XI Reunión. Estado del Arte en
INSUFICIENCIA CARDIACA
PRÁCTICA CLÍNICA Y MODELOS ORGANIZATIVOS
Sede: Hotel Meliá MaríaPita, A Coruña
A CORUÑA 27-28 SEPTIEMBRE 2024

XI Meeting. State of the Art in
HEART FAILURE
CLINICAL PRACTICE AND ORGANIZATIONAL MODELS
Venue: Hotel Meliá MaríaPita, A Coruña
ACoruñaHF2024
A CORUÑA 27-28 SEPTEMBER 2024

Galicia CS code: Short term mechanical circulatory support

Guillermo Bastos Fernandez,MD
Interventional Cardiology Unit
Alvaro Cunqueiro University Hospital - Vigo, Spain

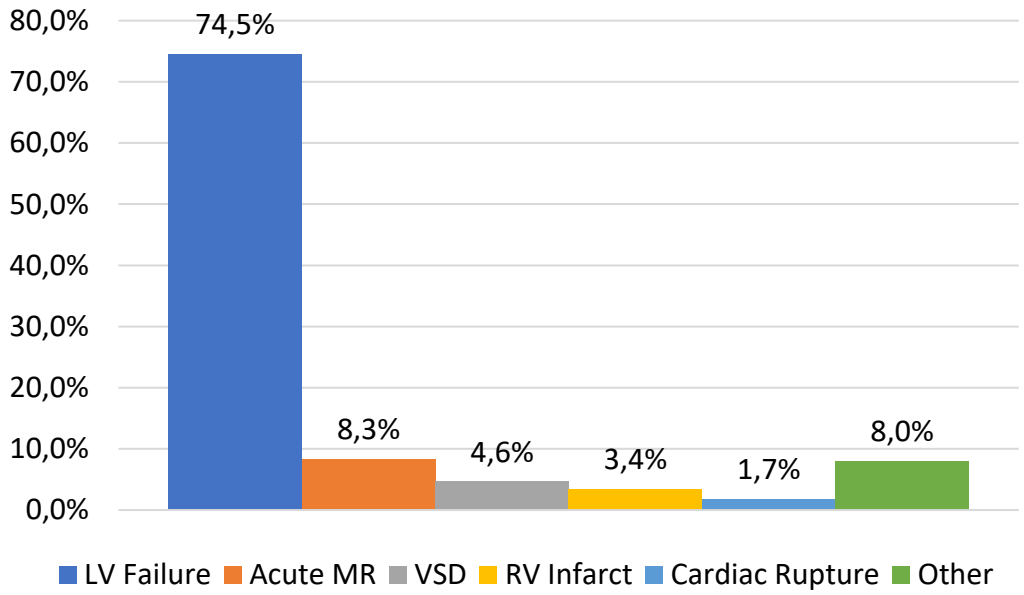
Short term mechanical circulatory support

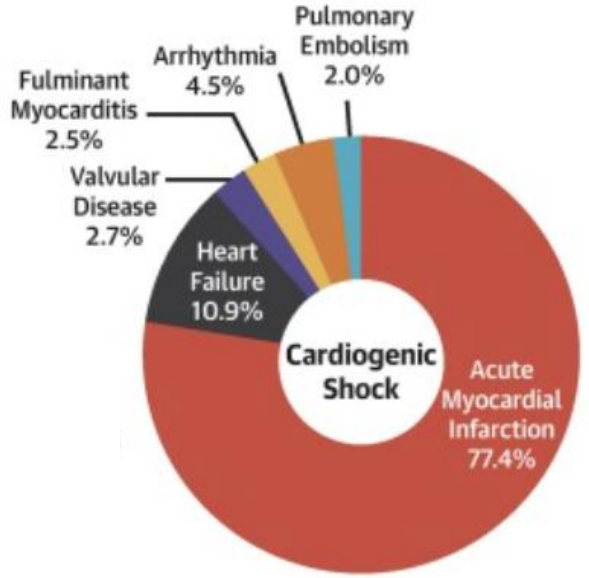
I do not have any potencial conflict of interst to declare

THE PROBLEM OF CS

- Acute coronary syndrom represent first cause of CS
  - ➢ ≈ 50% of all identificable causes

- LV predominant fenotipe





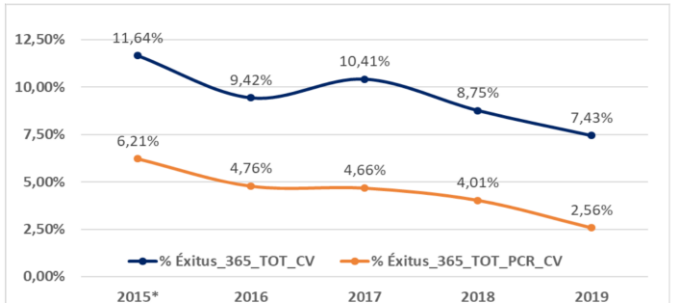
JACC Asia. 2022 Oct 31;3(1):122-134.

Hochman, J.S., et al. J Am Coll Cardiol, 2000. 36(3 Suppl A): p. 1063-70.

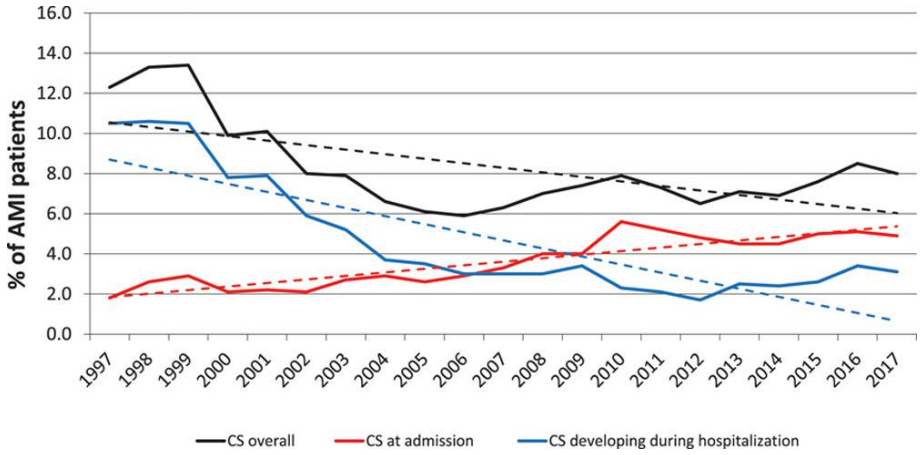
THE PROBLEM OF CS

- Rapid reperfusion strategies
  - ➢ Reduced complications and mortality <10%

Figura 8. Mortalidad cardiovascular (1 año). REGALIAM 2015-2019.



Regaliam 1y cardiovascular mortality

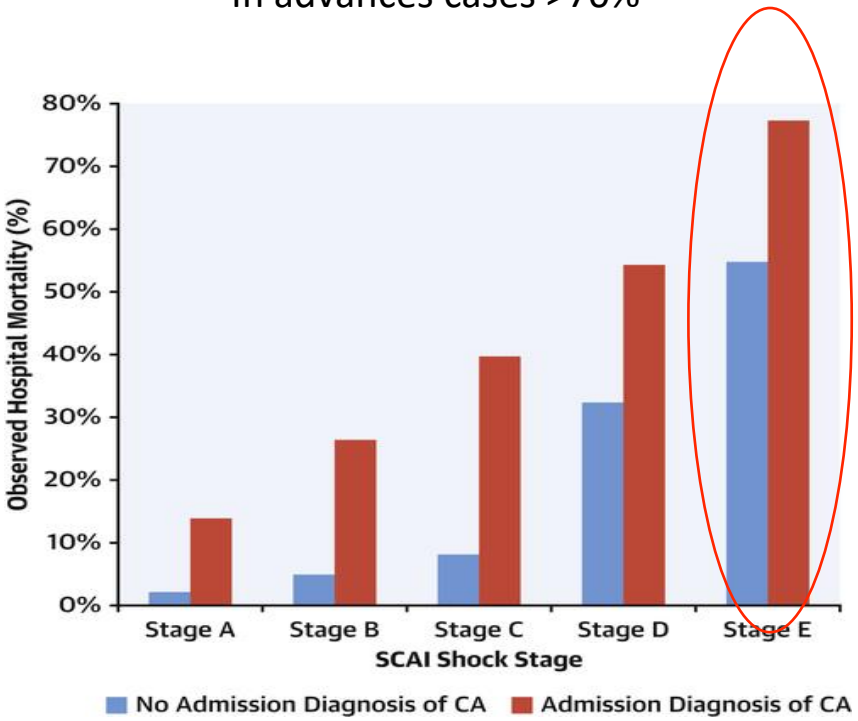


- There is still and important AMI-CS subgroup (5-10%).

Circ Cardiovasc Interv. 2019 Apr;12(4):e007293.

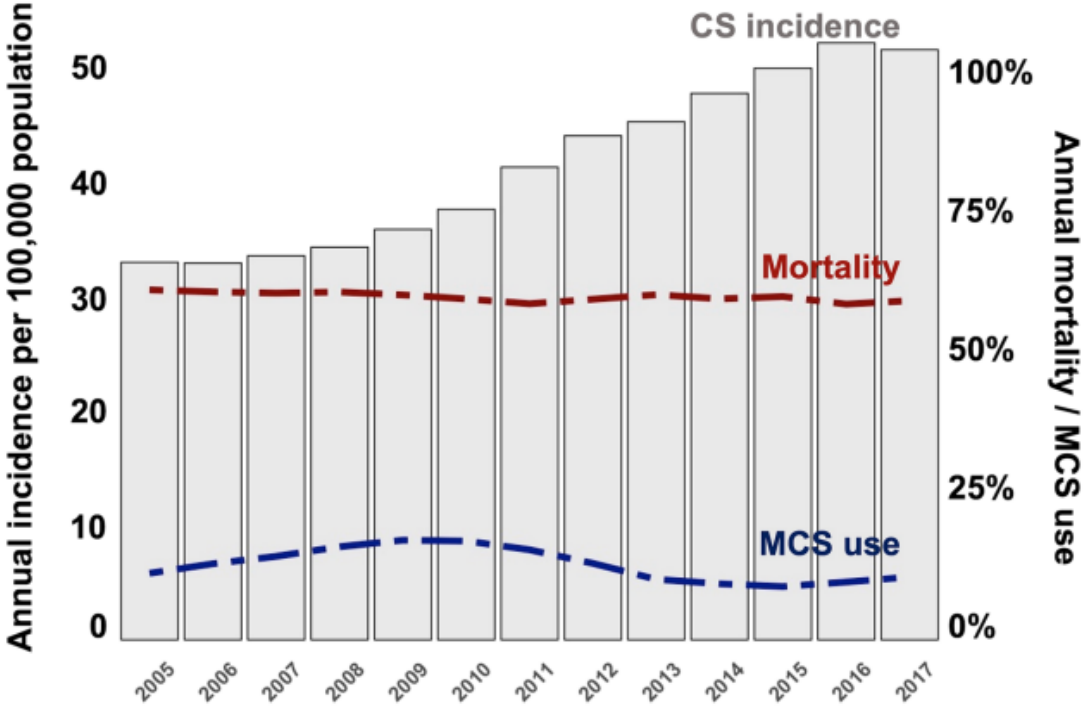
THE PROBLEM OF CS

- Very high mortality
  - Overall >50%
  - In advances cases >70%



Jacob C. Jentzer et al. JACC 2019; 74:2117-2128. Mayo Clinic CICU CS registry >10.000 pts

- Minimal improvement over time



ESC Heart Fail. 2021 Apr;8(2):1295-1303.

To start with… Nightmare case

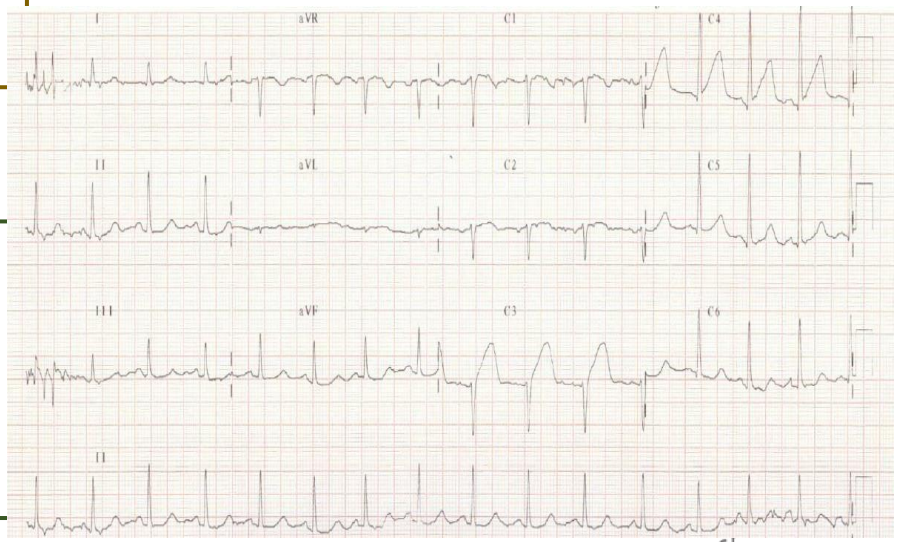
Female, 43 y.o no CV risk factors

Cardiac History

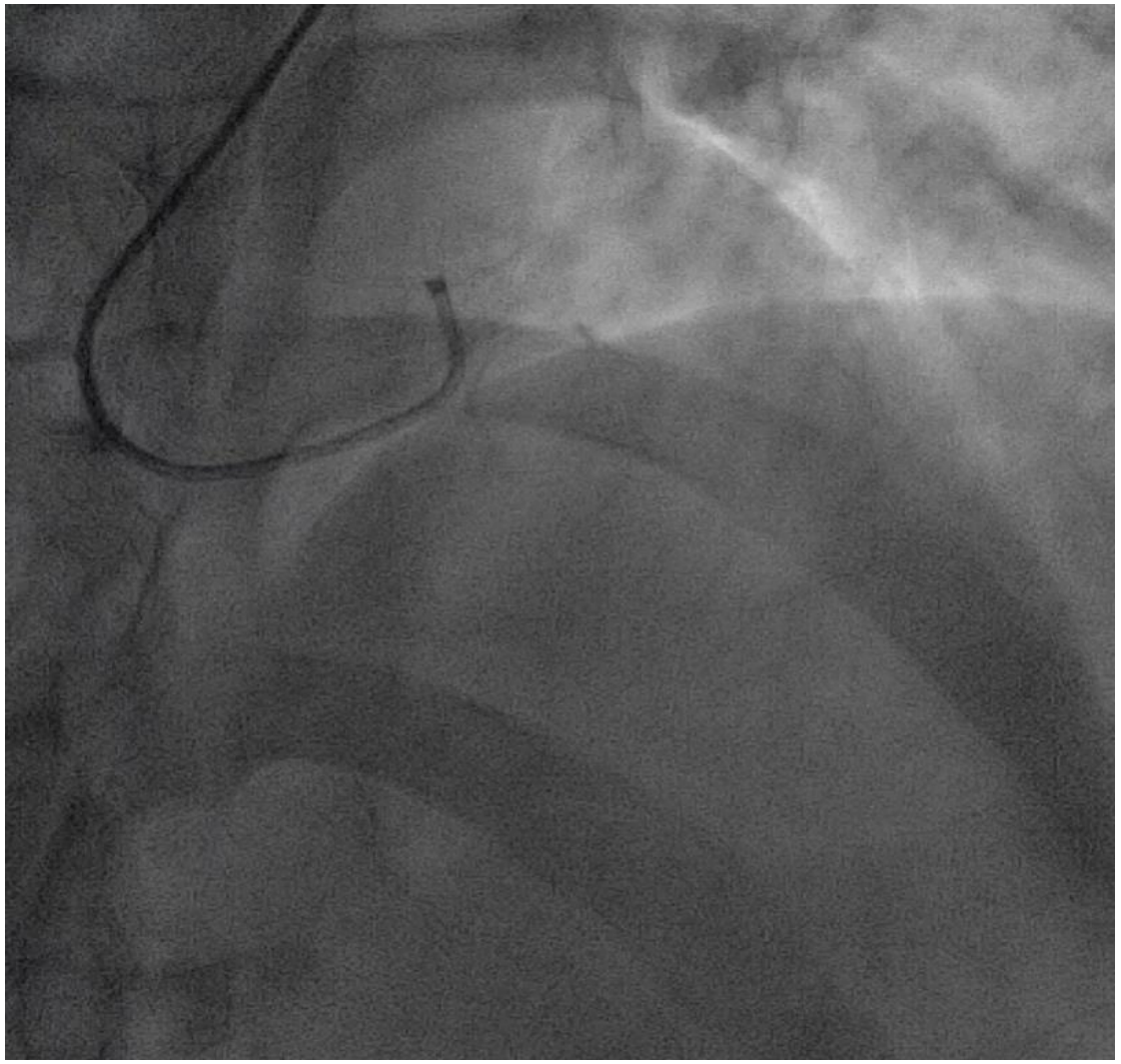
- **2014: Apical STEMI:** Spontaneous Coronary Artery Dissection (medical treatment). **TTE: Preserved LVEF**
- **Treatment**: Bisoprolol 2.5mg, AAS 100mg.

History of Present Illness

- **Chest pain with irradiation to left arm for the last 2h.**
- **ECG**: ST elevation in V3-V4
- **TpUs I:** 4441 ng/L
- **TTE**: Preserved LVEF, akinesia in LAD territory.



