

# IVUS

## Case Studies Library

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Interventional Cardiology  
Washington University in St. Louis

# Case Categories

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- Basic PCI and Sizing
- Thrombus and Dissections
- Stent optimization
- Ostial Disease and bifurcations
- OCT versus IVUS
- TAVR and IVUS
- Anomalous Coronary and interesting cases

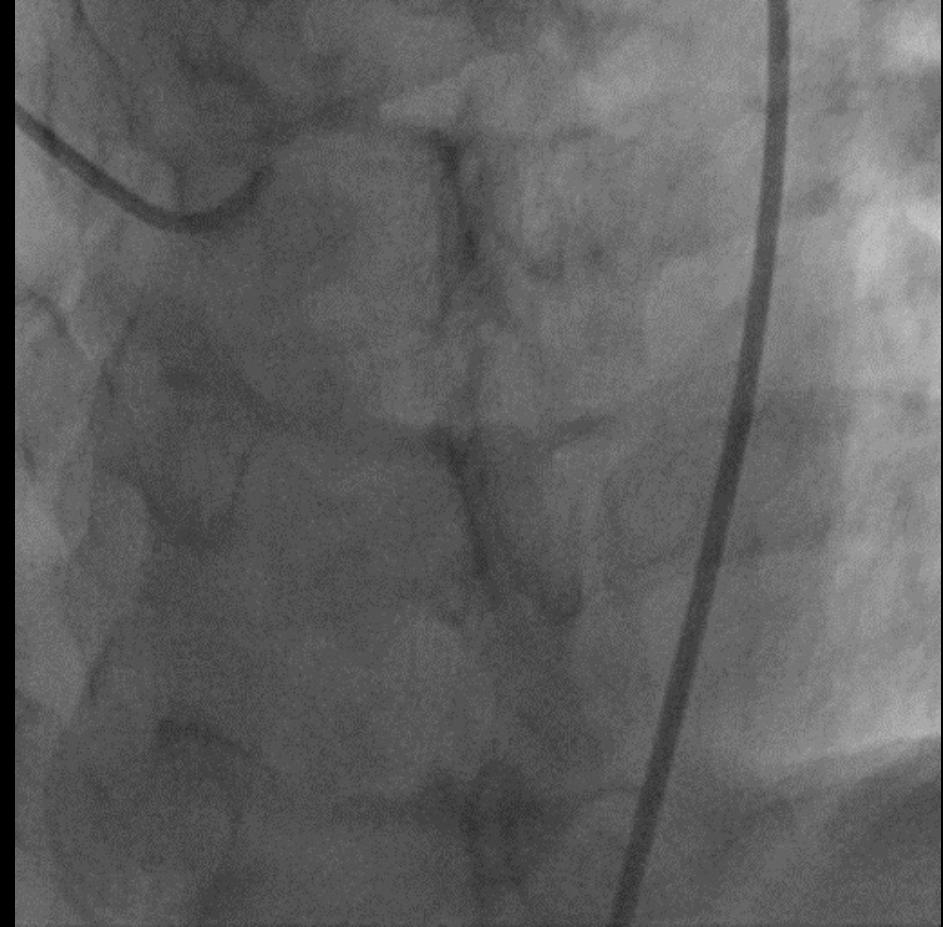
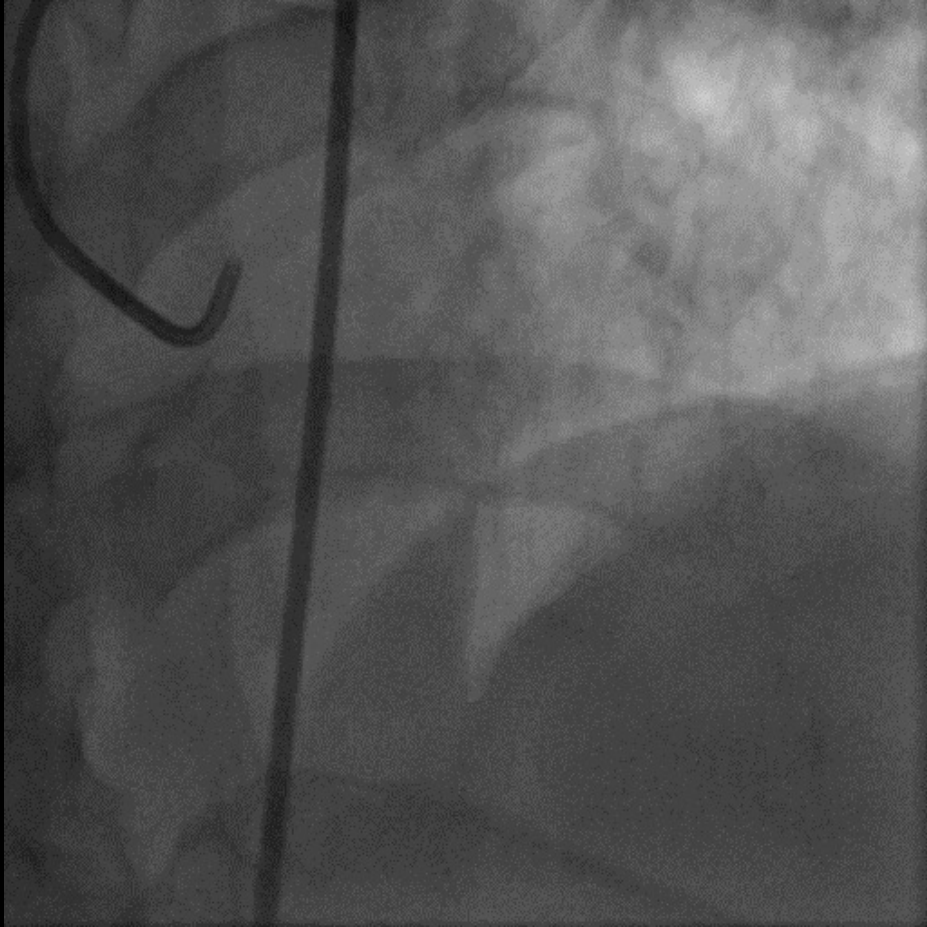


# Basic PCI and Sizing

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# Case of the Professor

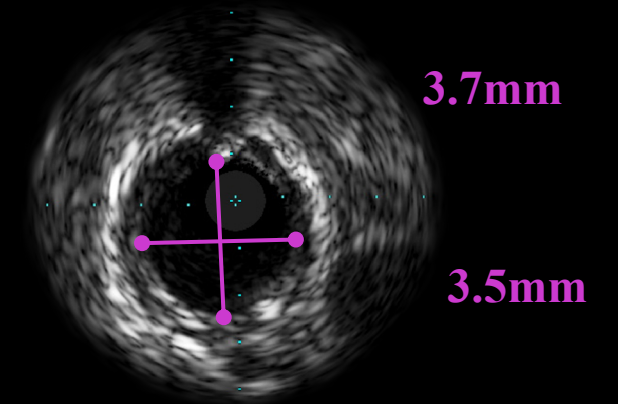
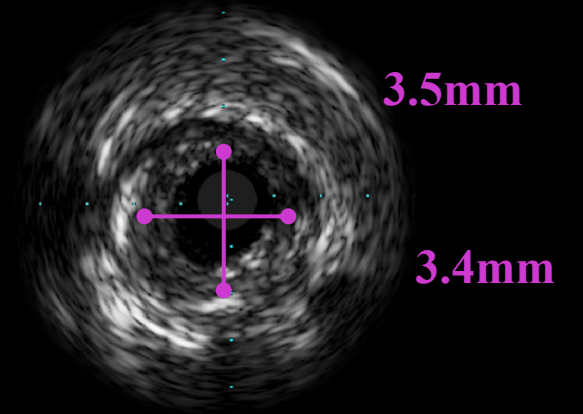
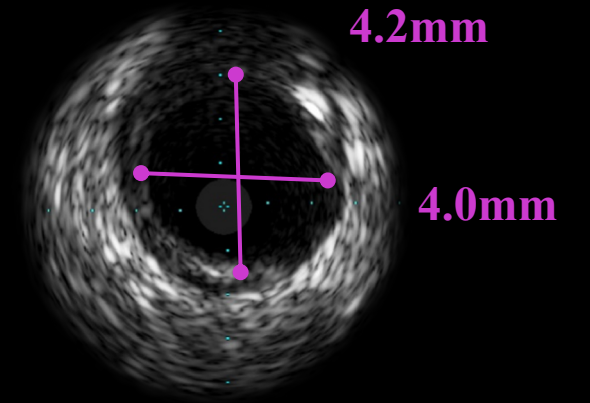
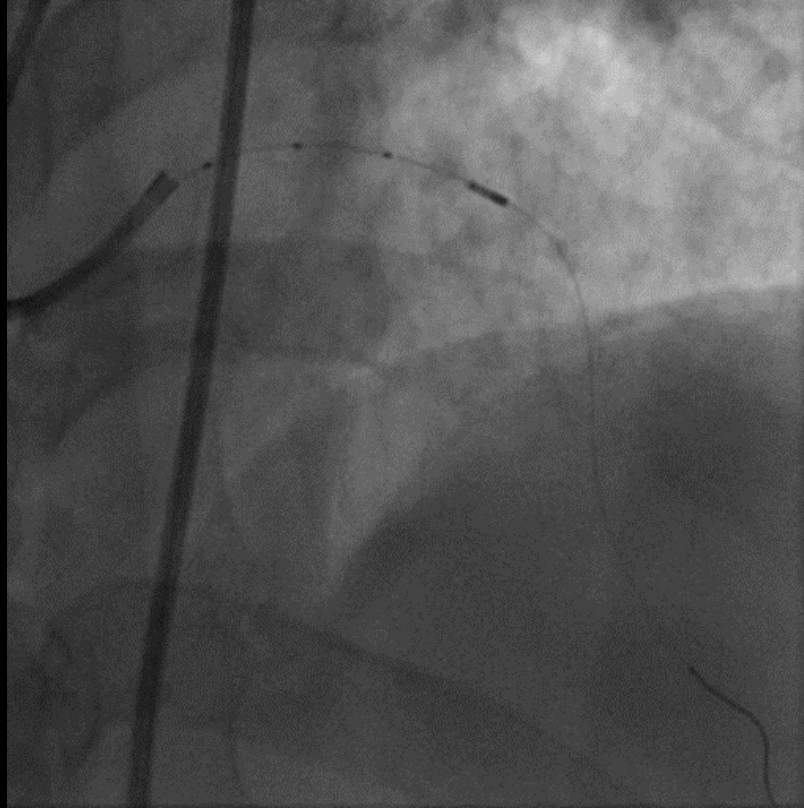
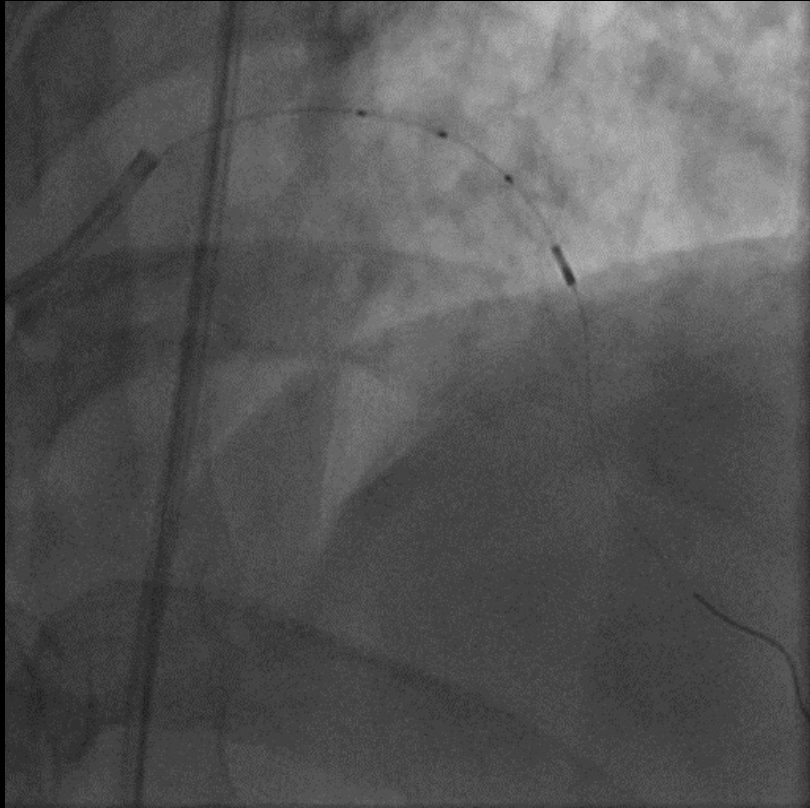
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58 y/o male professor presents with chest pain and positive troponin.

# IVUS Stent Sizing

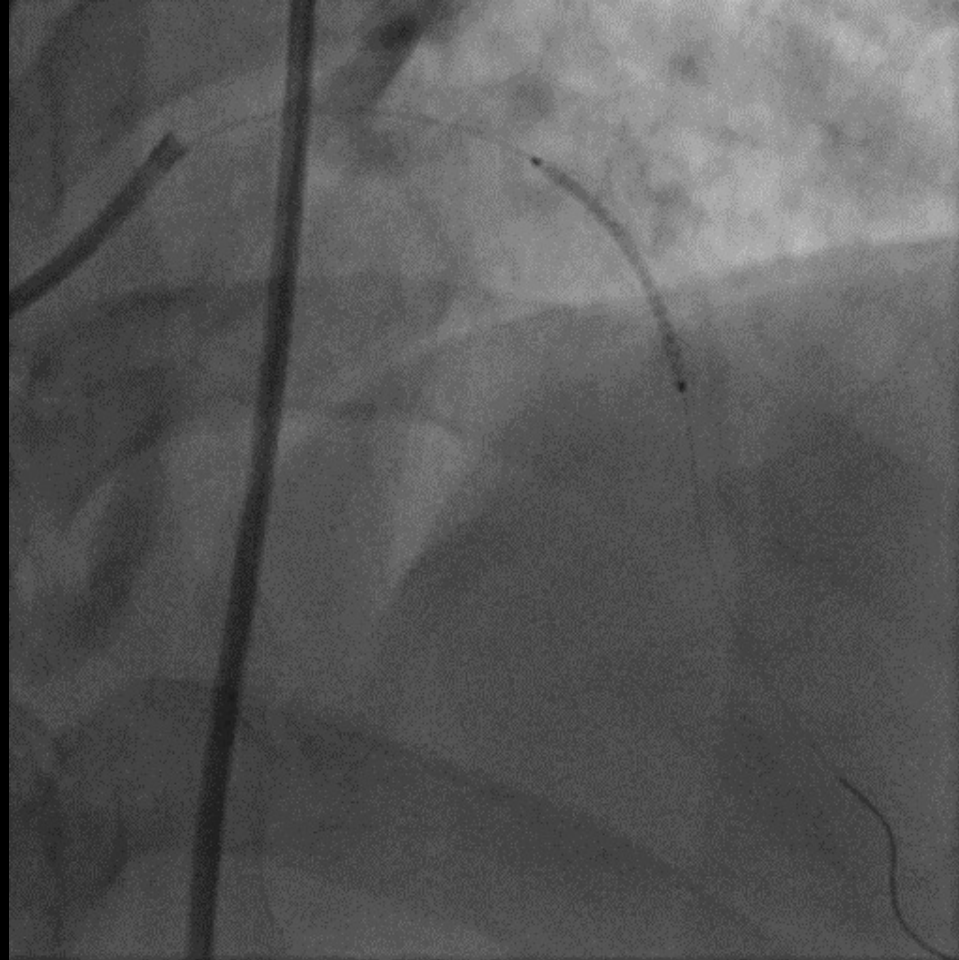
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# Case of the Professor

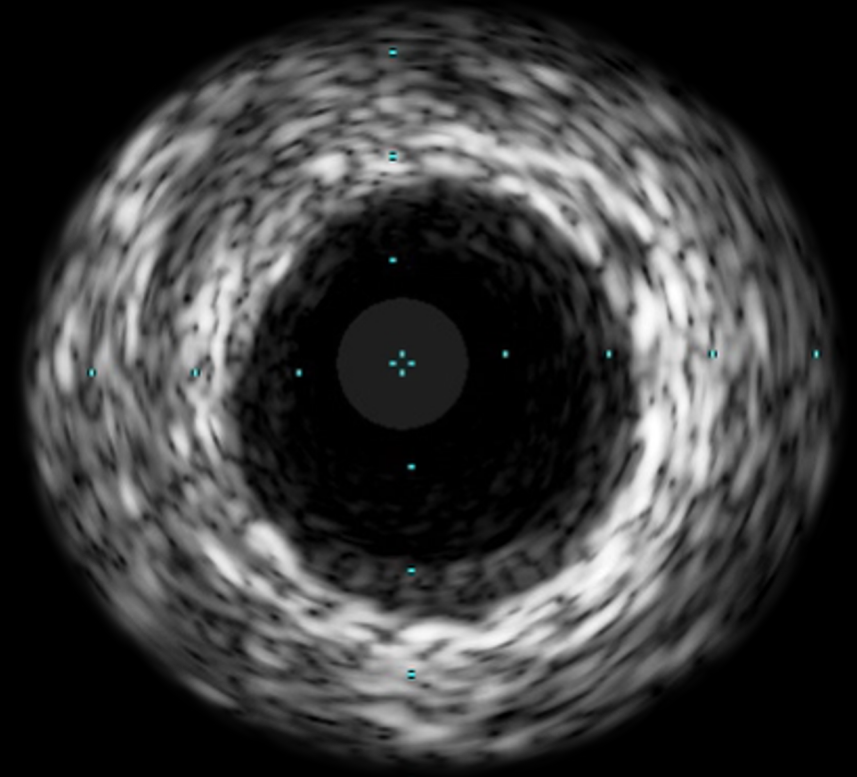
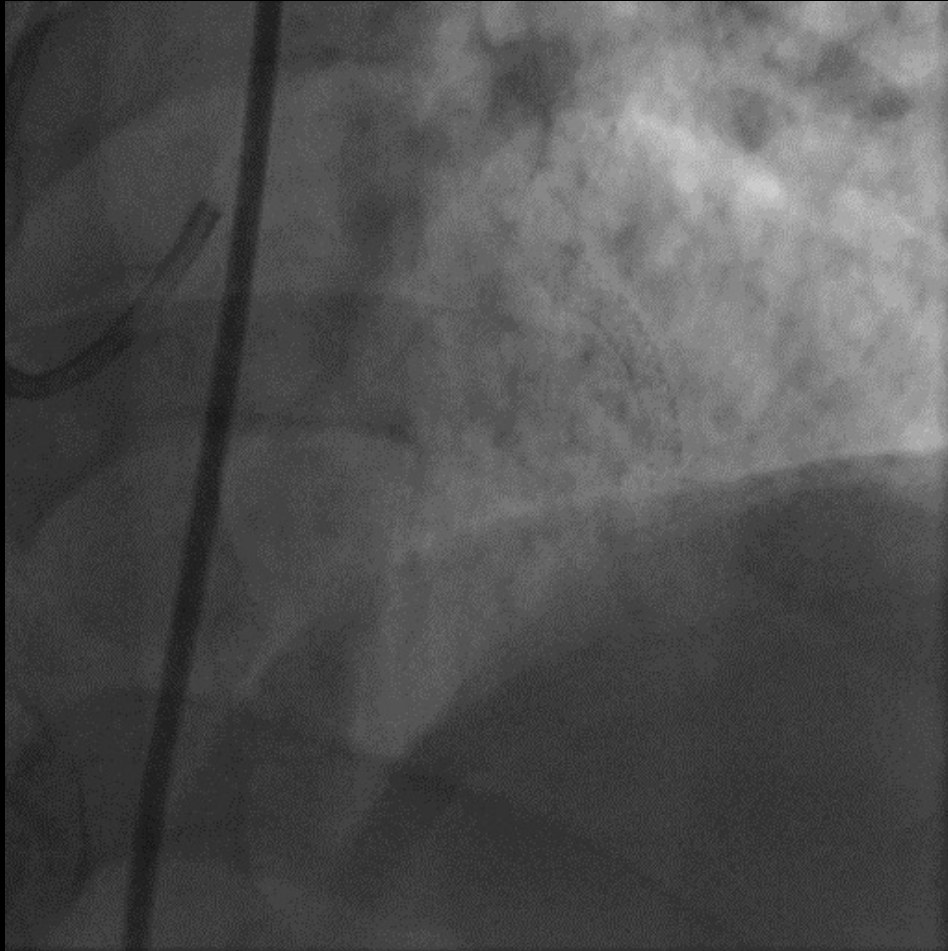
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3.5x 28 DES

# Case of the Professor

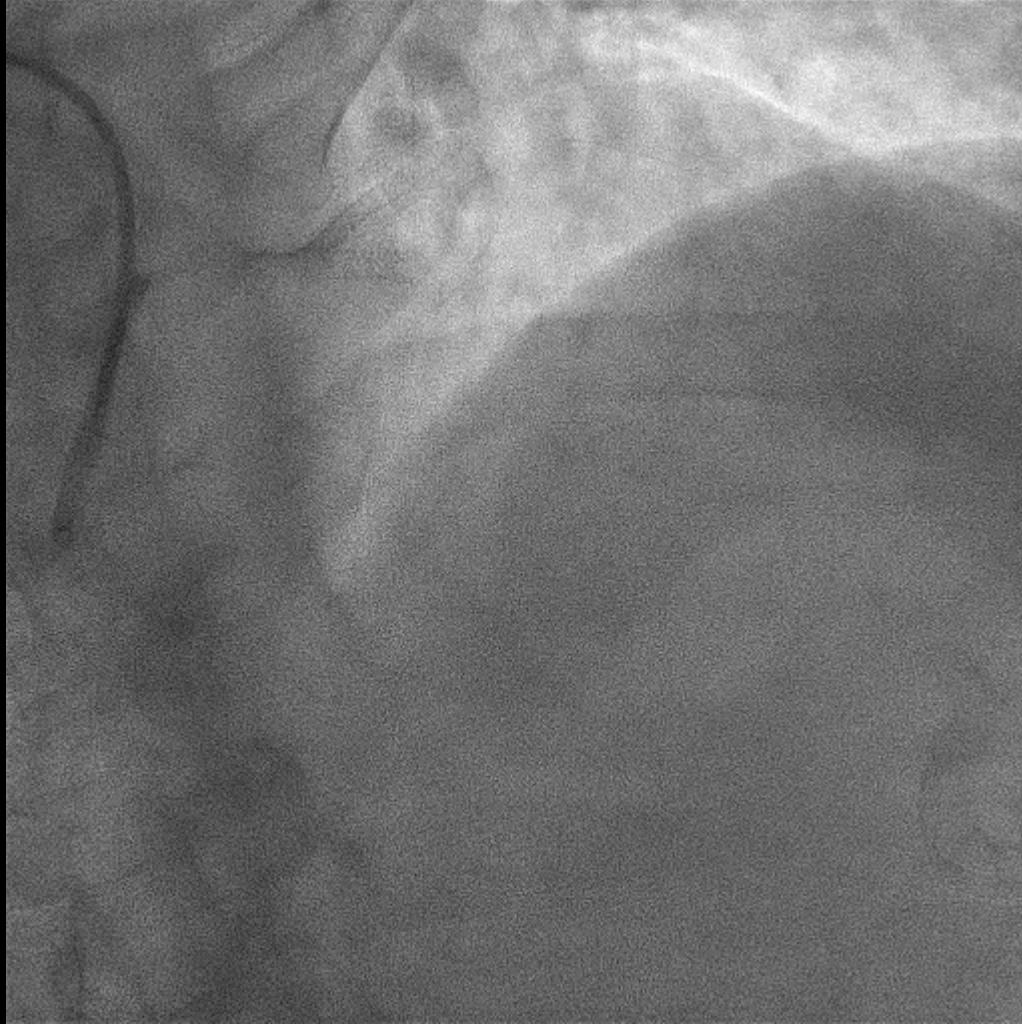
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Post with 4.0x8 mm Proximal and 3.5x20mm NC to 20 ATM distal

# Case Type A Lesion

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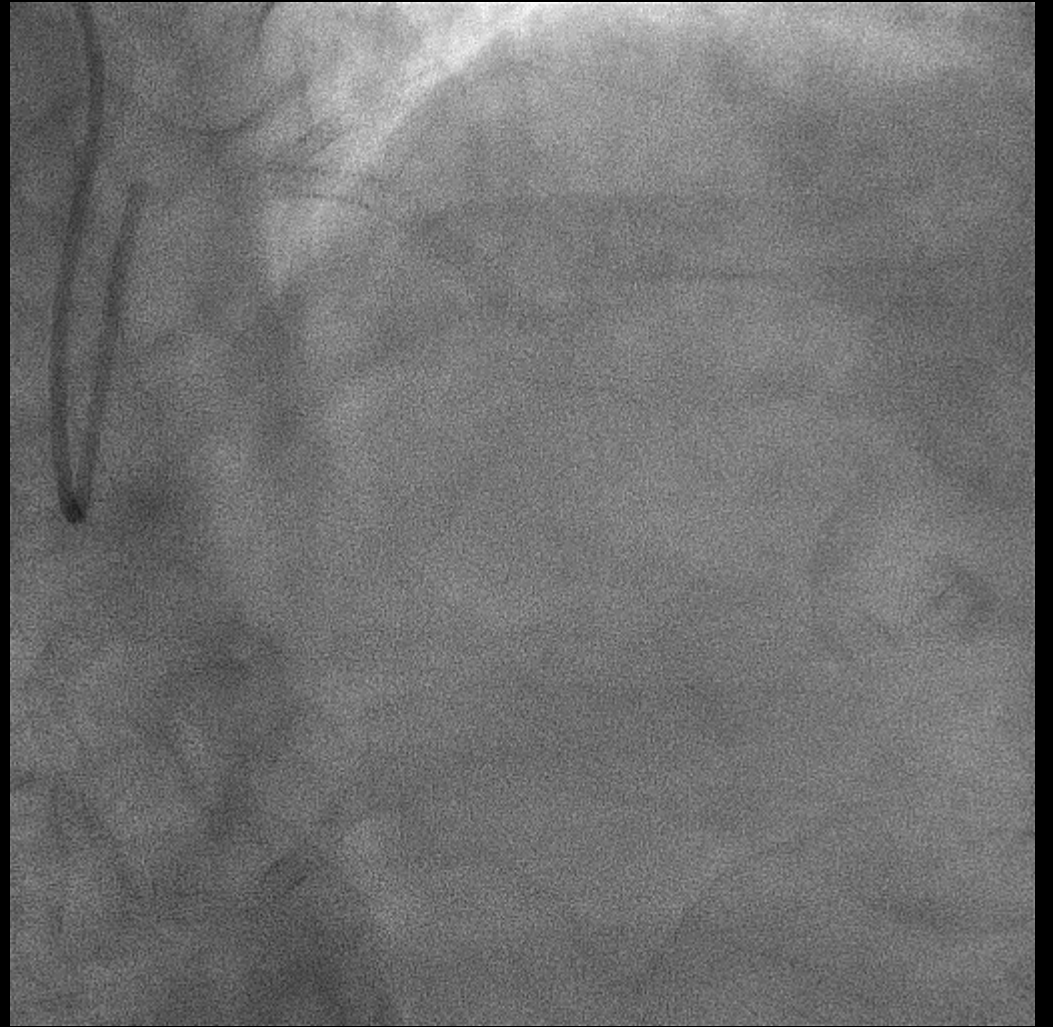
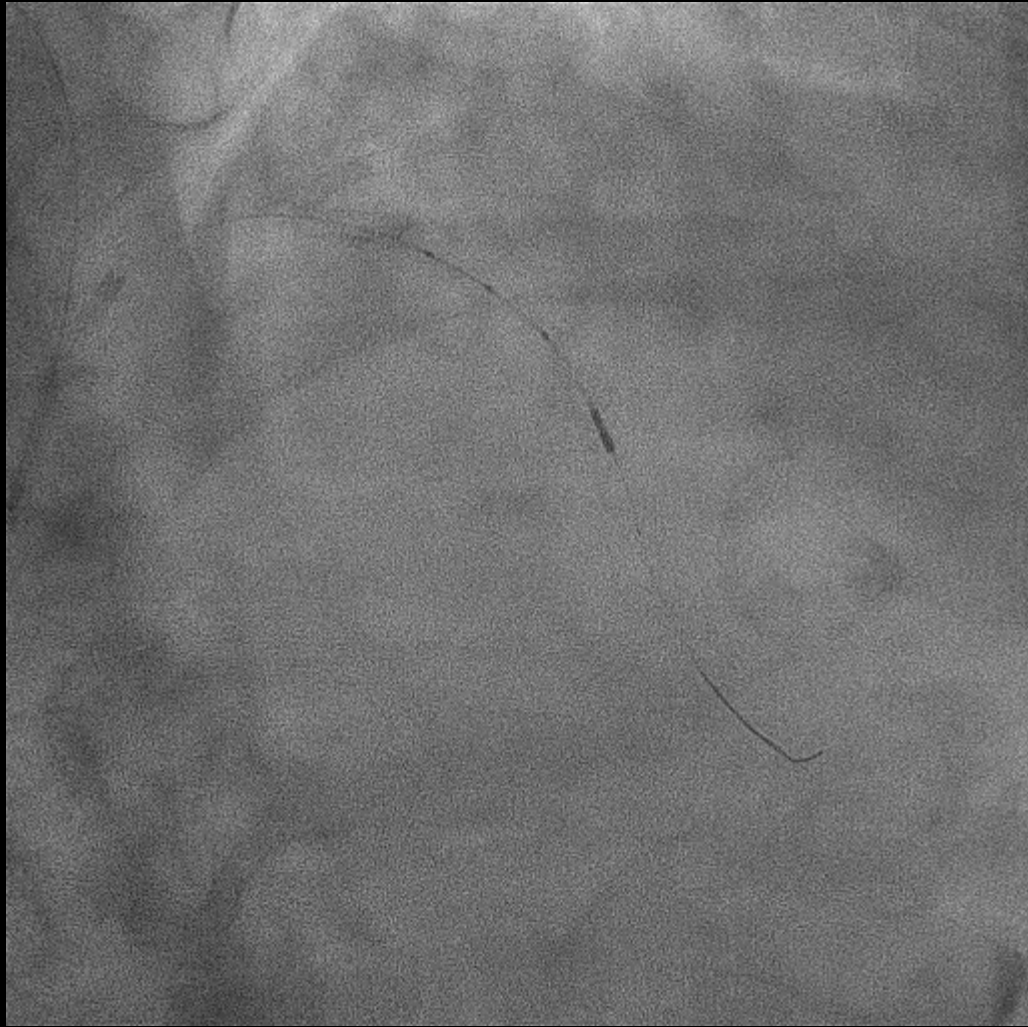


Stent Size?

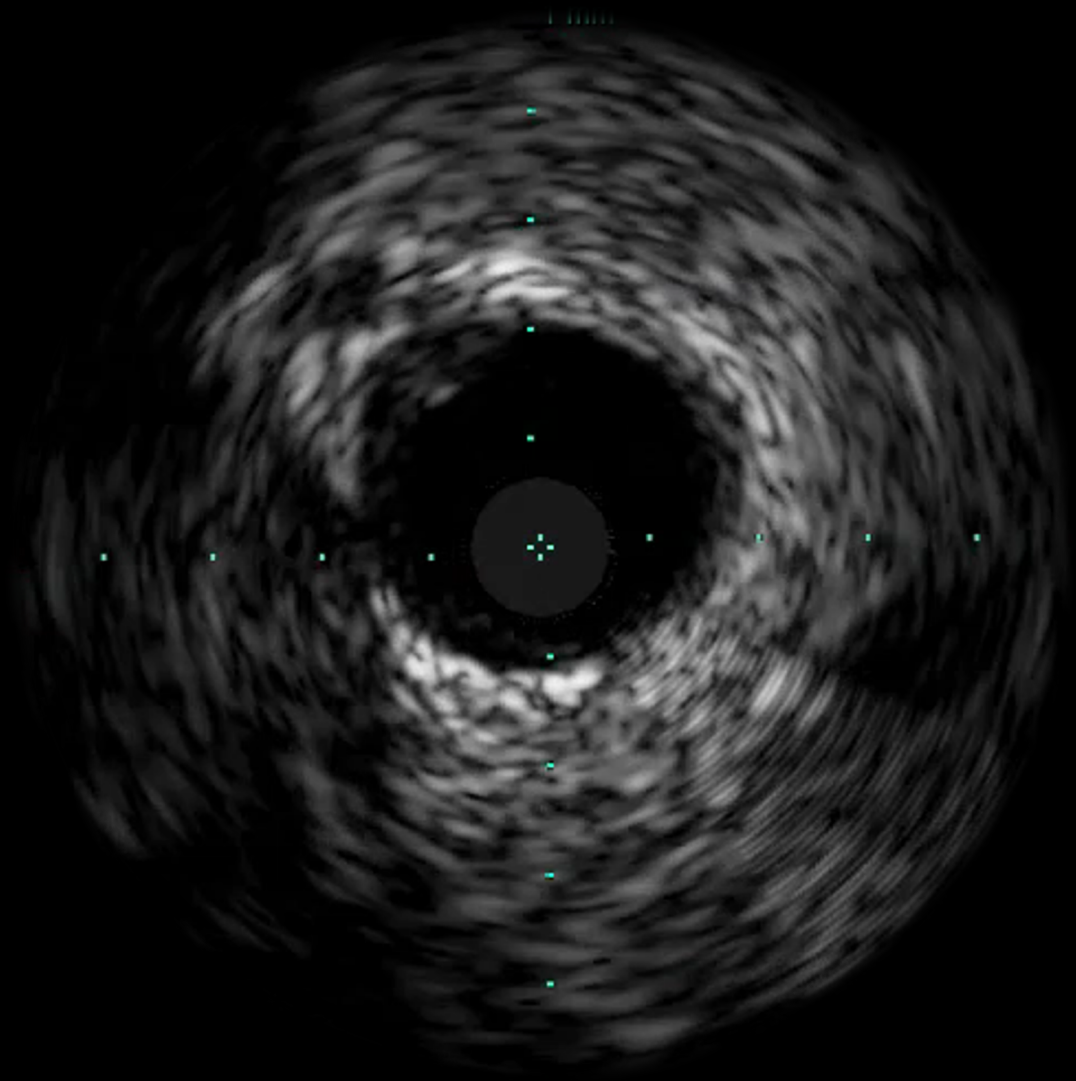
Where do you want to  
stop the stent?

55 y/o male who had recent PCI to RCA and iFR positive LAD presents for chest pain prior to his scheduled PCI





2.75 x 32mm Synergy and post dilated with 3.5 NC balloon to high pressure.

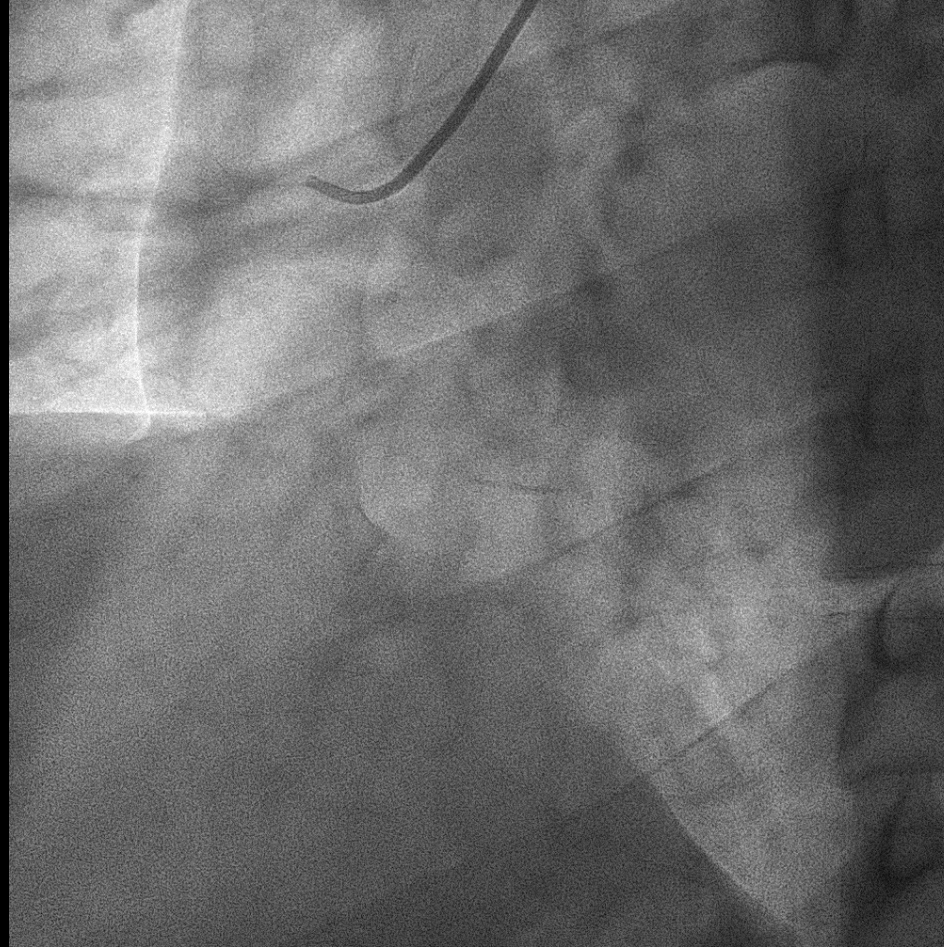


Final IVUS



# NSTEMI

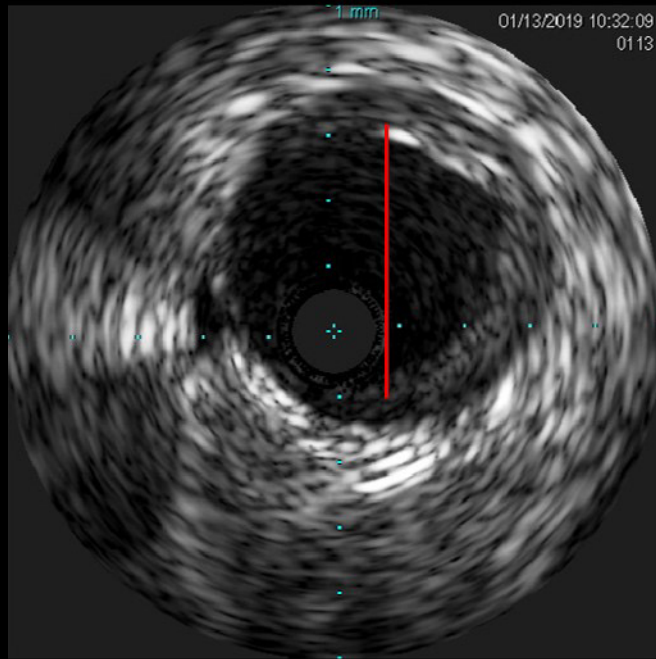
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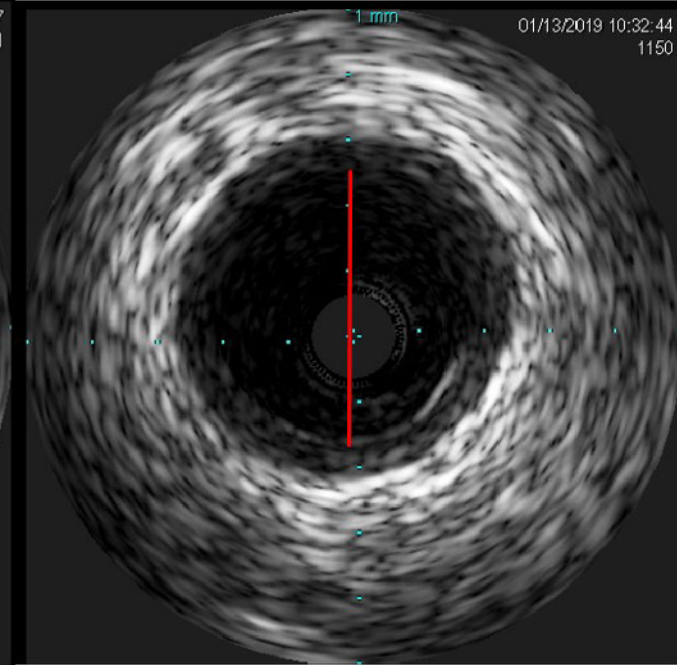
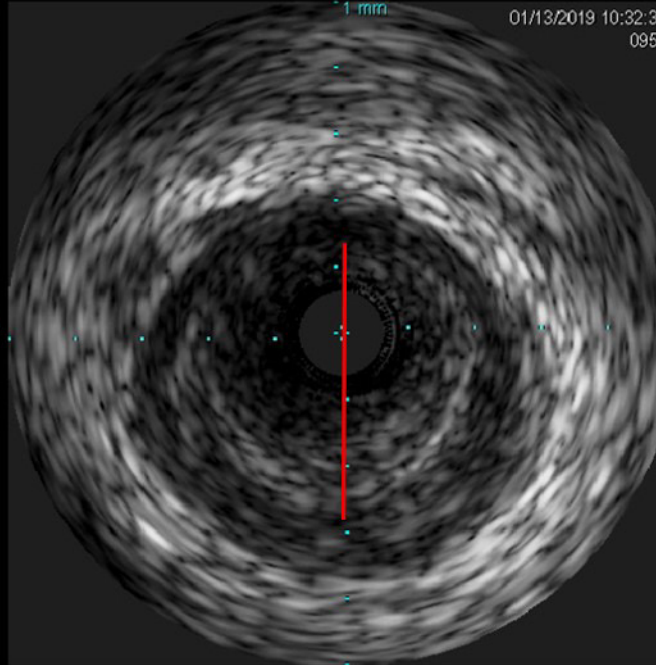
35 y/o male presented with chest pain, inferior st segment changes and positive troponin.

# NSTEMI

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Distal 4.3mm

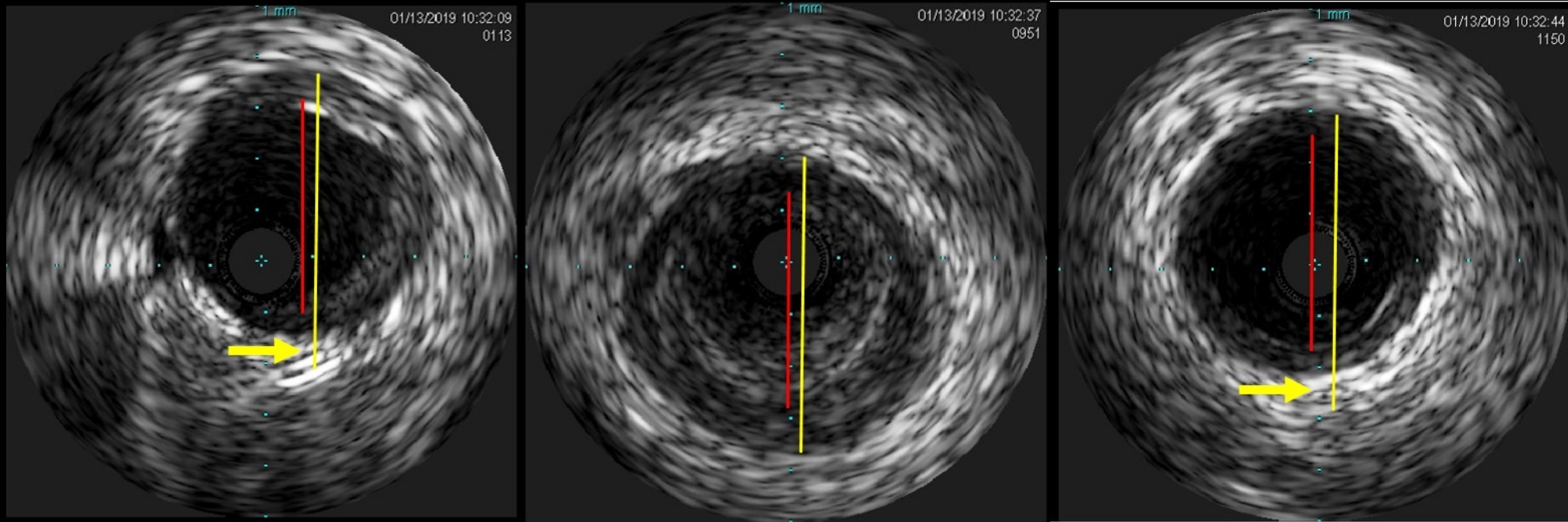


Proximal 4.7 mm

Predilate and IVUS run...how do you size this vessel?

# NSTEMI

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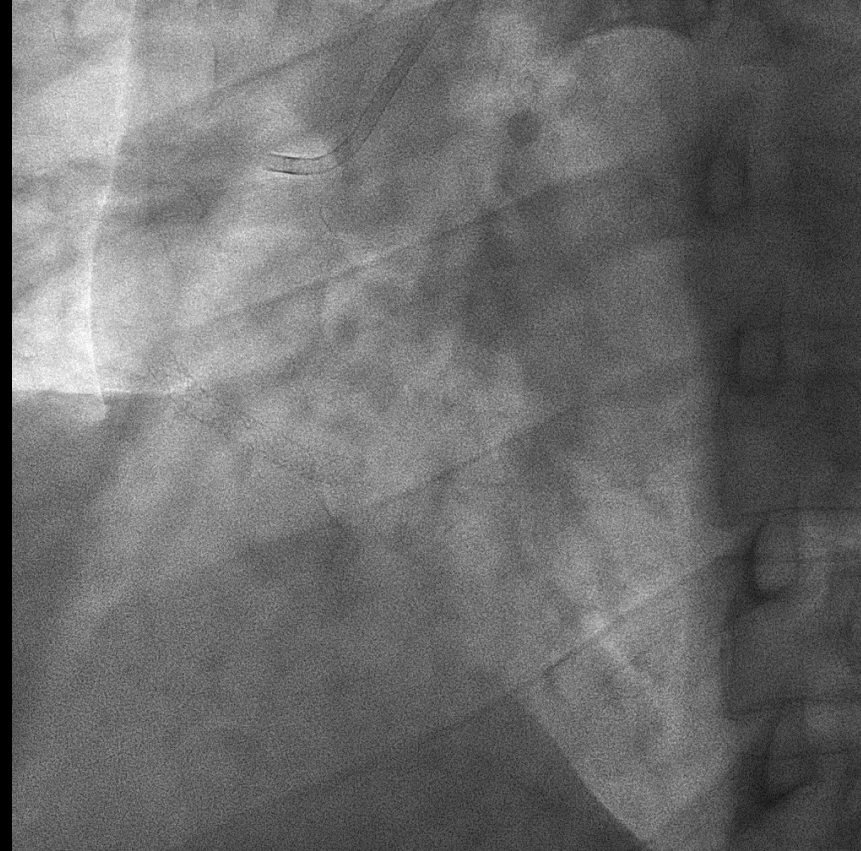
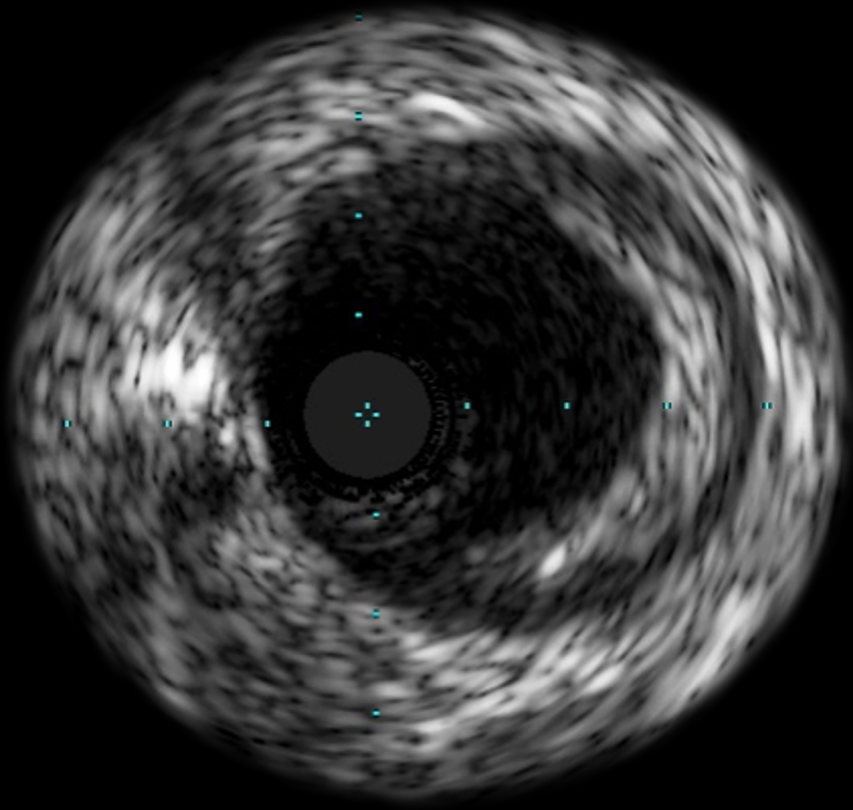


If you go adventitia to adventitia at the lesion  
Nice example of Glasgow phenomenon  
(positive remodeling to accommodate plaque)



# NSTEMI

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4.0mm DES and post dilated with 4.5mm NC balloon to 18 atms

# Basic PCI and Sizing

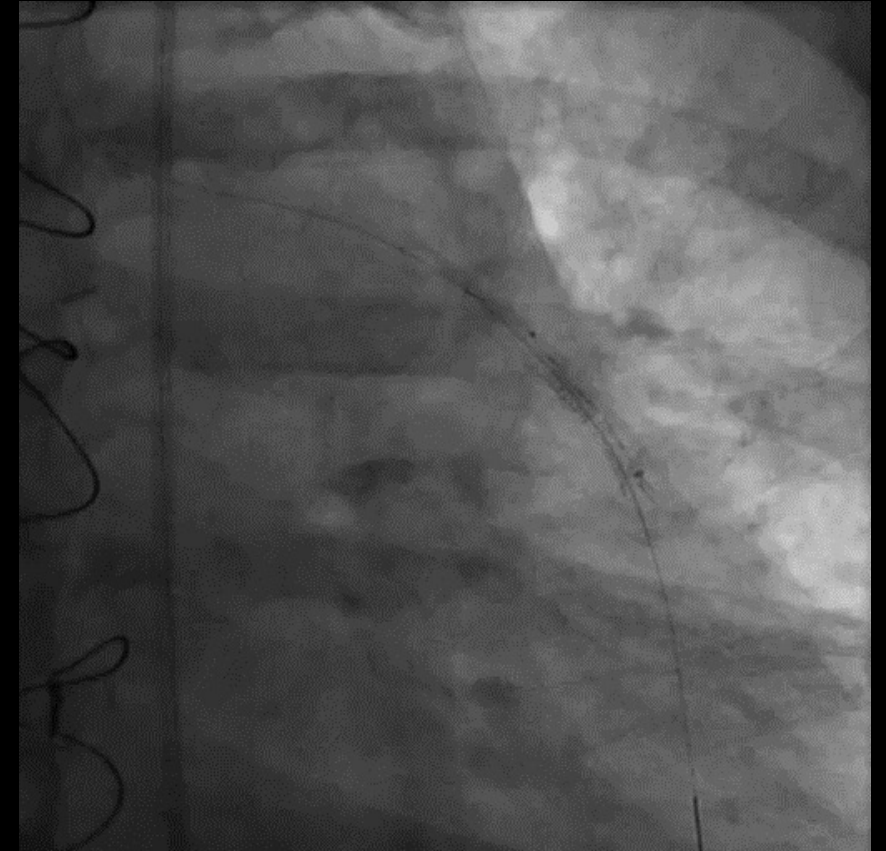
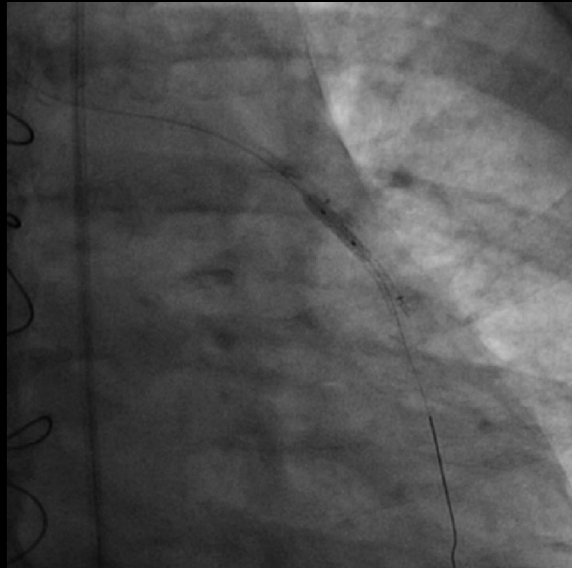
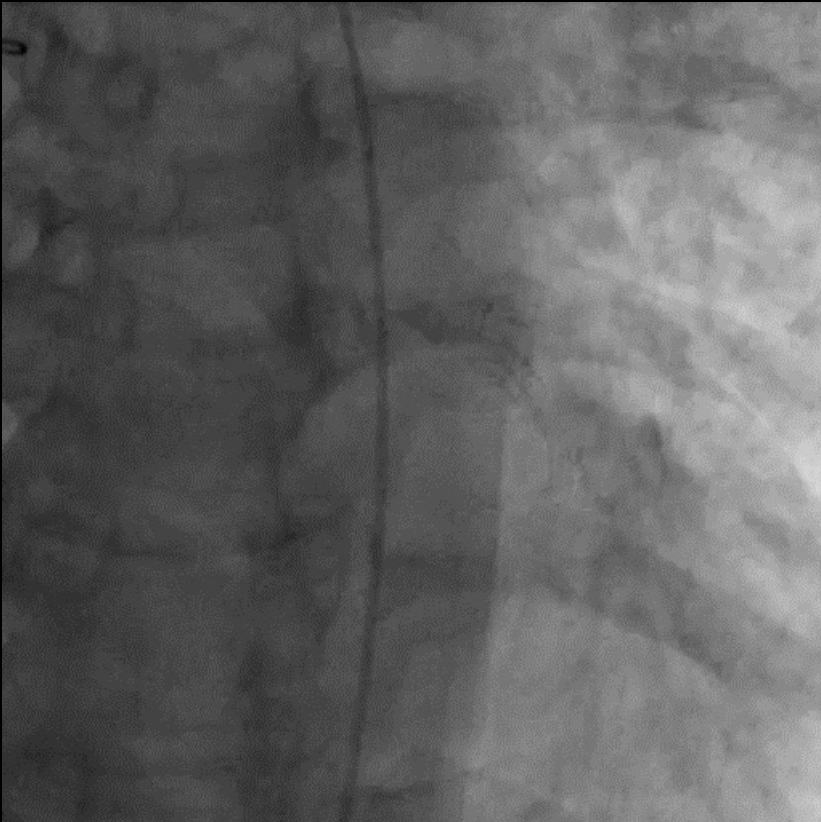
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# Thrombus and Dissections

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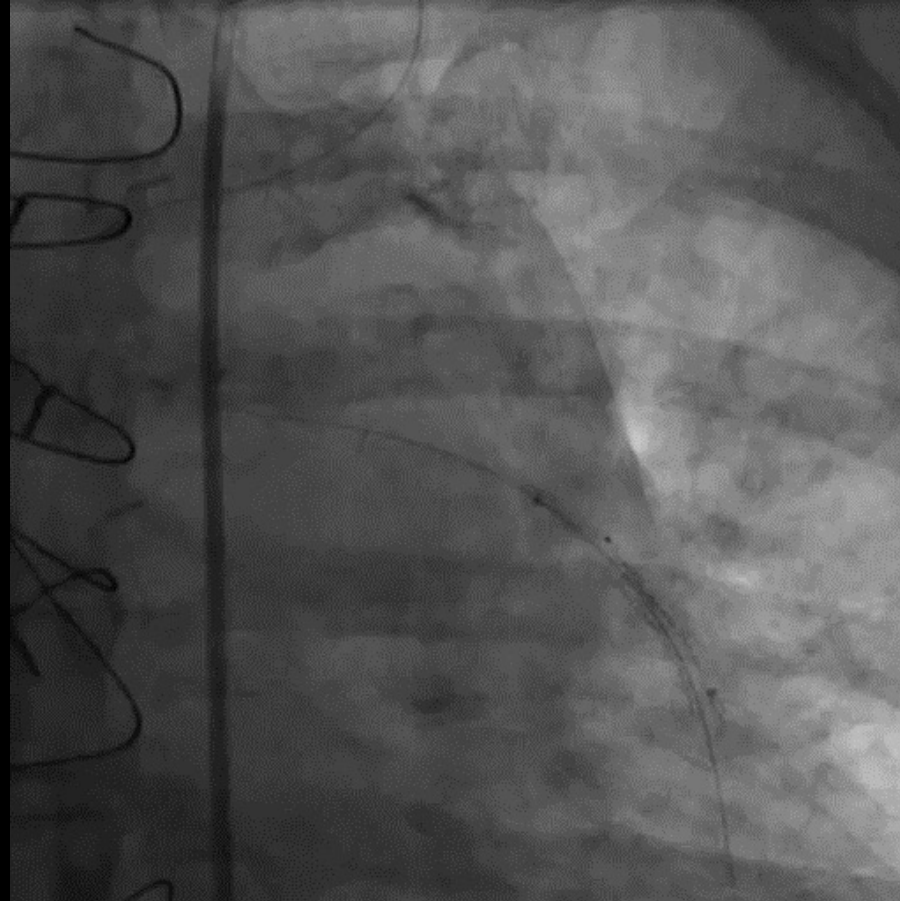
# Case LIMA

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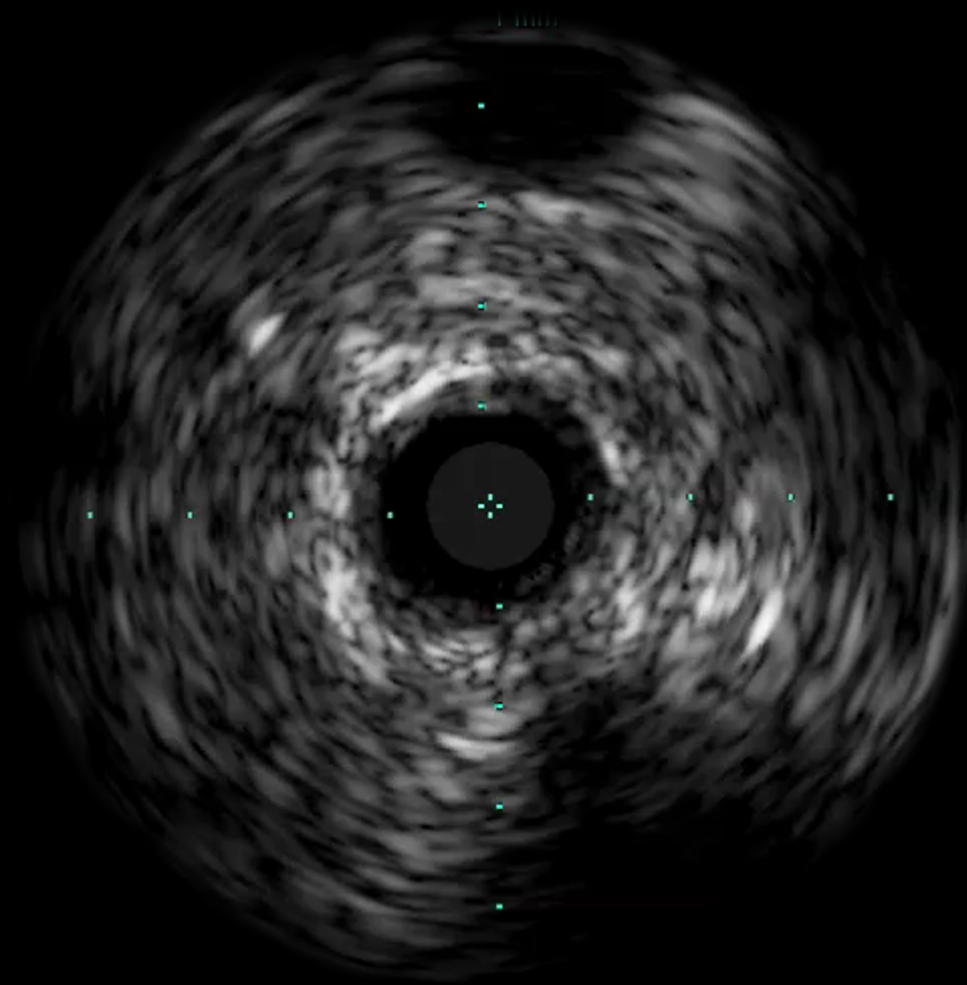


57 y/o female with pmh of CABG and prior PCI presents for positive stress test and class II CHF symptoms

