Coronary Physiology and Hemodynamic Support During Complex PCI

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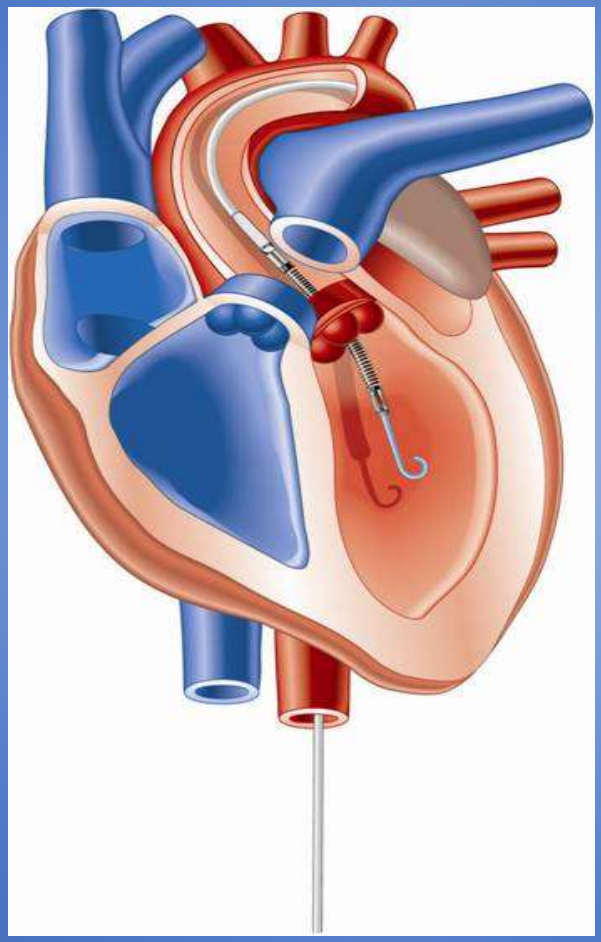
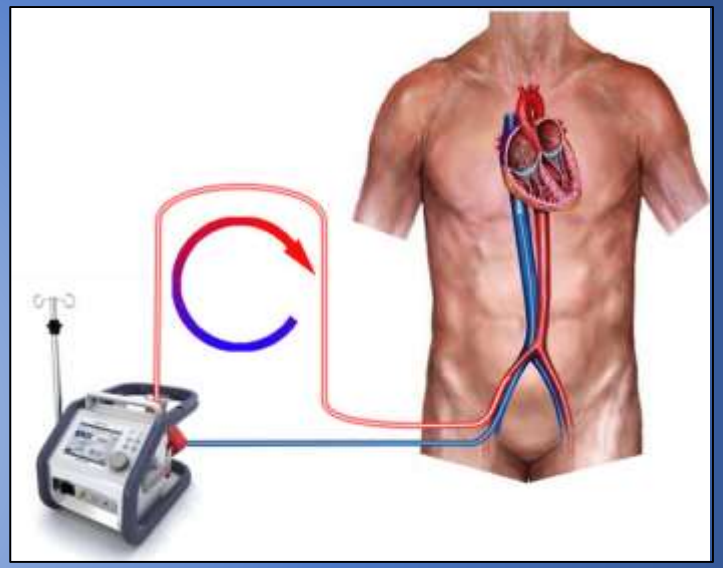
Percutaneous LV Assist Devices

