

20<sup>th</sup> CARDIOVASCULAR  
SUMMIT

APRIL 28 – MAY 1, 2015  
COEX, SEOUL, KOREA

**TCTAP, 2015**

The 4<sup>th</sup> Revolution in PCI  
(Bioabsorbable Vascular Scaffolds)

**BVS Real Practice in PCI**

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# **BVS Implantation techniques**

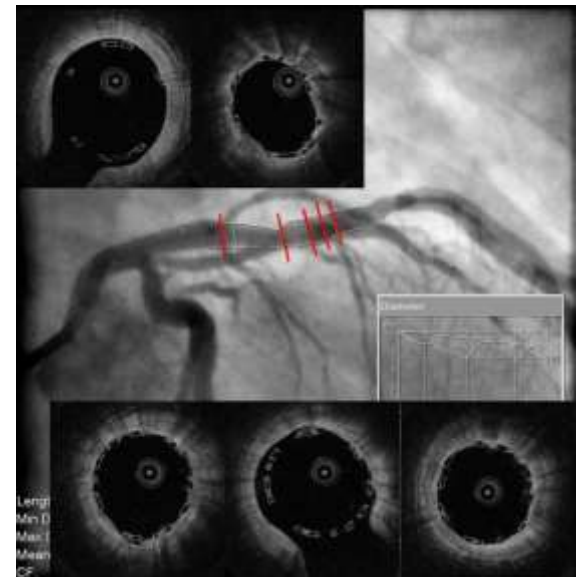
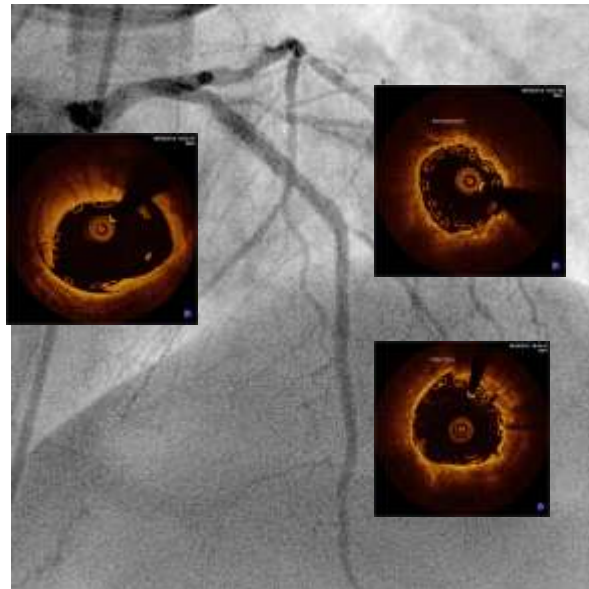
## **Tips and Tricks in nutshell**

# BVS Procedural Considerations

1. Good guiding support (6F or higher), support wires
  - 6 Fr. / 0.070" / 1.8 mm minimum inner diameter (i.e. inner diameter must be  $\geq$  0.070" / 1.8 mm)
  - If need be extra back up guides and extra support wires
2. Follow the 5 P's of implantation technique
  1. Prepare the lesion
  2. Properly size the vessel
  3. Pay attention to expansion limits
  4. Post dilate with non-compliant balloon
  5. Prescribe dual anti-platelet therapy

# Assessing strut apposition

- BVS scaffold are not visible on fluoroscopy or cine-angiography except the platinum markers at both ends. Therefore mal-apposition can be detected on fluoro or cine.
- Follow accepted hospital imaging guidance to ensure good strut apposition
- Only OCT or IVUS allows visualization of struts and scaffold apposition



# Additional consideration for difficult situations

If challenging to cross the lesion even after adequate preparation

- Extra back-up guide catheter
- More supportive guide-wire and / or buddy wire
- Guideliner or guide extensions:
  - 8 Fr (ID 0.071" through 8 Fr guide) is adequately supportive
  - If 7 Fr (ID 0.062" through 7 Fr guide), then BVS needs pre-loading
  - 6 Fr (ID 0.056") not compatible
- Multiple crossing attempts possible if within 30 min.
- Limited size: Longer lengths needs overlapping



Scaffold		Lengths (mm)				
		8	12	18	23	28
Diameters (mm)	2.5	X	X	X	X	X
	3.0	X	X	X	X	X
	3.5		X	X	X	X

# Practical tips to start BVS deployment

- Start with simple/Type A lesions, younger patients (Selection of cases with gradual increase of complexity) preferable with imaging pre/post implant...

## Remember

- Absorb is a flexible, large profile (but not fragile) device
- Follow the 5 P's



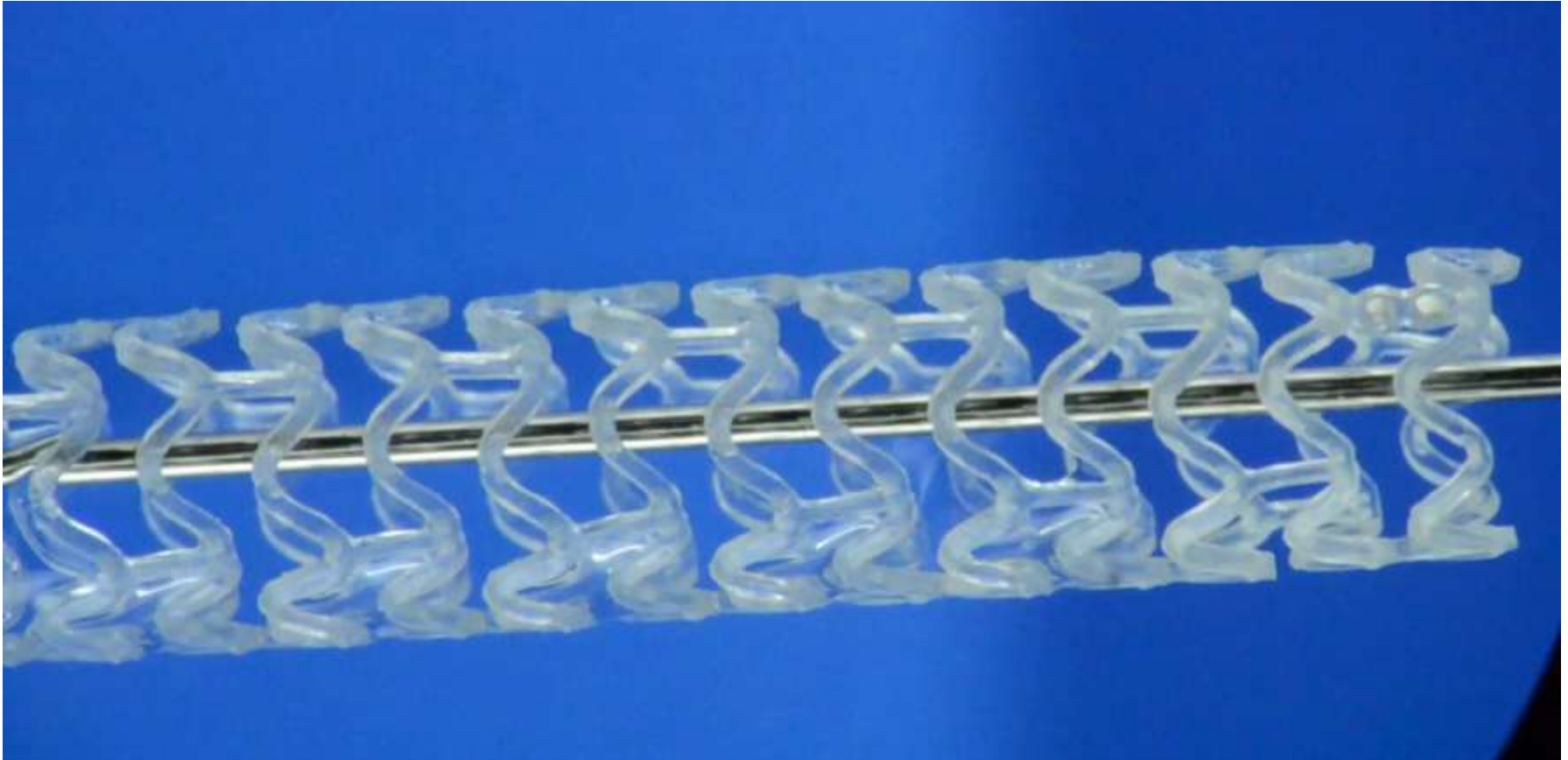
# Practical tips to start BVS deployment

- Complex cases:
  - Long lesions: Overlapping stents
  - Fibrotic / calcified lesion: Lesion prep with plaque modification
    - rotational atherectomy/ Cutting balloon / Angiosculpt scoring
  - Bifurcation lesions
  - Others: PAMI, ISR, SVG and LMCA

Needs some more understanding of the device...



## Tips and Tricks: Extend length Scaffold to Scaffold (no overlap)

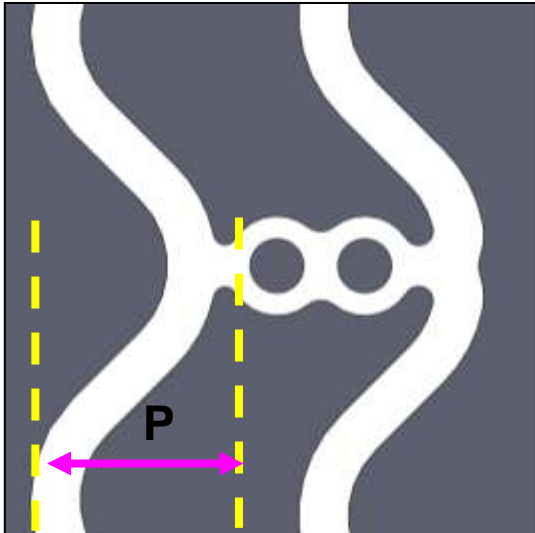


It's not a metallic DES! Procedural tips & tricks to optimize ABSORB outcomes *Pieter Smits*, from Maastad Hospital Rotterdam, The Netherlands at TCT 2013, San Francisco

# Relationship: Scaffold Markers to Delivery Catheter Markers

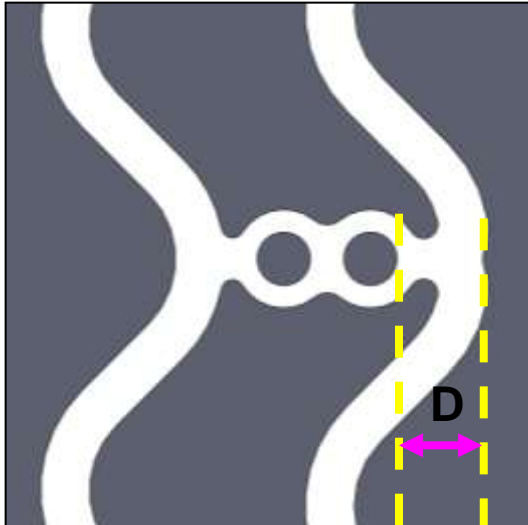


**Proximal End**



Stage	P (mm)
Crimp	1.4
Expn - 3.5	1.1
Expn - 4.0	1.0

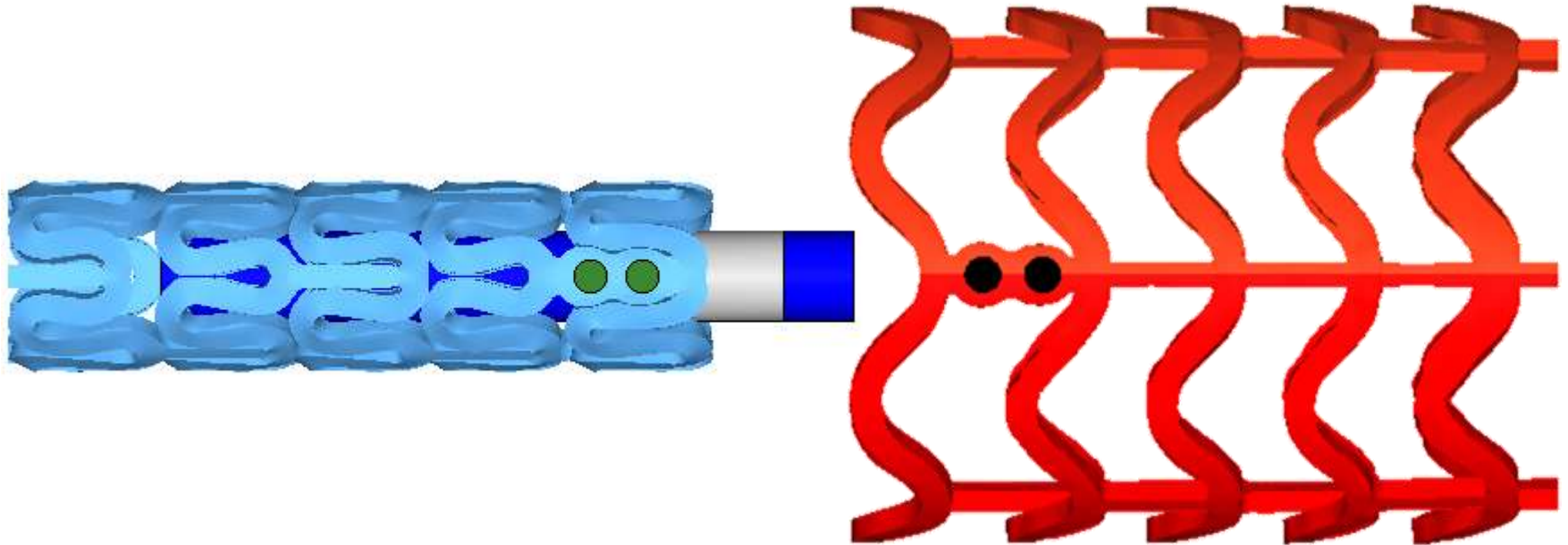
**Distal End**



Stage	D (mm)
Crimp	0.3
Expn - 3.5	0.3
Expn - 4.0	0.3

# Scaffold Overlap Considerations

## 'Scaffold to Scaffold'

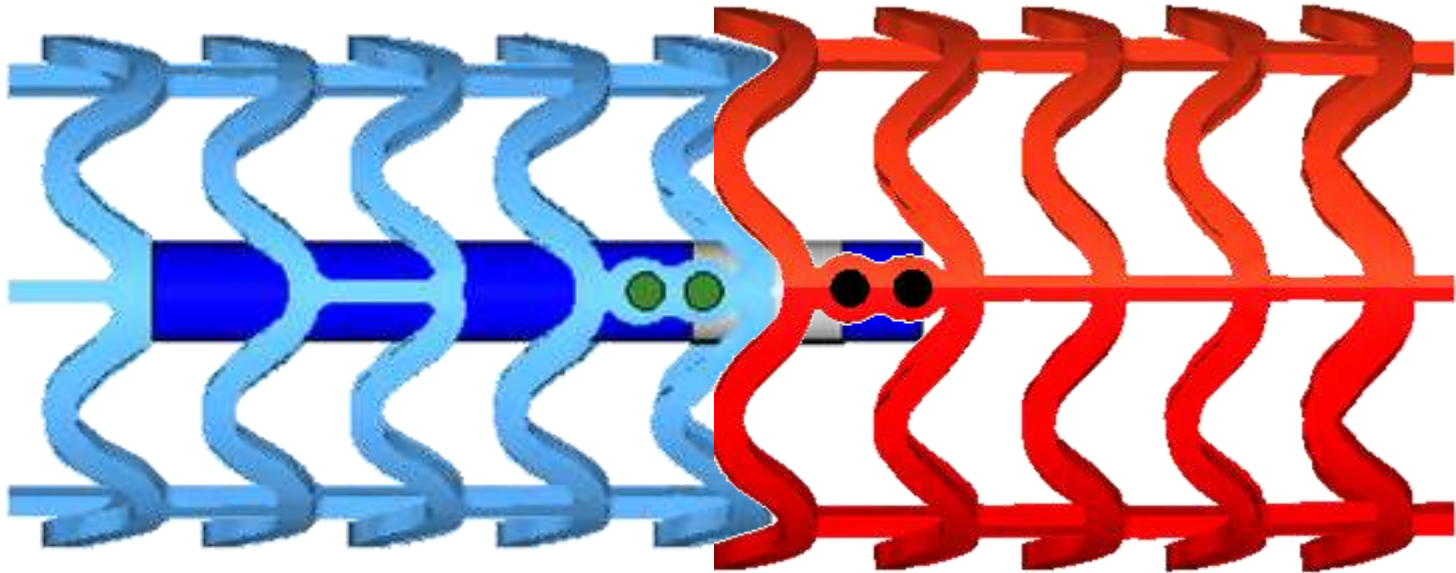


- Advance the second scaffold system until the distal balloon marker is aligned just proximal to the proximal marker beads of the implanted scaffold

It's not a metallic DES! Procedural tips & tricks to optimize ABSORB outcomes *Pieter Smits*, from Maasstad Hospital Rotterdam, The Netherlands at TCT 2013, San Francisco

# Scaffold Overlap Considerations

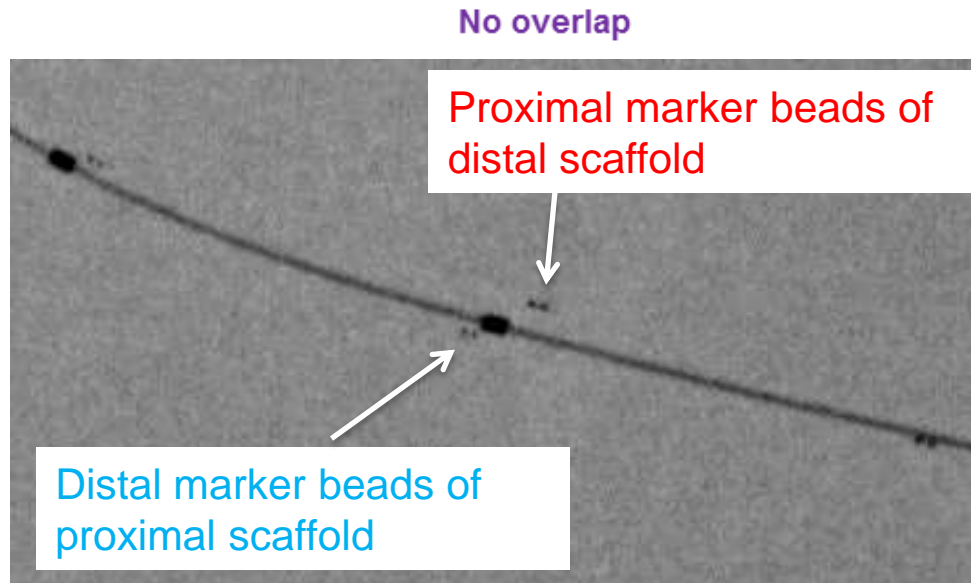
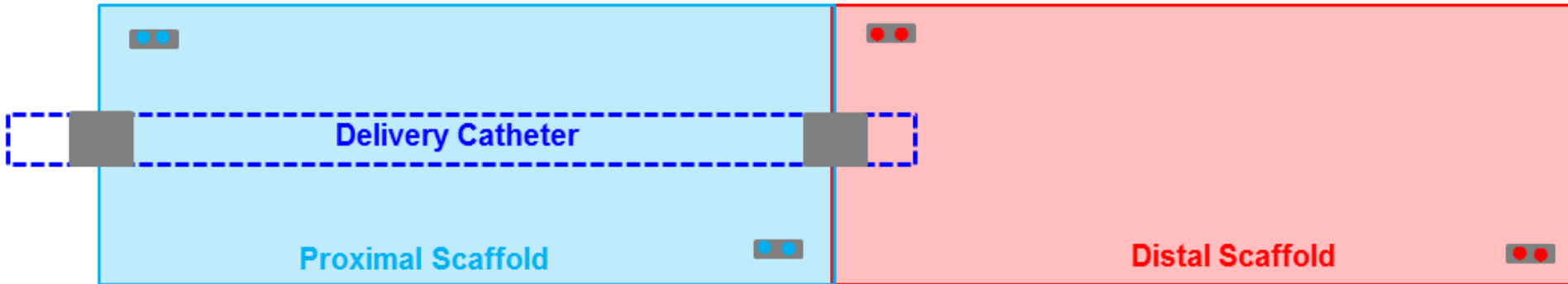
## 'Scaffold to Scaffold'



- There will be ~1 mm of space between the markers of the second scaffold and the markers of the deployed scaffold, but the two scaffolds will be adjacent to one another (scaffold to scaffold)

It's not a metallic DES! Procedural tips & tricks to optimize ABSORB outcomes *Pieter Smits*, from Maasstad Hospital Rotterdam, The Netherlands at TCT 2013, San Francisco

