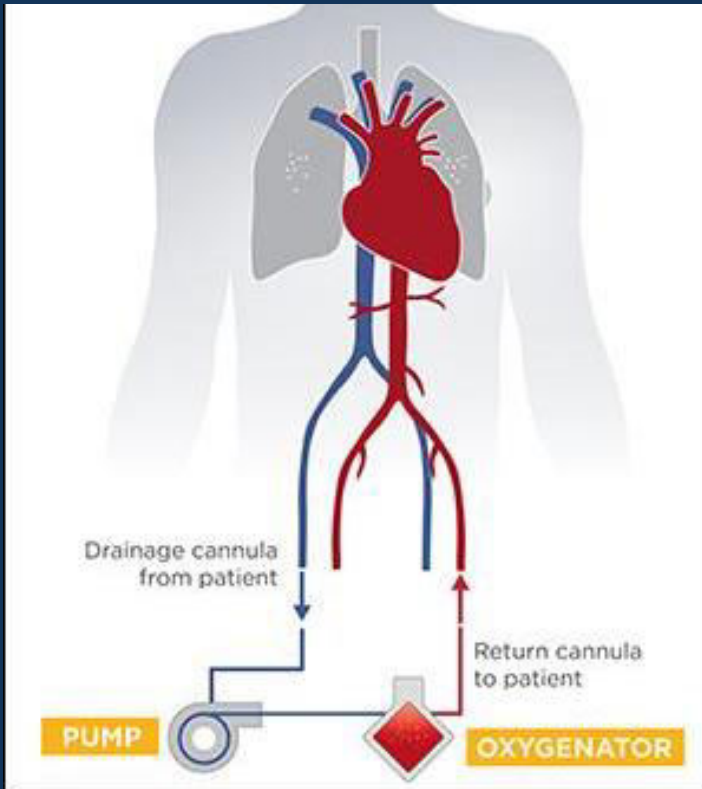
**IRCCS SAN RAFFAELE SCIENTIFIC INSTITUTE, MILAN - ITALY
GENOVA, 15 APRILE 2023**



PERIPHERAL V-A ECMO SUPPORT



THE PHYSIOPATHOLOGICAL BACKGROUND



- Peripheral VA ECMO is currently most implanted in patients with severe cardiogenic shock or refractory cardiac arrest
- Restoration of adequate systemic perfusion while protecting the failing heart and promoting myocardial recovery are equally important goals
- Following initial haemodynamic stabilization, the clinical focus is then directed towards the most efficient strategy for cardioprotection
- Optimal end-organ perfusion is mediated by the total cardiac output, but adverse effects may arise from altered myocardial loading conditions (for example mechanical stress and strain)



RATIONALE FOR LV UNLOADING

VA-ECMO increases LV afterload secondary to retrograde blood flow

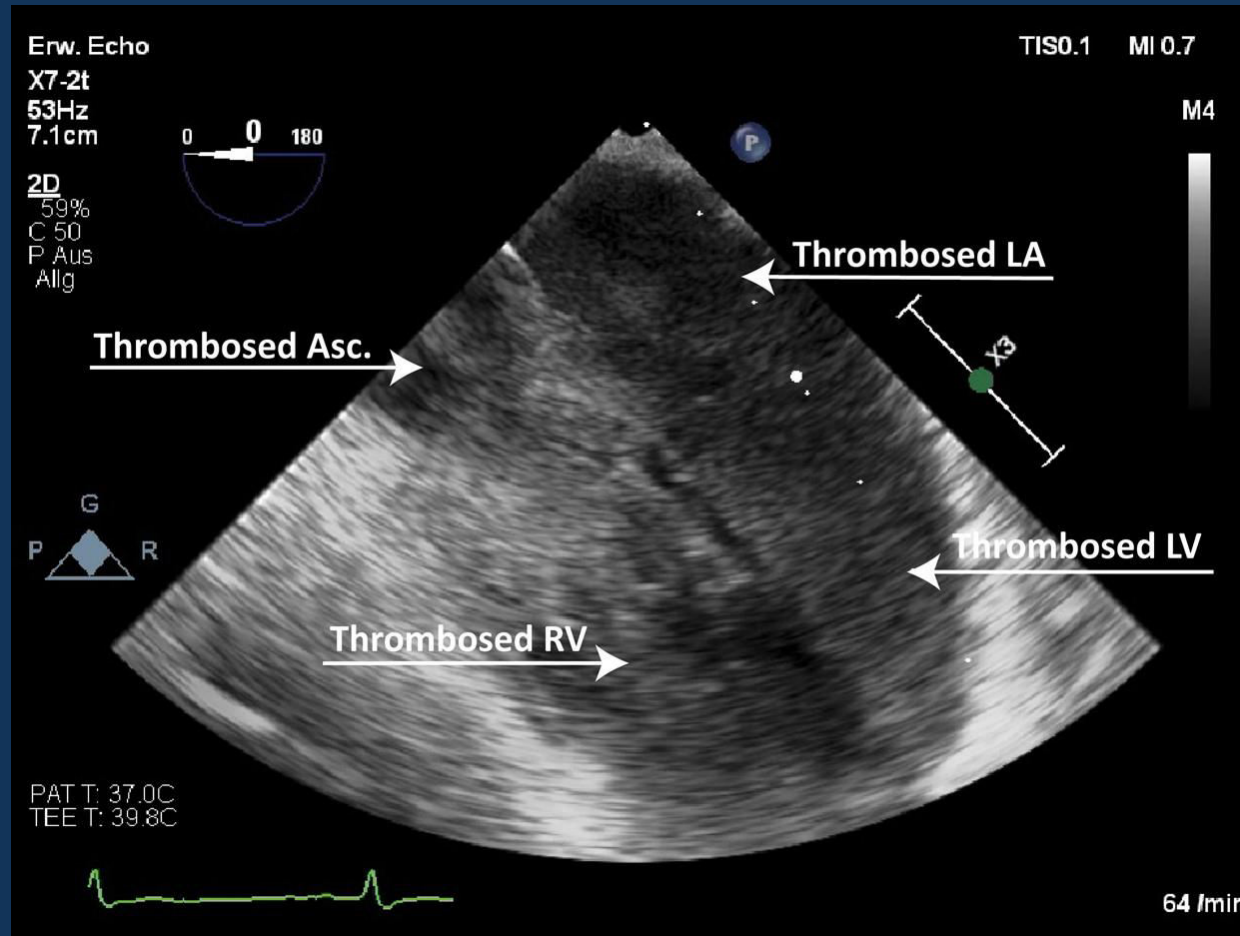


In a severely dysfunctional heart with a normal aortic valve the increased afterload prevents aortic valve



LV volume overload
Pulmonary vascular injury
Stasis with thrombus formation within the LV cavity
Increased wall stress and sub-endocardial ischaemia
Pulmonary venous congestion

CONSEQUENCES OF LV OVERLOAD



Belohlavek J, Hunziker P, Donker DW. Left ventricular unloading and the role of ECPella. Eur Heart J Suppl. 2021;23(Suppl A):A27-A34.