Cardiac Catheterization

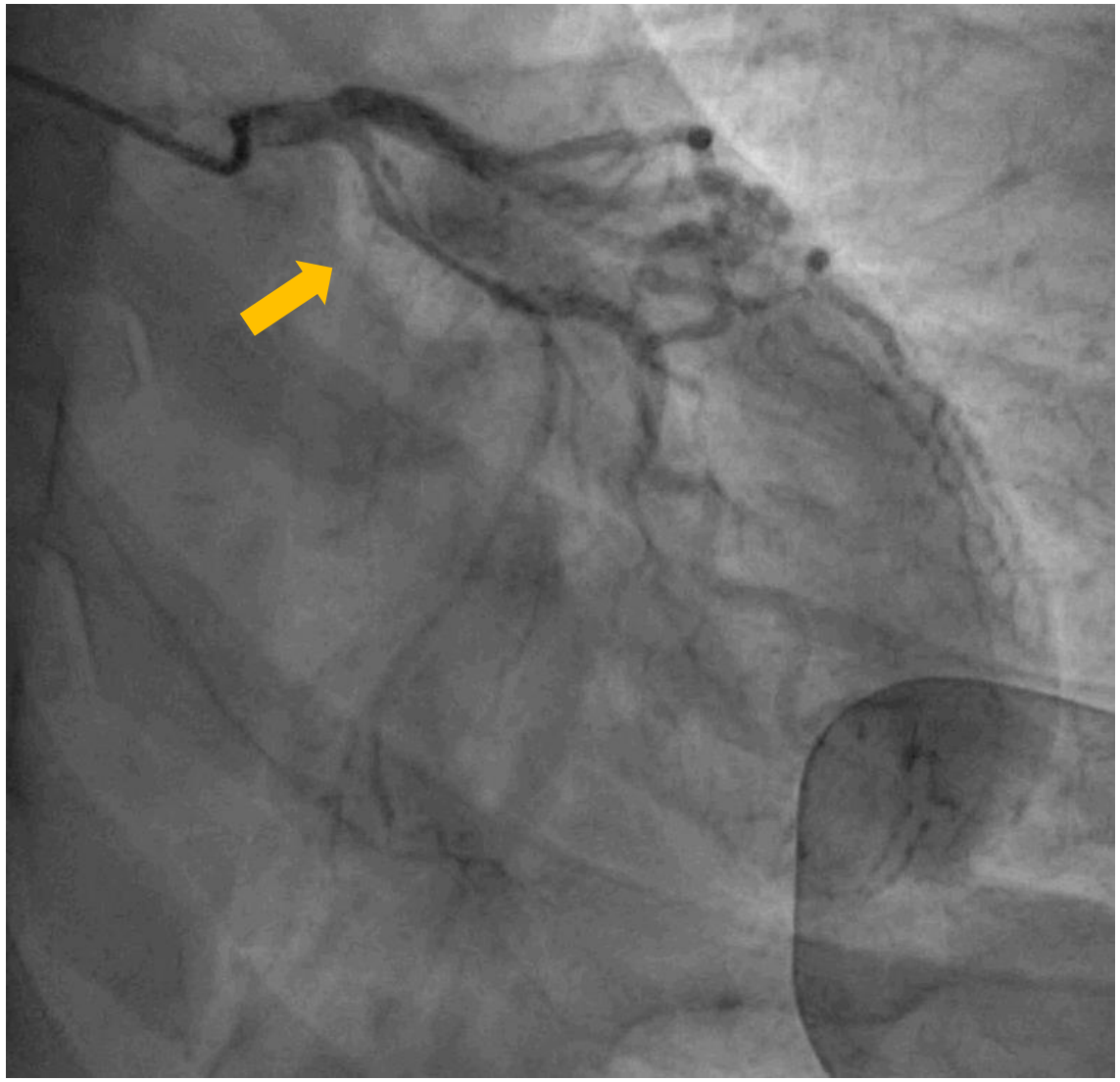


Cardiac Catheterization

Spontaneous coronary dissection

+

TIMI III culprit vessel



Cardiac Catheterization

Cardiac Arrest due to VF
DEF x5 and CPR 10 min

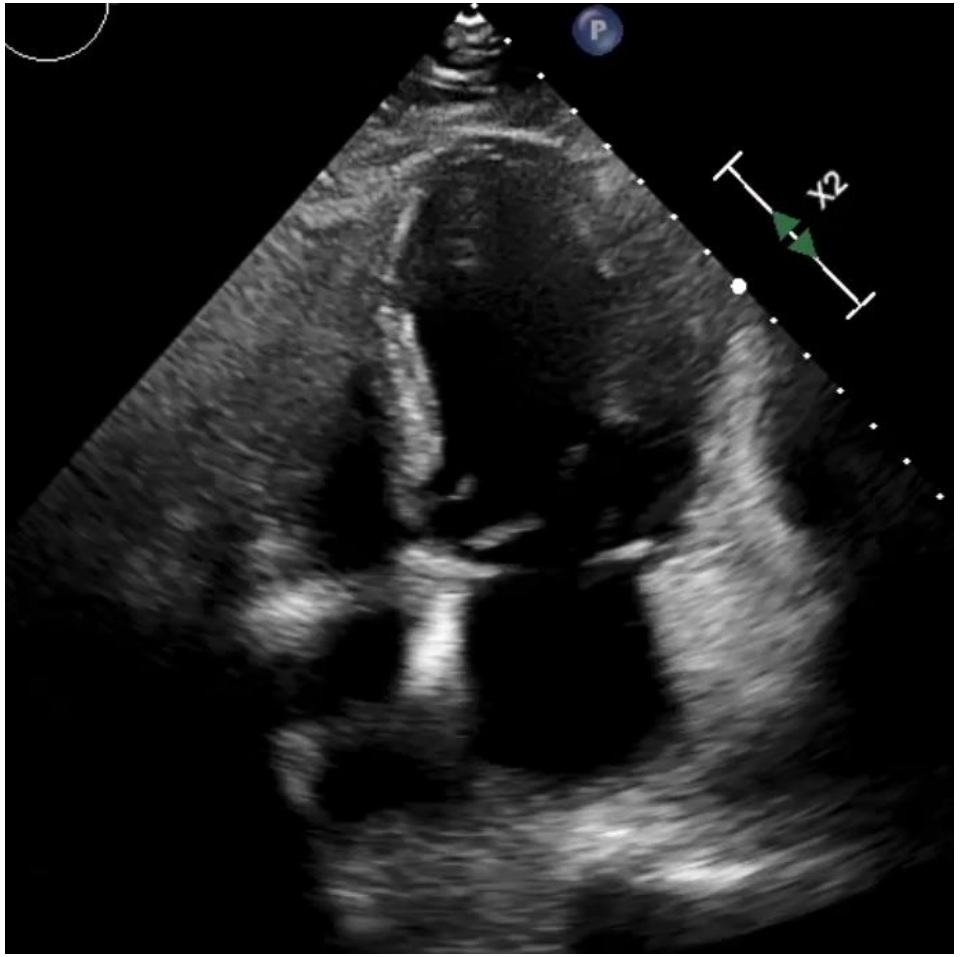
ROSC with ST elevation (anterior leads)

Mechanical Ventilation

Lactate 7mmol/L

BP 80/55mmHg (NEP 0.2 mcg/kg/min)

+



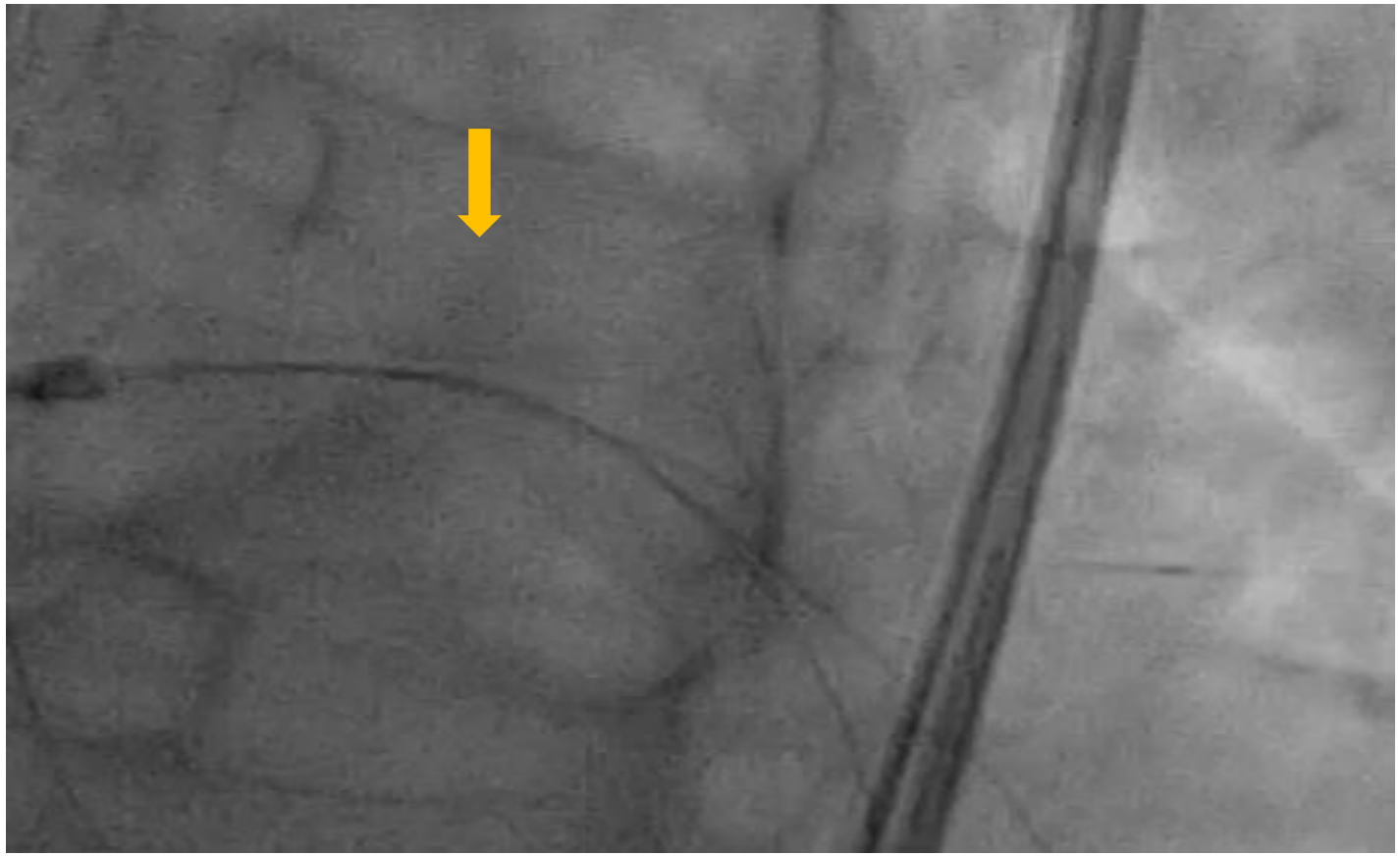
Severely decreased LVEF (25%)

Cardiac Catheterization *(LM-LAD)*

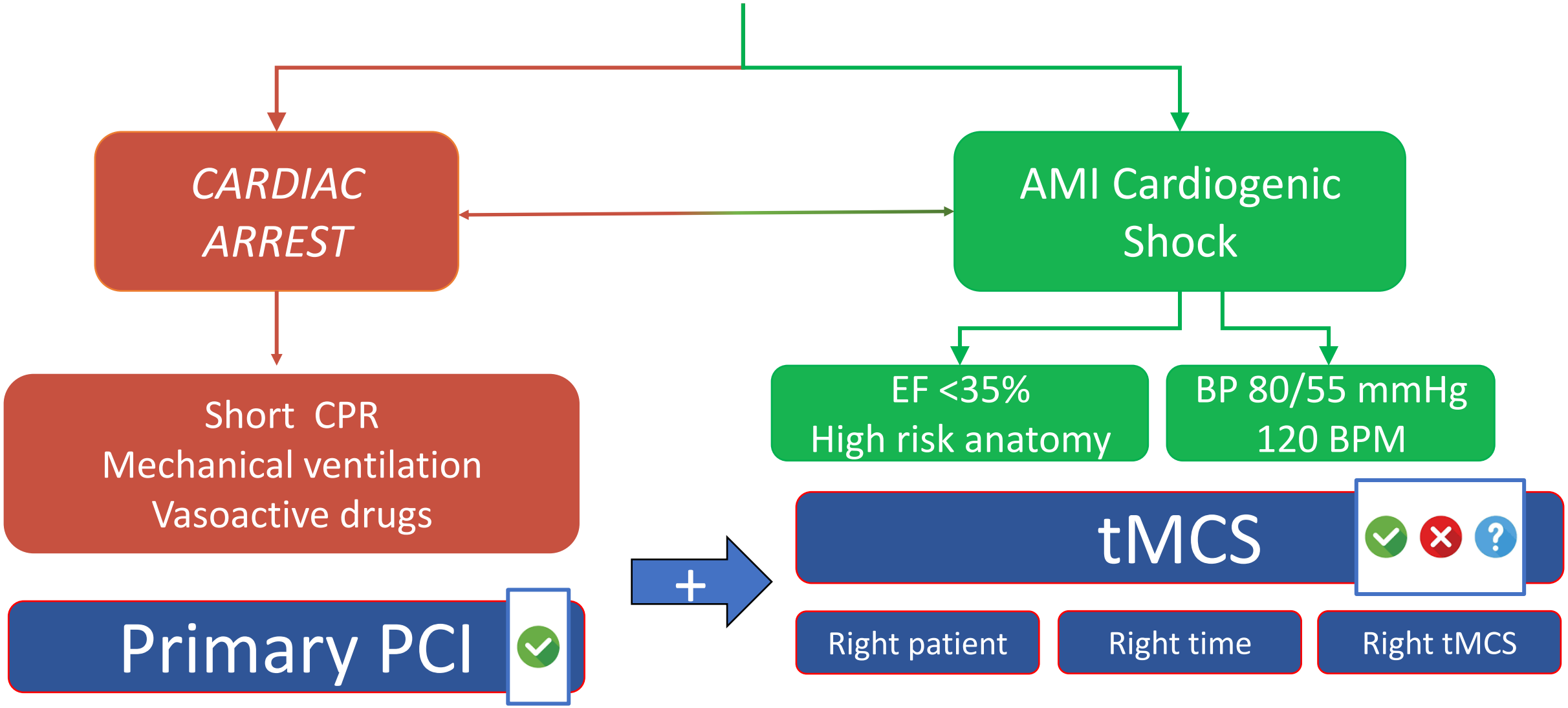
Coronary
dissection progression

+

LM hematoma
TIMI II flow



Heart Team Evaluation



Objetives of tMCS

- To improve hemodynamic stability before and during PCI
- To „buy time“ for recovery of stunned myocardium after PCI
- To bridge to LVAD/Tx if no myocardial recovery

Guidelines CS and tMCS

ESC European Society of Cardiology
European Journal of Heart Failure (2022) 24, 4–131
doi:10.1002/ejhf.2333

ESC GUIDELINES

2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

Recommendations for the use of short-term mechanical circulatory support in patients with cardiogenic shock

Recommendations	Class [a]	Level [b]
Short-term MCS should be considered in patients with cardiogenic shock as a BTR, BTD, BTB. Further indications include treatment of the cause of cardiogenic shock or long-term MCS or transplantation.	IIa	C

VS

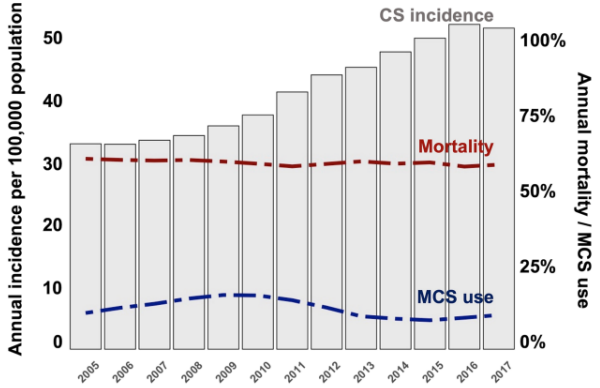
Inotropic agents		
Inotropic agents may be considered in patients with SBP <90 mmHg and evidence of hypoperfusion who do not respond to standard treatment, including fluid challenge, to improve peripheral perfusion and maintain end-organ function.[388]	IIb	C
Inotropic agents are not recommended routinely, due to safety concerns, unless the patient has symptomatic hypotension and evidence of hypoperfusion.[388,468,479]	III	C
Vasopressors		
A vasopressor, preferably norepinephrine, may be considered in patients with cardiogenic shock to increase blood pressure and vital organ perfusion.[486–488]	IIb	B

Kapur et al J Am Coll Cardiol 2022
Kochar et al J Am Coll Cardiol 2022

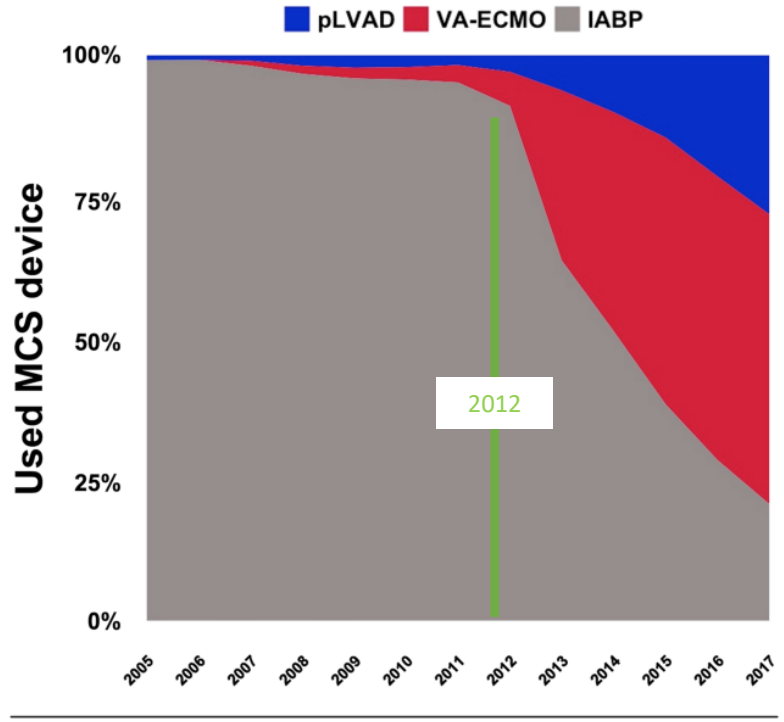
Daily practice tMCS

- Low MCS use: Only 10-15% of the CS

IABP treated (*N* = 42 636; 10%)	pLVAD treated (*N* = 4063; 1%)	VA-ECMO treated (*N* = 9825; 2%)	No device (*N* = 385 172; 87%)



ESC Heart Fail. 2021 Apr;8(2):1295-1303.



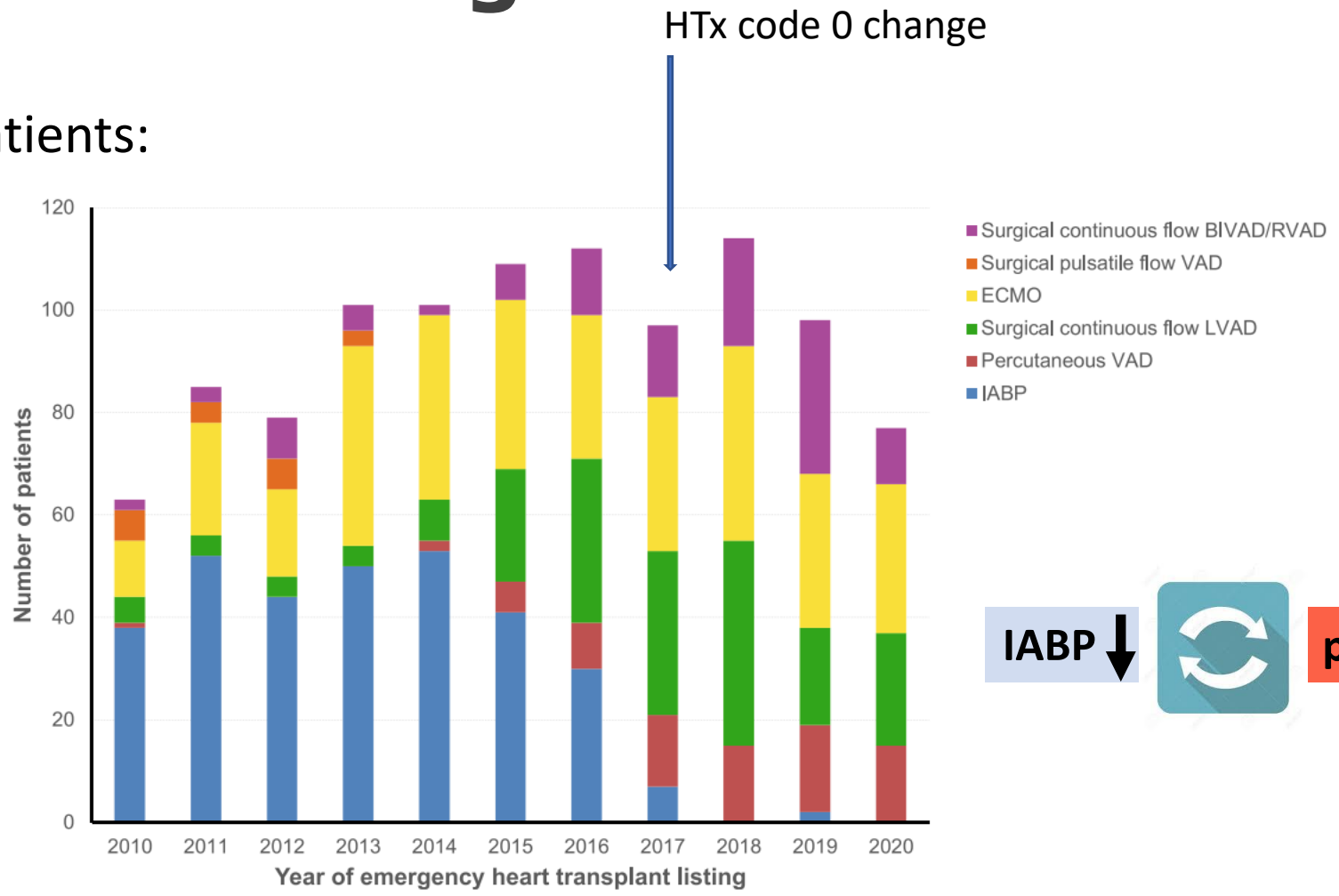
ESC Heart Fail. 2021 Apr;8(2):1295-1303.