IABP

Impella

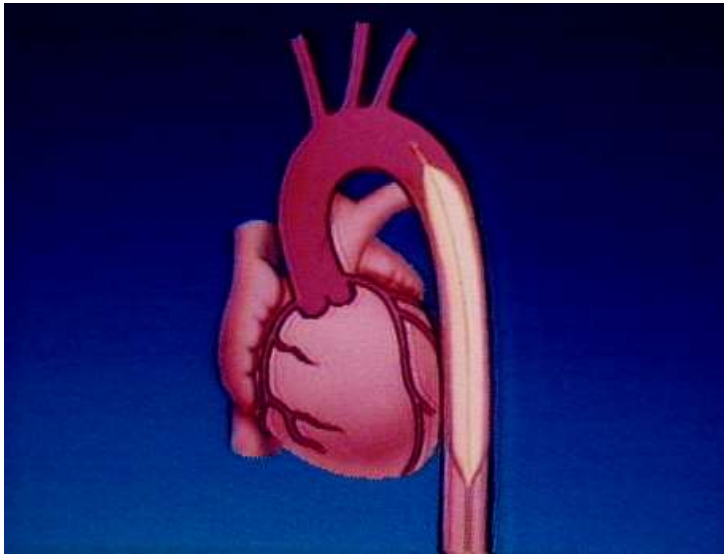


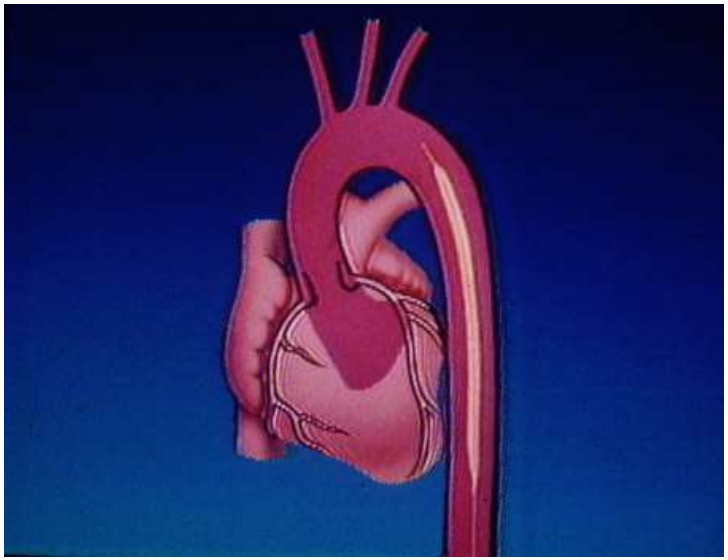
ECMO



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

PCI with IABP

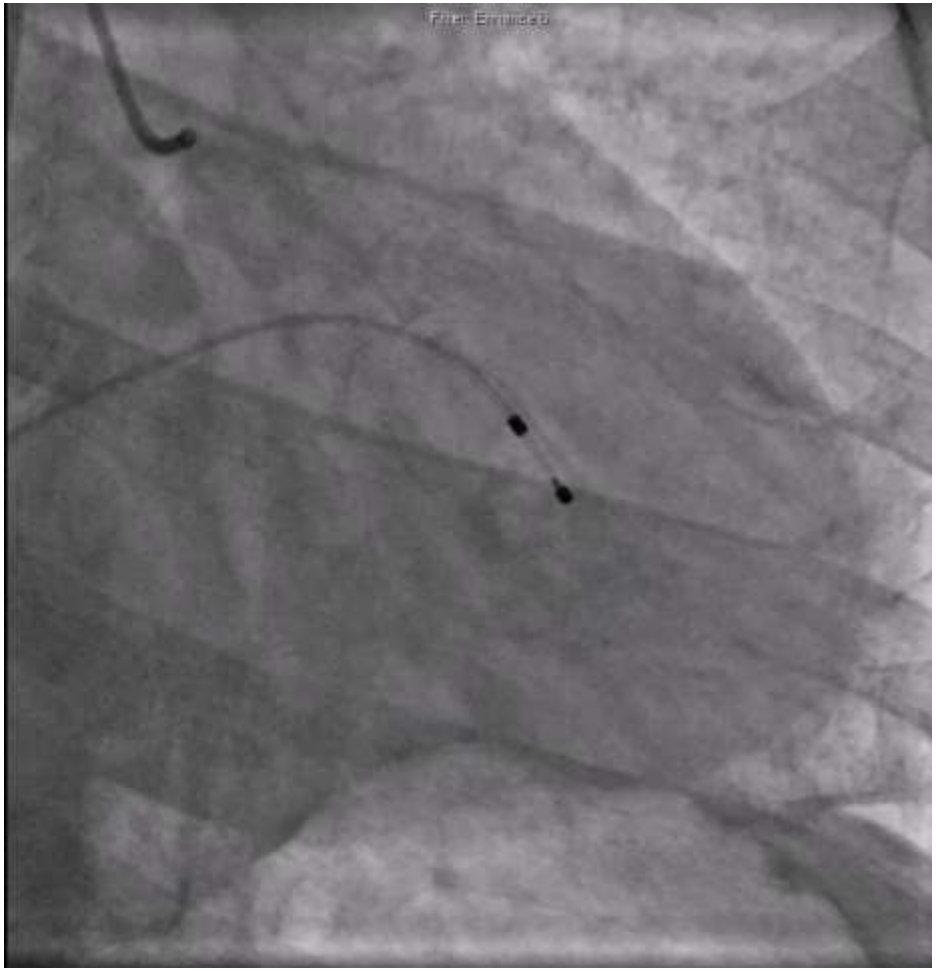


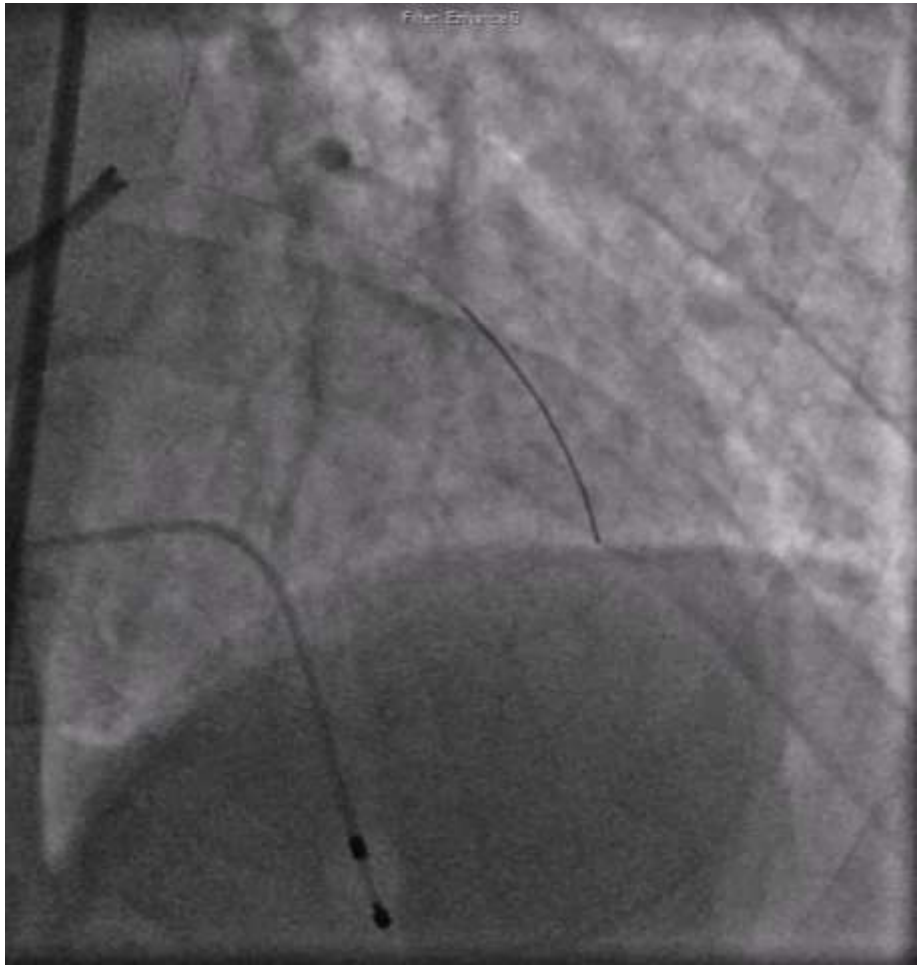


Advantages
- Easy
- Inexpensive ($800)
- 7F and 8F

Disadvantages
- Increases cardiac output by 0.5 L/m

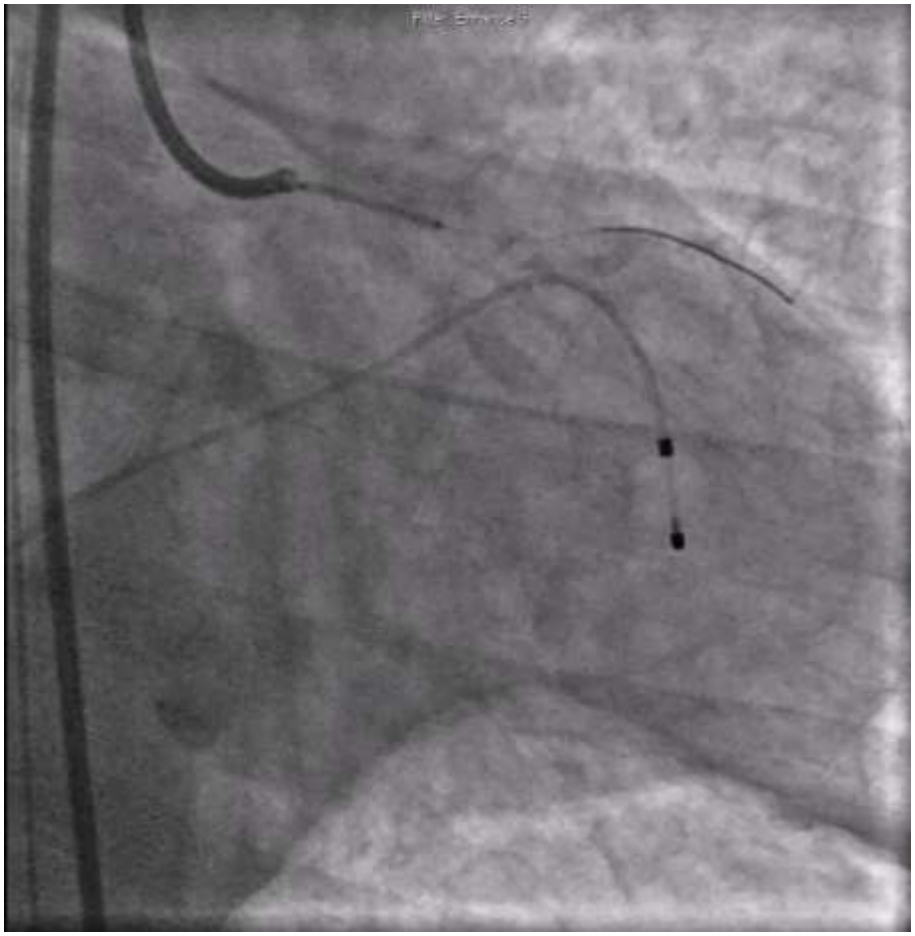
ULMCA PCI
With IABP

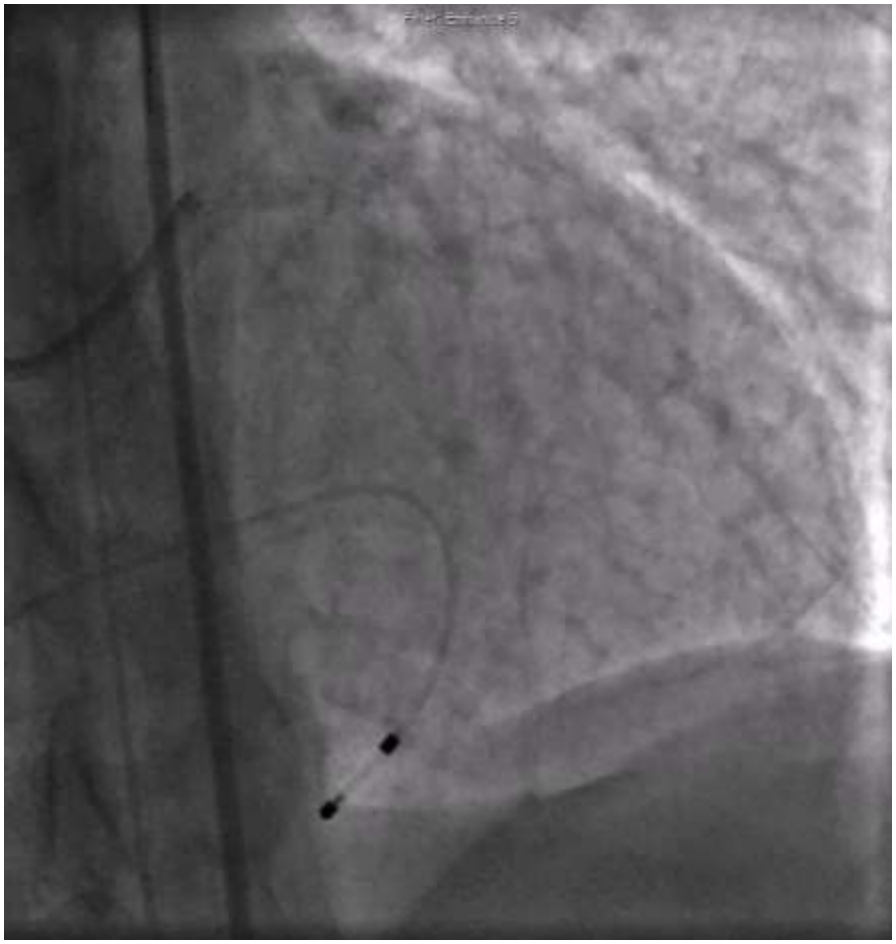




68 y.o. male with chest pain, ST-elevation in V1-V6, shock on inotropes

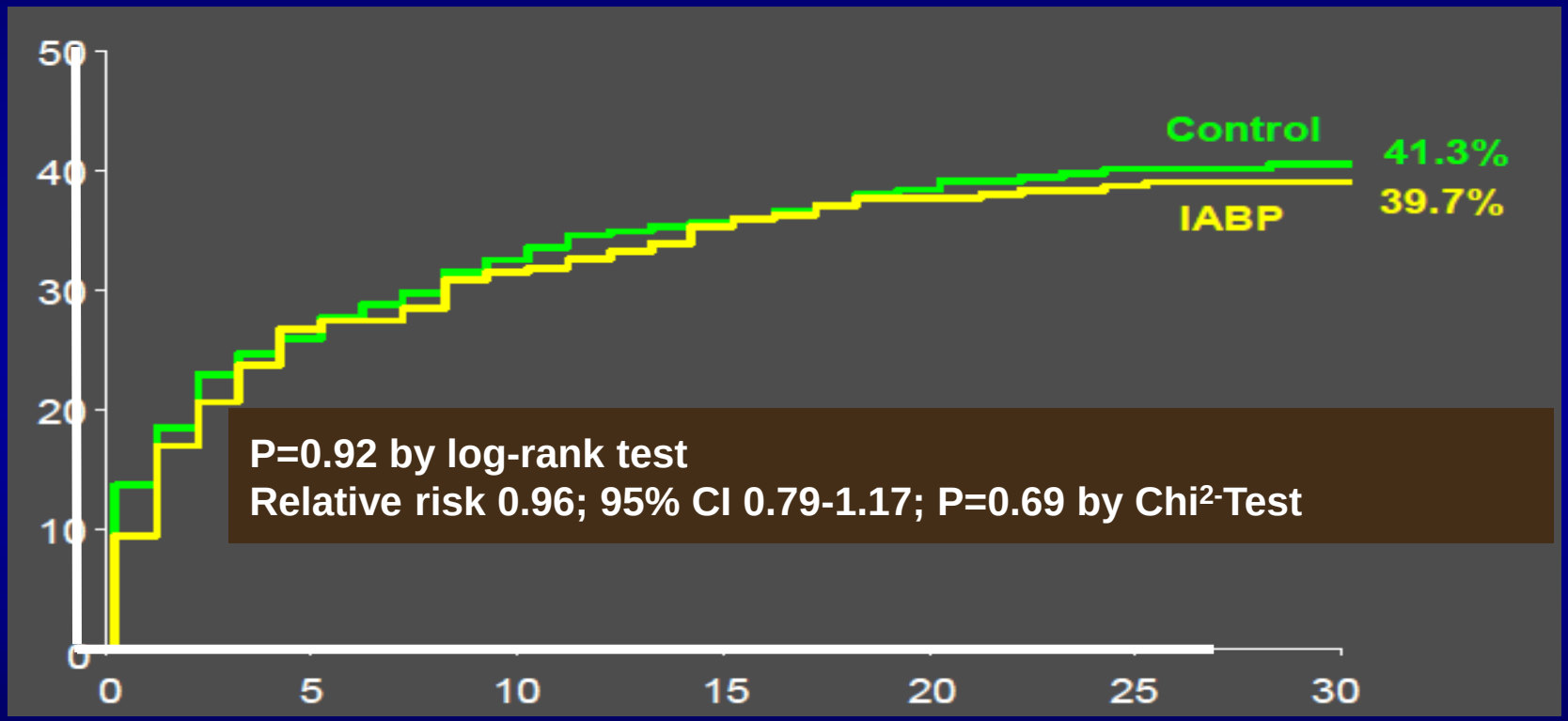
ULMCA PCI
With IABP





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

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



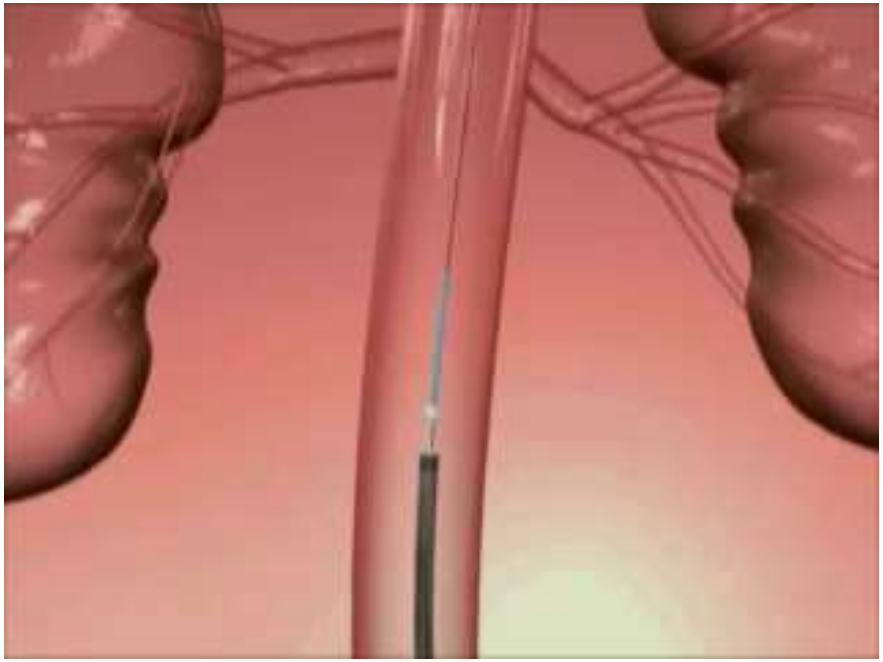
Thiele H et al. NEJM 2012;367:1287.

