EXTRACORPOREAL MEMBRANE OXYGENATION IN HIGH RISK PROCEDURES

Professor

Akram Abdelbary

Critical Care Department, Cairo University

High Risk PCI team Critical Care department Cairo University

Professor Helmy Elghawaby

Professor
Akram
Abdelbary

Dr Mahmoud Saad Dr Hany Zakaryia

Dr Ahmed Yehia

Dr Mohamed Kamal Dr Mohamed Abdelmonem

DEFINITION OF HIGH RISK PATIENT

It is the relative inability of the high-risk patient to withstand the deleterious

hemodynamic consequences of dysrhythmia, transient intervals of ischemia-reperfusion injury, or the distal embolization of atherogenic material (i.e., the

no-reflow phenomenon) associated with PCI. A high risk patient may have significantly attenuated cardiovascular reserve and be increasingly susceptible to post-ischemic stunning.

CRITERIA OF HIGH RISK PATIENT

Clinical criteria:

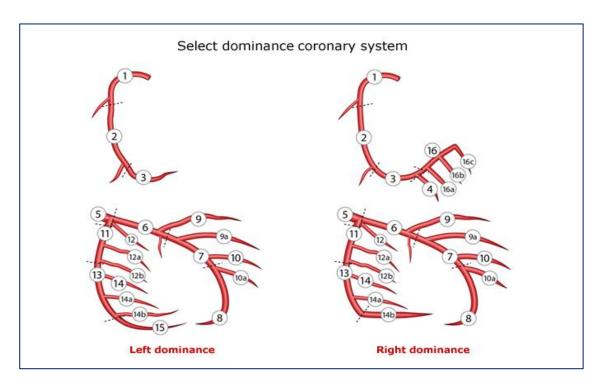
- Cardiogenic shock occurring within 24 h or at the start of coronary intervention.
- Left ventricular systolic dysfunction on presentation: ejection fraction ≤ 30-40%.
- Killip class II-IV on presentation or congestive hear failure.
- Coronary intervention after resuscitating cardiac arrest within 24 hours STEMI.
- ACS complicated by unstable hemomdynamics, dysrhythmia, or refractory angina.
- Mechanical complications of acute MI.
- Age:> 70-80 years. History of cerebrovascular disease, DM, renal dysfunction or chronic lung disease.

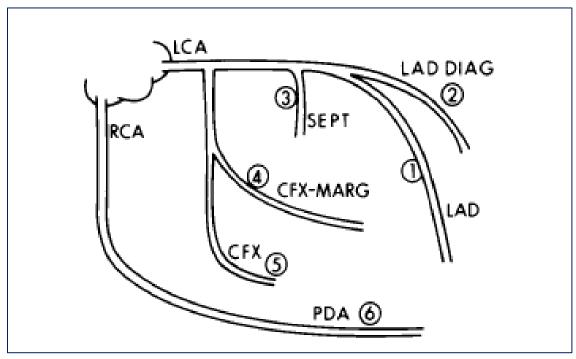
CRITERIA OF HIGH RISK PATIENT

Anatomic criteria:

- Intervention to an unprotected left main or left main equivalent.
- Multi-vessel disease.
- Distal left main bifurcation intervention.
- Previous CABG including intervention to a graft, particularly degenerated graft.
- Last remaining coronary conduit.
- Duke myocardial jeopardy score ≥8/12
- SYNTAX score ≥ 33
- Target vessel providing collateral supply to an occluded second vessel that supplies > 40% of the left ventricular myocardium.

CRITERIA OF HIGH RISK PATIENT





SYNTAX > **33**

Dukes J >8/12

CRITERIA OF HIGH RISK PATIENT

Hemodynamic criteria:

- Cardiac index <2.2L/min/m².
- Pulmonary capillary wedge pressure >15 mmHg.
- Mean pulmonary artery pressure >50 mmHg.

GUIDELINES

TABLE 2 Contest Guideline Recommendations for the Use of Percut resons Circulatory April 1 Devices Burley High Wisk Pl

Gradelines, Topa (Ref. 2

1.00

Graph to b

Found was No.

Extracorporaci Messicane Gaygeration

American College of Cardiology/American Heart Arcedistron/Society for Cardiovernator American Interventions Accommendations

Class I, Level of Evidence: B

Elective insertion of an appropriate hemodynamic support device as an adjunct to PCI may be reasonable in carefully selected high-risk patients.

Class IIb, Level of Evidence: C

High-risk patients include:

- Unprotected left main or last remaining conduit PCI.
- Cardiogenic shock.

 PCI of a vessel subtending a large territory on a background of severely depressed left ventricular function.

ATEMS, TOTA (94)

INDEX on be useful for profests in cardiogenic shock after 5.0

who do not quickly stabilities with pharmacological theore

Class its, Level of Evidence. 5

IABP is reasonable in UA/TEMI estimate for combouing or

frequencily recurring sovere aphenica shop he interseve

medical therapy, heroodynamic instability pre- to posyanging papty, and for medical complexions of Mi

Class its Level of Evidence (

Alternative left vertougher assest devices for eleminatory support may be considered in patients while refrectory paralogenic reloads.

Class Nix Level of Evidence: C

The industrial device reconstruction about

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY

© 2015 BY THE SOCIETY FOR CARDIOVASCULAR ANGIOGRAPHY AND
INTERVENTIONS, THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION,
THE HEART FAILURE SOCIETY OF AMERICA, AND THE SOCIETY FOR THORACIC SURGERY
PUBLISHED BY ELSEVIER INC.

VOL. 65, NO. 19, 2015 ISSN 0735-1097/\$36.00

http://dx.doi.org/10.1016/j.jacc.2015.03.036

EXPERT CONSENSUS DOCUMENT

2015 SCAI/ACC/HFSA/STS Clinical Expert Consensus Statement on the Use of Percutaneous Mechanical Circulatory Support Devices in Cardiovascular Care



Prophylactic use for high risk PCI	Particularly in patients with severe LV dysfunction (EF <20% to 30%) and complex coronary artery disease involving a large territory (sole-remaining vessel, left main or three vessel disease) (94,95,98).		
High-risk or complex ablation of ventricular tachycardia	Similar to HR-PCI, complex VT ablation can be made feasible with percutaneous support. MCS use allows the patient to remain in VT longer during arrhythmia mapping without as much concern about systemic hypoperfusion.		
High-risk percutaneous valve interventions	These evolving procedures may be aided with the use of MCSs.		