- Remarcable change after the IABP II-shock trial in AMI-CS patients

MCS preHTx bridge

- Also in preTx patients:

Asis-TC registry
Spanish
Emergency HTx



IABP ↓

pVDAs ↑ 1 -> 17%

J Heart Lung Transplant. 2023 Apr;42(4):488-502.

Types of percutaneous tMCS

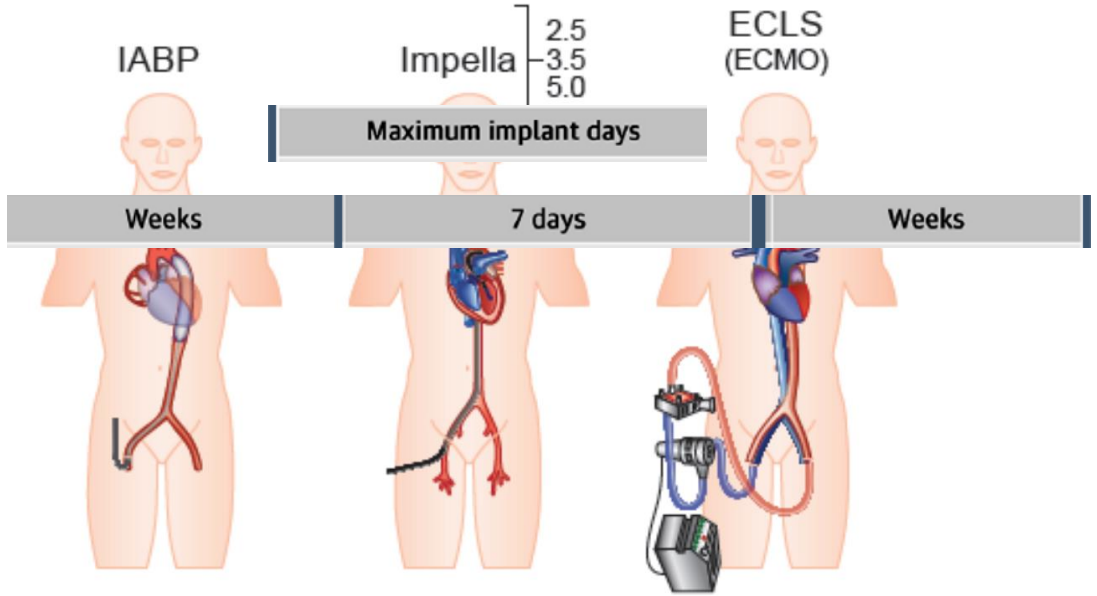
Disadvantage

"Not bad"

Advantage

	VA-ECMO	IABP	Impella (2.5, CP, 5.0, 5.5)
Flow	max 7.0 l/min	0.5 l/min	2.5 - 5.5 l/min
Pump Speed	max 5000 rpm	NA	max 51,000 rpm
Mechanism	Centrifugal flow continuous pump (RA-to-AO)	Balloon inflation-deflation (AO)	Axial flow continuous pump (LV-to-AO)
Cannula Size	14-19 F arterial 17-21 F venous	7-8 F arterial	13-21 F arterial
Insertion/Placement	Femoral vein Femoral artery	Femoral artery Axillary artery	Femoral artery Axillary artery
LV Unloading	-	+	+to+++
RV Unloading	++	-	-
Cardiac Power	↑↑	↑	↑↑
Afterload	↑↑	↓	↓↓
Coronary Perfusion	-	↑	↑

LV effect

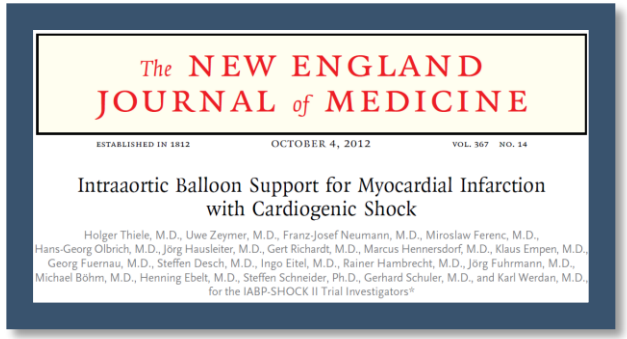


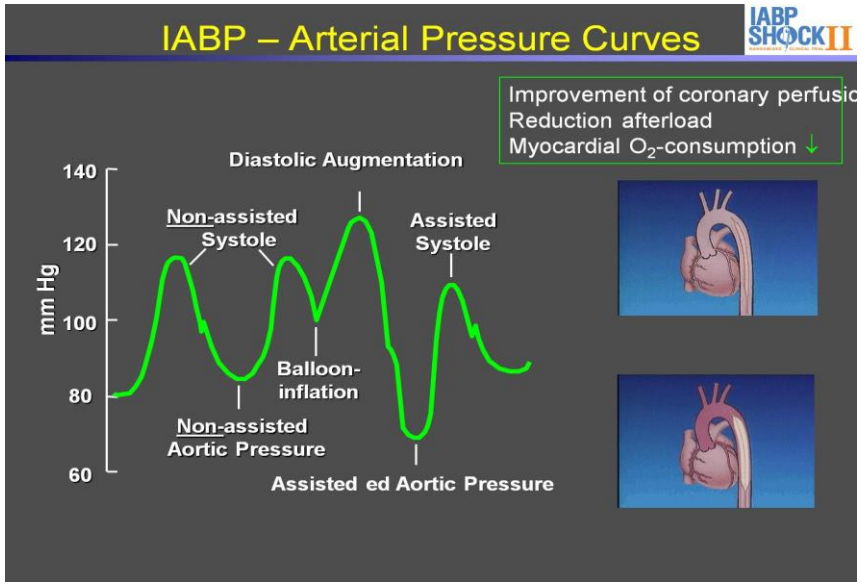
Eur J Heart Fail. 2018 Jan;20(1):178-186

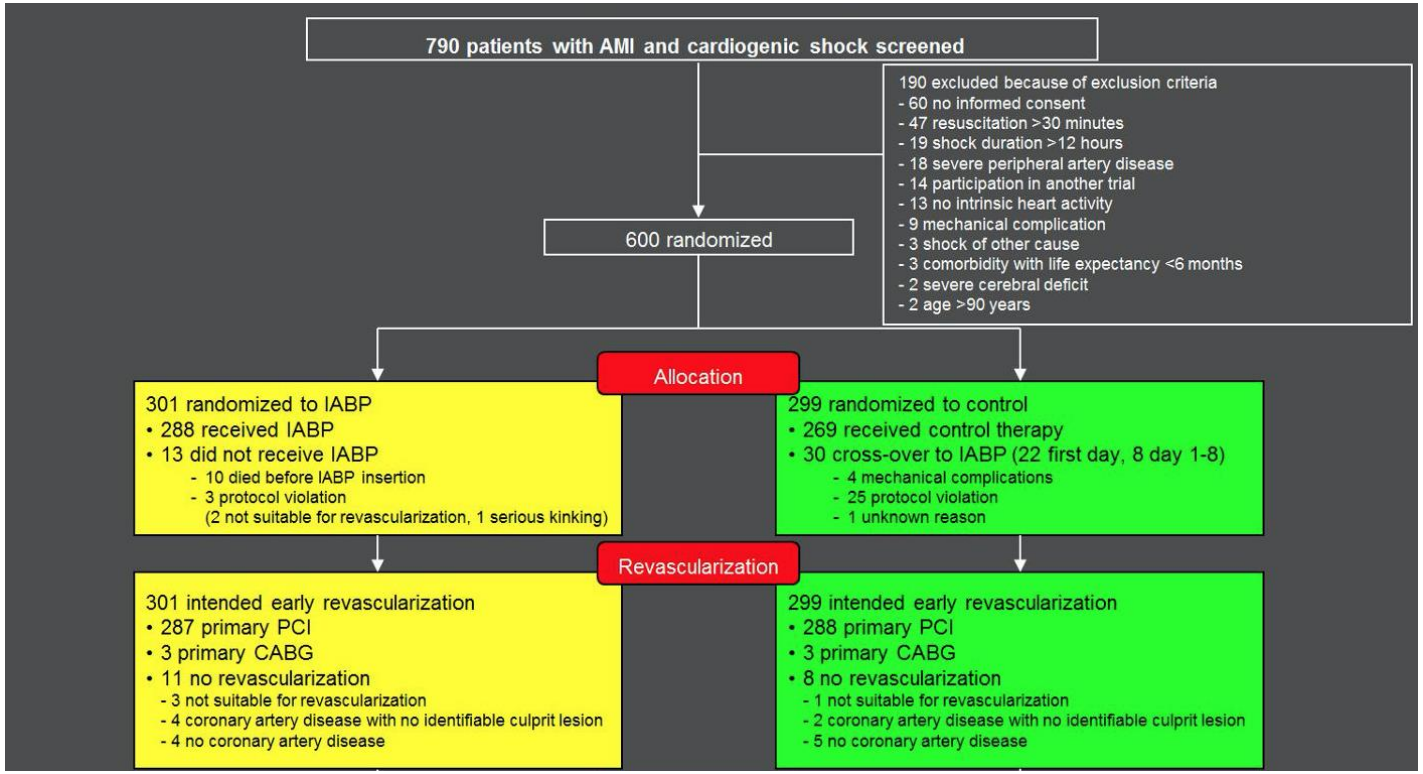
Respiratory support

A Coruña Heart Failure Academy

IABP in CS

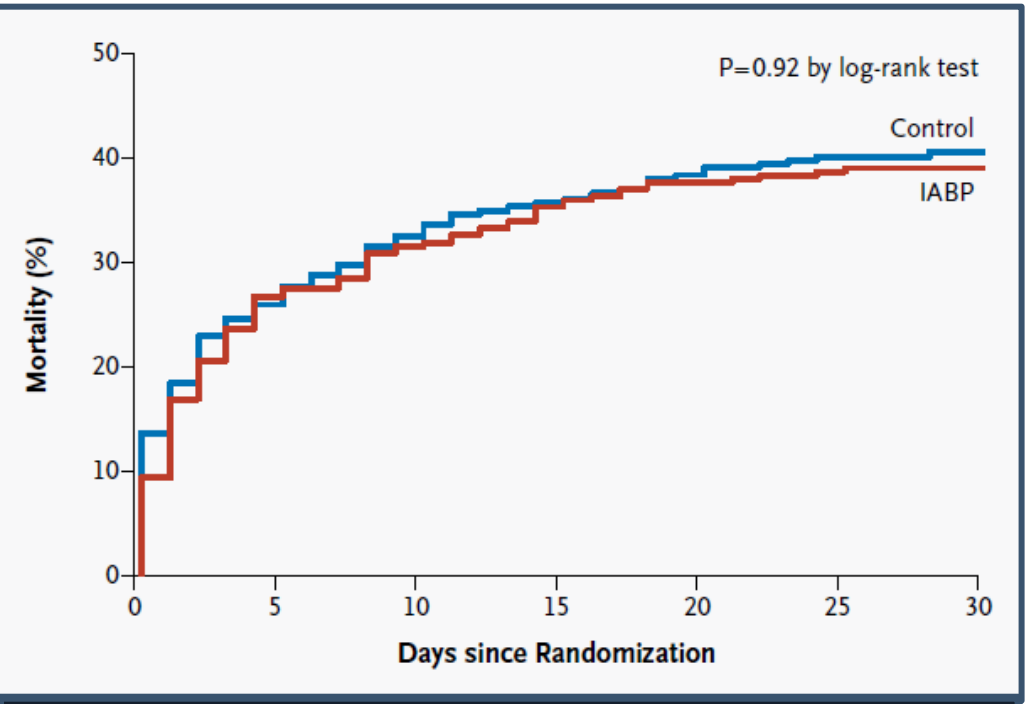




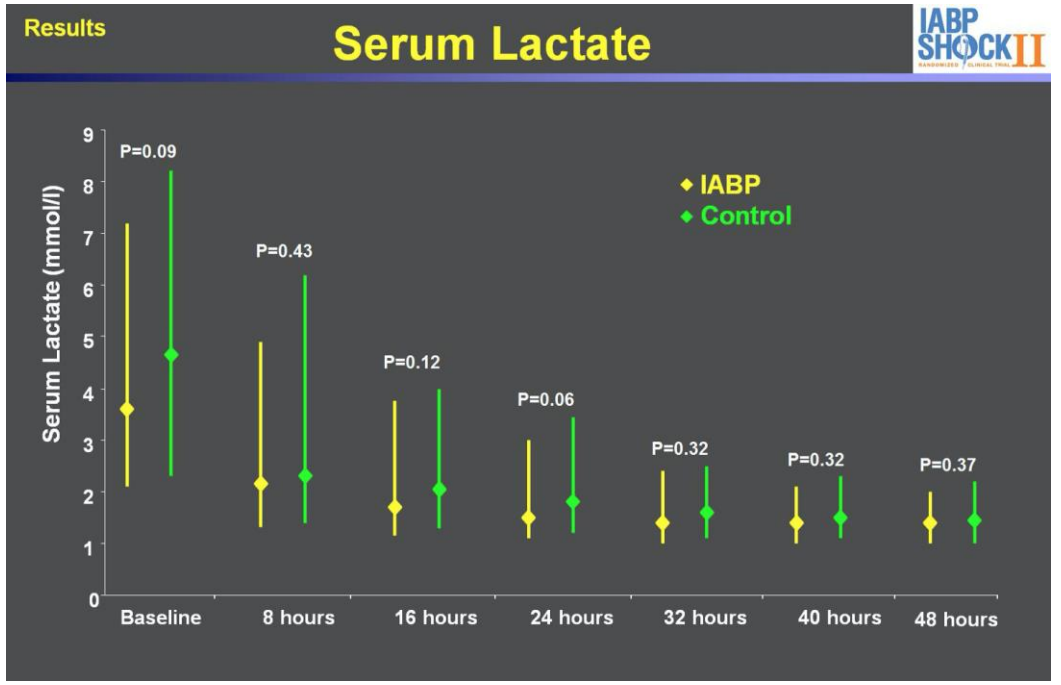


Thiele, H., et al. *N Engl J Med*, 2012. 367(14): p. 1287-96.

IABP in CS no clinical benefict



The use of ***IABP did not significantly reduce 30-day mortality*** in patients with CS complicating AMI for whom an early revascularization strategy was planned.



No effect on distal perfusion markers .

IABP in CS low complication rate

Outcome	IABP (N=300)	Control (N=298)	P Value	Relative Risk with IABP (95% CI)
	number (percent)			
Primary end point: all-cause mortality at 30 days	119 (39.7)	123 (41.3)	0.69	0.96 (0.79–1.17)
Reinfarction in hospital	9 (3.0)	4 (1.3)	0.16	2.24 (0.70–7.18)
Stent thrombosis in hospital	4 (1.3)	3 (1.0)	0.71	1.32 (0.30–5.87)
Stroke in hospital	2 (0.7)	5 (1.7)	0.28	0.40 (0.08–2.03)
Ischemic	2 (0.7)	4 (1.3)	0.45	0.49 (0.09–2.71)
Hemorrhagic	0	1 (0.3)	0.50	—
Peripheral ischemic complications requiring intervention in hospital	13 (4.3)	10 (3.4)	0.53	1.29 (0.58–2.90)
Bleeding in hospital*				
Life-threatening or severe	10 (3.3)	13 (4.4)	0.51	0.76 (0.34–1.72)
Moderate	52 (17.3)	49 (16.4)	0.77	1.05 (0.74–1.50)
Sepsis in hospital	47 (15.7)	61 (20.5)	0.15	0.77 (0.54–1.08)

IABP in the Guidelines

ESC Guidelines AMI routine use IABP

2012 IABP-SHOCK II Trial 2019

Class IC	Class IIb B	Class III

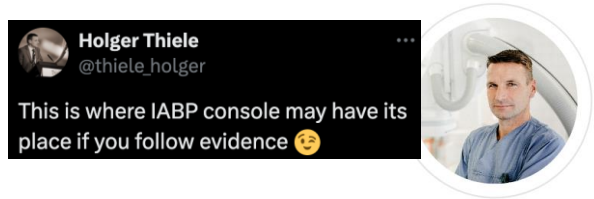
ESC European Society of Cardiology European Heart Journal (2021) 42, 3599–3726 doi:10.1093/eurheartj/ehab368

ESC GUIDELINES

2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

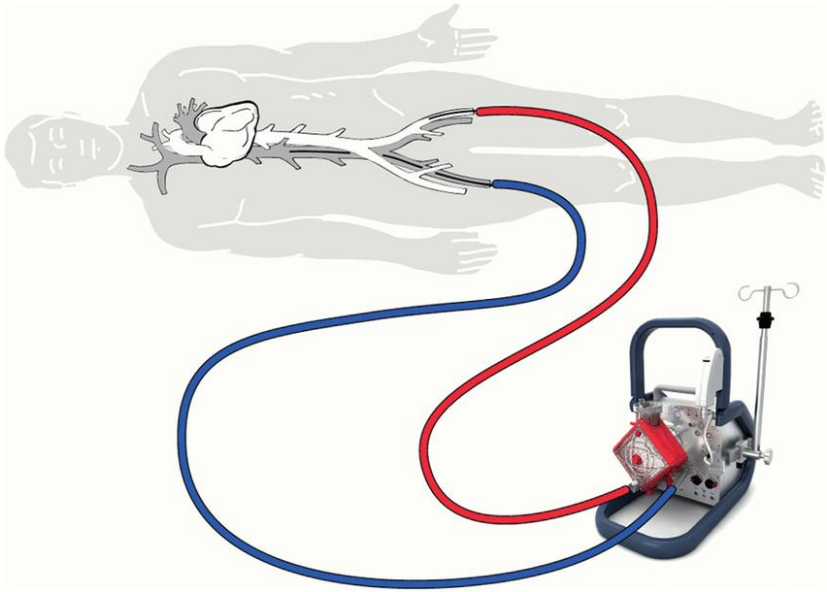
Class IIa C	Mechanical complications, as a bridge to more advanced supports
Class IIb C	Refractory shock not due to myocardial infarction

