

The Undesirable Fracture

Kim Heng Shee

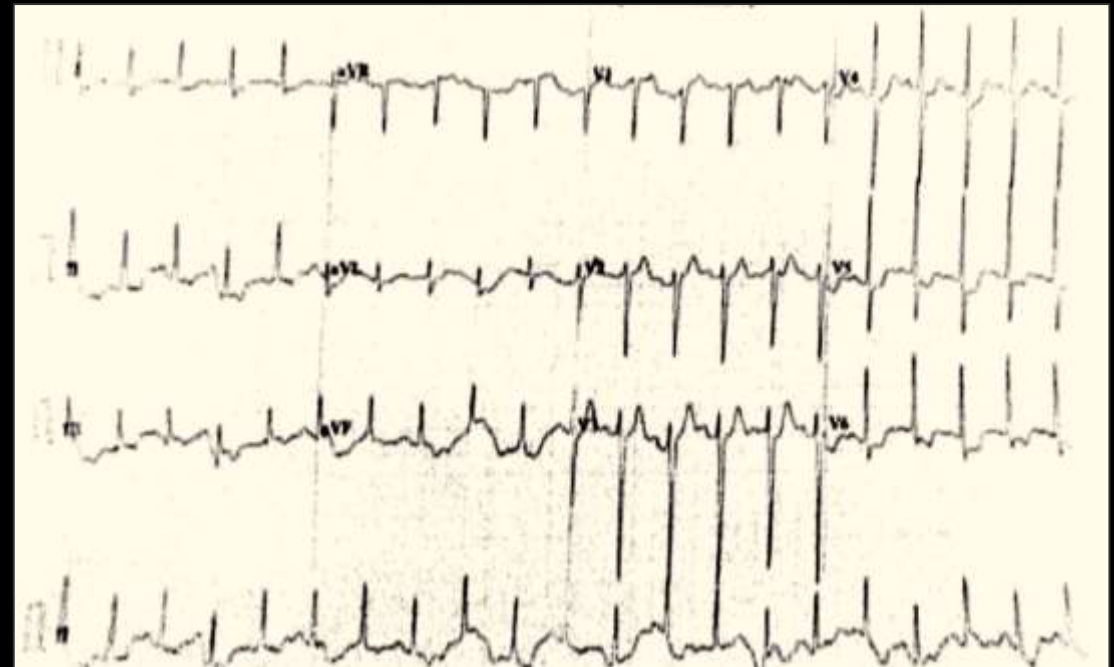
Operator: Kim Heng Shee, Lu Hou Tee

Cardiology Department

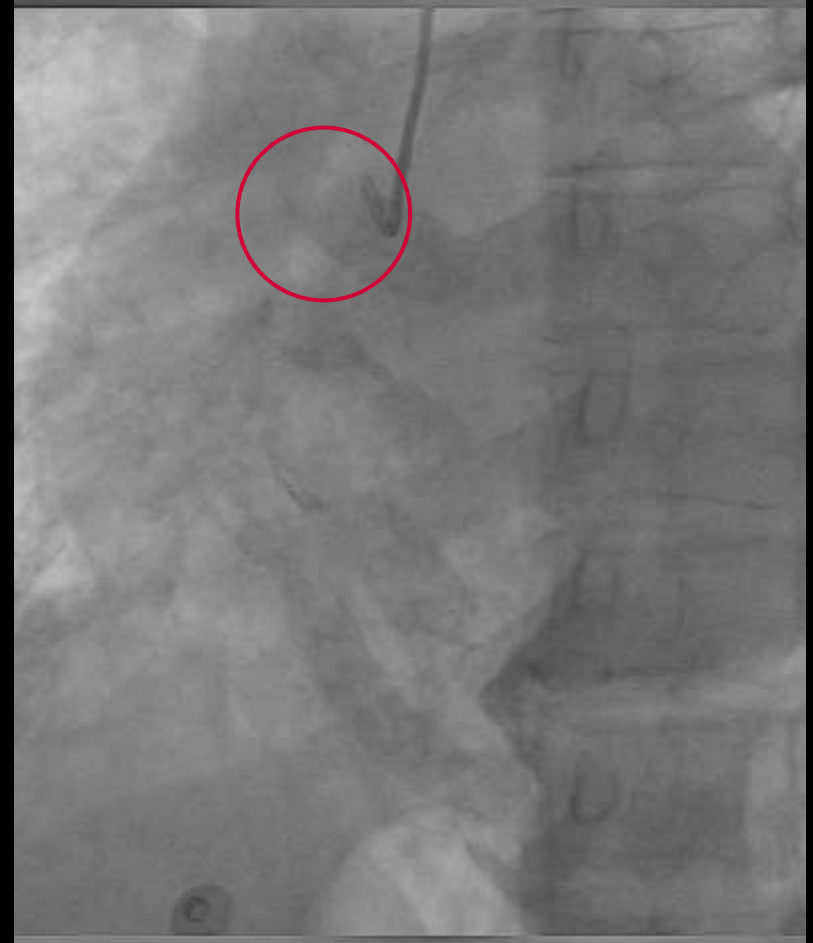
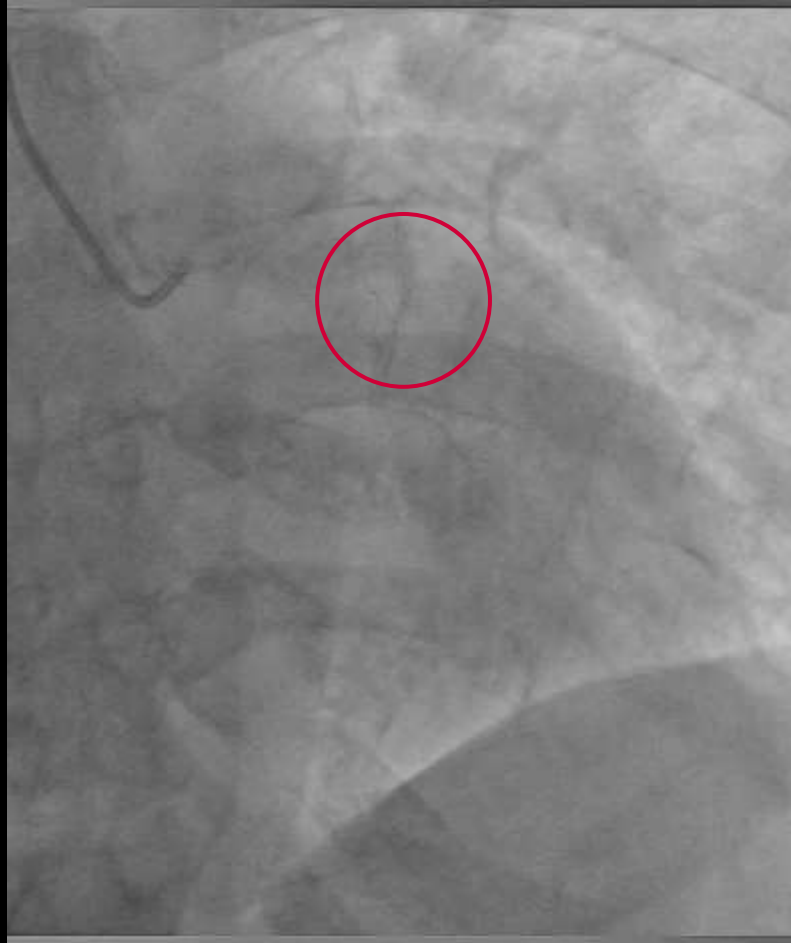
Hospital Sultanah Aminah Johor
Bahru, Malaysia

Initial Presentation

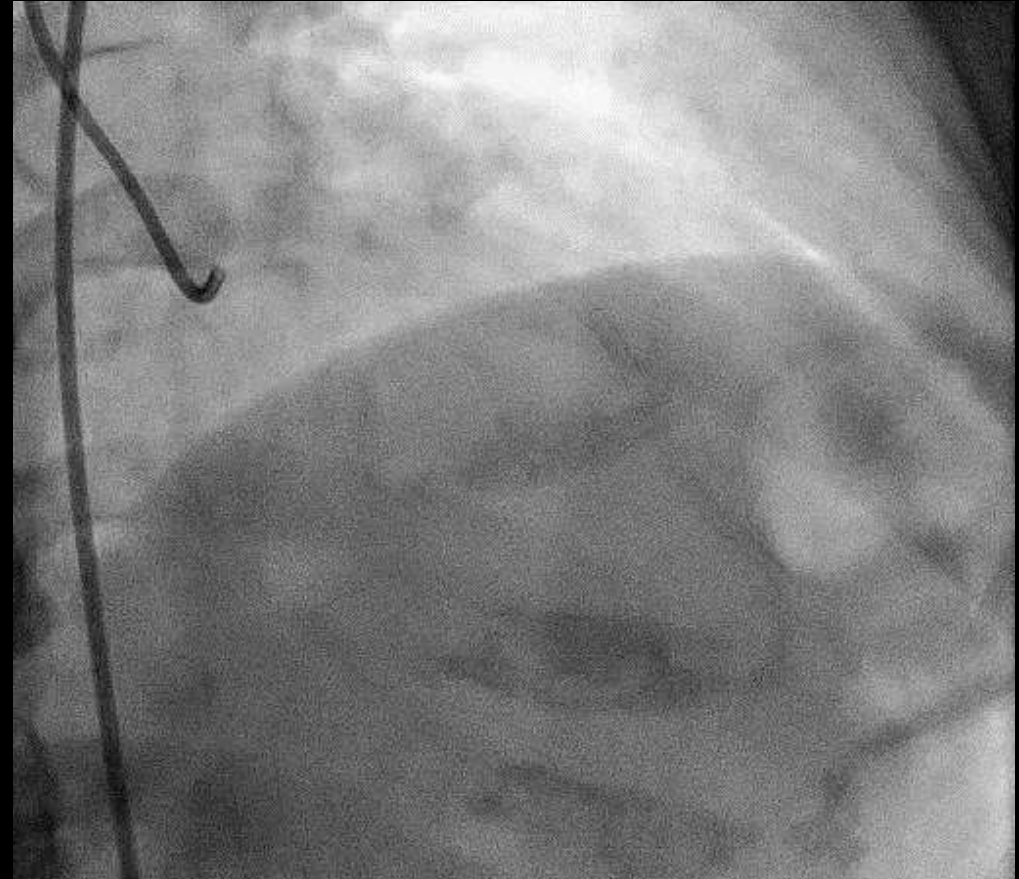
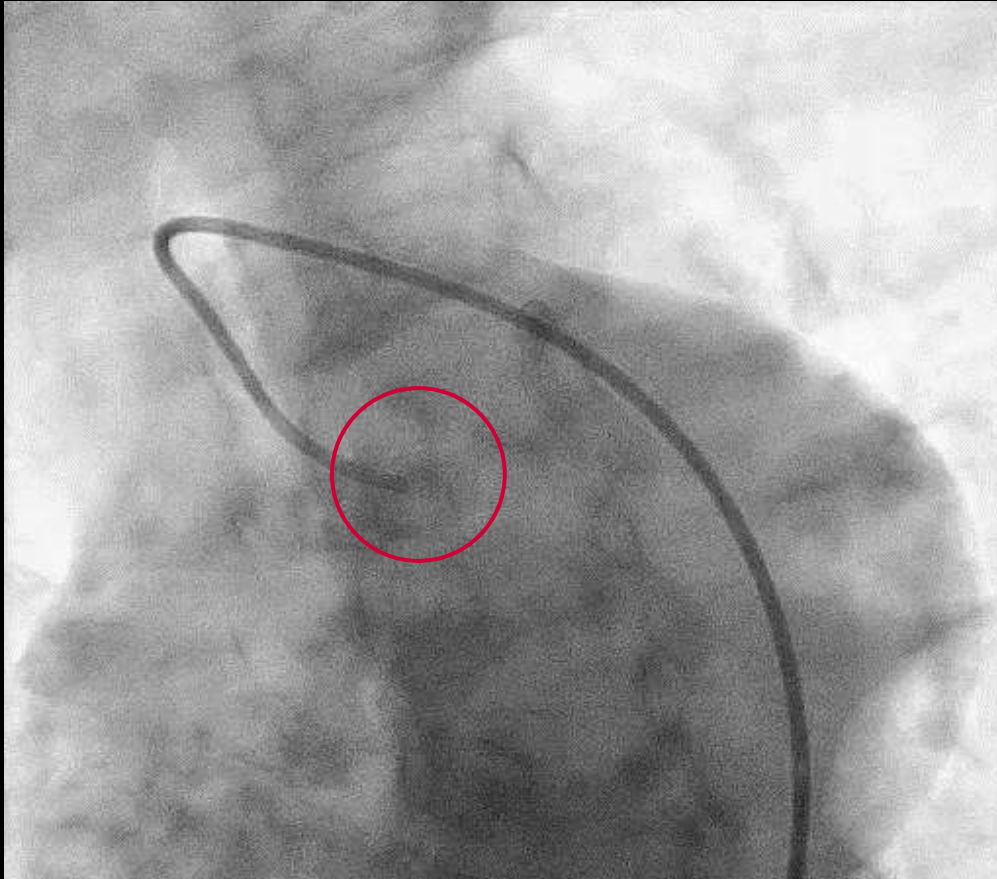
- A 60-year-old female with a history of hypertension and ischemic stroke
- First presented to another center with typical angina.
- ECG showed ST elevation lead aVR with wide-spread ST depression.
- Troponin T was elevated at 92 ng/L (normal value <50).
- Echo: LVEF 45-50%



Initial Presentation: Coronary Angiogram



Initial Presentation: Final Result



LAD stented with two long 2.5mm x 38mm DES

Initial Presentation

- Admitted to our center for recurrent angina (CCS II) 1 week after 1st PCI.
- Physical examination: unremarkable.
- ECG: No new changes
- Normal cardiac enzyme.
- Diagnosis: unstable angina
- Referred to the Heart team for consideration of CABG.
- However, the family and patient declined CABG and opted for PCI

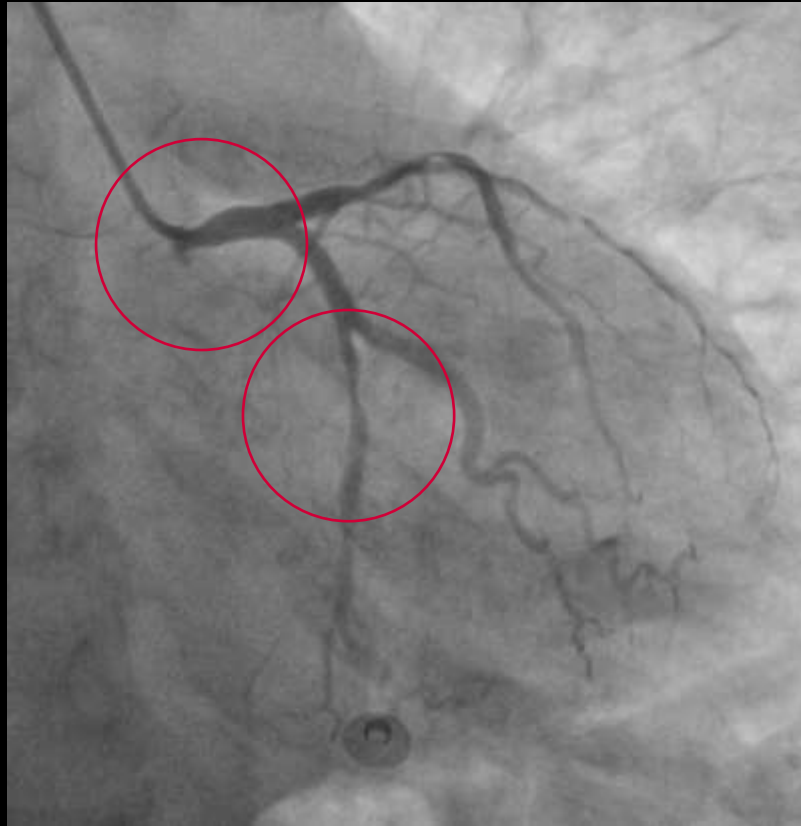
SYNTAX Score I overview		Exit
corresponds to.		
Lesion 1		
(segment 1): 1.0x2=		2.0
Aorto Ostial lesion		1.0
Sub total lesion 1		3.0
Lesion 2		
(segment 5): 5.0x2=		10.0
(segment 6): 3.5x2=		7.0
(segment 13): 0.5x2=		1.0
Aorto Ostial lesion		1.0
Sub total lesion 2		19.0
Total		22.0

SYNTAX Score II overview		Exit
Decision making -between CABG and PCI- guided by the SYNTAX Score II to be endorsed by the Heart Team.		
PCI		
SYNTAX Score II		28.2
PCI 4 Year Mortality:		5.9 %
CABG		
SYNTAX Score II		18.8
CABG 4 Year Mortality:		2.7 %
Treatment recommendation ⓘ		CABG

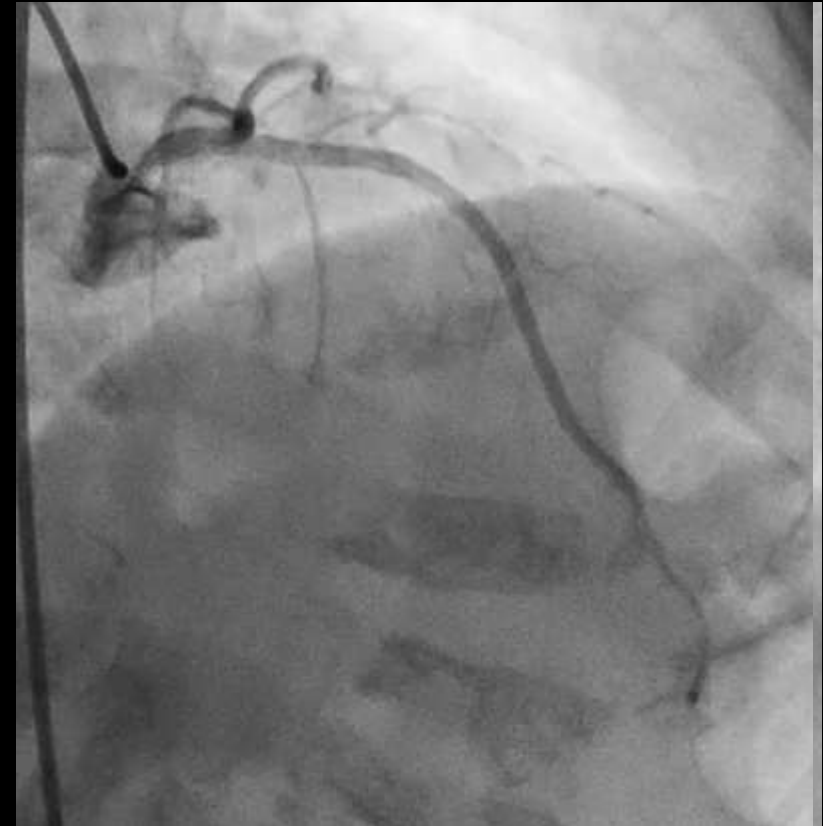
Triple Vessels Disease with LM Involvement