Impact of IABP on Coronary Physiology

- **Increase cardiac output by 0.5 L/min and diastolic blood pressure**
- **Improve coronary blood flow in nonstenotic arteries[1]**
- **No consistent improvement in coronary blood flow or coronary perfusion hemodynamics in the presence of a significant stenosis[2]**

1. Myat T, et al. JACC Cardiovasc Interv 2015;;8:229-44.
2. Kern MJ, et al. Circulation 1993;87:500-11.

PCI with Impella



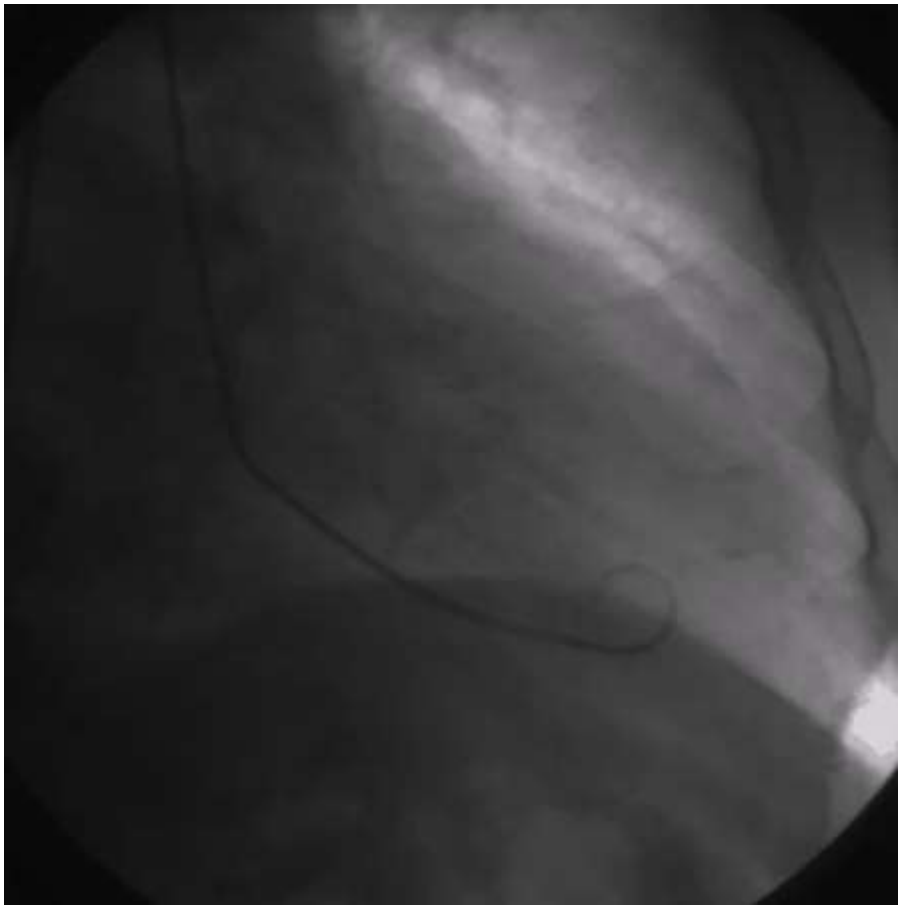
Advantages

- 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

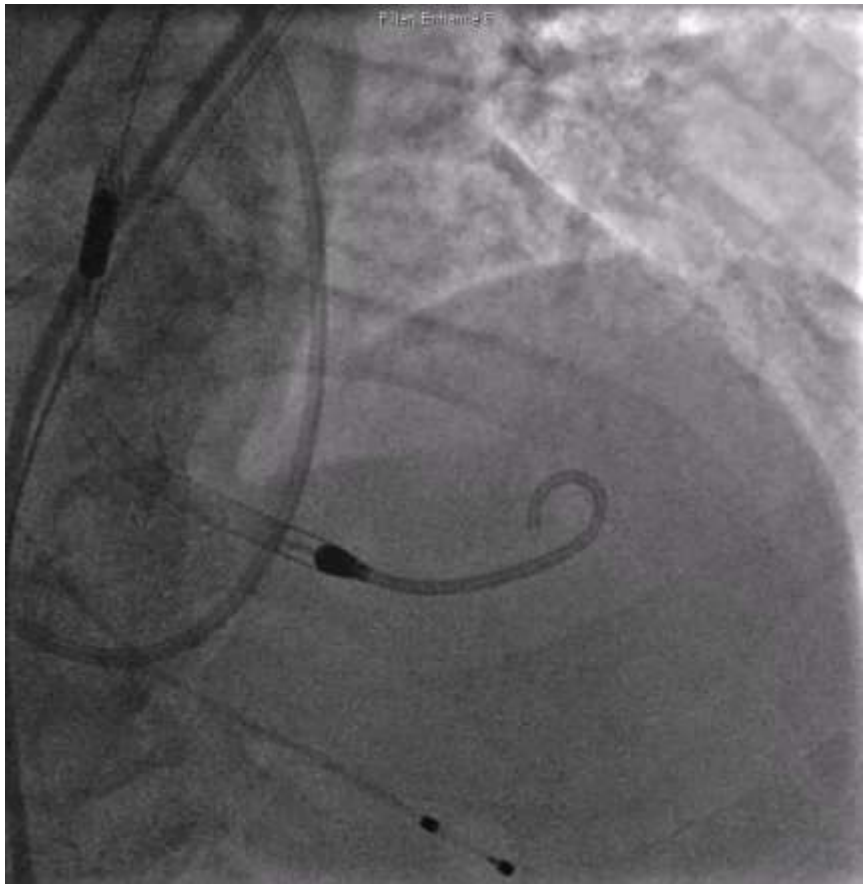
- Requires 14 F catheter
- Non-pulsatile flow
- $20,000

