Practical Approach to the Calcified Lesion PCI

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COI Disclosure

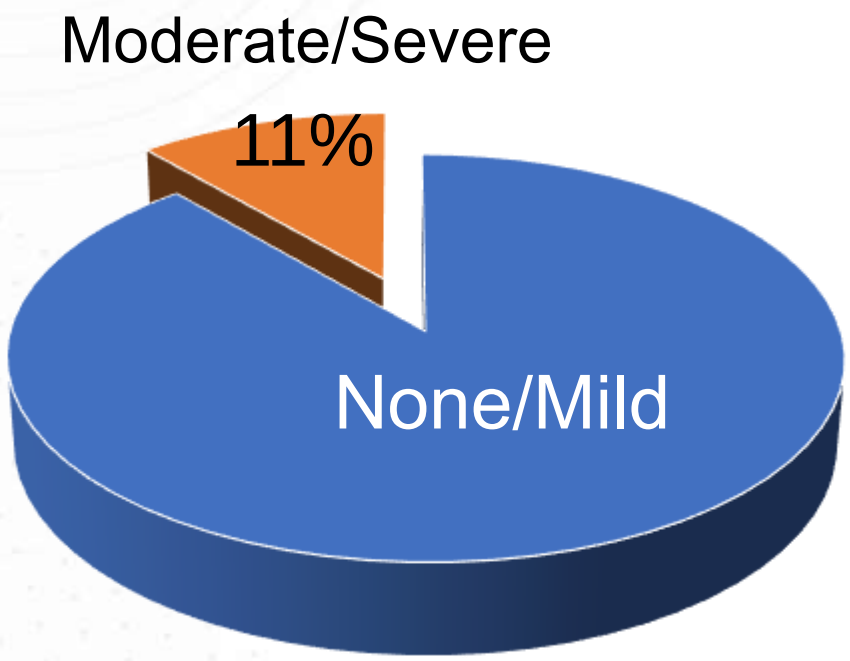
Do-Yoon Kang

I DO NOT have a financial conflicts of interest to disclose concerning the presentation

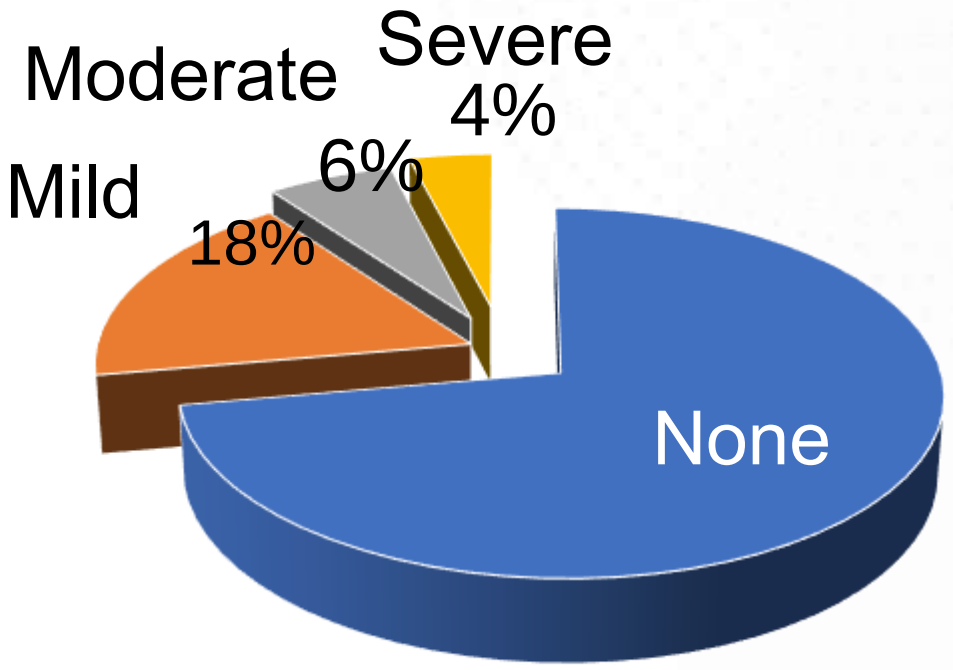
Why? Impact of Coronary Calcification

- Calcium is a marker of the extent of coronary atherosclerosis
  - ✓ Underlying patient condition
- Calcification results in *Suboptimal Stent Results*
  - ✓ Impaired stent delivery
  - ✓ Decreased stent expansion
  - ✓ Malapposition
  - ✓ Stent asymmetry
  - ✓ Complications: ***Dissection***, ***Perforations***

Prevalence of Calcium by Angiographic severity from IRIS-DES Registry



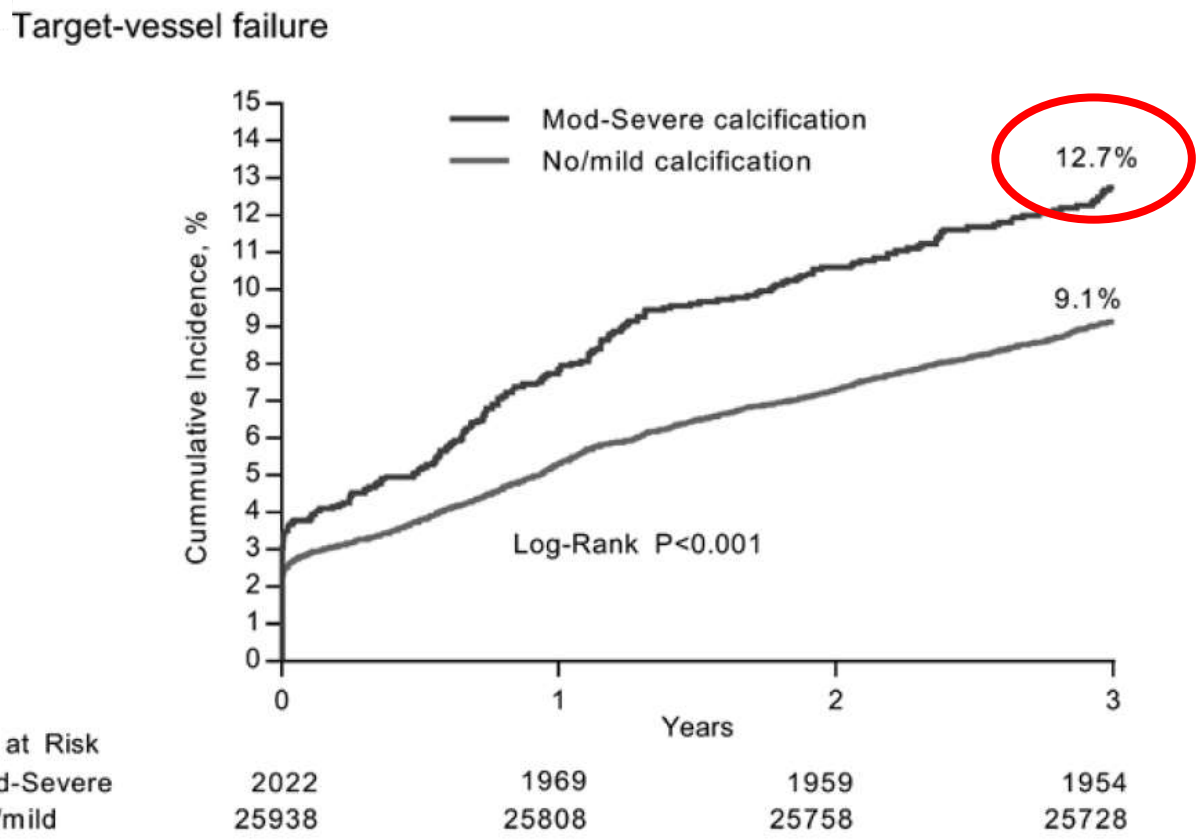
Number of Patient

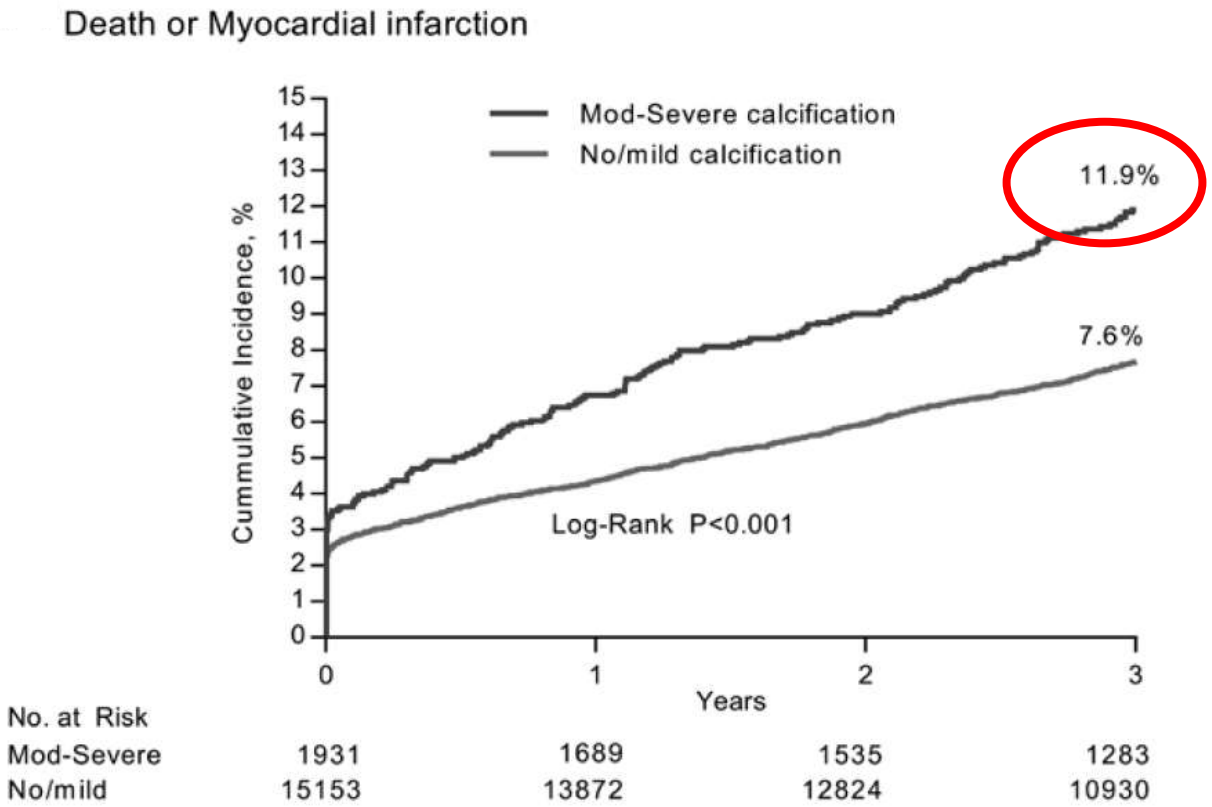


Number of Lesion

Lee CH et al. Coron Artery Dis. 2021 Jan;32(1):42-50

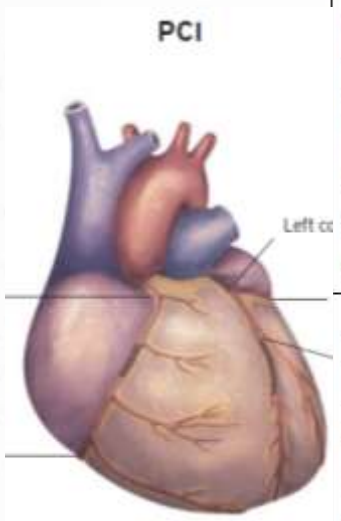
Clinical Outcome by Angiographic Calcium Severity from IRIS-DES Registry





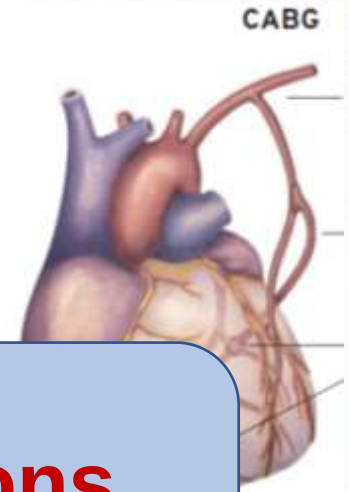
Lee CH et al. Coron Artery Dis. 2021 Jan;32(1):42-50

Calcium is a Final Enemy for Interventionists.



FAVOURS PCI
Clinical characteristics
Presence of severe co-morbidity (not adequately reflected by scores)
Advanced age/frailty/reduced life expectancy
Restricted mobility and conditions that affect the rehabilitation process
Anatomical and technical aspects
MVD with SYNTAX score 0–22
Anatomy likely resulting in incomplete revascularization with CABG due to poor quality or missing conduits
Severe chest deformation or scoliosis
Sequelae of chest radiation
Porcelain aorta[a]

FAVOURS CABG
Clinical characteristics
Diabetes
Reduced LV function (EF ≤35%)
Contraindication to DAPT
Recurrent diffuse in-stent restenosis
Anatomical and technical aspects
MVD with SYNTAX score ≥23

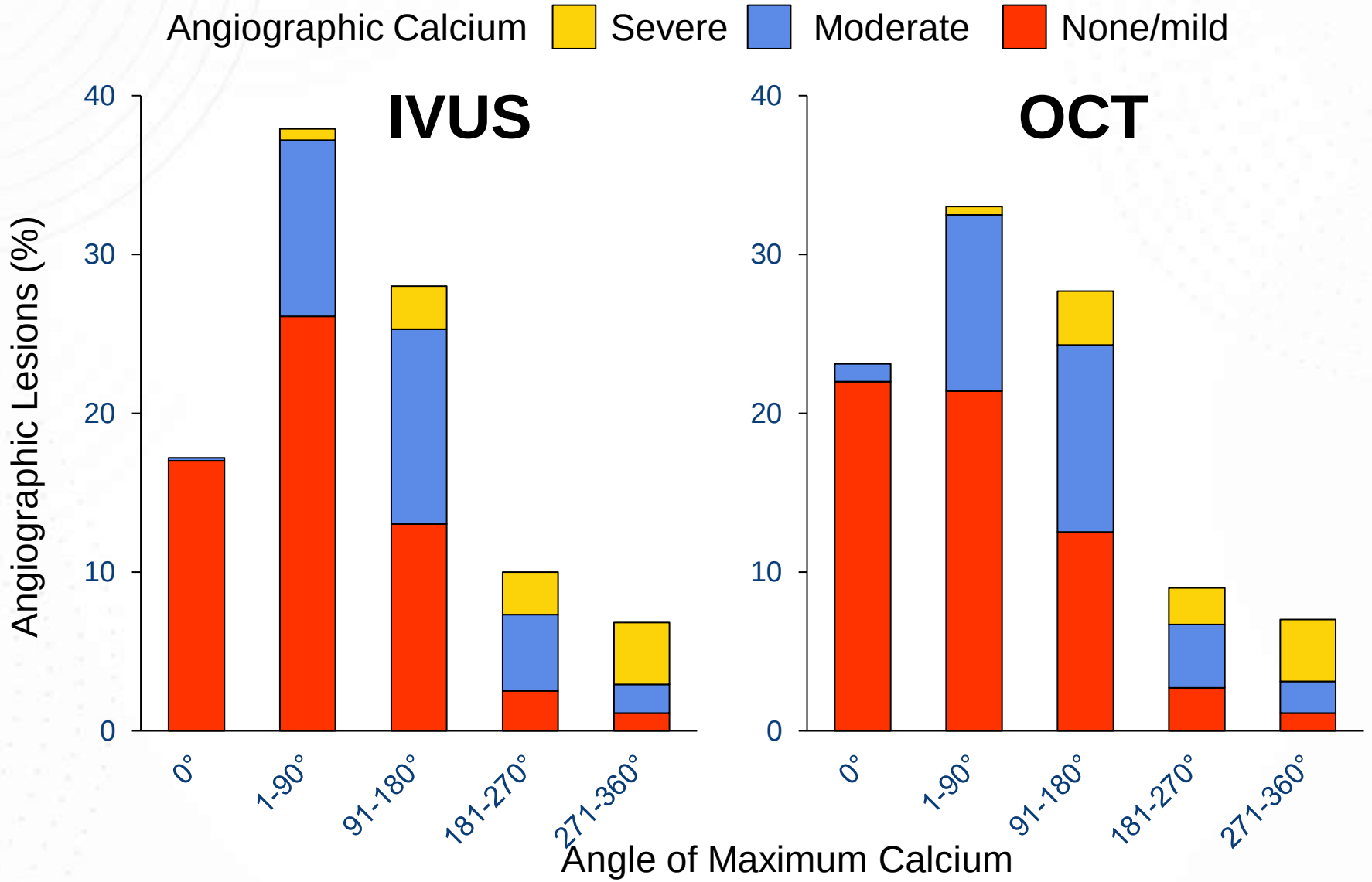


Severely calcified lesions limiting lesion expansion

Neumann FJ et al. Eur Heart J. 2019;40(2):87-165.