2015 SCAI/ACC/HFSA/STS Clinical Expert Consensus Statement on the Use of Percutaneous Mechanical Circulatory Support Devices in Cardiovascular Care

Suggested Schema for Support Device in High-Risk PCI

TABLE 2

Severe left ventricular dysfunction (EF <35%) or recent

decompensated heart failure

Patient With Left Main, Last Remaining Conduit, or Severe Multivessel Disease	Anticipated Noncomplex PCI	Anticipated Technically Challenging or Prolonged PCI		
Normal or mildly reduced left ventricular function	None	IABP/Impella as back up		

Impella or TandemHeart, choice dependent upon vascular anatomy, local

expertise, and availability. ECMO for concomitant hypoxemia or RV failure.

IABP/Impella

as back up

A suggested schema for use of support devices for high-risk PCI based upon clinical and anatomic circumstances. The greater the likelihood of hemodynamic compromise or collapse the greater the potential benefit of MCS.

Open access peer-reviewed chapter

Extracorporeal Membrane Oxygenation Support for Complex Percutaneous Coronary Interventions in Patients without Cardiogenic Shock

By Vladimir I. Ganyukov, Roman S. Tarasov and Dmitry L. Shukevich

Submitted: November 2nd 2015 Reviewed: March 15th 2016 Published: September 14th 2016 DOI: 10.5772/63089

Extracorporeal Membrane Oxygenation Support for Complex Percutaneous Coronary Interventions in Patients without Cardiogenic Shock

Variables	PCI + ECMO	CABG	p		
	(n = 22)	(n = 53)			
Successful revascularization	100% (22)	100% (53)	0.5		
MACE	9.1% (2)	9.4% (5)	0.15		
Death	9.1% (2)	7.5% (4)	0.2		
Myocardial infarction	0	3.8% (2)	0.2		
Repeated revascularization	0	0	0.5		
Stroke	0	0	0.5		
Major bleeding (TIMI)	9.1% (2)	13.2% (7)	0.3		

Table 5. Thirty-day outcomes of revascularization.

Circulation: Cardiovascular Interventions

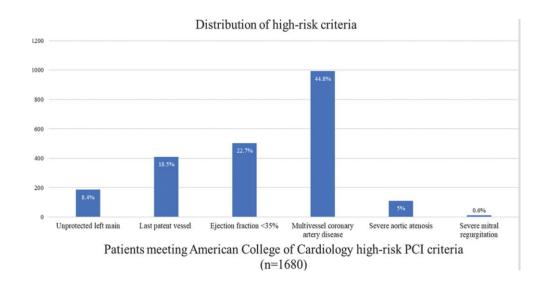
Volume 14, Issue 6, June 2021 https://doi.org/10.1161/CIRCINTERVENTIONS.120.009960



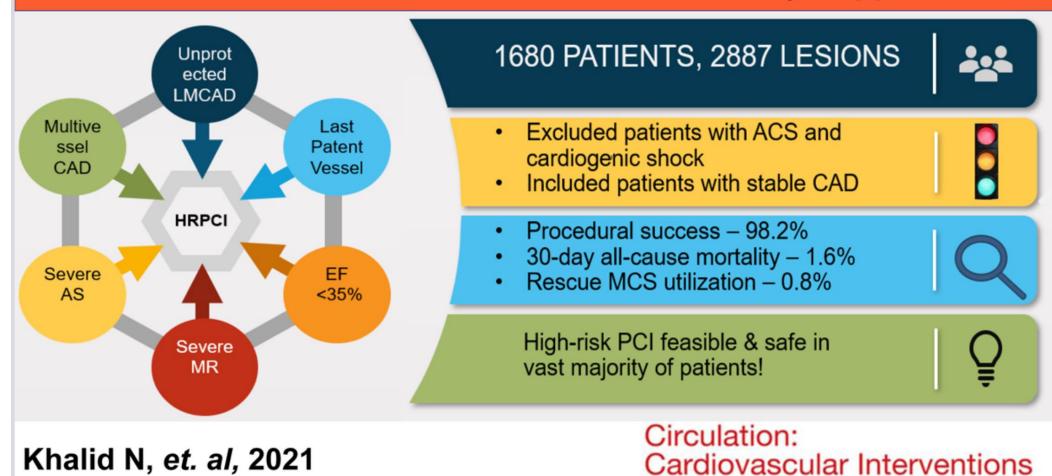
CORONARY INTERVENTIONS

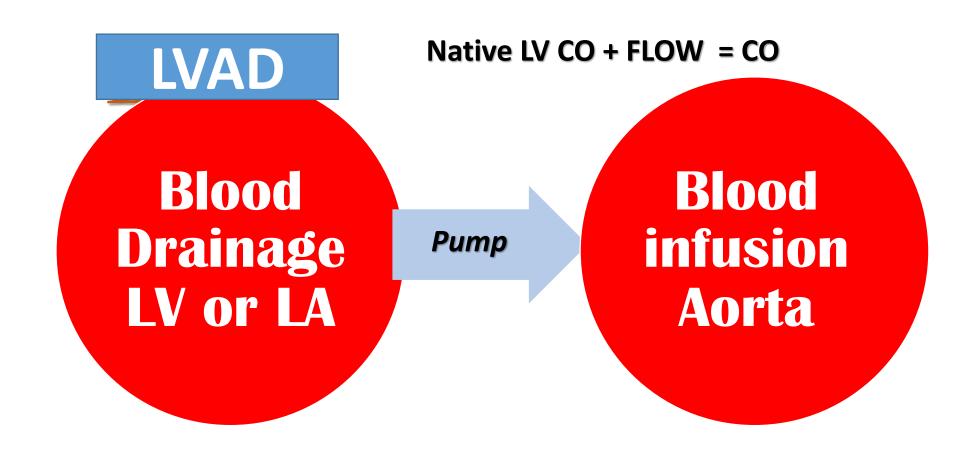
Feasibility and Safety of High-Risk Percutaneous Coronary Intervention Without Mechanical Circulatory Support