Tight Ostial RCA Stenosis



Ostial LM 50% stenosis
Mid left circumflex 50% stenosis

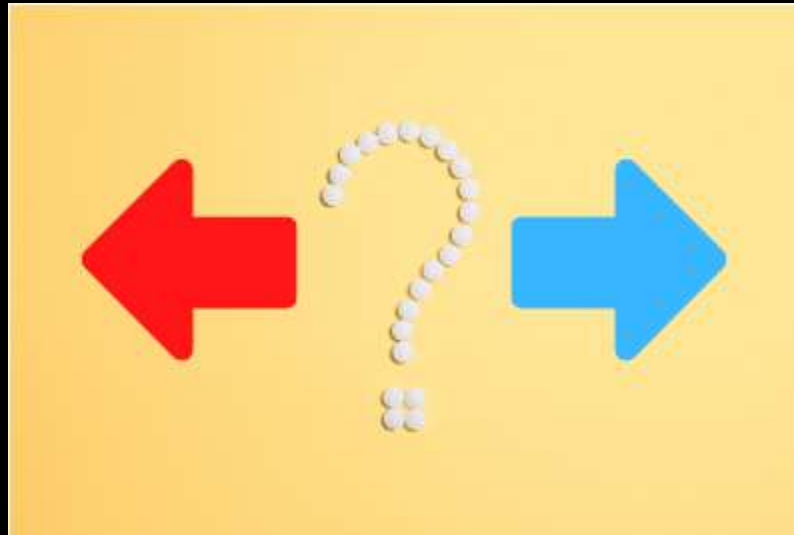


Proximal LAD 95% stenosis

Strategy

IVUS Guided PCI

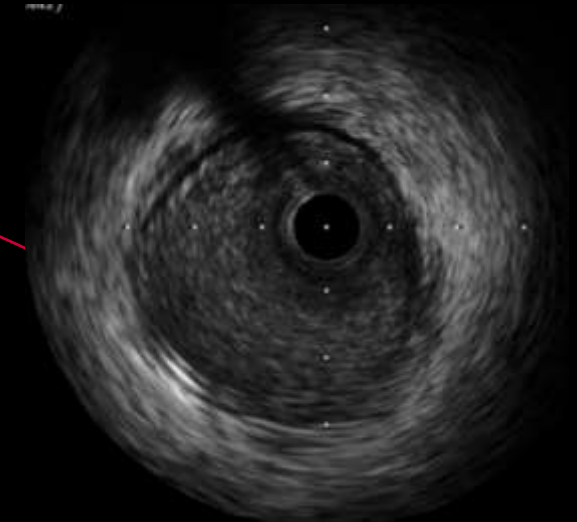
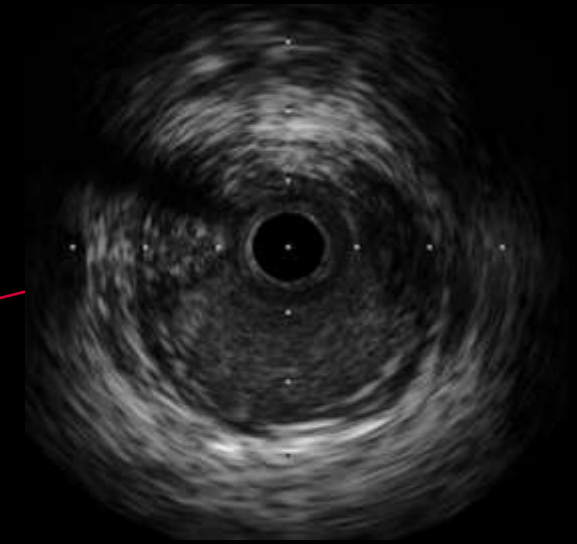
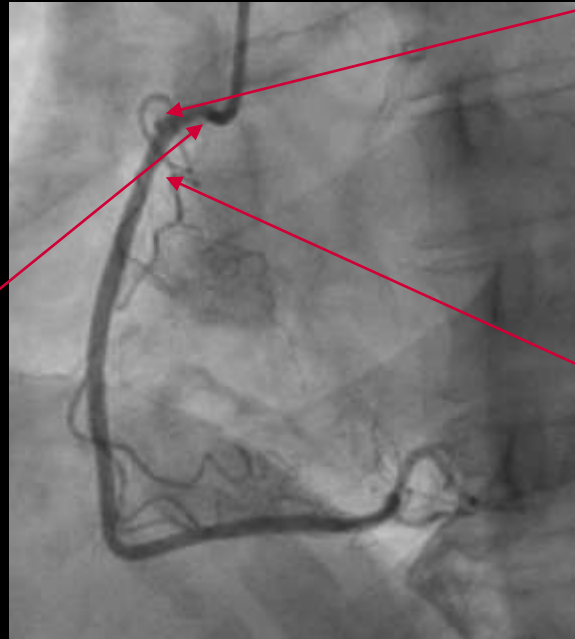
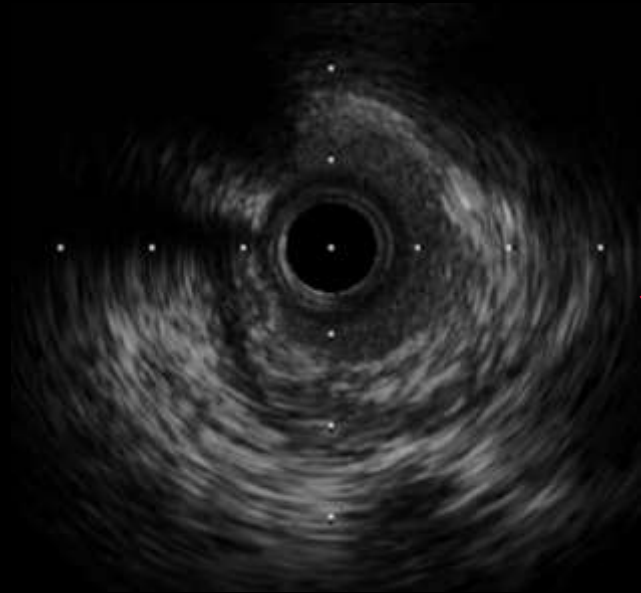
PCI to Ostial RCA



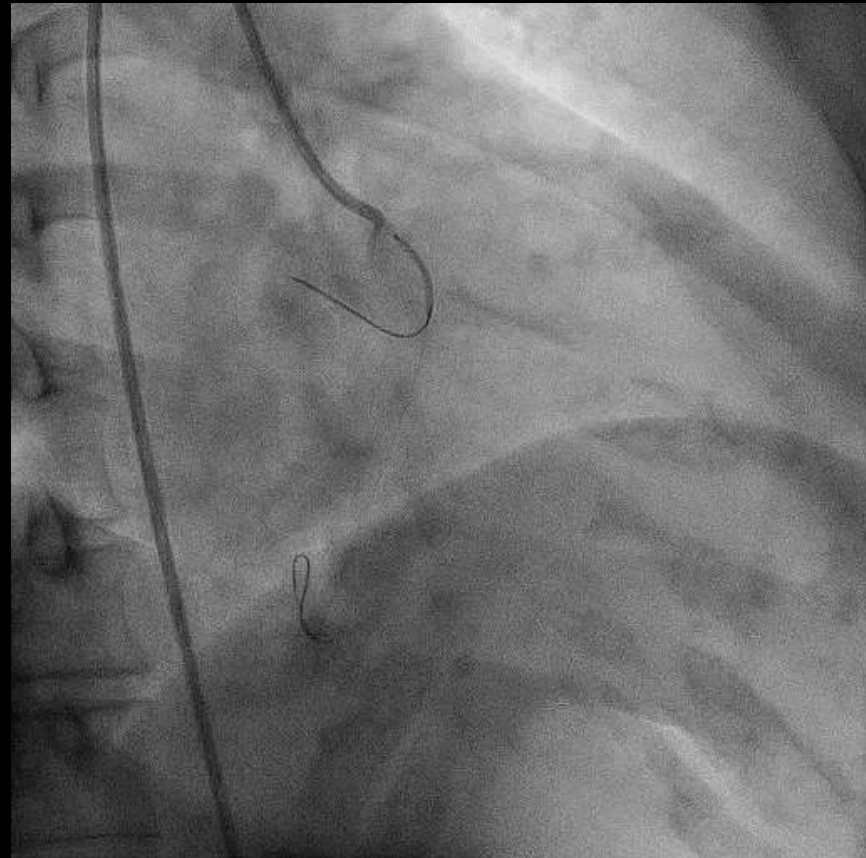
PCI to Left Main

IVUS- Guided PCI to Ostial RCA

- Access: Right femoral artery, 7F
- Strategy:
 - Buddy wire approach
 - IVUS



IVUS- Guided PCI to Ostial RCA



Floating wire technique

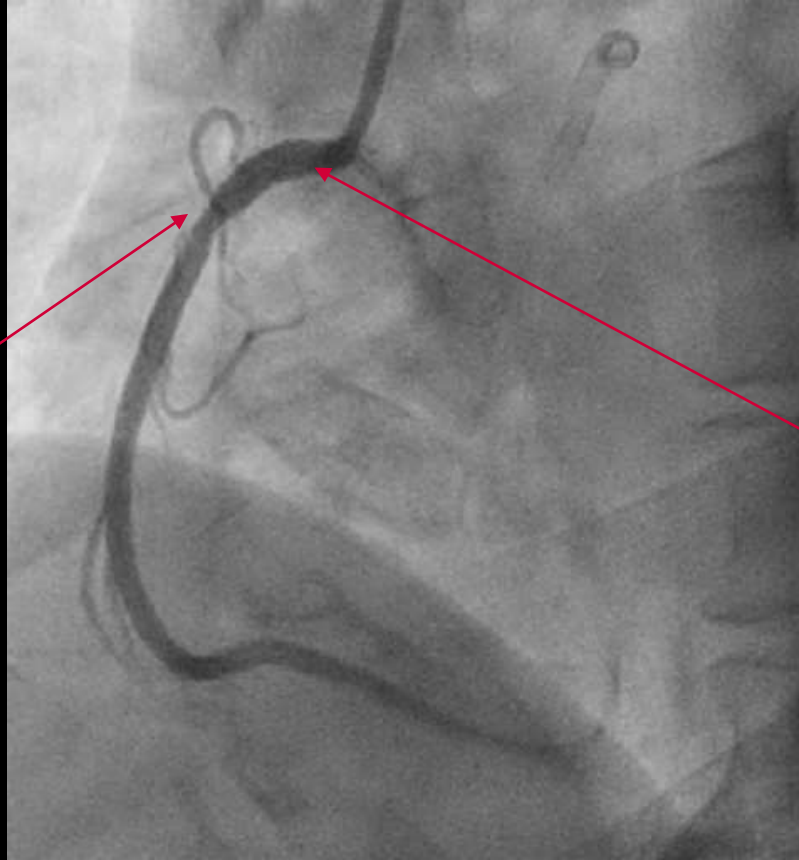
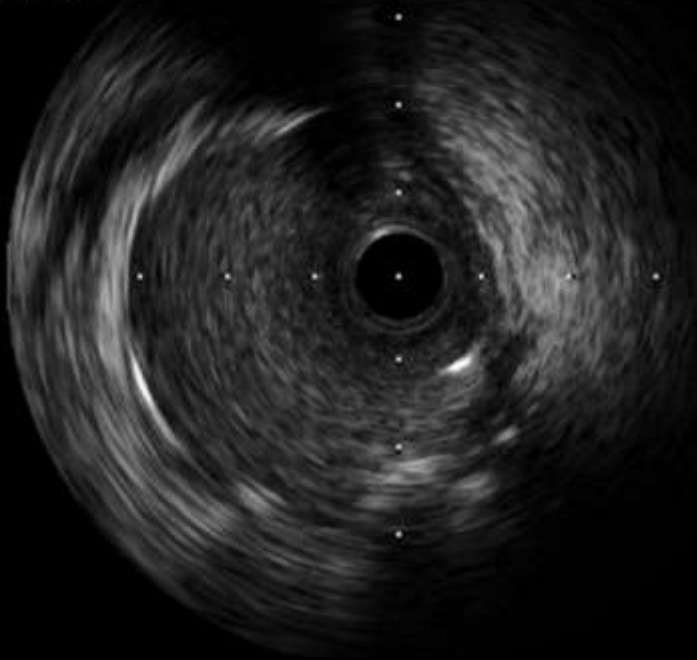


Ostial RCA stented with a 3.5mm x 15mm DES
Post-dilated with 4.0x12mm NC

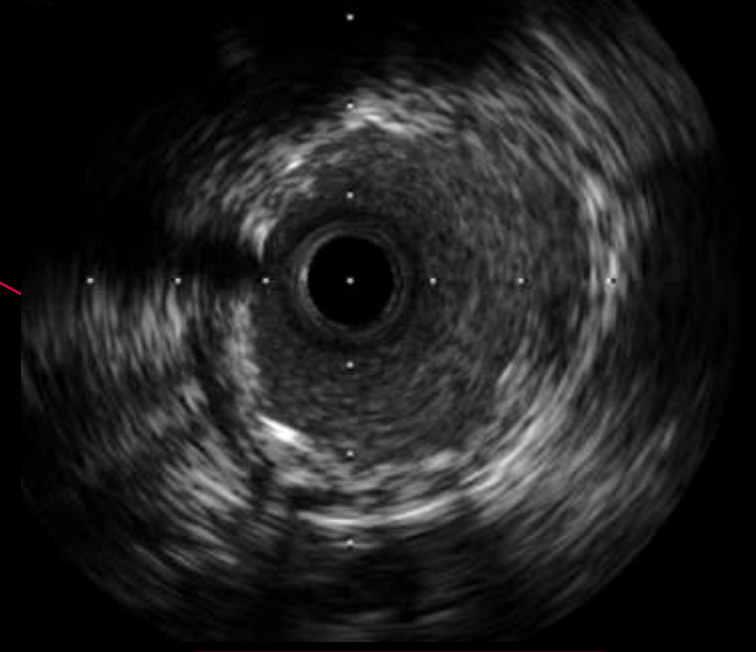


IVUS- Guided PCI to Ostial RCA

11814 (1 - 794)

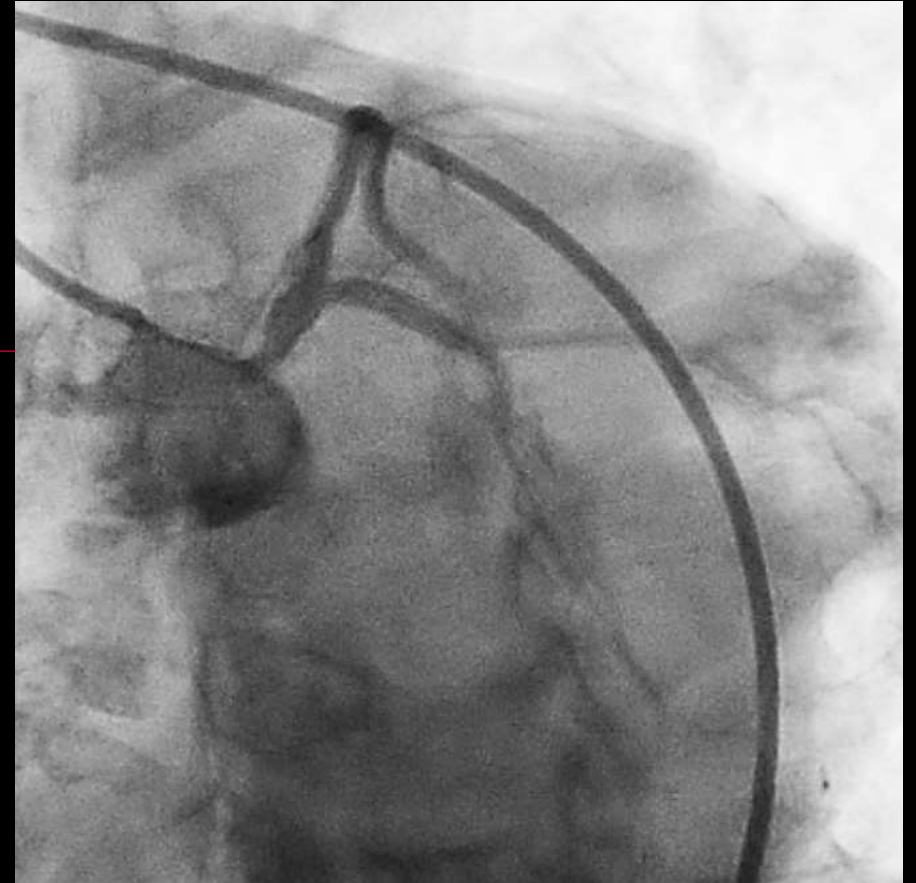
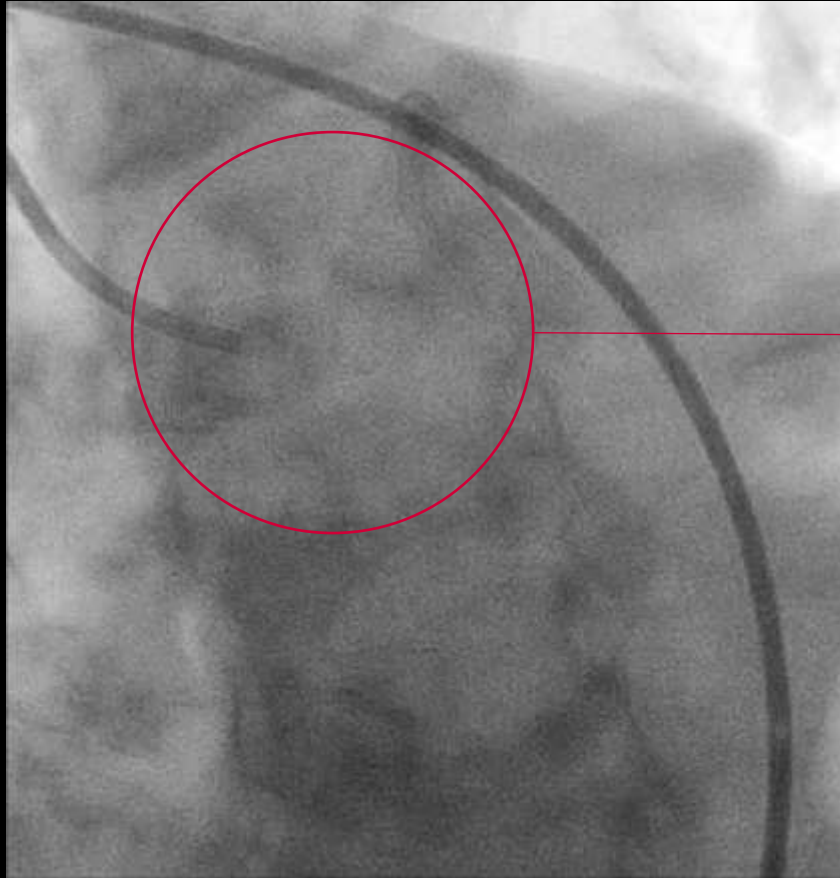


94)



MSA: 11.8mm²

PCI to Left-Main Stem



Medina 1,1,0

PCI to Left-Main Stem

Provisional or Two-Stent Strategy?



Medina 1,1,0

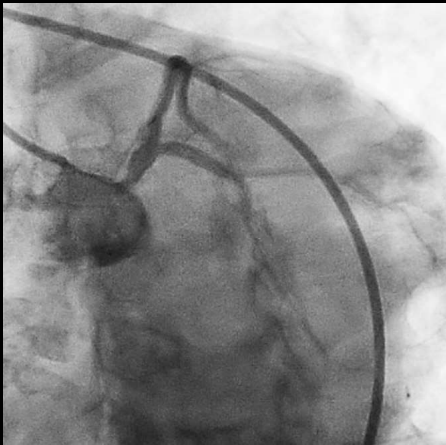


Table 1. Definition criteria for a complex coronary bifurcation.

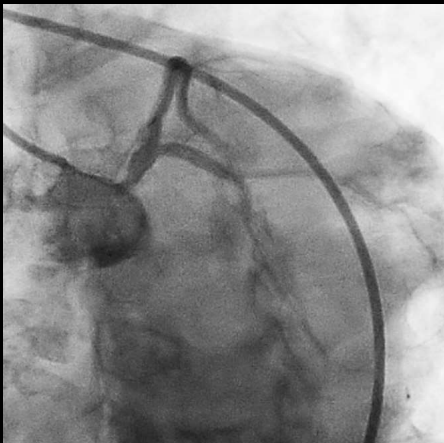
Major criteria	
For left main bifurcation (Major 1)	
- SB lesion length ≥ 10 mm, and	✓
- SB diameter stenosis $\geq 70\%$	
For non-left main bifurcation (Major 2)	
- SB lesion length ≥ 10 mm, and	
- SB diameter stenosis $\geq 90\%$	
Minor criteria	
- > mild calcification	✓
- Multiple lesions	
- Bifurcation angle $< 45^\circ$ or $> 70^\circ$	
- MV-RVD < 2.5 mm	
- MV lesion length ≥ 25 mm	
- Thrombus-containing lesions	

A complex bifurcation is defined as either two major criteria or one major criterion with two minor criteria fulfilled.