**After final IVUS run...**



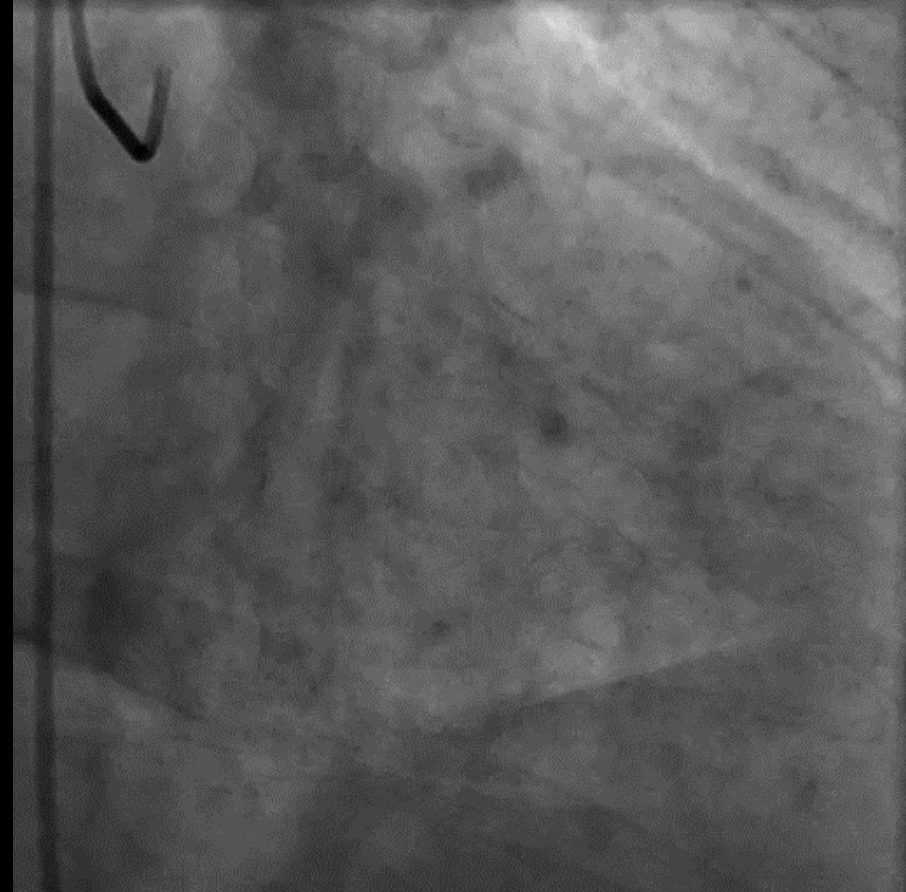
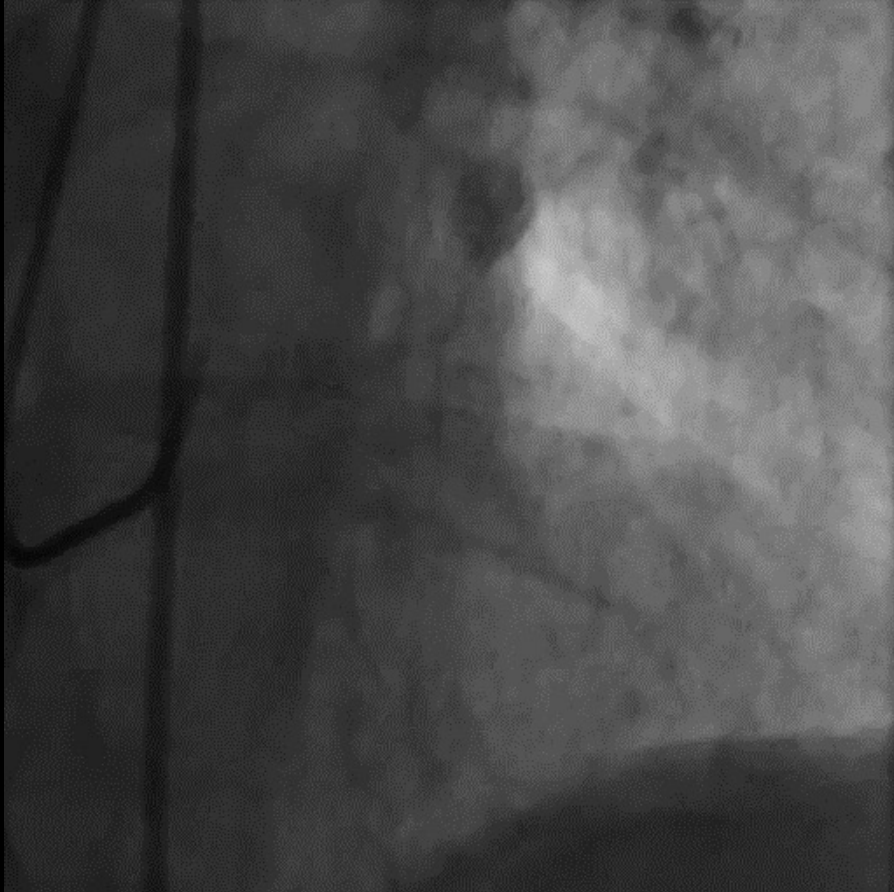




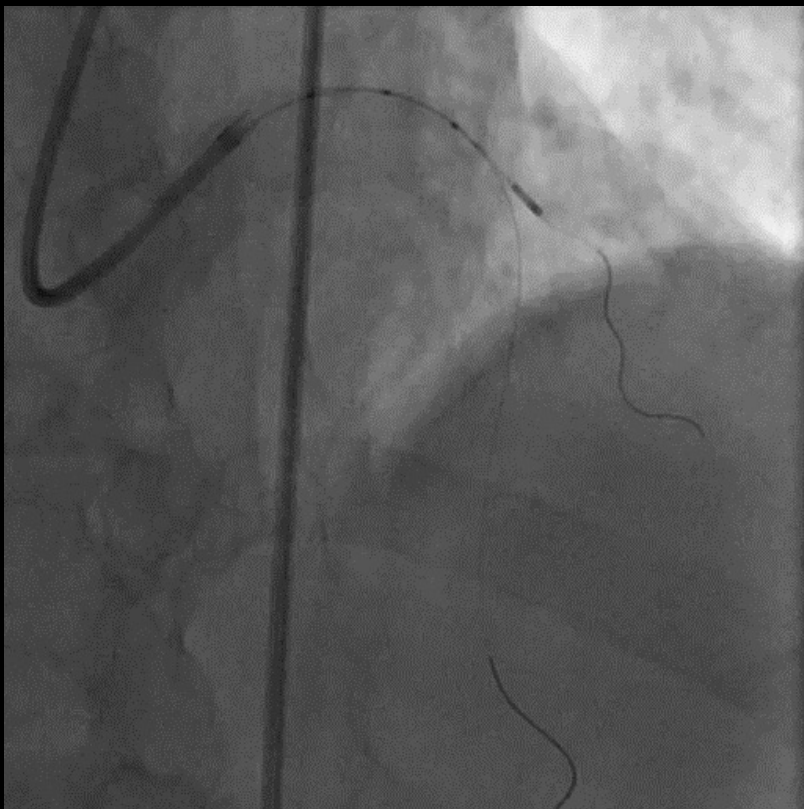
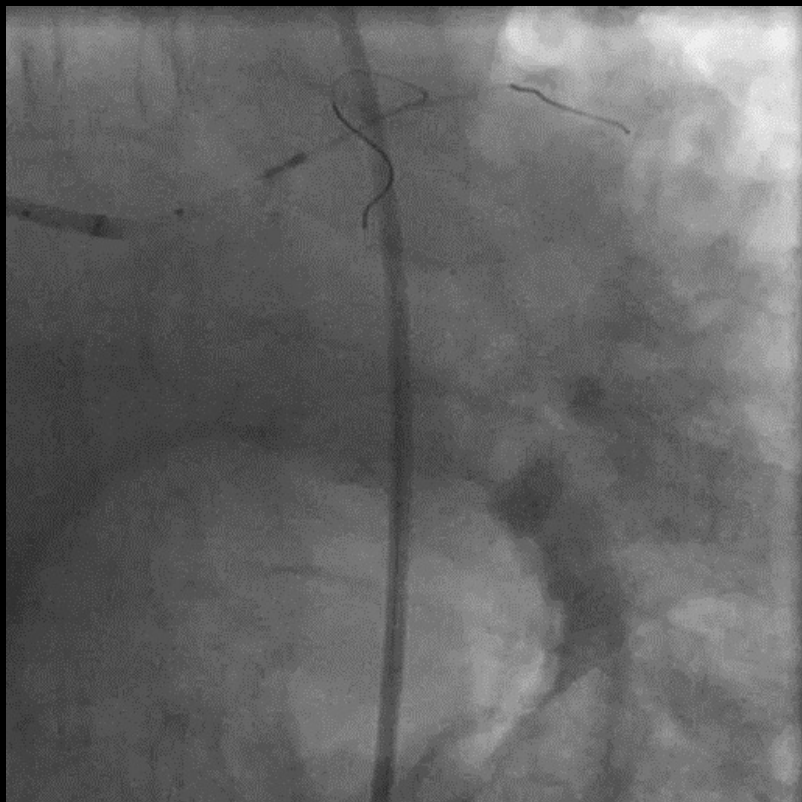
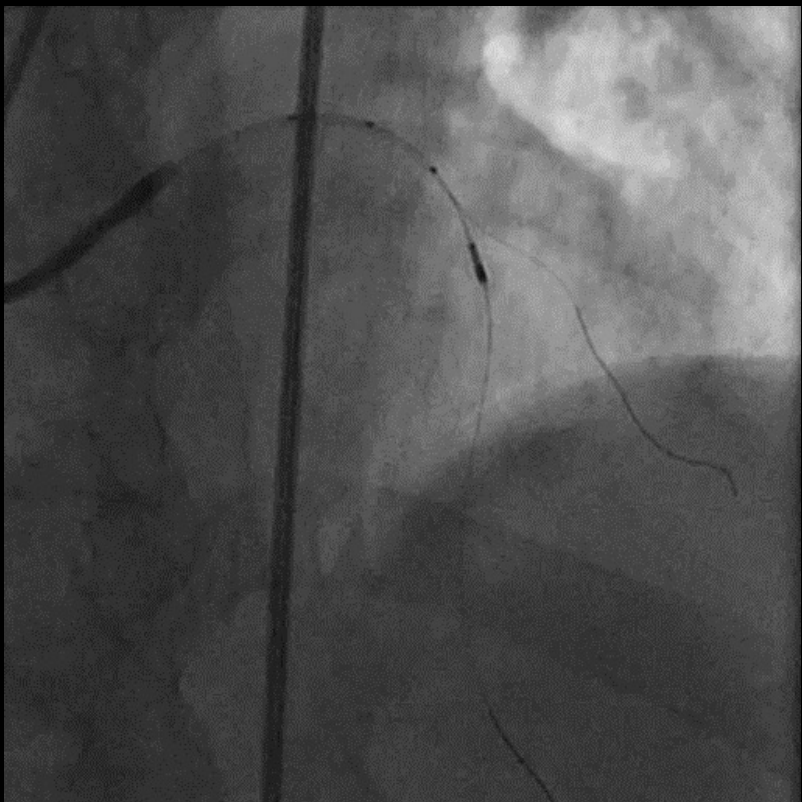


# Case ACS

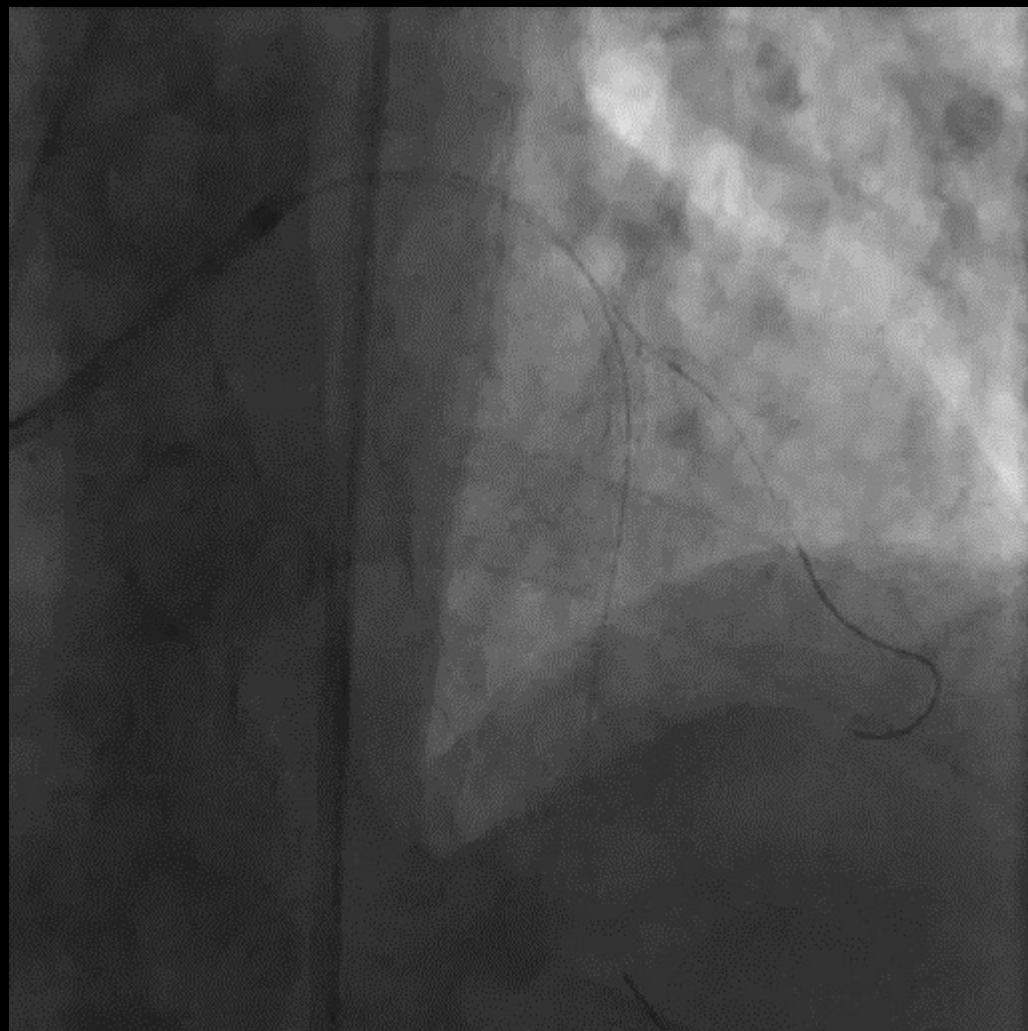
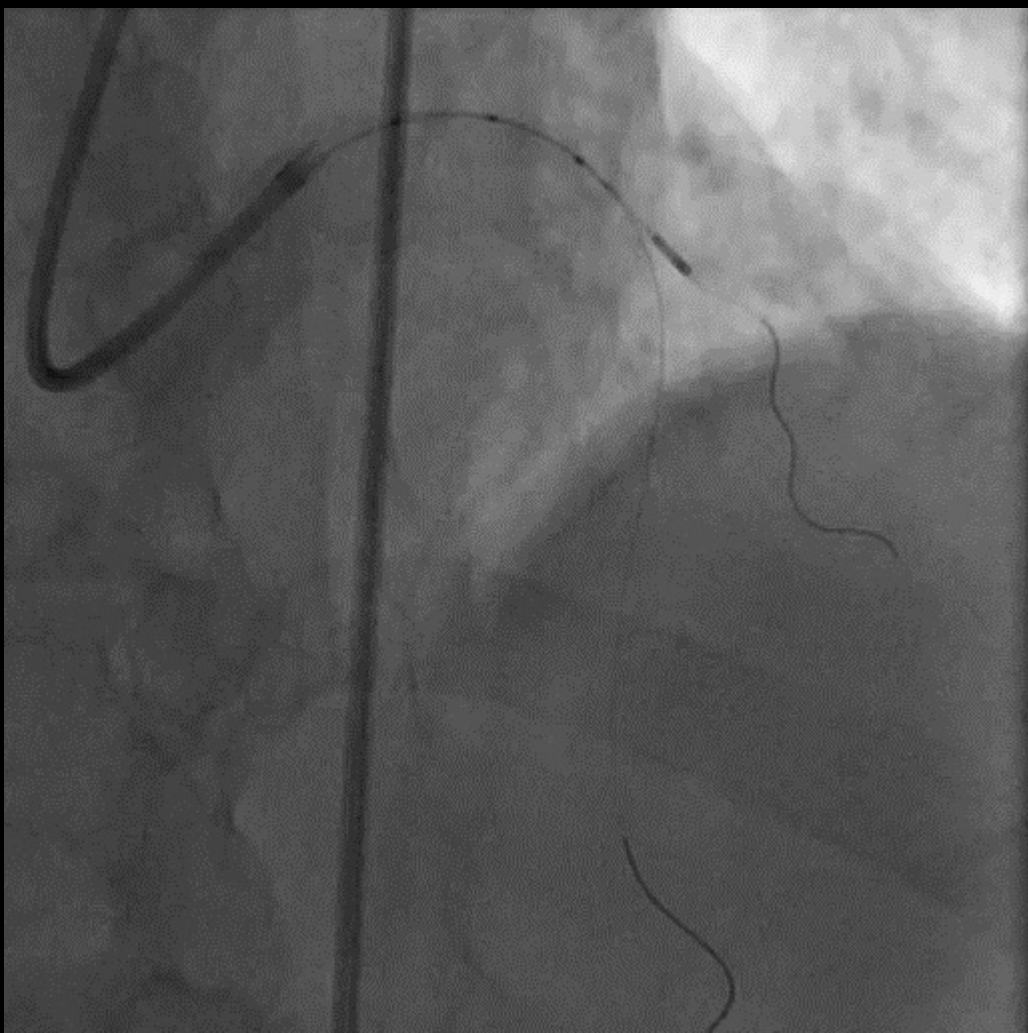
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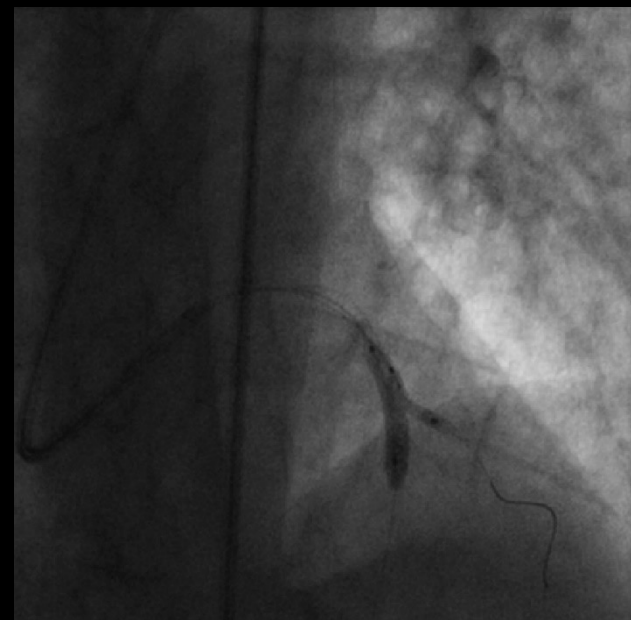
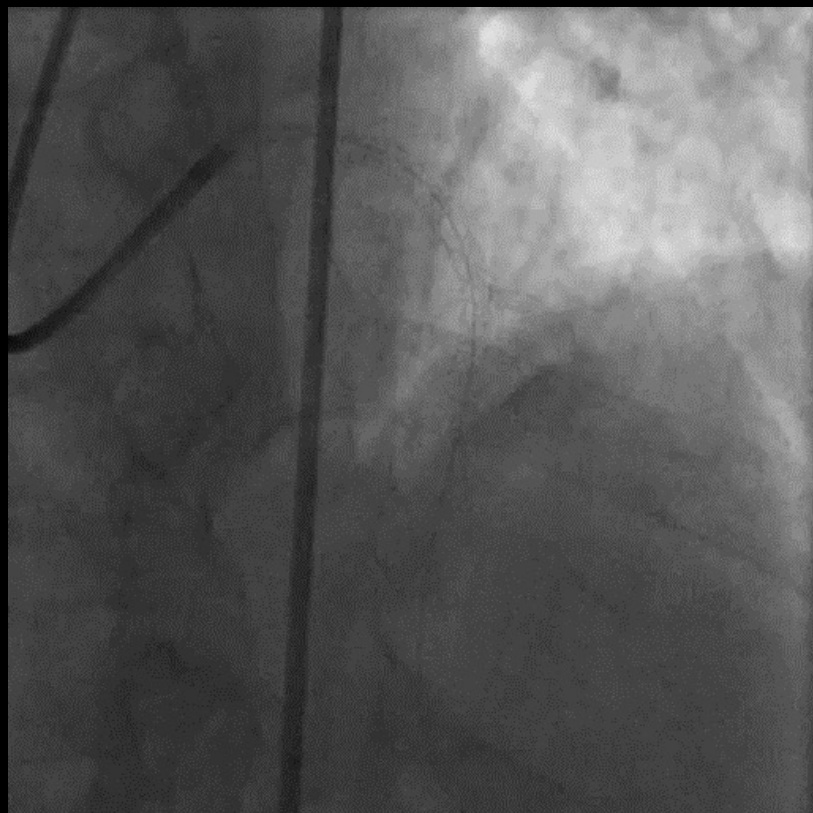
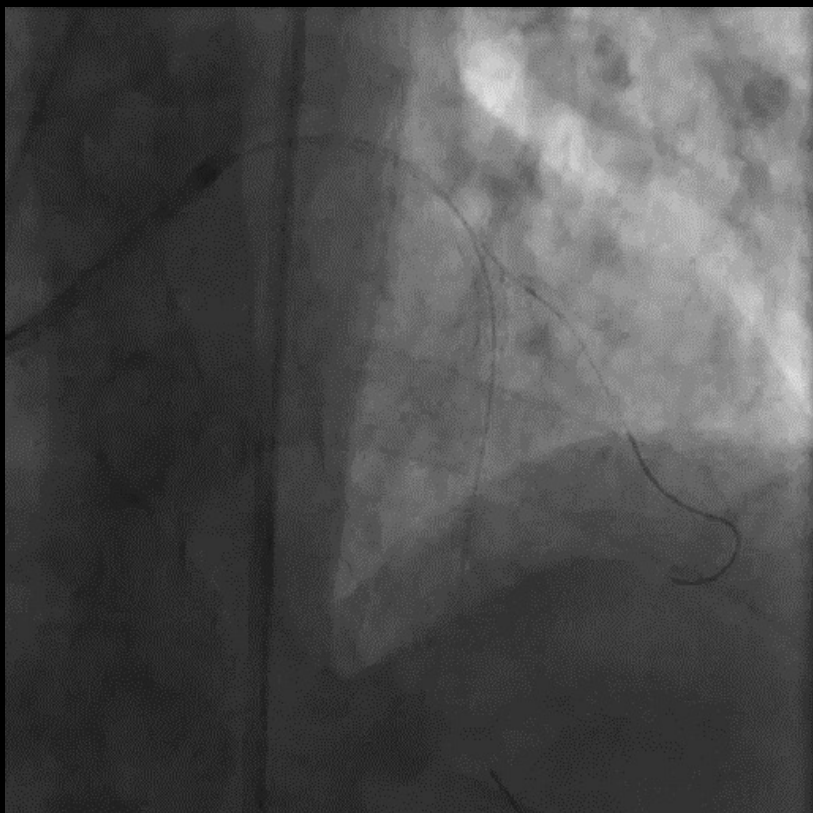


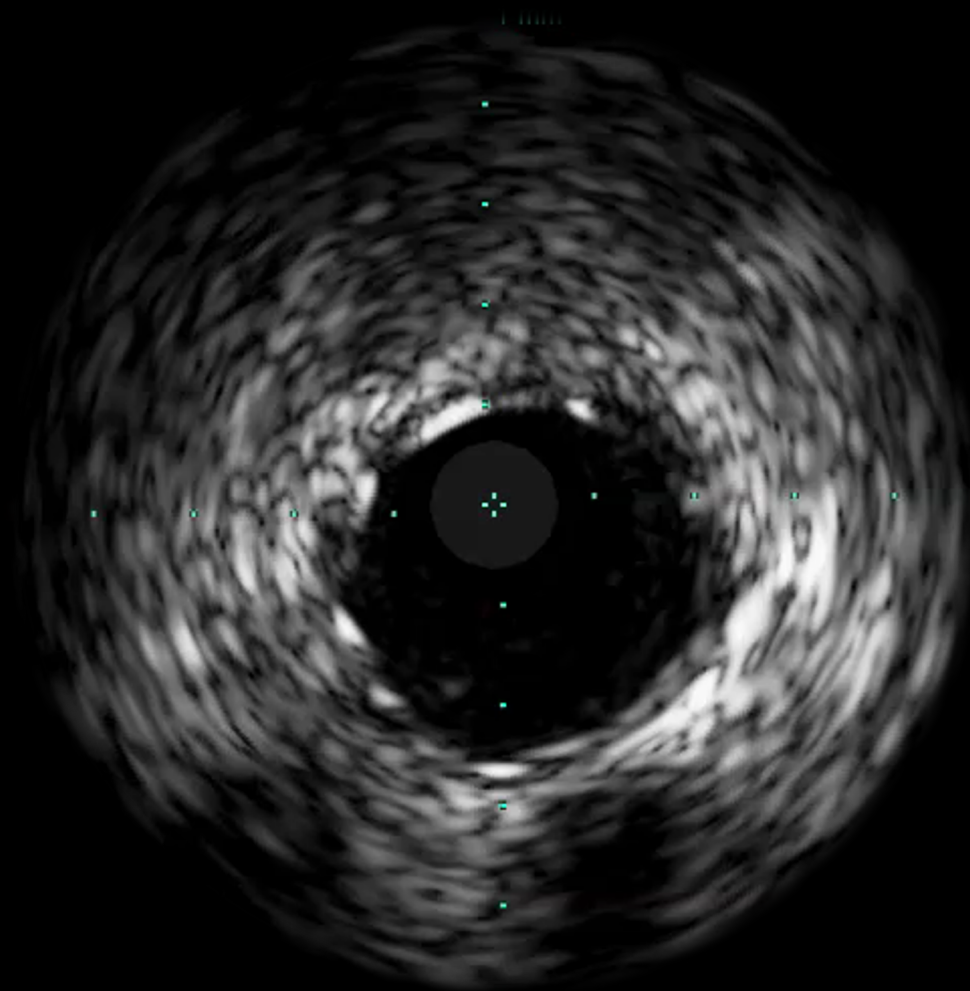
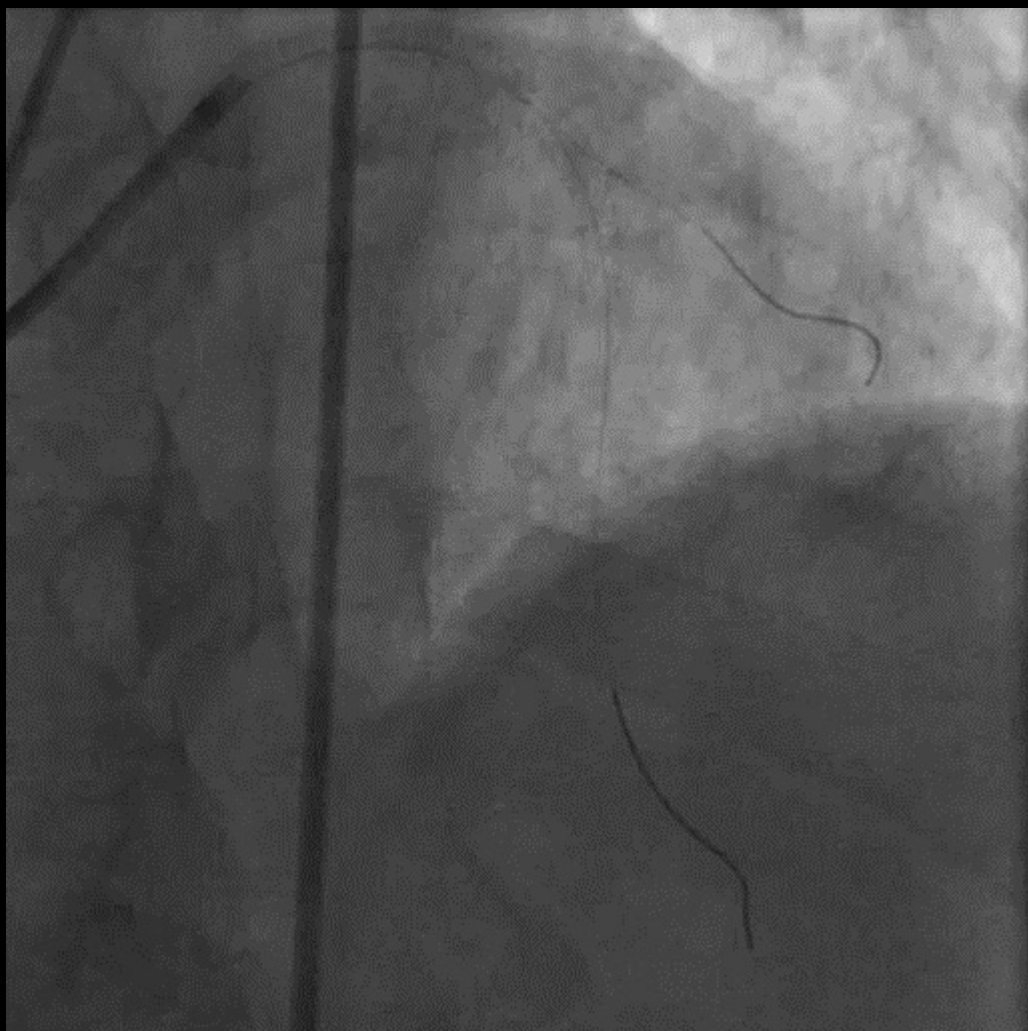
60 y/o male with pmh of DM presents with ongoing chest pain and troponin of 15.

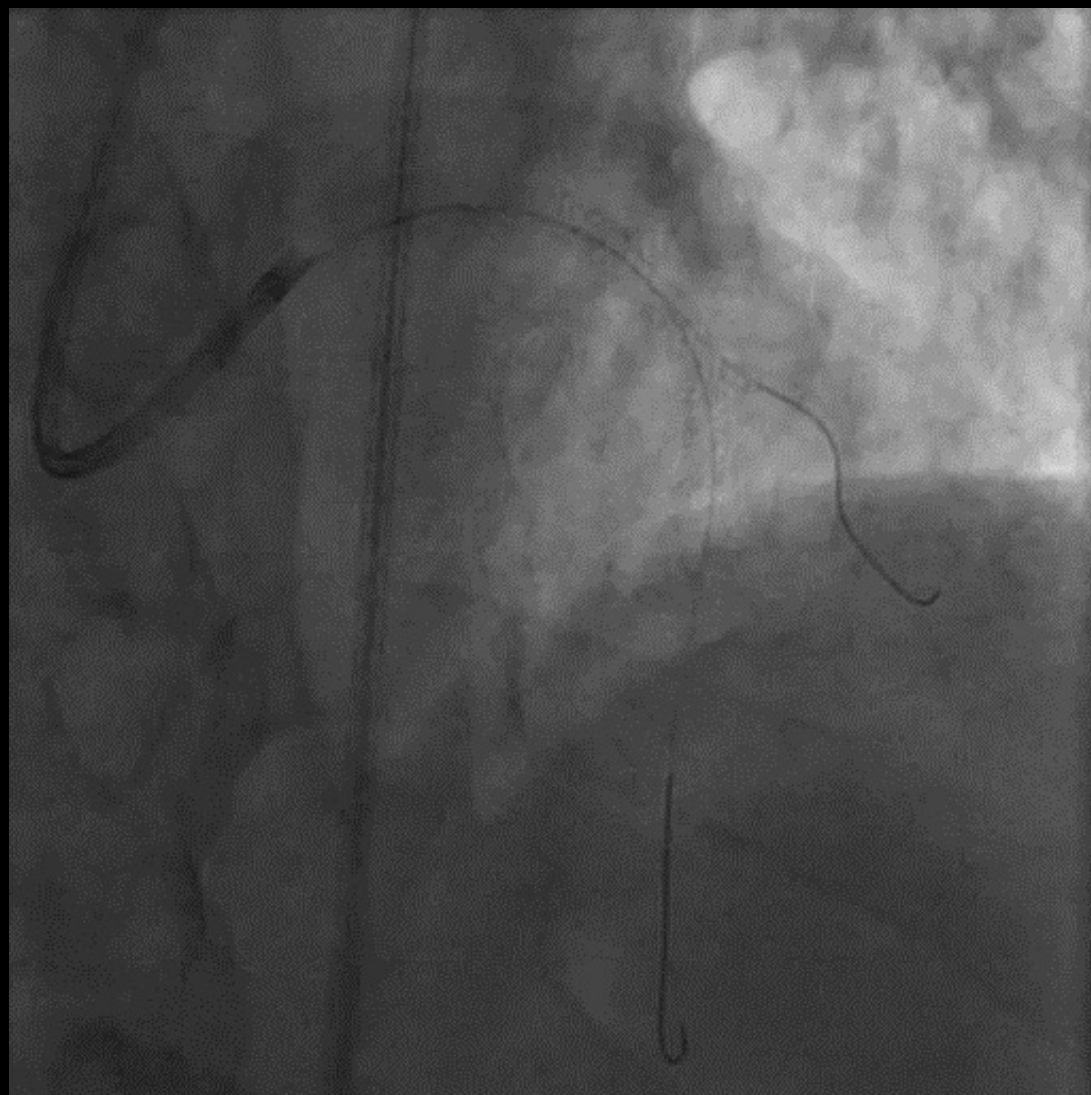




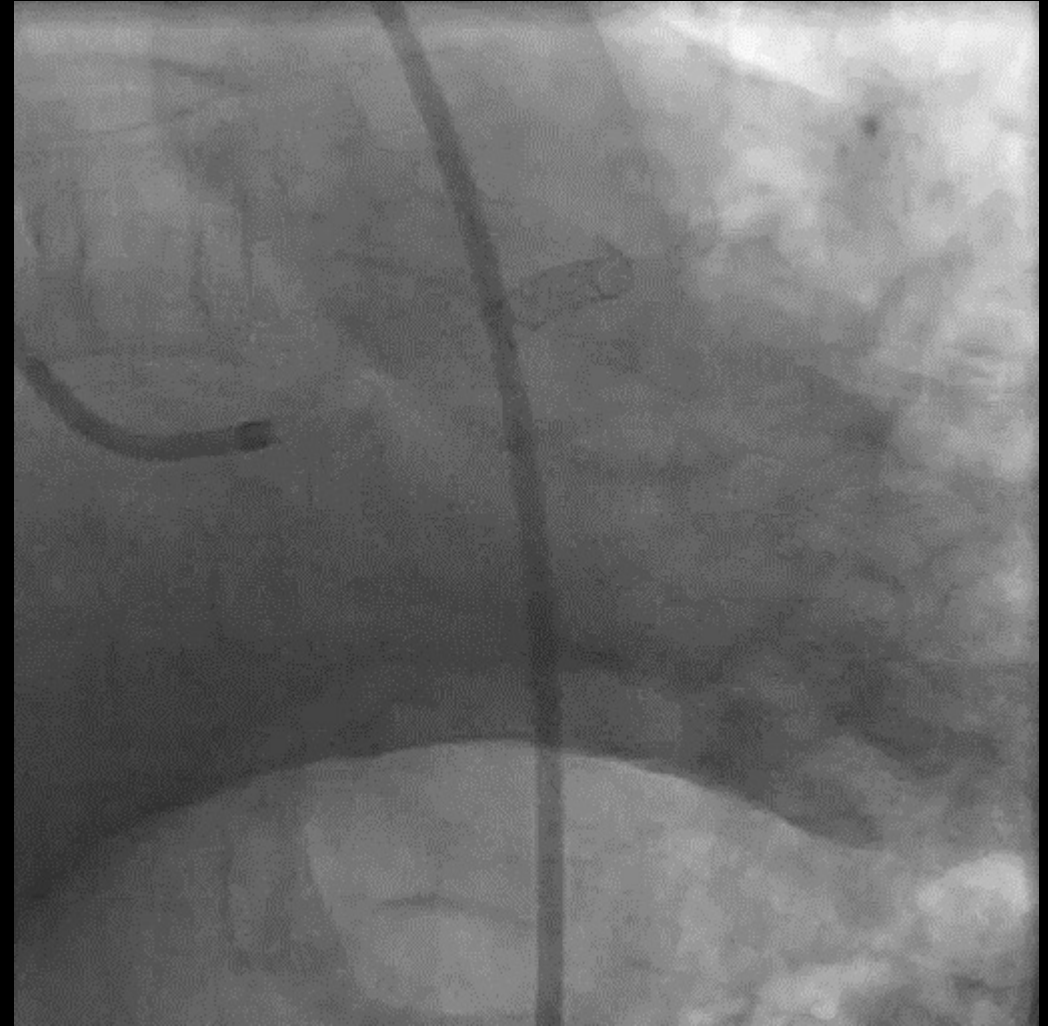
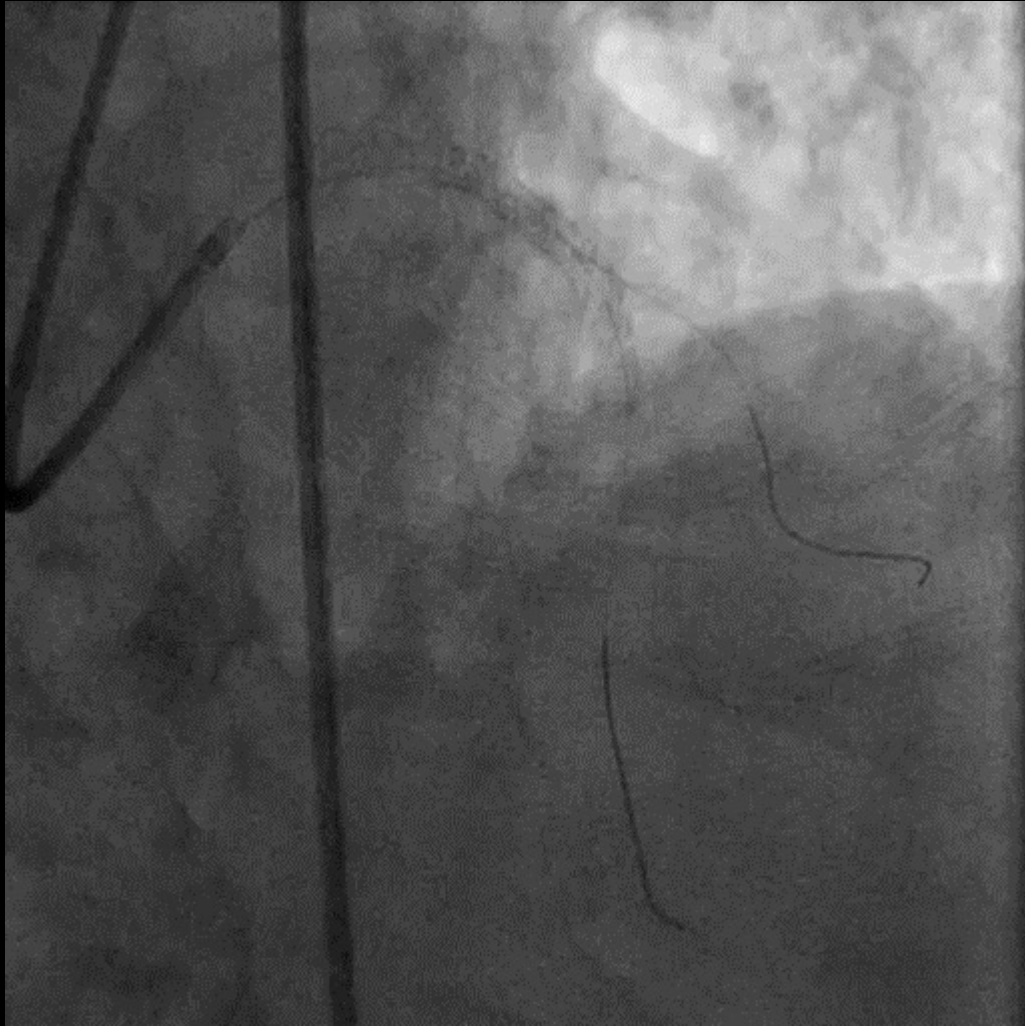








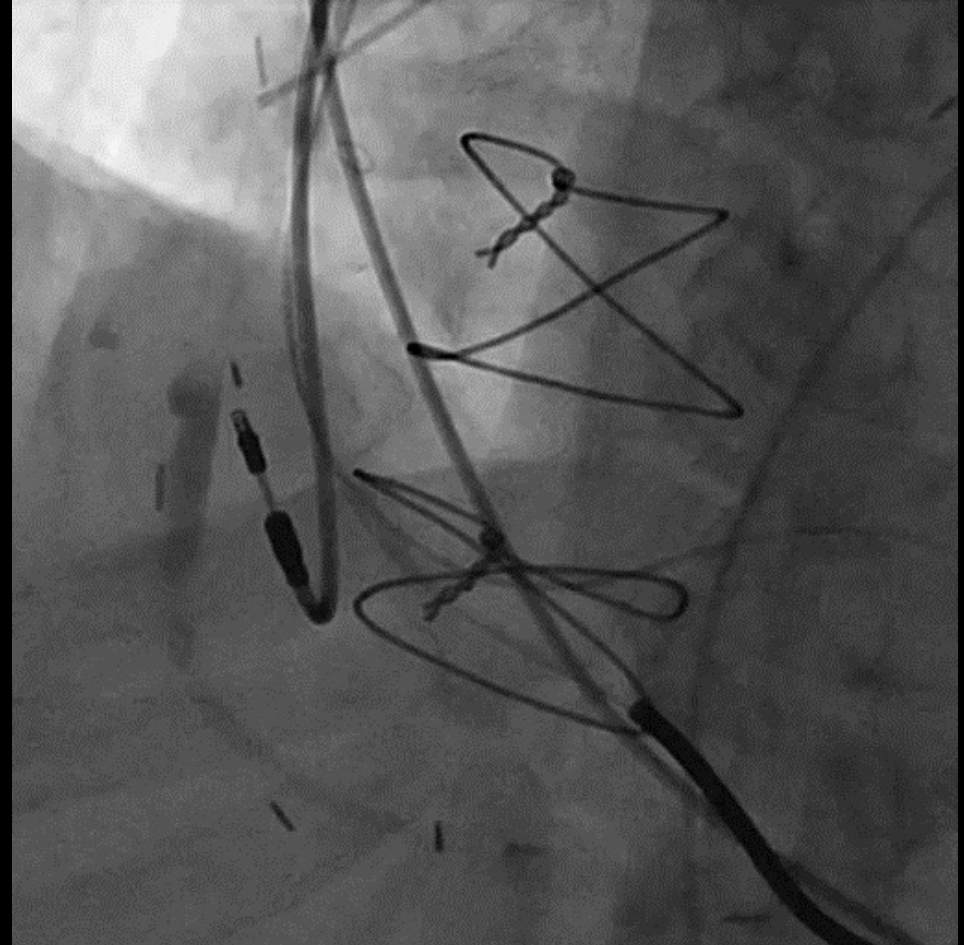
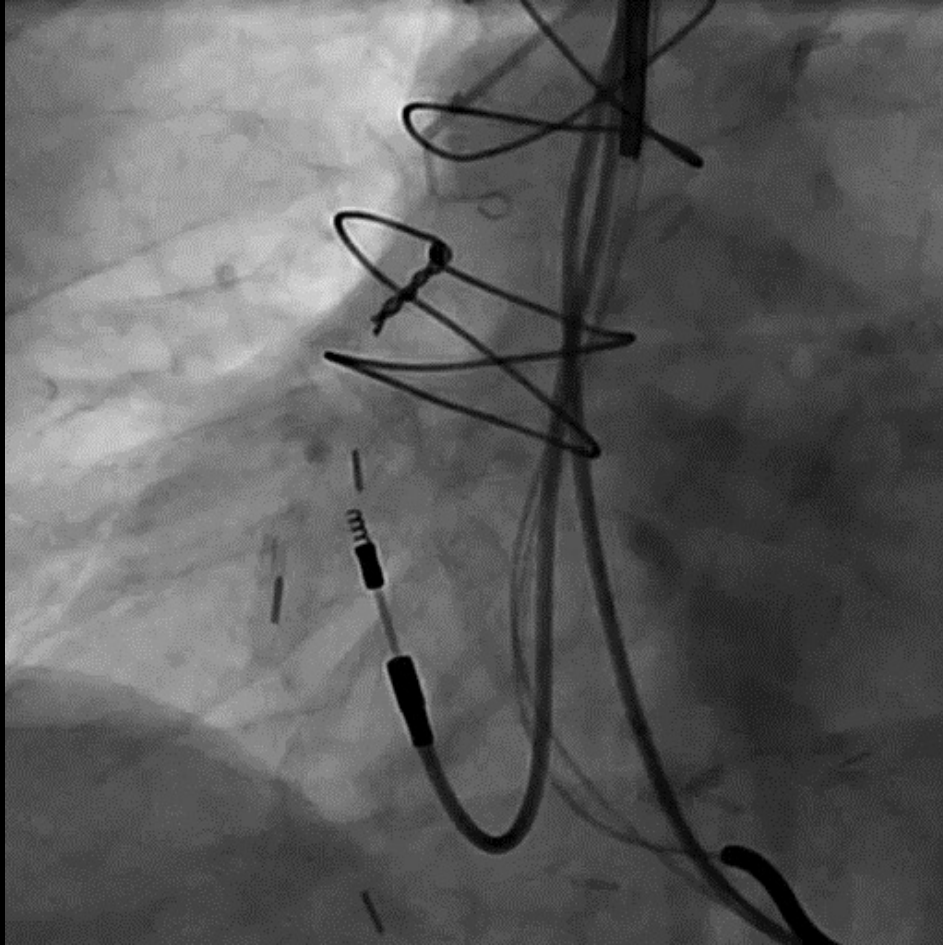




Restent Proximal LAD, Reopro and laser with angioplasty to side branch.

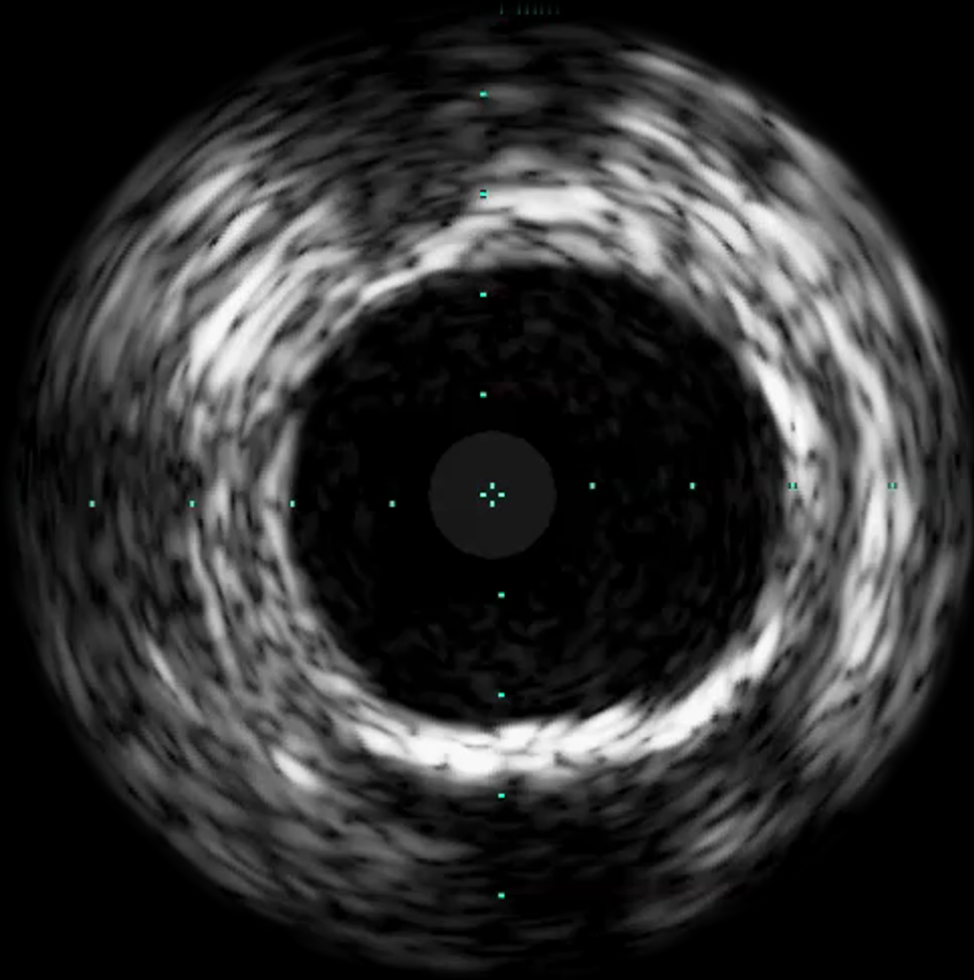
# Case SVG

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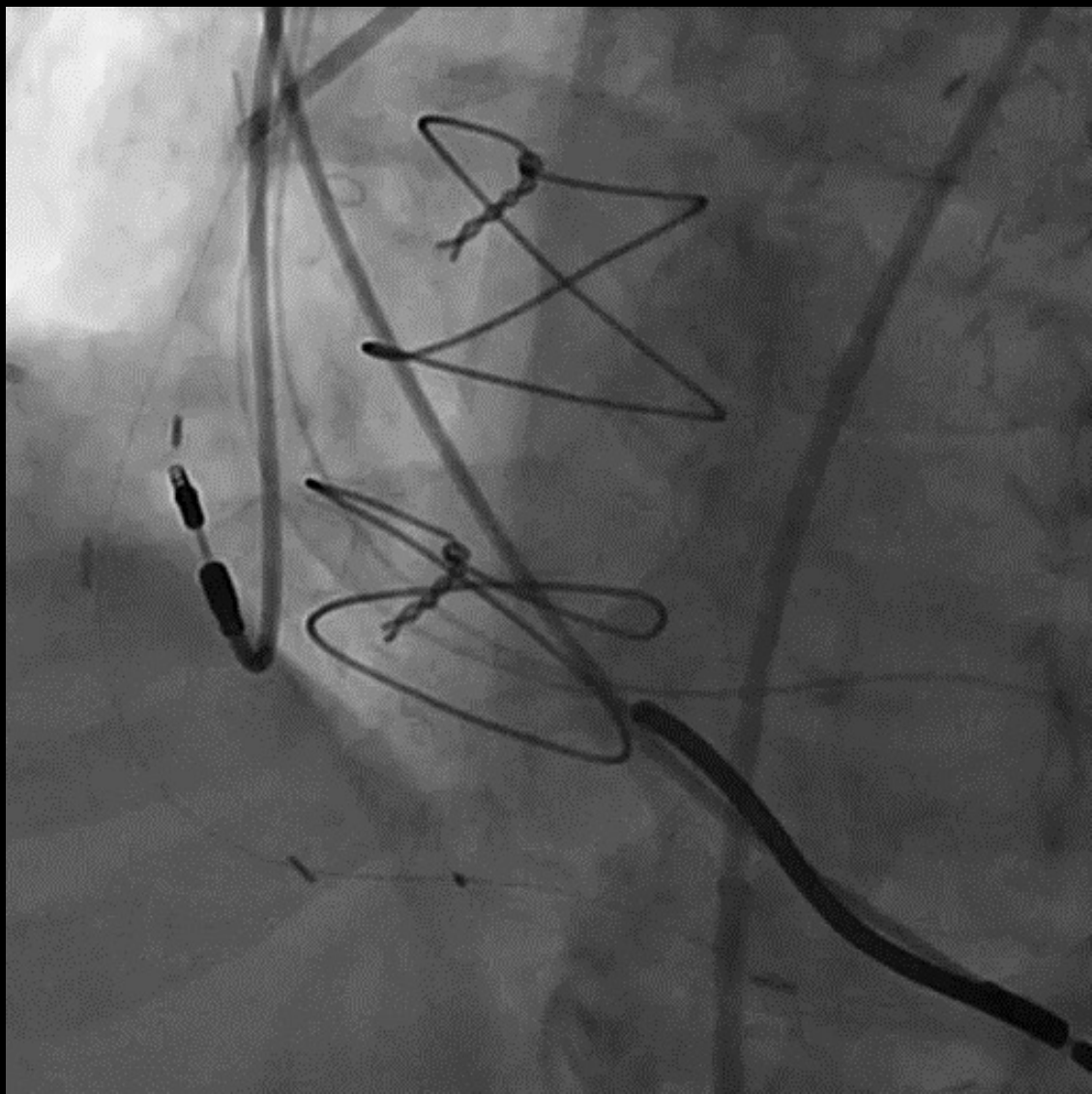


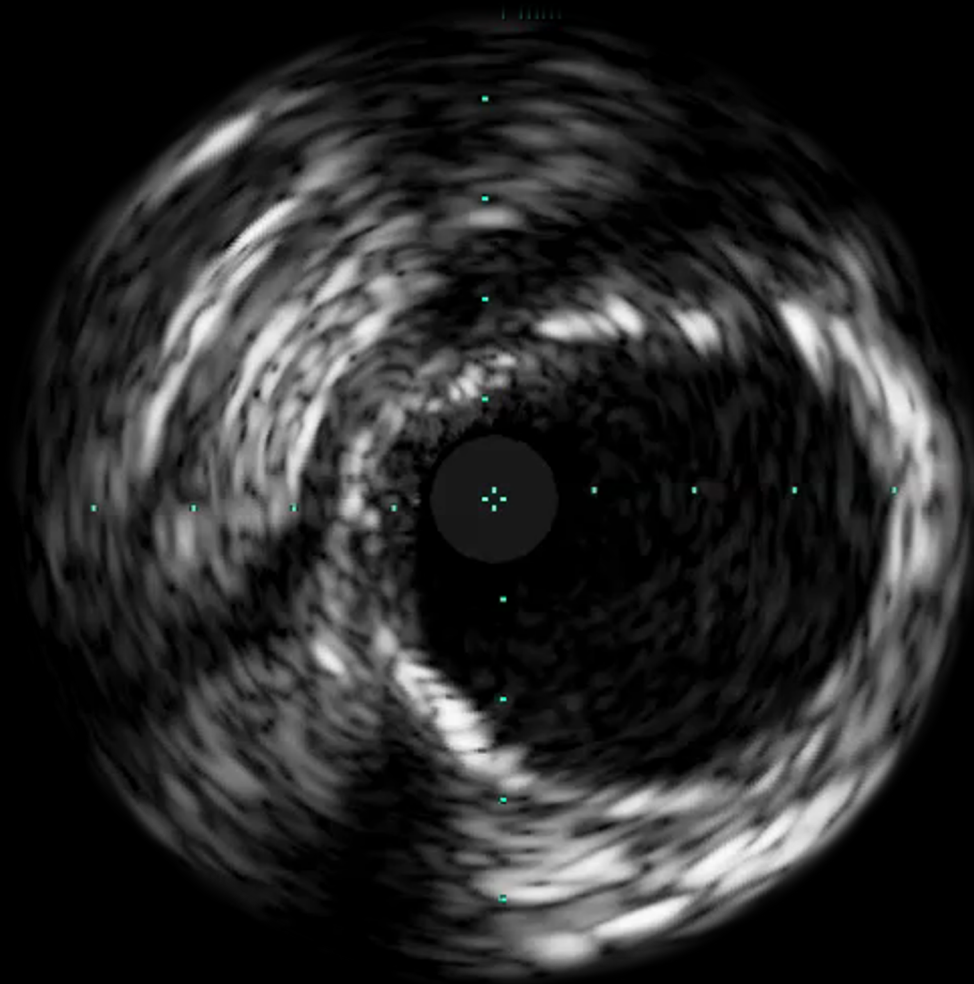
70 y/o male with pmh of DM, CABG and prior PCI to SVG presents with positive troponin.

Laser, Chocolate angioplasty and then IVUS...

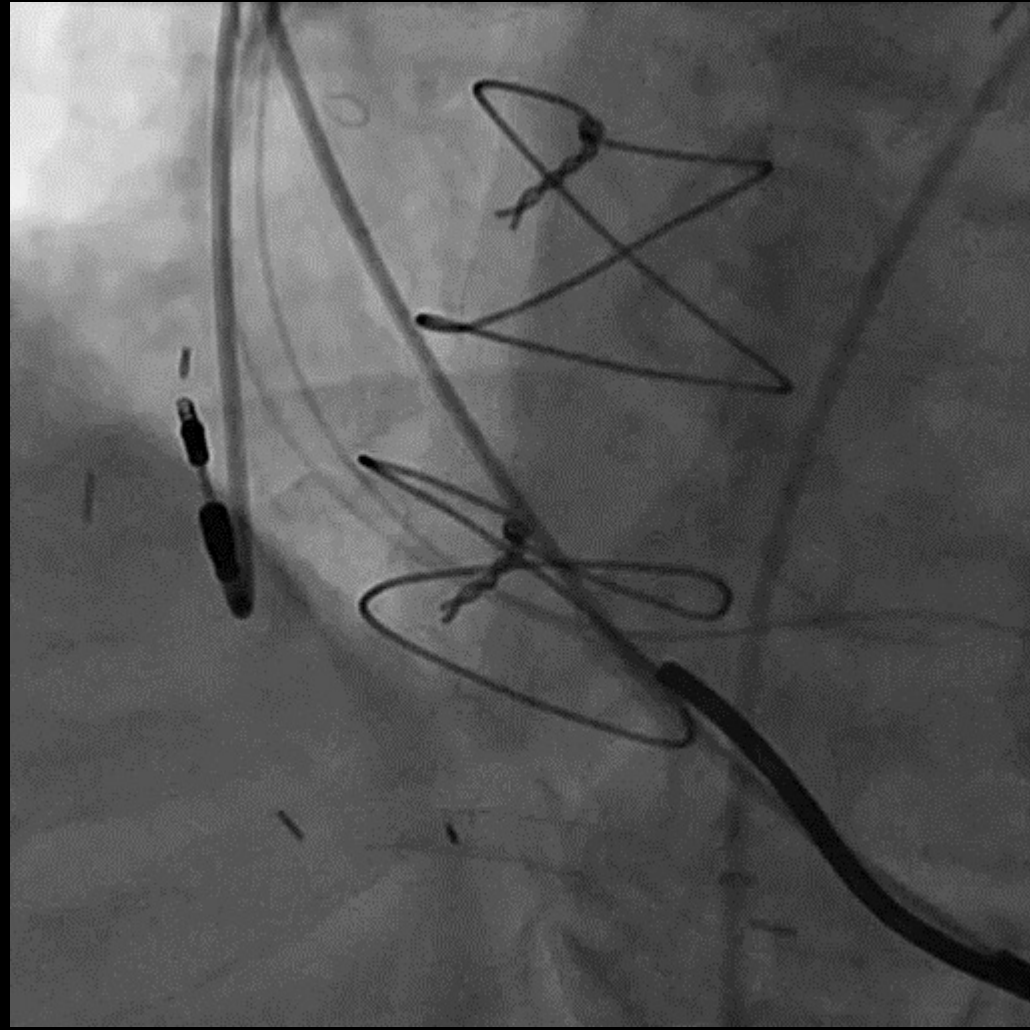






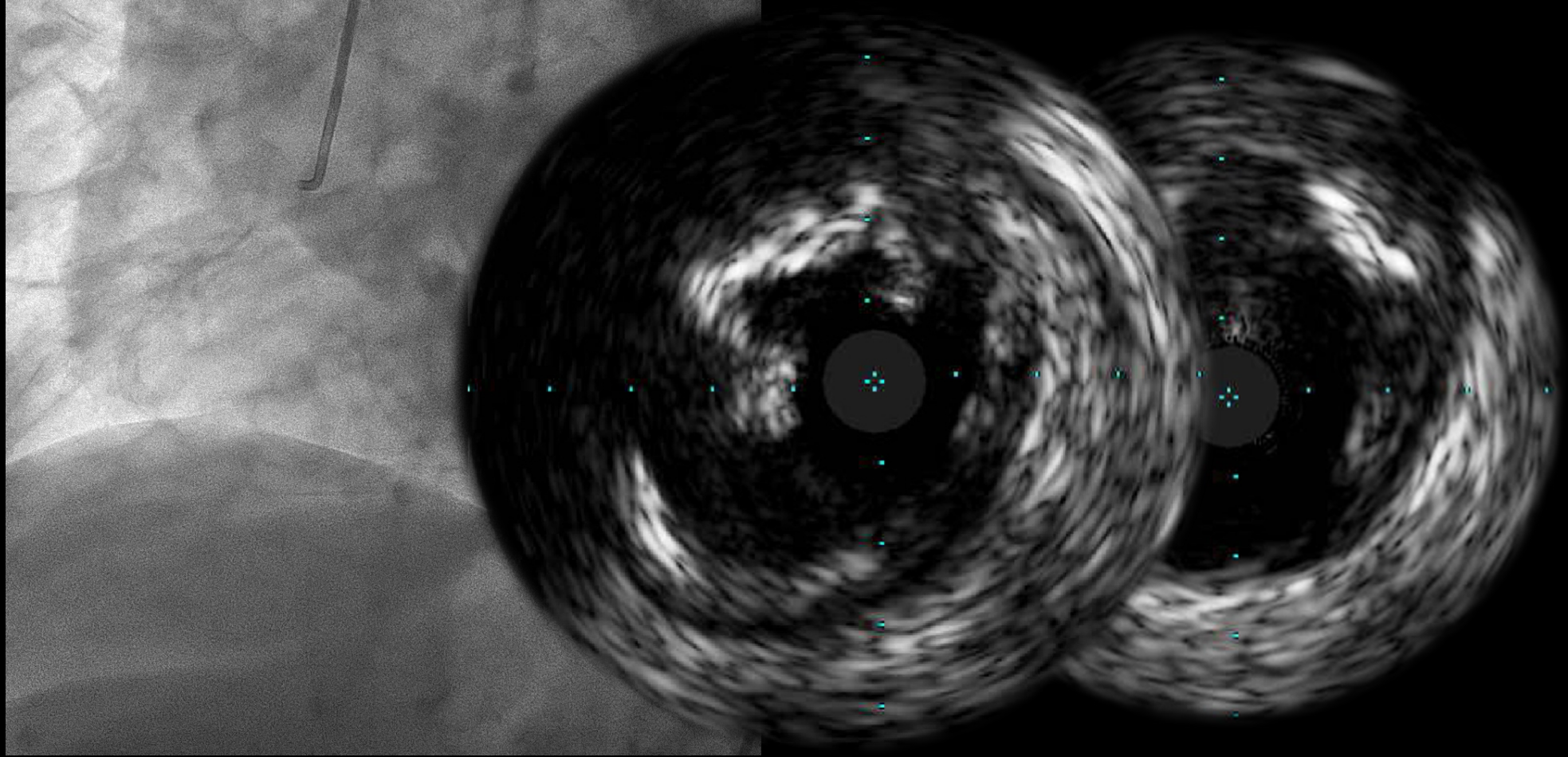


Post Stent IVUS



# Case AMI

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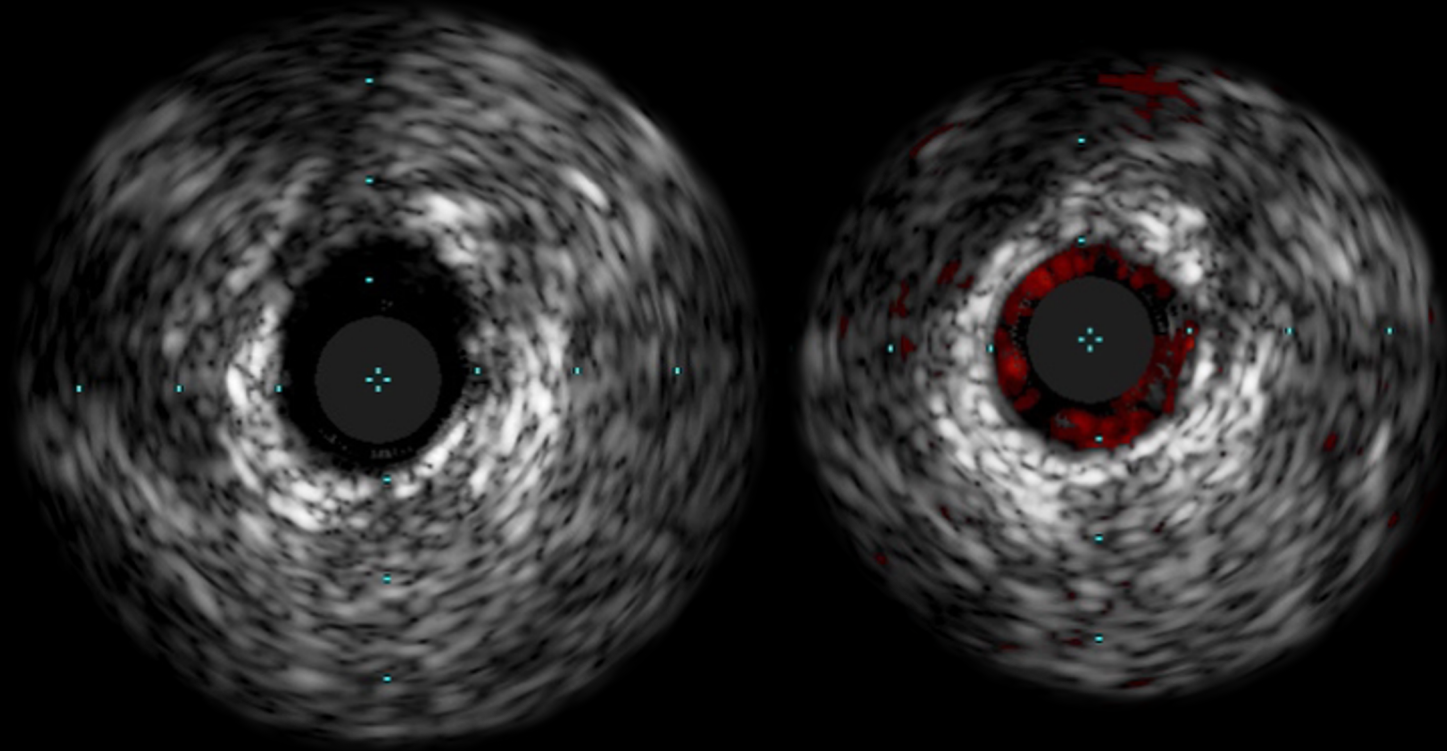
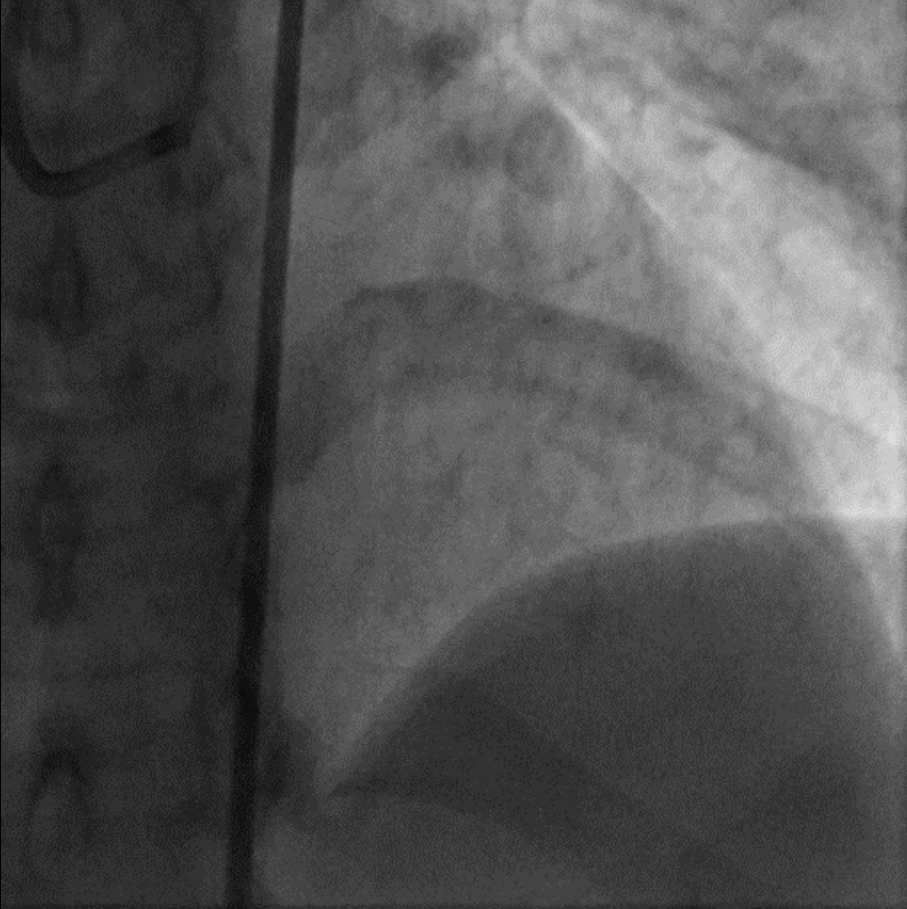


Anterior Changes with no disease on the left and this thing in the proximal RCA.



