EMO GVM CENTRO CUORE COLUMBUS s.r.l.

8th Emirates Cardiac Society Congress in collaboration with ACC Middle East Conference 2017

Dubai: 19-21 October 2017

OSPEDALE SAN RAFFAELE

Acute Coronary Syndromes

Contemporary management of patients in cardiogenic shock

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Centro Cuore Columbus and
S. Raffaele Scientific Institute, Milan, Italy

Nothing to disclose

Spectrum of Cardiogenic Shock

Pre/Early Shock

- Clinical
  - SBP <100 mm Hg
  - HR 70–100 beats/min
  - Normal lactate
  - Normal mentation
  - Cool extremities
- Hemodynamic
  - CI 2–2.2
  - PCWP <20
  - LVEDP <20
  - CPO >1 W
- Vasoactive medications
  - 0 or 1 low dose

Shock

- Clinical
  - SBP <90 mm Hg
  - HR >100 beats/min
  - Lactate >2
  - AMS
  - Cool extremities
- Hemodynamic
  - CI 1.5–2.0
  - PCWP >20
  - LVEDP >20
  - CPO <1 W
- Vasoactive medications
  - 1 moderate to high dose

Severe shock

- Clinical
  - SBP <90 mm Hg
  - HR >120 beats/min
  - Lactate >4
  - Obtunded
  - Cool extremities
- Hemodynamic
  - CI <1.5
  - PCWP >30
  - LVEDP >30
  - CPO <0.6 W
- Vasoactive medications
  - 2 or more

CASE SUMMARY

Patient Demographics

Age: 75 year old
Gender: male

Clinical Presentation

- Acute Pulmonary Oedema.

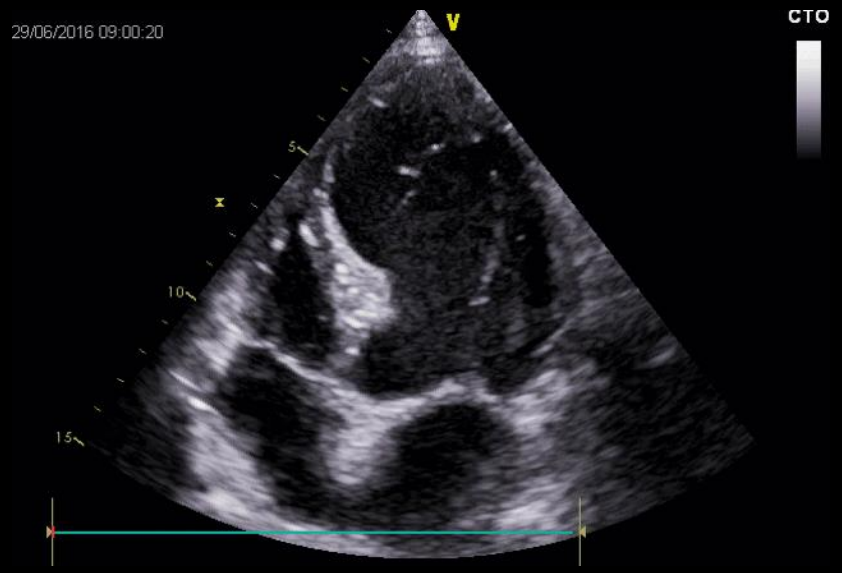
Medical History

- Hypertension, dyslipidemia, familiar history of CAD
- Previous hemorrhagic stroke in 1990
- February 2016 VTE on OAC.

Echocardiography

- EF 20% with apical aneurysm and spontaneous echocontrast.
- IM ++.
- RV dysfunction, PAPs 30 mmHg

Pre-procedural Echocardiogram



EF 25%

Increased LV filling pressure

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CORONARY ANGIOGRAM

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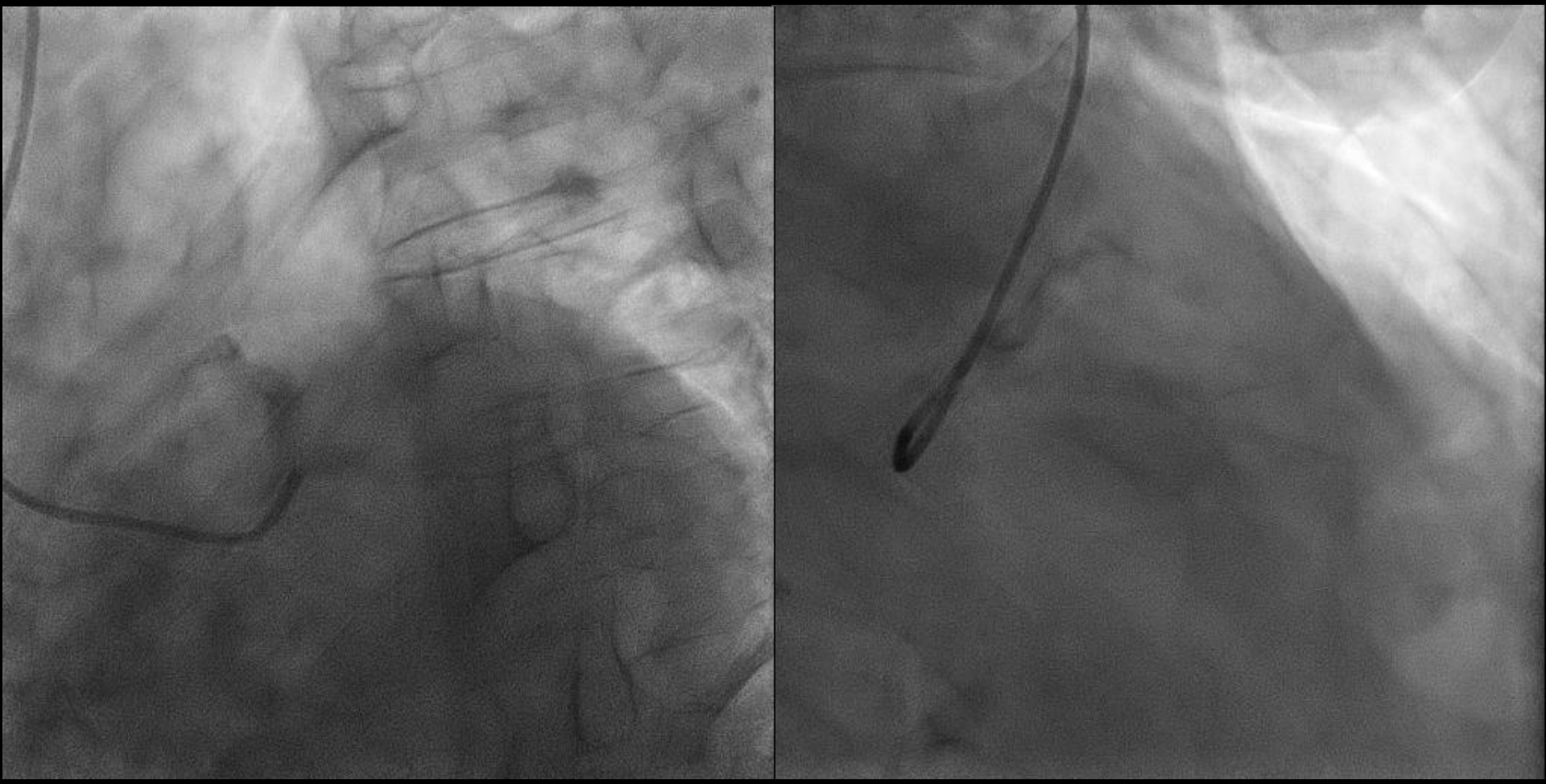