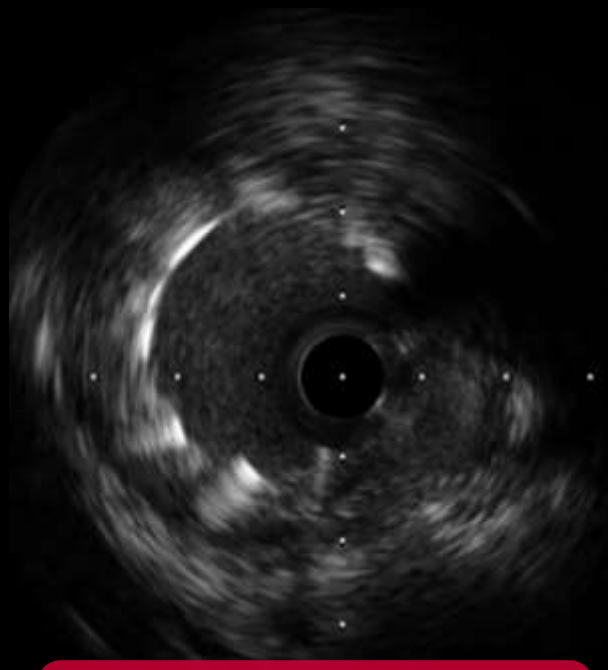
Non-complex bifurcation lesion

PCI to Left-Main Stem

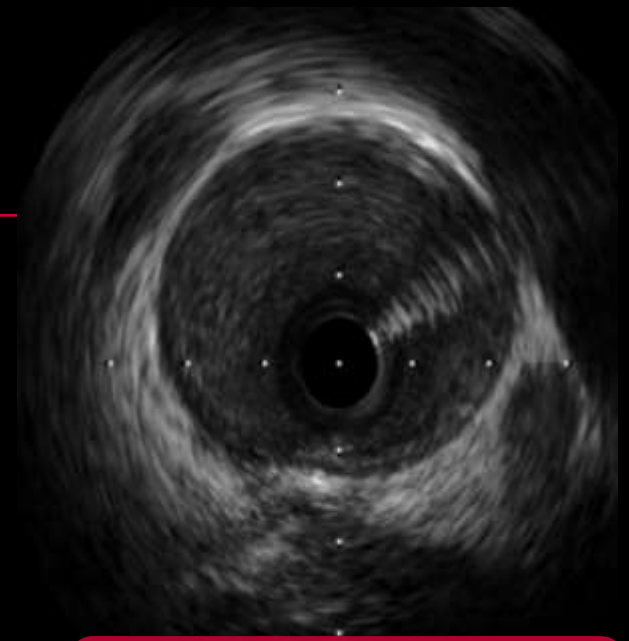
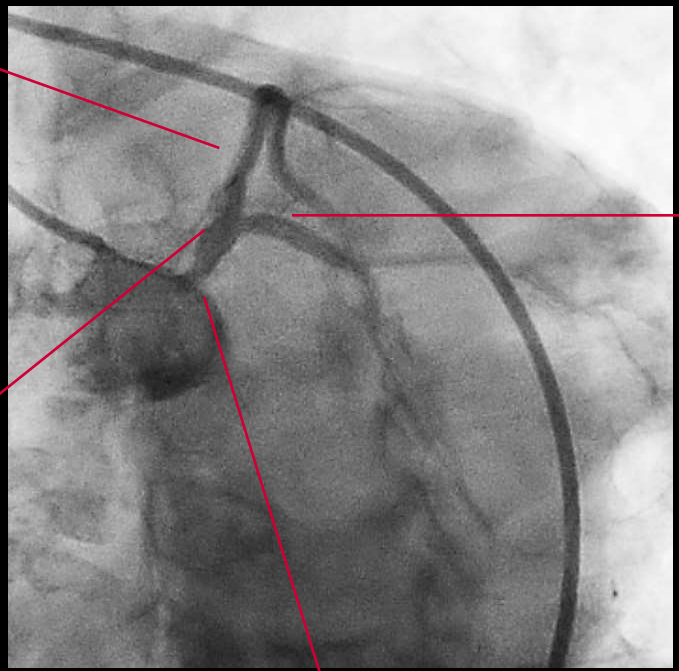
Provisional Stenting for LM-LAD



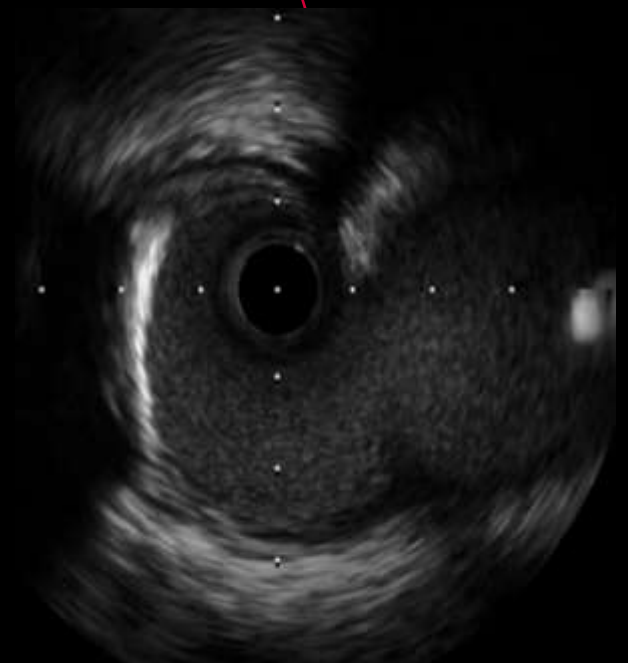
- Access: right femoral artery
- Guiding: JL 4.0, 7F
- Plan:
- Two wire approach
- IVUS assessment of LM, LAD and LCx



Less than 180° calcium at ostial LAD



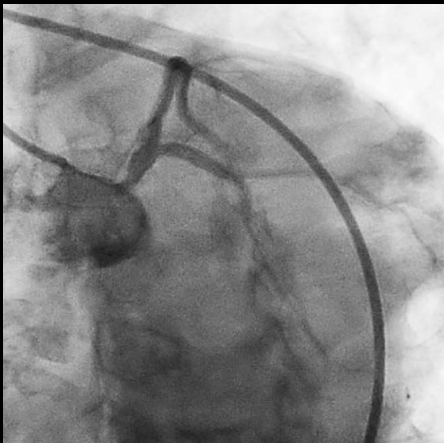
Healthy ostial LCx



Ostial LM stenosis (area 4.9 mm²) with non-calcified, circumferential fibro-fatty plaque

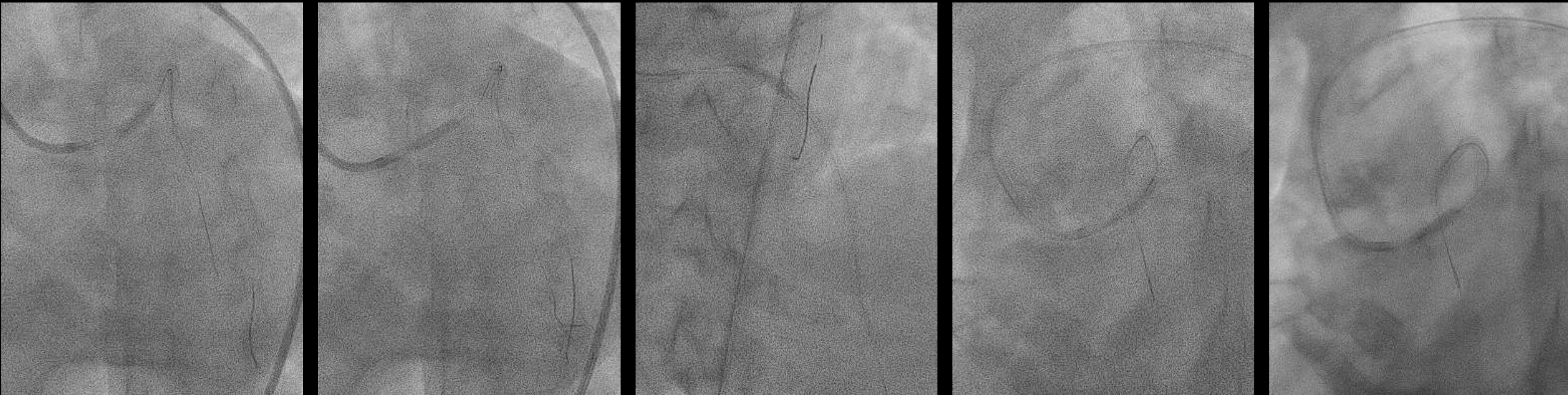
PCI to Left-Main Stem

Provisional Stenting for LM-LAD



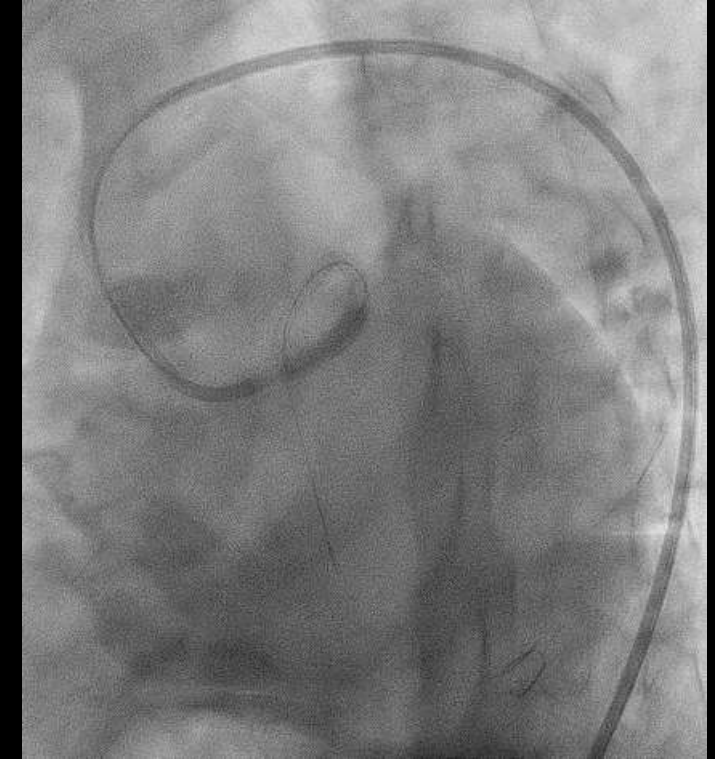
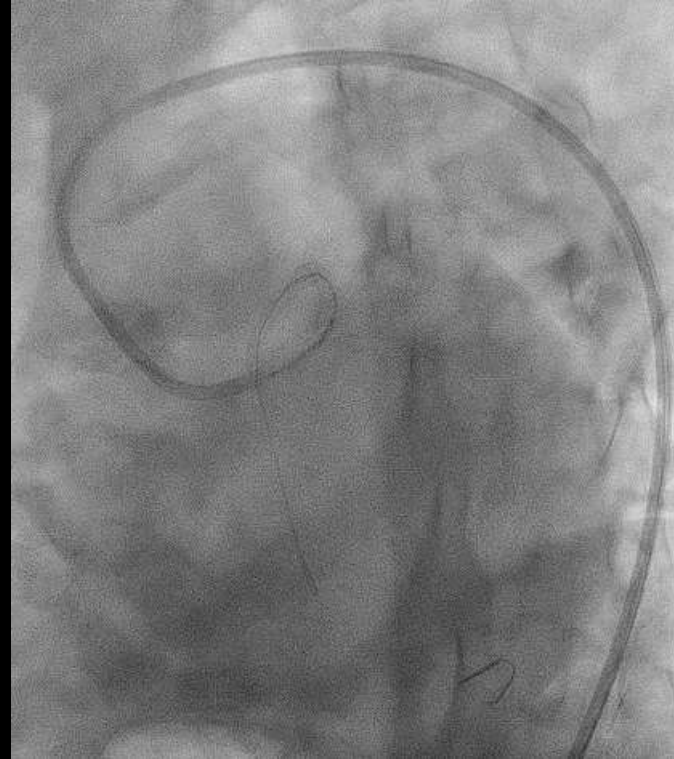
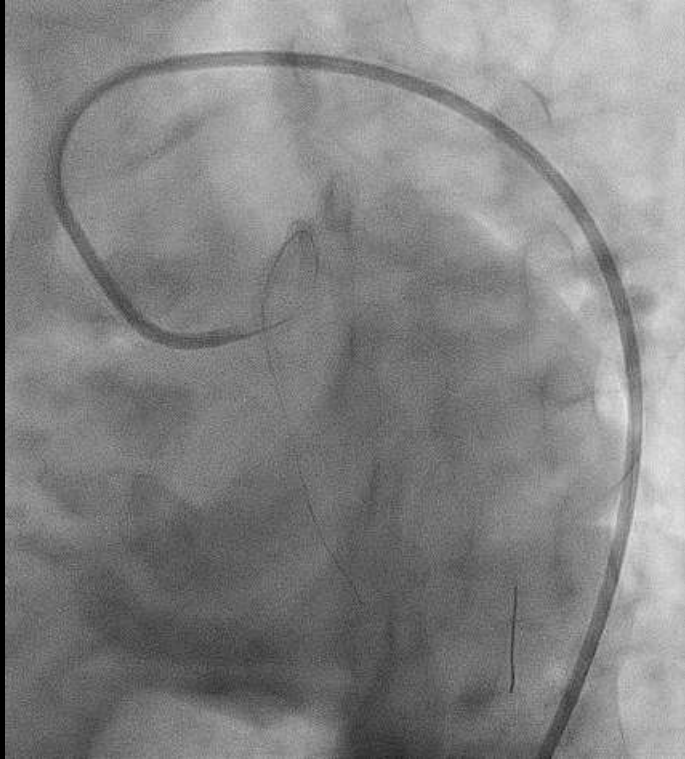
- Access: right femoral artery
- Guiding: JL 4.0, 7F
- Plan:
 - Two wire approach
 - IVUS assessment of LM, LAD and LCx
 - Provisional stenting of LM - LAD, POT-side-POT (rePOT).
 - Bail-out: TAP

Left Main -LAD Intervention: Procedure Steps



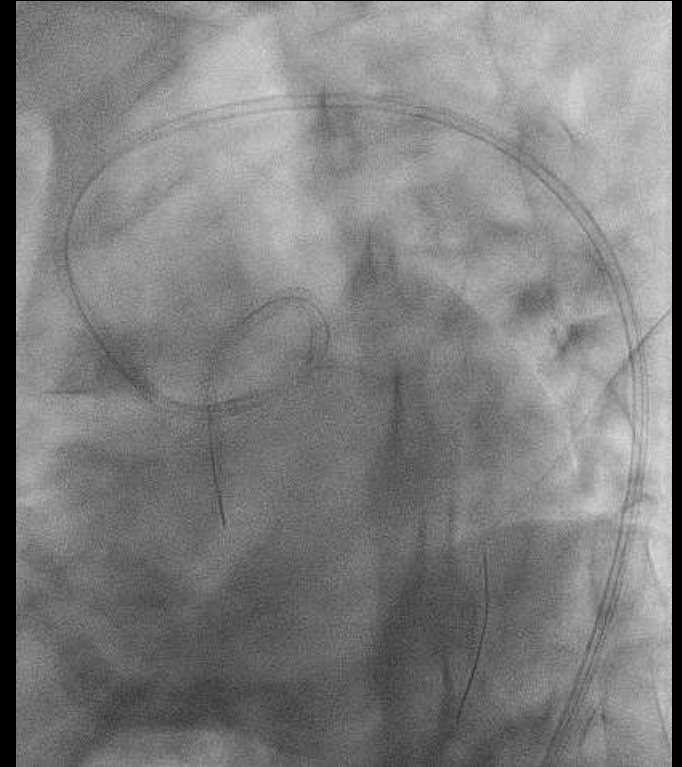
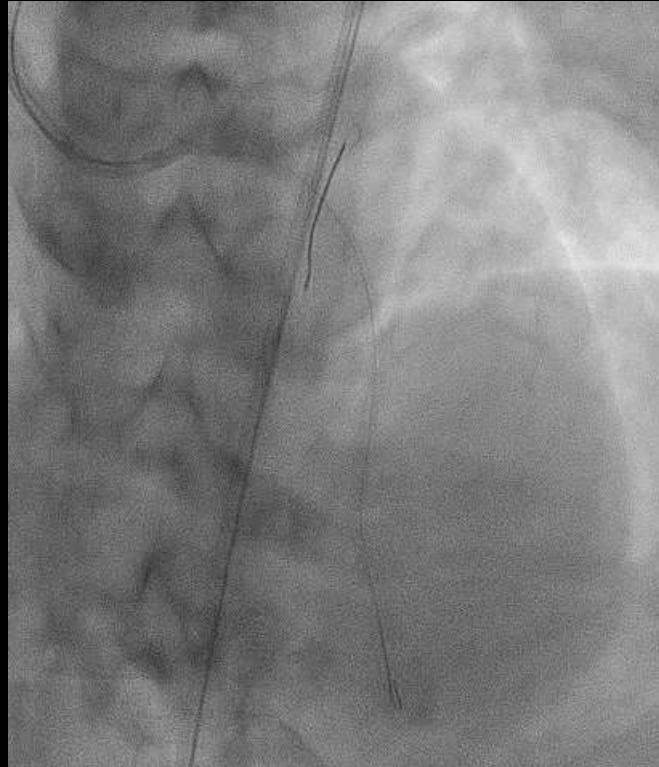
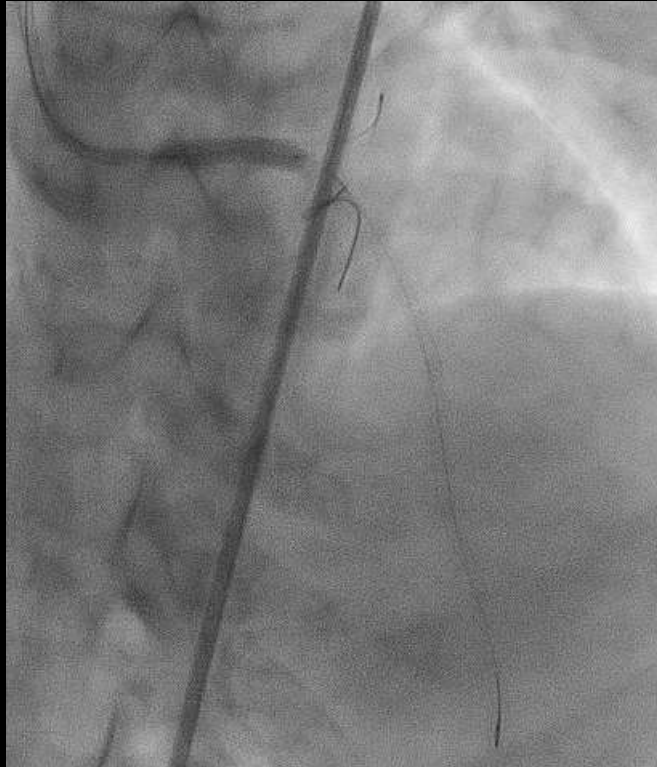
Predilated ostial LAD to ostial LM with 3.0x15mm and 3.5x12mm NC balloons.

Left Main -LAD Intervention: Procedure Steps

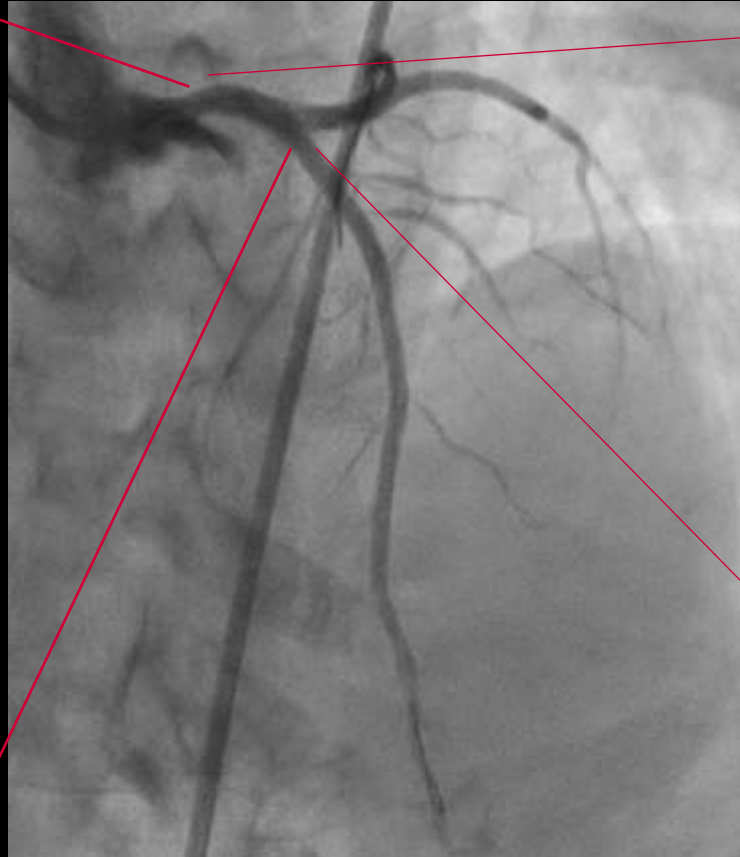
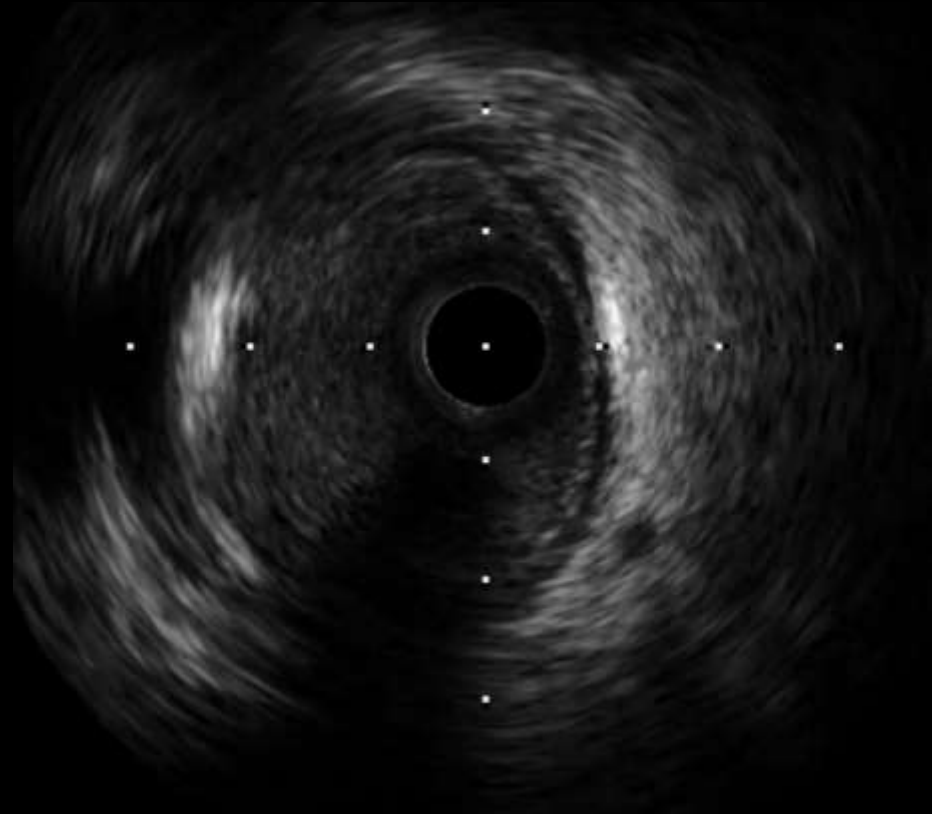