# Case AMI young women

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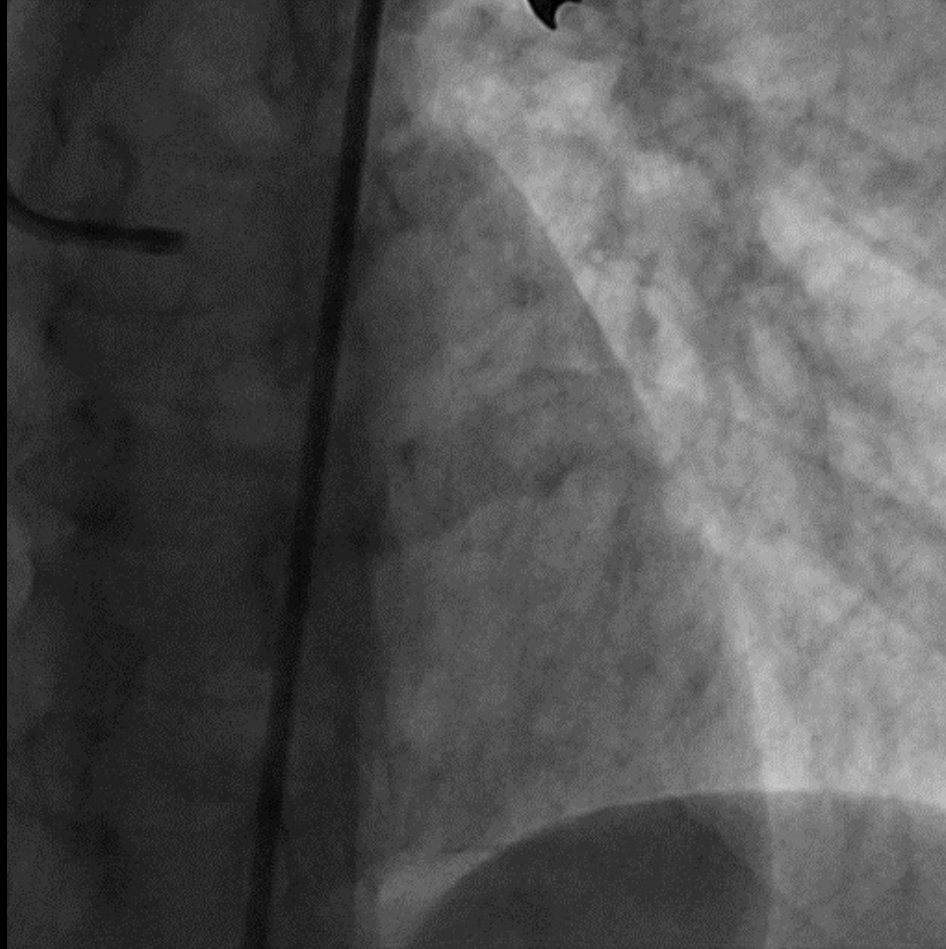


47 y/o female presents with chest pain and anterior ST elevations.



# SCAD

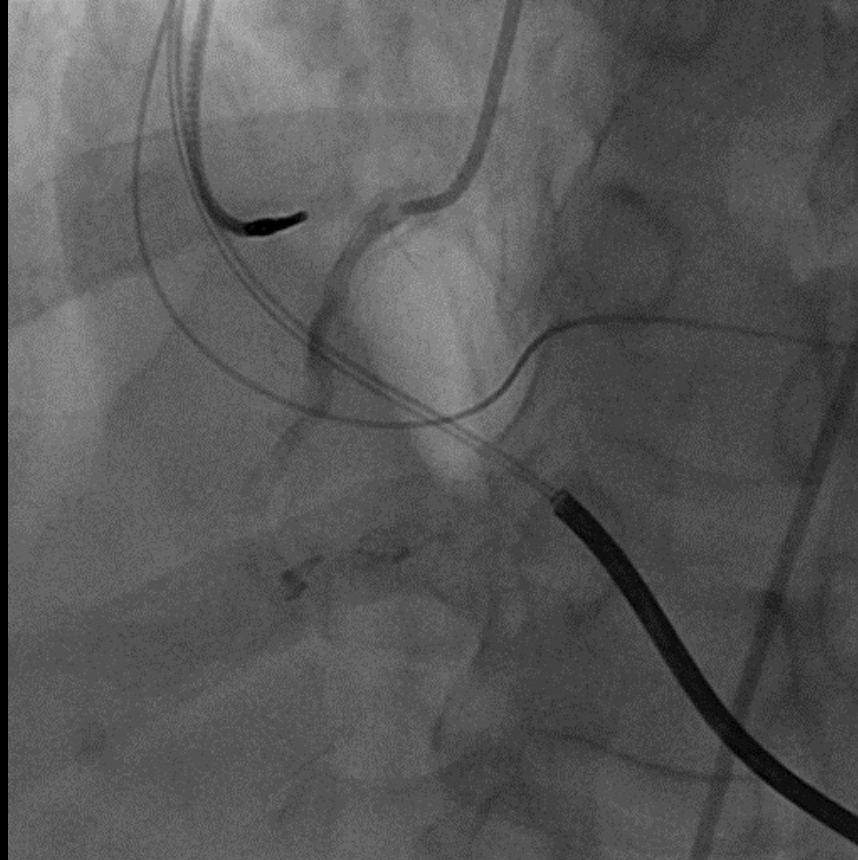
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POBA to left main and LAD. Placed IABP and monitored. Patient did well and was d/c with normal LV function

# Case AMI #2

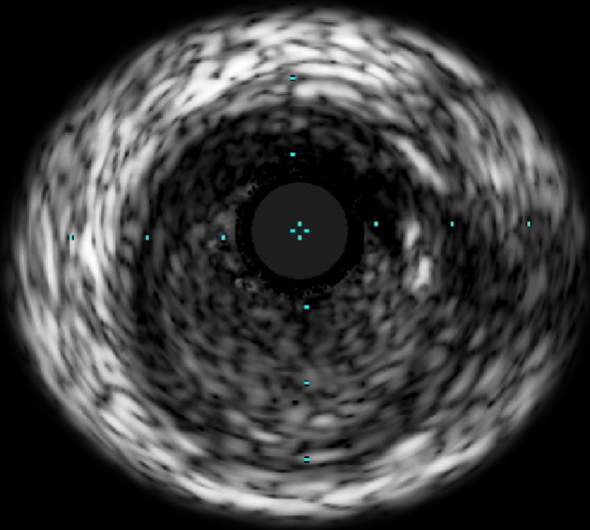
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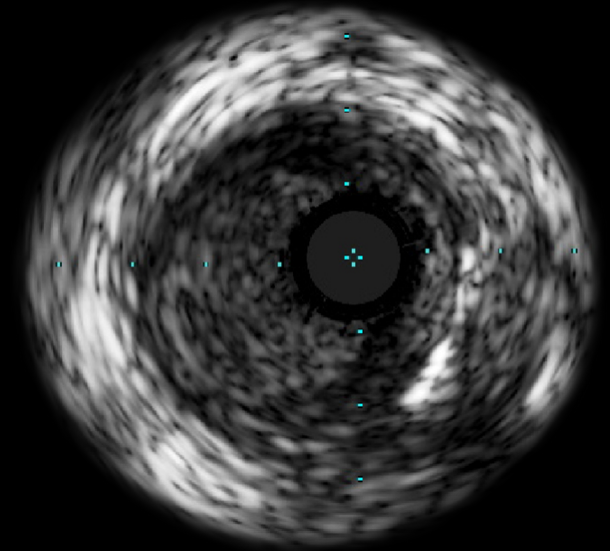
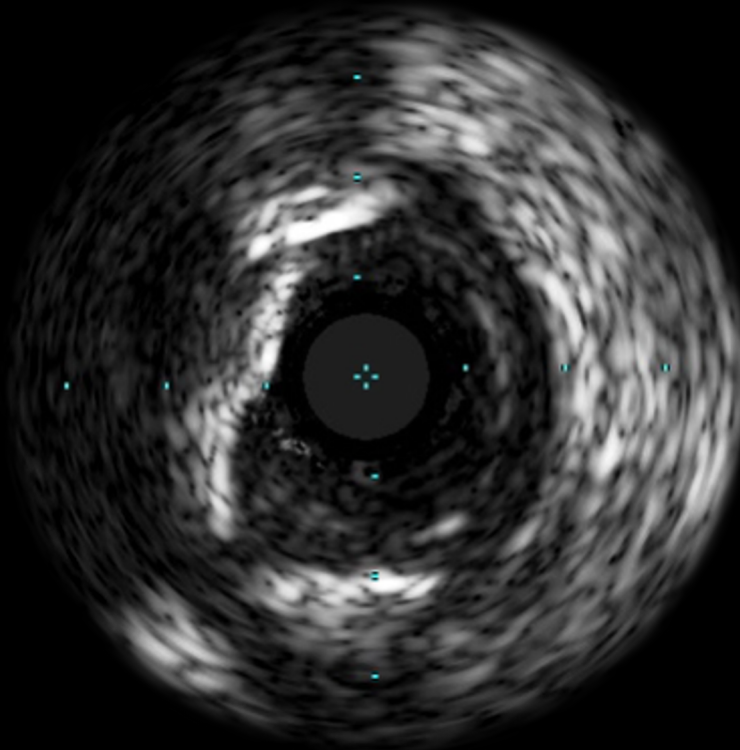
60 y/o with Inferior ST elevations and chest pain

# Case AMI #2

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No Flow on IVUS

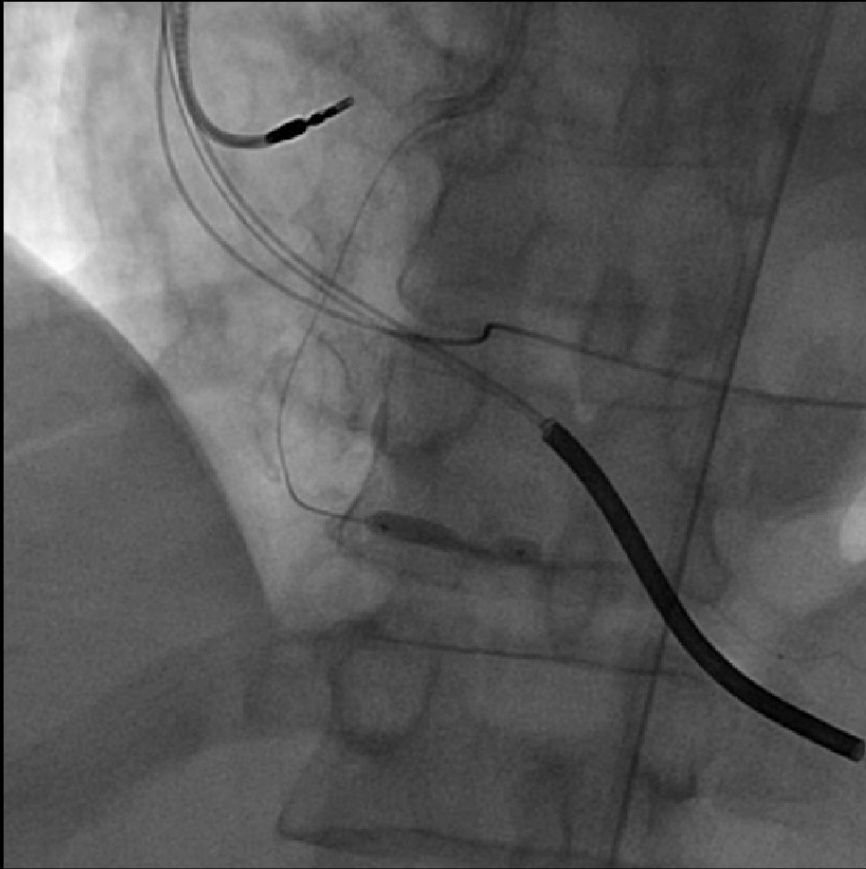


No Flow on IVUS

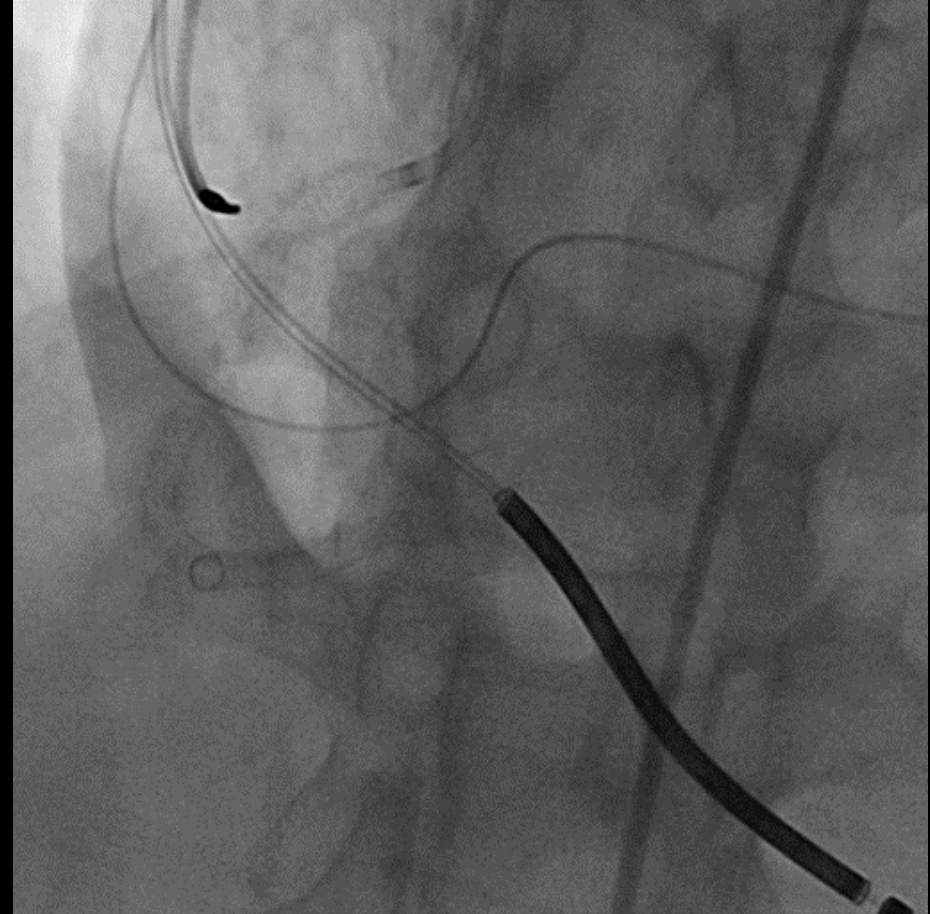
Difficult to wire and dilated distal RCA with 3.0 mm balloon.

# Case AMI #2

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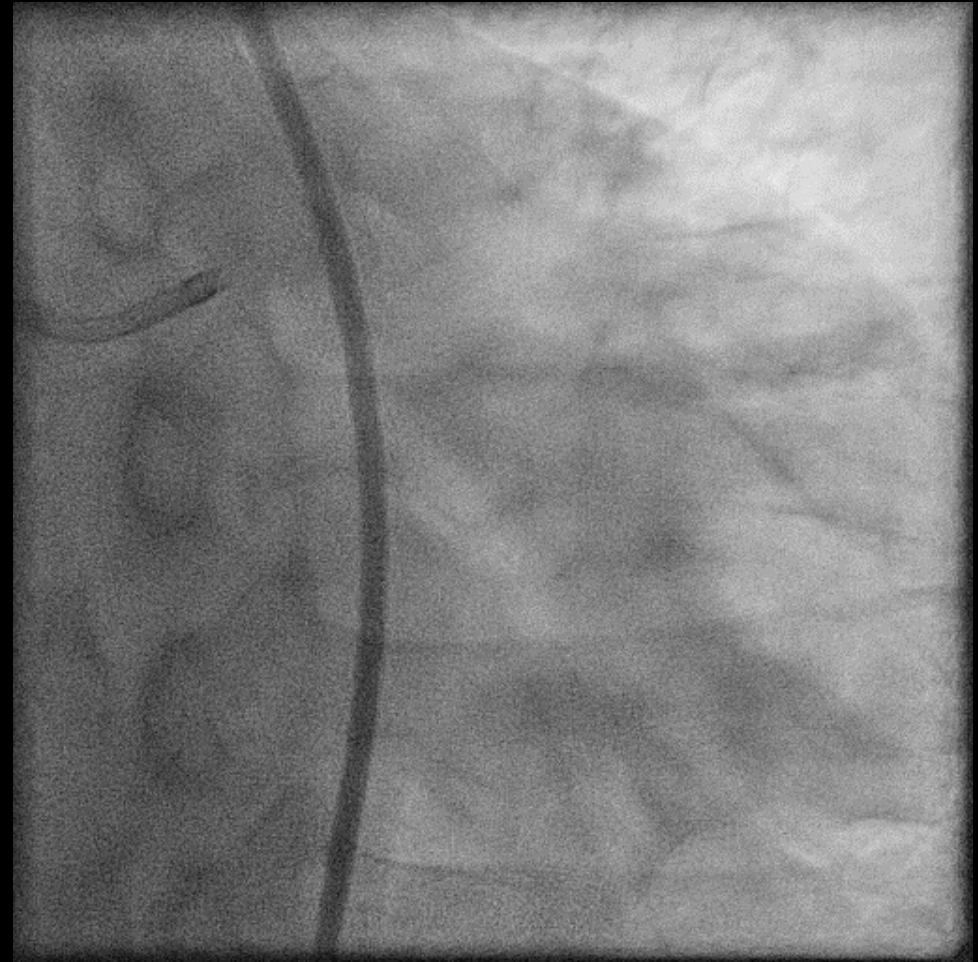
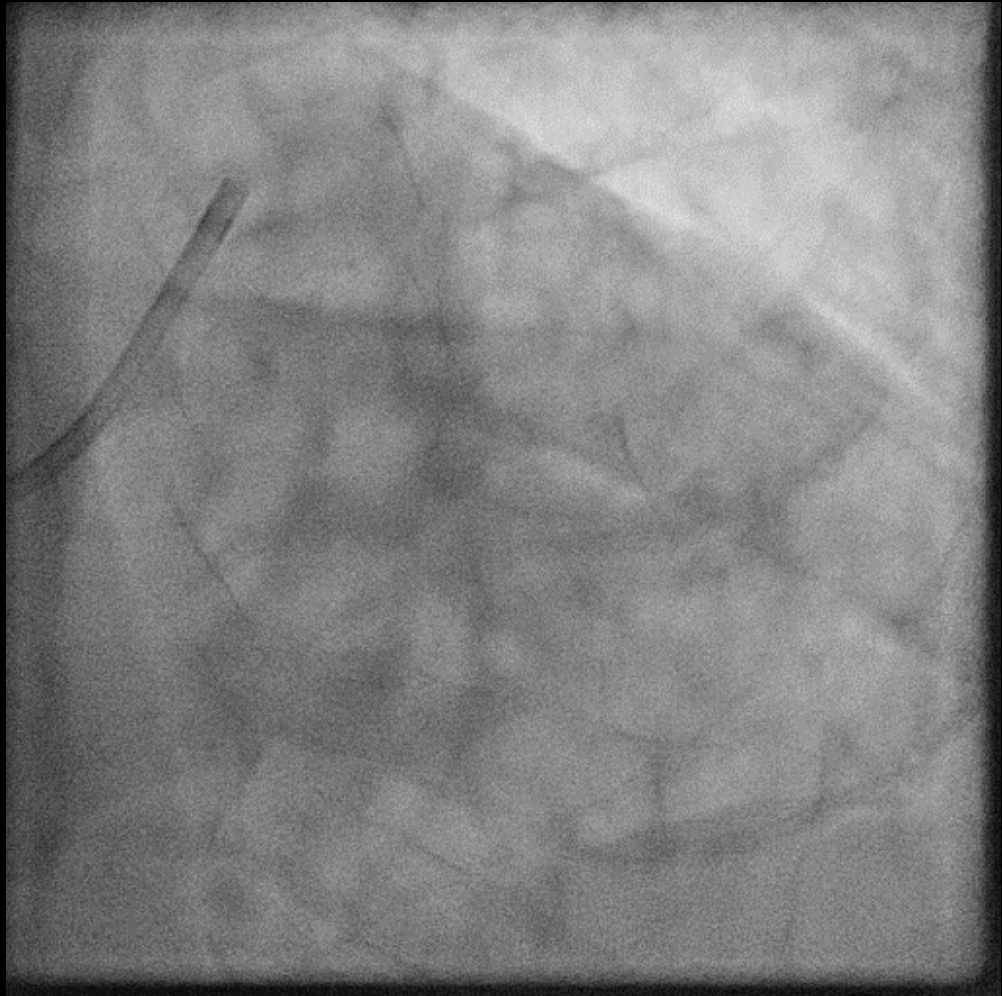
Tight Calcified Lesion



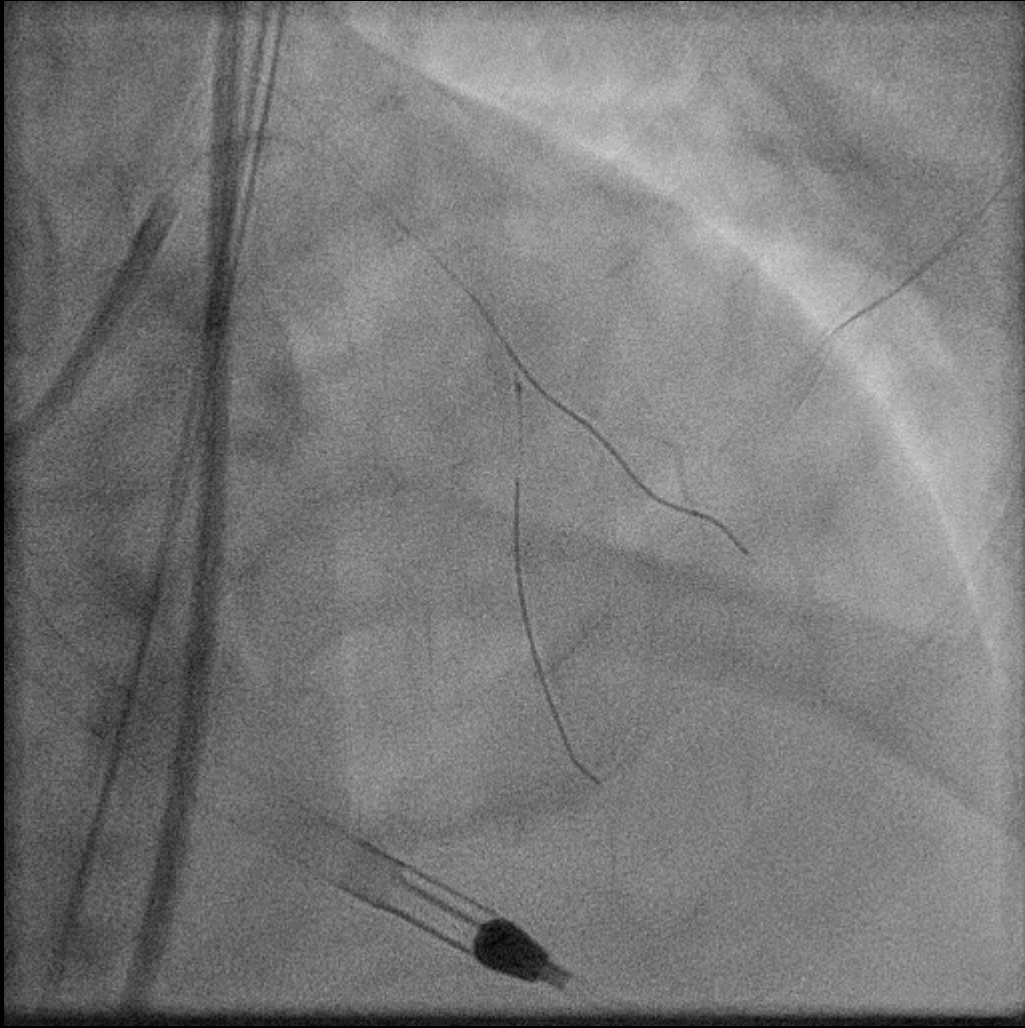
Final Result



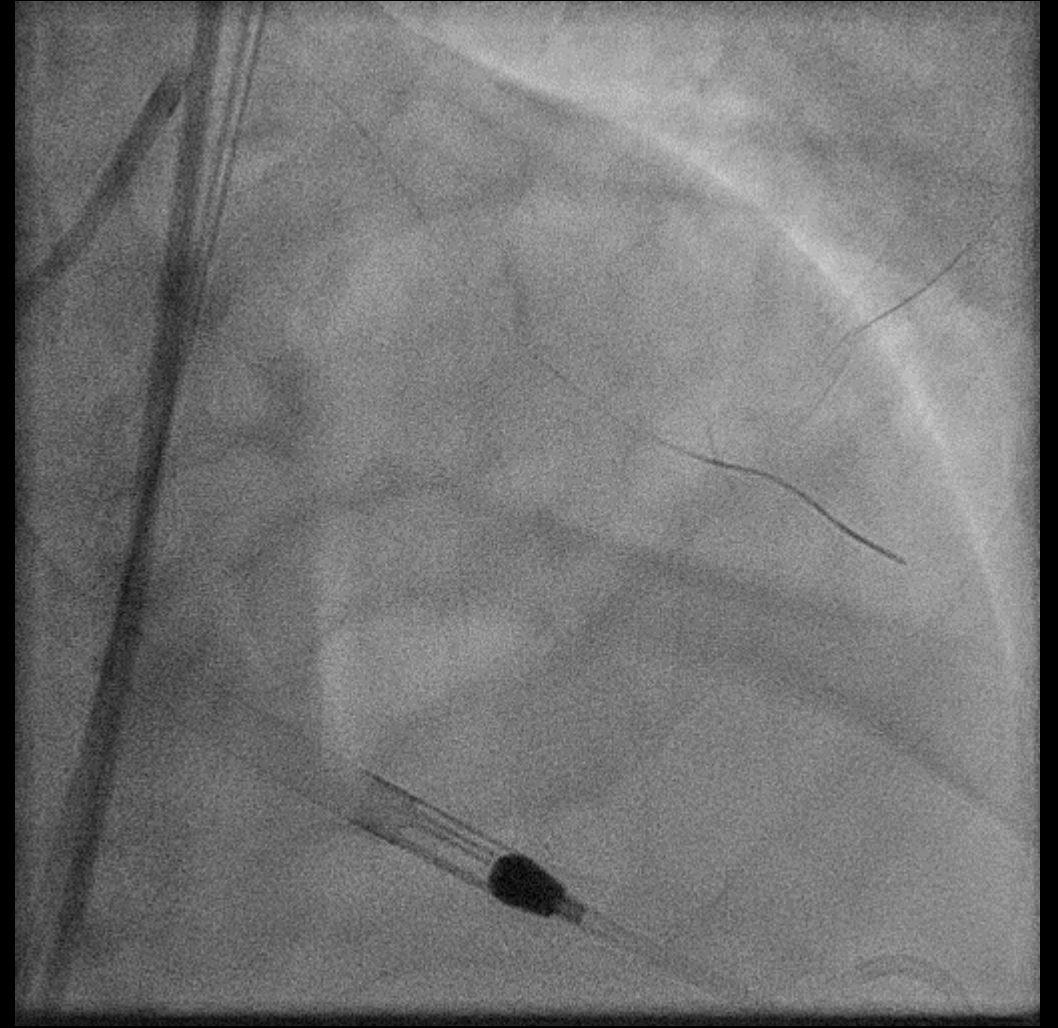
# Almost your worst Nightmare



46 y/o with no prior history presents with Anterior STEMI.



ELCA  
+  
Aspiration

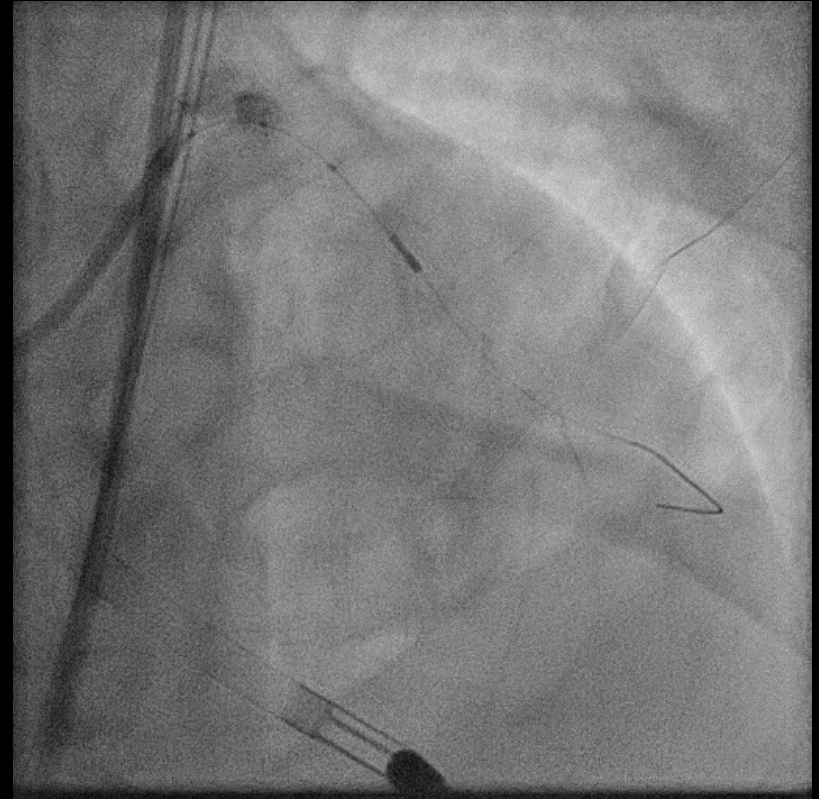
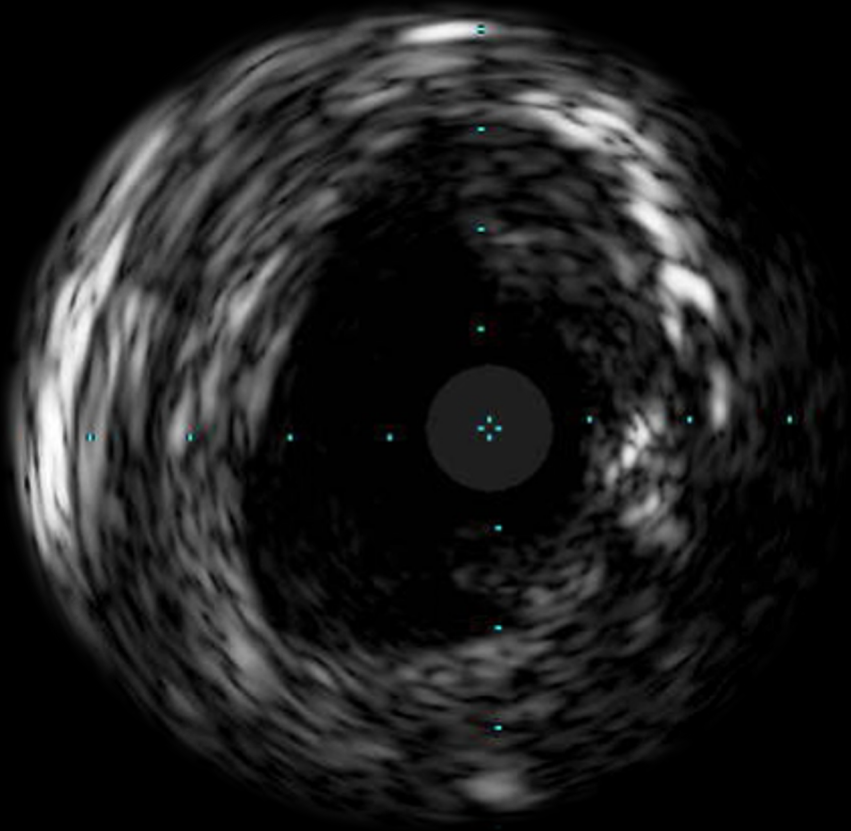


Gave IIbIIIa, Pneumbra Aspiration extensively and POBA with improvement.

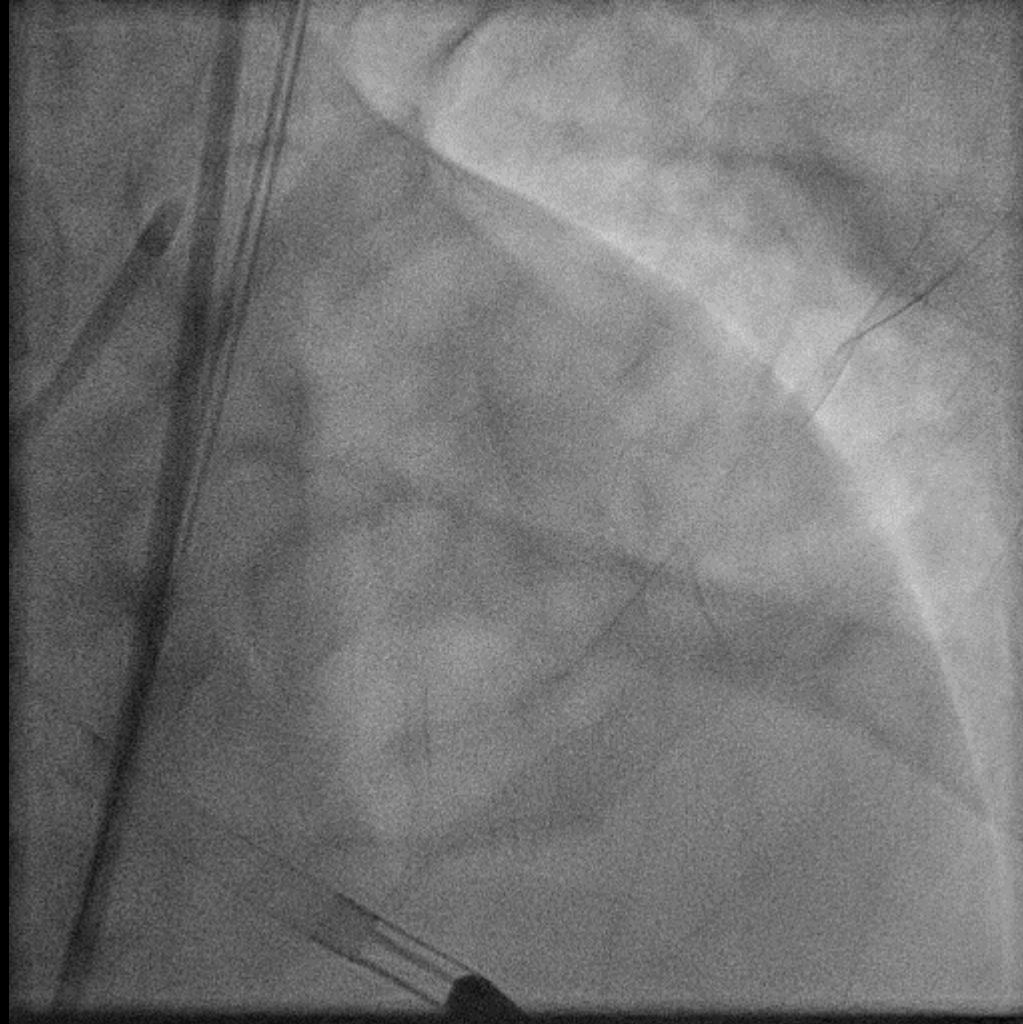


# IVUS

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IVUS showed extensive thrombus, even the area that looked like normal vessel.

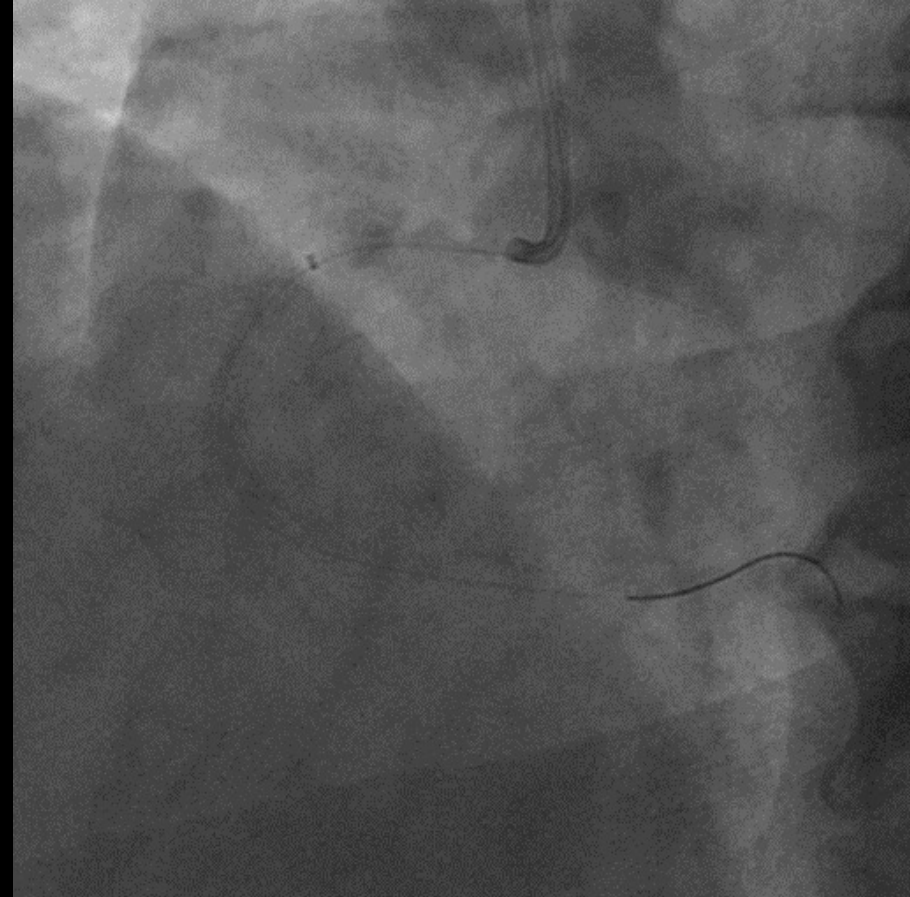
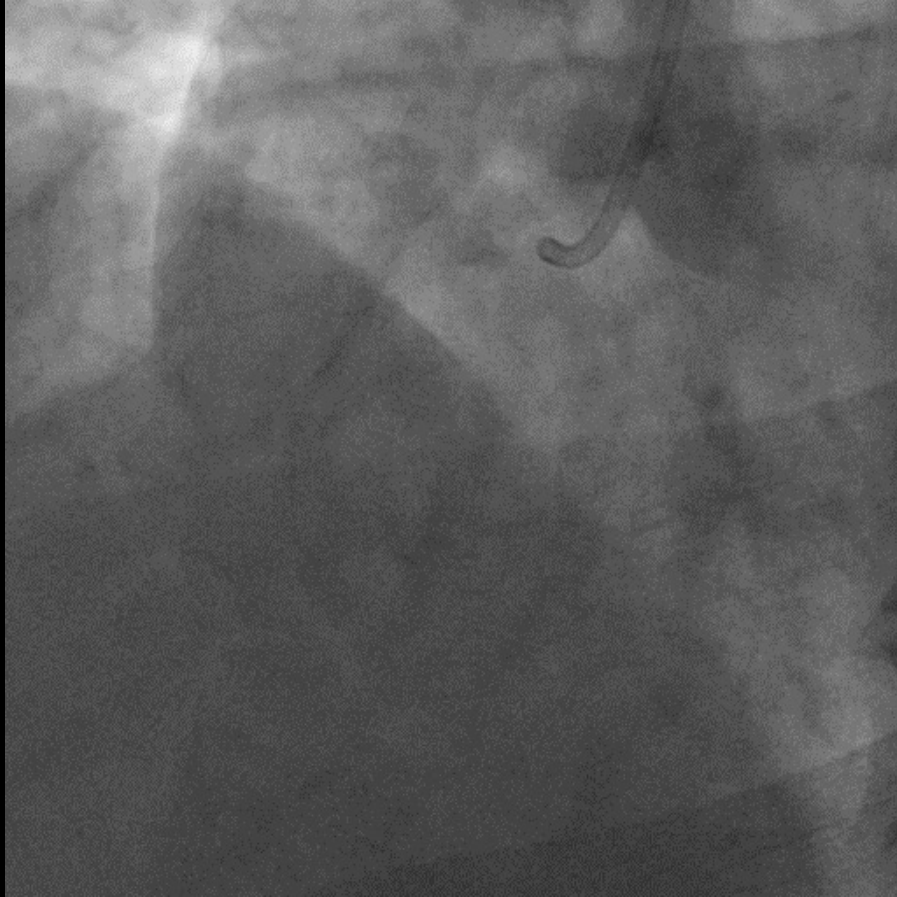


Final result with no stent. Supported with Impella for several days and dc on Triple therapy with EF 30%. Limited surgical options and decided on medical therapy. He is back at work with normal EF and no symptoms.



# Distal RCA dissection

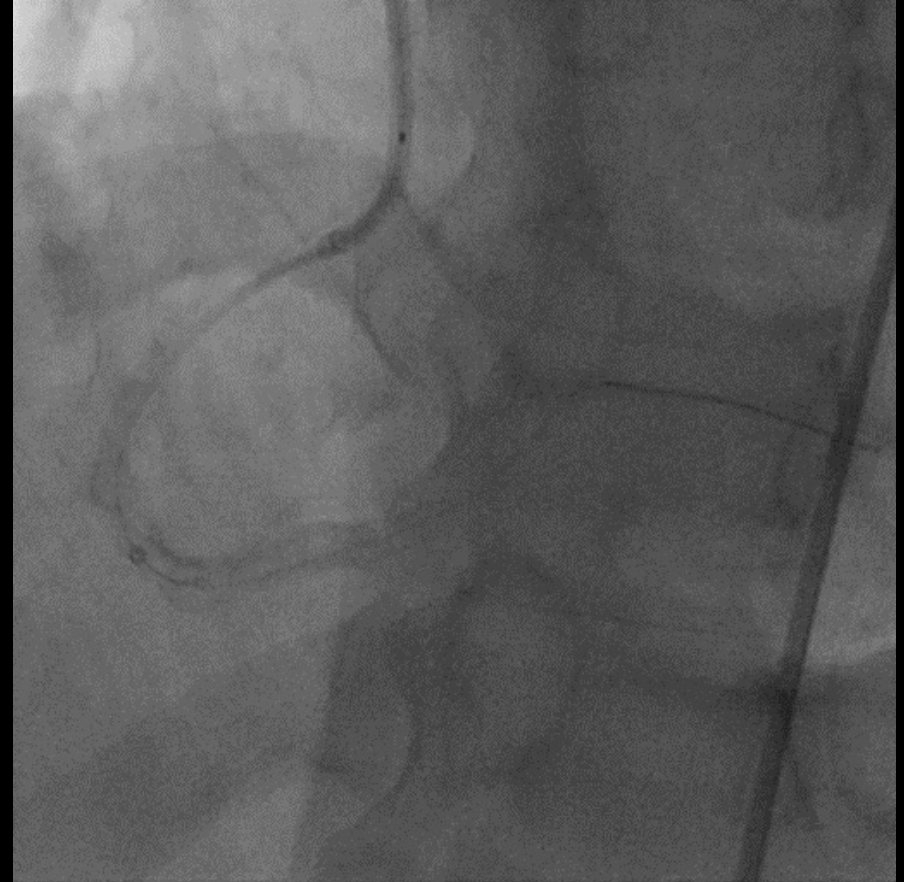
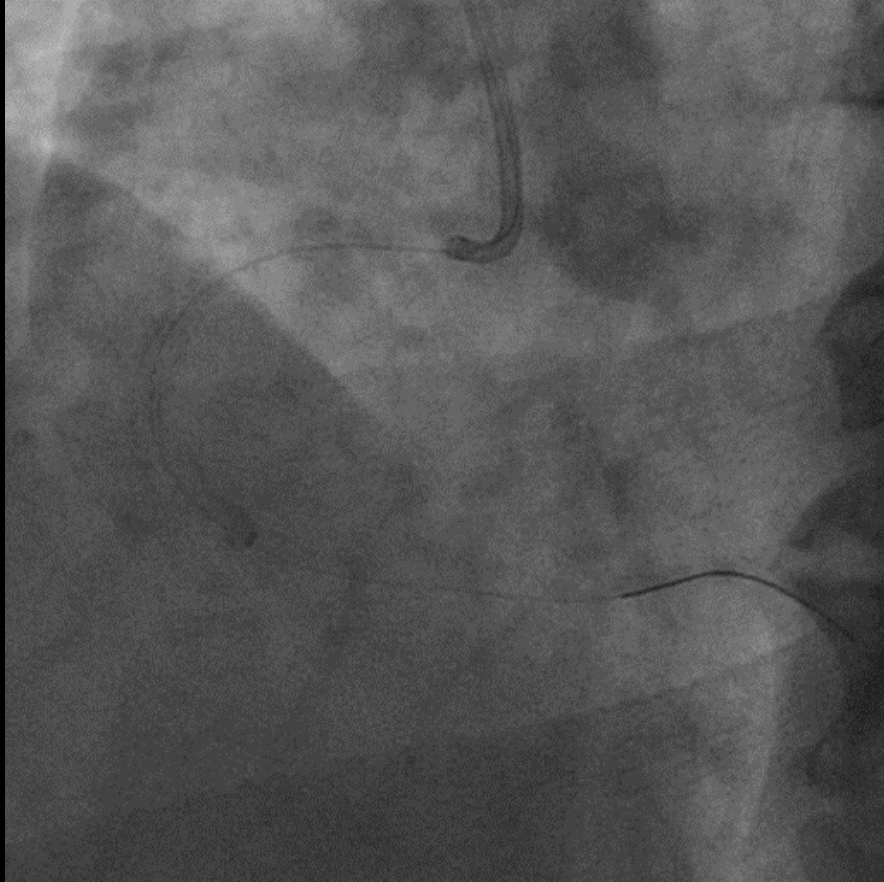
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48 y/o with 2 prior attempts to fix Severe ISR of RCA stent. He presented previously with cardiac arrest and MI and could only treat with POBA.

# Distal RCA dissection

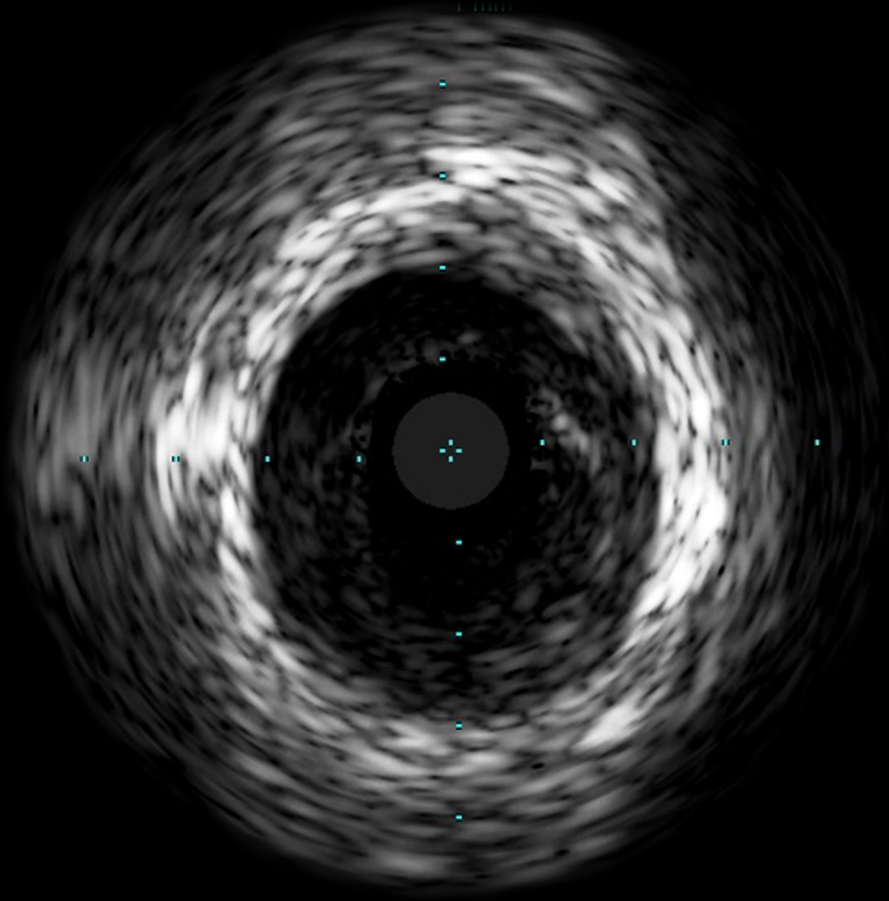
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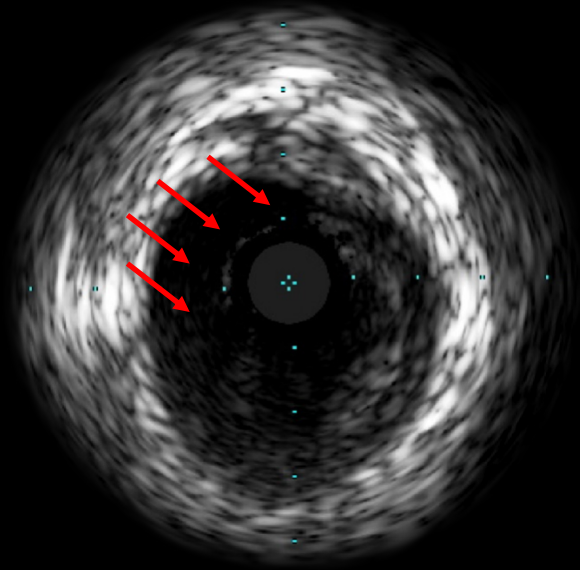
Medtronic Telescope guide Extender is used and dissection gets worse.  
Deploy DES up to the bifurcation.