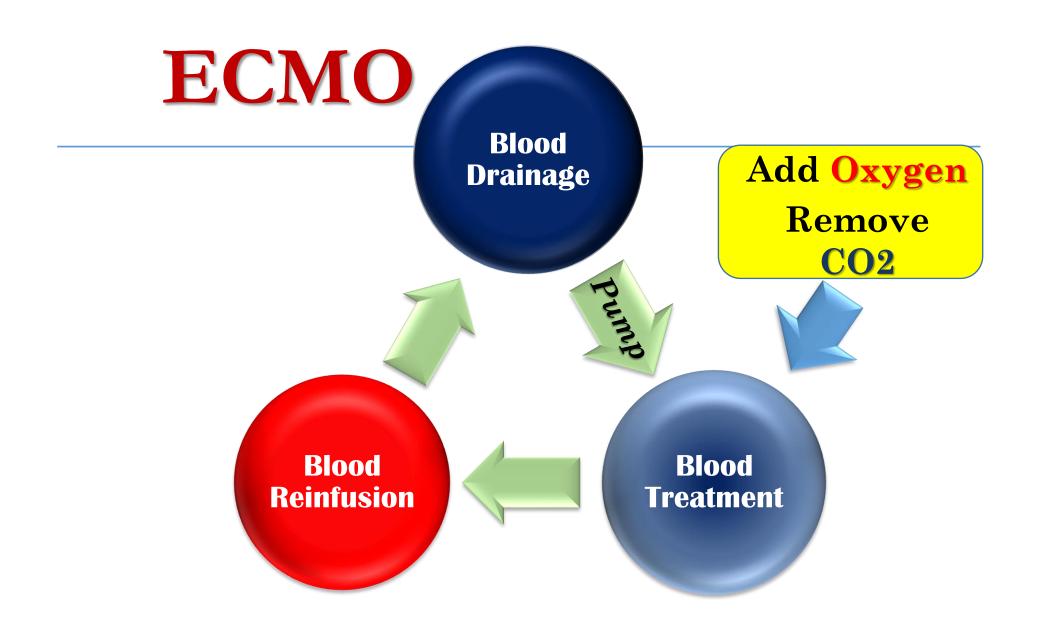
Nauman Khalid, MD (D), Toby Rogers, MD, PhD (D), Rebecca Torguson, MPH, Cheng Zhang, PhD, Corey Shea, MS, Evan Shlofmitz, DO (D), Yuefeng Chen, MD, PhD, Anees Musallam, MD, Jason P. Wermers, BS (D), Brian Case, MD, Hayder Hashim, MD, Itsik Ben-Dor, MD, Nelson L. Bernardo, MD, Lowell Satler, MD, and Ron Waksman, MD (D)



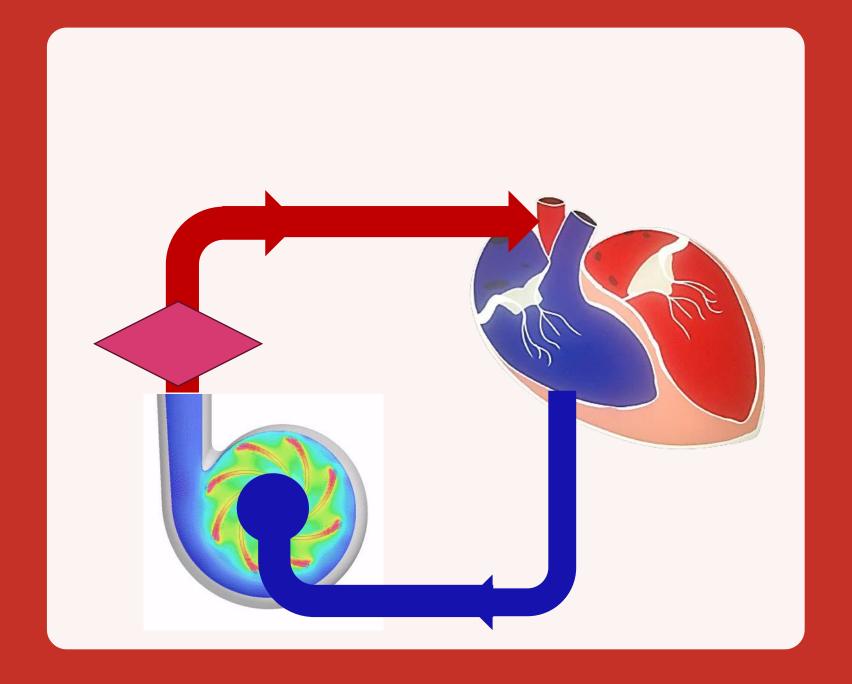
Feasibility and Safety of High-Risk Percutaneous Coronary Intervention Without Mechanical Circulatory Support