Stented with DES 4.0mm x 18mm Xience Xpedition

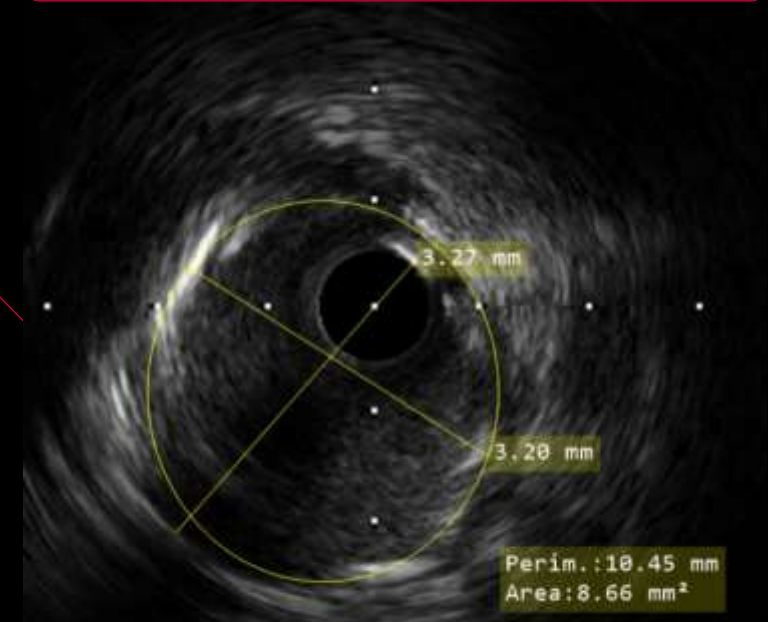
Left Main -LAD Intervention: Procedure Steps



Post-dilated with stent balloon 4.0mm x 18mm

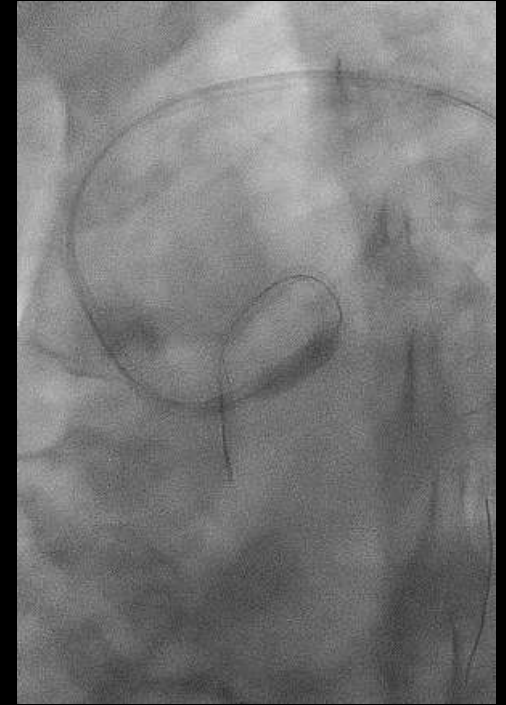
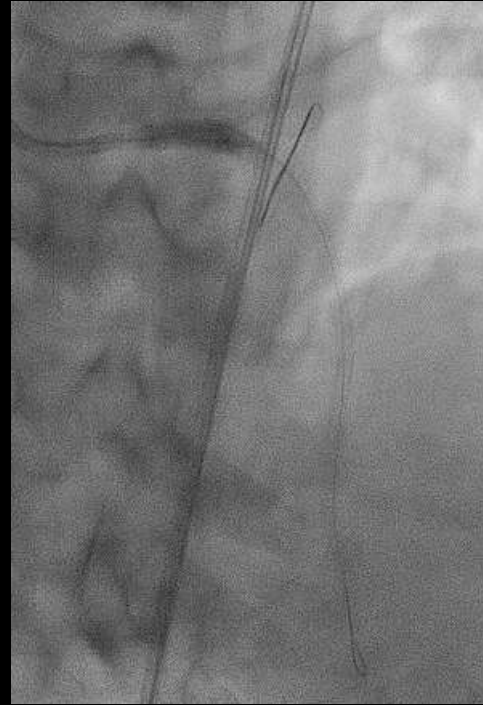


Proximal stent edge



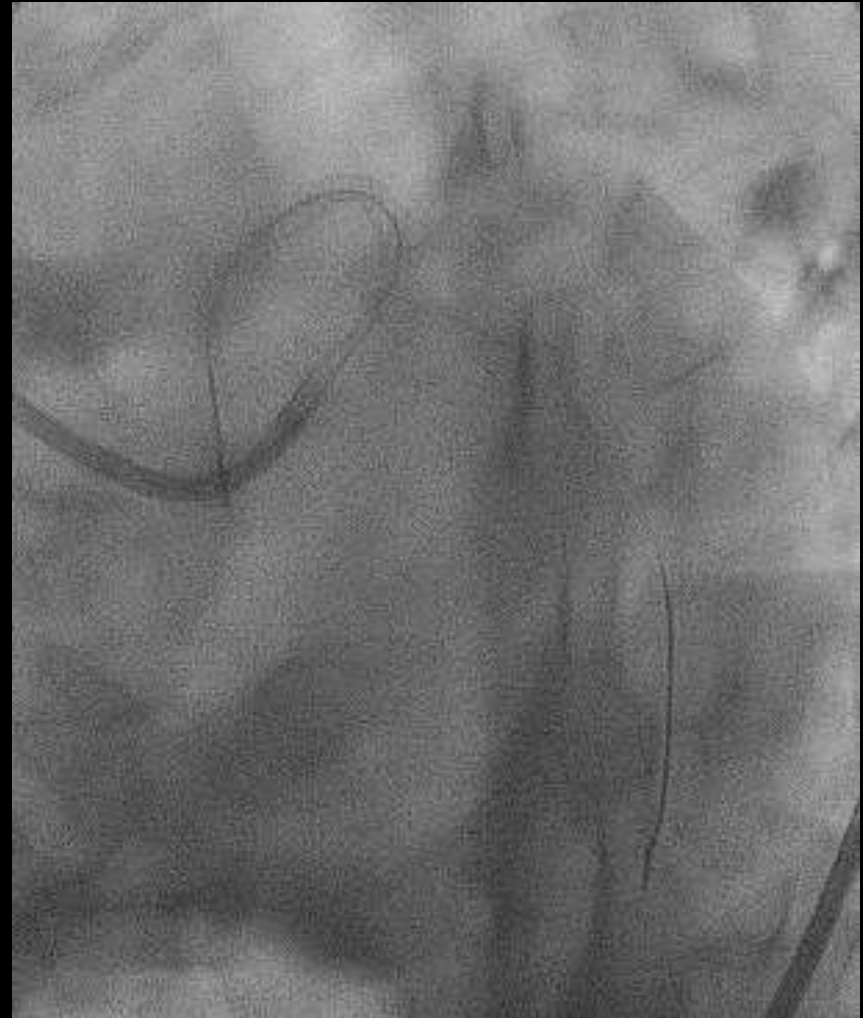
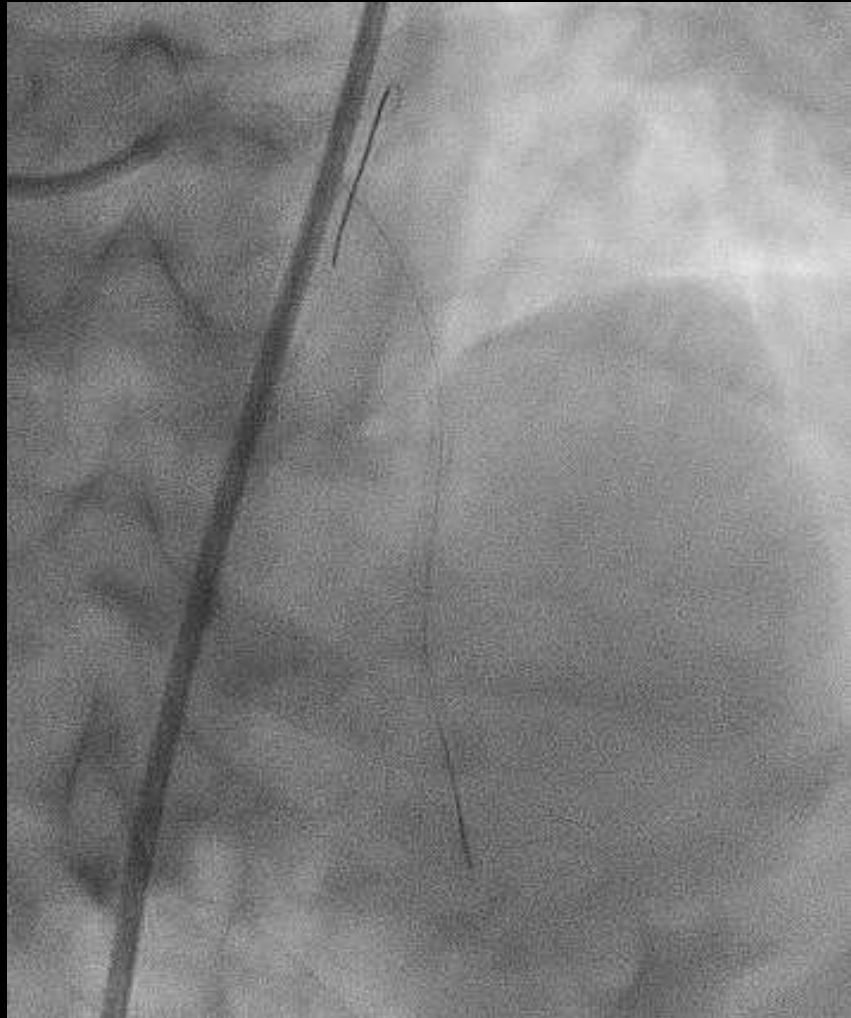
Distal stent edge

Left Main -LAD Intervention: Procedure Steps

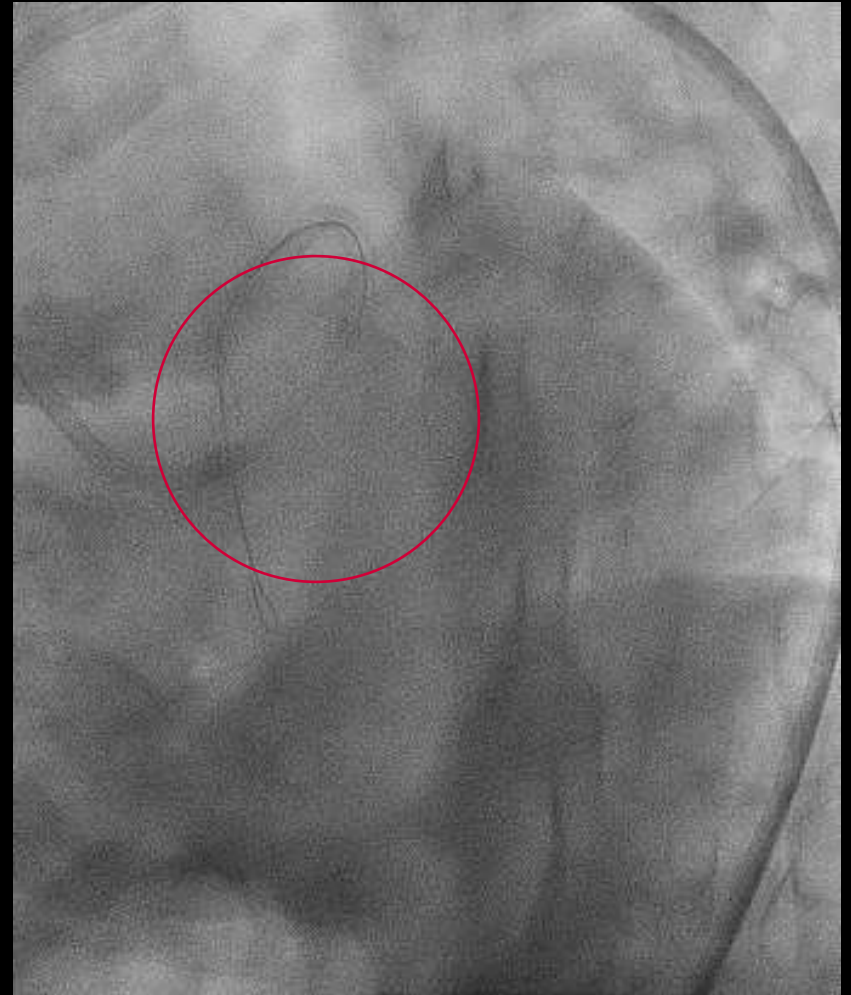
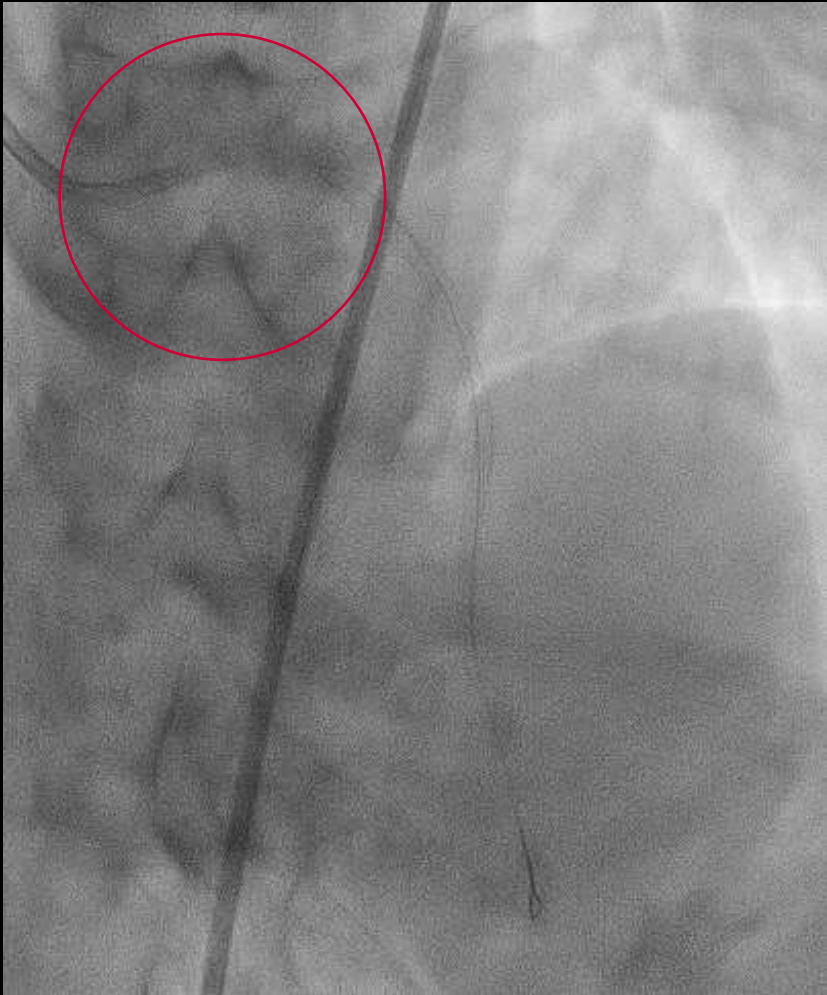


Post-dilated with NC balloon 4.5mm x 12mm

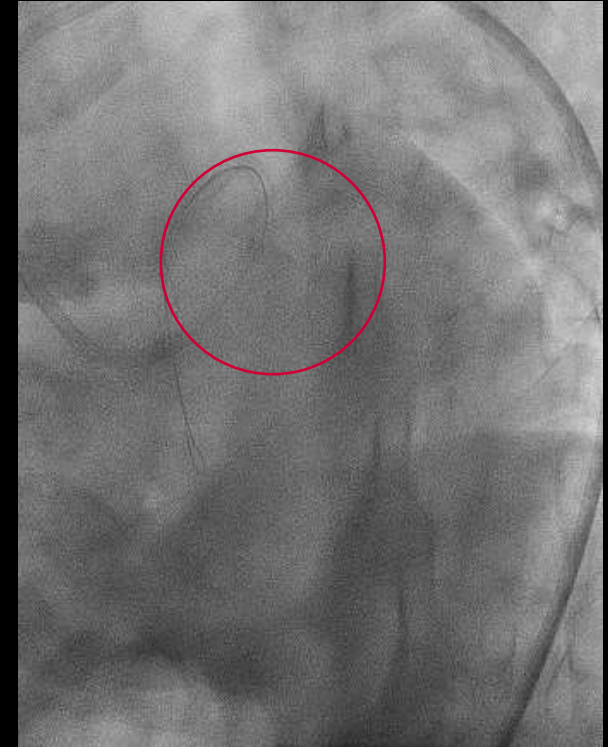
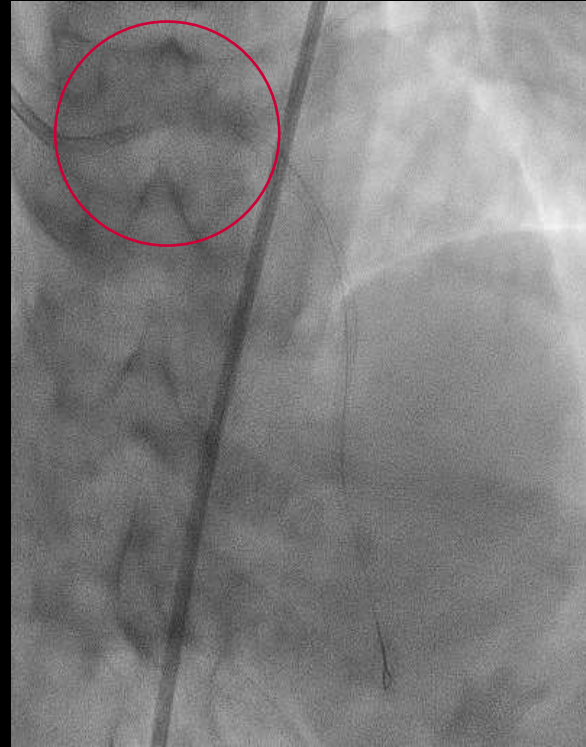
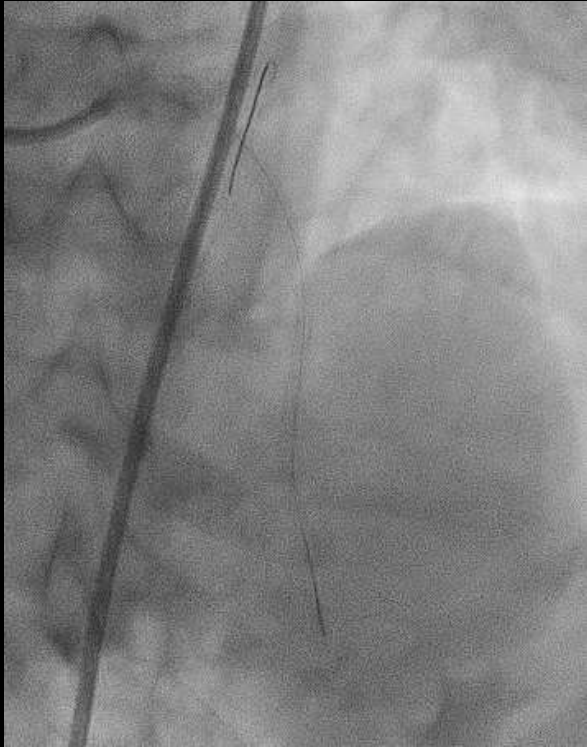
Left Main -LAD Intervention: After Post - dilatation



Recoil?