# IVUS

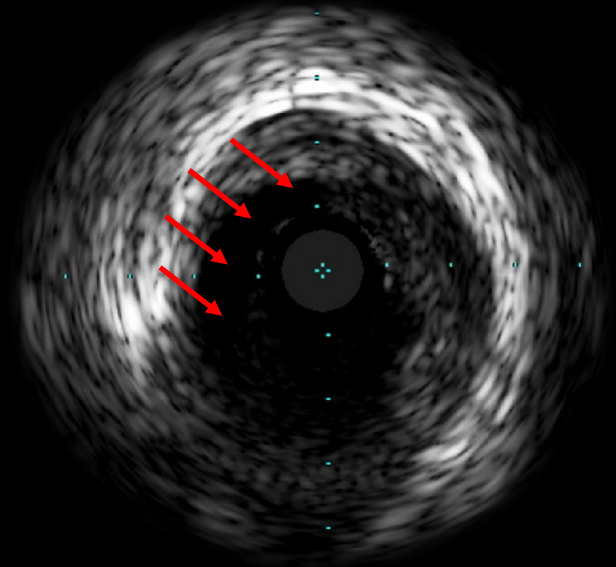
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IVUS



Dissection is  
PLV

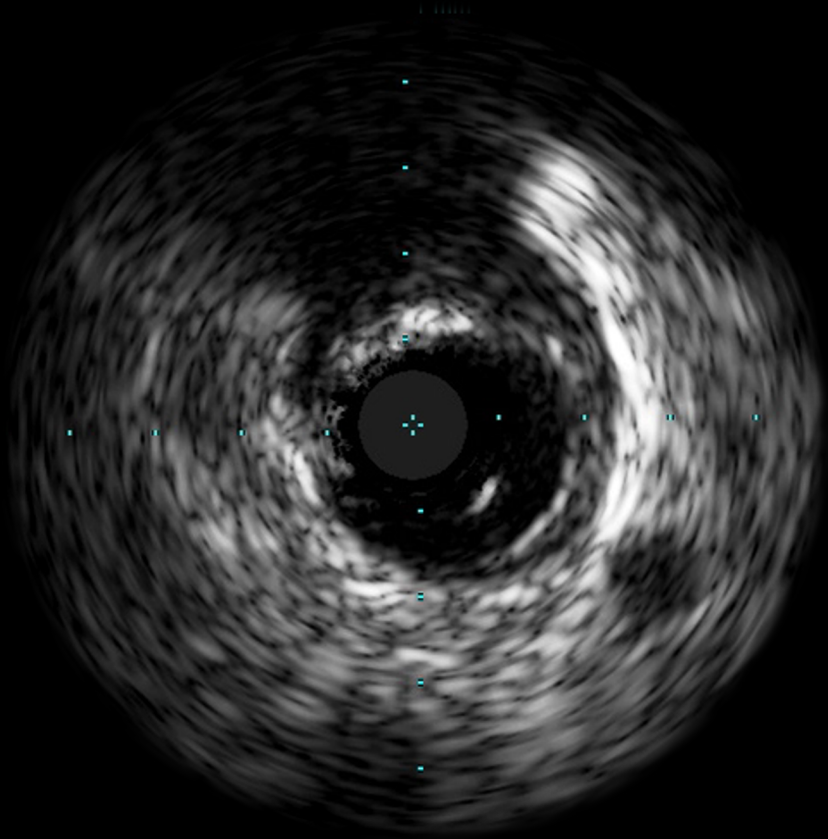


Dissection at  
bifurcation

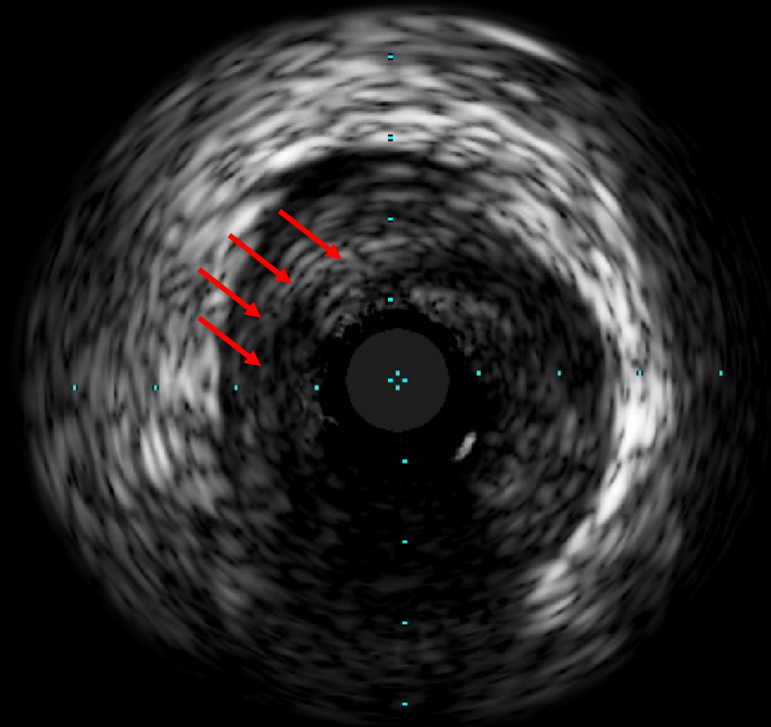


# IVUS

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Repeat IVUS

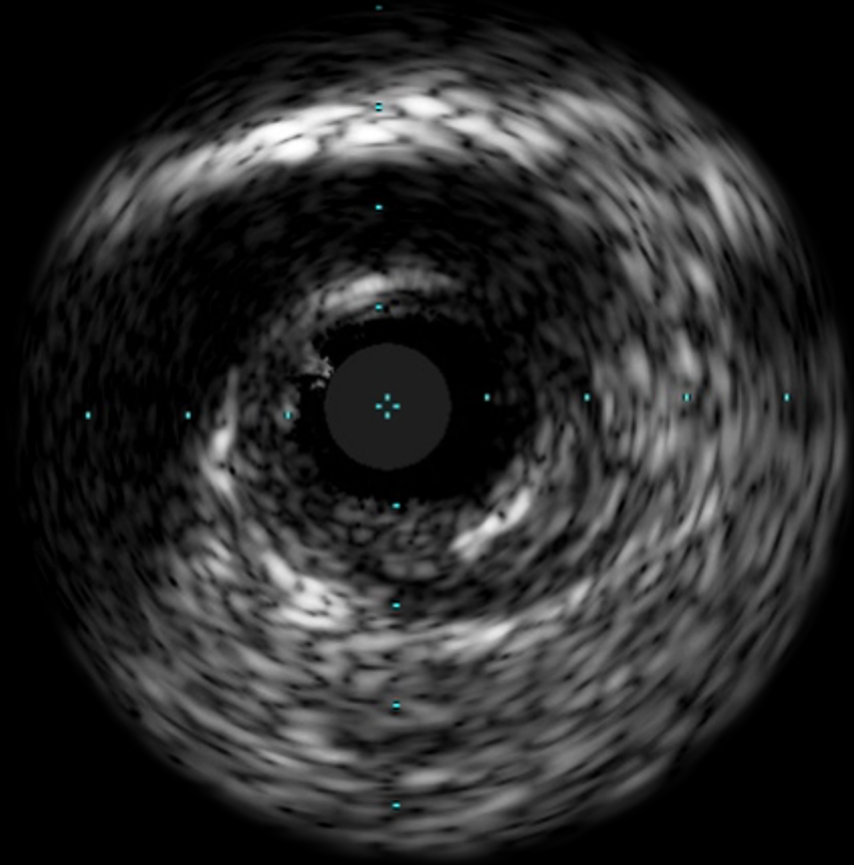
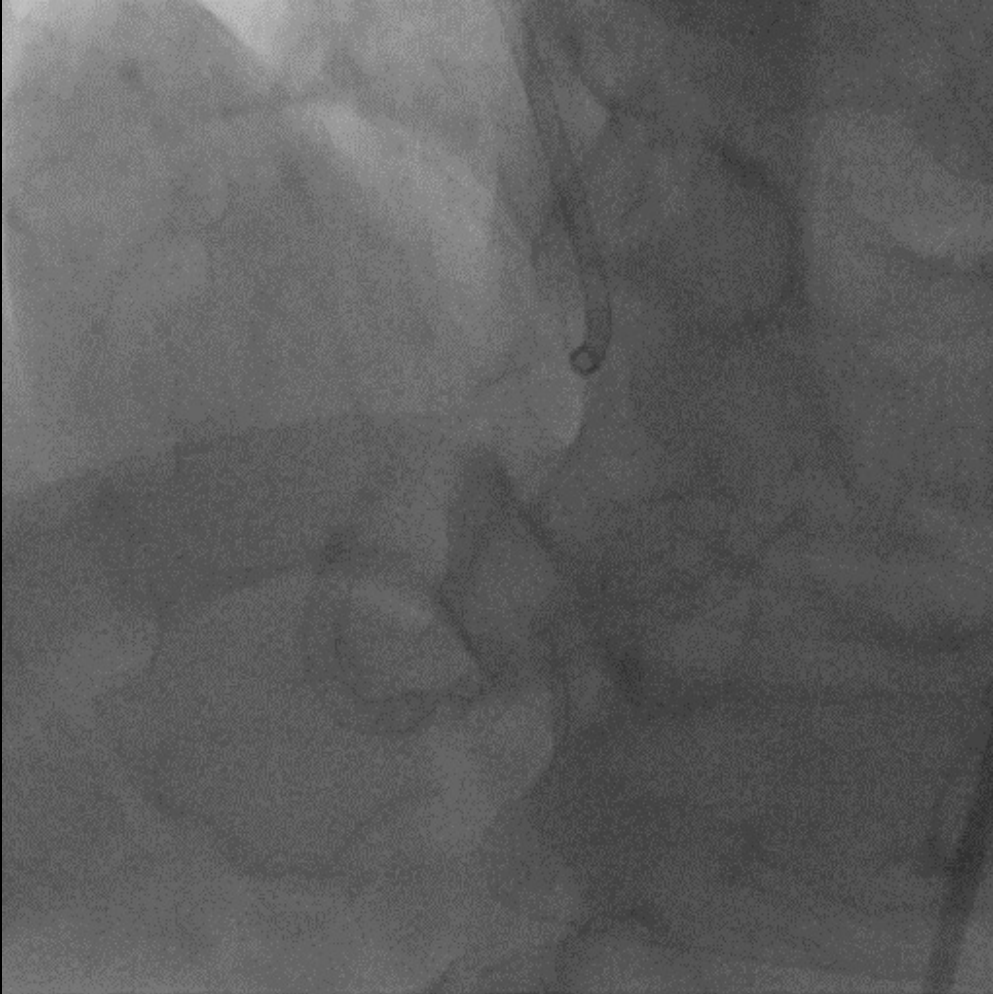


Intramural  
Hematoma



# Final result

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IVUS prior to further PCI in  
PLV

# Thrombus and Dissections

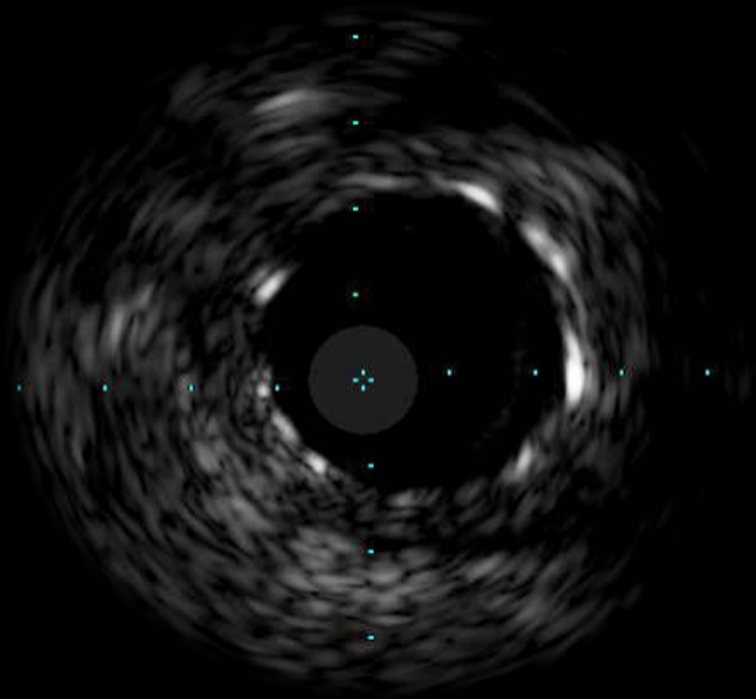
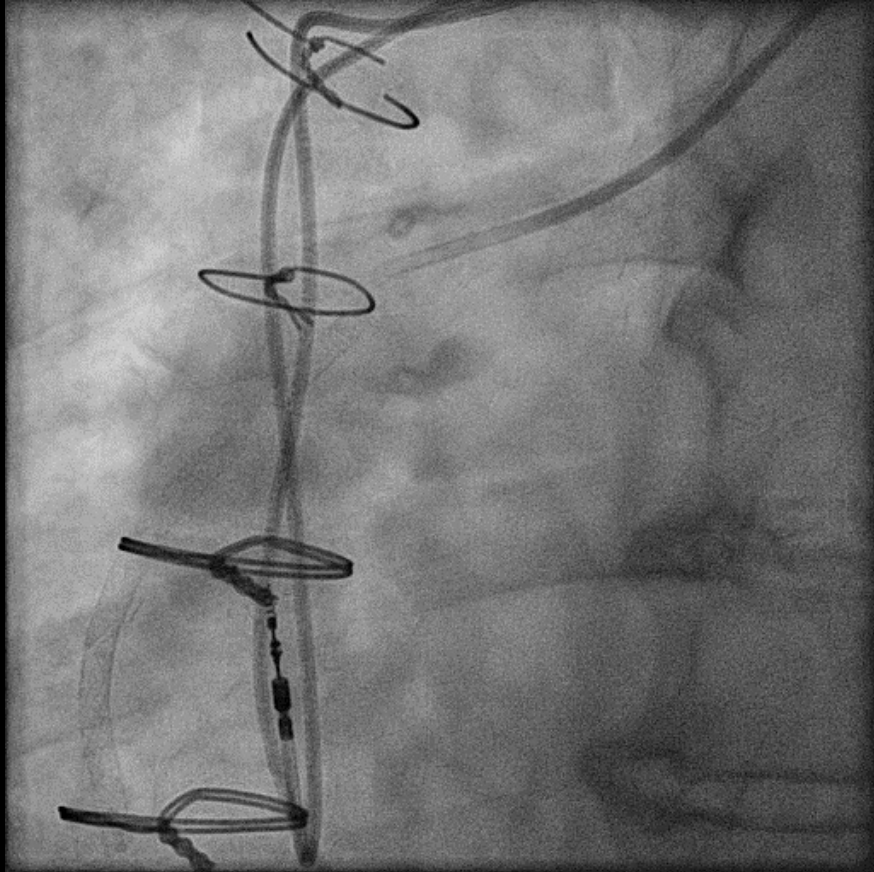
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# Stent optimization

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# SVG Stent Optimization

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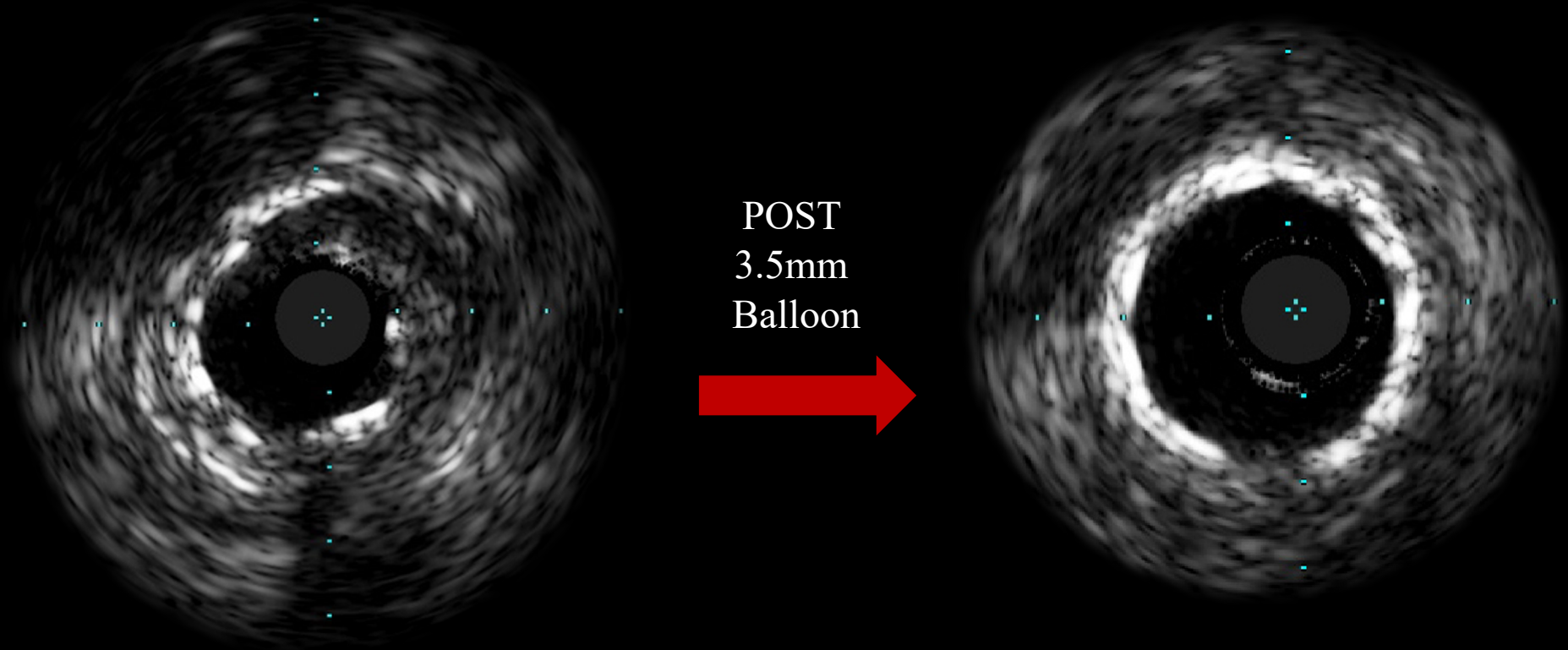


PCI to SVG graft to the RCA...angio looks pretty good, right?



# SVG Stent Optimization

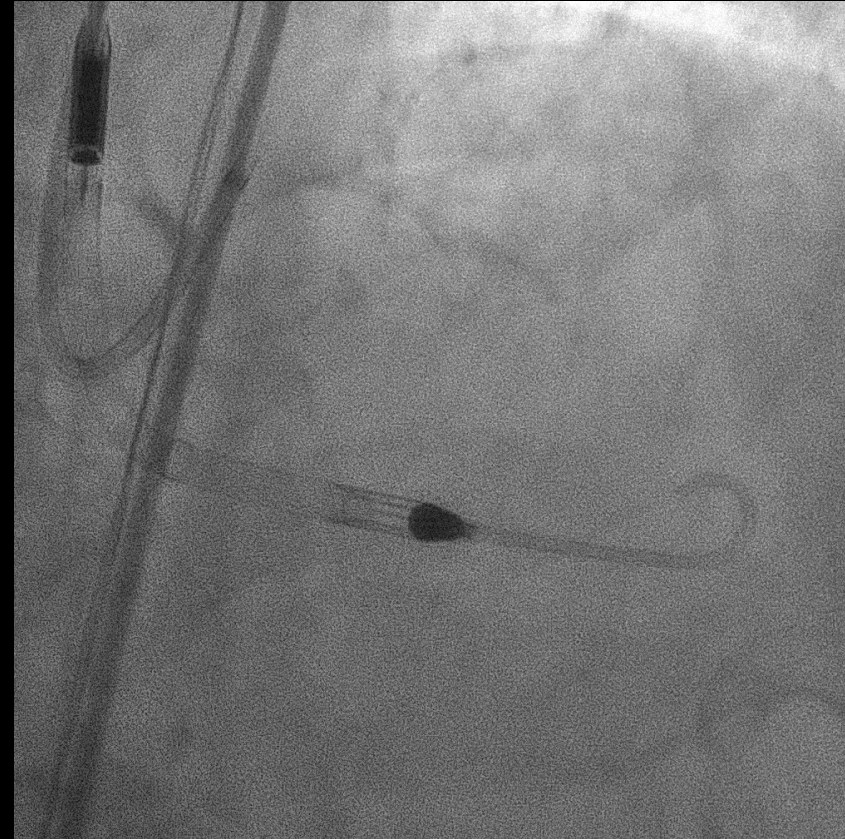
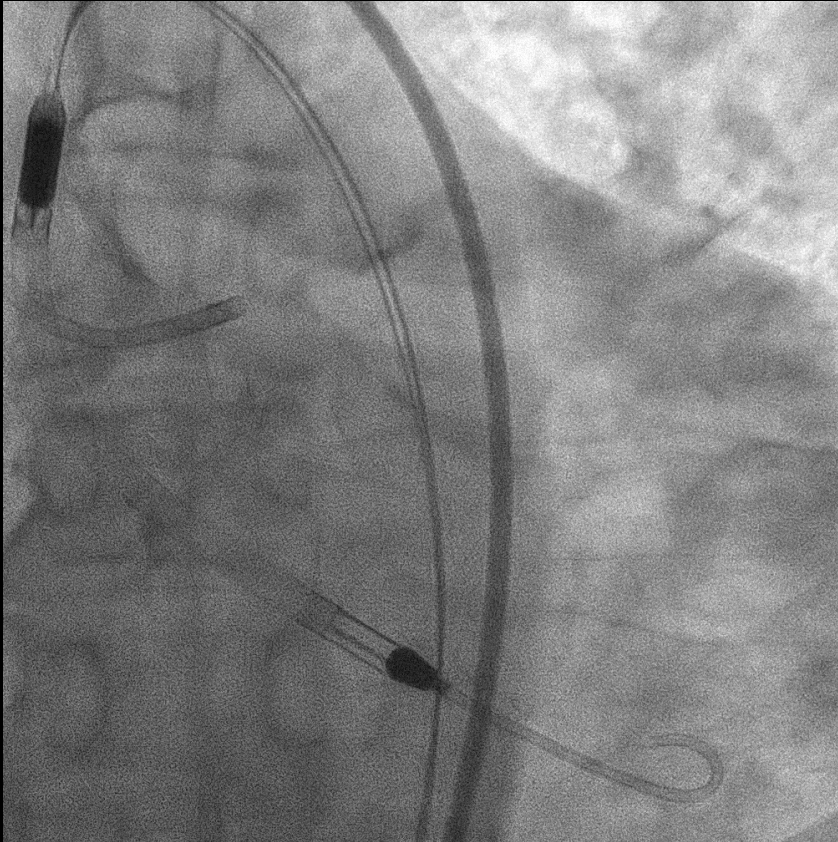
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Covered with an additional stent...looks good now, right?

# Left Main Optimization

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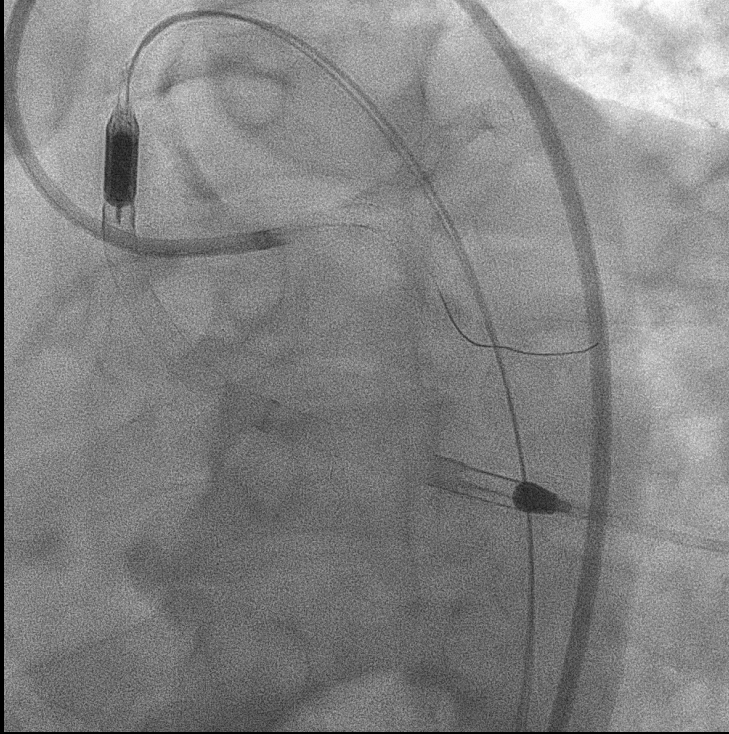


68 y/o male with recent diagnosis of Severe AS, EF 20% and Severe left main CAD. Felt to be a better candidate for TAVR/PCI so under went BAV with Impella placement and complex PCI.

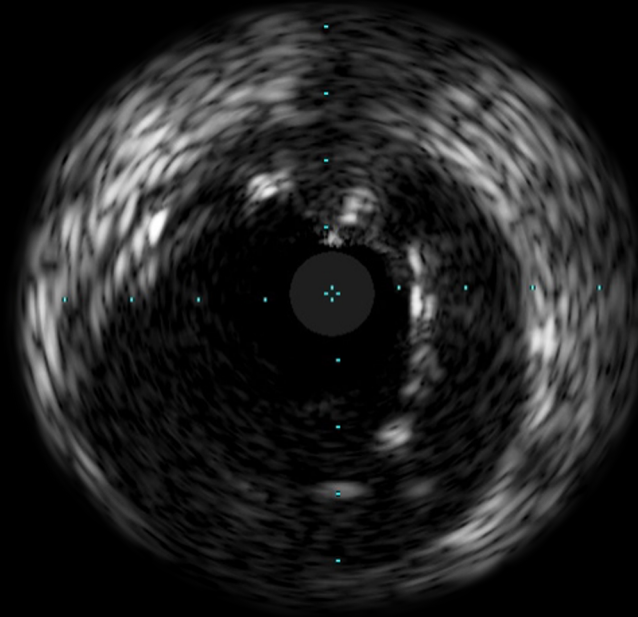


# Left Main Optimization

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Post POT

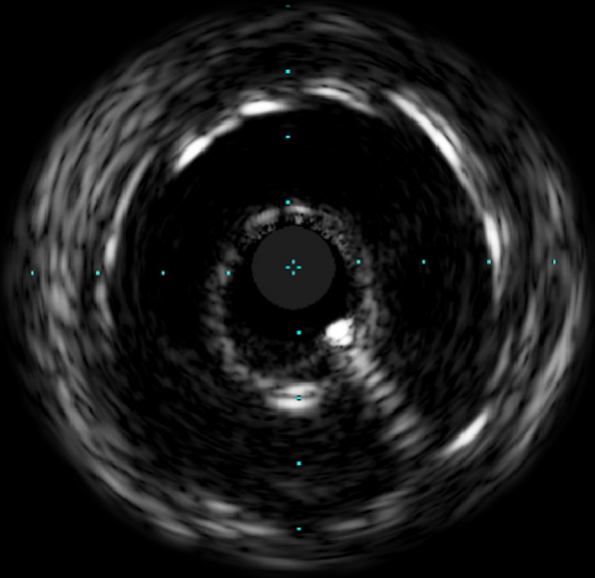


IVUS

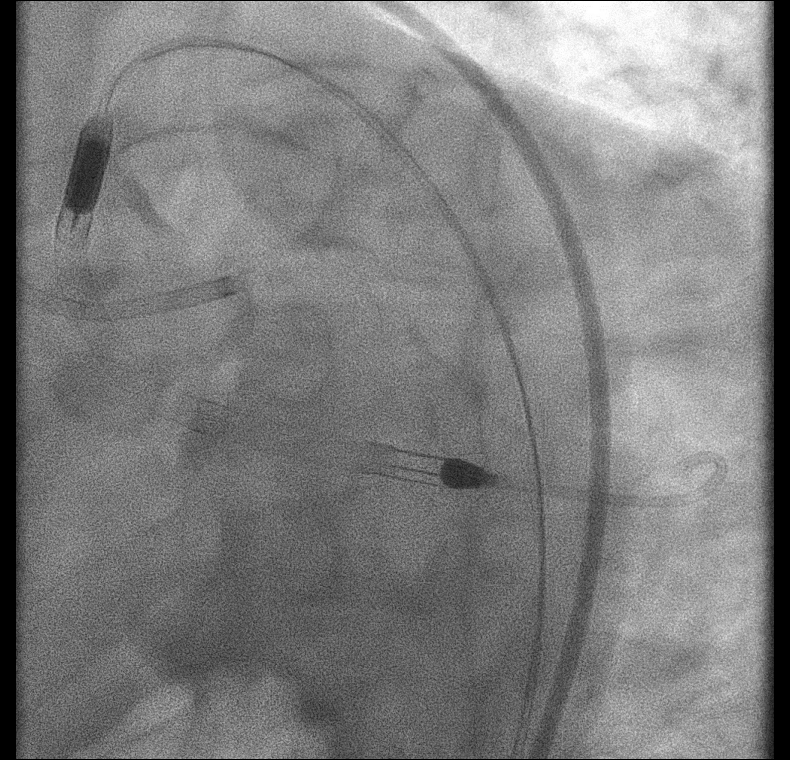
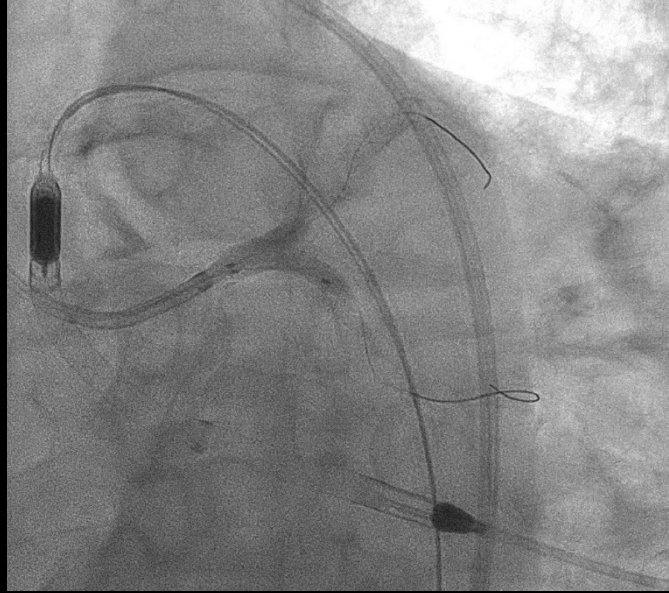
CSI to LAD and then PCI but patient developed severe hypotension and loss of pulsatility  
Despite the impella. Slow flow in the circumflex was noted, it was ballooned and eventually proceeded  
with bifurcation stenting of the left main. POT with a 5.0 mm balloon but could not get “kissing balloons”  
to cross despite multiple wires.

# Left Main Optimization

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Post 6.0mm balloon



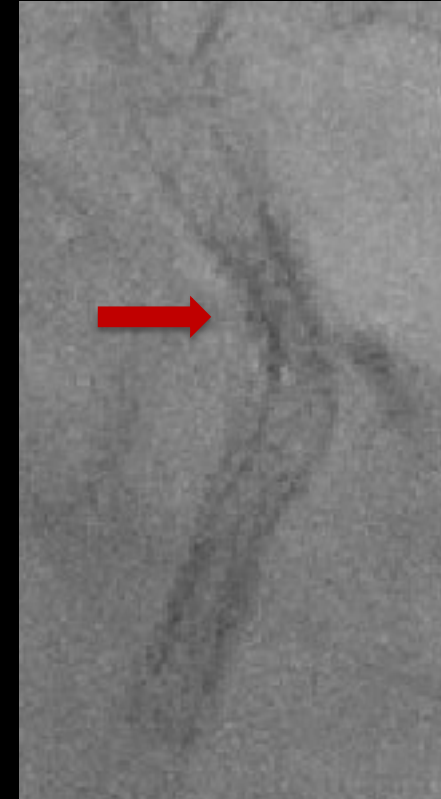
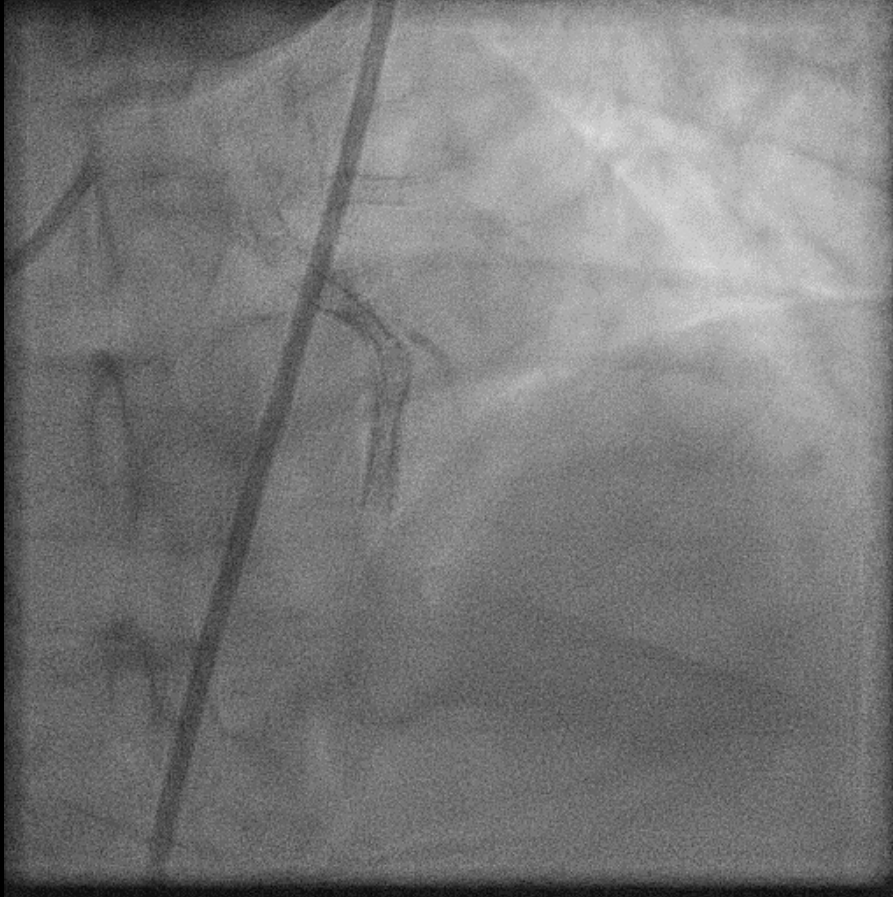
Final Result

Easily crossed with 1.5mm NC balloon and then placed a 3.75mm balloon in both limbs  
For “kissing balloon” inflations.



# Underexpanded Stents

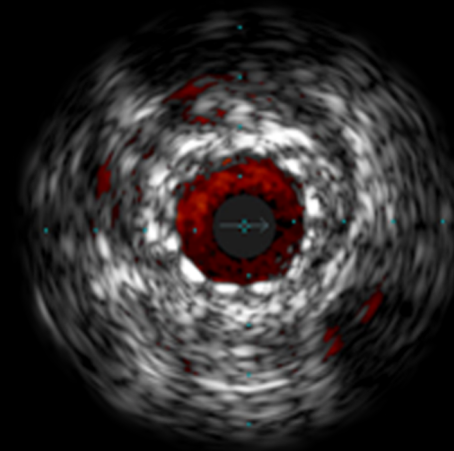
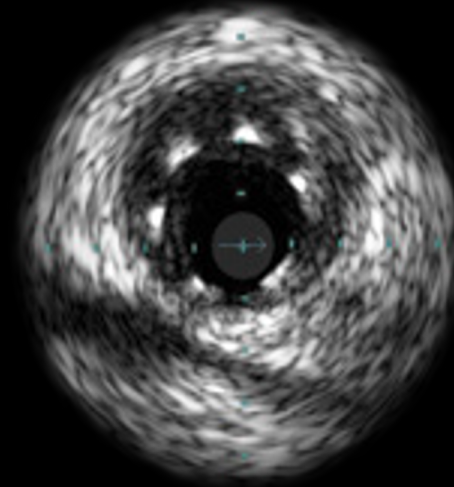
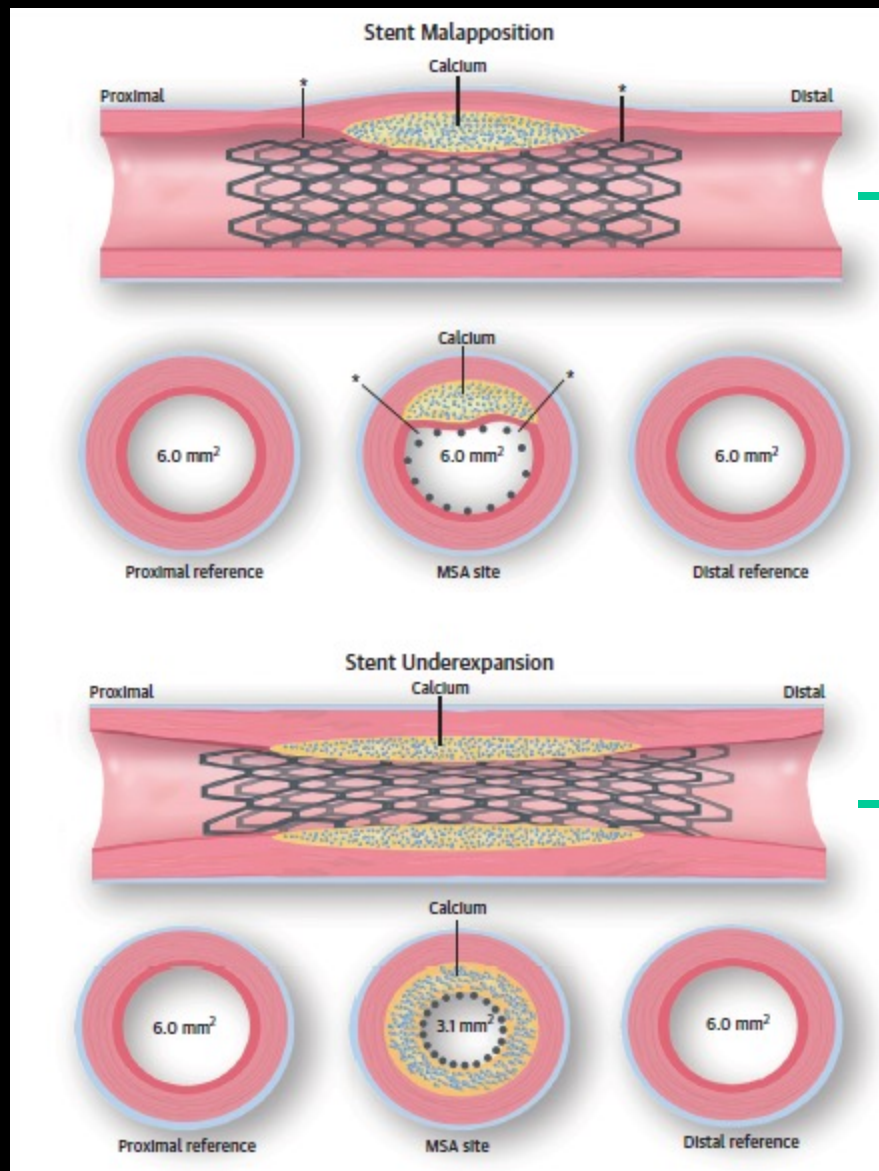
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Underexpanded  
Stent

54 year old with  $> 5$  PCIs to her LAD presents with Anterior ST elevations. Last PCI was 3 months ago.

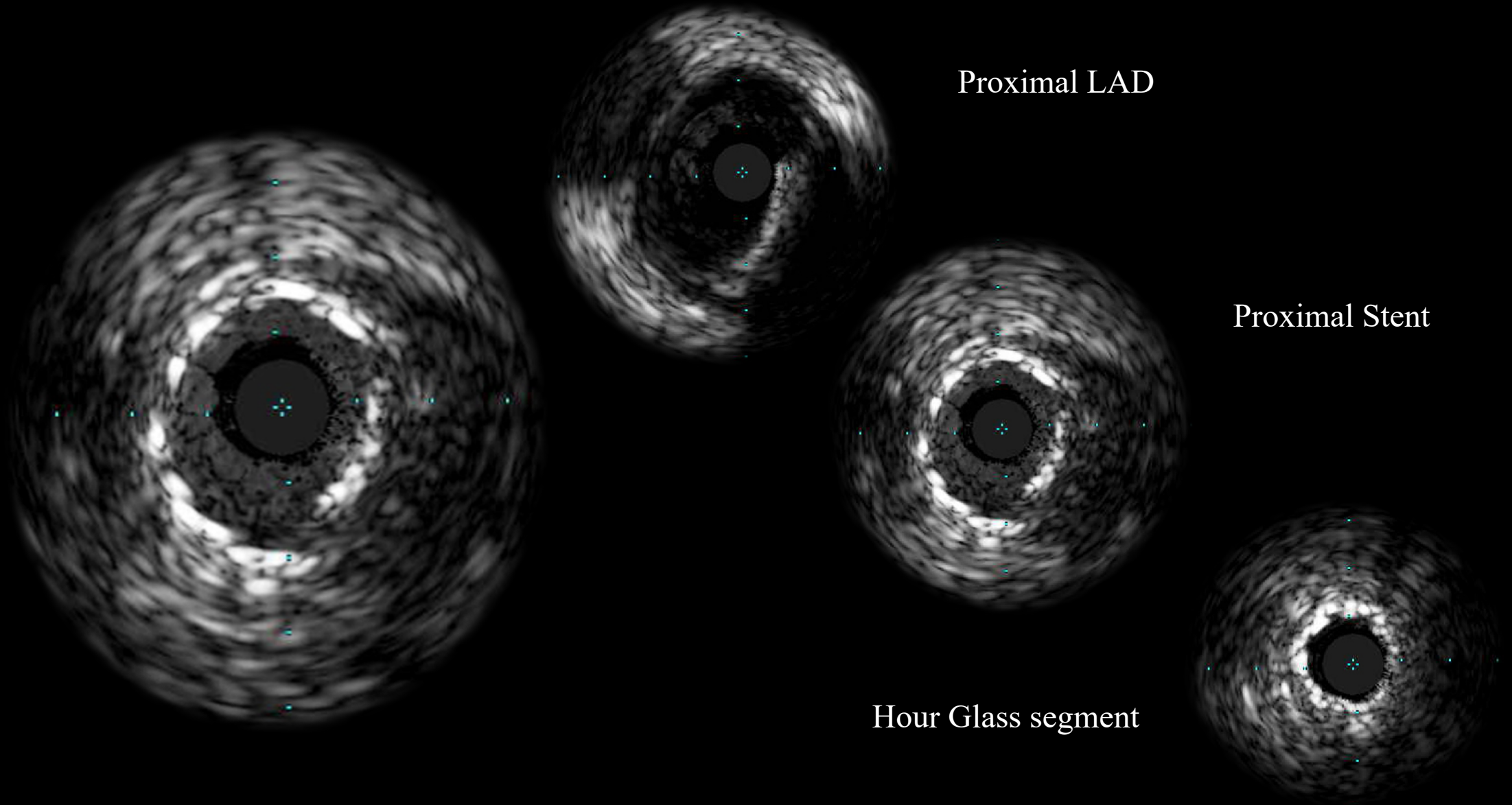
# Malapposed vs. Underexpanded



JACC. 2014; 64:207-22.

# Underexpanded Stents

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# Underexpanded Stents

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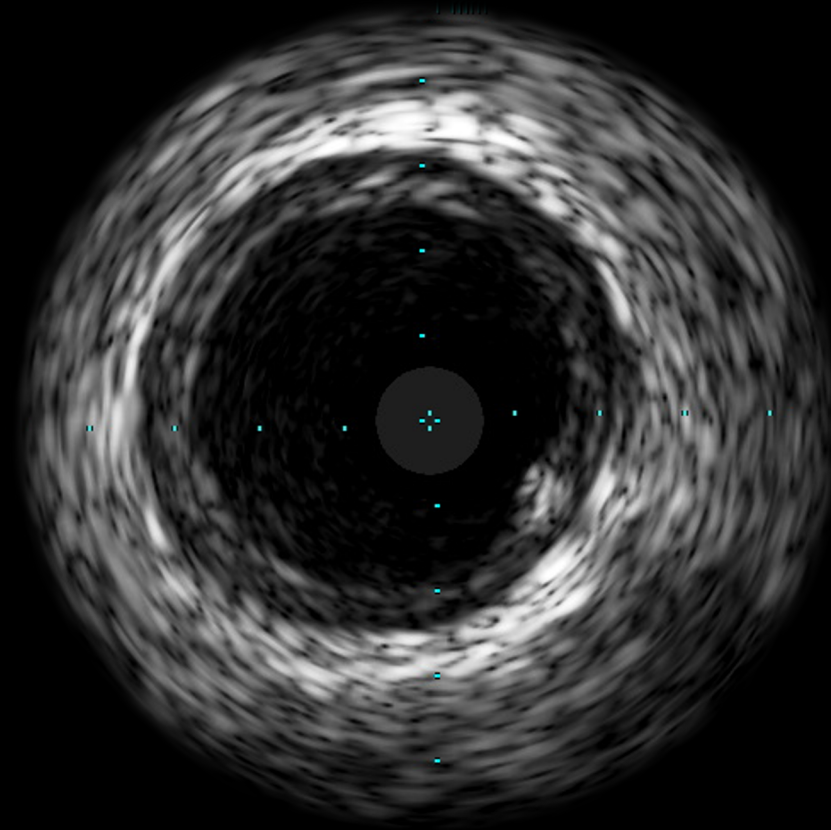
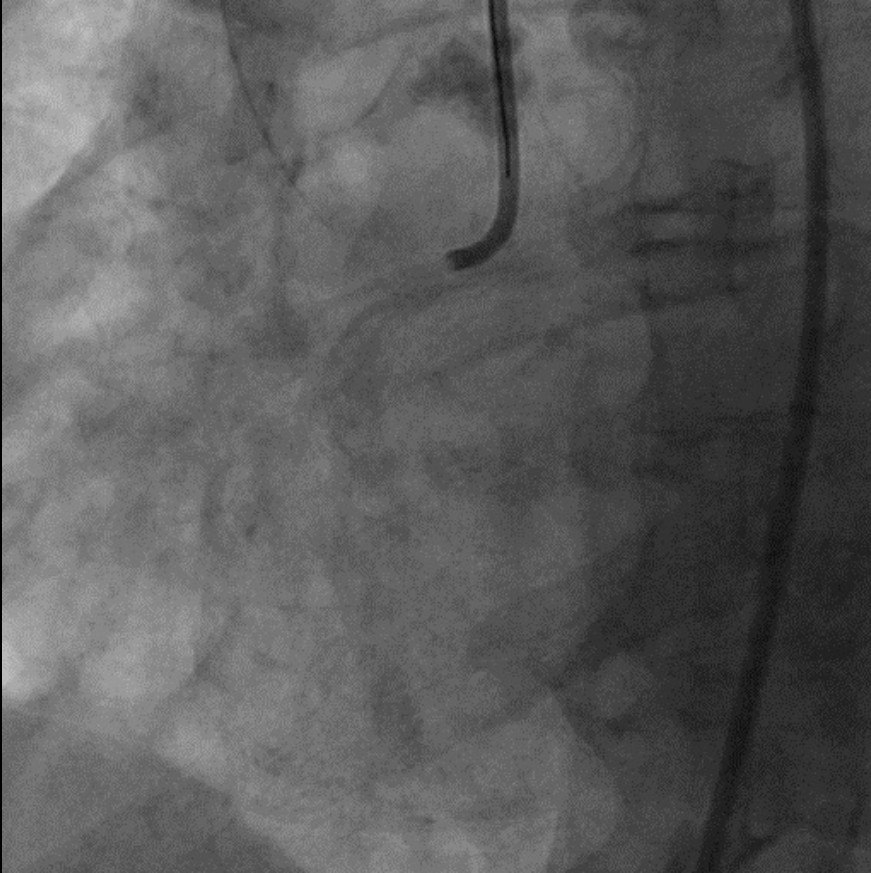


Final result s/p ECLA with contrast and multiple NC balloons to 35atms.  
Came back for PCI for her RCA and Ramus.



# Underexpanded Stents

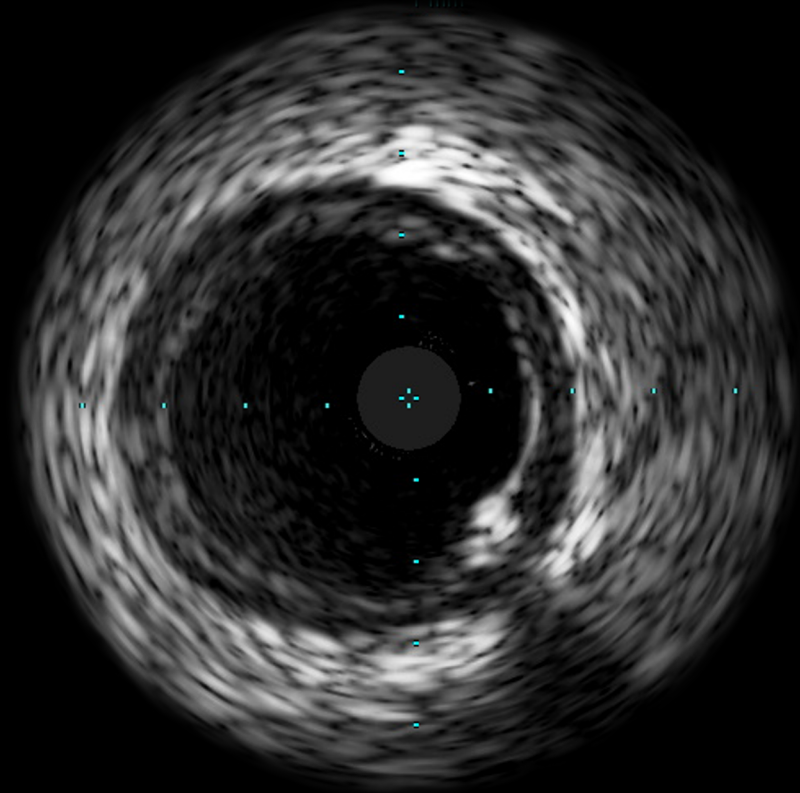
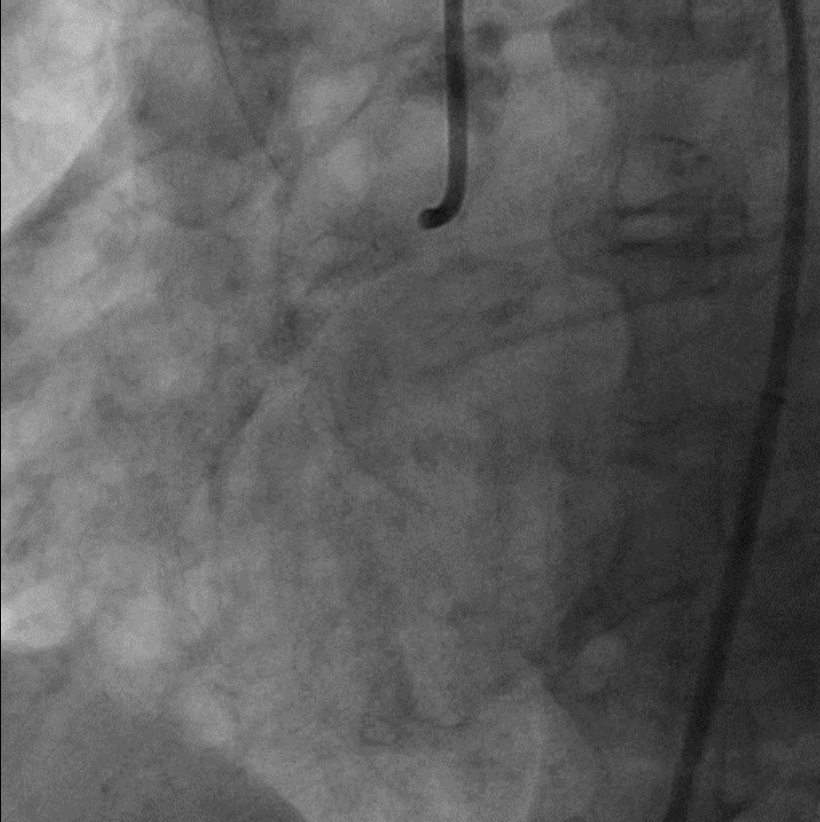
---



85 year old with Moderate AS and angina. Moderate lesion in the RCA is iFR positive.

# Underexpanded Stents

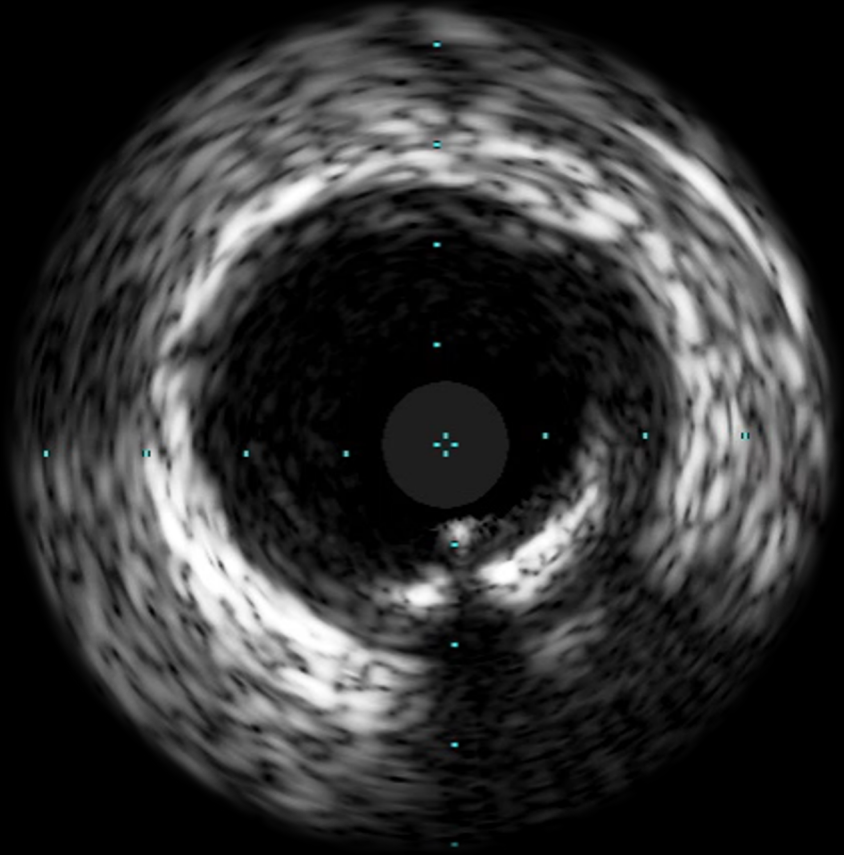
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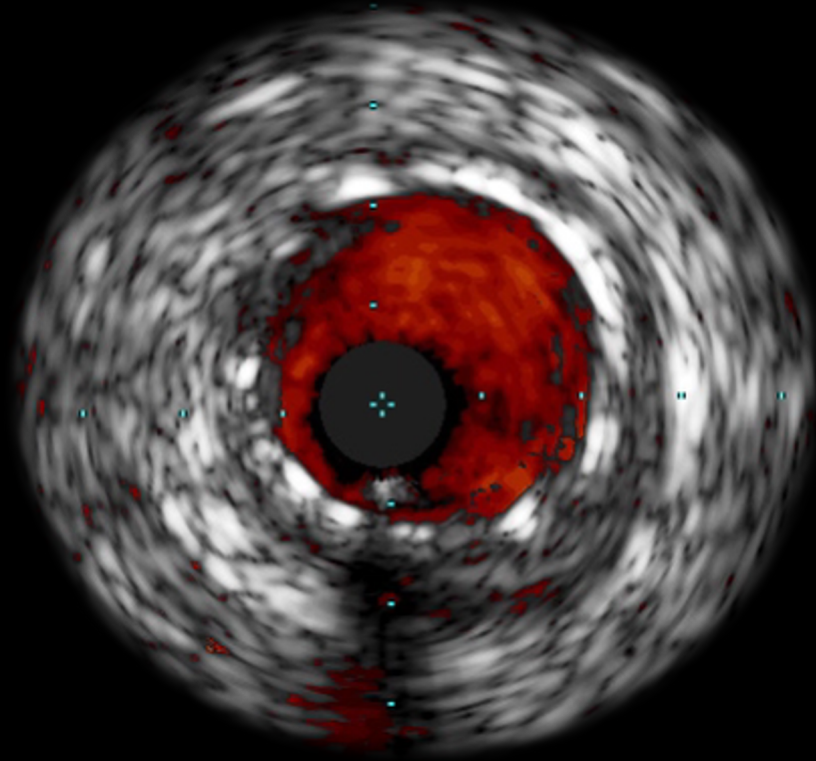
That amount of calcium you can't get away with. Final iFR was 0.97 but high chance of restenosis.

# STEMI

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Post PCI IVUS

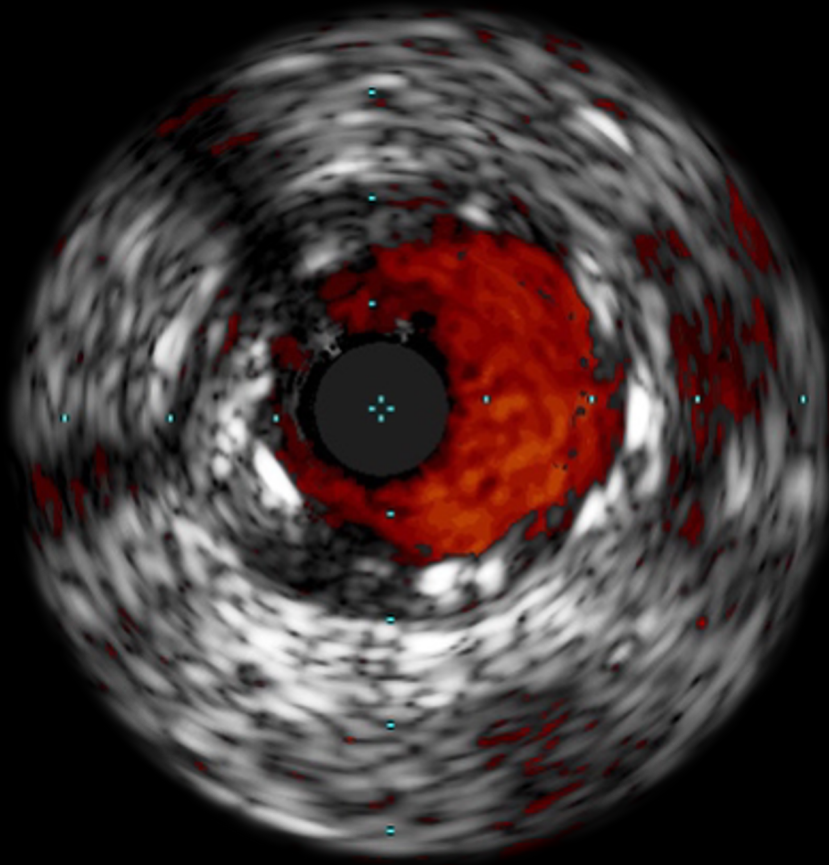


Chromoflow

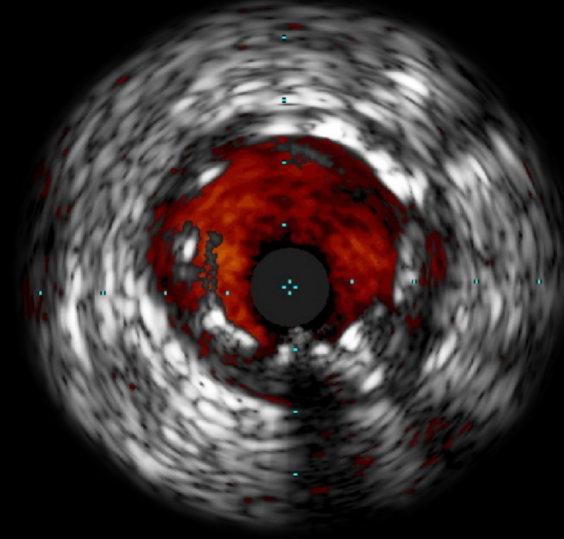


# Malapposed Stent

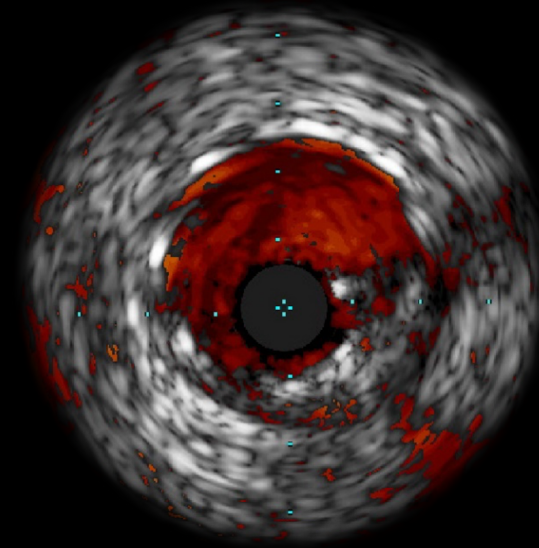
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Post Dilatation IVUS



Pre Dilatation IVUS

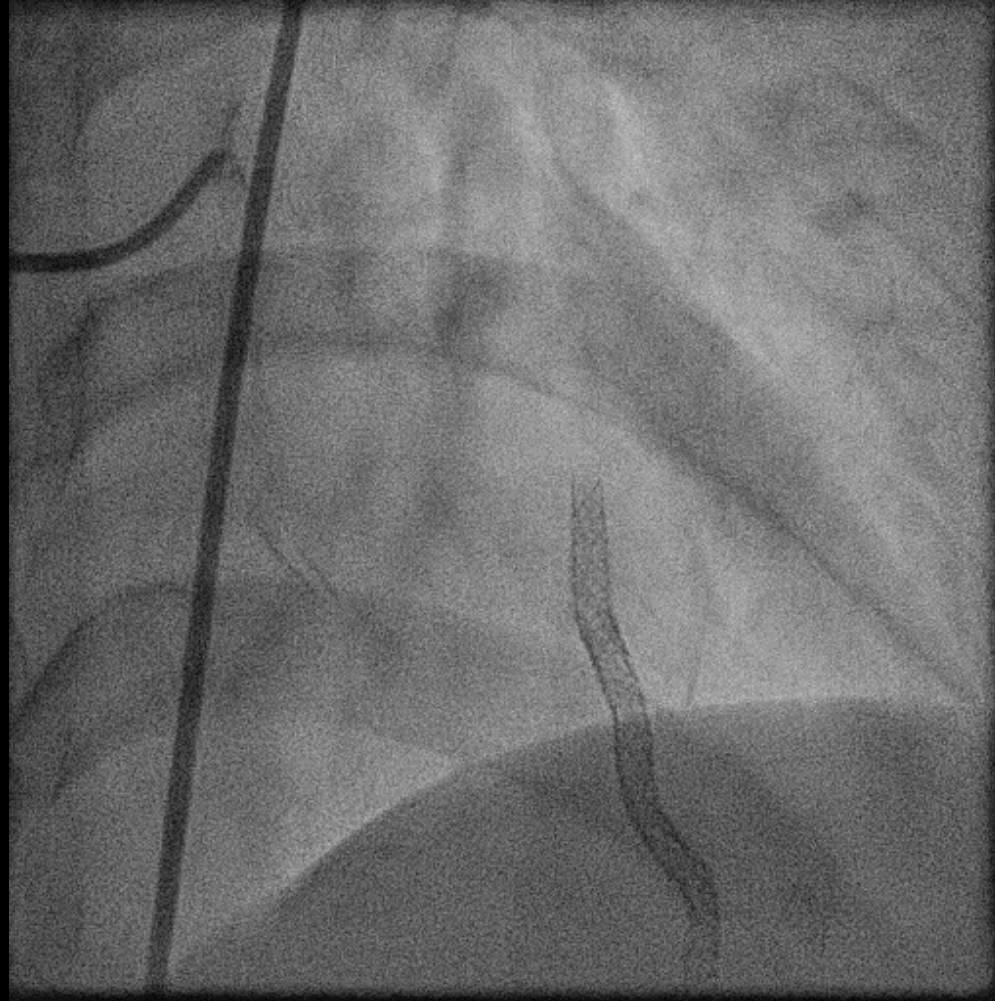


Post Dilatation IVUS



# Restenosis

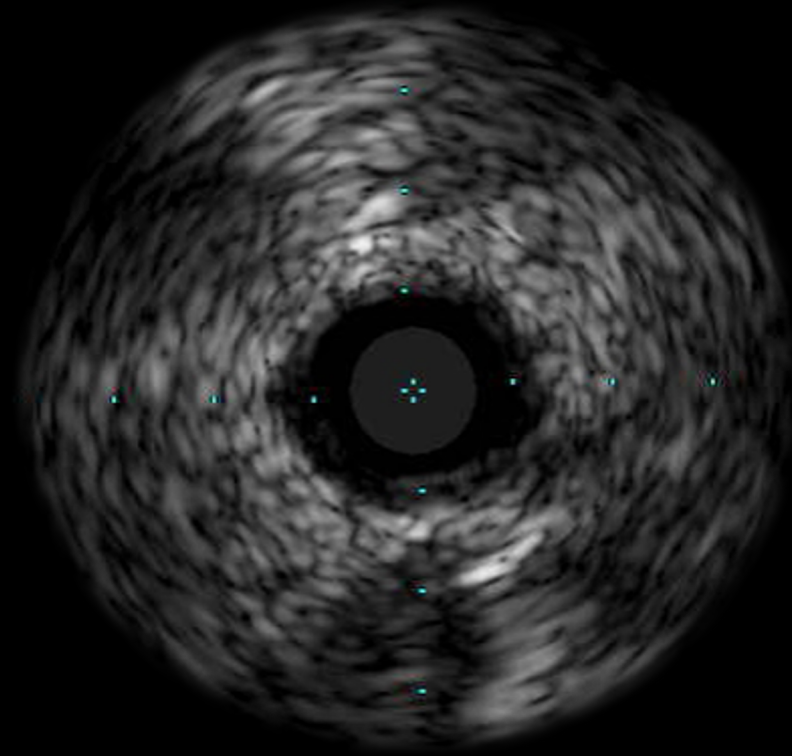
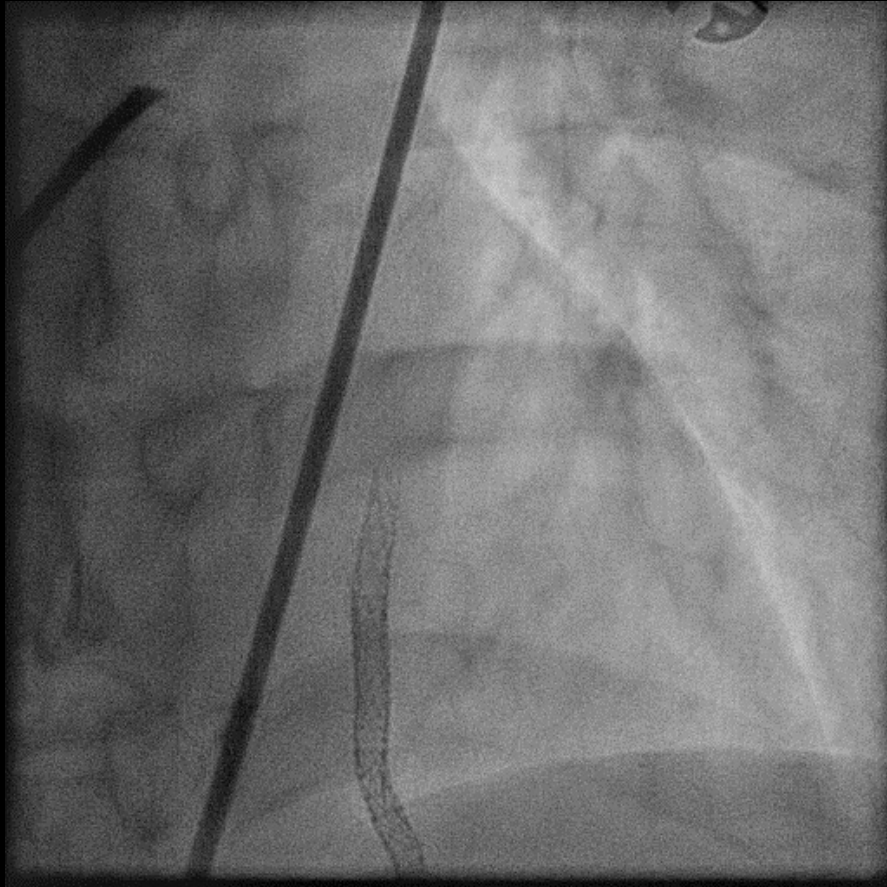
---



47 y/o with prior history of SCAD and BMS placement with multiple ISR with brachytherapy and repeat stenting presents with angina.