ULMCA PCI
With Impella

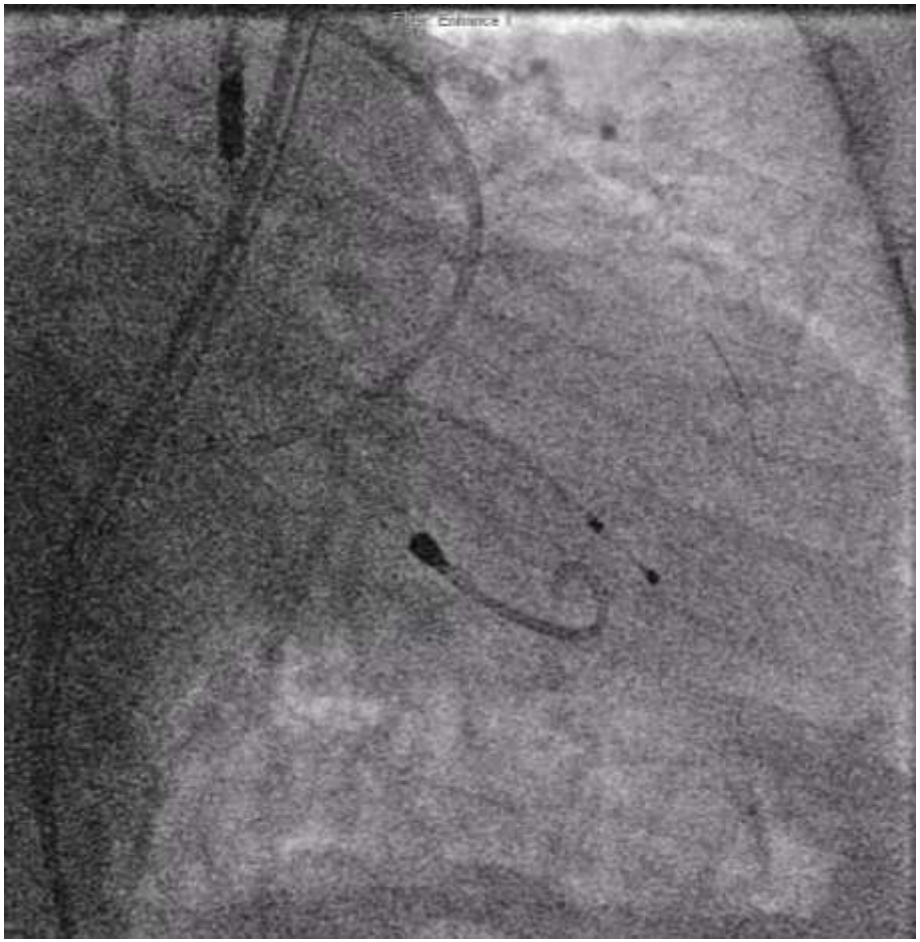


85 y.o. male with CKD, polio presents with NSTEMI

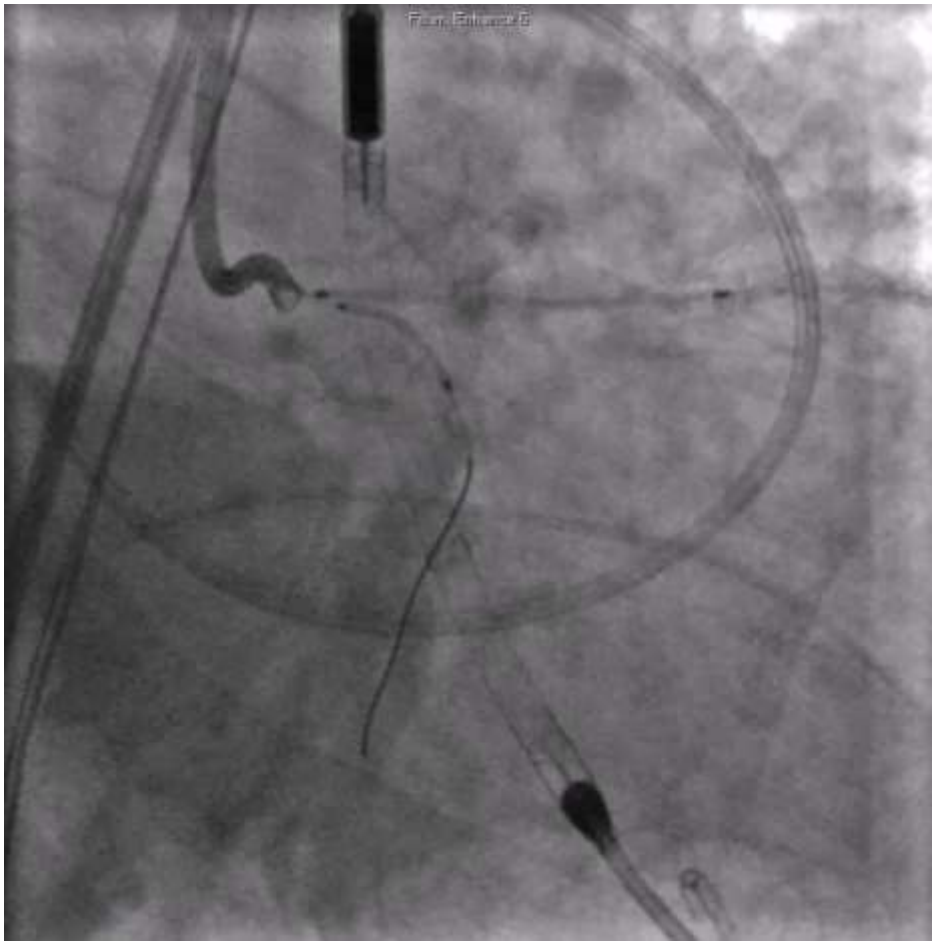
ULMCA PCI
With Impella



ULMCA PCI With Impella

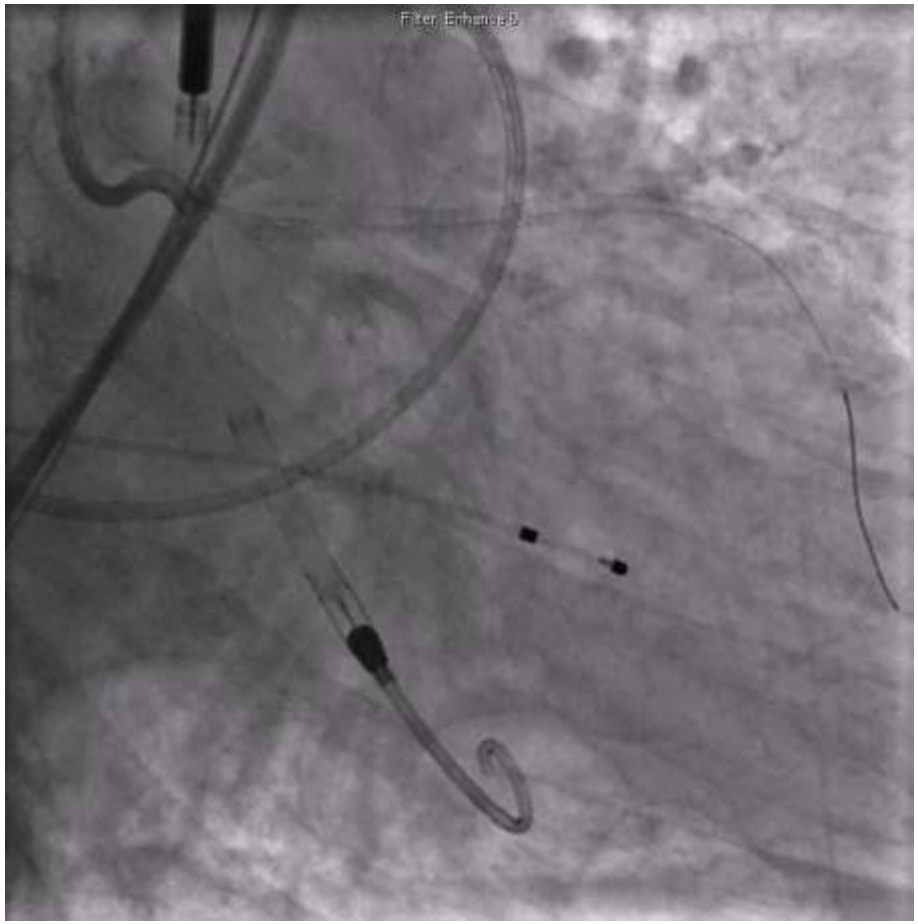


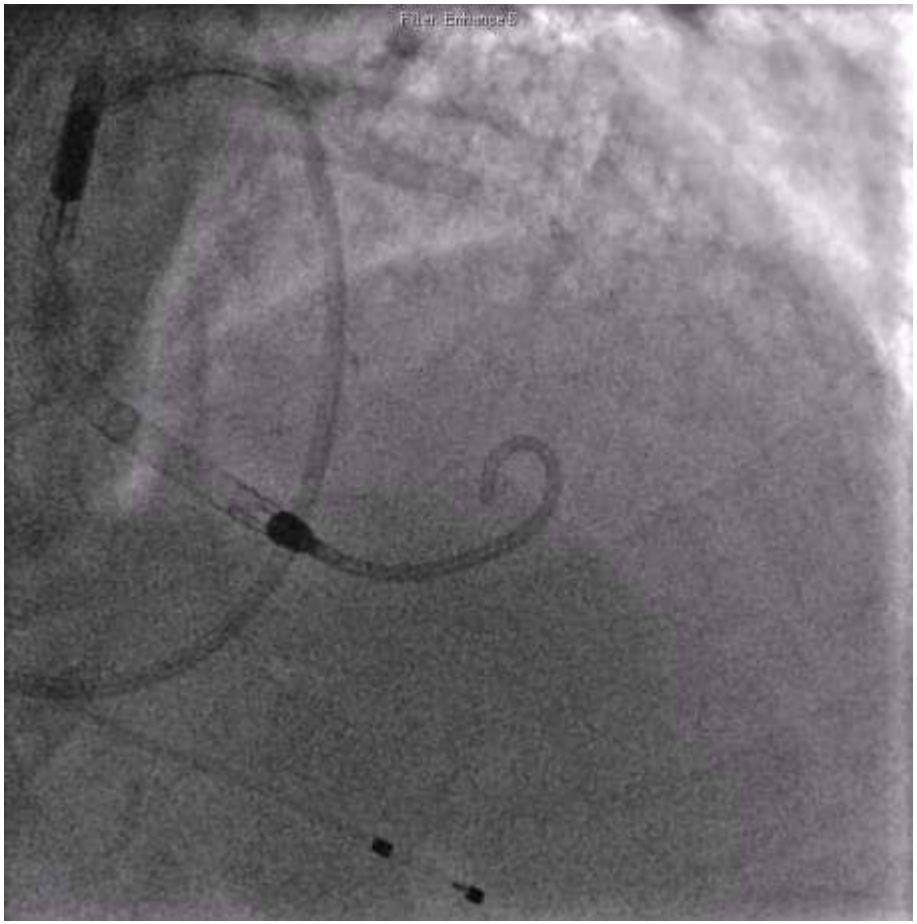
Rotational atherectomy



Crush technique

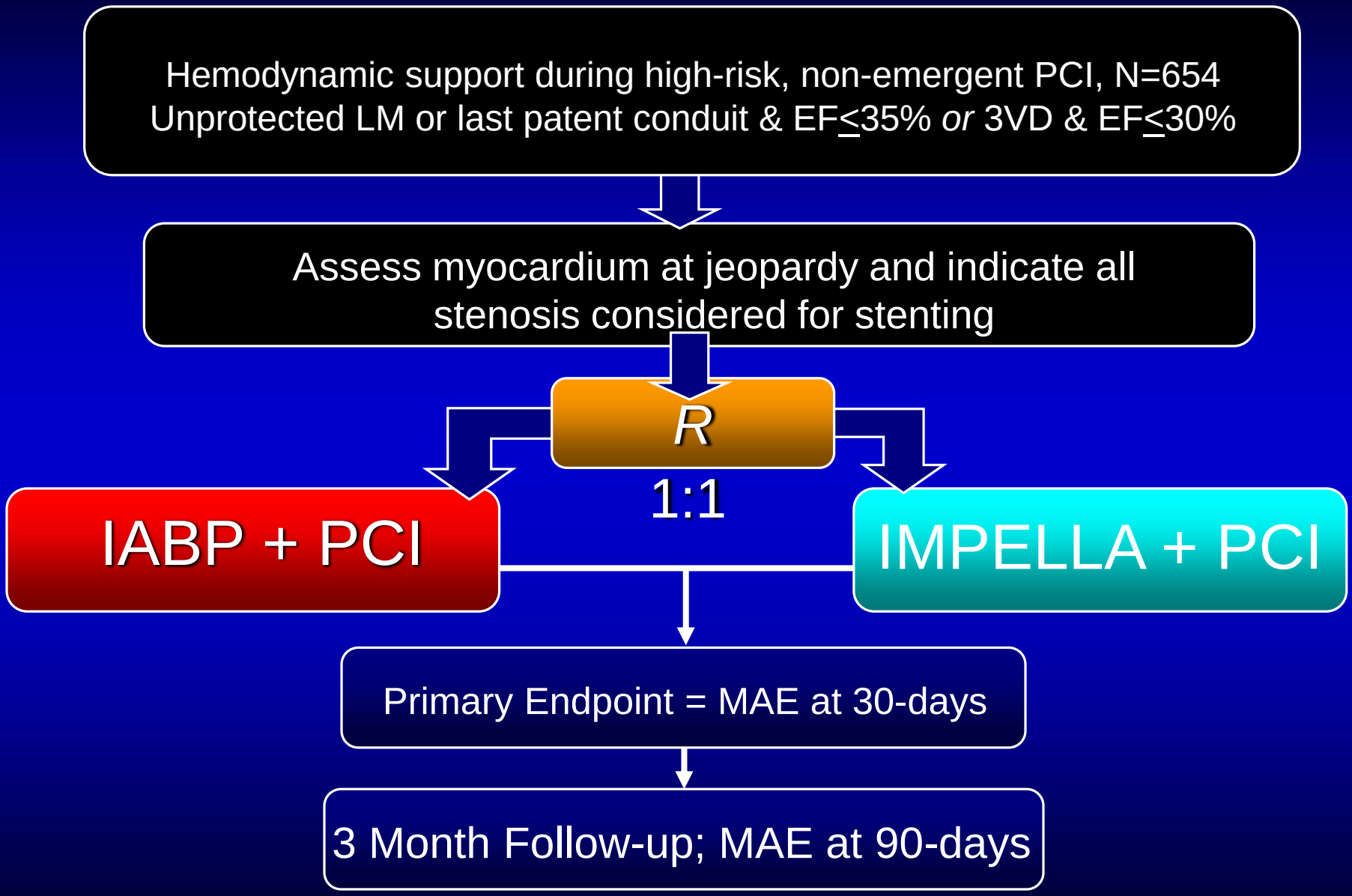
ULMCA PCI
With Impella





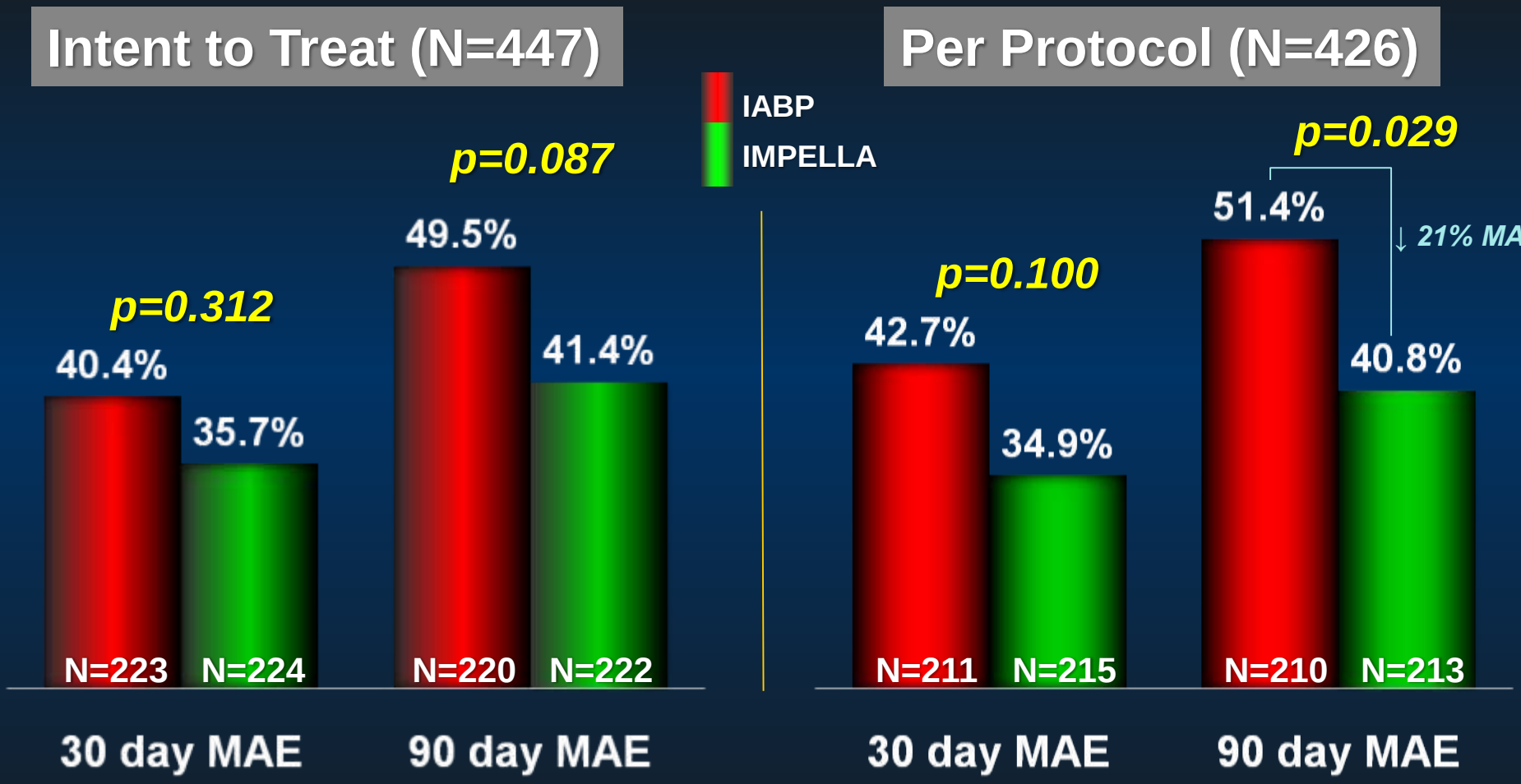
Final angiography

PROTECT II Trial Design



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

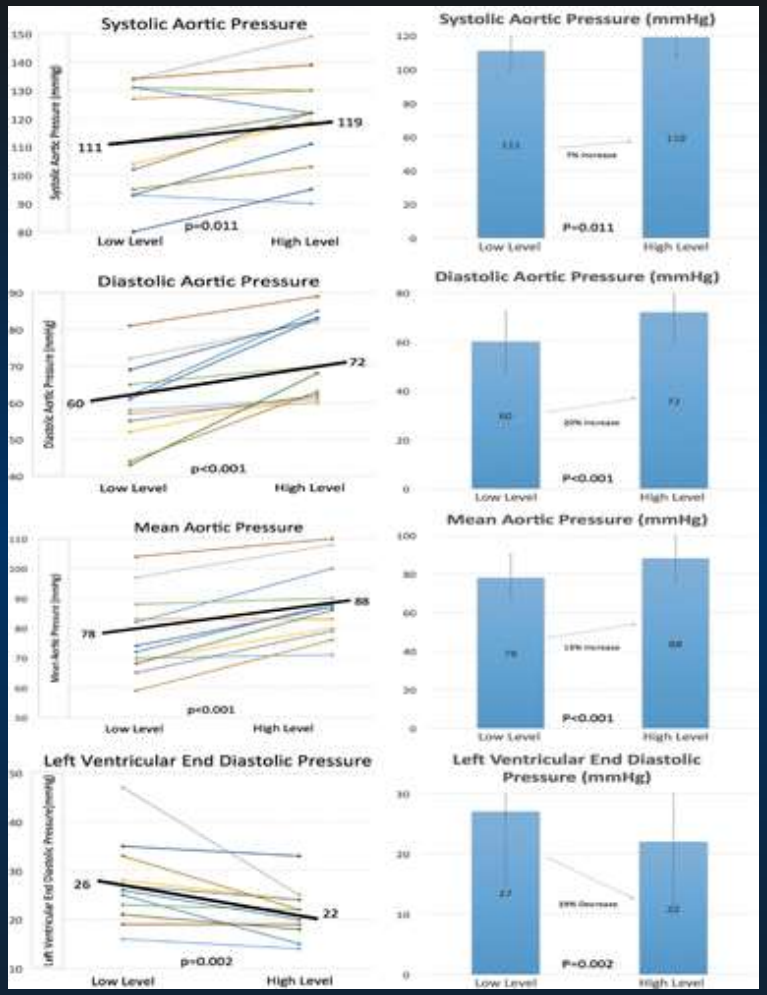
PROTECT II MAE Outcome



MAE= Major Adverse Event Rate

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