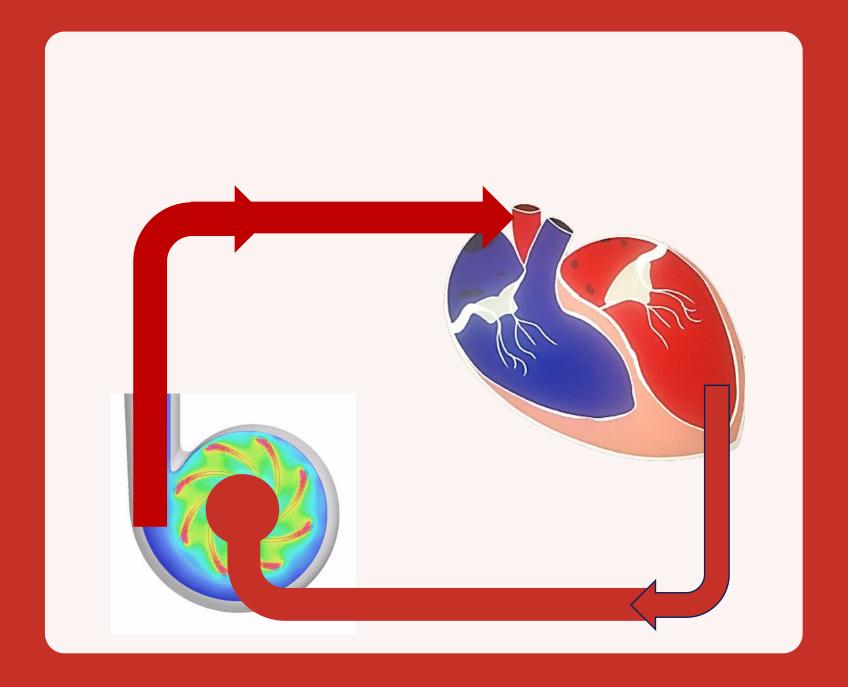




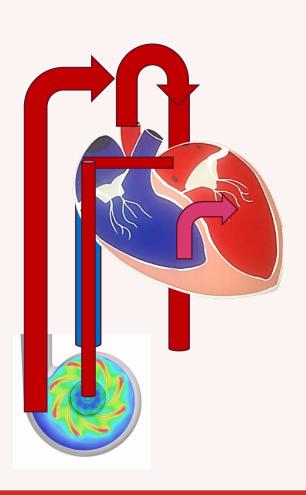
Classic VA
ECMO for
LV or
Biventricular
failure



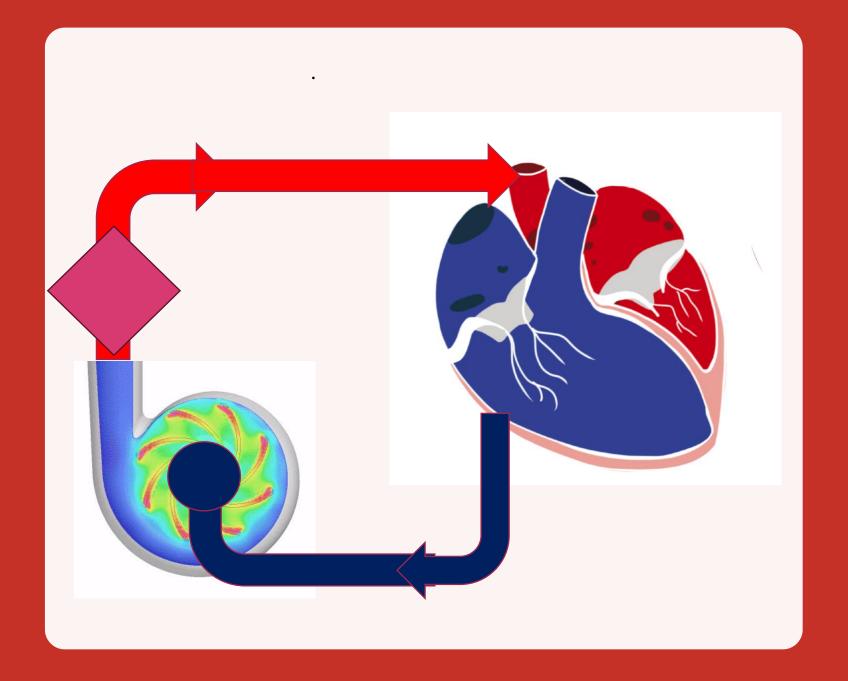
Trans arterial LVAD



Transvenous LVAD



Classic VA for RV failure



JACC: CARDIOVASCULAR INTERVENTIONS

© 2015 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER INC.

VOL. 8, NO. 2, 2015 ISSN 1936-8798/\$36.00 http://dx.doi.org/10.1016/j.jcin.2014.07.030

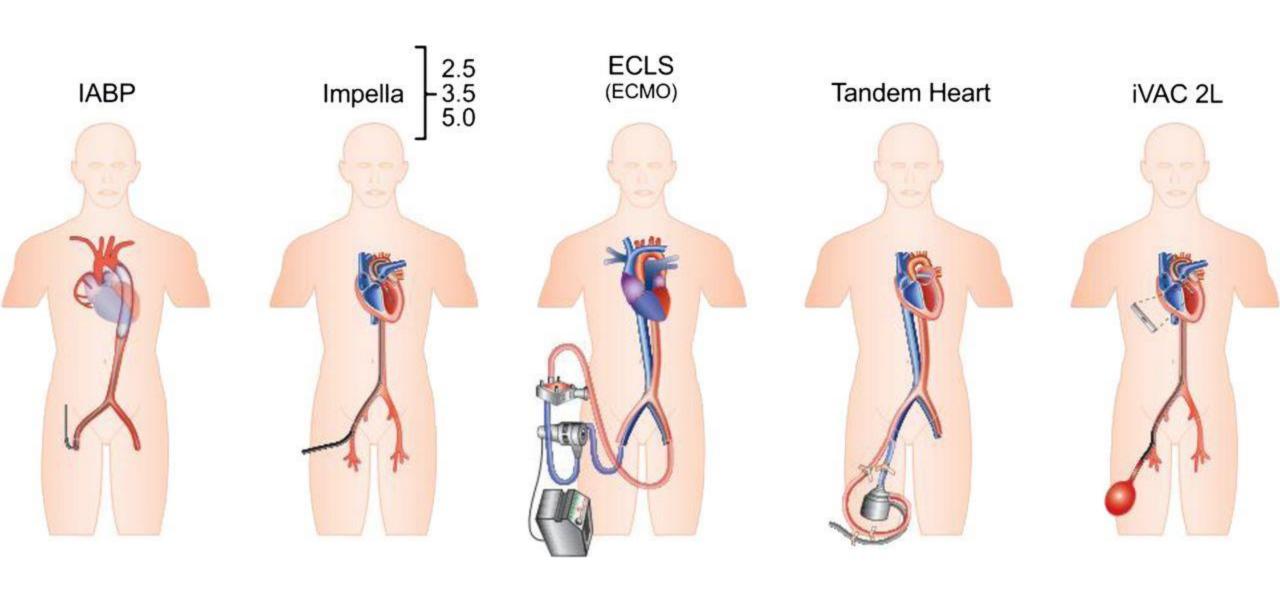
STATE-OF-THE-ART REVIEW

Percutaneous Circulatory Assist Devices for High-Risk Coronary Intervention





Aung Myat, MBBS,* Niket Patel, MBBS,† Shana Tehrani, MD,‡ Adrian P. Banning, MD, PHD,† Simon R. Redwood, MD,* Deepak L. Bhatt, MD, MPH§

