Unmet Needs in Contemporary Practice in Calcified Complex PCI

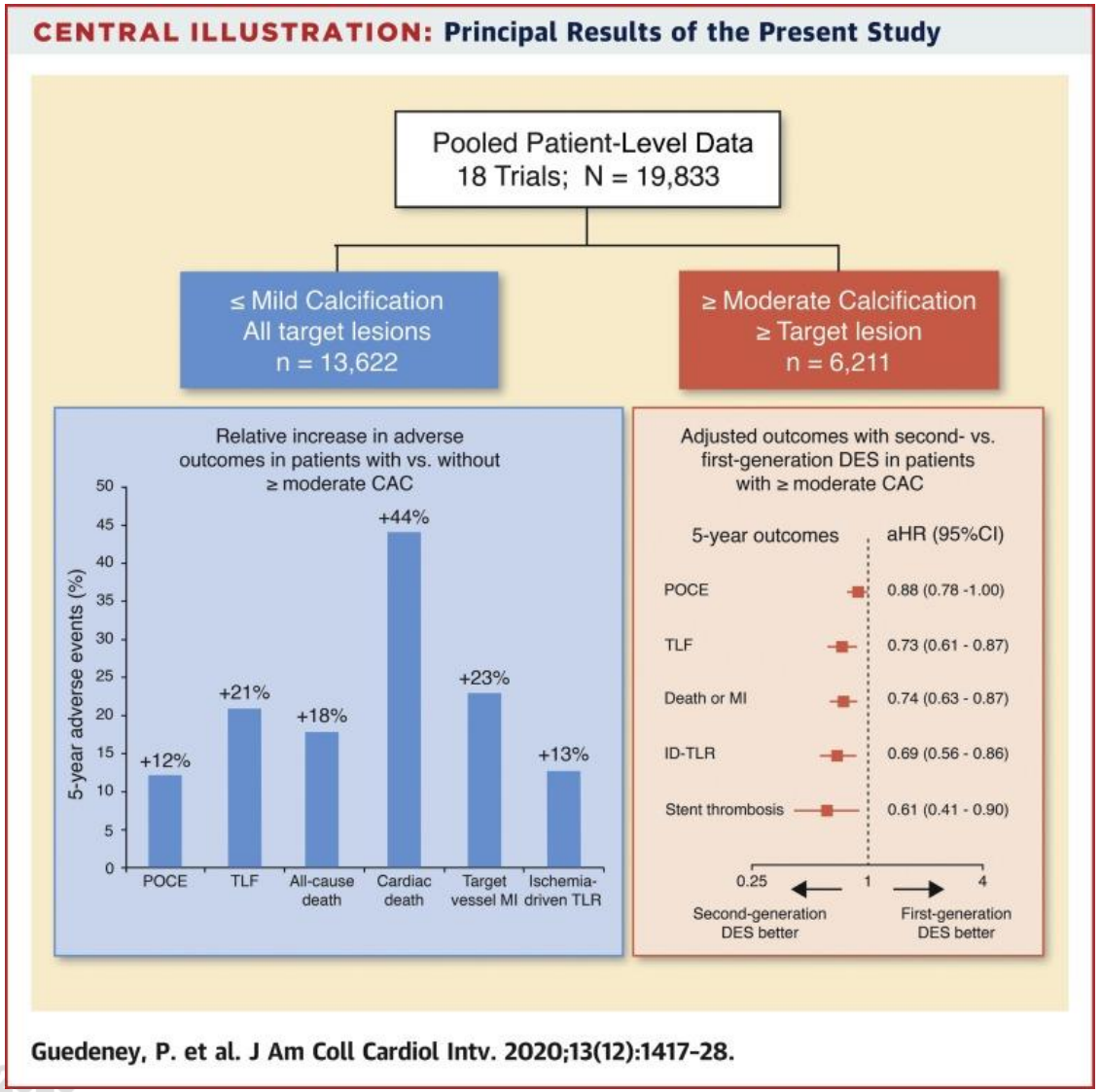
Dr. Yuen-fung Yiu

Princess Margaret Hospital, HKSAR

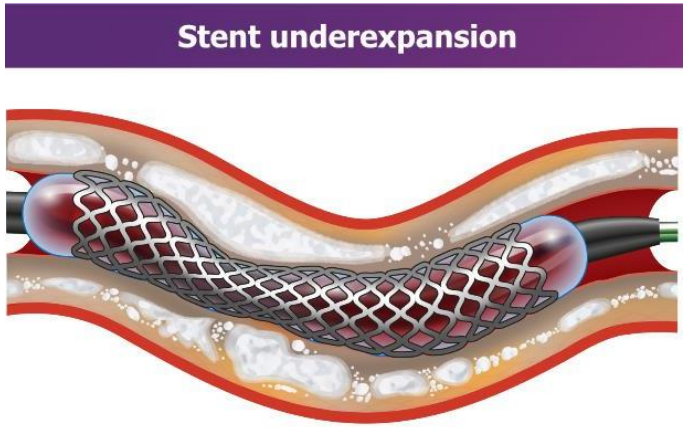
Disclosure

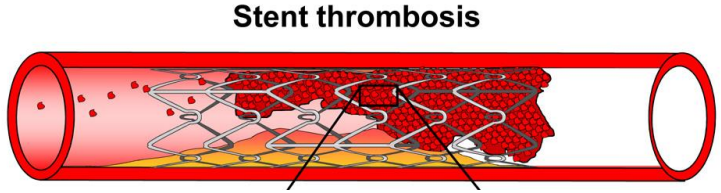
- I have no conflicts of interest to disclose.

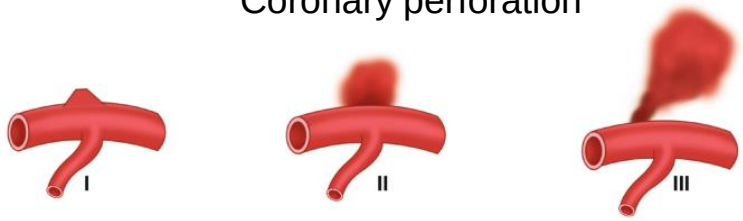
Coronary calcification is associated with poor outcomes



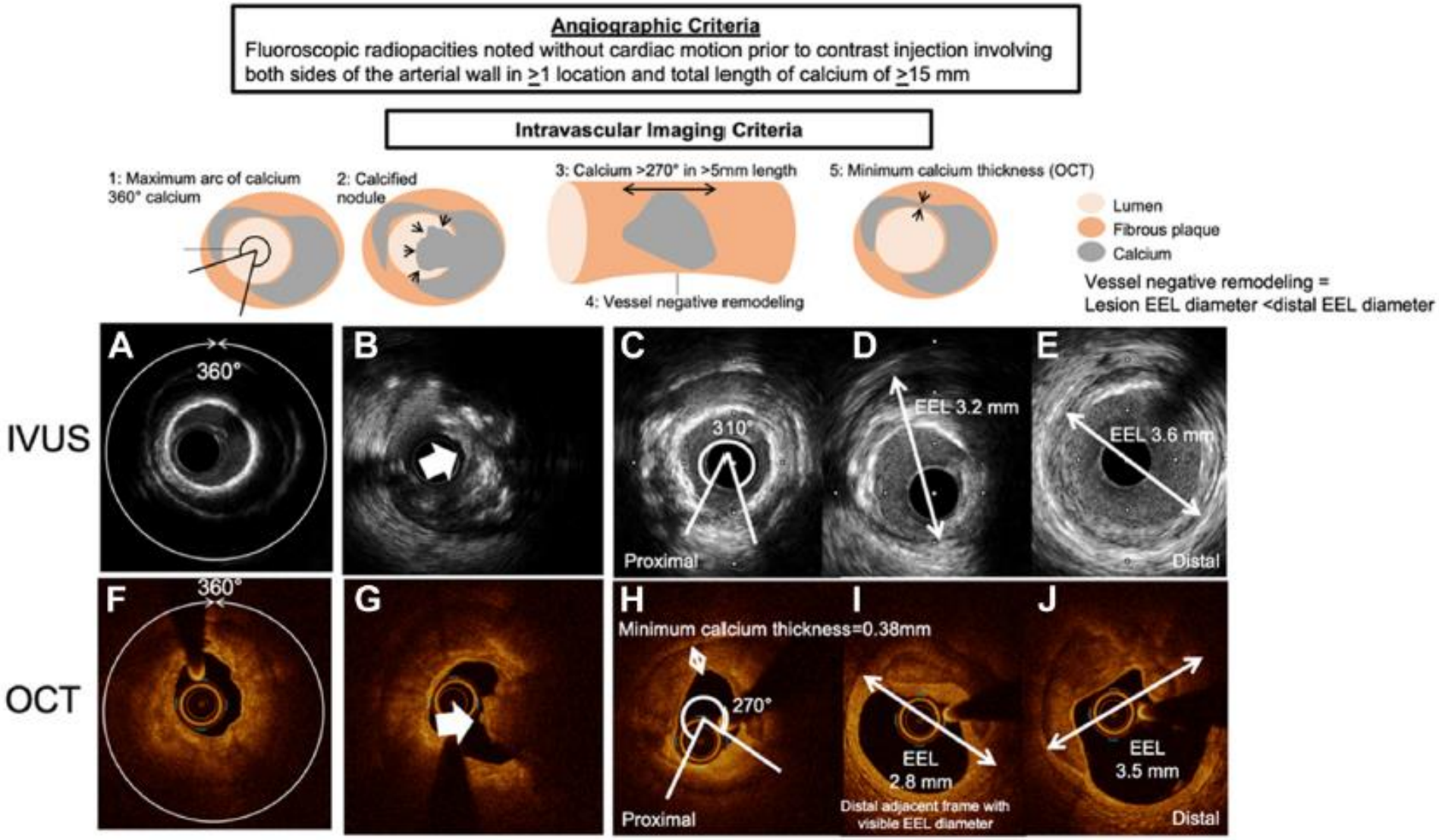
Guedeney, P. et al. J Am Coll Cardiol Intv. 2020;13(12):1417-28.







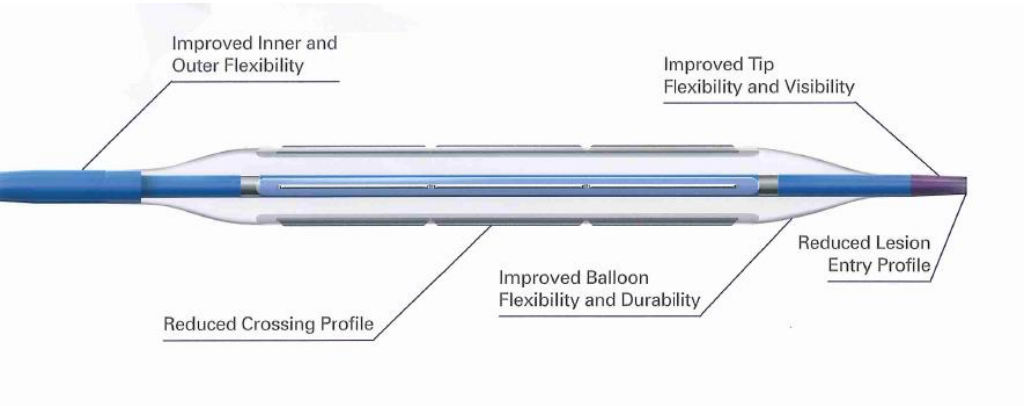
Assessment of calcification

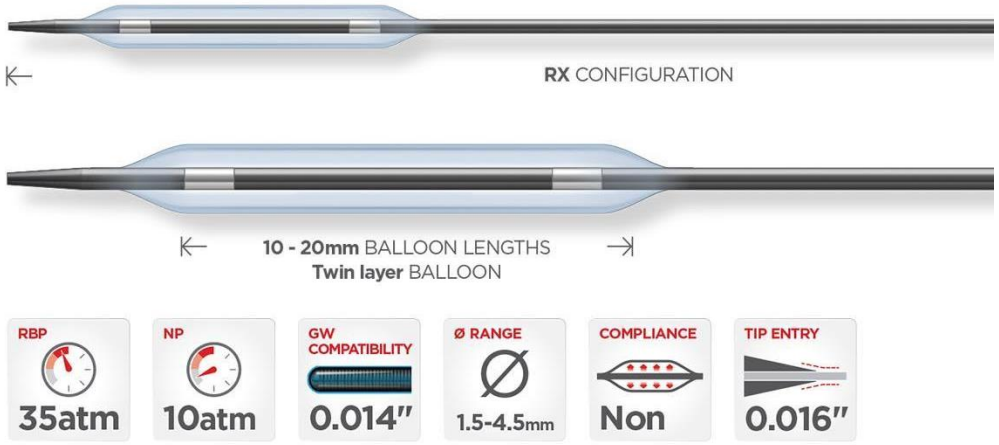


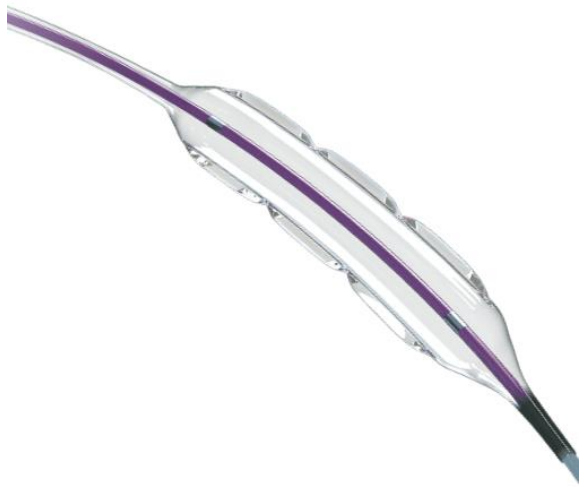
Lesion preparation

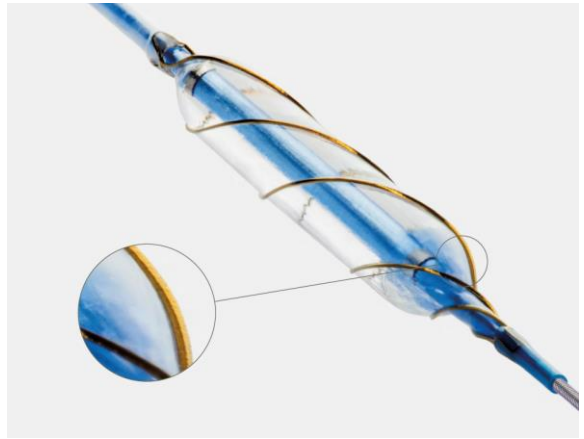
- Balloon-based techniques
  - NC balloons, super-high-pressure balloons, cutting balloons, scoring balloons.
- Intravascular lithotripsy
- Atherectomy devices
  - Rotational atherectomy
  - Orbital atherectomy
  - Laser atherectomy

