Mechanical Support Devices in High-Risk and/or Complex PCI

David Geffen School of Medicine

UCLA Health

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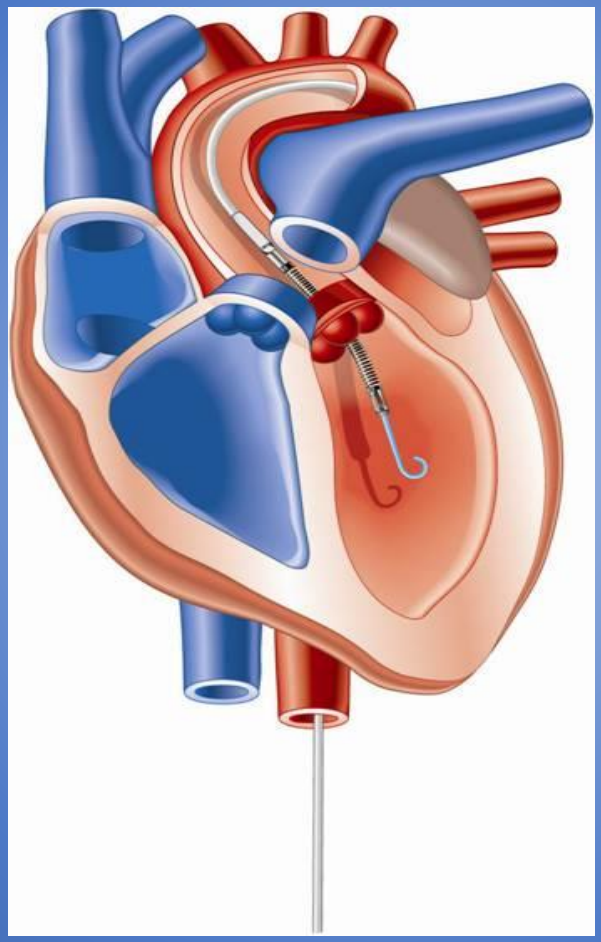
Associate Professor

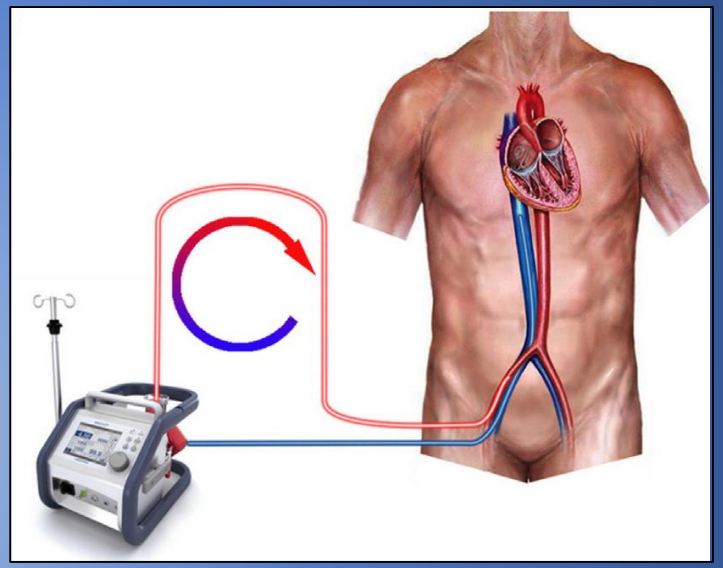
Percutaneous LV Assist Devices

IABP

Impella

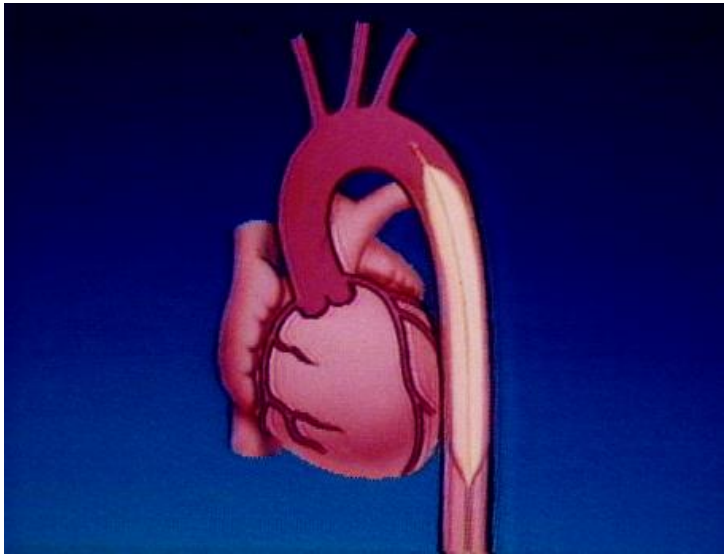


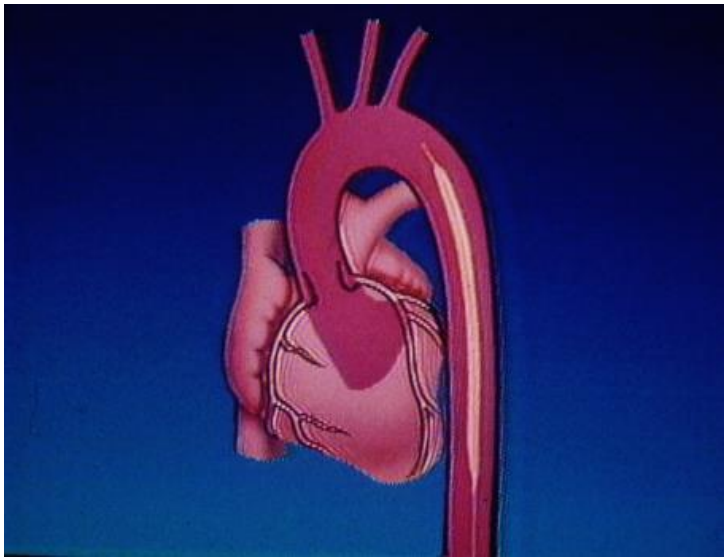
ECMO



Lee MS. Cardiol Clin 2006;24:265-275.

PCI with IABP

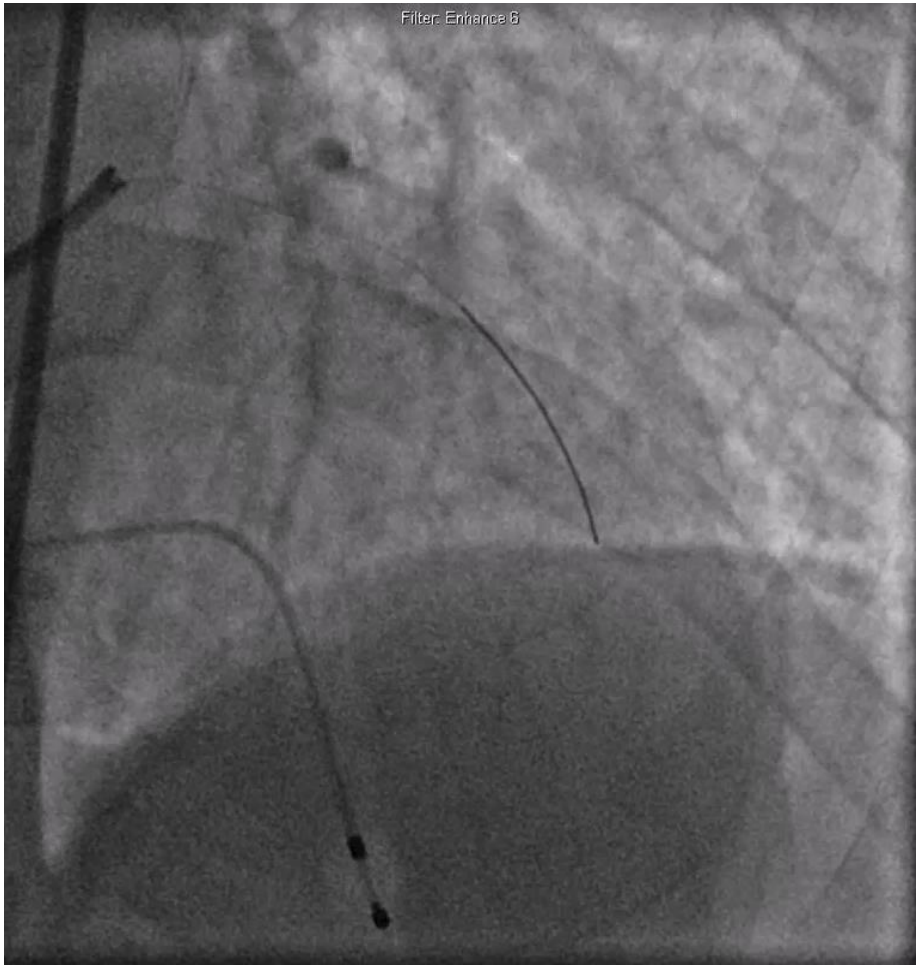




Advantages
- Easy
- Inexpensive ($800)
- 7F and 8F

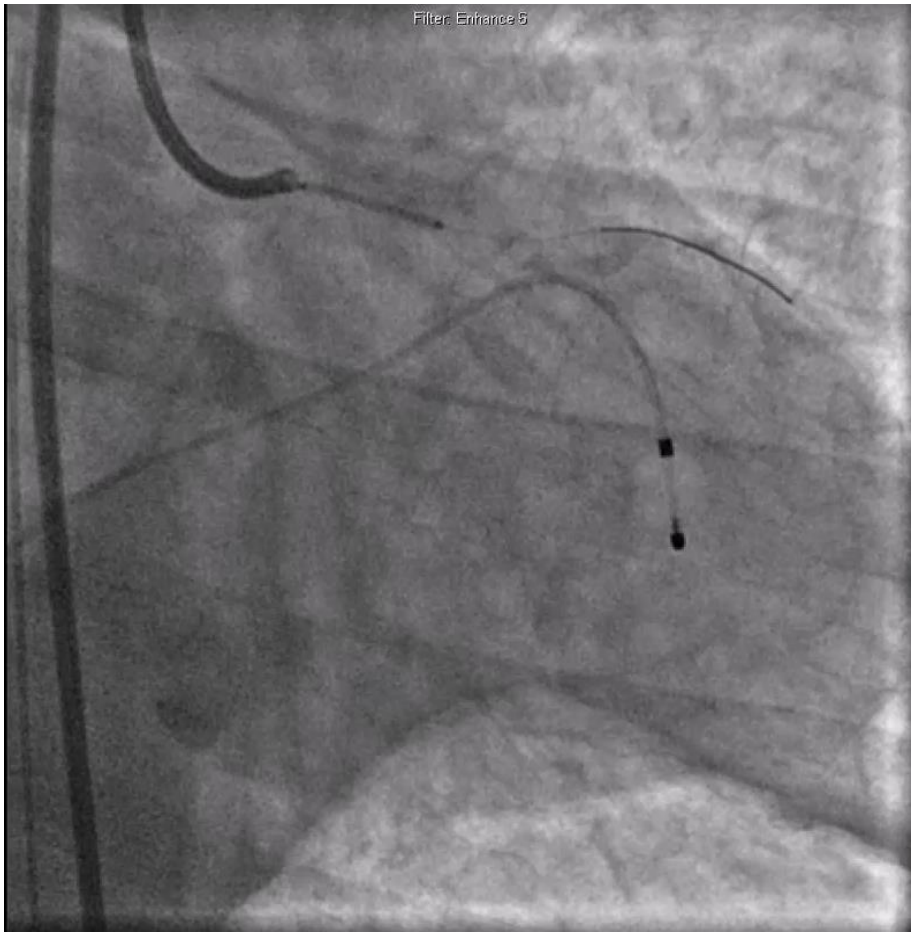
Disadvantages
- Increases cardiac output by 0.5 L/m

