

ECMO and PCPS Like a Surgeon

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Disclosure

- Disclose potential conflicts of interest : I have nothing to be disclosed

MCS (mechanical circulatory support)

- Extracorporeal membrane oxygenation (ECMO)
(VA ECMO)
- Percutaneous cardiopulmonary support (PCPS)

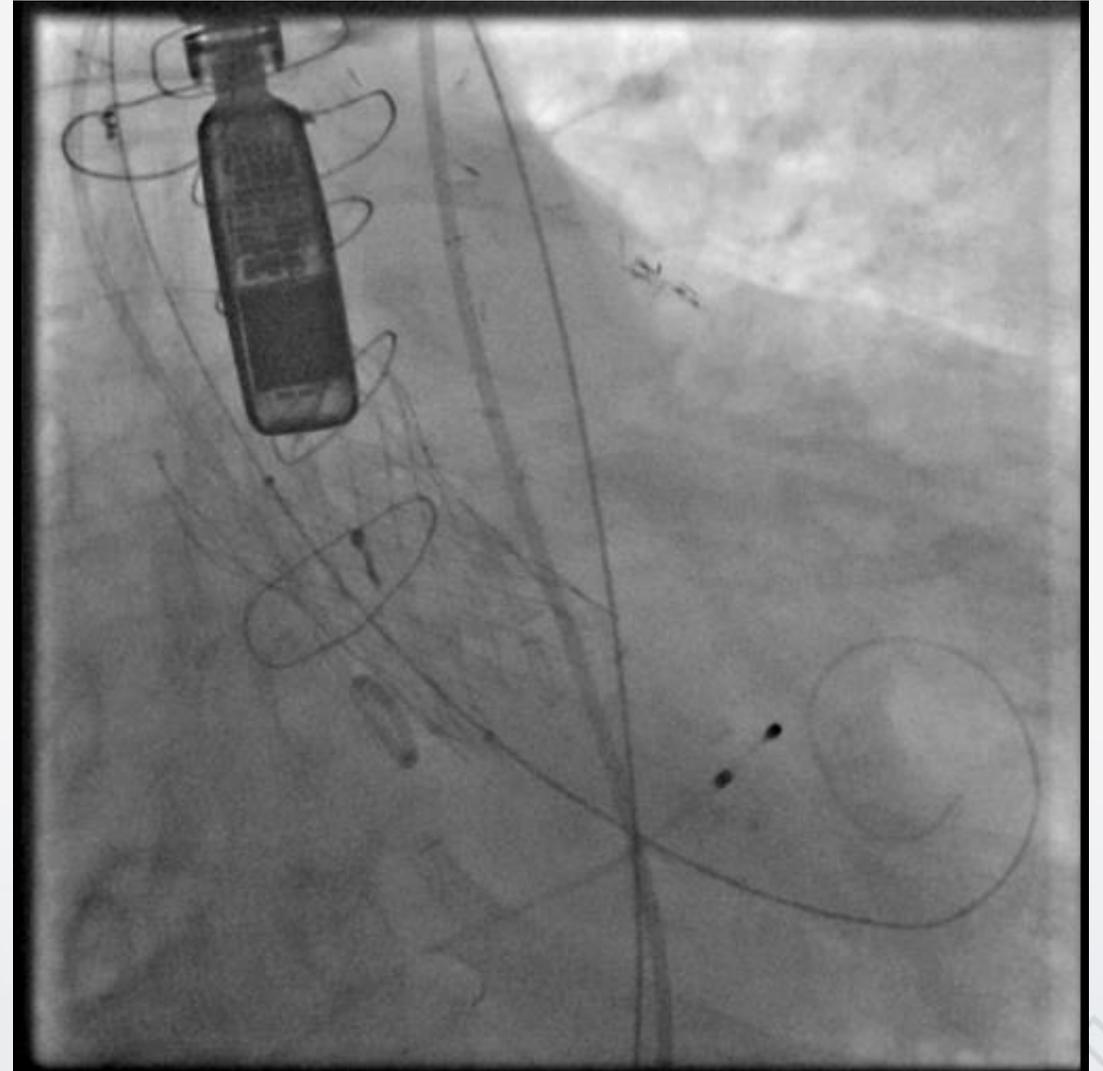


Brief history

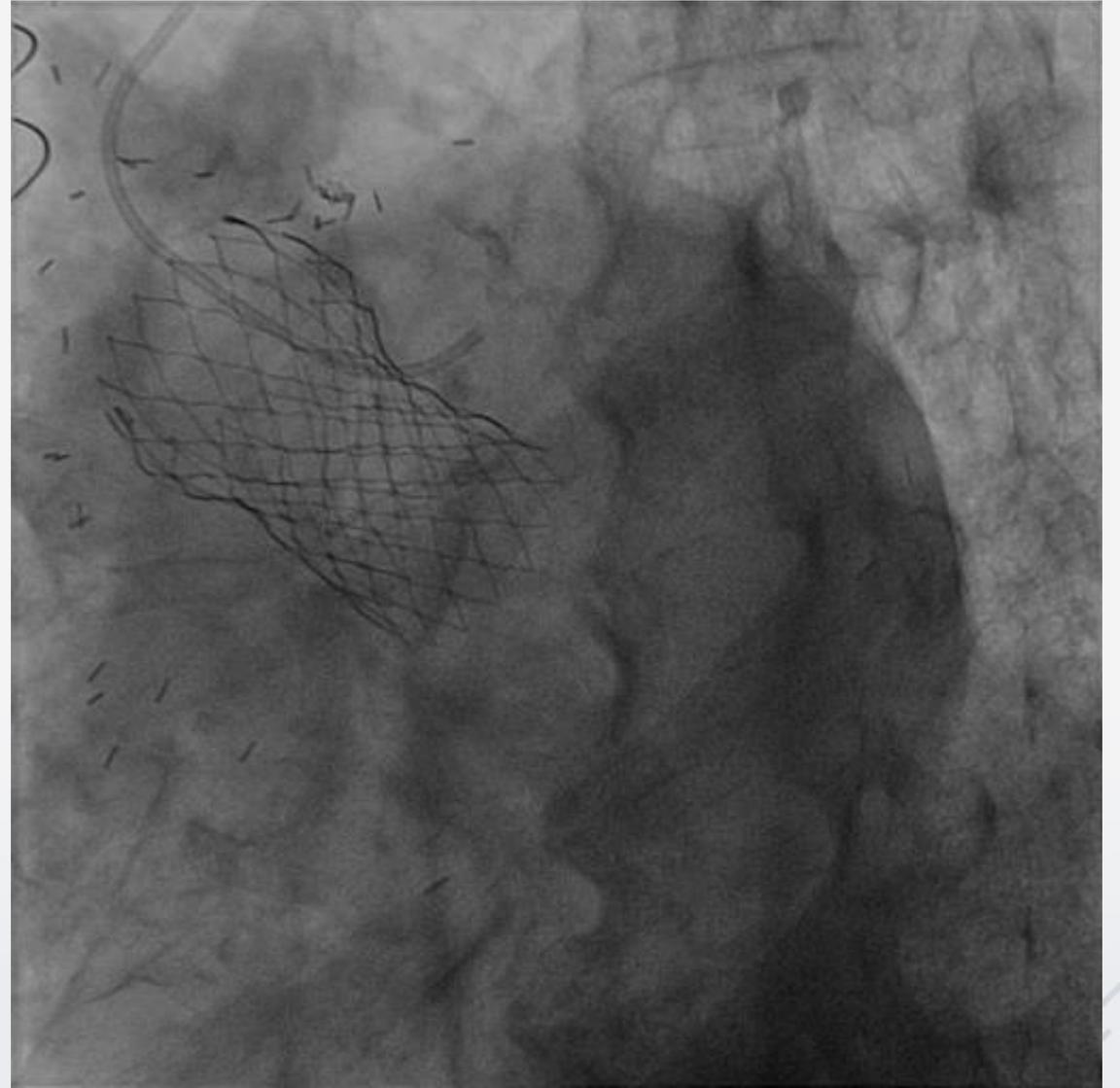
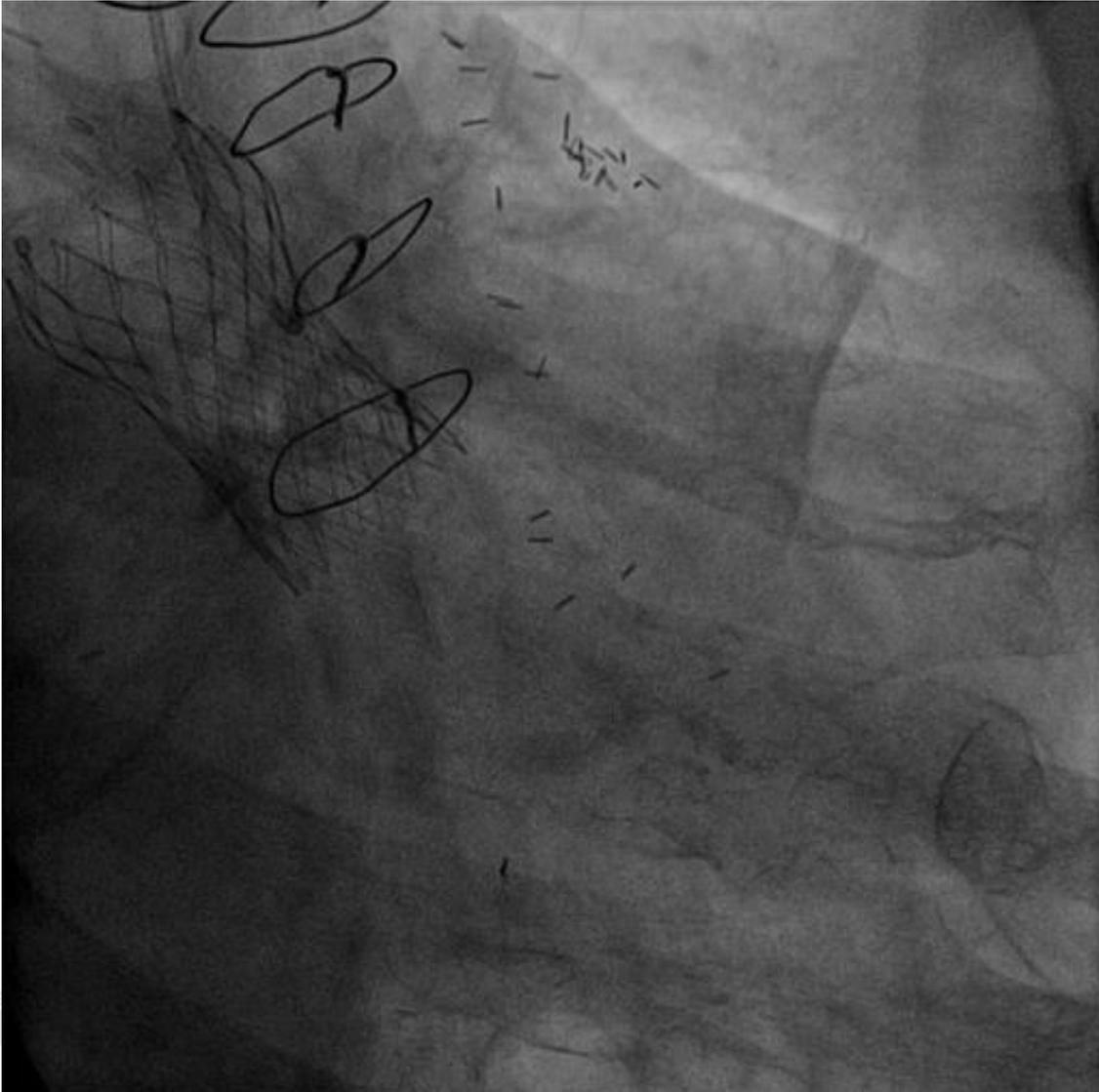
93 y/o man

- CAD, 3VD s/p CABG in 1990, re-do SAXCAB in 2005
- Severe AS (est-AVA 0.5cm^2 / mean PG 52mmHg) s/p TAVI in Oct 2019
- HF with reduced EF (LVEF 25%)
- Atrial fibrillation
- Hyperlipidemia

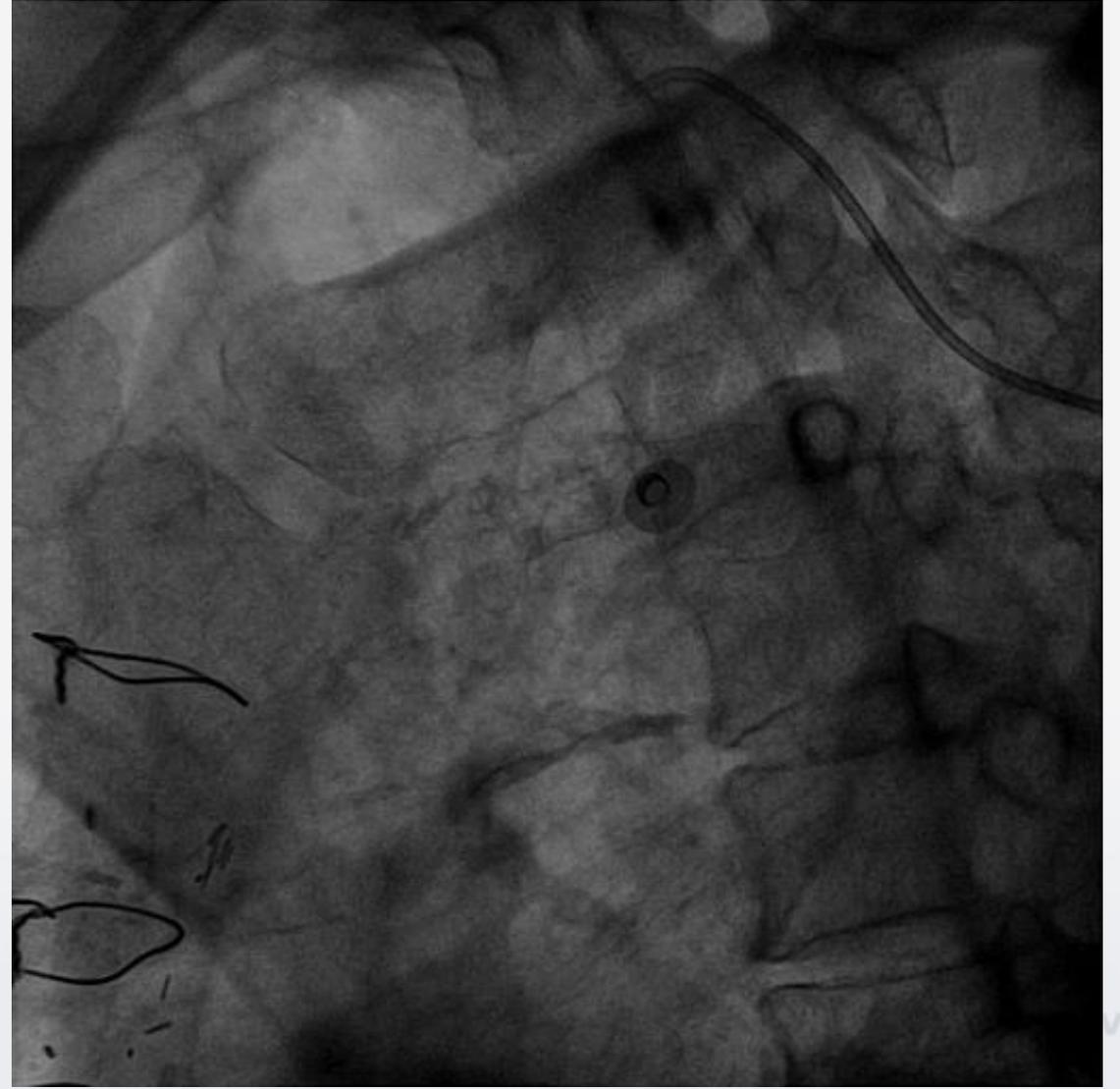
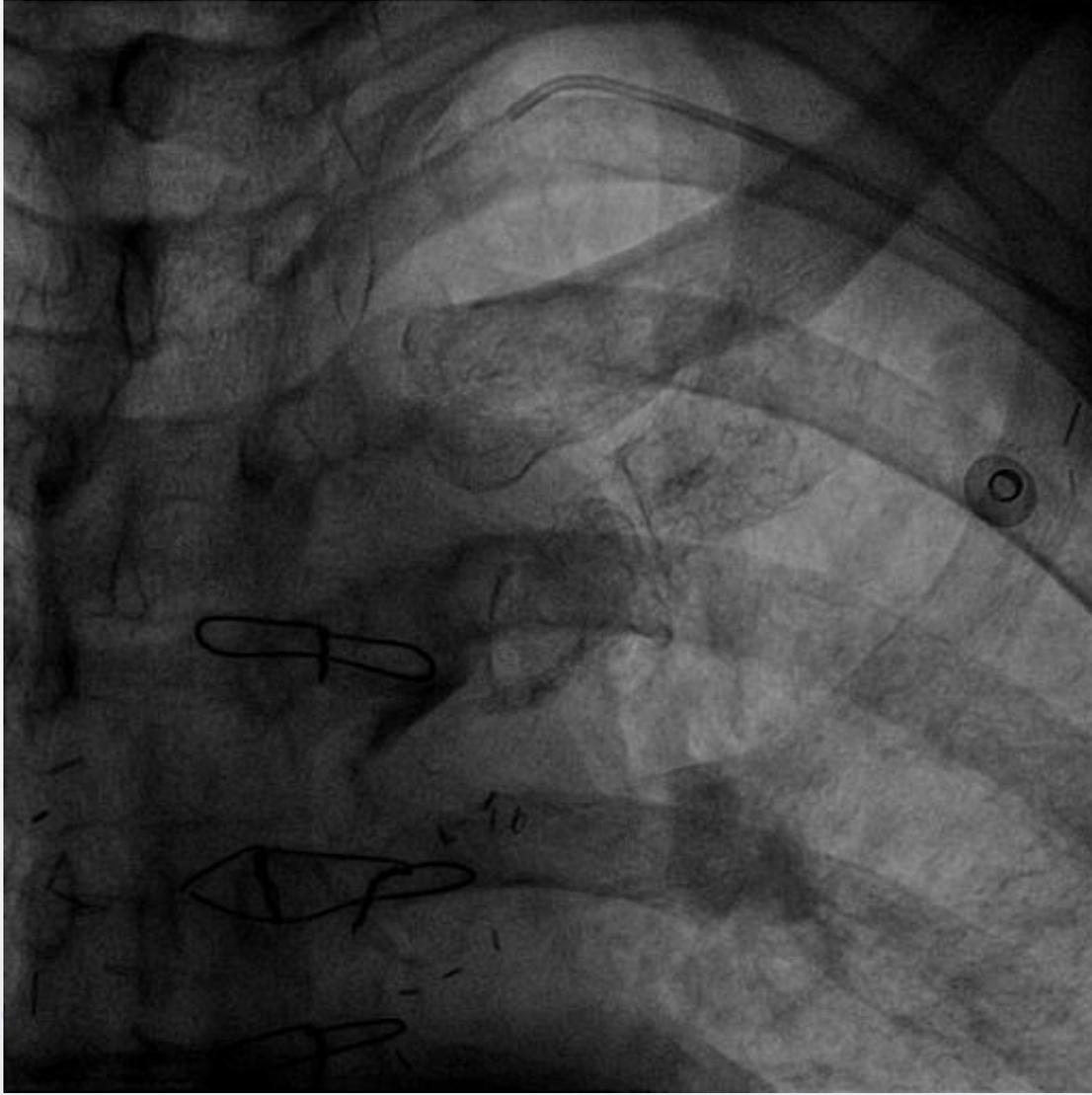
TAVI (Evolut R) /post-dilation in Oct 2019