Severe and calcified three vessels disease involving LM

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CORONARY ANGIOGRAM

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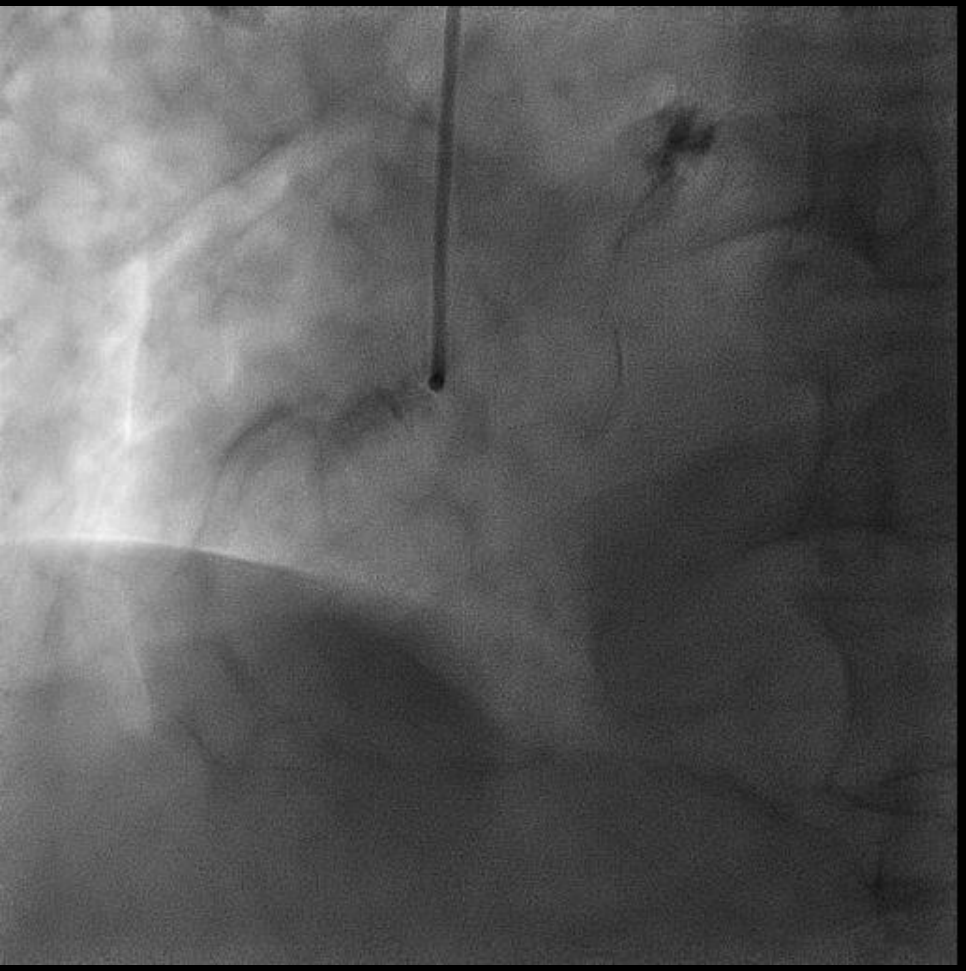
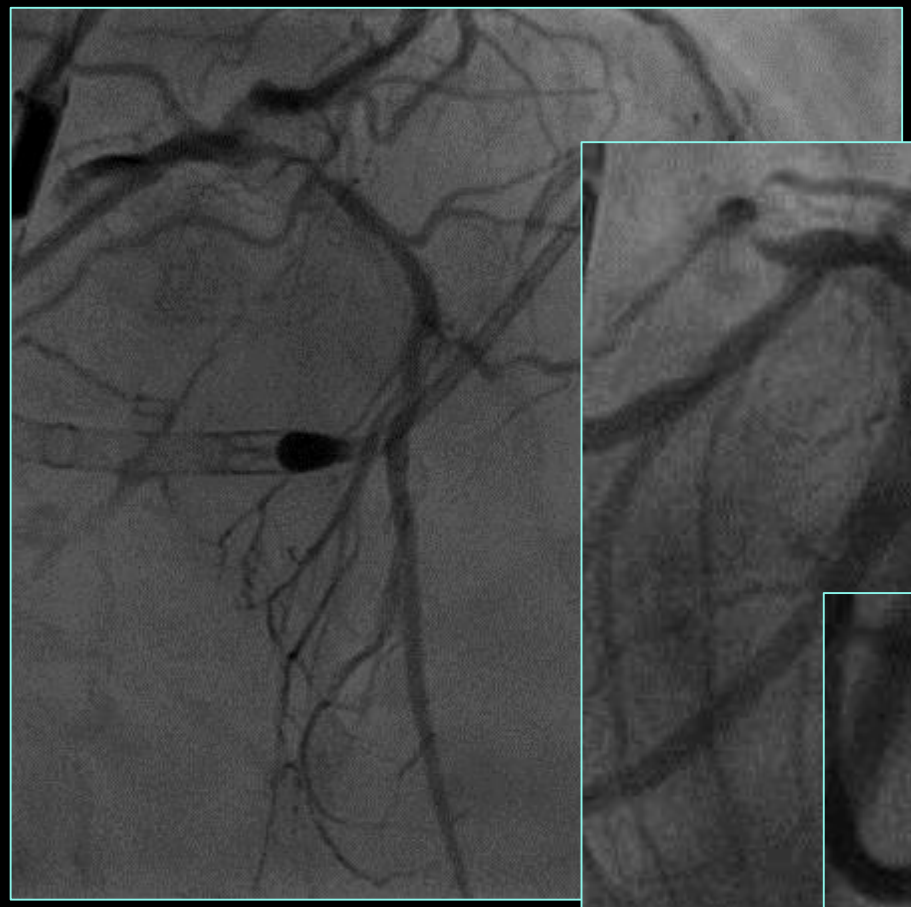
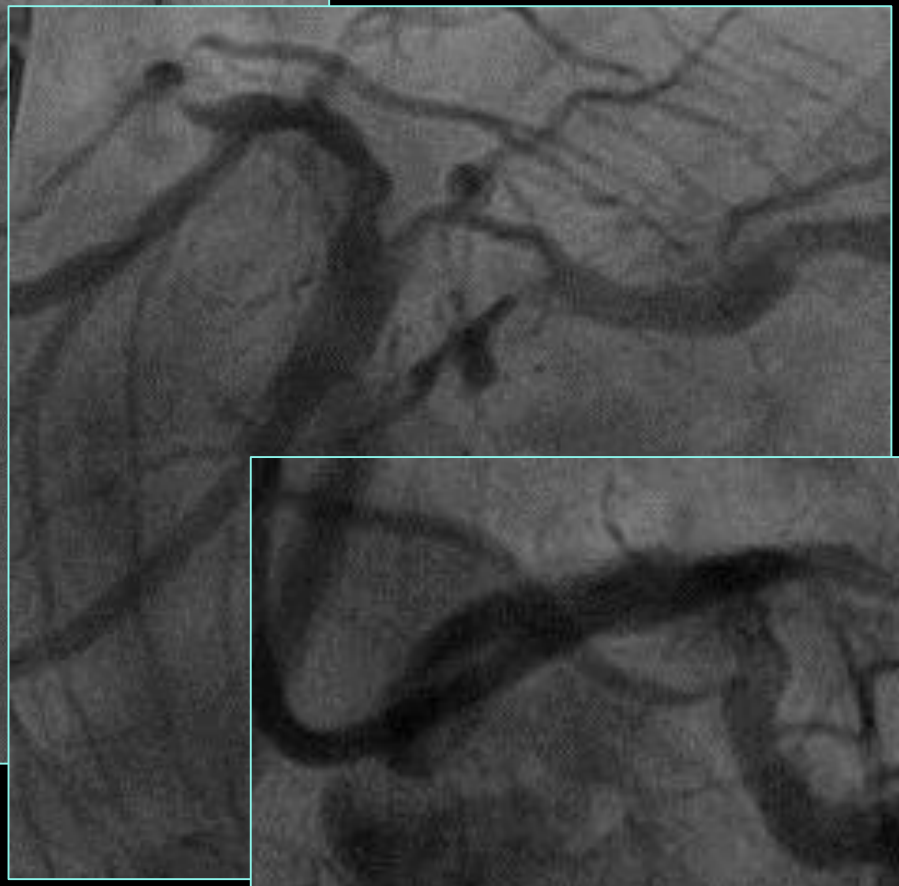
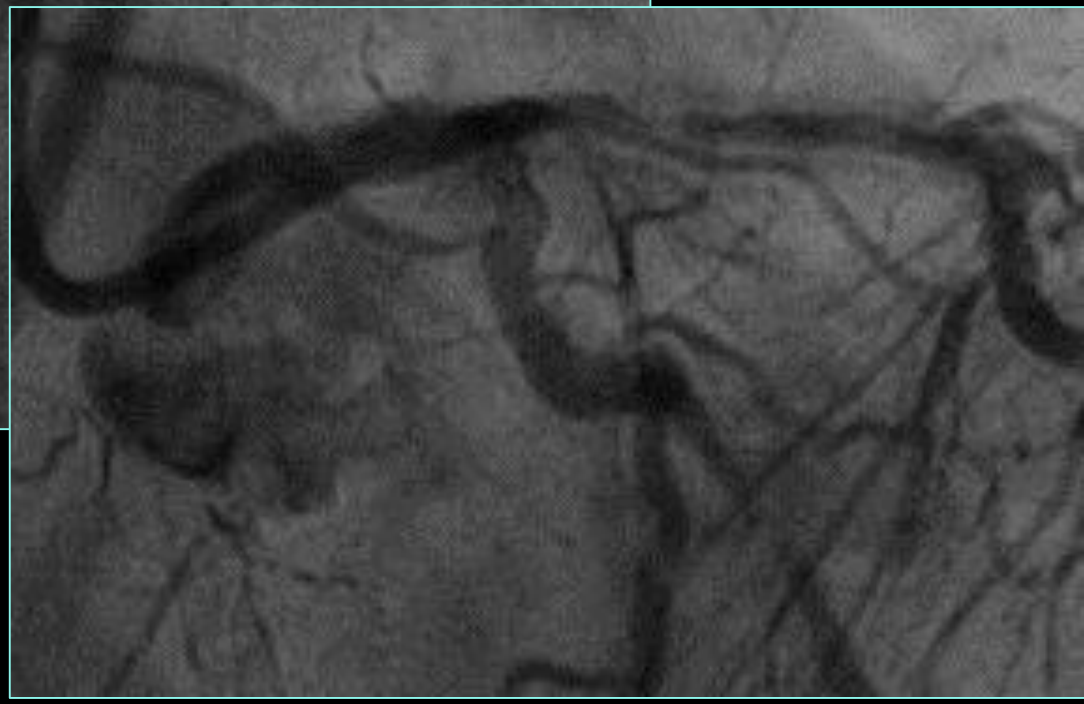


CTO of ostial RCA with Rentrop II from LAD







STRATEGY

- Double femoral access
- LV support with Impella 2.5
- Distal Circumflex treatment with Rotablator application
- Proximal LAD preparation with Rotablator application
- LM Bifurcation treatment
- IVUS evaluation

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POSITIONING IMPELLA 2.5

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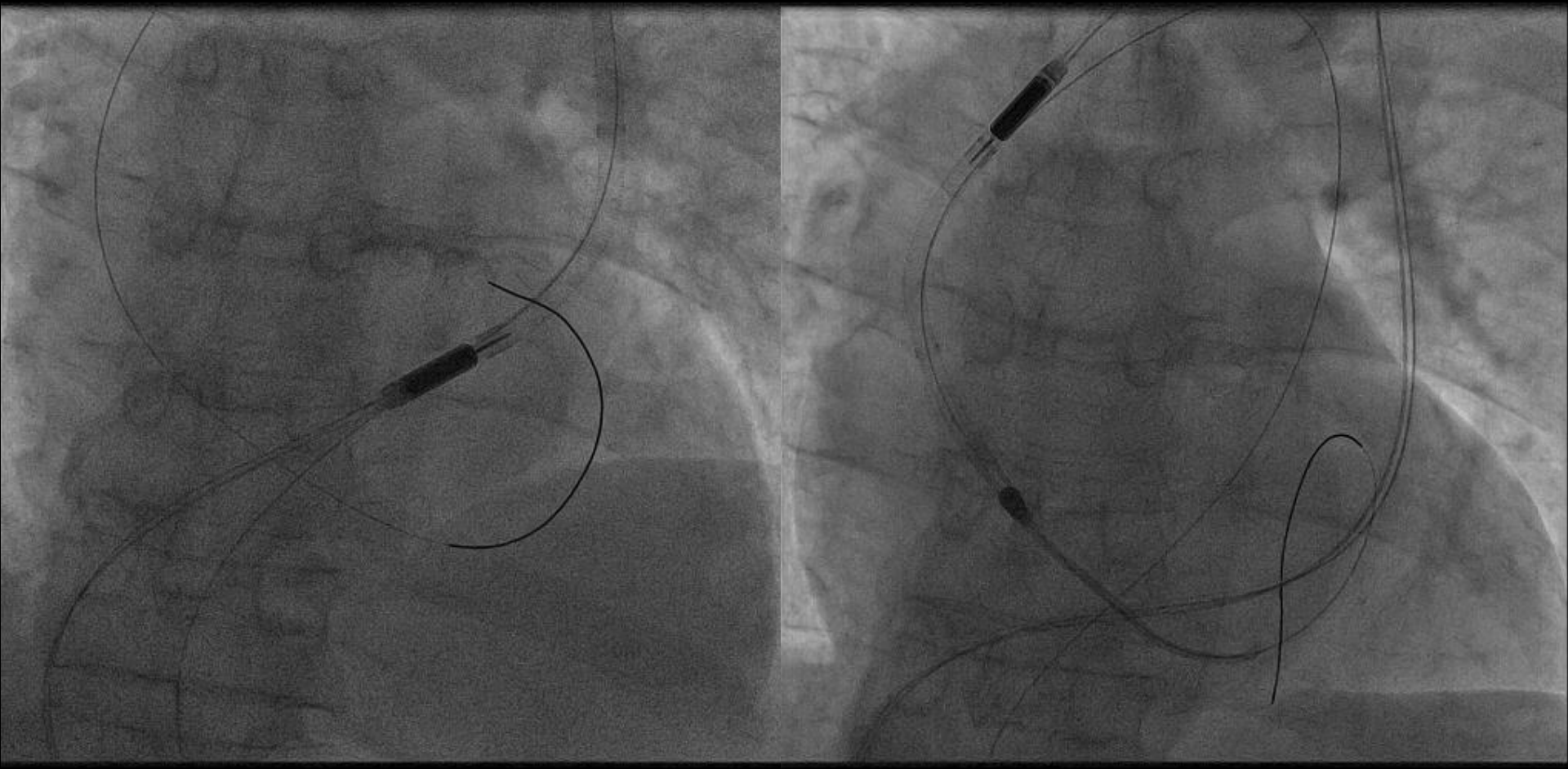