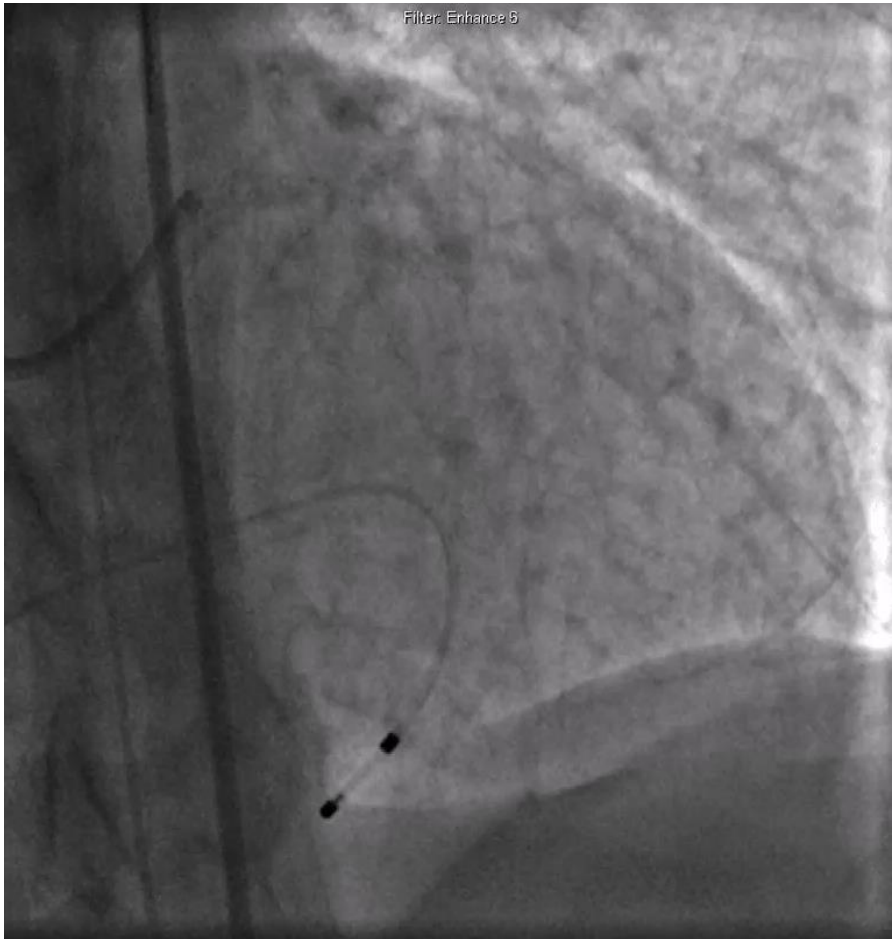
ULMCA PCI
With IABP



68 y.o. male with chest pain, ST-elevation in V1-V6, shock on inotropes

ULMCA PCI With IABP

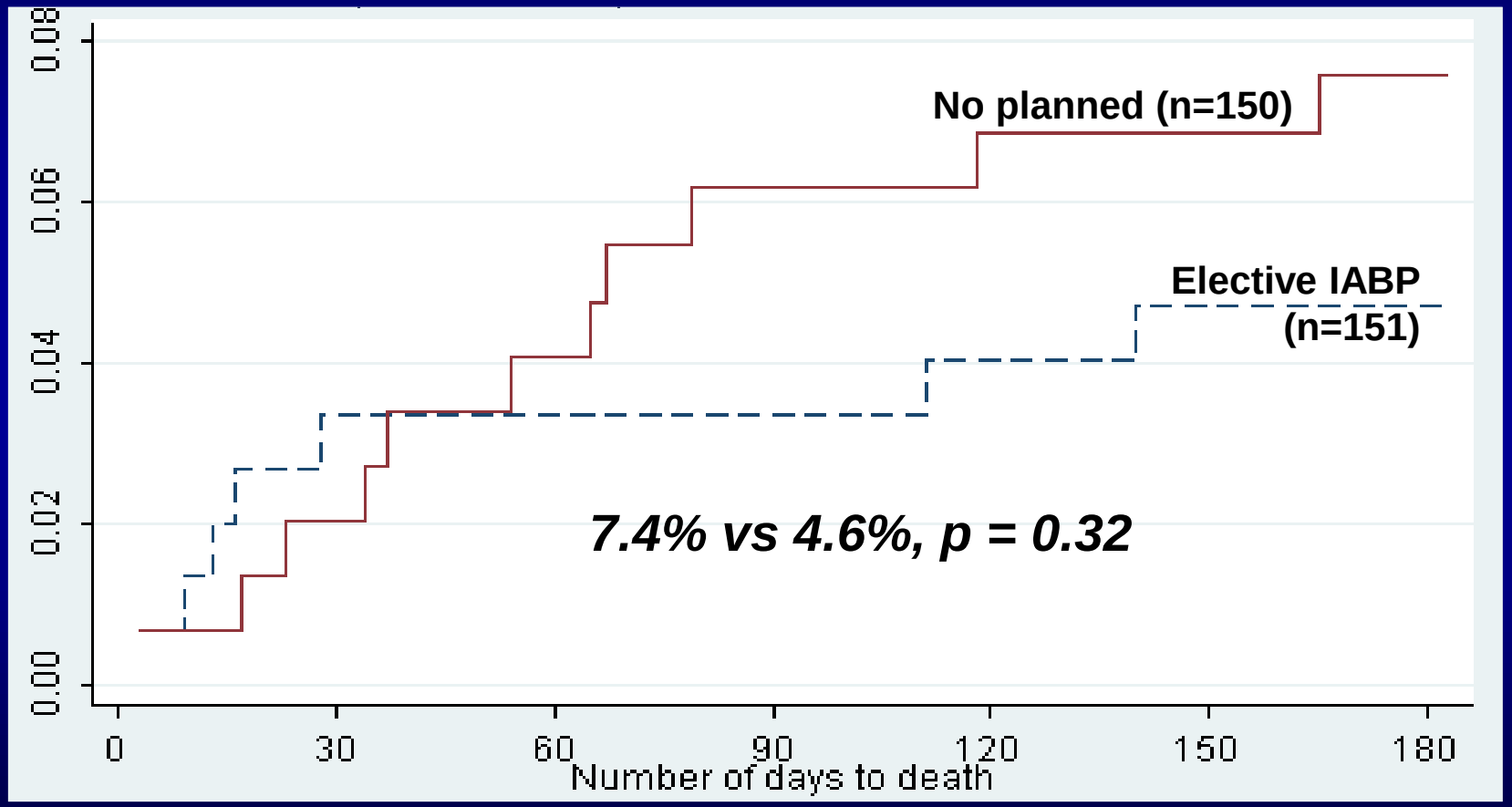




68 y.o. male with chest pain, ST-elevation in V1-V6, shock on inotropes

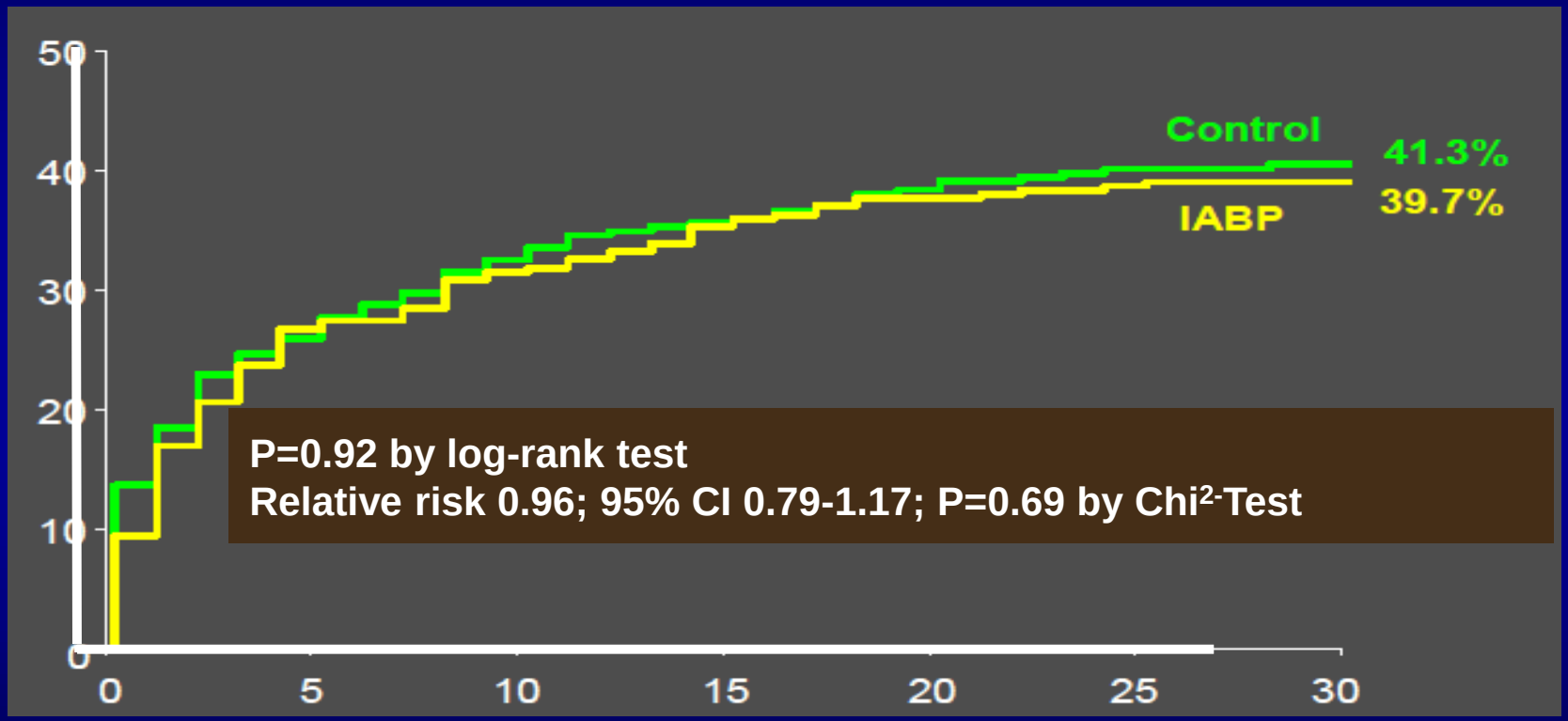
Balloon-pump assisted Coronary Intervention Study: *BCIS-1*

Kaplan Meier 6 month mortality



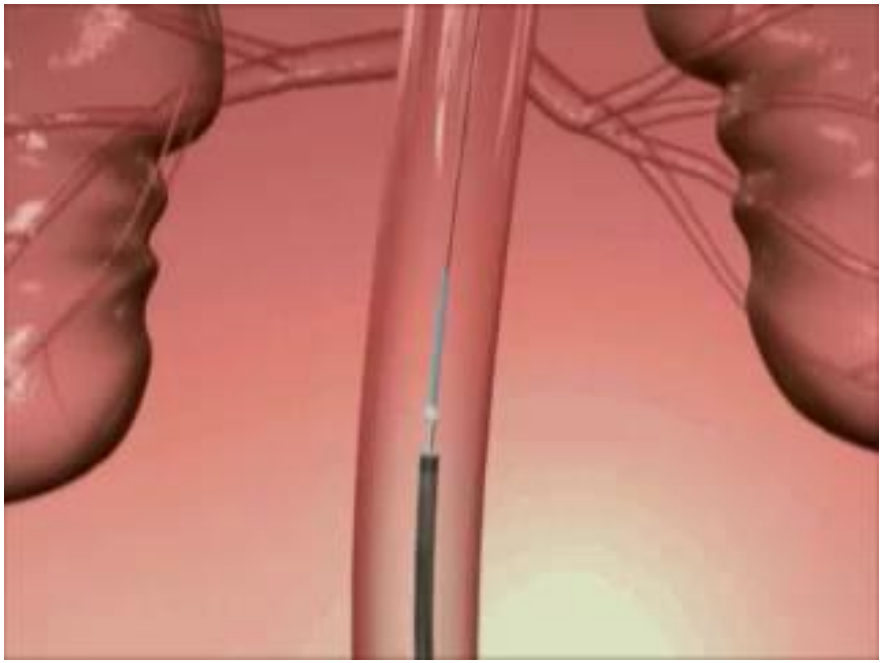
Perera D et al. JAMA 2010;304:867.