Balloon-based techniques





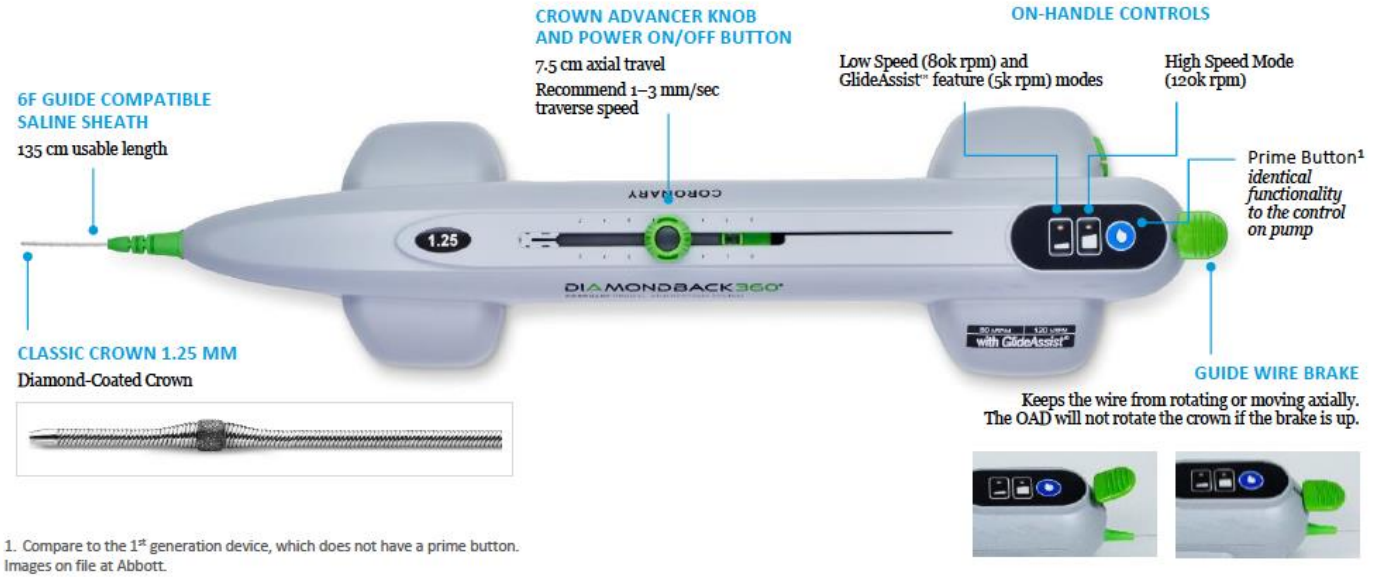




Rotational and Orbital Atherectomy

DIAMONDBACK 360™ CORONARY OAS

Orbital Atherectomy Device (OAD)



1. Compare to the 1st generation device, which does not have a prime button. Images on file at Abbott.

Dual mechanism of action

ATHERECTOMY

Bi-directional differential sanding[1,3]

- Reduce superficial calcium
- Increase luminal size and compliance
- Improve stent apposition

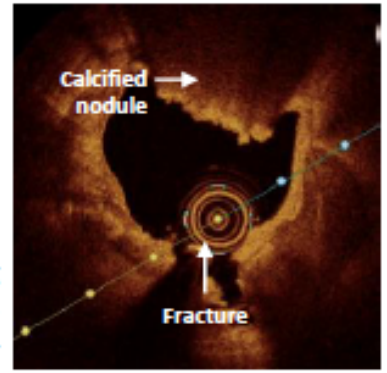
ATHERECTOMY

Pulsatile Forces[1,2]

- Deeper calcified plaque may be affected by pulsatile mechanical forces[1]
- May contribute to compliance change
- Improve stent expansion through compliance change[1]

Clinical Success[1,3]

Stent delivery, expansion and apposition leading to low MACE and restenosis

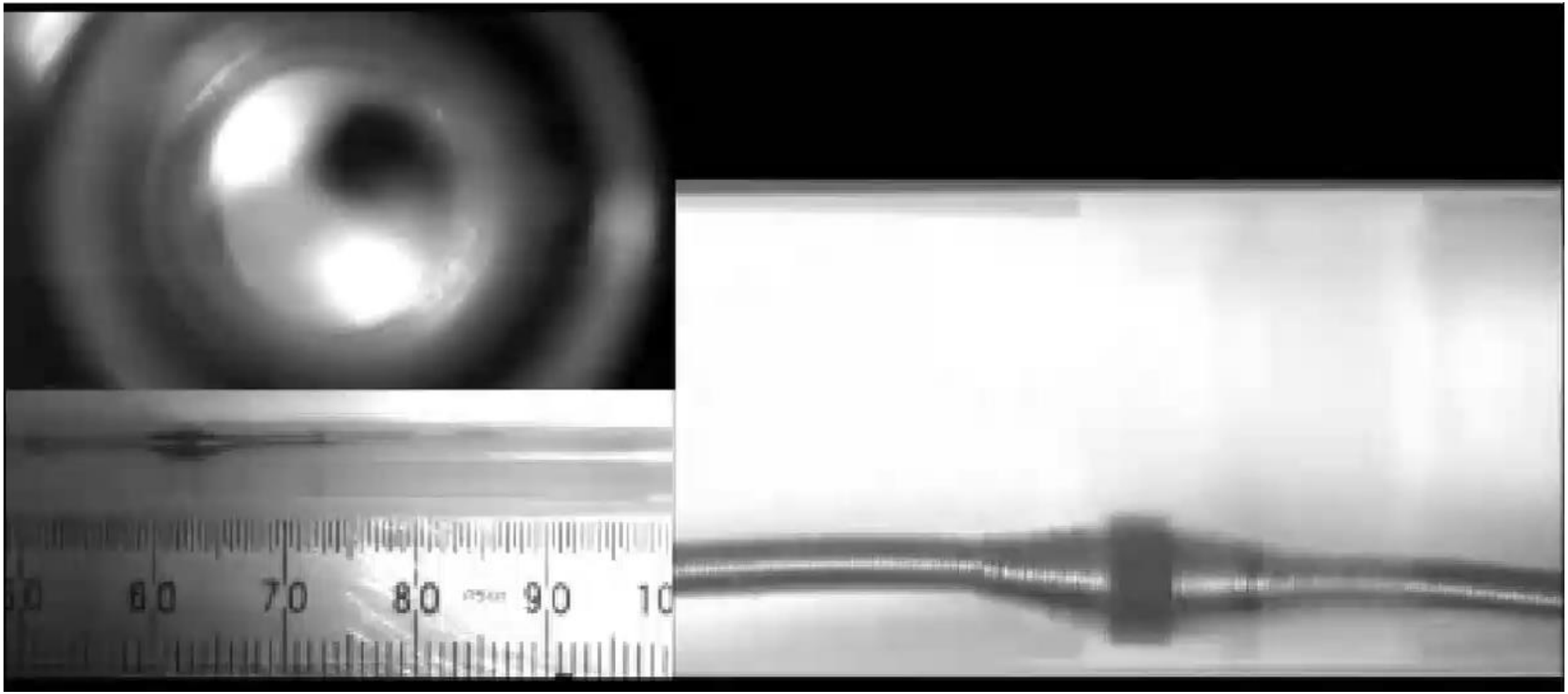


Example: Calcium cracking following orbital atherectomy.

Courtesy of Richard Shlofmitz, MD.[1]

1. Shlofmitz, E. et al. *Exp Rev Med Dev*. 2017;14(11):867-879.
2. Kini, AS., et al. *Catheter Cardiovasc Interv*. 2015 Nov 15;86(6):1024-32.

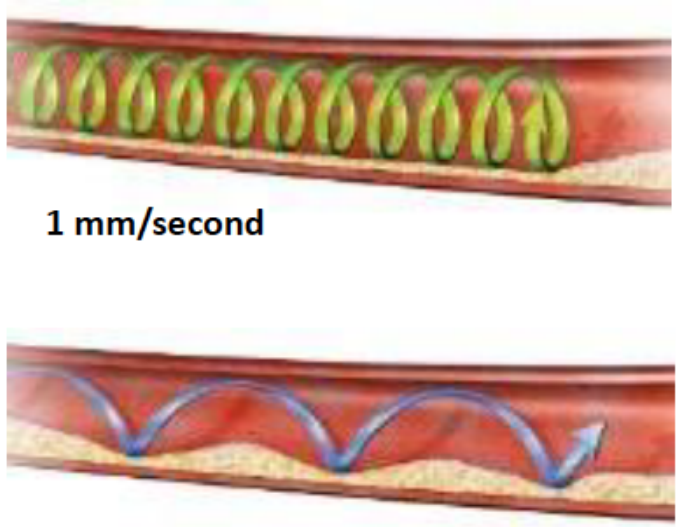
Orbital Atherectomy



Patience is key to success

Efficiency is dependent on traverse speed

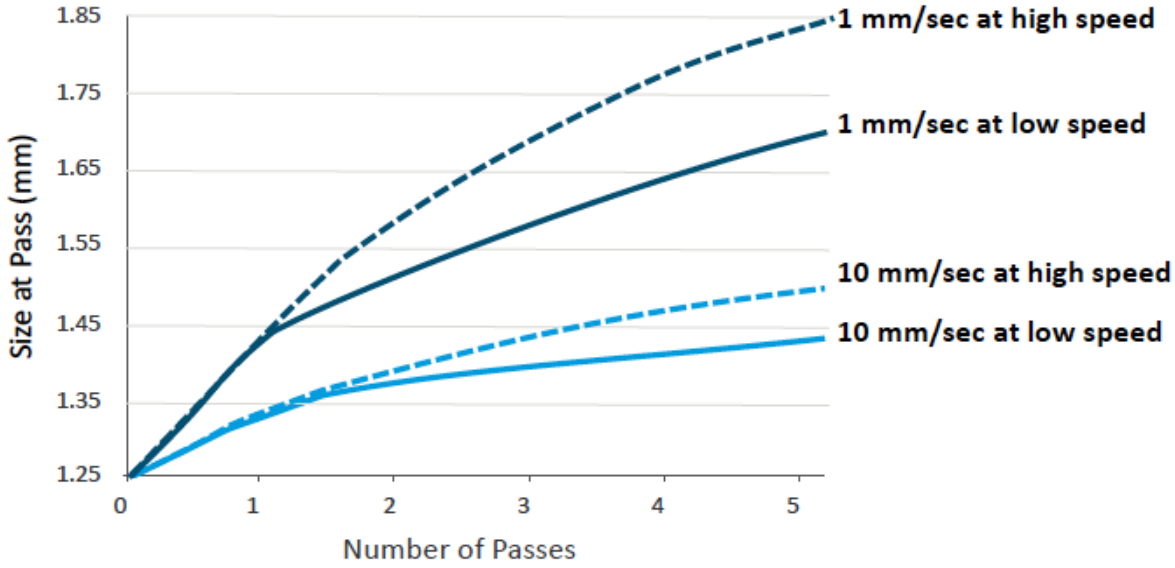
TRAVERSE SPEED INCREASES NUMBER OF ORBITS/MM



1 mm/second

> 10 mm/second

TREATMENT DIAMETER IS AFFECTED BY TRAVERSE SPEED AND ROTATION SPEED[1]



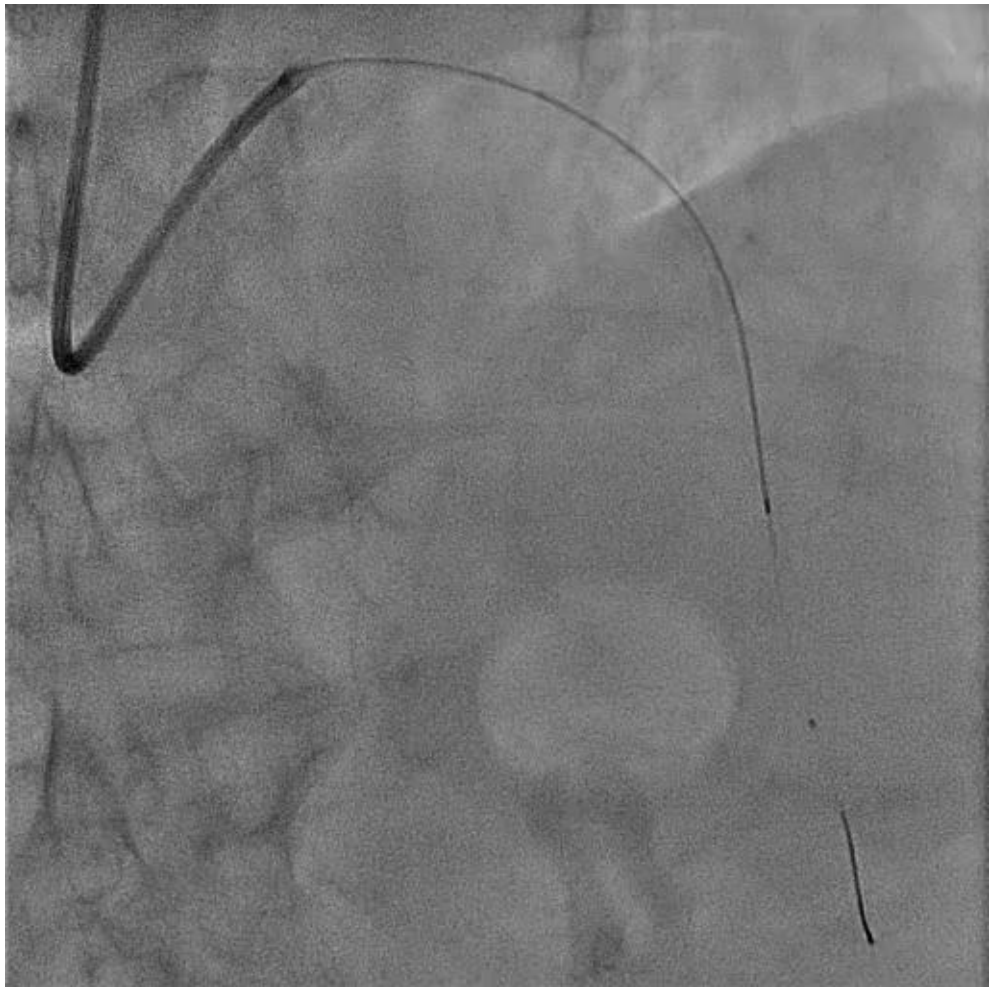
Slower traverse speeds provide more control and efficiency during treatment

1. Abbott data on file. Comparative data is from engineering testing in carbon block. Not representative of achievable orbit or required passes in clinical scenario. Images on file at Abbott.