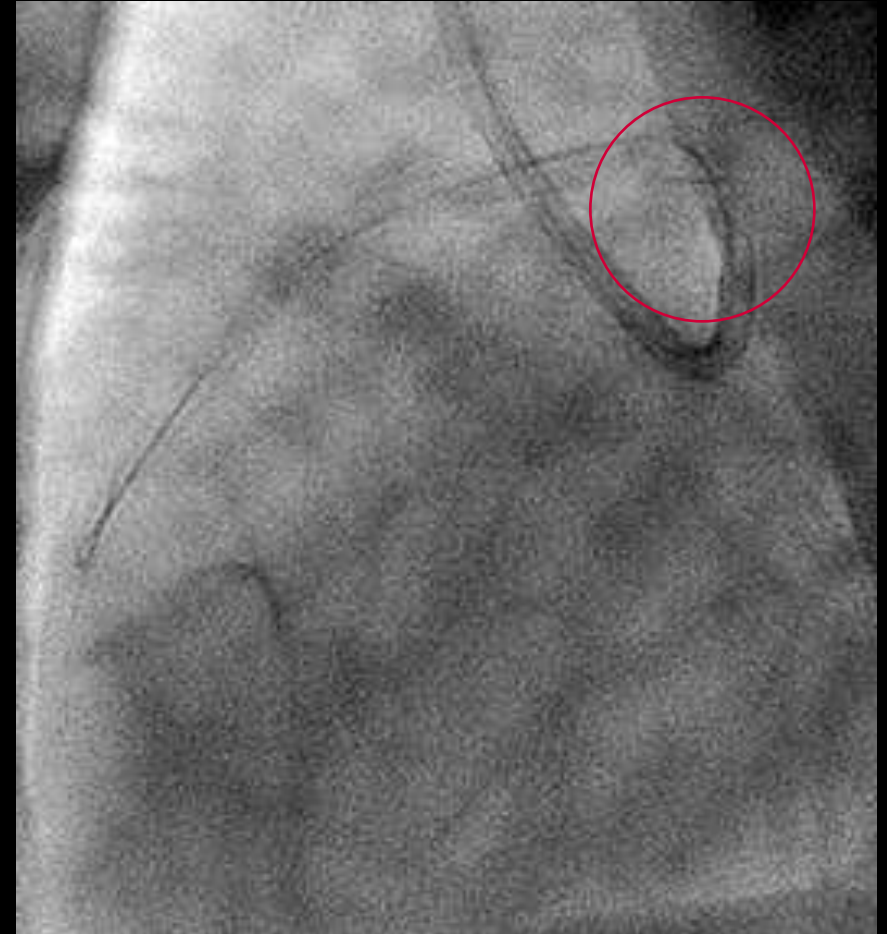
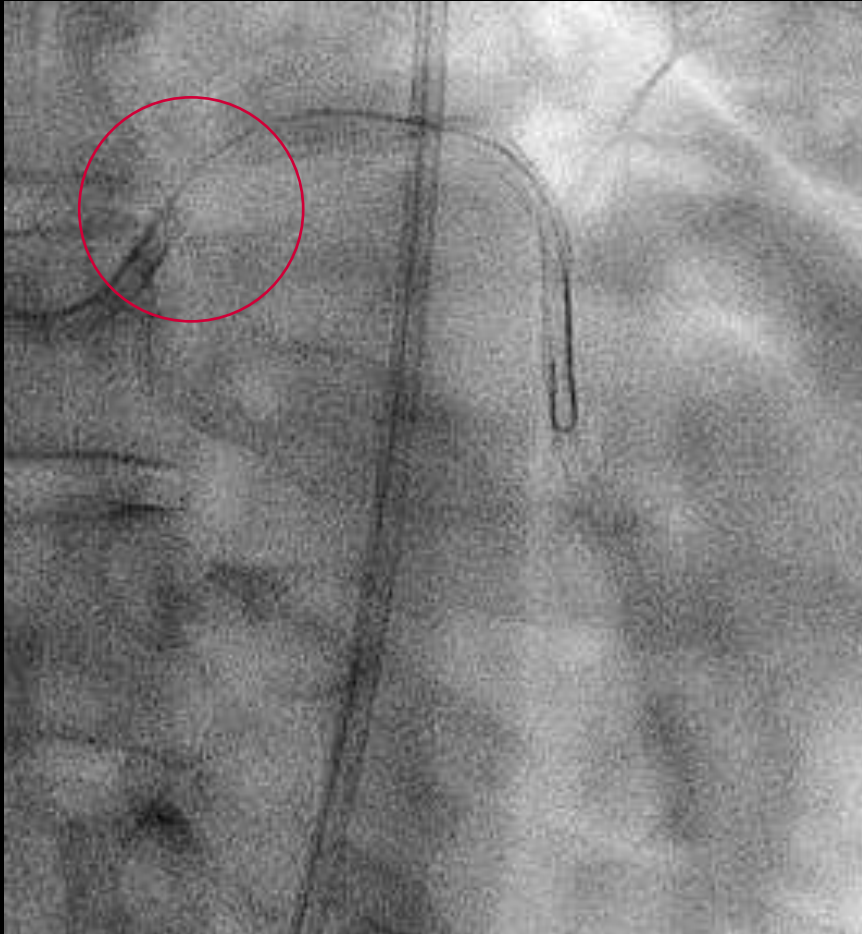
Recoil?



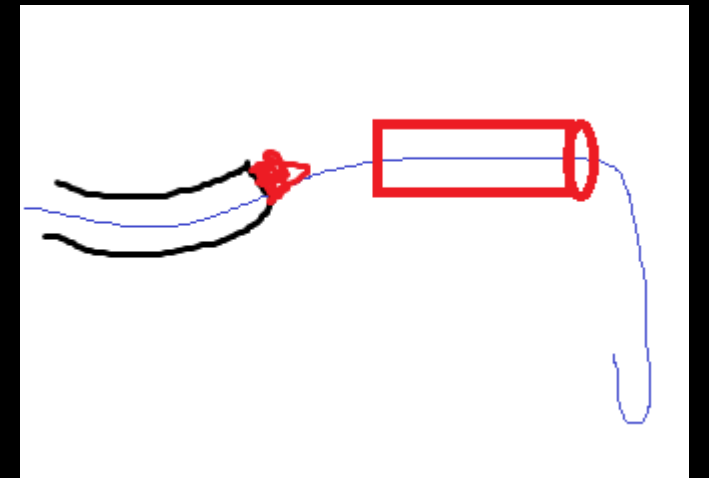
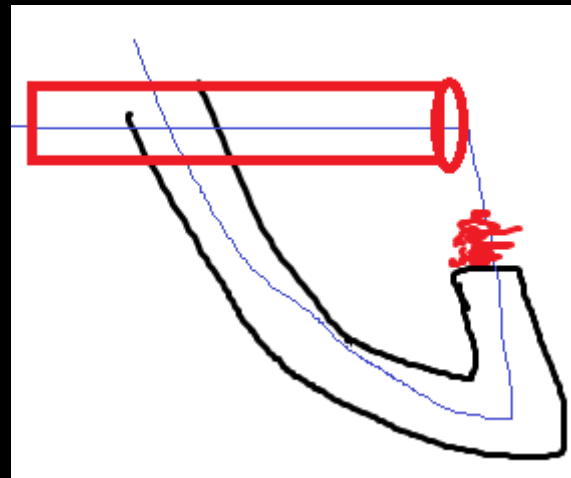
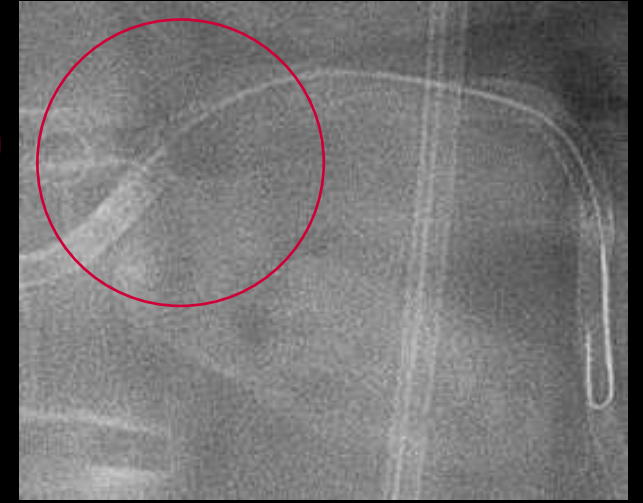
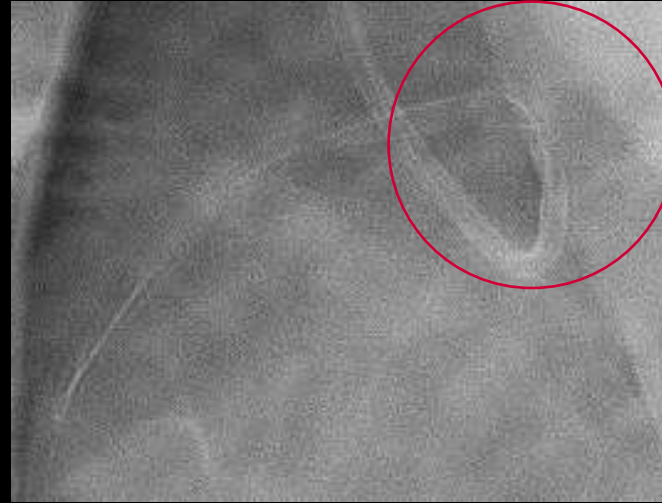
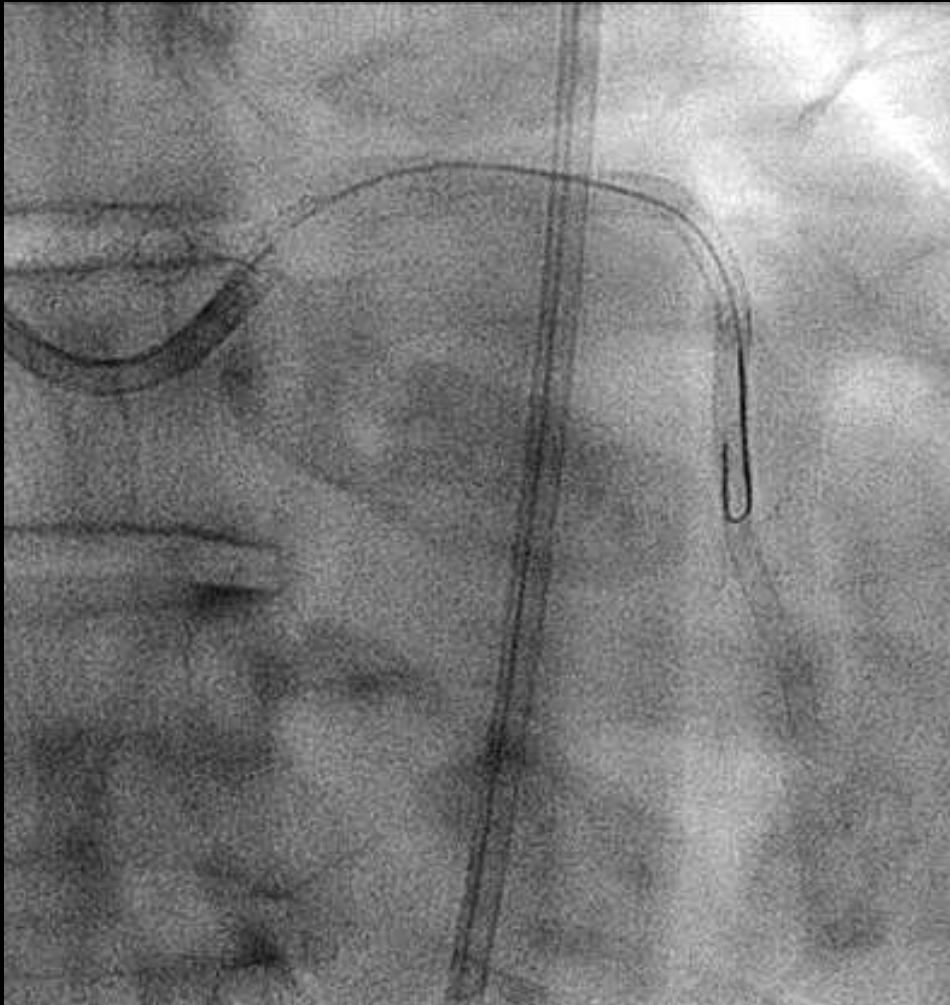
Before Removal of SB Wire

After Removal of SB Wire

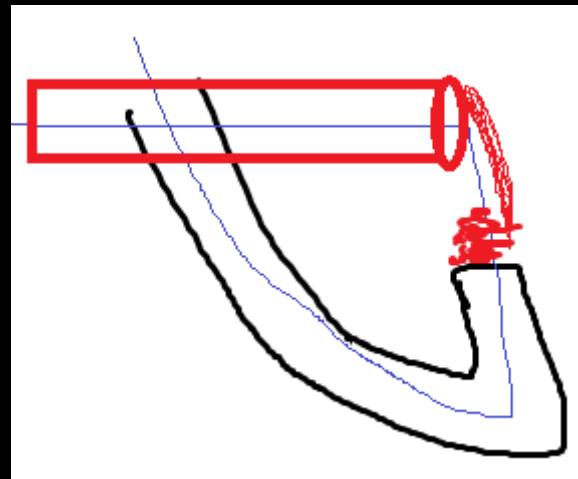
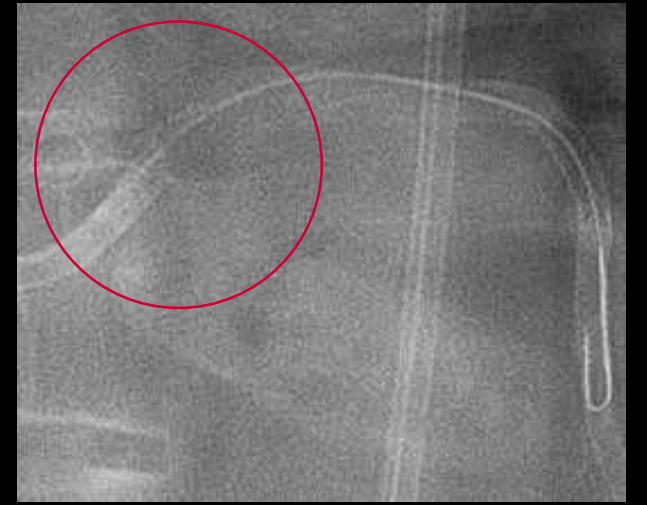
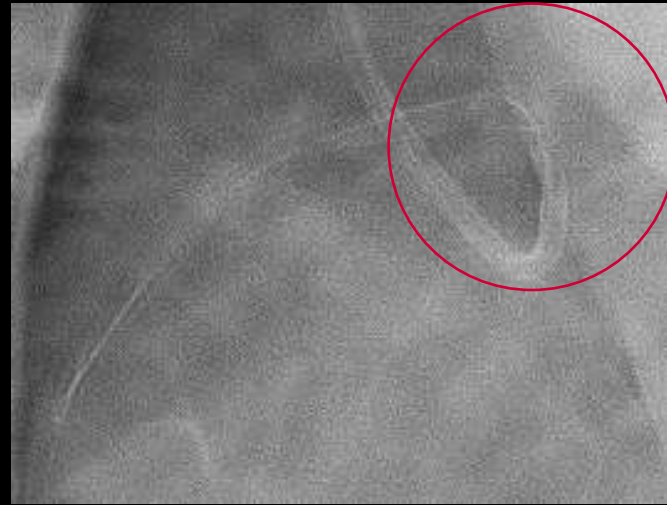
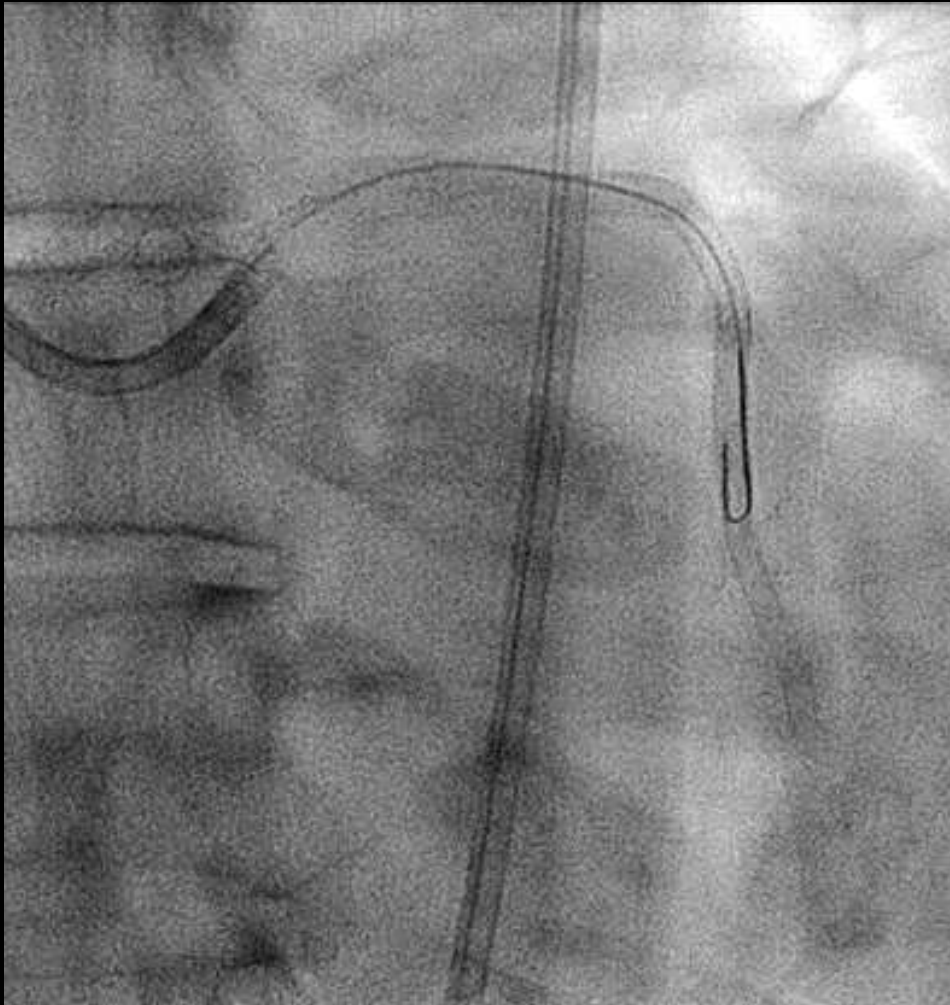
Fracture of Left Main Stent?



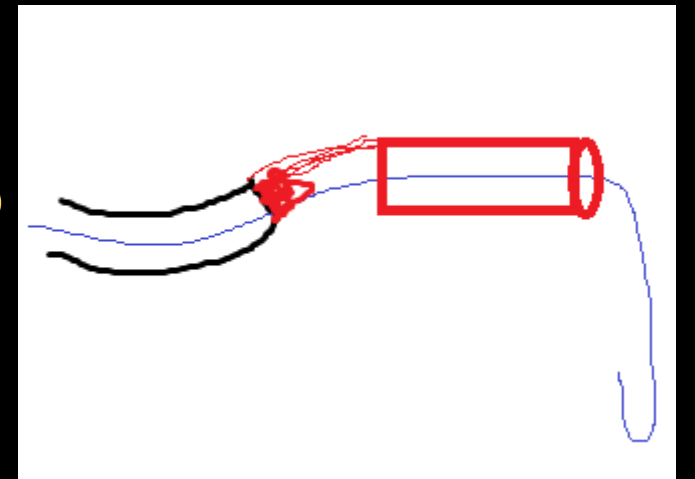
Left-Main Stent Fracture



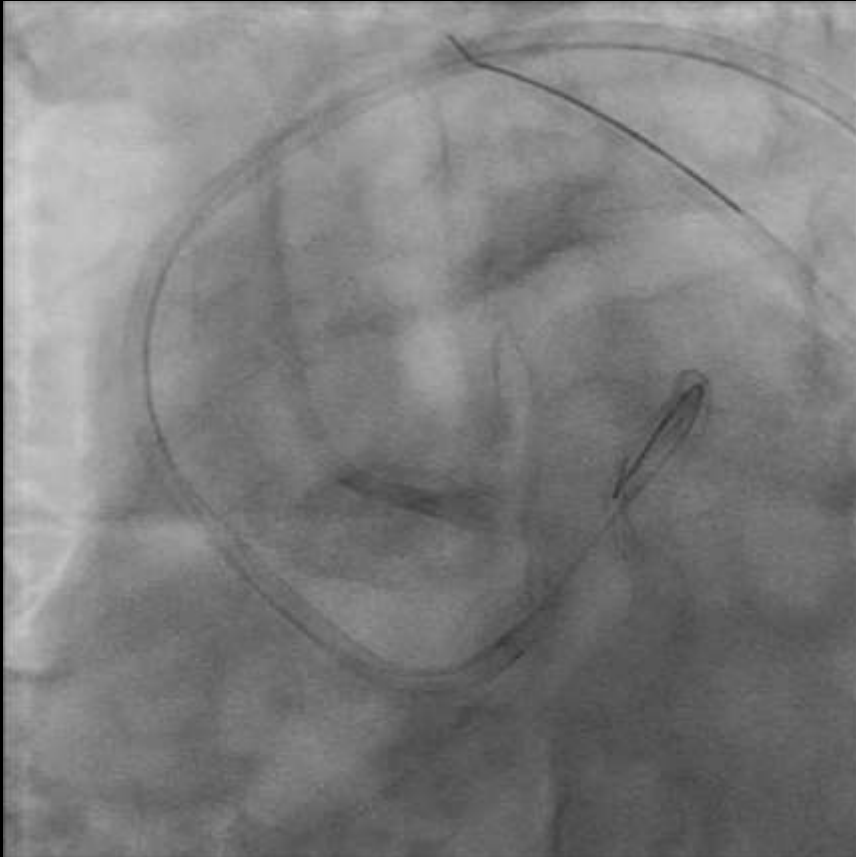
Left-Main Stent Fracture



?