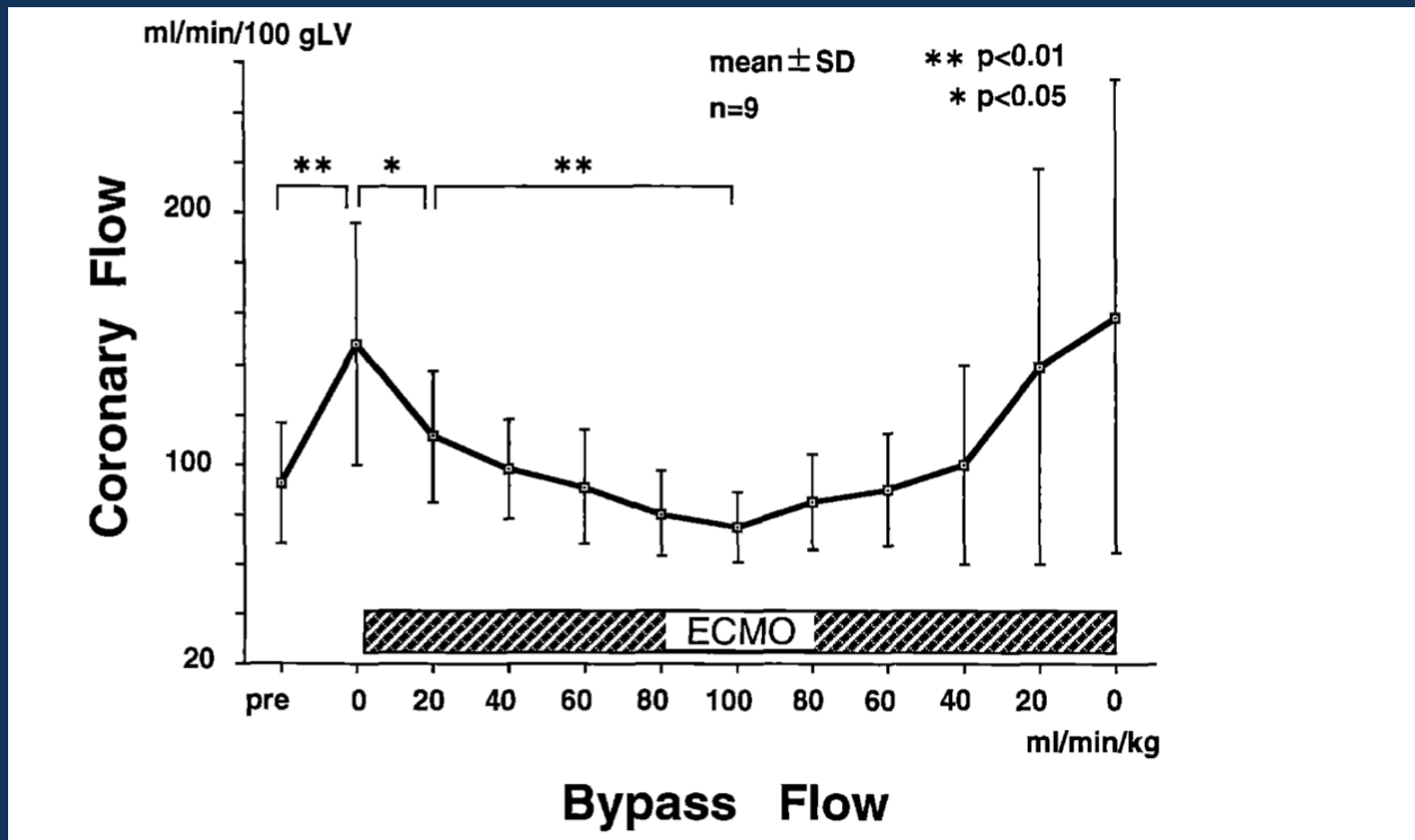
CORONARY ARTERY PERFUSION

- During peripheral VA ECMO support, they represent the most remote arterial vascular bed from a circulatory viewpoint
- In the case of 'no forward flow through the aortic valve' is impending, the coronary arteries are fed oxygenated blood from ECMO > but coronary circulation is impeded by coexisting high diastolic ventricular pressures
- If there is residual forward blood flow through the aortic valve, this blood originates from the lungs, which are typically compromised by severe pulmonary oedema



Unfortunately, no direct monitoring of coronaries arteries oxygenation is possible in routine clinical practice

CORONARY ARTERY PERFUSION



Kato J, et al. Coronary arterial perfusion during VA ECMO.
J Thorac Cardiovasc Surg. 1996 Mar;111(3):630-6.

KNOWING DEVICES LIMITATIONS



“ECMO, as a right-to-left bypass, improves peripheral vascularization in patients with heart failure, but may result in overloading of dysfunctional left heart chambers and pulmonary edema. This overload, in turn, impairs myocardial perfusion, further increasing LV dysfunction.”

Jouan J et al. J Heart Lung Transplant. 2010;29(1):135-6

“... in trying to get LV recovery ECMO is not really an unloading strategy. It is rather, a loading strategy...”

Rastan AJ, et al. J Thorac Cardiovasc Surg. 2010;139(2):302-11

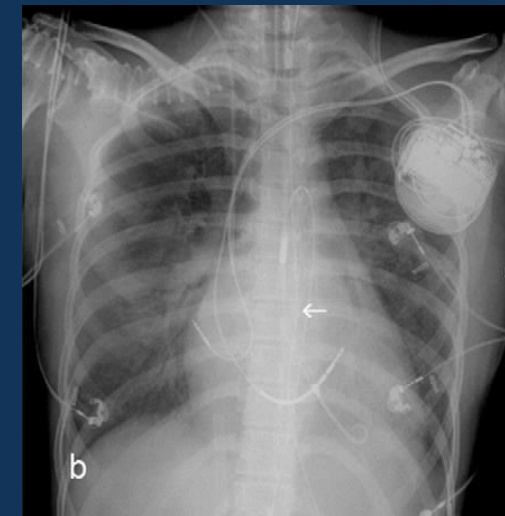
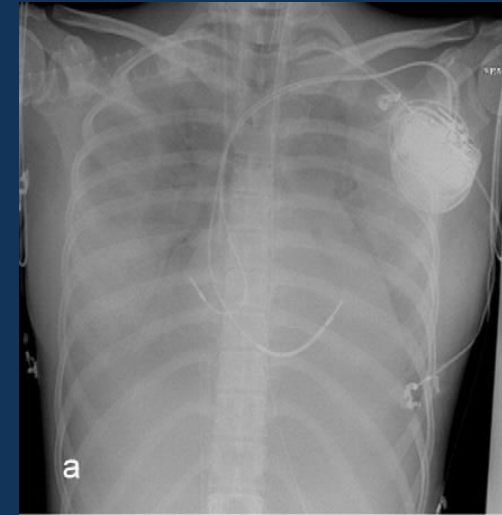