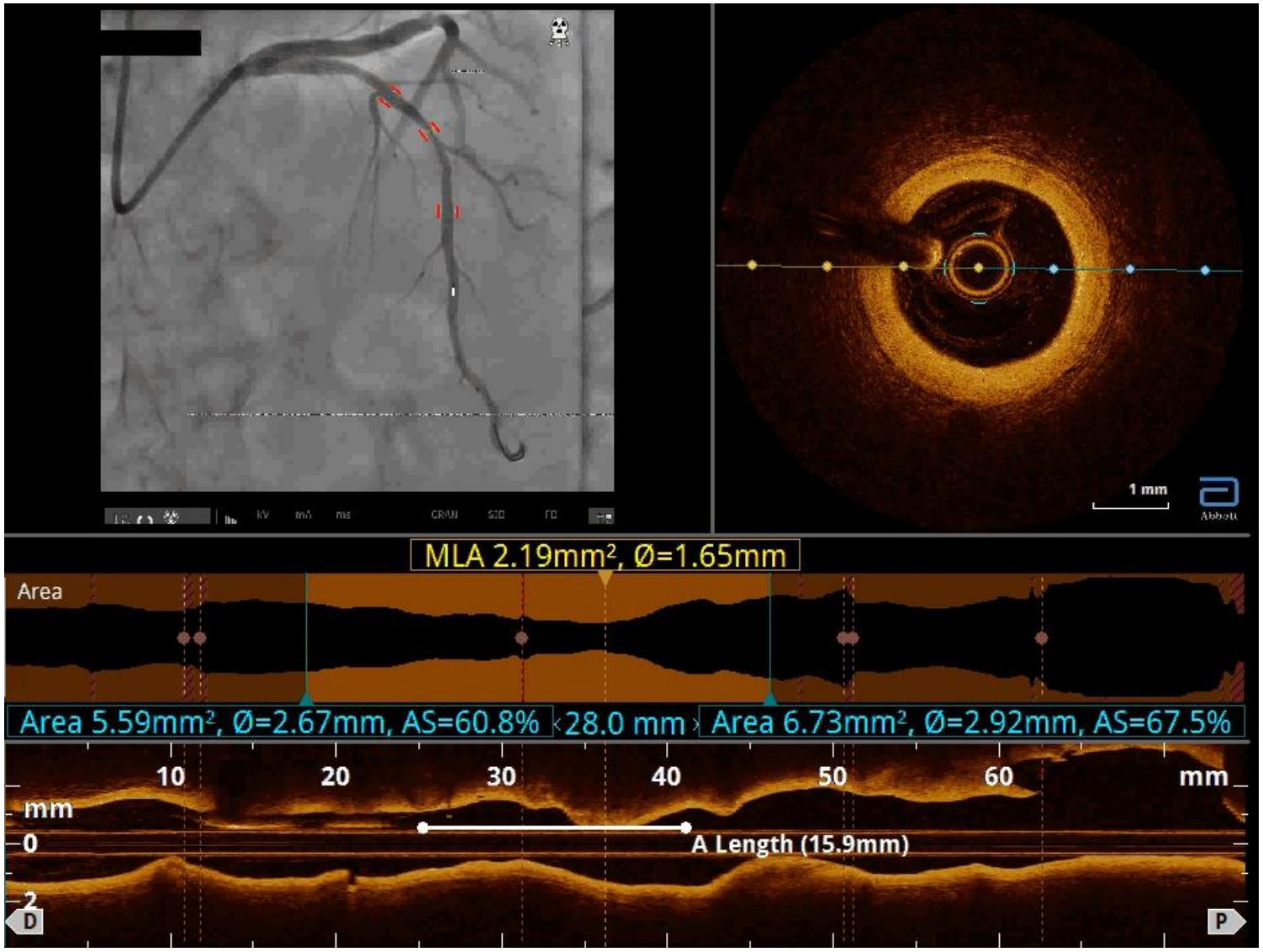
Mechanism of action	Bi-directional sanding Pulsatile force	Uni-directional treatment
Device size	One size 1.25mm (6Fr)	Multiple sizes (6-8Fr)
Speed	2 speeds (80,000 & 120,000rpm)	Usually 140,000-200,000rpm
Motion	Slow (1mm/sec)	Pecking motion
Blood flow	Continuous flow during OA	No continuous flow during RA
During atherectomy	Pitch change	Deceleration
Wire	0.012”, easier to manipulate	0.009”, difficult to manipulate
Presence of stent	Not recommended	Feasible and reported
No/ slow flow	Less common	More common