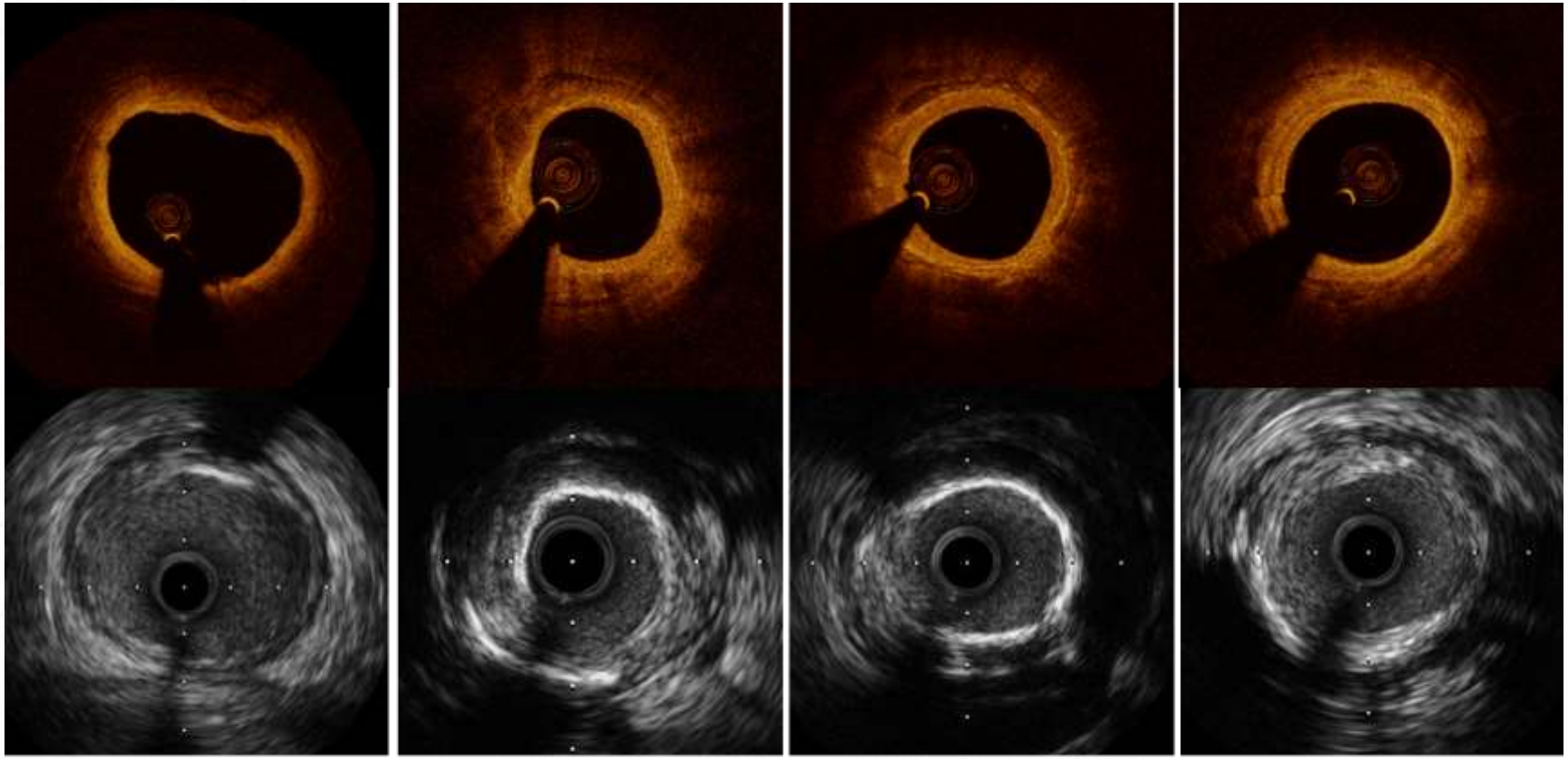
How Can We Detect Calcium?

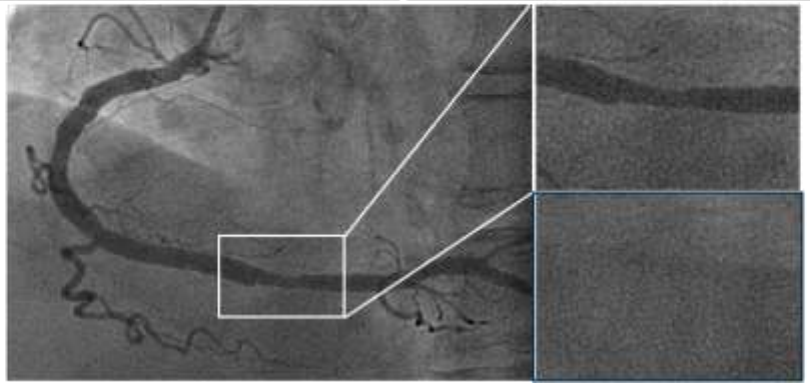
Discrepancy btw IVUS/OCT and Angiographic Calcium



Wang X and Matsumura M, et al. JACC Img 2017;10: 869-79.

Discrepancy btw IVUS/OCT and Angiographic Calcium



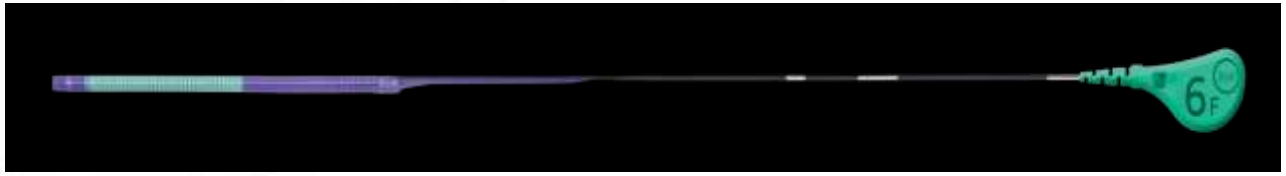


Always Prepare for the Worst Situation

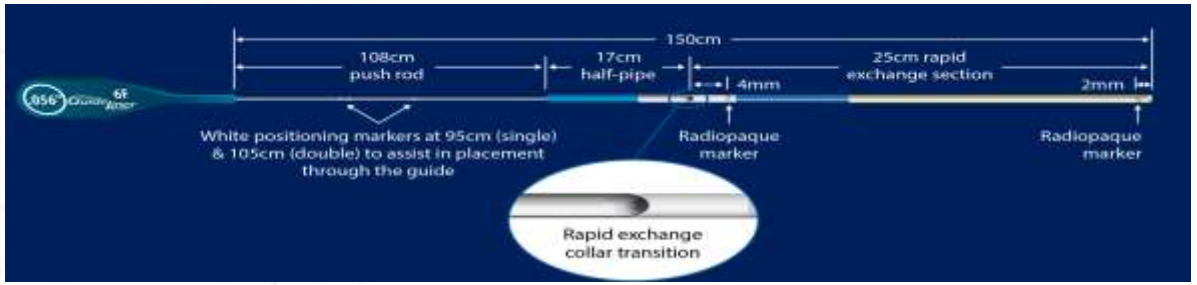
- Warning for the patients
- Strong guiding catheter
- Guide-extension catheter if needed
- Preparation of the atherectomy devices