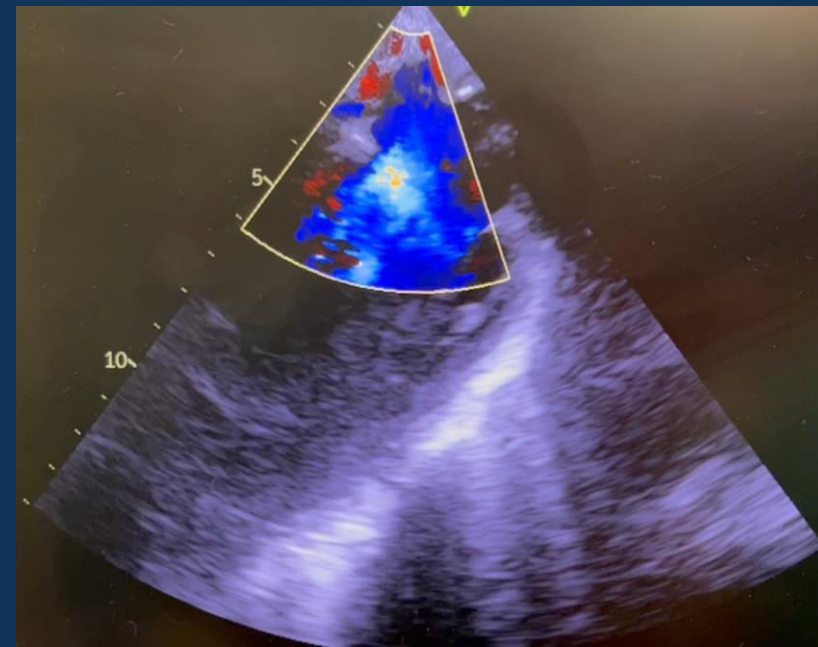
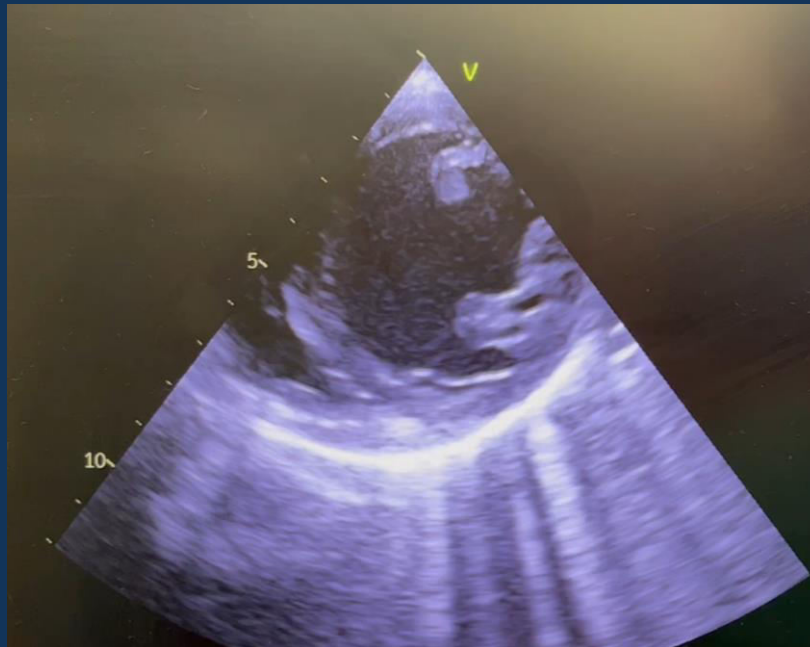
Figure A: massive pulmonary congestion
Figure B: 3 days after Impella implantation



SIGNS OF LV OVERLOAD

Bedside echography:

- ventricular distension
- stasis in LV
- right-left and left-right interaction
- aortic valve opening



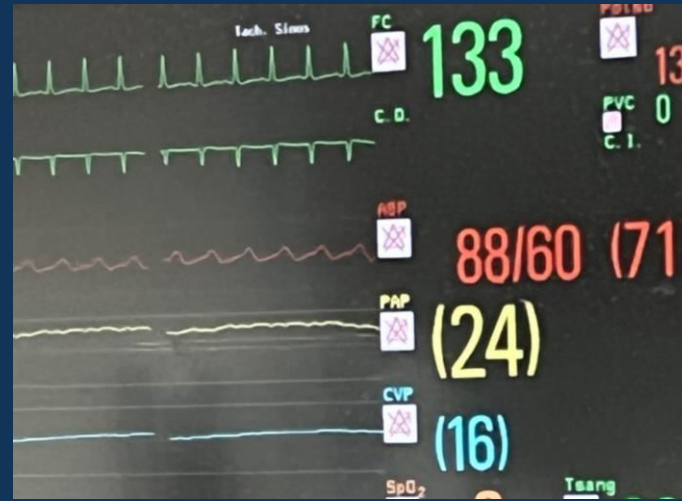
SIGNS OF LV OVERLOAD

Invasive hemodynamics:

- high filling pressure

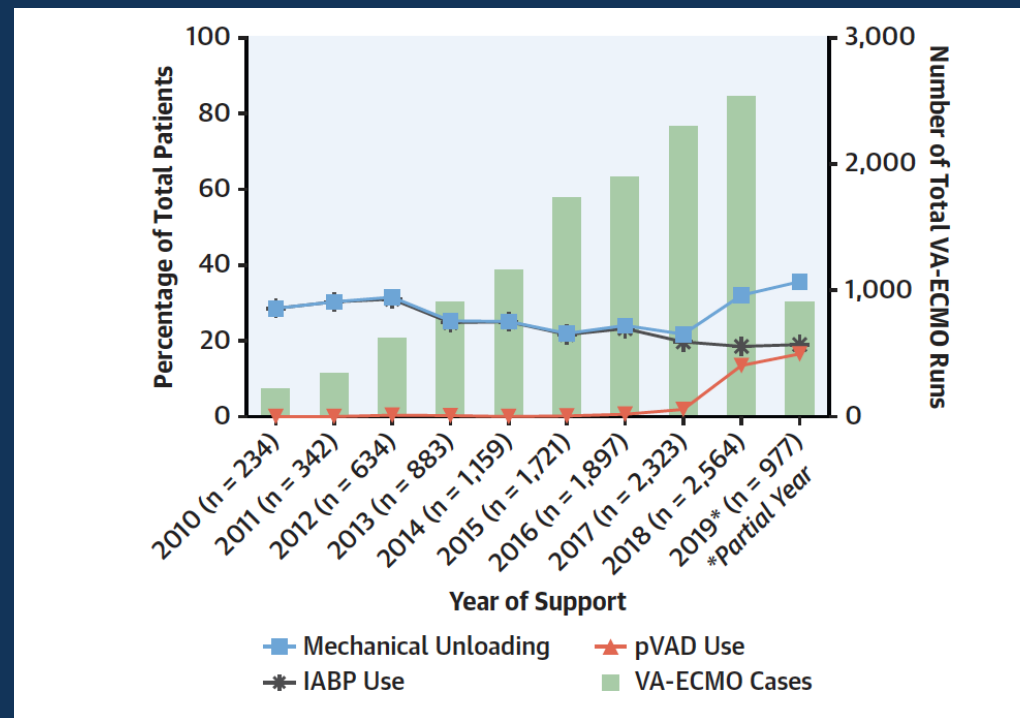
Chest radiogram:

- “wet” lung, pulmonary edema

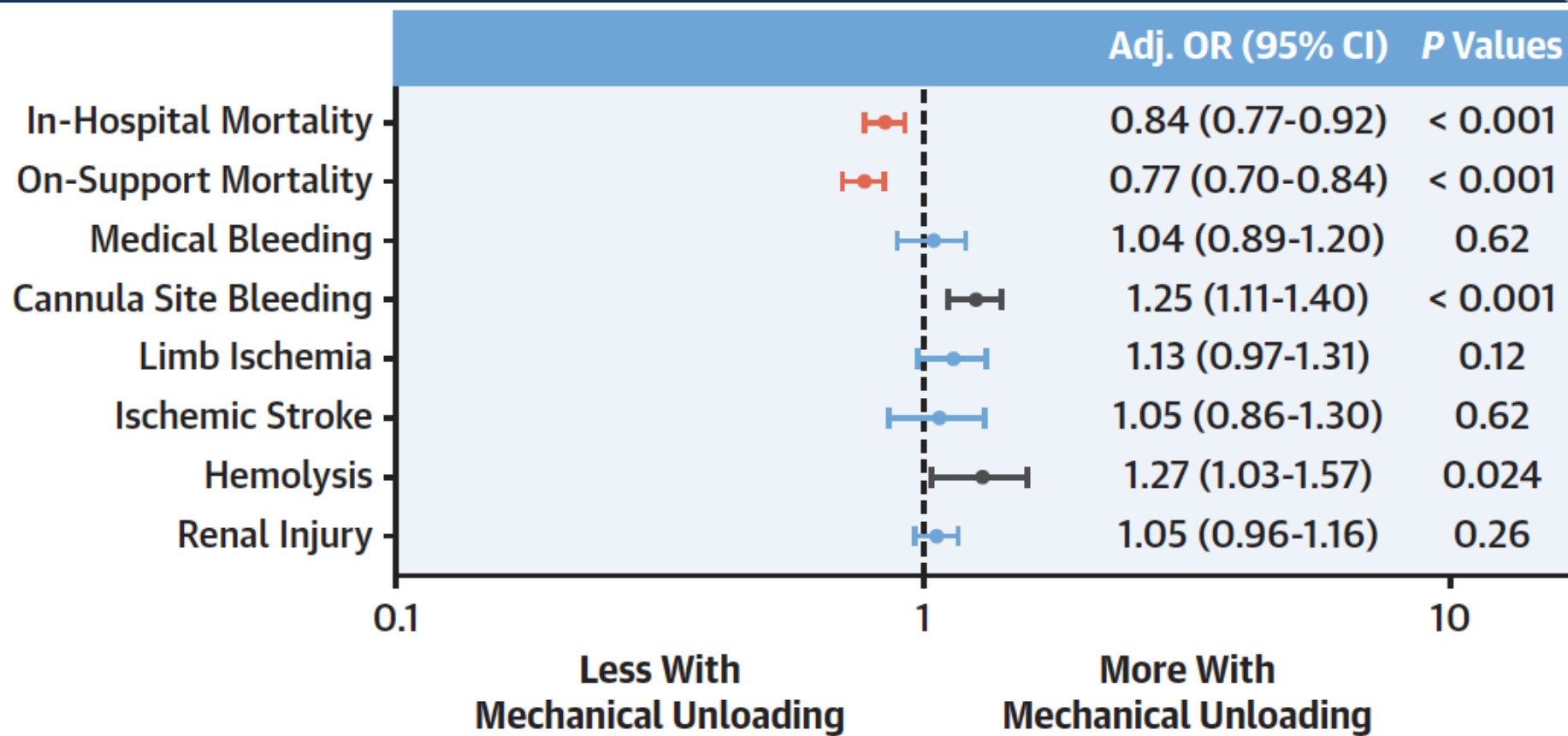


Mechanical Left Ventricular Unloading in Patients Undergoing Venoarterial Extracorporeal Membrane Oxygenation

E. Wilson Grandin, MD, MPH, MEd,^{a,b} Jose I. Nunez, MD,^c Brooks Willar, MD,^d Kevin Kennedy, MS,^b Peter Rycus, MPH,^e Joseph E. Tonna, MD, MS,^{e,f} Navin K. Kapur, MD,^g Shahzad Shaefi, MD, MPH,^h A. Reshad Garan, MD, MS^a



B



Grandin EW, et al. J Am Coll Cardiol. 2022;79(13):1239-1250.

THE IMPELLA FAMILY



Impella CP®
with SmartAssist®

Percutaneous insertion,
increased flow and
intelligent patient
management



Impella 5.5®
with SmartAssist®

Designed for surgeons
with forward flow and
intelligent patient
management



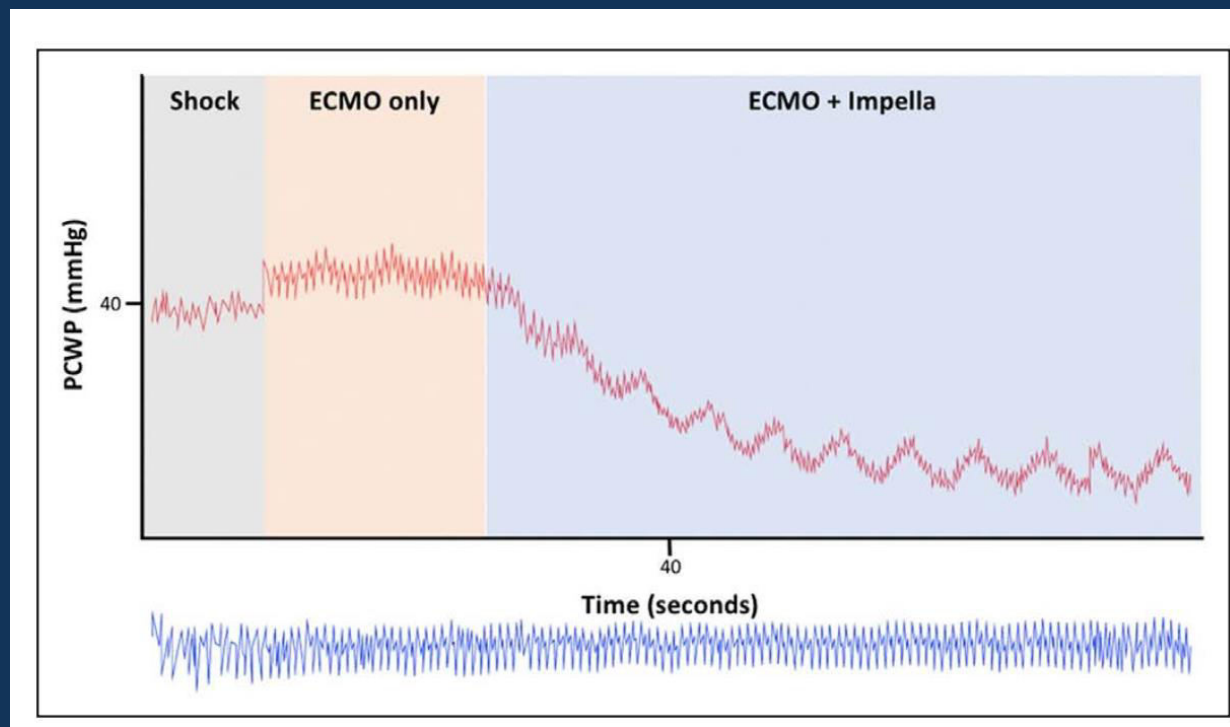
Impella RP®
with SmartAssist®

The only percutaneous
pump approved for right
heart support with
single vascular access,
designed for intelligent
patient management



LV UNLOADING: ECPELLA

- Crucial for outcome
- Multidevice support in VA ECMO patients (ECPELLA)
- Stepwise approach



Schrage B, et al. Unloading of the left ventricle during venoarterial extracorporeal membrane oxygenation therapy in cardiogenic shock. *JACC Heart Fail.* 2018;6:1035–1043.