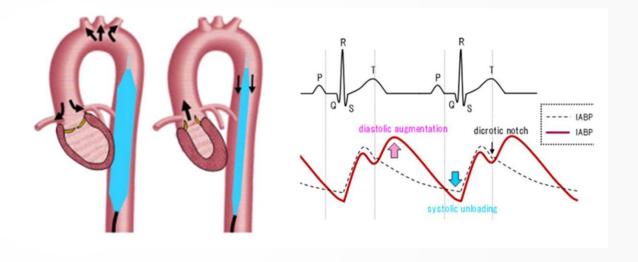


Holger Thiele et al. Eur Heart J 2015;36:1223-1230

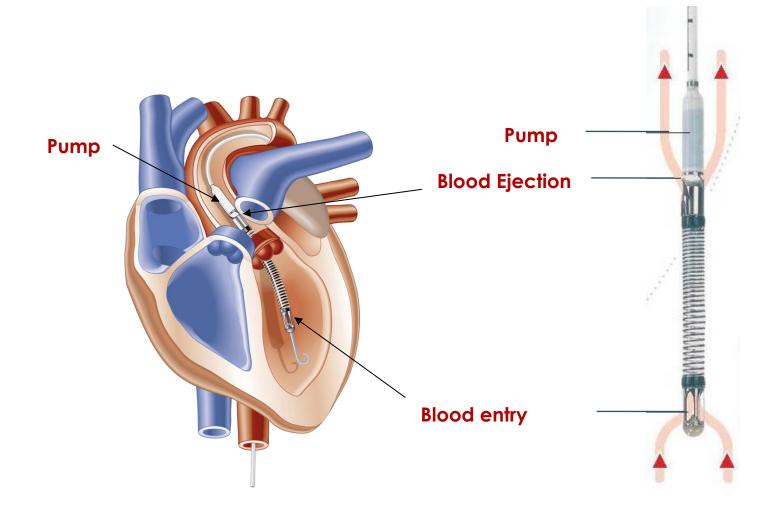
	Inotropic	IABP	Tandem- Heart	pVAD (Impella)	ECLS	LVAD (HM2/HVAD
Advantages Flow (L/min) Coronary Perfusion LVEDP	<0.5 ↑	0.5 ↑↑ ↓	3.5 ↑↑ ↓↓	2.5-5.0 ↑↑ ↓↓	4.6 ↑↑ ↑↑↑↑	4.8 ↑↑ ↓↓↓↓
Limitations Arrhythmia	+++	-	-	-	-	-
Stroke Limb ischemia Bleeding Cost	N.A N.A SS	++ + ++ SSS	+ ++ +++ SSSS	+ + +/++ SSSSS	++ +++ ++++ SSSSS	+++ N.A ++++ SSSSSS

Current Devices

Intra Aortic Balloon Pump



Impella



IMPELLA 2.5/5.0 = Principle of functioning

INSERTION:

- Impella 5.0 : Surgical

- Impella 2.5/CP : Percutaneous or Surgical

Catheter

Motor

Exit

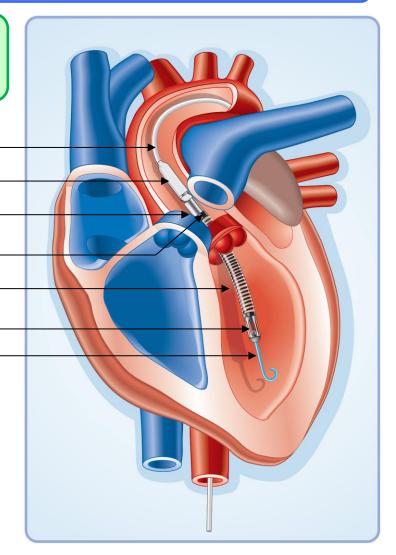
Differential pressure sensor

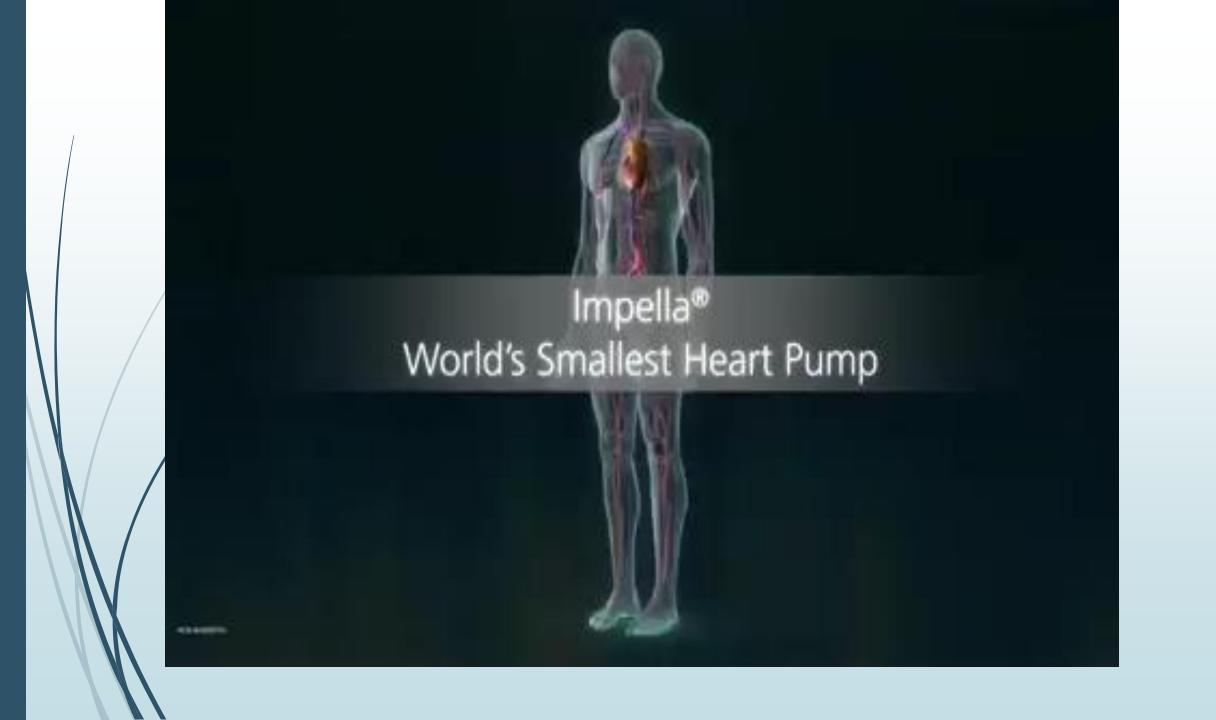
Pump

Entry

Pigtail

Axial Continuous flow Micro-pump

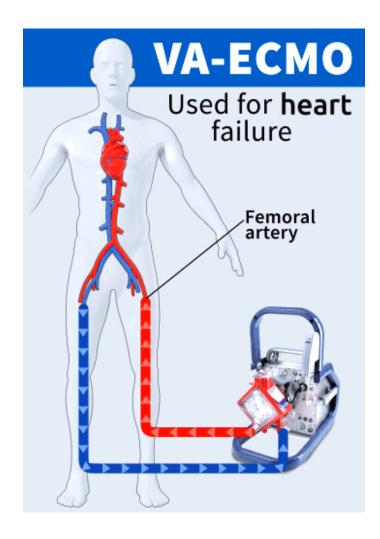








- Veno-Arterial ECLS •
- Cardio-respiratory failure or cardiac failure



ECMO SUPPORT IN HIGH RISK CORONARY INTERVENTION

Elective PCI in high risk patients and left main procedures.

Emergency PCI post STEMI and cardiogenic shock.

ECMO support for post infarct VSD

14 cases

Ischemic cardiomyopathy with; LVEF< 35% multivessel disease refused by cardiac surgery or patient because of high mortality risk.