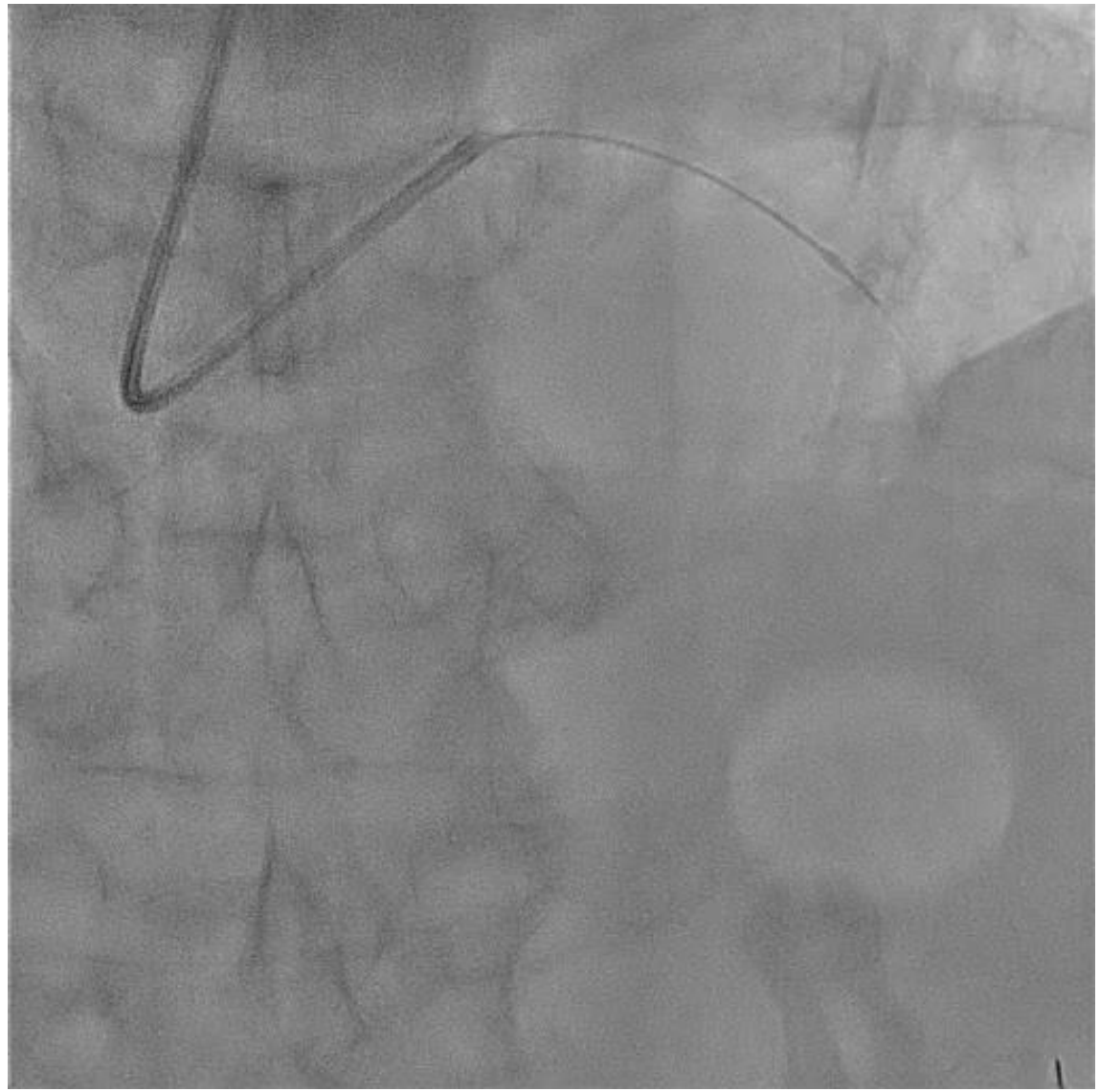
Case 1

85/M, Multiple CV risk factors. Eccentric calcification

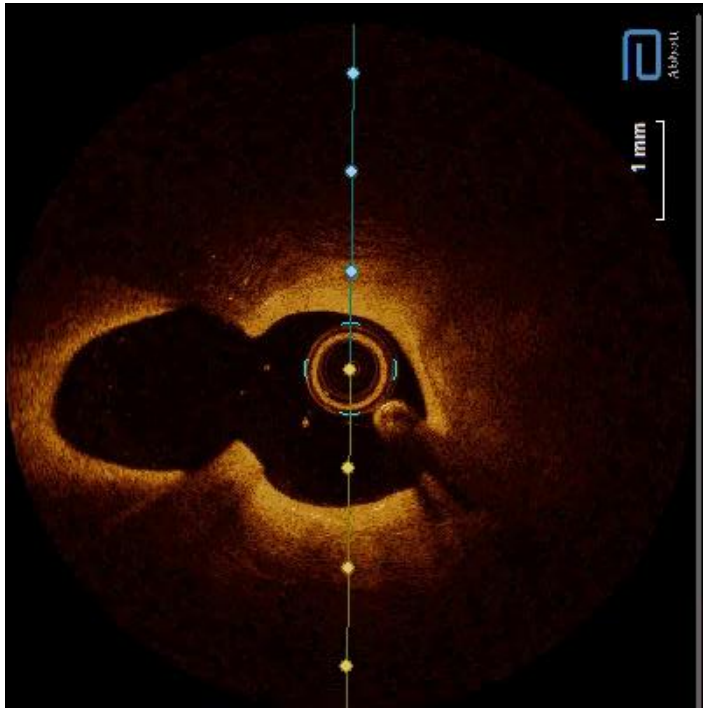


OCT assessment

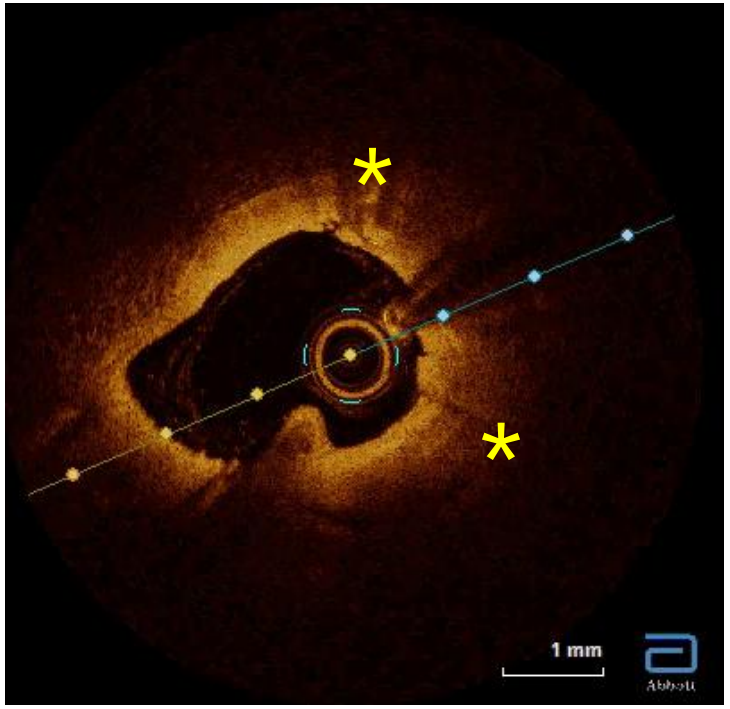


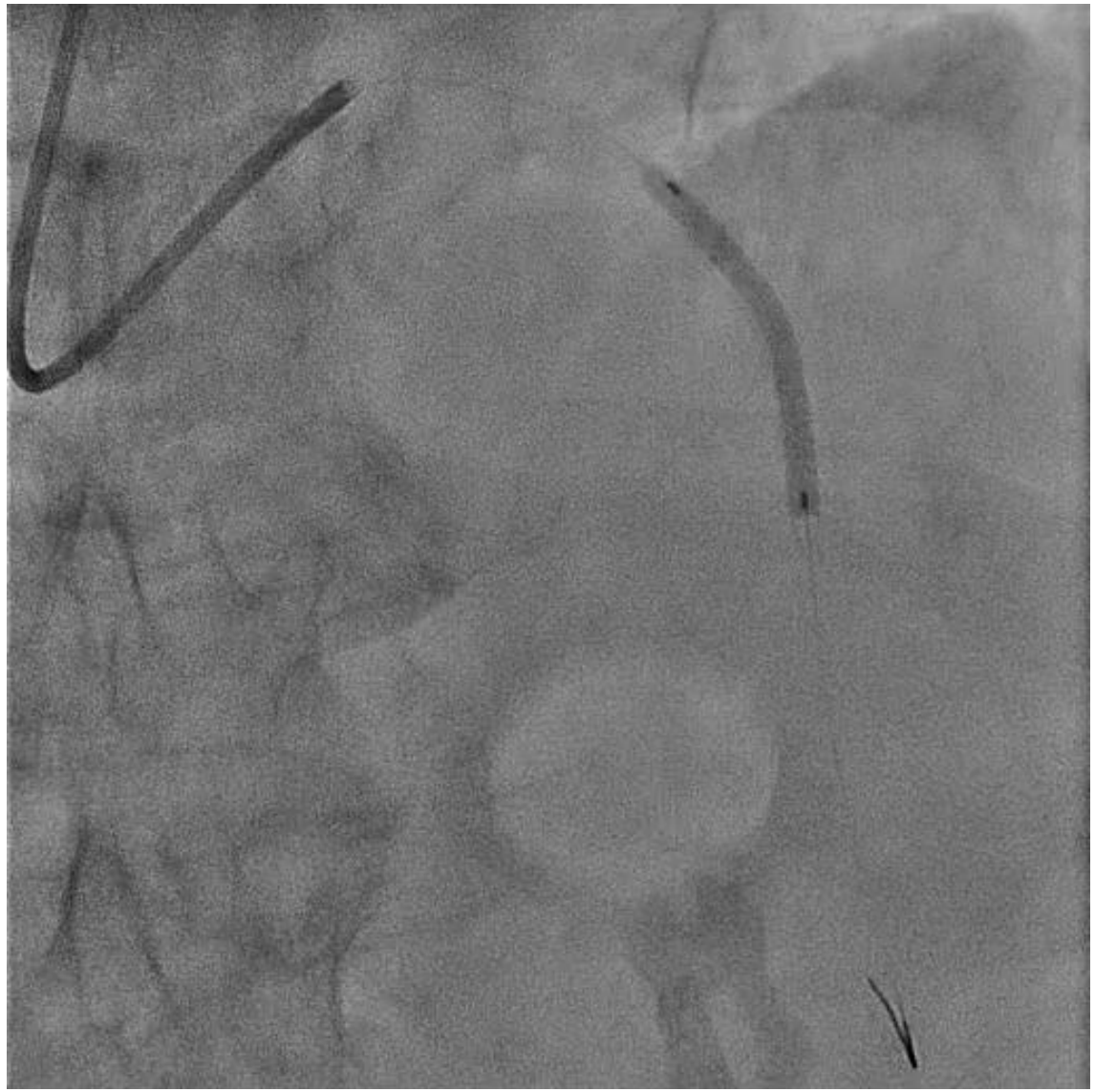


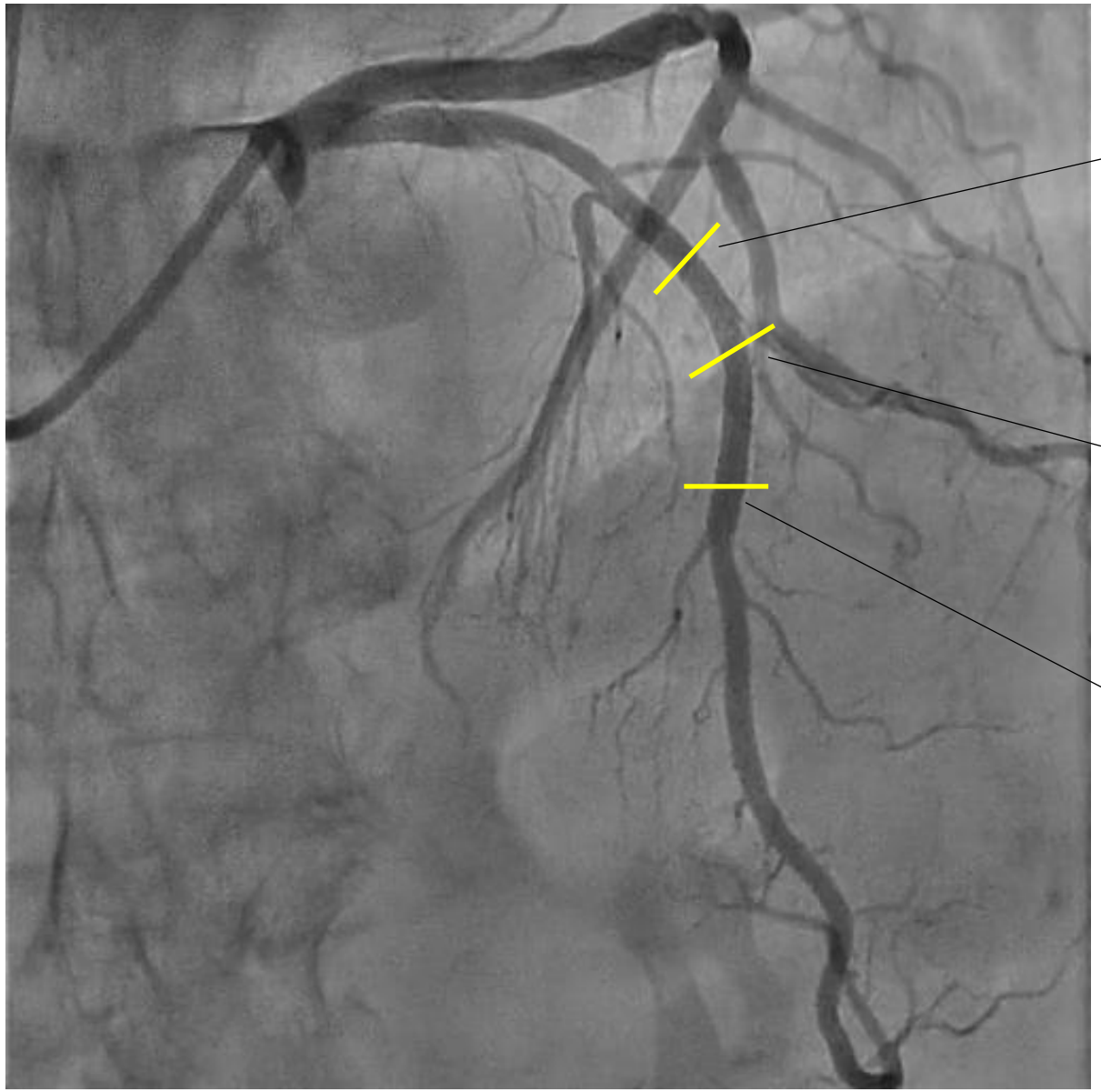
Pre

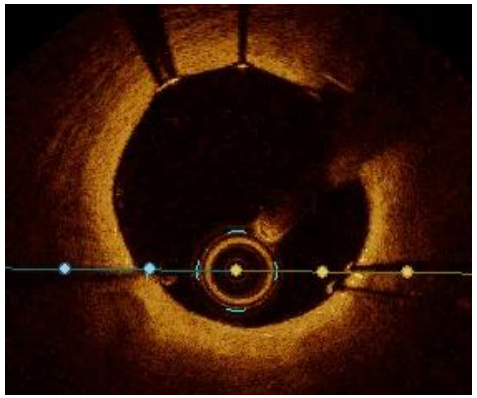


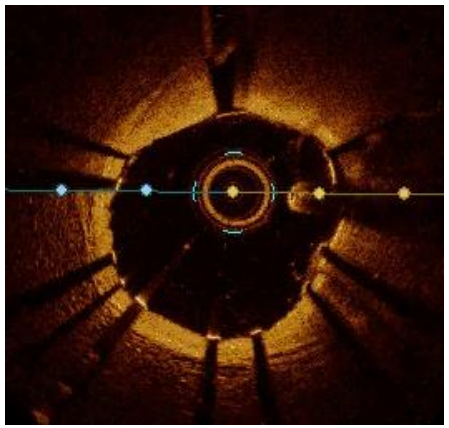
Post

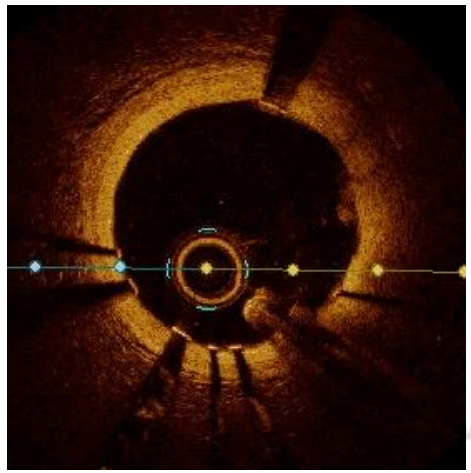






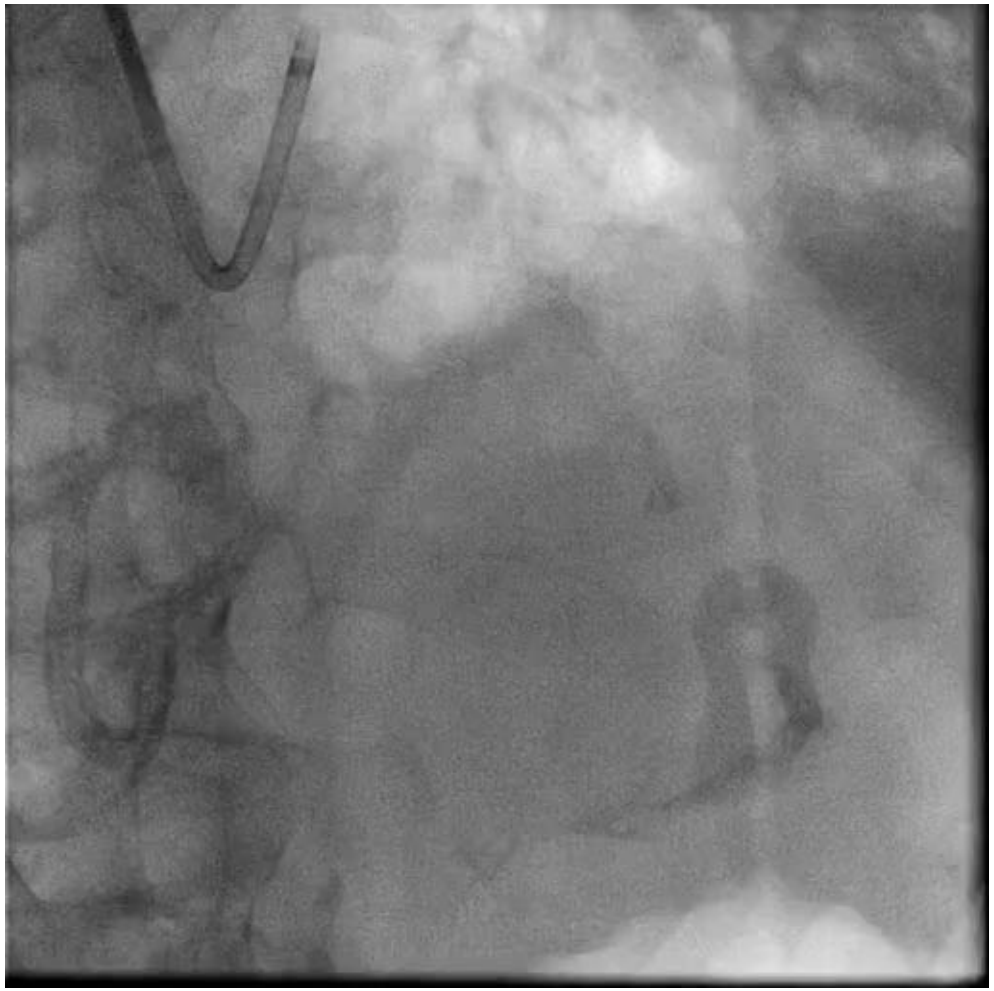


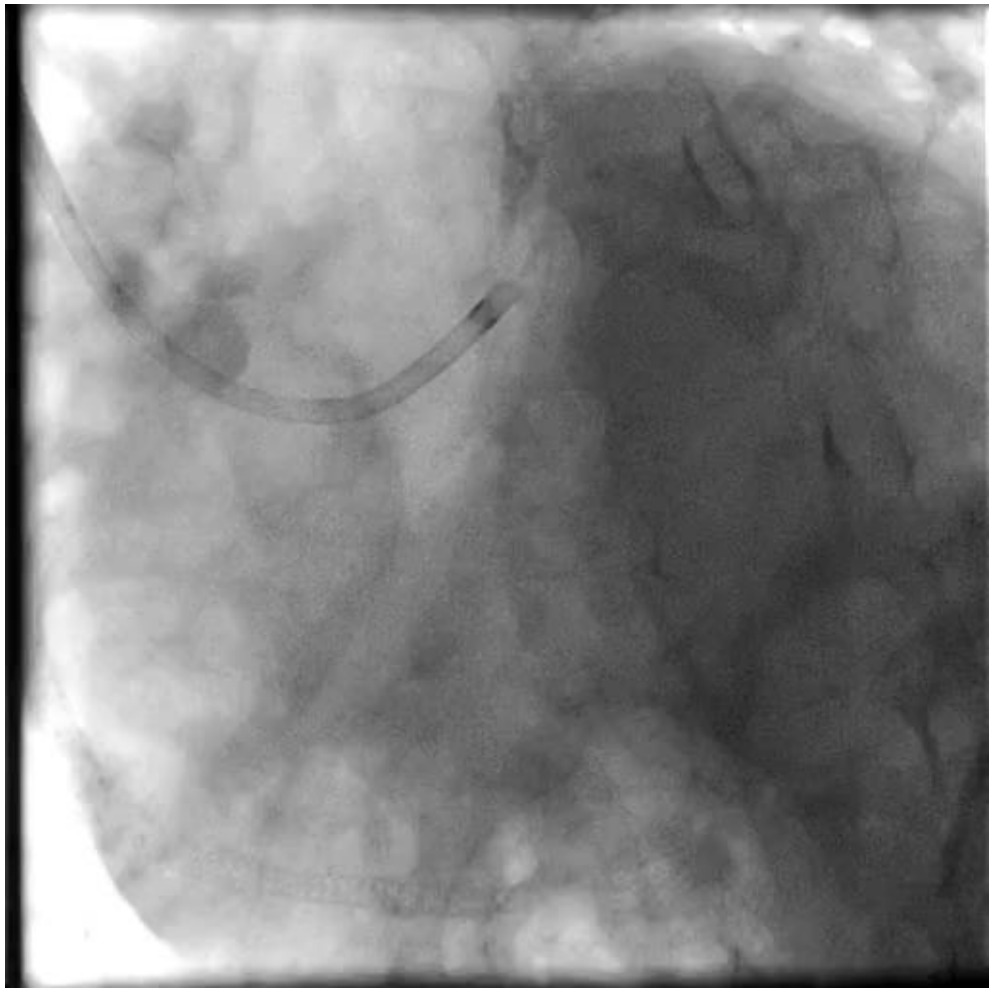




Case 2

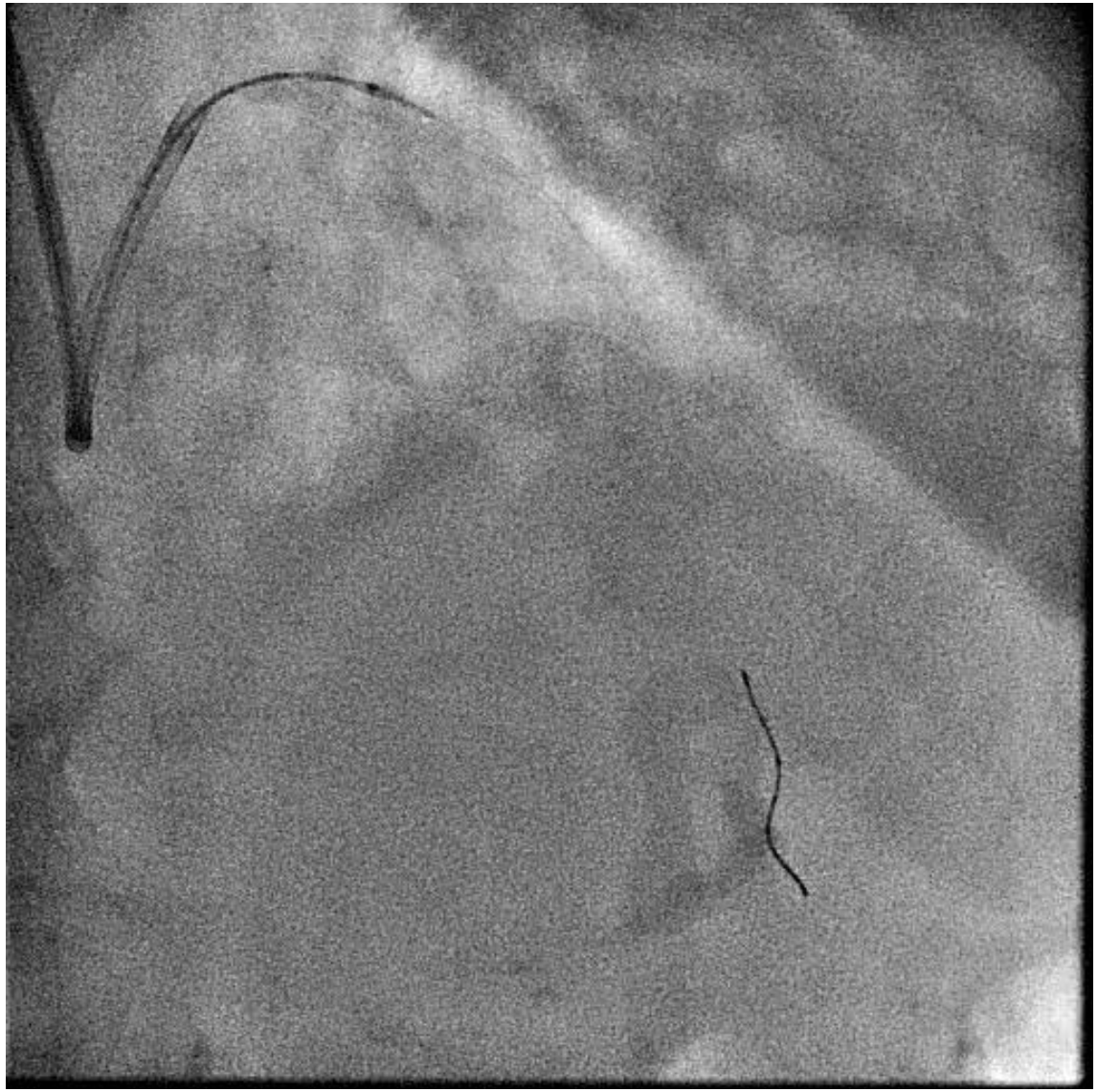
80/F, NSTEMI, APO. Diffuse calcification