# Scaffold Overlap Considerations



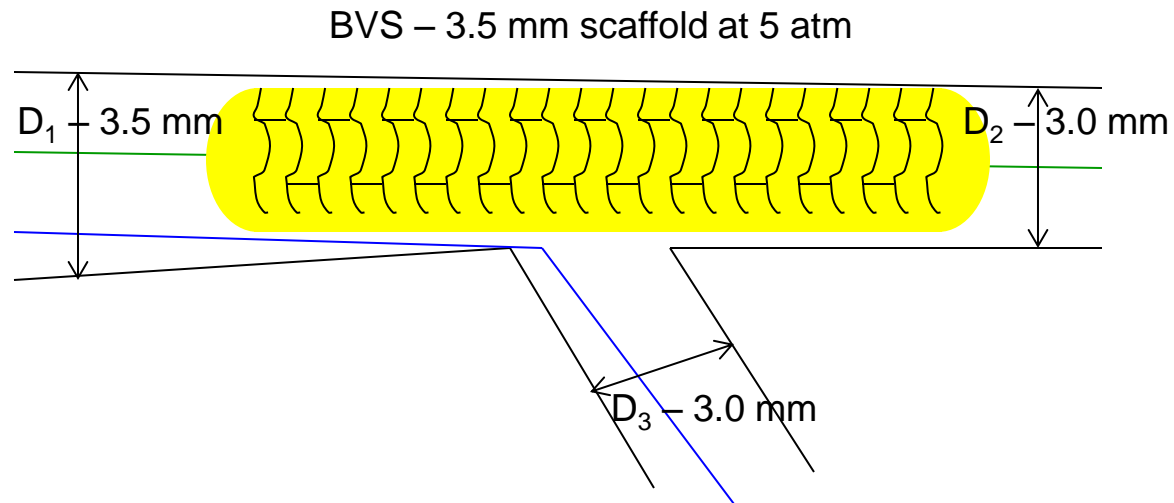
It's not a metallic DES! Procedural tips & tricks to optimize ABSORB outcomes *Pieter Smits*, from Maasstad Hospital Rotterdam, The Netherlands at TCT 2013, San Francisco

# Re-crossing deployed scaffold

- Difficulty in crossing with balloon
  - Advance balloon / device with gentle pull on wire to center and remove wire bias
  - If resistance encountered at struts avoid forceful pushing – manipulate the guide to change angle of introduction or use more supportive wire
- Crossing deployed stent with another stent / scaffold
  - Optimally deploy the scaffold and post-dilate prior to crossing with another device
- Re-crossing with wire to side branch
  - Most distal strut closest to carina should be attempted

# Tips and tricks: BVS in bifurcation

Modified strategy: Single scaffold with provisional SB strategy



# BVS in bifurcation: Modified strategy

Single scaffold with provisional SB strategy



Both branches wired and scaffold deployed at low pressure: 3.5 x 28 at 5 atm



POT (Optimization of proximal scaffold) with short balloon at high pressure: 3.5 x 15 at 15 atm at carina



Scaffold view after POT



# BVS in bifurcation: Modified strategy

Single scaffold with provisional SB strategy



Crossing of wire into side branch through distal most scaffold close to carina to provide scaffolding of side branch ostia



Optimization of side branch with balloon dilatation: 3.0 x 15 at 16 atm across side branch ostia



Micro-CT image of Scaffold after SB dilatation

# BVS in bifurcation: Modified strategy

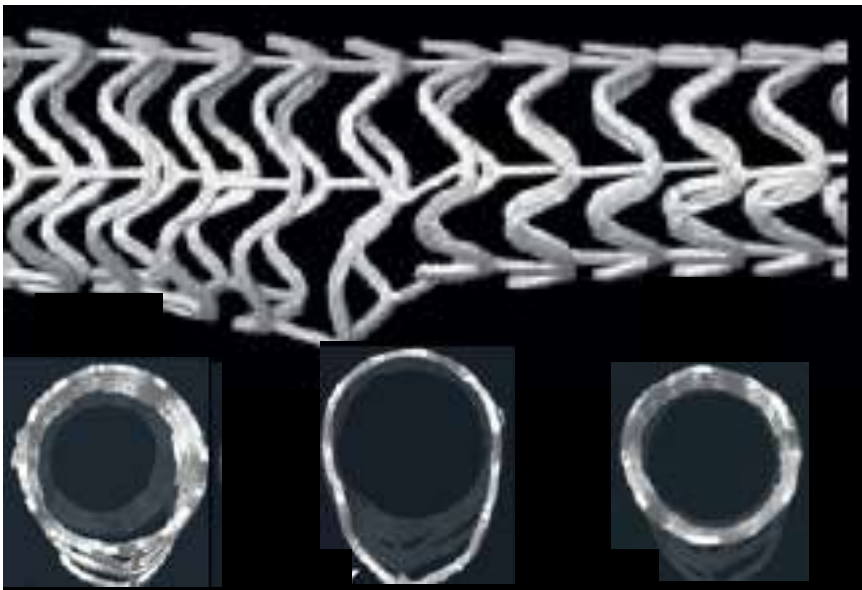
## Single scaffold with provisional SB strategy



Optimization of main branch with post dilatation: 3.5 x 15 at 15 atm across side branch ostia



Mini kissing balloon dilatation (MKBD) using 3.5 x 15 in MB and 3.0 x 15 in SB at 5 atm



Micro-CT image of Scaffold after MKBD, showing no distortions and cross-section views shows round shape at proximal MB, oval at SB origin and round at distal MB

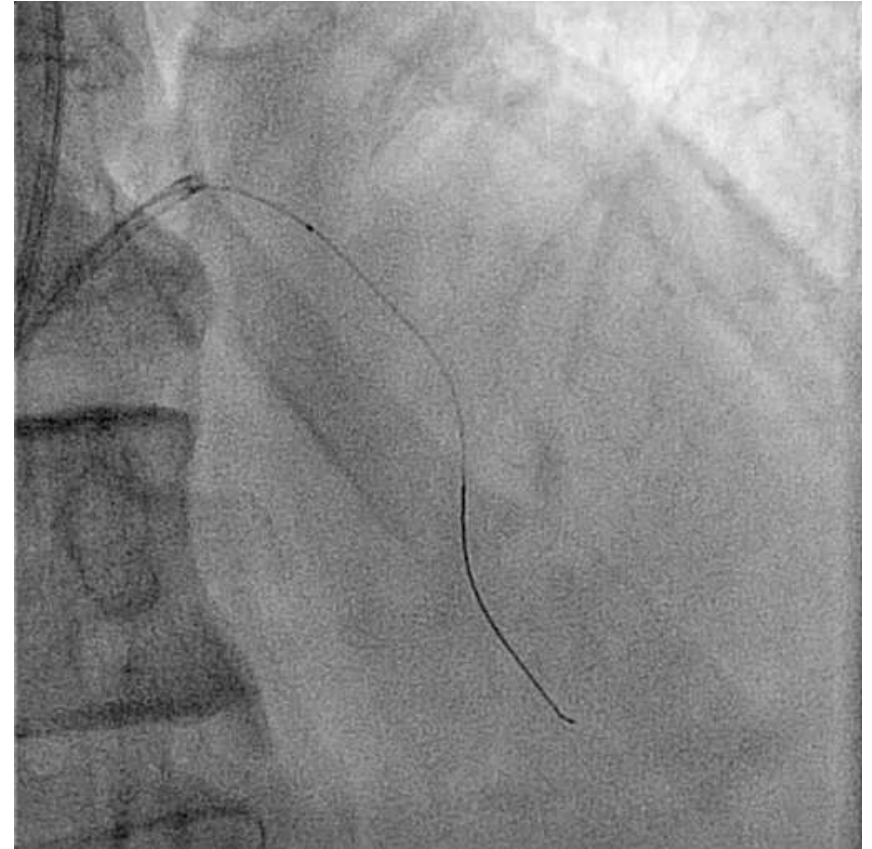
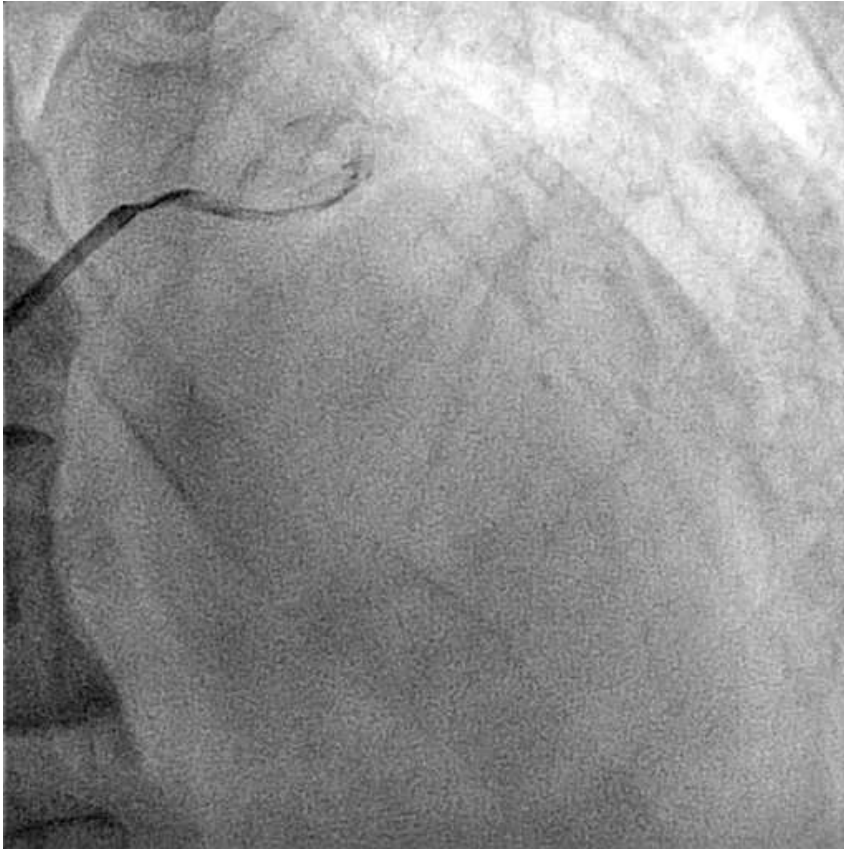
Images from Orminston JA *et al*  
EuroIntervention 2015;10:1169-1177

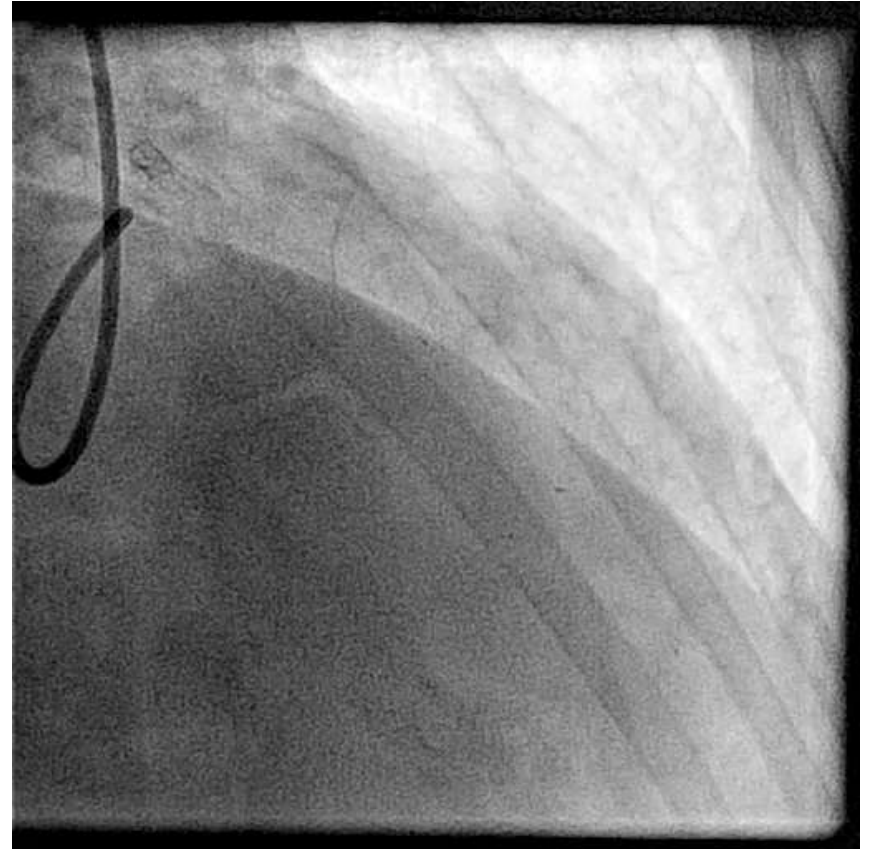
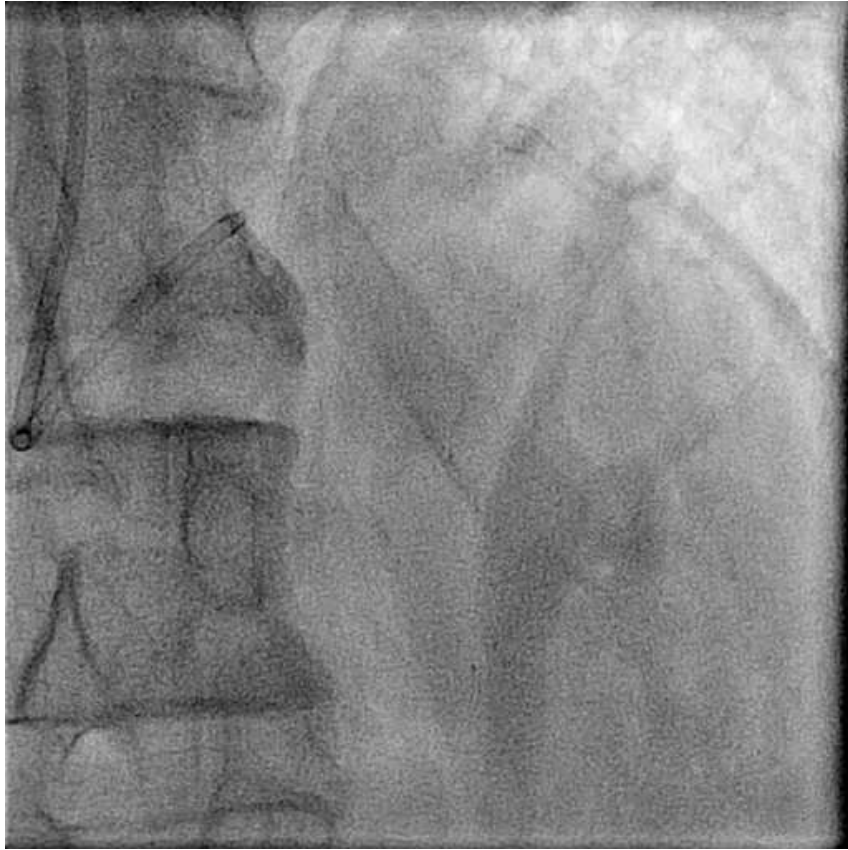
# Strategic approach to Bifurcation lesions using BVS

- “Keep it simple”
- Single scaffold cross over technique with provisional scaffold approach – most logical
  - Nothing else other than one scaffold approach
  - Side branch predilatation and one scaffold approach
  - Side branch dilatation and fenestration of scaffold
    - Use of balloon to fenestrate scaffold jailing side branch, POT and mini-kissing balloon (balloon size and pressure) or sequential dilatation or kissing balloon with very low profile under-sized balloon
- Two scaffold approach
  - TaP or Snuggle or T stenting (Culotte / Mini-crush reported) – ideally with imaging