BEDSIDE IMPELLA POSITIONING



International Journal of Cardiology 316 (2020) 26–30

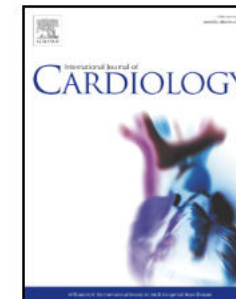


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Contents lists available at ScienceDirect

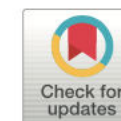
International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard



Bedside insertion of impella percutaneous ventricular assist device in patients with cardiogenic shock

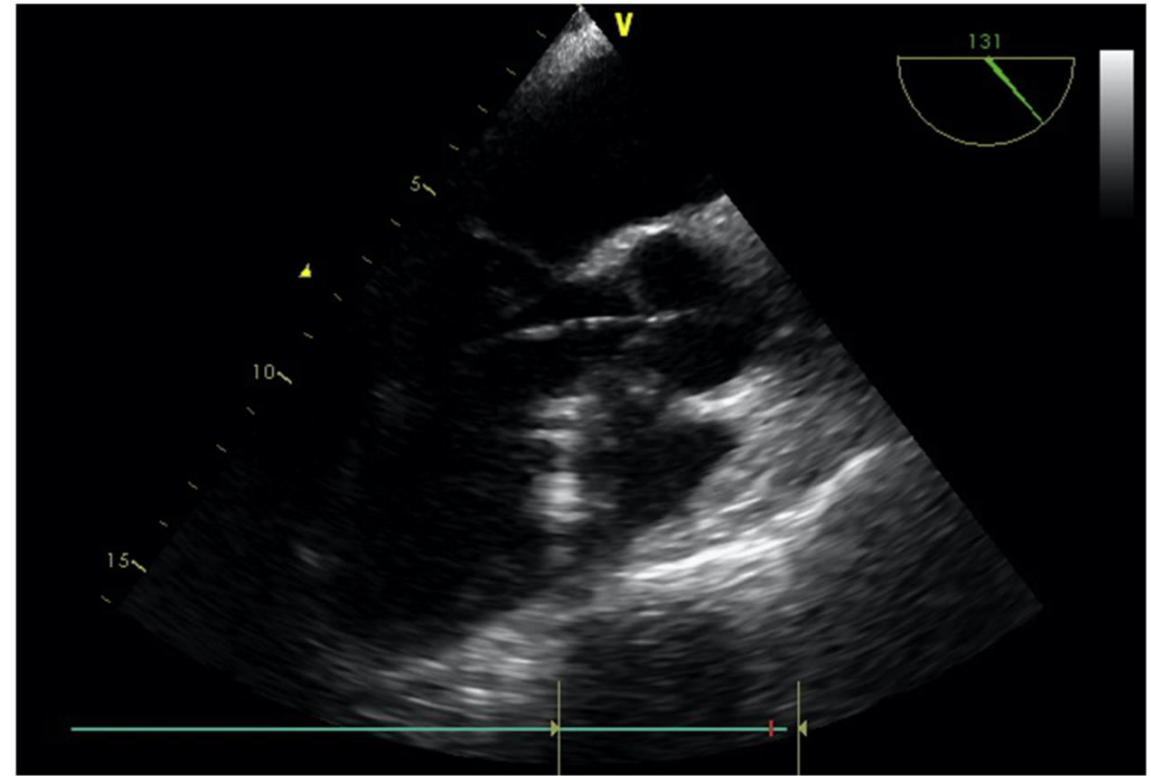
Marina Pieri ^{a,*}, Federico Pappalardo ^b



BEDSIDE IMPELLA POSITIONING

- «TEE-guided Impella placement is **feasible, not burdened by the risks connected to the transportation of an unstable patient to the catheterization laboratory.**
- Moreover, TEE not only allows **ruling out contraindications** to Impella placement, but also **immediately shows the anatomical relationship with the aortic cusps, and with the mitral valve.**»

M. Pieri, F. Pappalardo / International Journal of Cardiology 316 (2020) 26–30



CLINICAL SCENARIOS AND ECPELLA



EUROPEAN
SOCIETY OF
CARDIOLOGY®

European Journal of Heart Failure (2017) 19, 404–412

doi:10.1002/ejhf.668

Concomitant implantation of Impella® on top of veno-arterial extracorporeal membrane oxygenation may improve survival of patients with cardiogenic shock

Federico Pappalardo^{1†*}, Christian Schulte^{2†}, Marina Pieri¹, Benedikt Schrage²,

Parameter	Total (n = 63)	ECMO + Impella (n = 21)	ECMO (n = 42)	P-value
Hospital mortality, n (%)	41 (65)	10 (48)	31 (74)	0.04
Bridge to next therapy or recovery, n (%)	28 (44)	13 (62)	15 (36)	0.048
Weaning from MCS, n (%)	26 (41)	10 (48)	16 (28)	0.047

Concomitant treatment with VA-ECMO and Impella may improve outcome in patients with cardiogenic shock compared with VA-ECMO only.

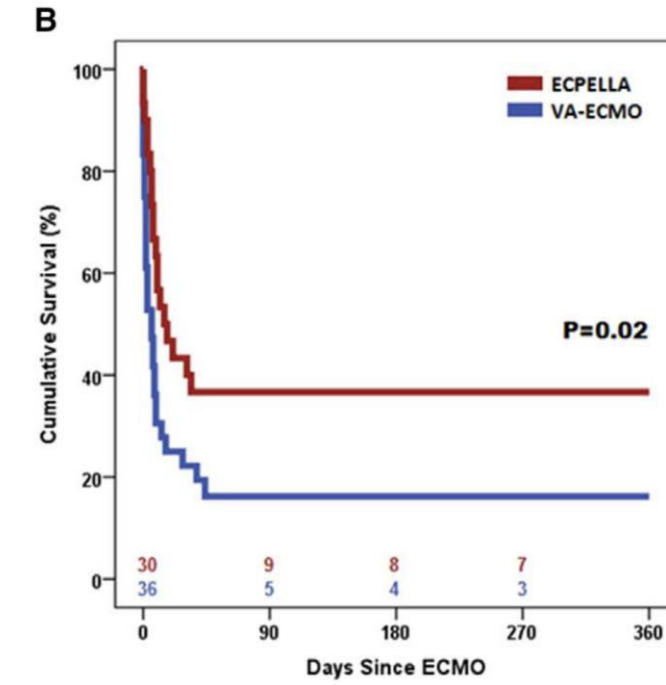
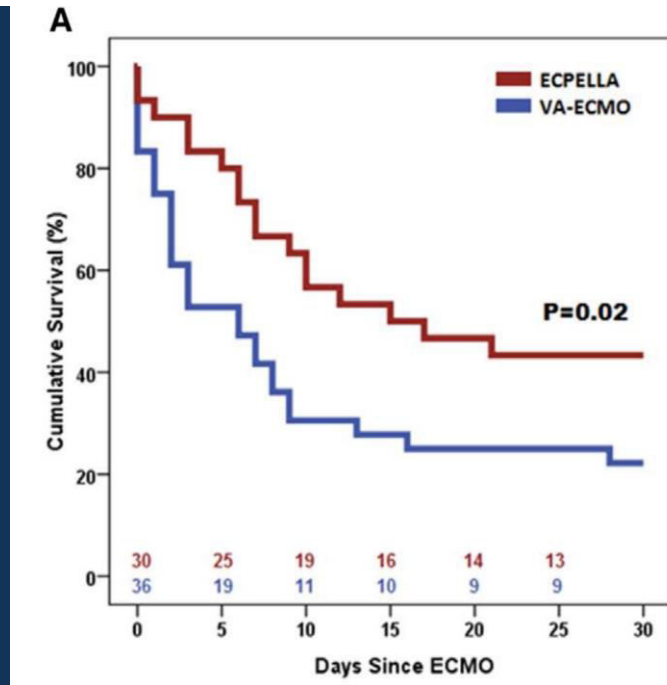


CLINICAL SCENARIOS AND ECPELLA

Simultaneous Venoarterial Extracorporeal Membrane Oxygenation and Percutaneous Left Ventricular Decompression Therapy with Impella Is Associated with Improved Outcomes in Refractory Cardiogenic Shock

Conclusions

This study suggests that the addition of Impella to VA-ECMO is associated to improved survival of patients with refractory CS. Randomized controlled trials are required to confirm these findings.