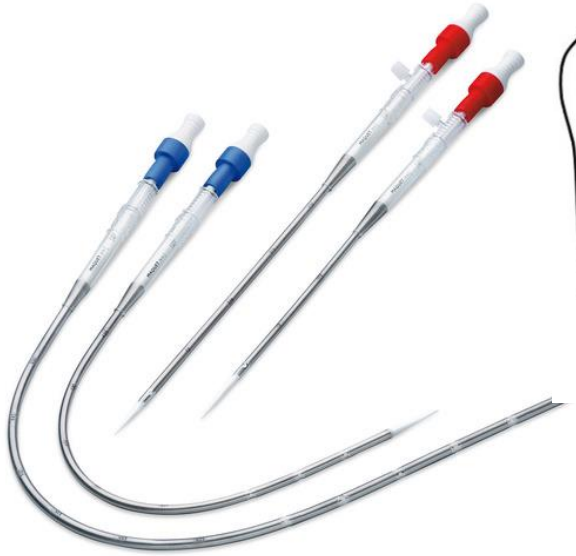
No based in any RCTs

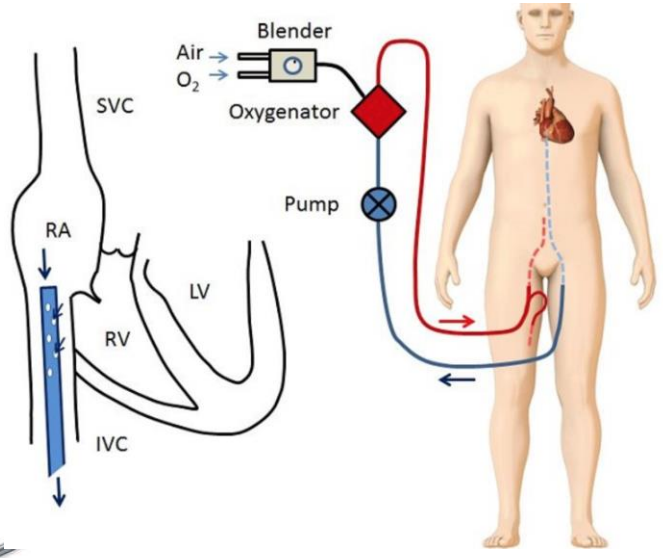


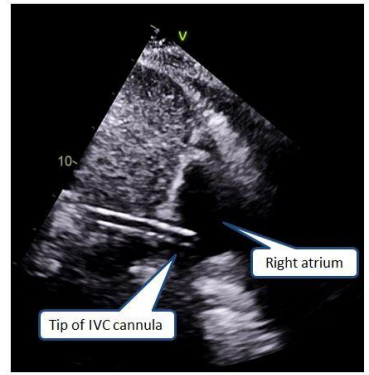
ECMO VA

VA-ECMO
max 7.0 l/min
max 5000 rpm
Centrifugal flow continuous pump (RA-to-AO)
14-19 F arterial 17-21 F venous
Femoral vein Femoral artery
-
++
↑↑
↑↑
-



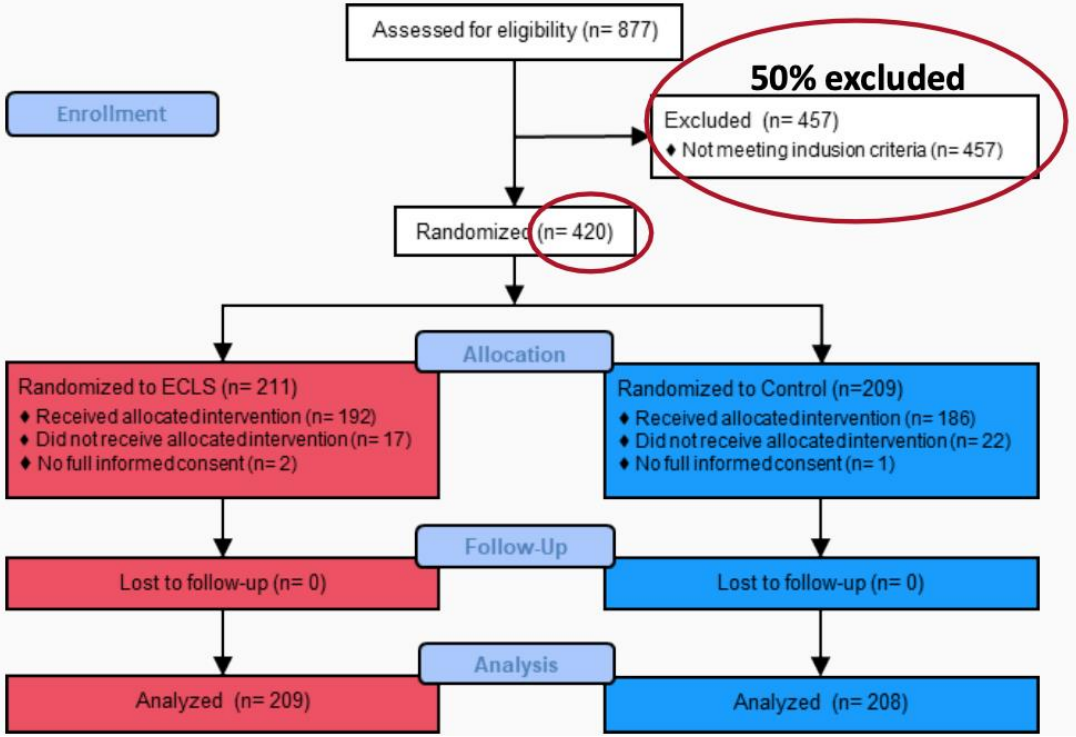






ECMO VA in CS ECLS SHOCH trial

420 pts in 44 centers in 3 years: nearly 3 patient per year/center



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Extracorporeal Life Support in Infarct-Related Cardiogenic Shock

H. Thiele, U. Zeymer, I. Akin, M. Behnes, T. Rassaf, A.A. Mahabadi, R. Lehmann, I. Eitel, T. Graf, T. Seidler, A. Schuster, C. Skurk, D. Duerschmied, P. Clemmensen, M. Hennersdorf, S. Fichtlscherer, I. Voigt, M. Seyfarth, S. John, S. Ewen, A. Linke, E. Tigges, P. Nordbeck, L. Bruch, C. Jung, J. Franz, P. Lauten, T. Goslar, H.-J. Feistritzer, J. Pöss, E. Kirchhof, T. Ouarrak, S. Schneider, S. Desch, and A. Freund, for the ECLS-SHOCK Investigators*

Inclusion Criteria	Exclusion Criteria
• Cardiogenic shock complicating AMI (STEMI or NSTEMI) plus obligatory: **SCAI C-D-E**	• Resuscitation >45 minutes
1. Planned revascularization	• Mechanical cause of cardiogenic shock
2. SBP <90 mmHg >30 min or catecholamines required to maintain SBP >90 mmHg	• Onset of shock >12 h
3. Signs of impaired organ perfusion with at least one of the following criteria:	• Severe peripheral artery disease with impossibility to insert ECLS cannulae
➢ Altered mental status	• Age <18 years or >80 years
➢ Cold, clammy skin and extremities	• Shock of other cause (bradycardia, sepsis, hypovolemia, etc.)
➢ Oliguria with urine output <30 ml/h	• Other severe concomitant disease with limited life expectancy <6 months
4. Arterial lactate >3 mmol/l	• Pregnancy
• Informed consent	• Participation in another trial

N Engl J Med. 2023 Oct 5;389(14):1286-1297

ECMO VA in CS ECLS SHOCH trial

Results

Baseline Characteristics

	ECLS (n=209)	Control (n=208)
Age (years); median (IQR)	62 (56 - 69)	63 (57 - 71)
Male sex; n/total (%)	170/209 (81.3)	169/208 (81.3)
Mean blood pressure (mmHg); median (IQR)	71 (61 - 87)	72 (60 - 88)
STEMI*; n/total (%)		
* 46.8 % vs 48.5%. LAD as IRA	135/204 (66.2)	141/207 (68.1)
Resuscitation before randomization; n/total (%)	162/209 (77.5)	162/208 (77.9)
Laboratory values on admission		
pH; median (IQR)	7.2 (7.1 - 7.3)	7.2 (7.1 - 7.3)
Lactate (mmol/L); median (IQR)	6.8 (4.5 – 9.6)	6.9 (4.6 – 10.0)
SCAI Shock classification; n/total (%)		
C	104/209 (49.8)	111/208 (53.4)
D	38/209 (18.2)	18/208 (8.7)
E	67/209 (32.1)	79/208 (38.0)

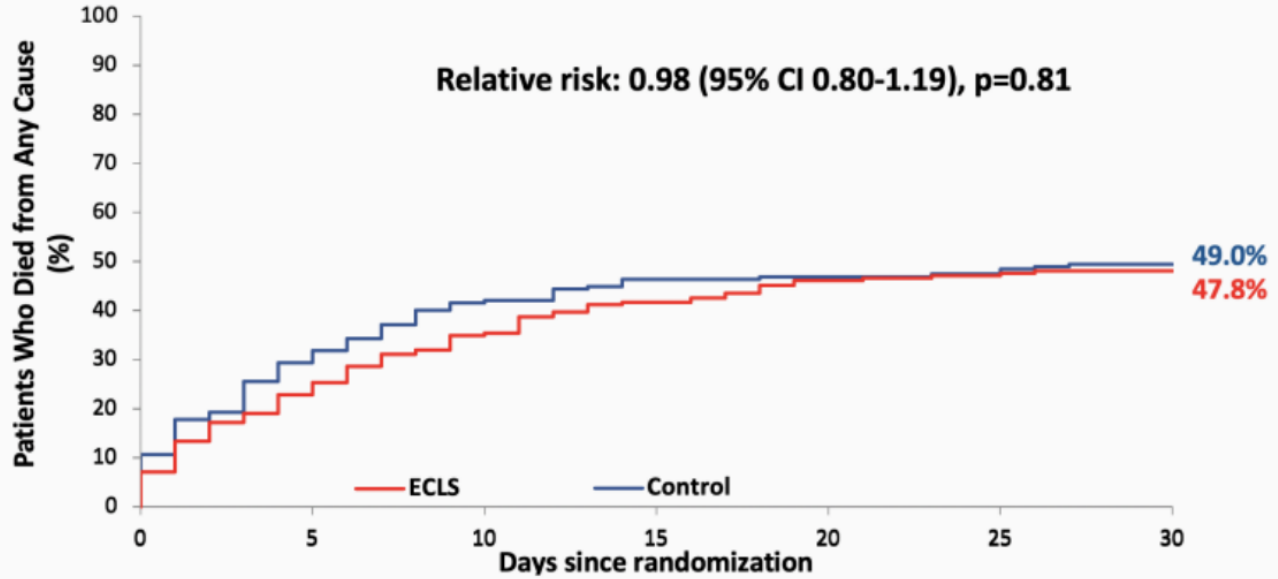
Median time until return of spontaneous circulation 20 minutes in both groups

N Engl J Med. 2023 Oct 5;389(14):1286-1297

ECMO VA in CS ECLS SHOCH trial

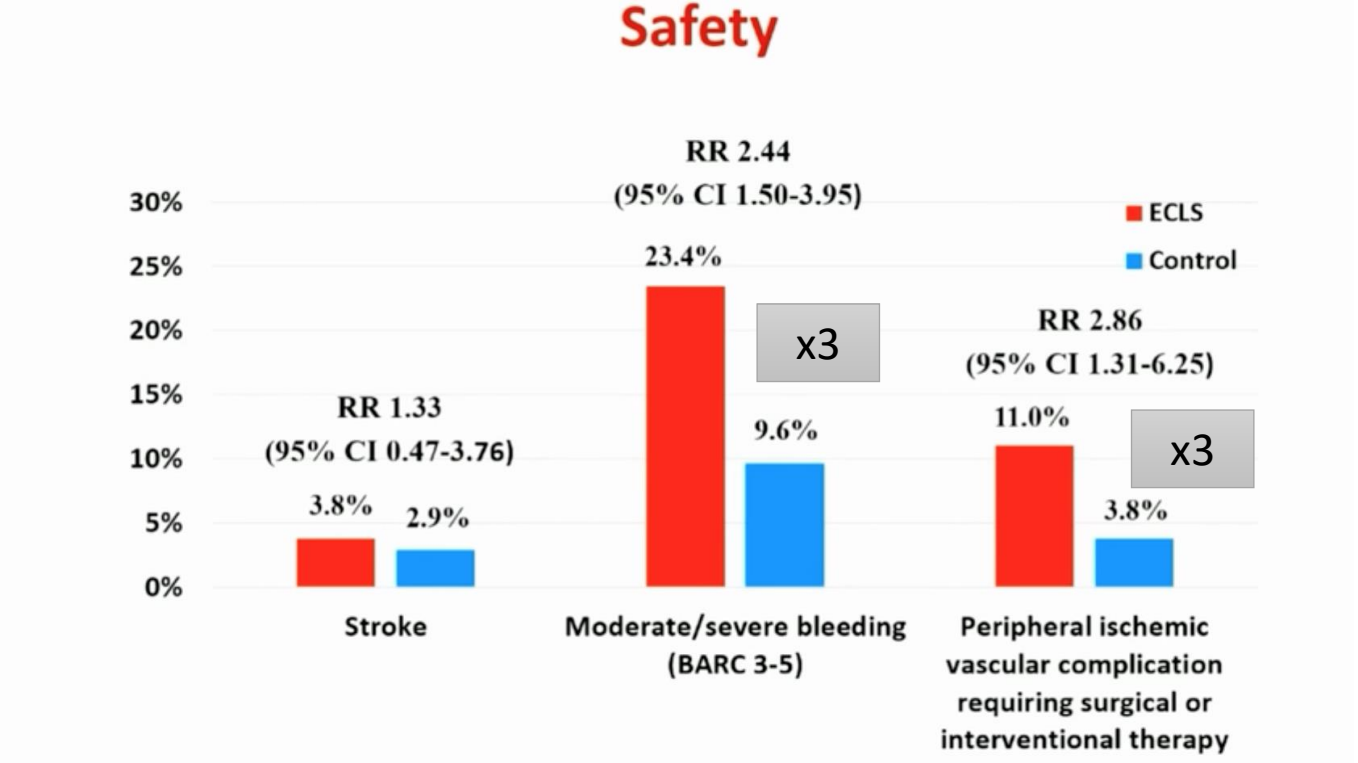
Results

Primary Endpoint – 30-Day All-Cause Mortality



N Engl J Med. 2023 Oct 5;389(14):1286-1297

ECMO VA in CS ECLS SHOCH trial



N Engl J Med. 2023 Oct 5;389(14):1286-1297

Microaxial Flow Pump in CS

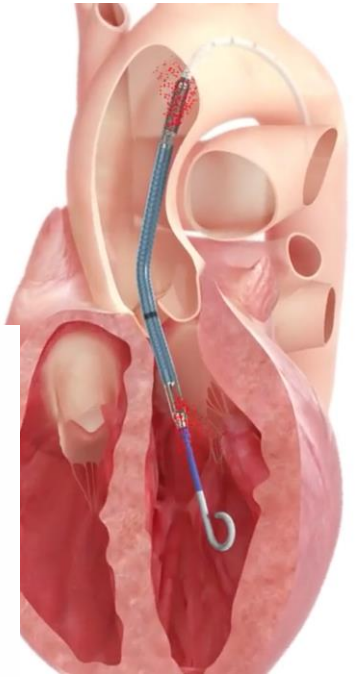
	Impella (2.5, CP, 5.0, 5.5)
Flow	2.5 - 5.5 l/min
Pump Speed	max 51,000 rpm
Mechanism	Axial flow continuous pump (LV-to-AO)
Cannula Size	13-21 F arterial
Insertion/Placement	Femoral artery Axillary artery
LV Unloading	+to+++
RV Unloading	-
Cardiac Power	↑↑
Afterload	↓↓
Coronary Perfusion	↑

Impella CP® with SmartAssist®
Percutaneous insertion, increased flow and repositioning without imaging

Impella 5.5® with SmartAssist®
Designed for surgeons; delivers full forward flow from the ventricle

Impella RP® with SmartAssist®
The first percutaneous, single access pump designed for right heart support

Automated Impella Controller™
The primary user control interface for the Impella Platform

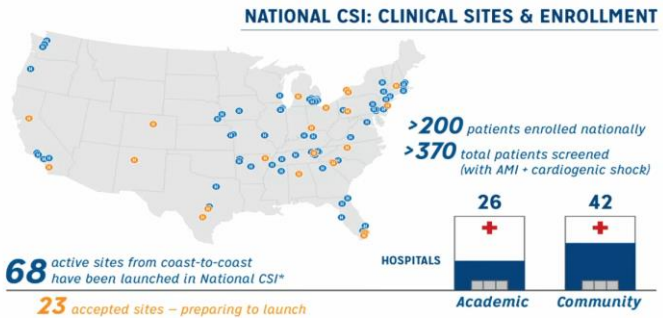


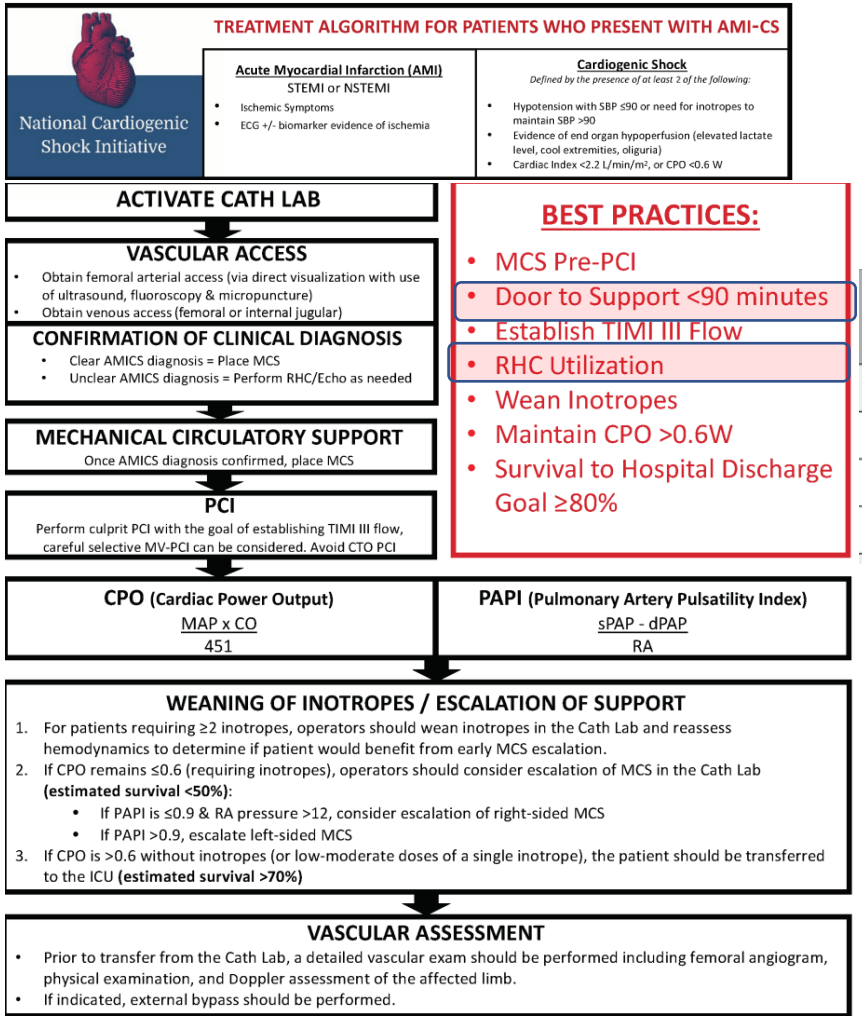
NCSI early tMCS registry

Journal of the American Heart Association
Volume 12, Issue 23, 5 December 2023
https://doi.org/10.1161/JAHA.123.031401

ORIGINAL RESEARCH

Early Utilization of Mechanical Circulatory Support in Acute Myocardial Infarction Complicated by Cardiogenic Shock: The National Cardiogenic Shock Initiative





Early tMCS

Door-to-support time in STEMI, min*	78 [41–237]	80 [41–238]	70 [43–226]	0.60

Characteristics	All (N=406)	Stage C/D (N=295)	Stage E (N=111)	*P* value
Impella insertion				
Pre-PCI	70% (285)	69% (201)	76% (84)	0.38
Intraprocedural	9% (35)	9% (27)	8% (7)	
Post-PCI	21% (84)	22% (65)	17% (19)	

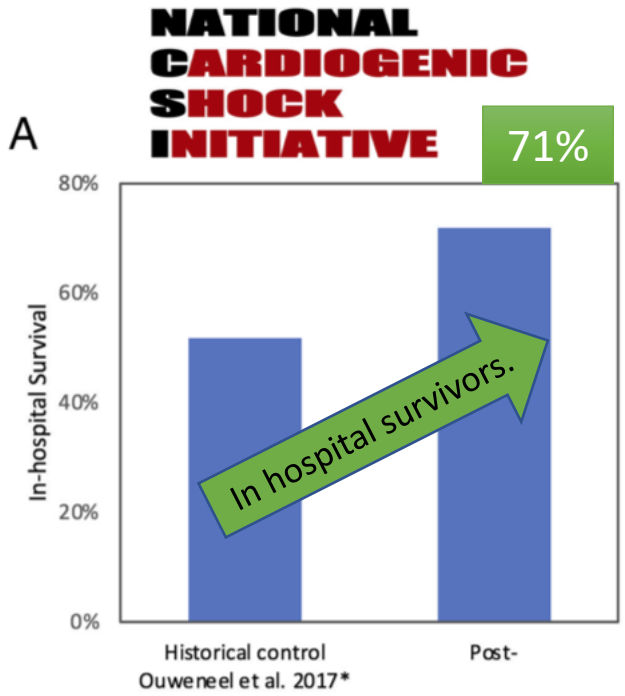
J Am Heart Assoc. 2023 Dec 5;12(23):e031401.