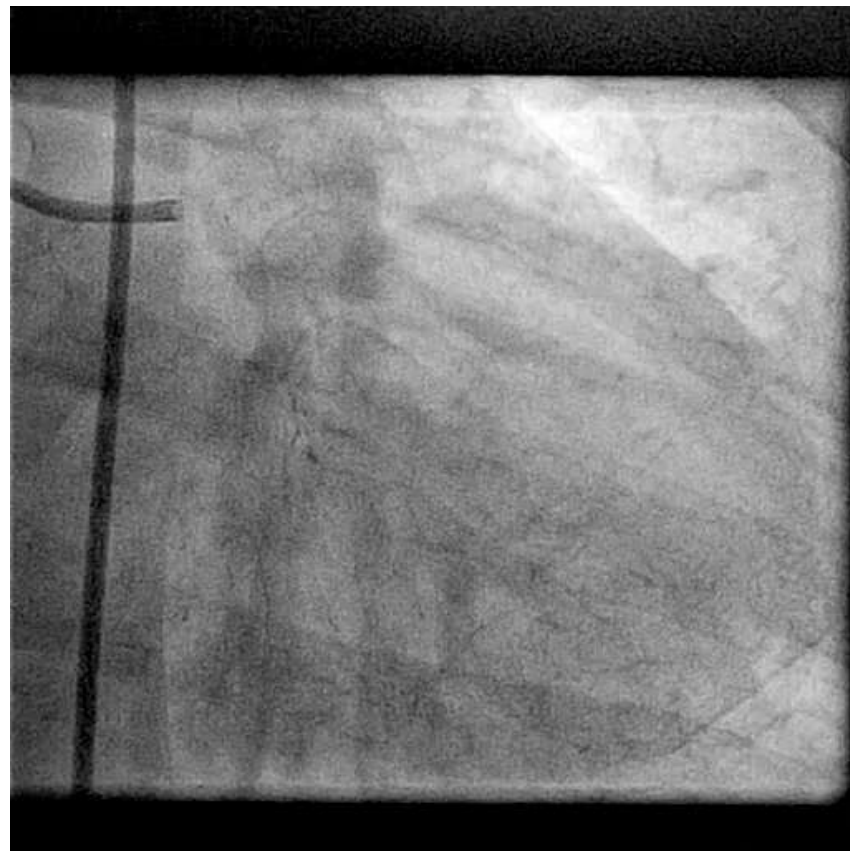
**Interesting cases with BVS**

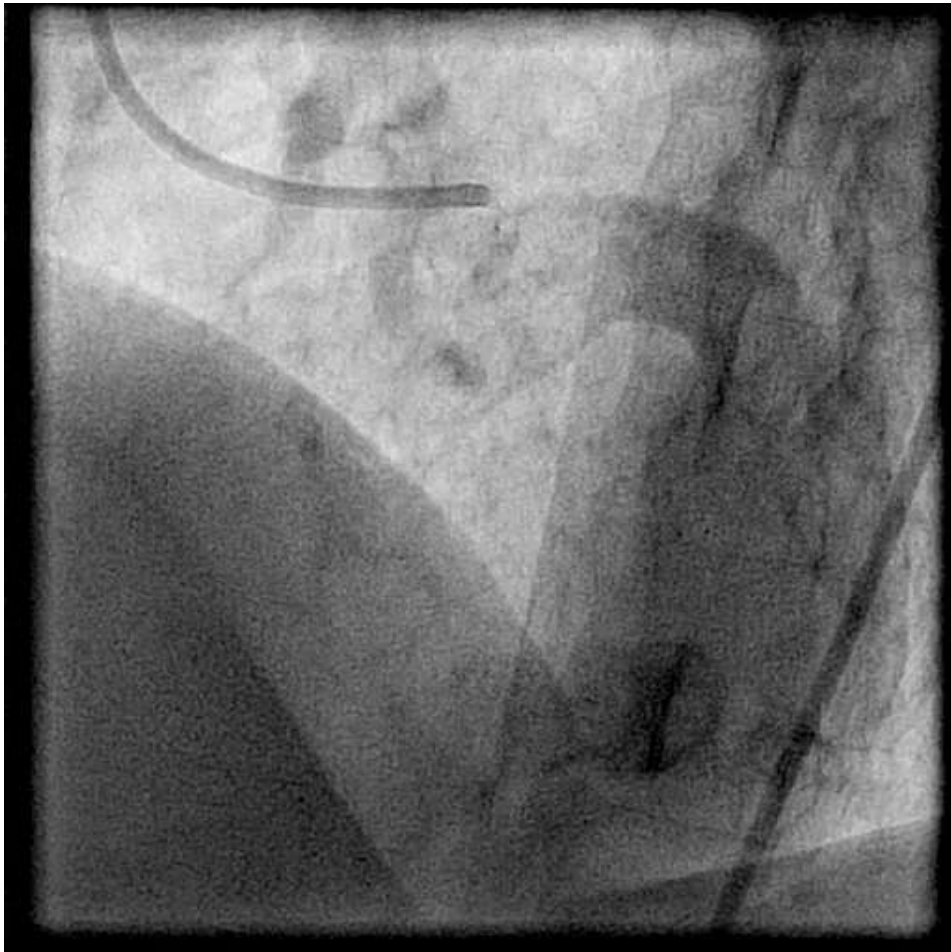
# Long CTO lesion in LAD





# Long CTO in LCX



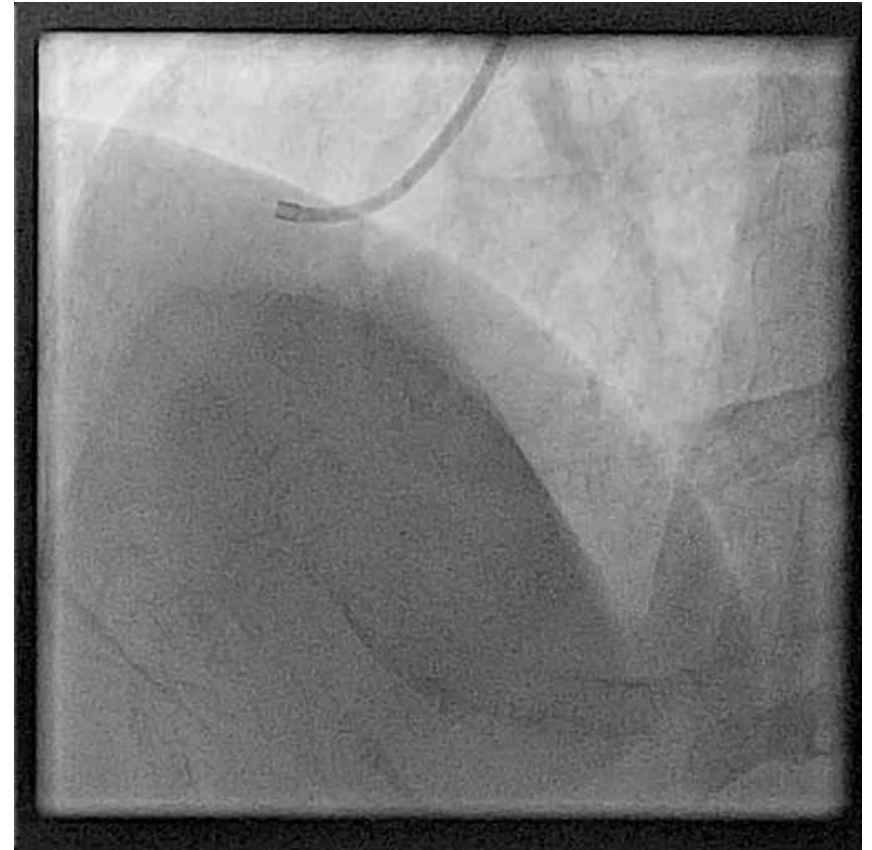
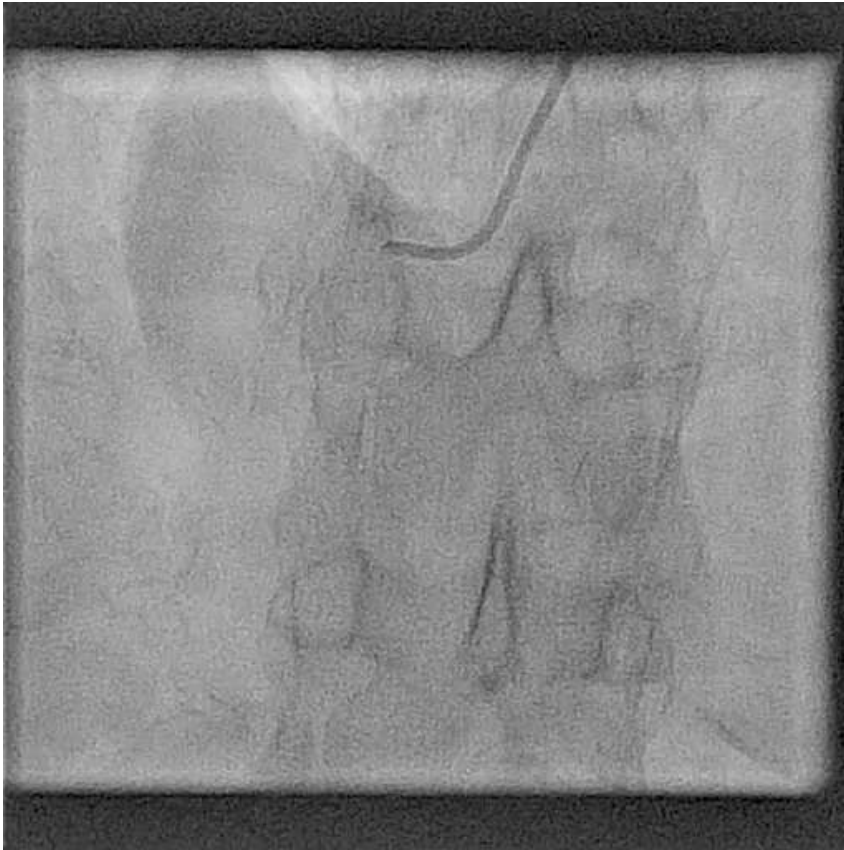


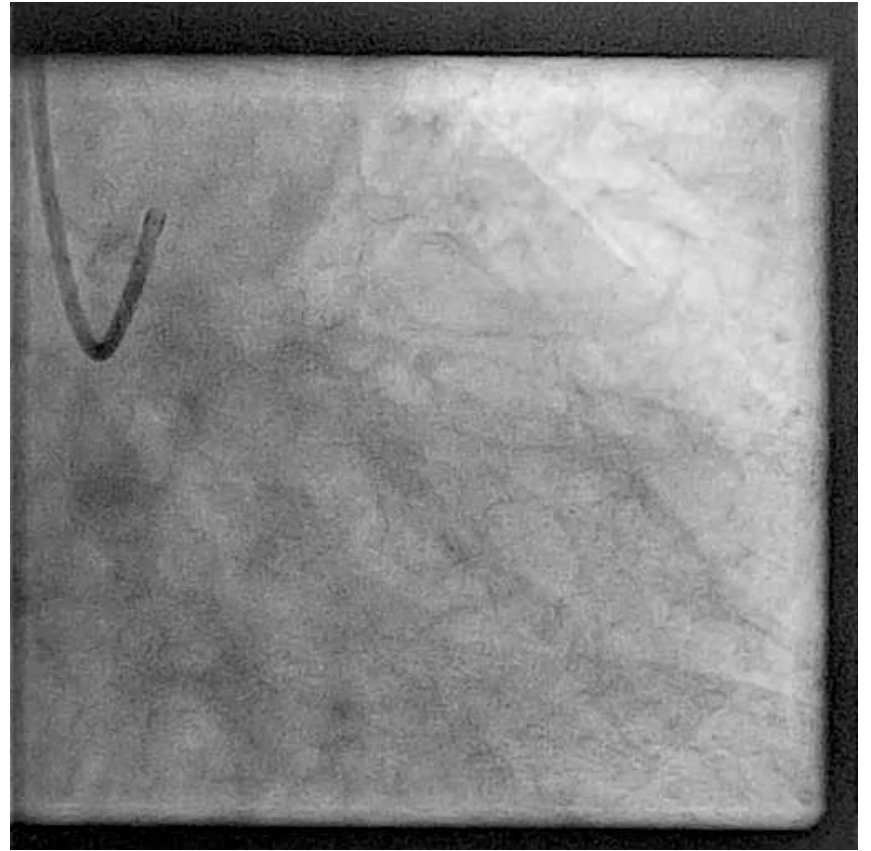
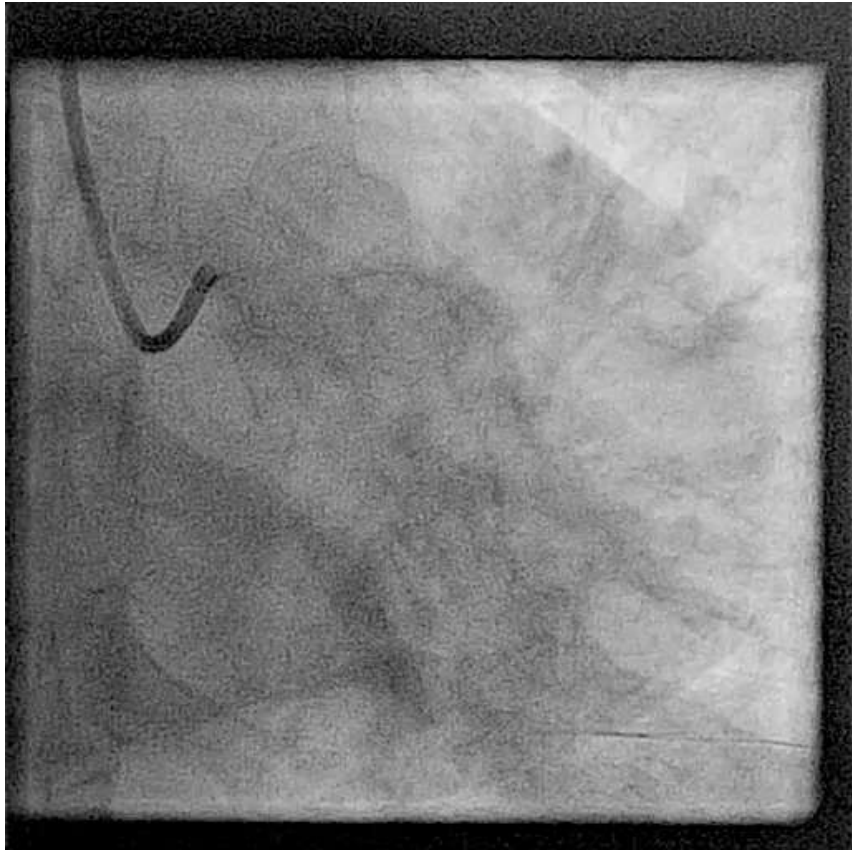


# Multiple LAD lesion

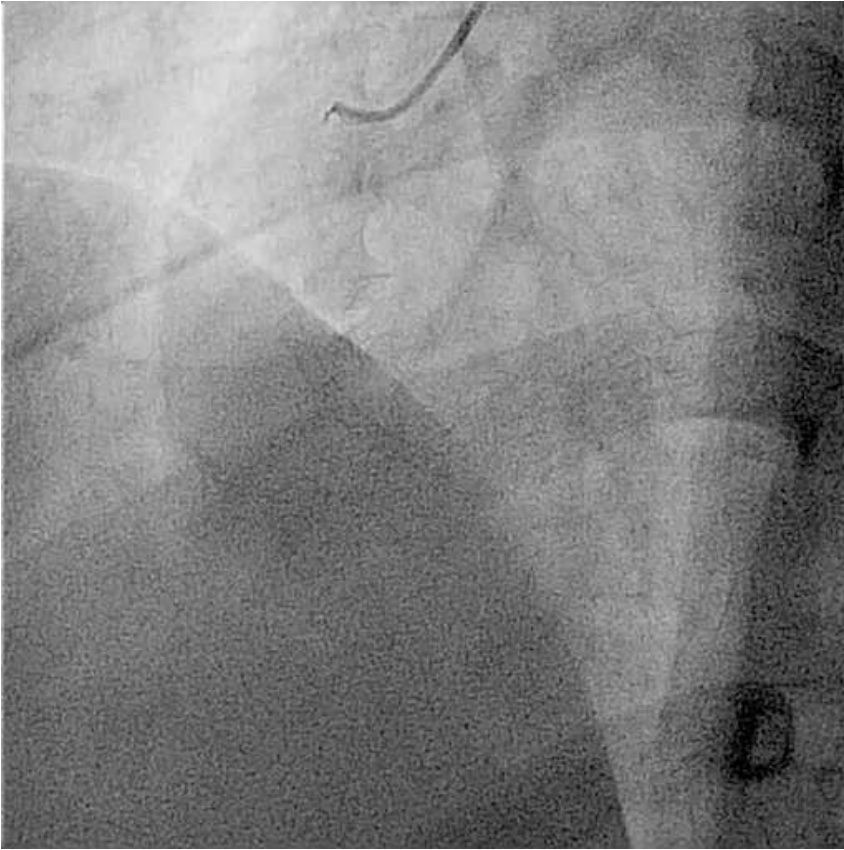


# Distal lesion at tortuous segment

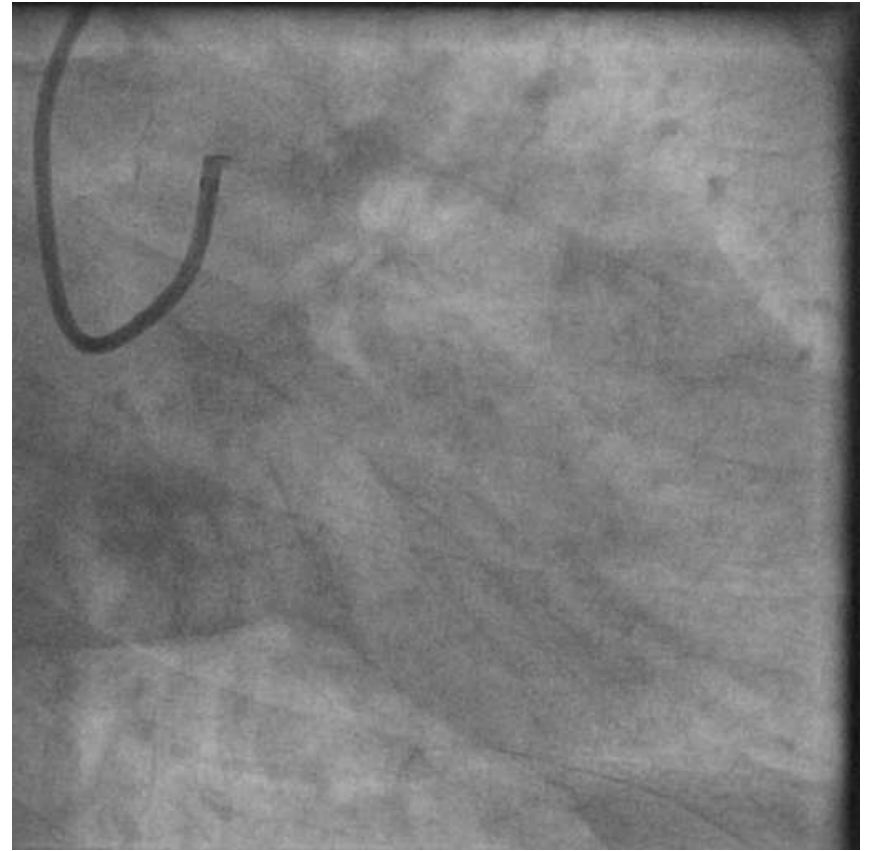
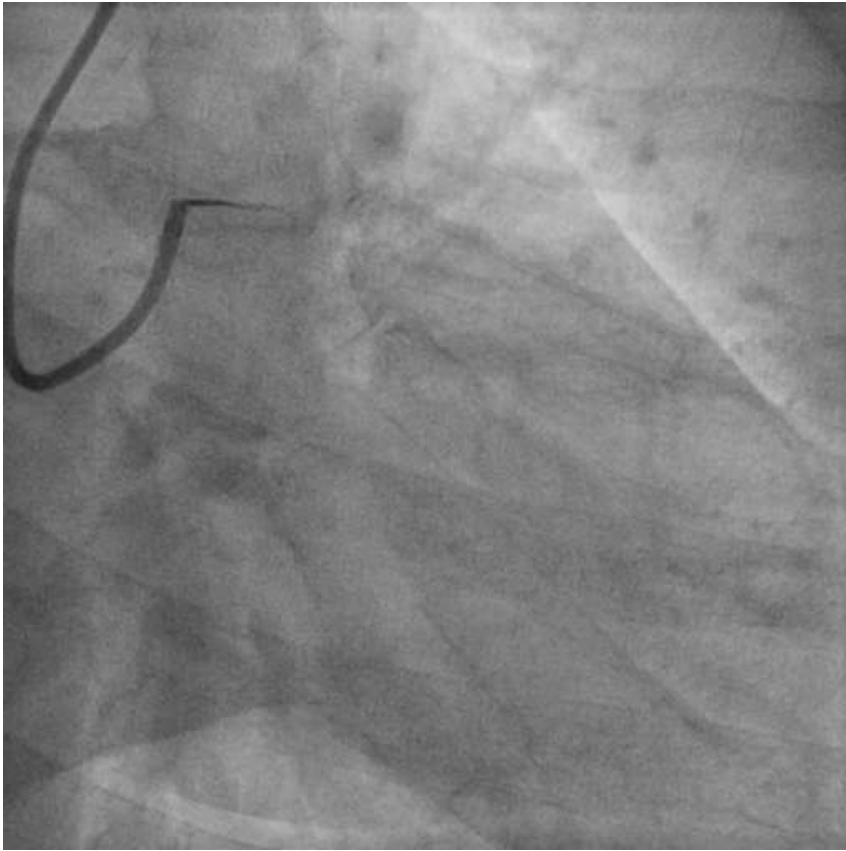




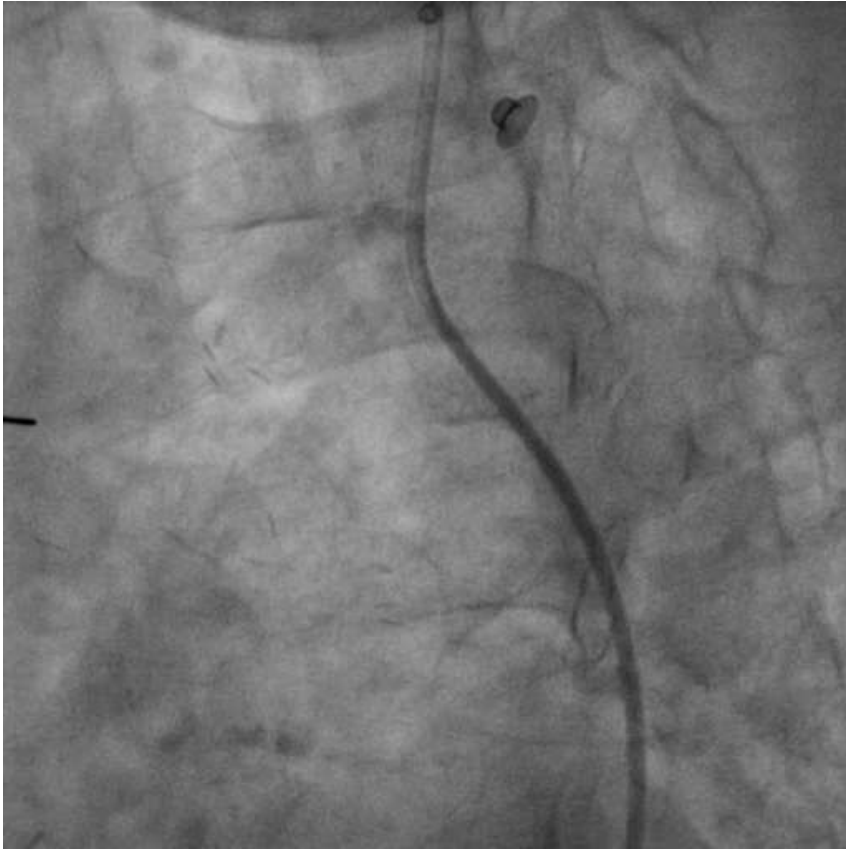
# In-stent restenosis



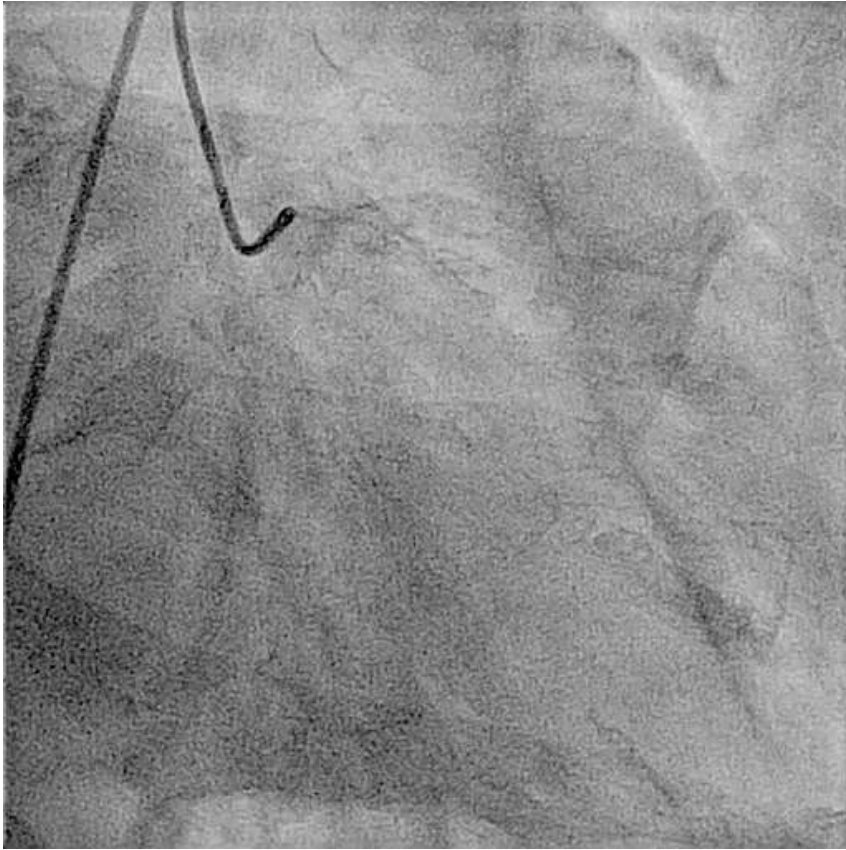
# Primary angioplasty (PAMI)