Patel SM, et al. ASAIO J. 2019;65:21-28.

CLINICAL SCENARIOS AND ECPELLA



Circulation

Circulation. 2020;142:2095–2106.

ORIGINAL RESEARCH ARTICLE



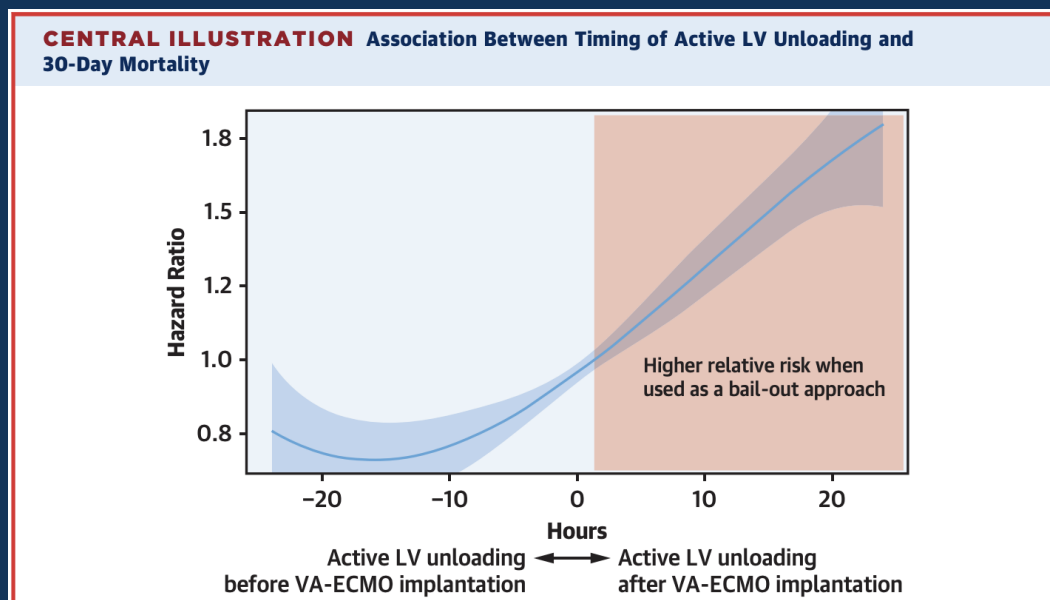
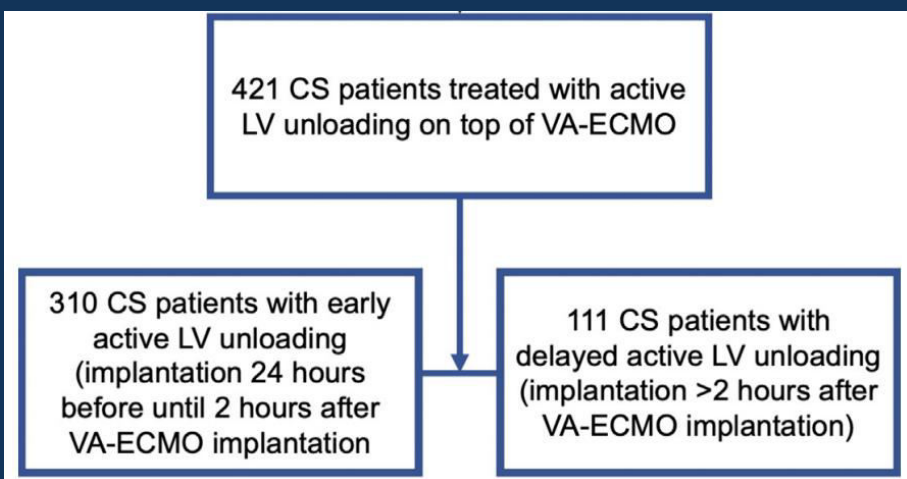
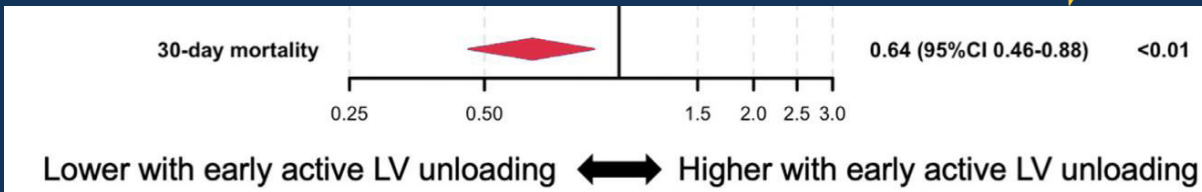
Left Ventricular Unloading Is Associated With Lower Mortality in Patients With Cardiogenic Shock Treated With Venoarterial Extracorporeal Membrane Oxygenation Results From an International, Multicenter Cohort Study



CLINICAL SCENARIOS AND ECPELLA



Timing of Active Left Ventricular Unloading in Patients on Venoarterial Extracorporeal Membrane Oxygenation Therapy



CONCLUSIONS This exploratory study lends support to the use of early active LV unloading in CS patients on VA-ECMO, although the findings need to be validated in a randomized controlled trial.

Schrage B, et al.
JACC Heart Fail. 2023;11:321-330.



CLINICAL SCENARIOS AND ECPELLA



UNLOAD ECMO

LEFT VENTRICULAR UNLOADING TO IMPROVE OUTCOME IN CARDIOGENIC SHOCK PATIENTS ON VA-ECMO - A PROSPECTIVE, RANDOMIZED, CONTROLLED, MULTI-CENTER

TRIAL
ClinicalTrials.gov

RECRUITING

- Prospective, multi-center, randomized (1:1), controlled trial of Impella for active left ventricular unloading on top of veno-arterial extracorporeal membrane oxygenation vs. veno-arterial extracorporeal membrane oxygenation alone for the treatment of cardiogenic shock.
- 198 patients with cardiogenic shock will be randomized 1:1.
- Primary endpoint; death from any cause 30 days after randomization.