LCA angio in Sep 2022

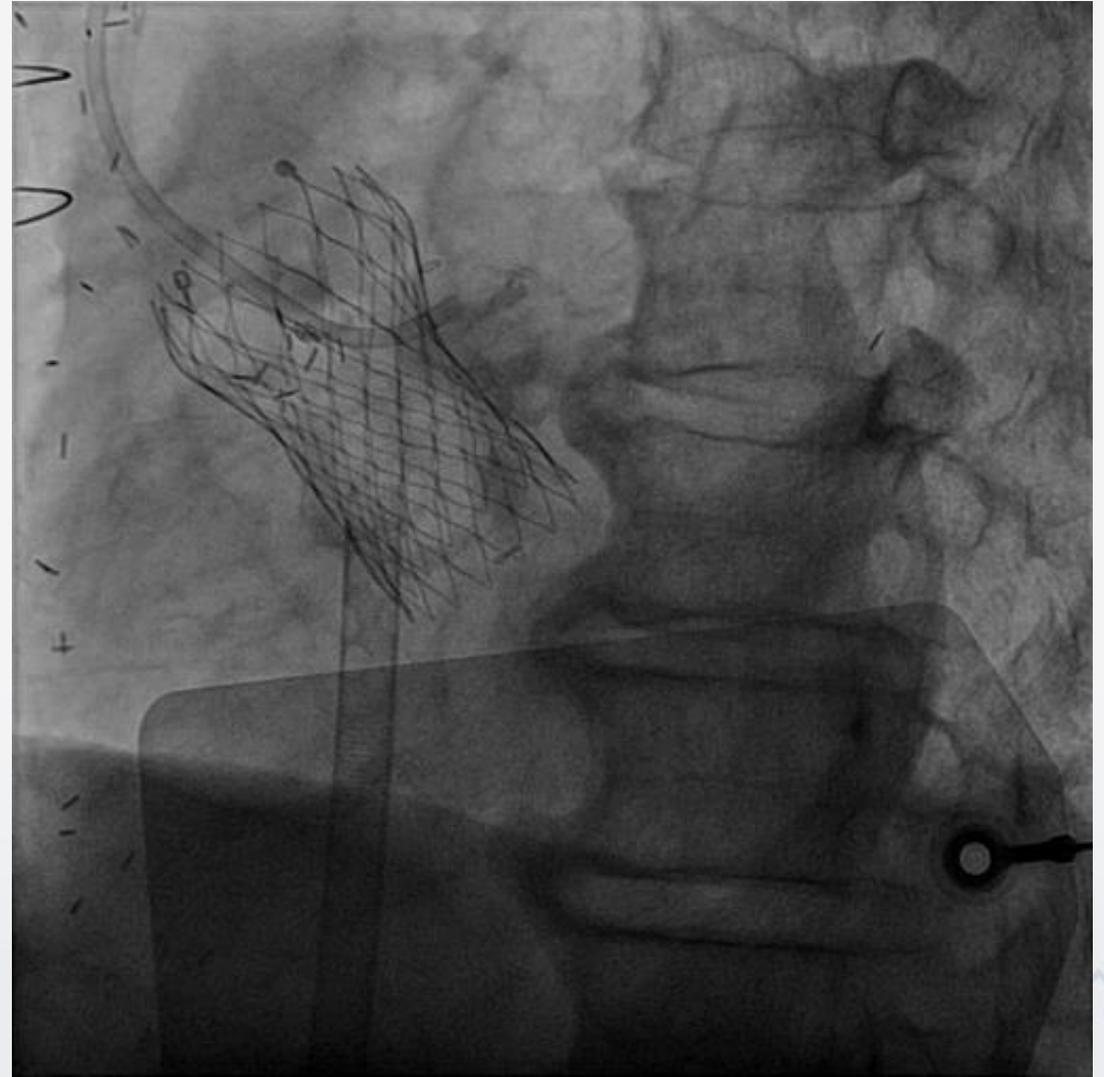
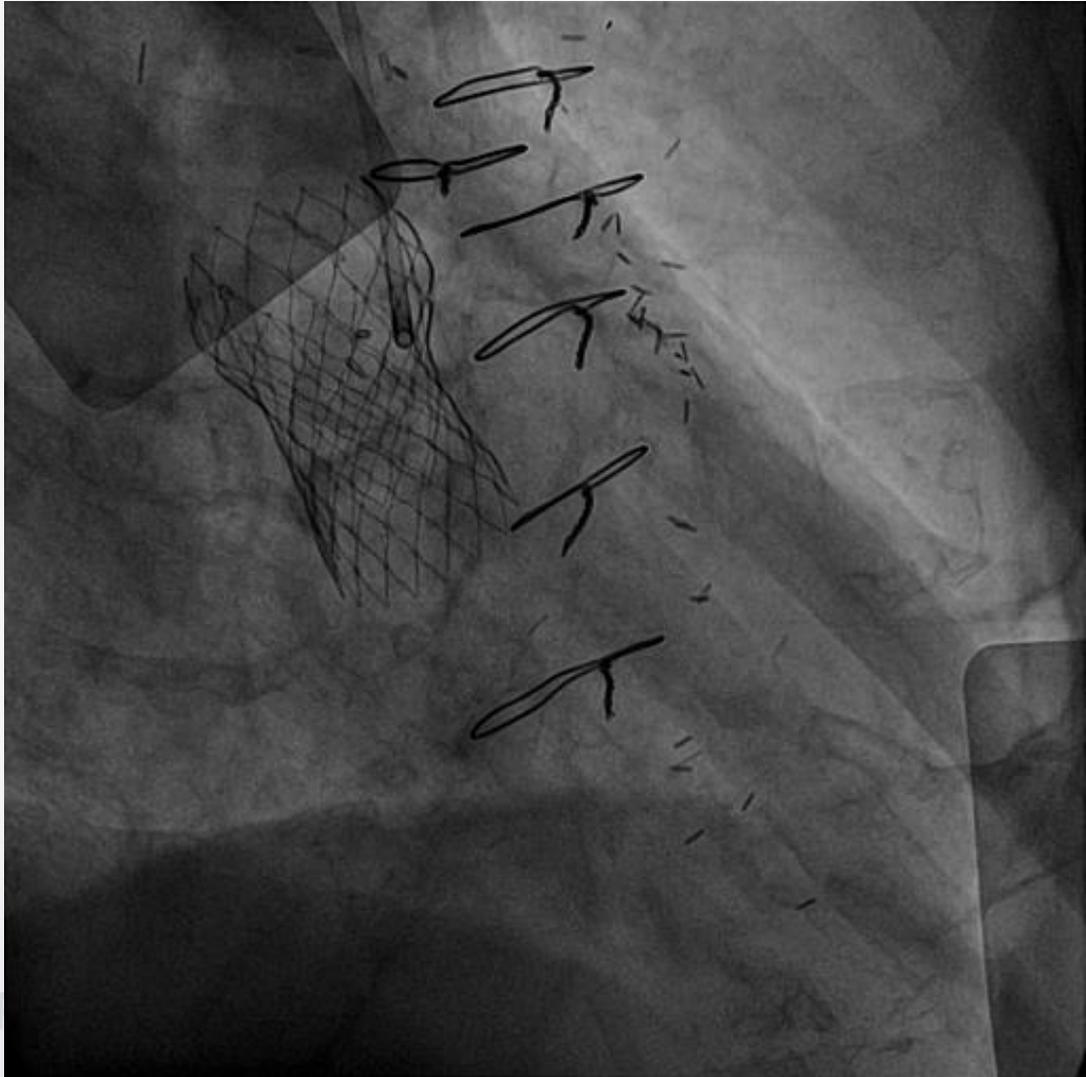


LIMA graft angio

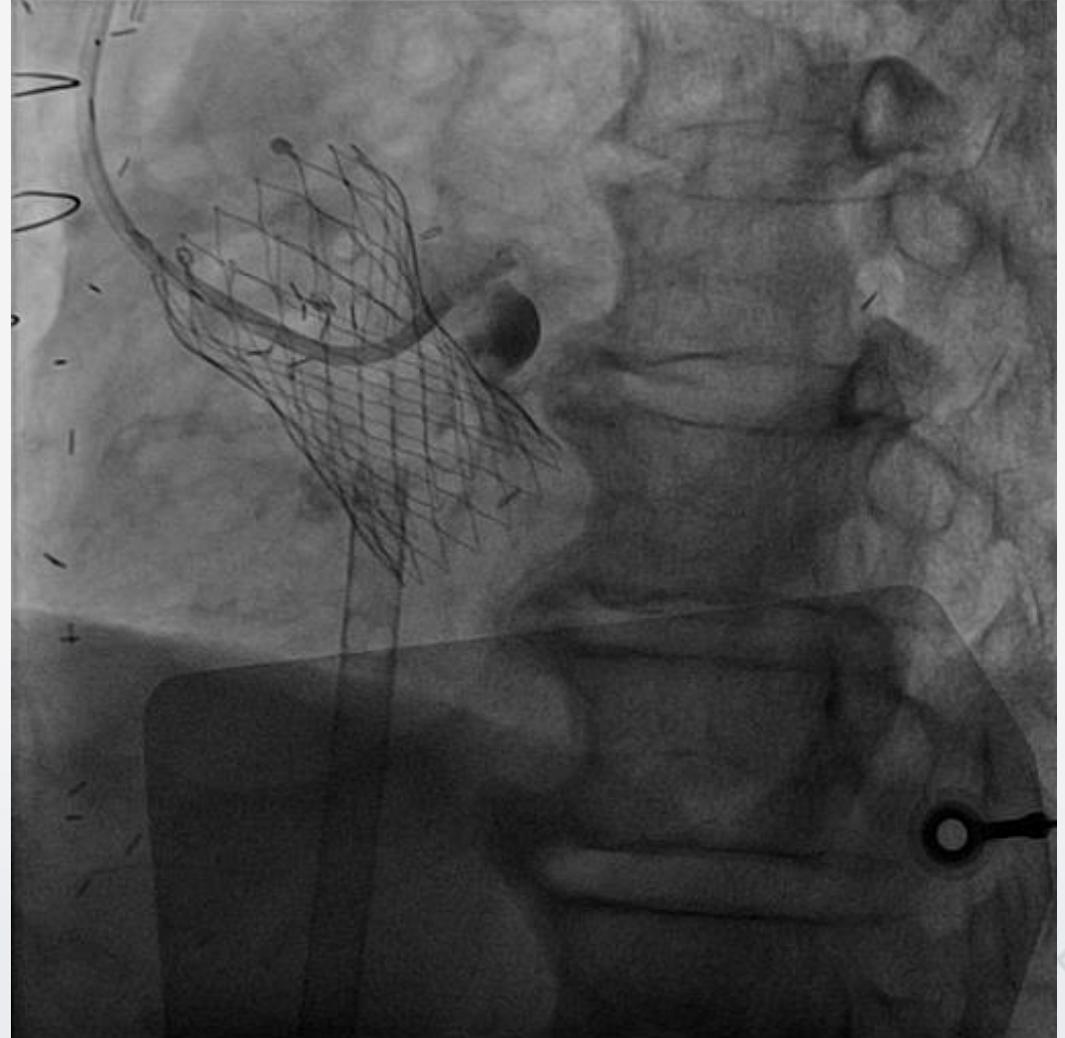
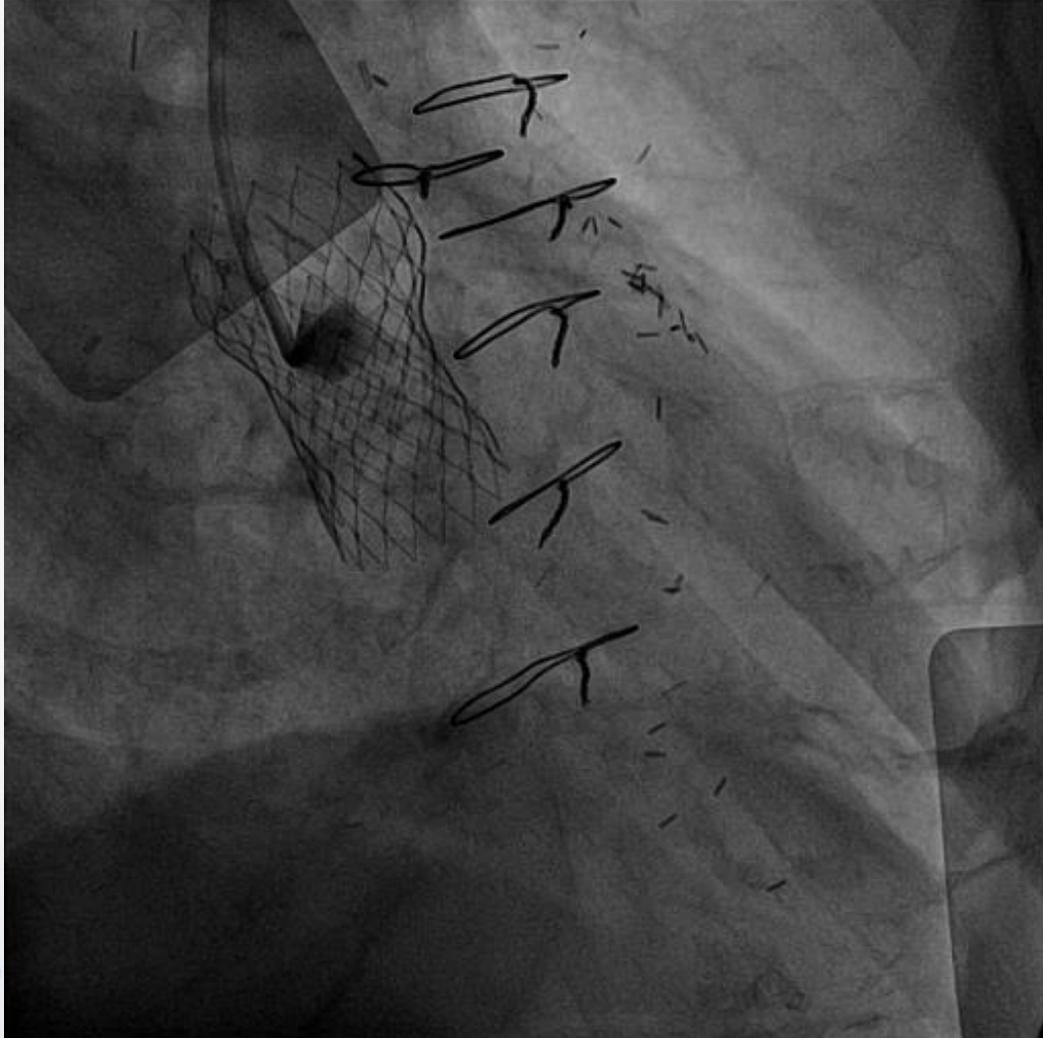