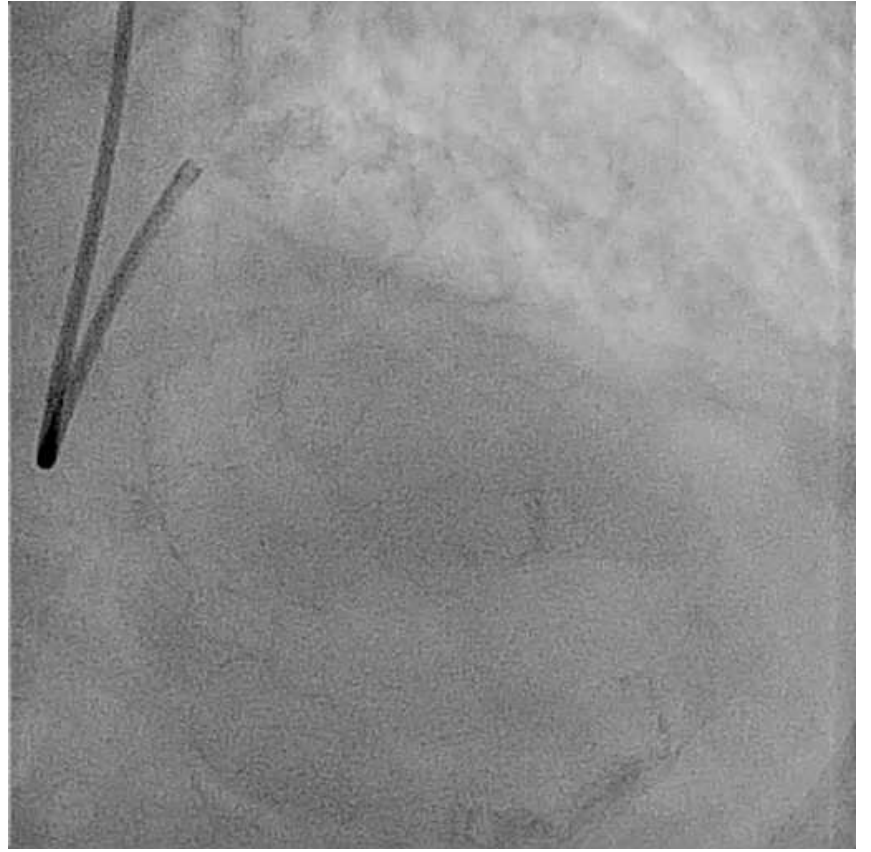
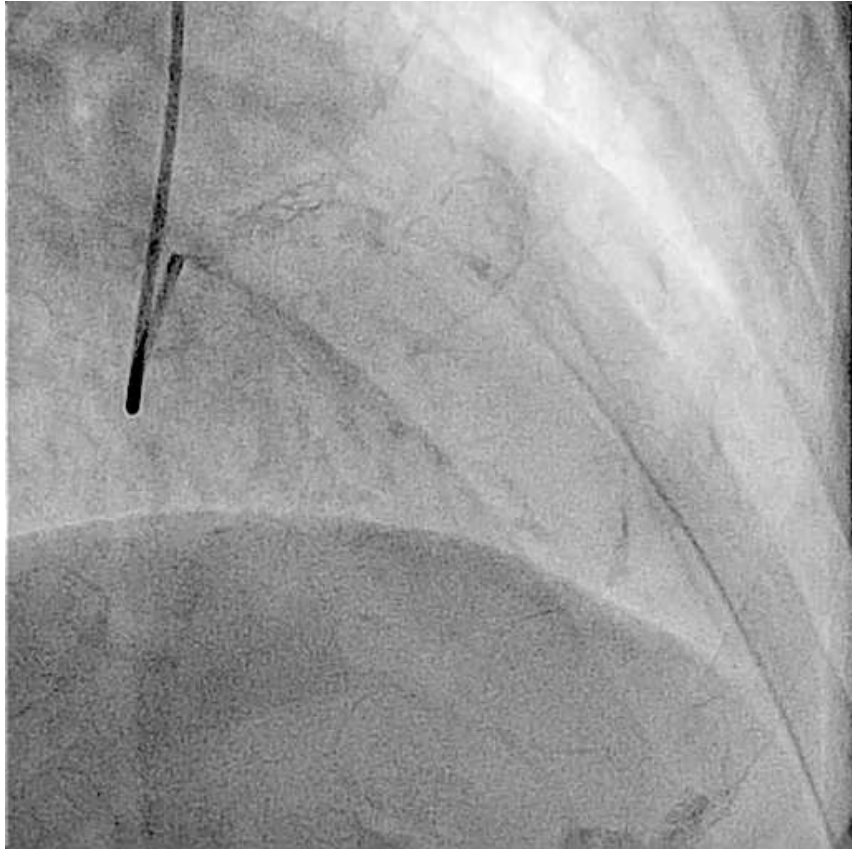


# Native LAD through LIMA graft

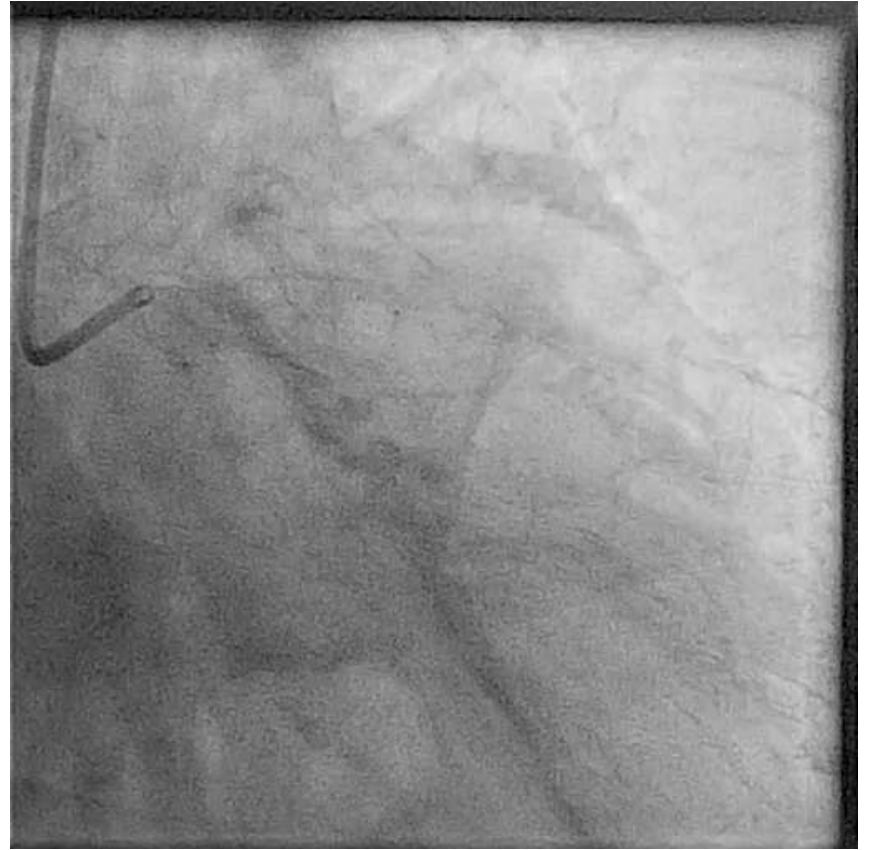
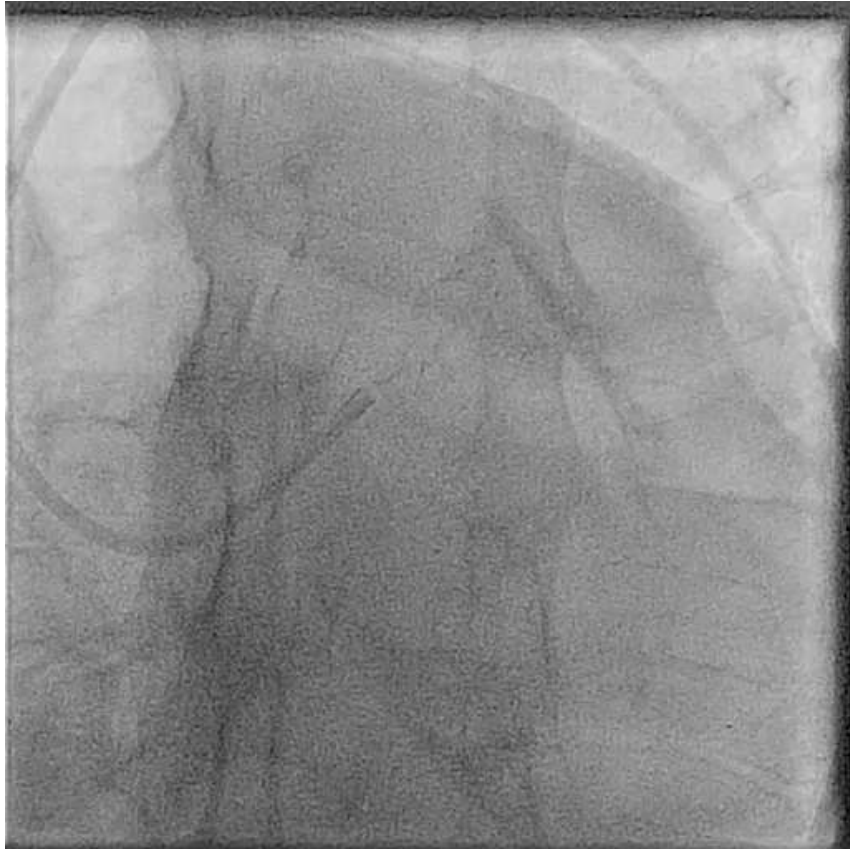


# Fibro-calcific lesion

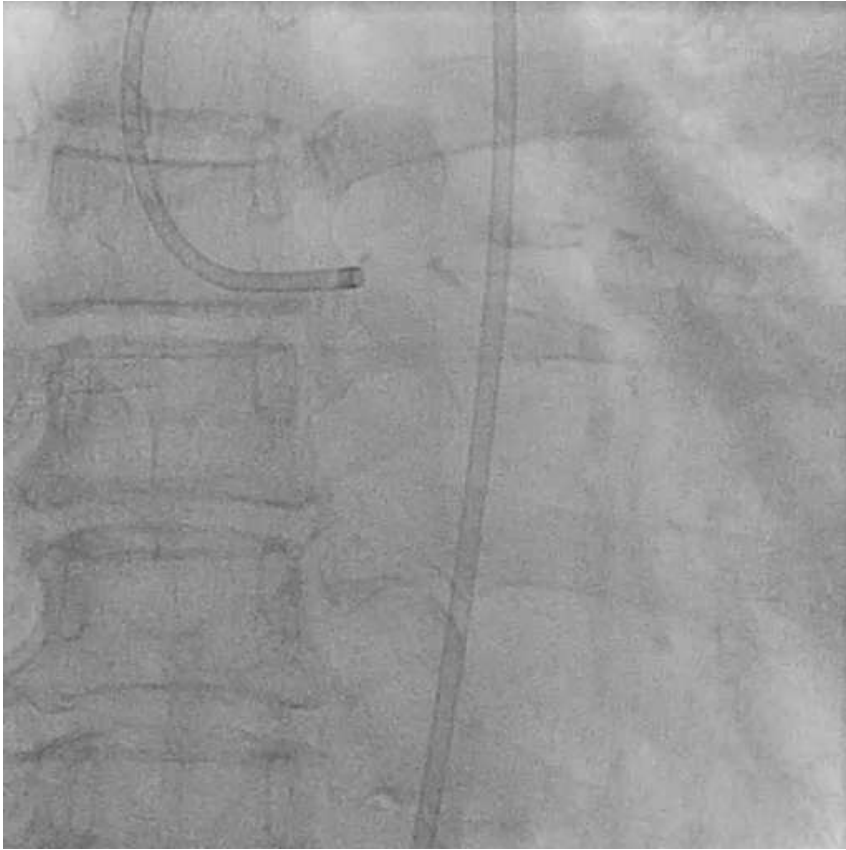




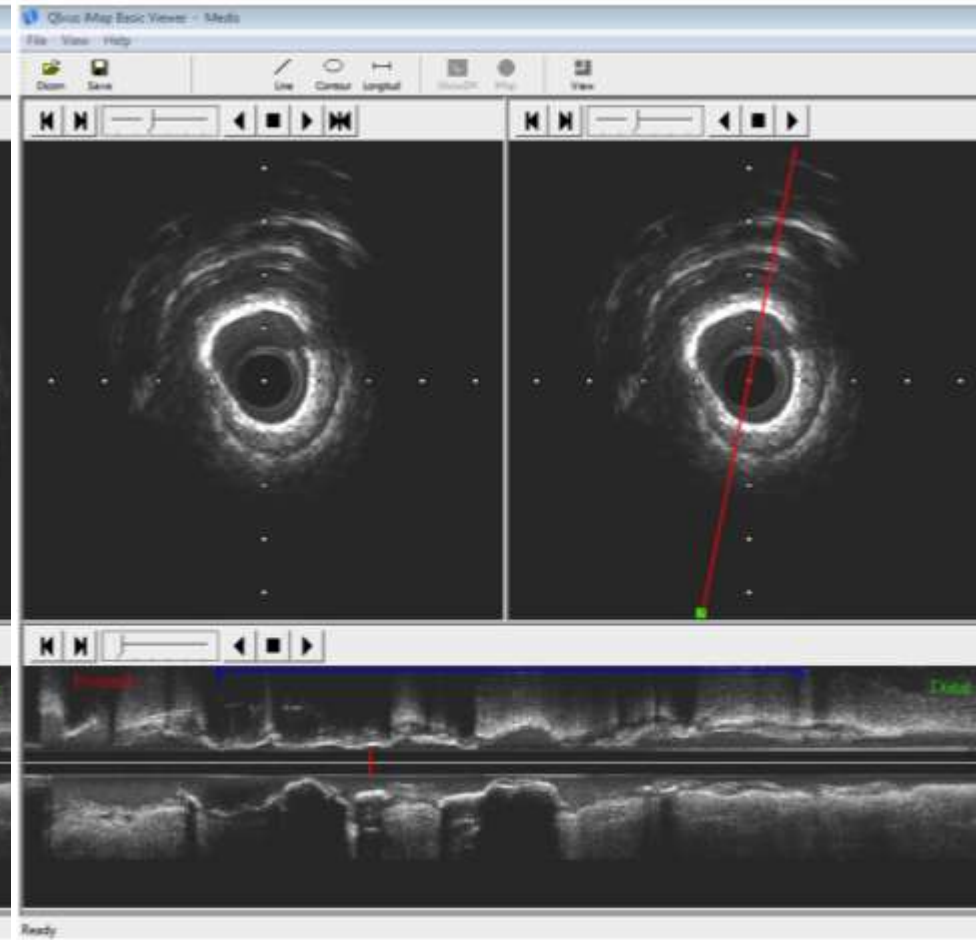
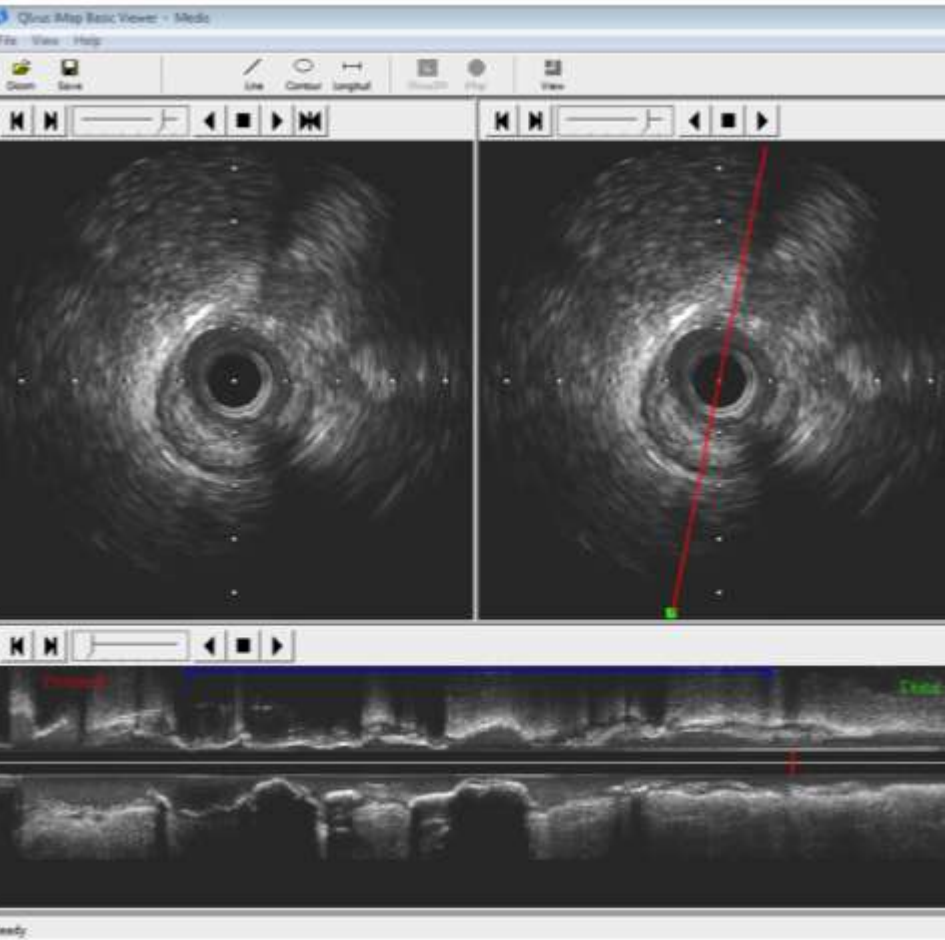