TIP: use of Lunderqvist wire to support device advance through tortuous Aorta

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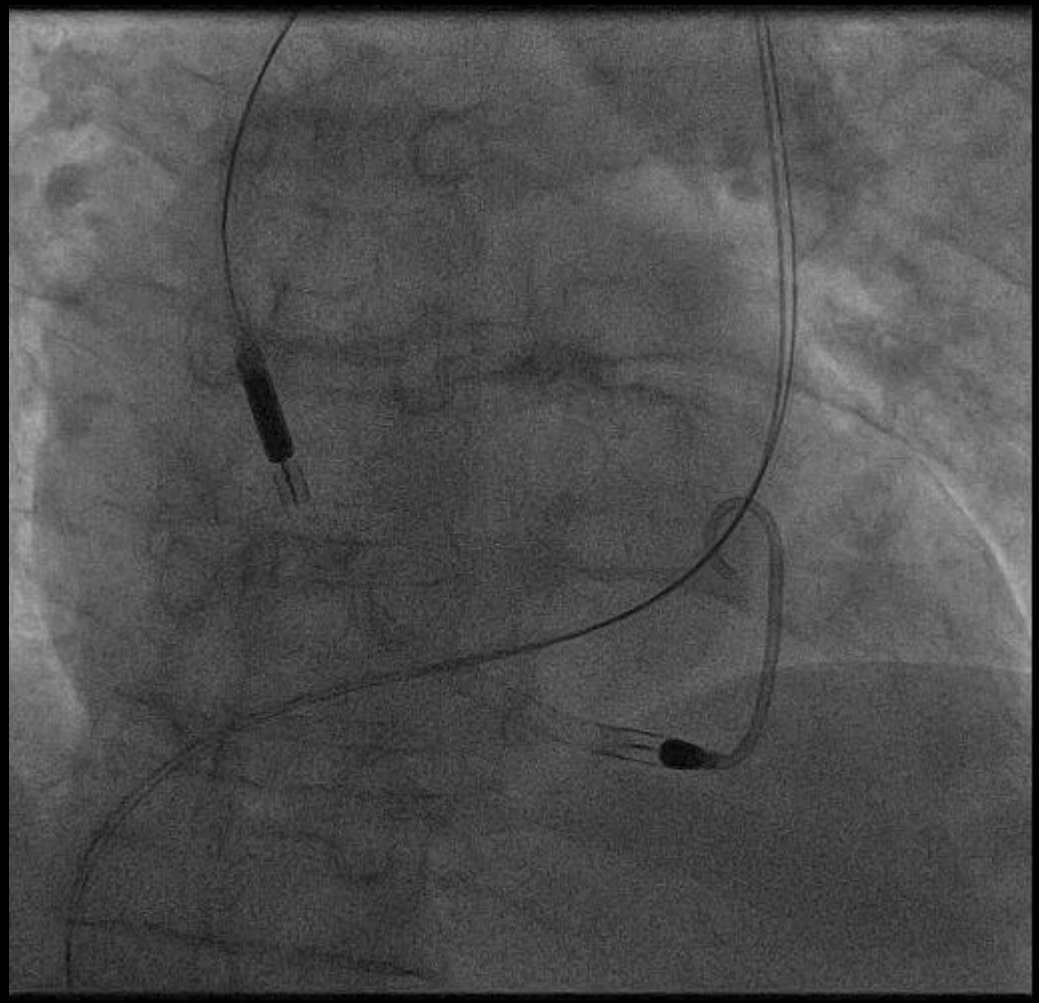
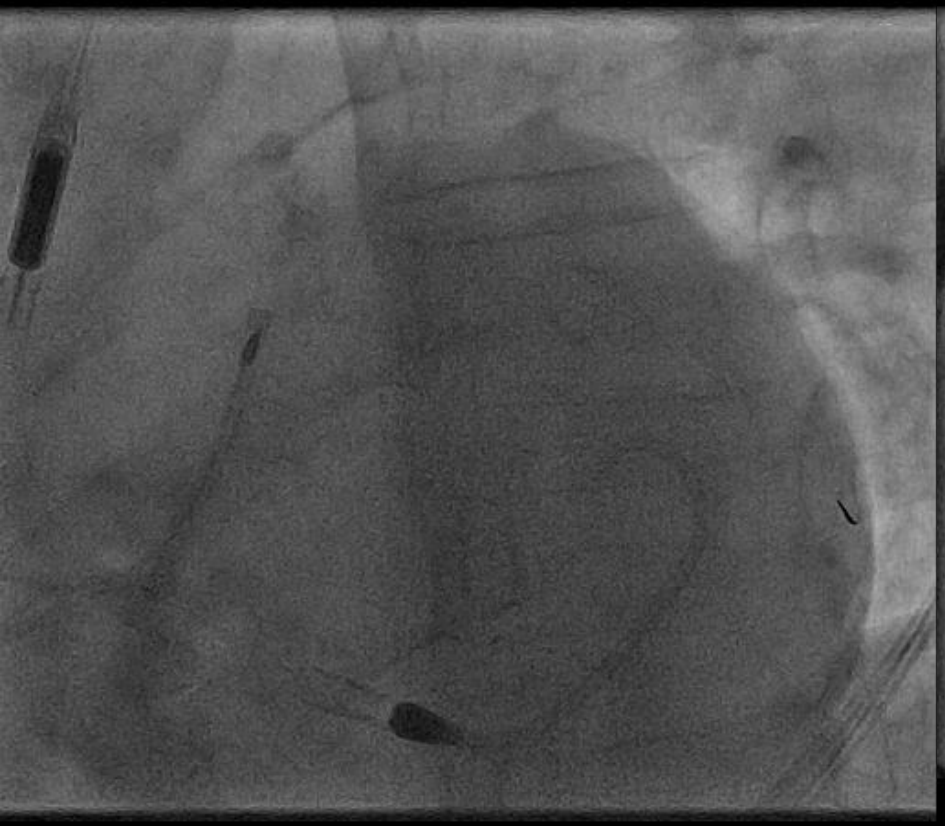
POSITIONING IMPELLA 2.5



Distal Circumflex treatment

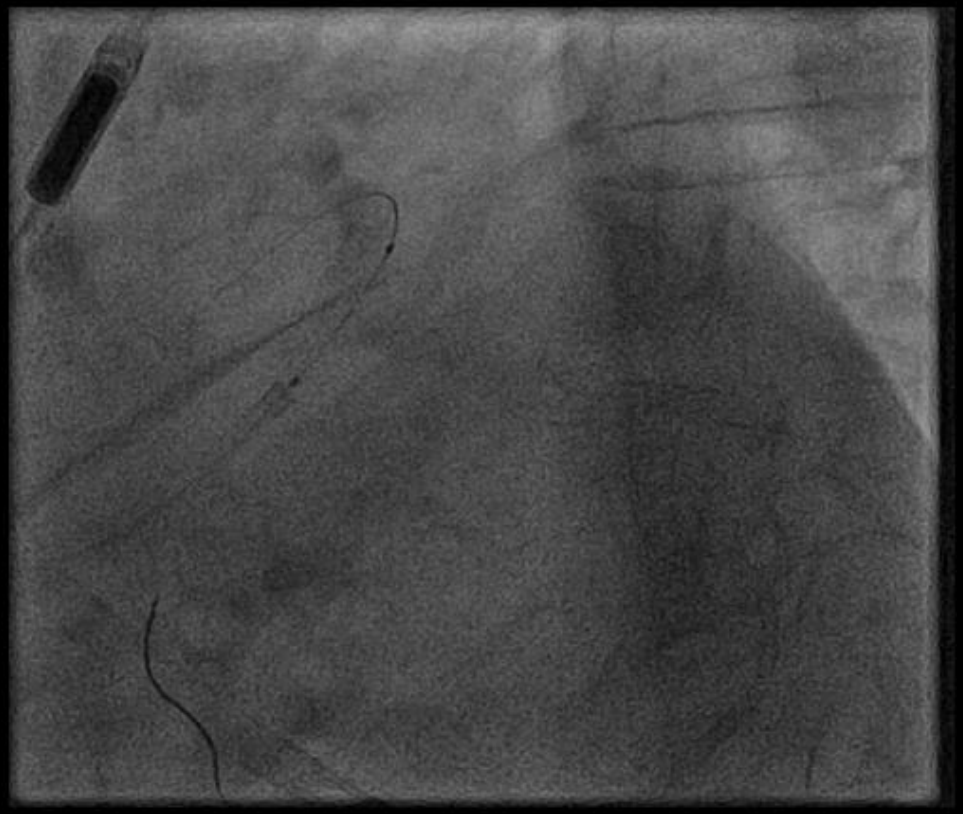


Rotablator application (1.5 burr)

Proximal LAD preparation

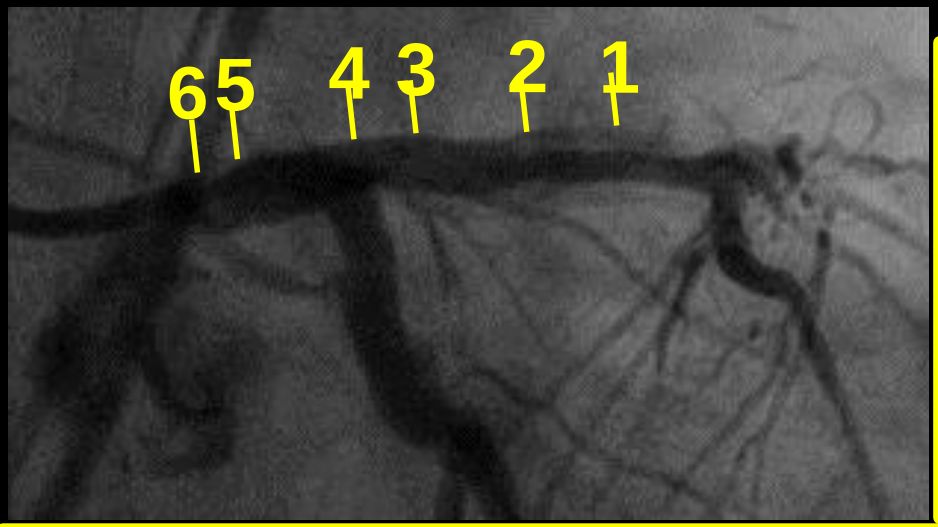
Rotablator application (1.5 burr)