LCA angio (under VA-ECMO support)

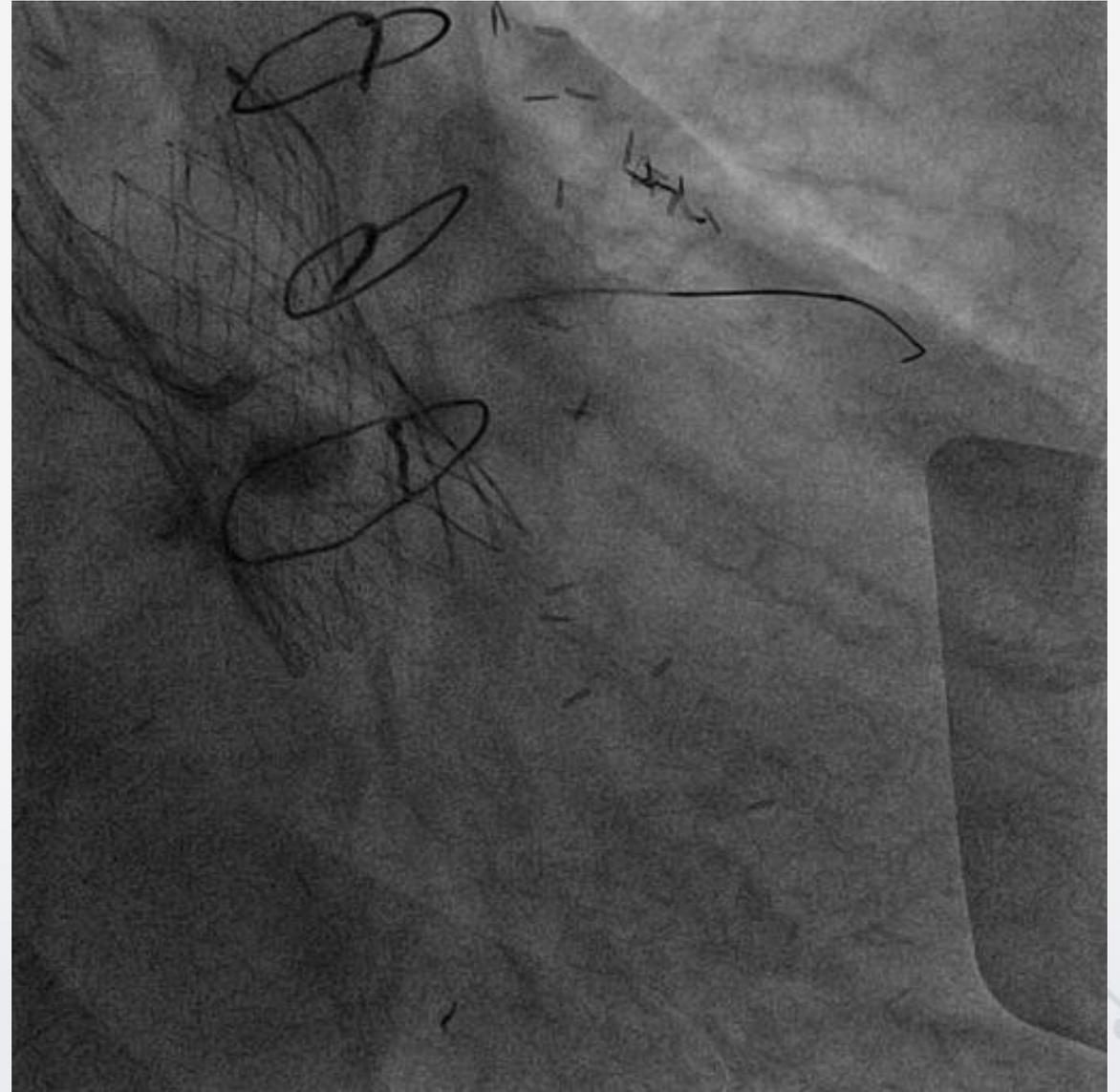
2022-09-19



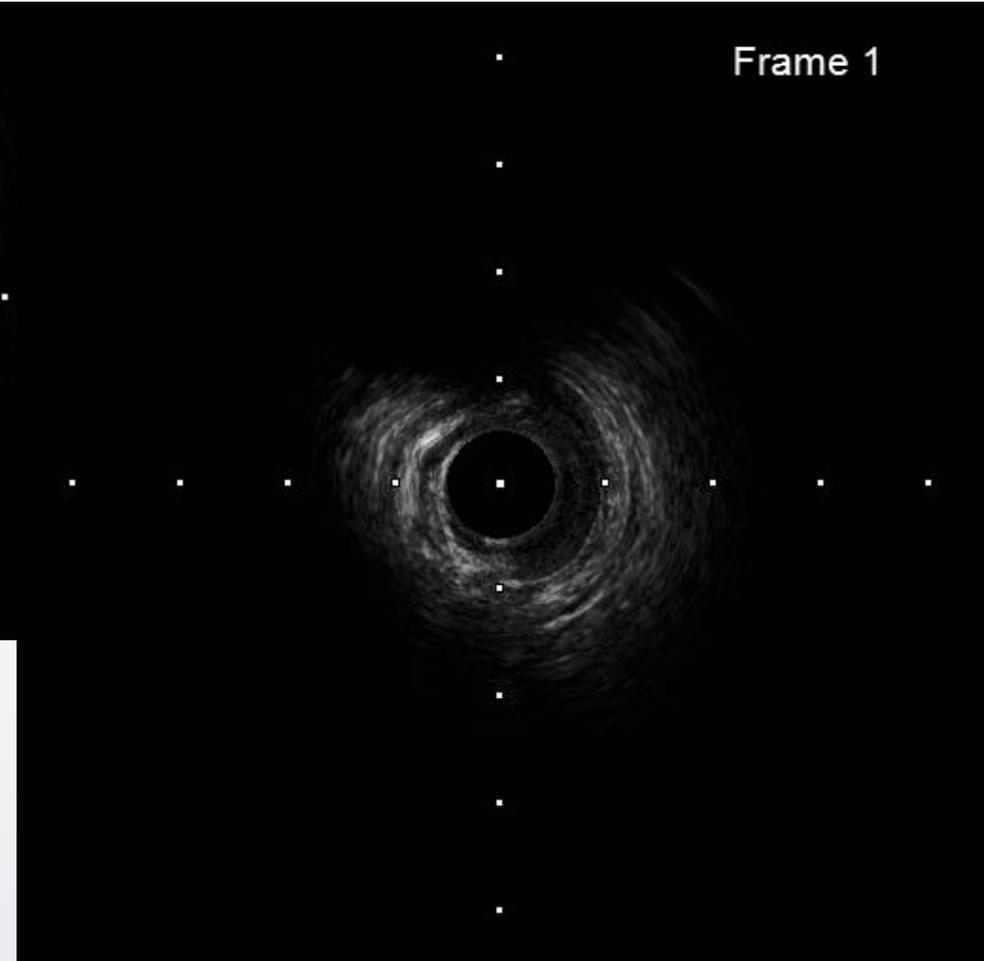
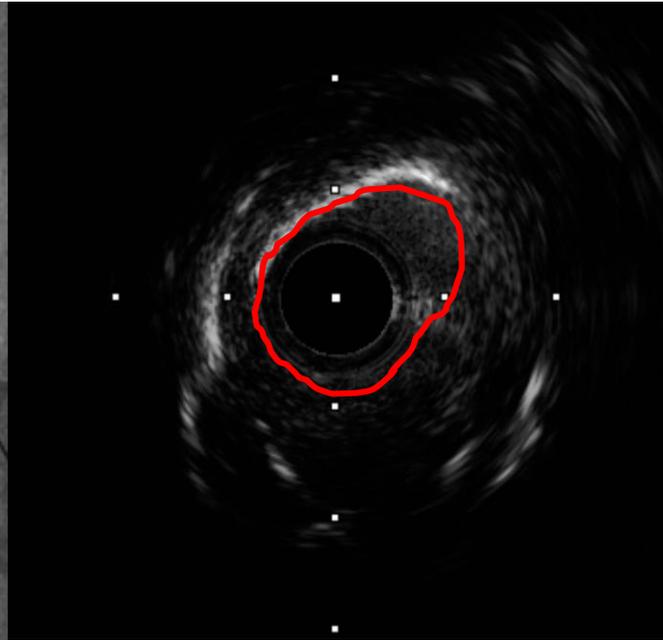
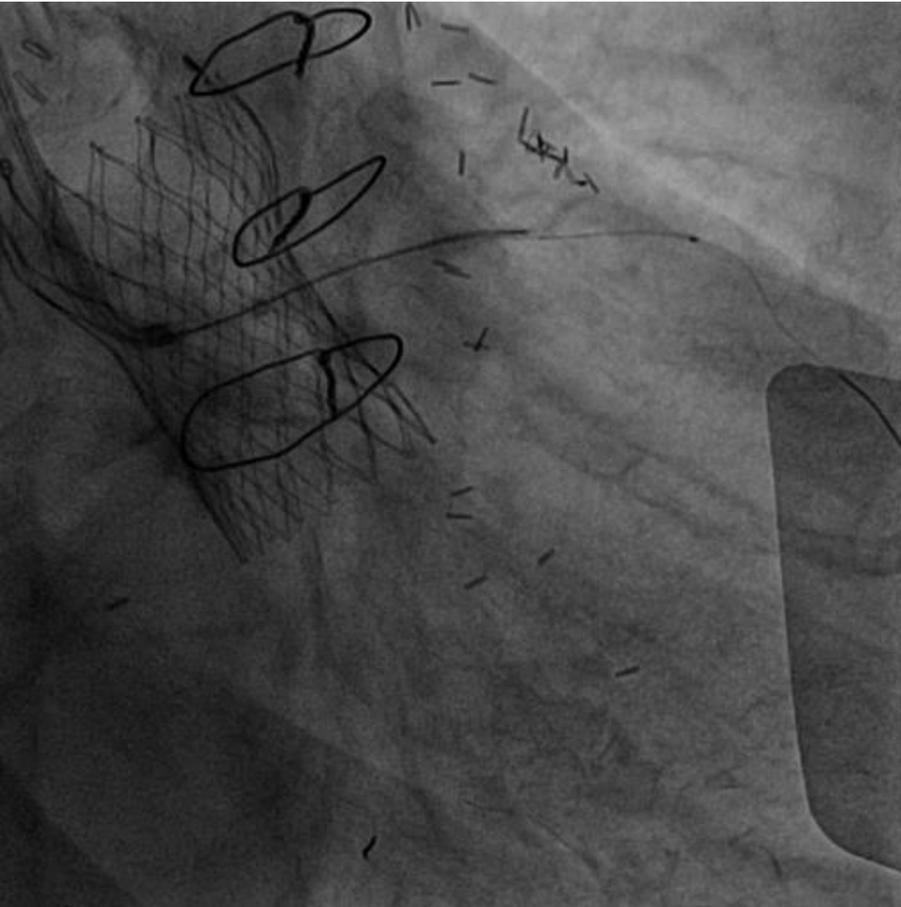
Engage the JL 3.0 GC, 7Fr