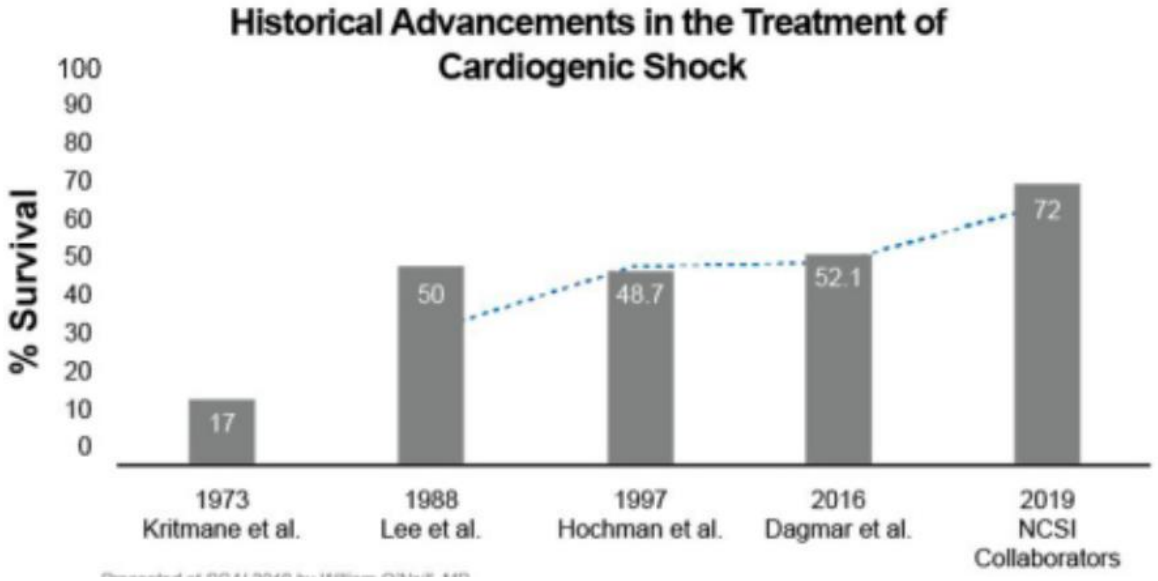
NCSI early tMCS registry

Journal of the American Heart Association
Volume 12, Issue 23, 5 December 2023
https://doi.org/10.1161/JAHA.123.031401

ORIGINAL RESEARCH

Early Utilization of Mechanical Circulatory Support in Acute Myocardial Infarction Complicated by Cardiogenic Shock: The National Cardiogenic Shock Initiative





J Am Heart Assoc. 2023 Dec 5;12(23):e031401.

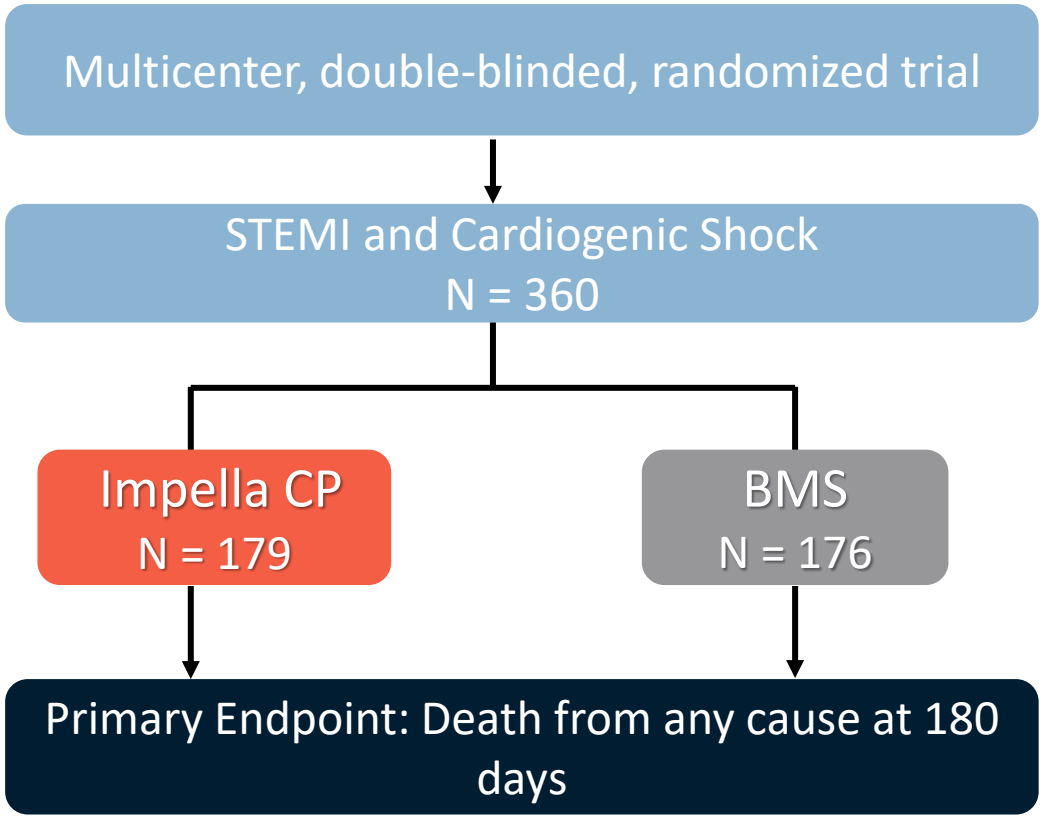
Danger SHOCK Trial

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Microaxial Flow Pump or Standard Care in Infarct-Related Cardiogenic Shock

Study Design



Danger SHOCK Trial

Inclusion

Lactate >2.5 mmol/L

STEMI

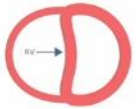
Hypotension and hypoperfusion

LVEF < 45%

Randomization when shock was diagnosed

Exclusion

Comatose OHCA



RV failure

Mechanical complication

Patients characteristics – N=355

Median 67 years
79% male

Median lactate 4.5 mmol/L

72% LAD or LM culprit
72% Multi vessel disease

Median 4 hrs from onset of STEMI symptoms to randomization

84% randomized in cath lab

Median LVEF 25%

55% SCAI class C
45% SCAI class D or E

Median systolic BP
82 mmHg

Apply 20% all CS

Very selected population

Acute STEMI: symptoms <5h

LV predominant CS

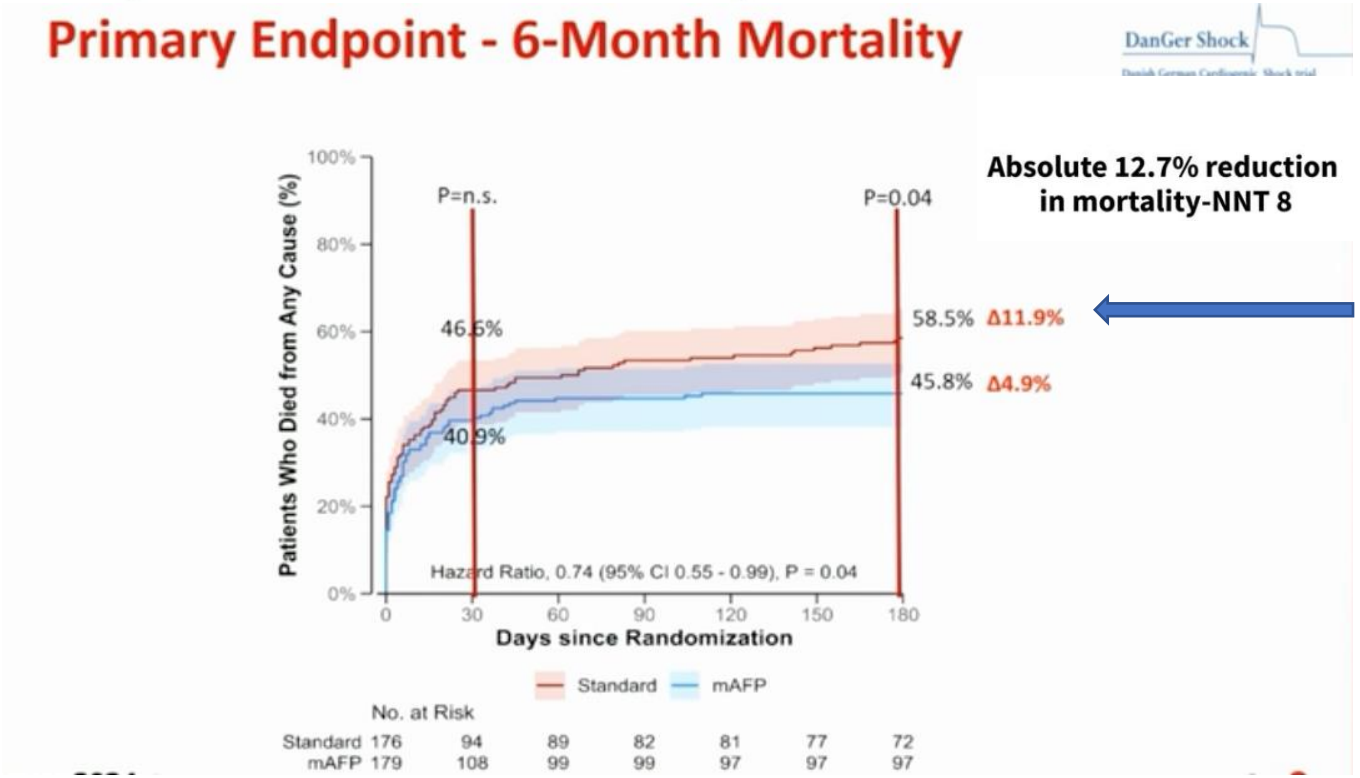
Low CPR 20% rate
(only short, no comatose)

10y to complete reclutation (2013-2023)

N Engl J Med 2024;390:1382-1393

Danger SHOCK Trial

Primary Outcome Measures	Time Frame
All-cause mortality	180 days



The NEW ENGLAND JOURNAL of MEDICINE

RESEARCH SUMMARY

Microaxial Flow Pump or Standard Care in Infarct-Related Cardiogenic Shock

Møller JE et al. DOI: 10.1056/NEJMoa2312572

Conclusion

- The routine use of a mAFP on top of standard care reduced death from any cause in patients with STEMI and cardiogenic shock.

Very high mortality in control group from 30d-6M

N Engl J Med 2024;390:1382-1393

Danger SHOCK Trial

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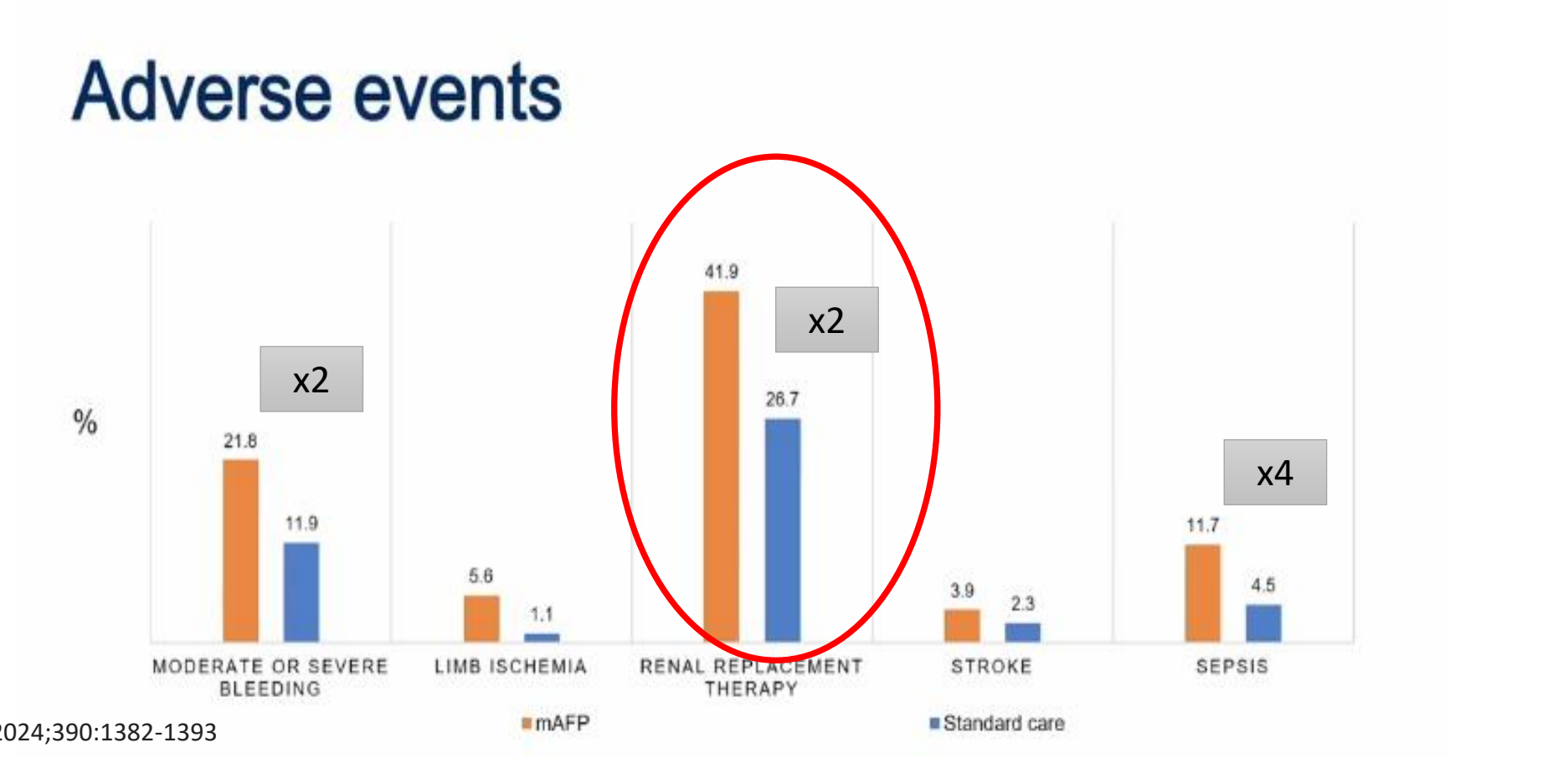

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X

NSTEMI ≈**25**%

n (%)	No CS (n=47 752)	CS (n=4090)	*P* Value
Age, y; mean (SD)	65.8 (13.2)	69.6 (12.5)	<0.001
Sex: female (%)	12 631/47 752 (26.5)	1263/4090 (30.9)	<0.001
Resuscitation prior admission (%)	1569/47 549 (3.3)	1223/4059 (30.1)	<0.001
Delay, min (symptoms on admission); median (IQR)	230 (115–660)	165 (84–483)	<0.001
Vital signs at admission, mean (SD)			
Systolic blood pressure, mm Hg	138.4 (27.1)	111.7 (31.0)	<0.001
Diastolic blood pressure, mm Hg	80.6 (16.8)	67.4 (21.5)	<0.001
Heart rate, bpm	78.2 (19.2)	89.5 (28.2)	<0.001
STEMI (%)	27 466/47 752 (57.5)	3027/4090 (74.0)	<0.001
NSTEMI (%)	20 286/47 752 (42.5)	1063/4090 (26.0)	<0.001

Circ Cardiovasc Interv. 2019 Apr;12(4):e007293.

≈ 20-30% AMI CARDIOGENIC SHOCK

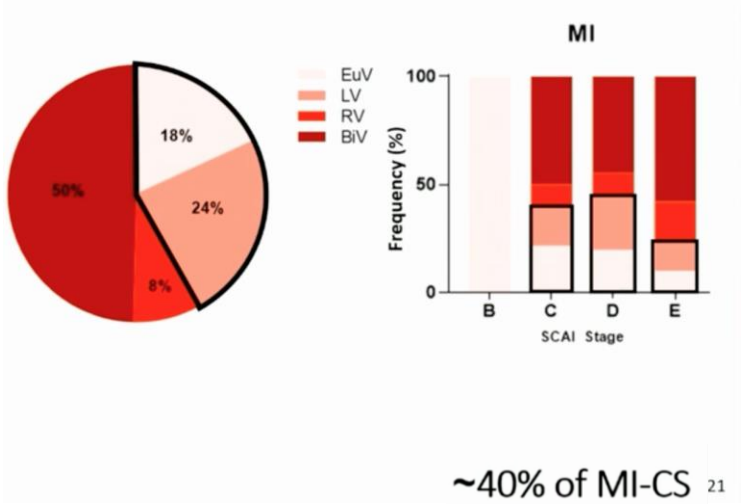
OHCA in CS ≈ **5%**

Table 1 – Incidence of OHCA within patients treated for for STEMI by year (95% confidence interval in parenthesis).

	OHCA+	OHCA-	OHCA + incidence (%)
2014	263	4284	5.78 [5.12–6.50]
2015	306	5253	5.50 [4.92–6.14]
2016	288	5733	4.78 [4.26–5.35]
2017	342	5894	5.48 [4.93–6.08]
2018	336	5384	5.87 [5.38–6.52]
Total	1535	26548	5.47 [5.20–5.74]

Resusc Plus 2021 Mar 31:6:100113.

BiV / VD STEMI SHOCK ≈ 50%



A Coruña Heart Failure Academy

ECLS SHOCK Vs Danger SHOCK trial

No mortality reduction

How Can these Differences Be Explained?

ECLS-SHOCK		DanGer Shock
 LV Loading	**Device?**	 LV Unloading
STEMI + NSTEMI 77% Resuscitation -> 20% hypoxic brain injury Lactate 6.9 mmol/l Ventilation: 90% Catecholamines: 90%	**Patient selection?**	STEMI only 20% Resuscitation - only witnessed CA -> 2% hypoxic brain injury Lactate 4.5 mmol/l Ventilation: 70% Catecholamines: 85%
30 days	**Follow-up?**	6 months
RRT 8.1% vs 13.1% ICU time: 10 vs 8 days MCS duration: 2.7 days	**Treatment Bias?**	RRT 41.9% vs 26.7% ICU time: 6 vs 3 days MCS duration: 2.5 days

Absolute 12.7% reduction in mortality- NNt 8

tMCS Meta-analysis

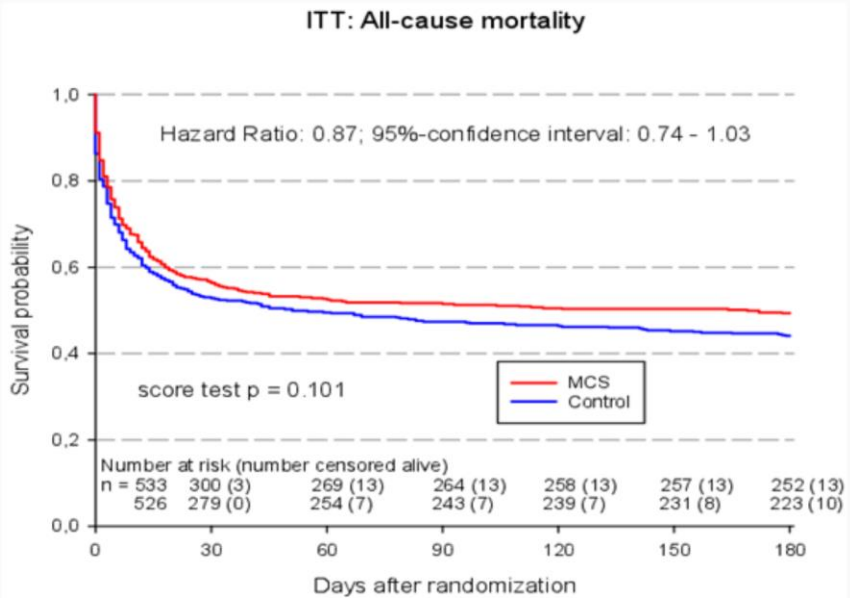
Temporary mechanical circulatory support in infarct-related cardiogenic shock: an individual patient data meta-analysis of randomised trials with 6-month follow-up

Holger Thiele, Jacob E Møller*, Jose P S Henriques, Margriet Bogerd, Melchior Seyfarth, Daniel Burkhoff, Petr Ostadal, Richard Rokyta, Jan Belohlavek, Steffen Massberg, Marcus Flather, Matthias Hochadel, Steffen Schneider, Steffen Desch, Anne Freund, Hans Eiskjær, Norman Mangner, Janine Pöss, Amin Polzin, P Christian Schulze, Carsten Skurk, Uwe Zeymer†, Christian Hassager†, on behalf of the MCS Collaborator Scientific Group‡*

>1000 pts

9 RCTs included

6-Month Mortality - MCS versus no MCS



Lancet 2024 Sep 14;404(10457):1019-1028.