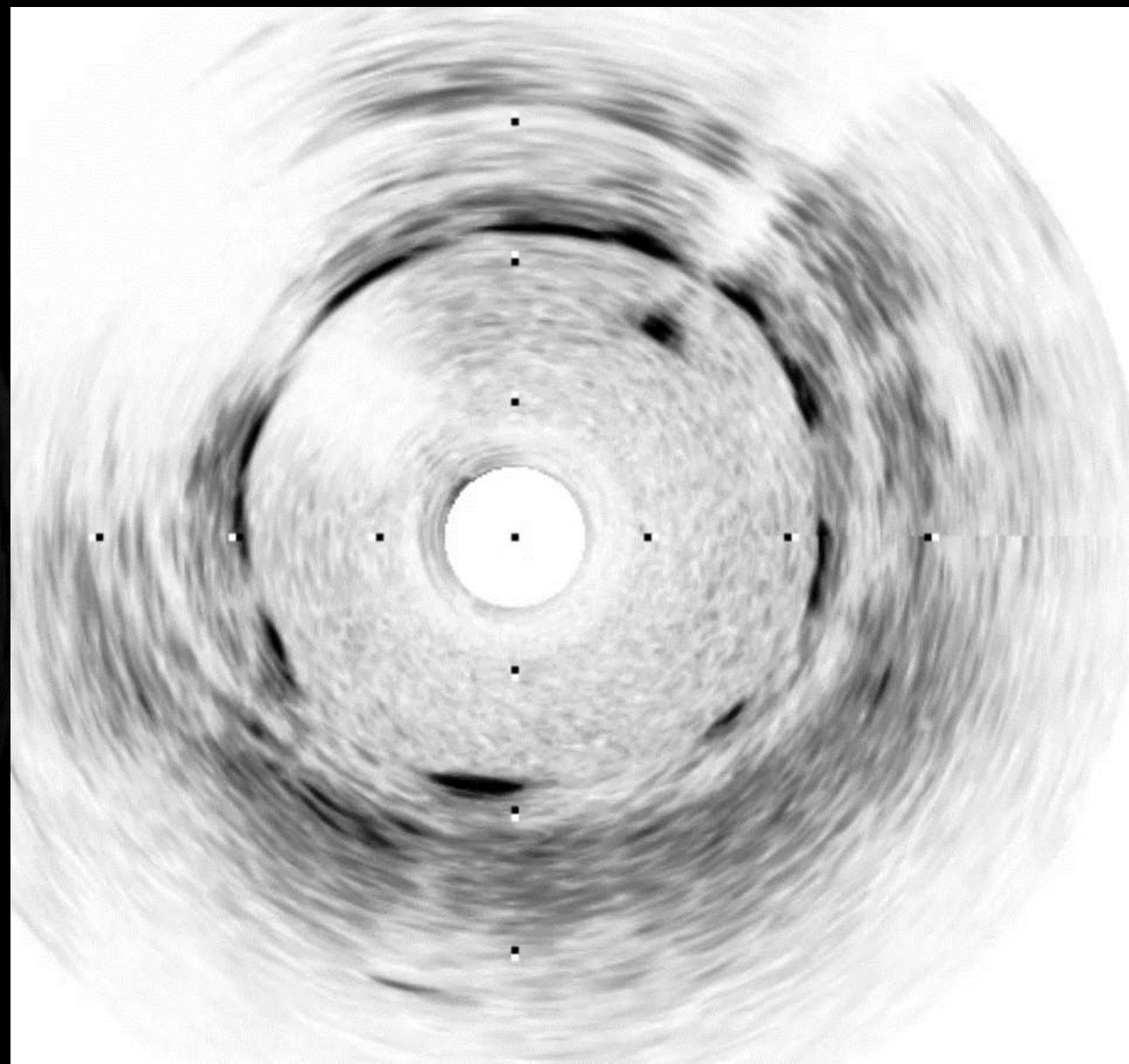
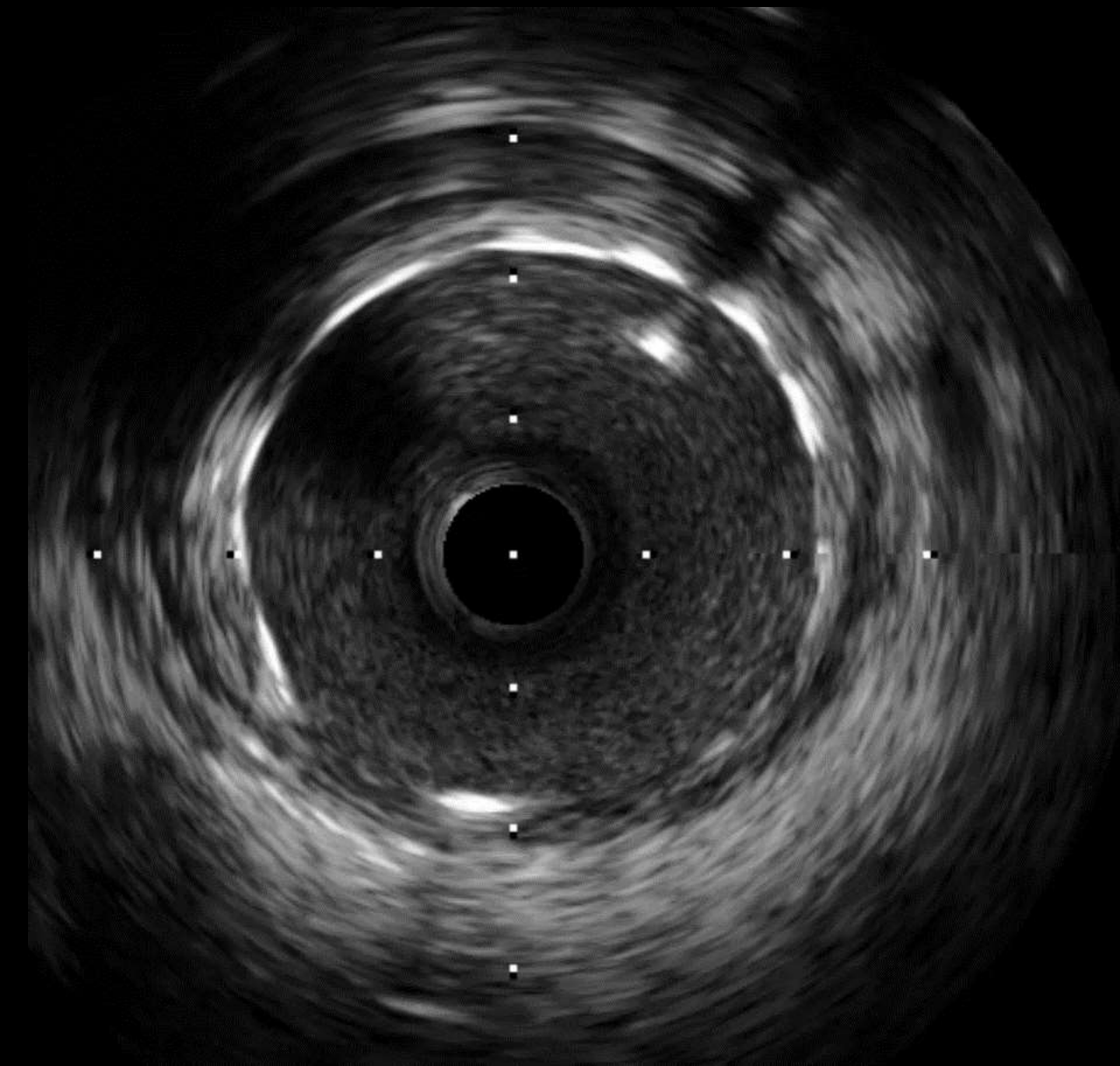


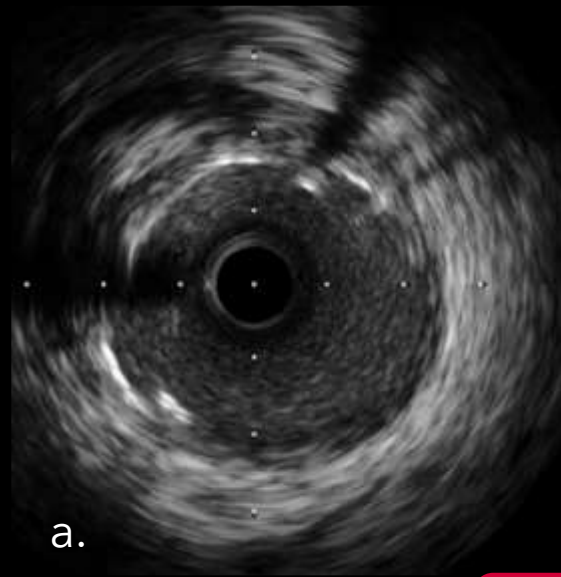
Left-Main Stent Fracture



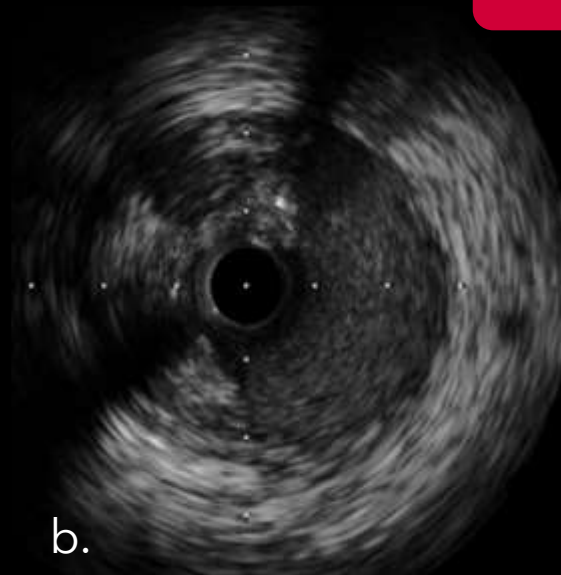
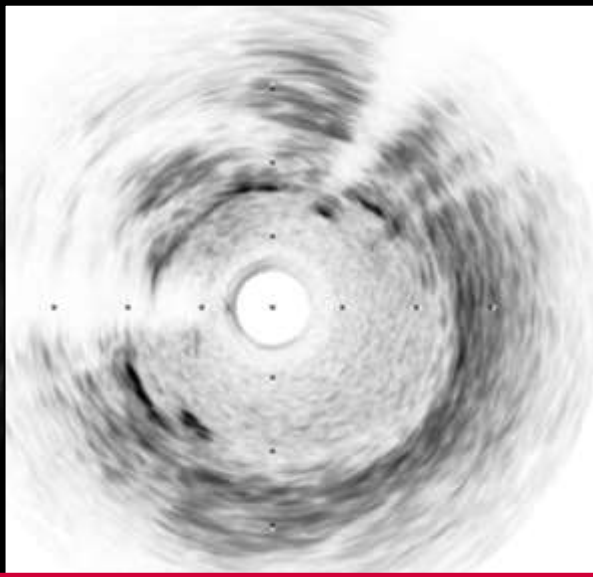
- Access: Left femoral artery
- Guiding: JL 3.5, 7F: failed → EBU 3.0
- Rewired into LAD with new BMW II wire via ping-pong technique

Ping-pong Technique

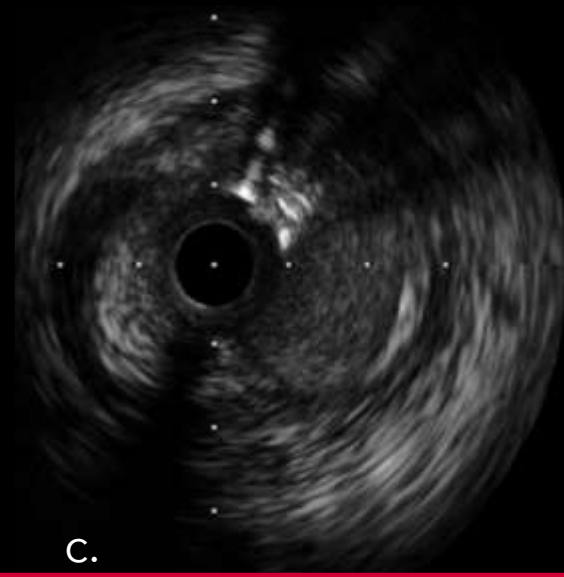
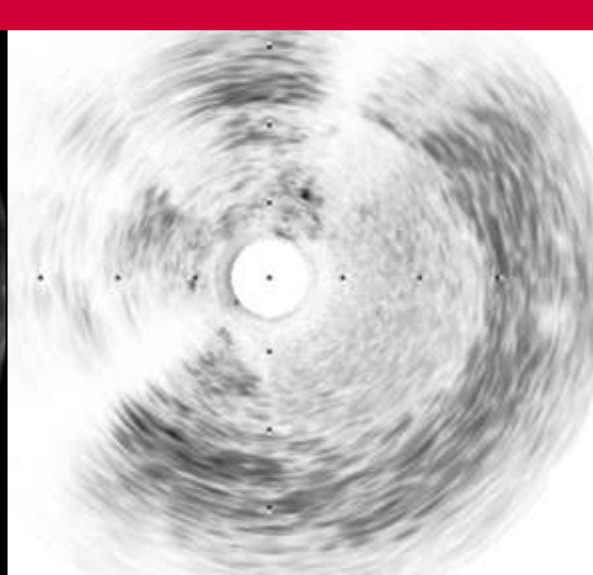




a.



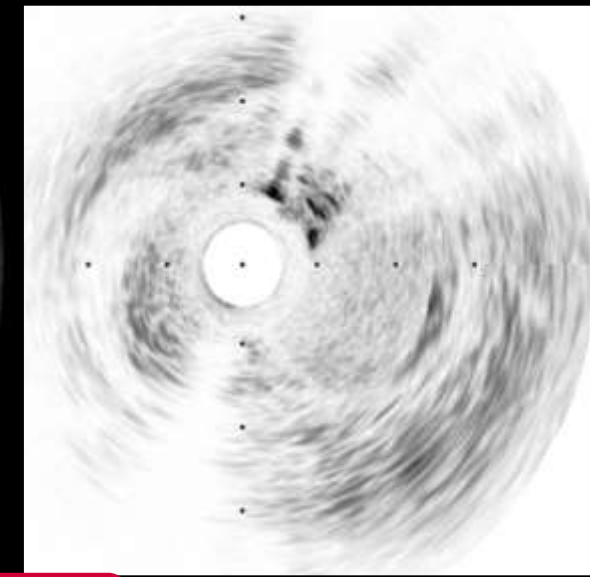
b.



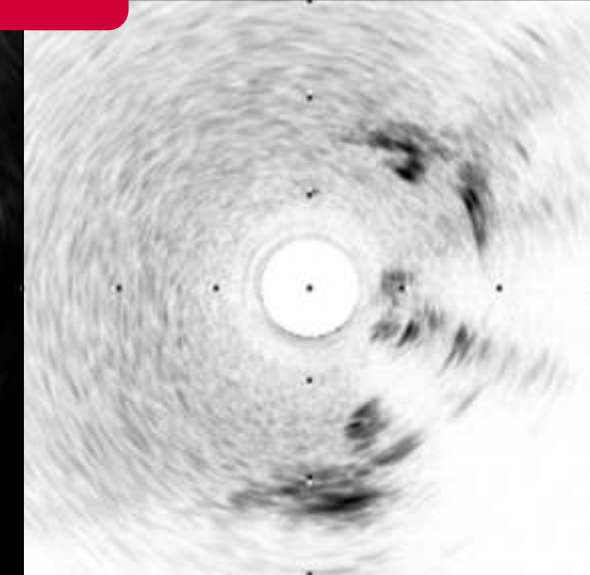
c.



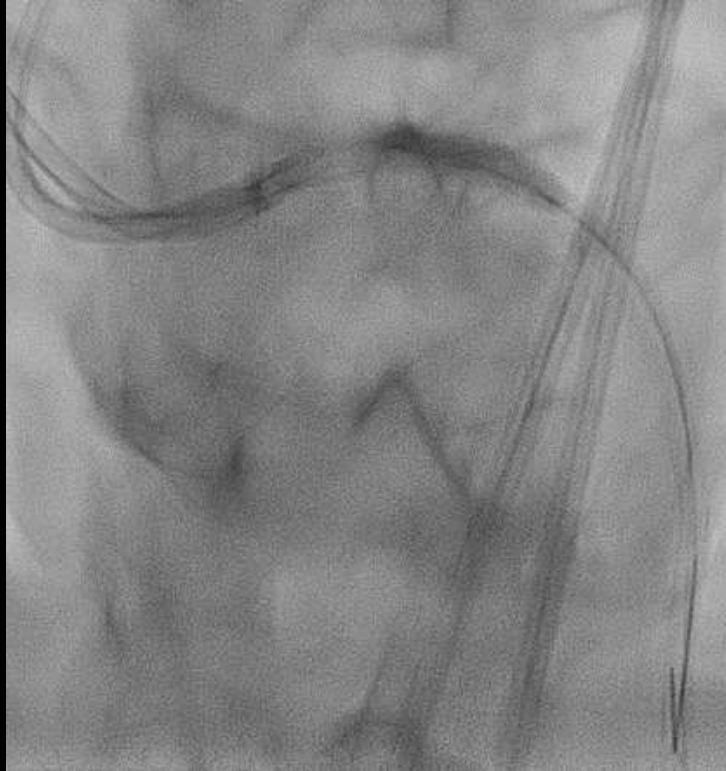
d.