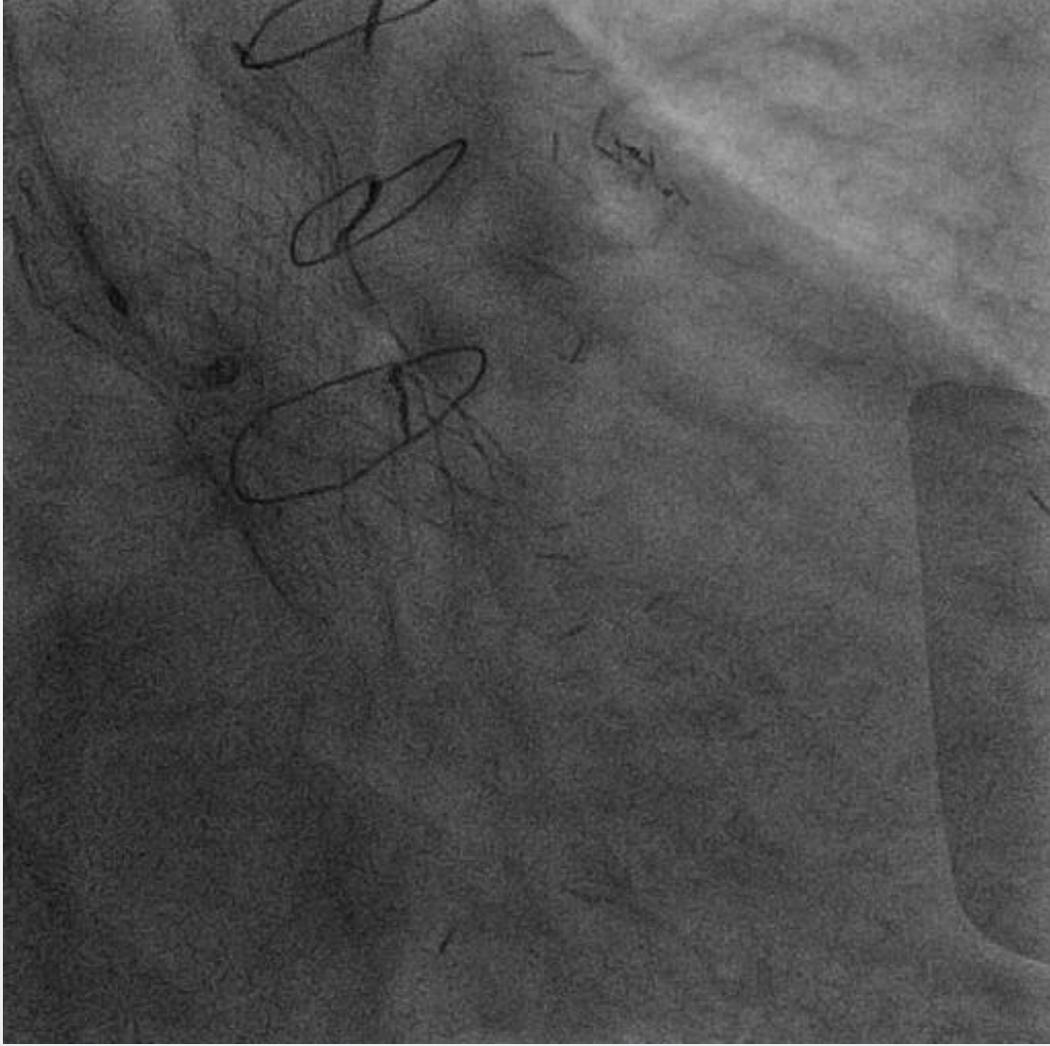
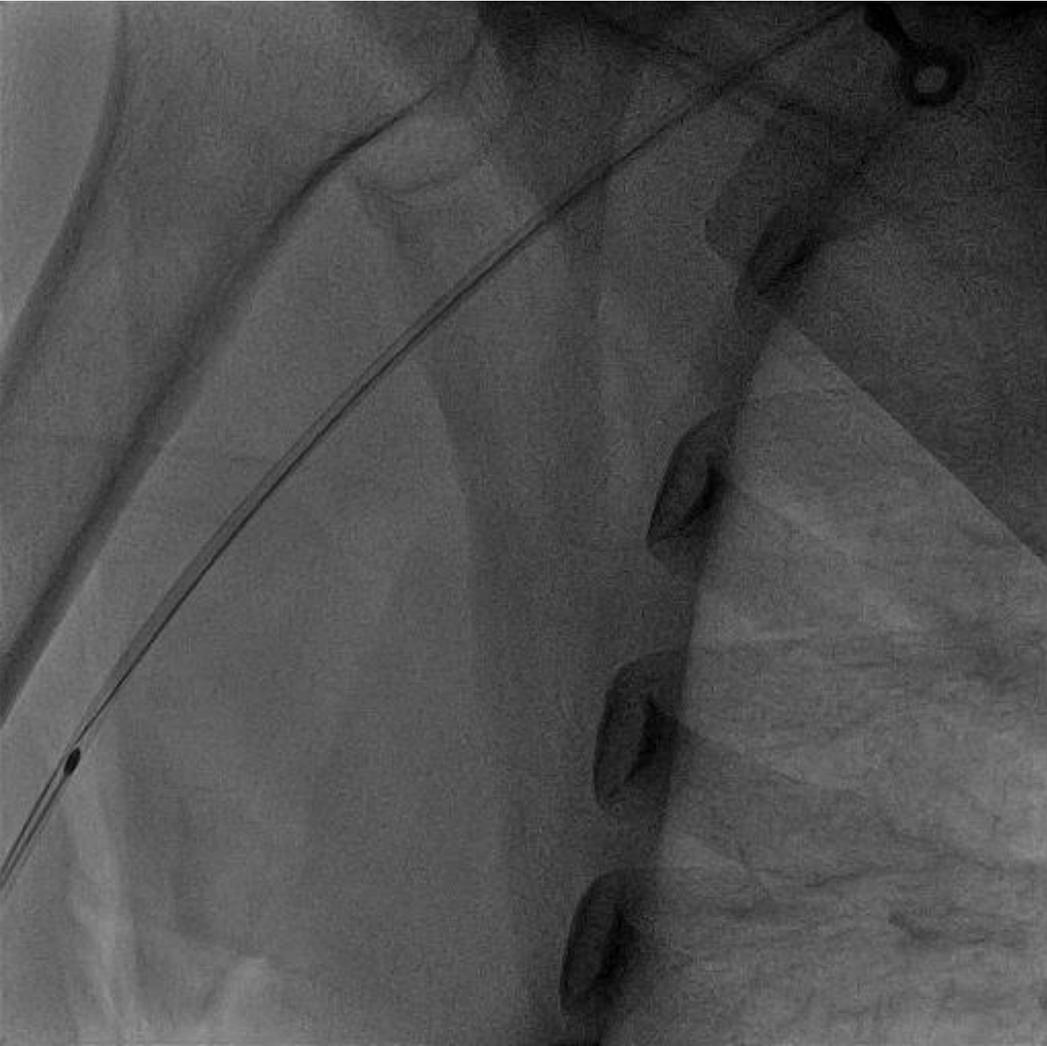
Advance the microcatheter/ GEC



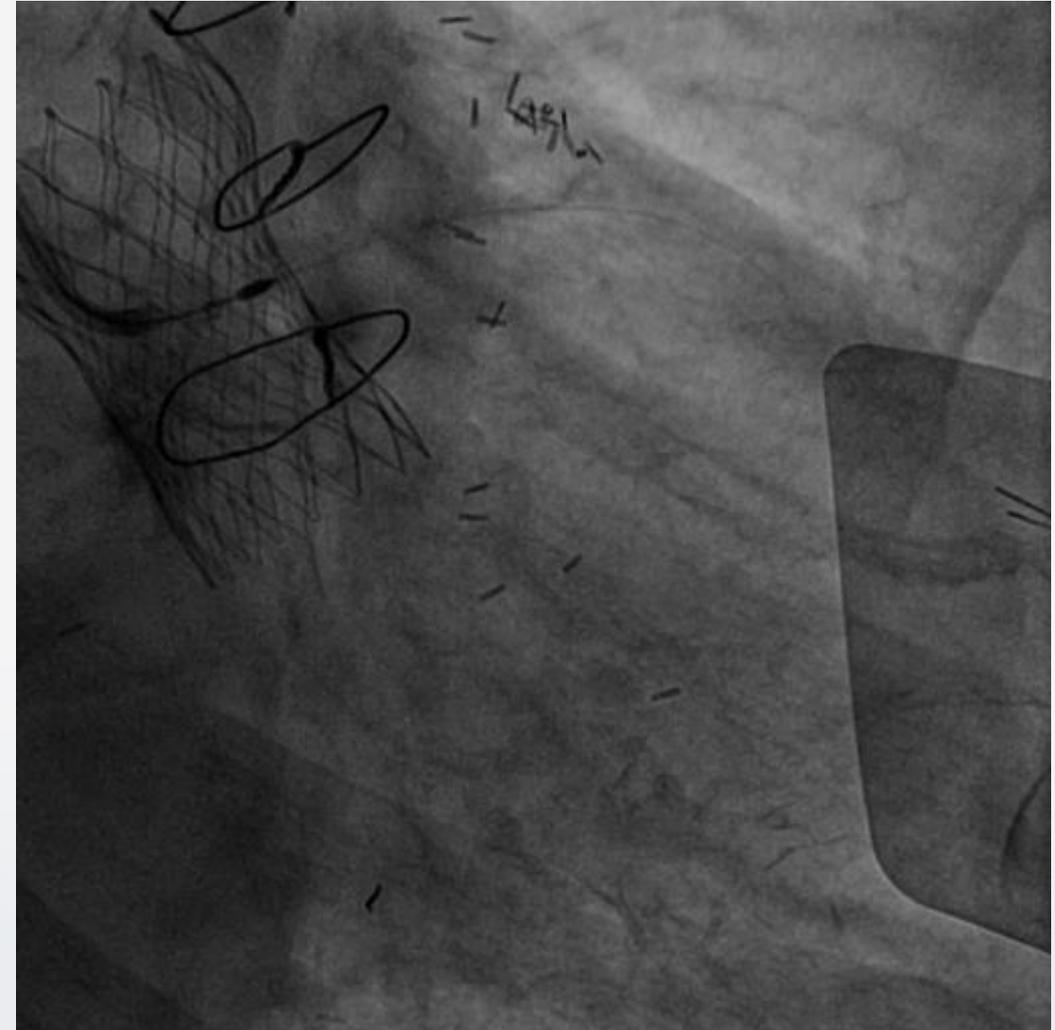
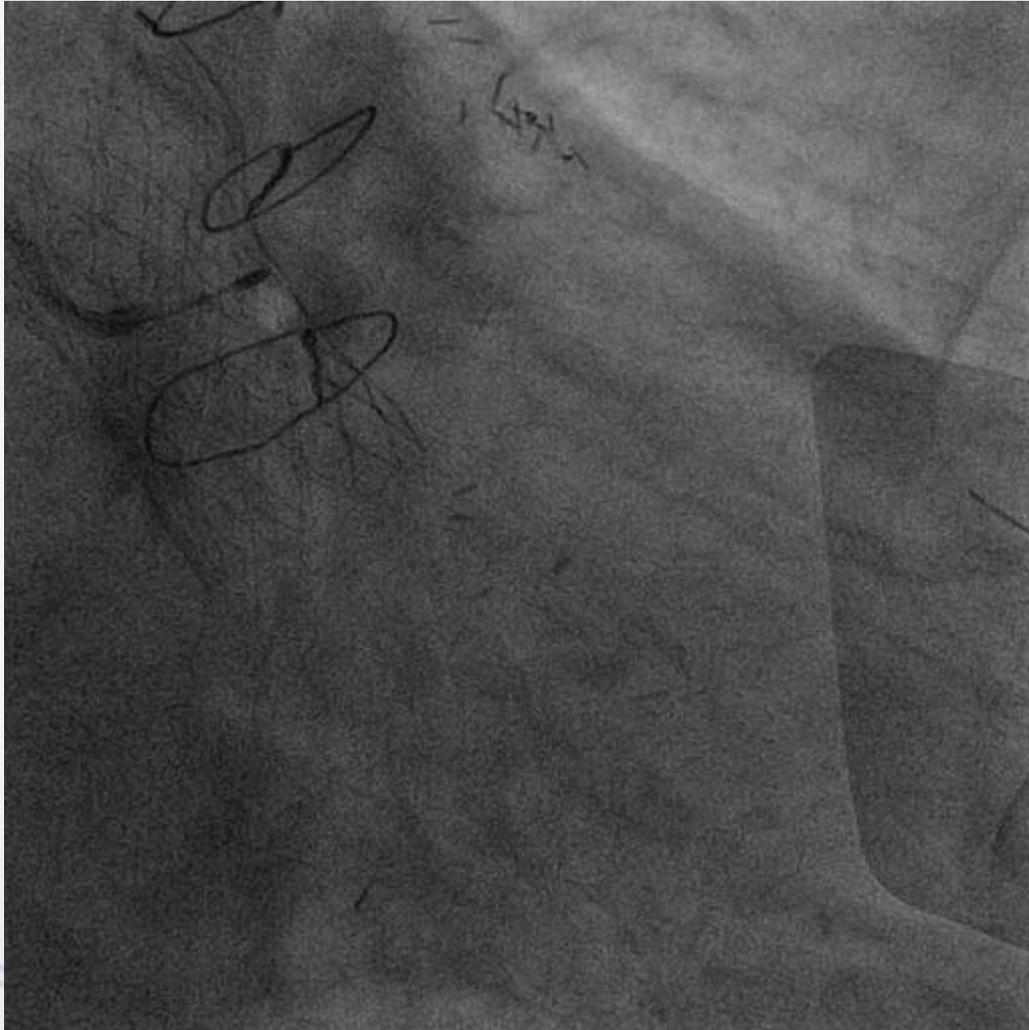
IVUS: distal LM MLA < 4mm²



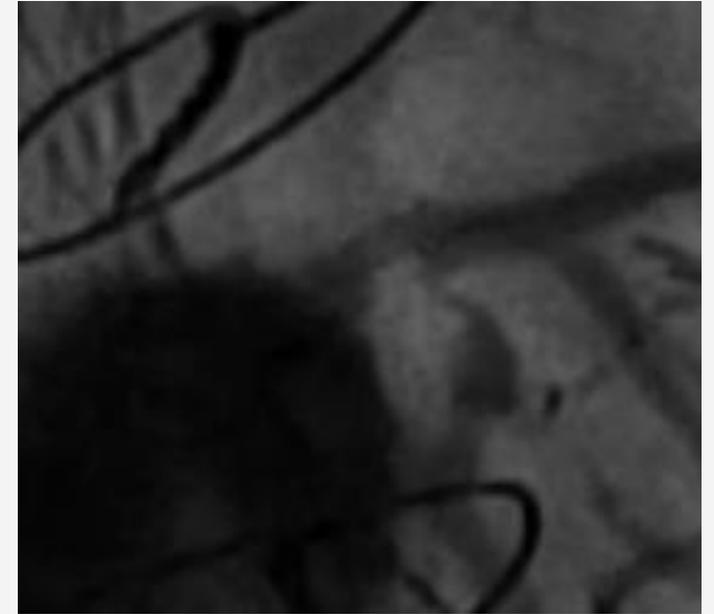
Rota burr could not enter into the collar of GEC Pre-load Rota burr (out of the Y connector)



Rotational atherectomy (RA, 1.5mm burr)