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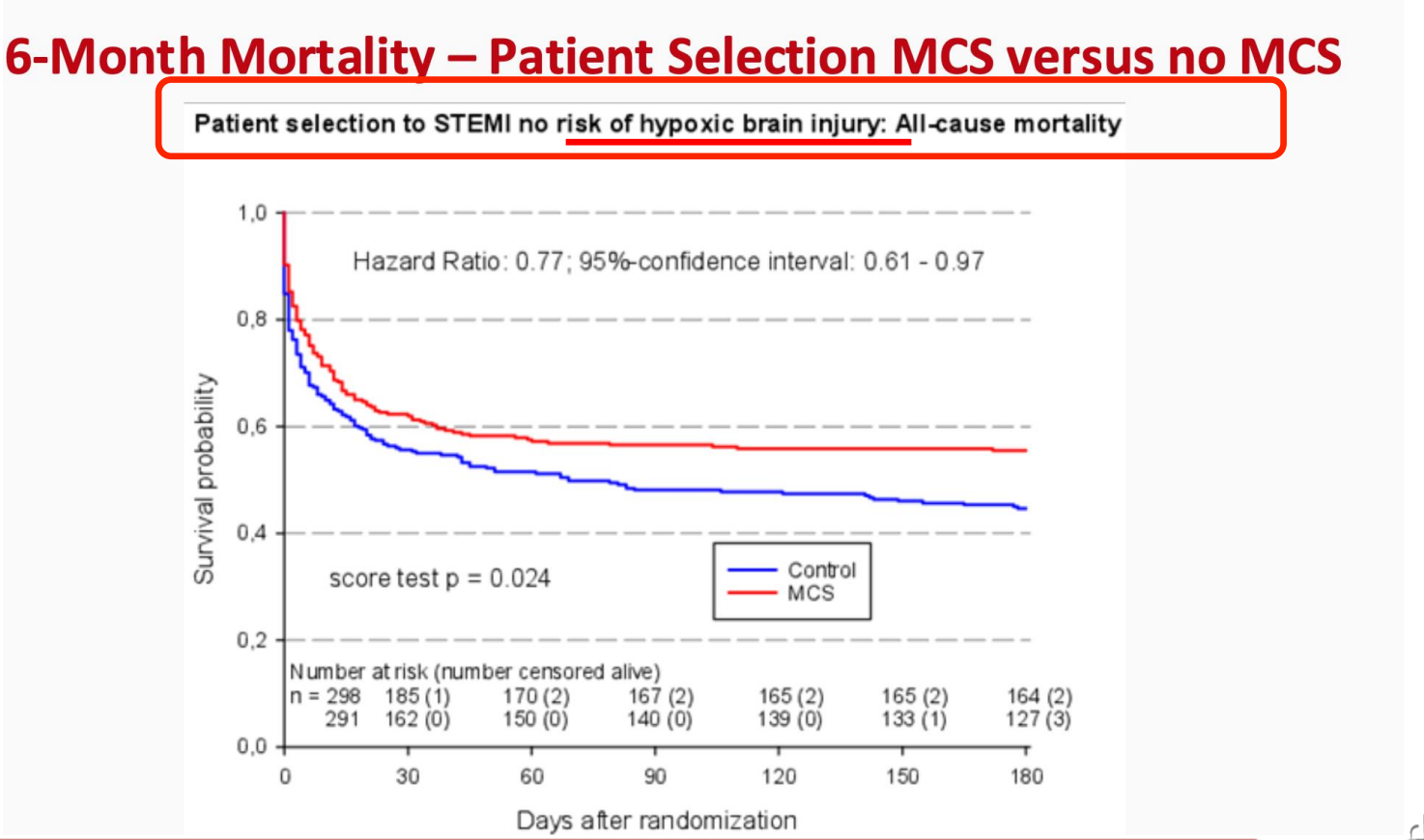

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ECMO VA Vs Microaxial Flow Pump in CS

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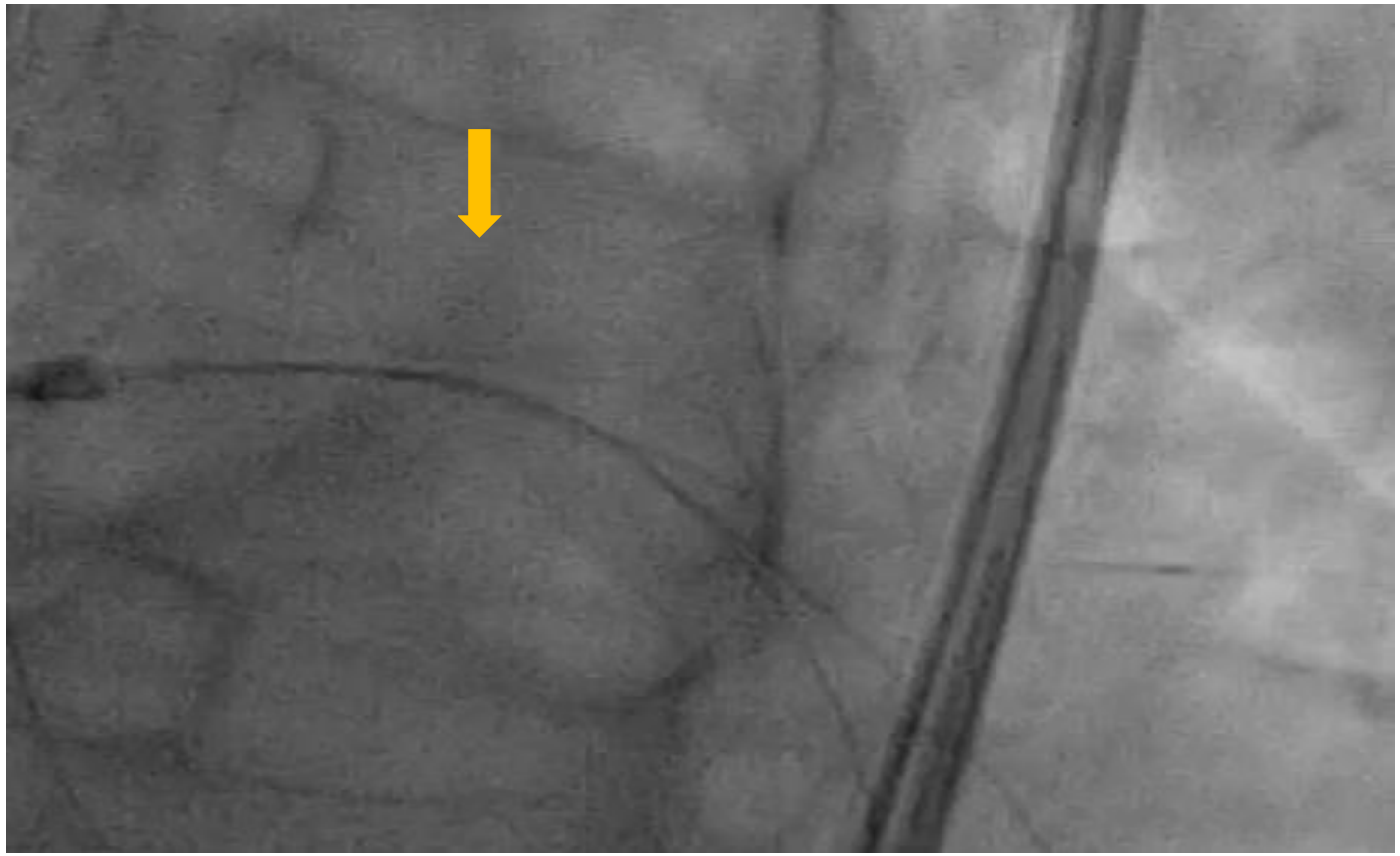
Cardiac Catheterization *(LM-LAD)*