IABP-Shock II Trial
Primary Study Endpoint:
30-day Mortality



Thiele H et al. NEJM 2012;367:1287.

PCI with Impella



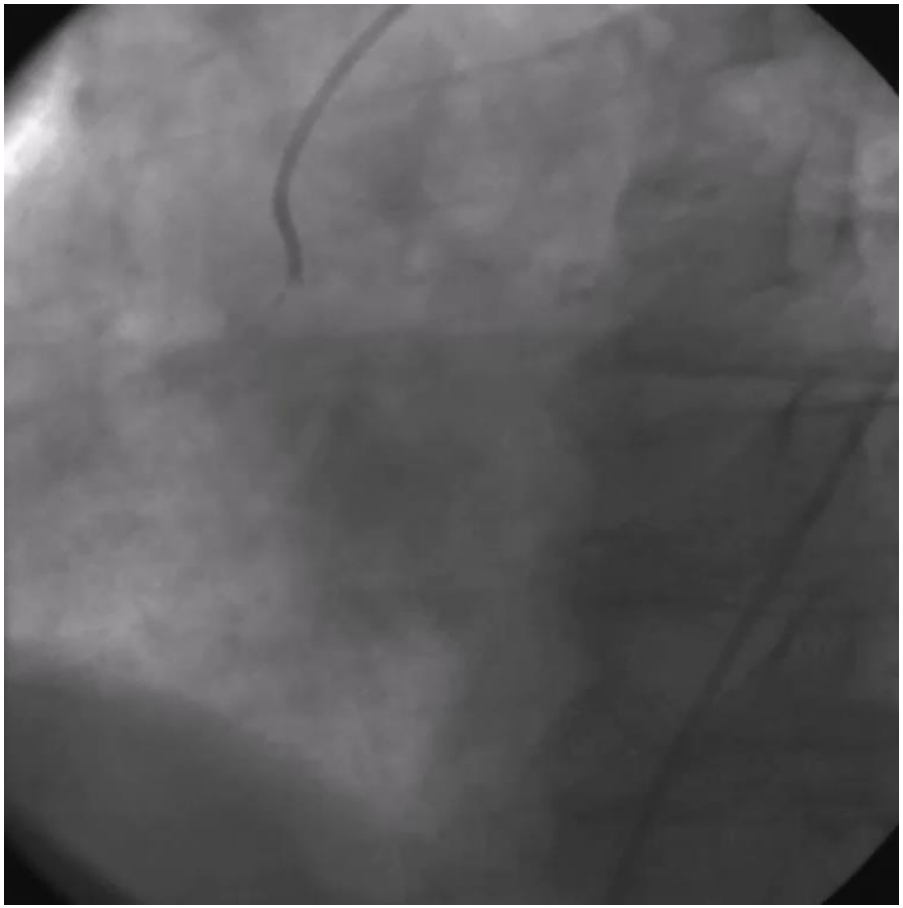
Advantages

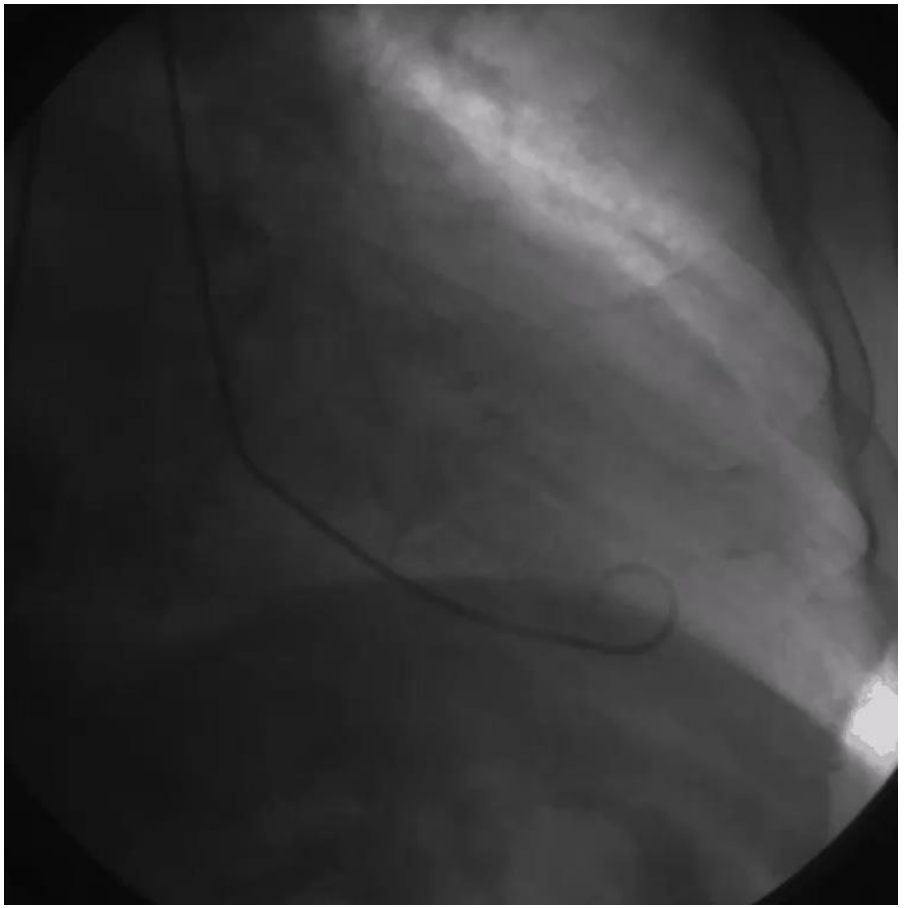
- Augment cardiac output by 3.5 L/min
- Use up to 7 days
- Does not require stable cardiac rhythm or native cardiac output/blood pressure signal for optimal function
- Unloads left ventricle

Disadvantages

- Requires 14 F catheter
- Non-pulsatile flow
- $20,000

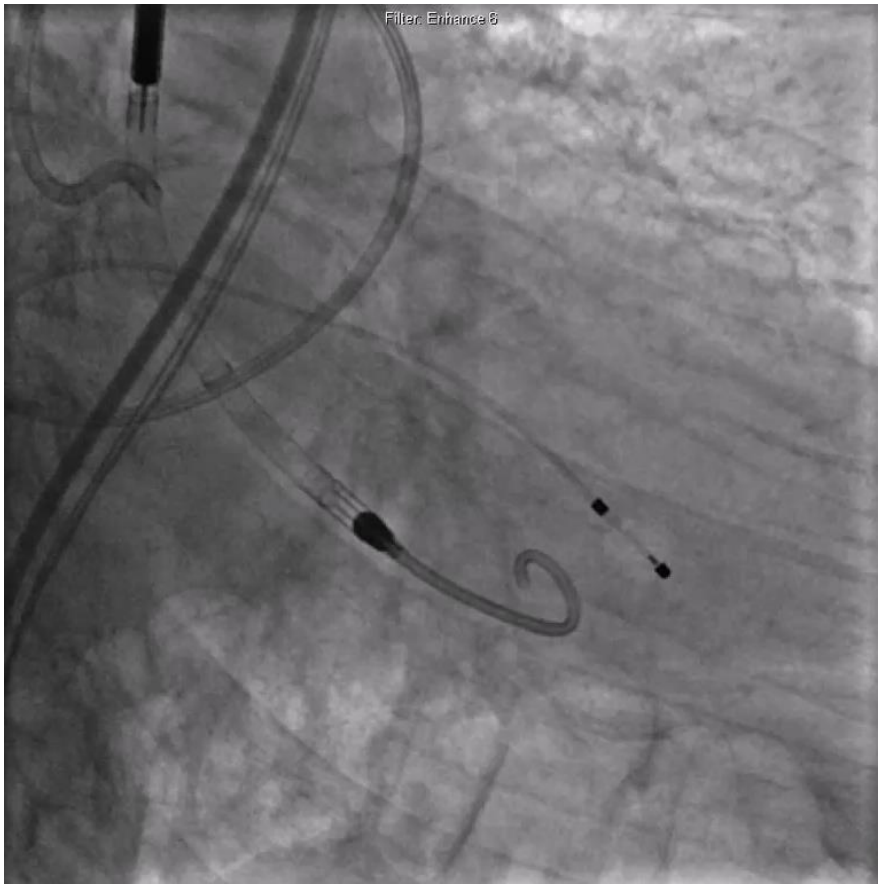
ULMCA PCI
With Impella





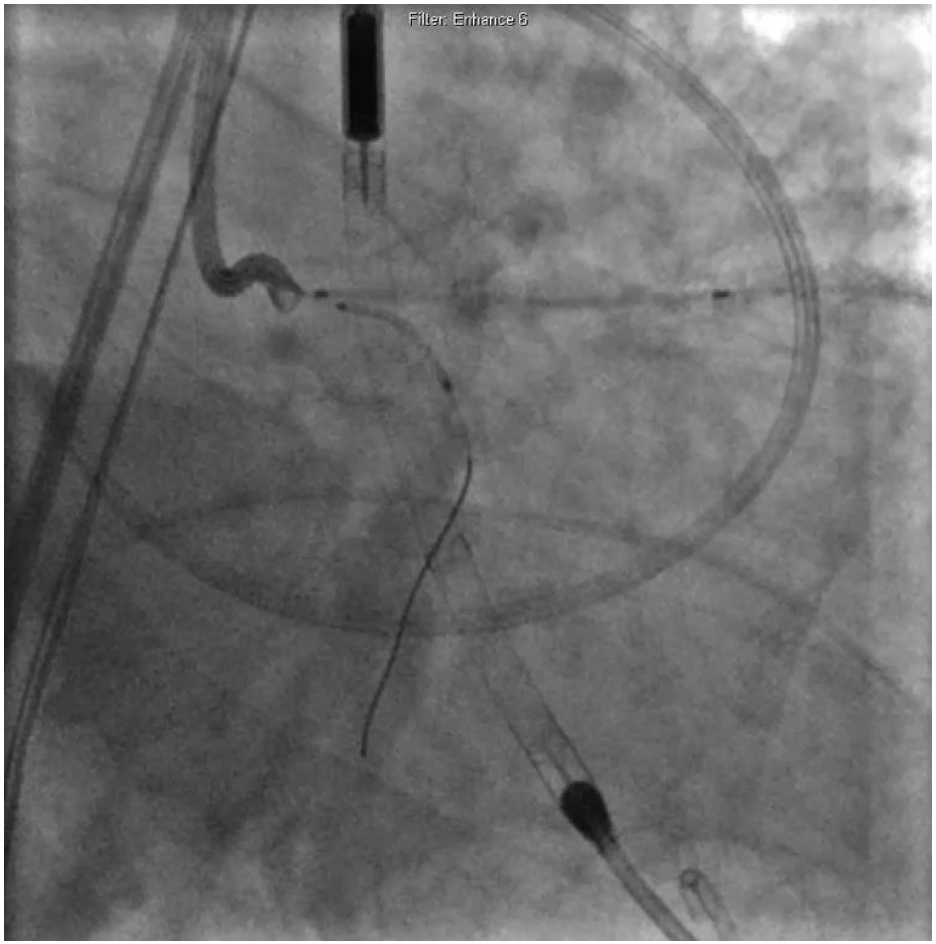
85 y.o. male with CKD, polio presents with NSTEMI