# Restenosis

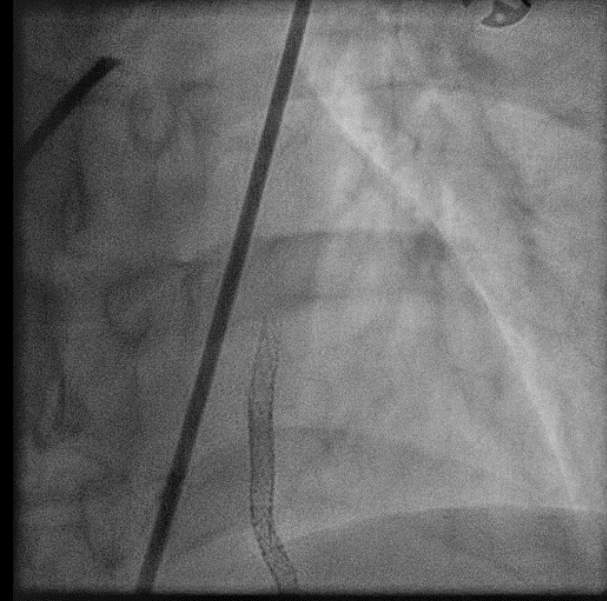
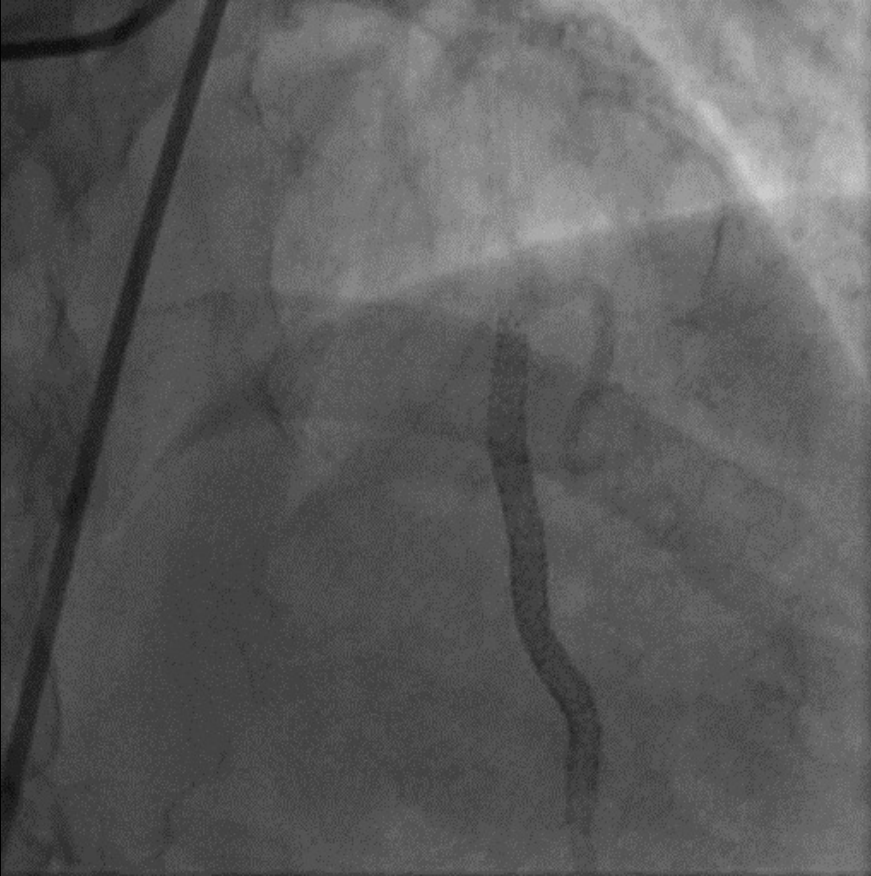
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Laser with contrast and high pressure balloons with repeat stenting.

# Restenosis

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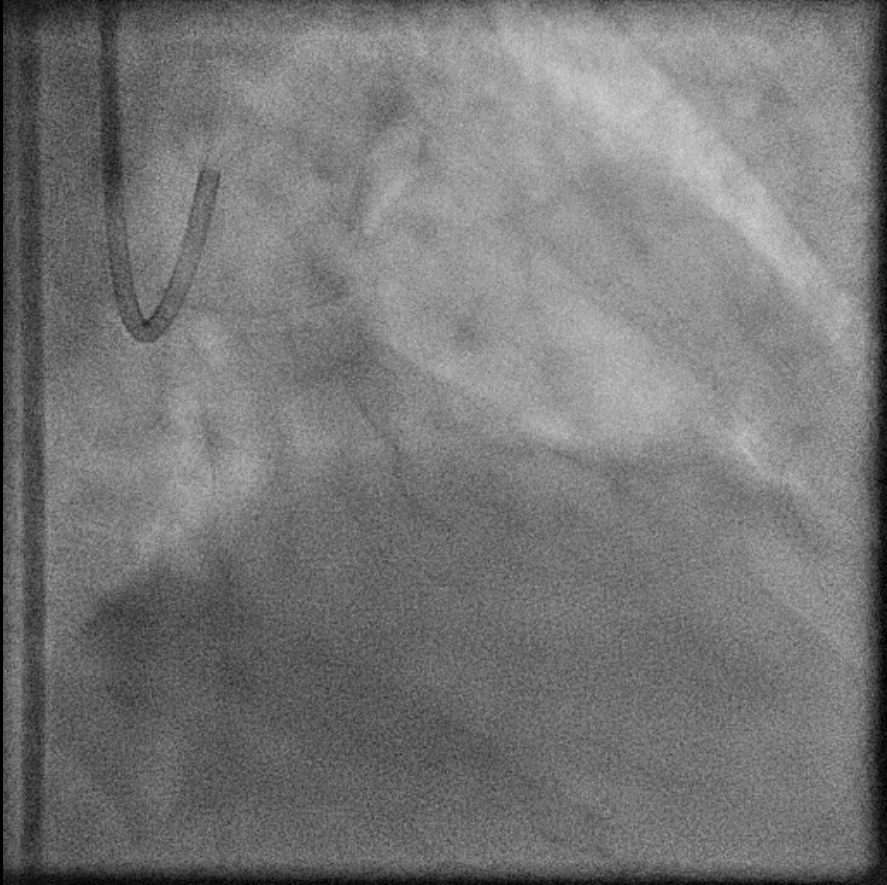


Came back with chest pain 1 week later.

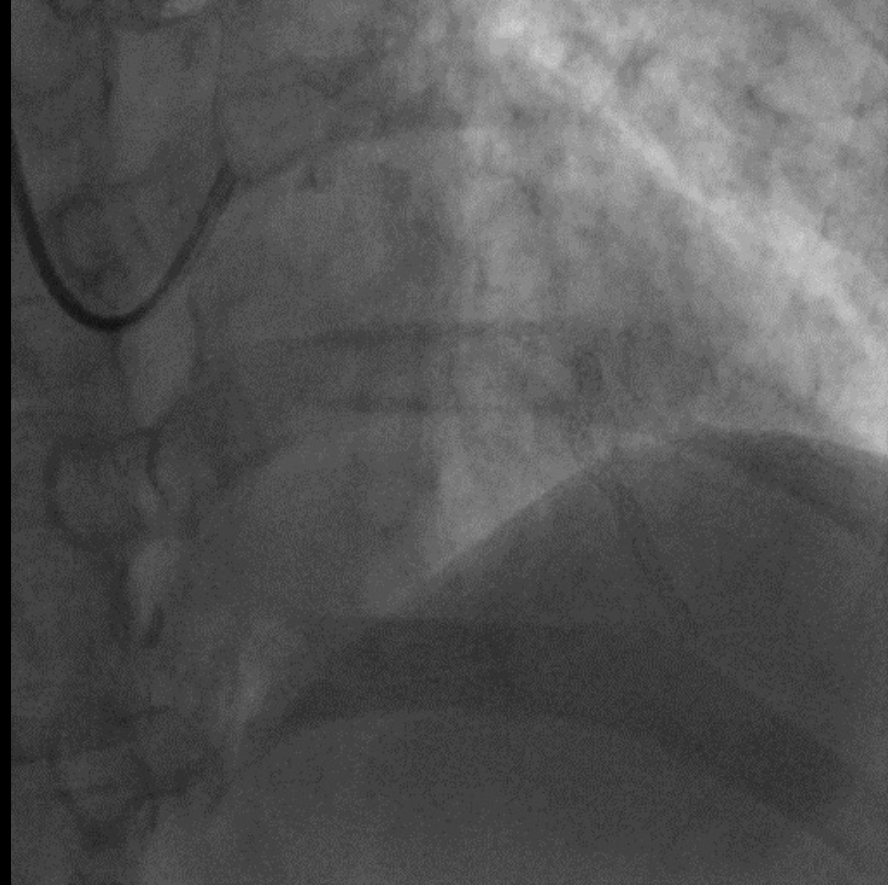


# Restenosis

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Post STEMI



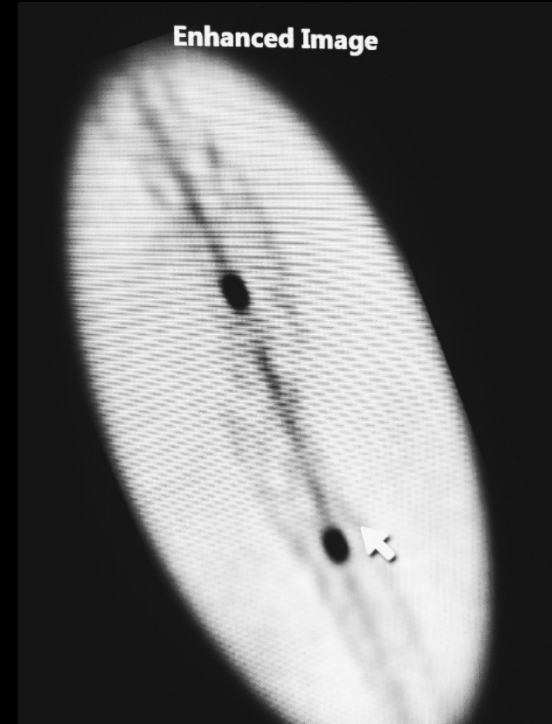
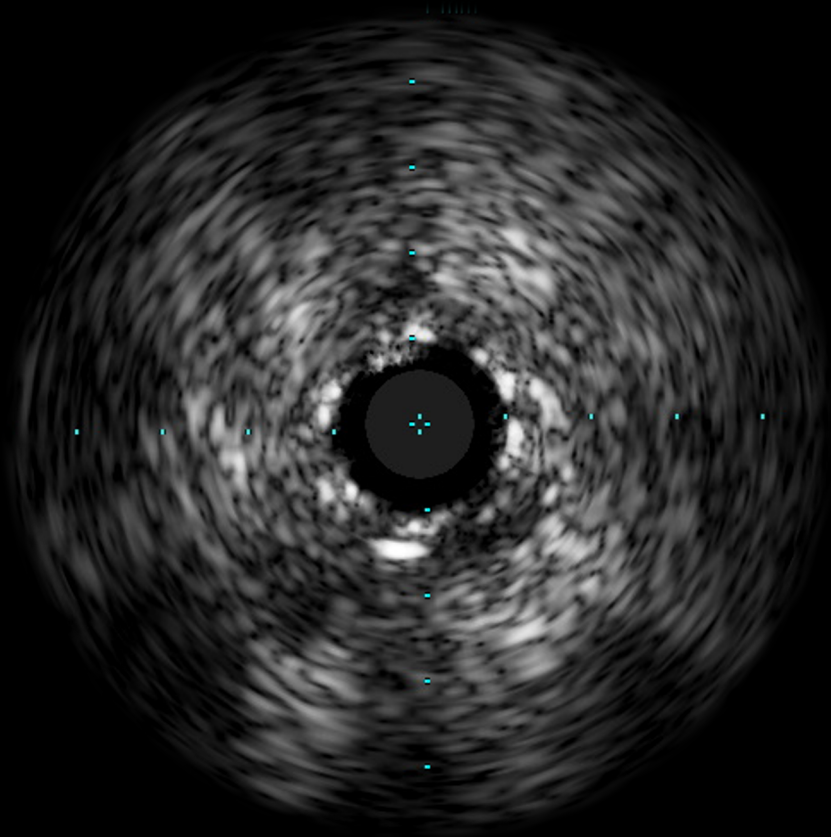
Return

72 y/o with recent STEMI s/p PCI to her LAD 2 months prior presents for angina. She had known Severe disease In other arteries and presented for PCI/iFR evaluation of her Ramus, Circumflex and RCA.



# Restenosis

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iFR of her LAD 0.84.

# Stent Optimization

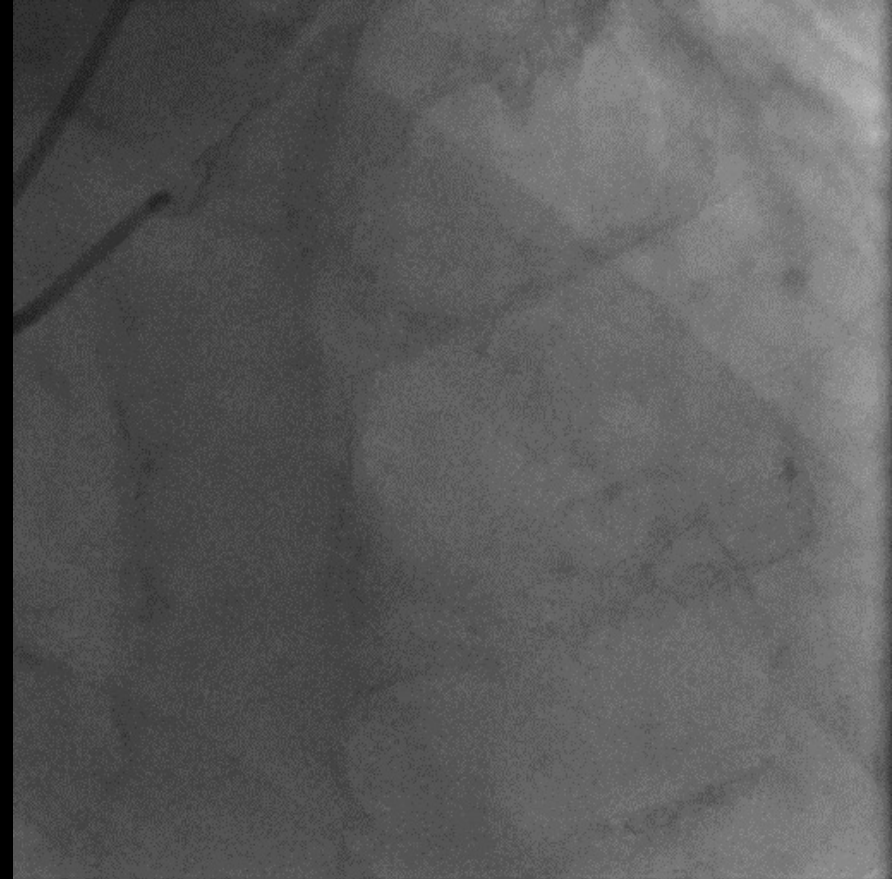
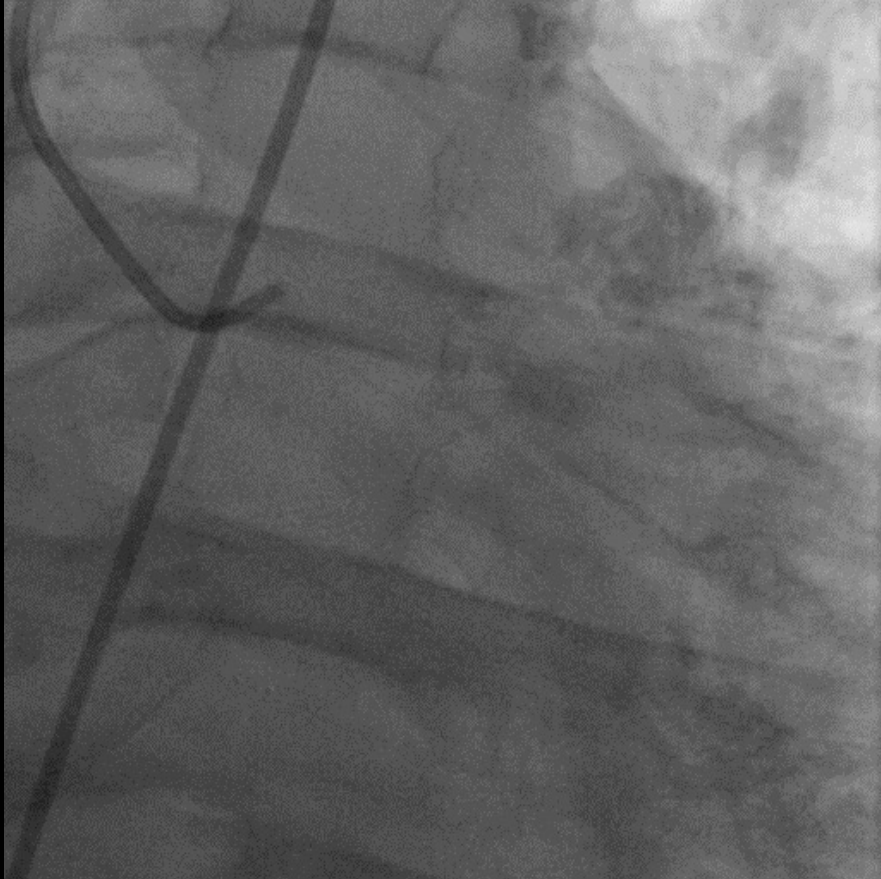
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# Ostial Disease and bifurcations

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# NSTEMI

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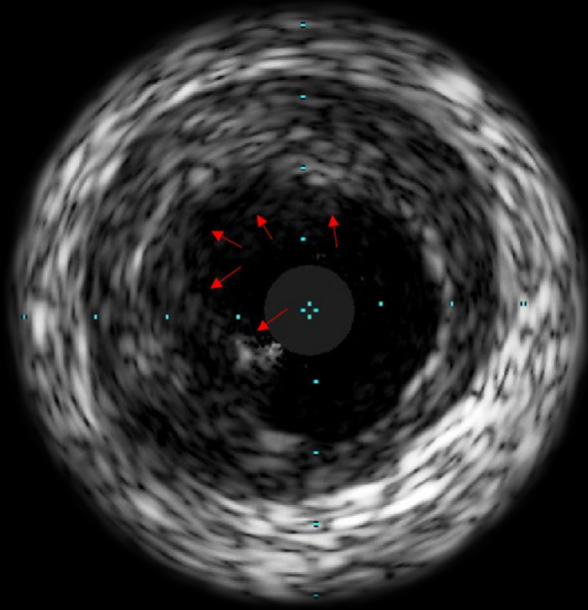


84 y/o male father of a partner comes in with chest pain and NSTEMI.

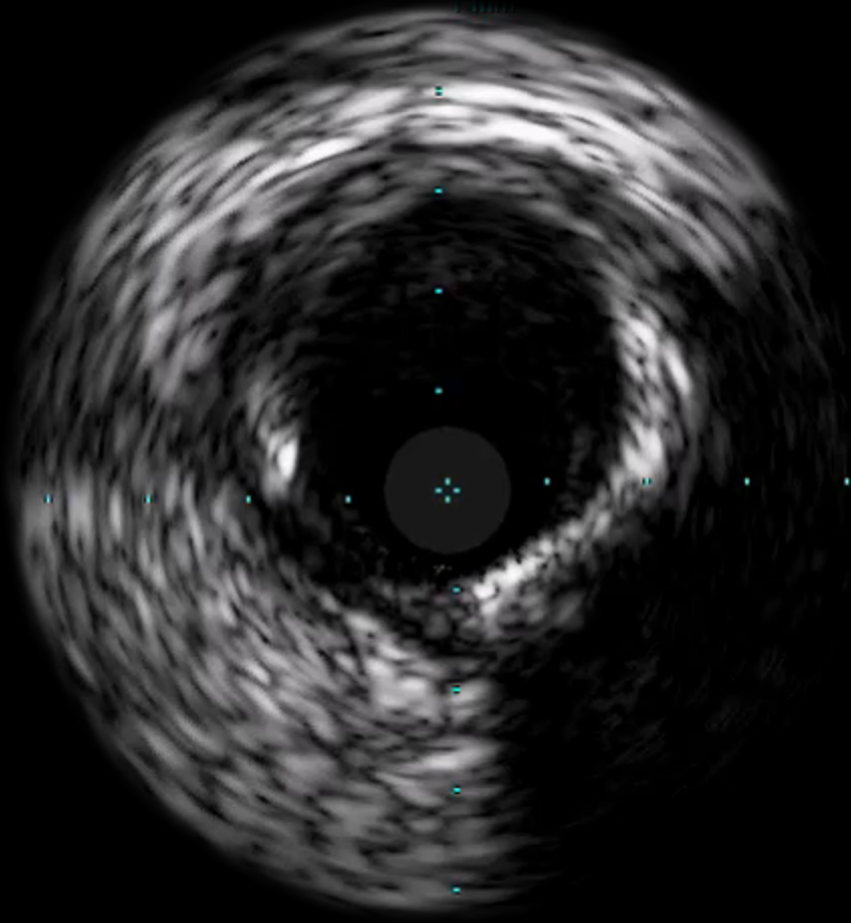


# LAD ostium

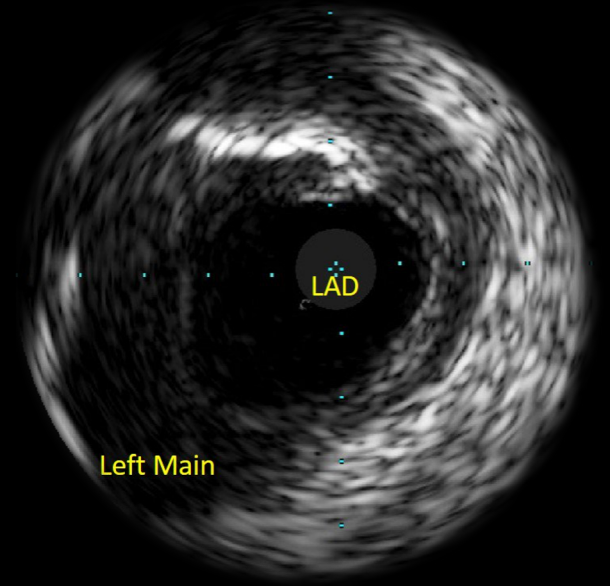
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Ulcerate Plaque



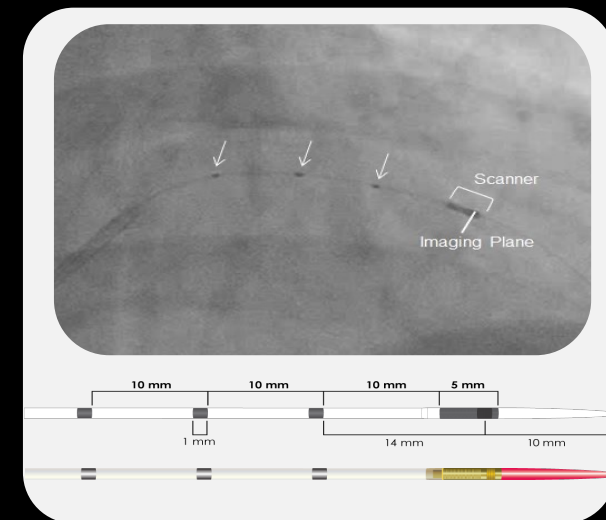
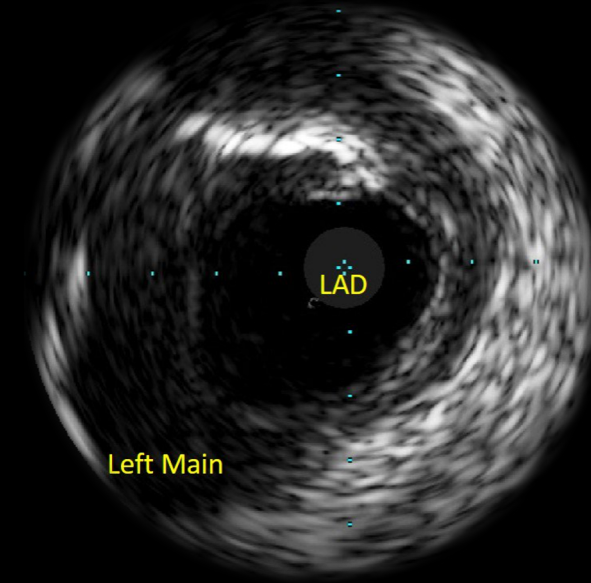
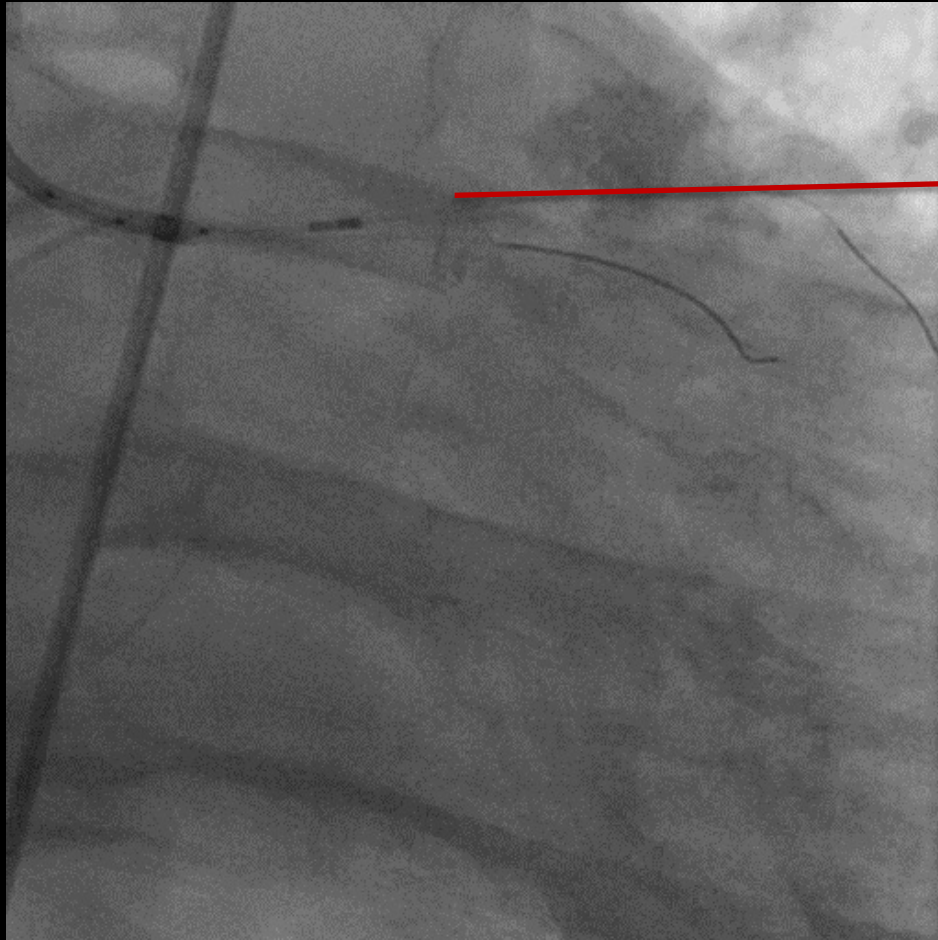
IVUS after predilatation



Ostium

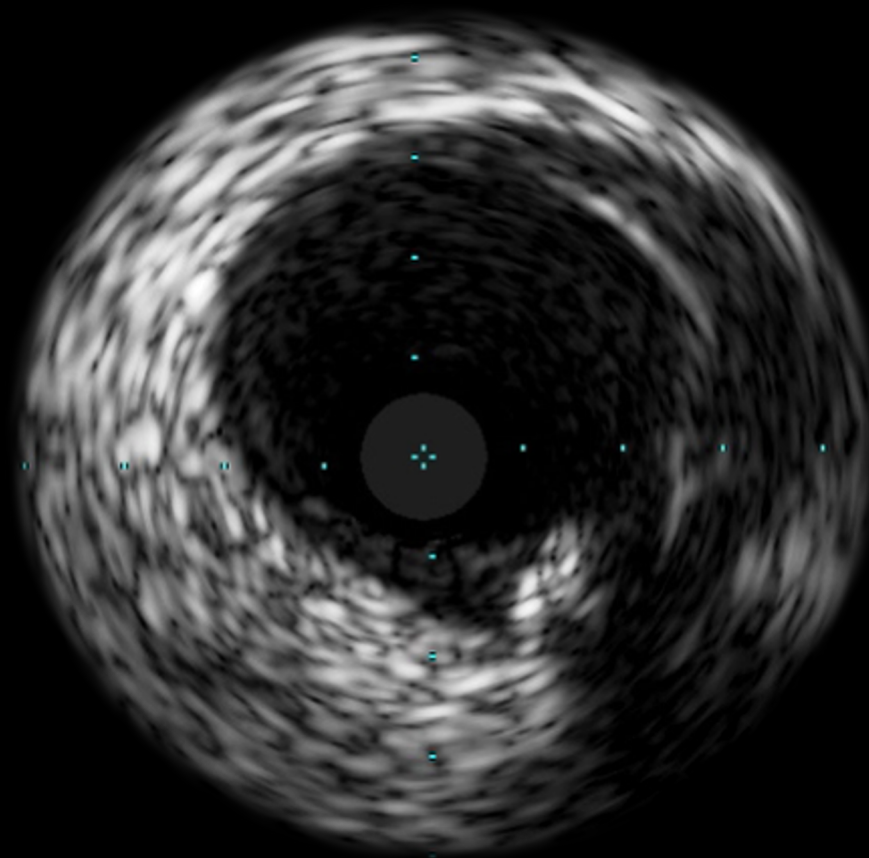
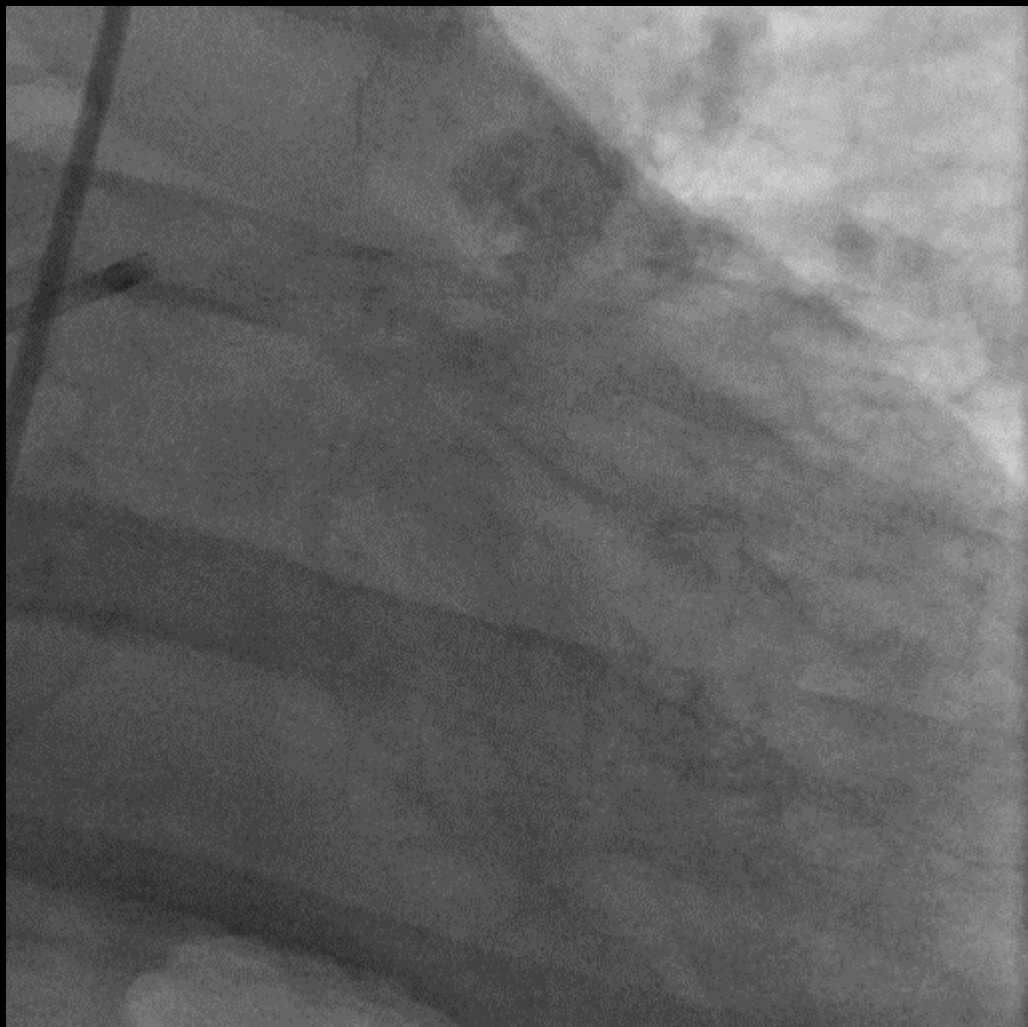
# LAD ostium

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# LAD Final Result

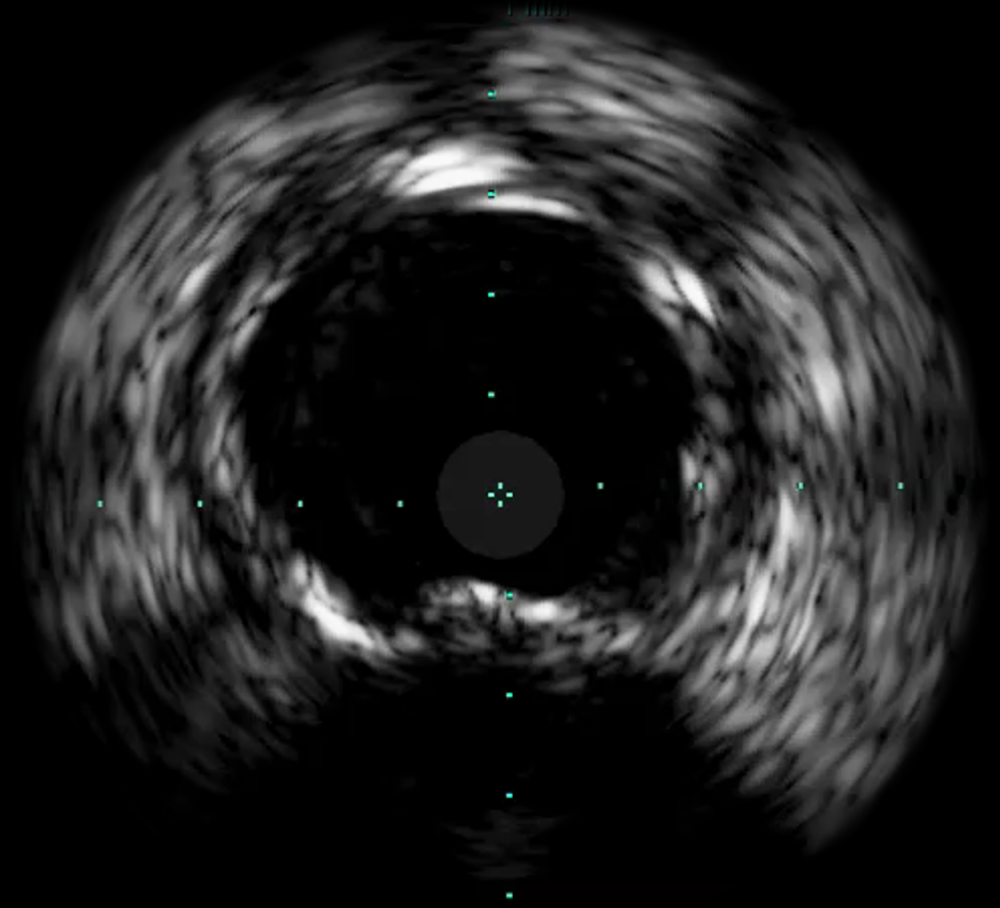
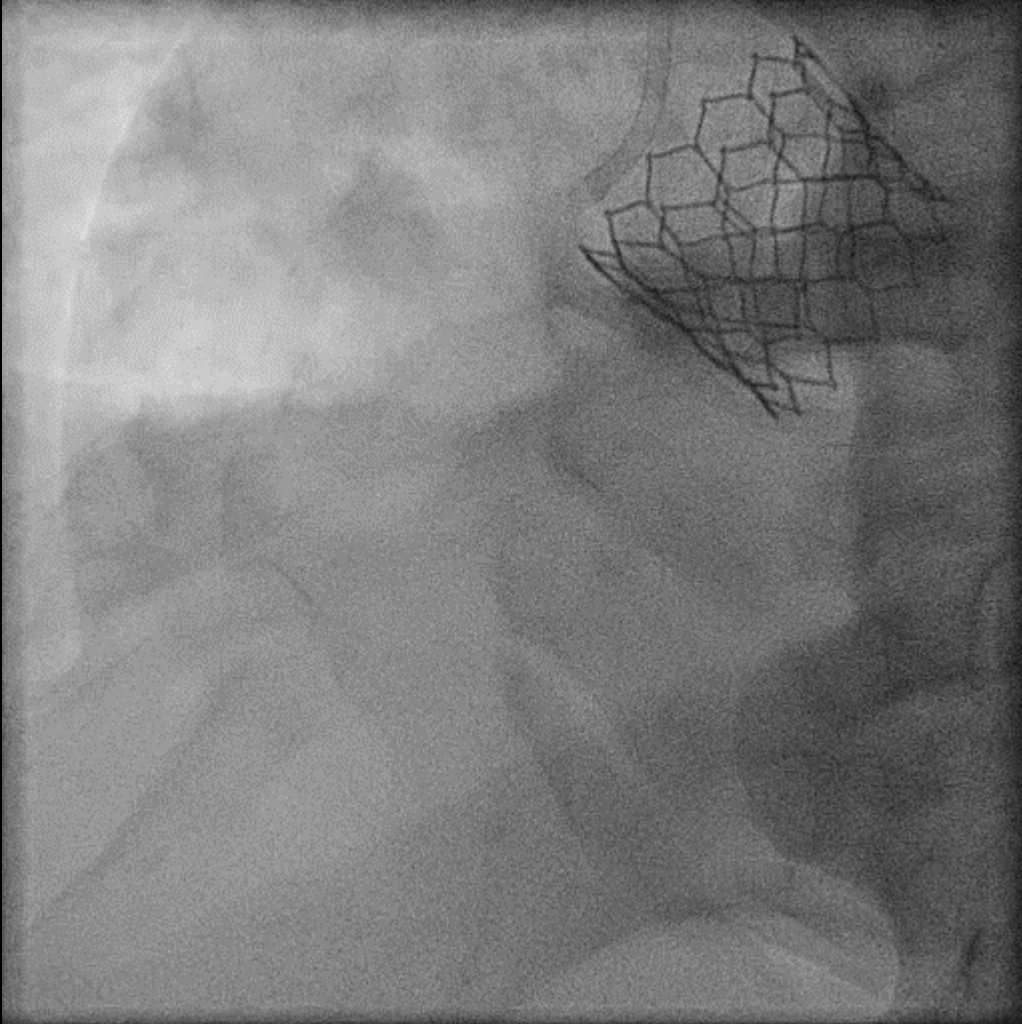
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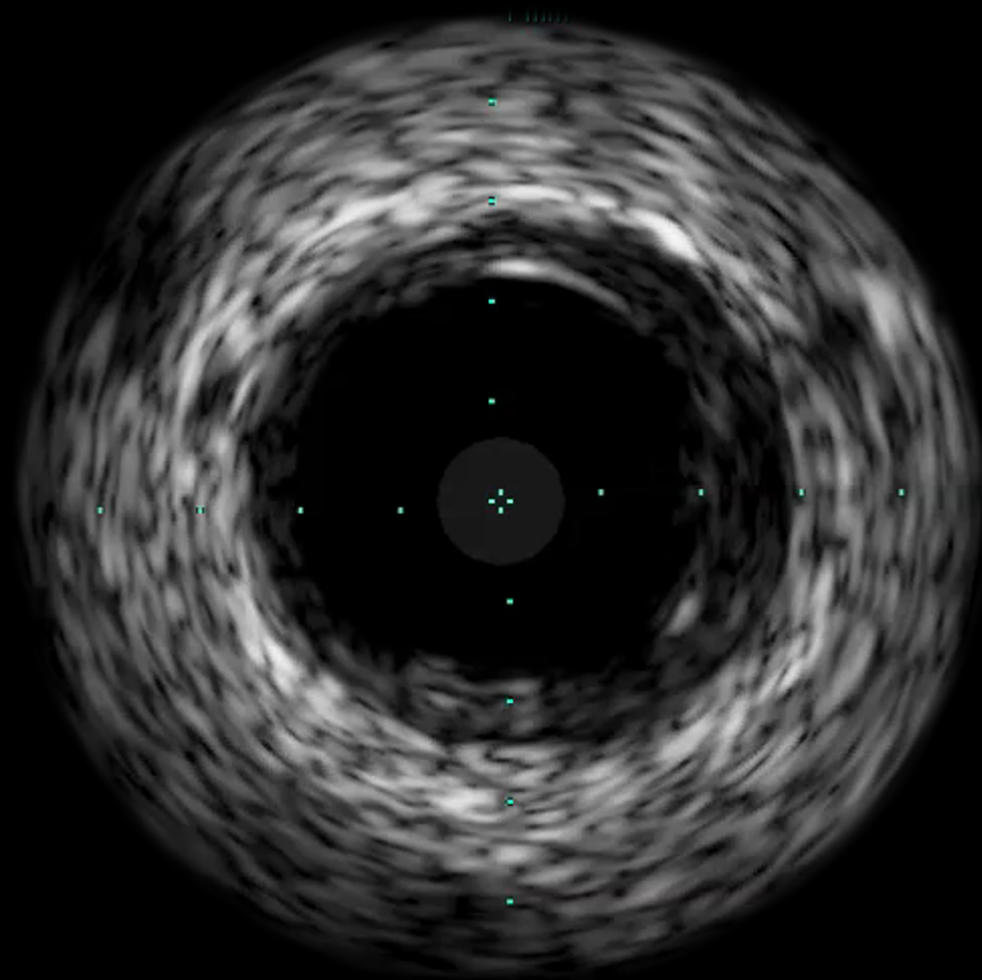
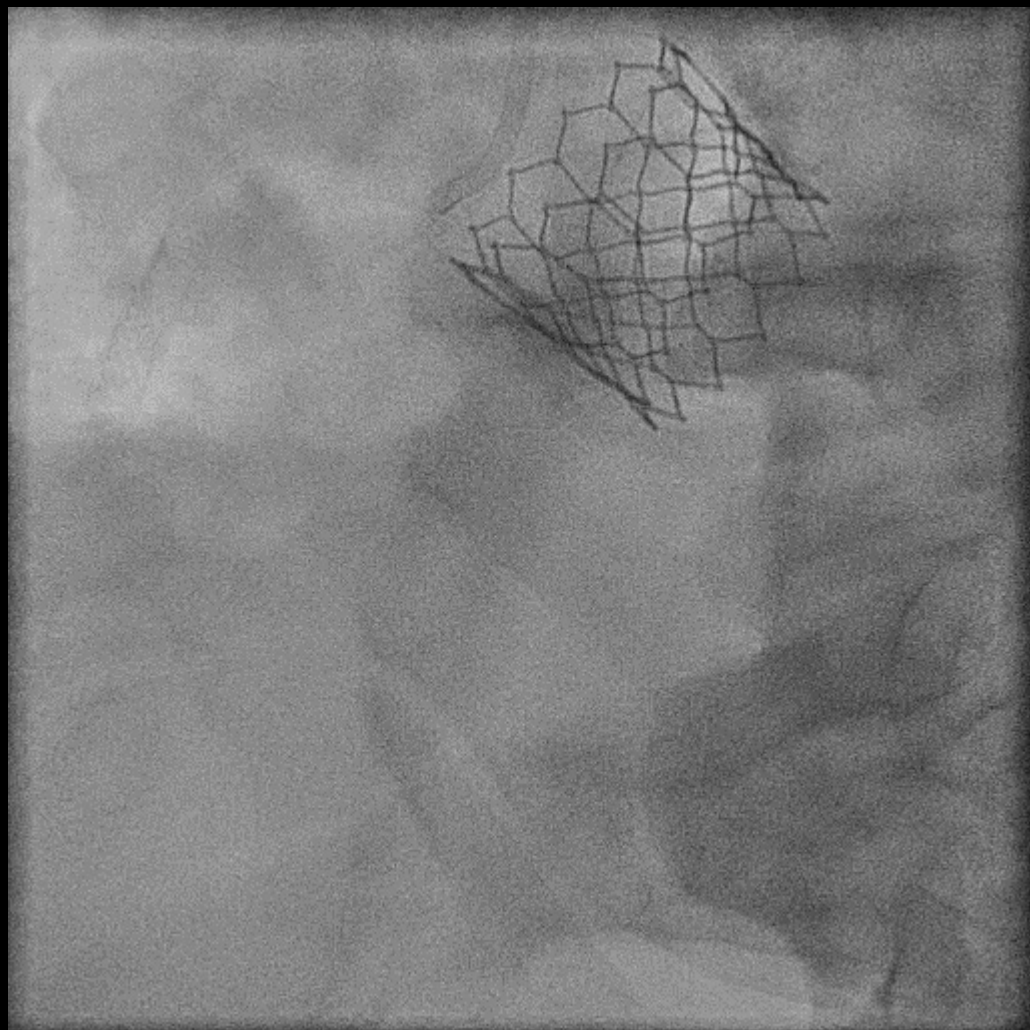
# Case Post TAVR

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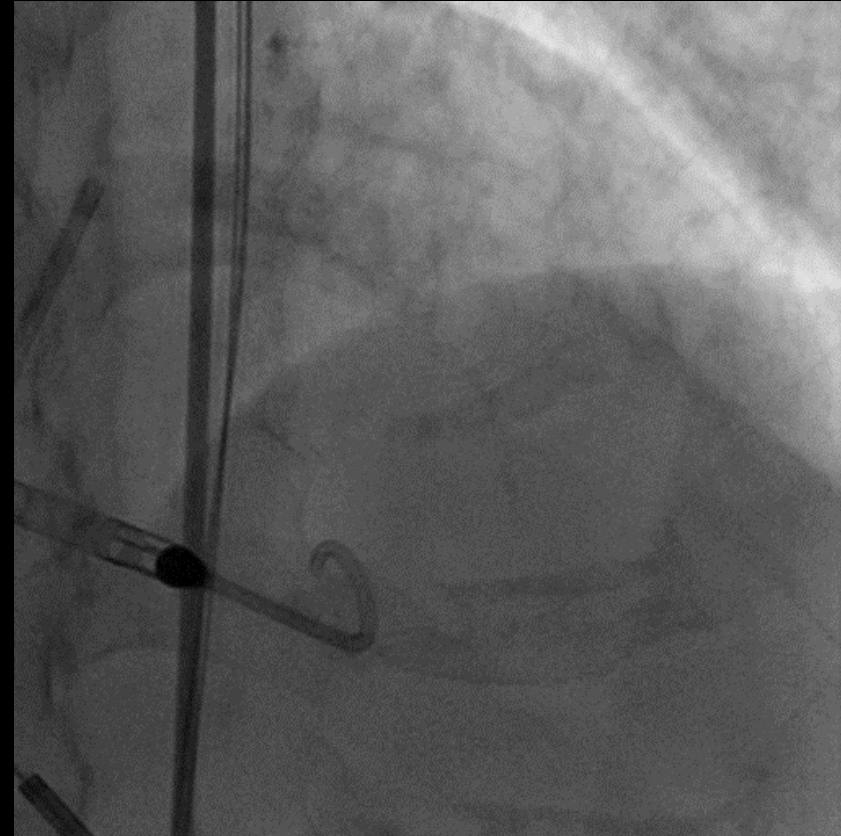
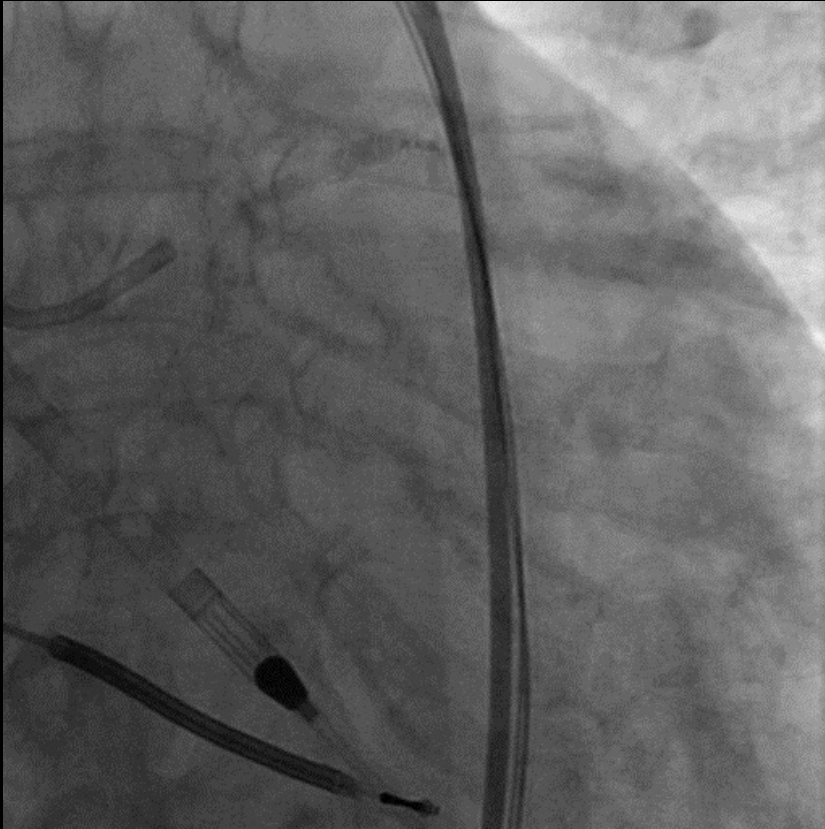
Post PCI to mid portion of RCA





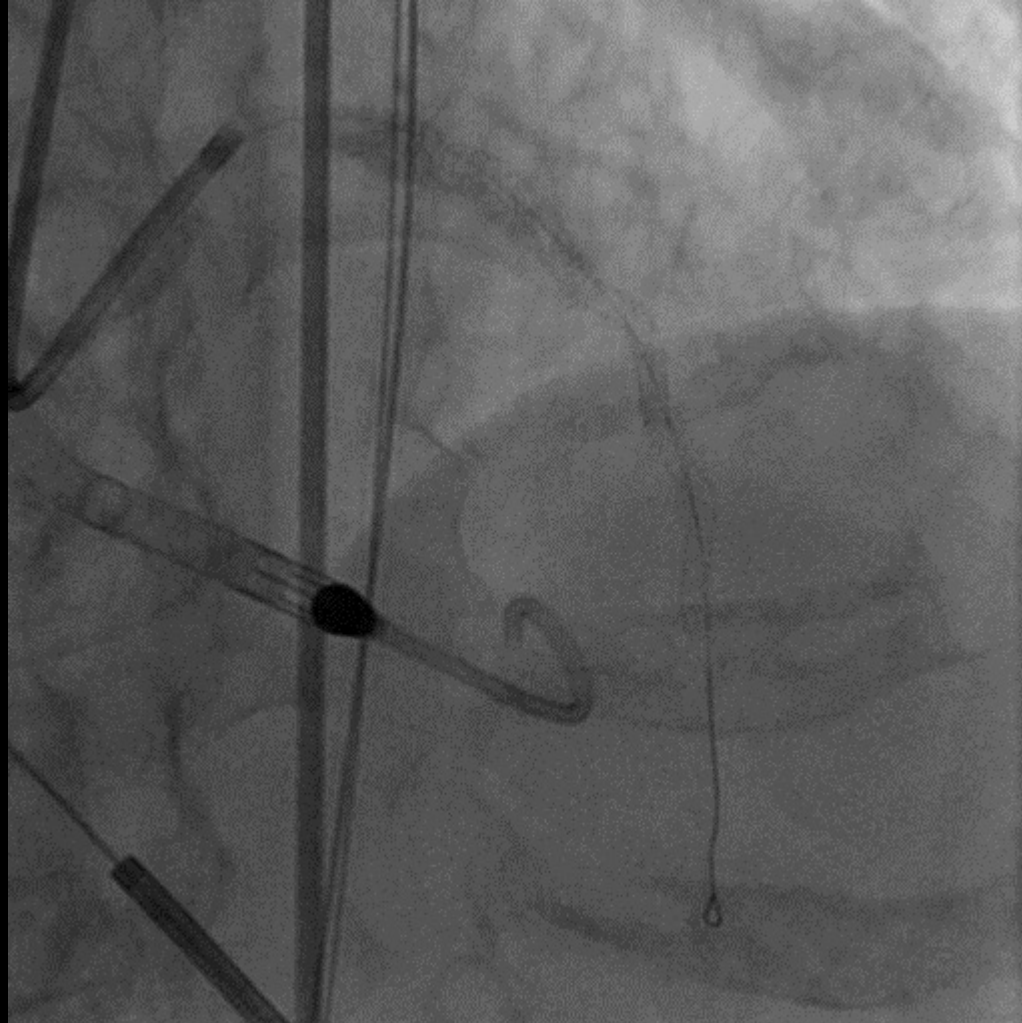
# Case CHIP

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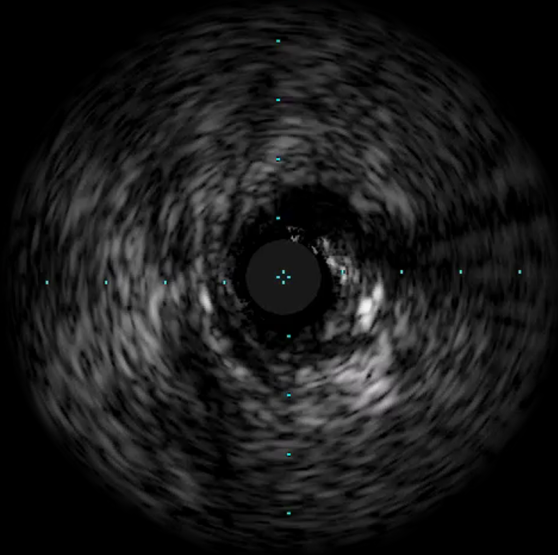
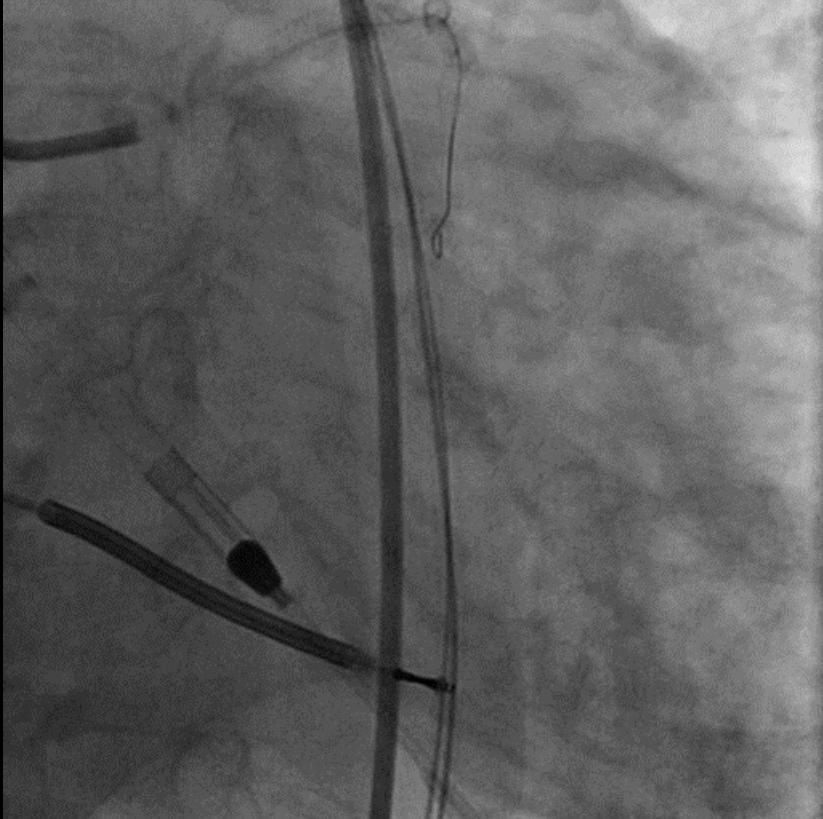
69 y/o female with newly diagnosed ICM, EF 15%, and viability in Anterior and lateral walls.

# LAD PCI

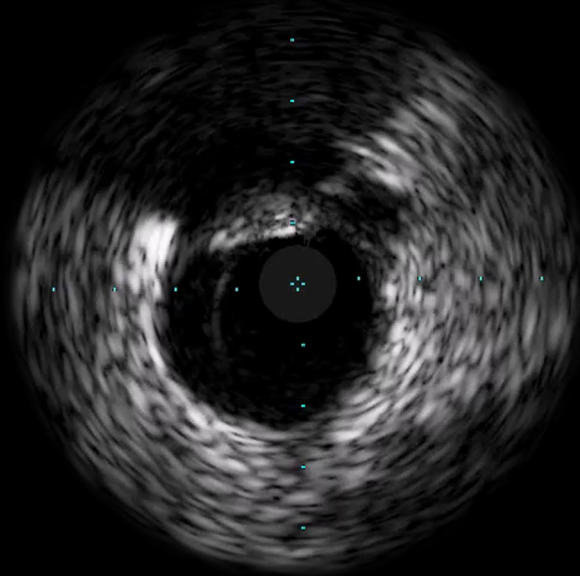




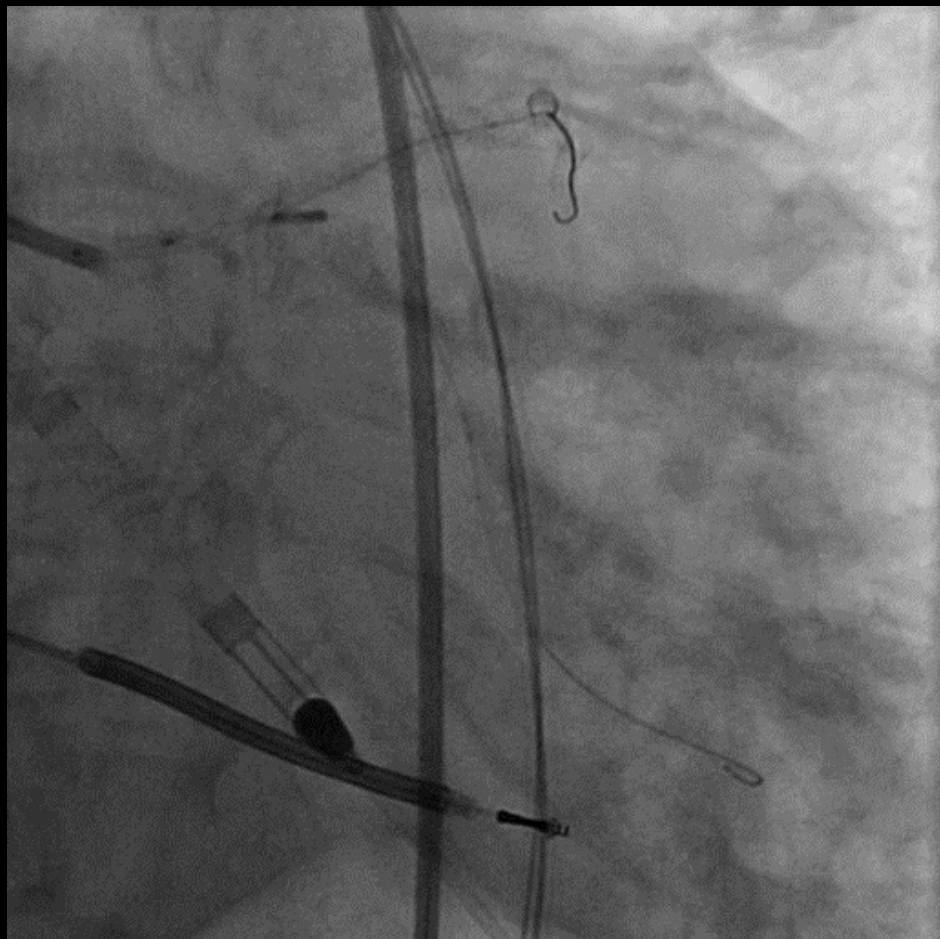
# What about LM and Circ?