Guide-Extension Catheter

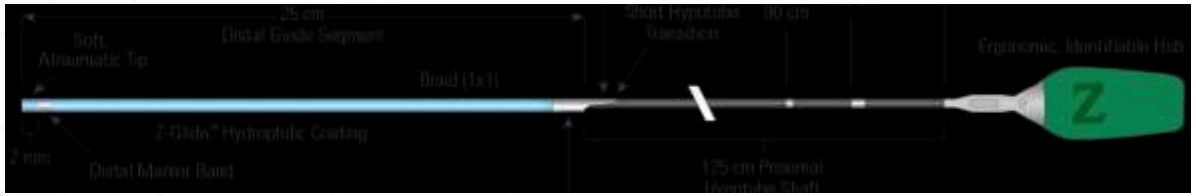
Telescope Softer & More Deliverable

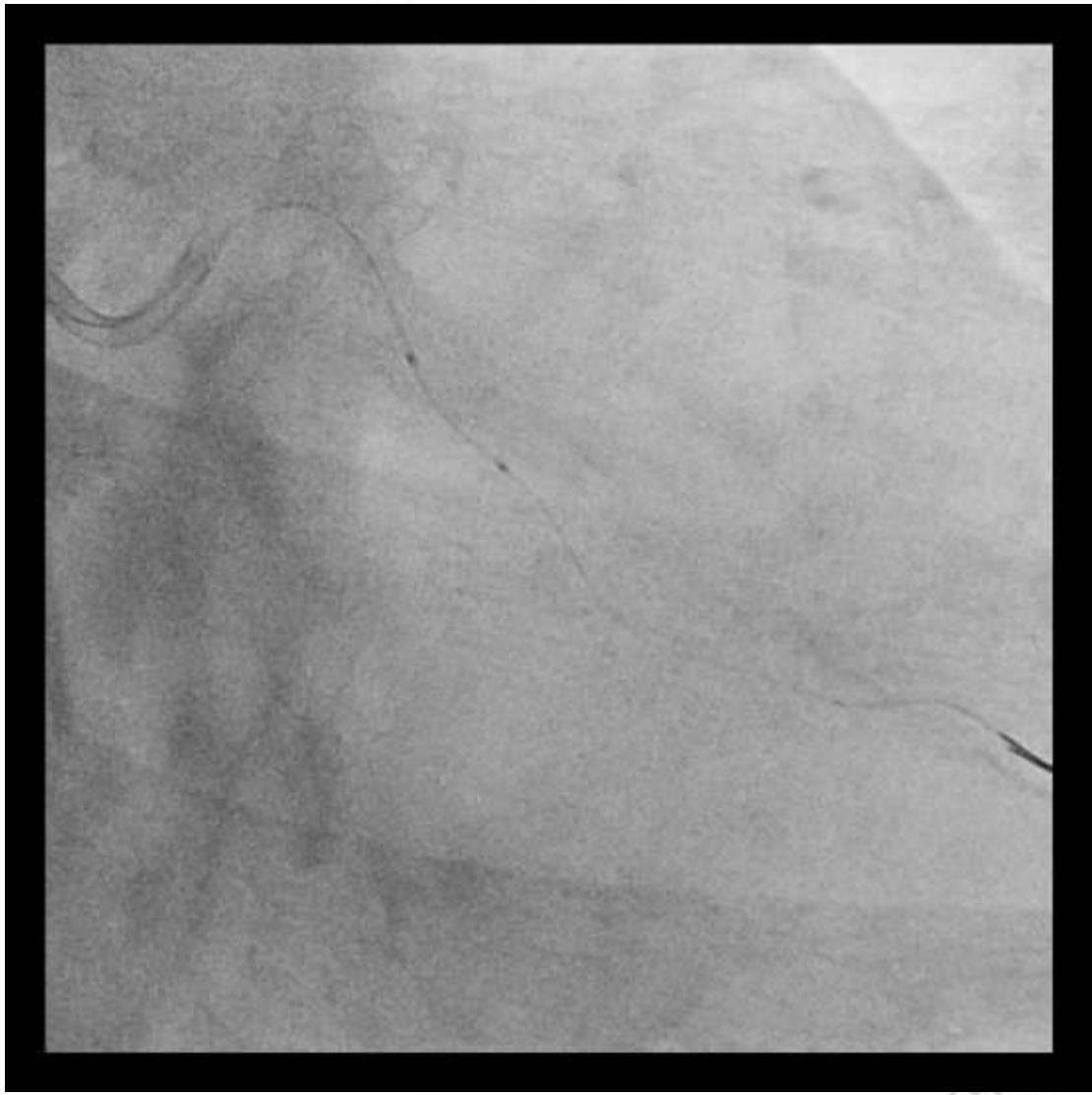


GuideLiner More Flexible

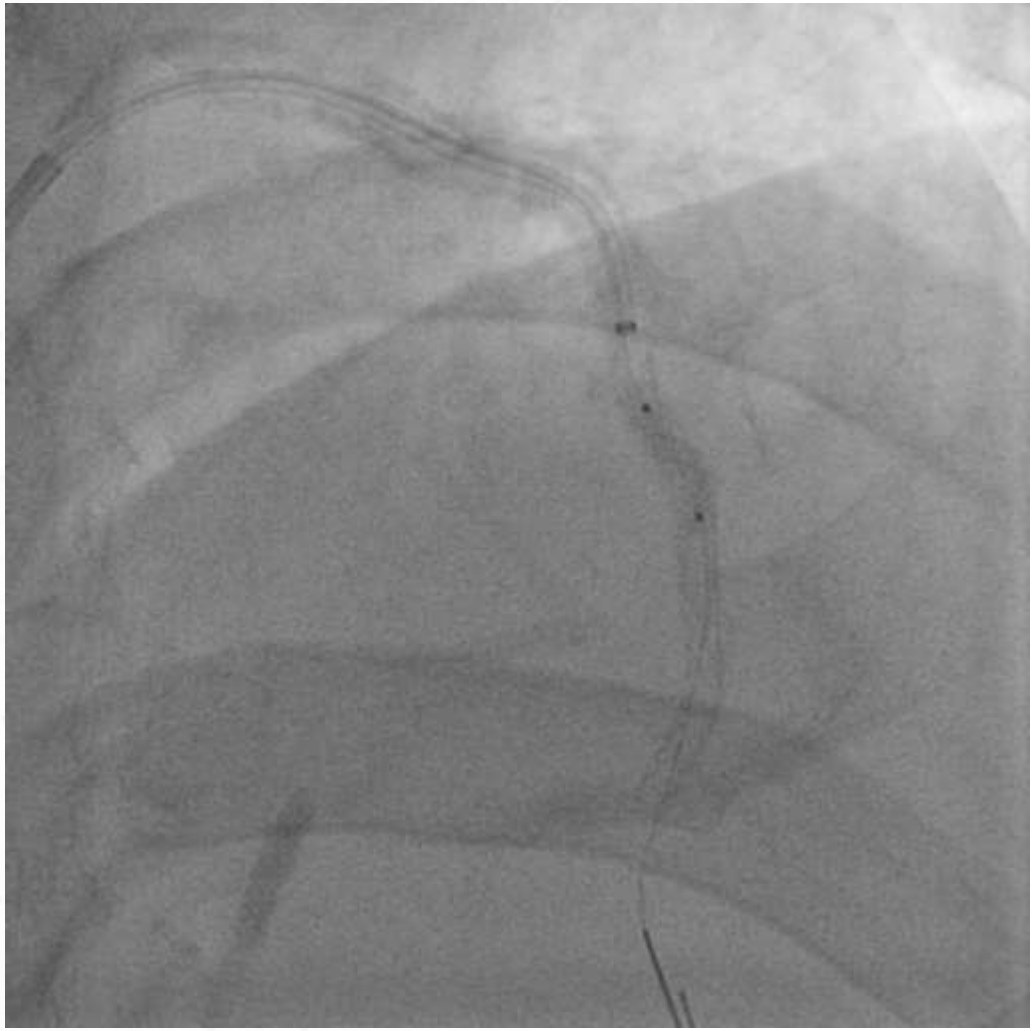


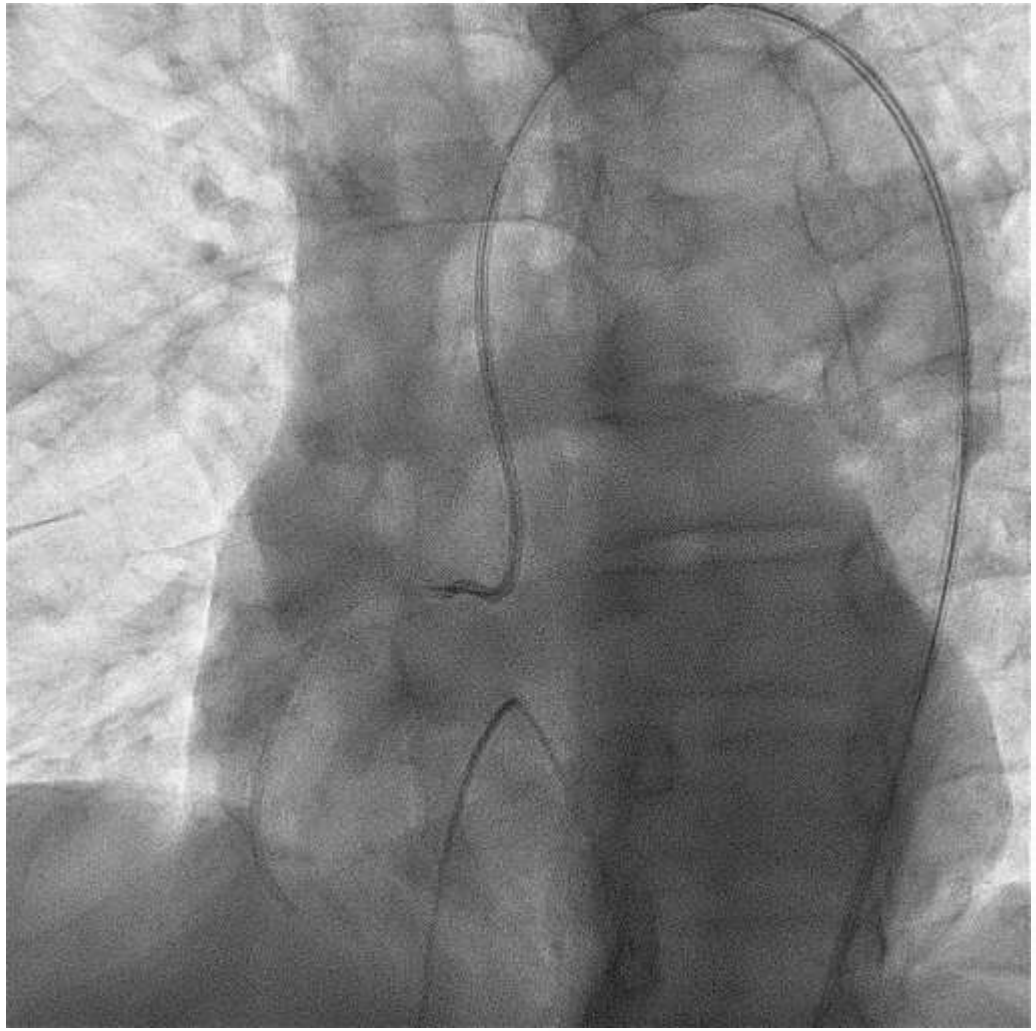
GuideZilla II More Pushable





Guide-Extension Catheter



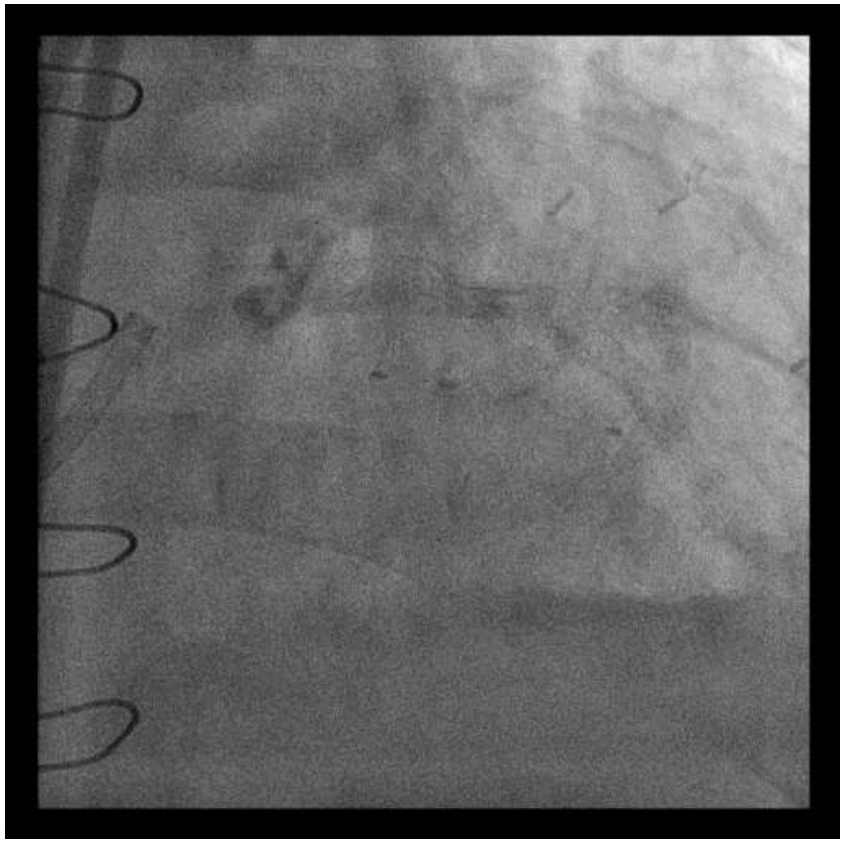


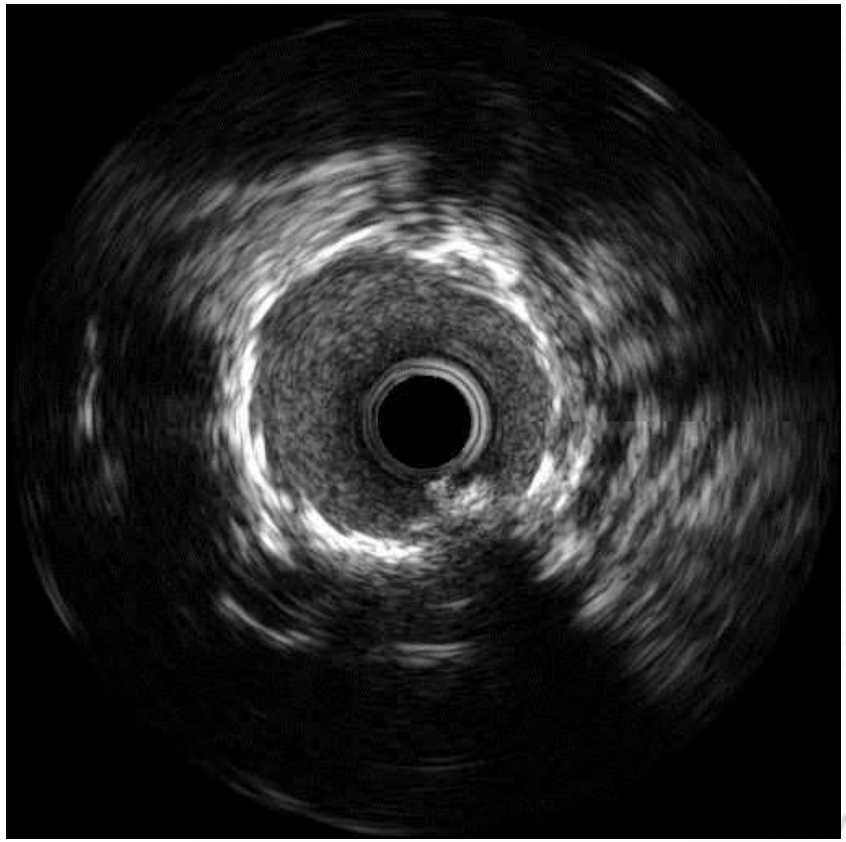
Rotablator (1.25 burr) via guidezilla (7Fr)

PCI for Heavily Calcified Lesion

1. Lesion preparation
2. Lesion preparation
3. Lesion preparation

Do not Stent on Poorly Prepared Calcification

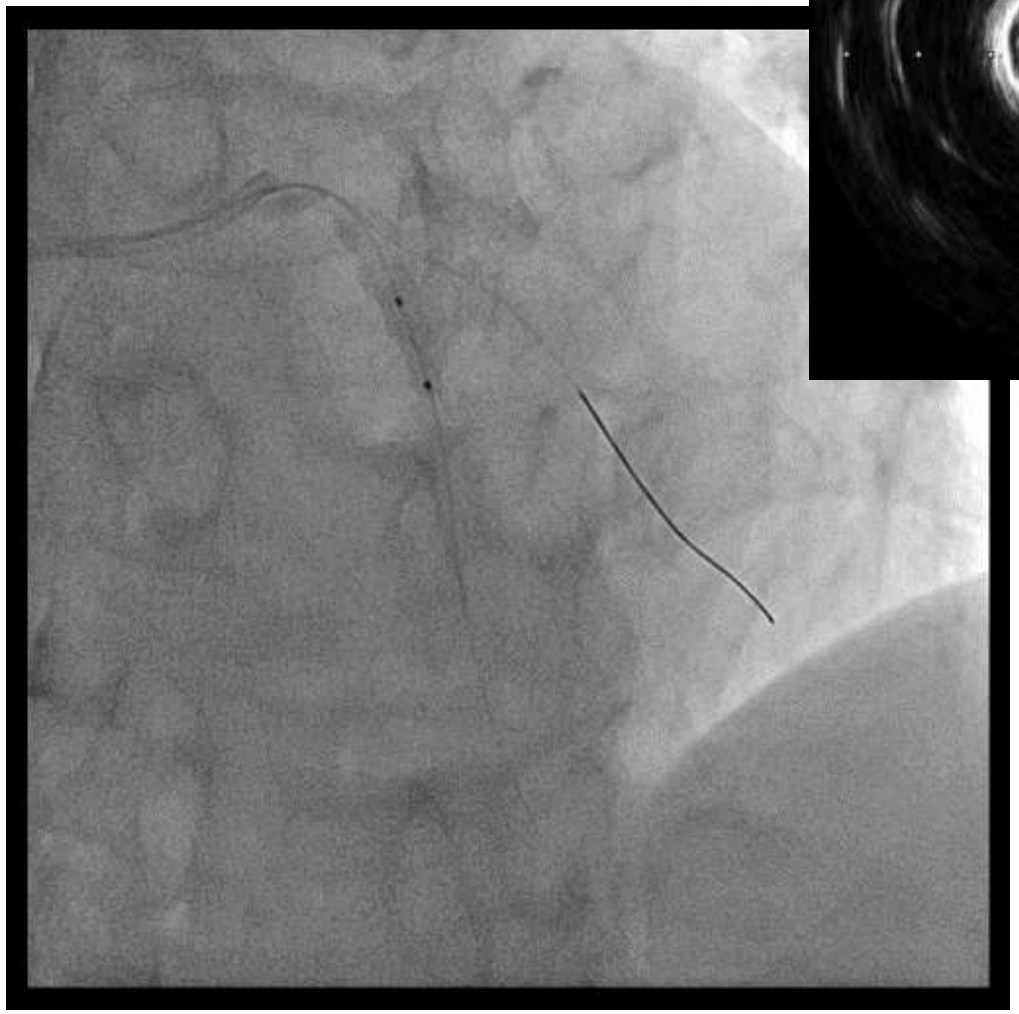


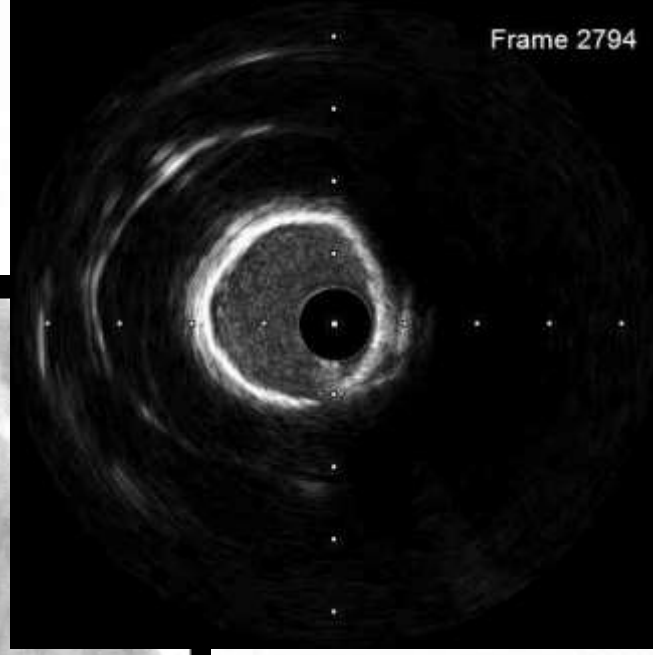


Never Put the Stent

Before Optimal Lesion Preparation !