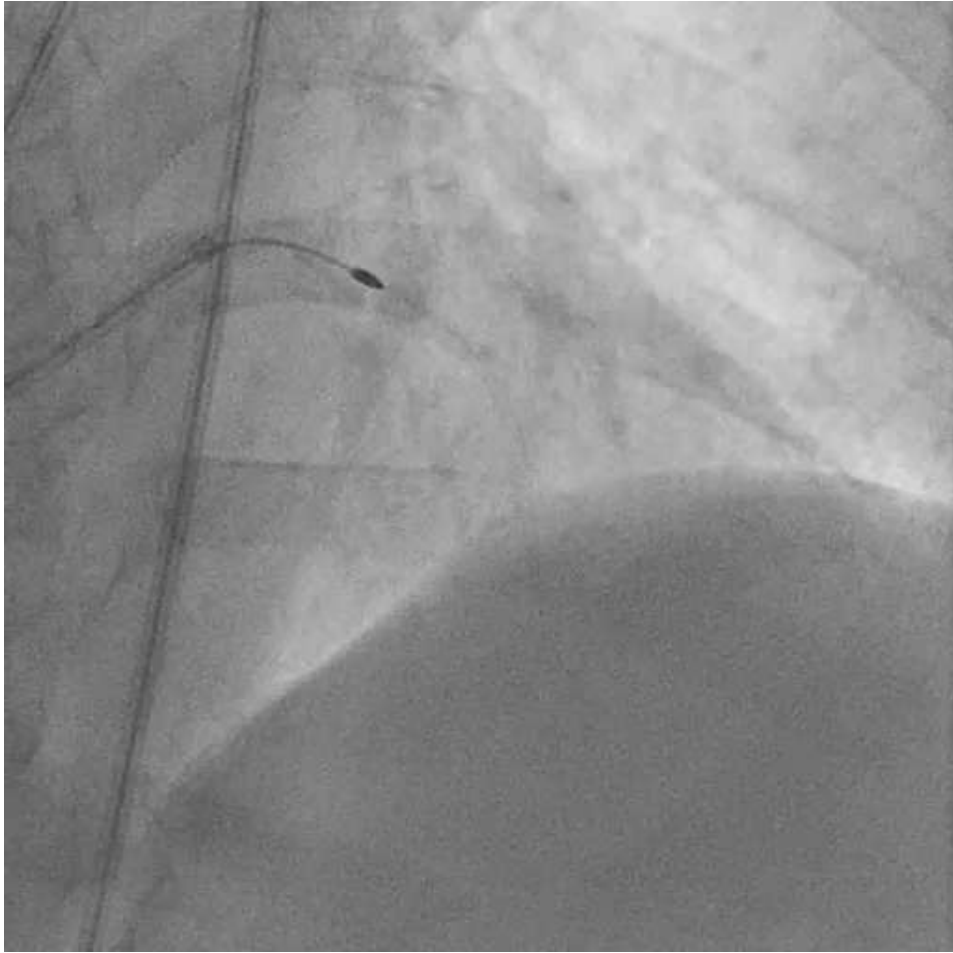


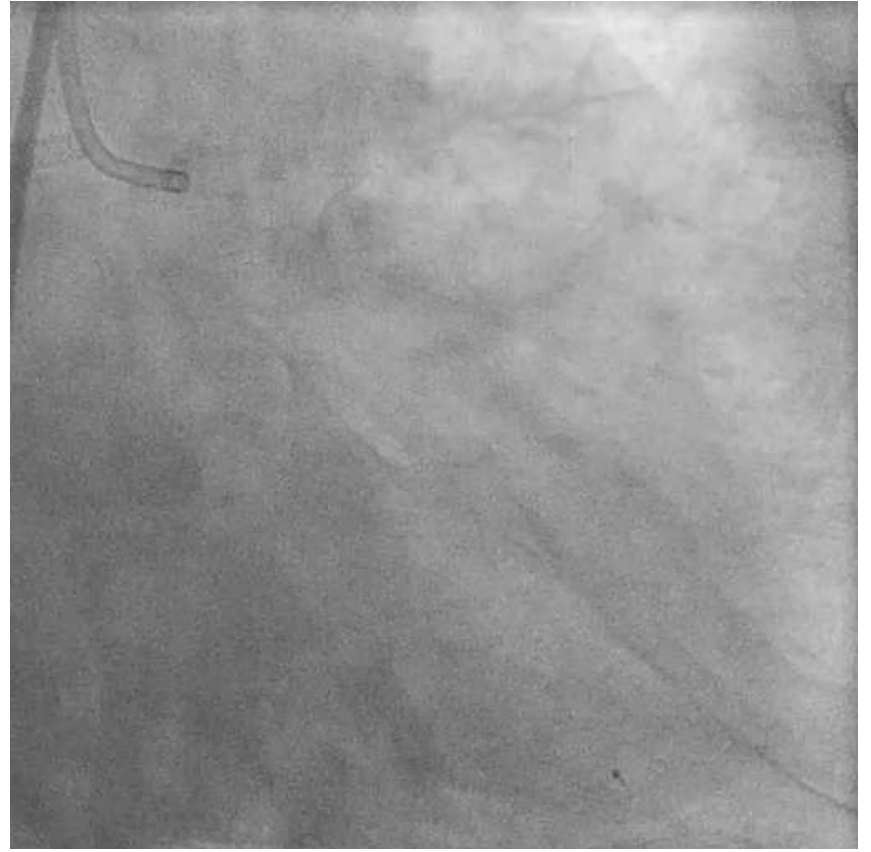
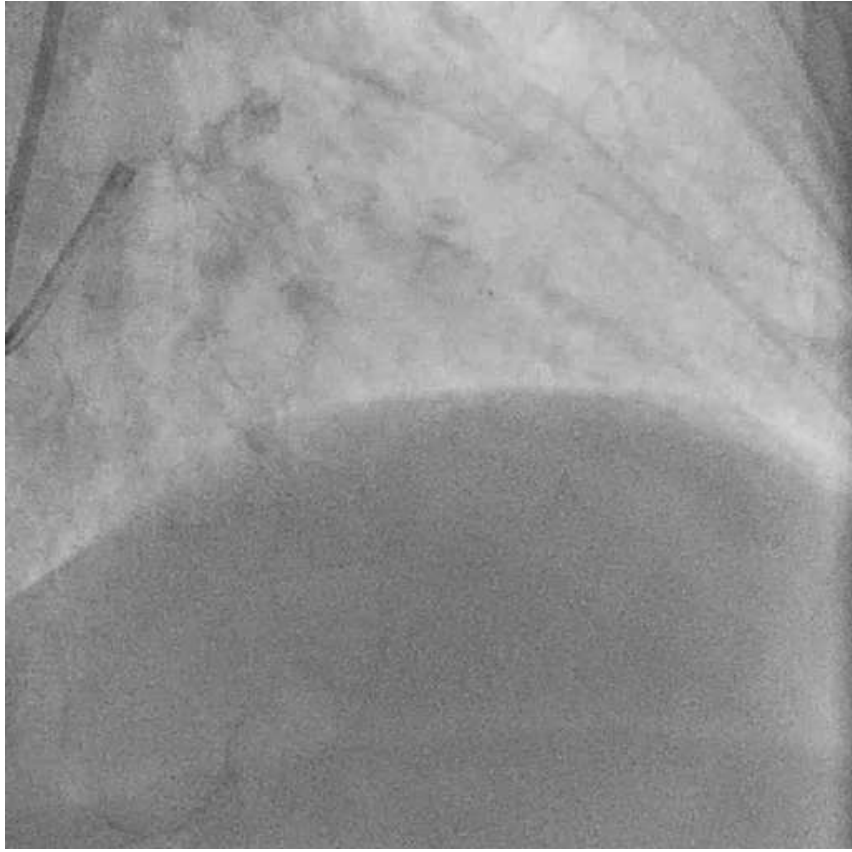
# Calcified lesion



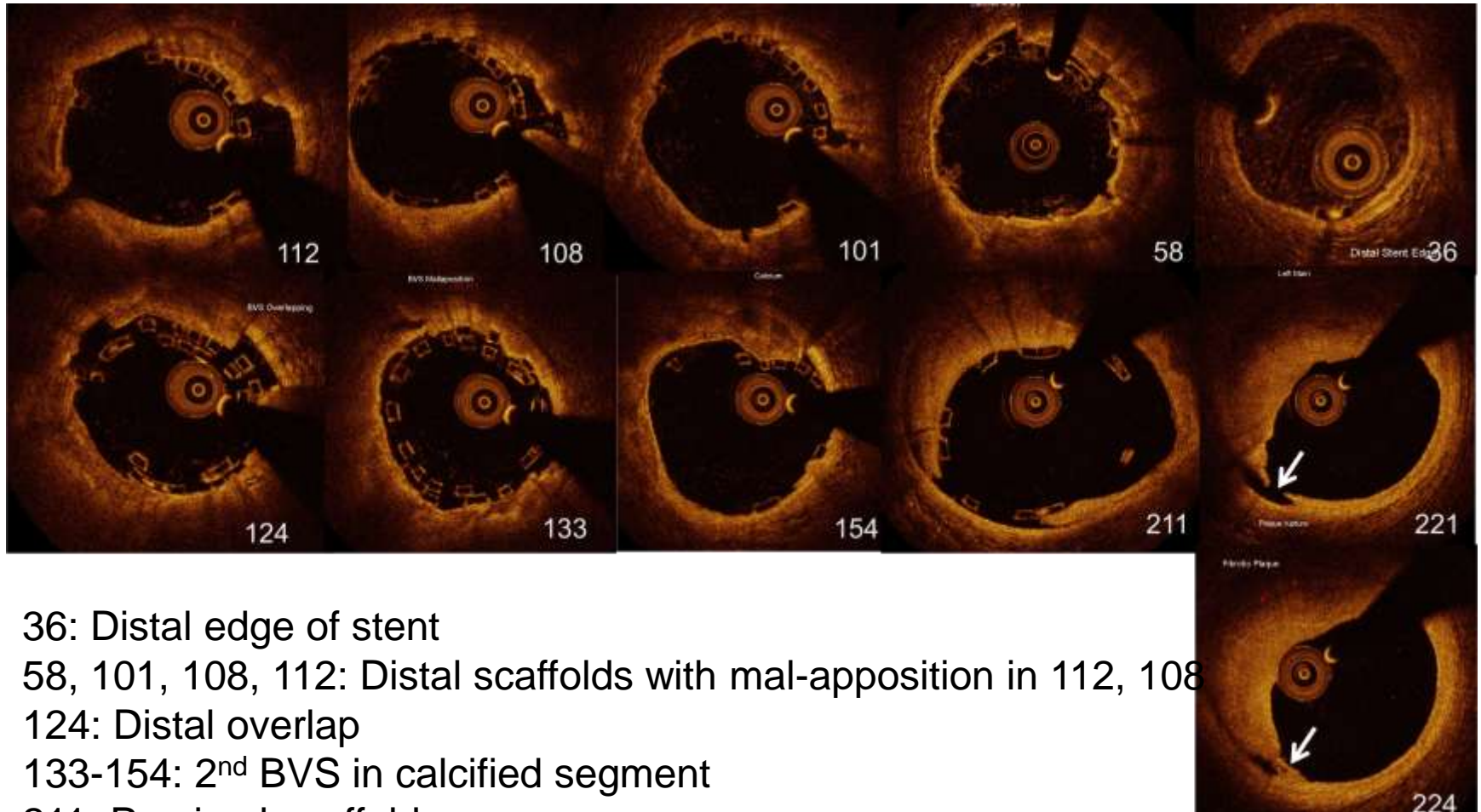
# IVUS images







# OCT images after BVS deployment



36: Distal edge of stent

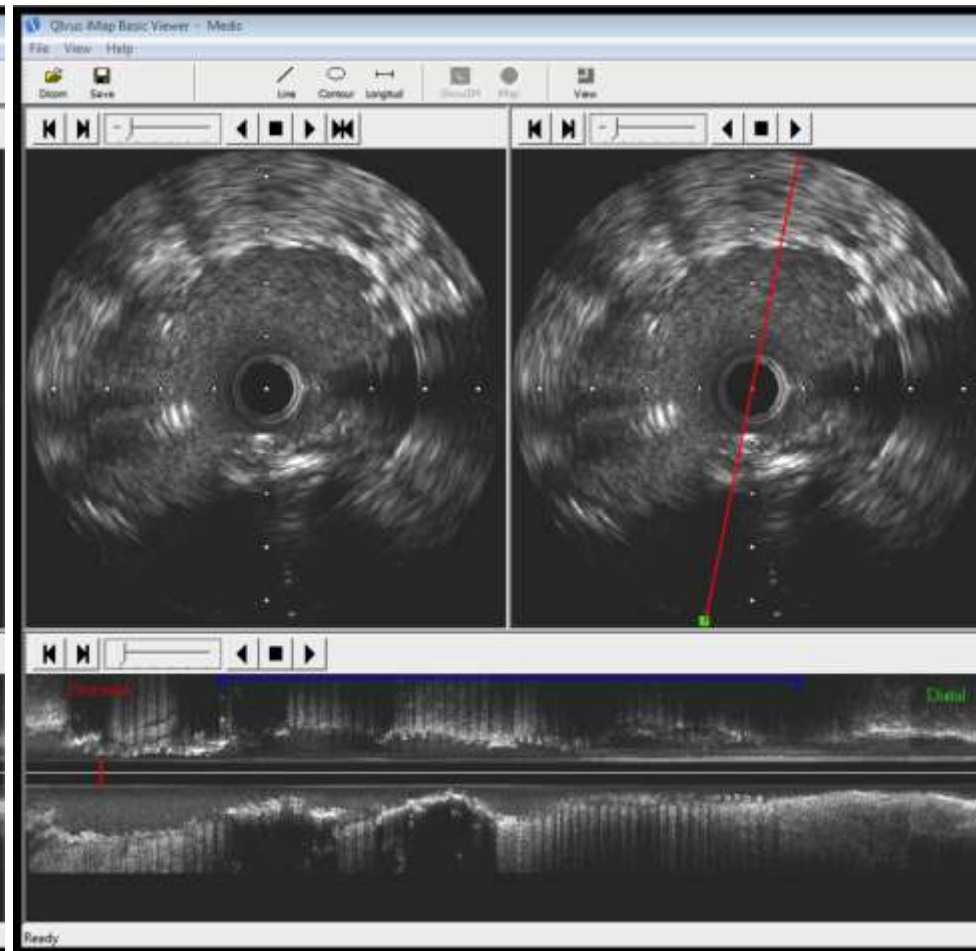
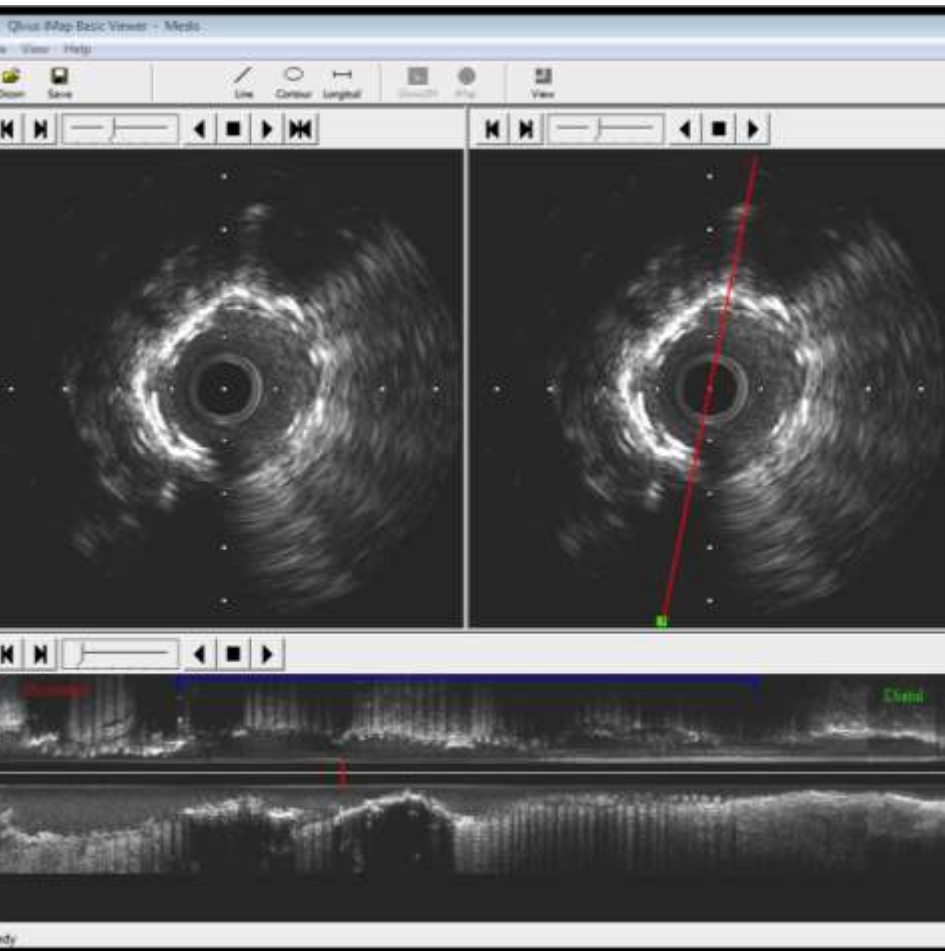
58, 101, 108, 112: Distal scaffolds with mal-apposition in 112, 108

124: Distal overlap

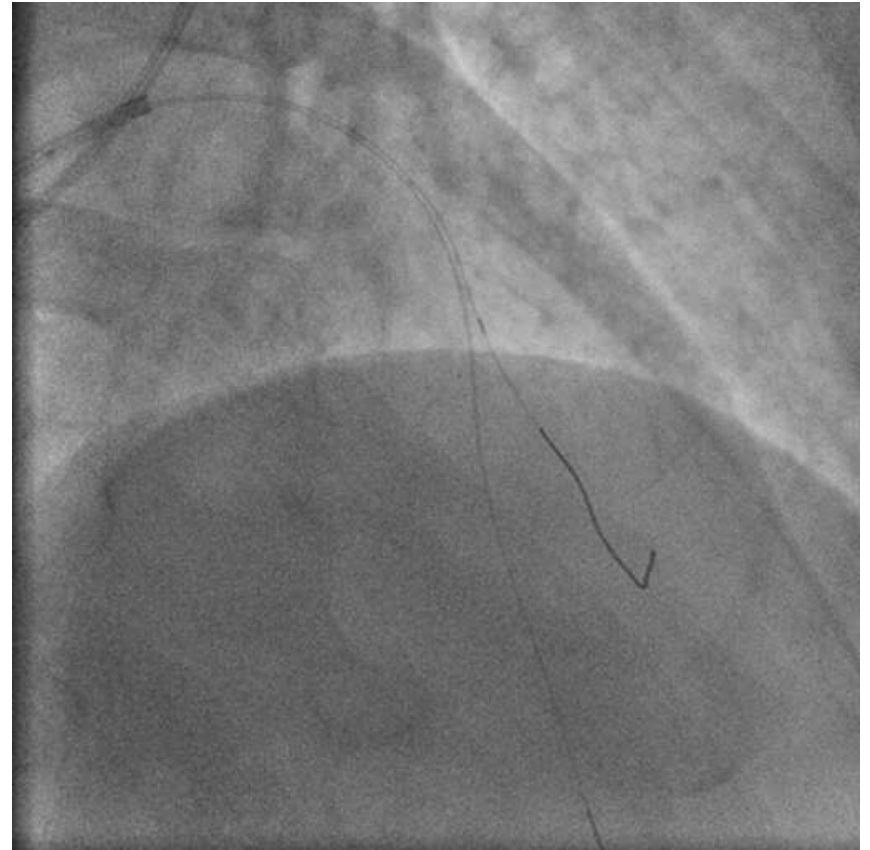
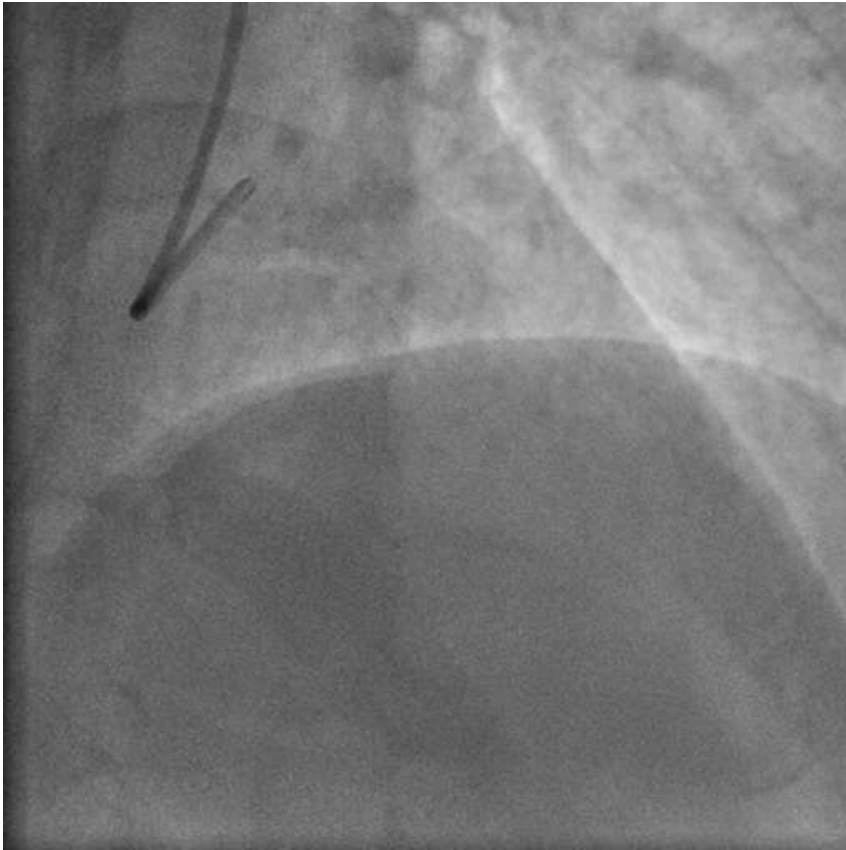
133-154: 2<sup>nd</sup> BVS in calcified segment