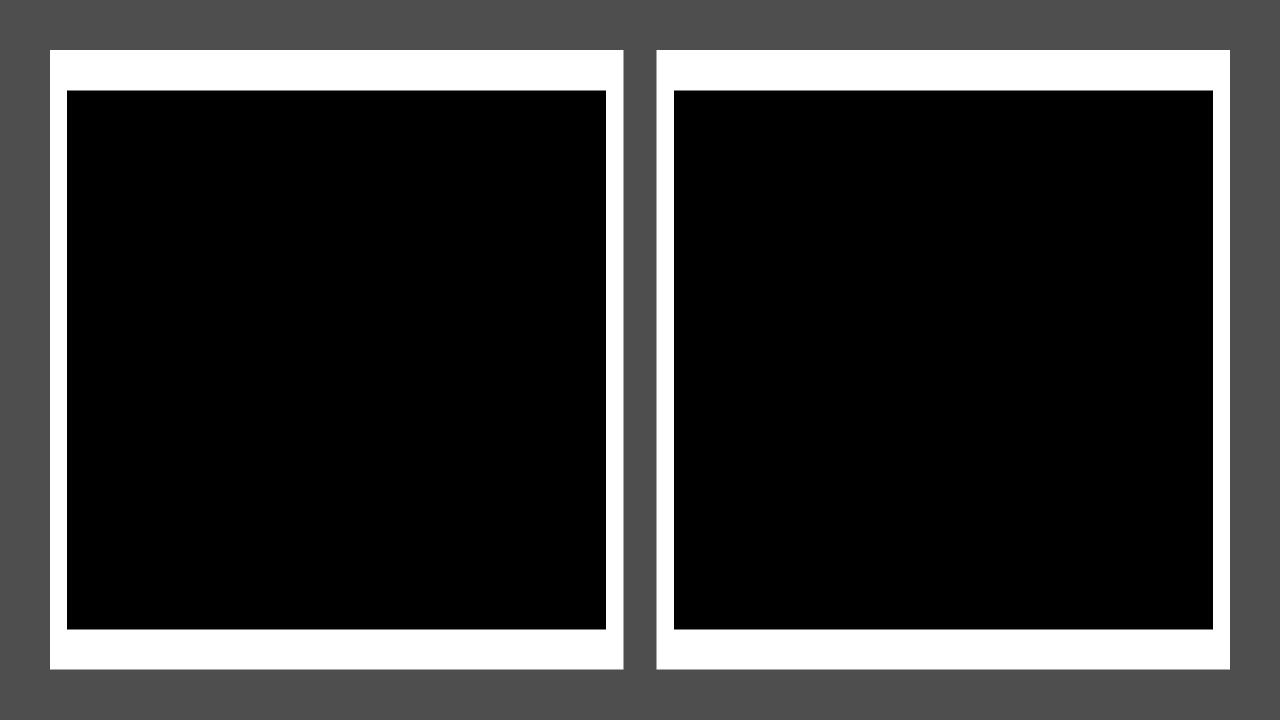
Viable myocardium is a prerequisite

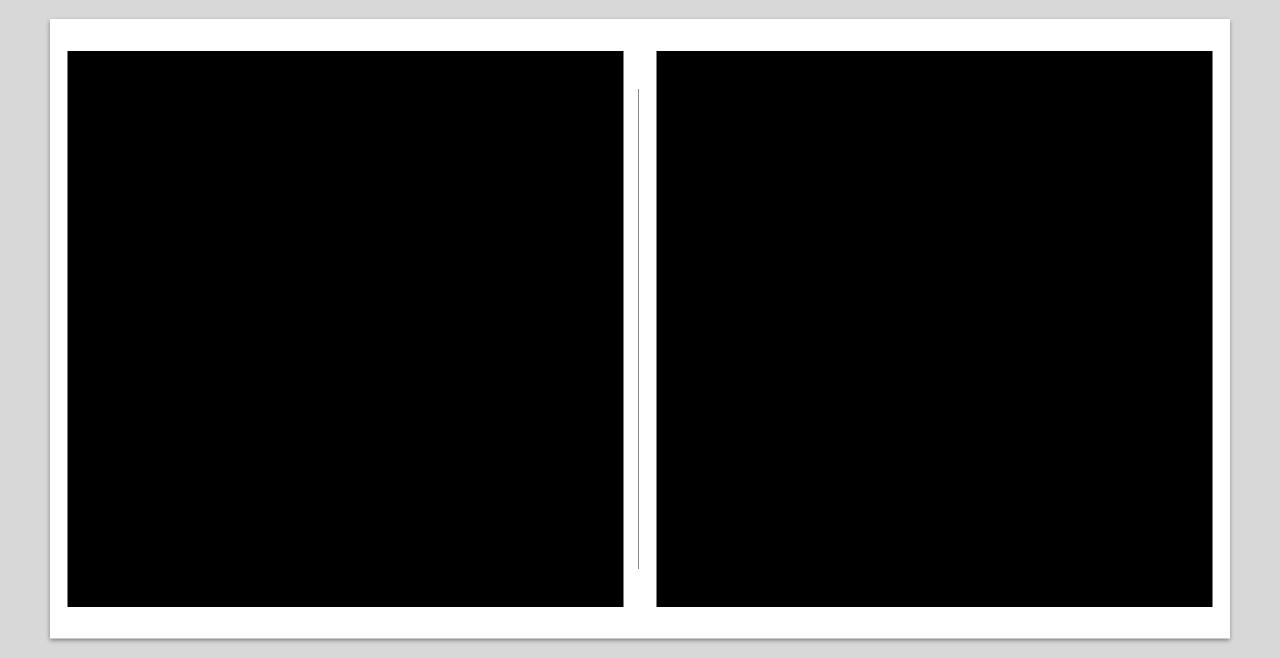
VA ECMO inserted before procedure and removed after stability

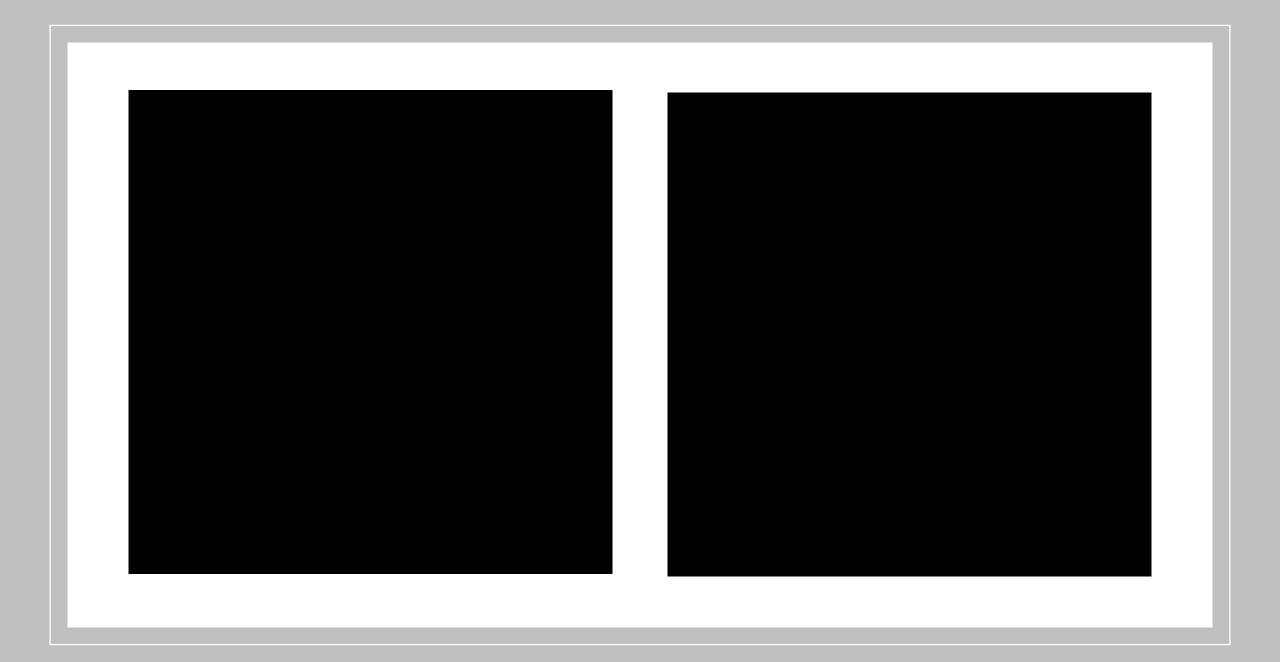
Duration from 4-48 hours

All completely revascularized and discharged.