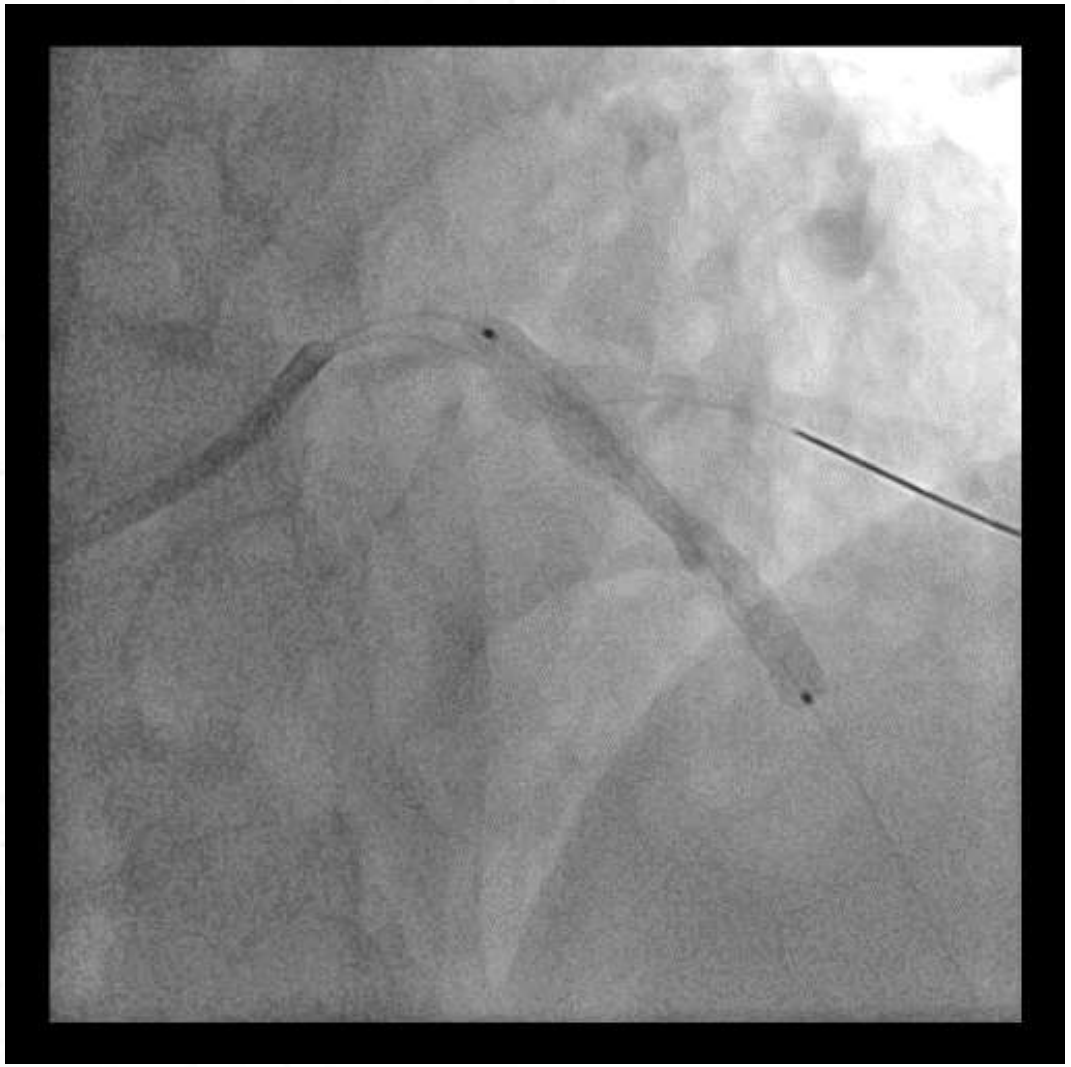
65/M, Stable Angina, DM





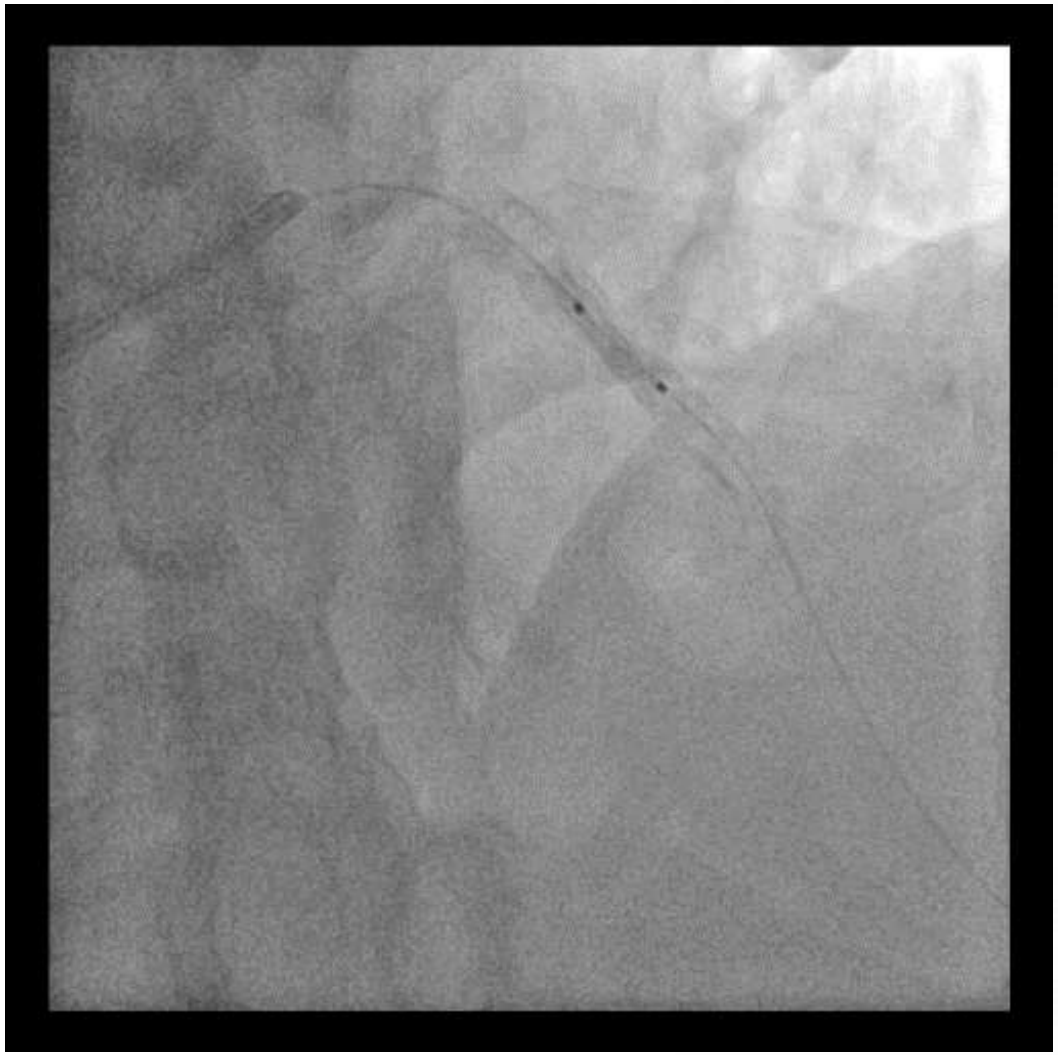
2.5 compliant balloon followed by Cutting 3(10) upto 16 atm

Stent should not be implanted before checking the full expansion of the NC Balloon



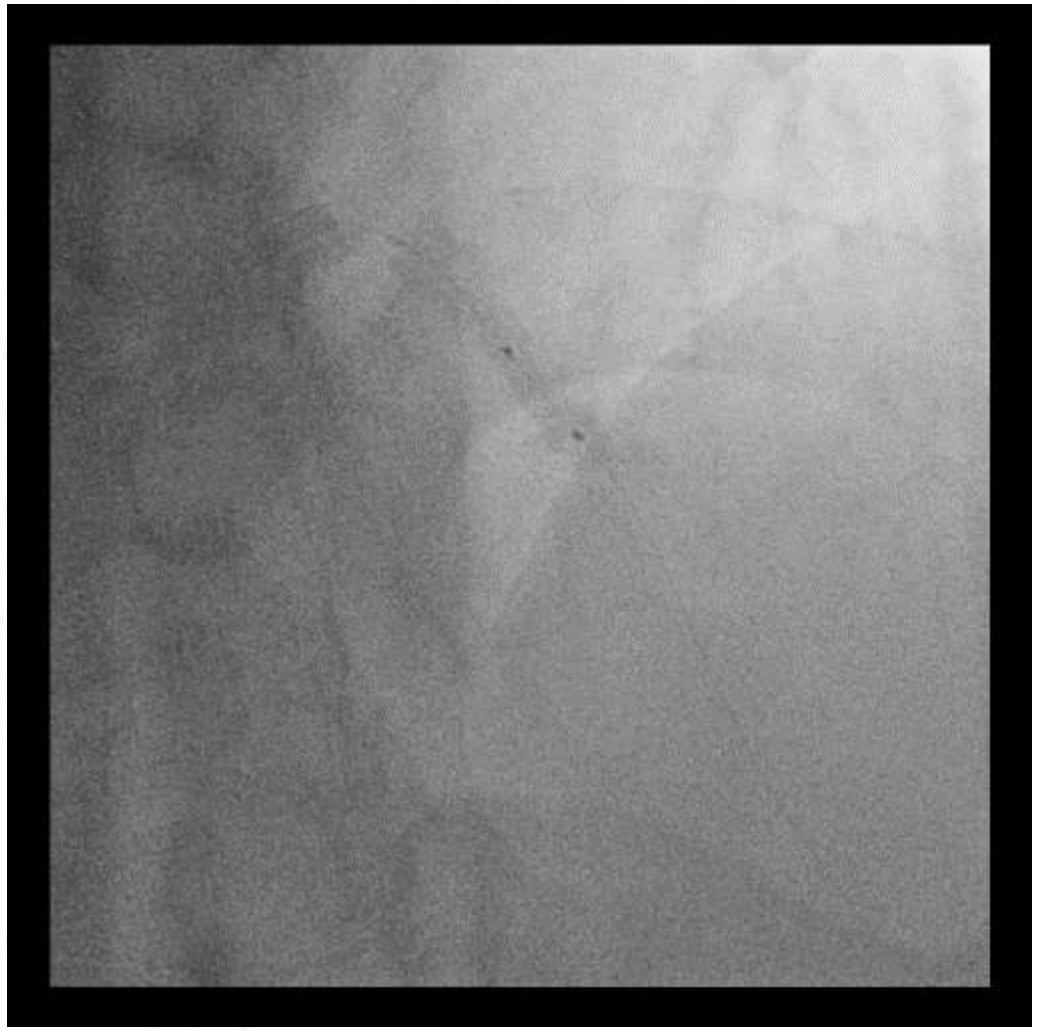
3.5(38) DES at 10 atm

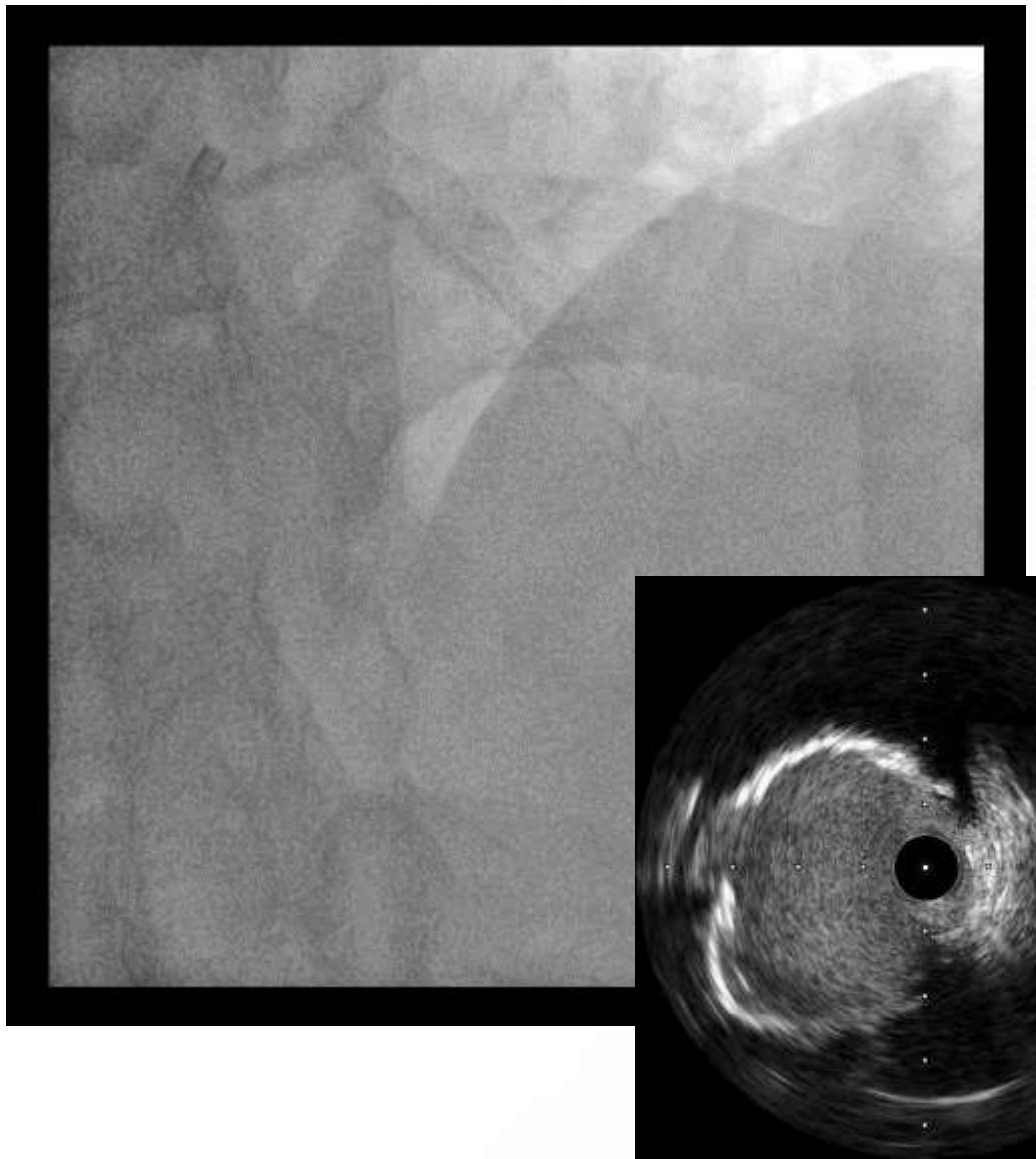
Stent Does Not Expand



3.5(15), 3.75(10) NC Balloon at 30 atm

Finally Expanded with Very High-pressure Balloon





Selecthru NC 4.0 (10) at 34 atm

Approach to Calcified Lesions

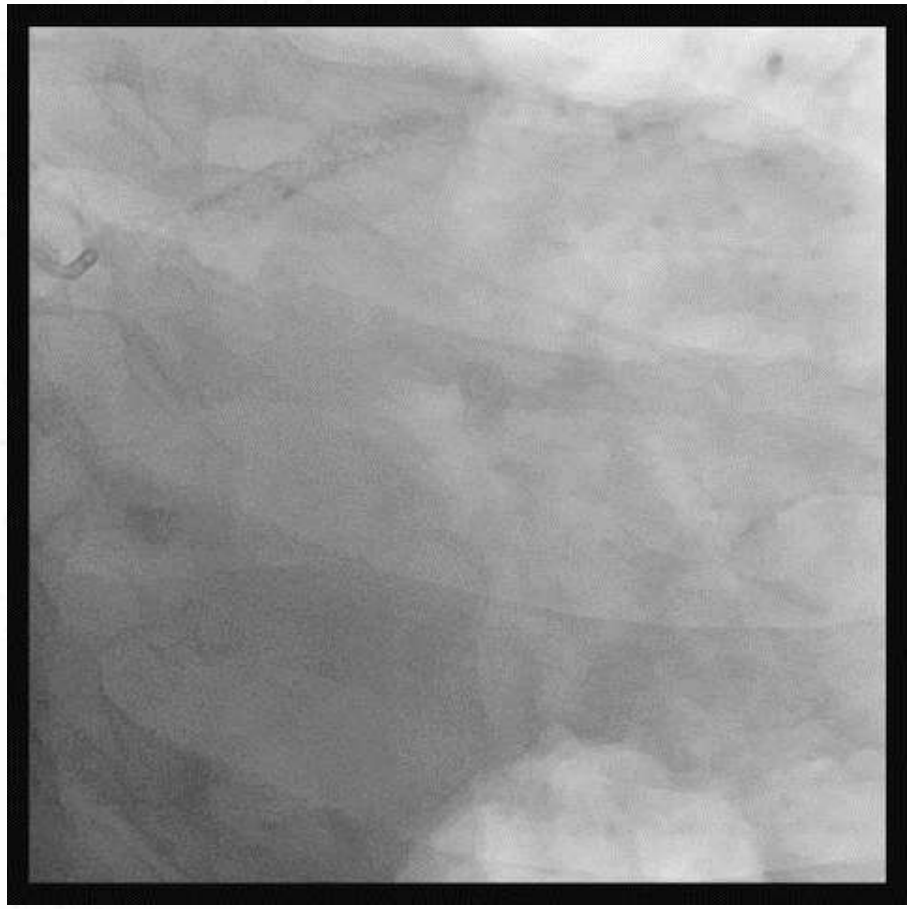
- High-pressure balloon
- Angiosculpt / Cutting balloon
- Rotational / Orbital atherectomy
- Intravascular lithotripsy
- Laser atherectomy

Rotational Atherectomy, When

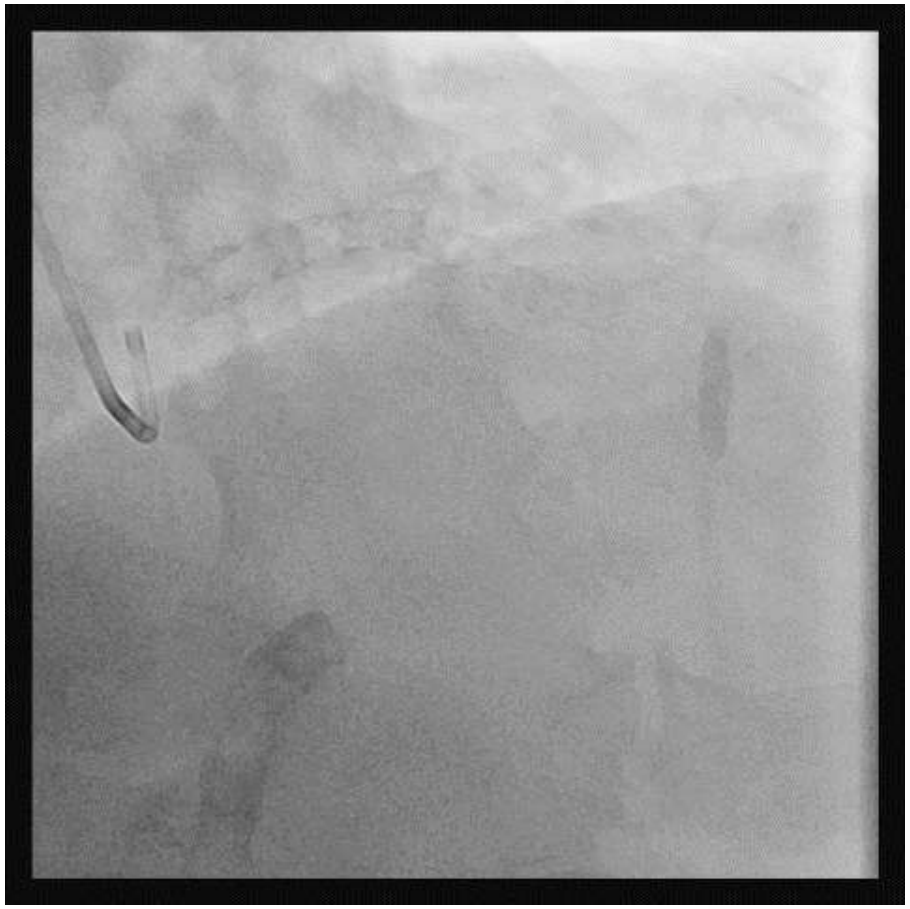
- Balloon or IVUS Catheter Failure to Pass
- Undilatable Lesion
- High amount of Calcium