211: Proximal scaffold

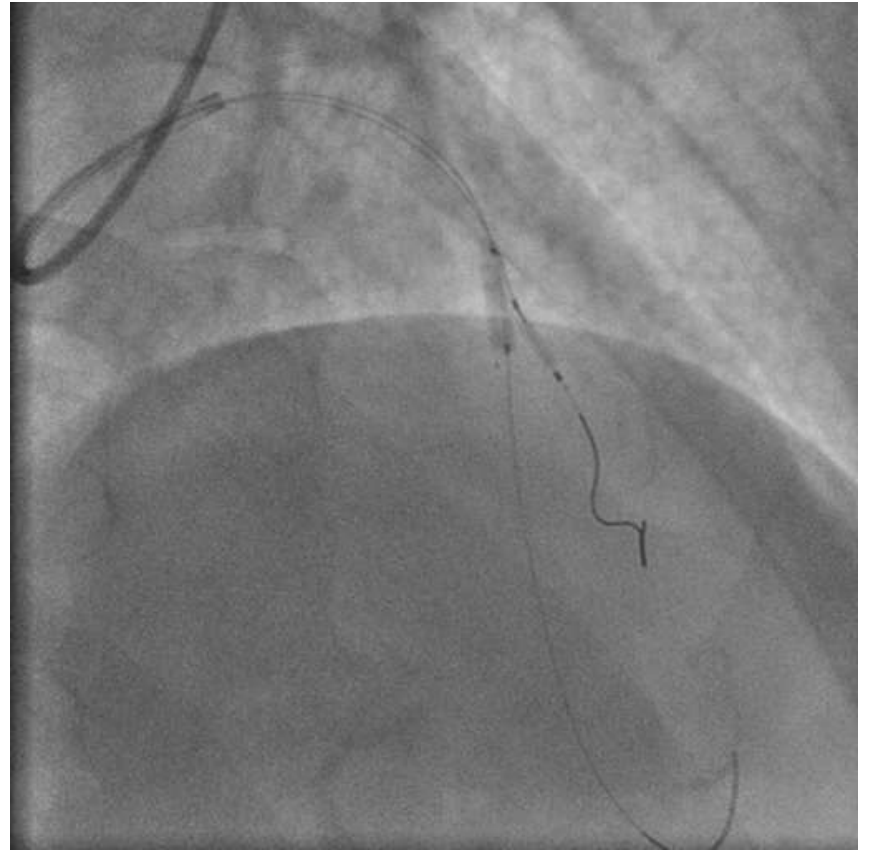
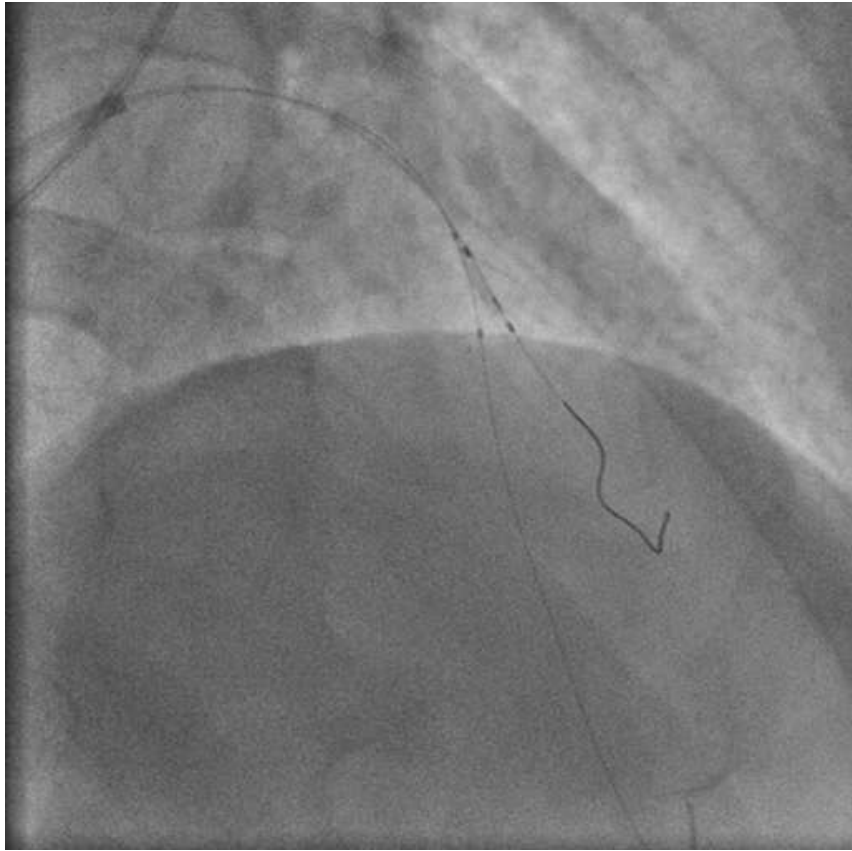
221 and 224: LMCA with dissection

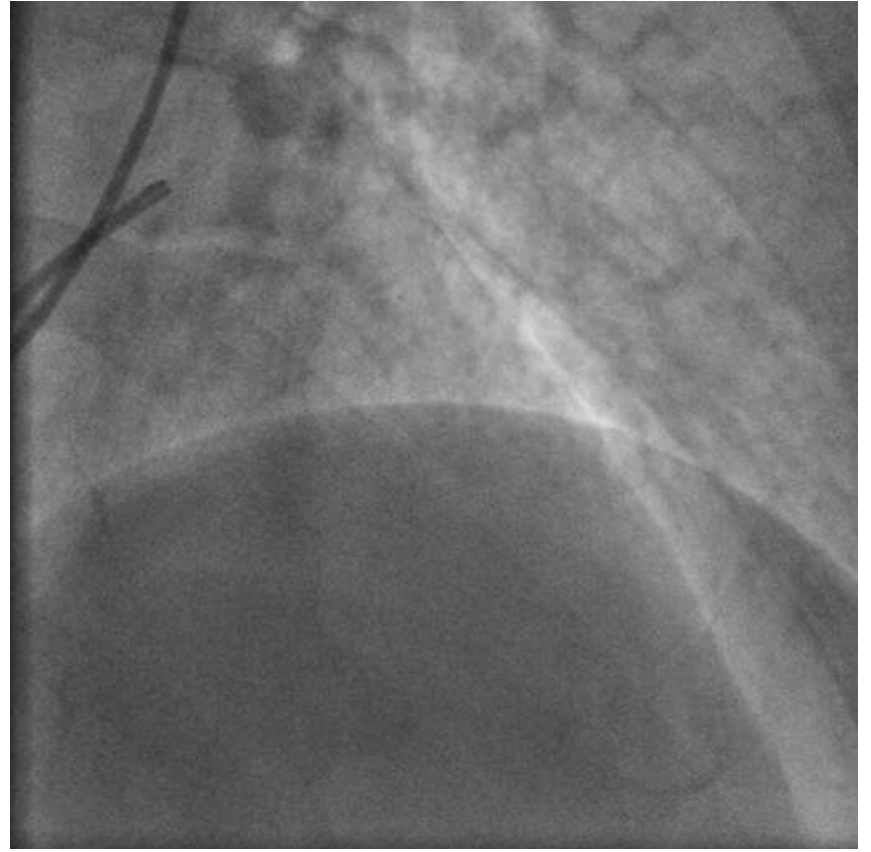
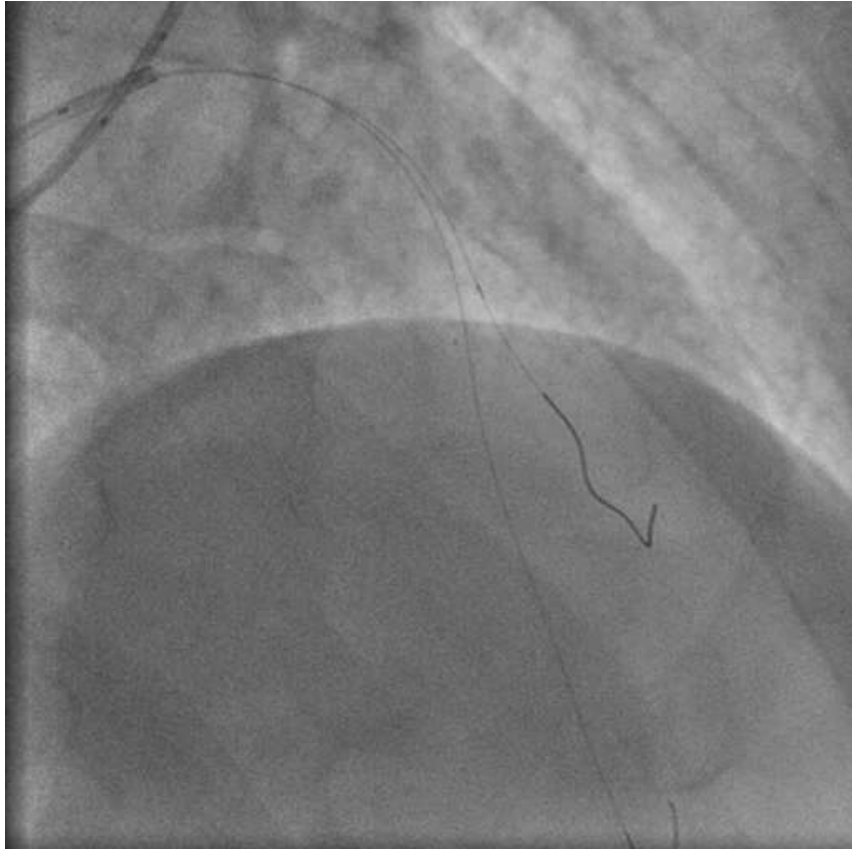


# Bifurcation: Single scaffold

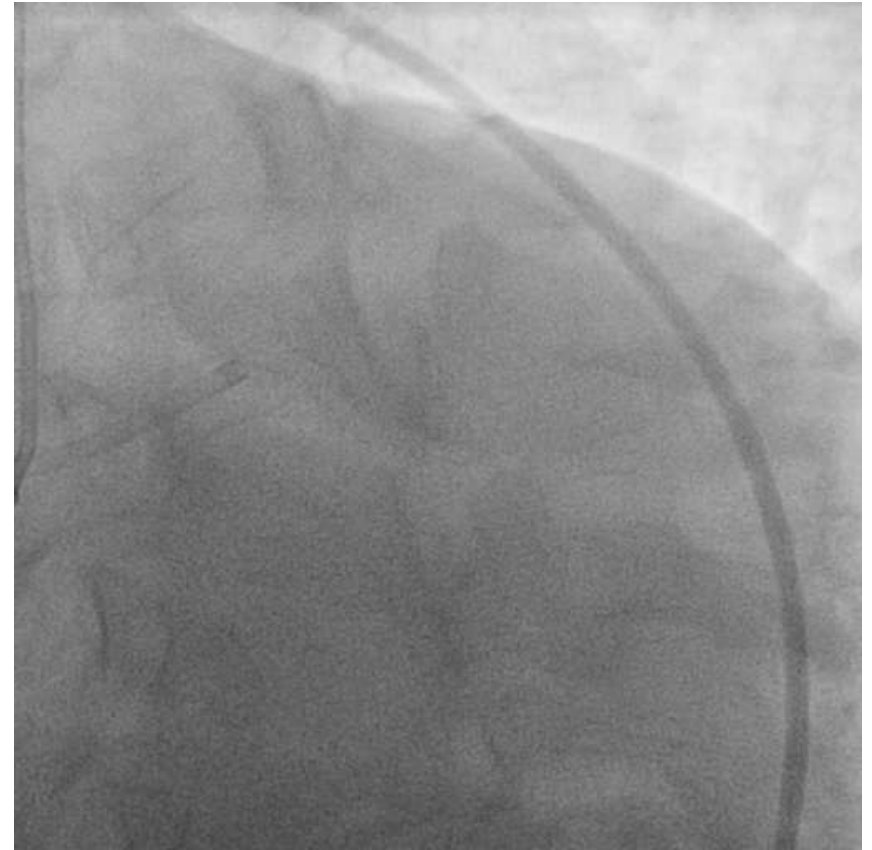
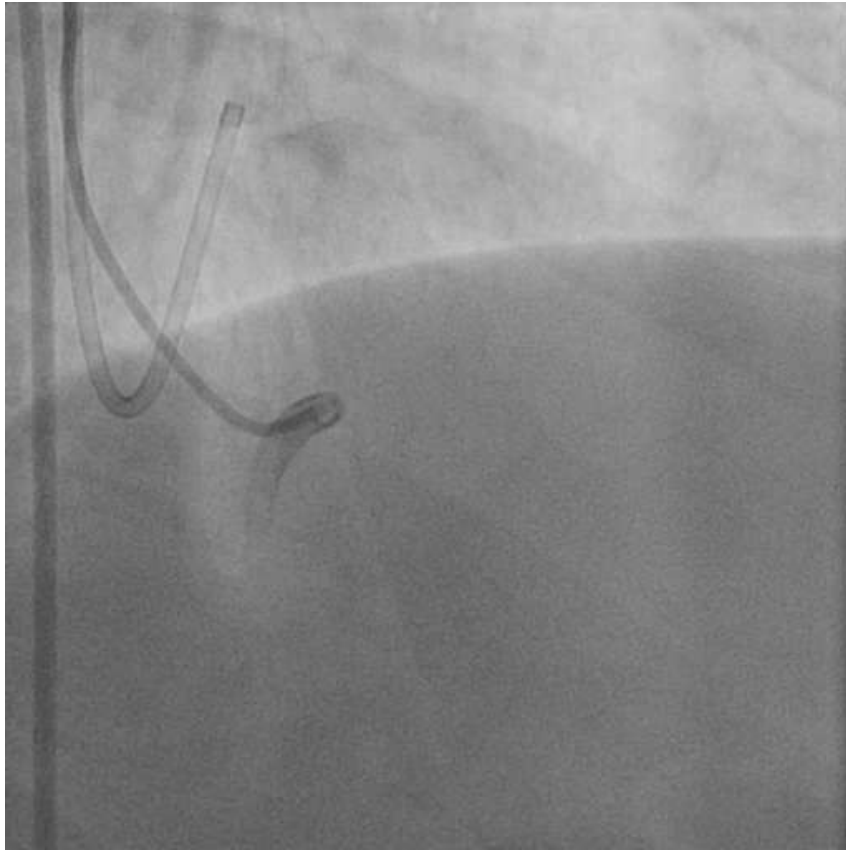


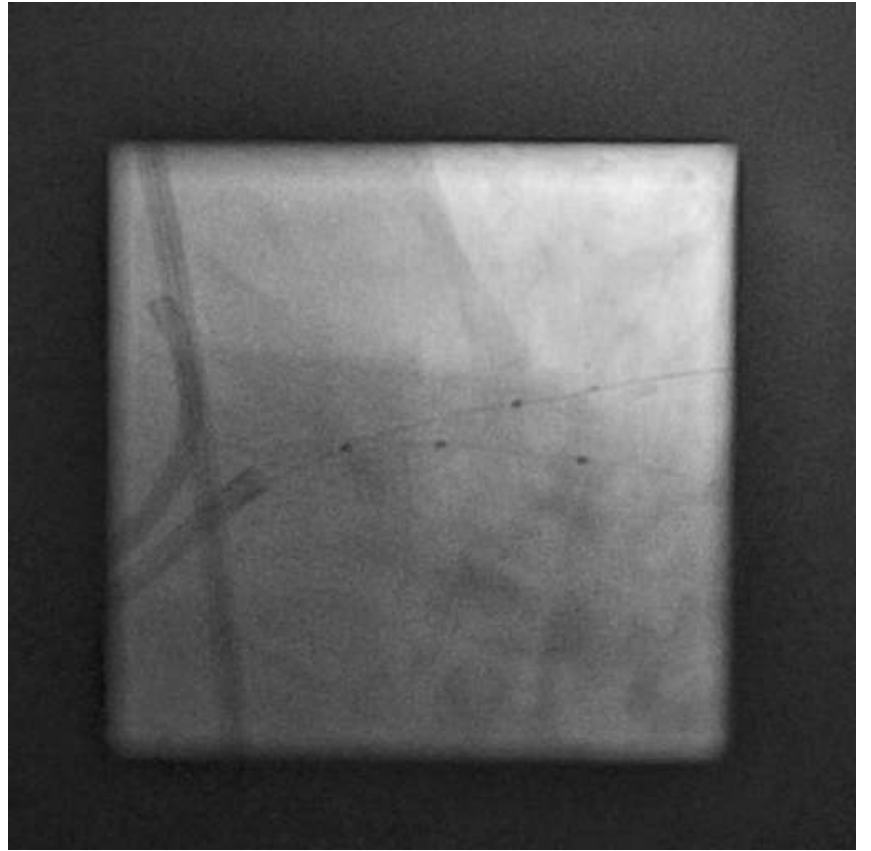
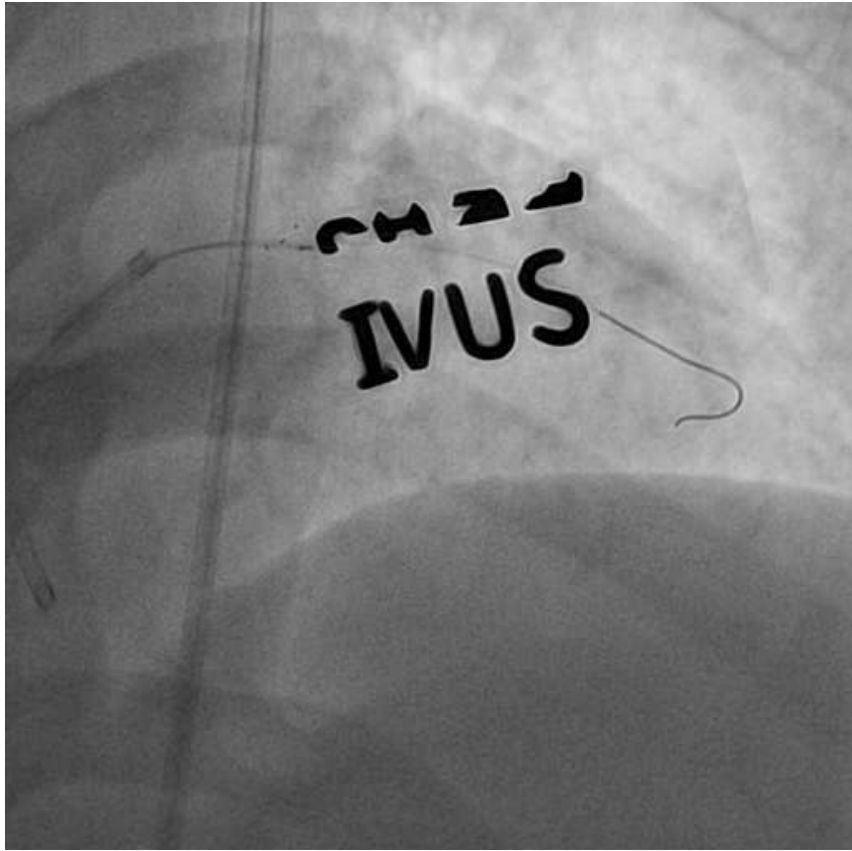