Case 2
Dr Amro Imam NHI
and Cairo ECMO team

71 year old male

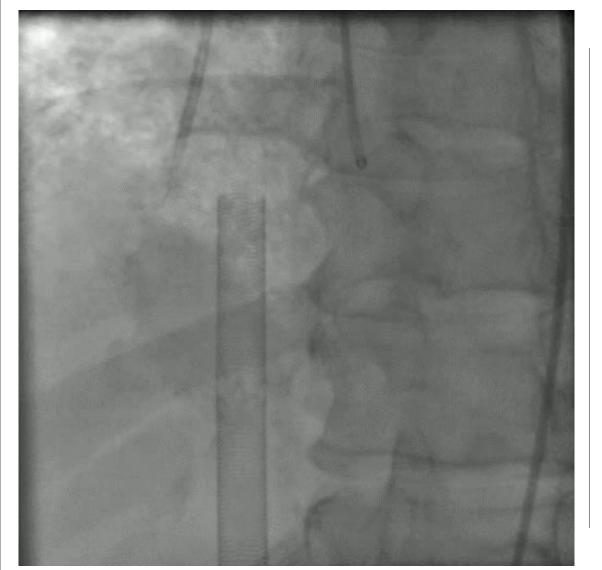
Diabetic, Hypertensive

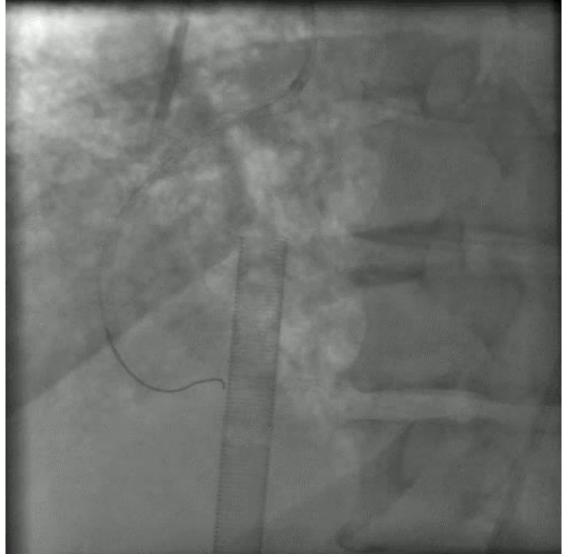
Chronic kidney disease, Grade II nephropathy

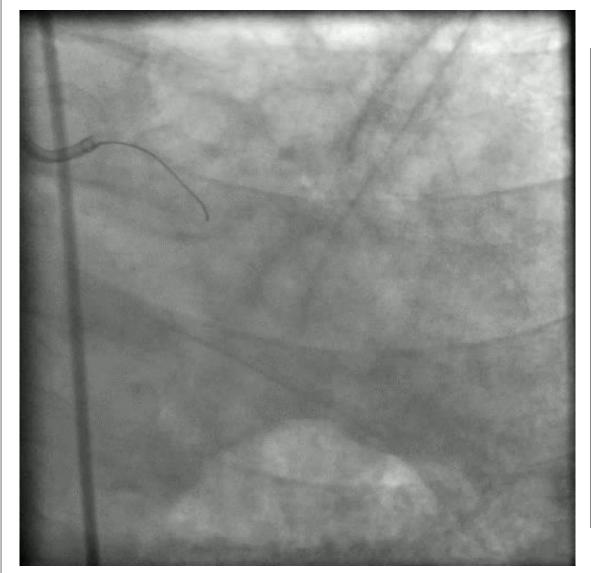
Pulmonary fibrosis

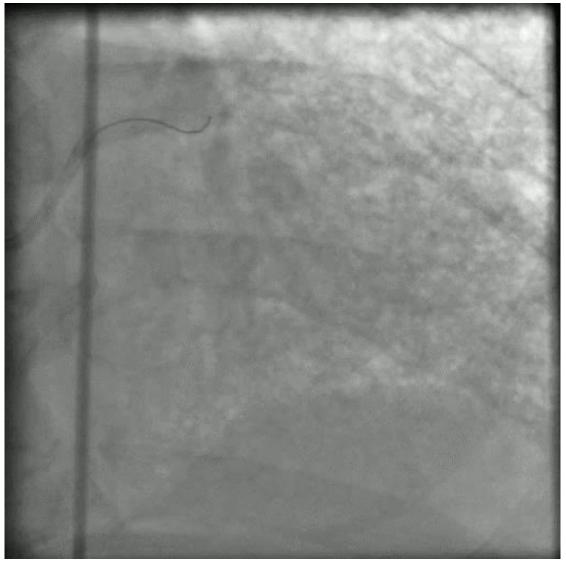
LVEF 20%

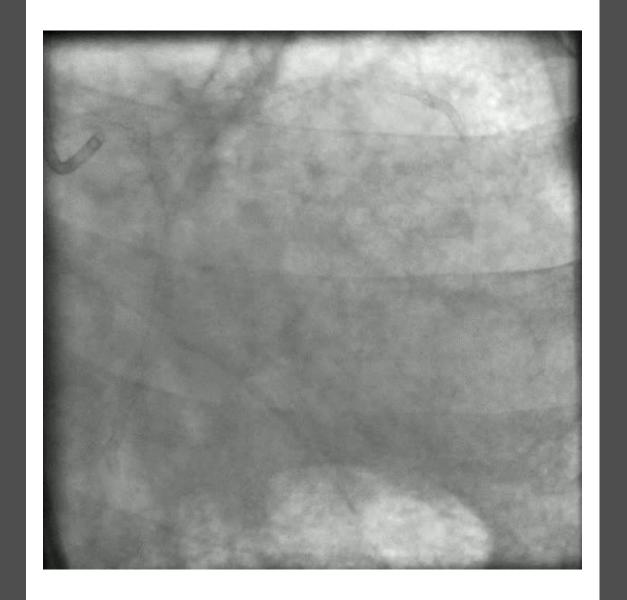
Last coronary angiography aborted after first two injections due to pulmonary edema.

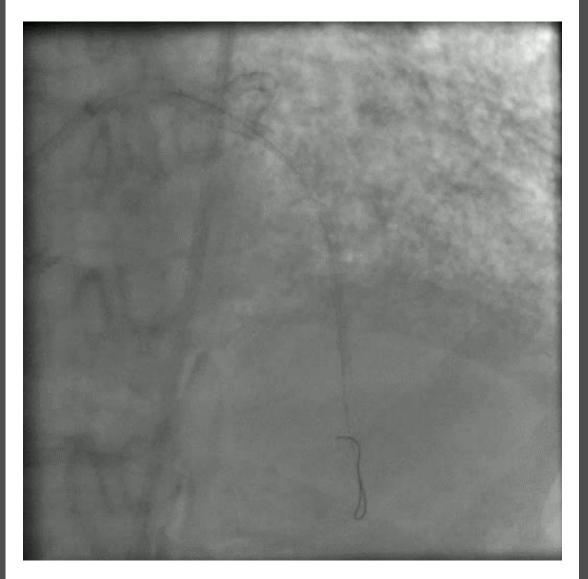












TAKE HOME MESSAGE



ECLS use in high risk patients may offer an opportunity for revascularization and myocardial recovery.



Selection of patients needs thorough and comprehensive evaluation.

\$

Selection of ECLS depends on center experience, availability and cost.



ECMO availability in many centres can offer the suitable solution.





Thank you