: Angle >180^{o}, Thickness >0.5 mm, Length >5.0 mm

66yo Man with effort angina

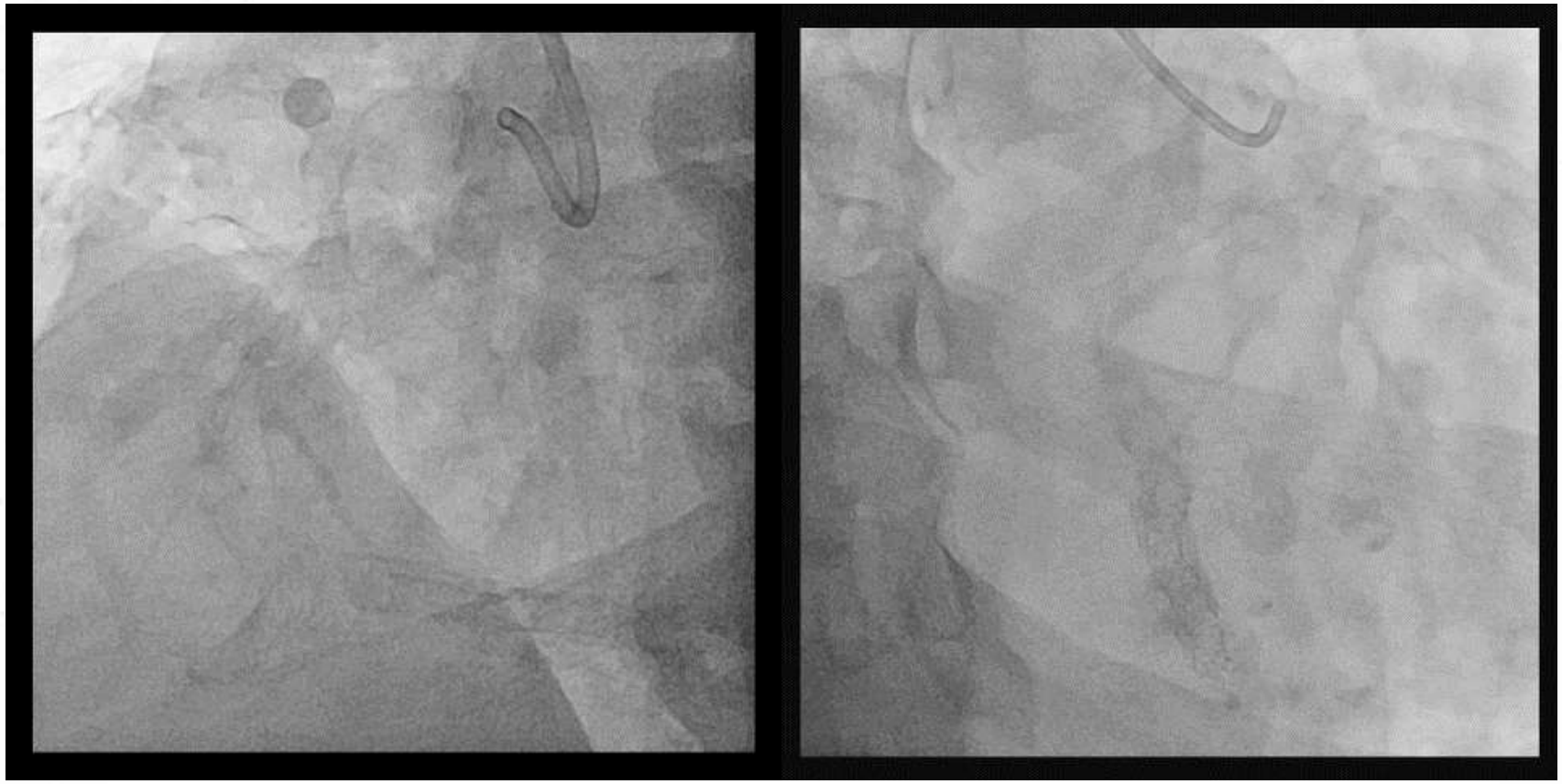


LAD, AP CAUDAL



AP CRANIAL

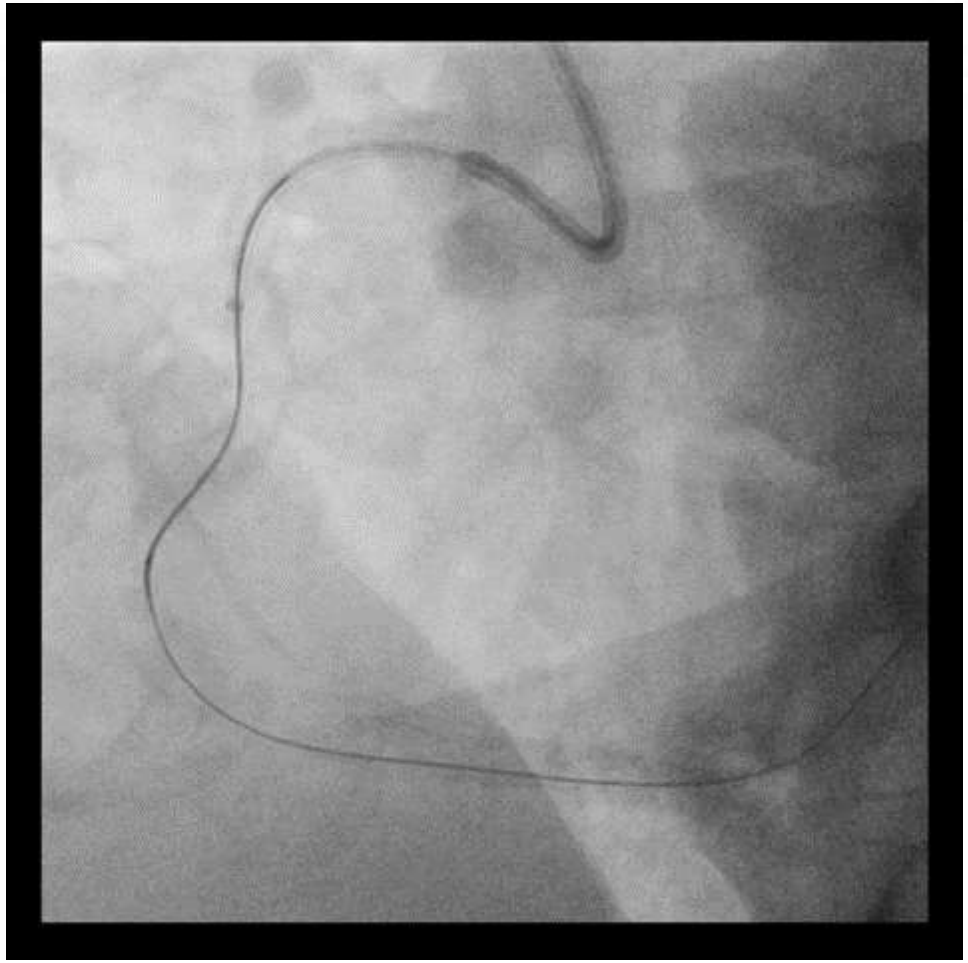
RCA



LAO

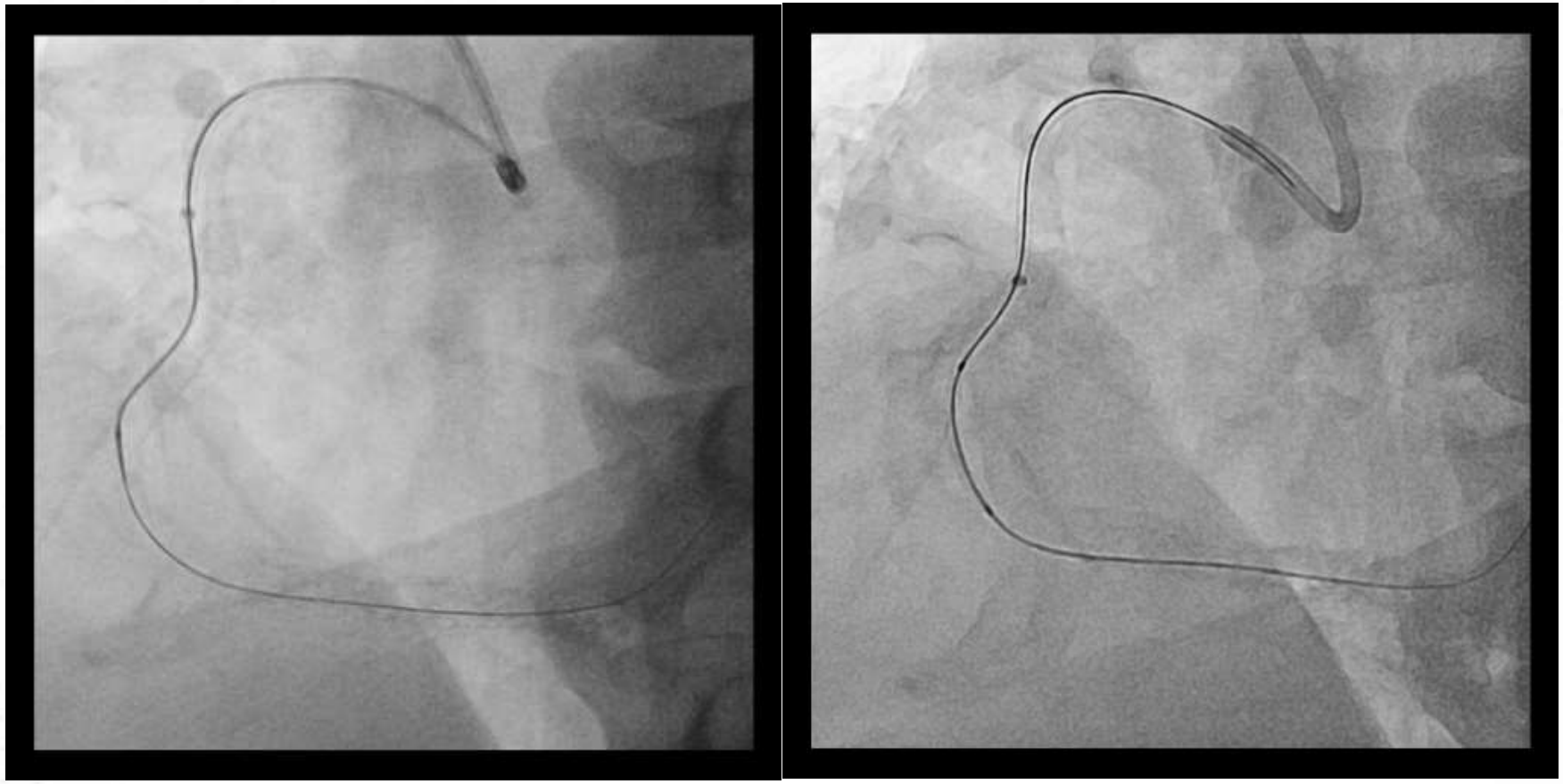
RAO

Wiring (mRCA)



Guidezilla (6Fr) + Corsair + Fielder XT-R

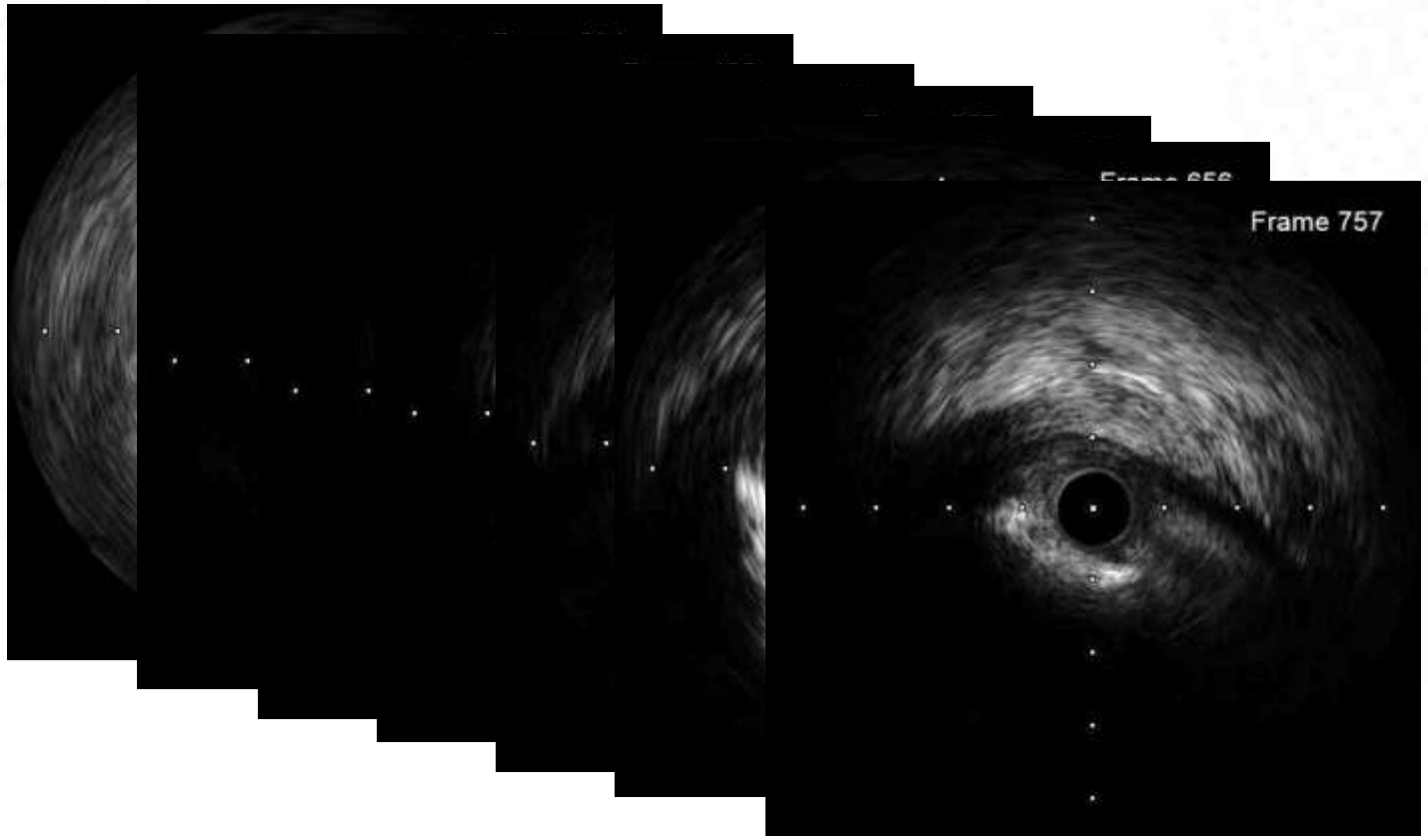
Pre-Balloon (mRCA)



mRCA: Lacrosse (LAXA) 1.0(5) upto 16 atm (1.16)
Pantera LEO 2.0(20) upto 24 atm (2.1)