Hemodynamic Effects of Impella



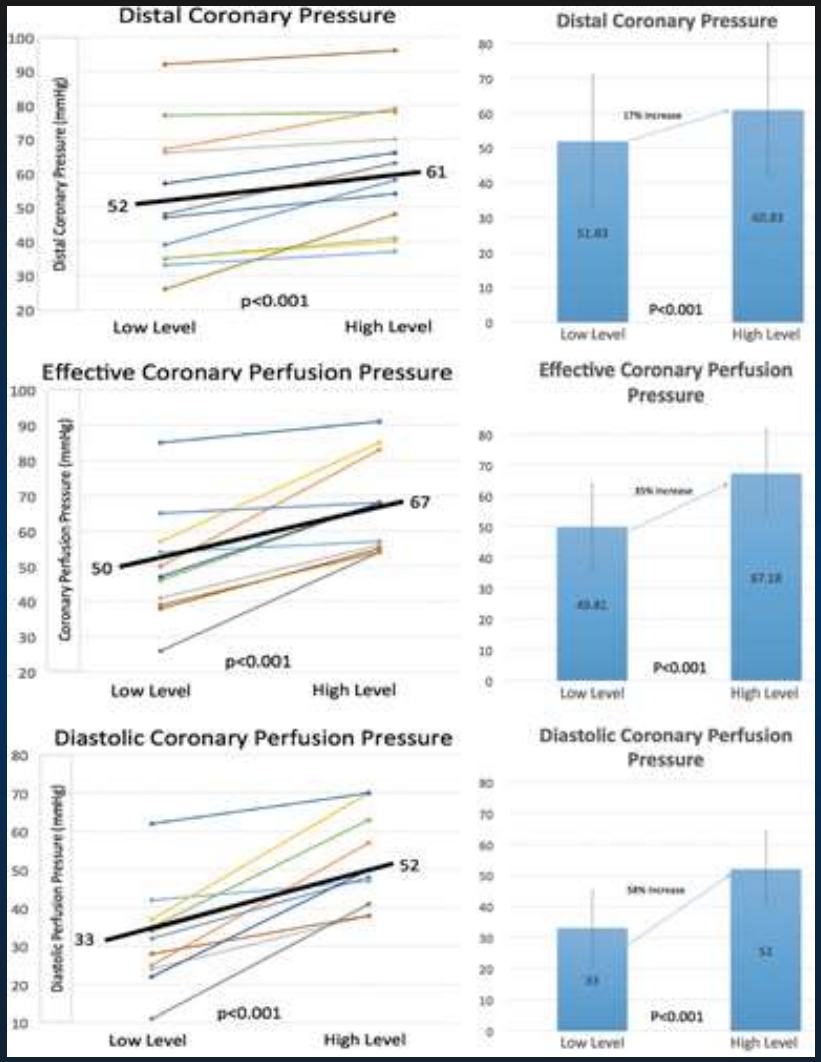
Mohammad Alqarqaz. Circulation: Cardiovascular Interventions. Effects of Impella on Coronary Perfusion in Patients With Critical Coronary Artery Stenosis, Volume: 11, Issue: 4, DOI: (10.1161/CIRCINTERVENTIONS.117.005870)

Impact of Impella on Coronary Physiology

0.014’ pressure wire

Coronary perfusion pressure= MAP minus LVEDP

Diastolic perfusion pressure= diastolic blood pressure minus LVEDP



Mohammad Alqarqaz. Circulation: Cardiovascular Interventions. Effects of Impella on Coronary Perfusion in Patients With Critical Coronary Artery Stenosis, Volume: 11, Issue: 4, DOI: (10.1161/CIRCINTERVENTIONS.117.005870)