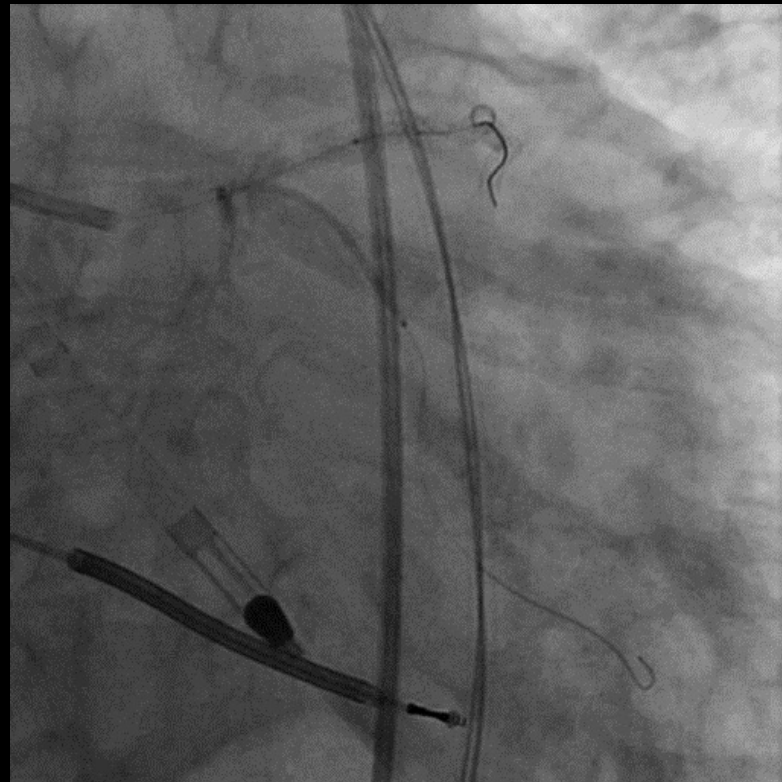
**LAD**



**CIRC**



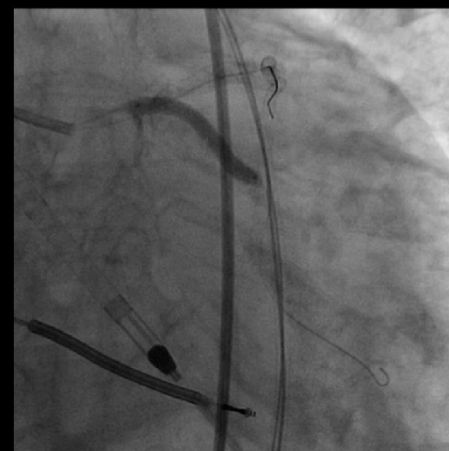
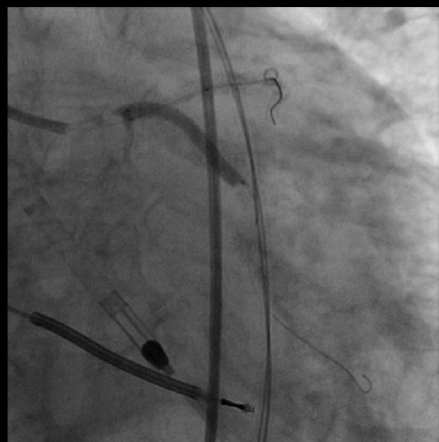
**IVUS at Ostium**



**1**

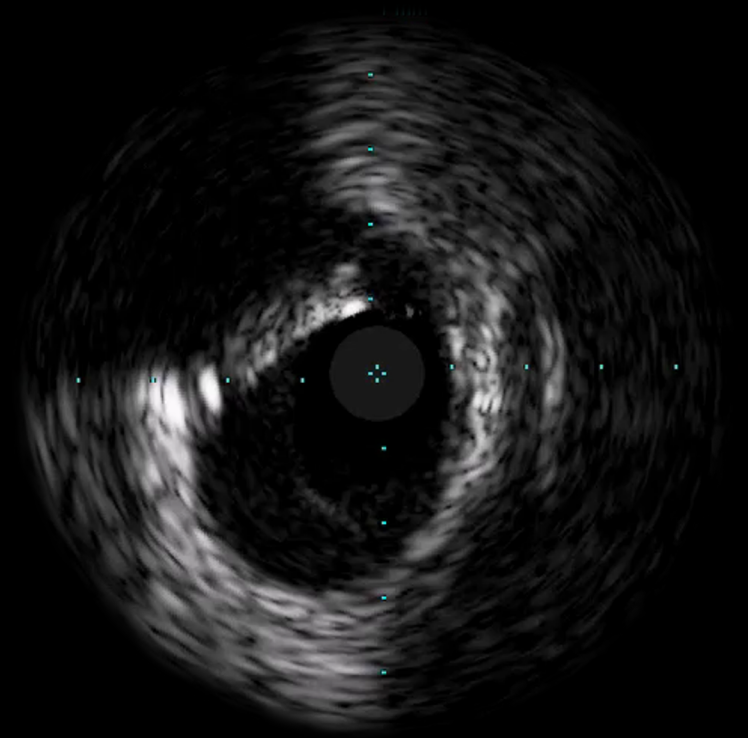
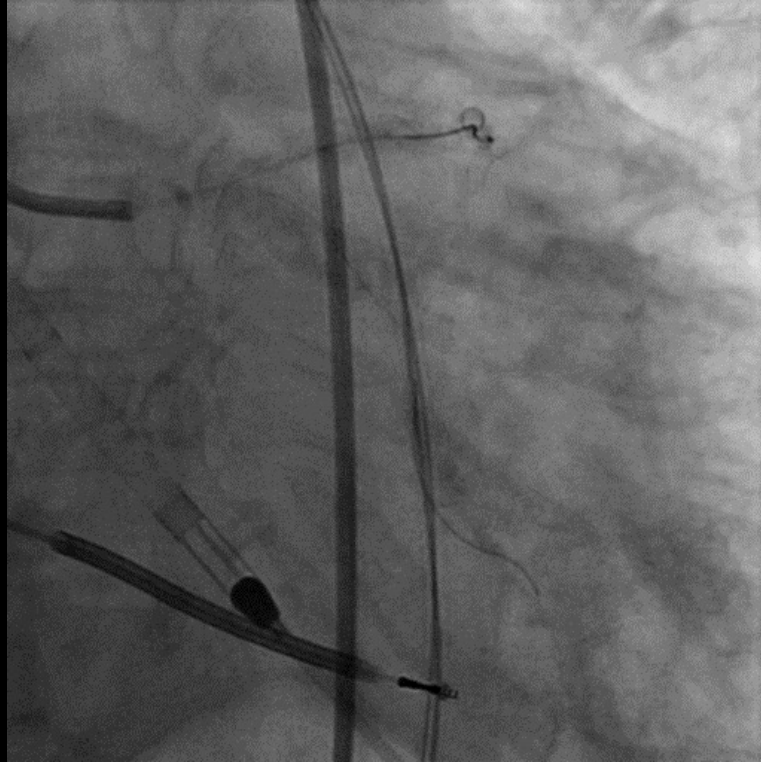
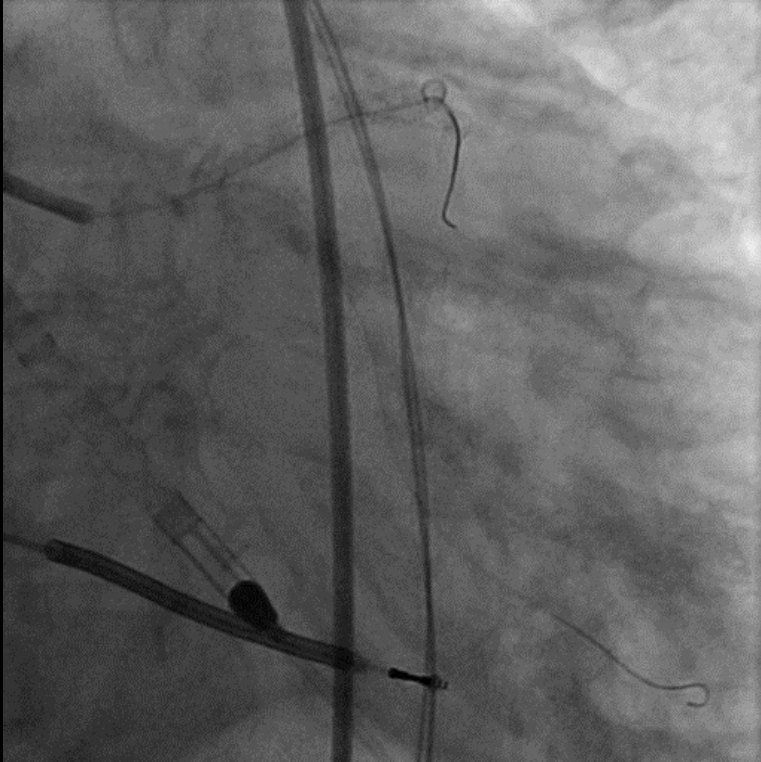
**2**

**3**





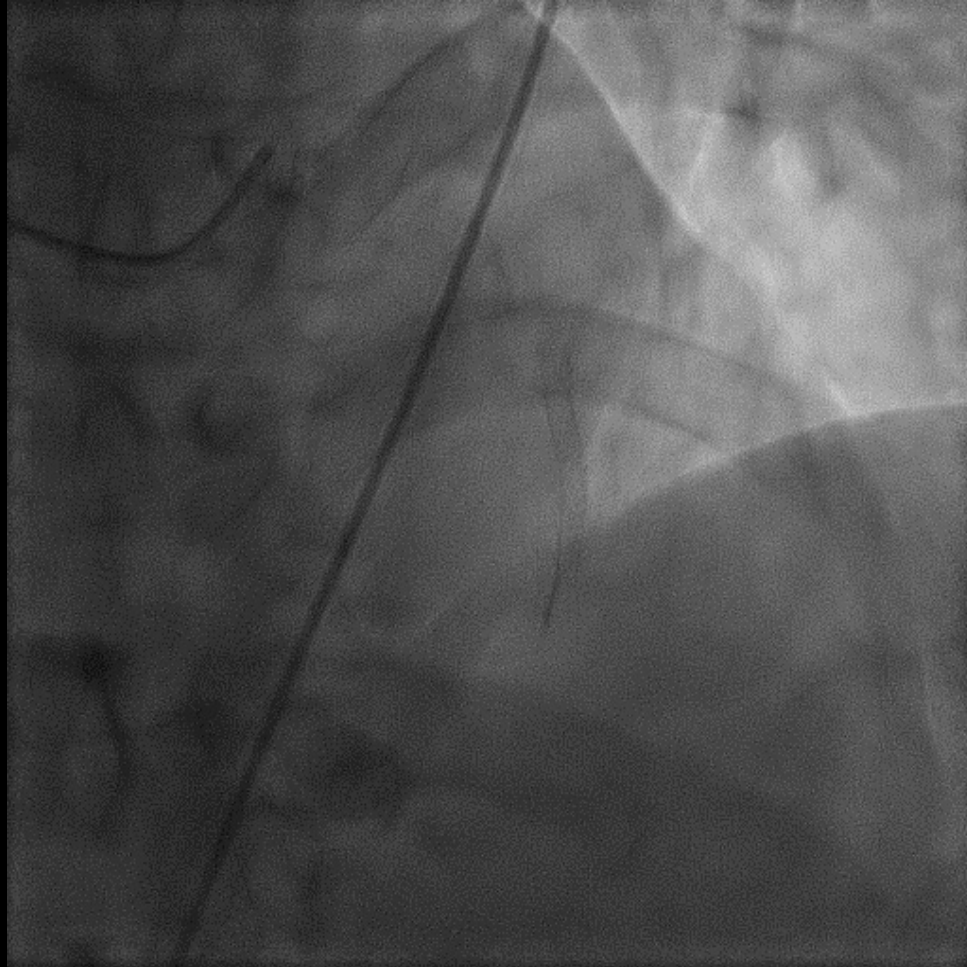
# Post Stent and Final





# Case AMI LAD/DIAG

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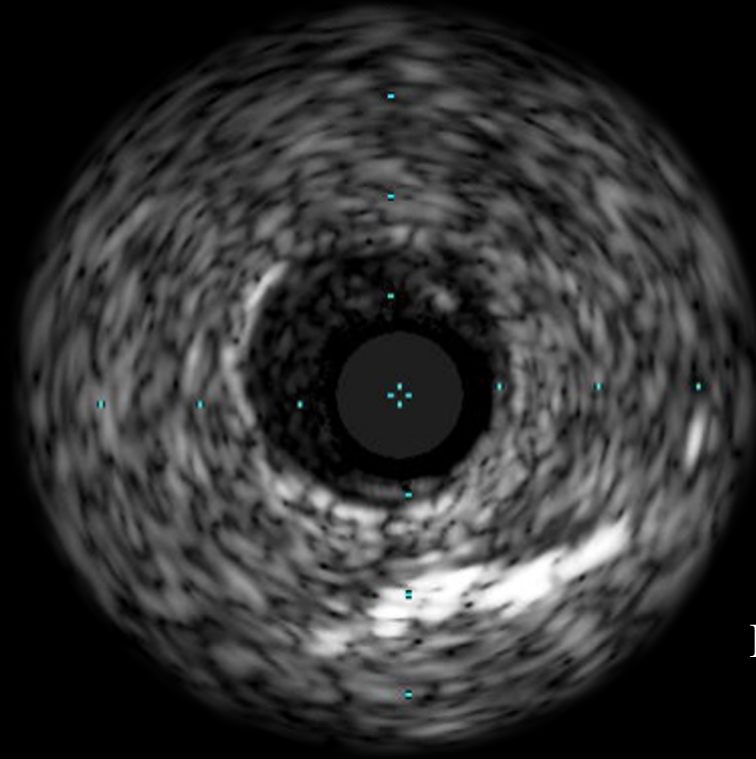
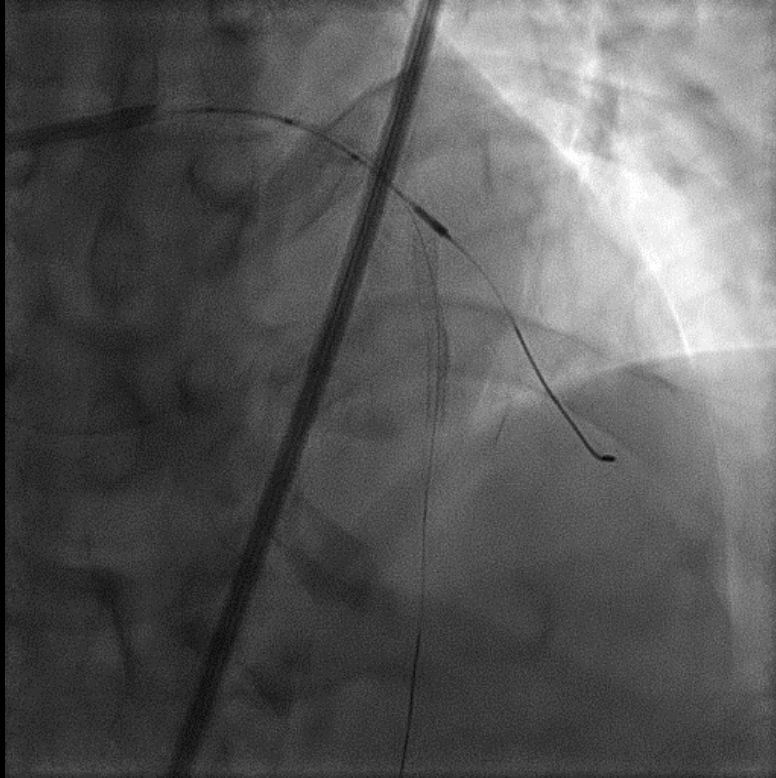


How do you handle  
this bifurcation?

64 y/o female presents with NSTEMI and anterior wall motion abnormality.

# Case AMI LAD/DIAG

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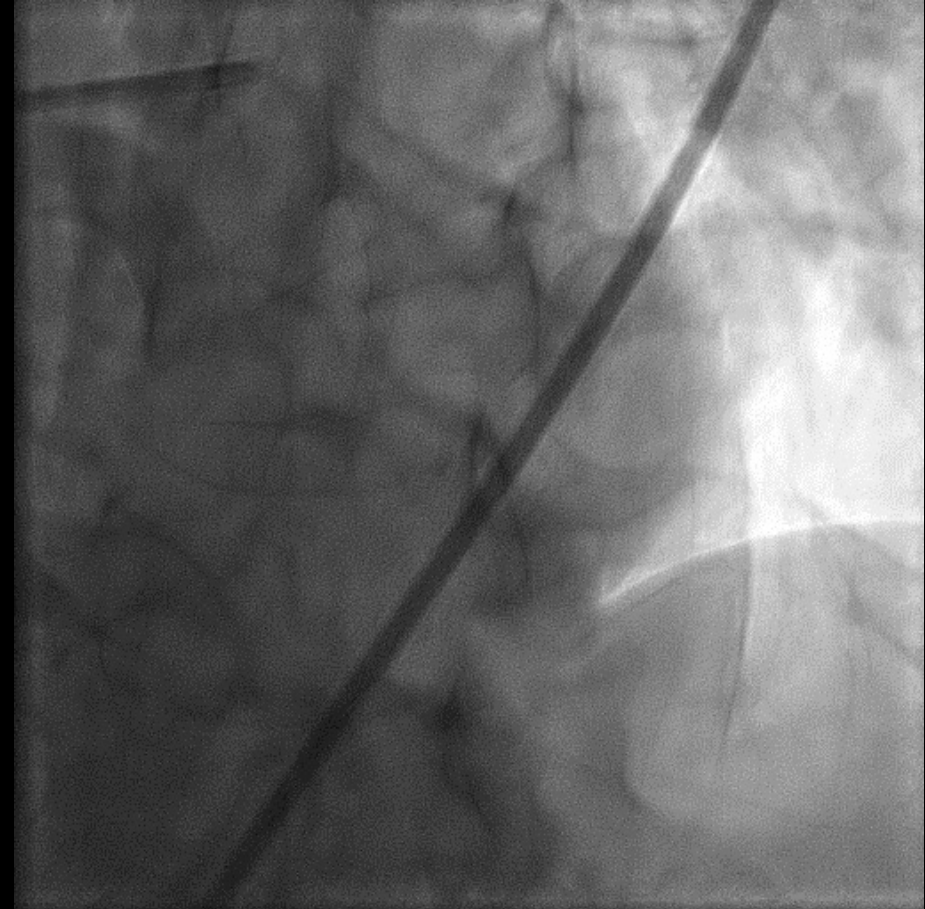
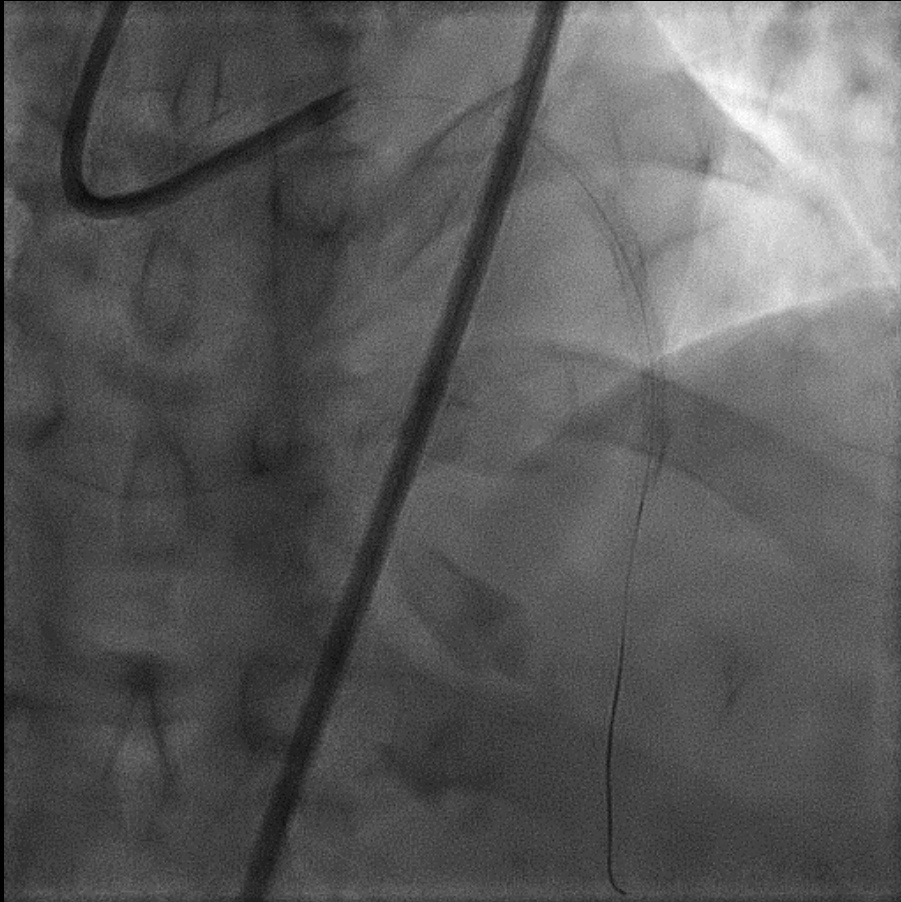


Diagonal IVUS

Difficult to wire but managed and did predilatation of LAD. IVUS the main and side branch

# Case AMI LAD/DIAG

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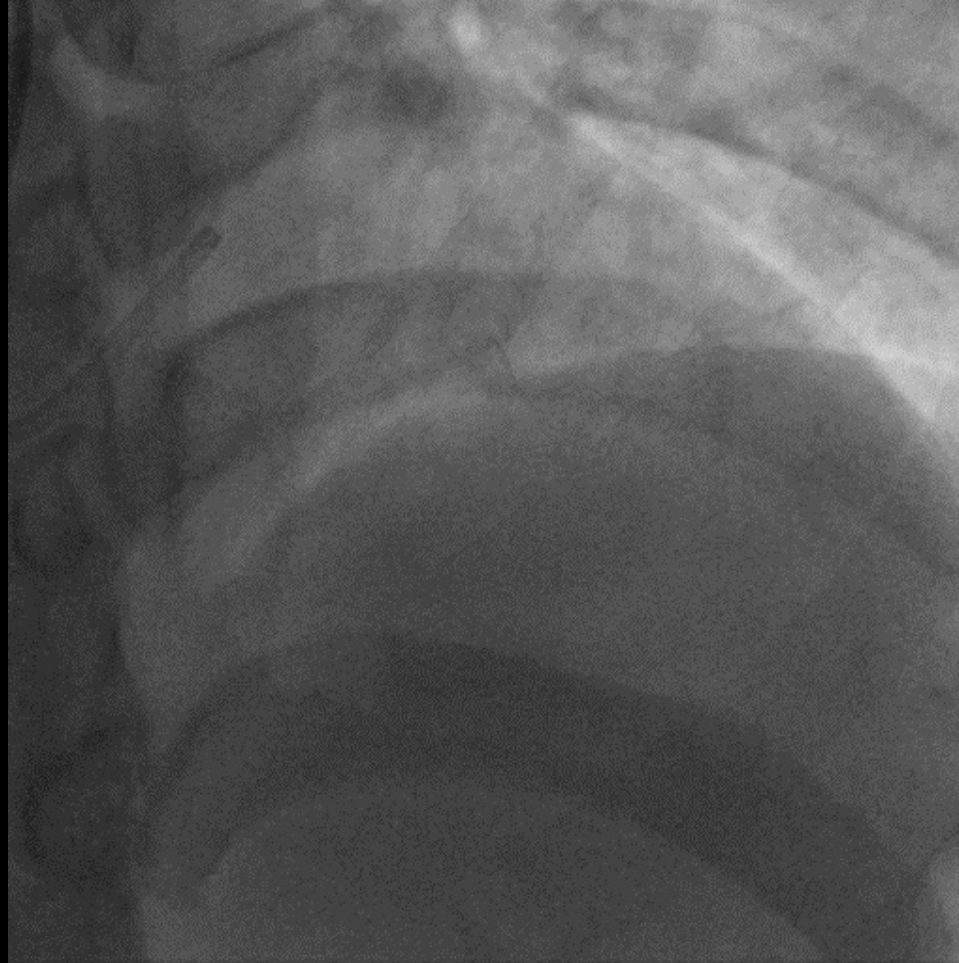


Jailed balloon technique on the side branch, single stent strategy.



# Case “I didn’t take my Plavix”

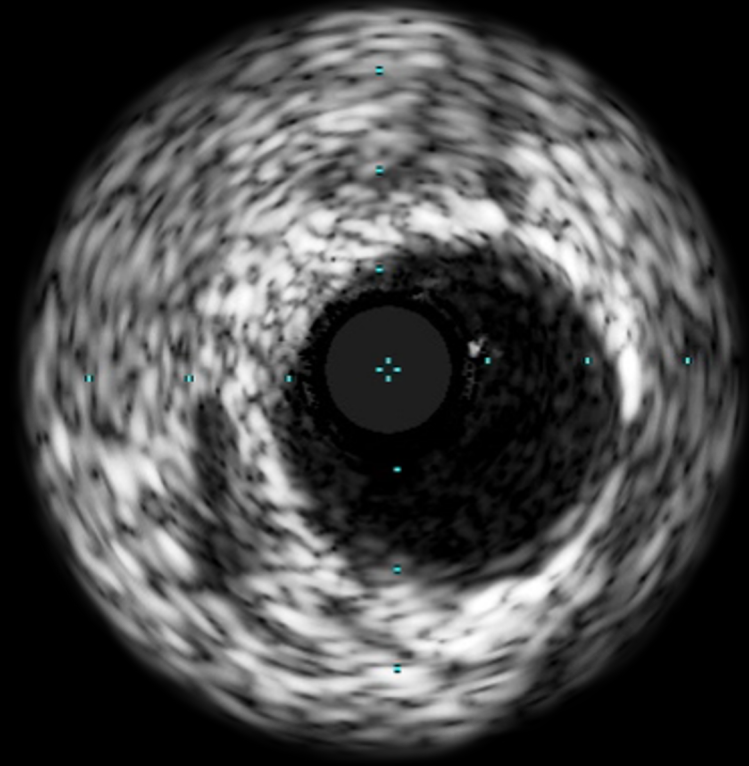
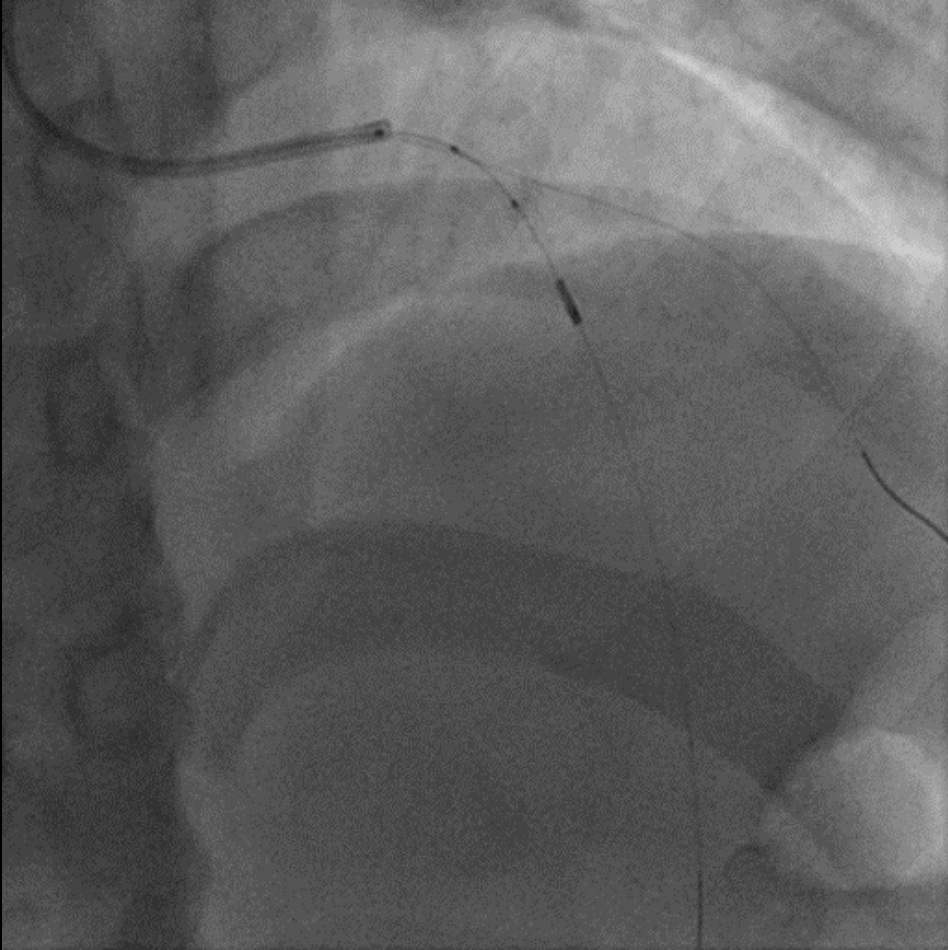
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44 y/o female presents with NSTEMI and anterior wall motion abnormality. She had PCI Preformed 4 months ago and stopped taking her Plavix and all meds.

# Case “I didn’t take my Plavix”

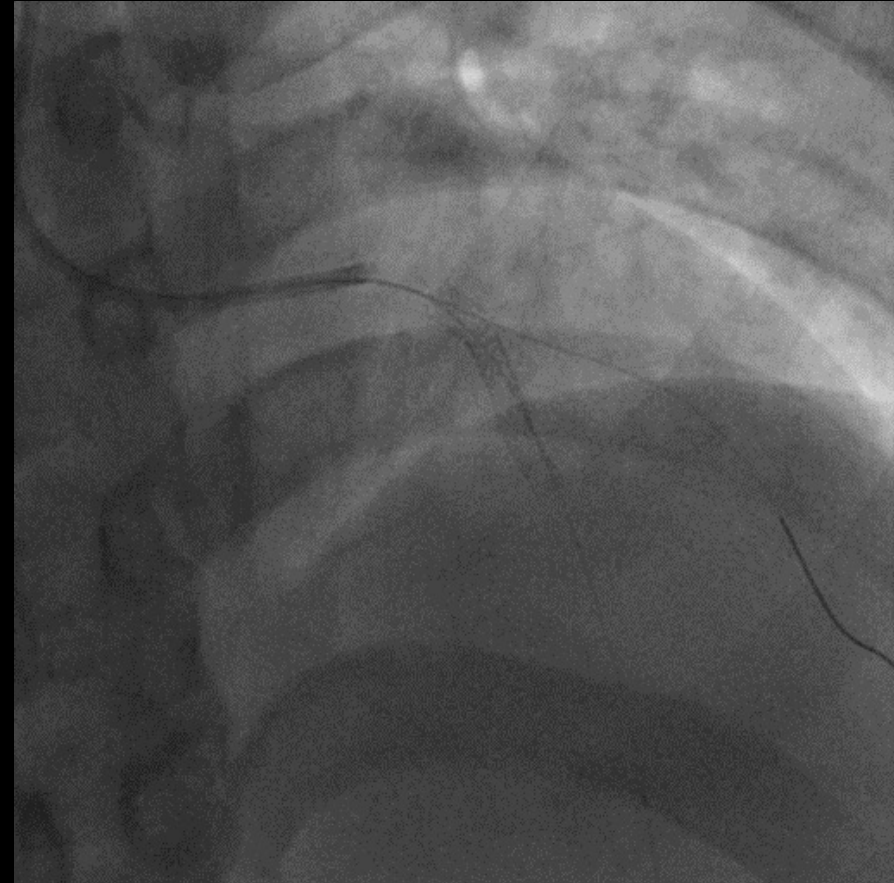
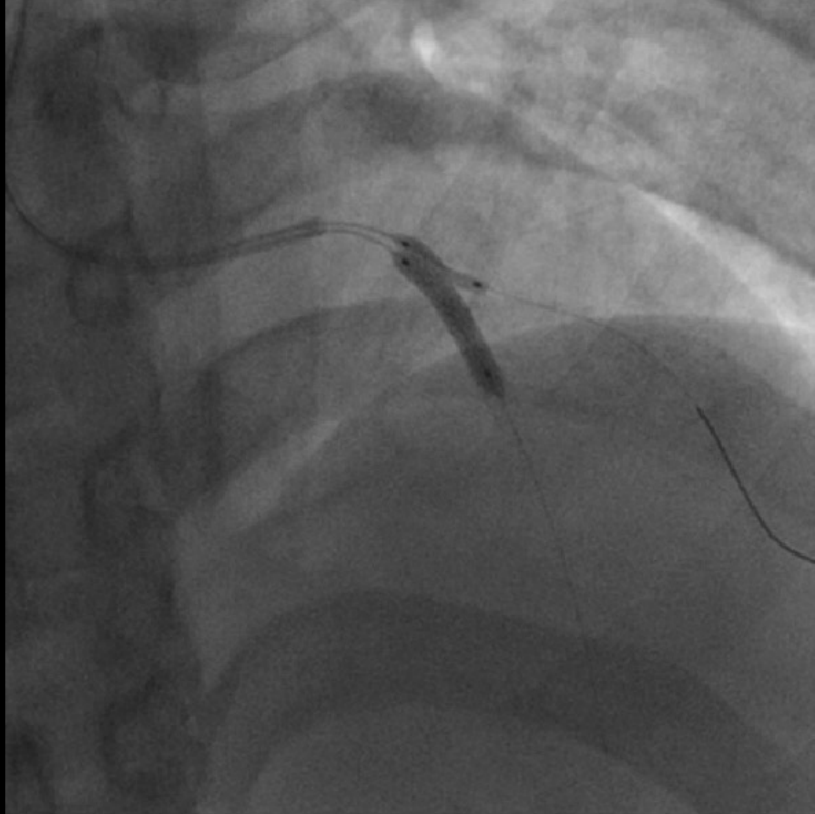
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POBA and wired both limbs. Note on IVUS the stent size and location relative to diagonal.

# Case “I didn’t take my Plavix”

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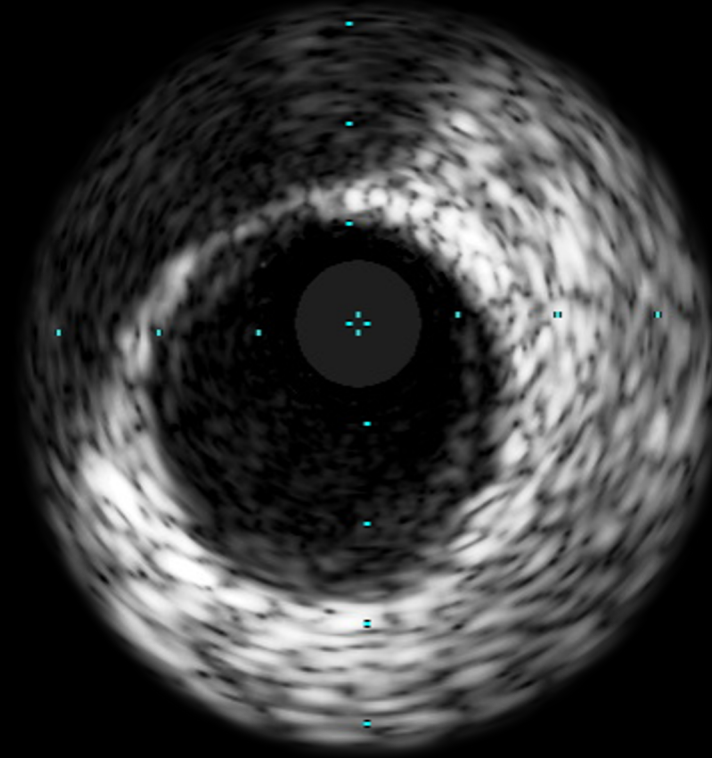
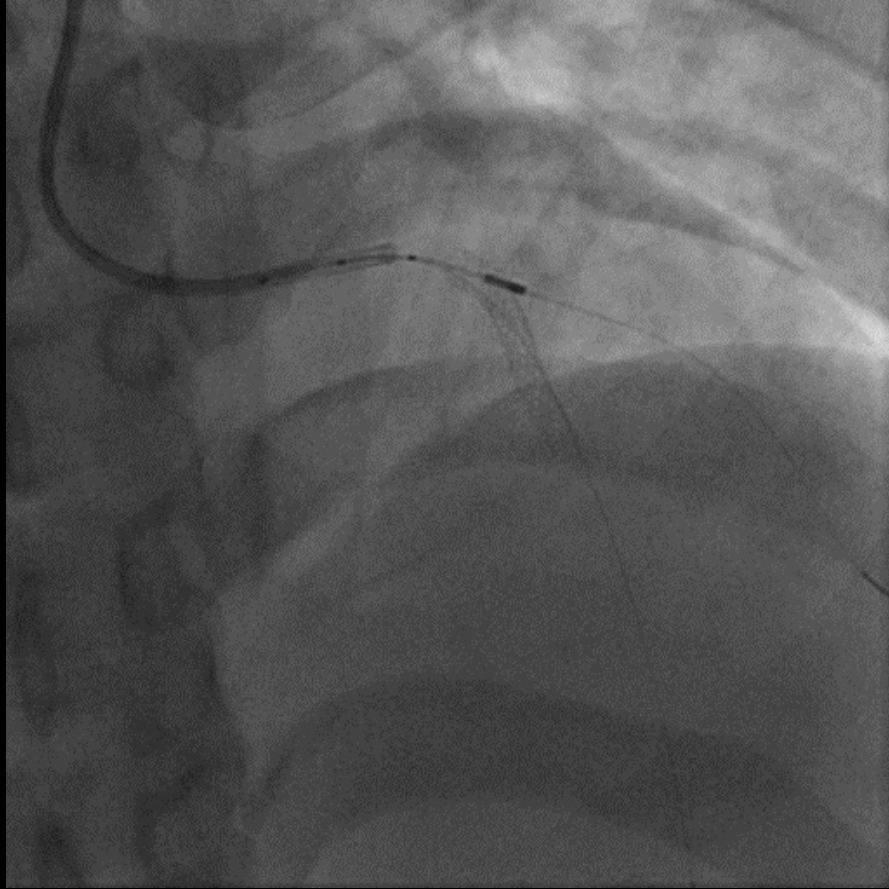


Predilated the stent struts into the diagonal and restented LAD. Recross and Kiss.



# Case “I didn’t take my Plavix”

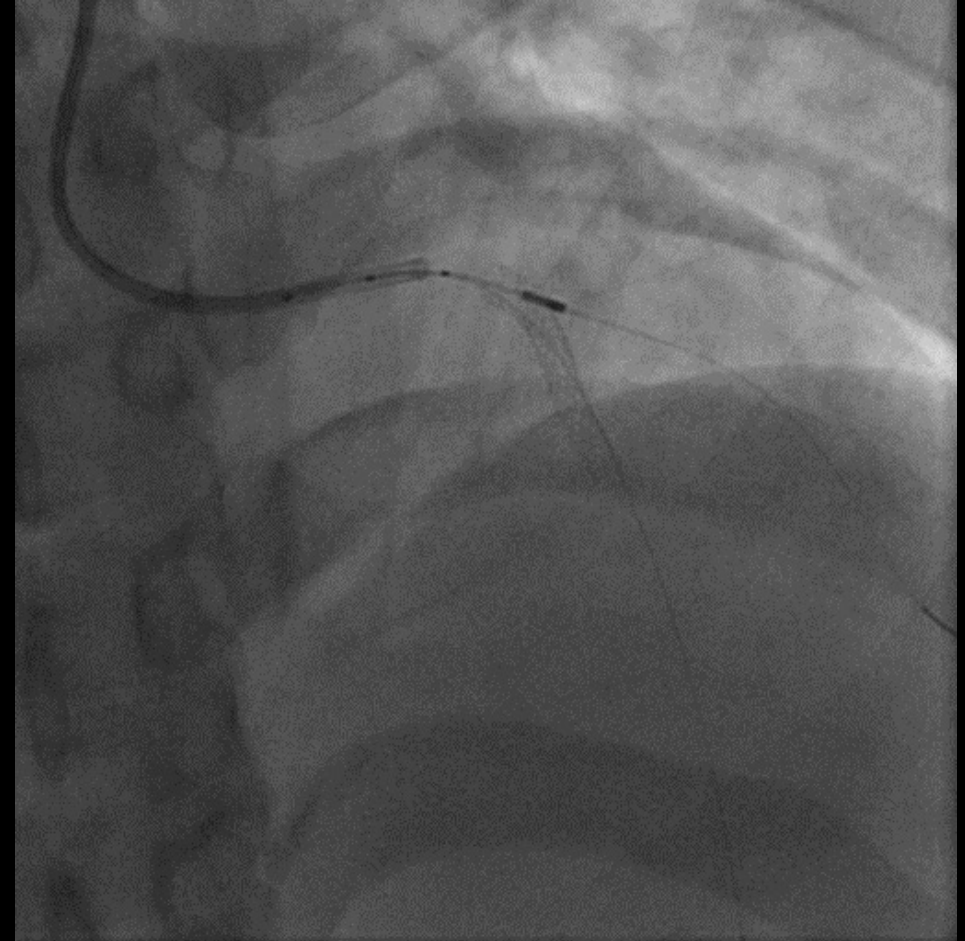
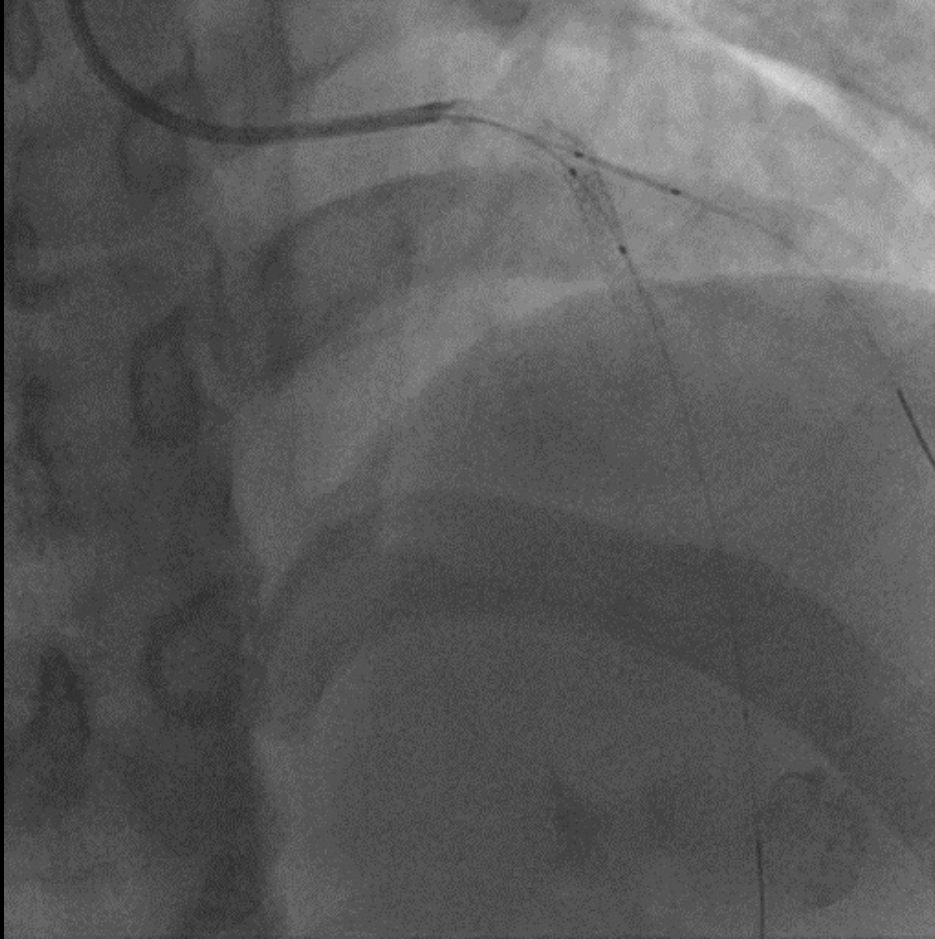
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IVUS diagonal to mark ostium

# Case “I didn’t take my Plavix”

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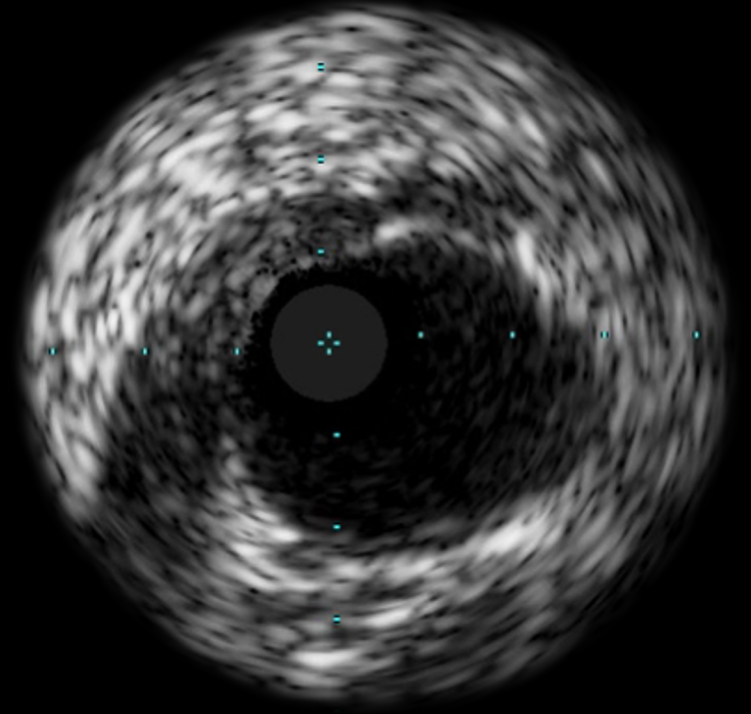
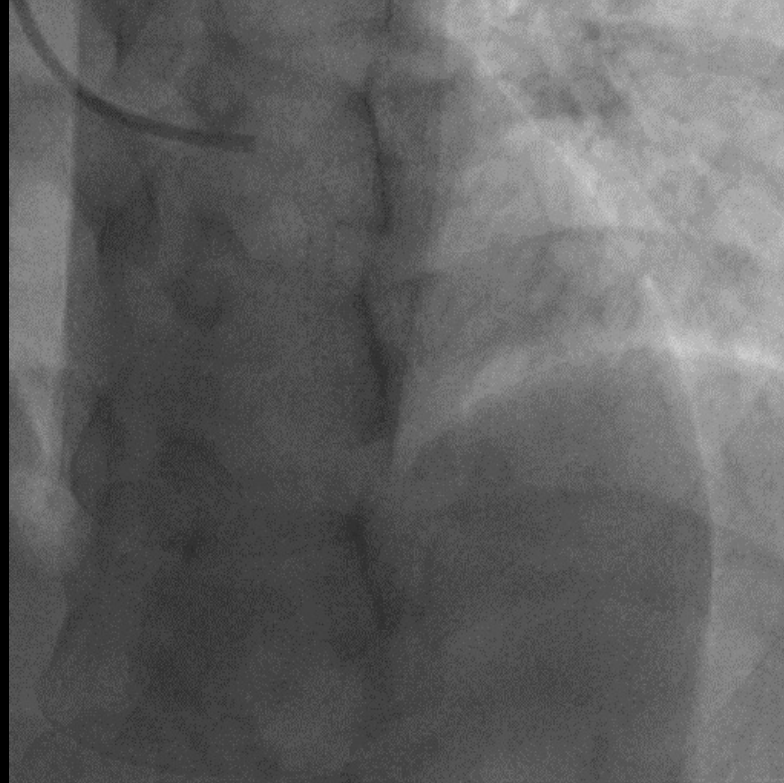
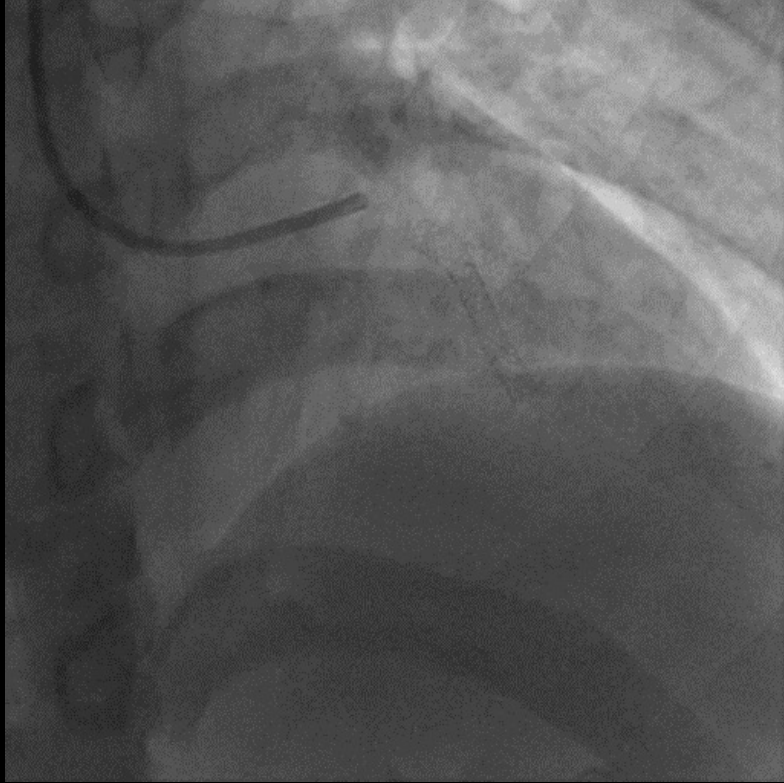


Use the IVUs to cover the ostium.



# Case “I didn’t take my Plavix”

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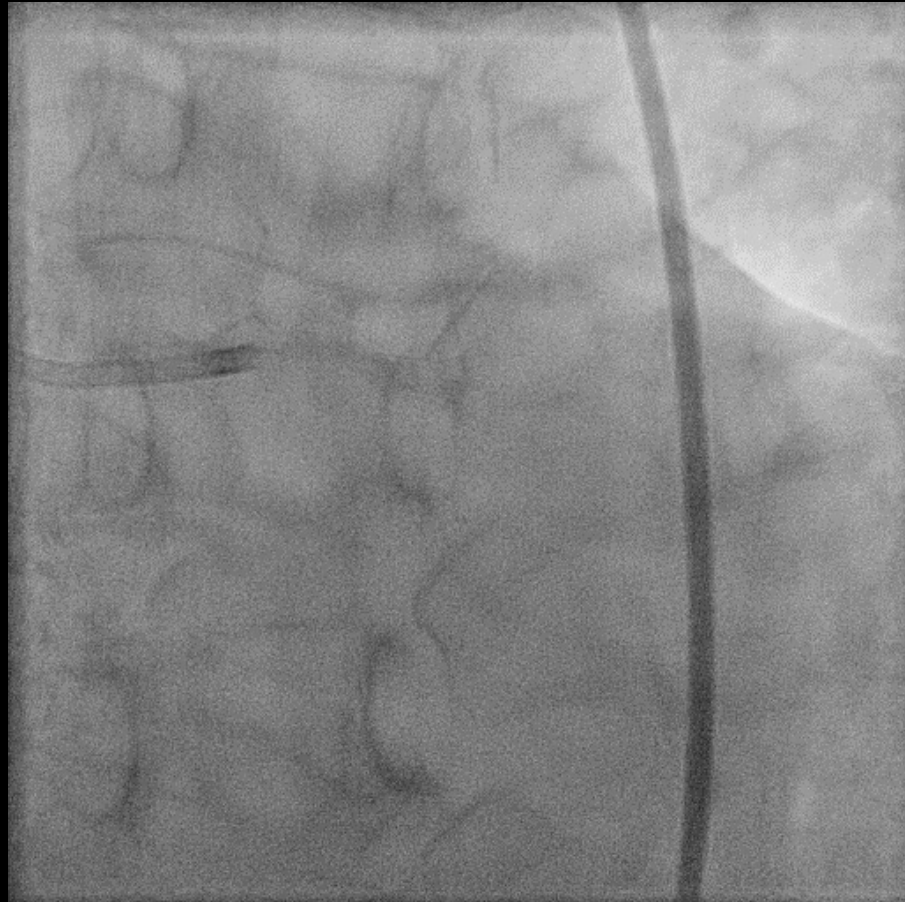


Final result after kissing balloon inflation.



# Bifurcation Work Flow

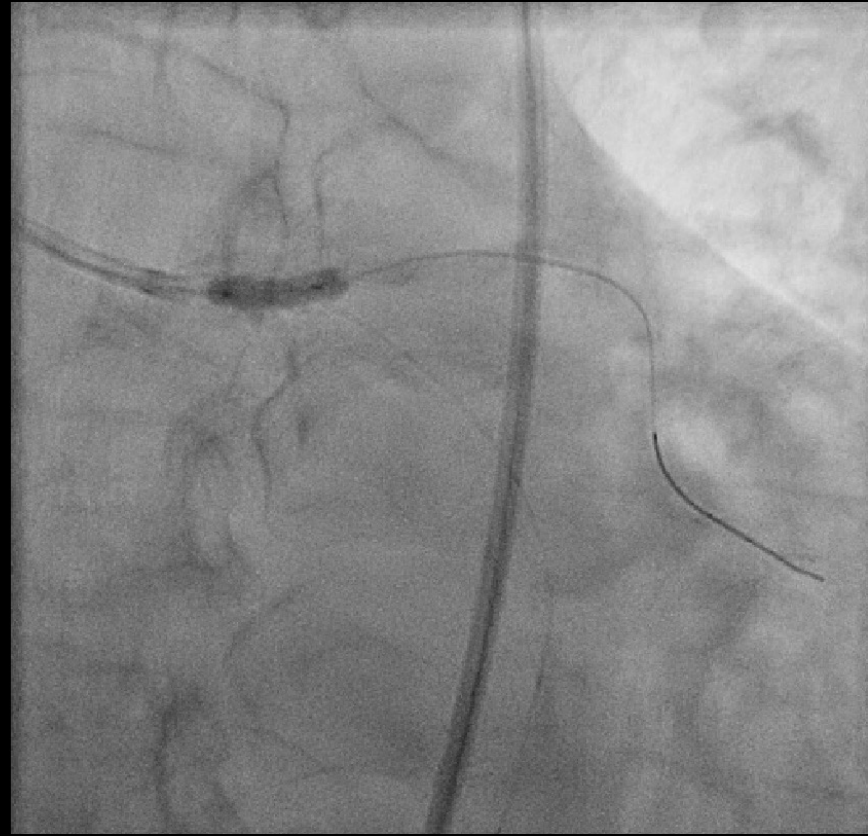
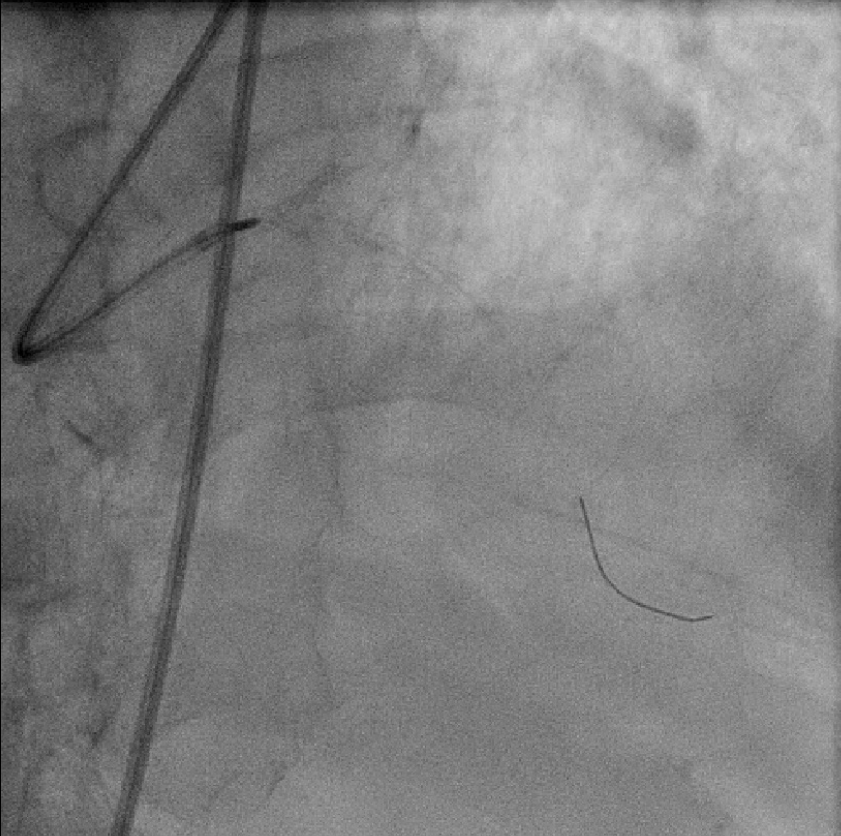
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79 y/o farmer presents with chest pain and NSTEMI. Turned down for surgery with normal EF.

# Bifurcation Work Flow

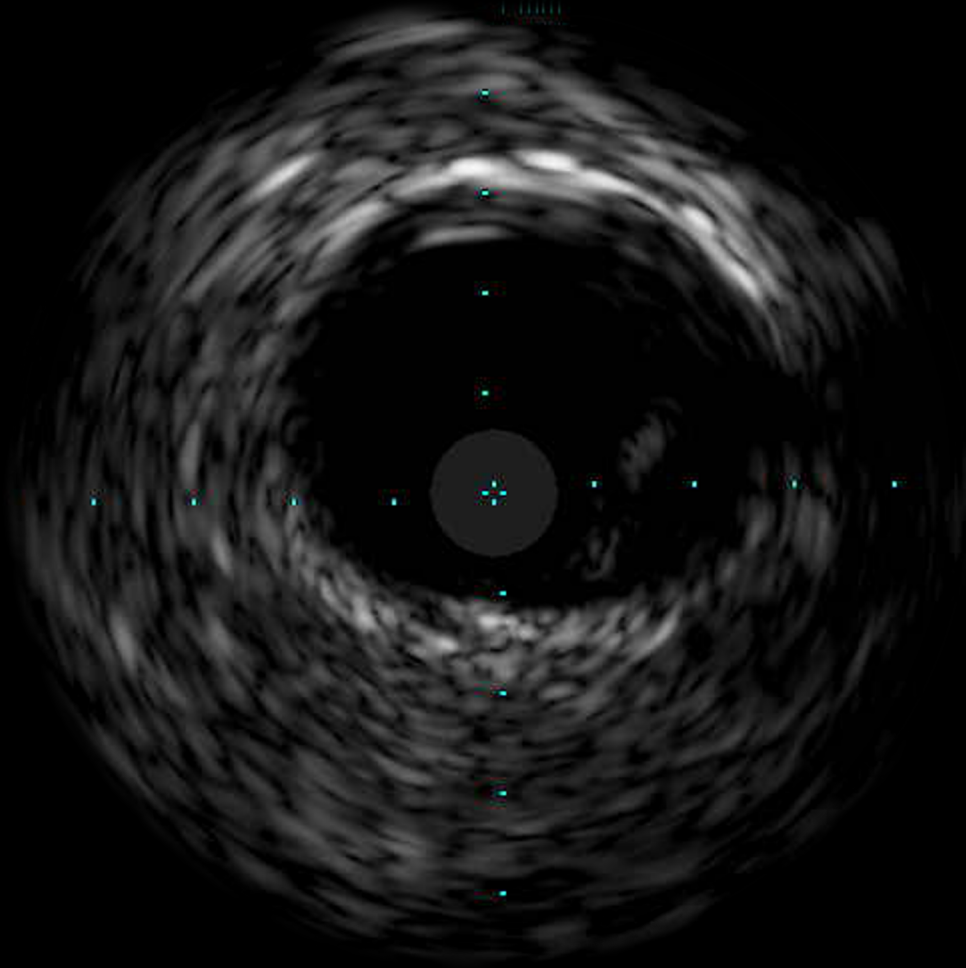
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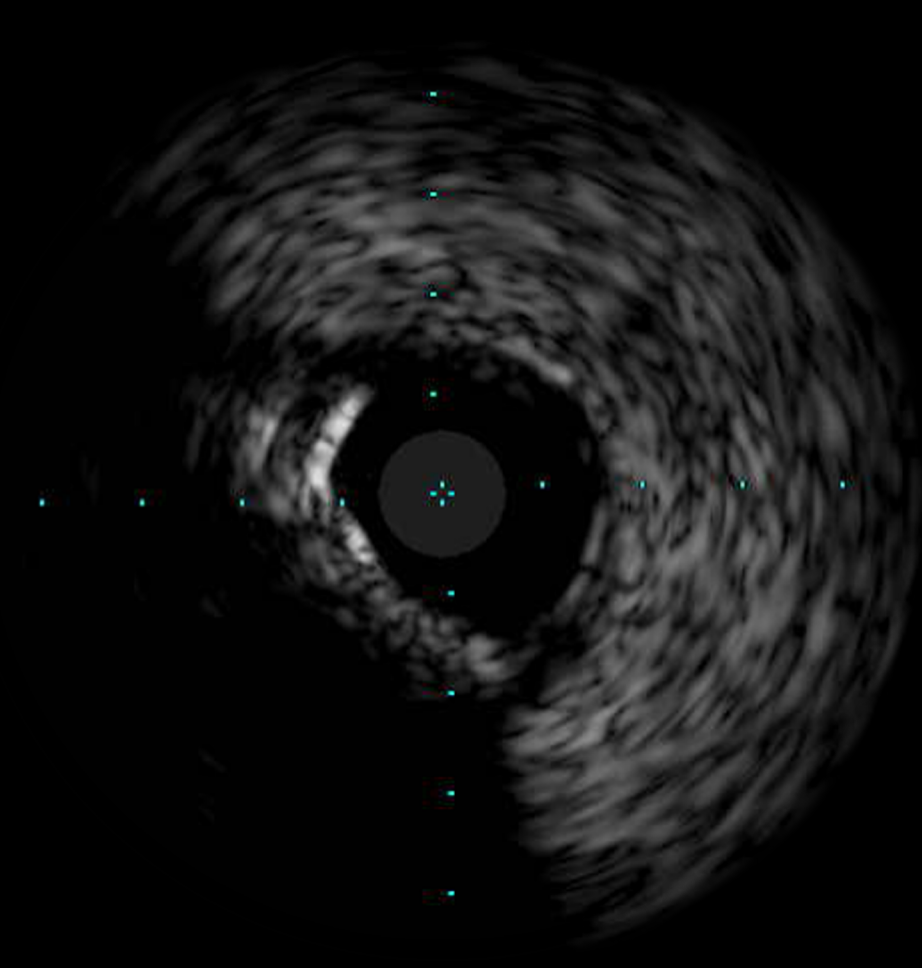
1.5mm rotabur down the LAD followed by 3.0 Chocolate Angioplasty balloon.