ULMCA PCI
With Impella



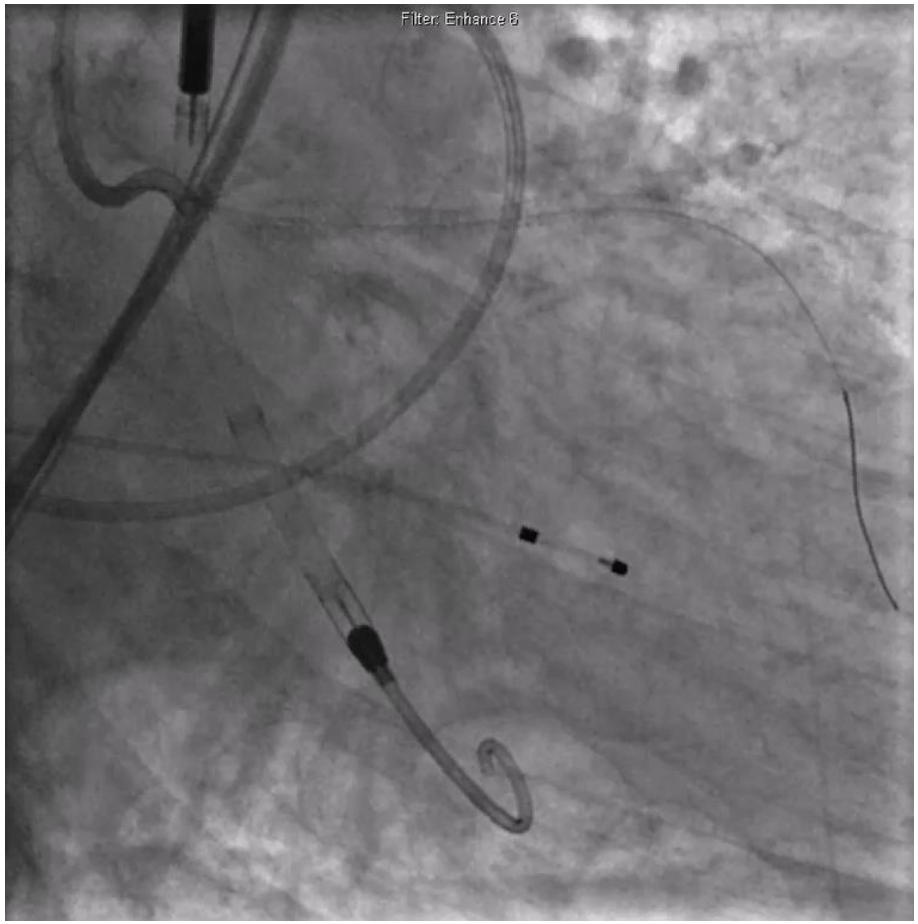
ULMCA PCI With Impella

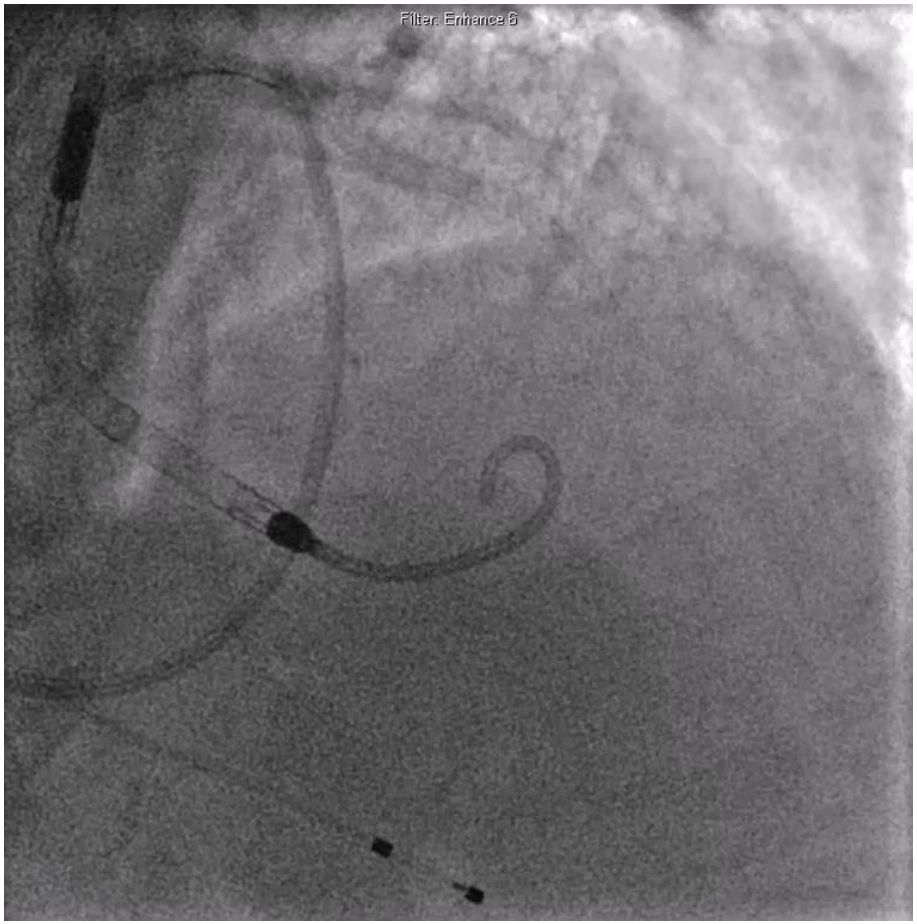
Rotational atherectomy



Crush technique

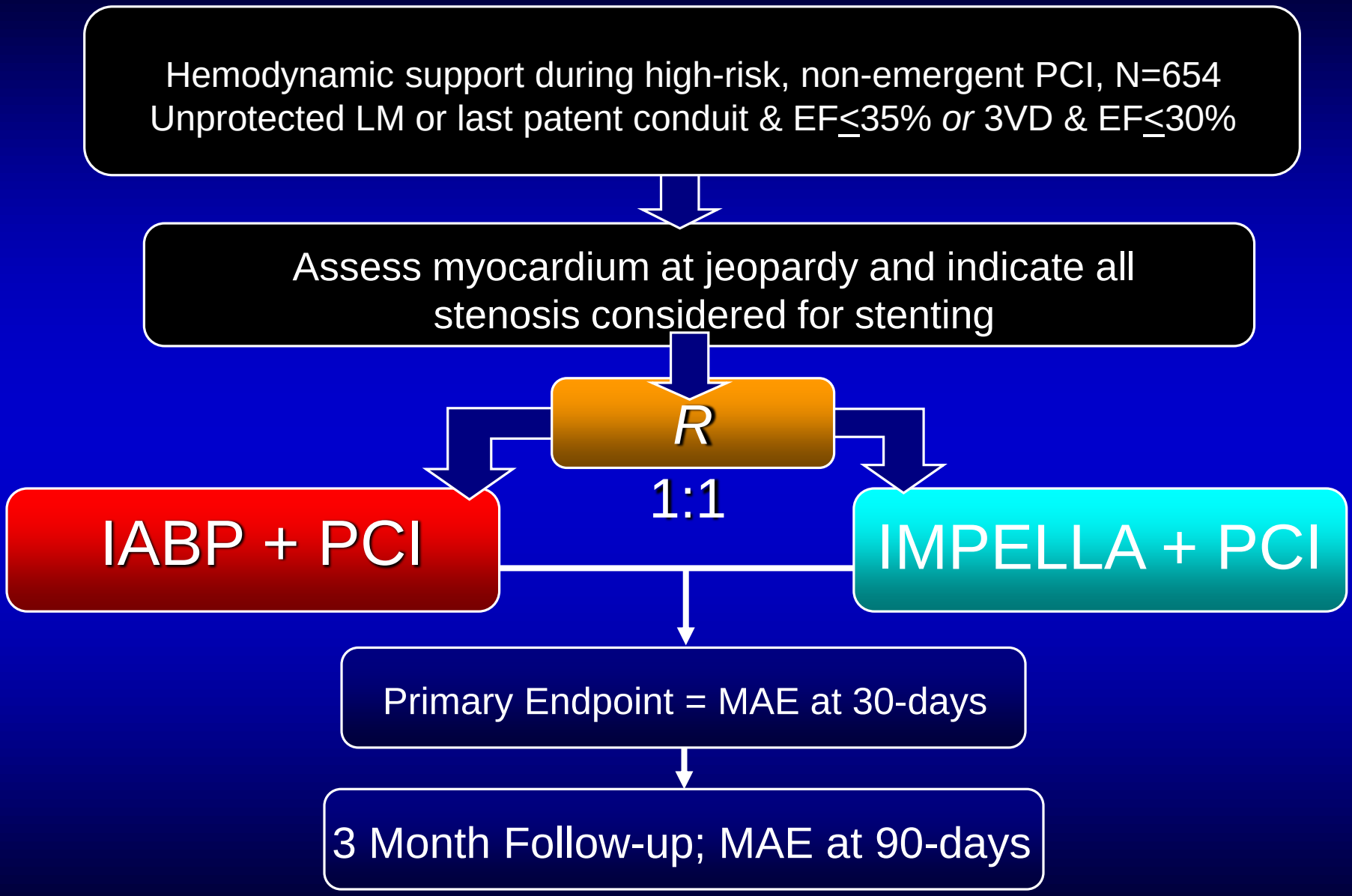
ULMCA PCI
With Impella





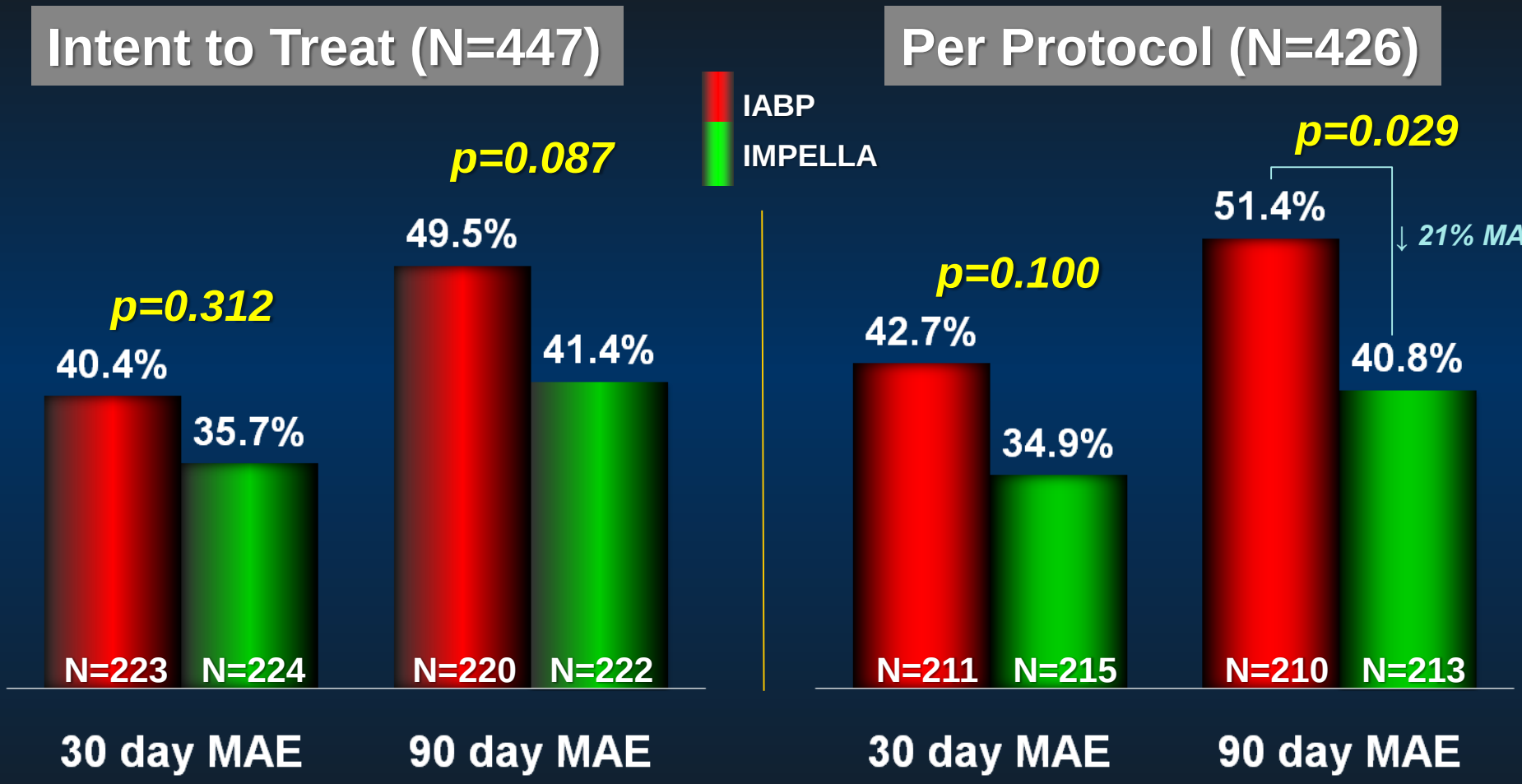
Final angiography

PROTECT II Trial Design



O'Neill et al, Circulation. 2012;126:1717

PROTECT II MAE Outcome



MAE= Major Adverse Event Rate

Per Protocol= Patients that met all incl./ excl. criteria.