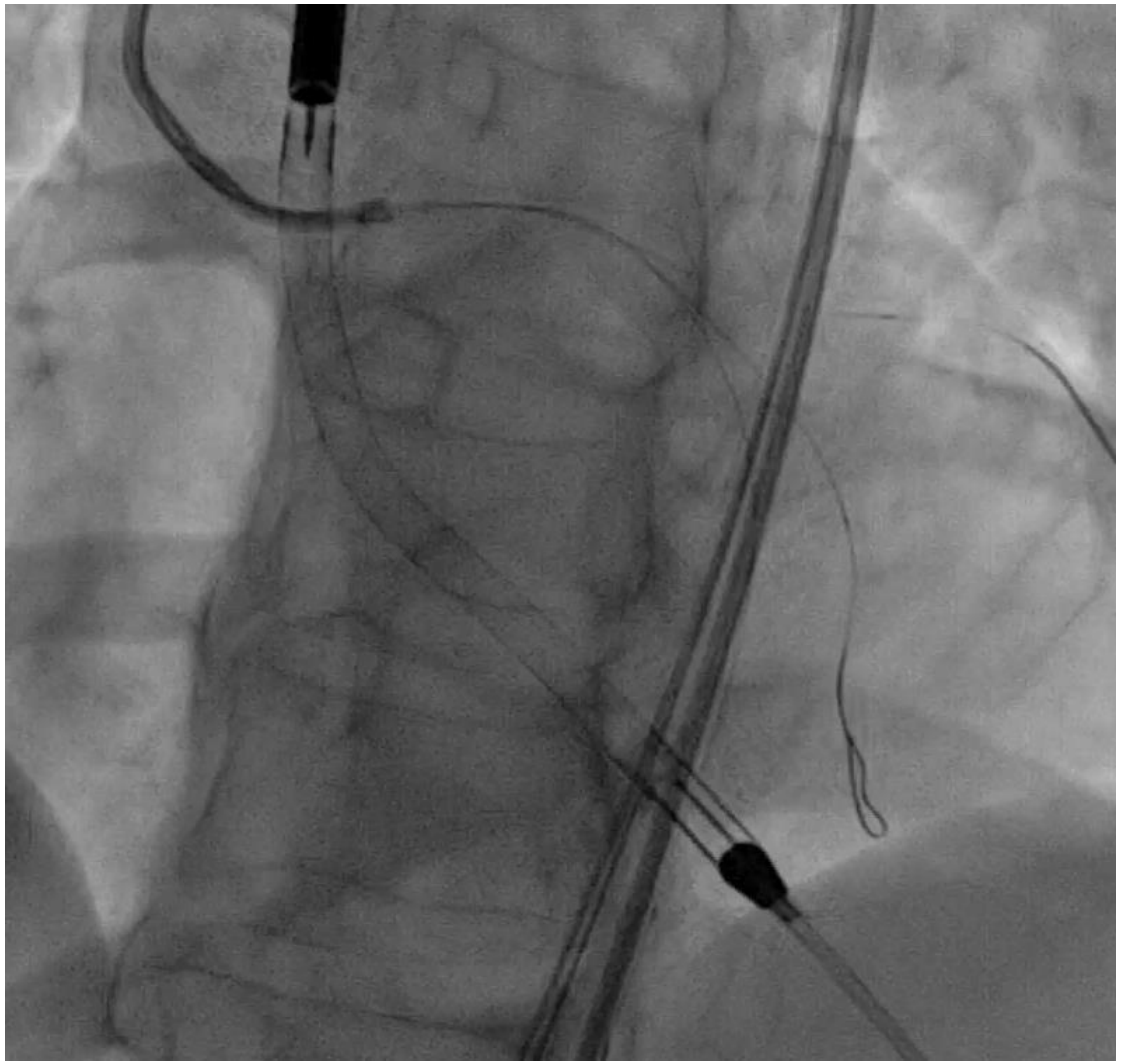
Coronary
dissection progression

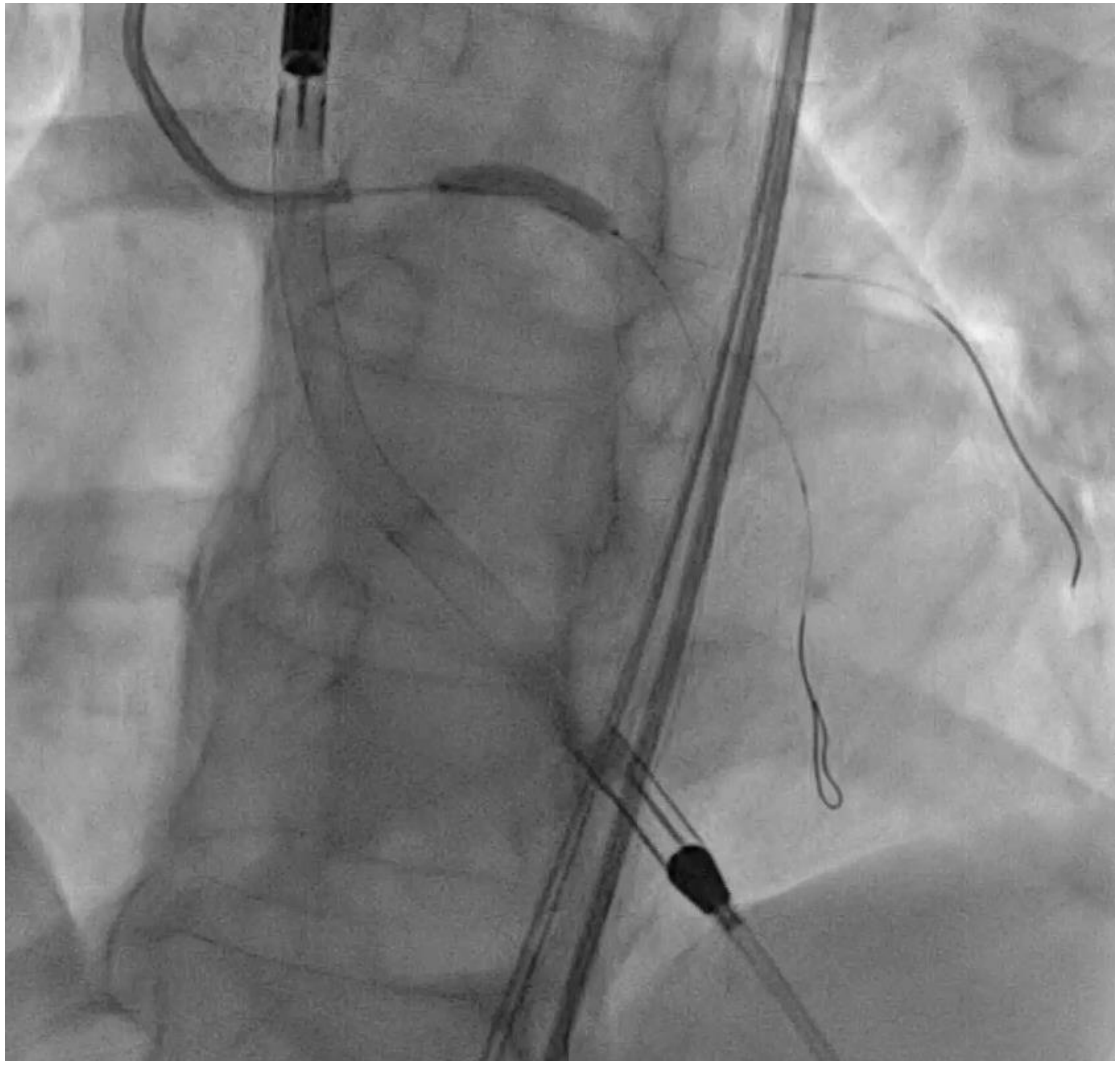
+

LM hematoma
TIMI II flow



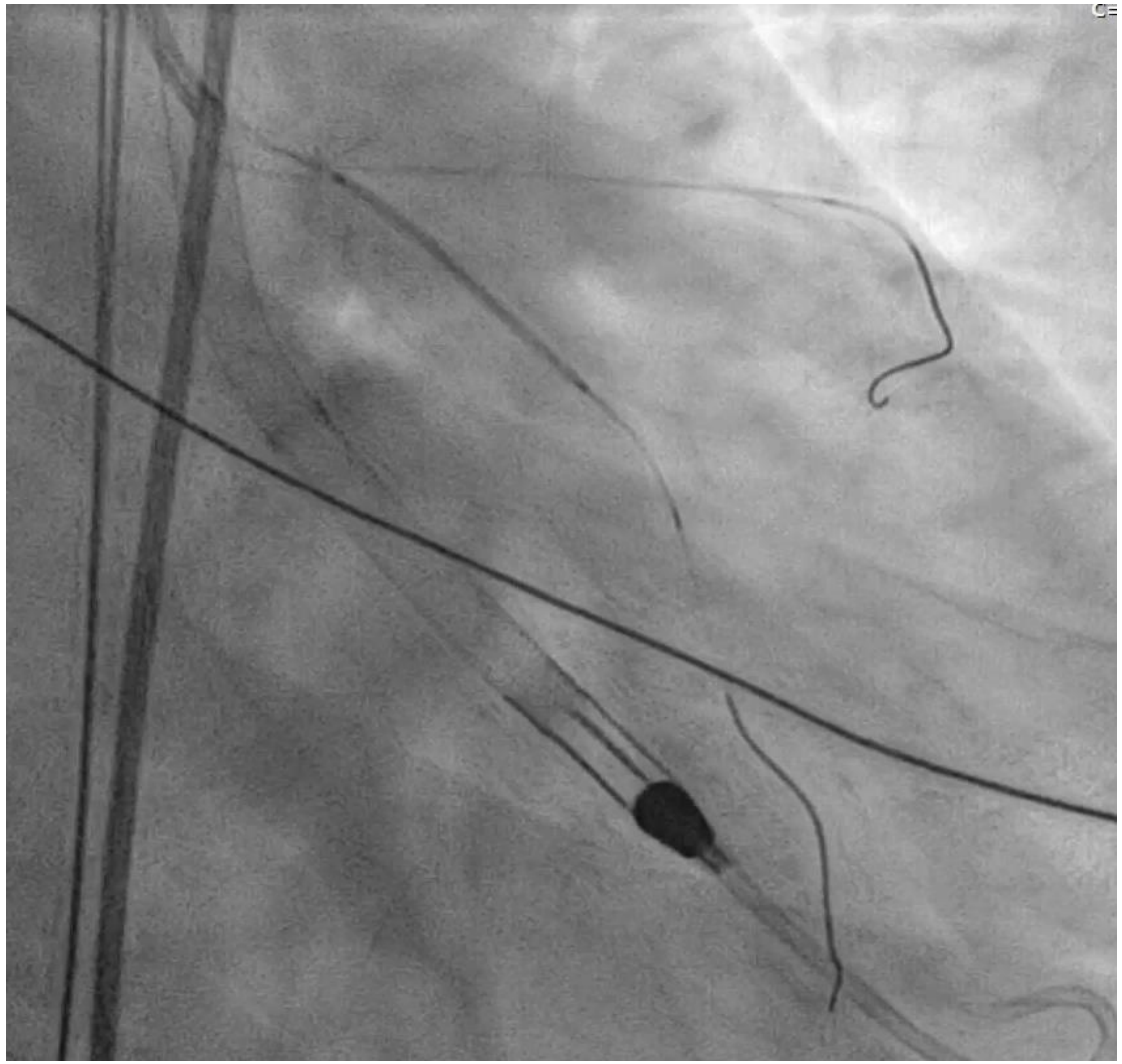
Cardiac Catheterization *(TCI-LAD)*

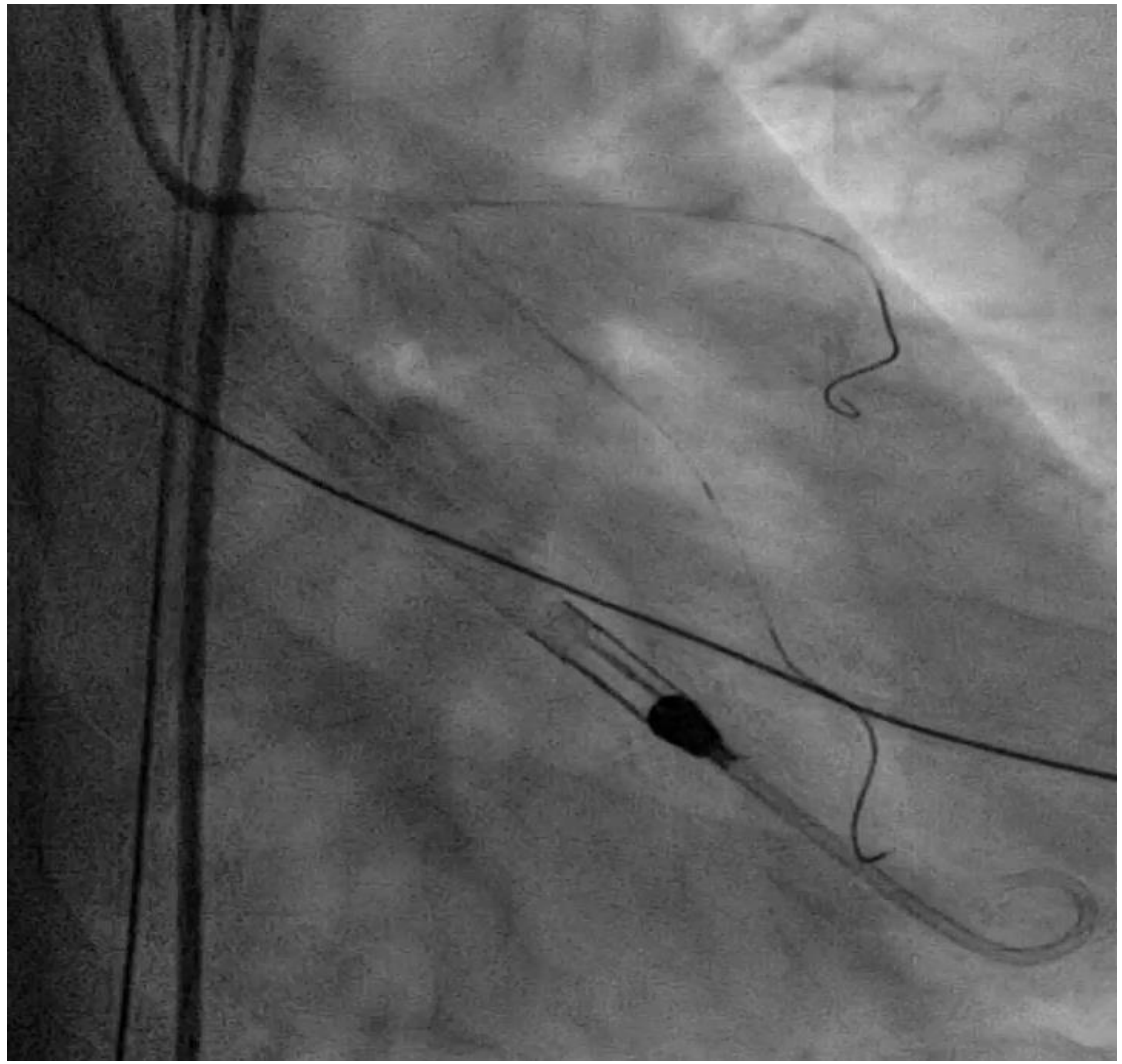




Synergy 3/20mm

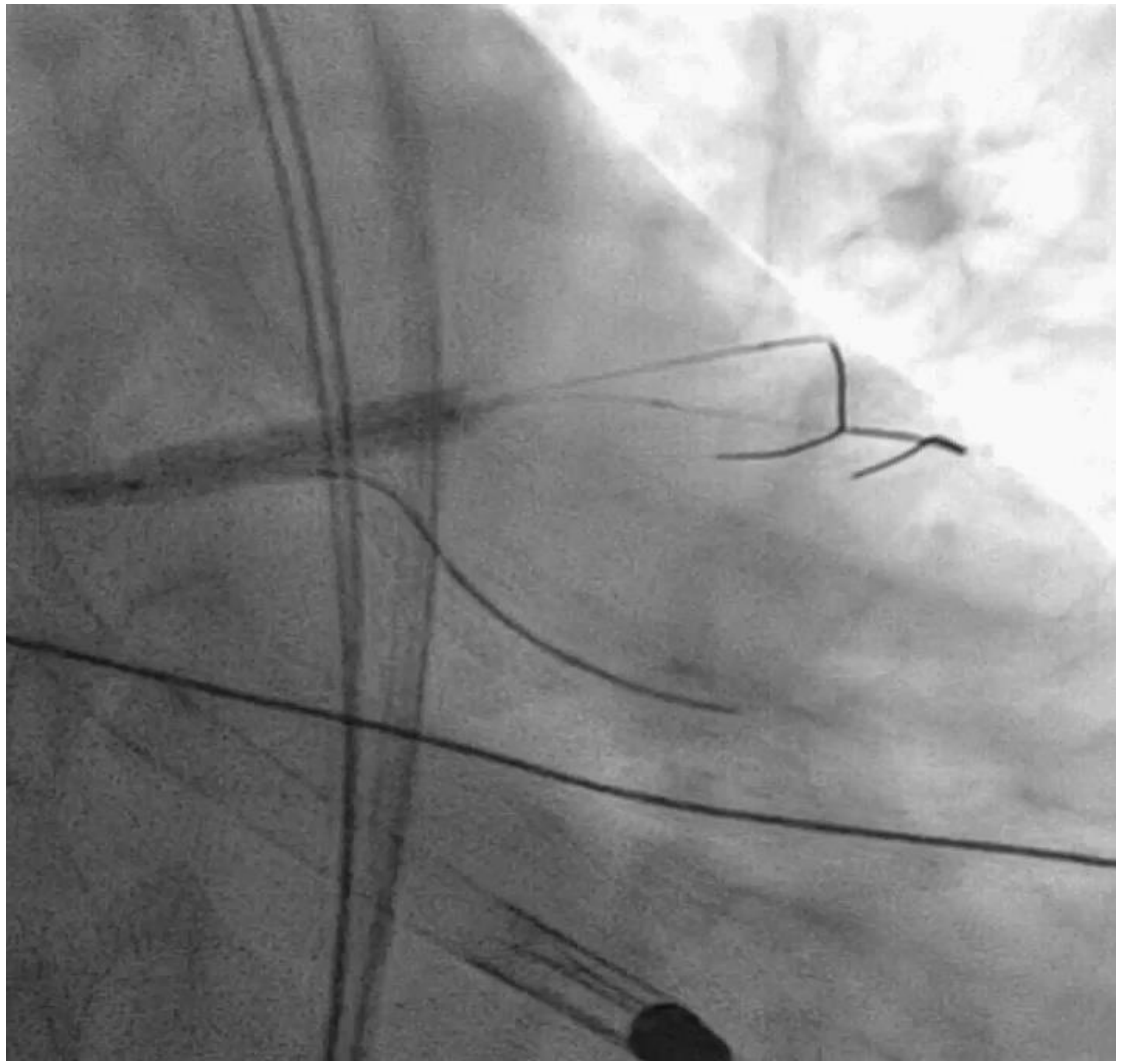
Cardiac Catheterization *(TCI-Cx)*

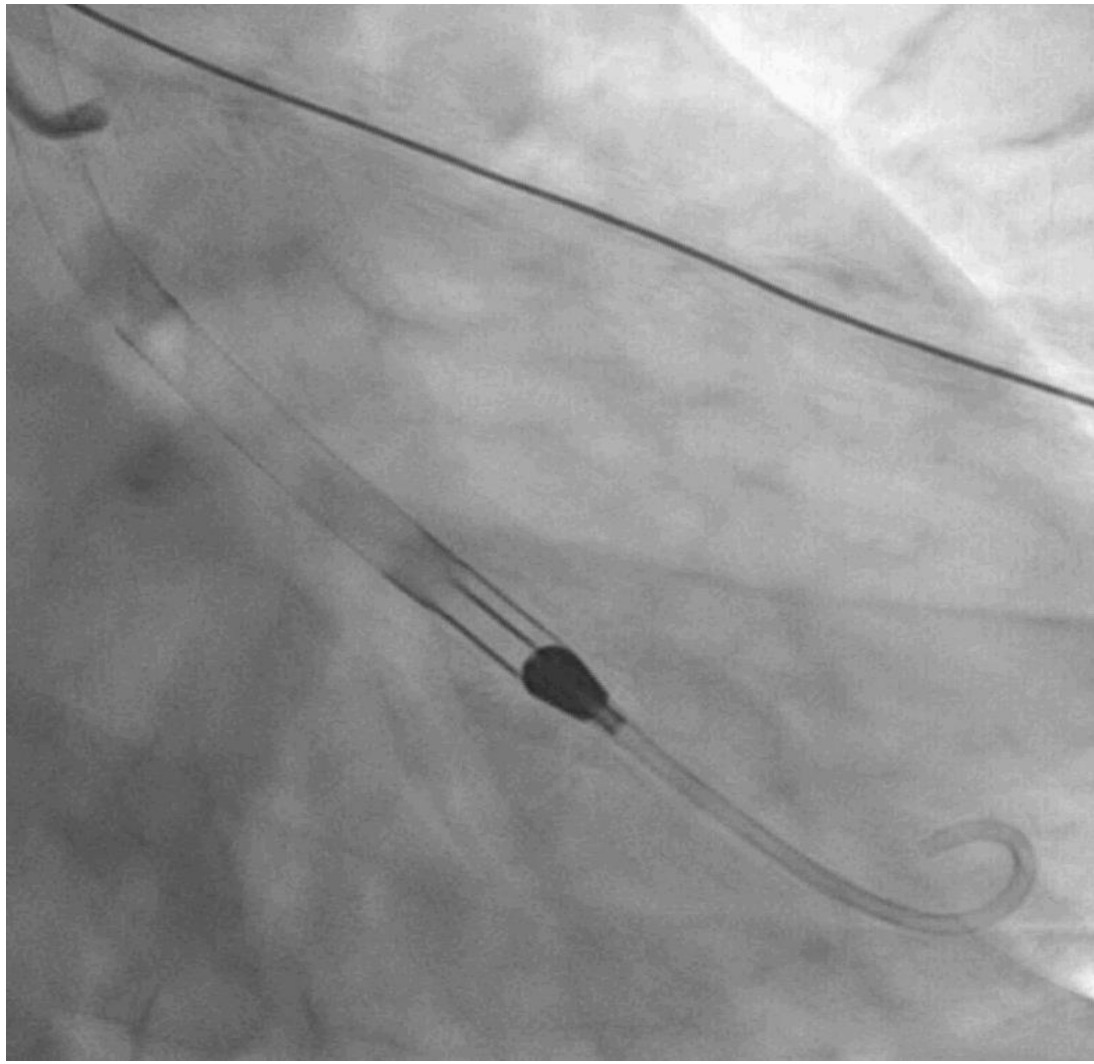




Synergy 3/24mm

Final Result





NC balloon 3.5/20mm

Hospital Course

ICU

Continuous deterioration (increase of lactate, refractory cardiogenic shock, high doses of vasoactive drugs)

Severe decreased LVEF (15%)
Worsening renal and hepatic function

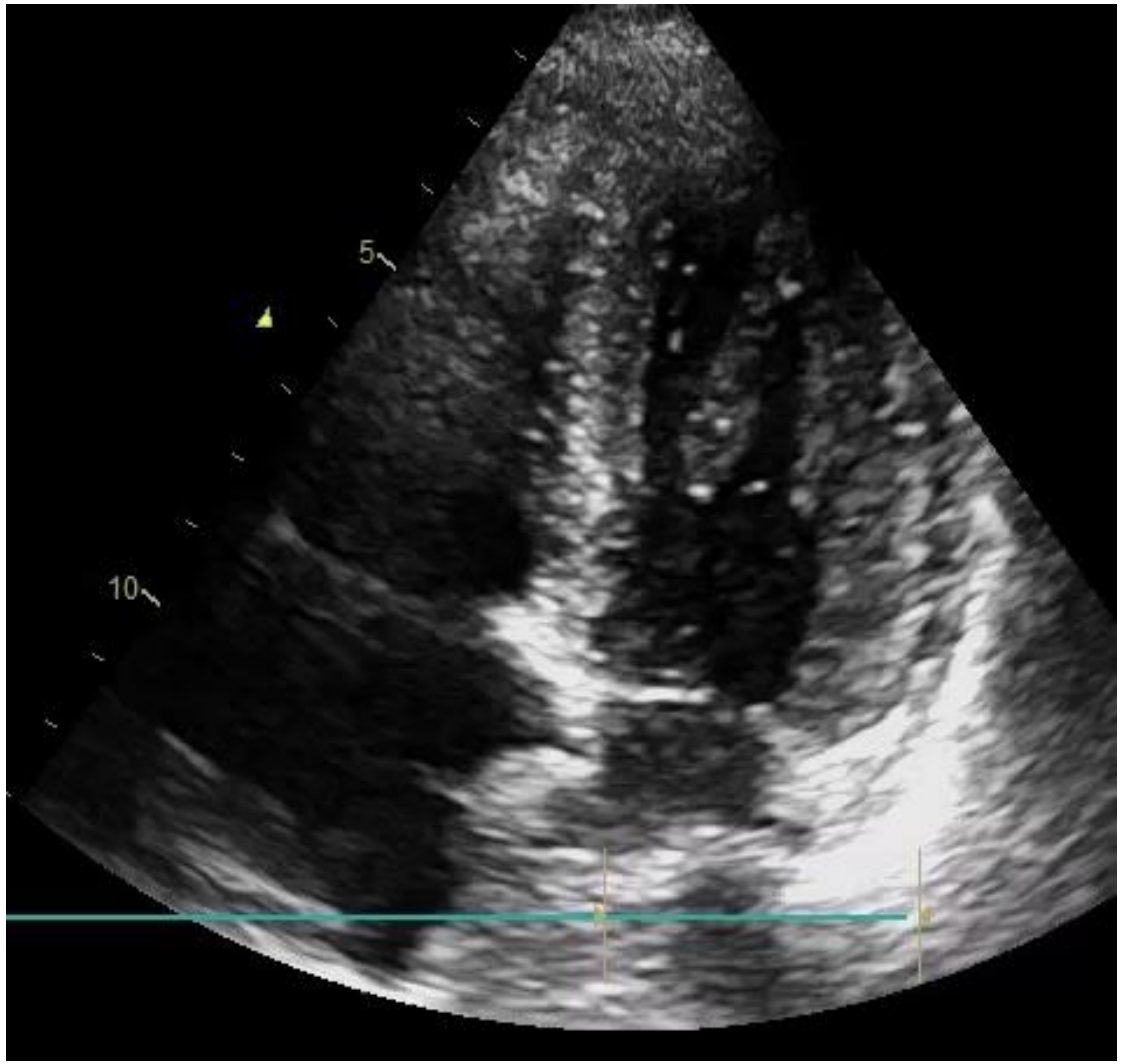
ECMO AV

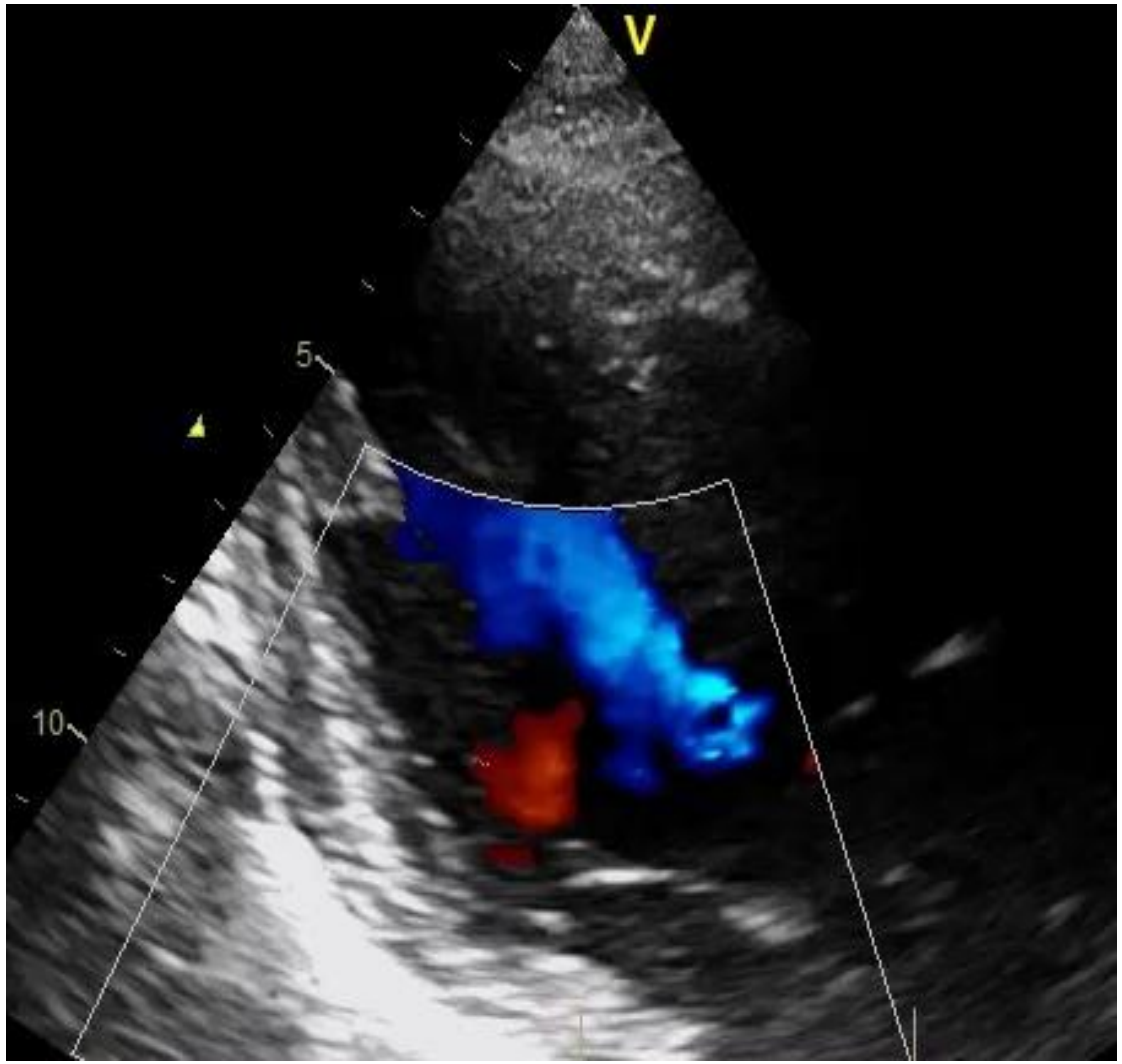
Gradual improvement in cardiac function
De-escalation on Mechanical Circulatory Support

- Impella was removed 4 days after PCI
- ECMO was removed 9 days after PCI
- Transferred to Ward 21 days after PCI

Discharge

FOLLOW UP *(3 weeks)*





LVEF 64%

No valvulopathies

CÓDIGO SHOCK CARDIOGÉNICO

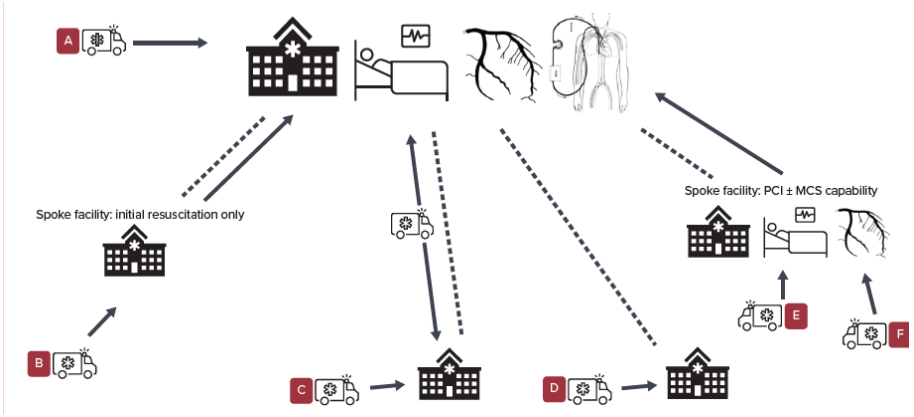
Atención al paciente en Shock Cardiogénico en el Servicio Gallego de Salud.