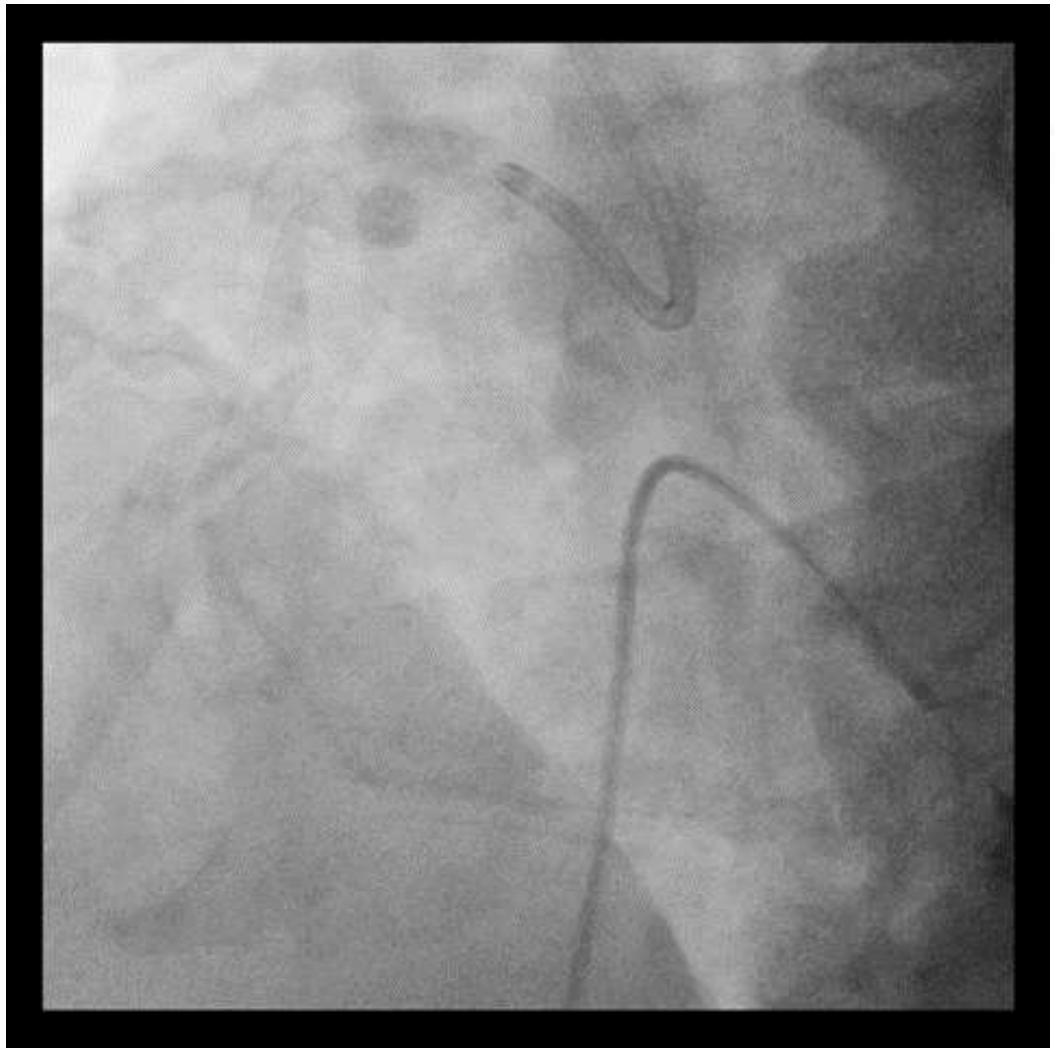
IVUS

Post balloon



Diffuse Multiple Heavy Calcified Nodule

Rotablation using 1.5 mm burr

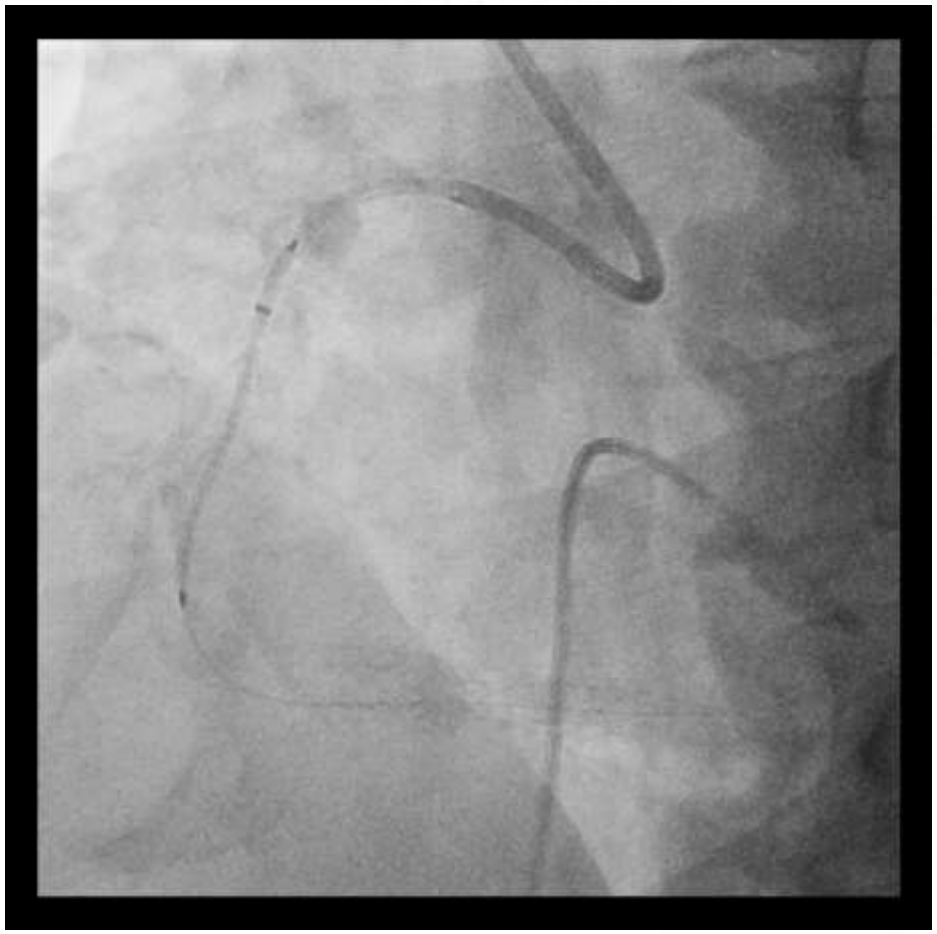


Post Rotablation

Pre-NC Balloon

Sapphire NC 3.0 (15mm)
upto 14 atm (3.05)

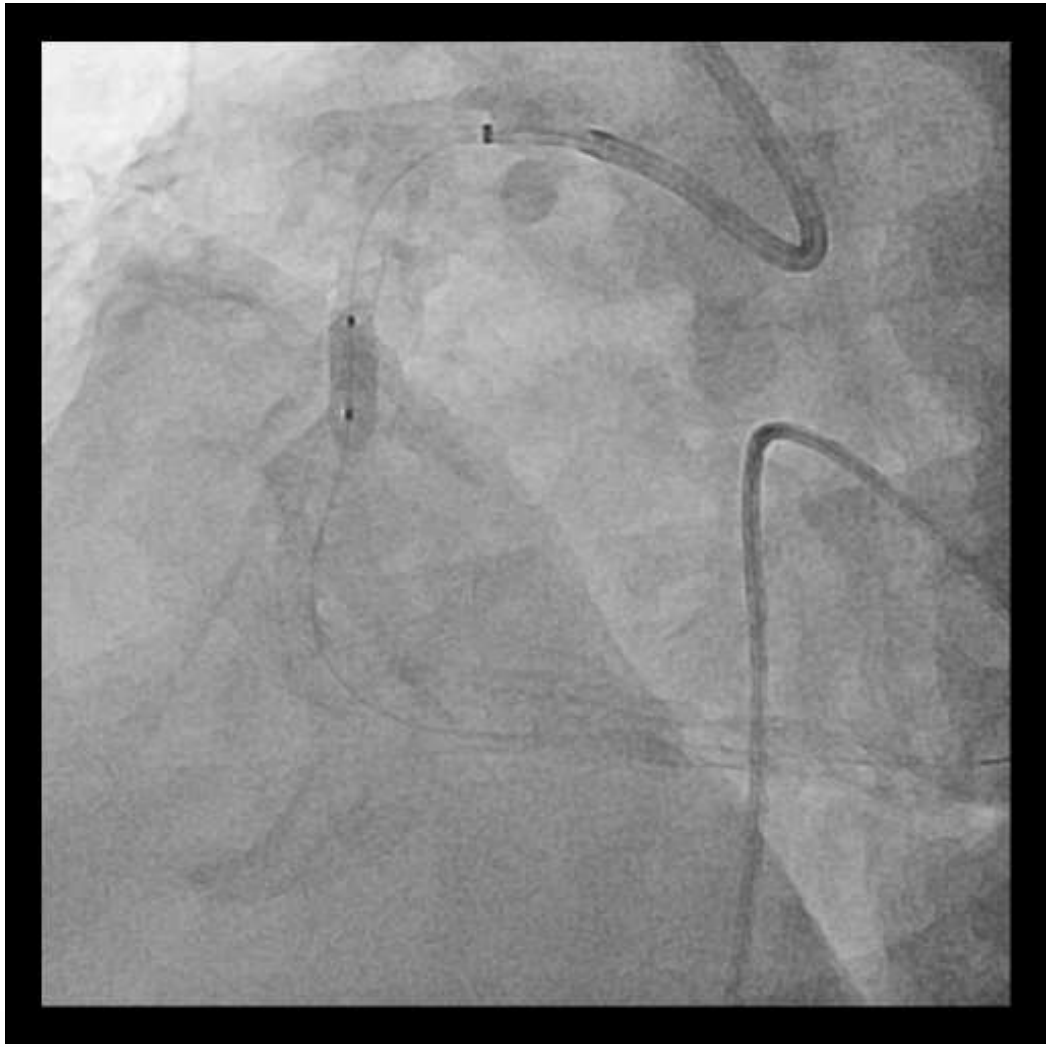
Stenting with GuideZilla Support



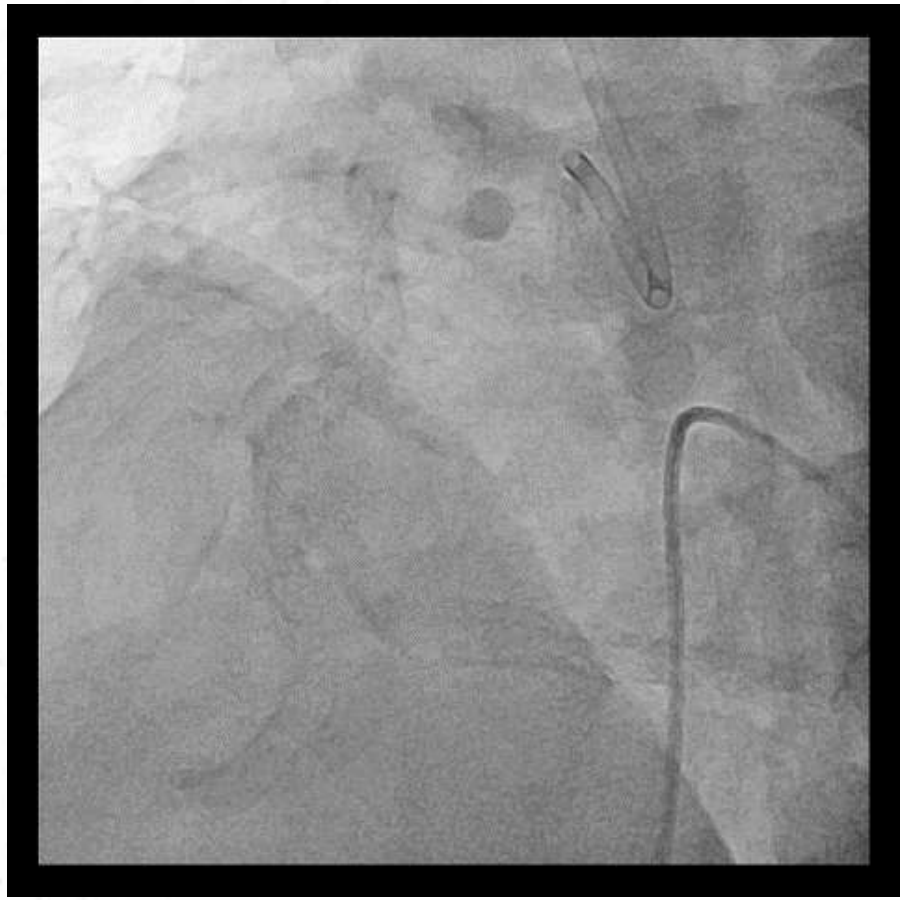
Xience 4.0 mm (38 mm)

High Pressure Post Dilation

With Sapphire NC 4.0 up to 4.5 mm (28 atm)