PCI with ECMO

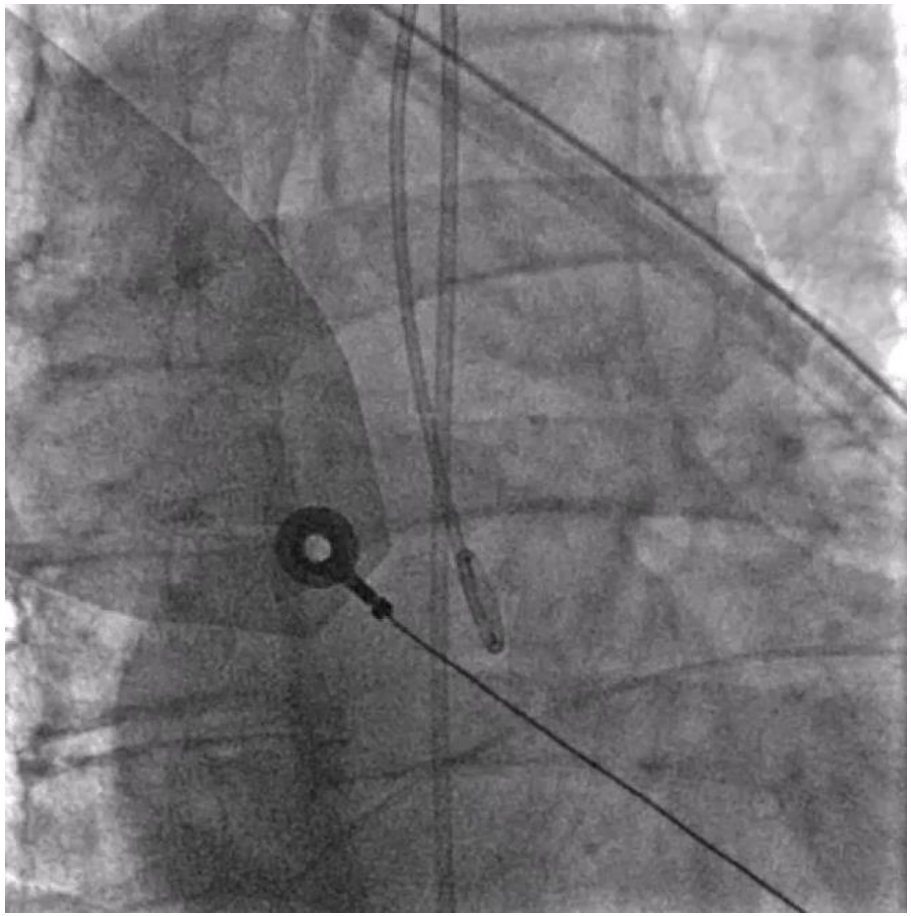
Advantages

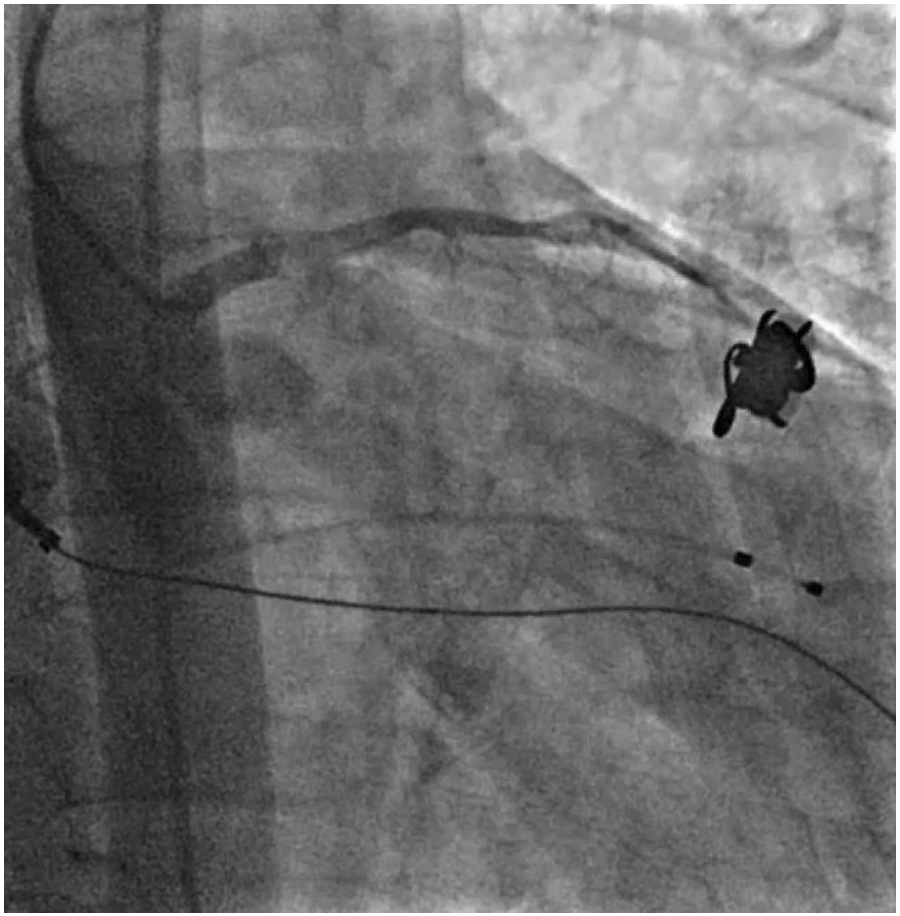
- Augment cardiac output by >4.5 L/min
- Use up to several weeks
- Does not require stable cardiac rhythm or native cardiac output/blood pressure signal for optimal function
- Does not require fluoroscopy

Disadvantages

- Requires 21F and 18F catheters
- Non-pulsatile flow
- Increases afterload
- $25,000
- Dedicated perfusionist at bedside