PCI with ECMO

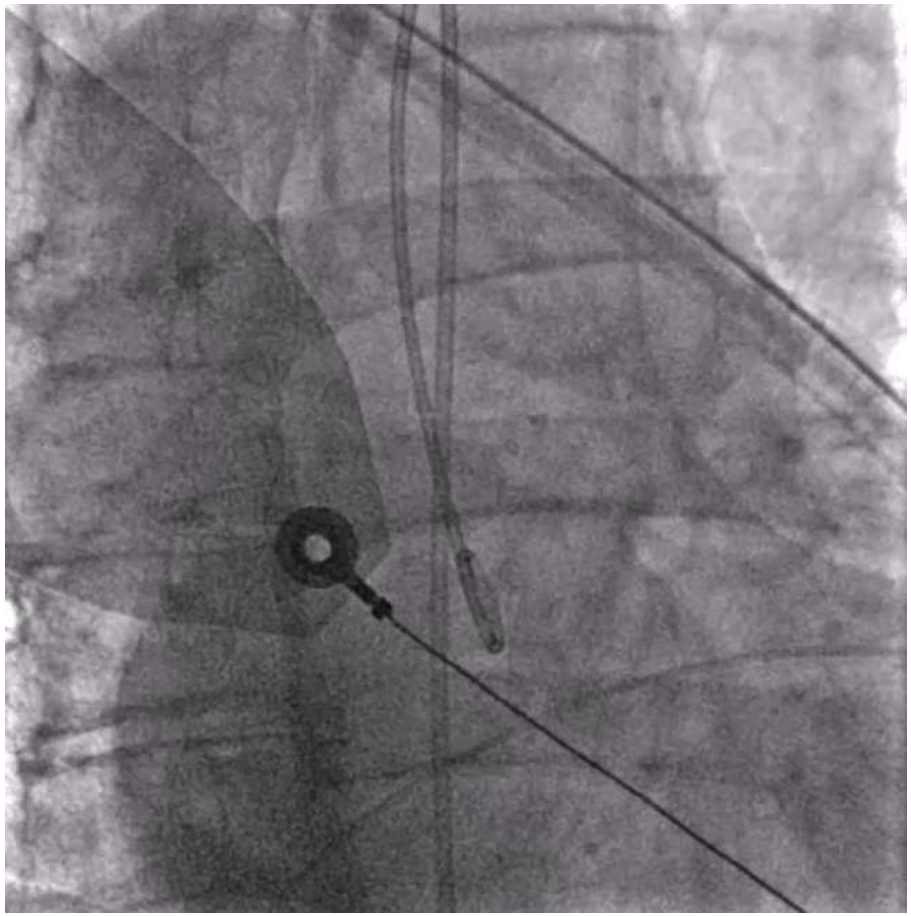
Advantages

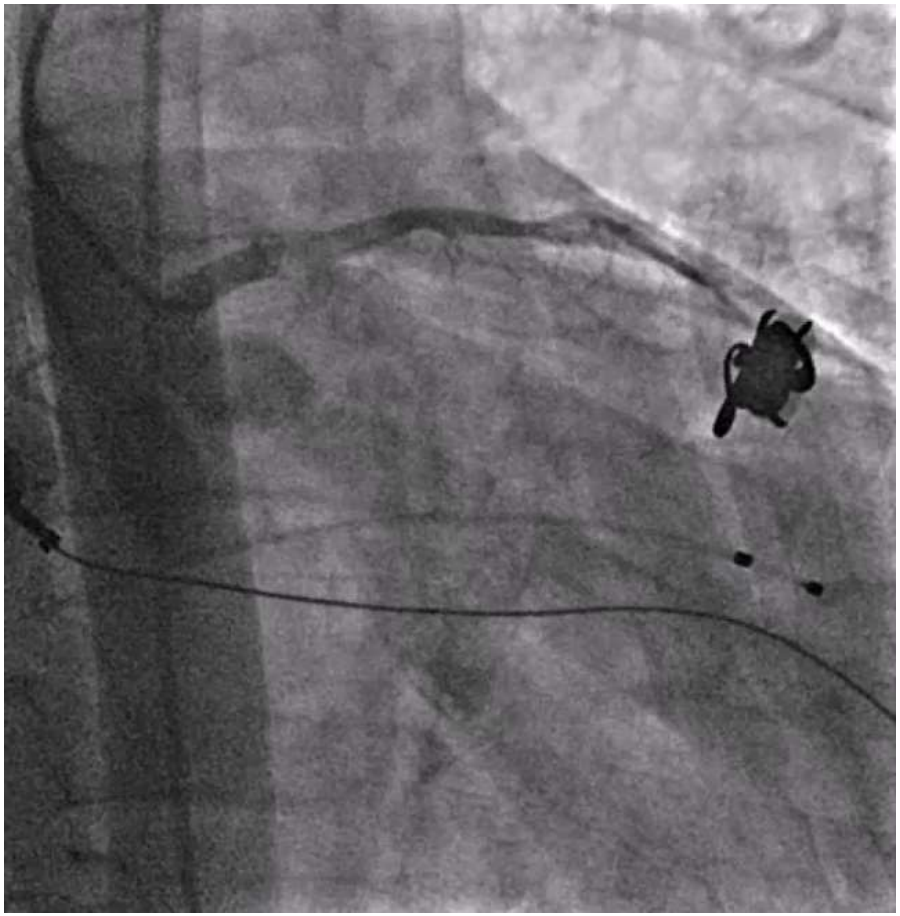
- Augment cardiac output by >4.5 L/min
- Use up to several weeks
- Does not require stable cardiac rhythm or native cardiac output/blood pressure signal for optimal function
- Does not require fluoroscopy