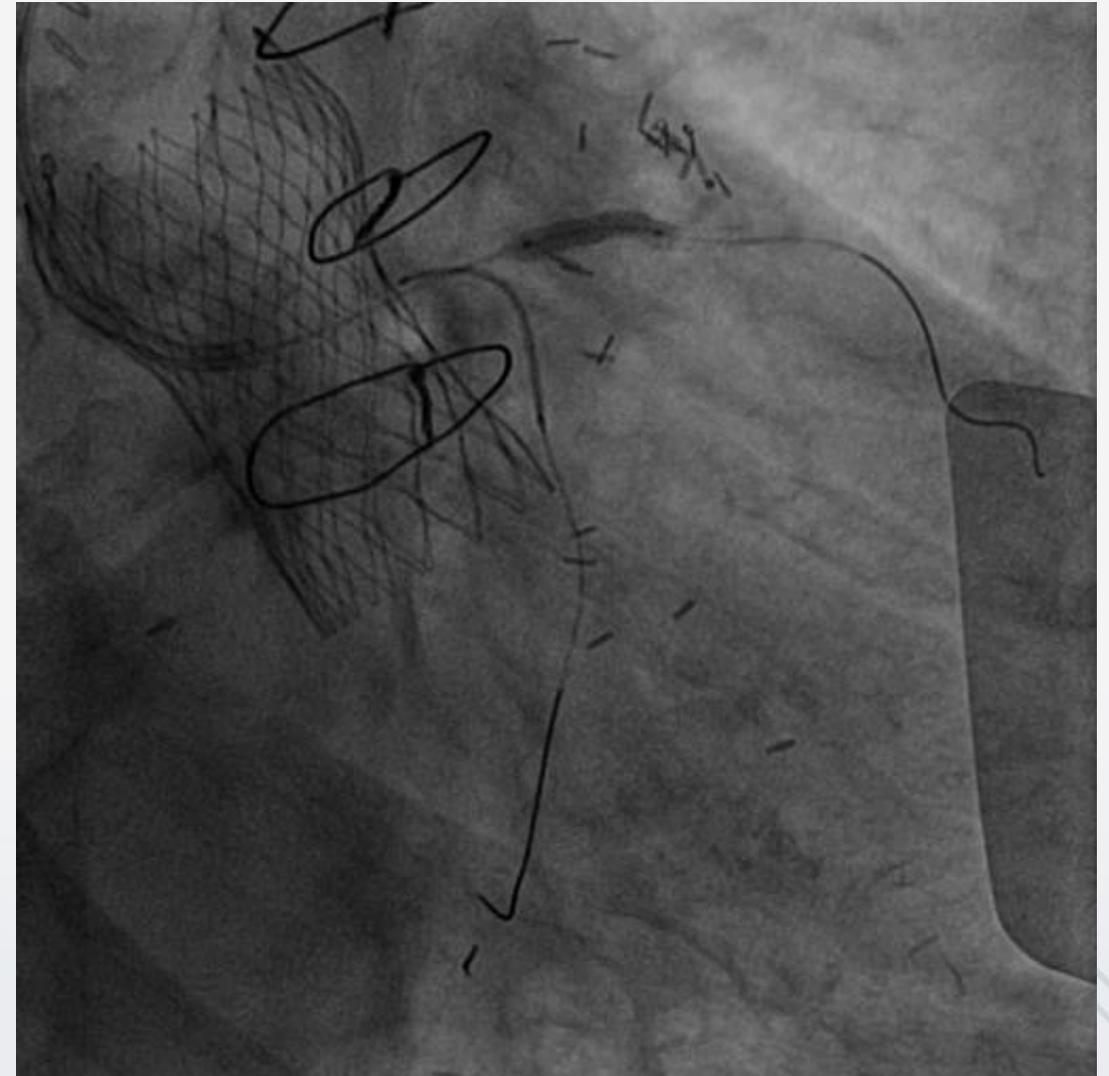
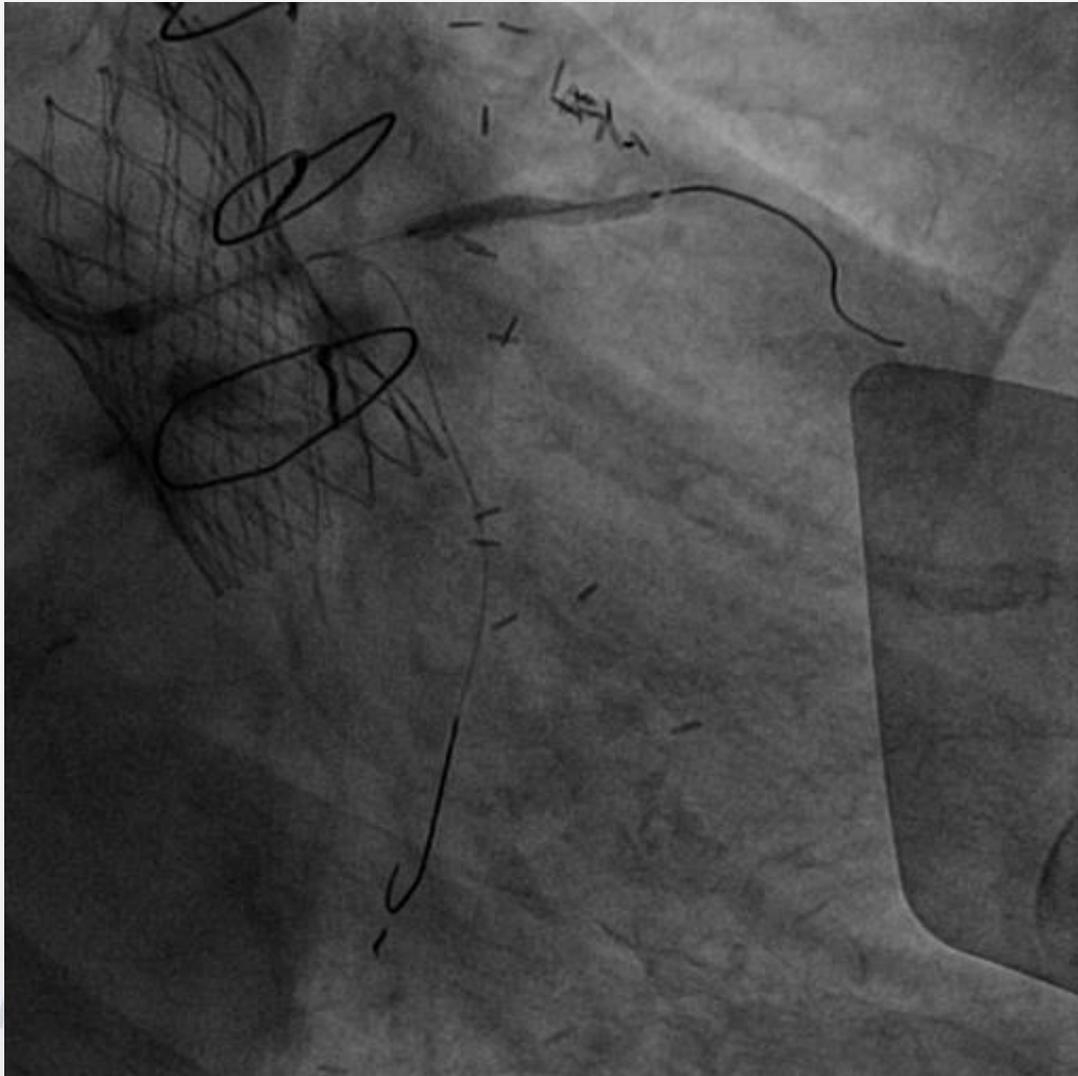
Unfriendly angulation of LCXos



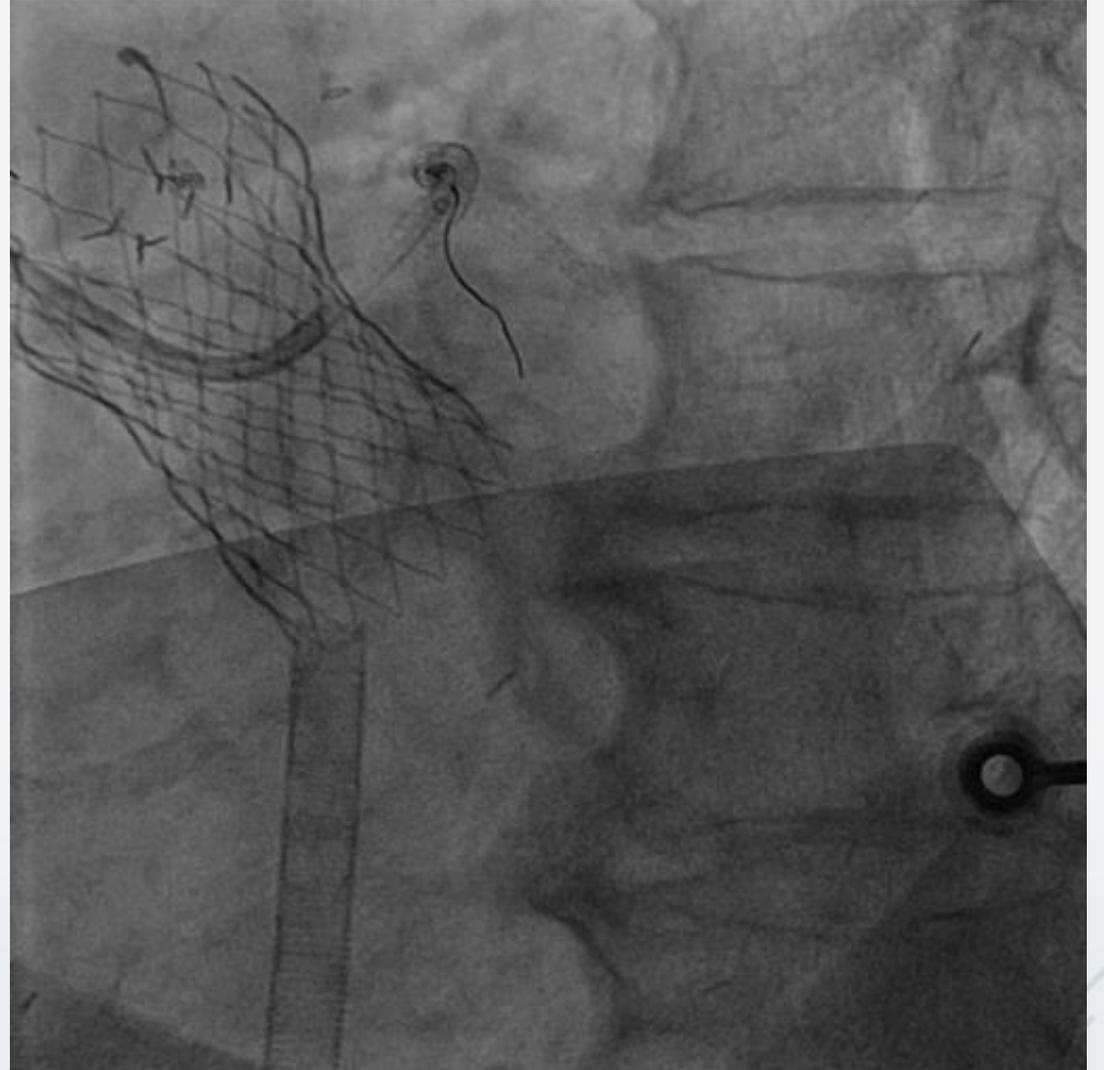
Reverse wire for wiring to LCx



Anchor balloon for LCx-LM stent



Final angio (LM culotte stent)



ECMO-assisted elective HR (high risk) -PCI

- CHIP PCI (score =15), severe AS s/p TAVI with SEV, VA-ECMO, GEC-assisted RA at distal LM, reverse wire for LCx, Culotte stent technique
- Under MCS support, CHIP PCI could be done un-eventfully

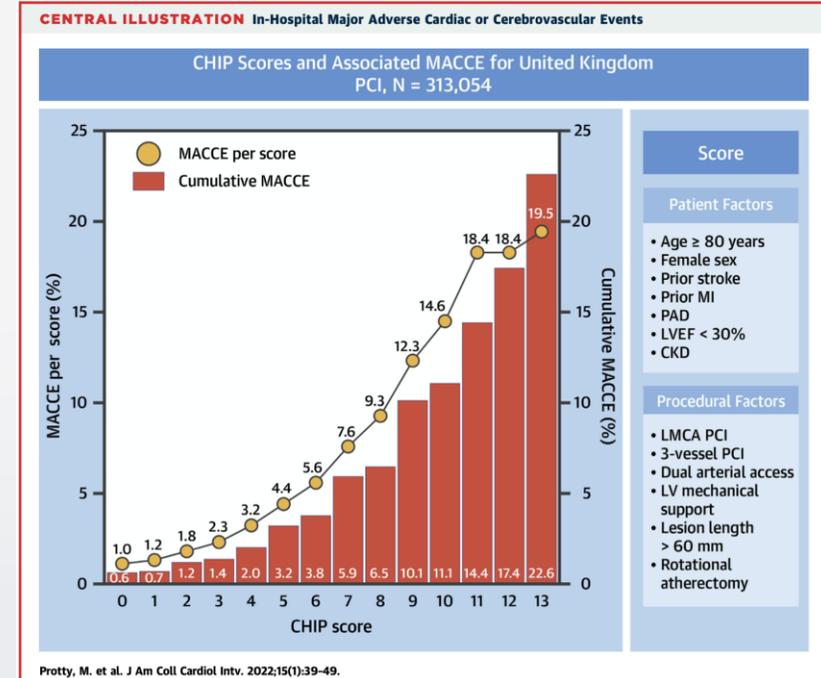
  

Complex High-Risk Indicated PCI (CHIP) Score calculation

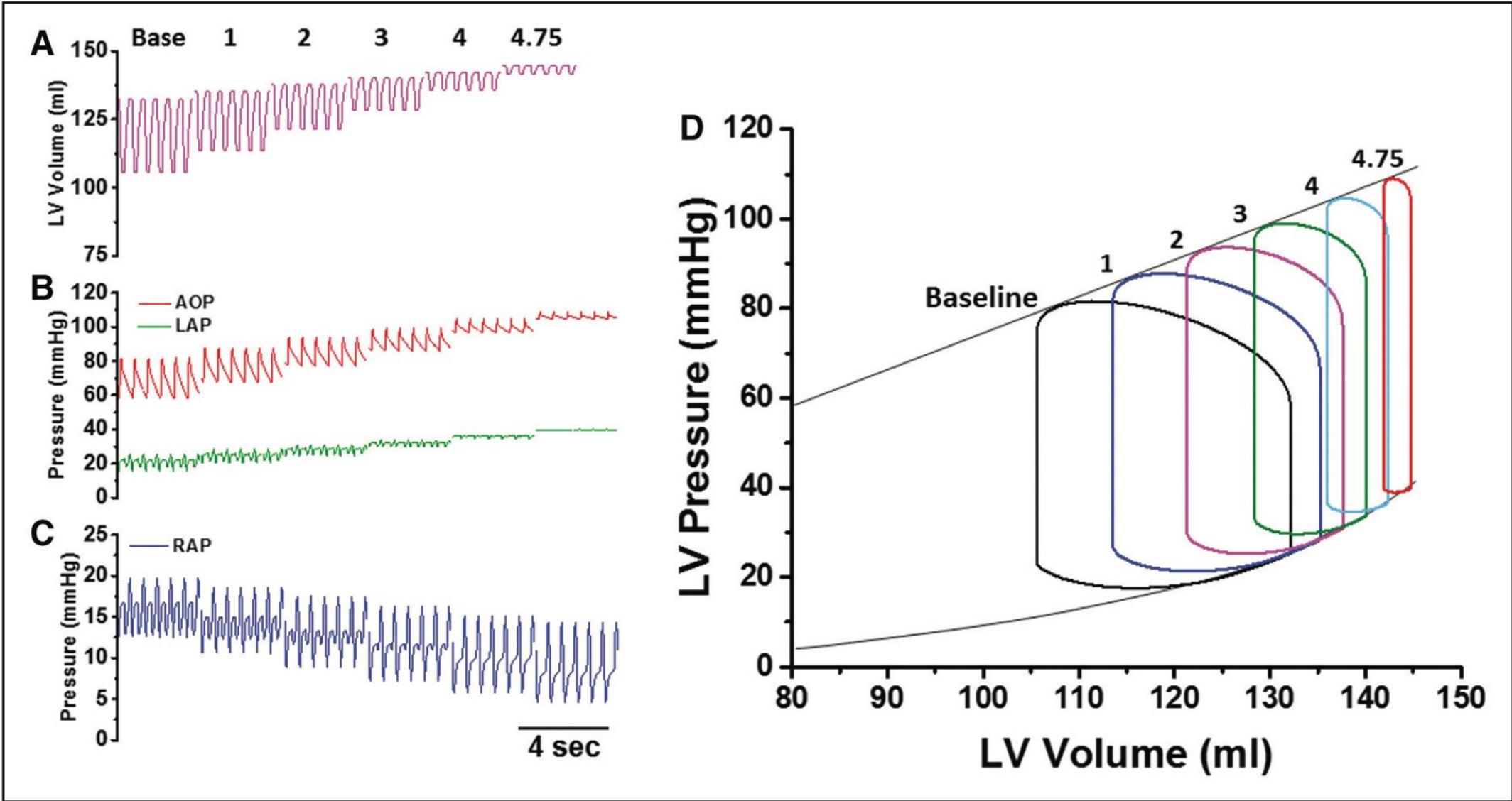
The total CHIP-PCI score is 15

In the BCIS (UK) PCI database, this score equated to a risk of in-hospital MACCE of >22.6%

Based on the current parameters, this is considered a CHIP-PCI case (score ≥ 5)



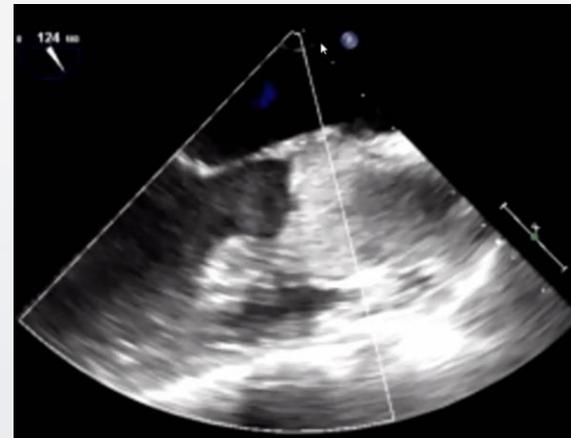
Peripheral VA-ECMO with an un-vented LV



LAVA ECMO

LV distention / LV venting strategy

- VA-ECMO increased LV afterload (retrograde oxygenated blood flow), including LVEDP, PCWP, LV wall tension
- VA-ECMO increased the risk of LV distention (poor LV contractility vs high ECMO retrograde flow)
- Residual inflow into LV: pulmonary circuit, Thebesian vein (small cardiac vein), bronchial vein, aortic regurgitation (if present)
- Risk of thrombosis at aortic root/ LV



How to do LAVA ECMO (trans-septal LA drain)

step by step ?