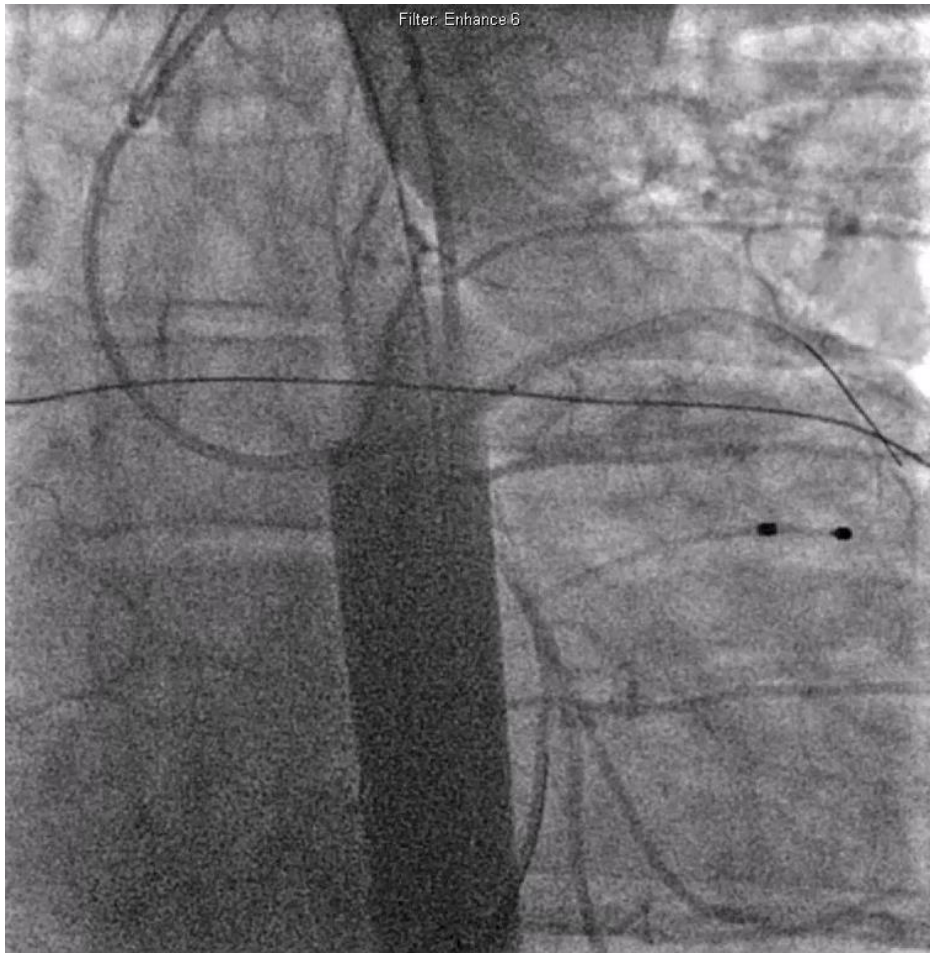
ULMCA PCI With ECMO





49 y.o. male with inferior ST-elevation and cardiac arrest in ED

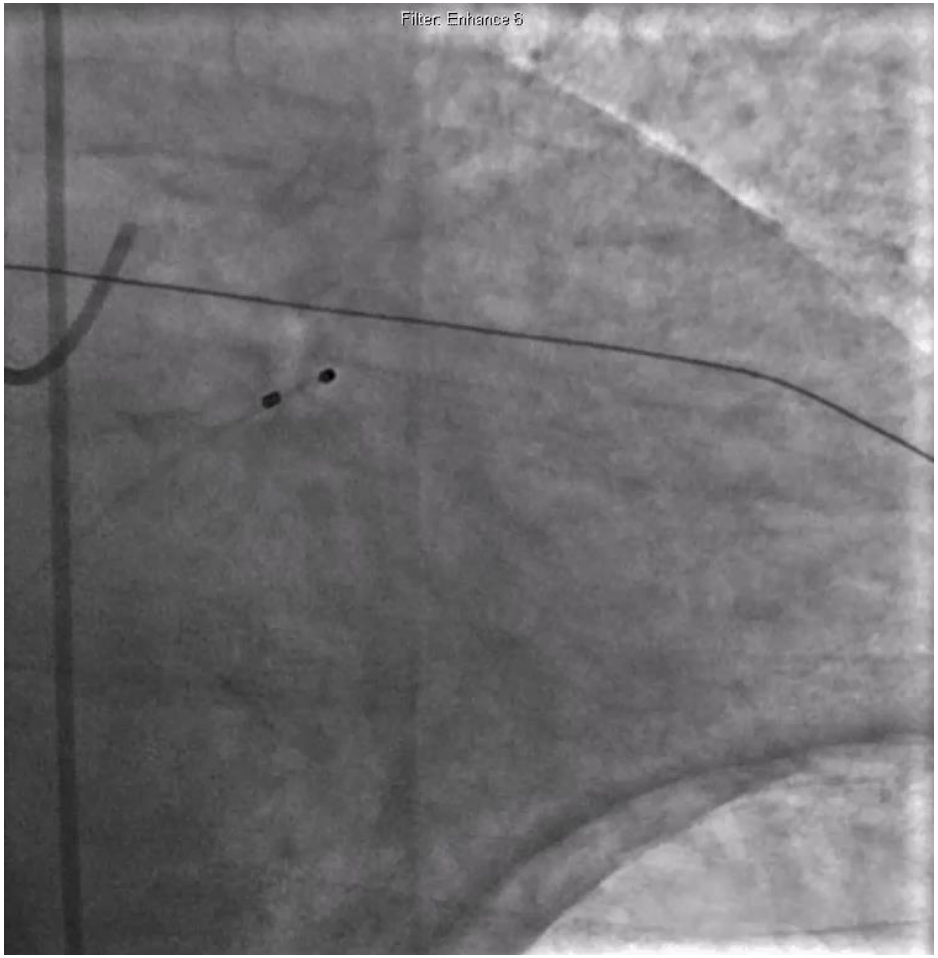
ULMCA PCI With ECMO



LM stent across LCX
ECMO inserted

Compromise of LCX

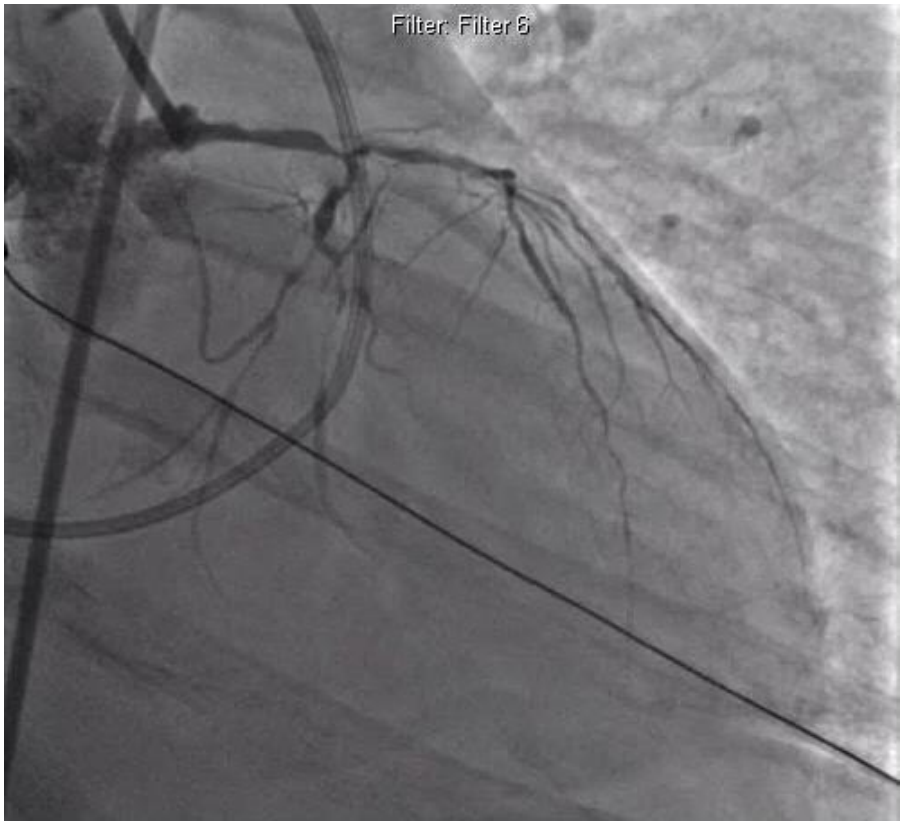
ULMCA PCI With ECMO



Final angiography

Ventricular fibrillation

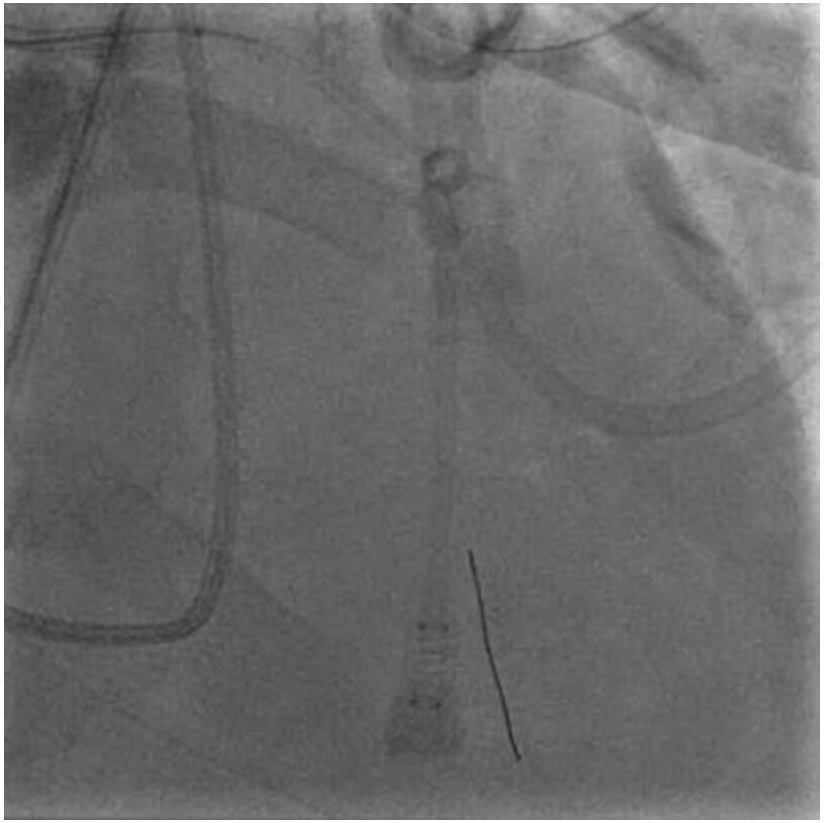
ULMCA PCI
With ECMO

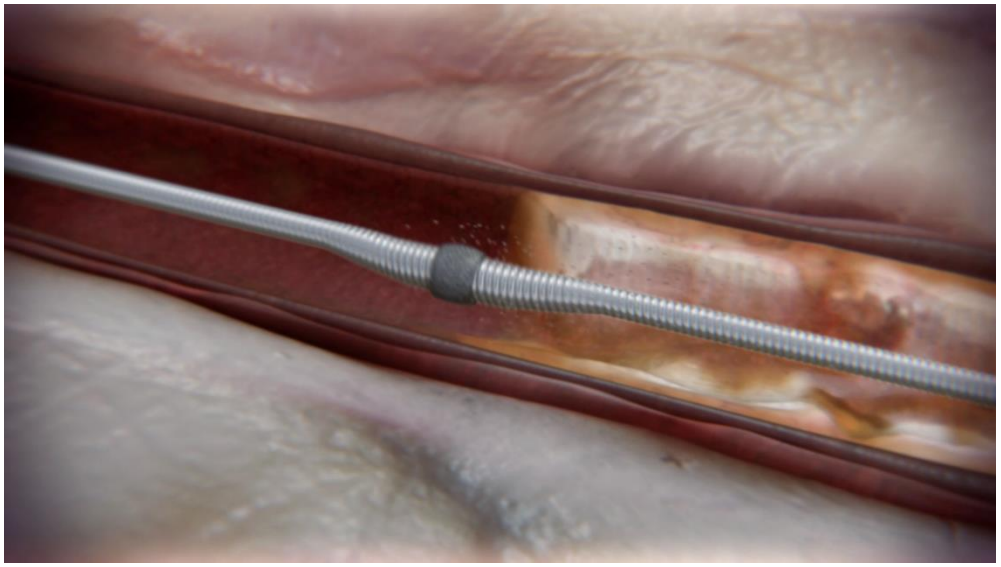


48 y.o. male with DM who presents with MI, cardiac arrest, cardiogenic shock, on ECMO

Orbital Atherectomy

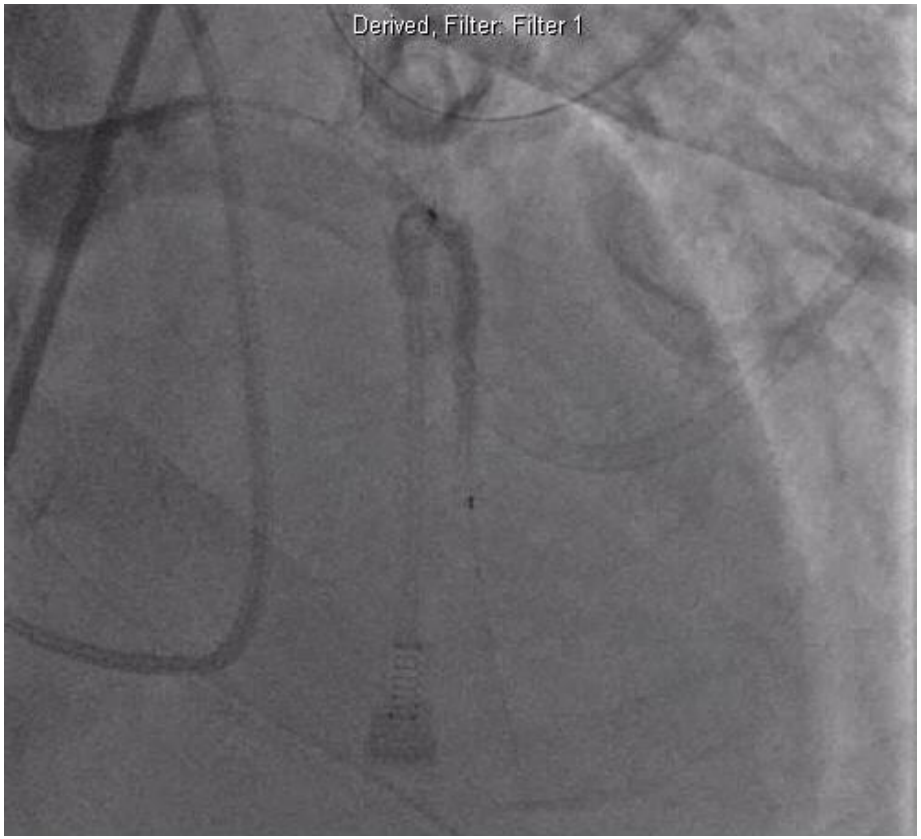
Differential Sanding and Centrifugal Force