# Bifurcation Work Flow

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LAD into Left main

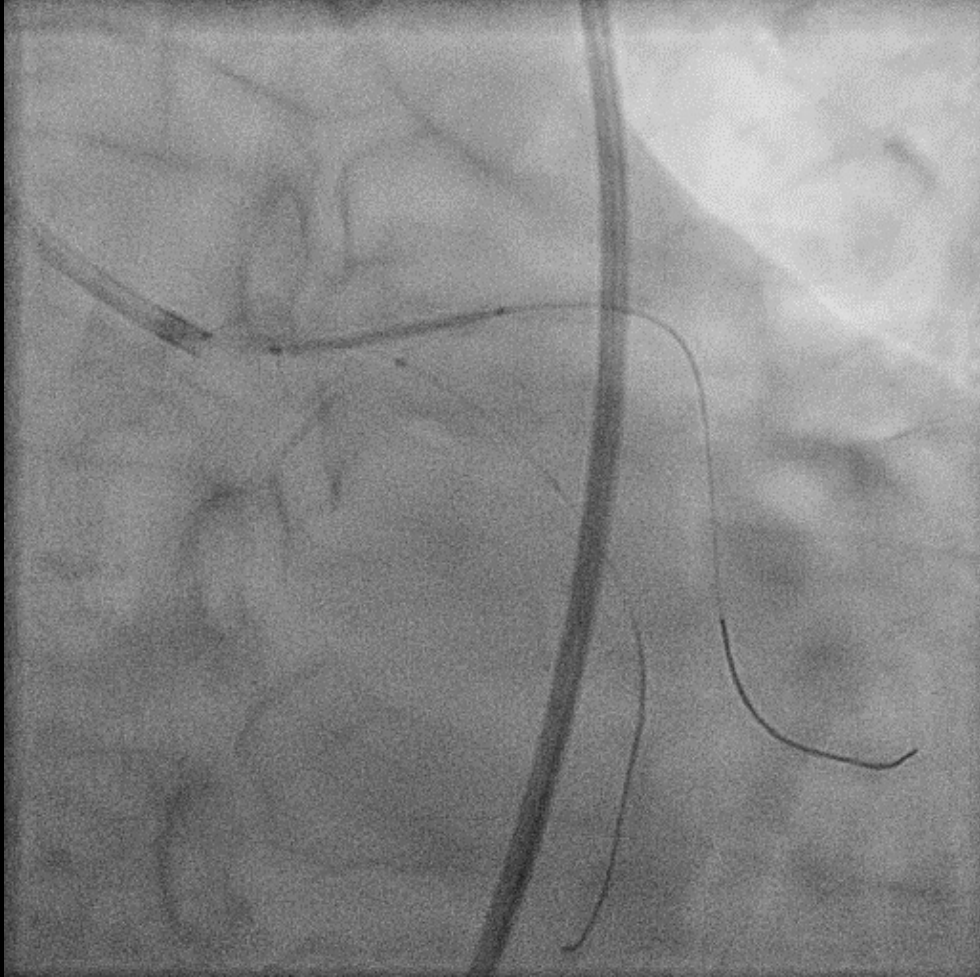


Circumflex into left main

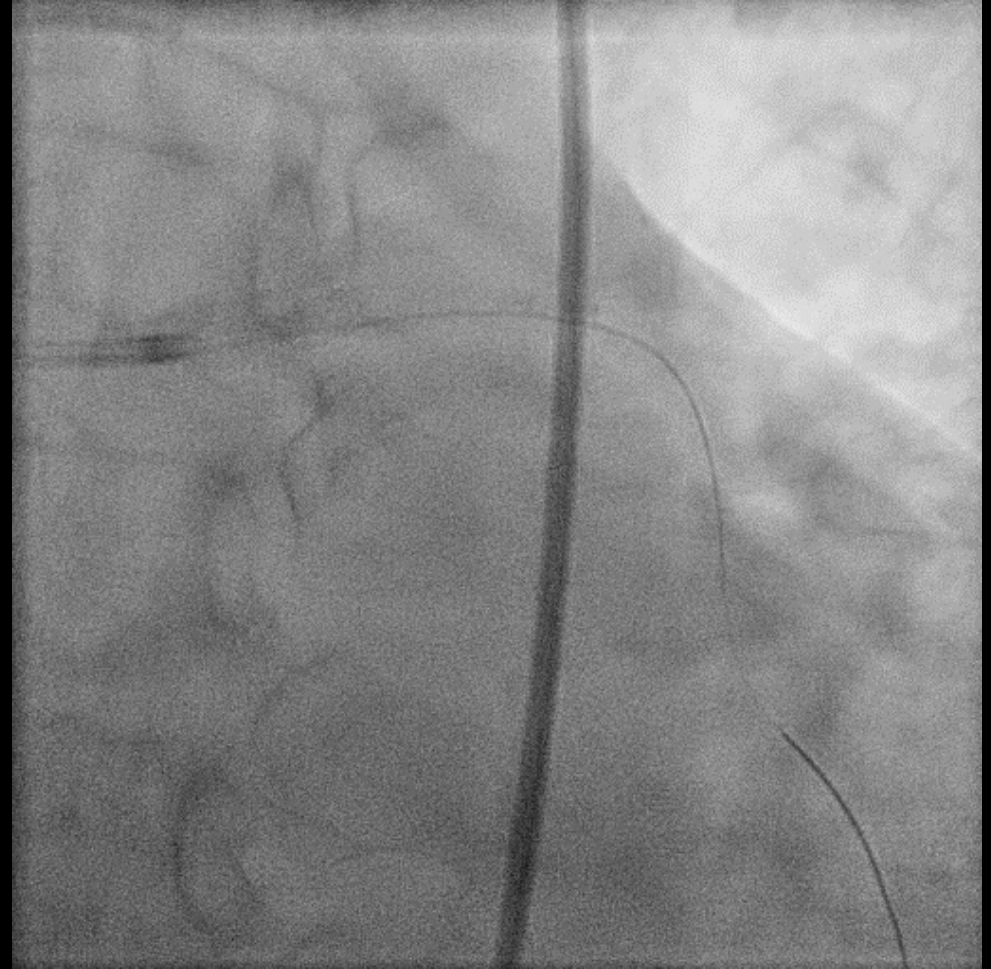


# Bifurcation Work Flow

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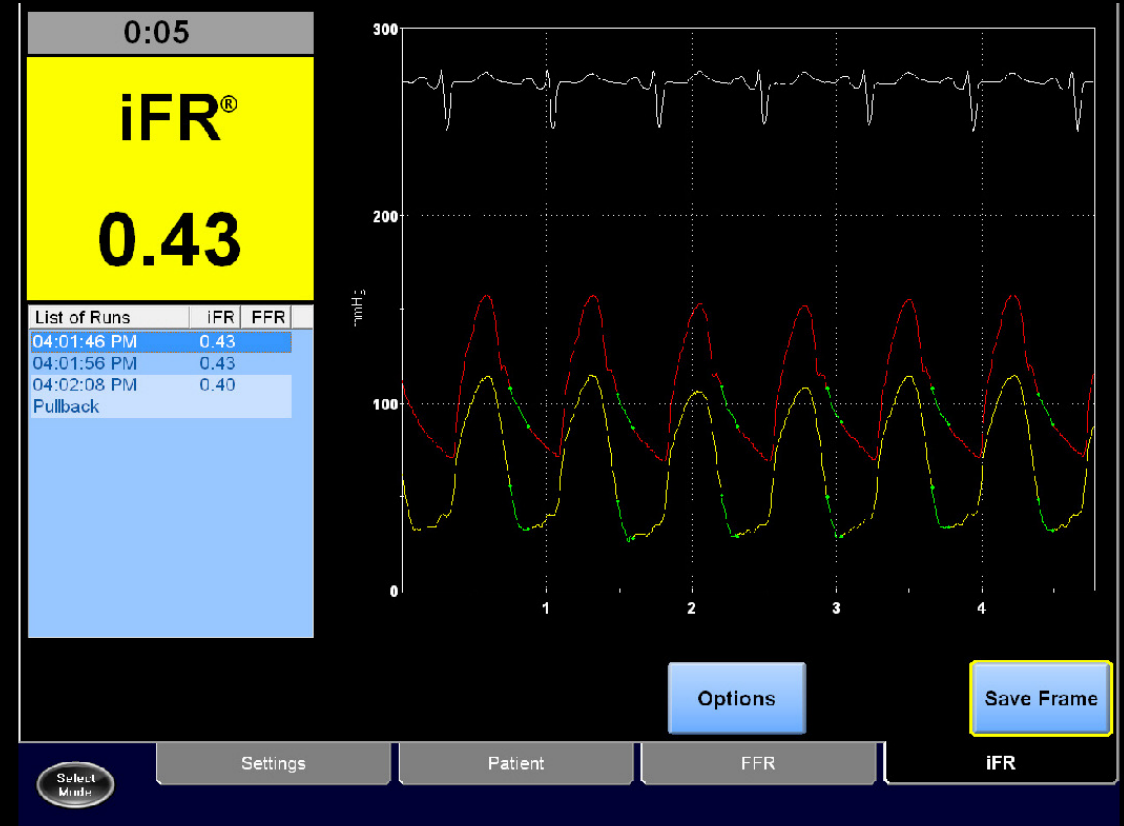
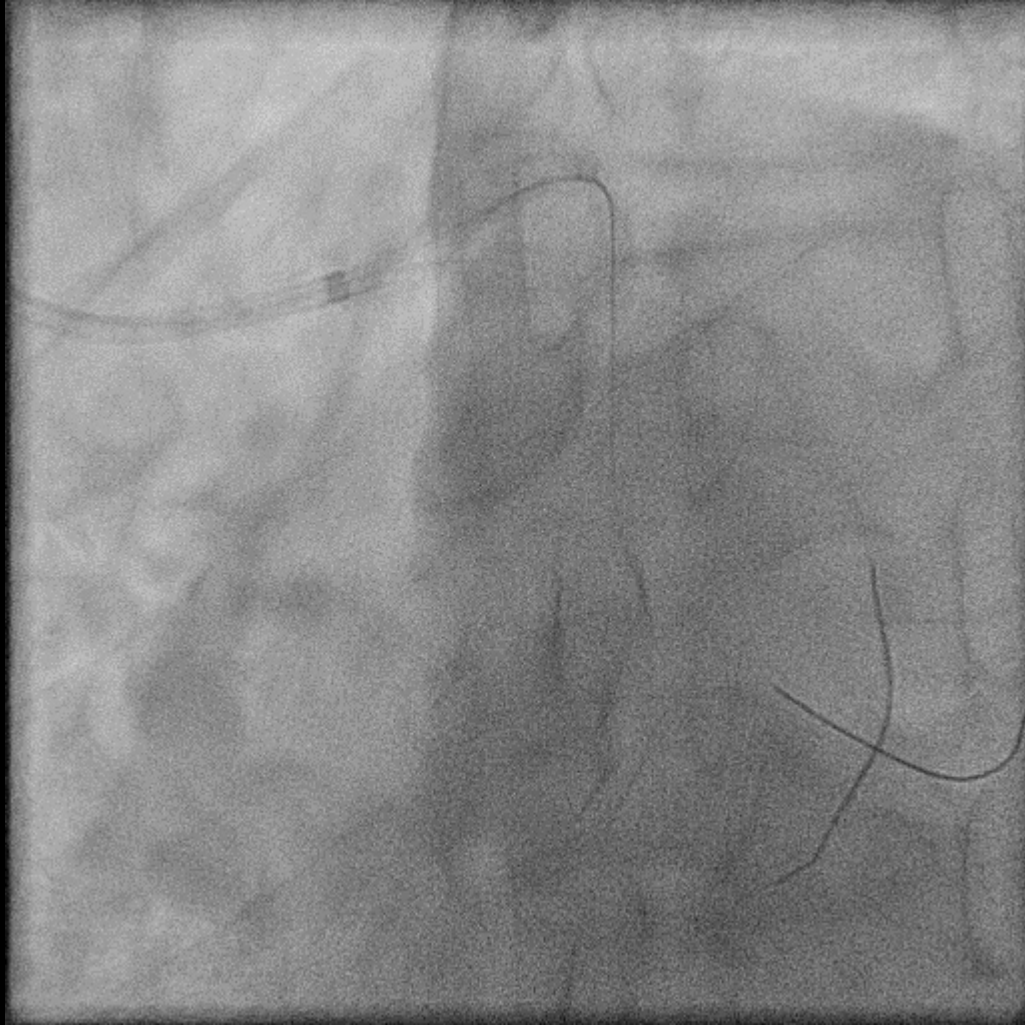


PCI LAD into Left main. JB the circumflex



Post POT

# Bifurcation Work Flow

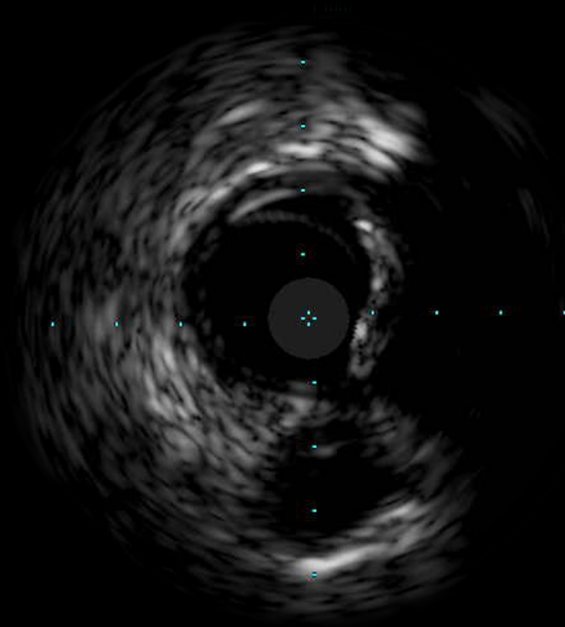
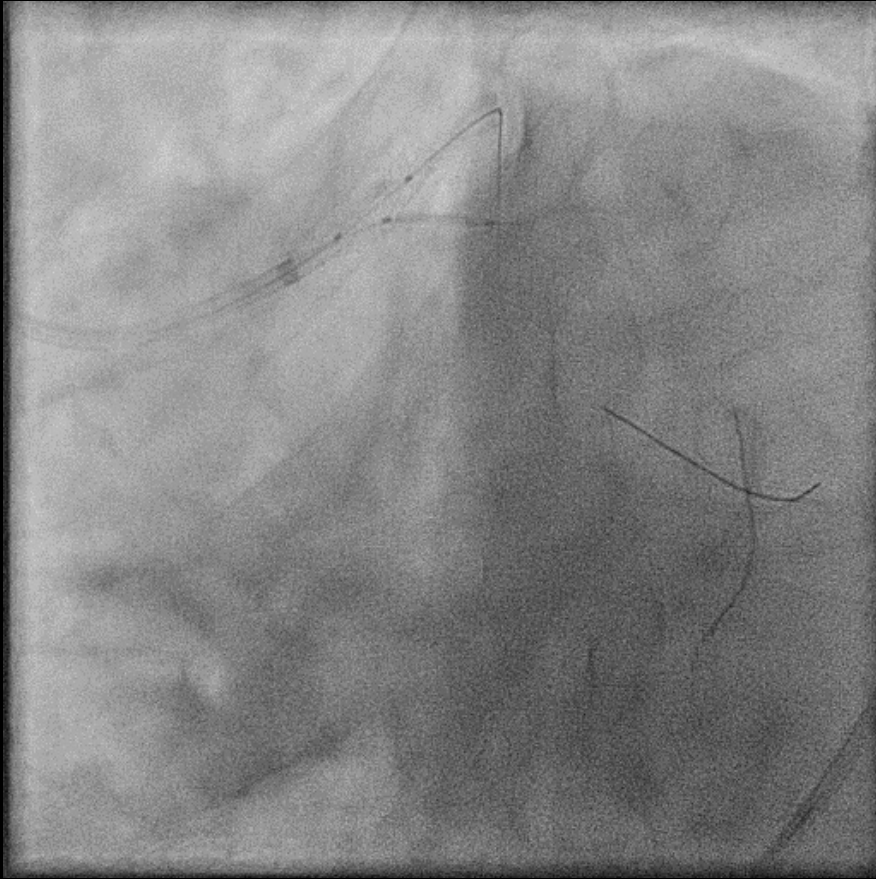


Rewire and Balloon side with repeat POBA LM.

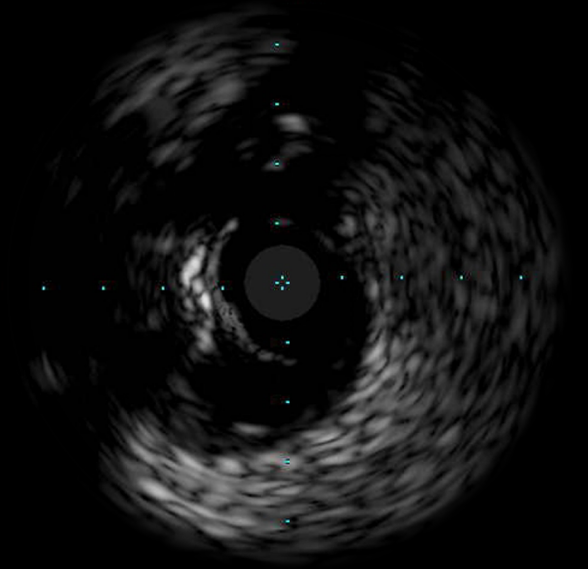


# Bifurcation Work Flow

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IVUS LAD

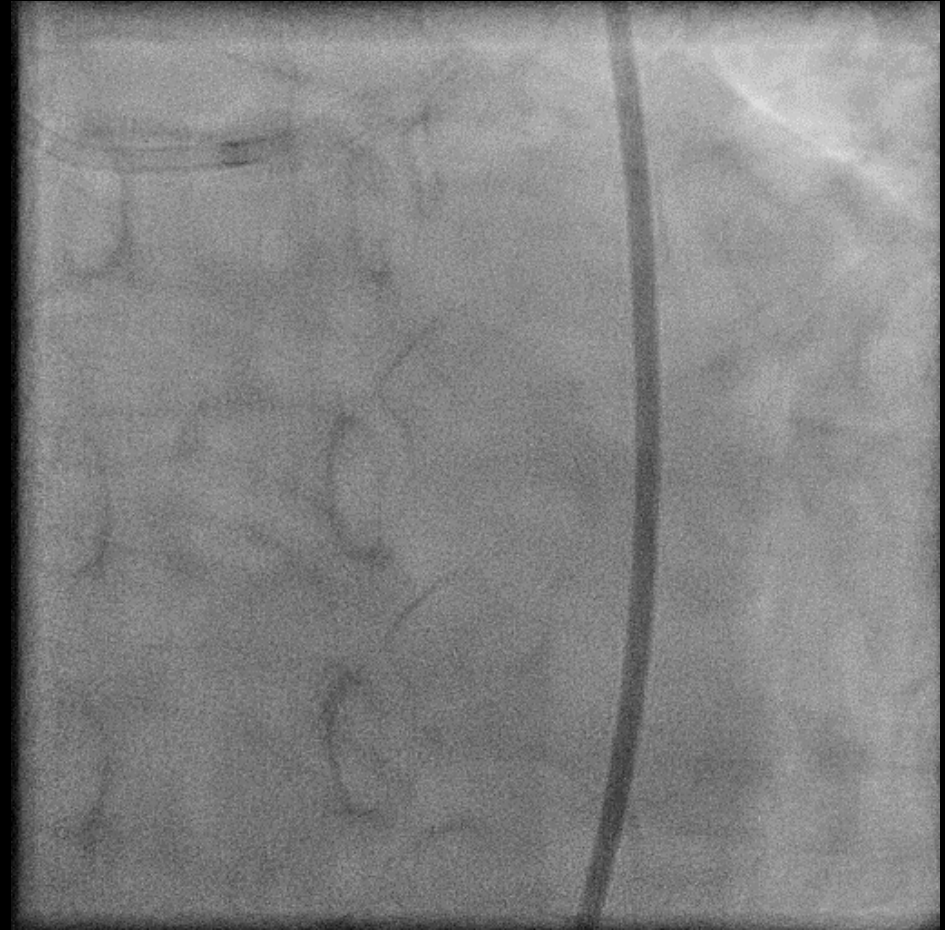


IVUS Circ



# Bifurcation Work Flow

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Final result

# Ostial Disease and Bifurcations

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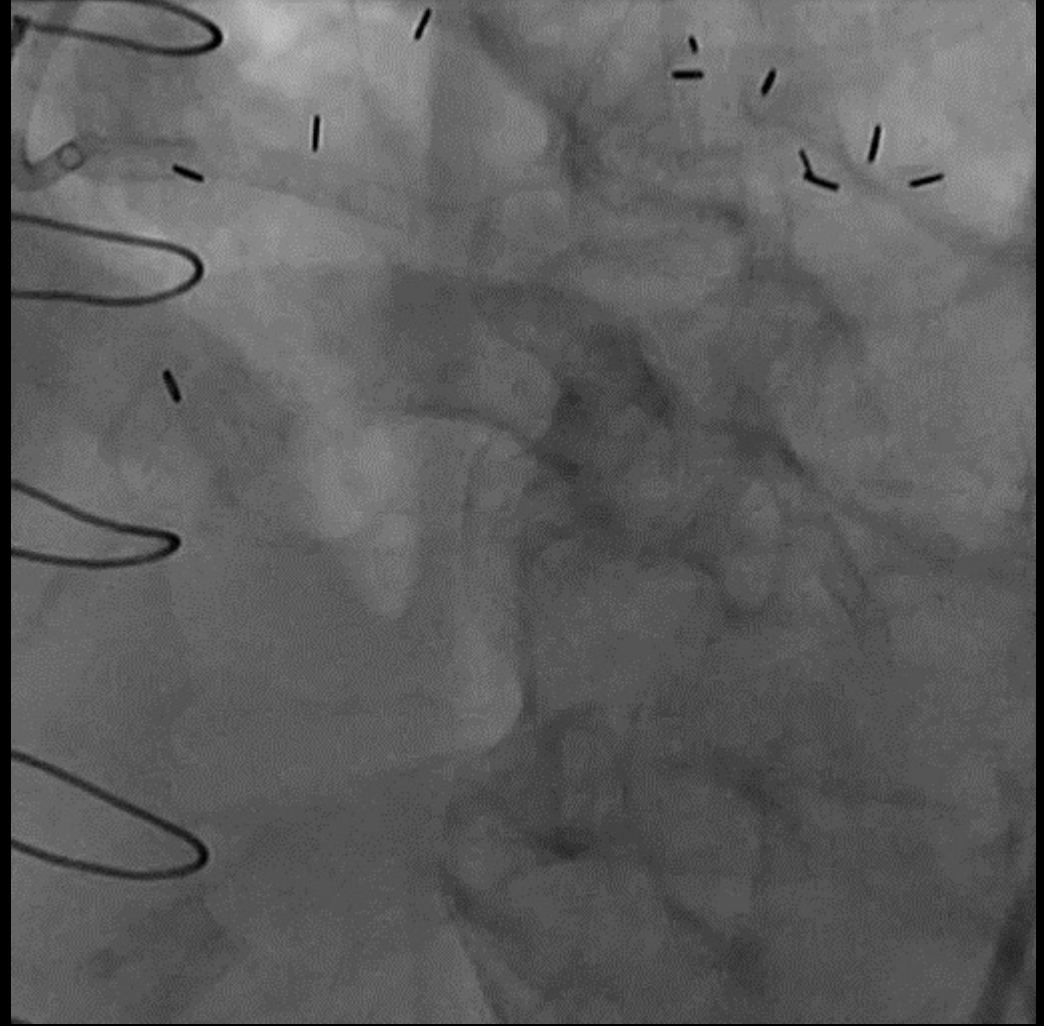
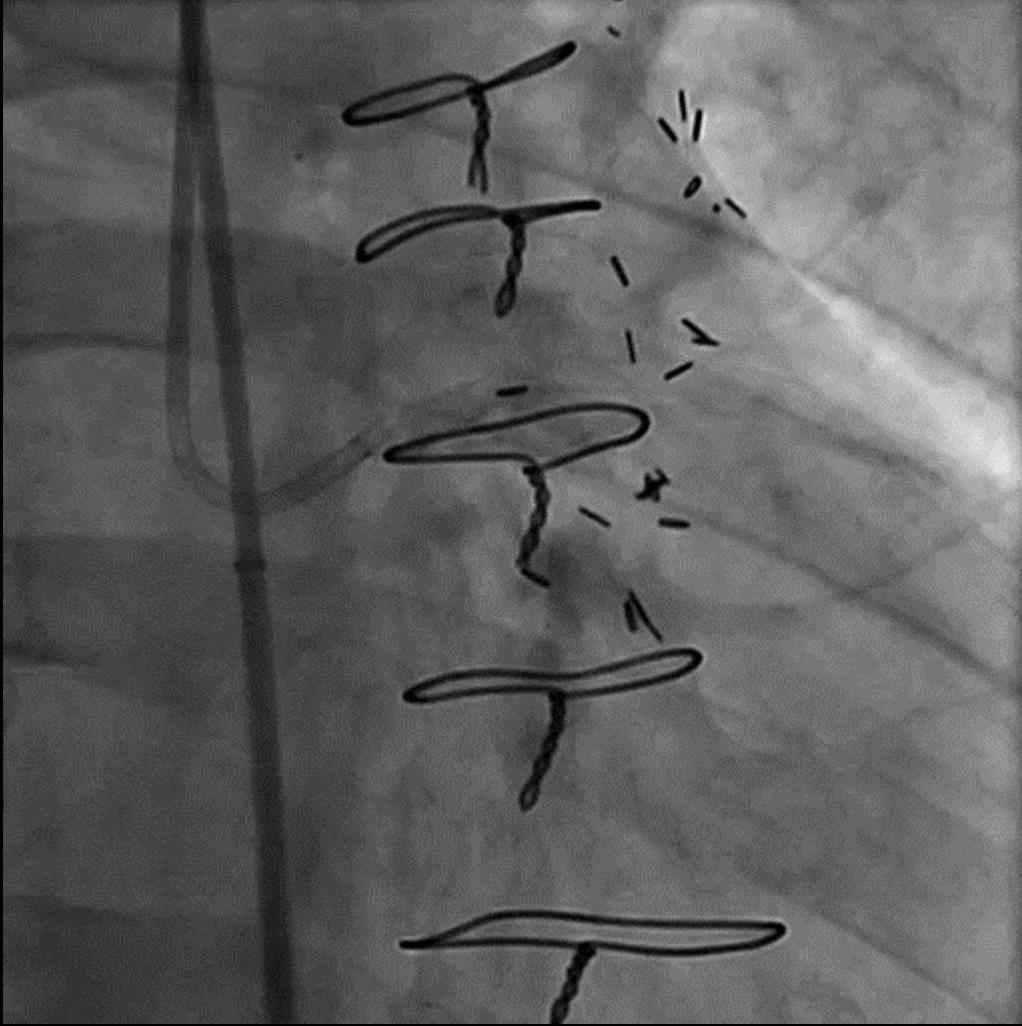
# OCT versus IVUS

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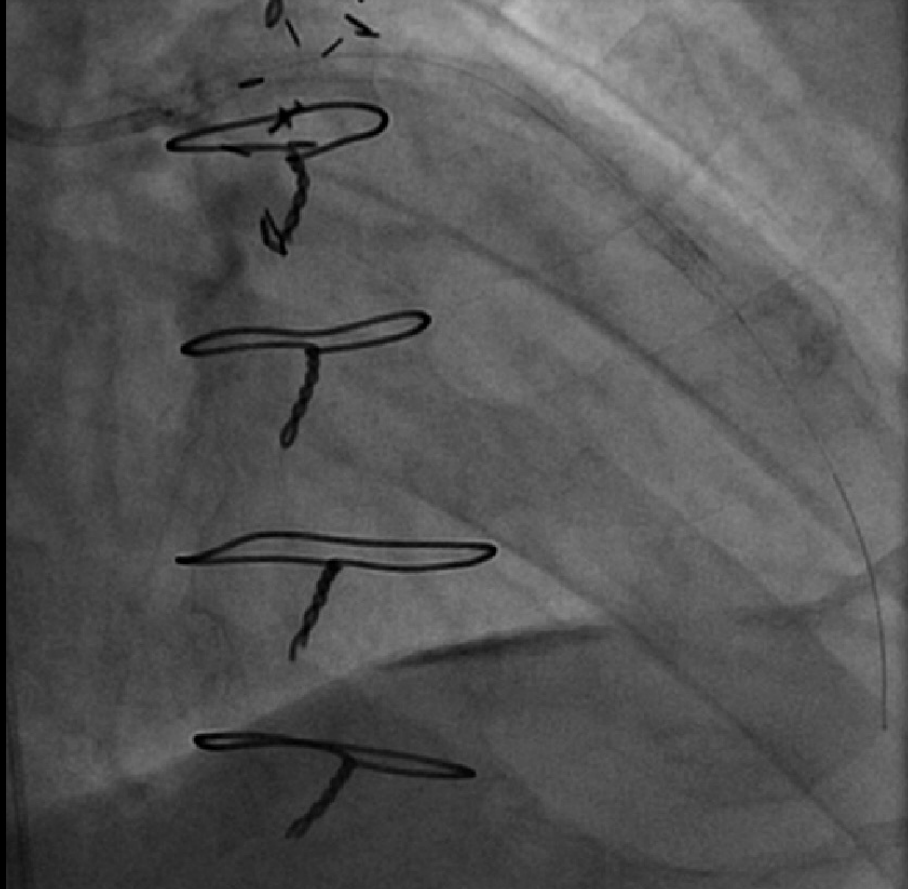


# Case ISR

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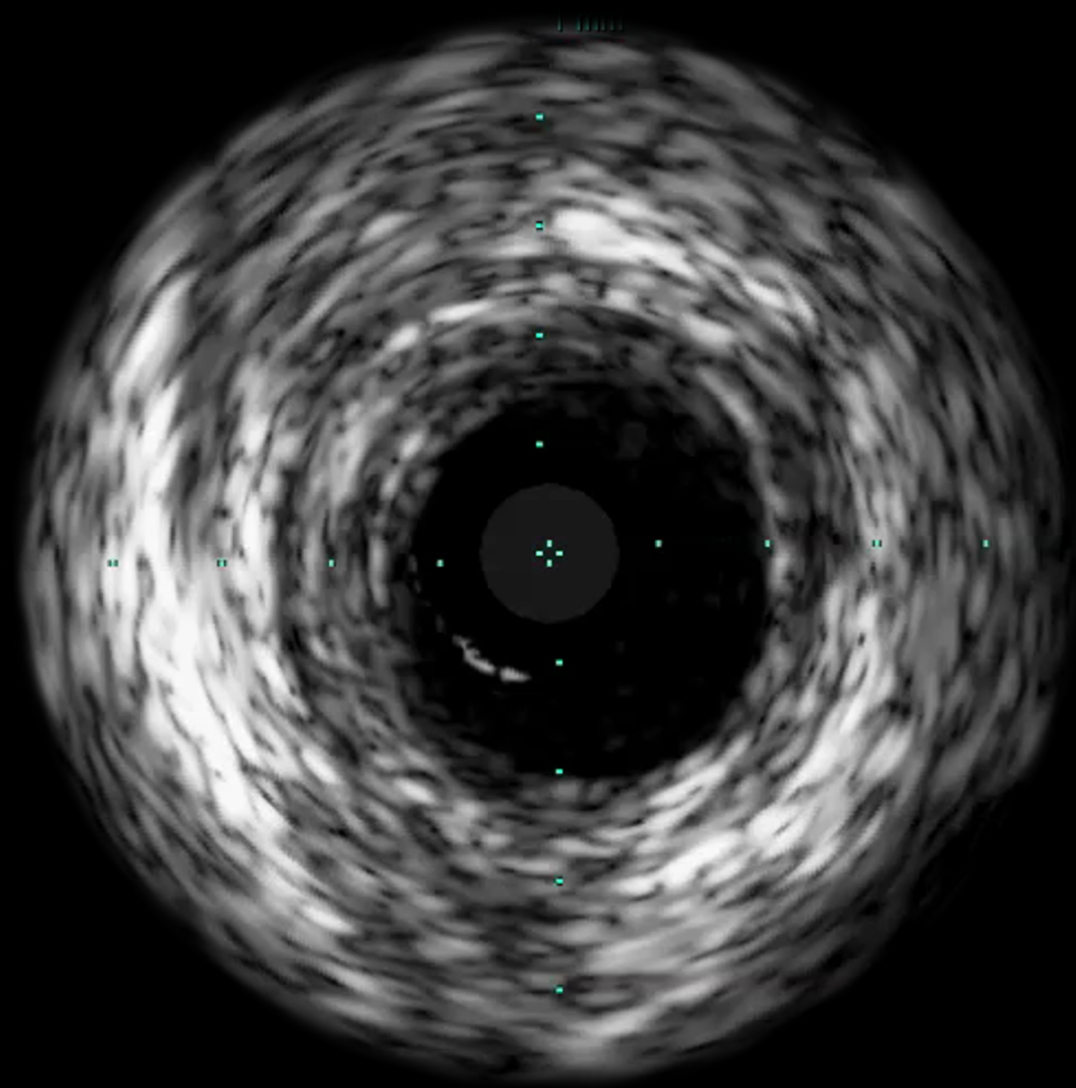


84 y/o male with pmh of CABG and PCI presents for increasing angina.



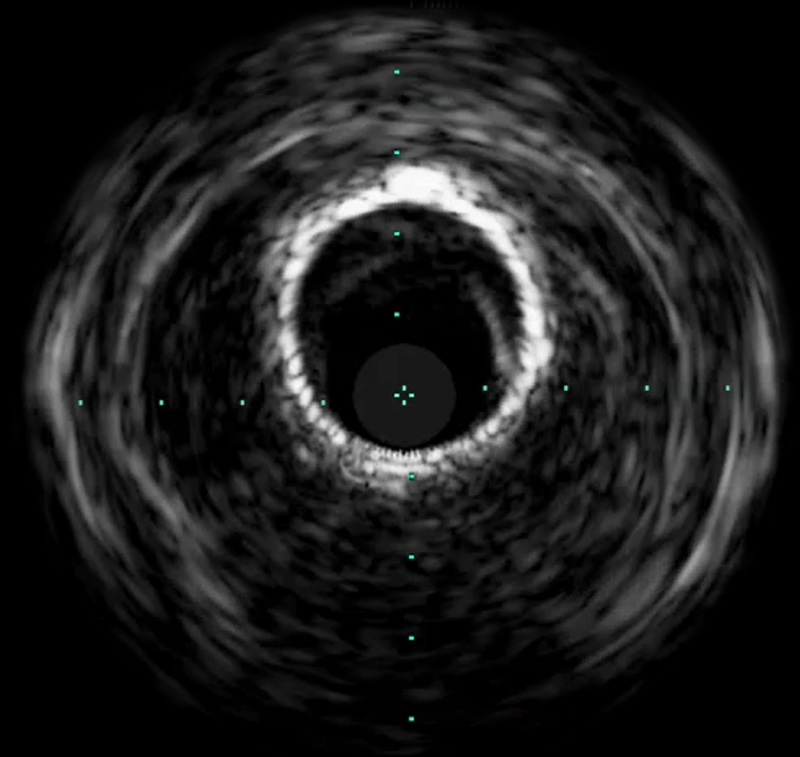
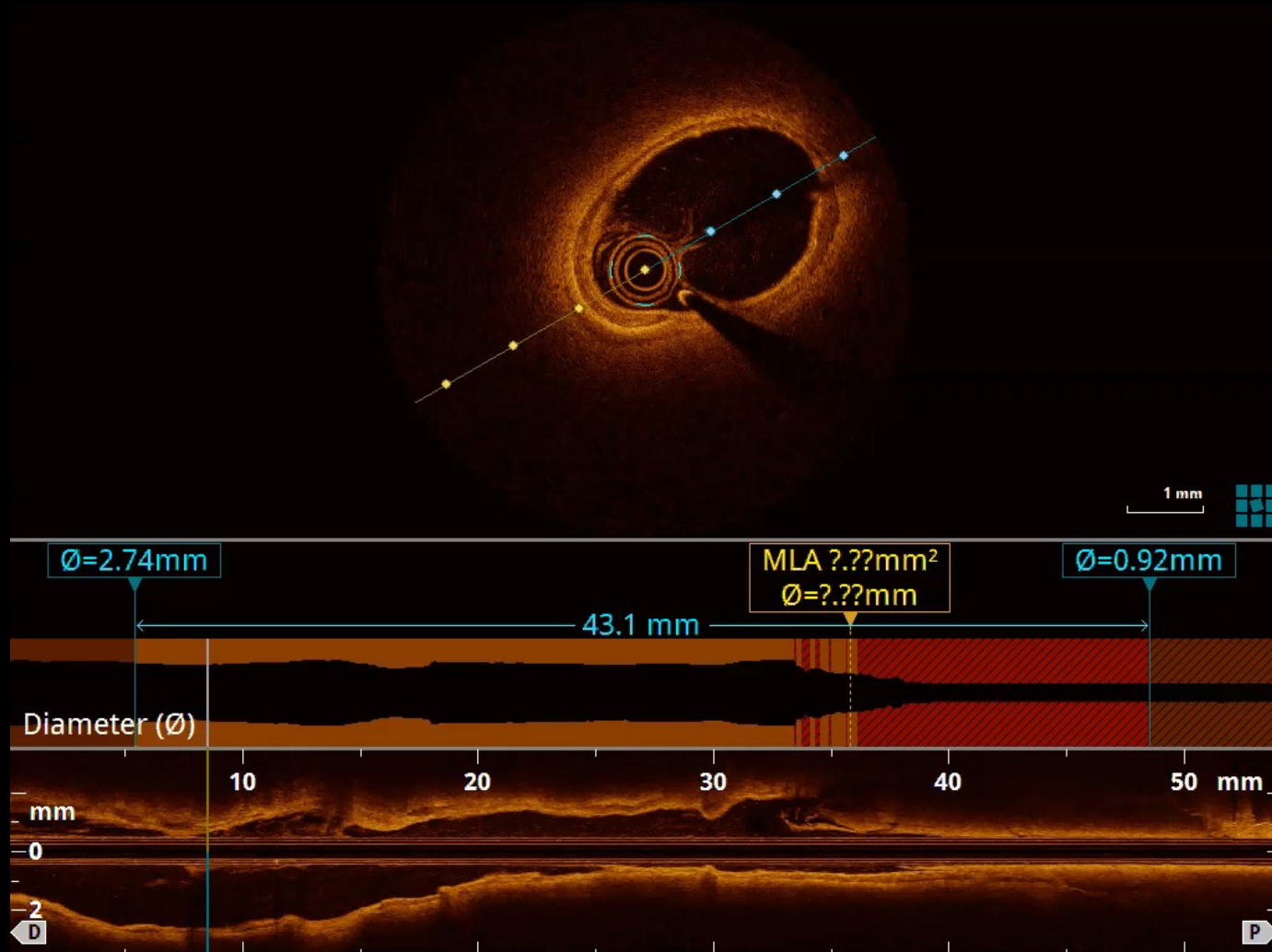
0.9mm Laser Catheter

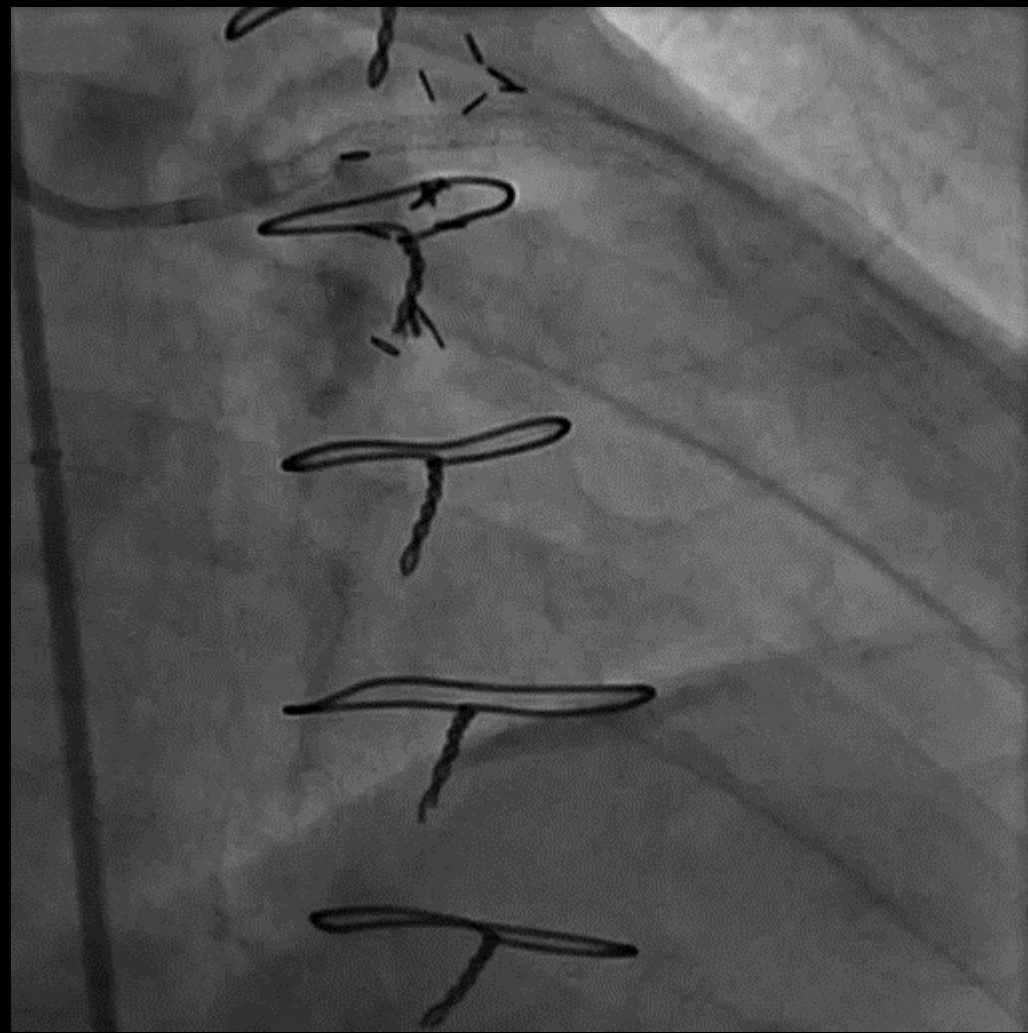






# OCT vs. IVUS

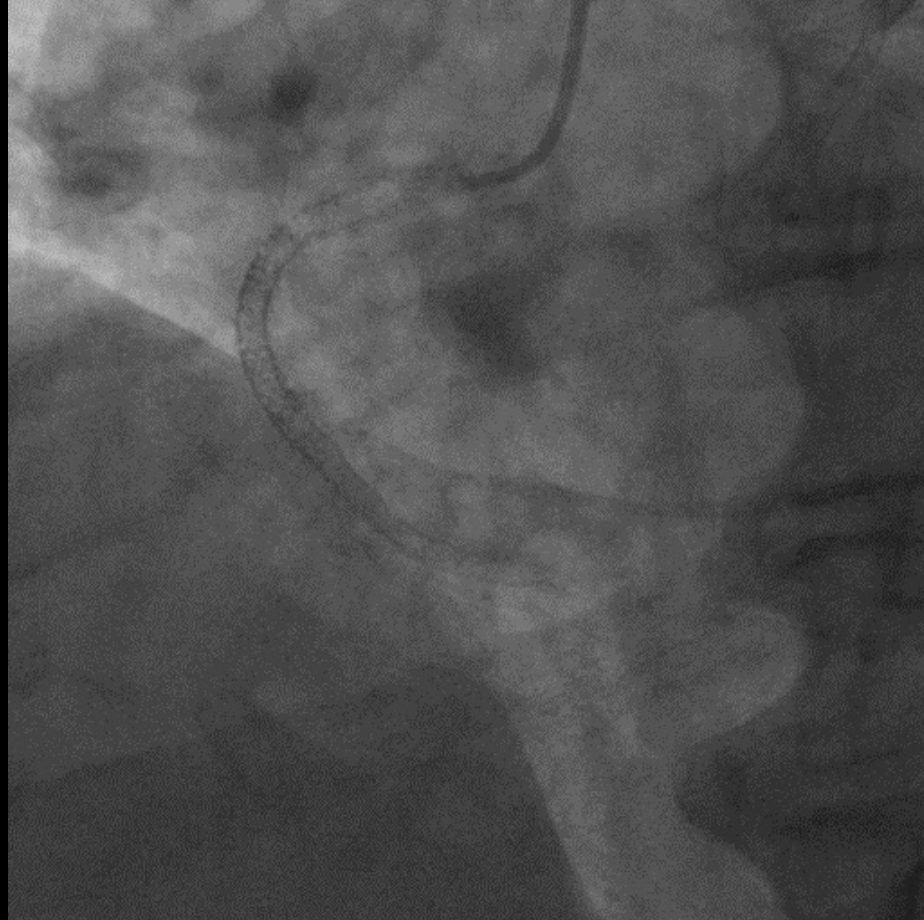




Final Result

# Case Repeat Thrombosis

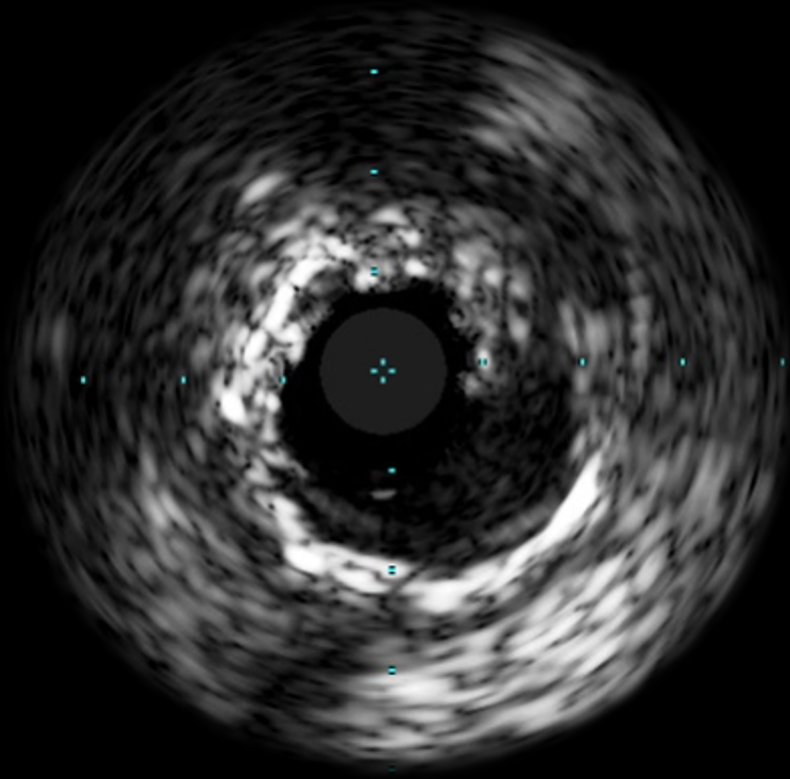
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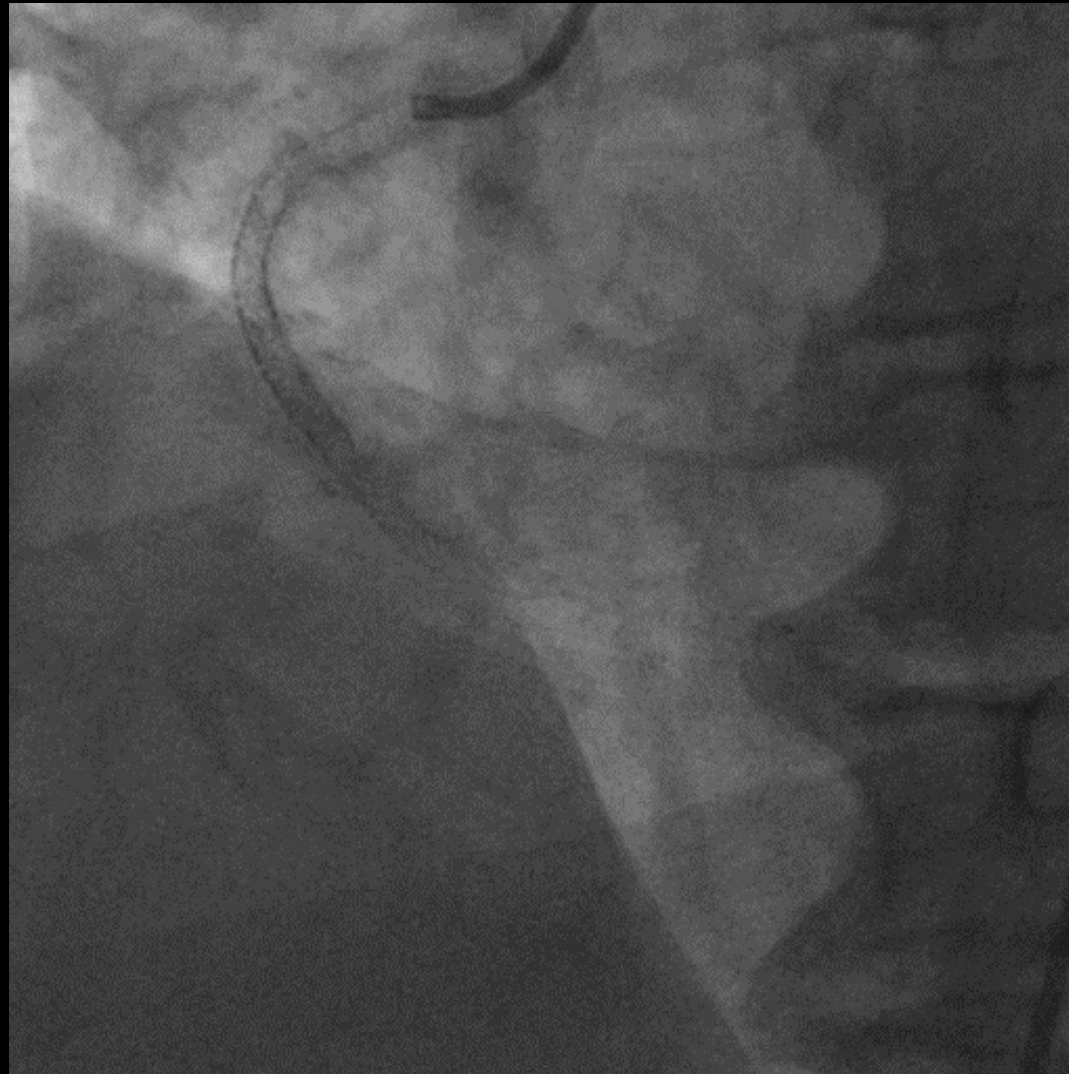
70 y/o with many previous PCI comes in for unstable angina after recent DES placement.  
1 month prior to that PCI he had another episode with thrombosis noted in same area.



# OCT vs. IVUS



Mostly “red clot” or thrombin rich clot as opposed to platelet rich clot. So many layers of stent were present it was proposed that it was a nidus for thrombosis despite aggressive DAPT.



ECLA and resented the segment. Placed on Coumadin and has not had symptoms since.

# OCT versus IVUS

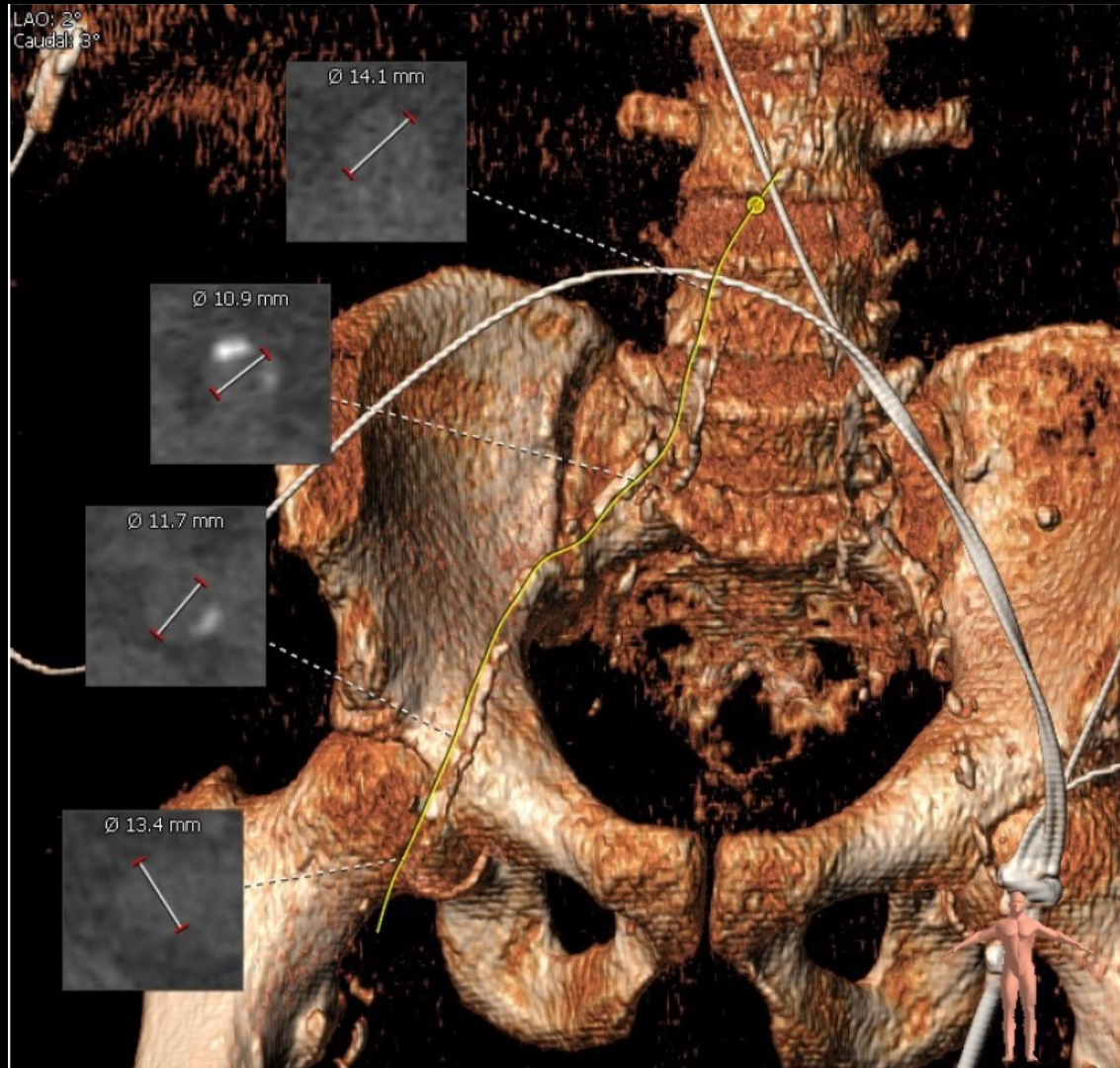
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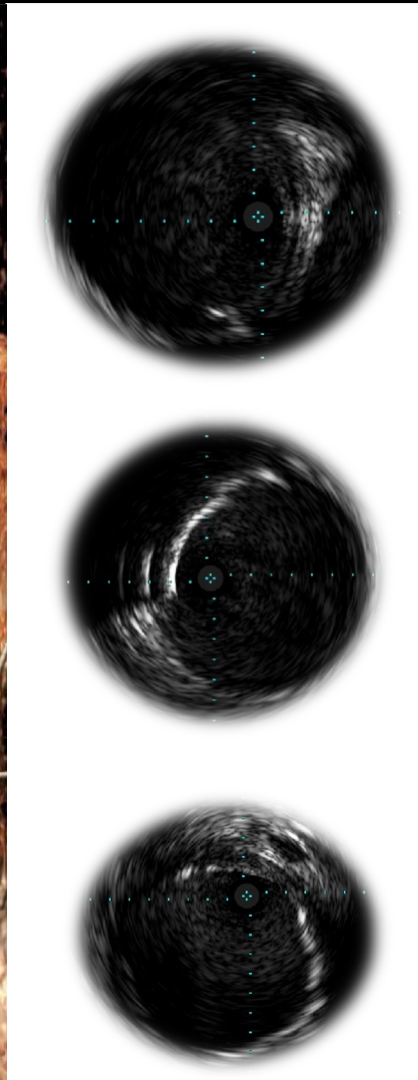
# TAVR and IVUS

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# IVUS for TAVR



Non Contrast CT



IVUS

12x12mm

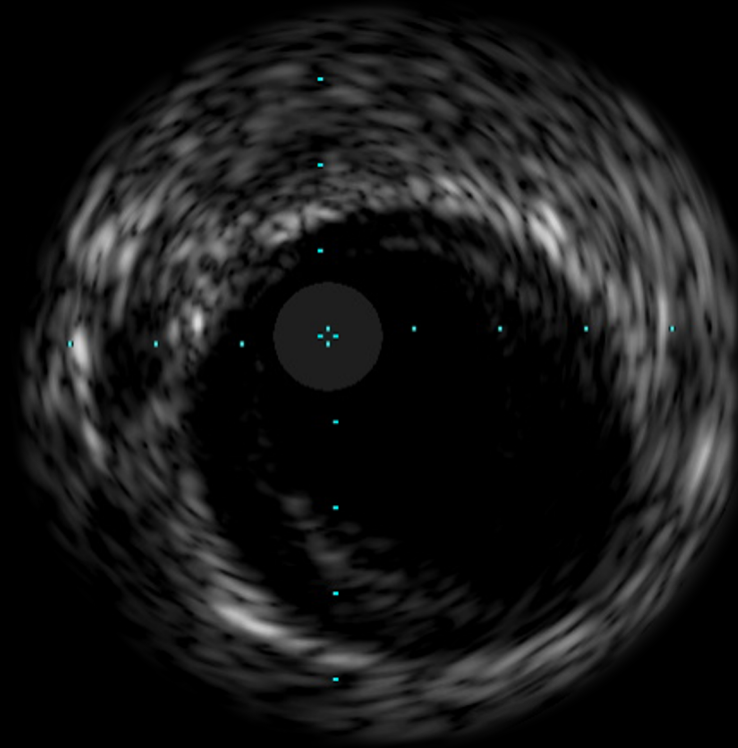
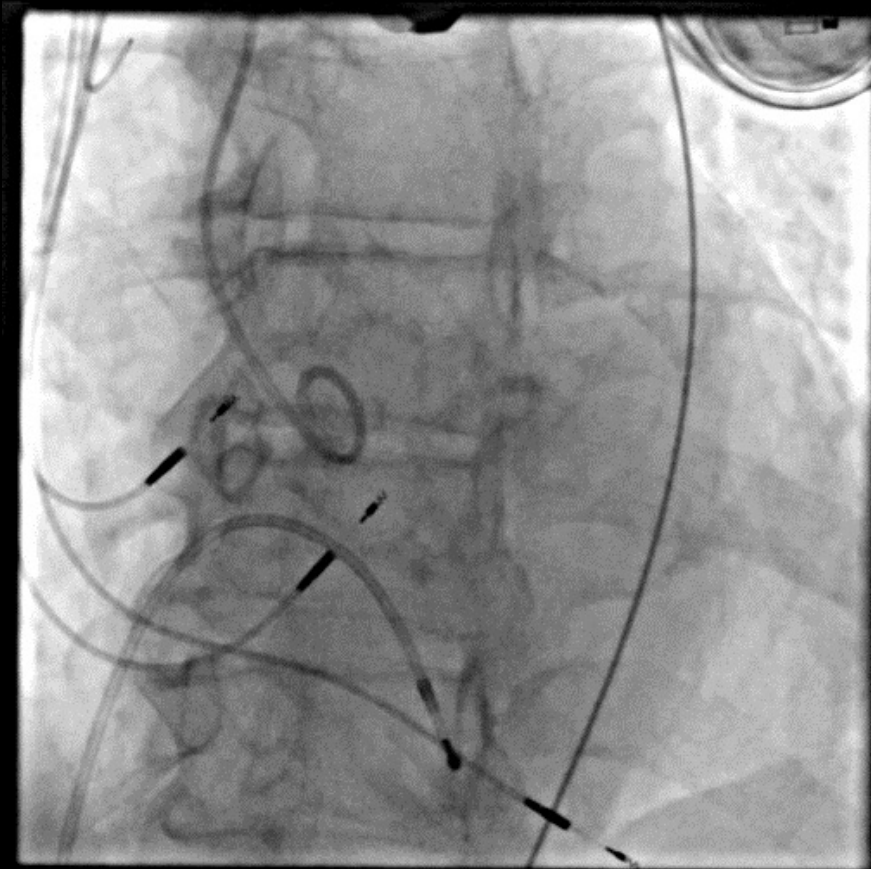
9.0 x 9.2mm  
mild calcification

9.2 x 10 mm  
mild calcification



# IVUS for TAVR

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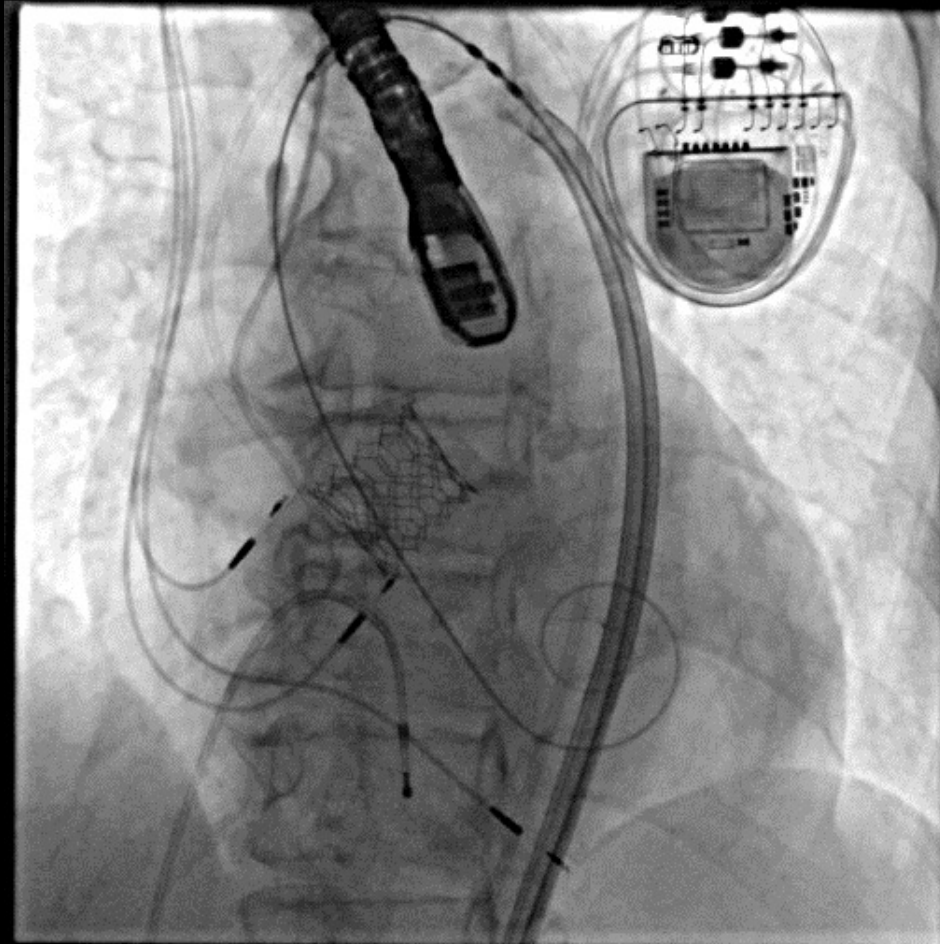


Left coronary was low at 8mm and the sinus was narrow. Left main protection with pre and post IVUS



# IVUS for TAVR

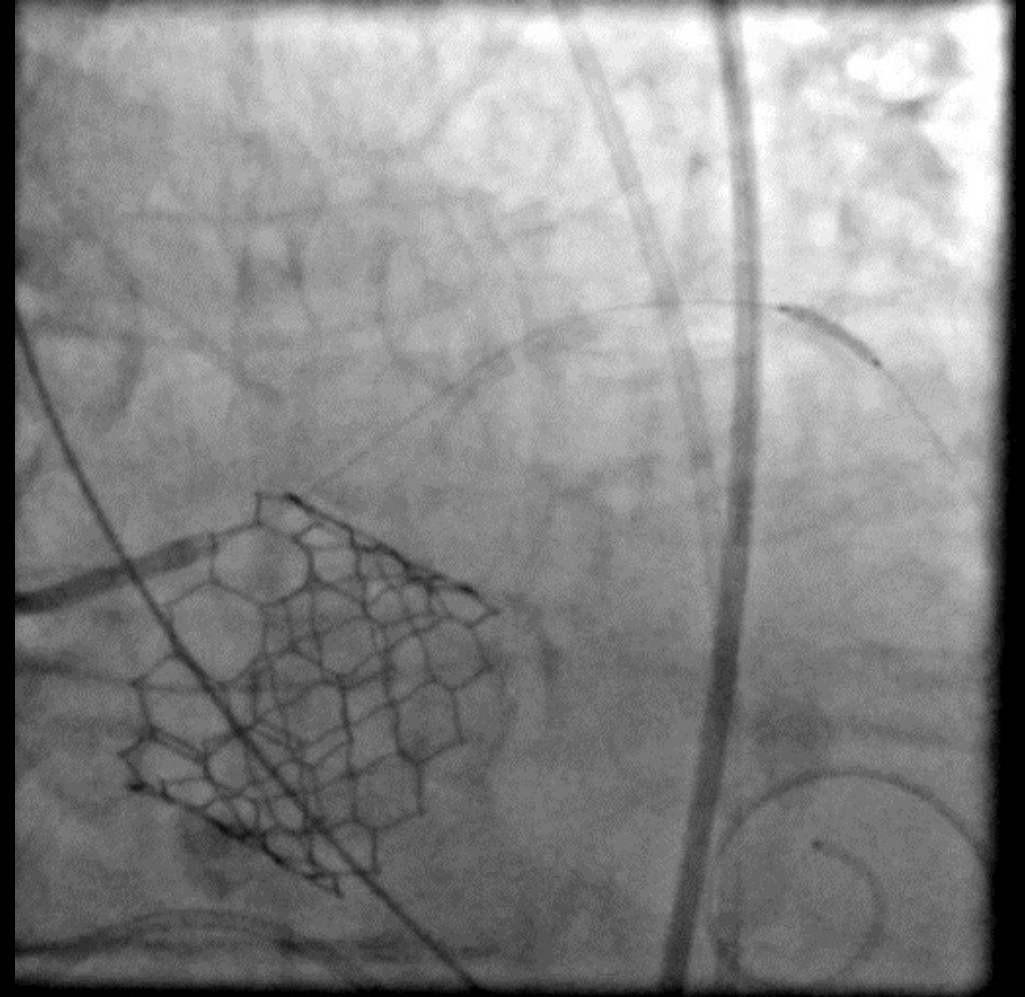
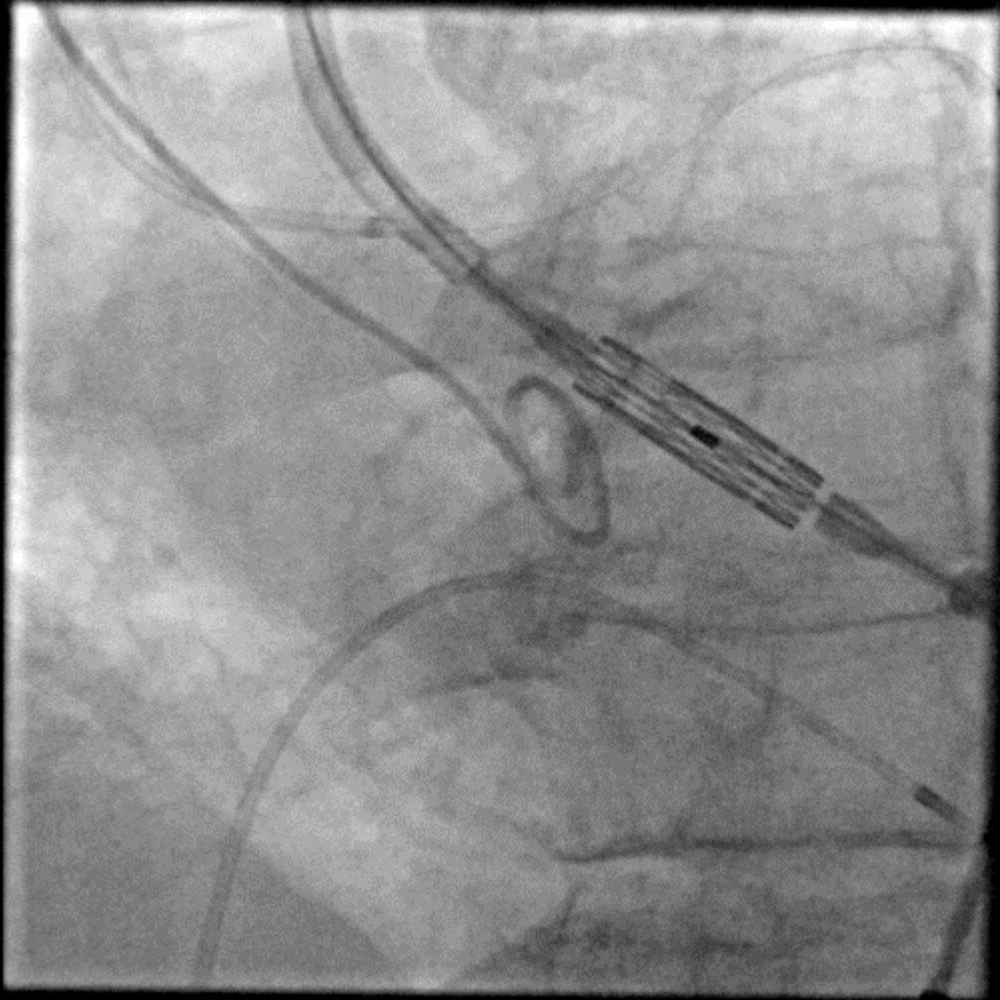
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Final Angiogram

# IVUS for TAVR

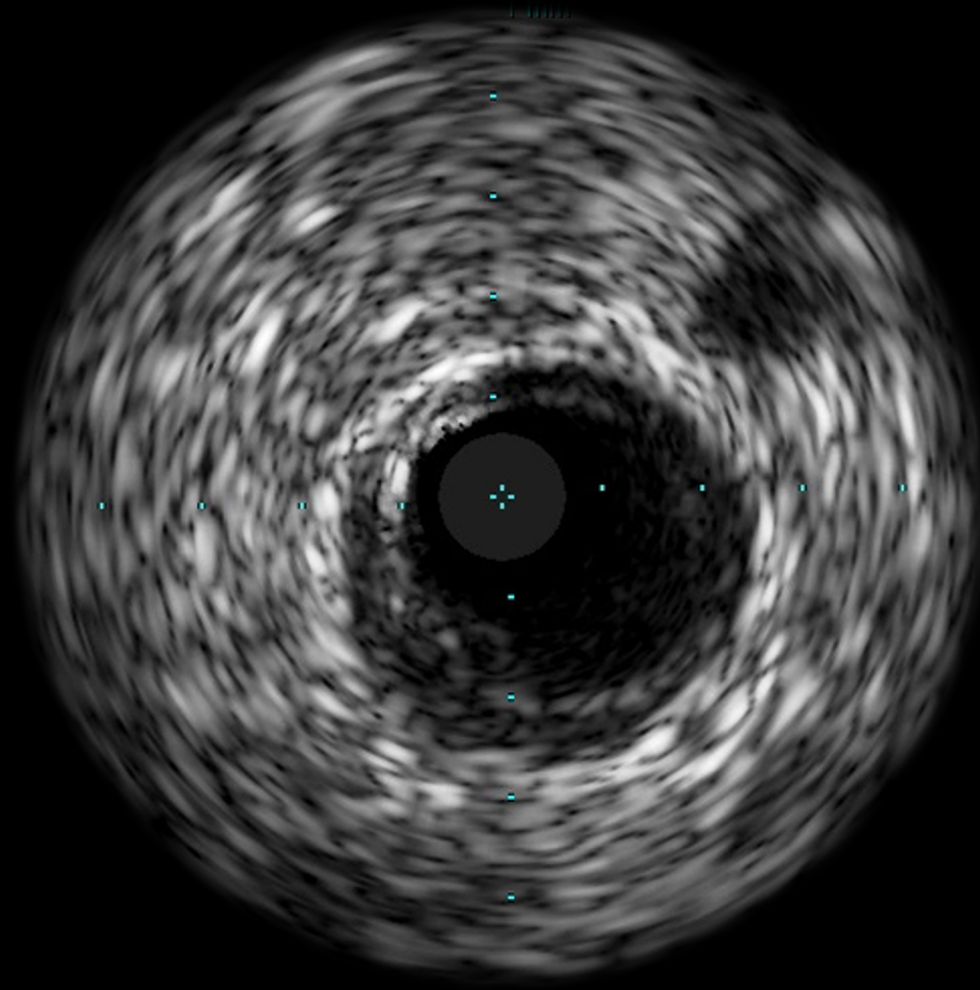
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Subclavian TAVR with low left coronary.