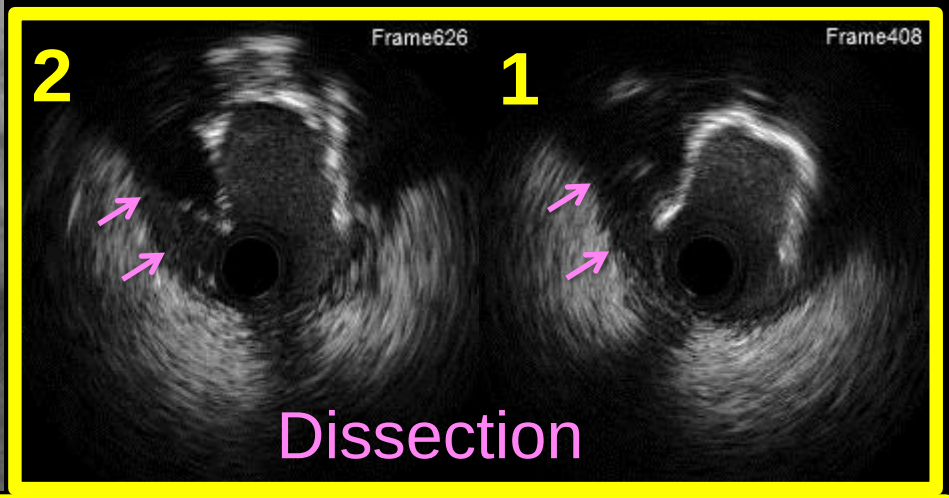
LM Treatment: minicrush

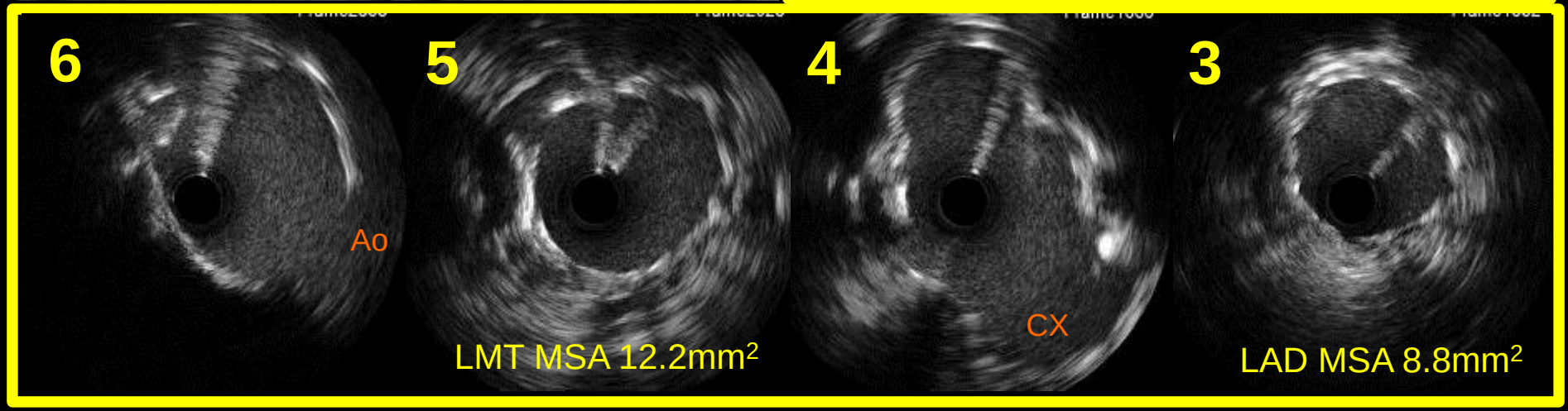


Crushing & Kissing

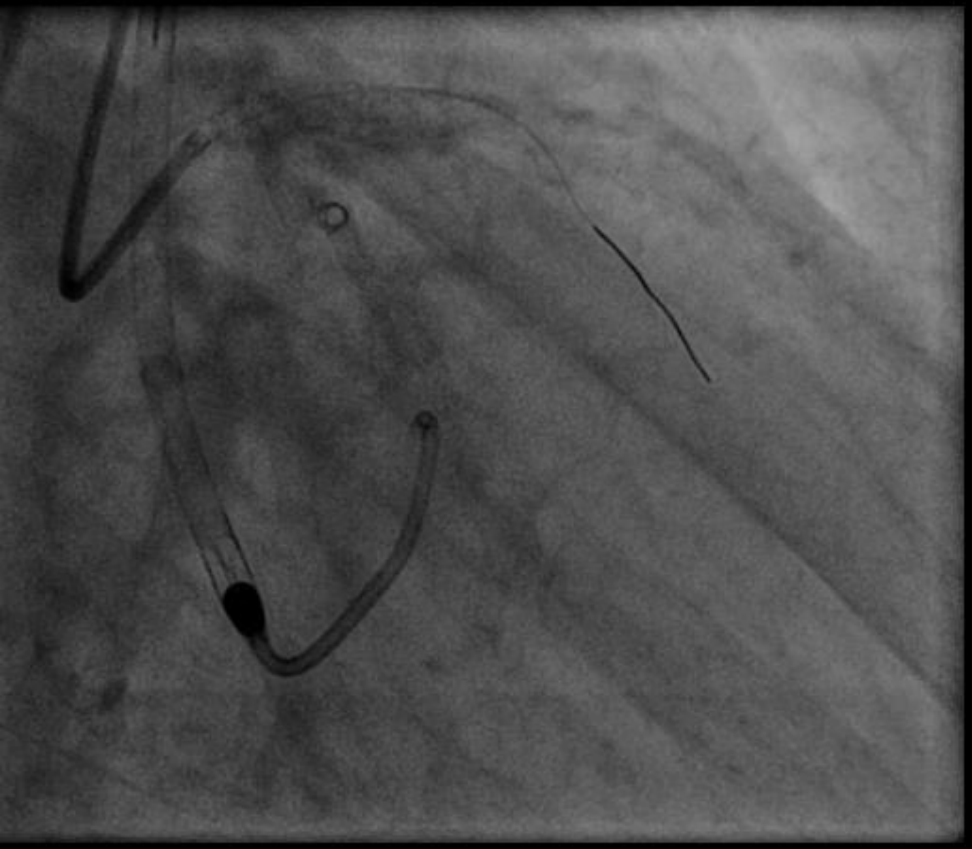
IVUS evaluation to optimize PCI: LAD evaluation

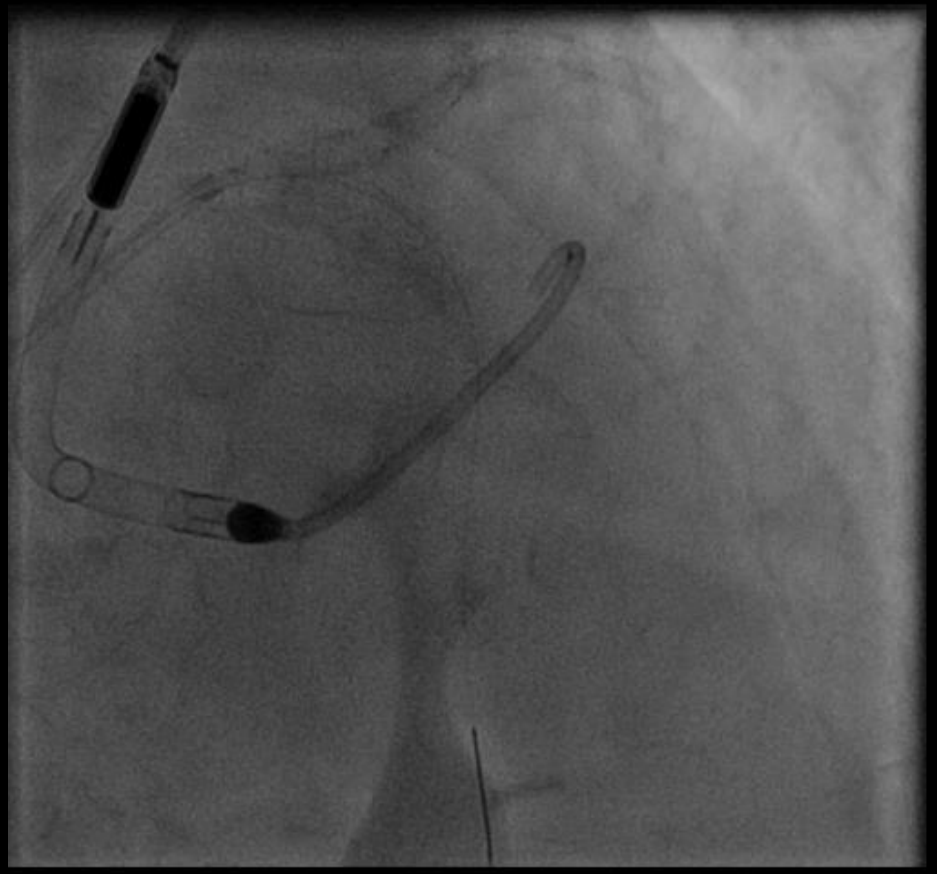






Final angiographic result



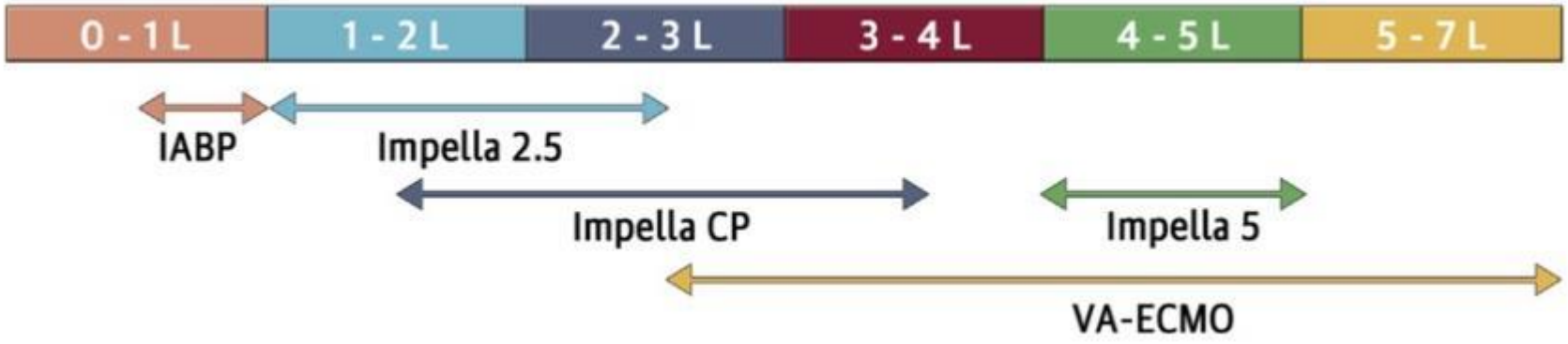


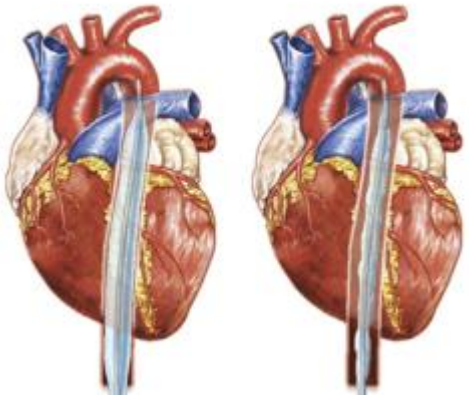
The incidence of cardiogenic shock has been declining from 7% in 1990 to 5% presently

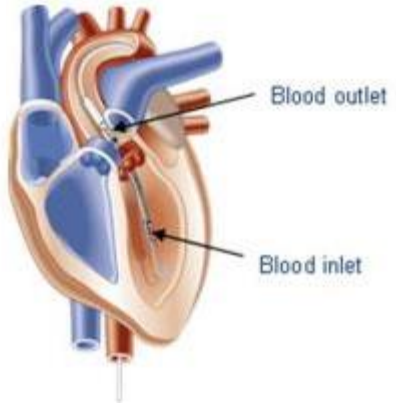
Current hospital mortality 5%

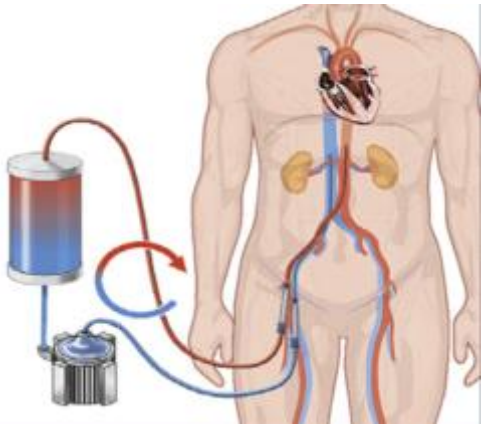
Left main and triple vessel disease are the main offenders (Shock Trial, JACC 2000)

Important predictors of outcome are: LV ejection fraction and degree of mitral regurgitation (Circ. 2003)



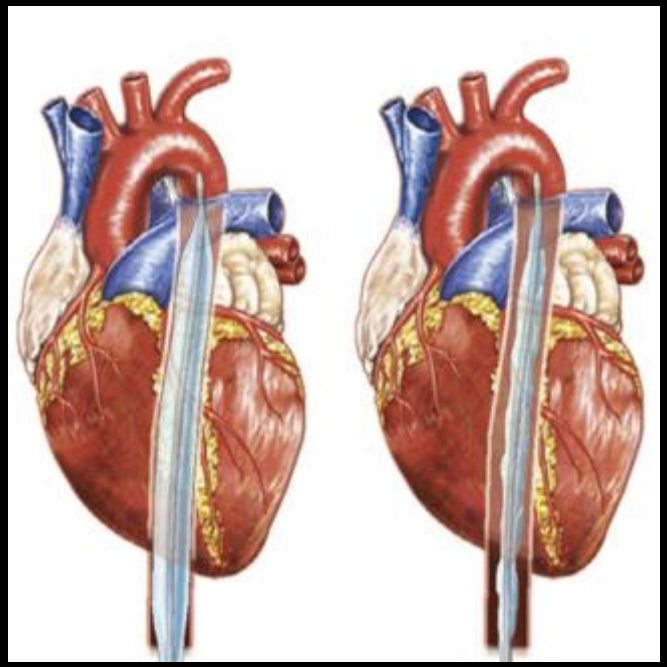






Mechanical Circulatory Support (MCS)

IABP



- **CO increase: 0.5 – 1 L/min**
- Increases MAP
- Reduces LVEDP
- Increases coronary perfusion
- Sheath size: 7-8 F

- Easy to be implanted but minimal Hemodynamic Support
- Contraindicated with severe AR