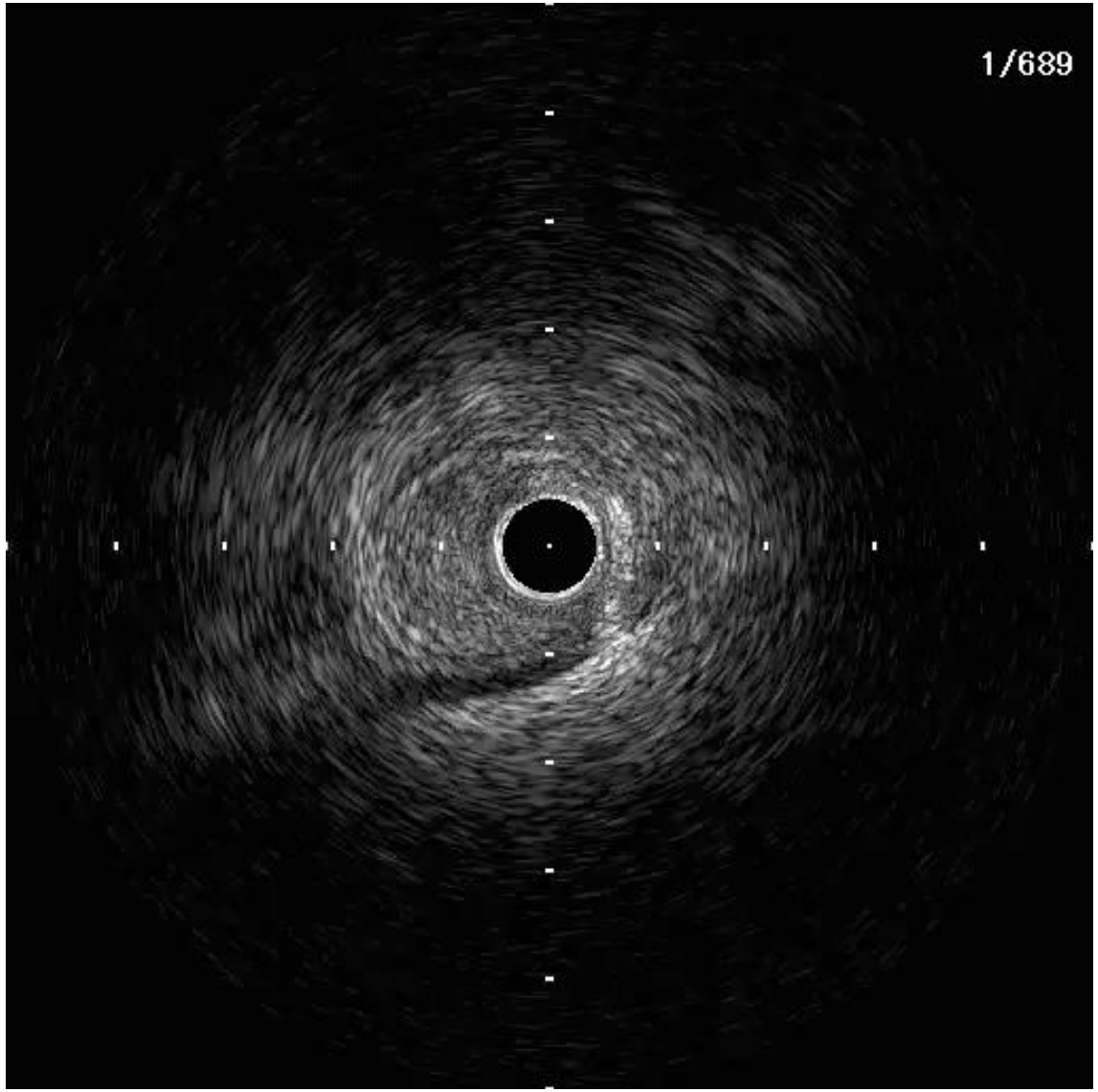


Low speed

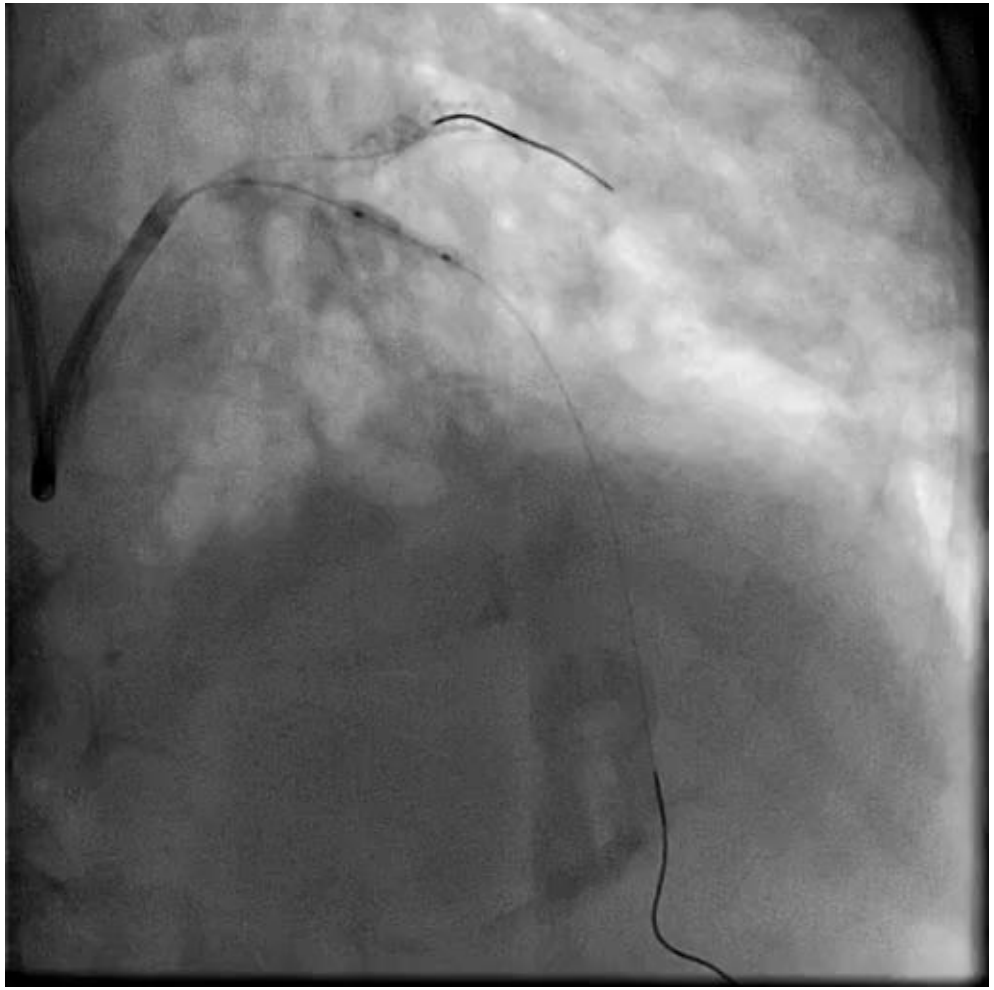
Crown jump

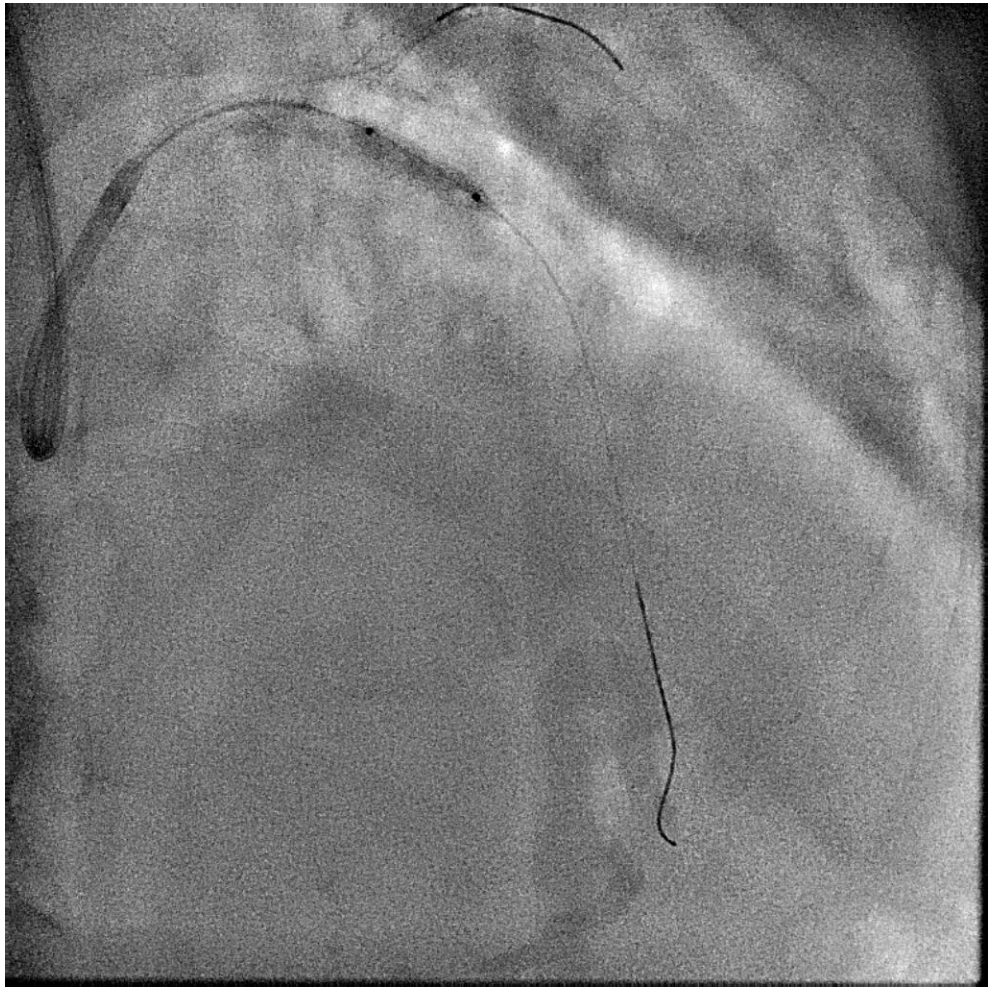


IVUS

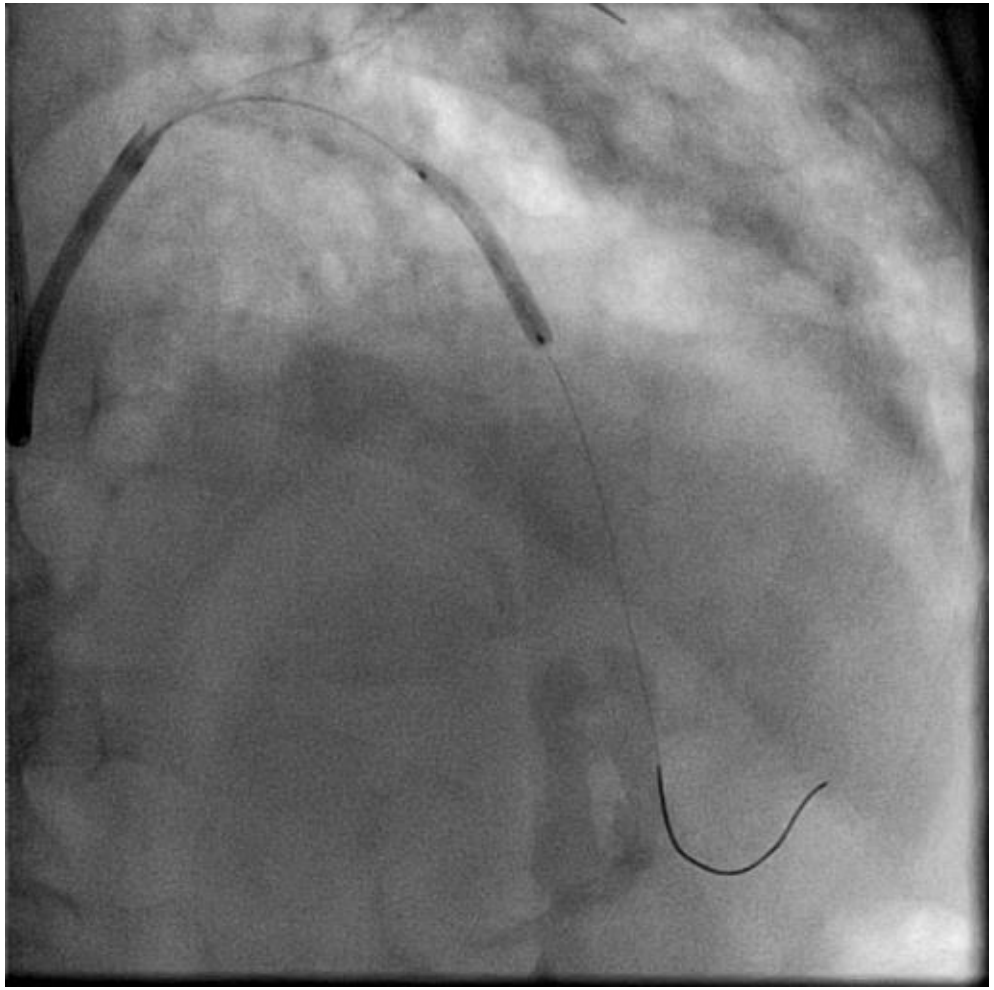


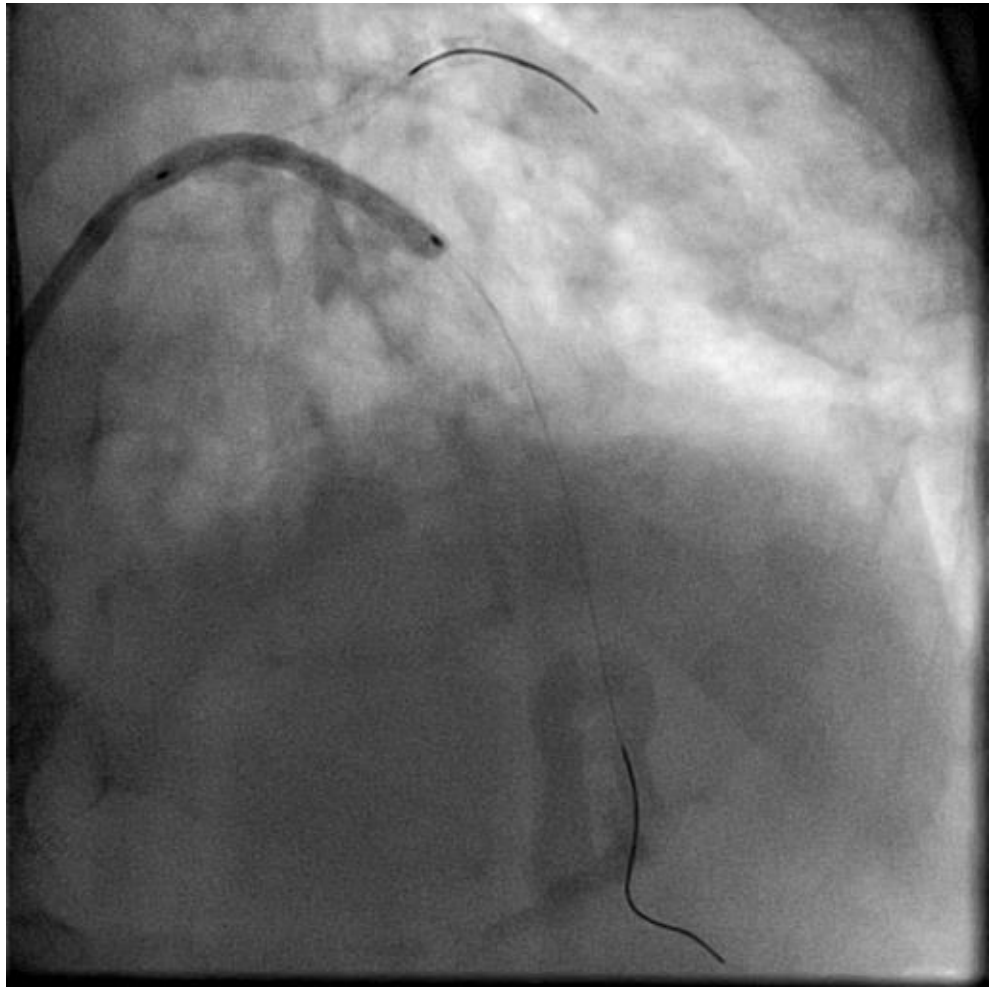
Undilatable with NC balloon, IVL 3.0mm done