Grupo de trabajo Código Shock Cardiogénico.

SHOCK CENTER

High-volumen

24/7 Cath Lab, Intensive Unit, on call SHOCK TEAM, Cardiac Surgery, Advanced MCS



CARDIOGENIC SHOCK PROTOCOL

AMI CARDIOGENIC SHOCK PROTOCOL

SHOCK CARDIOGÉNICO

Escala SCAI

POCUS: Descartar complicaciones mecánicas y causas no isquémicas

SHOCK TEAM

IAM - SHOCK CARDIOGÉNICO

TRASLADO SALA CATETERISMO

CONFIRMACIÓN HEMODINAMICA
PAs <90mmHg/ PAM <60mmHg. PTDVI >18mmHg

PUNCIÓN ECOGUIADA
ANGIO ILIACOFEMORAL

SHOCK TEAM

IMPELLA CP (SCAI C/D)
BCIAo (en centros sin otros dispositivos)

PCR

ECMO-RCP

SCAI C/D/E

Valorar ACMt
PRE-ICP

ICP

REEVALUACIÓN
POST-ICP

ACMt
POST-ICP

SHOCK TEAM

UCI CARDIOLÓGICA

AMINAS (VIS <10)
PAS>90mmHg/ PAm >60mmHg
Lactato =/ ↓

AMINAS (VIS >20)
PAS<90mmHg/ PAM <60mmHg
Lactato >4 / diuresis <30ml/h

REEVALUACIÓN CLÍNICA, HEMODINÁMICA

CAP (SWAN GANZ)

Valorar CAP (S. GANZ):

IC / CPO / PAPI / lactato cada 4-6h

PAS/ PAM invasiva continua

CALCULOS HEMODINÁMICOS

(1) Cardiac Power Output (CPO) $\frac{MAP \times CO}{451}$

(2) Pulmonary Artery Pulsatility Index (PAPI) $\frac{sPAP - dPAP}{RA}$

IC<2 L/min/m2

CPO<0.6W

SHOCK REFRACTARIO

SHOCK TEAM

V.I.

PAPI >0.9
PAD <15
PCP >18

*IMPELLA CP: SCAI C/D
*ECMO VA:SCAI E/hipoO2/TV-FV
*BCIAo: Si lo anterior no disponible

V.D.

PAPI <0.9
PAD >15
PCP <18
PAD/PCP>0.86

*ECMO VA
*CANULA PROTECK DUO
*IMPELLA RP

BiV

PAPI <0.9
PAD >15
PCP >18

*ECMO VA

SHOCK CARDIOGÉNICO

Escala SCAI

POCUS: Descartar complicaciones mecánicas y causas no isquémicas

SHOCK TEAM

IMPELLA CP (SCAI C/D)
BCIAo (en centros sin otros dispositivos)

A	B	C	D	E
Hemodinamicamente estable	Hemodinamicamente inestable TAS≤90 mmHg o TAM≤ 60 mmHg FC>100 lpm)	Hipoperfusión= SHOCK Lactato>2 mmol/L, fracaso renal/hepático y acidosis metabólica	Fallo de estabilización con terapia inical	Shock refractario Soporte aminas >2 pH <7.2 **Lactato >8 mmol/L**

IAM - SHOCK CARDIOGÉNICO

TRASLADO SALA CATETERISMO

CONFIRMACIÓN HEMODINAMICA
PAs <90mmHg/ PAM <60mmHg. PTDVI >18mmHg

PUNCIÓN ECOGUIADA
ANGIO ILIACOFEMORAL

PCR

ECMO-RCP

SCAI C/D/E

SHOCK TEAM

Valorar ACMt
PRE-ICP

- Edad <70, no PCR (solo si no prolongada y RCP precoz)
- SCAI D/E — ETT: FEVI<35%. FEVD normal.
- IAM extenso <6h + anatomía coronaria riesgo:
  - TCI / DA
  - Bifuracion /carga trombótica
  - ICP vaso único permeable EAC multivaso
- NO: trombos V.I. , Insuf. aórtica severa /prótesis mecánica , Disección aórtica
- Accesos arteriales (AFC >5mm). Punción ECO-angio

ICP

REEVALUACIÓN POST-ICP

ACMt
POST-ICP

SHOCK TEAM

UCI CARDIOLÓGICA

Valorar CAP (S. GANZ):

CALCULOS HEMODINÁMICOS

AMINAS (VIS <10)
PAS>90mmHg/ PAm >60mmHg
OLIGURI Lactato =/ ↓

AMINAS (VIS >20)
PAS<90mmHg/ PAM <60mmHg
Lactato >4 / diuresis <30ml/h

REEVALUACIÓN CLÍNICA, HEMODINÁMICA

IC / CPO / PAPI / lactato cada 4-6h

PAS/ PAM invasiva continua

CAP (SWAN GANZ)

IC<2 L/min/m2

CPO<0.6W

SHOCK REFRACTARIO

SHOCK TEAM

V.I.	PAPI >0.9 PAD <15 PCP >18	*IMPELLA CP: SCAI C/D *ECMO VA:SCAI E/hipoO2/TV-FV *BCIAo: Si lo anterior no disponible
V.D.	PAPI <0.9 PAD >15 PCP <18 PAD/PCP>0.86	*ECMO VA *CANULA PROTECK DUO *IMPELLA RP
BiV	PAPI <0.9 PAD >15 PCP >18	*ECMO VA

(1) Cardiac Power Output (CPO) $\frac{MAP \times CO}{451}$

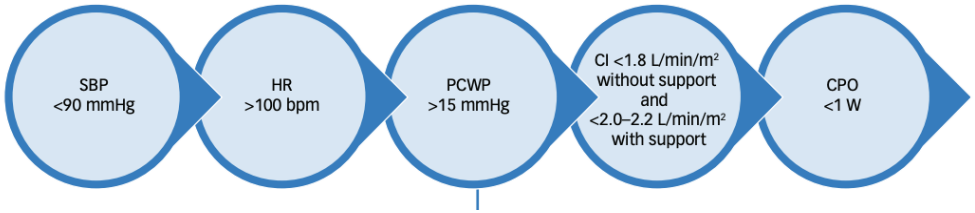
(2) Pulmonary Artery Pulsatility Index (PAPI) $\frac{sPAP - dPAP}{RA}$

ACS REFRACTORY CS POST PCI

SCAI

E
Extremis

D
Deteriorating



INICIATE or tMCS ESCALATION

HUB SHOCK CENTER TRANSFER

SHOCK TEAM

High dose inotropes (VIS >20)
pH <7.2 / Lactate >4 /Urine output <30ml/h

Bridge to decision/ recovery / LAVD-TX

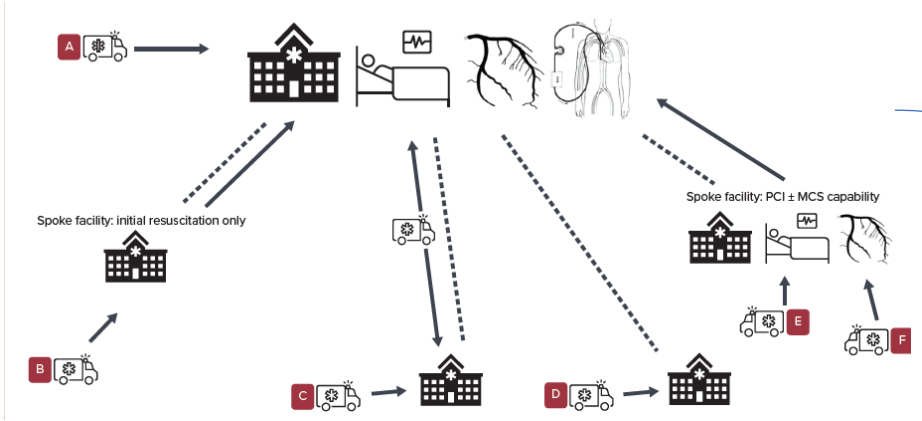
<70 y/o

No comatose / short cardiac arrest

No contraindications for tMCS

High-volumen

24/7 Cath Lab, Intensive Unit, on call SHOCK TEAM, Cardiac Surgery, Advanced MCS



Spoke (low-volume) centers: triage, Culprit PCI, short MCS

ACS REFRACTORY CS

SCAI

E
Extremis

D
Deteriorating

INICIATE
or
tMCS ESCALATION

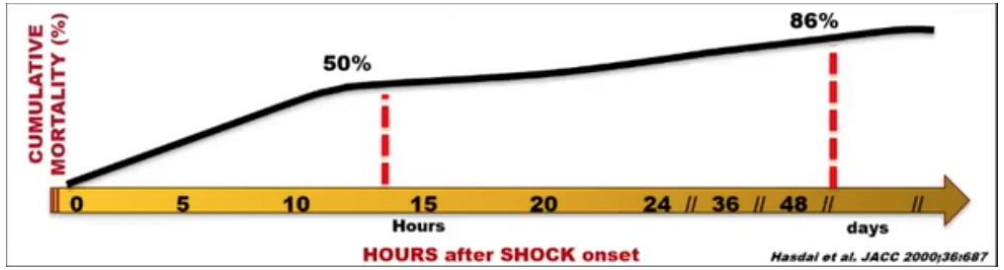
HUB SHOCK CENTER
TRANSFER

SHOCK
TEAM

The GOLDEN HOUR: “Time S2S”

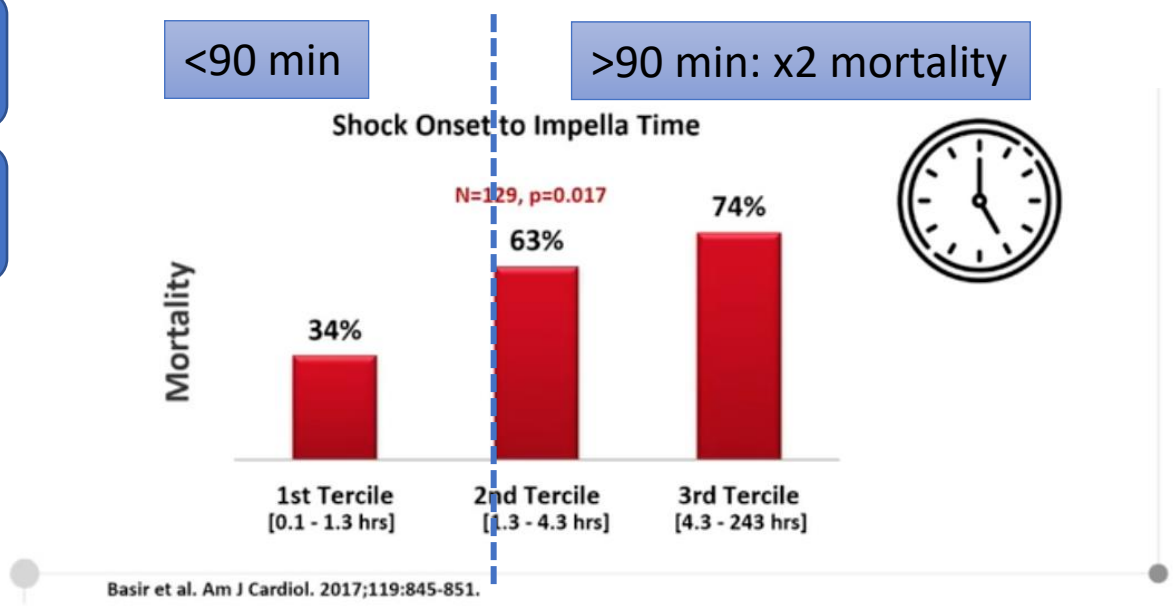
TIME DEPENDENT
DECISION

MORTALITY

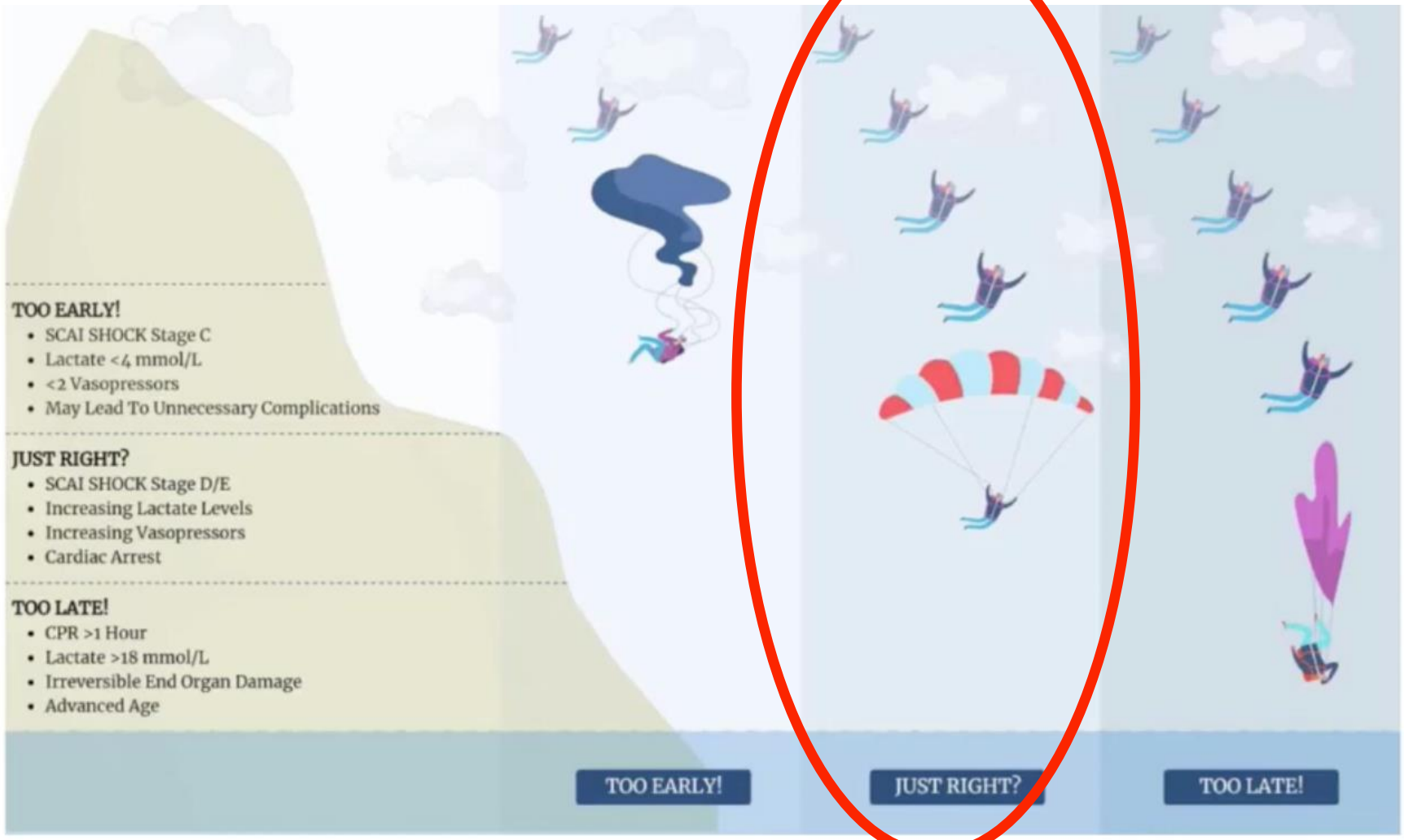


<90 min

>90 min: x2 mortality



Basir et al. Am J Cardiol. 2017;119:845-851.



Henry T et al. Circulation 2023; 47:465–468.

TAKE HOME MESSAGE

- Is tMCS a routine option in CS ? Yes / No
- Does tMCS have any mortality benefit? Yes / No

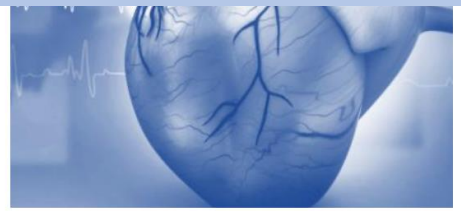
But ...

- Attending to RCTs (DANGER trial) and registries (NCSI) experience
  - Only CS very selected patients: Lactate >4, Extense STEMI, LV predominant, no prolonged CPR
  - Device selection according hemodinamics
  - High volumen centers: minimize complicactions
  - Time dependent therapy: “Time S2S” <90min

REGIONAL SC code programs

MULTIDISCIPLINAY SHOCK TEAMS

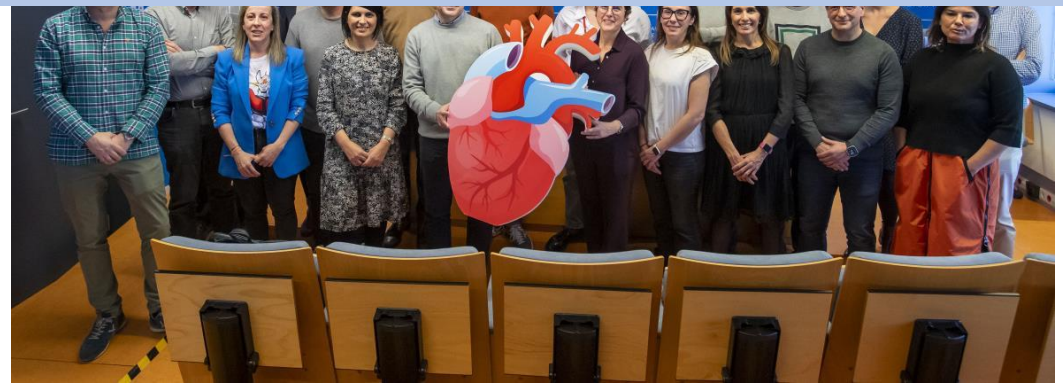
Essential for a good quality tMCS program…



Grupo de trabajo Código Shock Cardiogénico.

Mayo de 2024

XUNTA DE GALICIA



¡GRACIAS!

SERVIZO GALEGO de SAÚDE

CARDIOLOGÍA
Área Sanitaria de Vigo

Fundación Biomédica Galicia Sur

IIS Galicia Sur