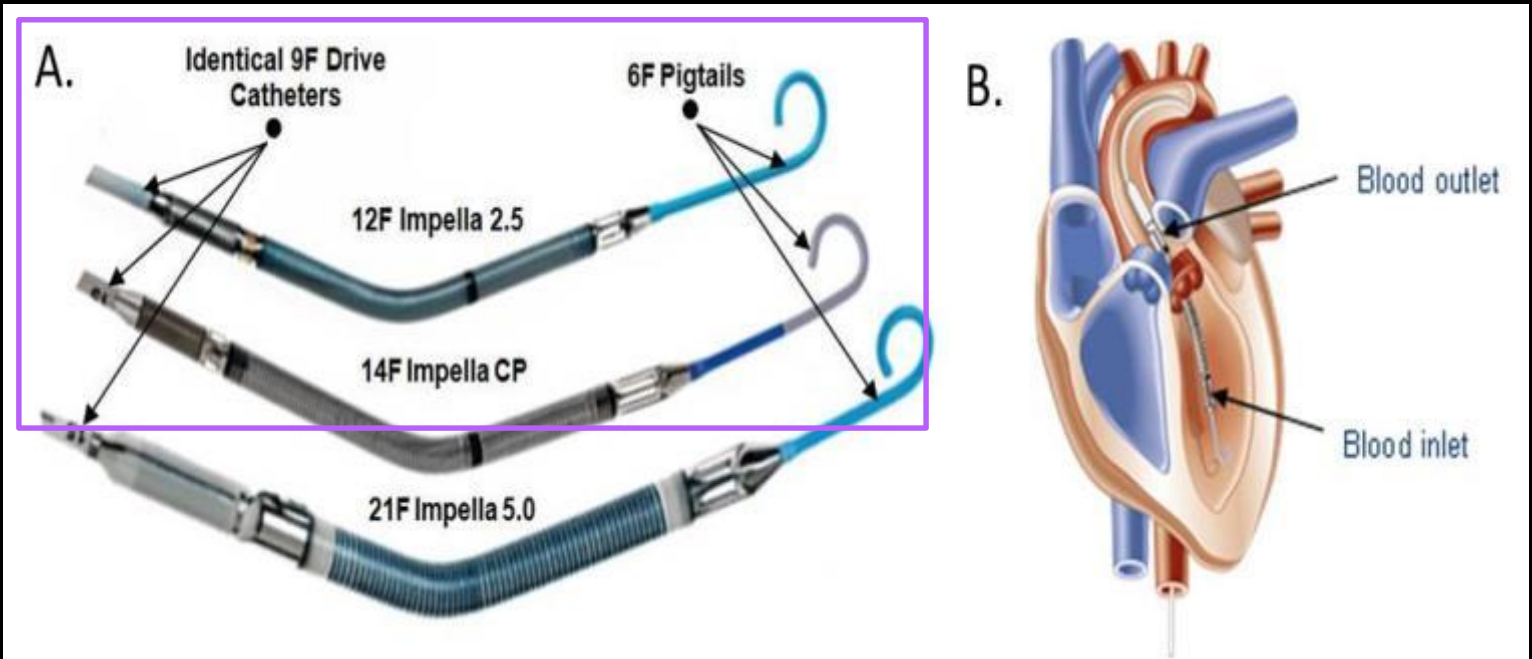
IABP-Shock Trial; NEJM 2012

600 pts. randomized to IAPB versus supportive therapy

30 days mortality

IABP: 39.7%
Standard therapy: 41.3%

IMPELLA


A.
Identical 9F Drive Catheters
6F Pigtails
12F Impella 2.5
14F Impella CP
21F Impella 5.0
B.
Blood outlet
Blood inlet

Active forward flow and LV unloading

Impella 2.5: 12 F insertion sheath

Impella CP, 4 lt/min: 14 F insertion sheath

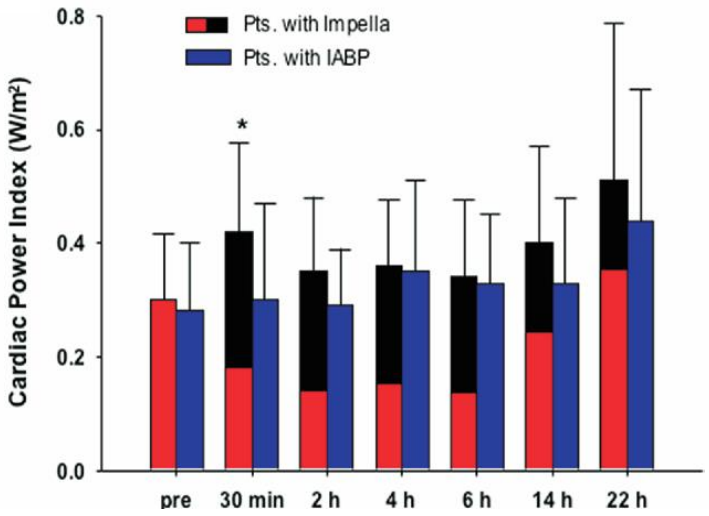
Impella 5 lt/min: 21 F insertion sheath

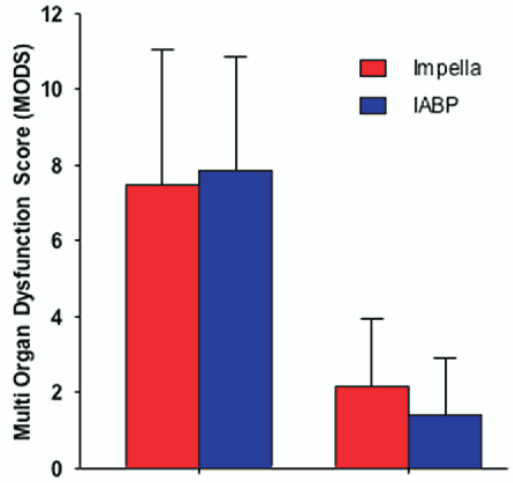
Impella RP for RV support, 4 lt/min: 22 F insertion sheath

ISAR SHOCK

A Randomized Clinical Trial to Evaluate the Safety and Efficacy of a Percutaneous Left Ventricular Assist Device Versus Intra-Aortic Balloon Pumping for Treatment of Cardiogenic Shock Caused by Myocardial Infarction

(J Am Coll Cardiol 2008;52:1584–8)





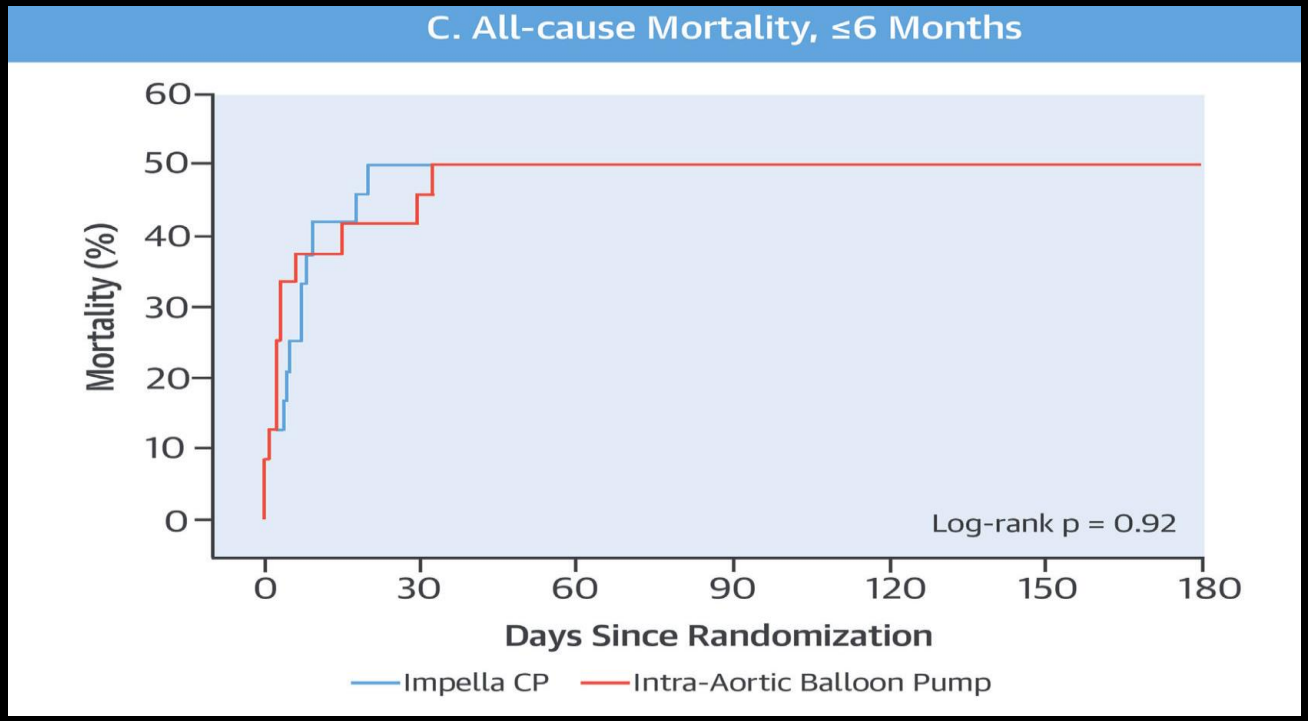
25 patients

Impella 2.5 provides better haemodynamic support than IABP but no difference in mortality

IMPRESS in Severe shock

Percutaneous Mechanical Circulatory Support Versus Intra-Aortic Balloon Pump in Cardiogenic Shock After Acute Myocardial Infarction

(J Am Coll Cardiol 2017;69:278-87)



48 patients No difference in 30 day mortality

Advantage only for early Impella

RESEARCH CORRESPONDENCE

Early Initiation of Impella in Acute Myocardial Infarction Complicated by Cardiogenic Shock Improves Survival

A Meta-Analysis

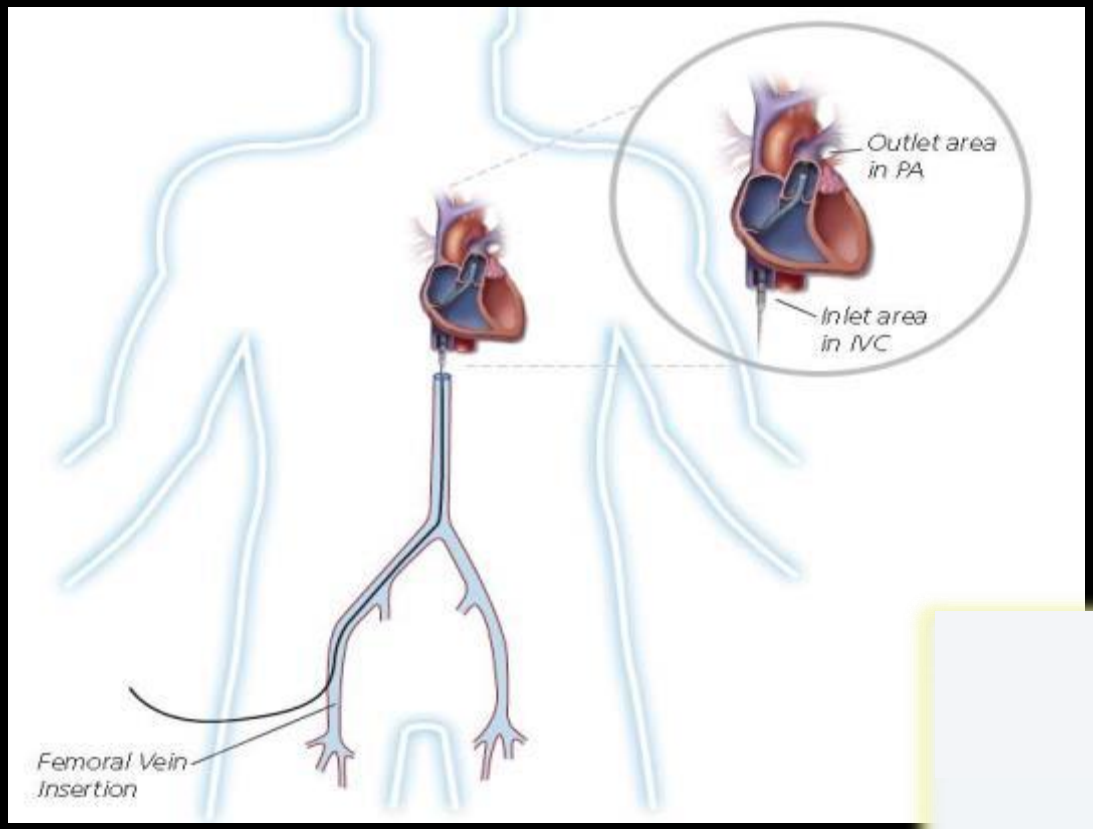
FIGURE 1 Forest Plot Comparing In-Hospital/30-Day Mortality in "Early" vs. "Late" Impella

CI = confidence interval.

3 Studies

Survival benefit in "Early Impella" (During PCI) vs "Late Impella" (after PCI)

IMPELLA RP:
Temporary Right Ventricle support



- Selective RV Unloading
- CO increase: 4.4 L/min
- Sheath size: 23 F

Tandem Heart

The Tandem Heart is a continuous-flow centrifugal assist device placed outside the body (extracorporeally).

Cannulas are inserted percutaneously through the femoral vein and advanced across the intra atrial septum into the left atrium.

The pump withdraws oxygenated blood from the left atrium, propels it by a magnetically driven, six-bladed impeller through the outflow port, and returns it to one or both femoral arteries via arterial cannulas.

The pump is capable of delivering blood flow up to 5.0 liters per minute.

Randomized study of Tandem Heart vs. IABP in 41 pts.