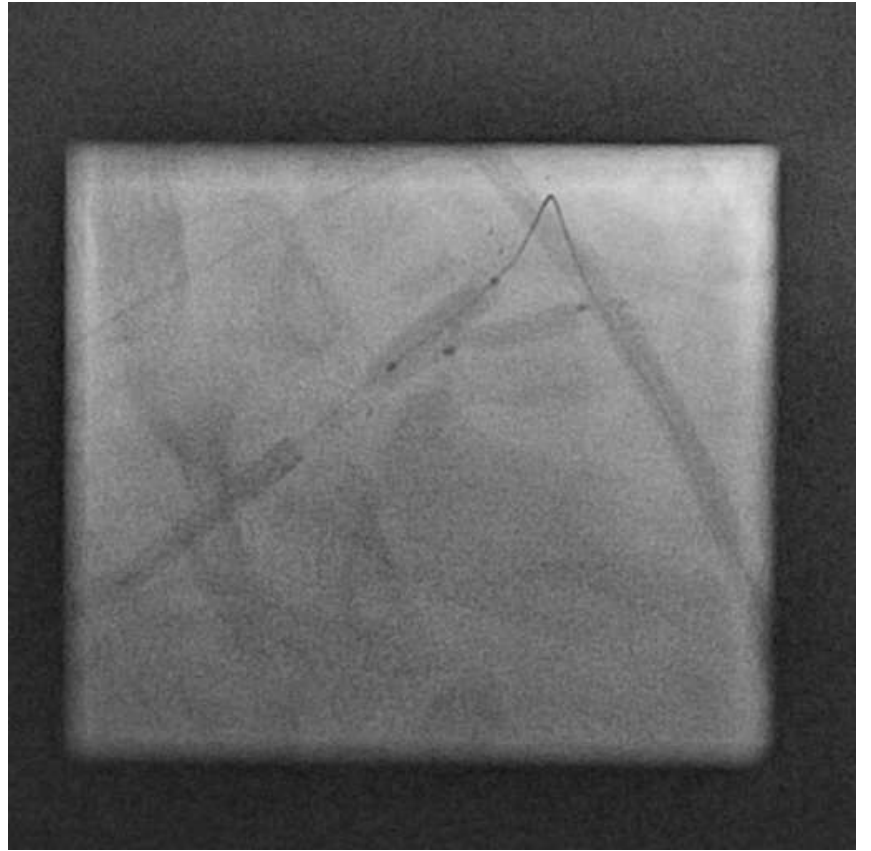
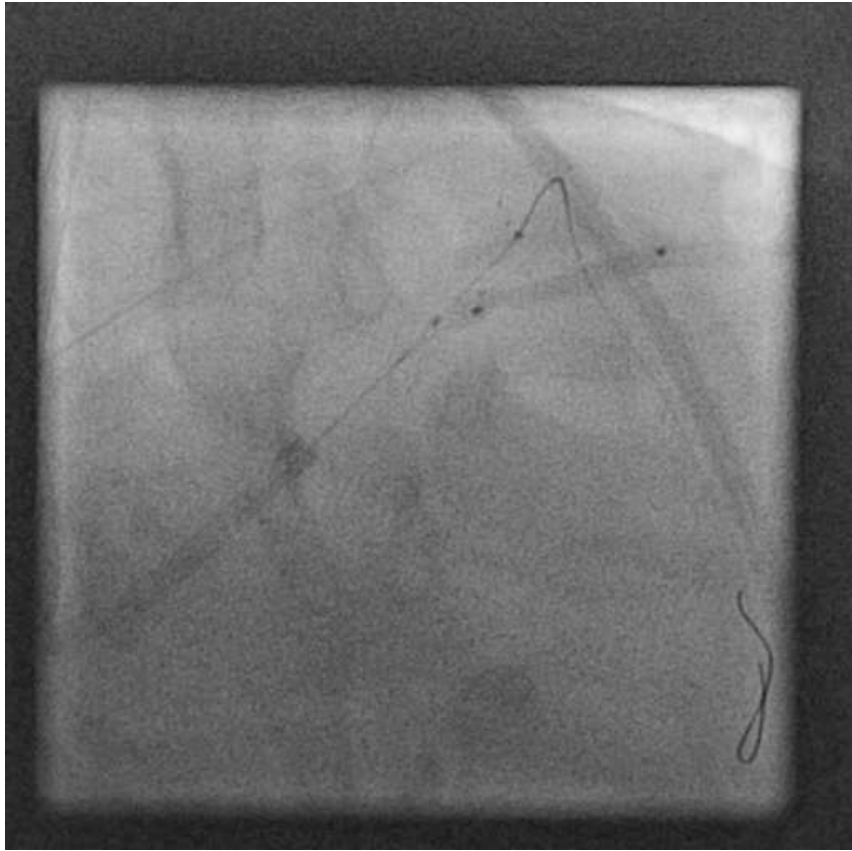


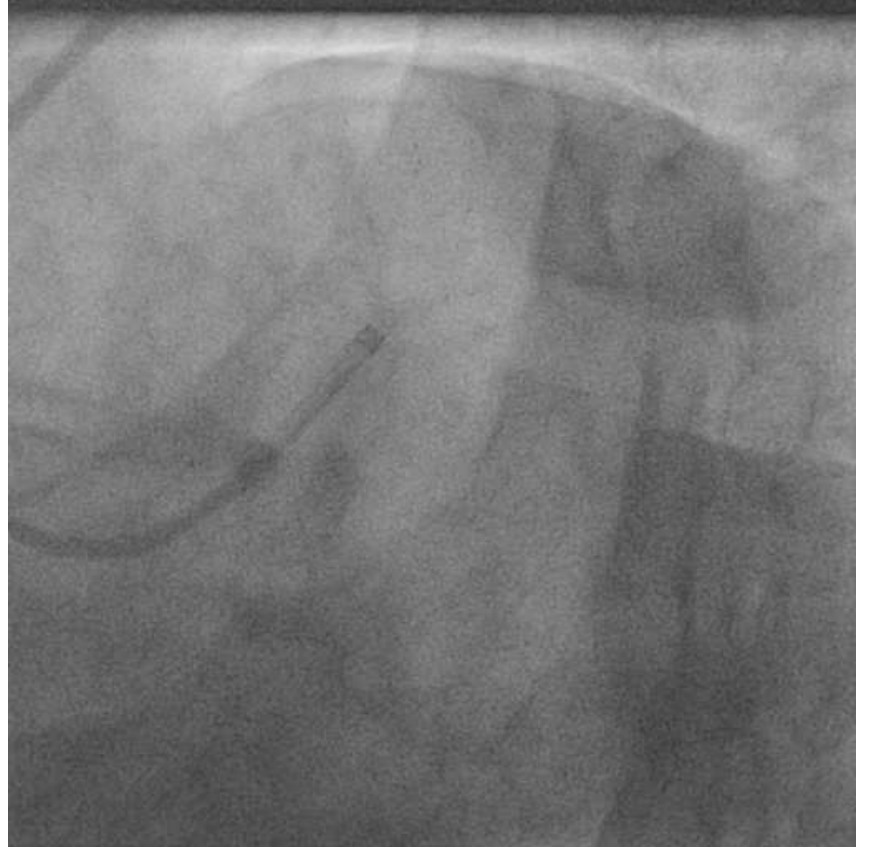


# CTO and Bifurcation with TaP

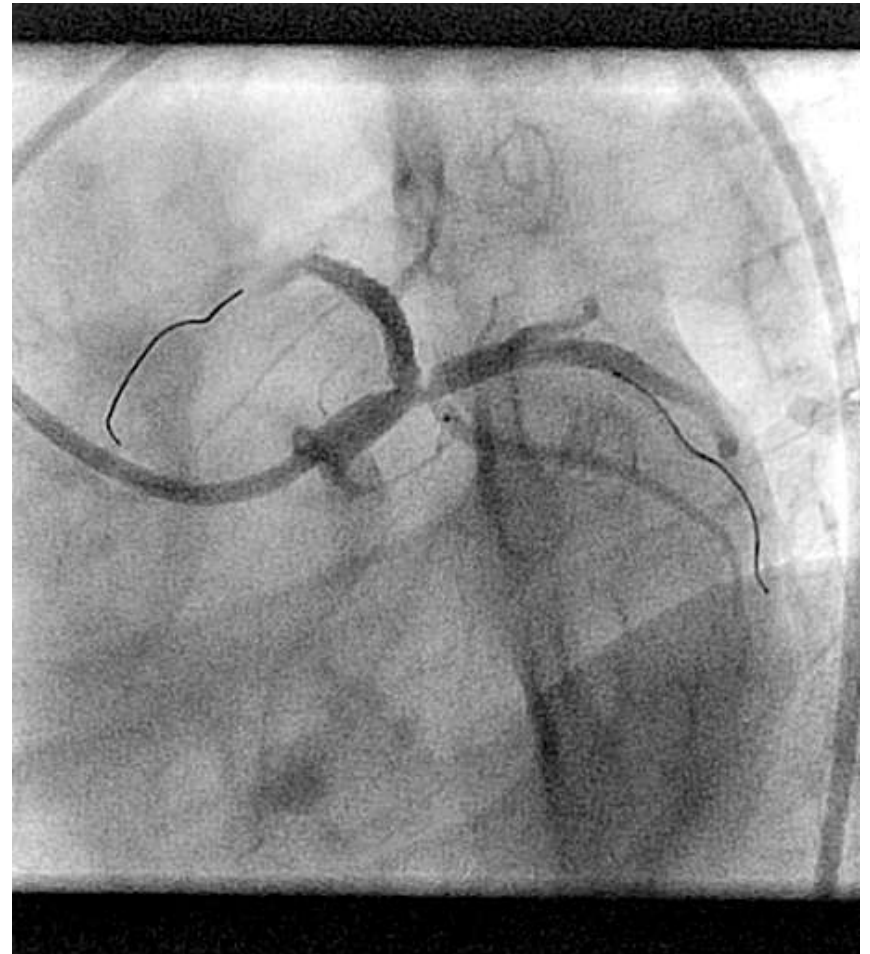
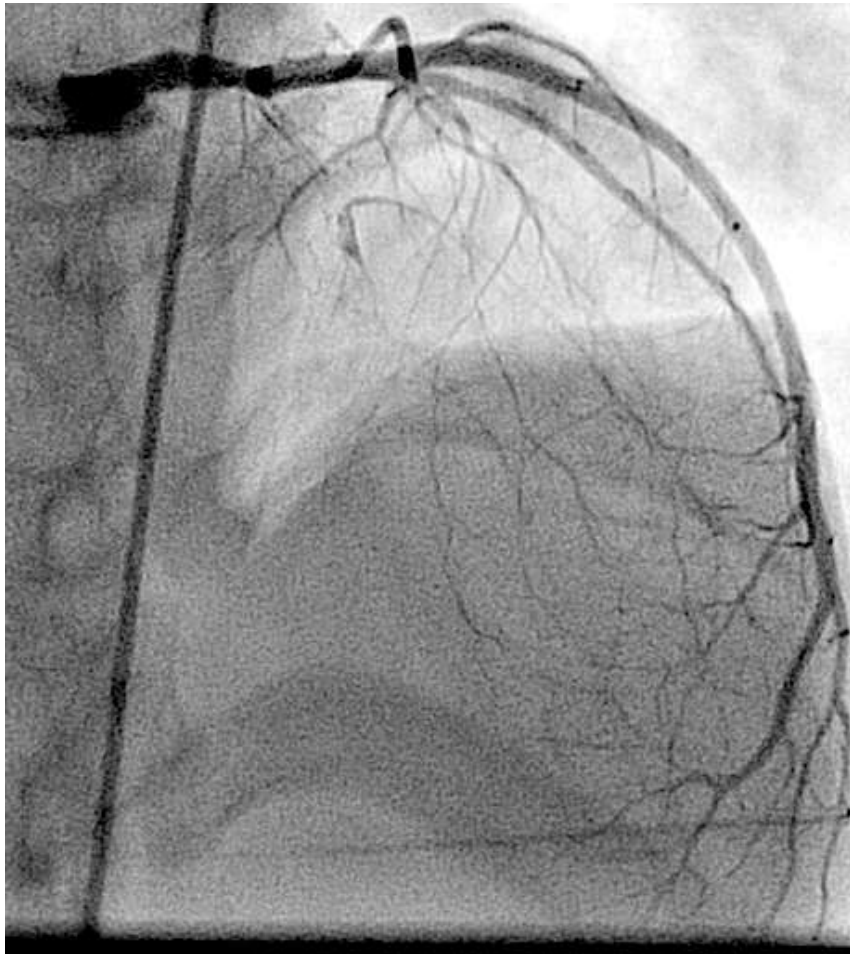


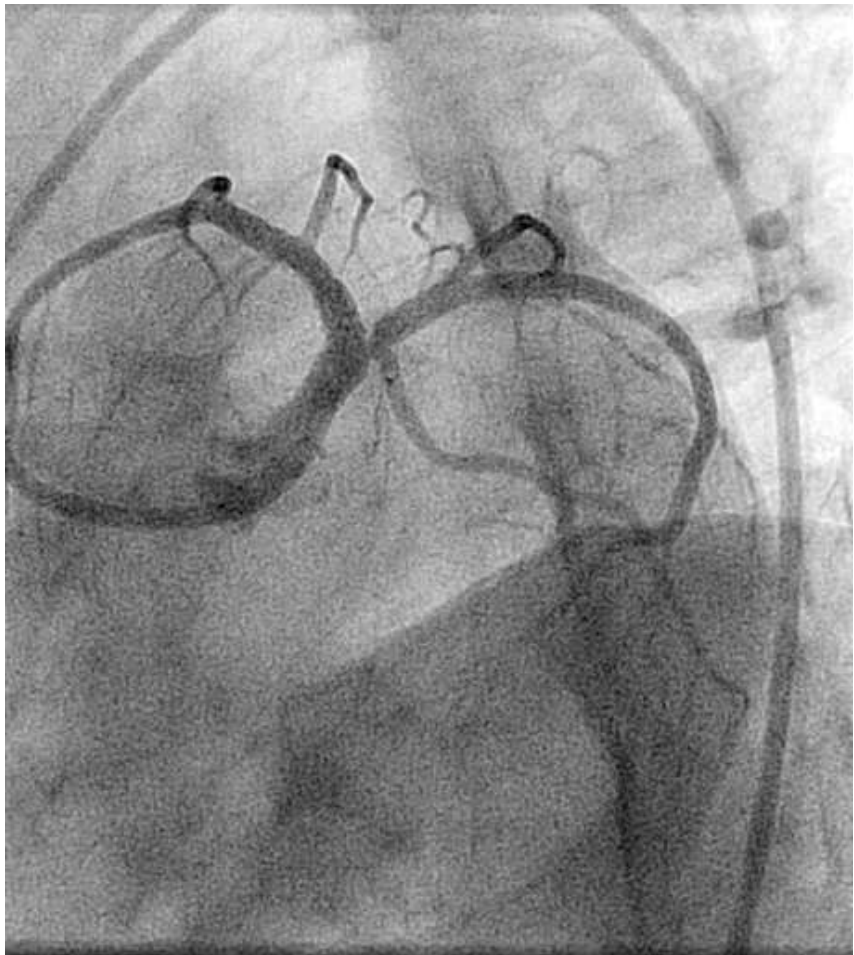






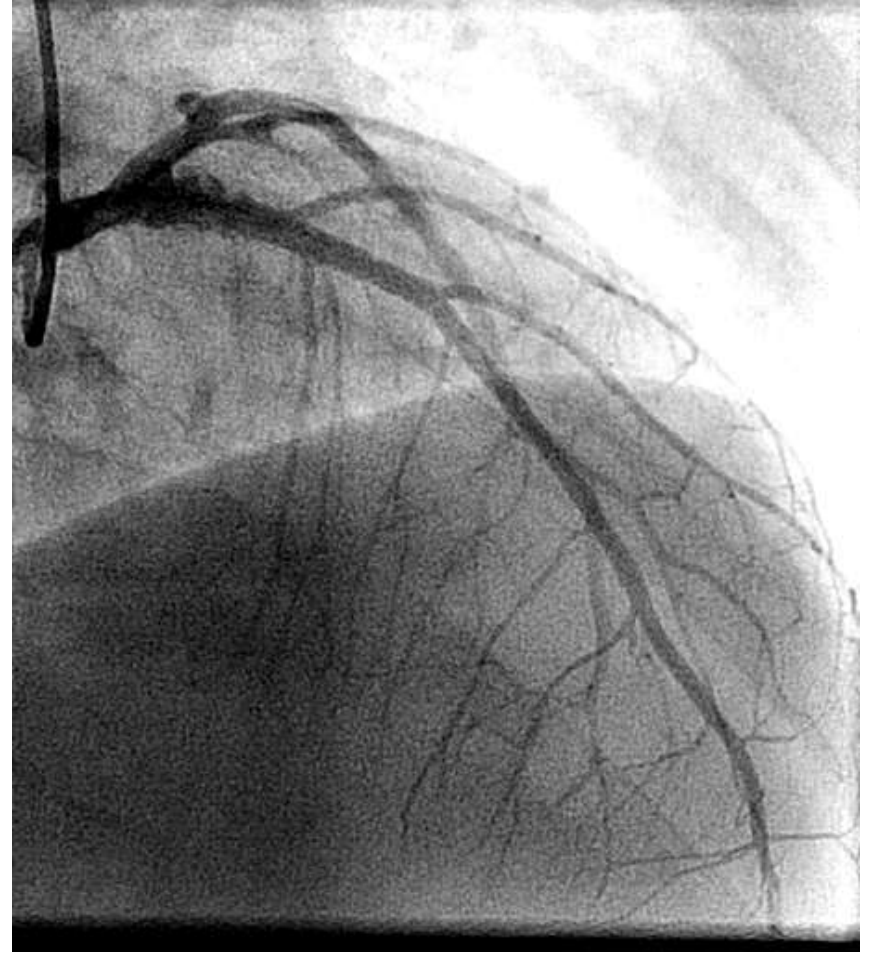
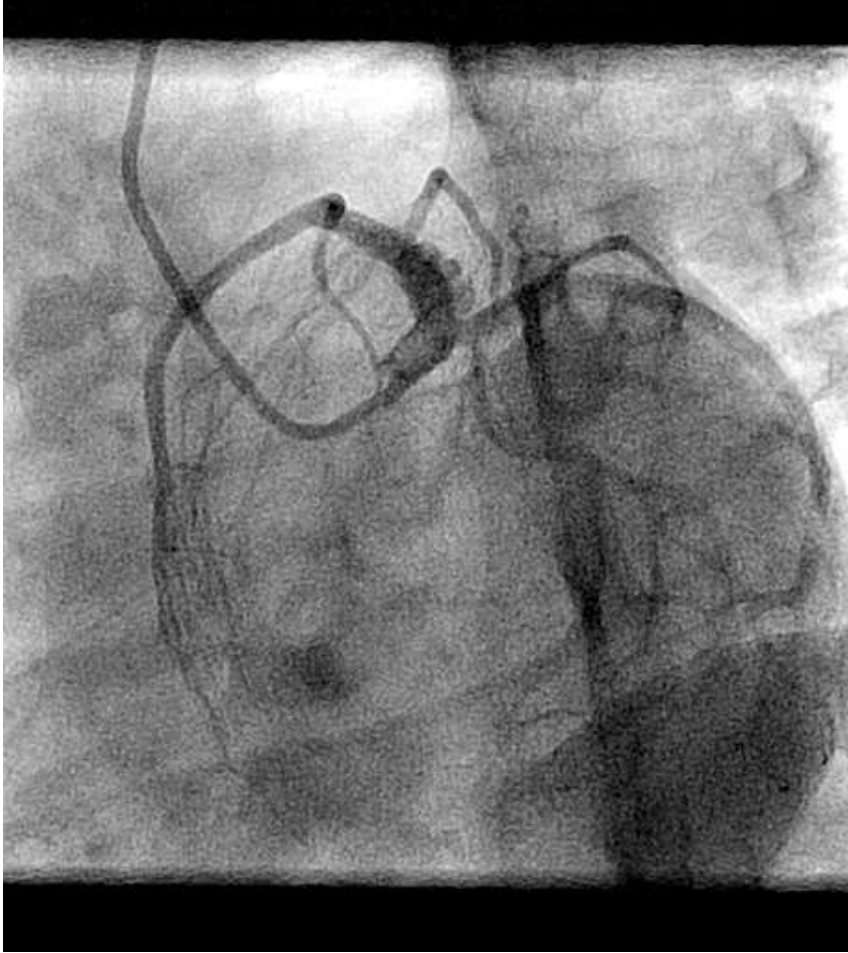
# Diffuse ISR and CTO: the most complex