- Step 1: Trans-septal puncture
- Step 2: Superstiff wire or Toray guidewire or buddy wire
- Step 3: balloon atrial septostomy (6-8mm)
- Step 4: insertion V cannula to LA (or ostium of LSPV)

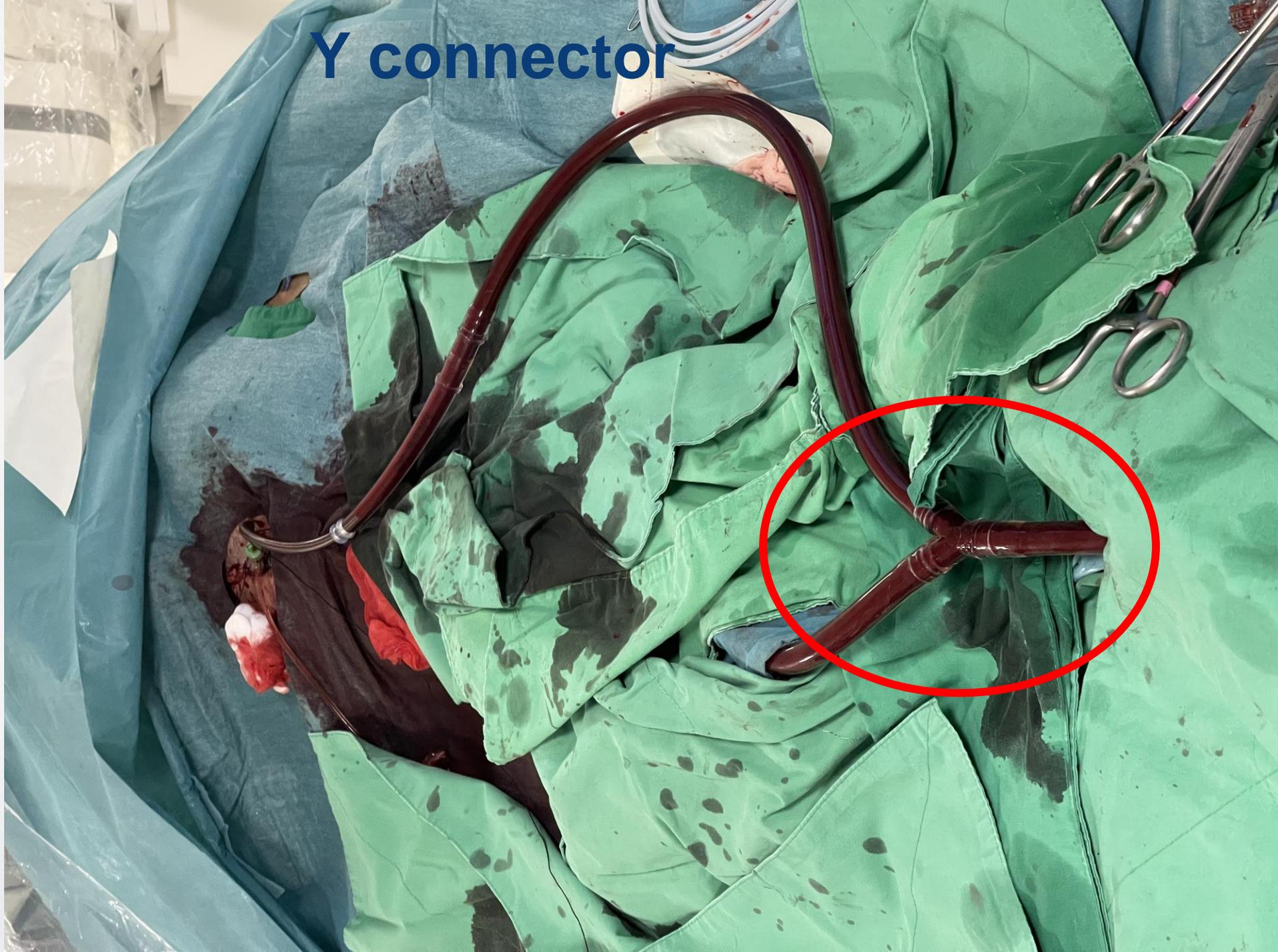
FEMH case: Trans-septal puncture/ Toray guidewire



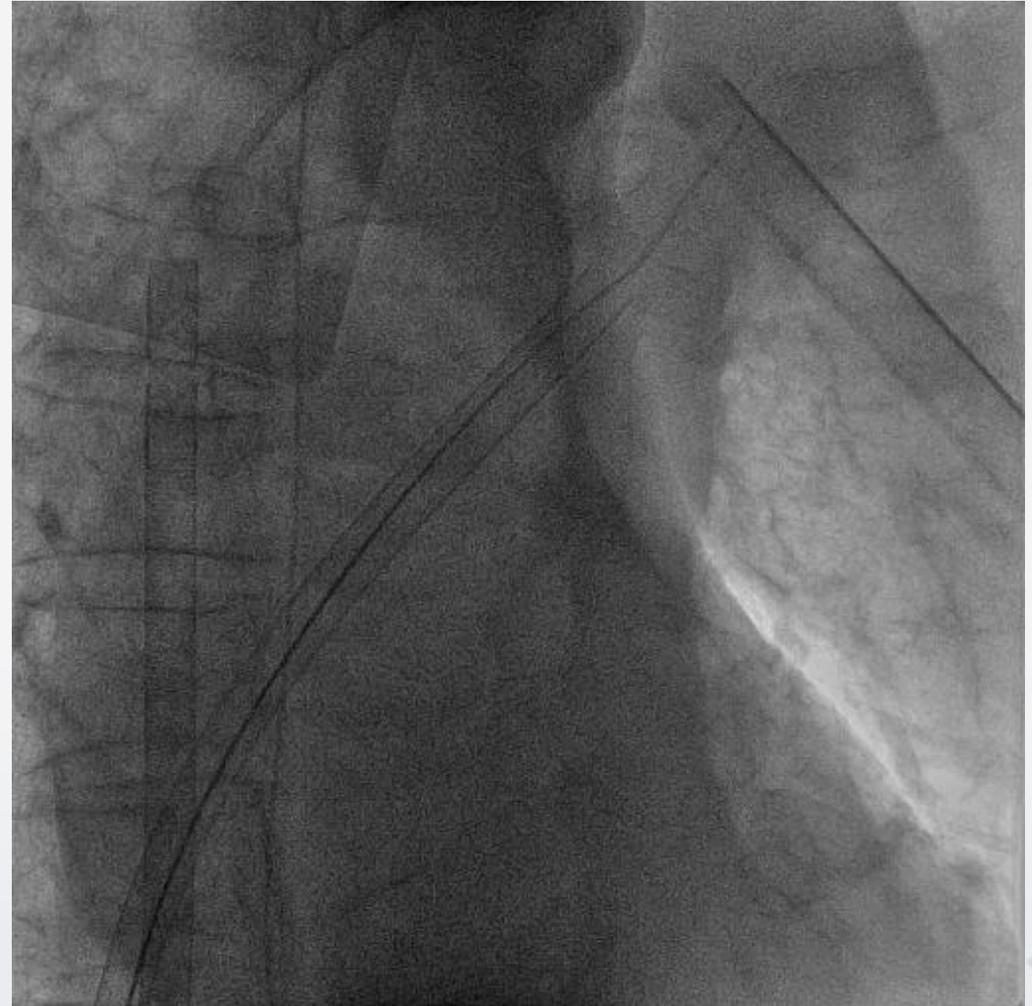
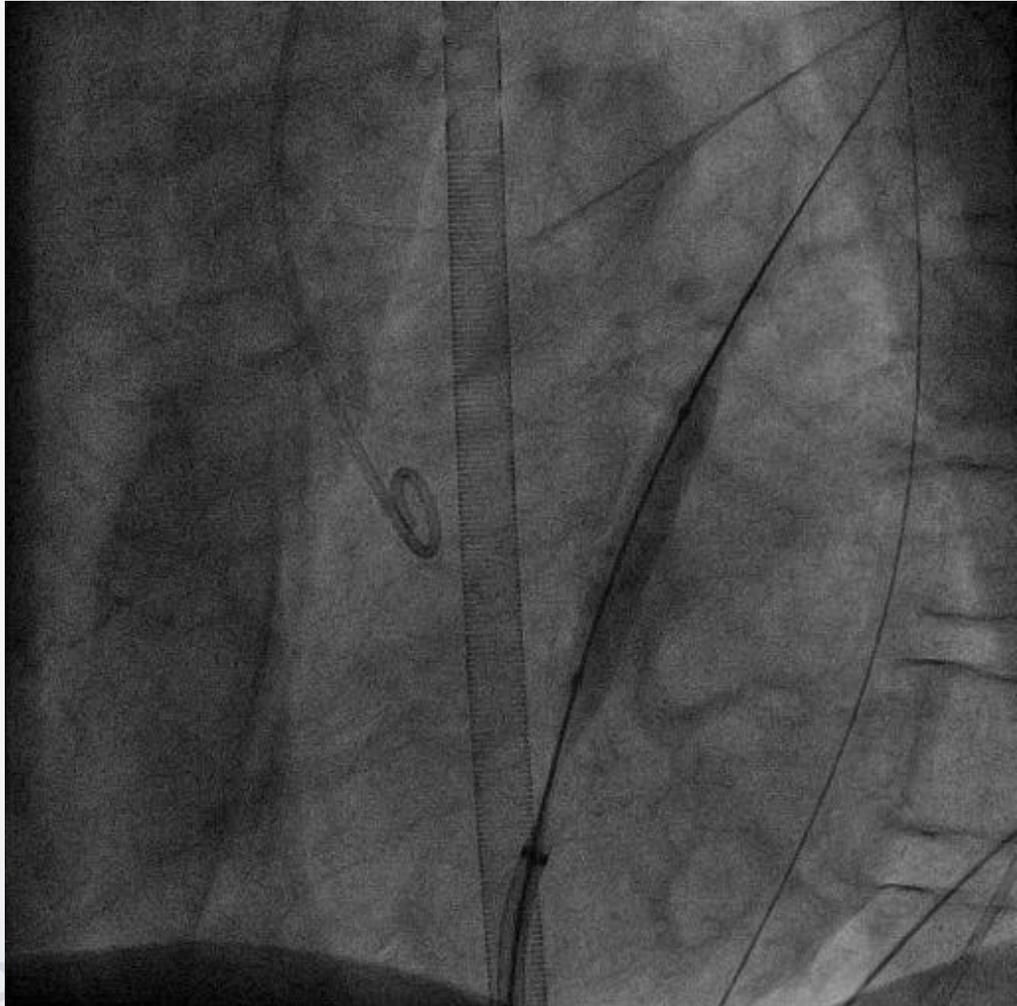
Balloon atrial septostomy/ Amplatz Superstiff wire at LSPV for V cannula