No mortality difference, more bleeding events with Tandem Heart (EHJ 2005)

Randomized study of Impella vs. IABP in 25 pts. Better hemodynamics with Impella, no mortality difference (JACC 2008)

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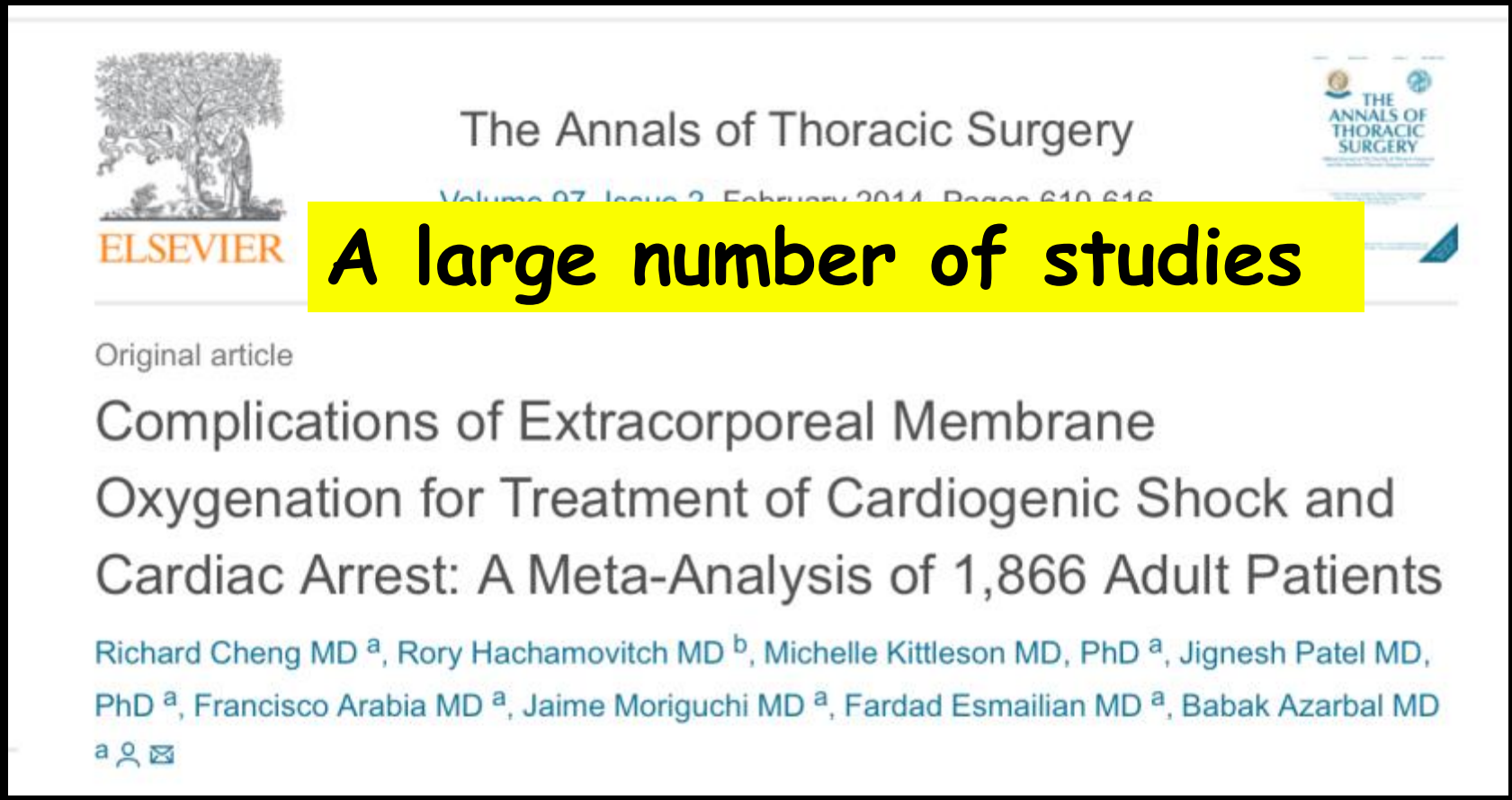
ECMO

Venous canula: 19-25 F
Arterial canula: 15-23 F



ELSEVIER

The Annals of Thoracic Surgery

Volume 97, Issue 2, February 2014, Pages 610-616

A large number of studies

Original article

Complications of Extracorporeal Membrane Oxygenation for Treatment of Cardiogenic Shock and Cardiac Arrest: A Meta-Analysis of 1,866 Adult Patients

Richard Cheng MD [a], Rory Hachamovitch MD [b], Michelle Kittleson MD, PhD [a], Jignesh Patel MD, PhD [a], Francisco Arabia MD [a], Jaime Moriguchi MD [a], Fardad Esmailian MD [a], Babak Azarbal MD [a]

Mortality range from 25-60%
quite high complication rates

How to individualize MCS therapy

3. Myocardial performance

LV Shock (PVC<14, PCWP>18)	RV Shock (PVC>14, PCWP<18)	Biventricular Shock (PVC>14, PCWP>18)
First line IMPELLA 2.5/CP	First line IMPELLA RP	Hypoxia* ECMO + IABP
Second line + ECMO (IMPELLA 5.0)	Second line e/o Hypoxia* ECMO	NON Hypoxia* ECMO o BI-IMPELLA (CP/5.0 + RP)

* Hypoxia: PaO2<55 con FiO2 100%

Rescue Mitraclip Implantation in the unstable patient with prohibitive surgical risk following Acute ST Elevation Myocardial Infarction