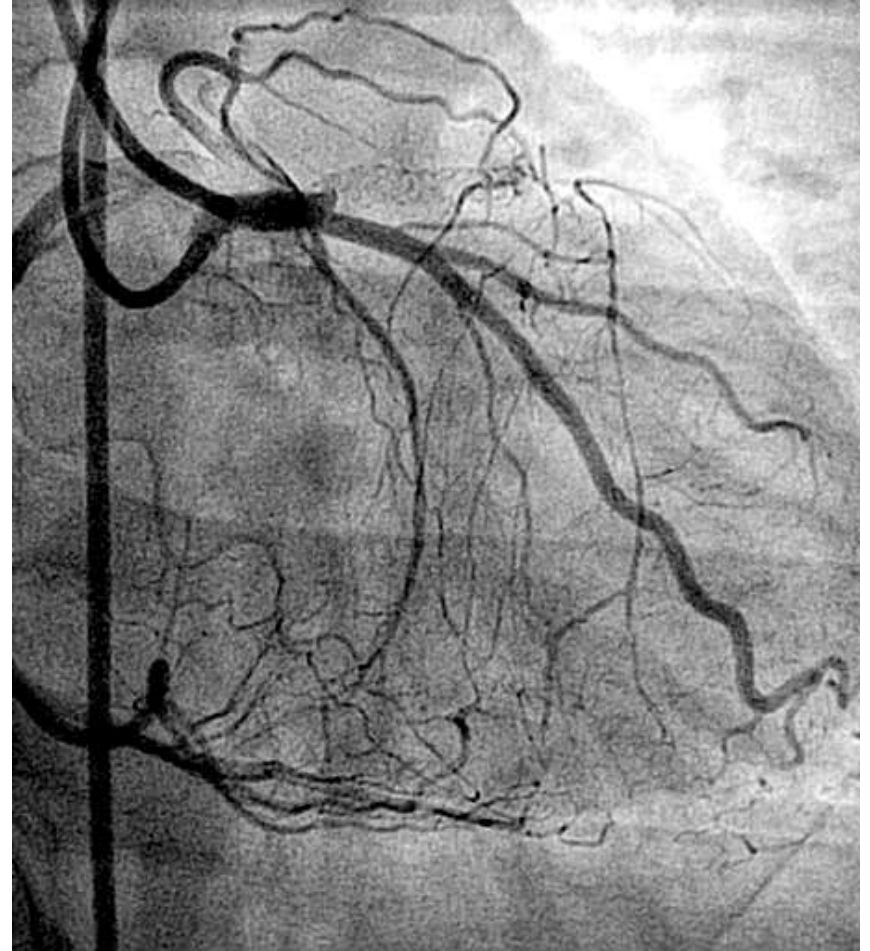
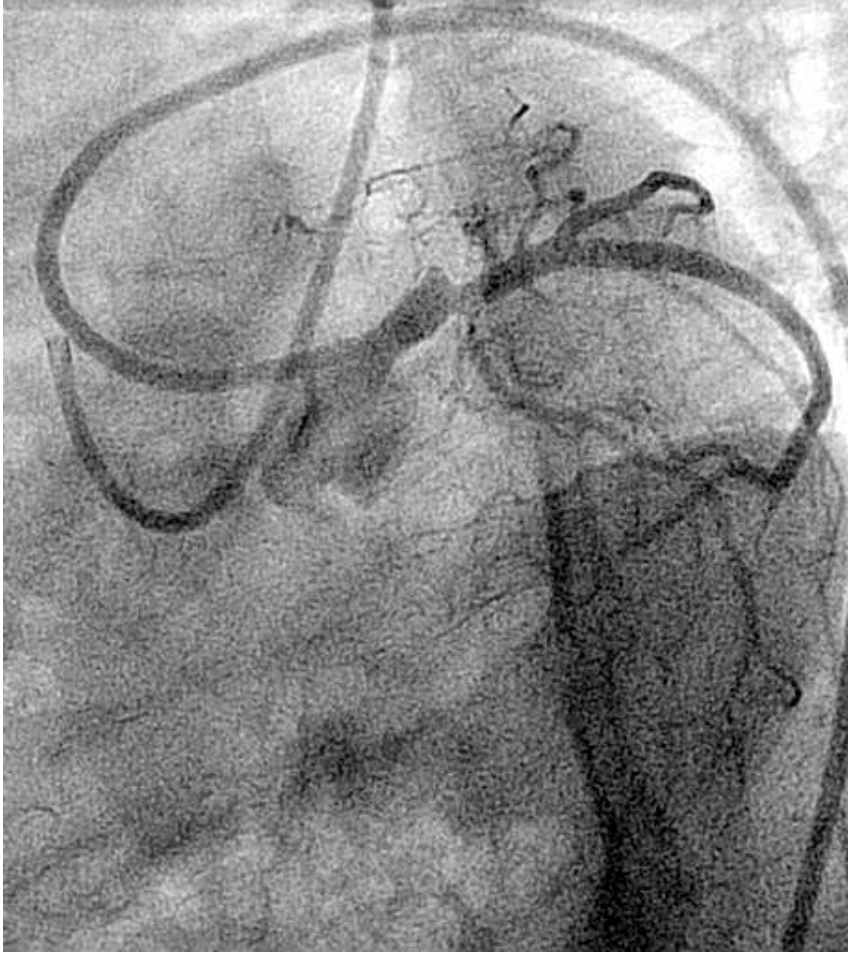


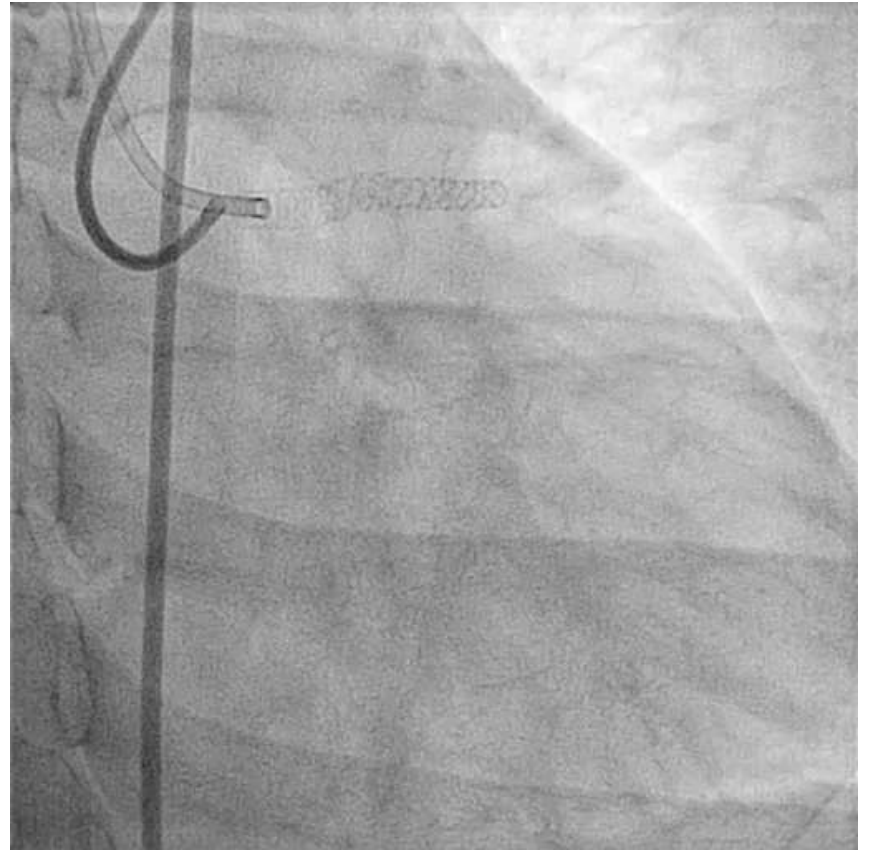


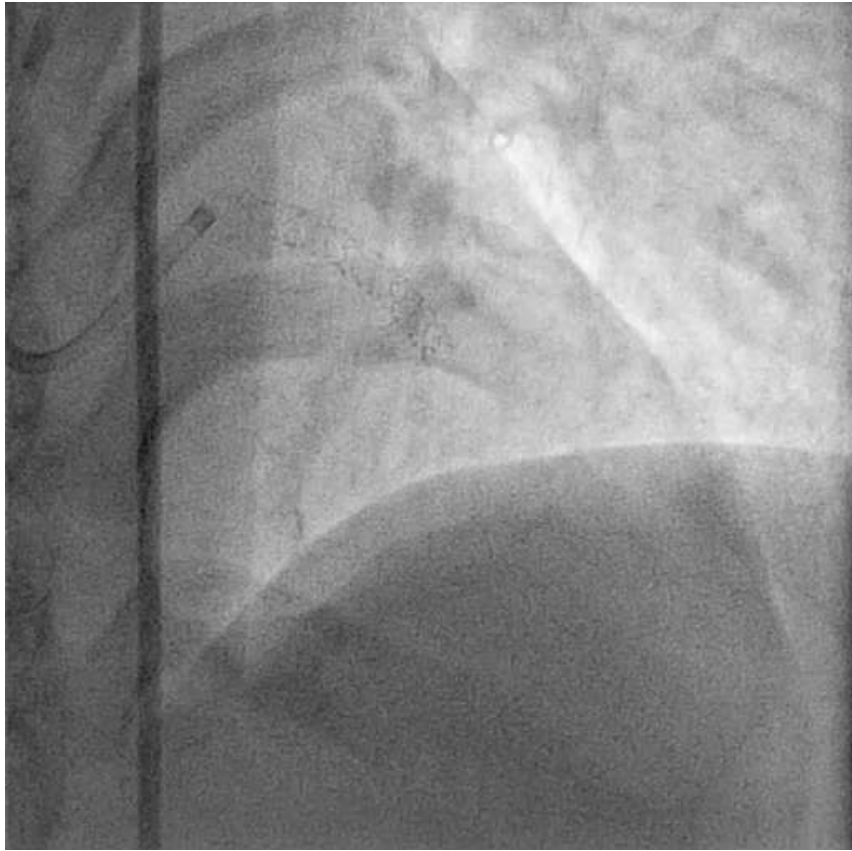
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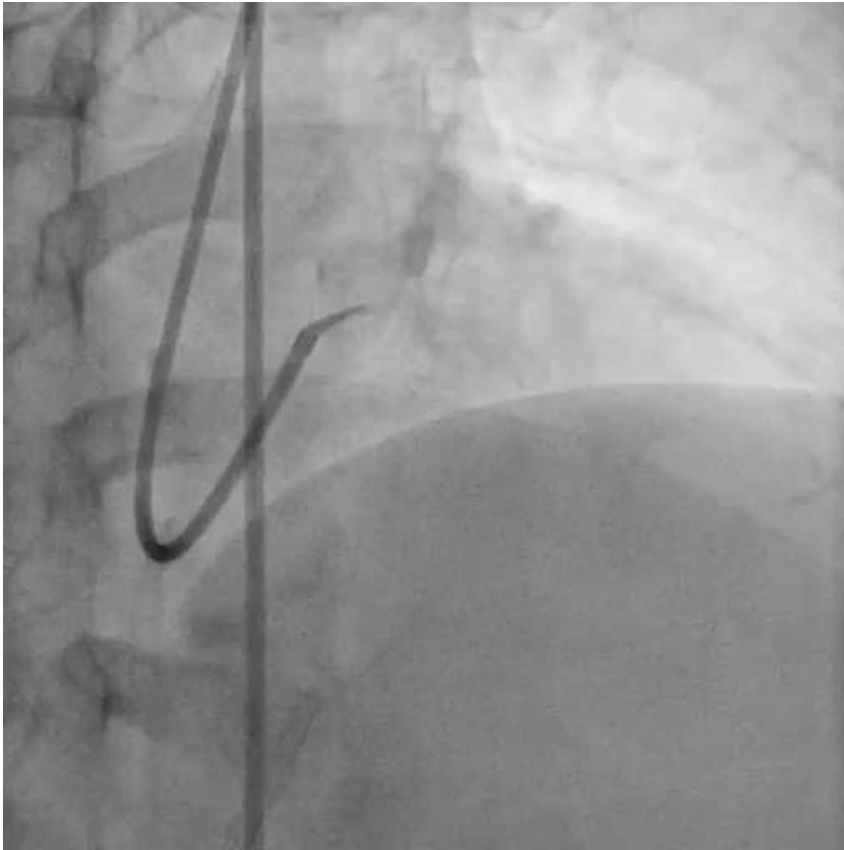


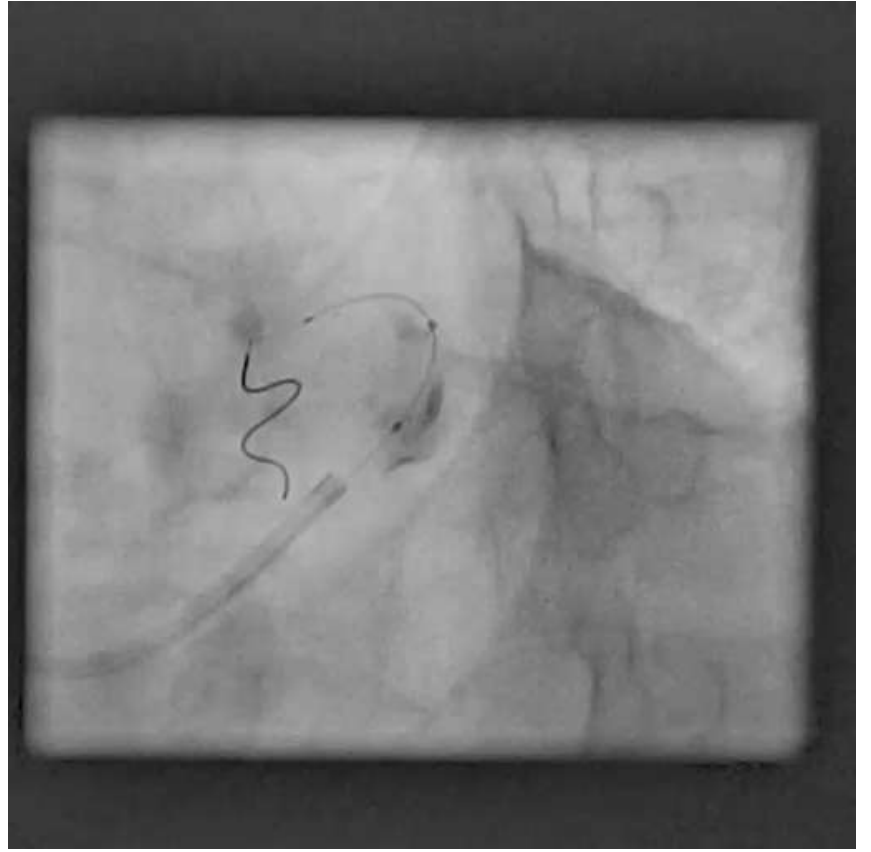
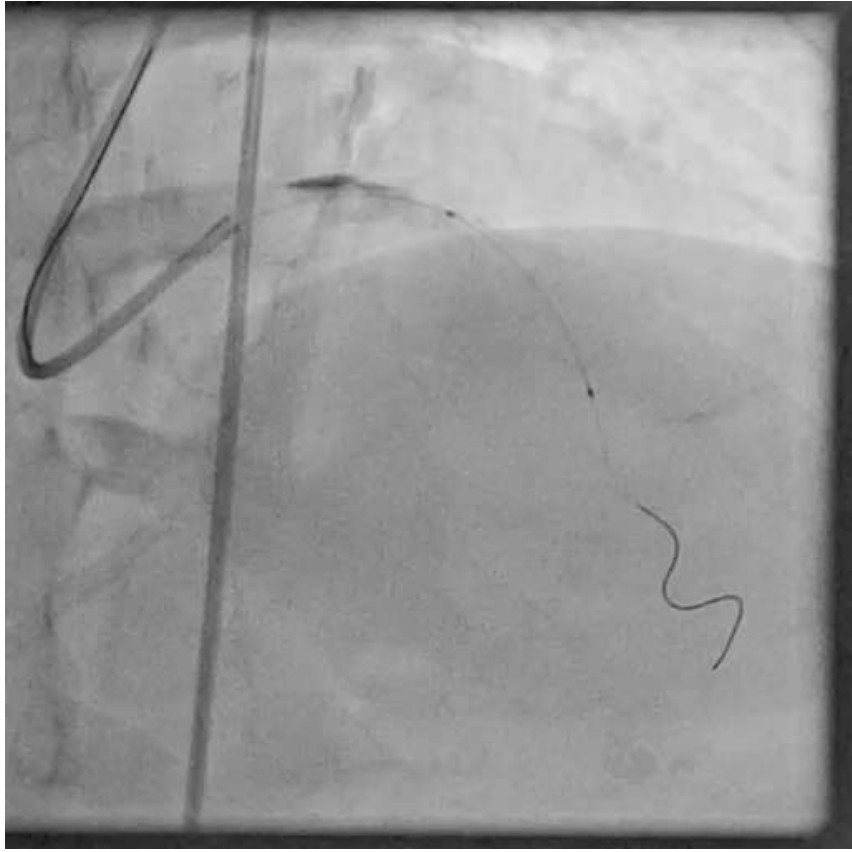


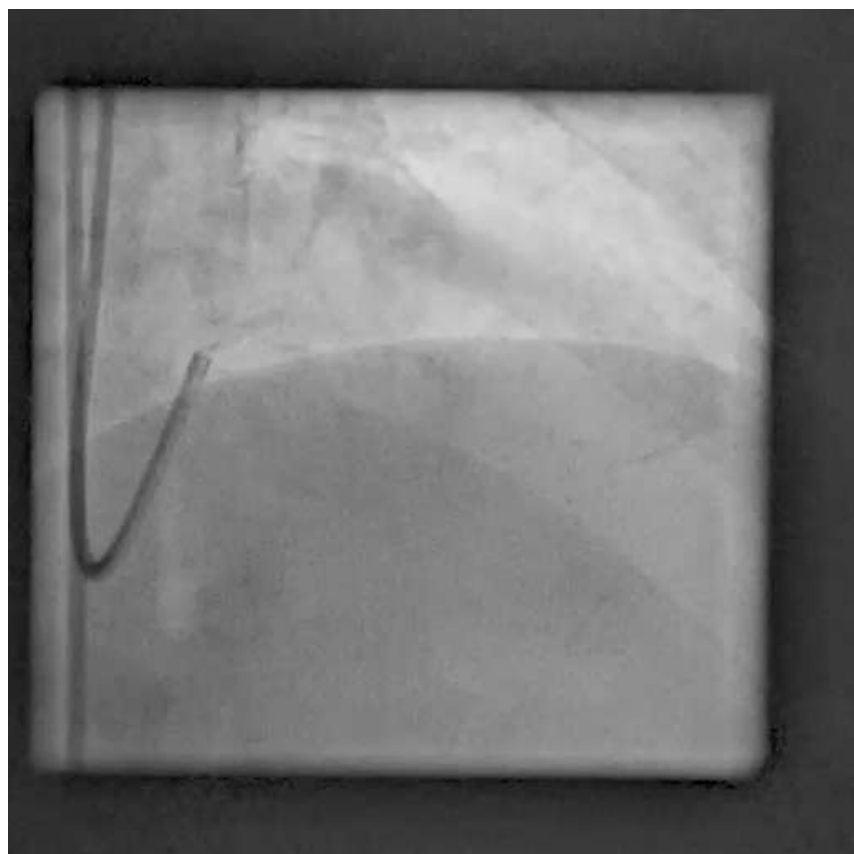


**Why I feel so confident for BVS**

# My first case









**Its not all rosy!!!**

# Potential Concerns of BVS

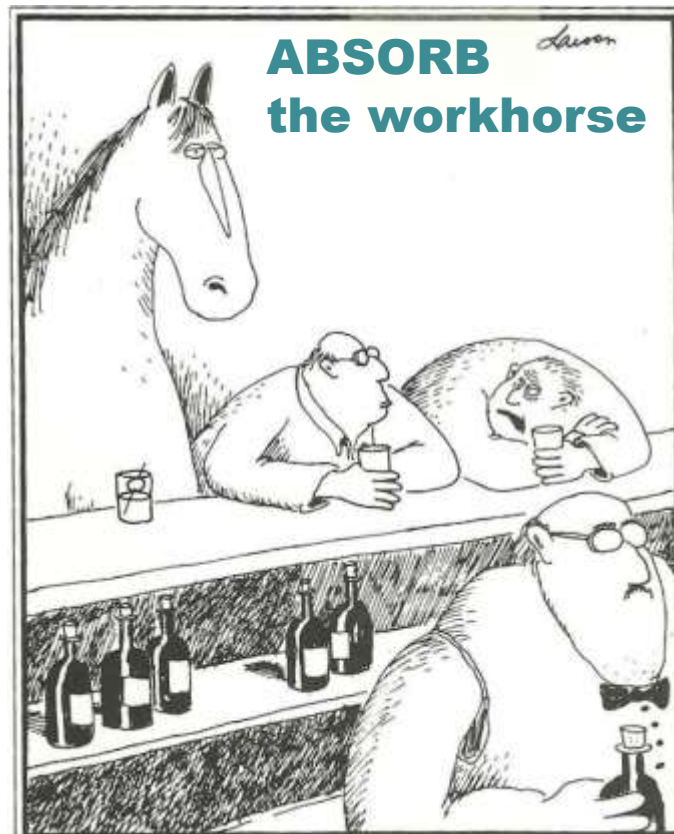
- Thick struts ( $\sim 150\mu\text{m}$ ) might lead to (transient) flow disruption at the bifurcation with potential adverse consequences (i.e., stent thrombosis).
- Expansion limits may impair adequate stent expansion and apposition. Accurate sizing is key.
- Challenging ostial positioning with no radiopaque scaffolds.
- Challenging bifurcation re-crossing.
- Risk of strut fracture of a BVS implanted across major side branches.
- Limited size availability restricts the use of BVS in LM.

# Conclusion

# Conclusion

- Bioresorbable technology is an alternative and challenging therapeutic PCI approach for the treatment of CAD.
- Like any technological innovation and advancement, one must appreciate its positive aspects and limitations of such dynamic device
  - “does the job and disappears”, leading to the restoration of vascular physiology (“vascular reparative therapy”)
  - Radial strength comparable to metallic stents but if stretched beyond designed limits, shown to lose some of its radial strength and may possibly fracture

- It can be used in complex lesions, but *“Invest time and effort”* and follow the basics – 5 P’s of deployment
- With further advancement (third version in process), perhaps in can become the “work horse”



“Sure – but can you really make him drink?”

# THE WORKHORSE

PULLING US FORWARD WHEN THINGS NEED TO MOVE



**WELL  
ALMOST !**