NCT05577195

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ECPELLA: IN QUALI PAZIENTI E PERCHÉ? – A.M. SCANDROGLIO | GENOVA, 15 APRILE 2023

ECMELLA VS ECPELLA



ECMELLA

ECMO based therapy
Bail-out Impella

VS

ECPELLA

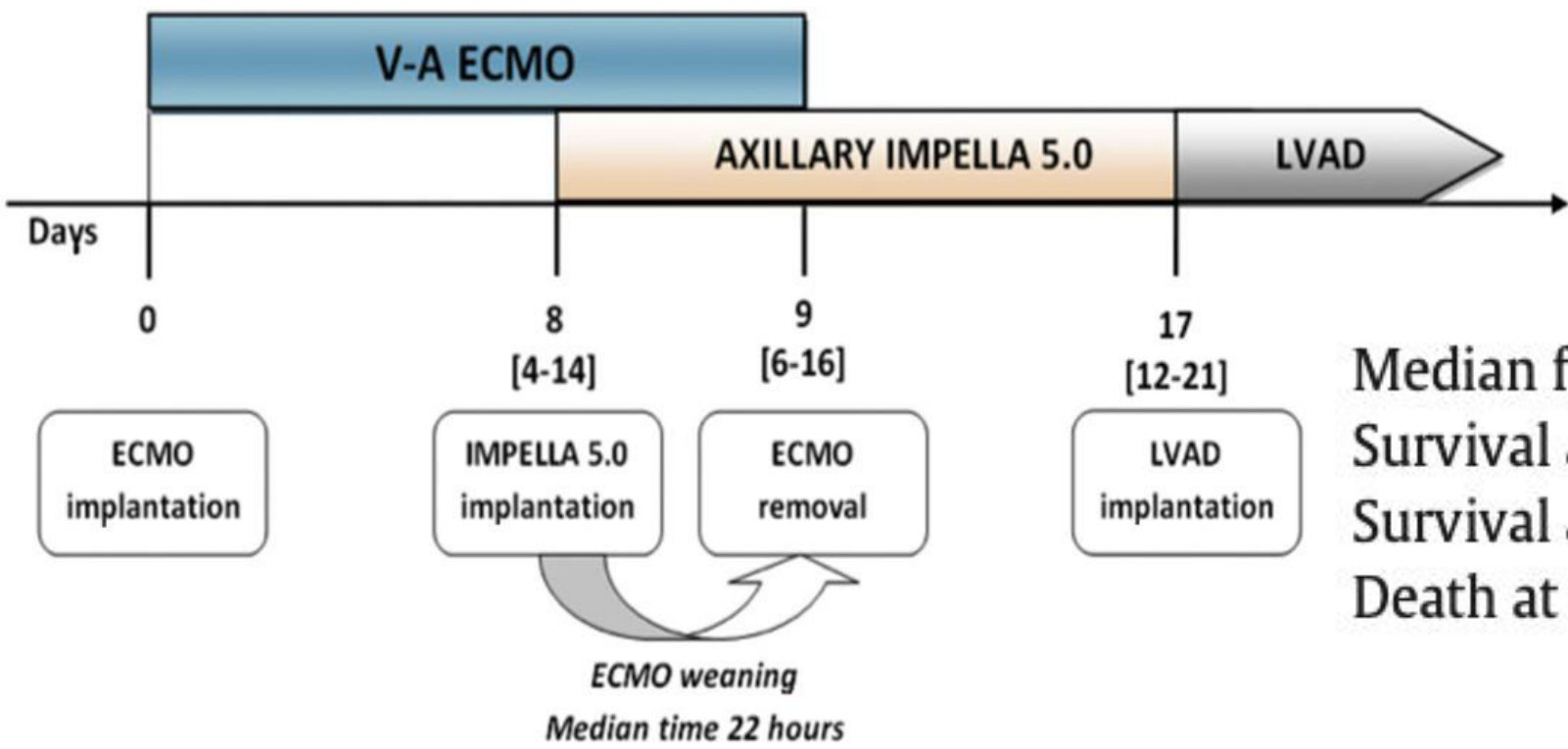
Impella based therapy
Periods of ECMO support

- Two steps strategy
- **1st**: Overcome resuscitation phase and optimize hemodynamic status with ECMO
- **2nd**: Bridge to mid-term support



MULTIDEVICE BRIDGING TO LVAD

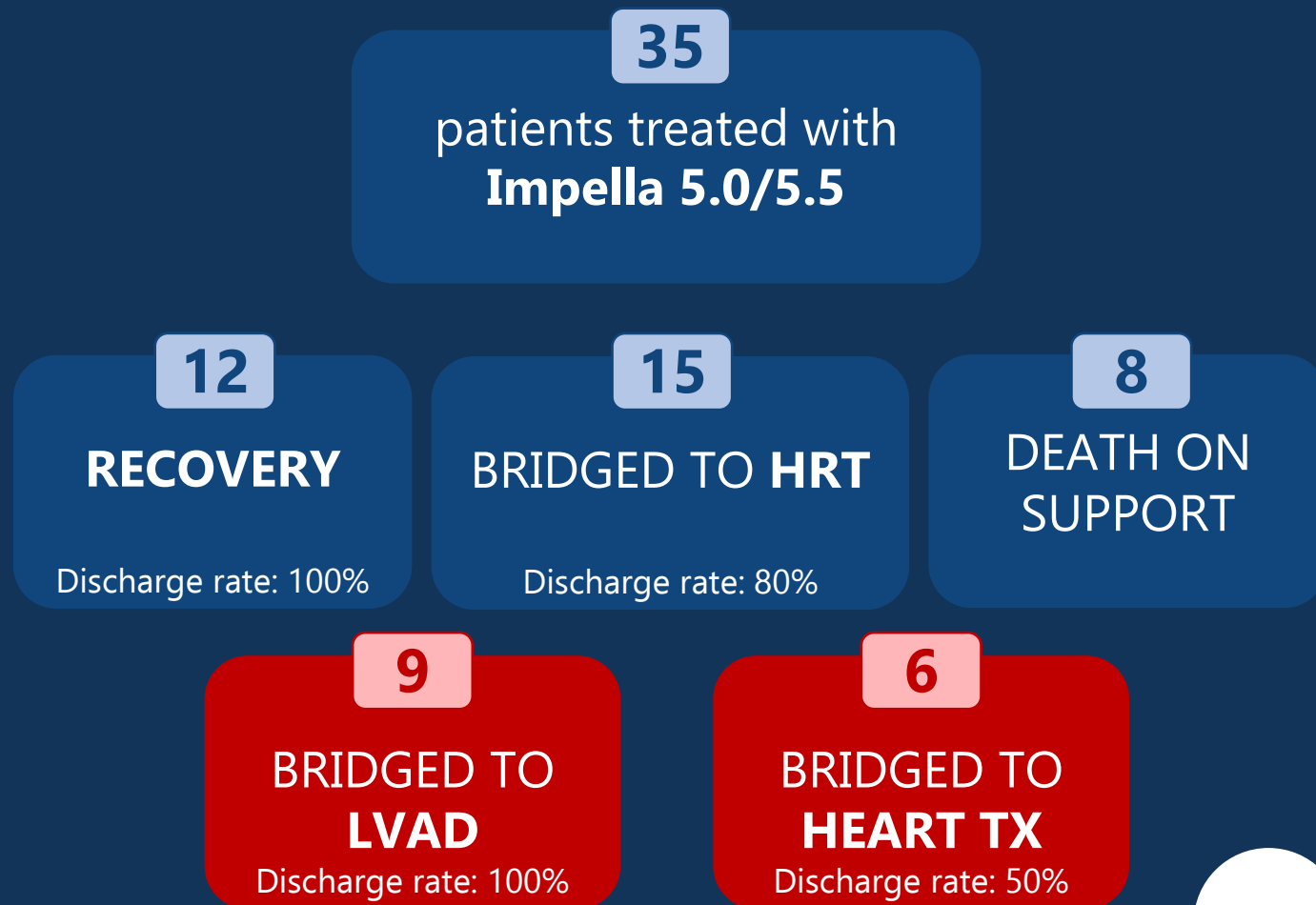
L.F. Bertoldi et al. / Journal of Critical Care 57 (2020) 259–263