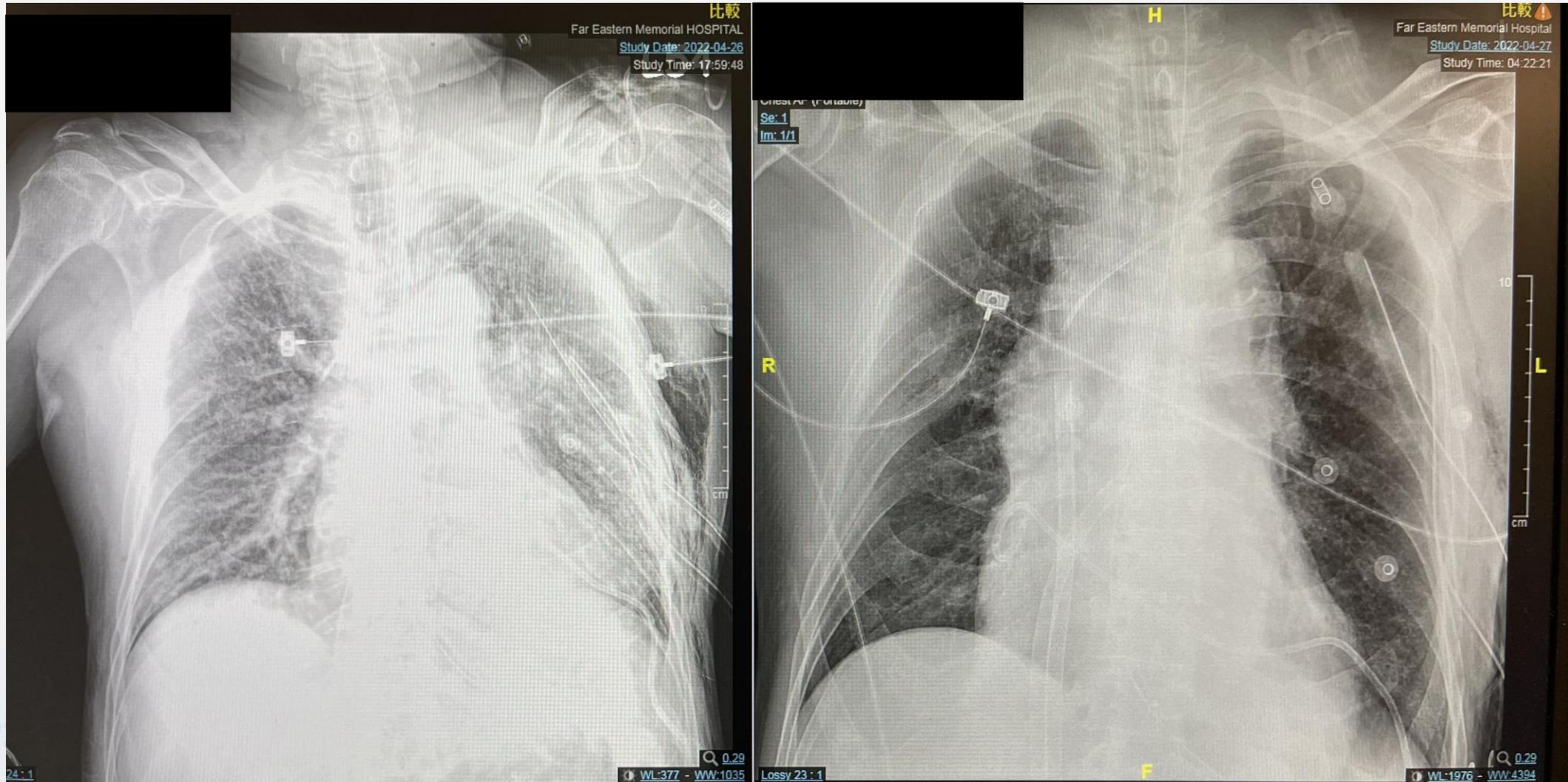
Y connector



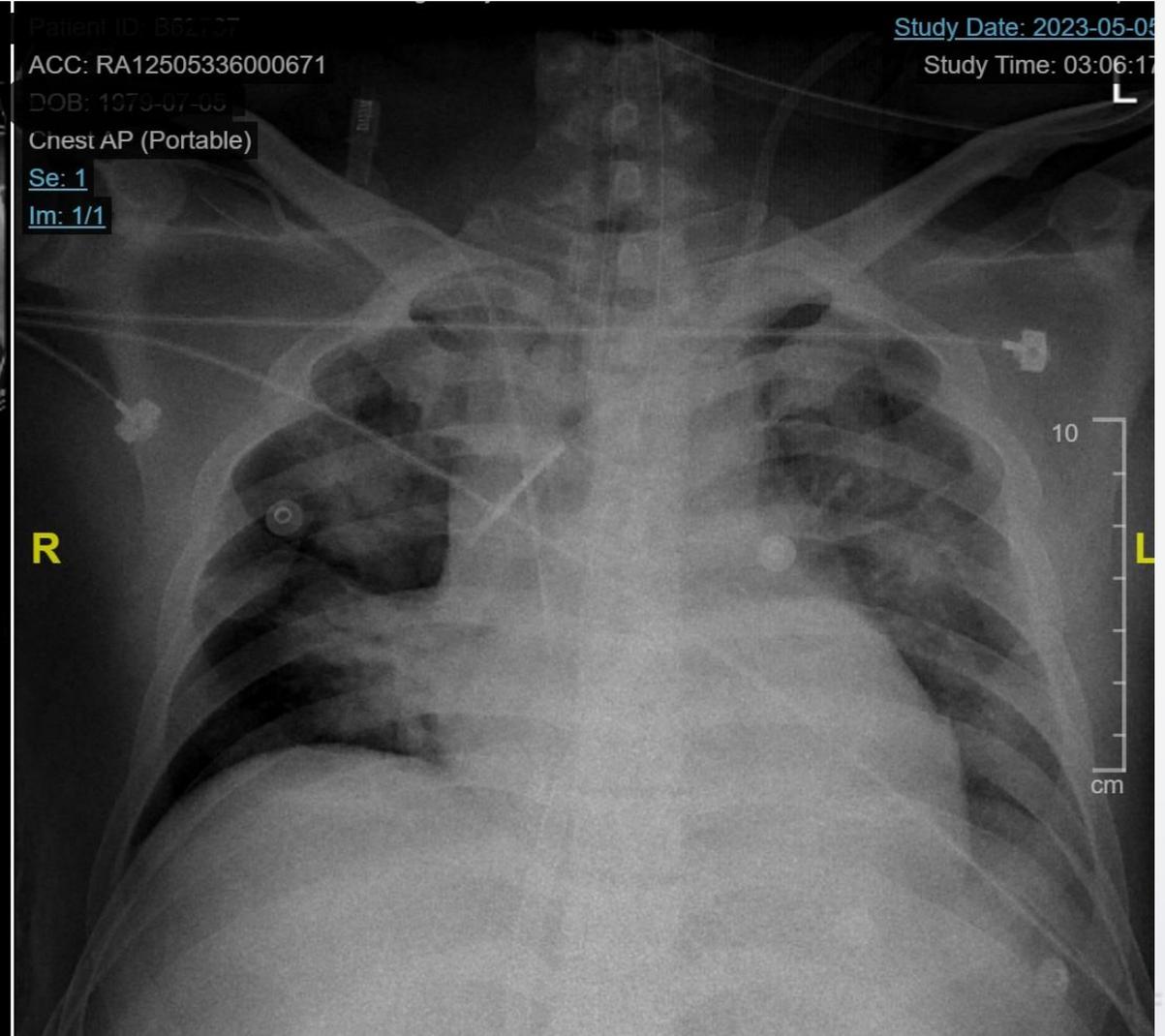
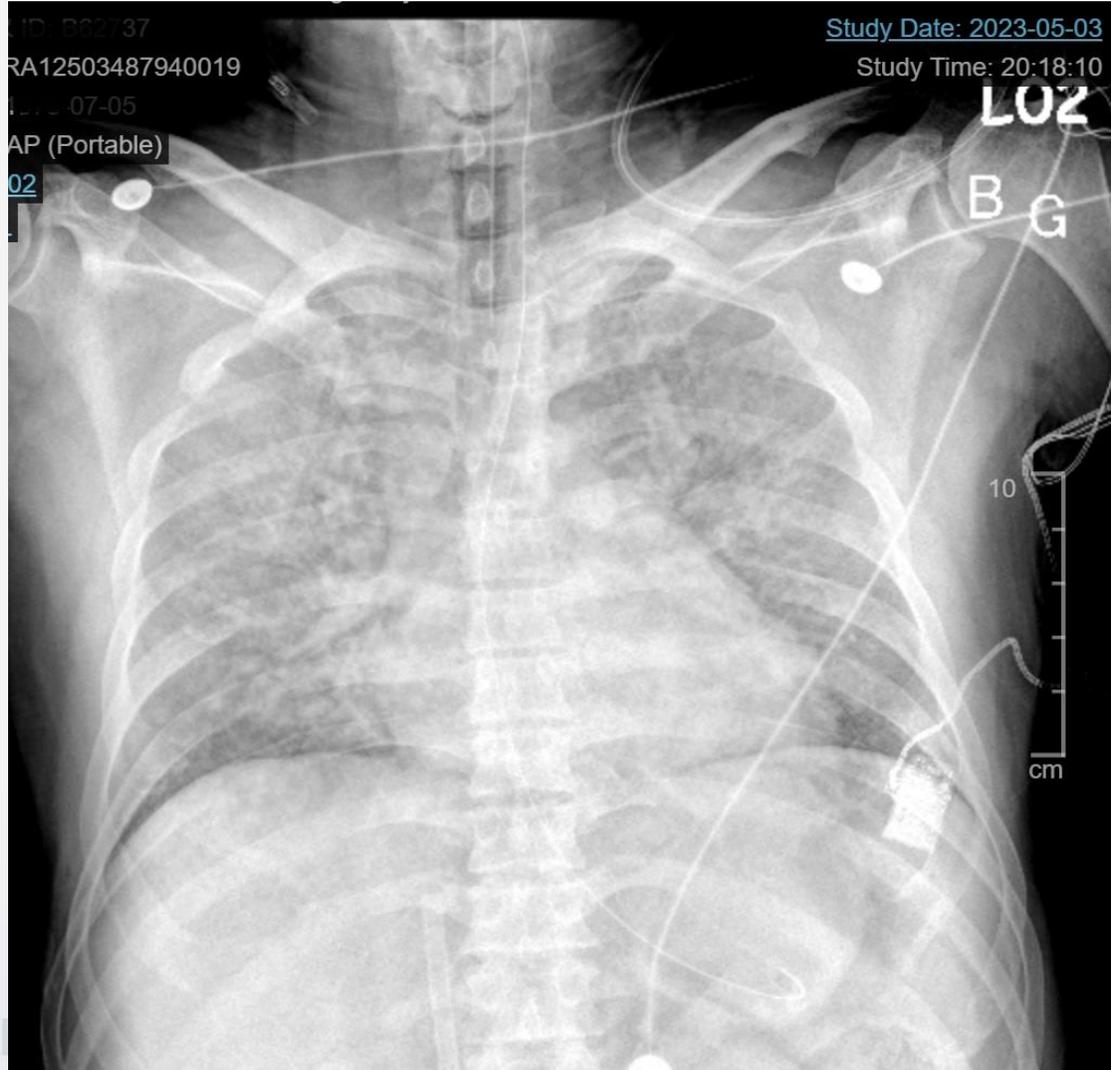
OHCA/IHCA/STEMI with CS, s/p LAVA ECMO



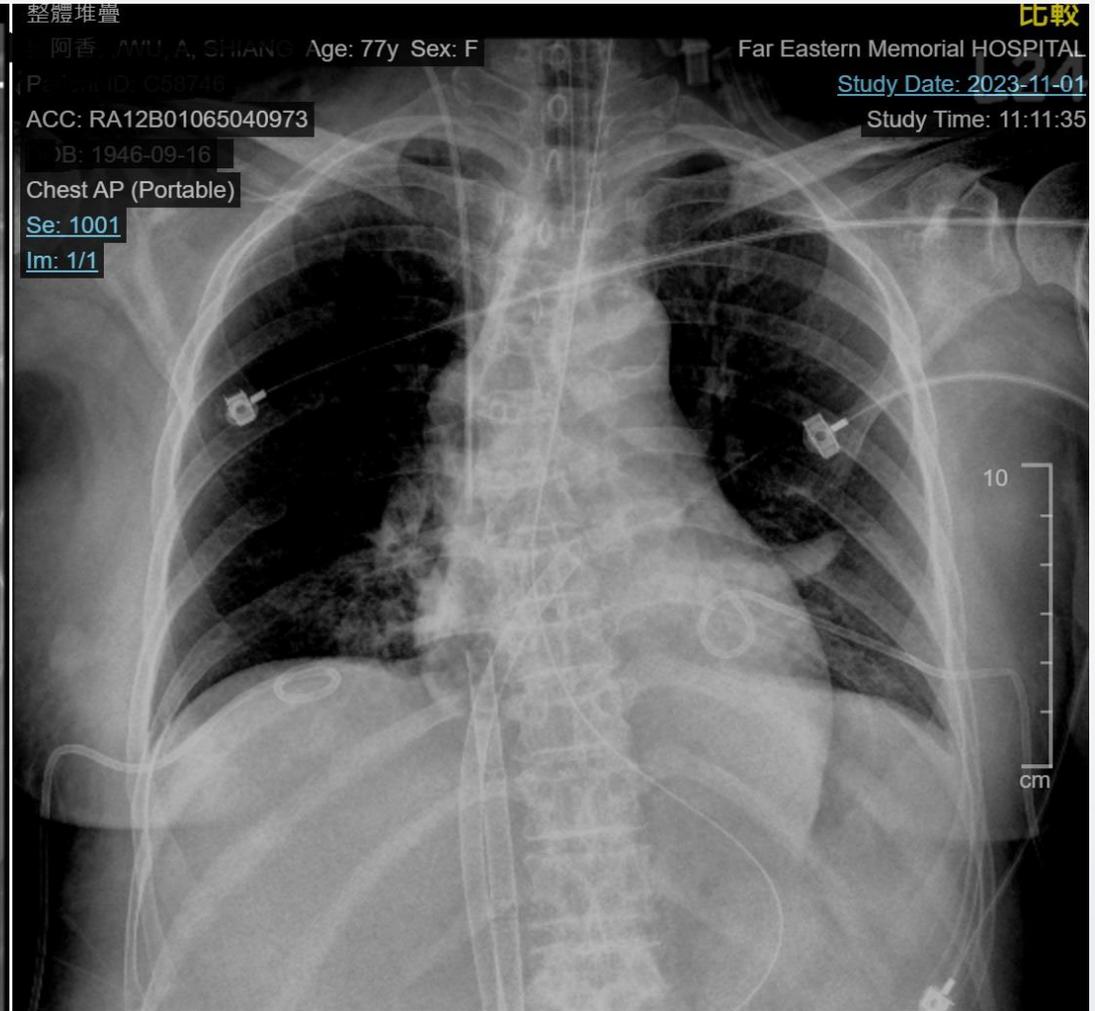
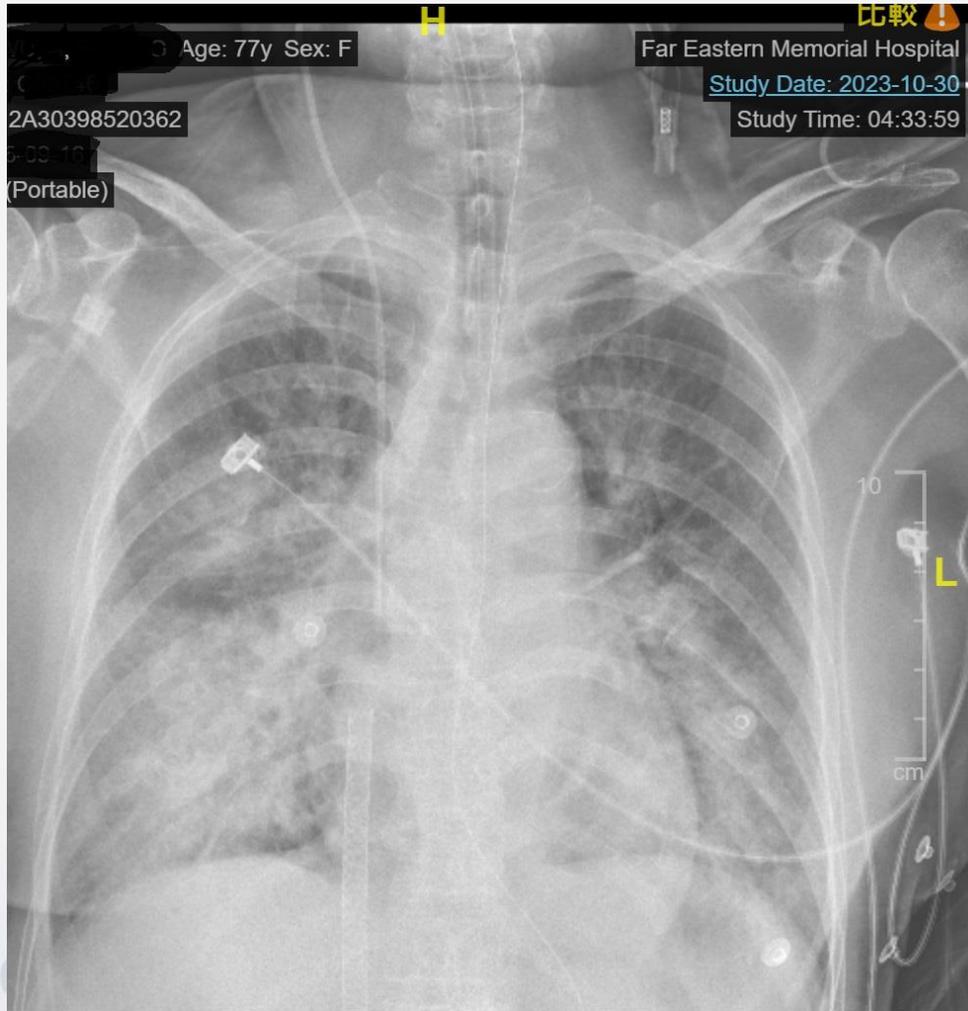
Lung edema improved quickly after LAVA ECMO



Lung edema improved quickly after LAVA ECMO

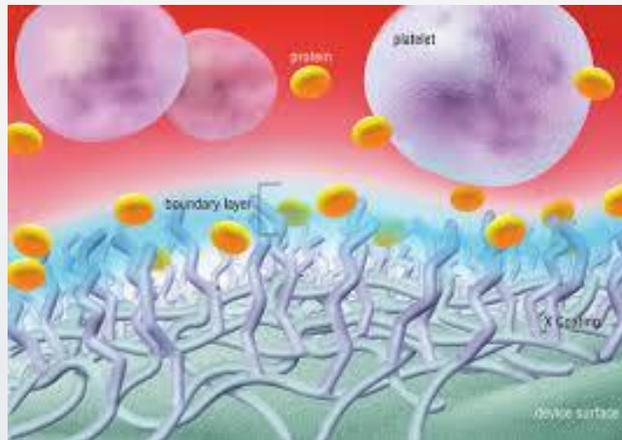


Lung edema improved quickly after LAVA ECMO



PCPS Equipment

- Centrifugal Pump
- Hollow Fibre Membrane Oxygenator
- Heparin & PMEA-coated Circuit (pre-connected)
- Gas Blender (Air-Oxygen Mixer)
- Heat Exchanger
- Cannula Kits with PMEA-coated



(PMEA)
Poly-2-
methoxyethylacrylate

[J Biol Biomed Sci. 2014 May; 2\(1\): 27-32.](#)

PMCID: PMC4680762

PMID: [16637520](#)