Final Angiography

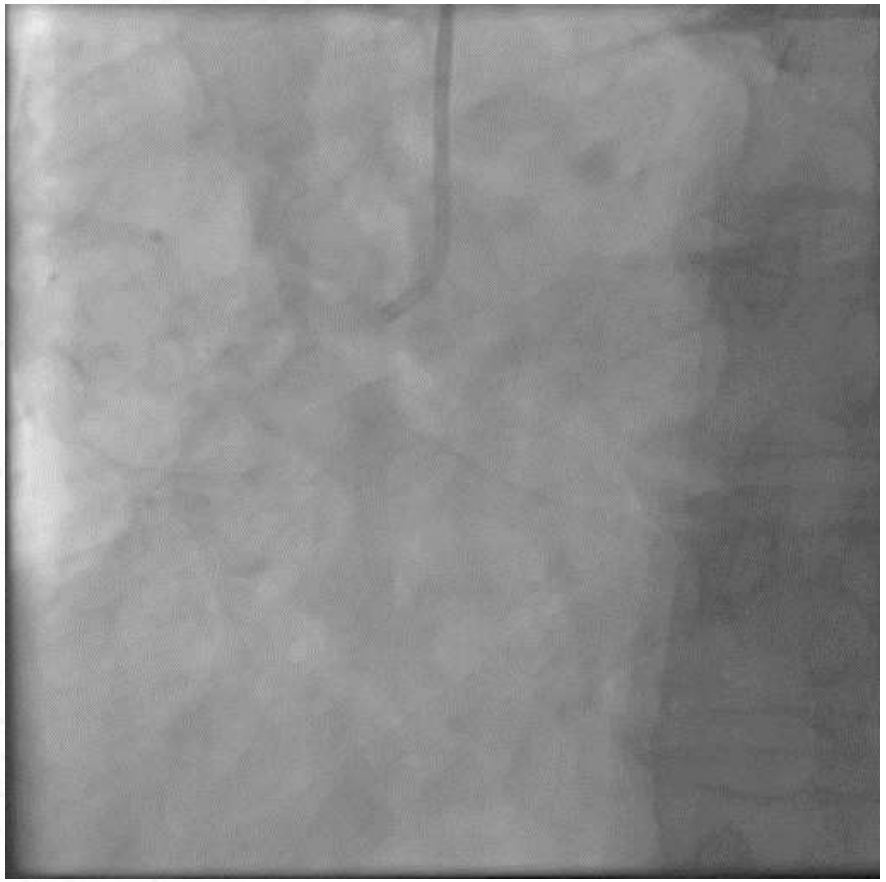


LAO

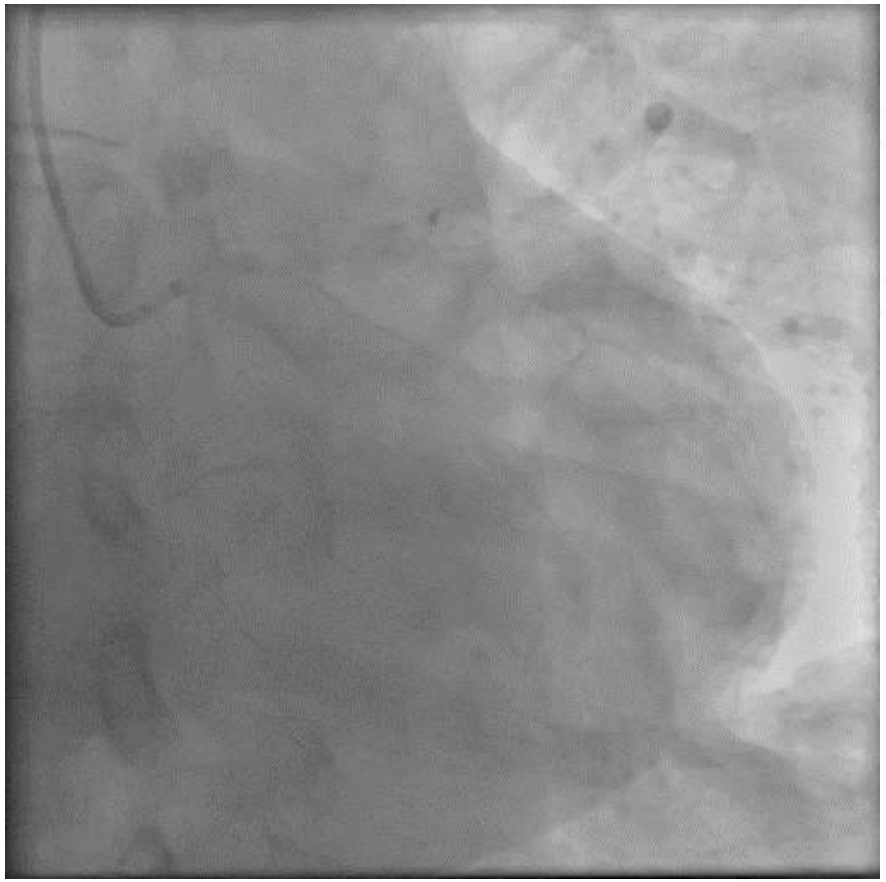
RAO

New Option, Super High-Pressure Balloon

76y Man with effort angina

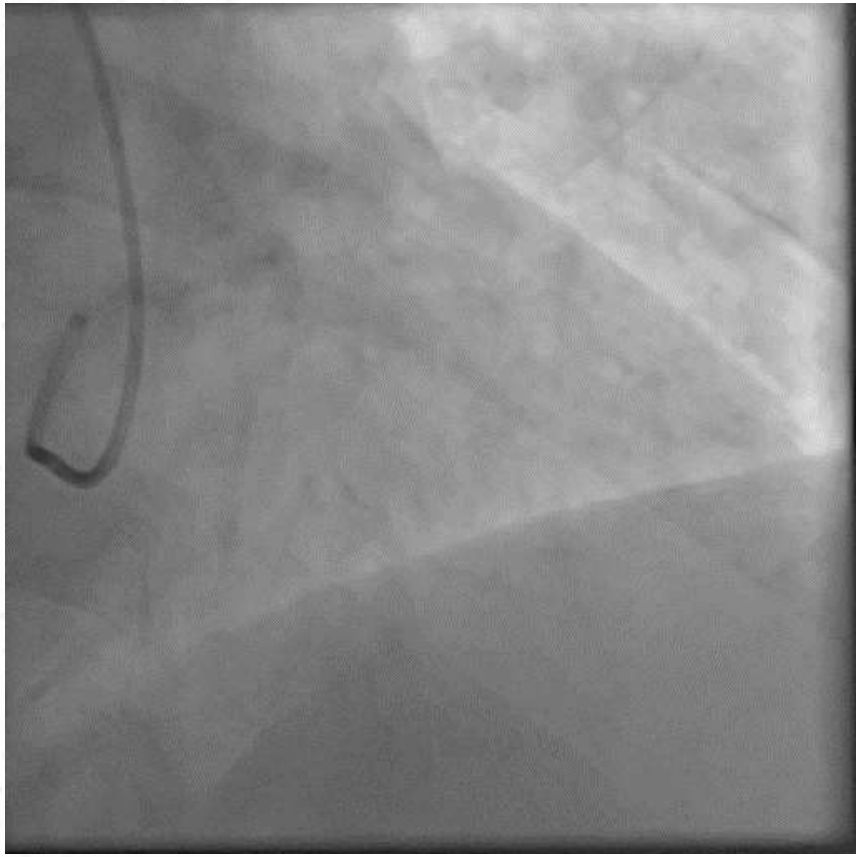


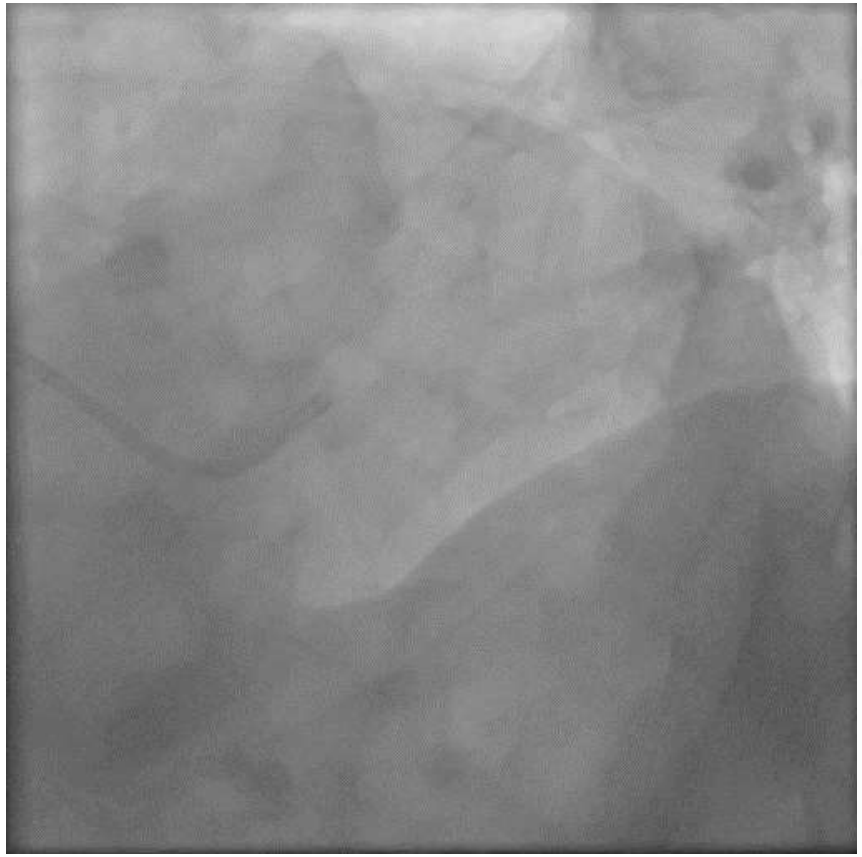
RCA CTO



LAD Calcific disease
With dLCX CTO

LM-LAD disease with Severe Calcification





Emerge NC 2.0(20) mm 28 atm

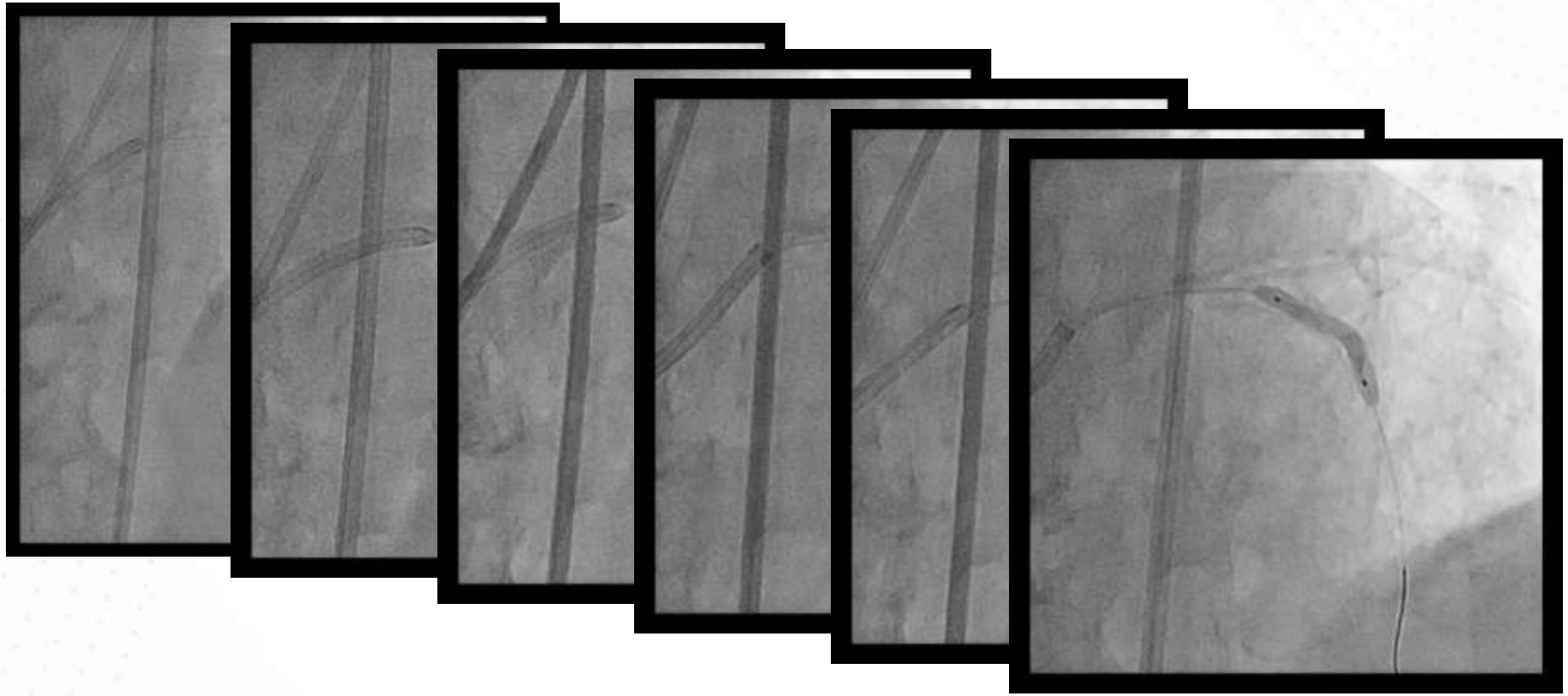
Sapphire NC 2.5(18) mm 28 atm

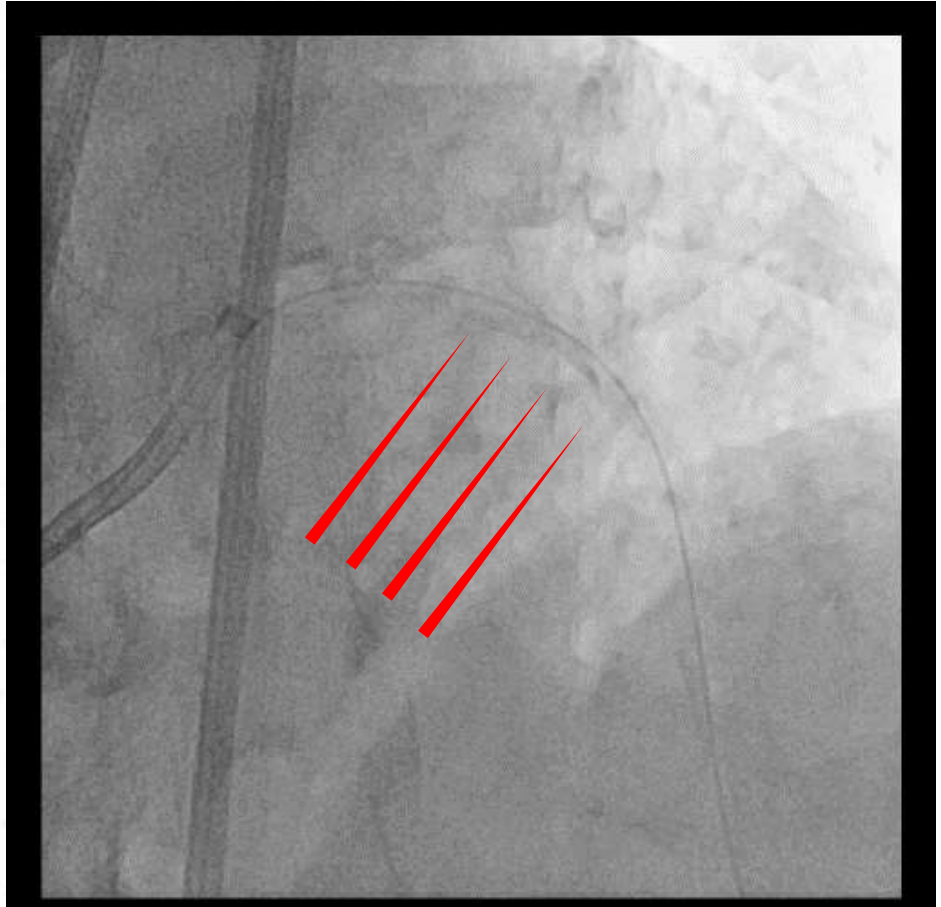
Emerge NC 2.75(20) mm 25 atm….Still not opened