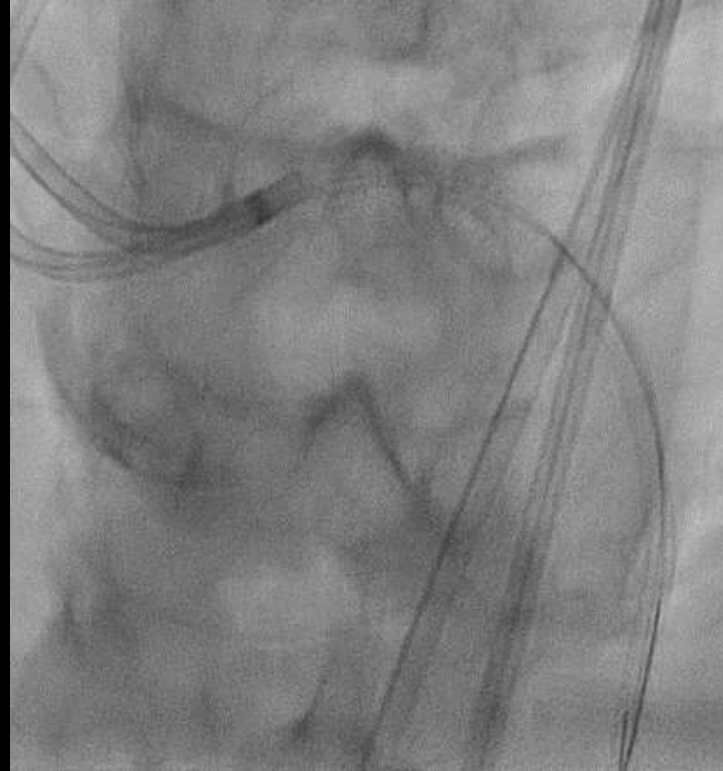
Stent Fracture or Longitudinal Stent Deformation (Pseudo-fracture)



Left-Main Stent Fracture

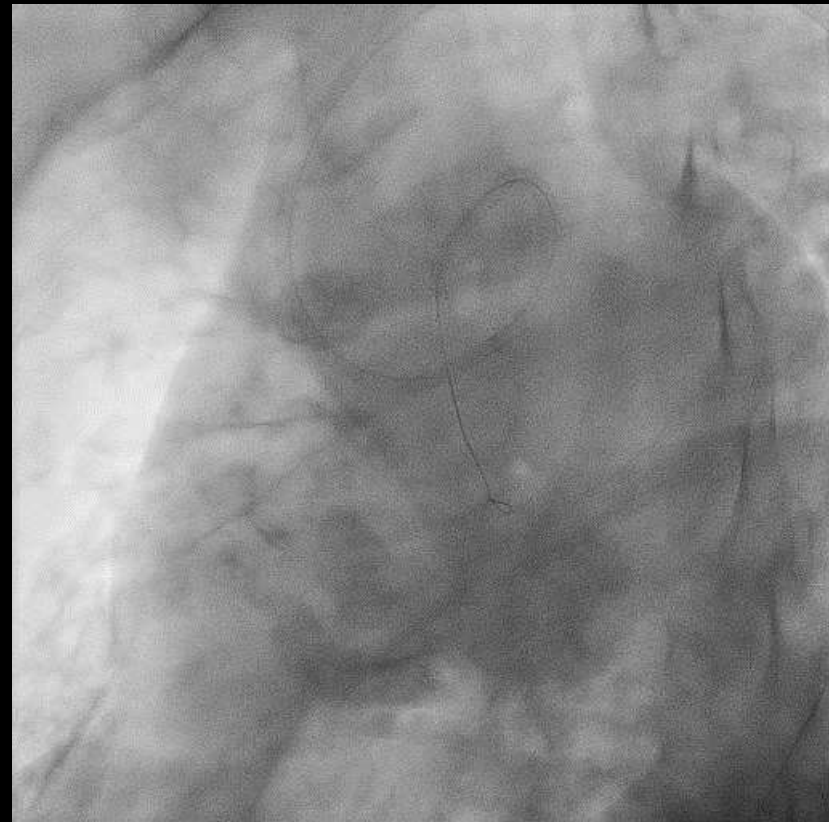
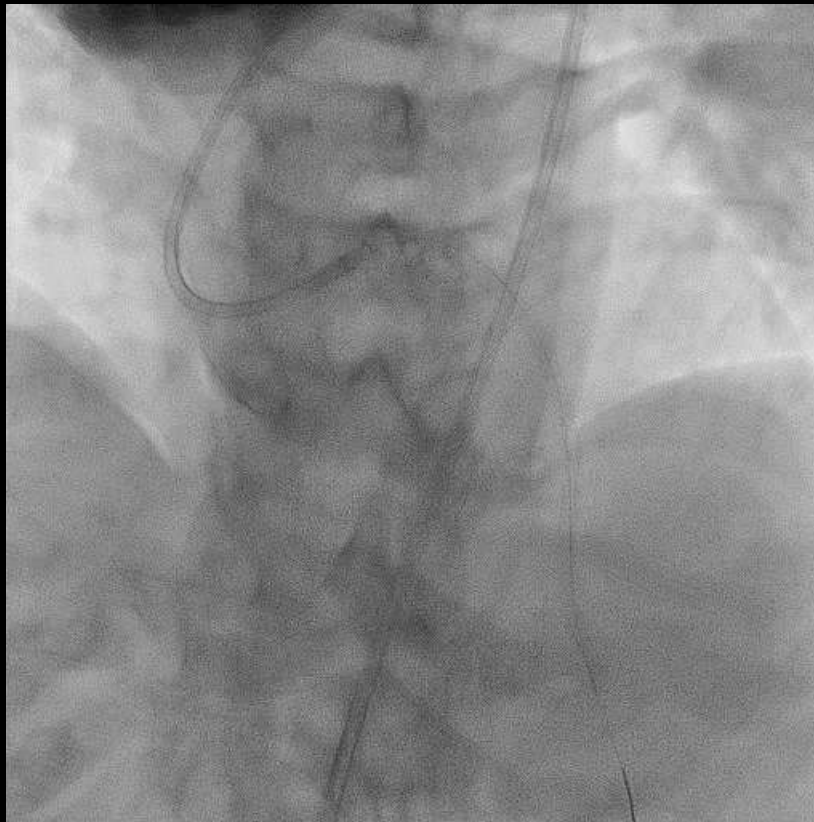
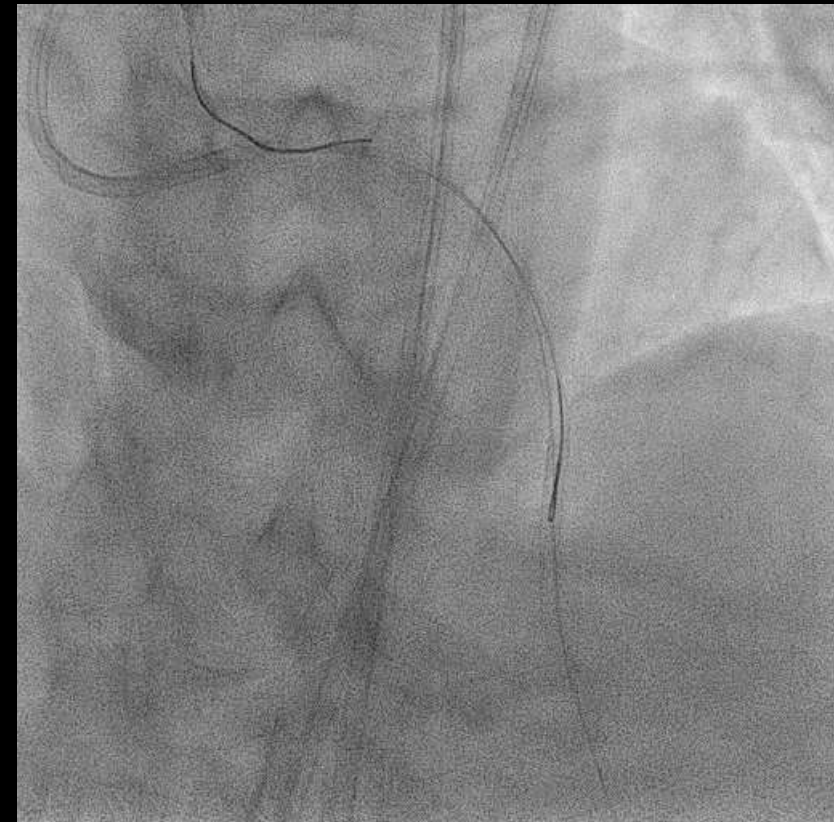


NC 3.0mm x 15mm Balloon



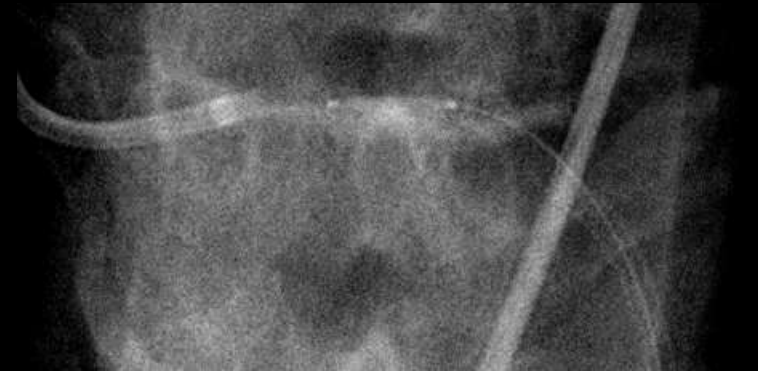
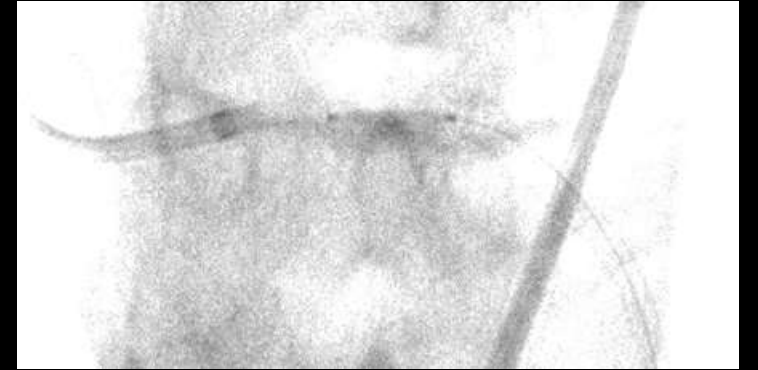
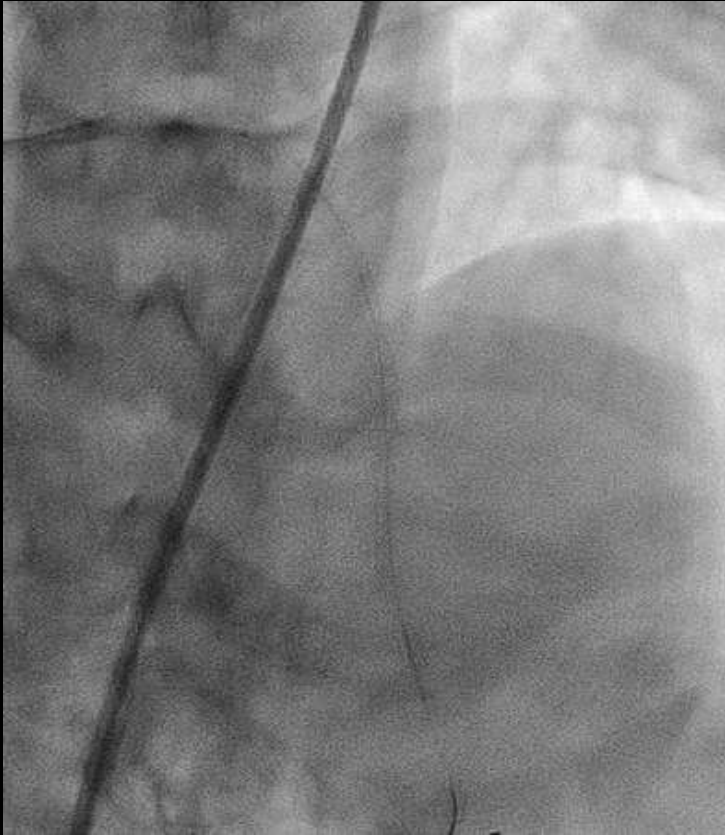
NC 3.5mm x 15mm Balloon

Left-Main Stent Fracture



Careful Retrieval of 1st GC

Overlapped Left Main Stent



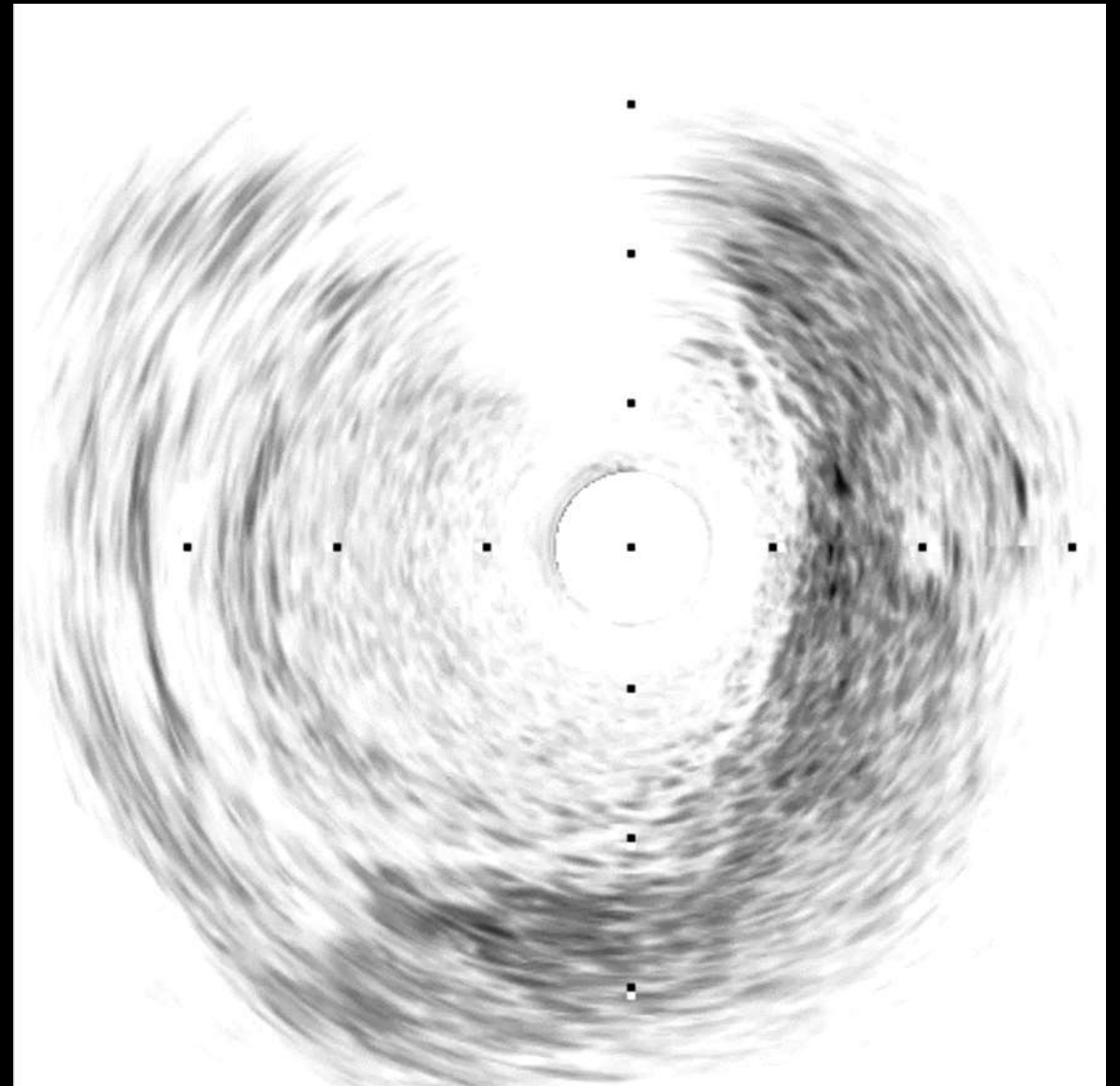
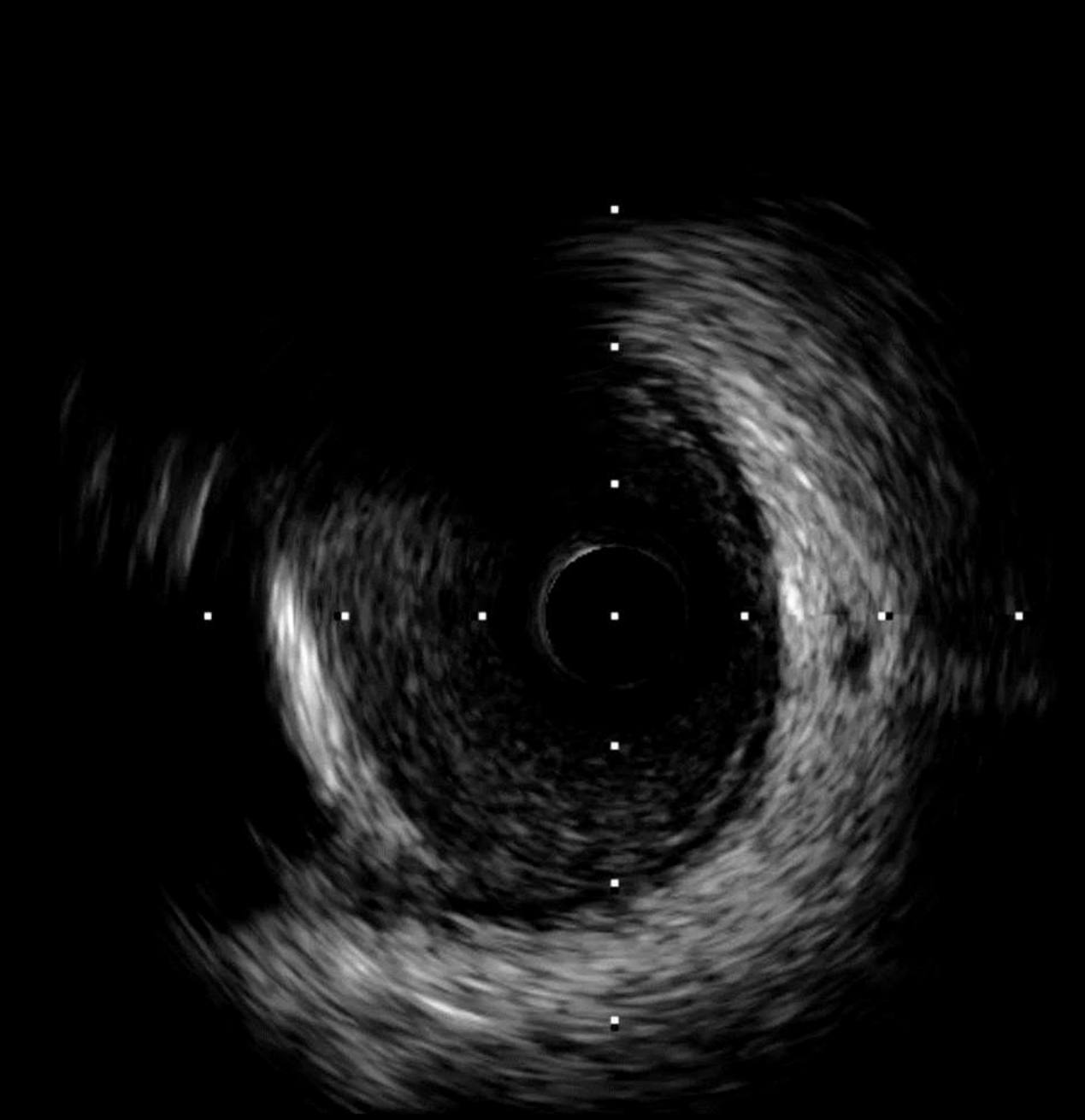
Overlapped Left Main Stent: 4.0mm x 9mm DES



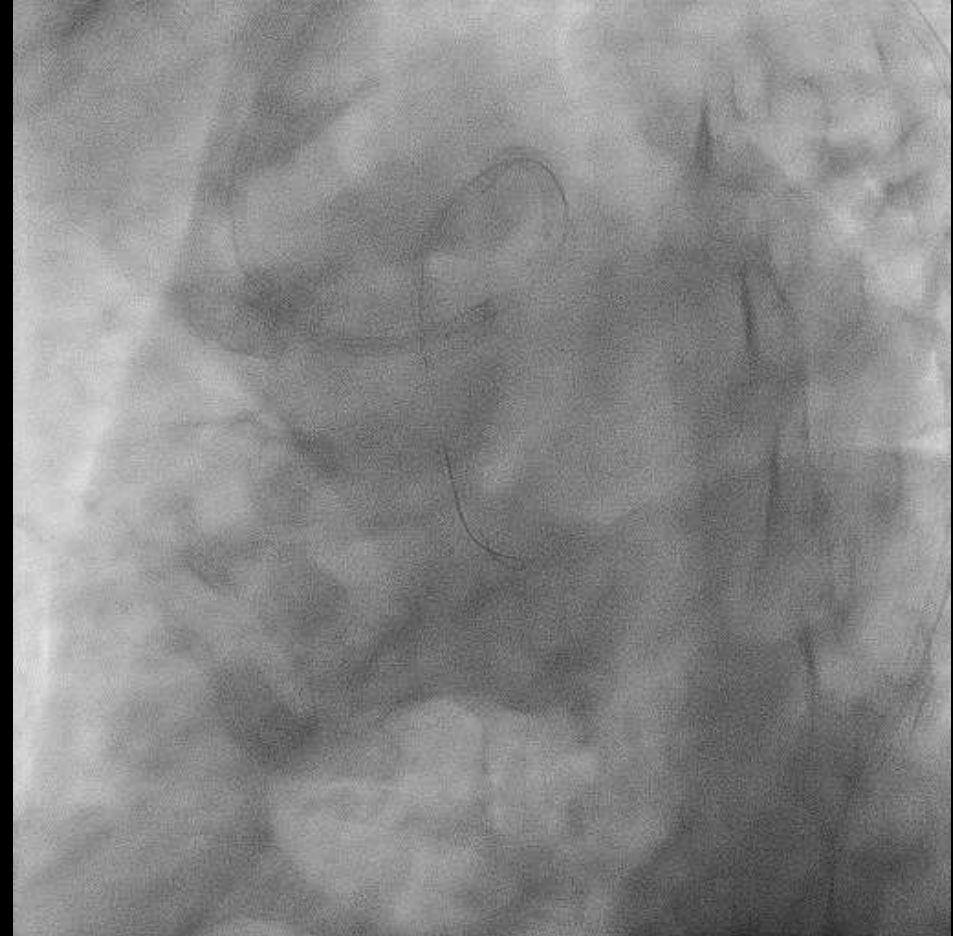
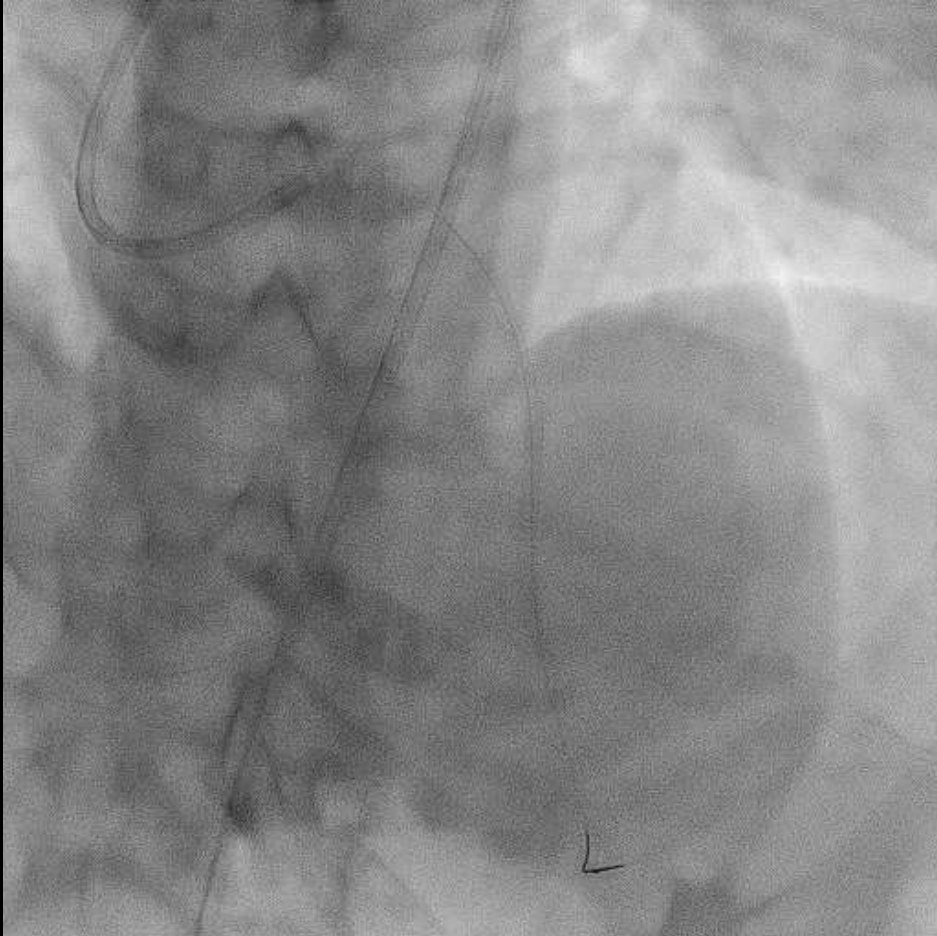
Overlapped LM DES 4.0mm x 9mm