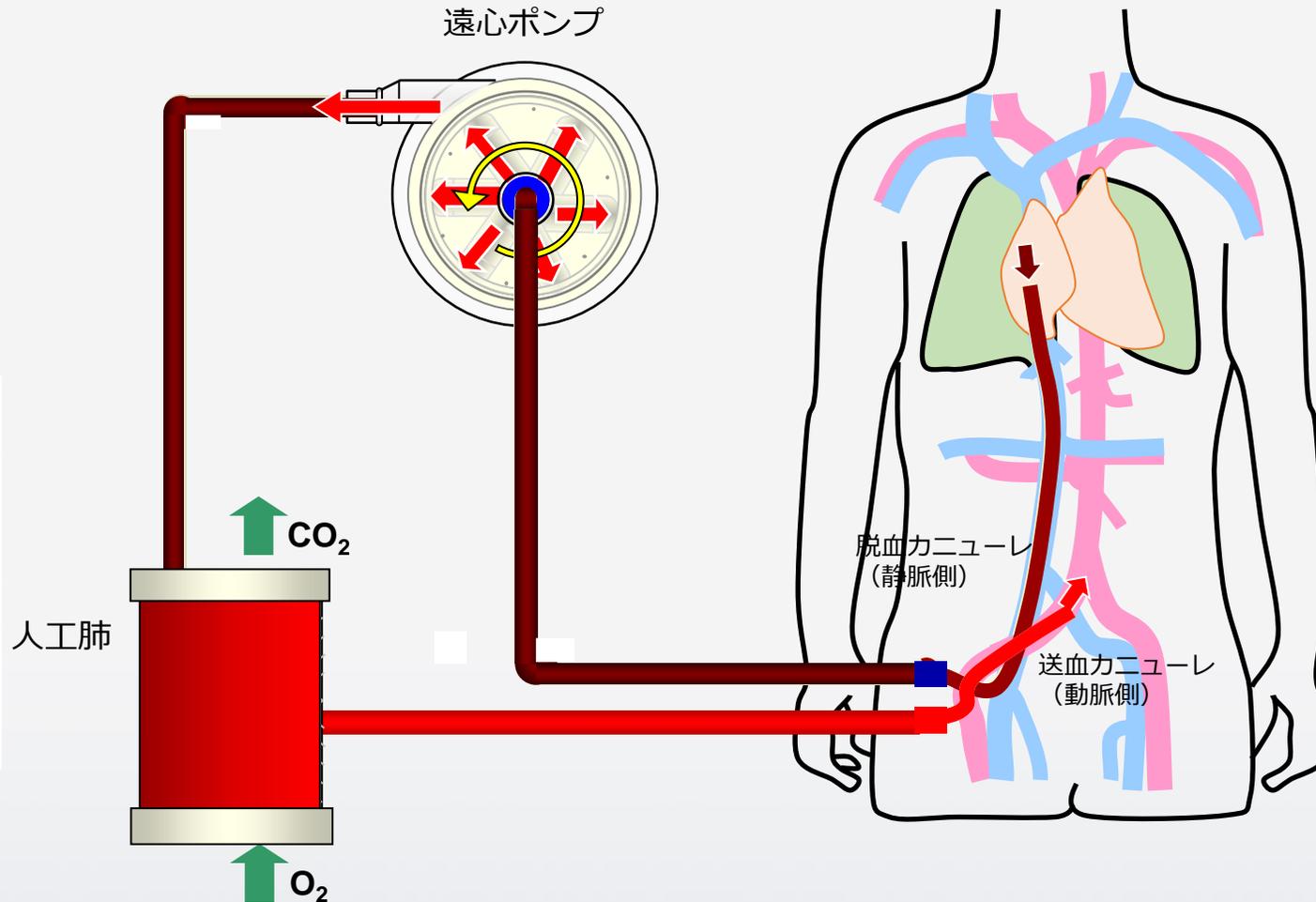
In Vivo Comparison Study of FDA-Approved Surface-Modifying Additives and Poly-2-Methoxyethylacrylate Circuit Surfaces Coatings During Cardiopulmonary Bypass

[Angela Ask](#), BS, CCP, [David Holt](#), MA, CCT, NRABT, and [Lynette Smith](#), MS

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PCPS血液流動 (blood circulation)

- **脱血部位**
静脈 (大腿静脈)
- **送血部位**
動脈 (大腿動脈)

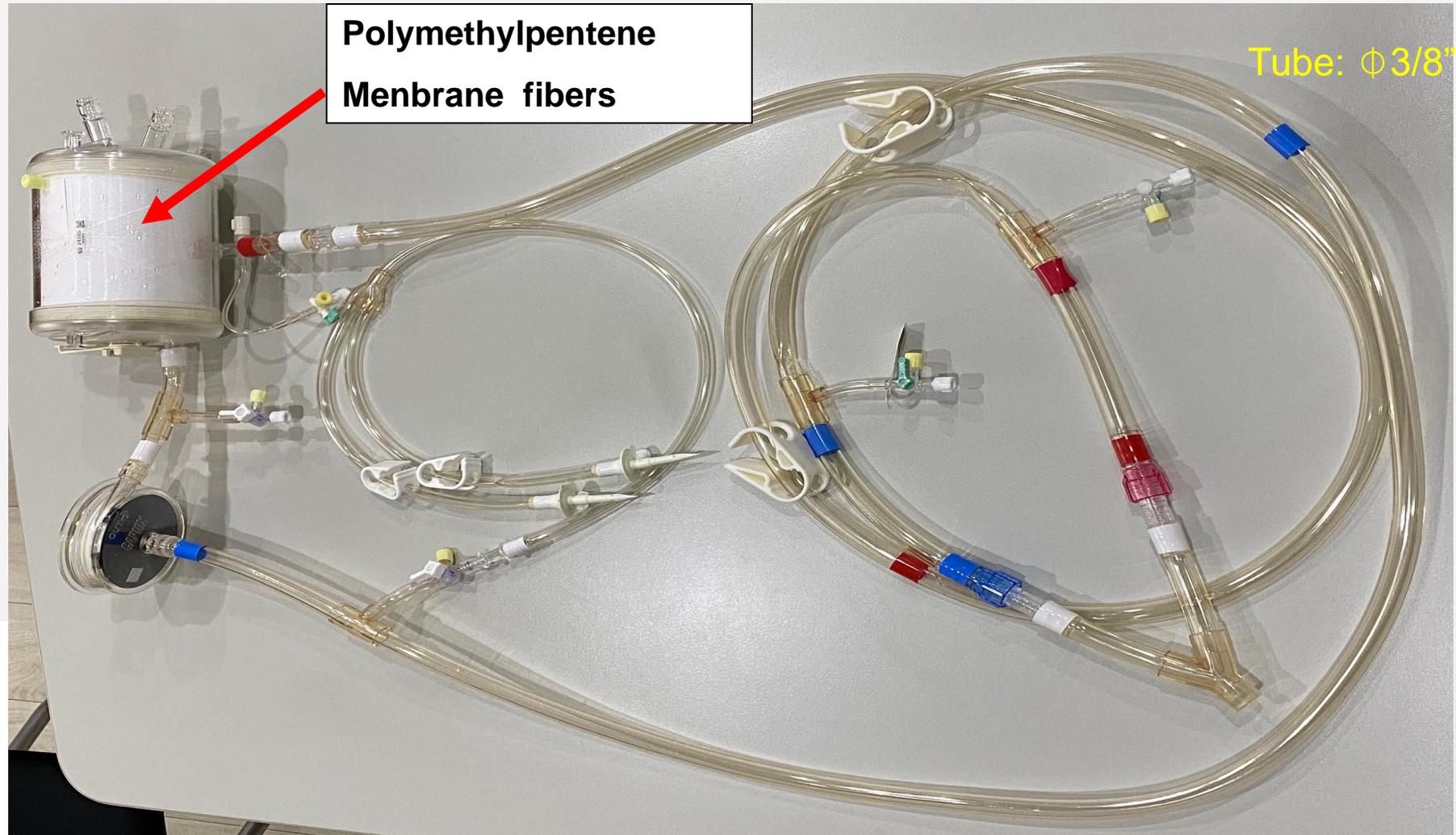


Arterial / Venous cannula

- Arterial 15cm :15, 16.5 Fr.
- Venous 50cm :18, 21 Fr.
- Lock Connector



New membrane fibers provide high resistance against plasma leakage



ACS with CS, HFrEF

- 69 years-old man
- Past history: ESRD under HD, CAD 3VD s/p CABG(only RCA), AS s/p SAVR, HFrEF (LVEF:30%)
- Present illness: Dyspnea for 3 days
- BP: 95/76 under Dopamin IF (10ug/ml/kg)
- Trop-I: 12000, NT-pro-BNP: >70000

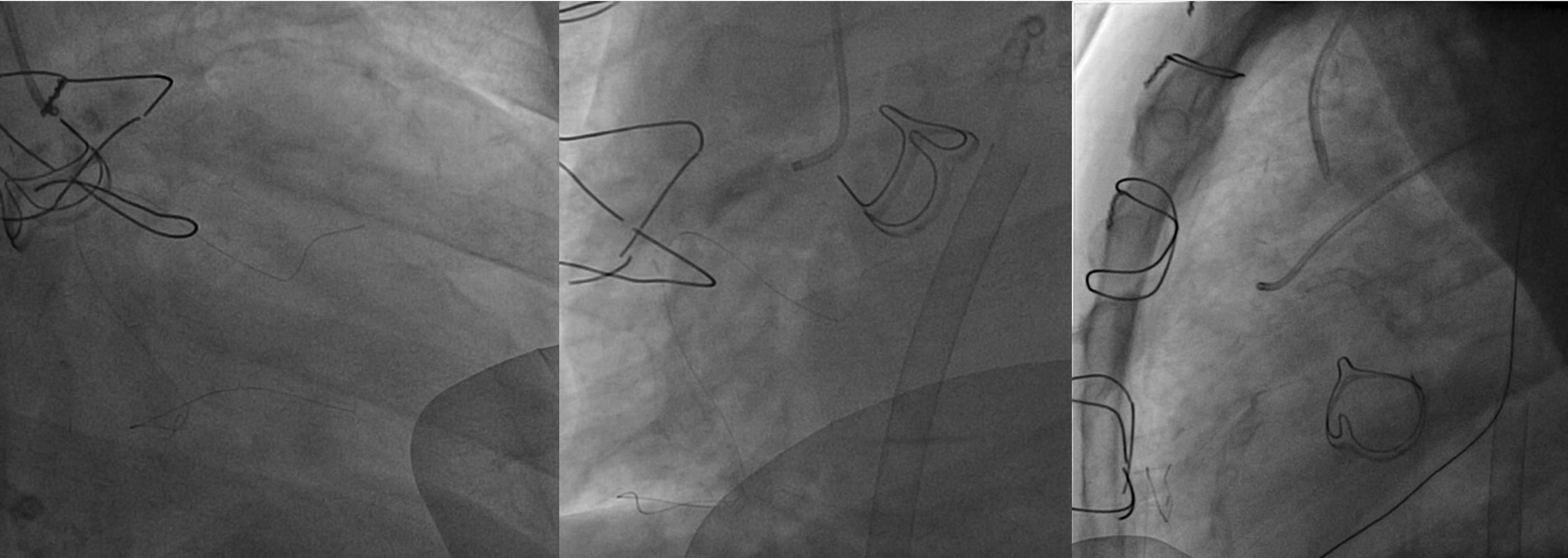


Courtesy from Shuang-Ho hospital, Ta-Jung Wang

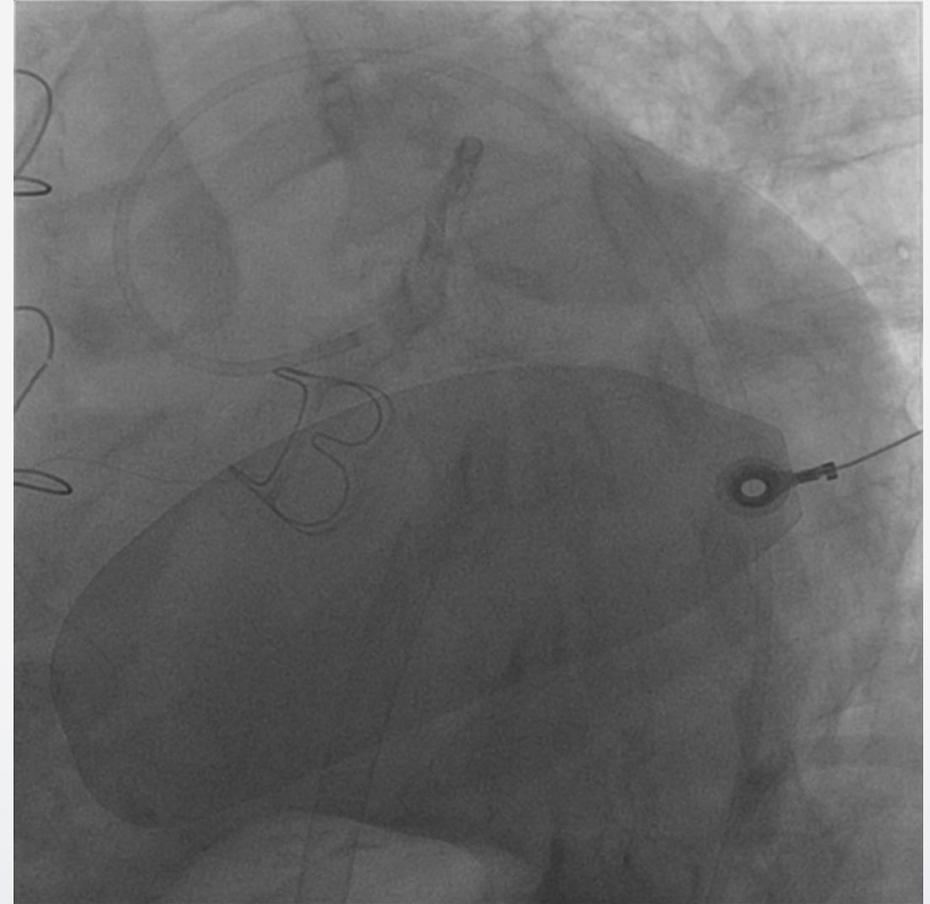
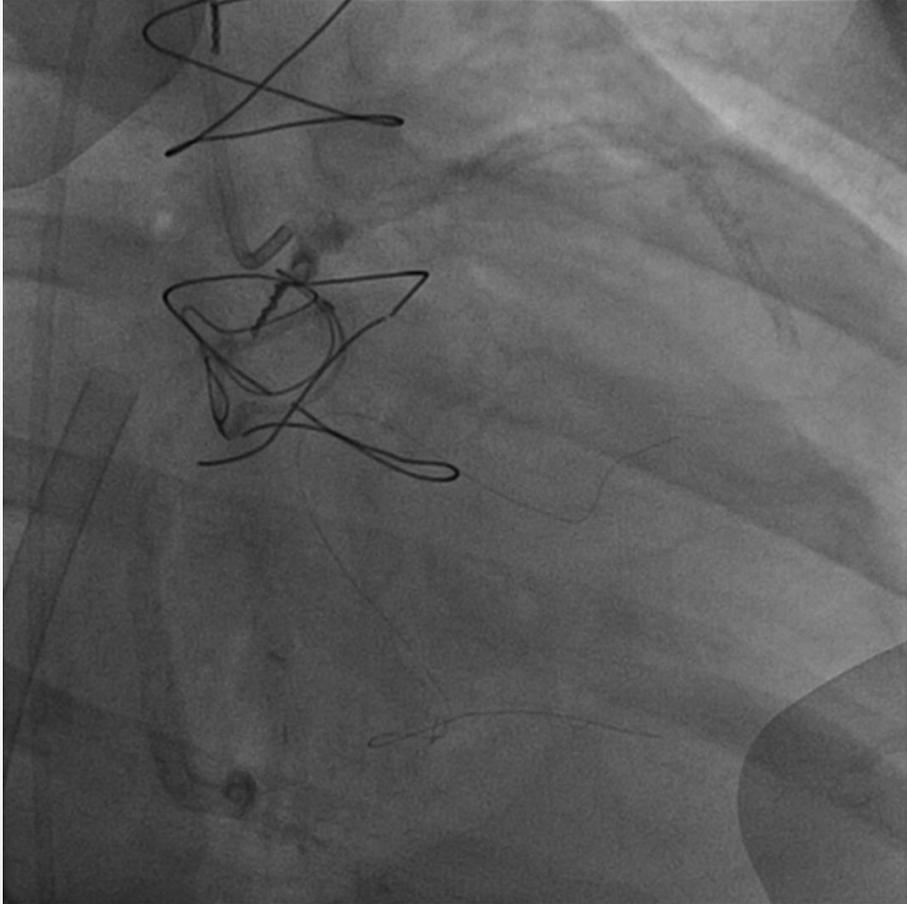
LAVA PCPS before CAG (LV unload)



Coronary angiography



Final angio (T stent technique)



Conclusion

- Mechanical circulatory support (MCS) is the important tool in current era, for both CHIP-PCI and Cardiogenic Shock.
- ECMO, PCPS, LAVA-ECMO (PCPS) are our good friends, however, device related complications should be avoided or carefully managed.