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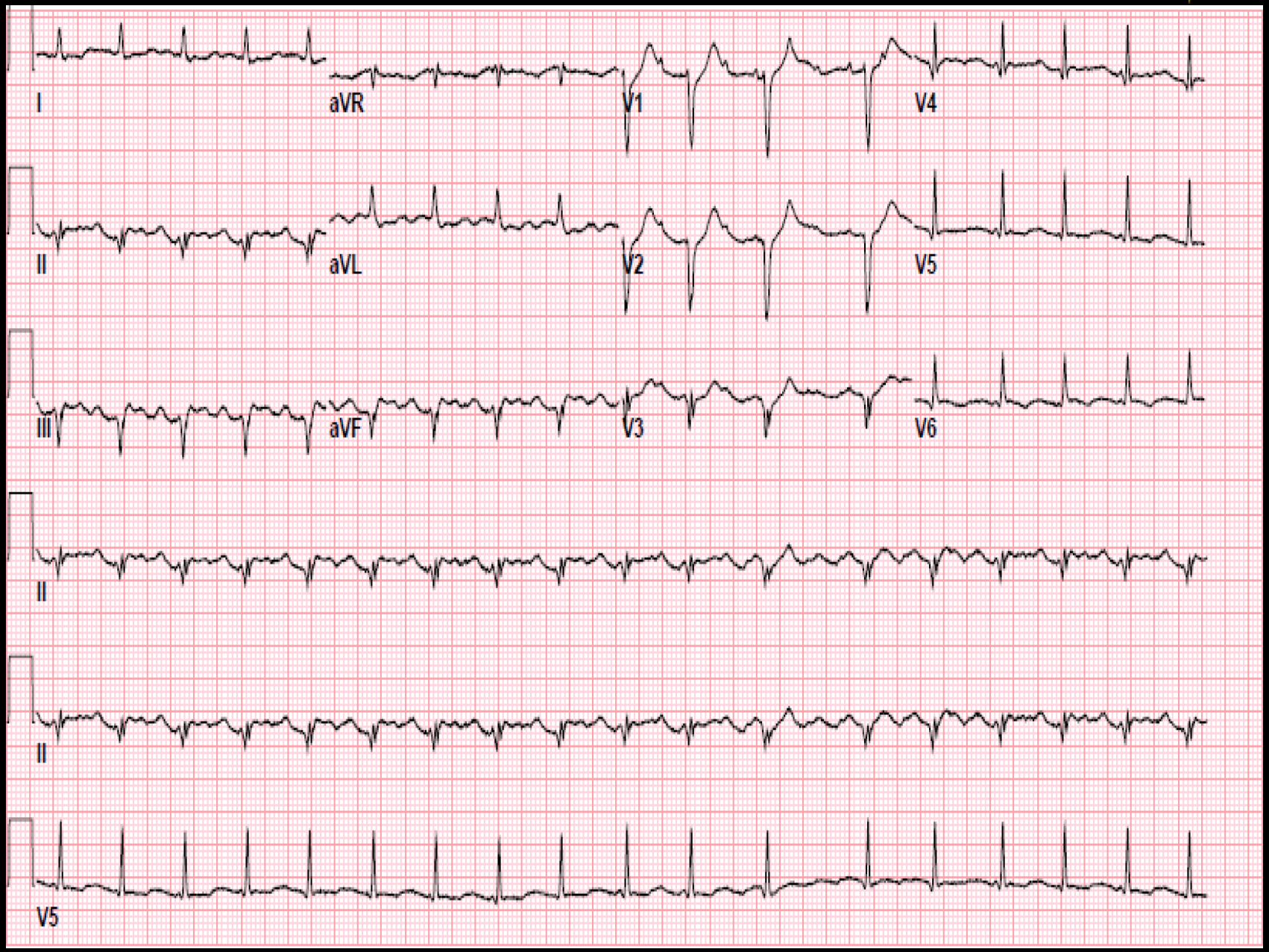
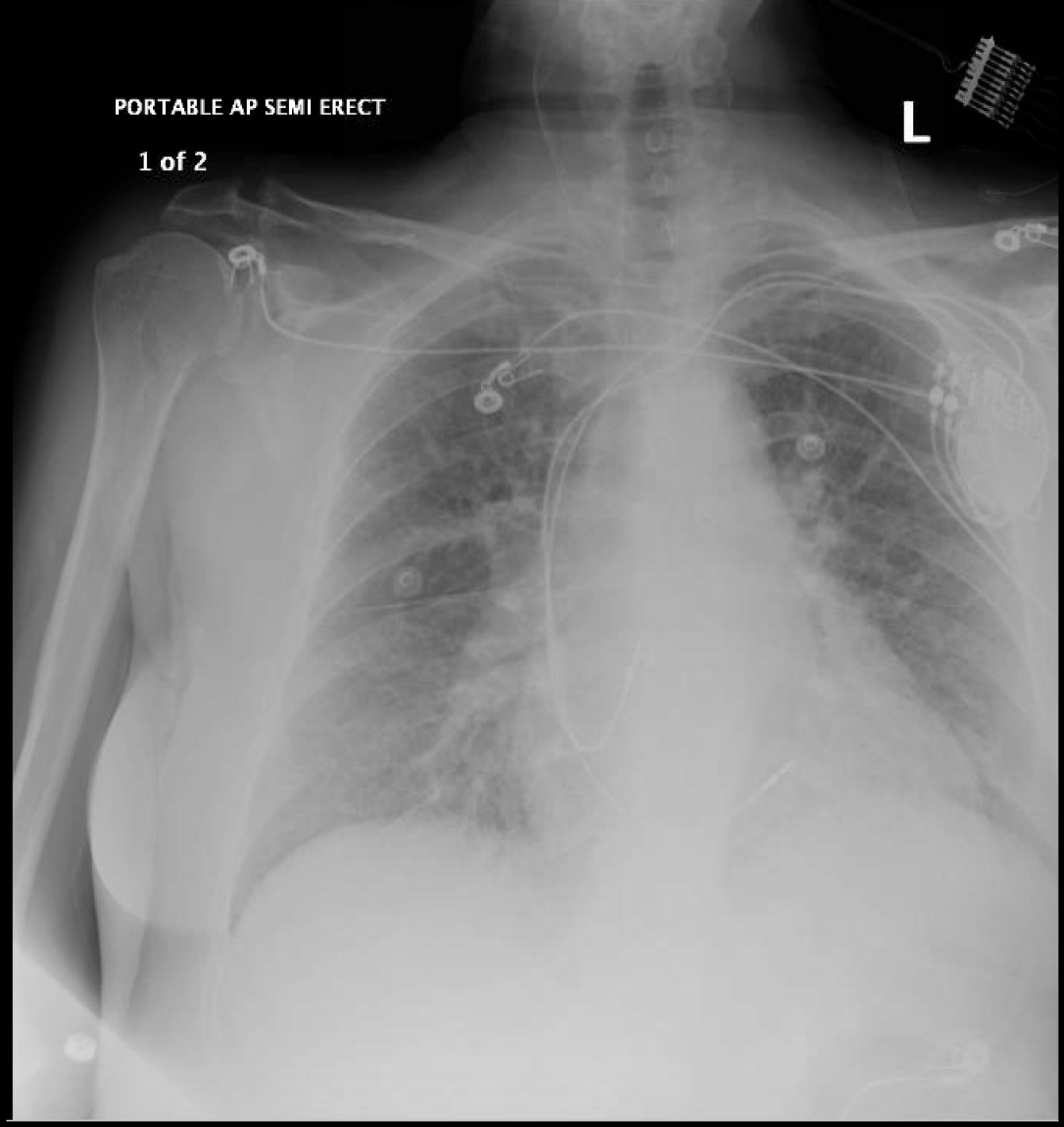
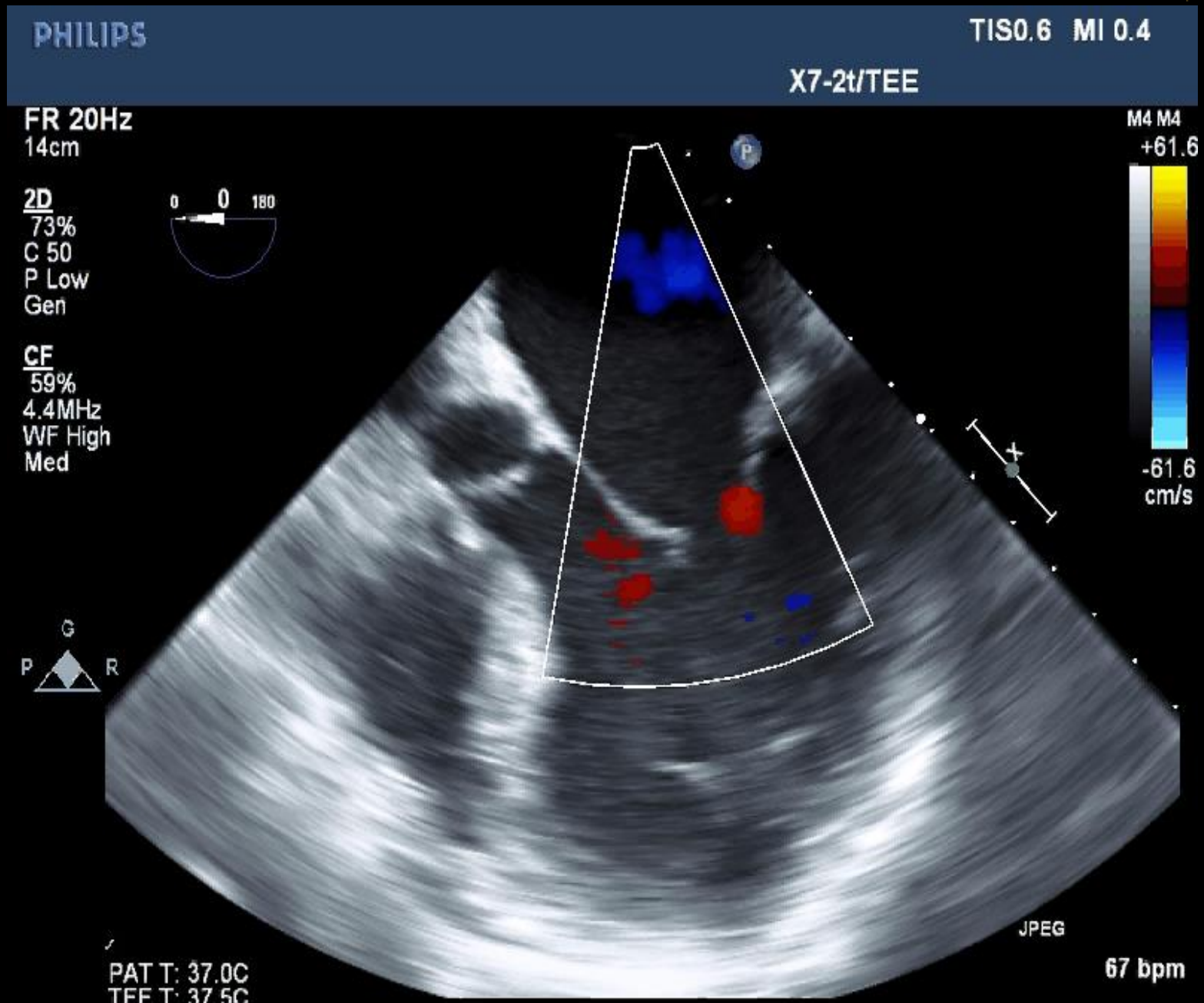
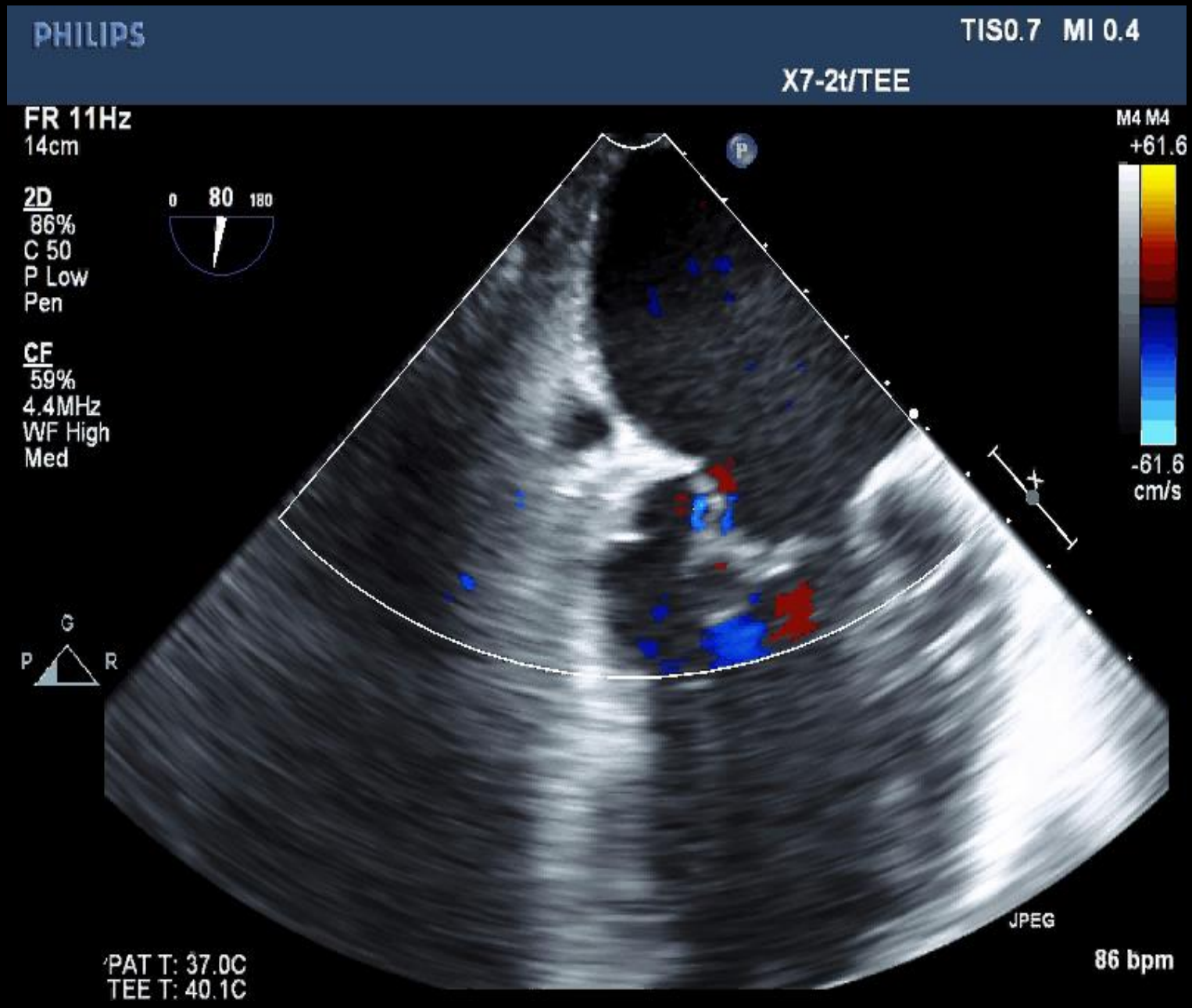





PHILIPS
TIS0.6 MI 0.4
X7-2t/TEE
FR 20Hz
14cm
2D
73%
C 50
P Low
Gen
CF
59%
4.4MHz
WF High
Med
0 0 180
M4 M4
+61.6
-61.6
cm/s
G
P
R
JPEG
PAT T: 37.0C
TEE T: 37.5C
67 bpm


PHILIPS
TIS0.7 MI 0.4
X7-2t/TEE
FR 11Hz
14cm
2D
86%
C 50
P Low
Pen
CF
59%
4.4MHz
WF High
Med
0 80 180
M4 M4
+61.6
-61.6
cm/s
G
P R
JPEG
PAT T: 37.0C
TEE T: 40.1C
86 bpm

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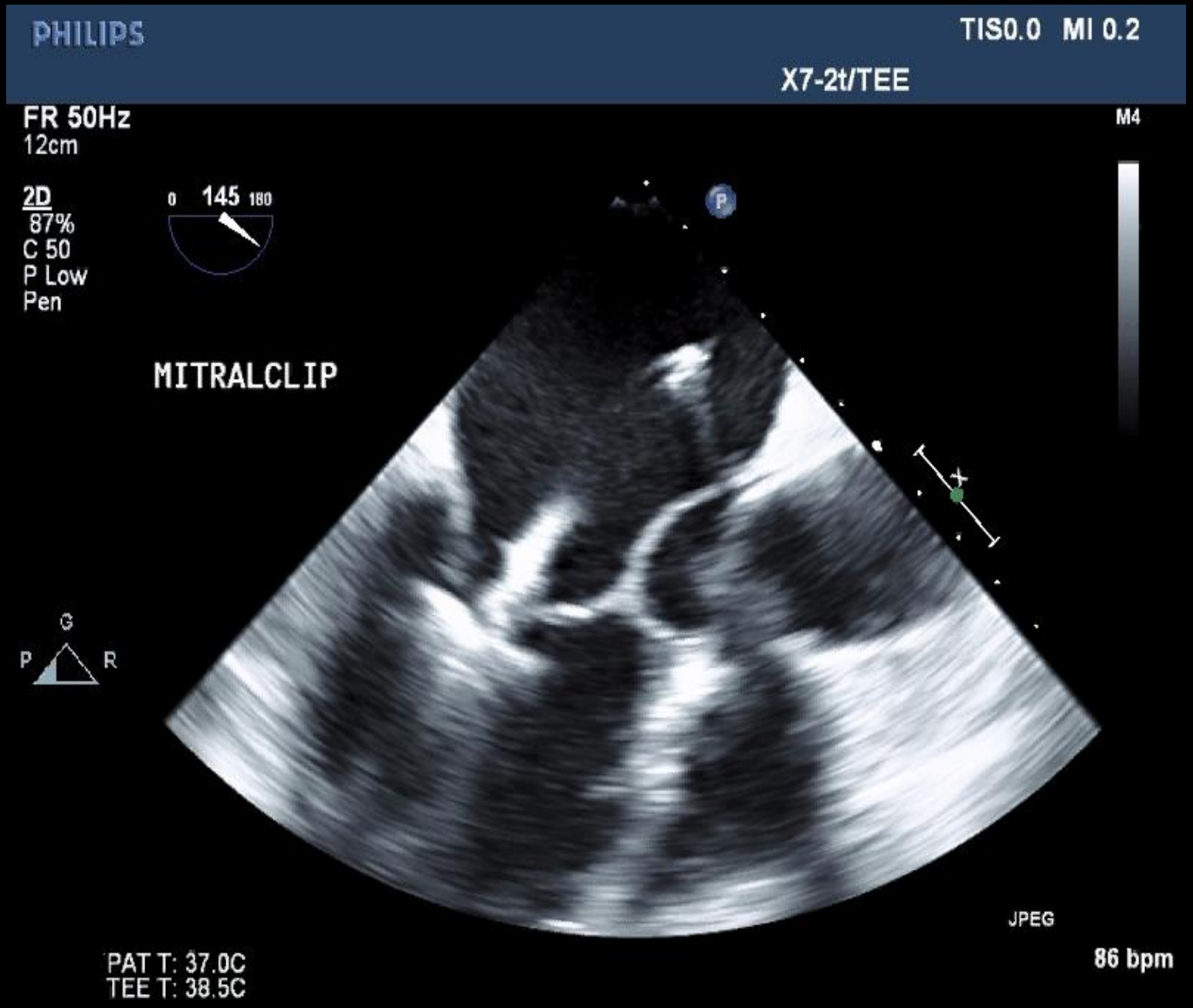