Median follow-up time - days	227 [127–380]
Survival at 30-days	9 (100%)
Survival at 6-months	9 (100%)
Death at median follow-up	1 (11.1%)

THE OSR EXPERIENCE | IMPELLA 5.0/5.5

- Study period: Jan 2018 – Sep 2022
- 35 pts with AMI CS received Impella 5.0/5.5 via axillary cannulation
- Mean age was 61 ± 11 years
- Median support time was 12 days
- Overall hospital survival was 69%



IMPELLA POSITIONING: PITFALL AND HINT



- Tortuous iliac or axillary arteries
- Mural LV thrombus
- Mechanical heart valves
- Severe aortic regurgitation or calcification/stenosis
- Assess distal angiogram of the groin to visualize possible calcification, stenosis or tortuosity
- Confirm vessel size (axillary artery at least 7 mm)

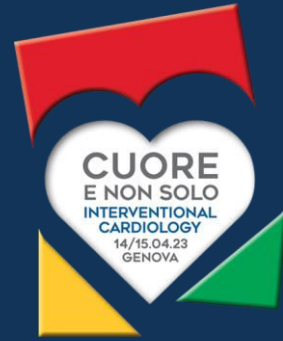
VA ECMO is a very complex scenario that warrants ad hoc evaluation



CONCLUSIONS

- Clinical management of VA ECMO remains challenging and requires mechanistic insights and careful monitoring of a proper balance between the circulatory needs and the cardiac condition of an individual patient.
- Left ventricular unloading during VA ECMO results in improved survival
- Among several possible unloading strategies, ECPELLA is the most promising

**Clinical success in the result of a TEAM
work**



THANK YOU FOR YOUR

ATTENTION

IN QUALI PAZIENTI E PERCHÉ?

ANNA MARA SCANDROGLIO, MD

mailto: scandroglio.mara@hsr.it

IRCCS SAN RAFFAELE SCIENTIFIC INSTITUTE, MILAN - ITALY





ONE MORE THING

A REAL-LIFE CLINICAL CASE



CASE HISTORY

- 20 y.o. man, no past medical history
- Acute presentation to ED with shortness of breath and chest pain
- EKG: antero lateral STEMI
- Coronary angiography: LM thrombosis.
- Development of hemodynamic instability (PEA) requiring intubation and IABP



CASE DEVELOPMENT



- **Day 0:** Upgrade from V-A ECMO + IABP to ECPella
- **Day 1:** Cardiac tamponade > pericardial drainage
- **Day 3:** Left hemothorax > angiography & surgical evacuation

Progressive stabilization, V-A ECMO weaning

- **Day 7:** V-A ECMO removal
- **Day 10:** Extubation

Repeated coronary angiography on **day 11:** good result of previous pPCI

- Progressive Impella weaning



THE BUMPY ROAD

- **Day 13:** Impella removal

Early severe cardiogenic shock relapse

- ECMO re-run
- Axillary Impella 5.5 with SmartAssist implantation

Progressive clinical stabilization

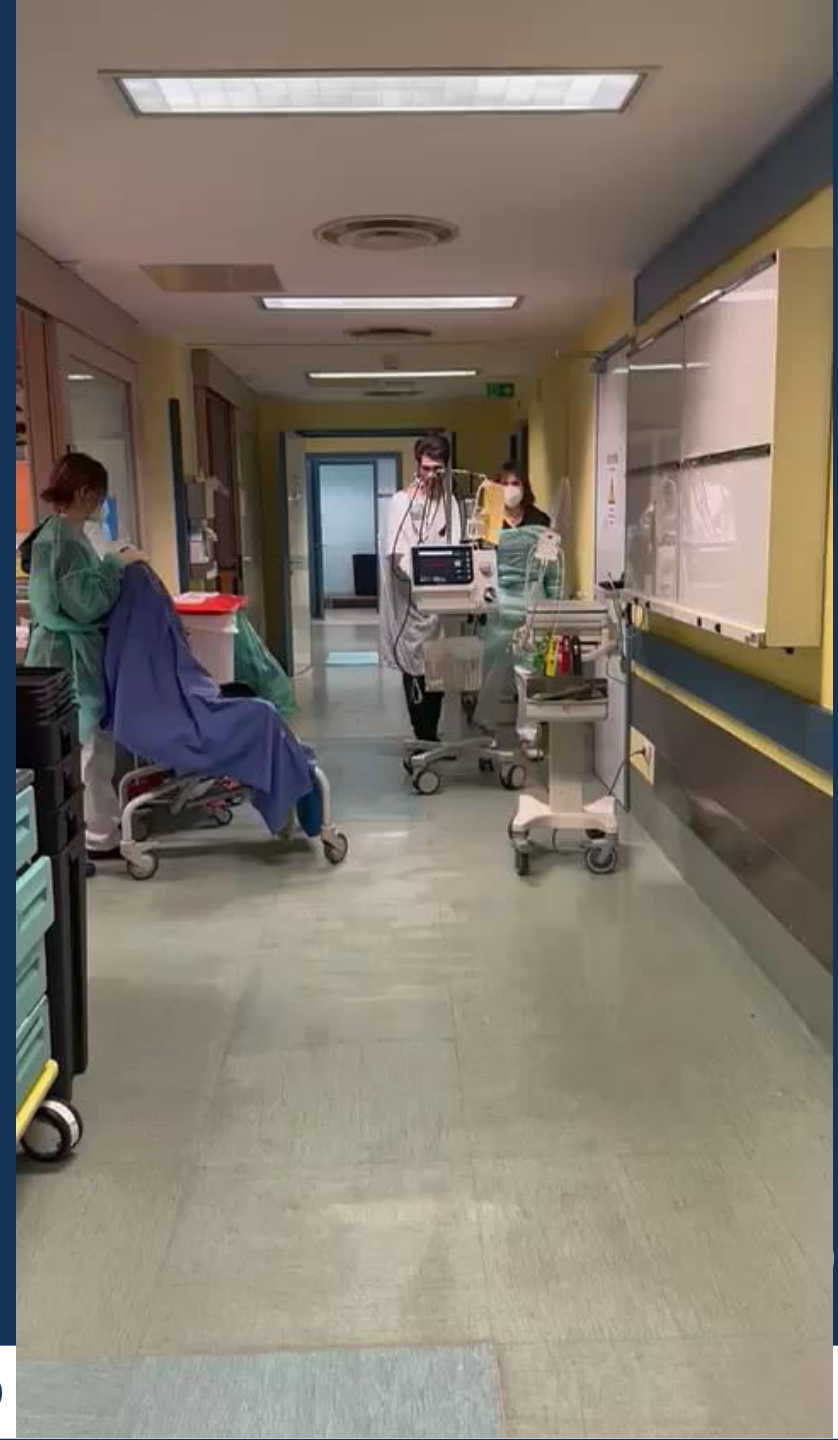
- **Day 15:** V-A ECMO weaning and removal
- **Day 16:** Extubation

Stable on support for 20 days

STATUS 1 (NATIONAL EMERGENCY) ON HTX LIST



ECPELLA: IN QUALI PAZIENTI E PERCHÉ? – A.M. SCANDROGLIO



HEART TRANSPLANT



- Transferred to HTx center on **Day 40** under full Impella 5.5 support
- **HEART TRANSPLANTATION** on **Day 41**
- Regular postoperative course
- Currently doing well (on ward)