POT with the stent balloon



Coronary Angiogram Post 2nd DES to Left Main



POT-side-POT (rePOT)



SB distal stent re-wiring

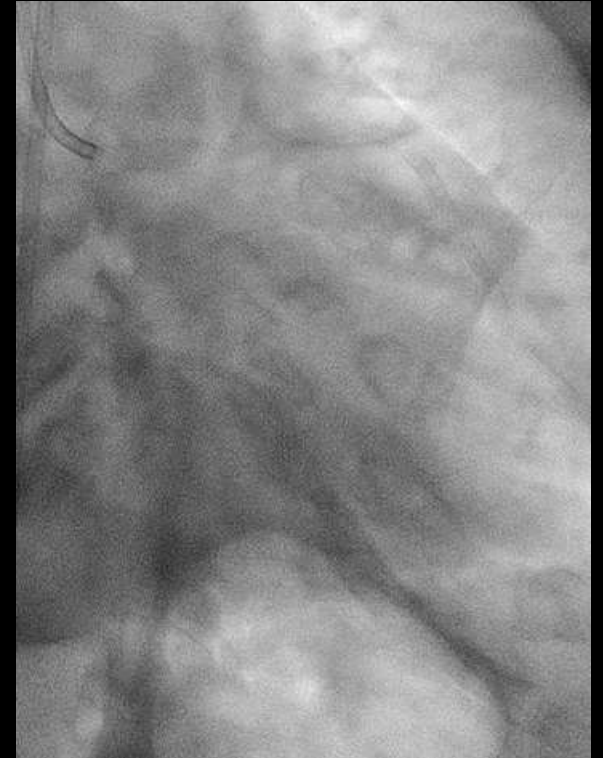
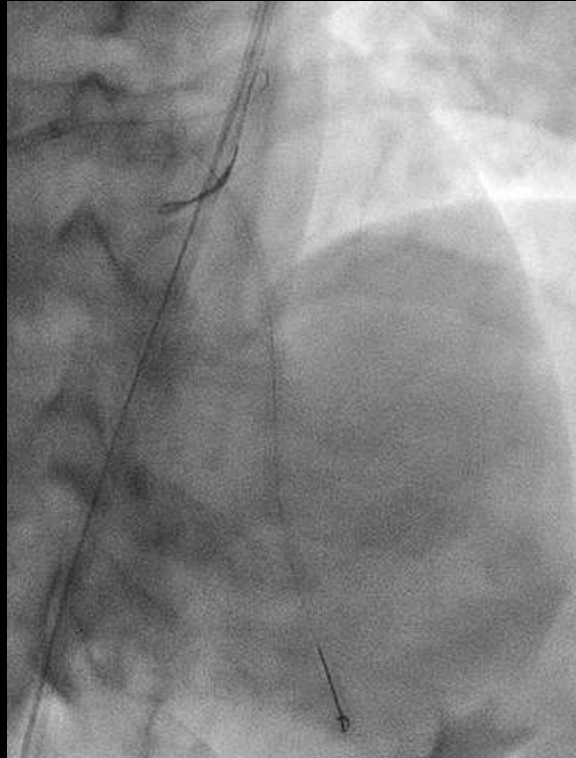


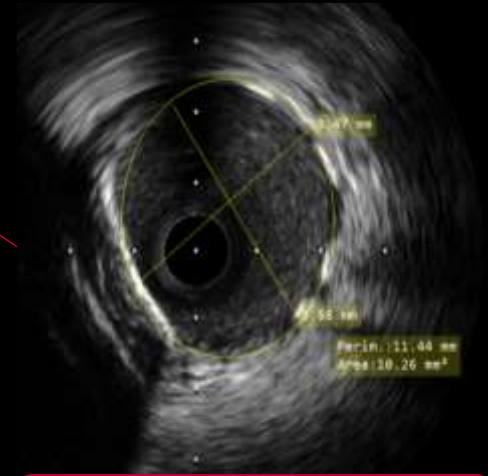
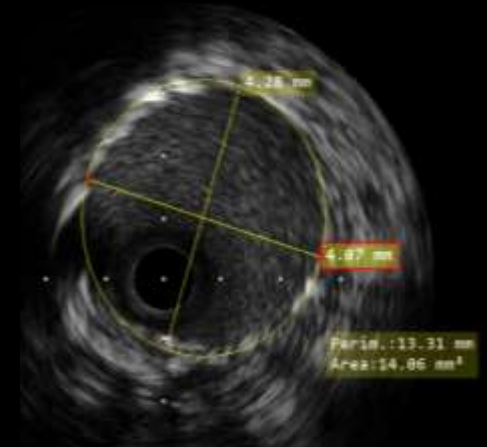
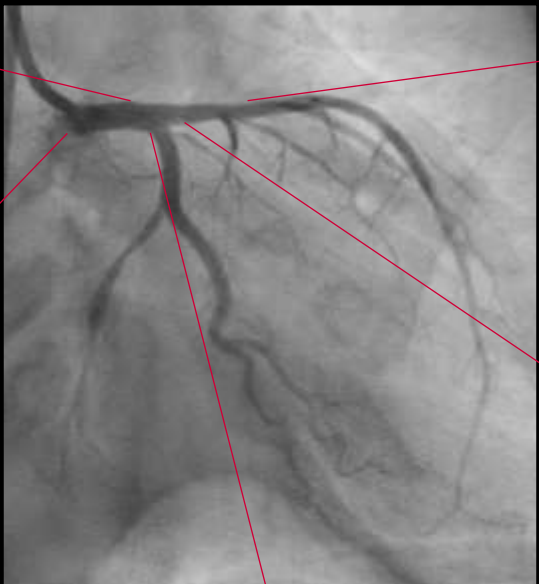
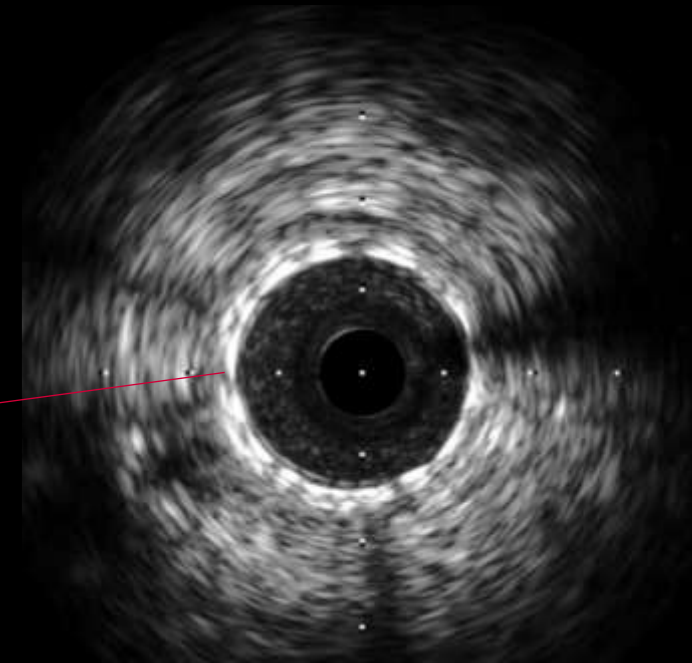
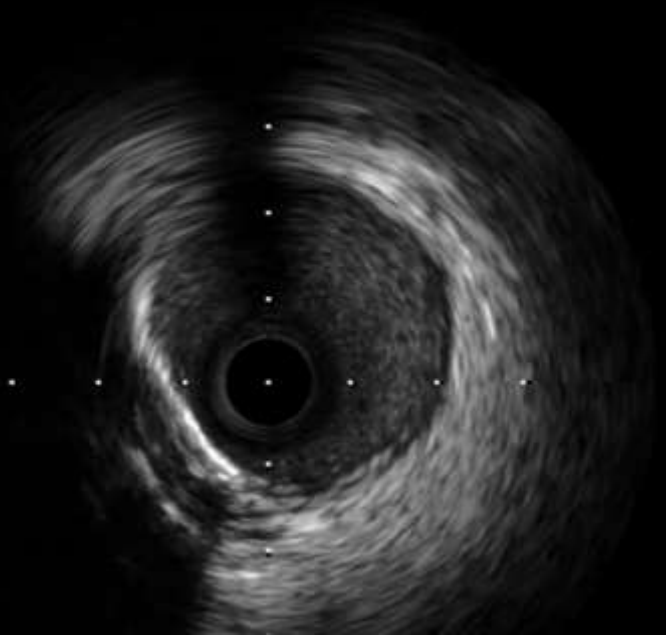
SB dilatation with 2.0mm x 10mm → 3.5mm x 12mm NC



Re-POT with NC 4.5mm x 12mm

Final Coronary Angiogram





Proximal Stent Edge

Confluence (POC)

Distal Stent Edge

Final Result



Pre-PCI



Post-PCI

Outcome

- She required a pint of packed cell transfusion and was discharged well later
- She remained asymptomatic during the recent follow-up.

Learning Point

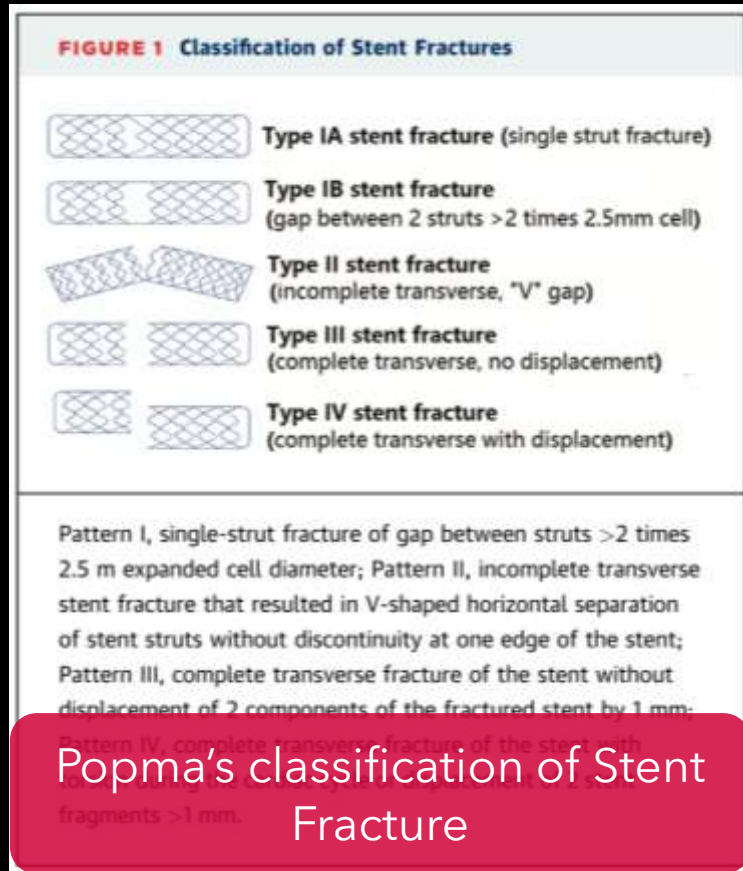
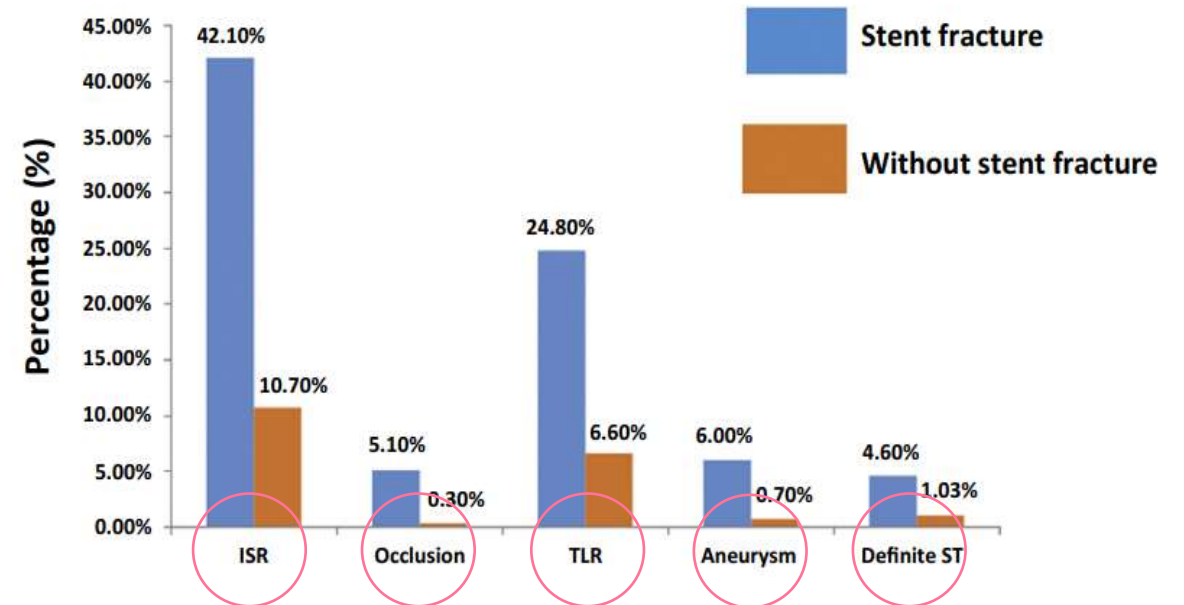
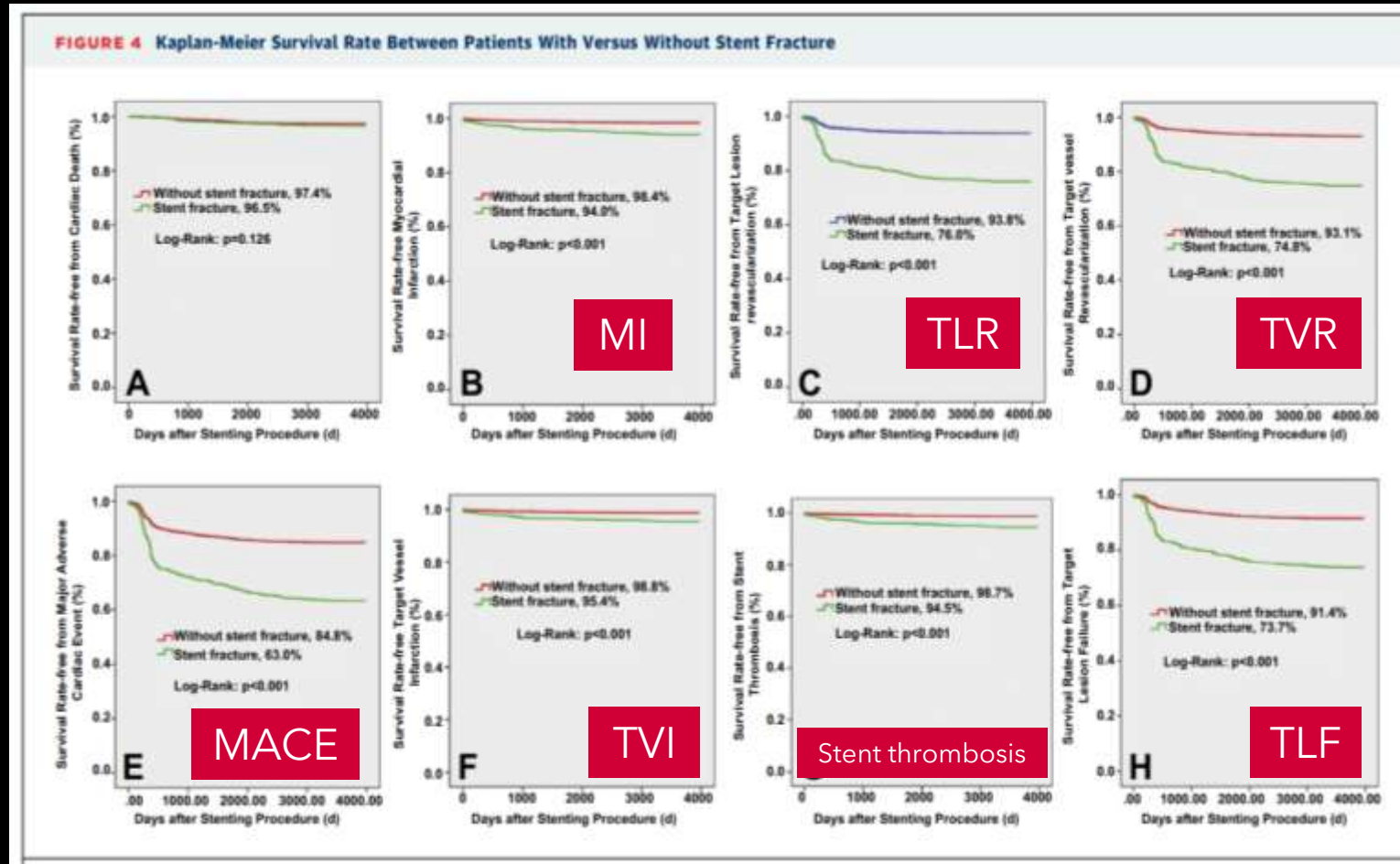


FIGURE 3 Complications Associated With SF



A total of 42.1% of stent fractures (SF) had in-stent restenosis (ISR), and SF were associated with more frequent target lesion revascularization (TLR), total occlusion, aneurysm formation, and definite stent thrombosis (ST) compared with stents without fracture.

Learning Point



Kan J, Ge Z, Zhang JJ, Liu ZZ, Tian NL, Ye F, Li SJ, Qian XS, Yang S, Chen MX, Rab T, Chen SL. Incidence and Clinical Outcomes of Stent Fractures on the Basis of 6,555 Patients and 16,482 Drug-Eluting Stents From 4 Centers. *JACC Cardiovasc Interv.* 2016 Jun 13;9(11):1115-23. doi: 10.1016/j.jcin.2016.02.025. Epub 2016 Mar 18. PMID: 27009464.

Learning Point

1. Demonstrate the potential challenge and complications of treating an ostial lesion.
 - Ex: Catheter related complication, geographical mismatch
2. Layout the bail-out strategy to treat a deformed and fractured left main stent.
 - Ping-pong technique, intravascular imaging
3. Exhibit the use of different strategies when dealing with ostial lesion PCI.
 - Provisional stenting, 2-stent strategy, KBI, rePOT
4. Demonstrate the importance of using intravascular imaging in dealing with complex coronary artery intervention and complications.
 - IVUS guided PCI: Pre, intra, post-procedure, and follow-up



Hoping for the best, prepared
for the worst, and unsurprised
by anything in between.

Maya Angelou