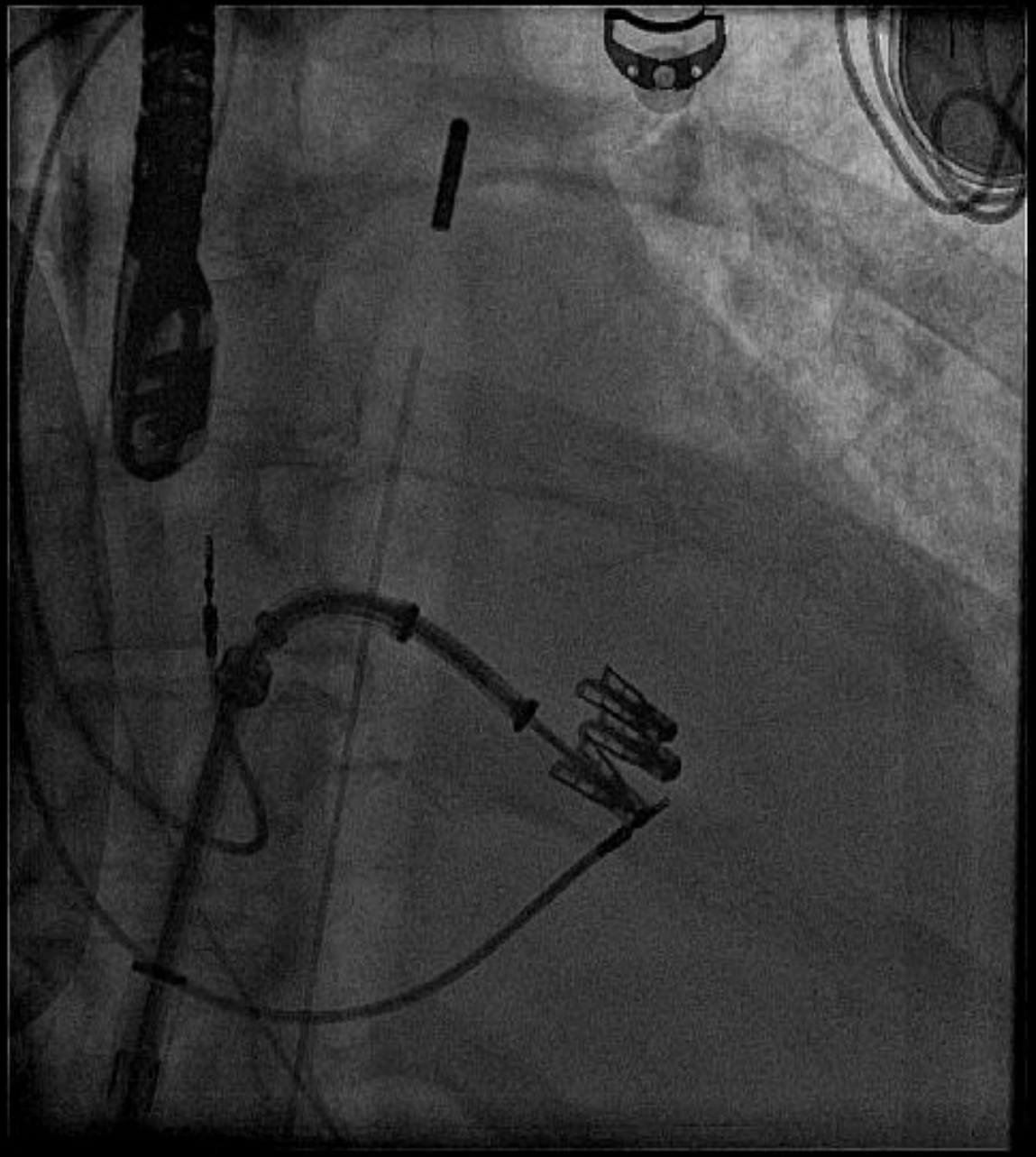

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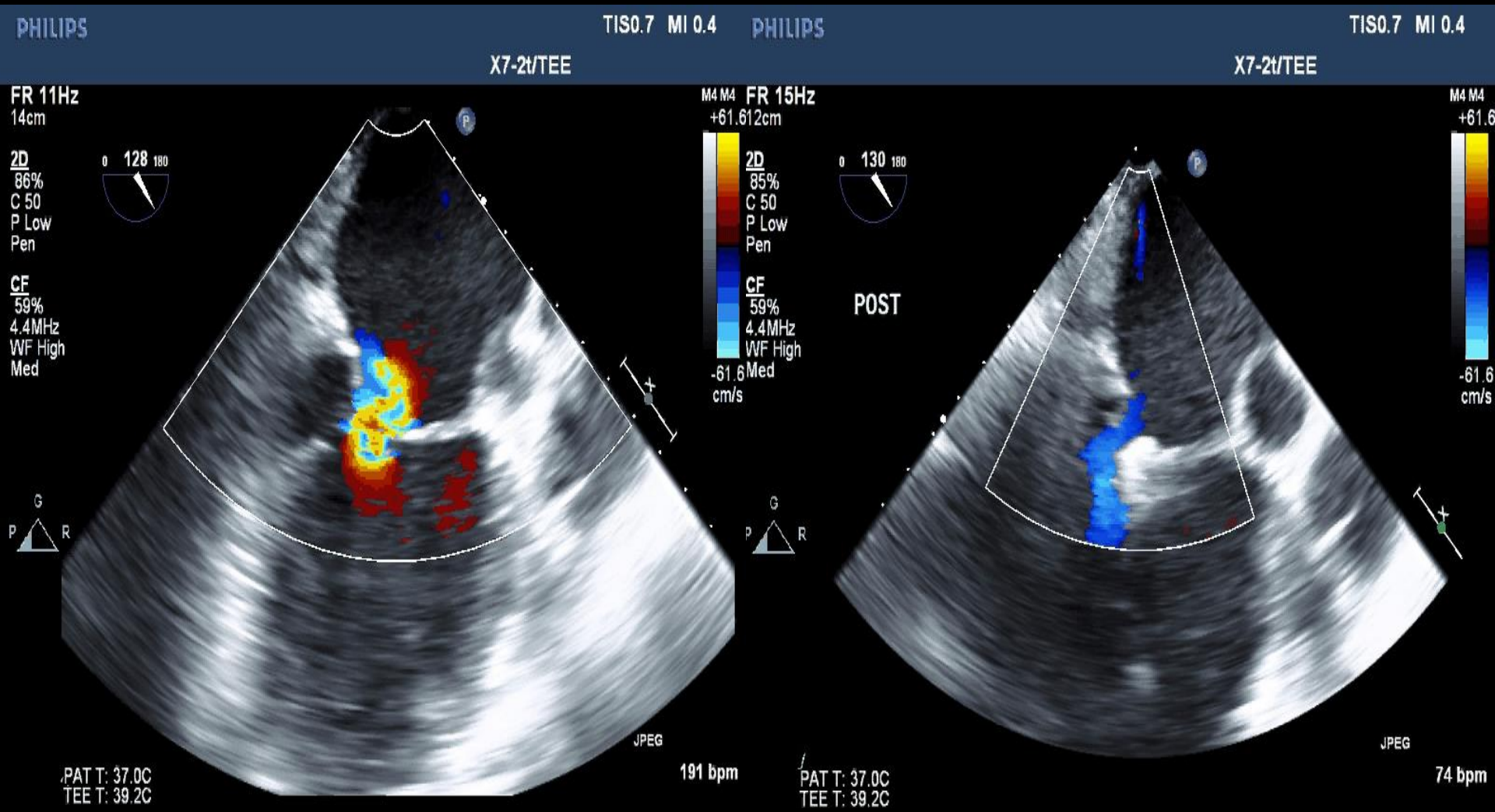
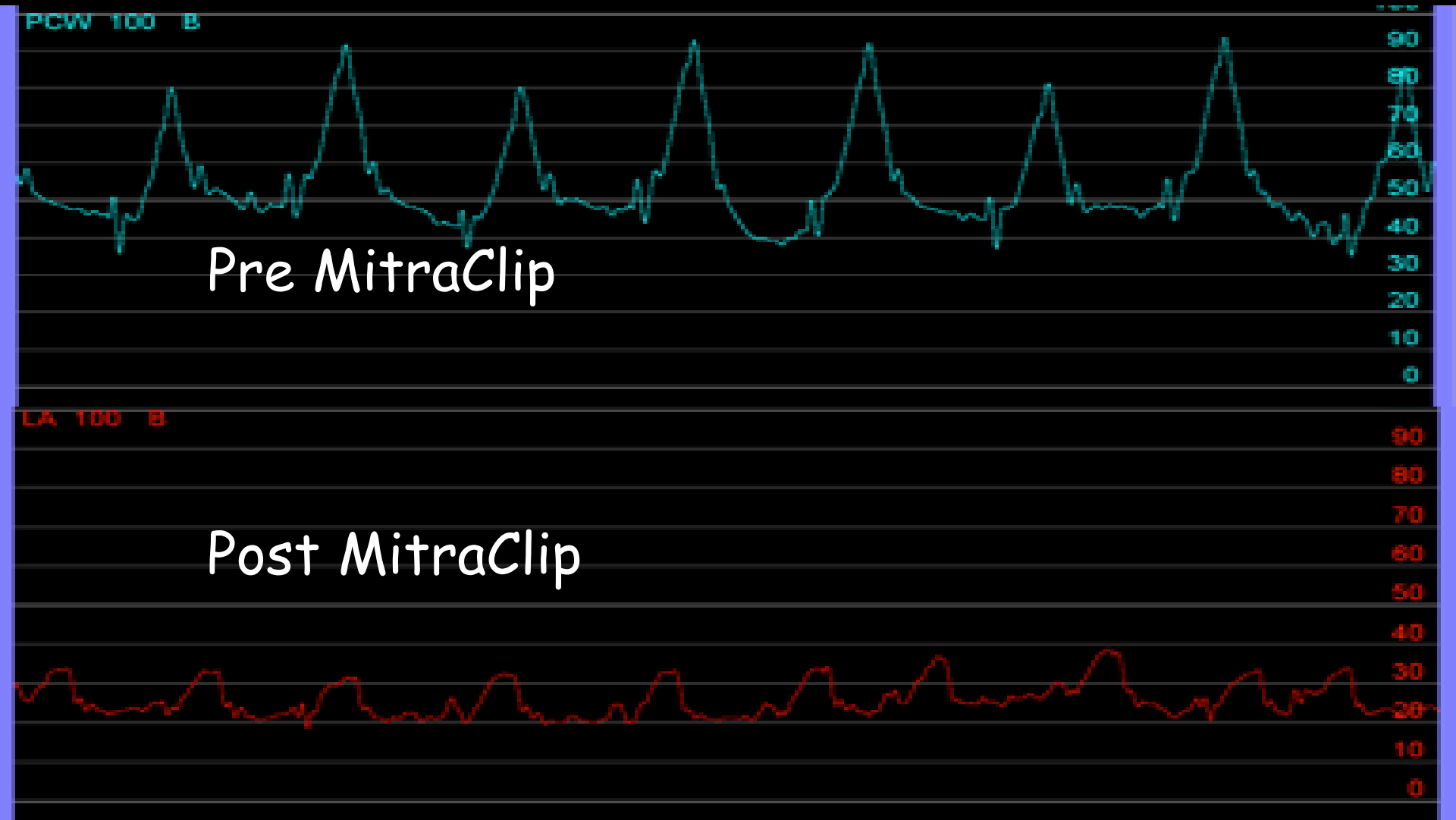
MR: Pre & Post



HEMODYNAMICS: Pre & Post



CLINICAL COURSE

- Did well post procedure and was discharged 7 days later.
- Doing well on 4 week and 6 month follow up in valve clinic.

CABG for Cardiogenic Shock

Pooled data from 370 pts. in 22 studies
Hospital mortality 36% (JACC 1999)

Retrospective analysis in Shock Trial
128 pts. PCI vs. CABG (47 pts.)
30 day mortality
CABG 57%
PCI 56%

Fibrinolysis is still an option when PCI delay is over 60 min

The benefits of fibrinolysis decrease as the delay from symptoms onset to fibrinolysis increase.

Side effects related to bleeding stay the same

Conclusions

- Early reperfusion is the most important element
- Hemodynamic support with Impella, Tandem Heart, ECMO should be considered at an early stage
- Correction of severe mitral regurgitation with MitraClip should be considered