# IVUS for TAVR

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IVUS post shows left main is wide open.



# TAVR and IVUS

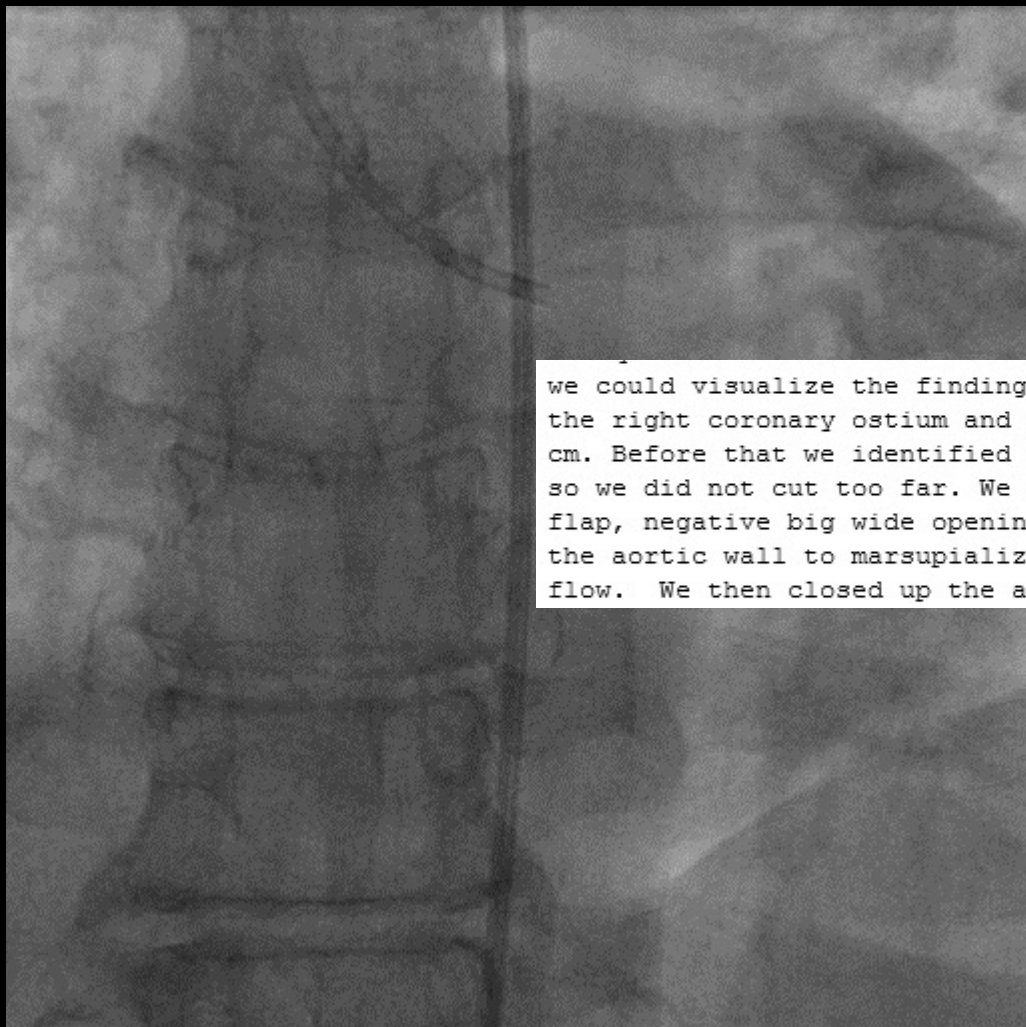
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# Anomalous Coronary and interesting cases

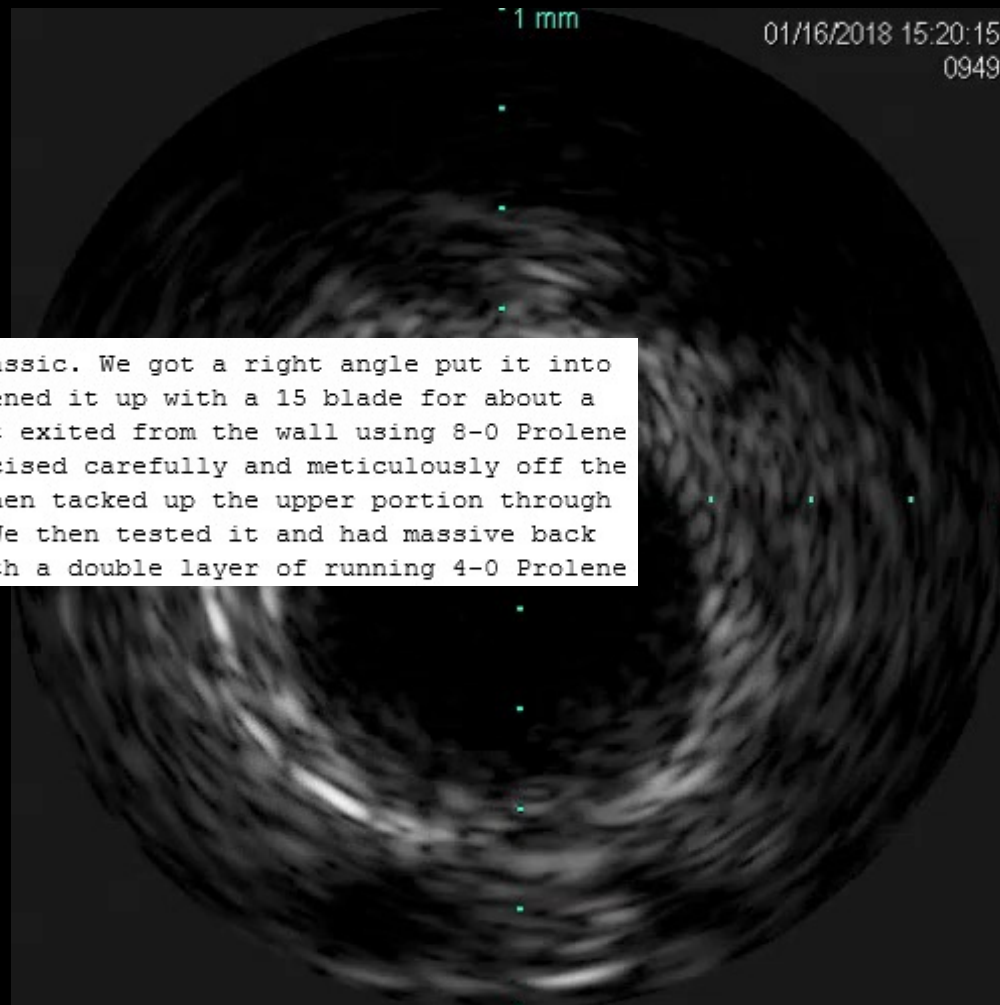
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# IVUS for Anomalous RCA

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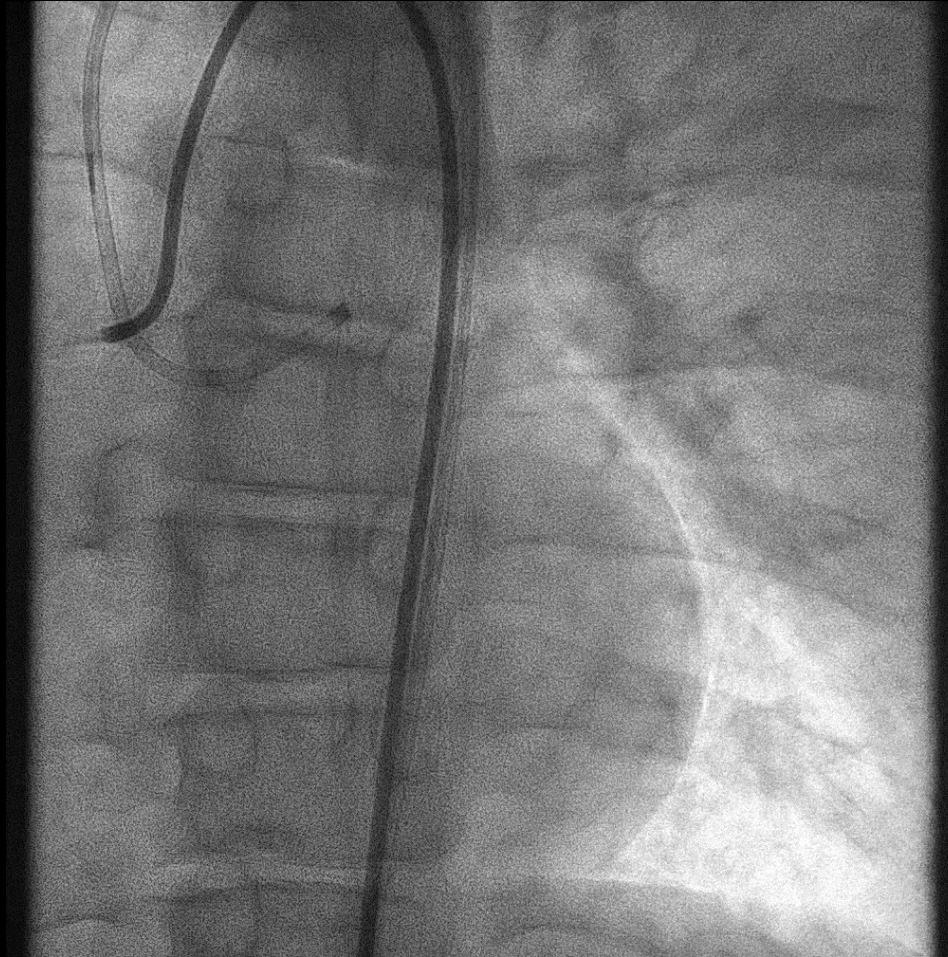
we could visualize the findings of classic. We got a right angle put it into the right coronary ostium and then opened it up with a 15 blade for about a cm. Before that we identified where it exited from the wall using 8-0 Prolene so we did not cut too far. We then excised carefully and meticulously off the flap, negative big wide opening and then tacked up the upper portion through the aortic wall to marsupialize it. We then tested it and had massive back flow. We then closed up the aorta with a double layer of running 4-0 Prolene





# 14 year old with CTO

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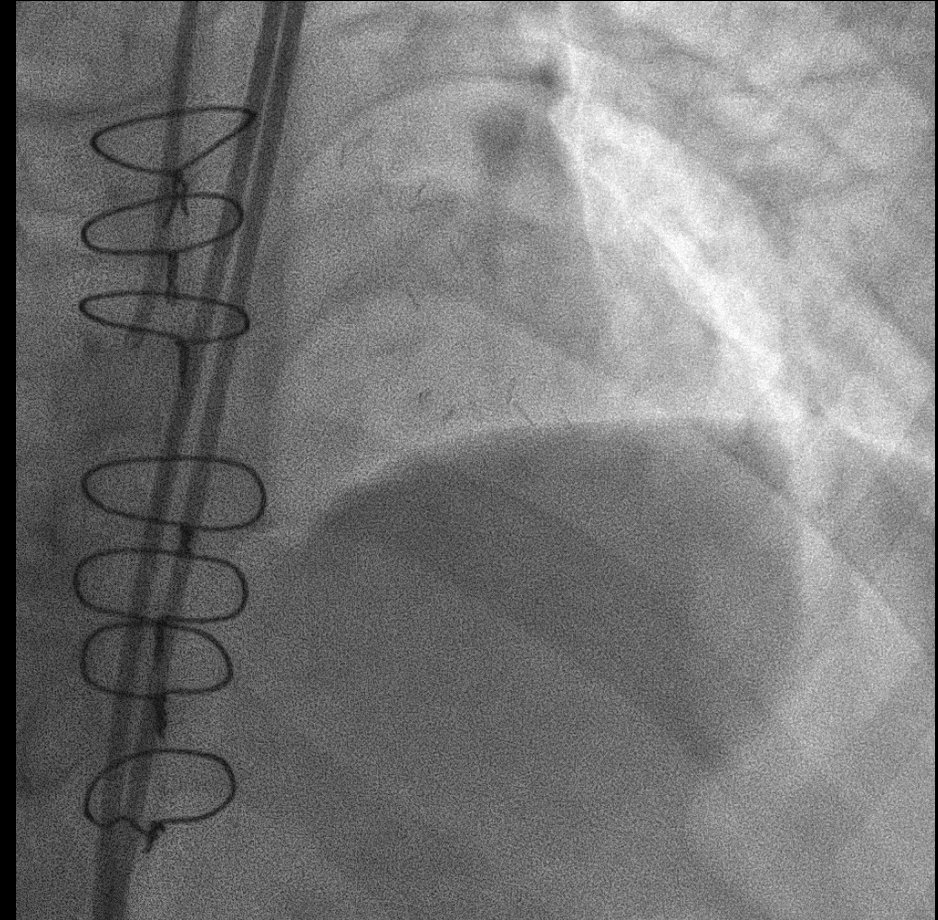
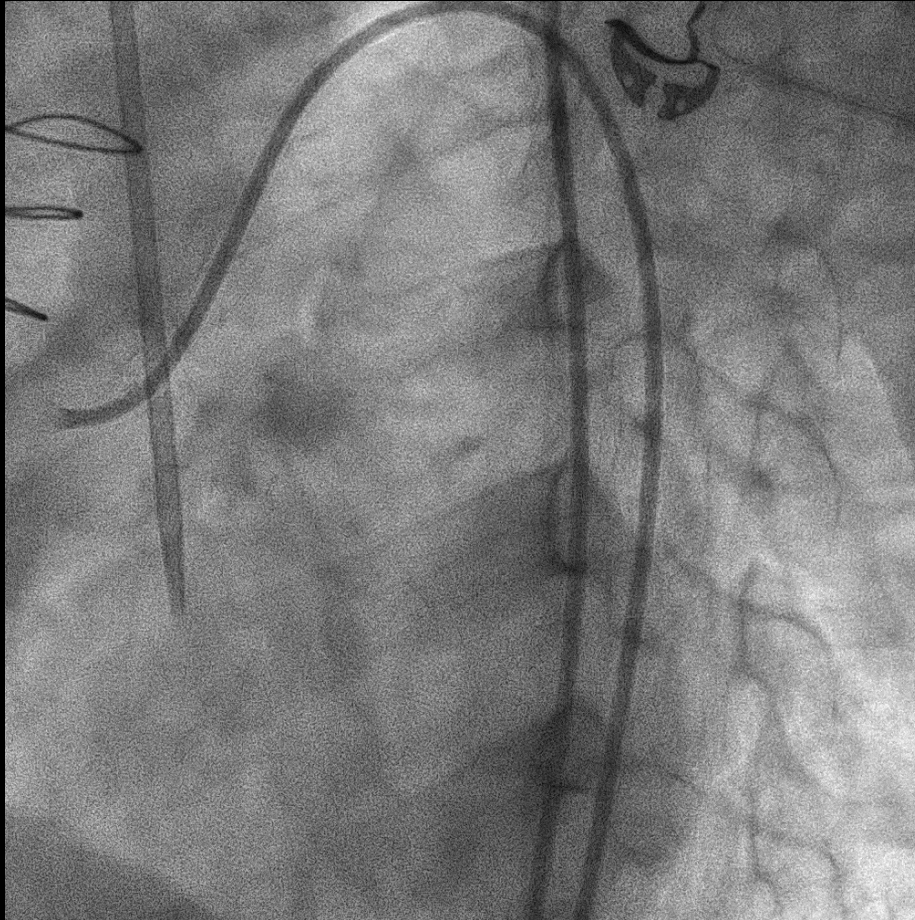
Tried for 4 hours both retrograde and antegrade with no luck.  
Sent for CABG IMA to LAD.

14 year old female with PMH of pulmonary valve stenosis presented with dyspnea and chest pain. MRI showed Occlusion of left main and cath at children's hospital showed robust Right to left collaterals with occluded left main



# 14 year old with CTO

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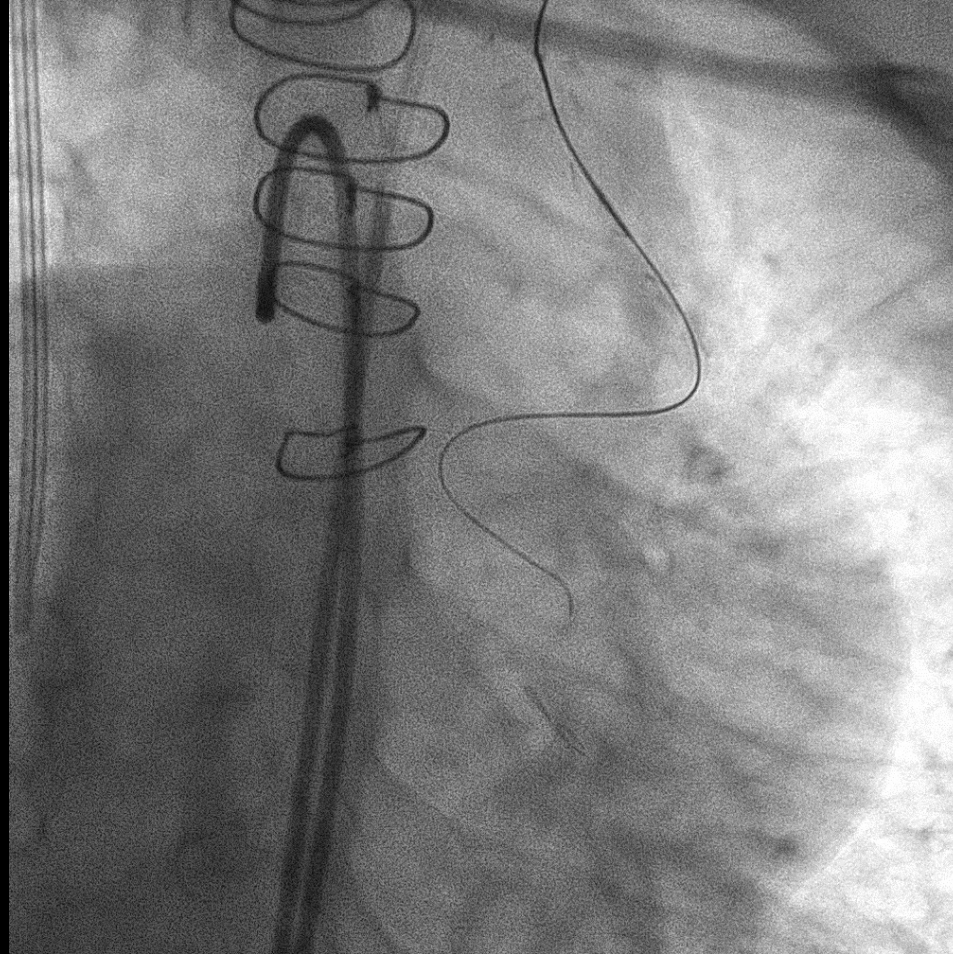


Unfortunately she never felt better and repeat cath showed issues with IMA anastomosis with marked Ischemia of her left ventricle despite the collaterals



# 14 year old with CTO

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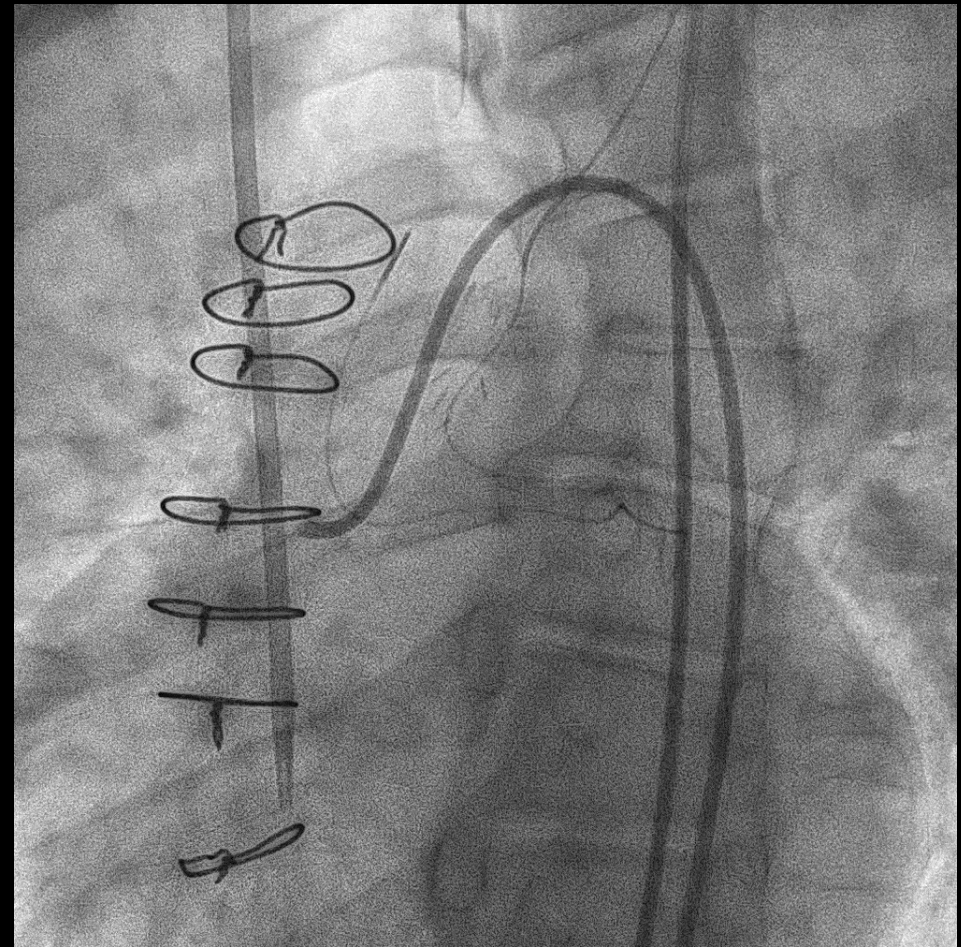
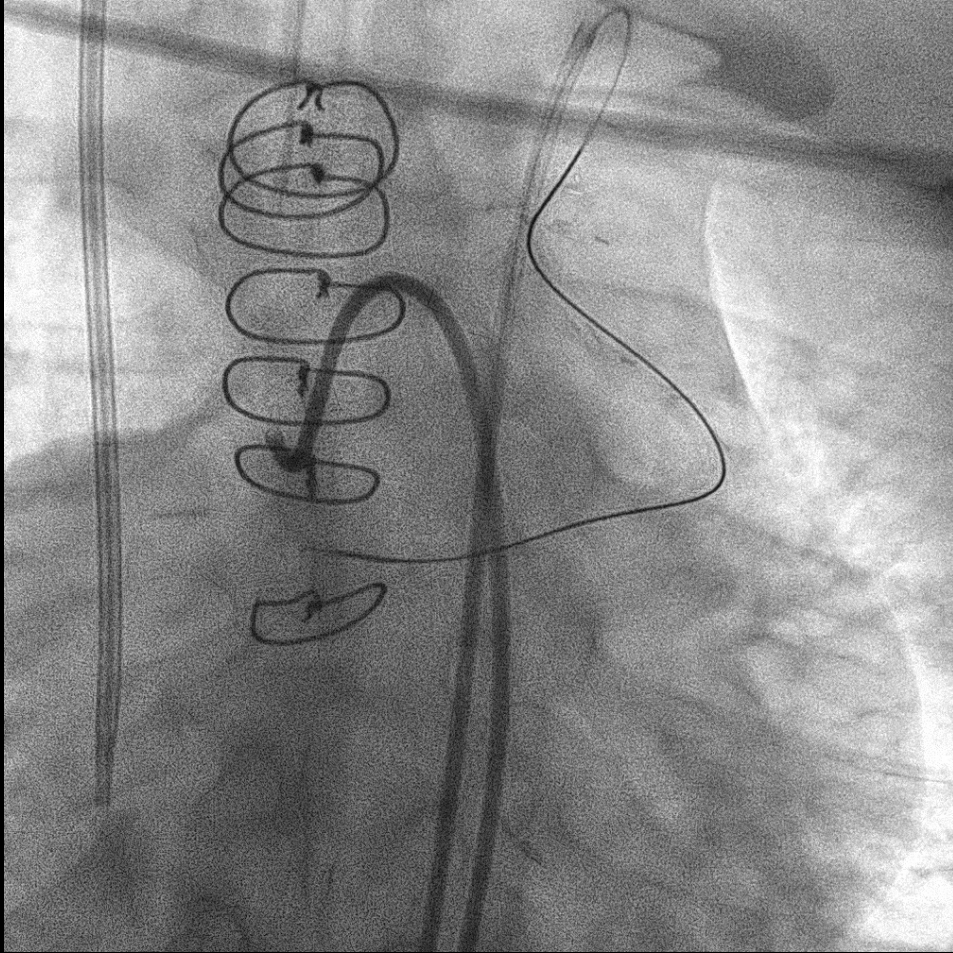


Now used LIMA for retrograde access using a Fielder XT and Turnpike LP microcatheter



# 14 year old with CTO

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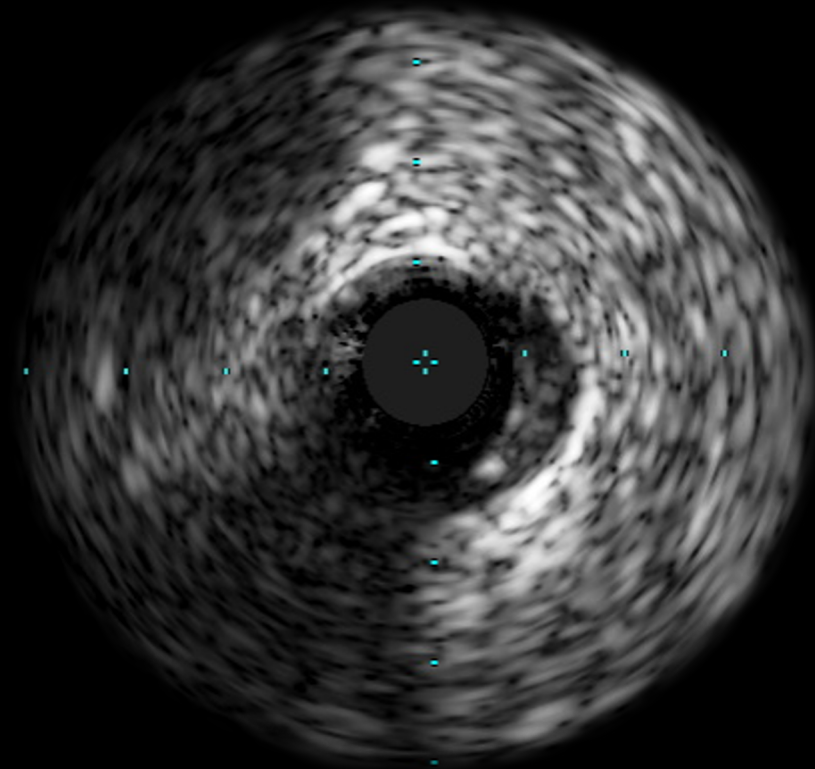
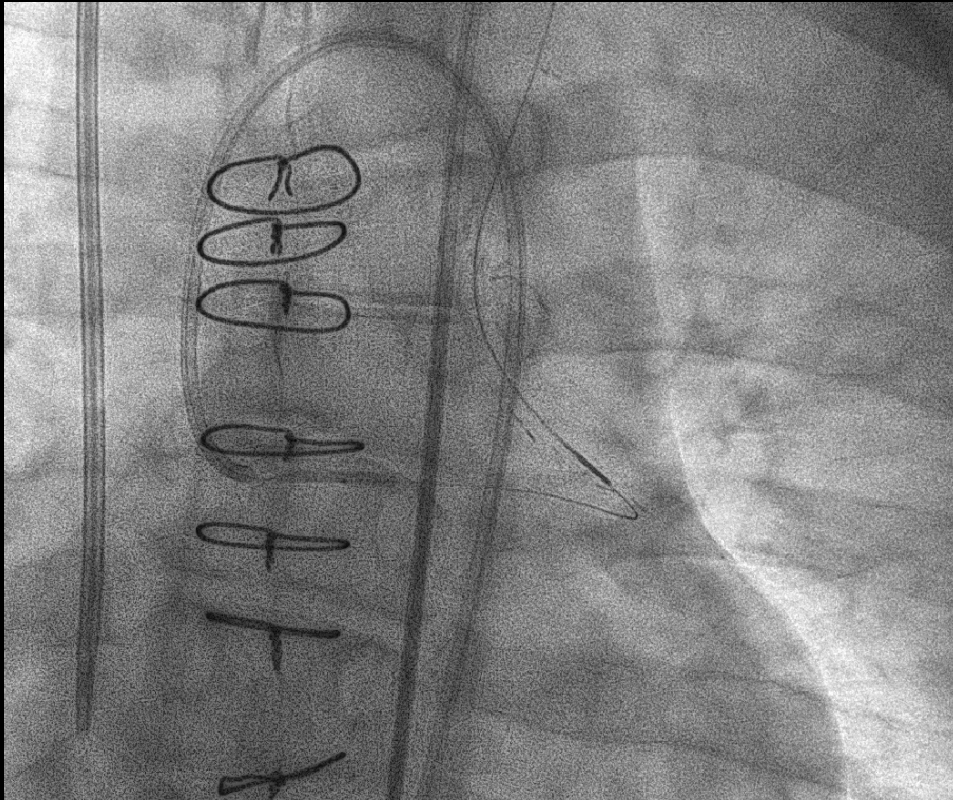


Easily moved gear to left main and using Gia 2<sup>nd</sup> wire made progress but notice where.



# 14 year old with CTO

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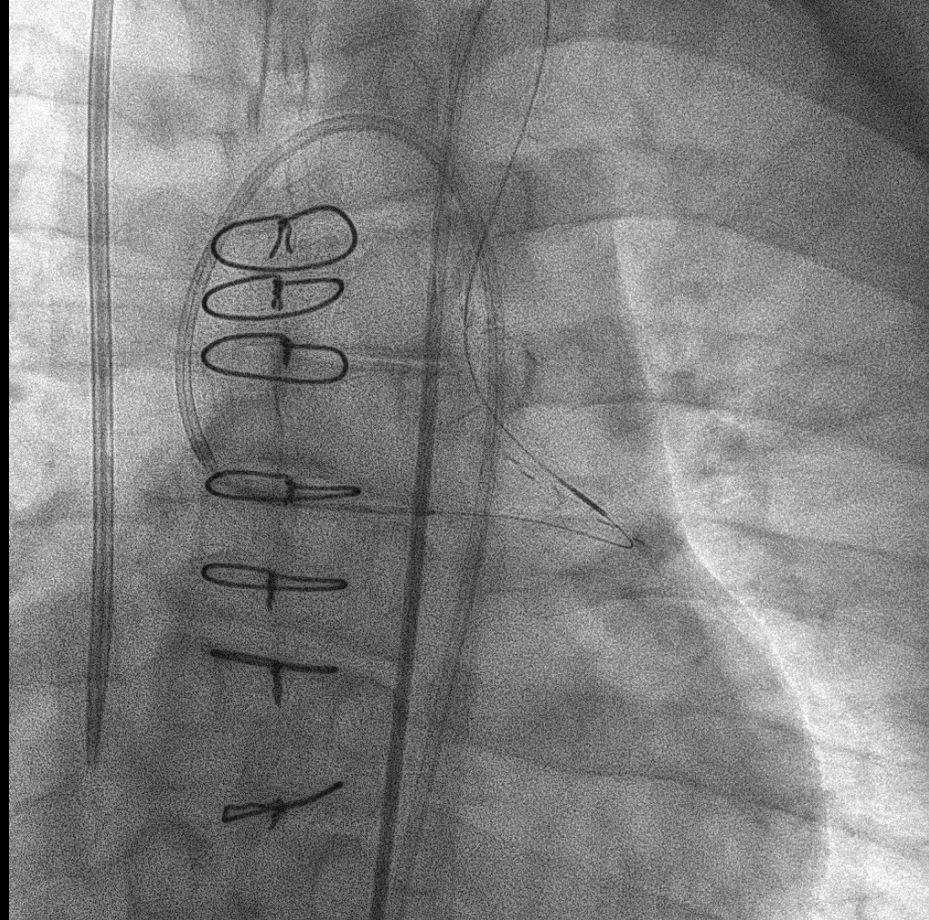
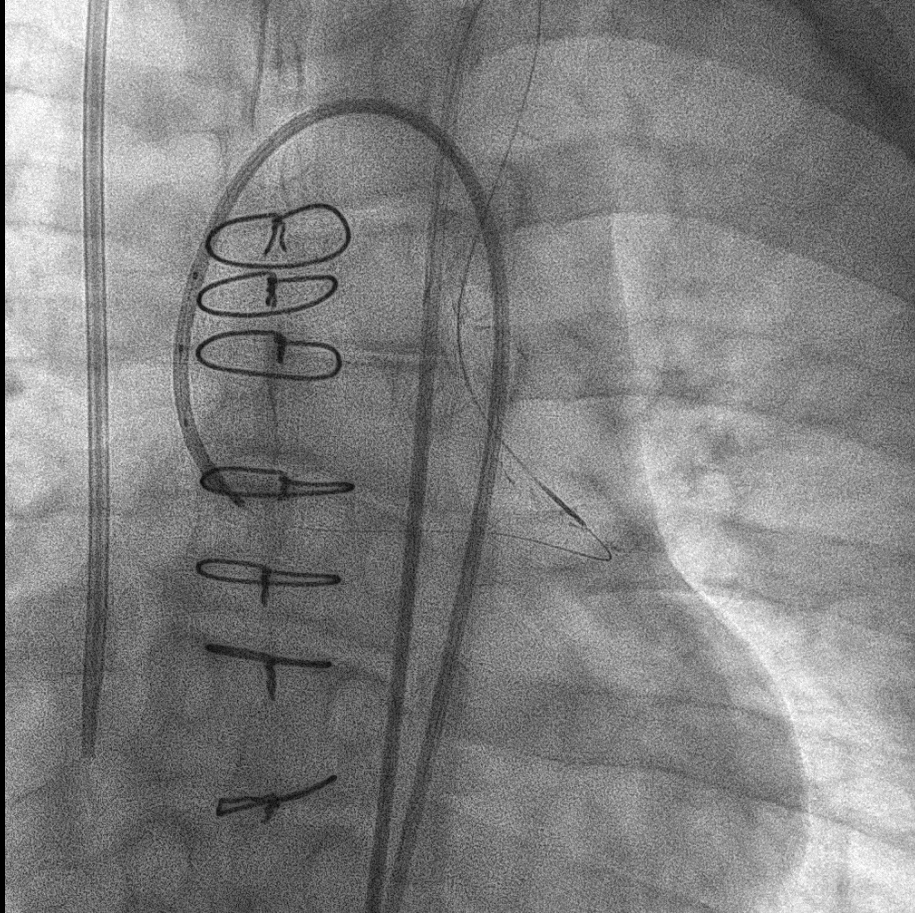


Snared RG 350 wire and externalized through the femoral artery. Angioplasty and IVUS to follow.



# 14 year old with CTO

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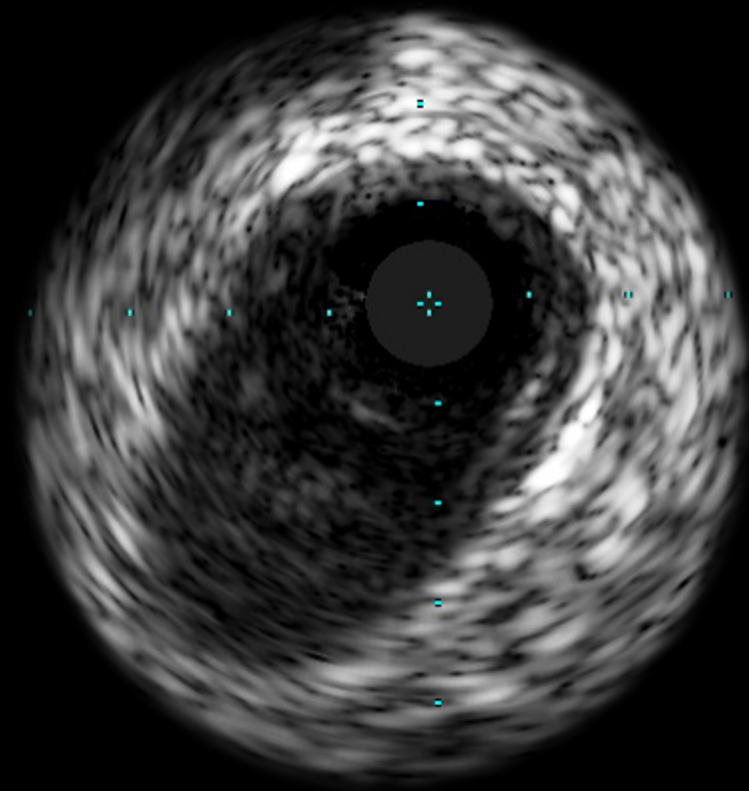


IVUS to mark the ostium followed by stent.

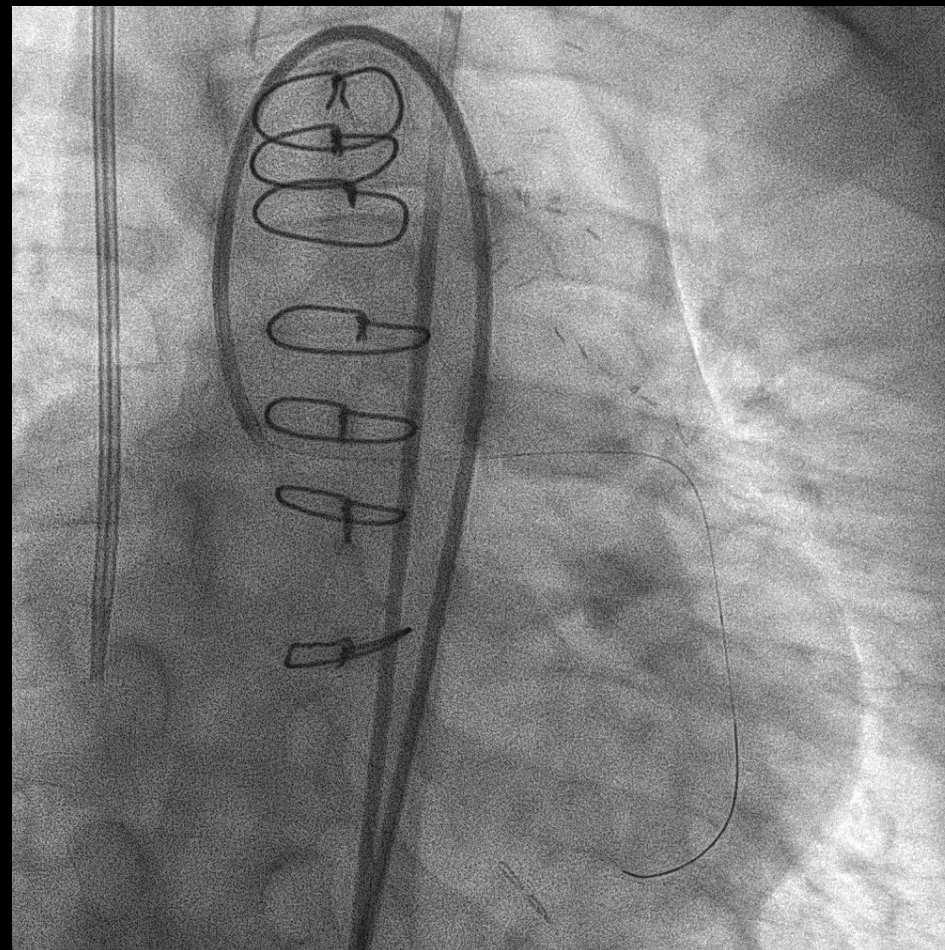


# 14 year old with CTO

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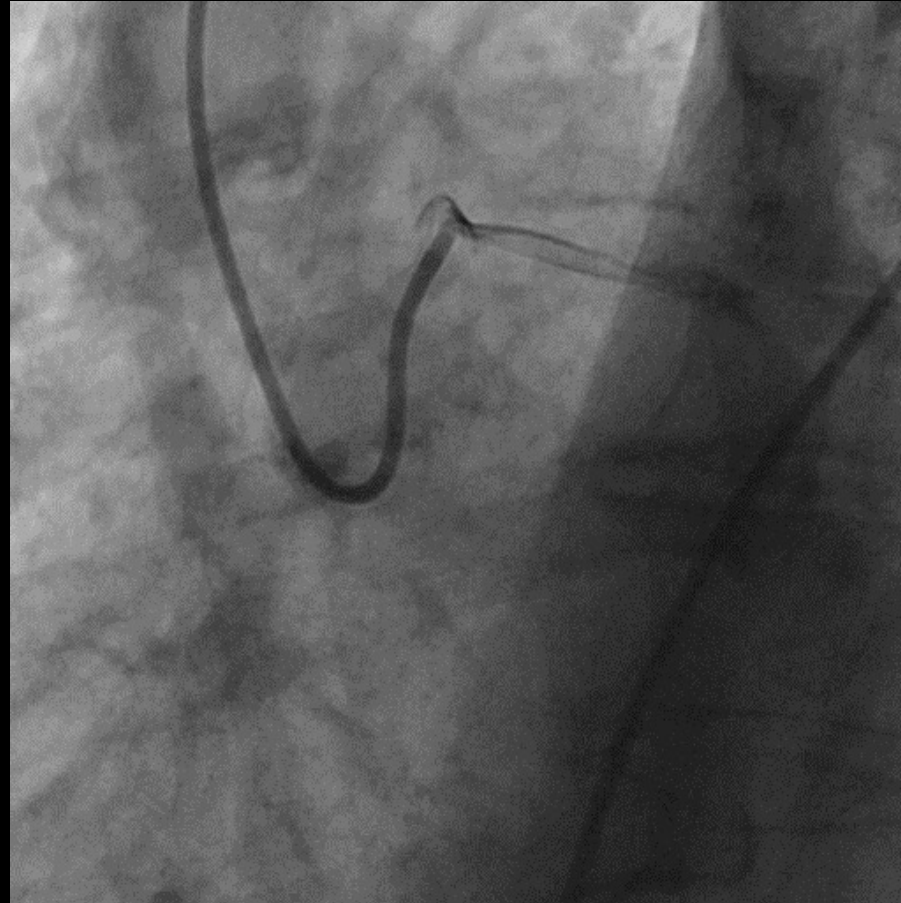
IVUS post stent



Final Result

# Pre Op Cath

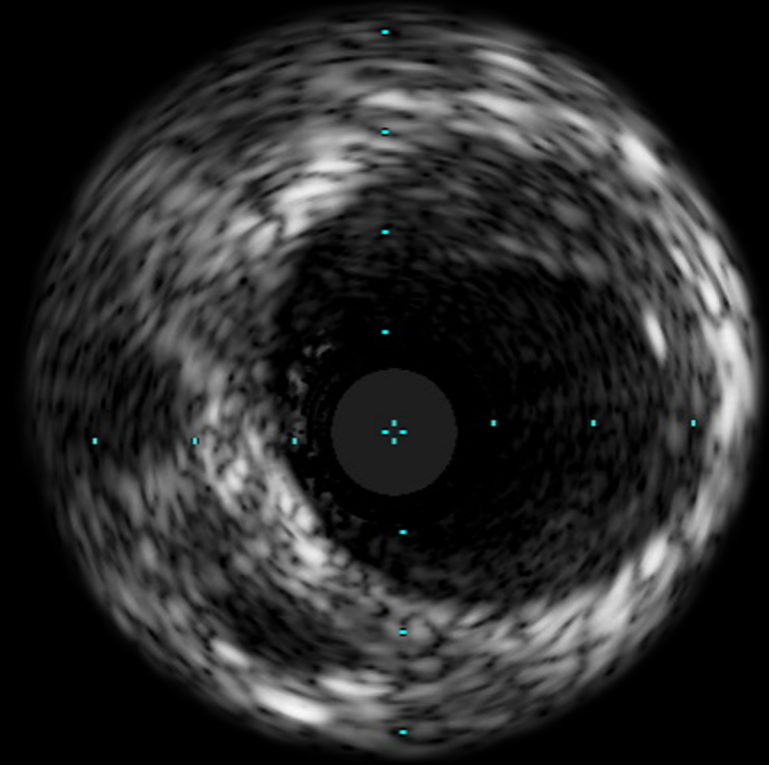
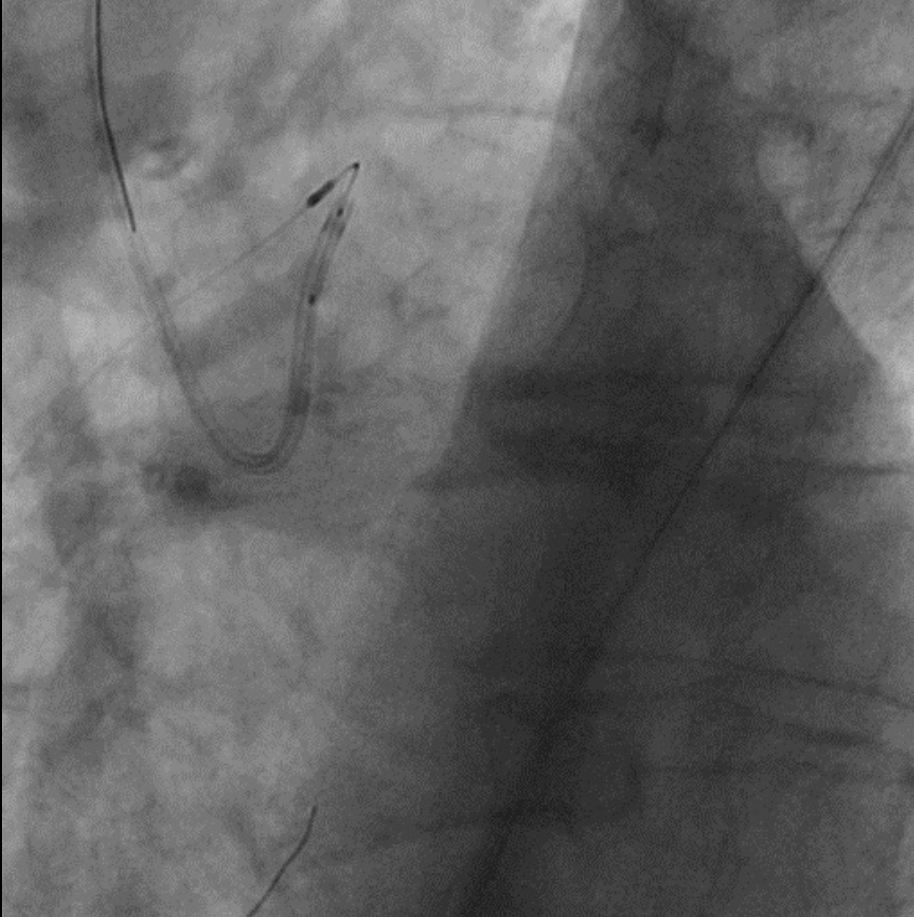
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54 y/o with severe AS presented for pre op angiogram.

# Pre Op Cath

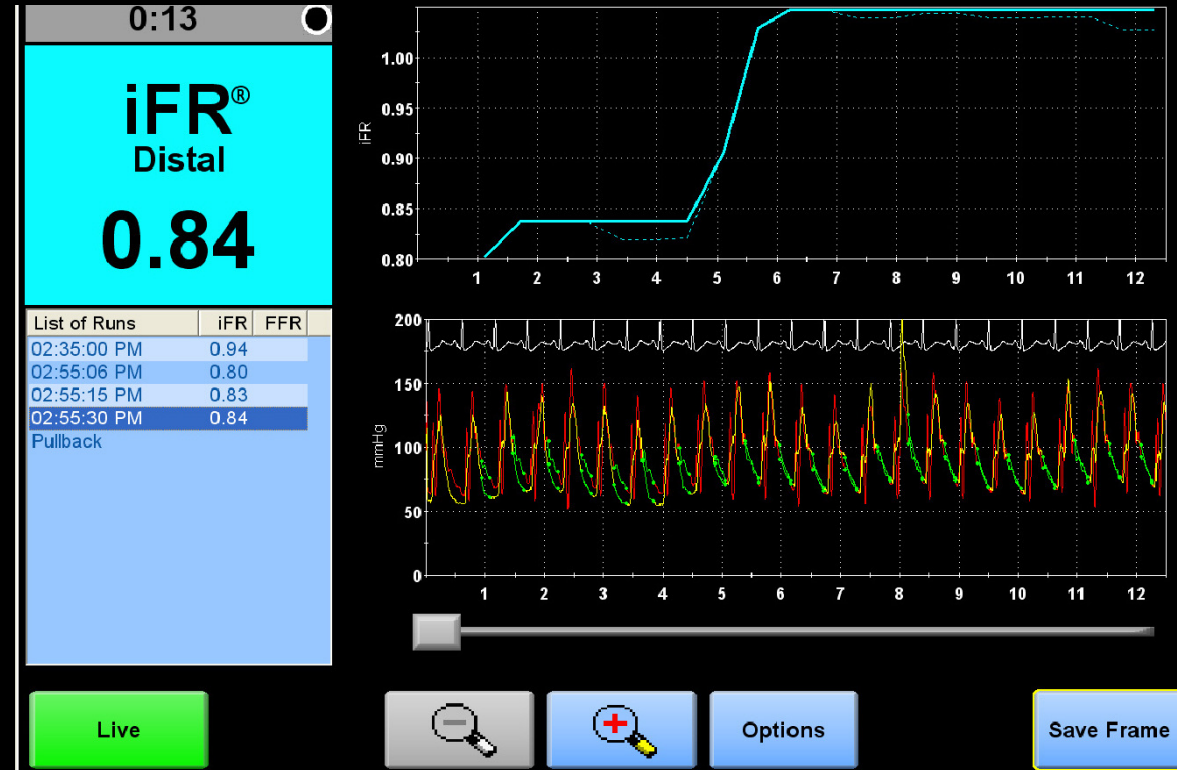
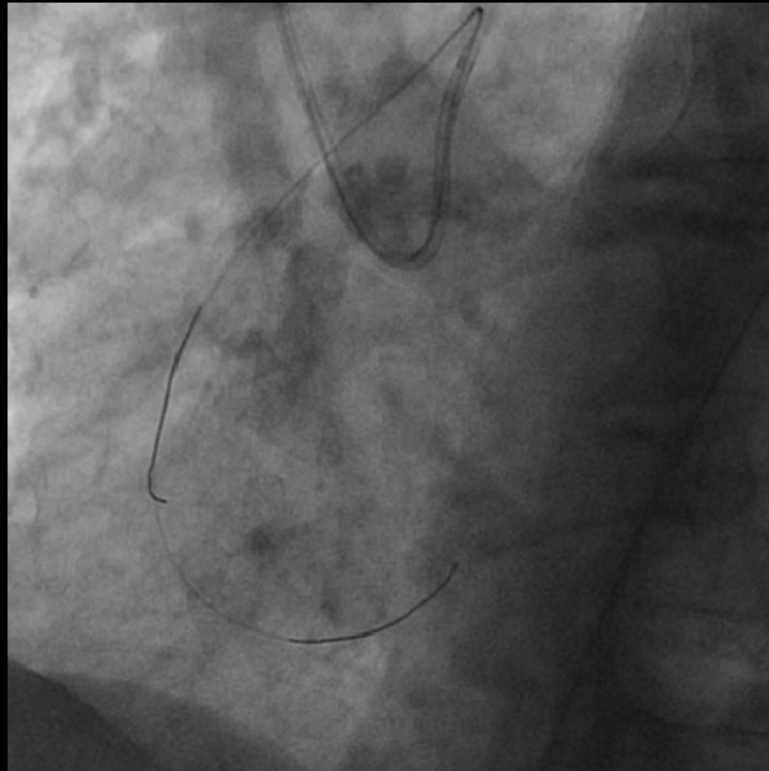
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RCA coming off the left Cusp (anomalous coronary artery from the opposite cusp)  
What do you do with this?



# Pre Op Cath



Now you place a pressure wire, measure resting parameters and give dbt to simulate exercise.

# Pre Op Cath

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resected with removal of all debris. We then after some probe dilatation identified the route of his anomalous right coronary artery. Thankfully it tended to stay somewhat distal with regard to the commissures and the aortic valve apparatus. We used a 4 mm punch in order to make serial successive punches extending from its orifice to basically to the more anterior portion of the right coronary sinus. Once this was done, we then used 6-0 PDS sutures in order to tack up the intimal disruption associated with the punching and then after finishing the unroofing of the vessel, we then sized this to a 23 mm pericardial valve, secured in the standard fashion. We copiously

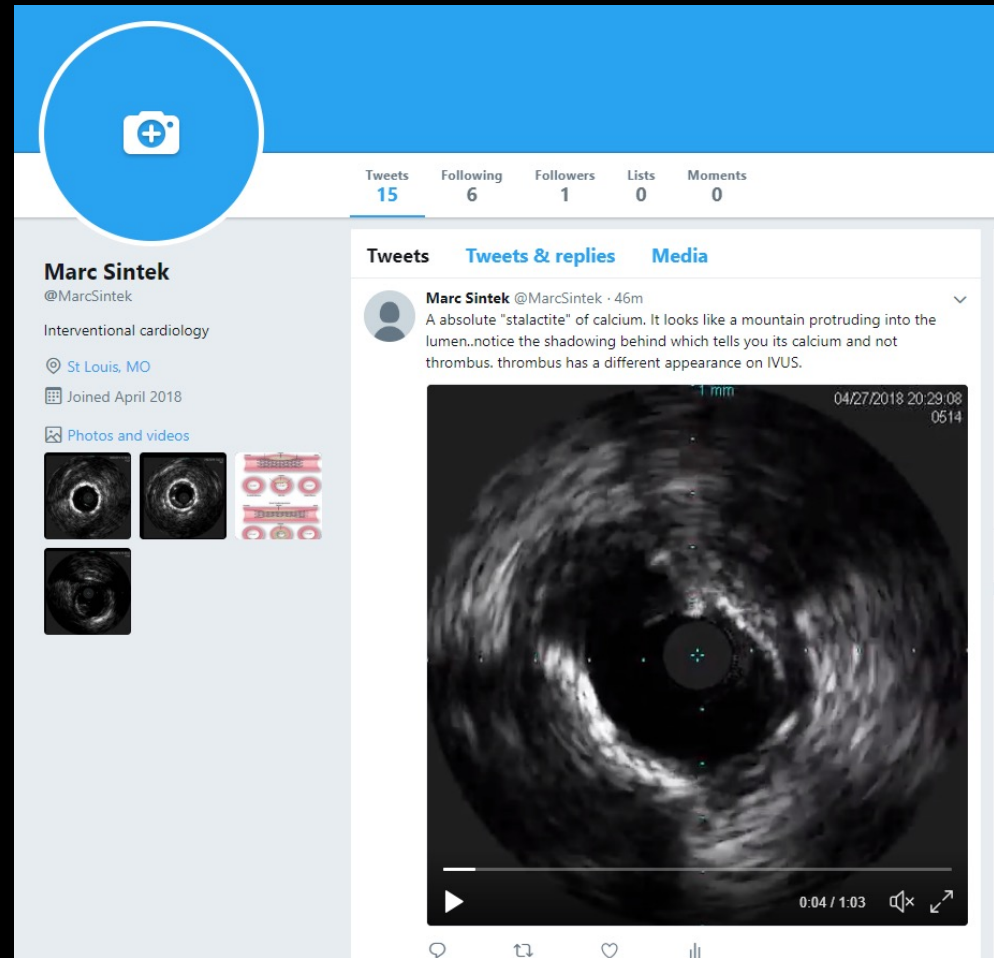
Unroofed with AVR and patient did very well.

# Anomalous Coronary and interesting cases

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# Is there an “atlas” for this?



@MarcSintek

# Questions?

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