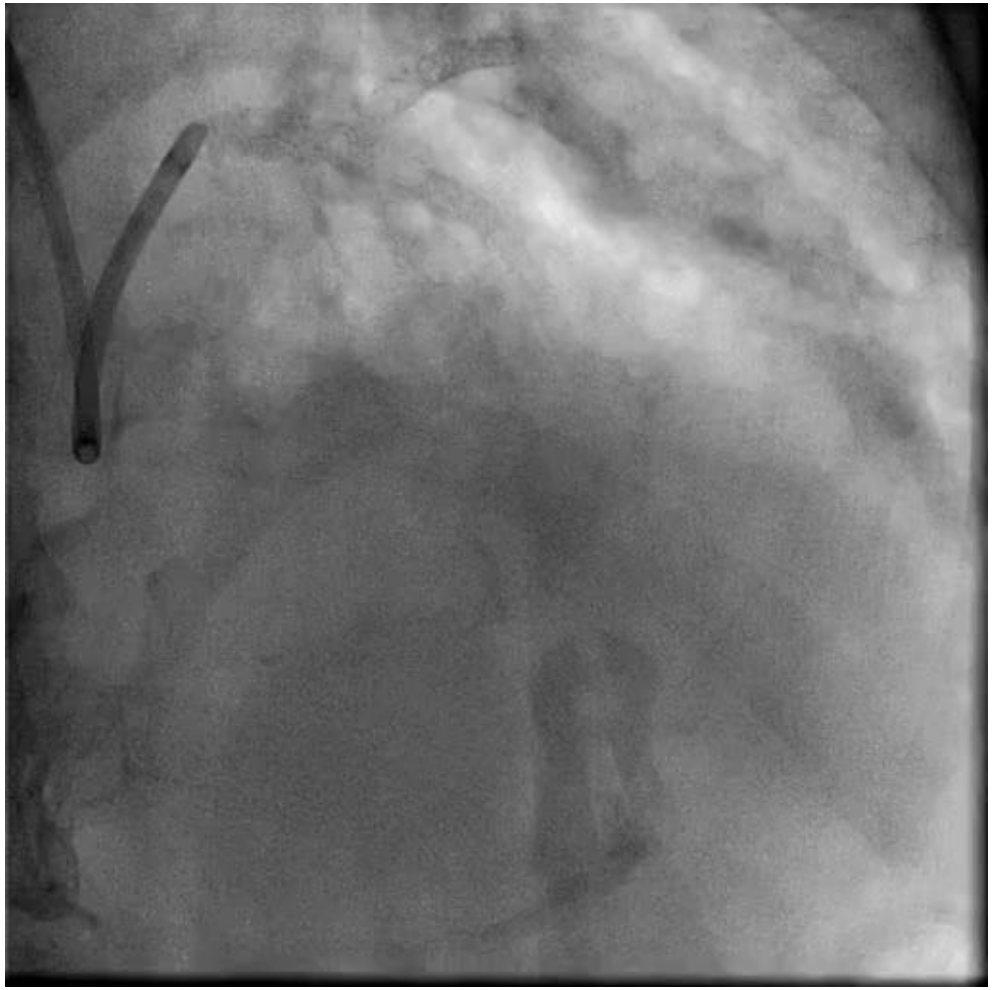


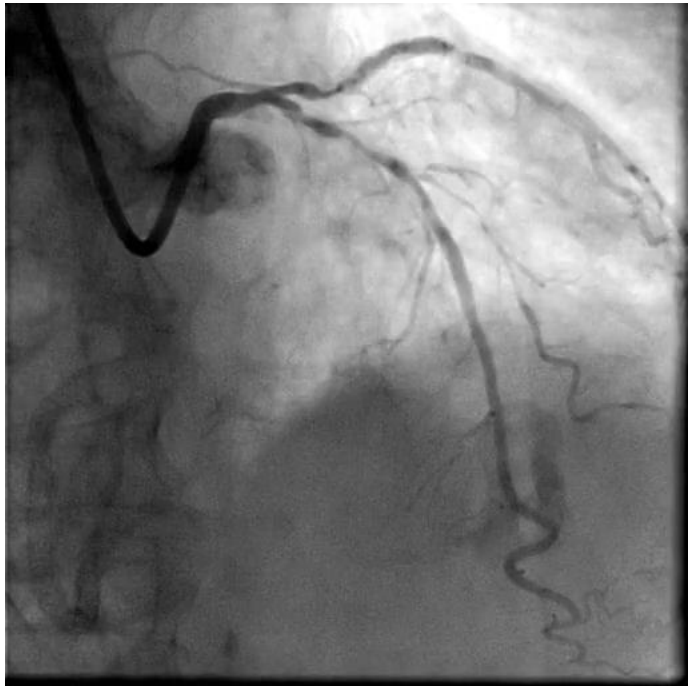
DES x 2 implanted LM-LAD, pLCX DCB

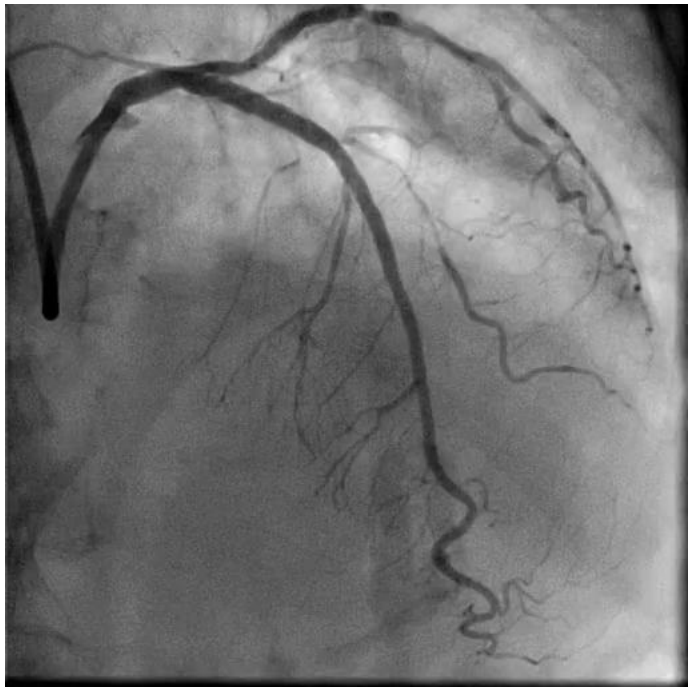




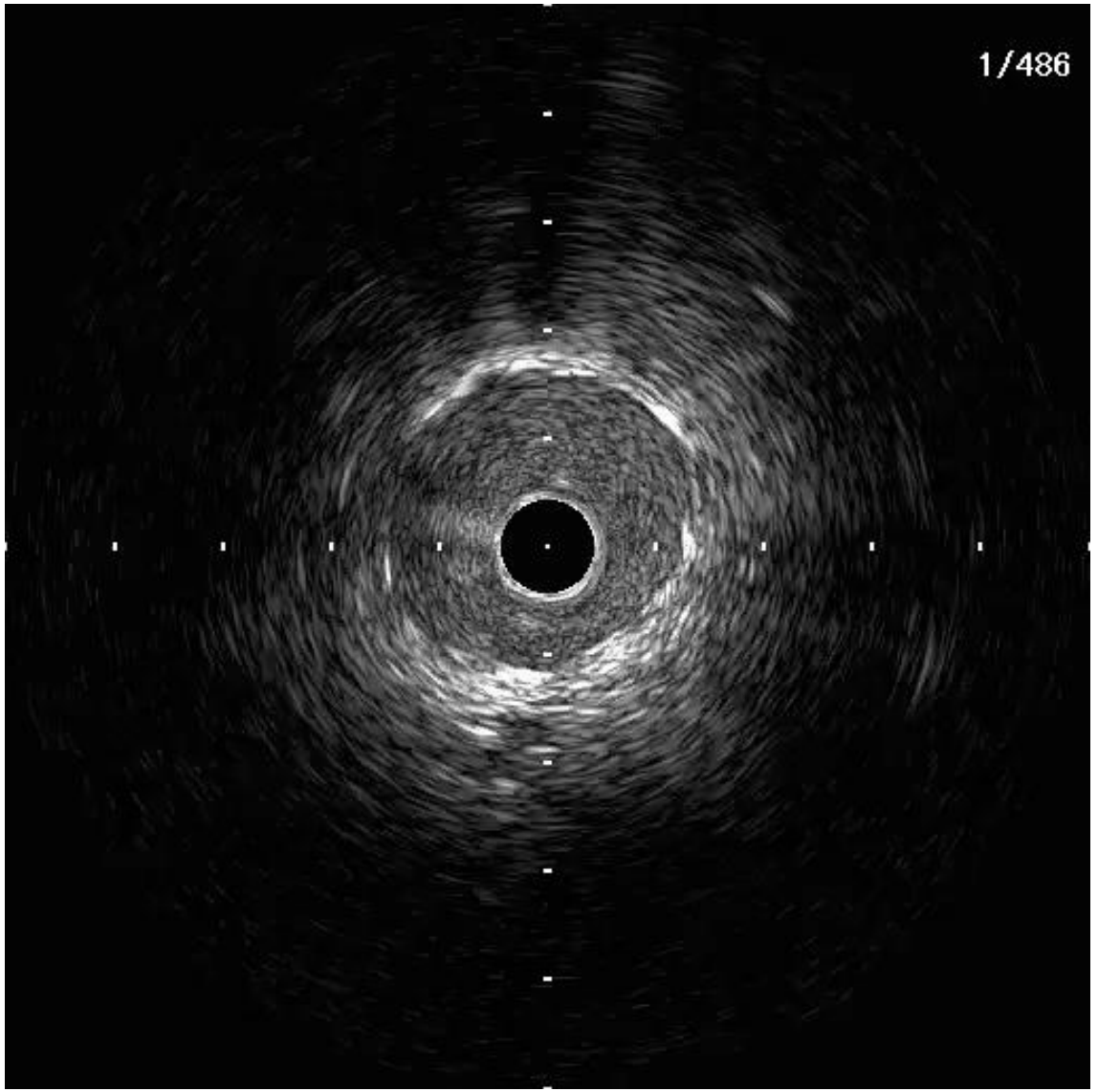
Final angiogram





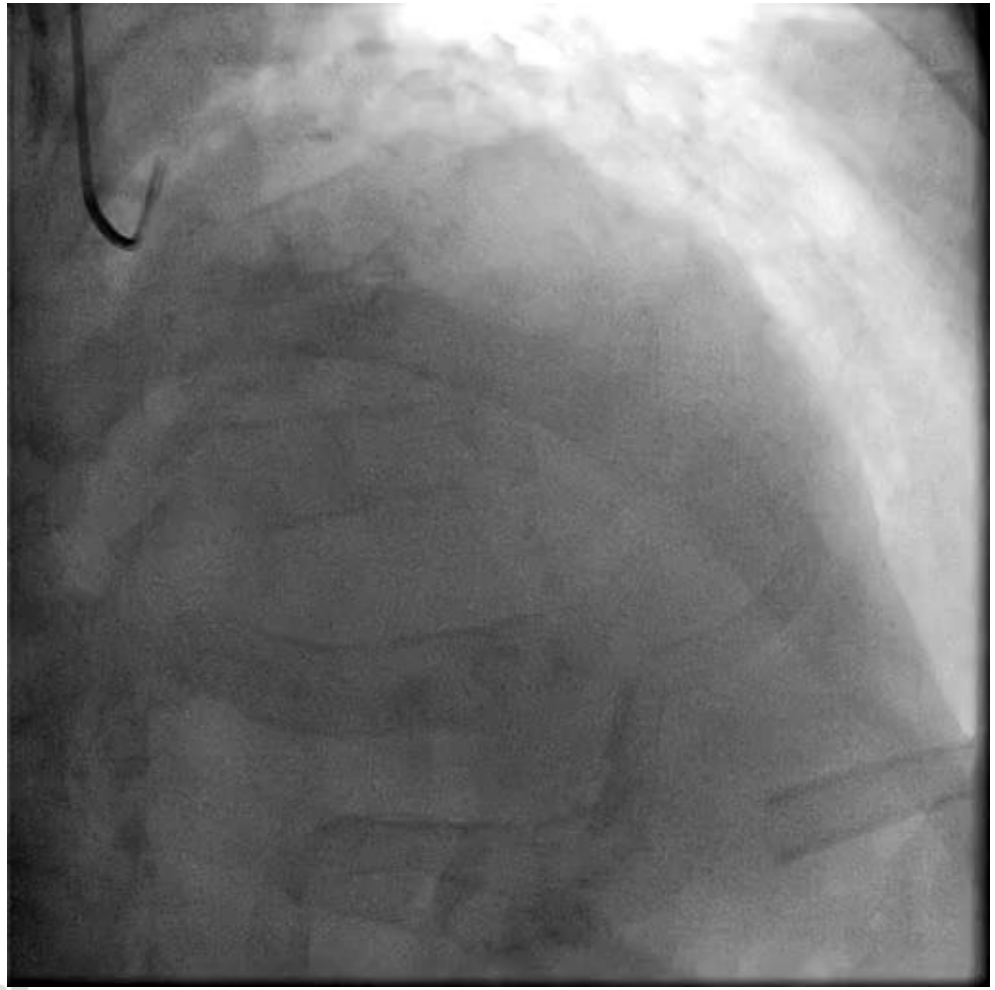


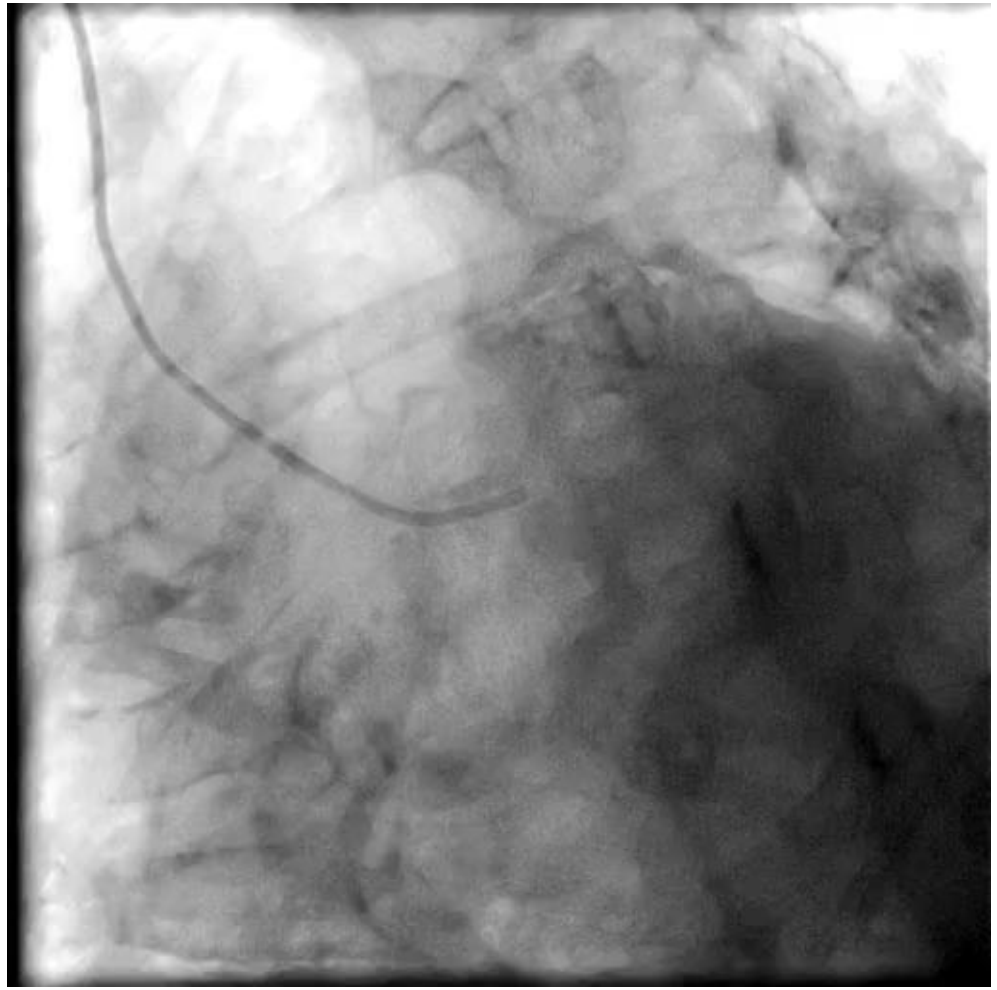
IVUS



Case 3

66/F, DM, ESRF, PVD, AKA. Recurrent ACS. Coro 3 months prior:





Case 3

66/F, DM, ESRF, PVD, AKA. Recurrent ACS. Coro 3 months prior:

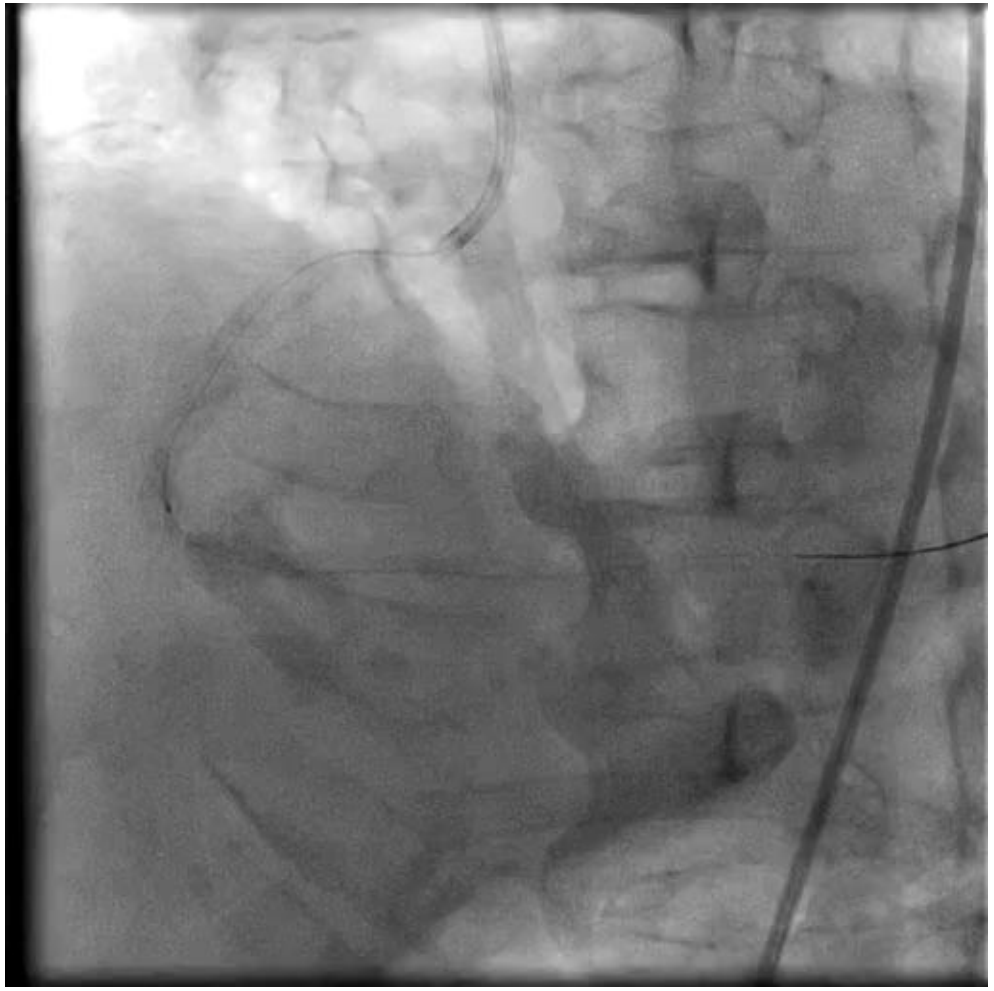
Case 3

66/F, DM, ESRF, PVD, AKA. Recurrent ACS. Coro 3 months prior:

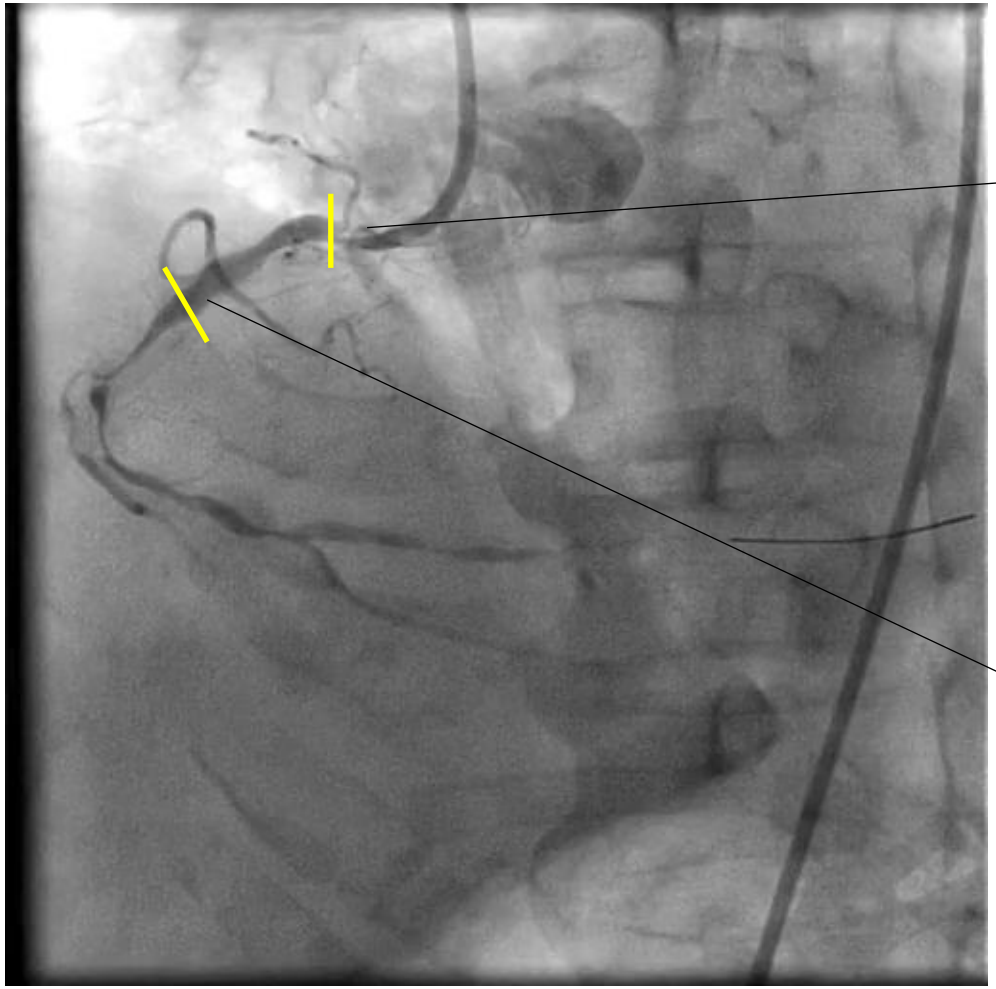
Inferior STEMI

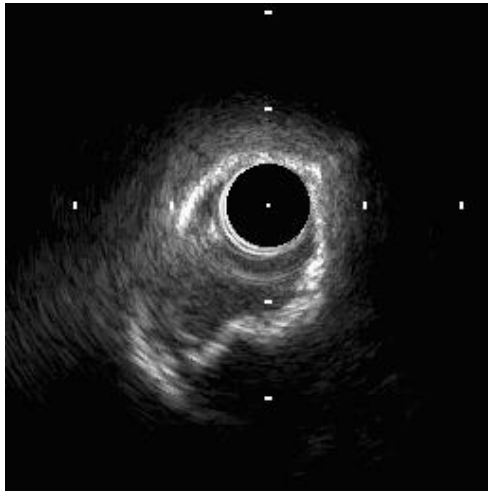
Wiring with microcatheter

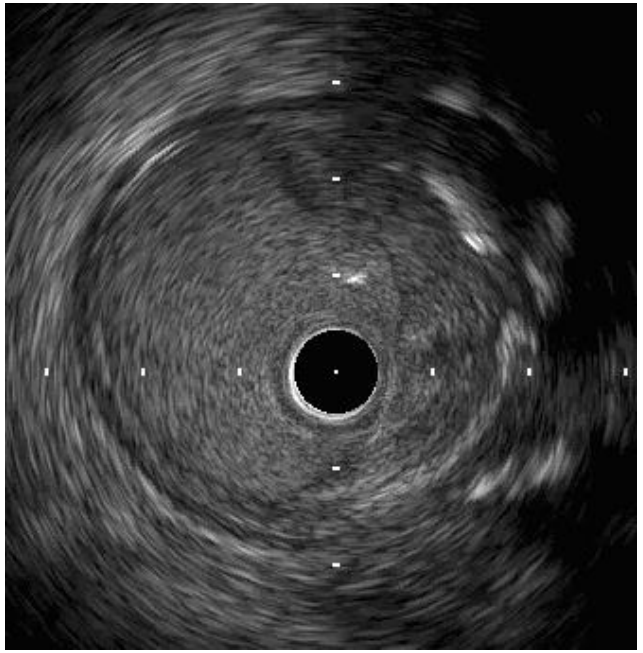
POBA 0.85mm and 1.0mm



IVUS cannot pass mRCA



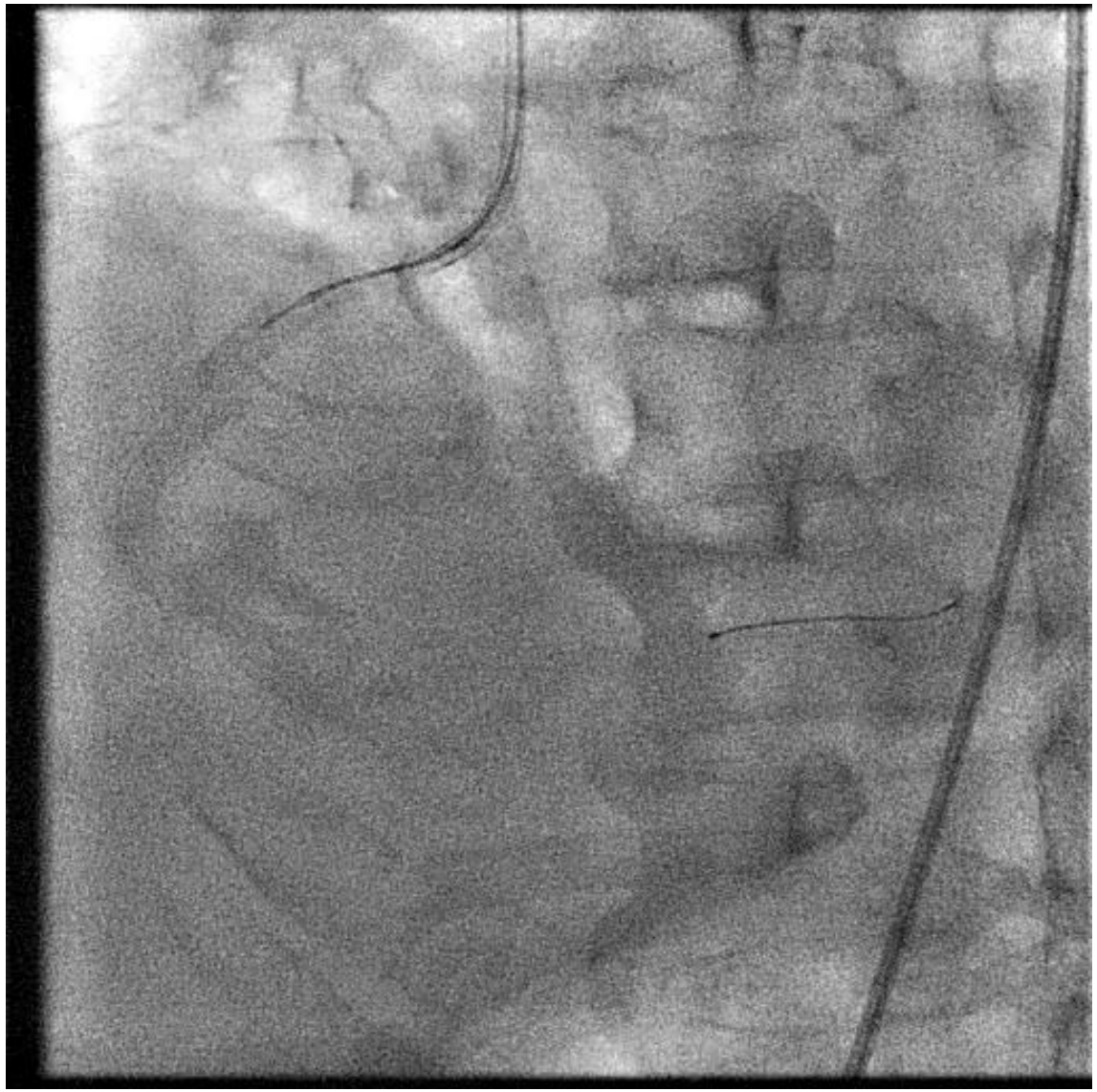




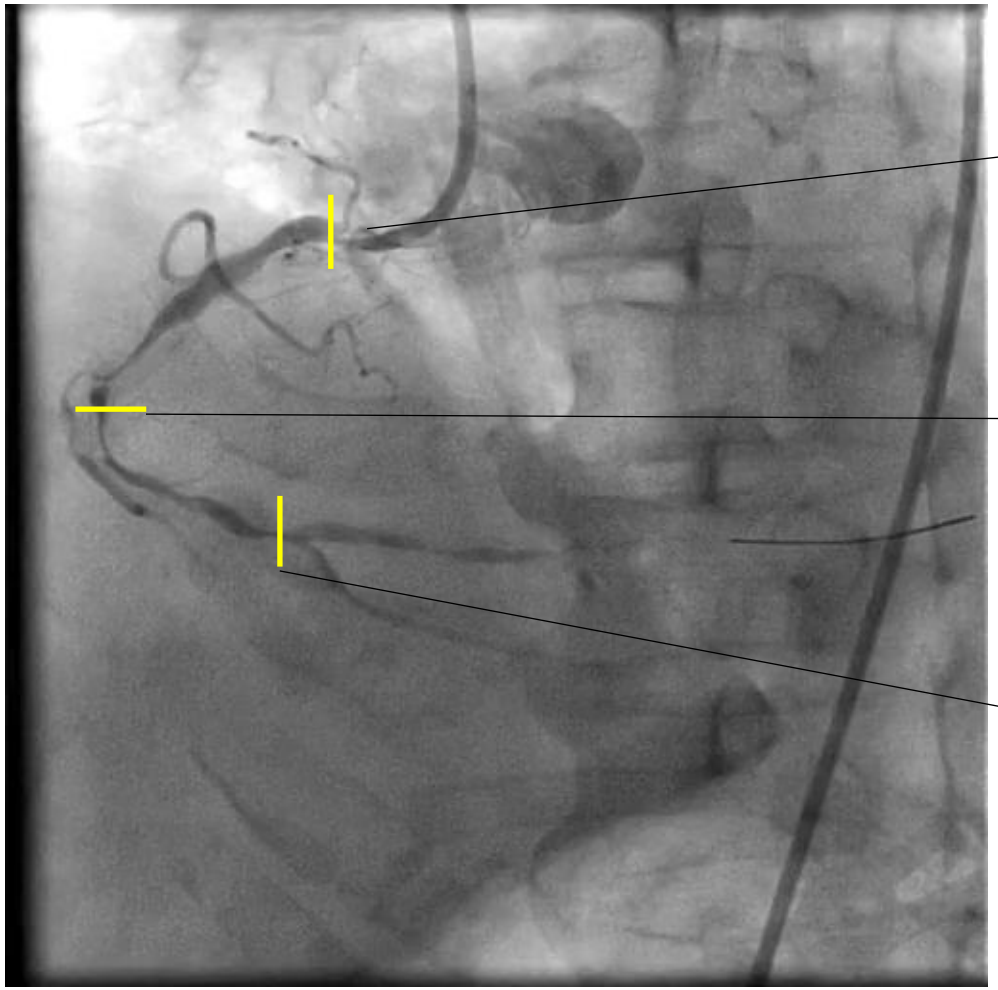
Crossed with Turnpike LP

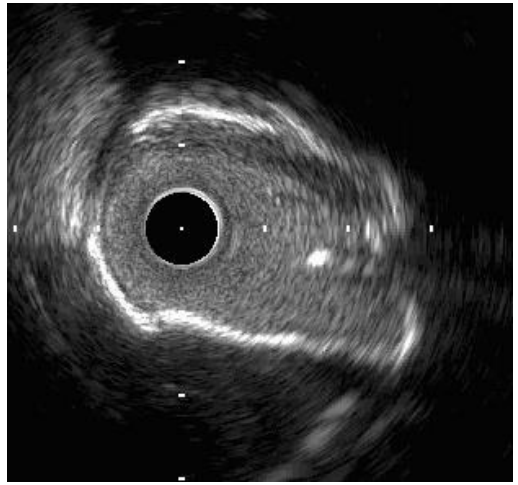
OAS to mRCA

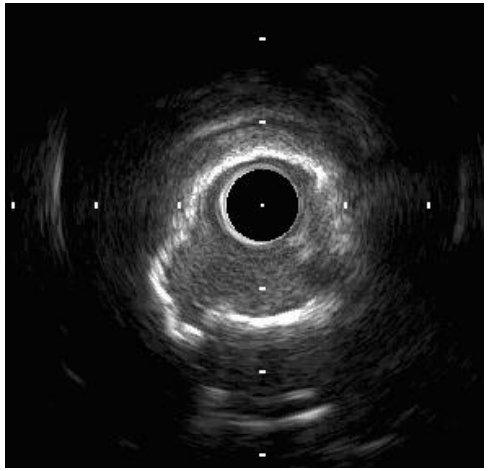
Sanding to ostial RCA in retrograde fashion

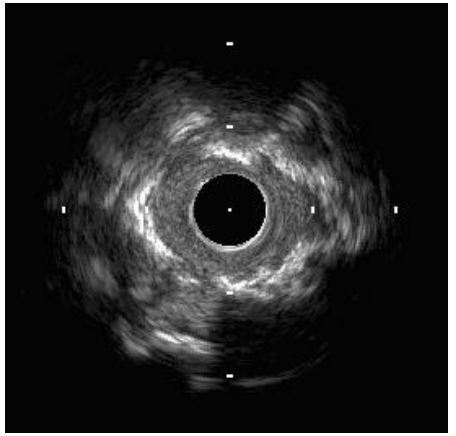


IVUS post OA

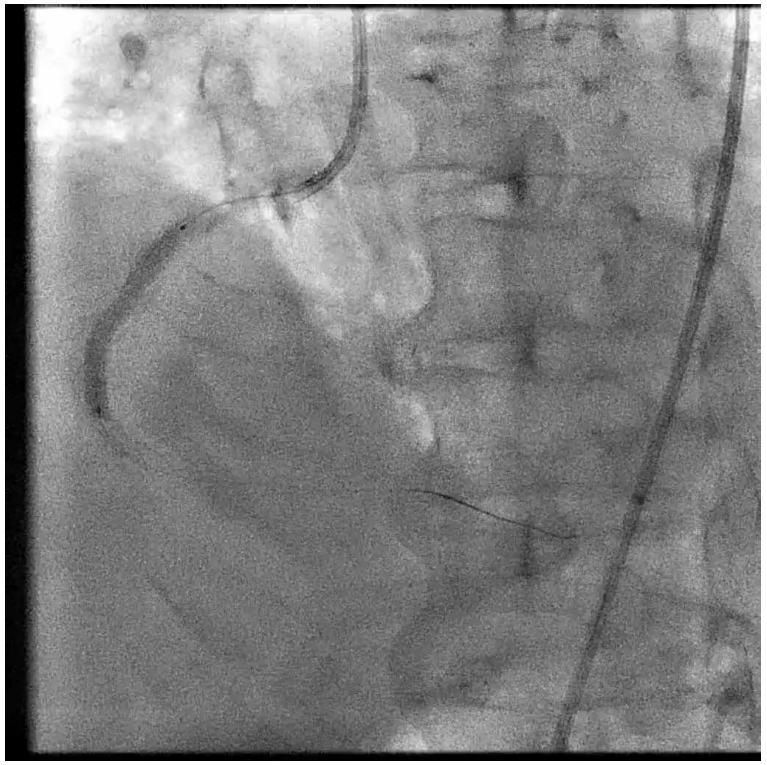




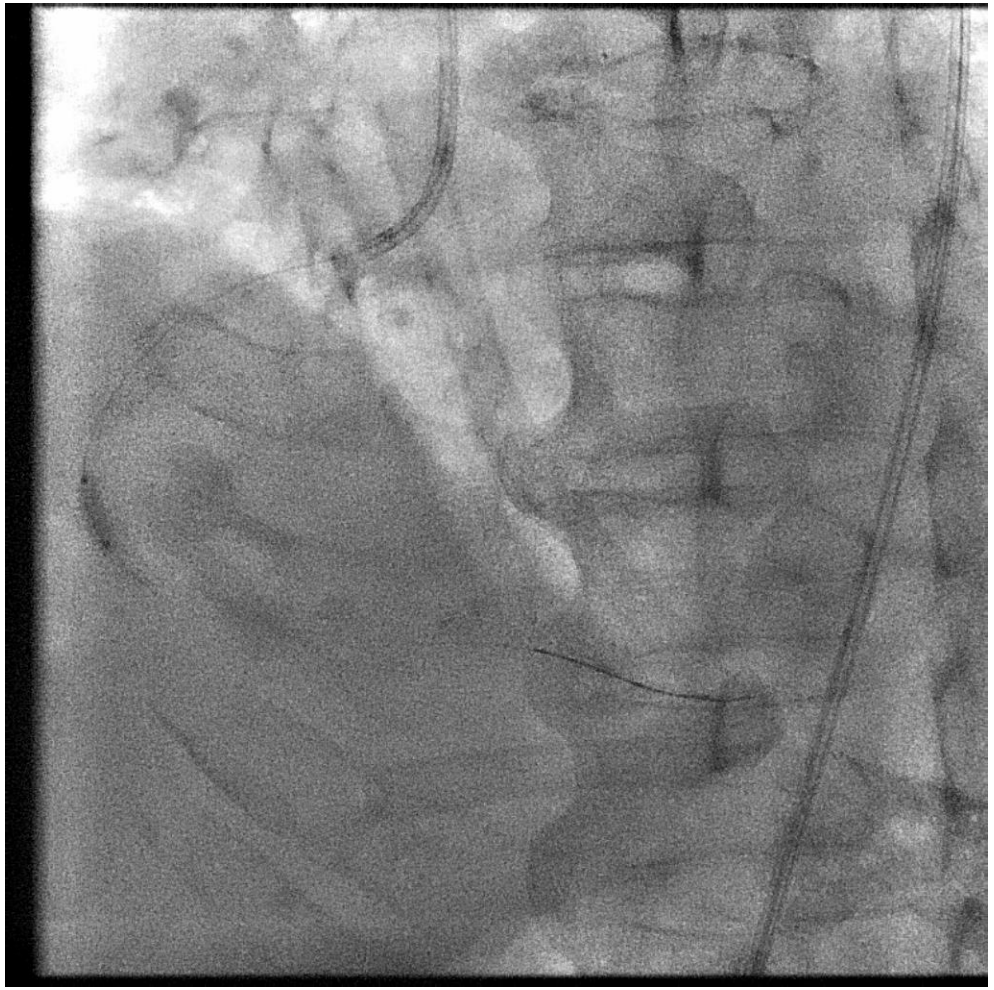


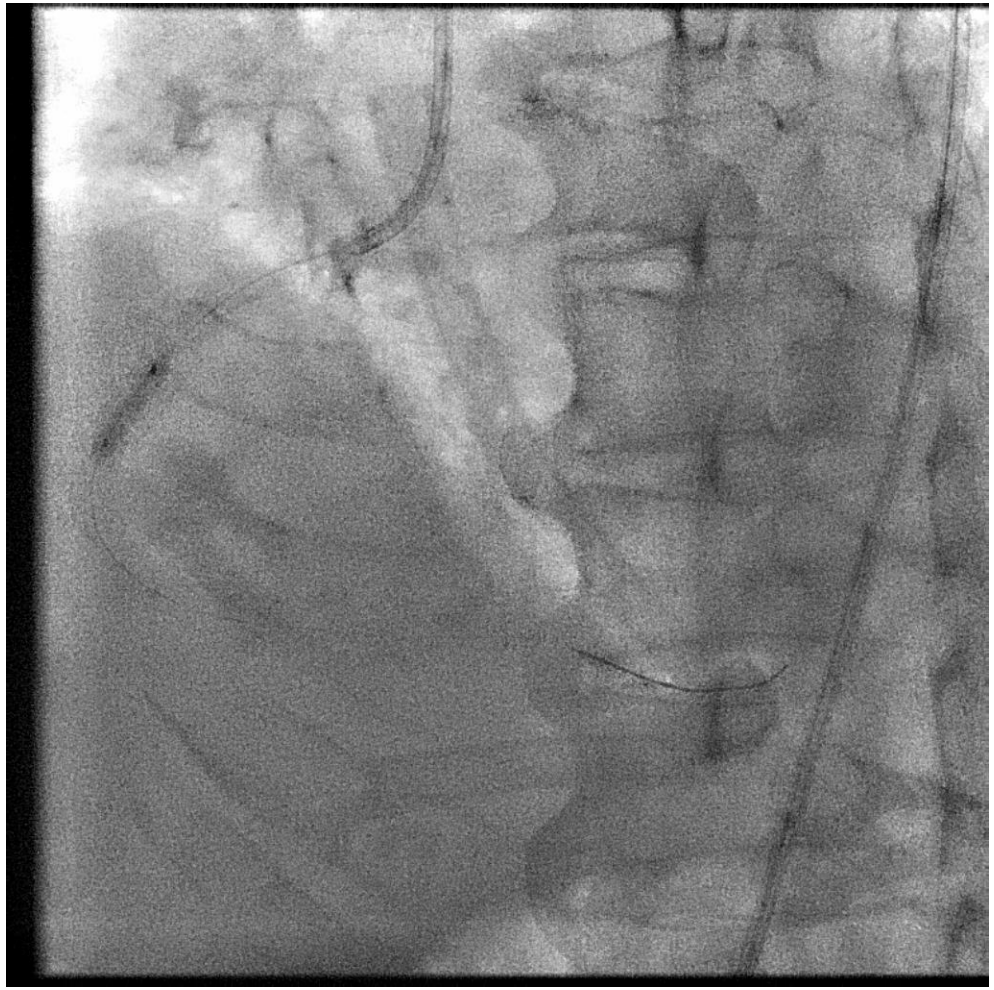


DES x 3



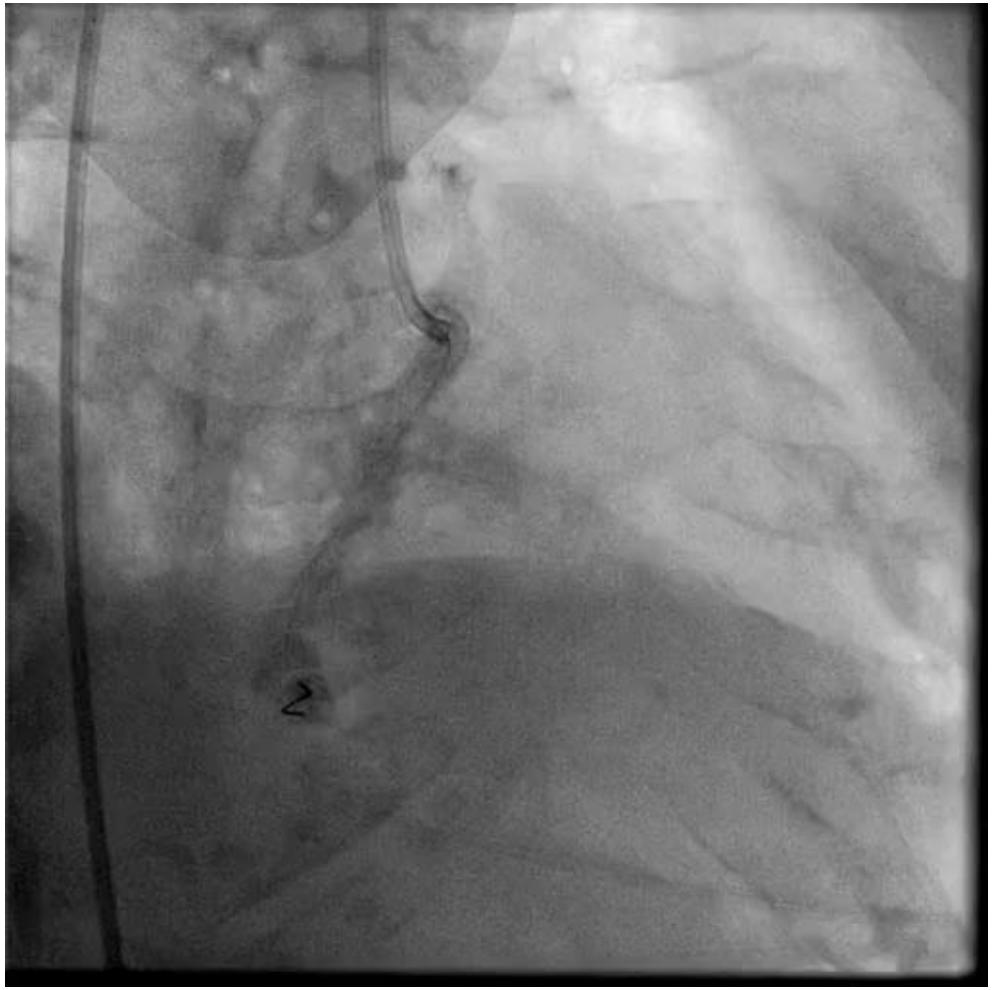
High pressure post-dilatation





OPN to ostial RCA

Final angiogram



Conclusion

- Orbital atherectomy is a safe and effective option for lesion preparation for severely calcified disease
- Advantages in large vessel, calcified nodule, eccentric lesion, aorto-ostial lesion.
- Combination therapy with other modalities may be necessary in the most challenging cases
- Do not consider OA in the following: presence of stent, thrombus, significant dissection and microcatheter non-crossable lesions.