Disadvantages

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

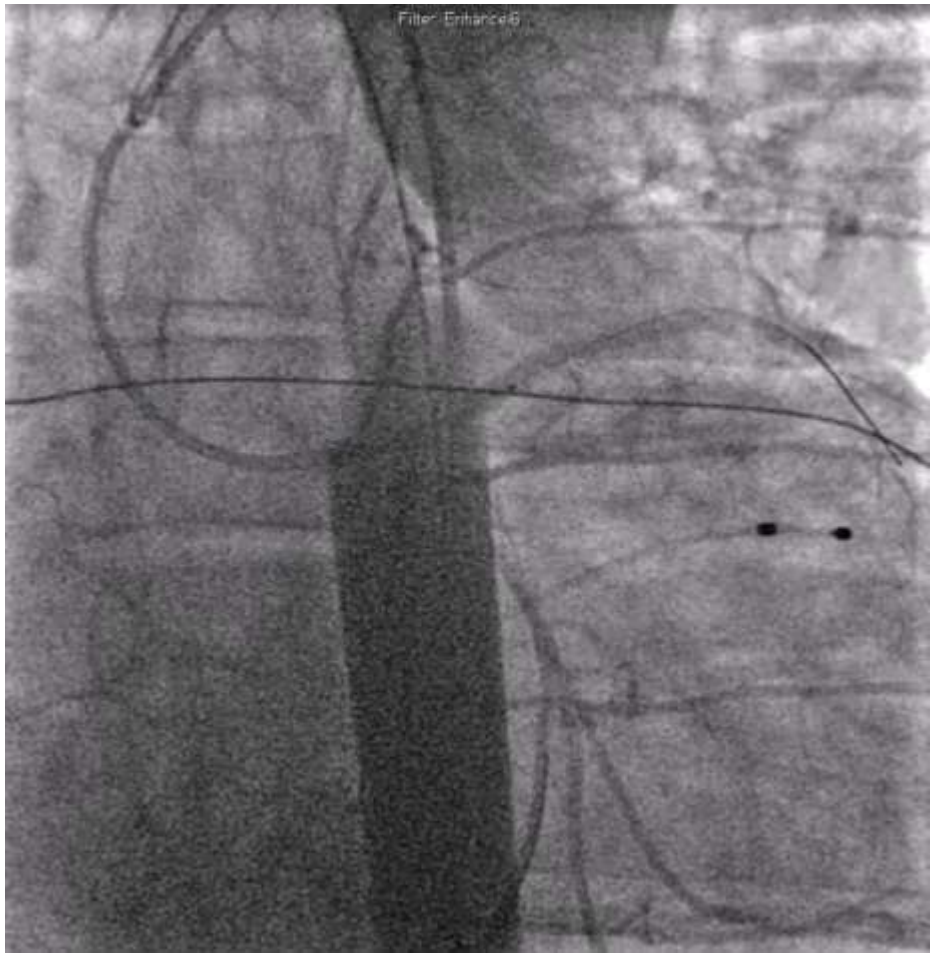
ULMCA PCI With ECMO



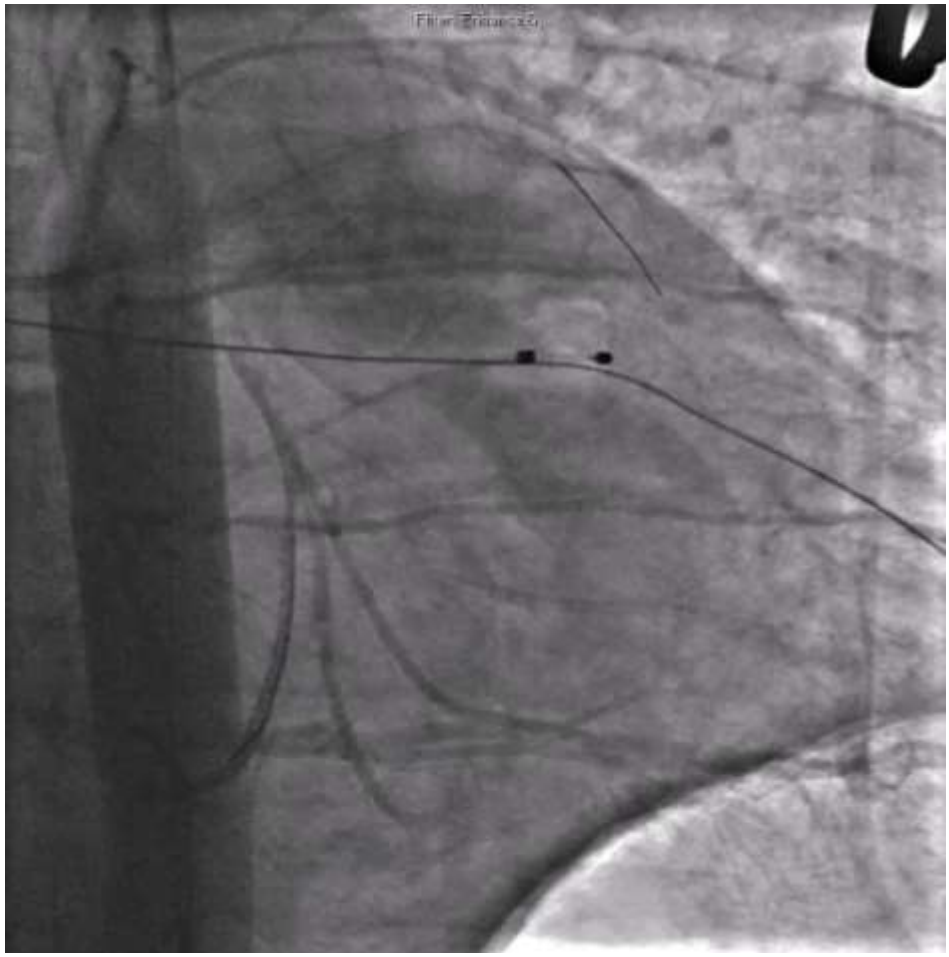


49 y.o. male with inferior ST-elevation and cardiac arrest in ED

ULMCA PCI With ECMO

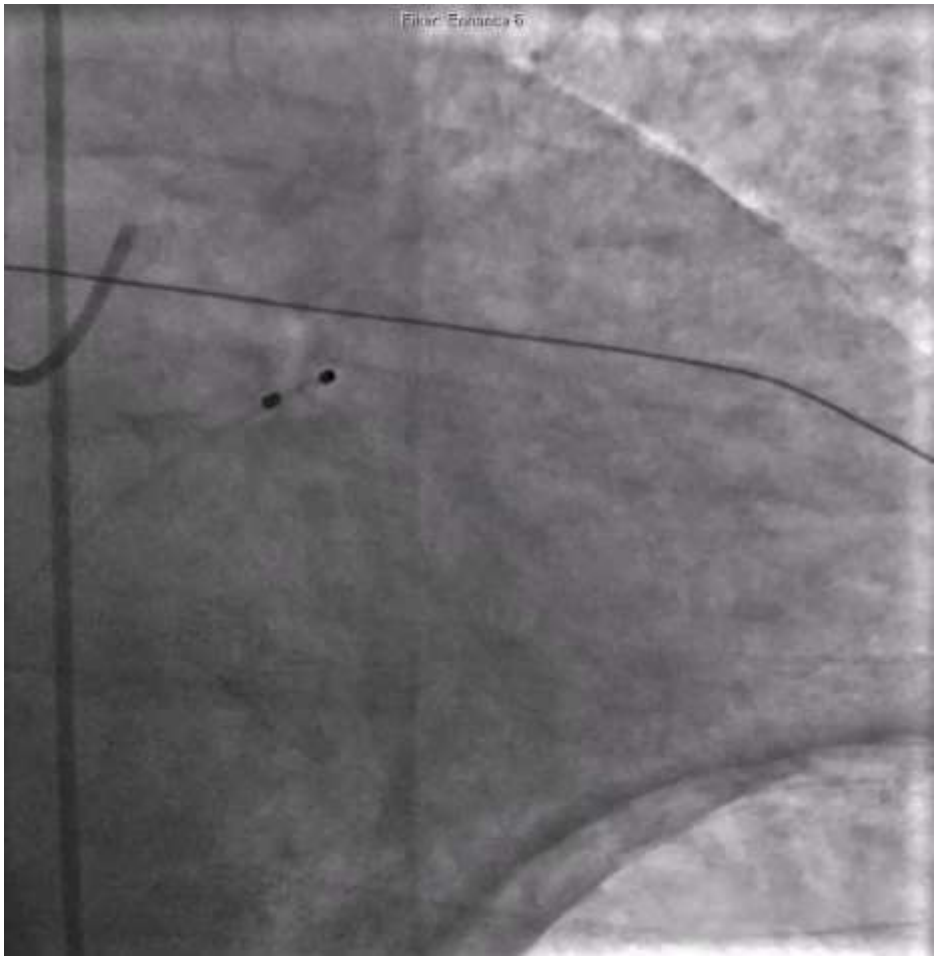


LM stent across LCX
ECMO inserted

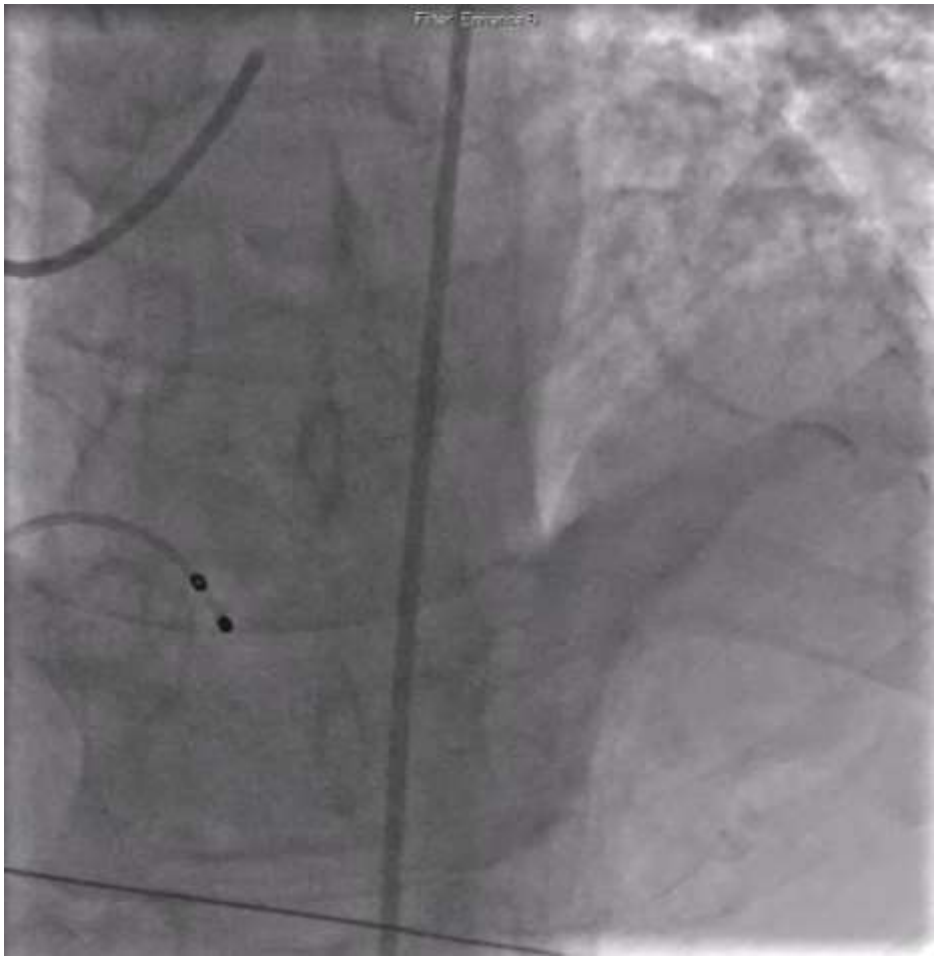


Compromise of LCX

ULMCA PCI With ECMO

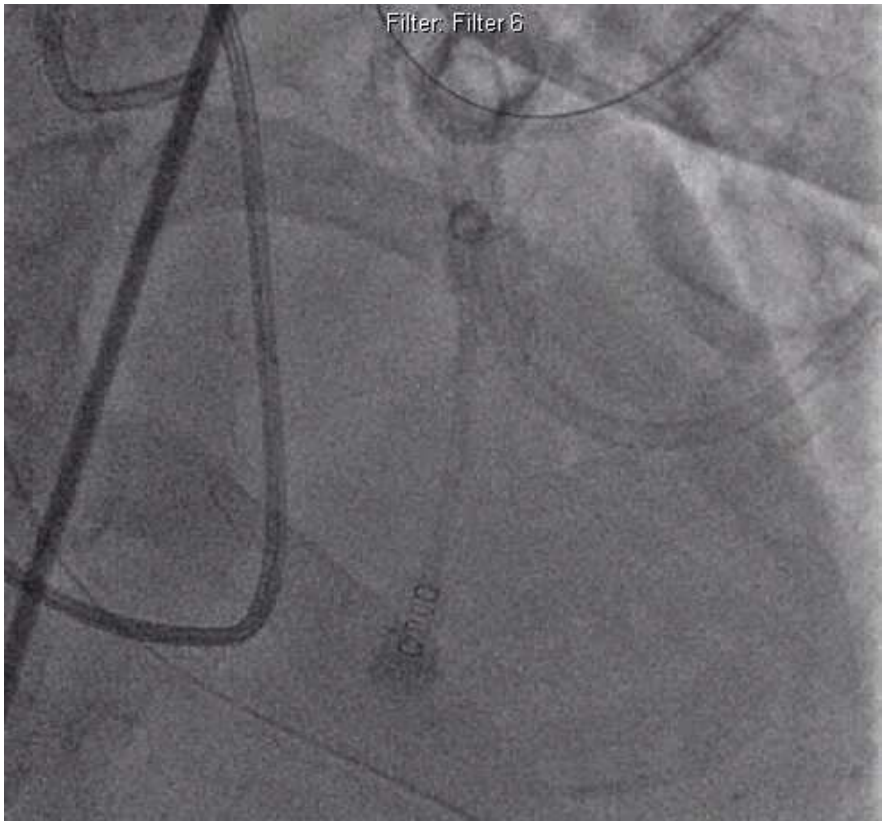


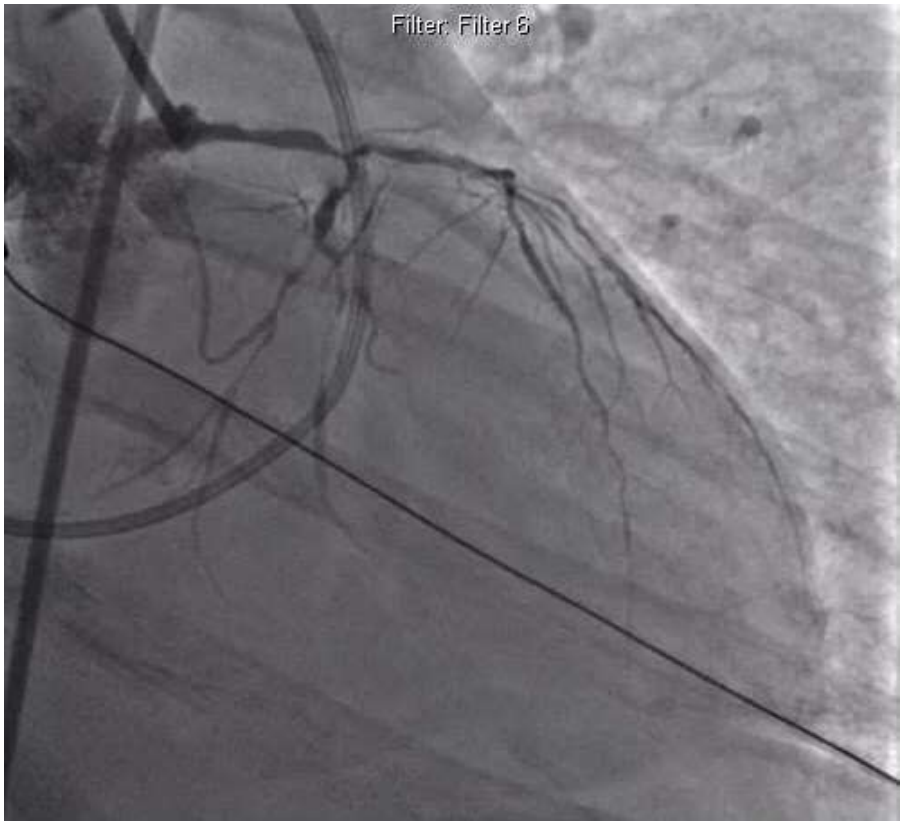
Final angiography



Ventricular fibrillation

ULMCA PCI With ECMO

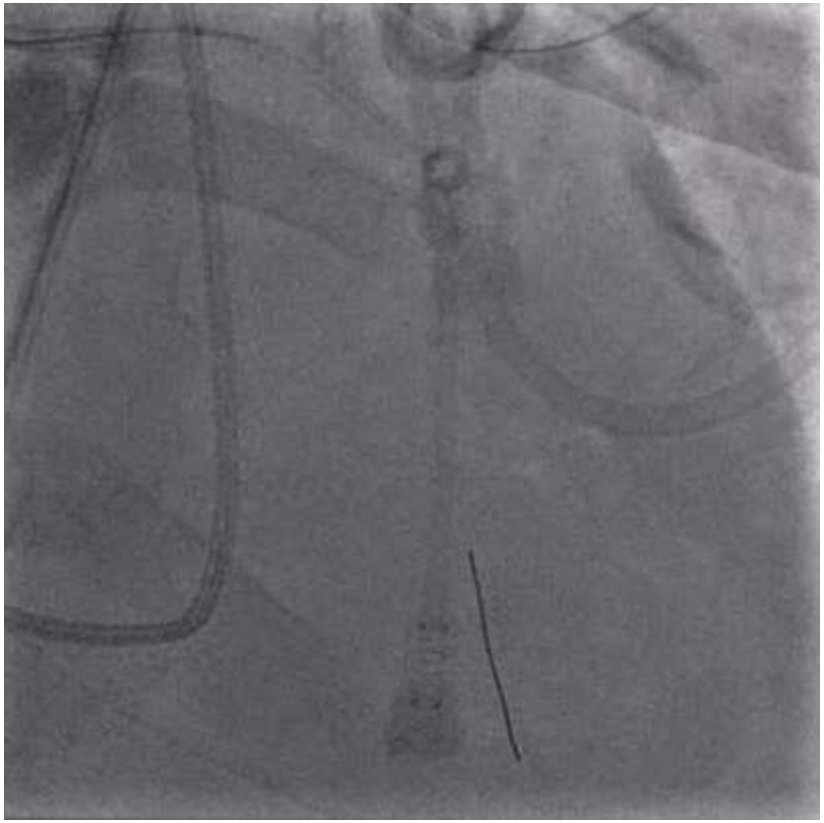


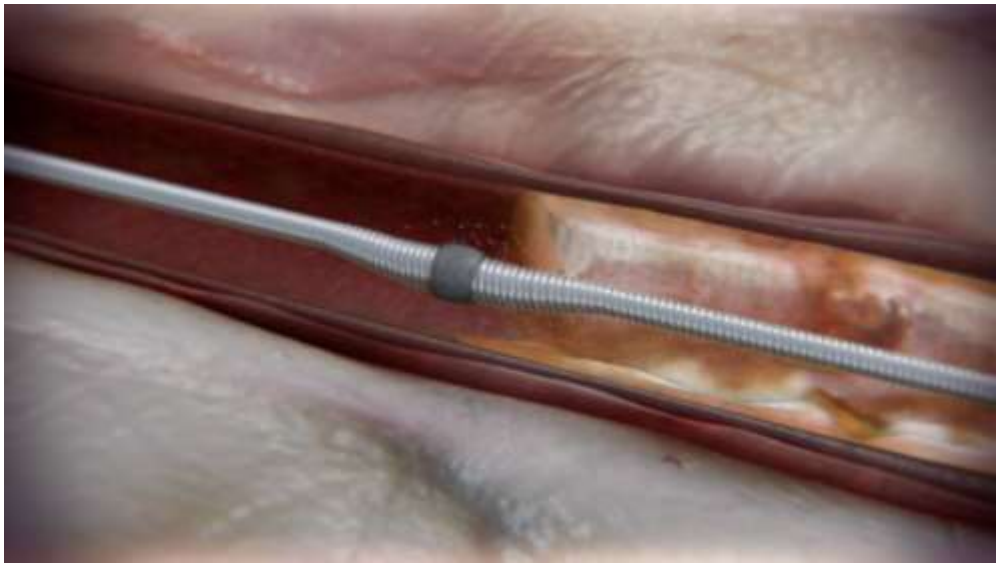


48 y.o. male with DM who presents with MI, cardiac arrest, cardiogenic shock, on 4 vasopressors, and ECMO