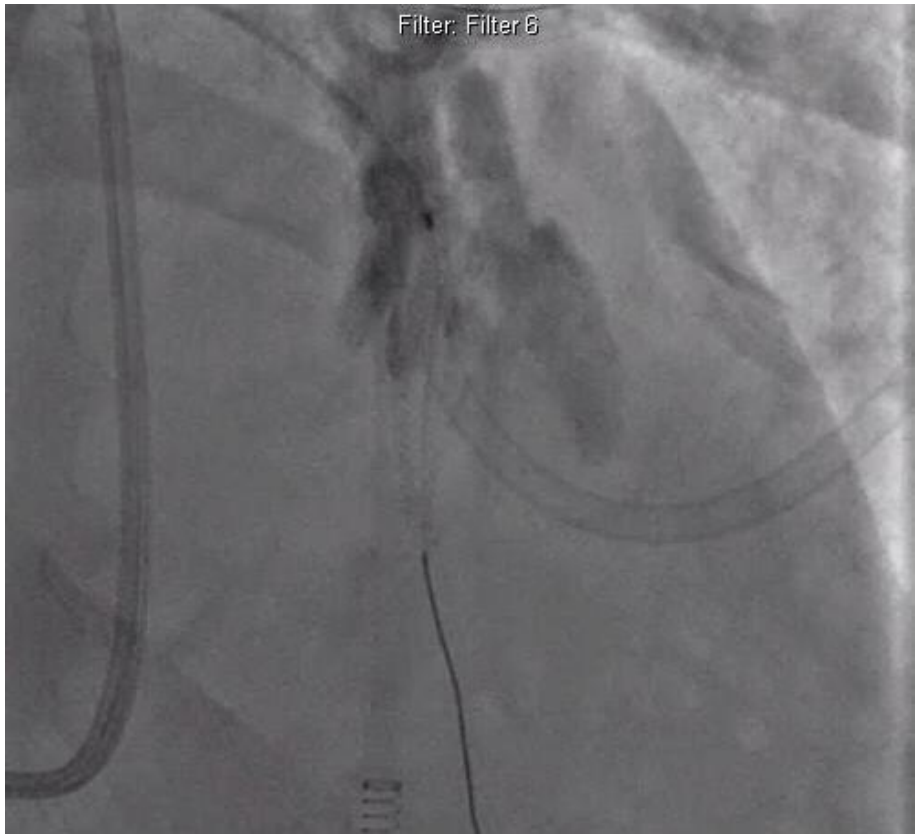




MOA treats 360˚ of the vessel.The diamond coated crown sands away calcium and allows healthy elastic tissue to flex away minimizing injury to the vessel.

ULMCA PCI With ECMO



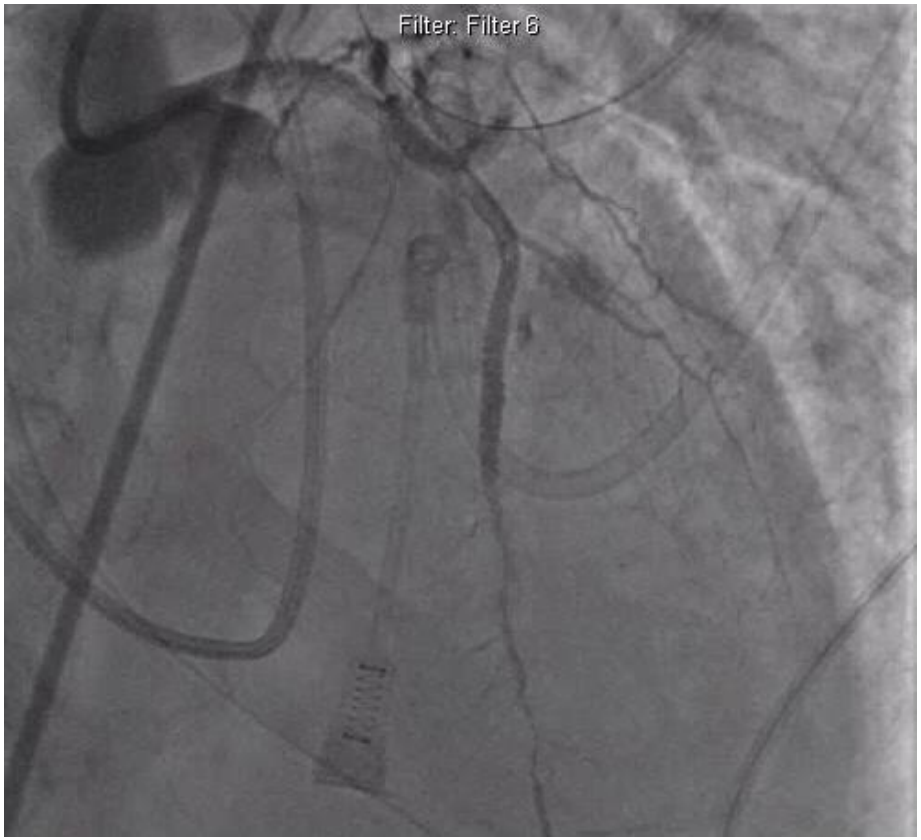


2.75 x 38 mm EES

Grade 3 perforation

ULMCA PCI With ECMO

LM stenting in LAO cranial



Final angiography after covered stent

ULMCA PCI in Myocardial Infarction

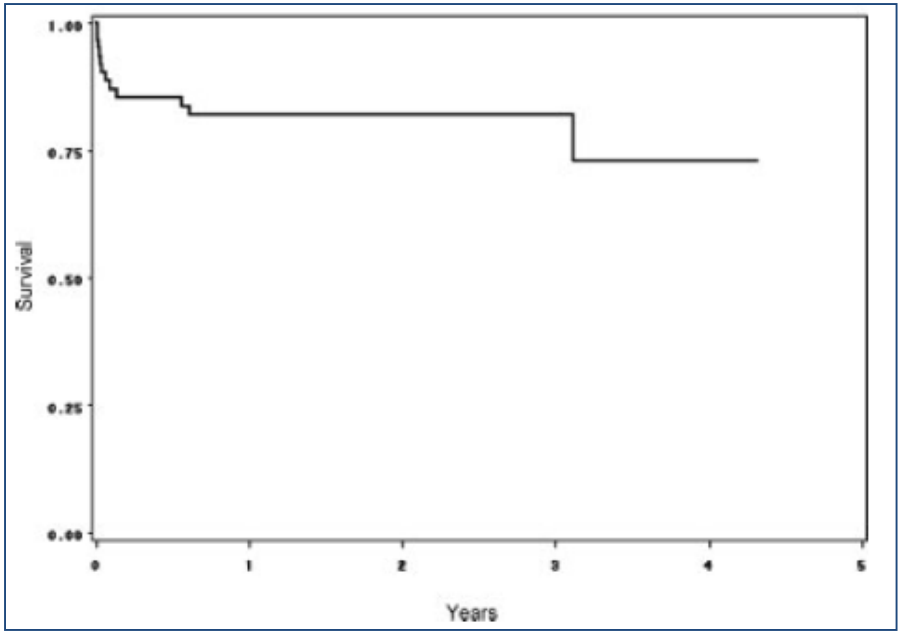
Multicenter International Registry of Unprotected Left Main Coronary Artery Percutaneous Coronary Intervention With Drug-Eluting Stents in Patients With Myocardial Infarction

Michael S. Lee,[1*] MD, Dario Sillano,[2] MD, Azeem Latib,[3] MD, Alaide Chieffo,[3] MD, Giuseppe Biondi Zoccai,[2] MD, Ravi Bhatia,[1] Imad Sheiban,[2] MD, Antonio Colombo,[3] MD, and Jonathan Tobis,[1] MD

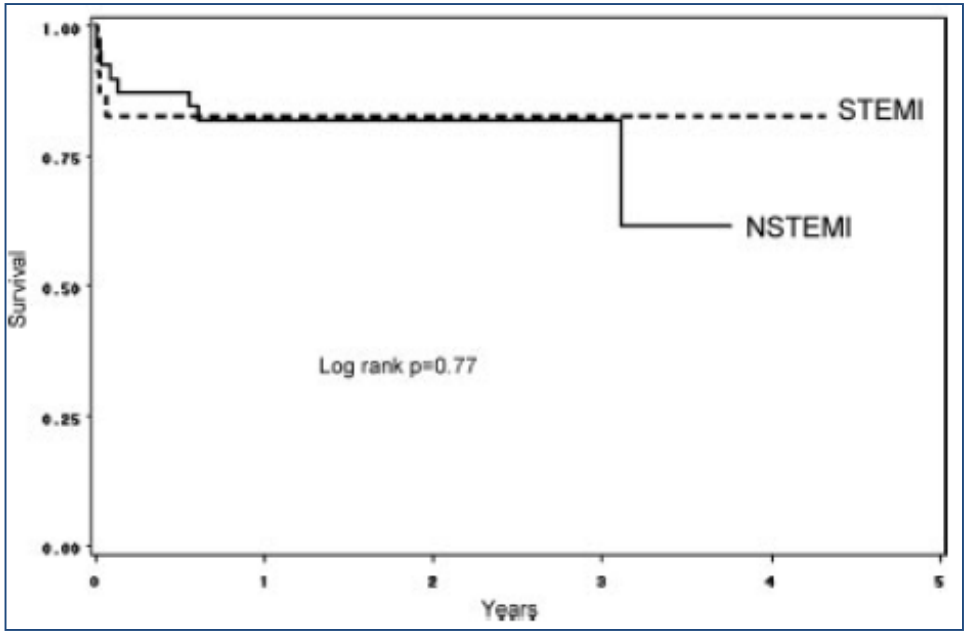
Background: Patients who present with myocardial infarction (MI) and unprotected left main coronary artery (ULMCA) disease represent an extremely high-risk subset of patients. ULMCA percutaneous coronary intervention (PCI) with drug-eluting stents (DES) in MI patients has not been extensively studied. **Methods:** In this retrospective multicenter international registry, we evaluated the clinical outcomes of 62 consecutive patients with MI who underwent ULMCA PCI with DES (23 ST-elevation MI [STEMI] and 39 non-ST-elevation MI [NSTEMI]) from 2002 to 2006. **Results:** The mean age was 70 ± 12 years. Cardiogenic shock was present in 24%. The mean EuroSCORE was 10 ± 8. Angiographic success was achieved in all patients. Overall in-hospital major adverse cardiac event (MACE) rate was 10%, mortality was 8%, all due to cardiac deaths from cardiogenic shock, and one patient suffered a periprocedural MI. At 586 ± 431 days, 18 patients (29%) experienced MACE, 12 patients (19%) died (the mortality rate was 47% in patients with cardiogenic shock), and target vessel revascularization was performed in four patients, all of whom had distal bifurcation involvement (two patients underwent repeat PCI and two patients underwent bypass surgery). There was no additional MI. Two patients had probable stent thrombosis and one had possible stent thrombosis. Diabetes [hazard ratio (HR) 4.22, 95% confidence interval (CI) (1.07–17.36), $P = 0.04$), left ventricular ejection fraction [HR 0.94, 95% CI (0.90–0.98), $P = 0.005$), and intubation [HR 7.00, 95% CI (1.62–30.21), $P = 0.009$) were significantly associated with increased mortality. **Conclusions:** Patients with MI and ULMCA disease represent a very high-risk subgroup of patients who are critically ill. PCI with DES appears to be technically feasible, associated with acceptable long-term outcomes, and a reasonable alternative to surgical revascularization for MI patients with ULMCA disease. Randomized trials are needed to determine the ideal revascularization strategy for these patients.

ULMCA PCI in Myocardial Infarction

Overall Survival

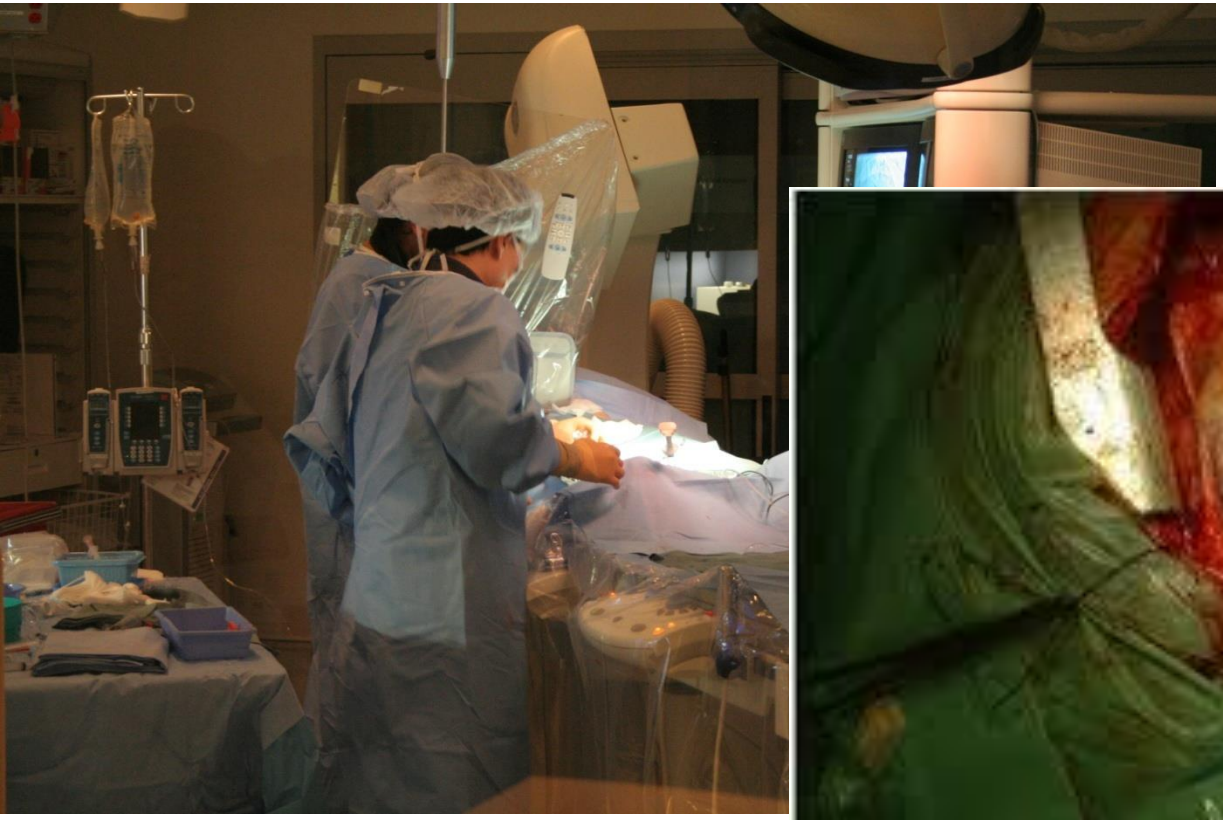


STEMI vs. NSTEMI



N=62
Cardiogenic shock 24%
All in-hospital deaths from cardiogenic shock

ULMCA PCI in Myocardial Infarction



Minimum 1 hour

ULMCA PCI in Myocardial Infarction

STATE-OF-THE-ART PAPER

Unprotected Left Main Coronary Disease and ST-Segment Elevation Myocardial Infarction

"Absent a randomized trial, it is our belief that physicians and guidelines committees should recognize emergent PCI as the preferred reperfusion modality for selected patients with MI and LMCA occlusion."

pared with CABG with acceptable short- and long-term outcomes, and is associated with a lower risk of stroke. PCI of the ULMCA should be considered as a viable alternative to CABG for selected patients with MI, including those with ULMCA occlusion and less than Thrombolysis In Myocardial Infarction flow grade 3, cardiogenic shock, persistent ventricular arrhythmias, and significant comorbidities. The higher risk of target vessel revascularization associated with ULMCA PCI compared with CABG is an acceptable tradeoff given the primary need for rapid reperfusion to enhance survival. (J Am Coll Cardiol Intv 2010;3:791–5) © 2010 by the American College of Cardiology Foundation

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PRACTICE GUIDELINE

2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines and the Society for Cardiovascular Angiography and Interventions

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2.2. Revascularization to Improve Survival: Recommendations

Left Main CAD Revascularization

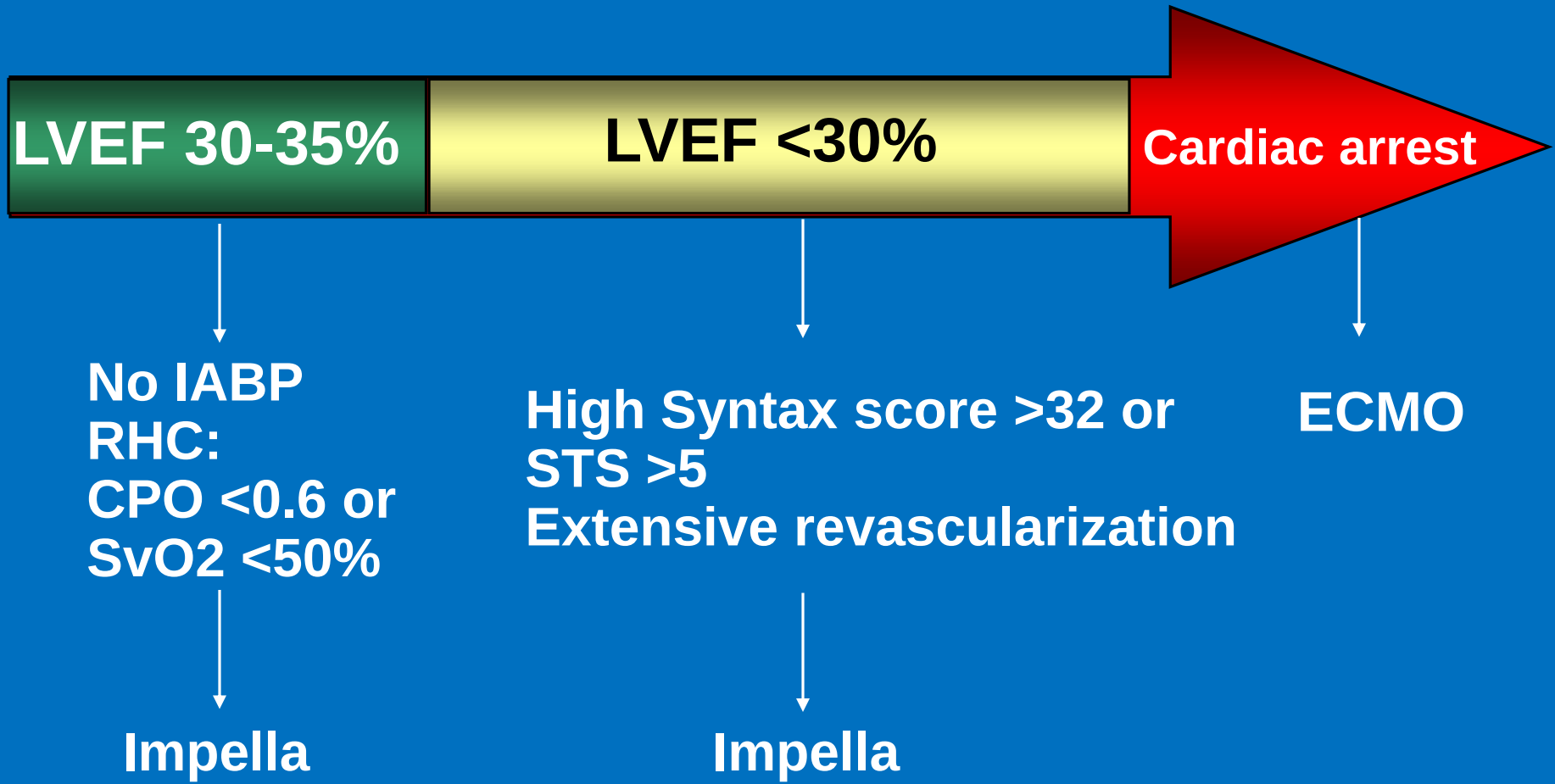
CLASS I

1. CABG to improve survival is recommended for patients with significant (≥50% diameter stenosis) left main coronary artery stenosis (24–30). *(Level of Evidence: B)*

CLASS IIa

1. PCI to improve survival is reasonable as an alternative to CABG in selected stable patients with significant (≥50% diameter stenosis) unprotected left main CAD with: 1) anatomic conditions associated with a low risk of PCI procedural complications and a high likelihood of good long-term outcome (e.g., a low SYNTAX score [≤22], ostial or trunk left main CAD); and 2) clinical characteristics that predict a significantly increased risk of adverse surgical outcomes (e.g., STS-predicted risk of operative mortality ≥5%) (13,17,19,23,31–48). *(Level of Evidence: B)*
2. PCI to improve survival is reasonable in patients with UA/NSTEMI when an unprotected left main coronary artery is the culprit lesion and the patient is not a candidate for CABG (13,36–39,44,45,47–49). *(Level of Evidence: B)*
3. PCI to improve survival is reasonable in patients with acute STEMI when an unprotected left main coronary artery is the culprit lesion, distal coronary flow is less than TIMI (Thrombolysis In Myocardial Infarction) grade 3, and PCI can be performed more rapidly and safely than CABG (33,50,51). *(Level of Evidence: C)*

LV Support during High-Risk PCI: *LVEF + Lesion Complexity*



CPO – Cardiac power output (MAP x CO)/451
SvO2 – Mixed venous oxygen saturation

Kareem Abdul Jabbar

All-time NBA scoring leader

Kareem Abdul Jabbar

All-time NBA scoring leader

John Wooden

10 time NCAA champion

"Failing to prepare is preparing to fail."