Orbital Atherectomy

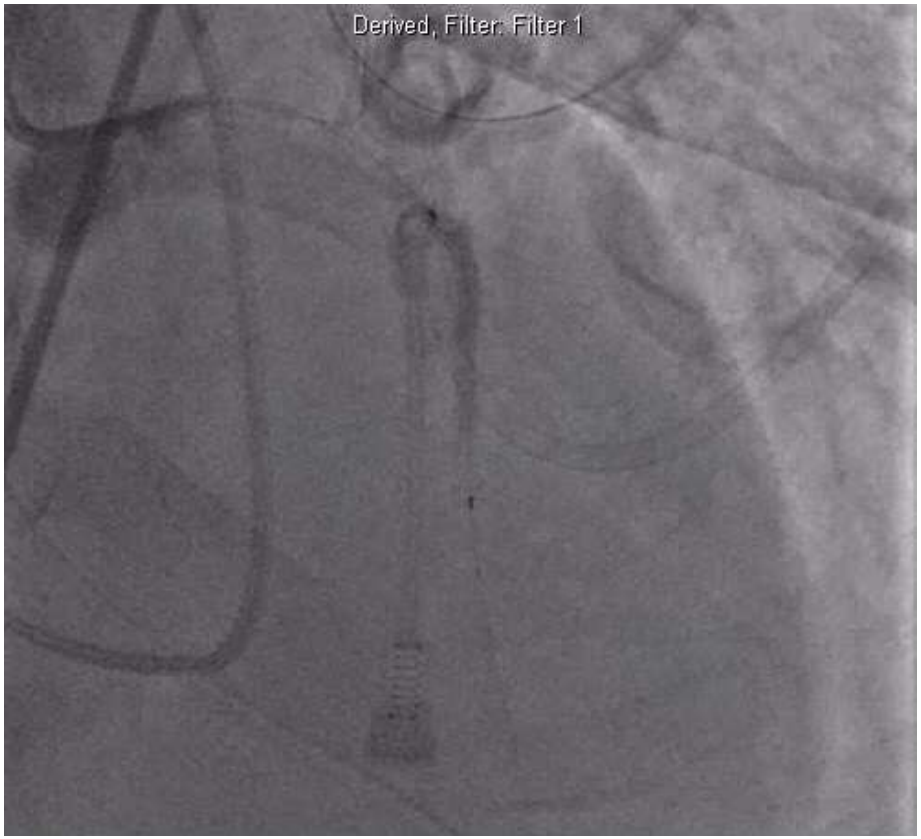
Differential Sanding and Centrifugal Force

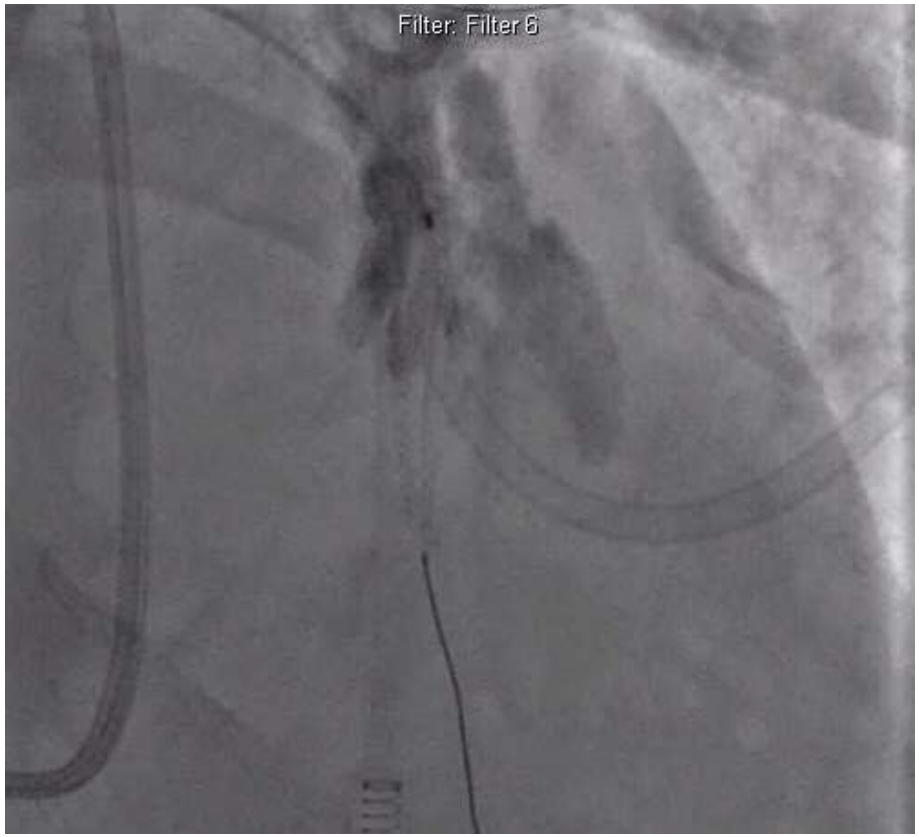




MOA treats 360˚ of the vessel.The diamond coated crown sands away calcium and allows healthy elastic tissue to flex away minimizing injury to the vessel.

ULMCA PCI With ECMO

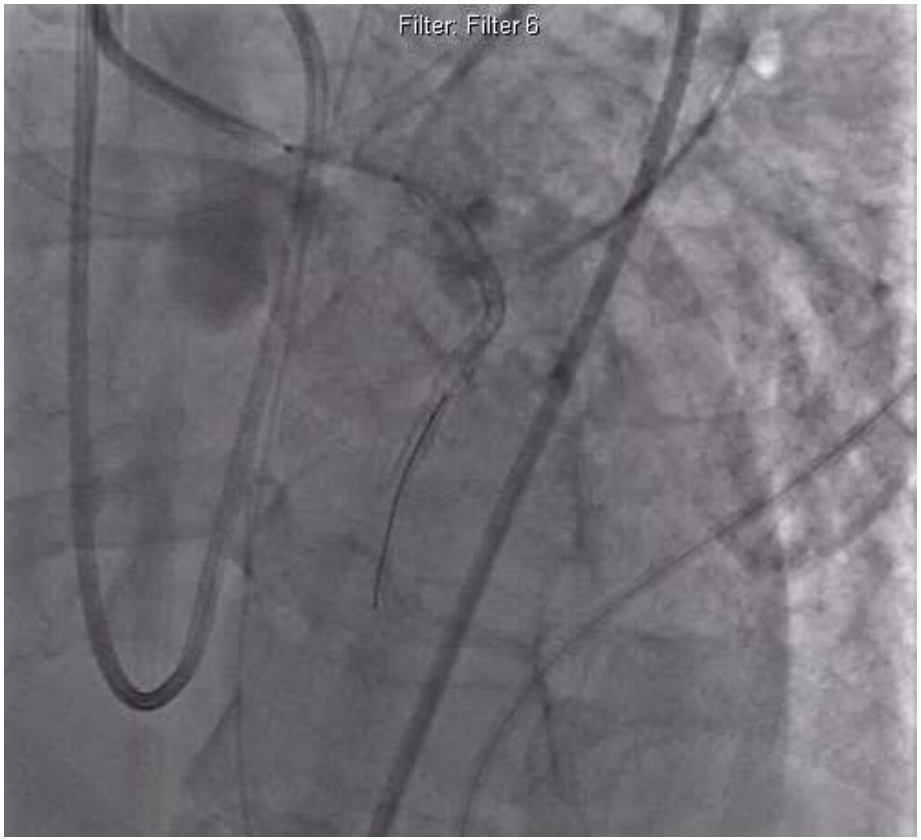




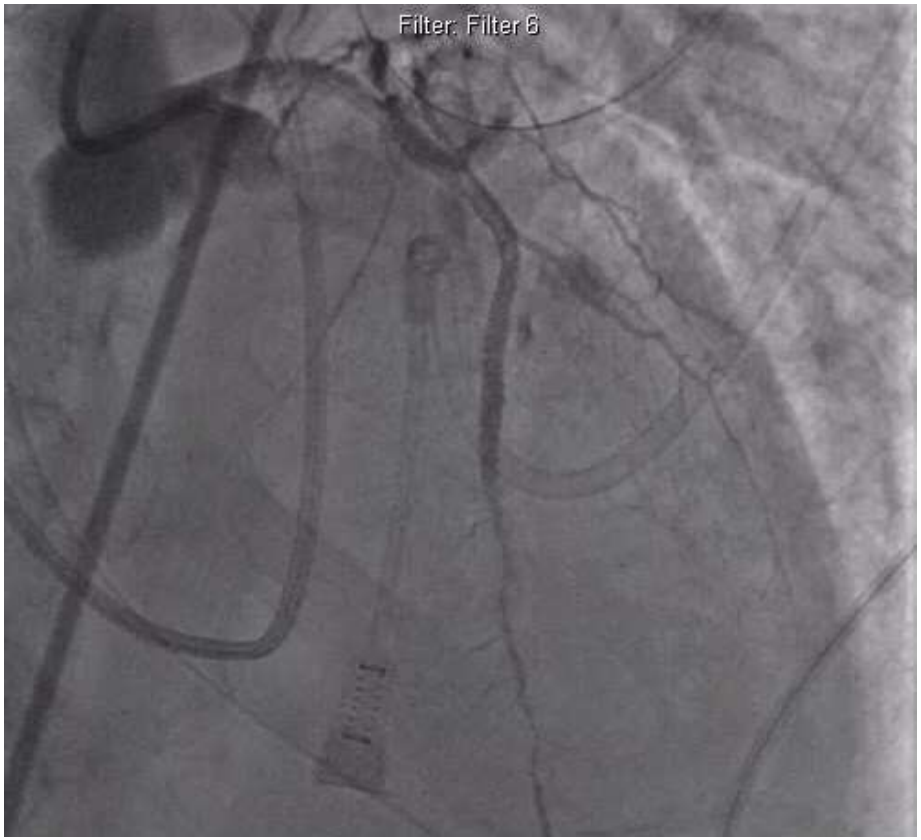
2.75 x 38 mm EES

Grade 3 perforation

ULMCA PCI With ECMO



LM stenting in LAO cranial



Final angiography after covered stent

Impact of ECMO on Coronary Physiology

- **Increases cardiac output and system perfusion**
- **However, it increases filling pressure, afterload, and myocardial oxygen demand[1]**
- **Worsens left ventricular wall motion in regions subtended by a stenotic coronary artery.[2]**

1. Myat T, et al. JACC Cardiovasc Interv 2015;;8:229-44.
2. Pavlides GS, et al. JACC 1991;18:499-505