Cutting balloon 2.75(10) mm 12 atm

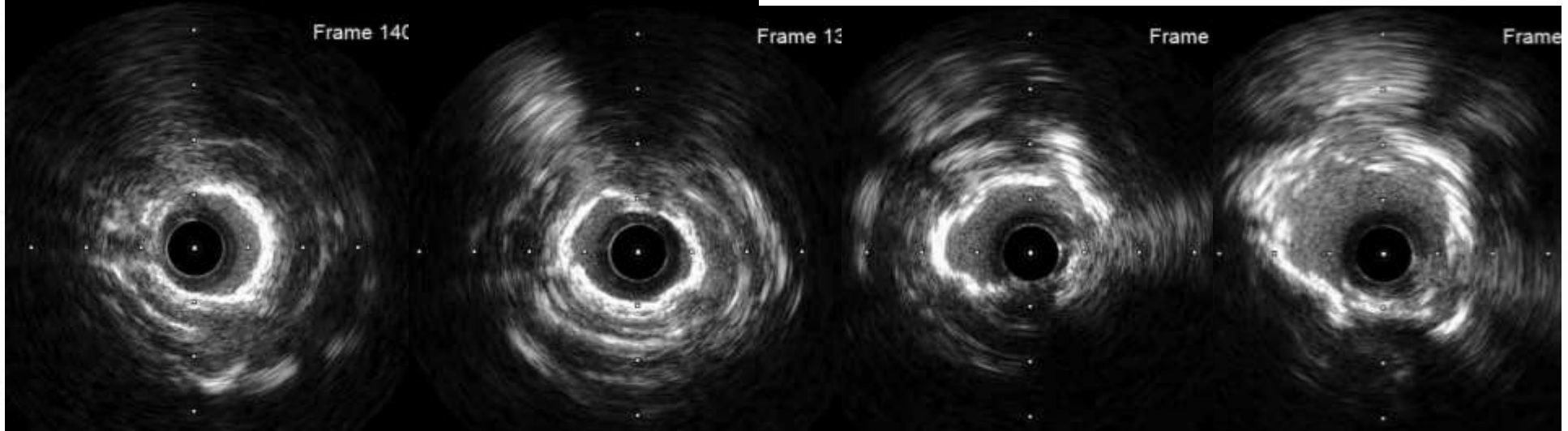
Selecthru NC 2.75(8) mm 24 atm

Selecthru NC 2.75(20) mm 20 atm**, upto 34 atm…Finally it was opened !**

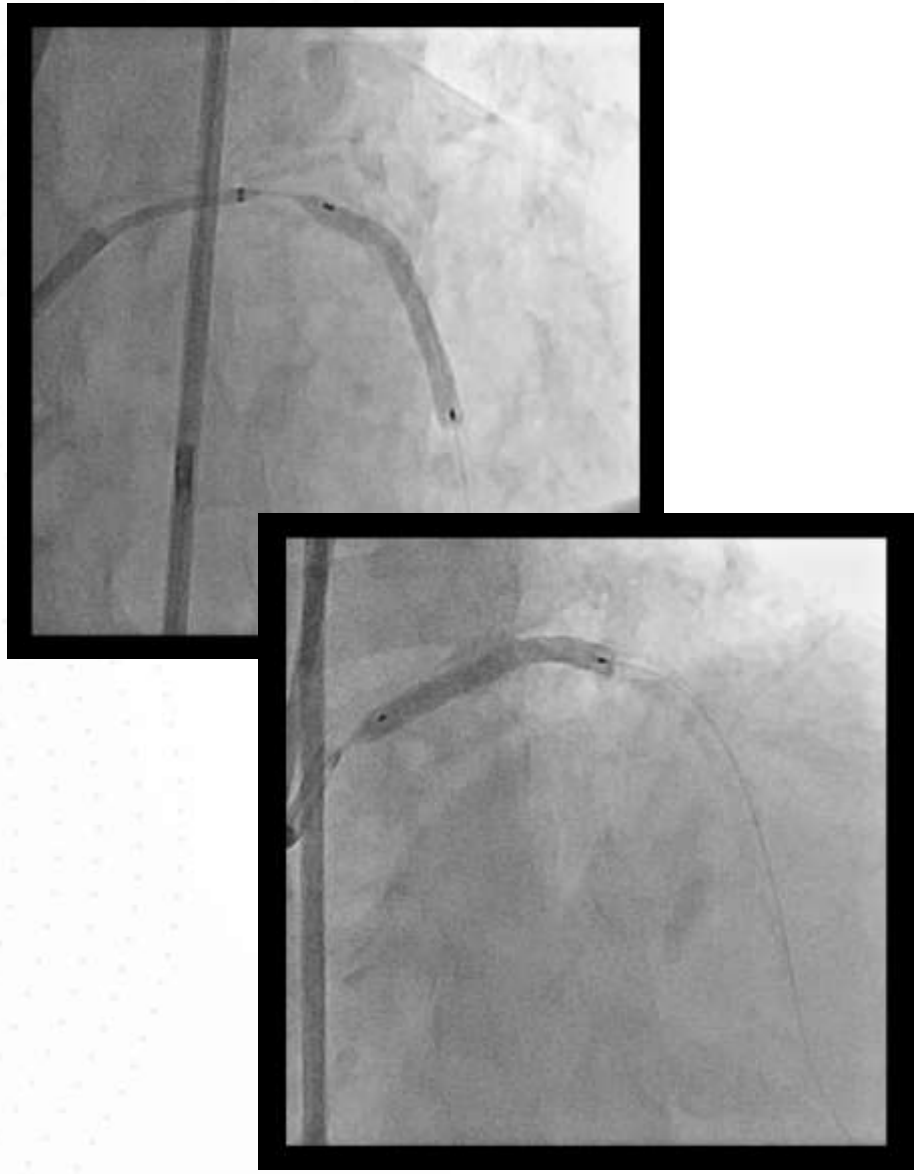




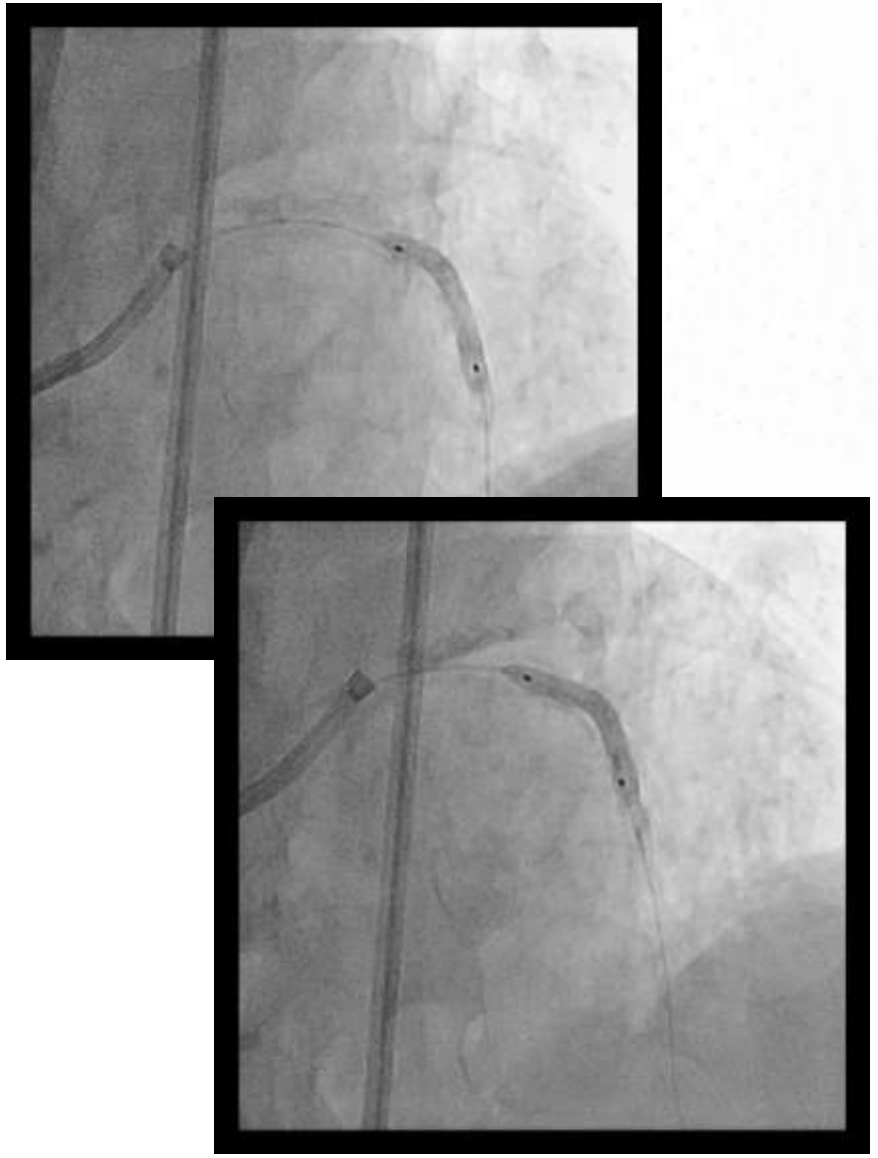
IVUS showed ring-like encircling heavy calcification With balloon-induced breakage

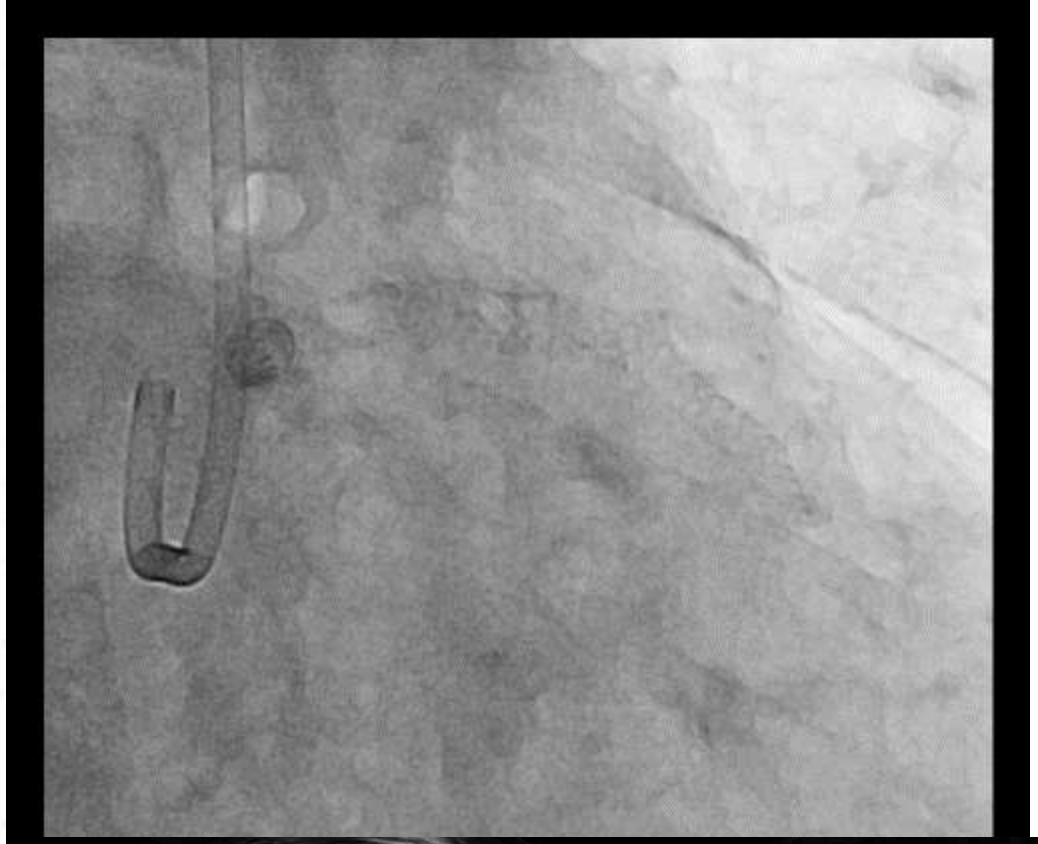


Xience Sierra 3.25(28) + 3.25(33mm)
Under Guidezilla back-up

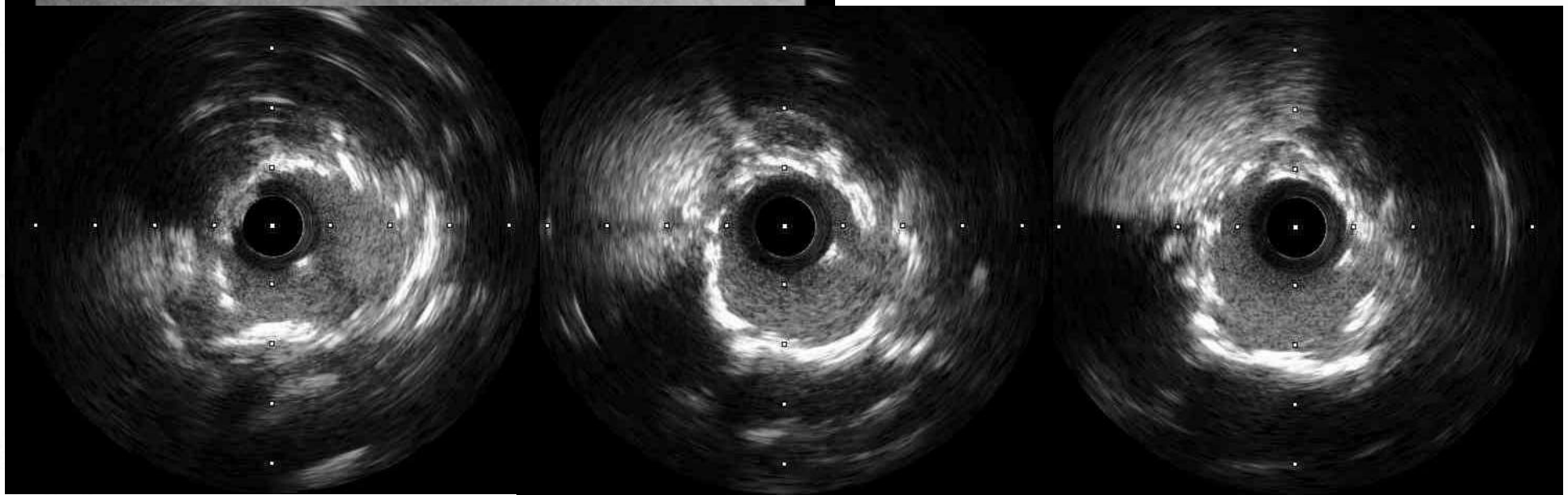


Post-dilation with
Emerge NC 2.75 (20mm) upto 24 atm &
Sapphire NC 4.5(10) upto 20 atm





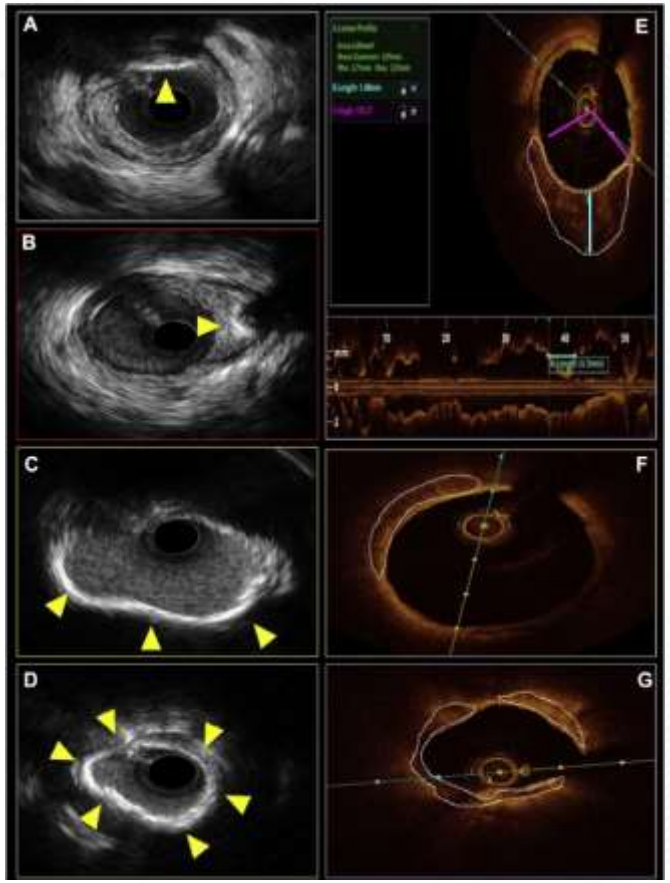
Final IVUS showed
Well-apposed stents with
MLA 6.8 mm^2 at mLAD.



Imaging for Calcified Lesion PCI

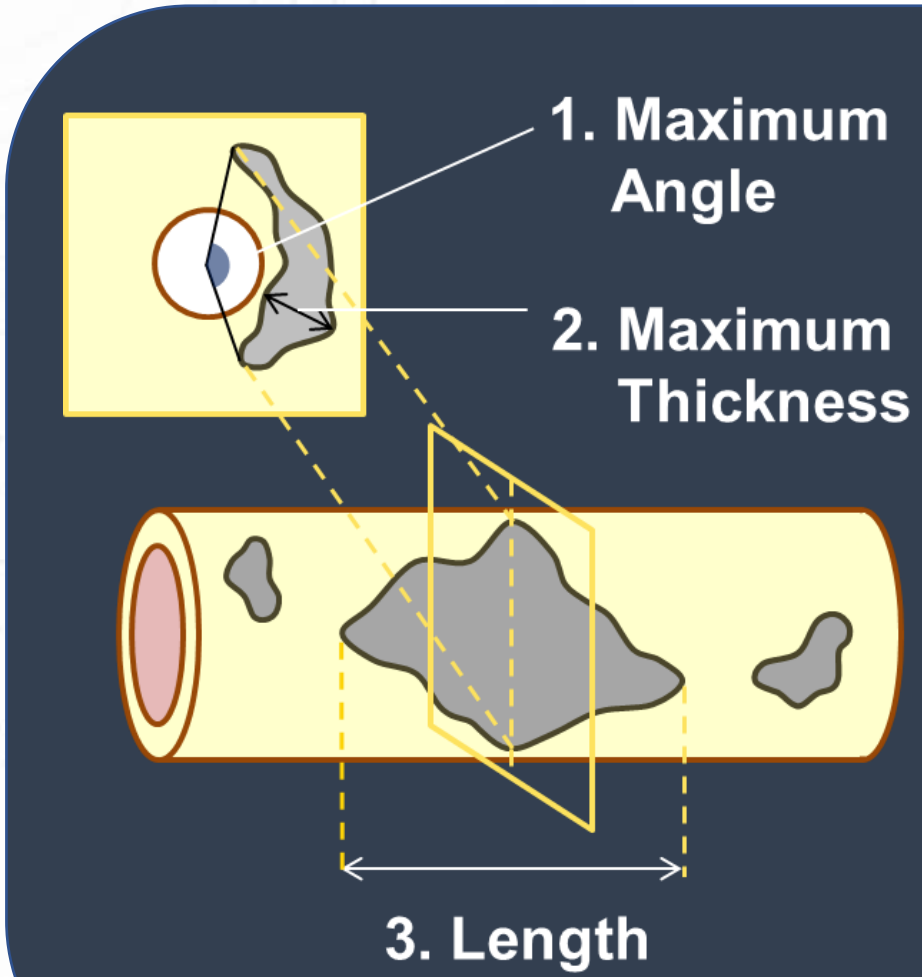
Diagnostic Accuracy	Angiography	IVUS	OCT
Severe LHCC	●●●	●●●	●●●
Mild/Moderate LHCC	●	●●	●●●
Deep calcium	●	●●●	●●
Calcium arch	✗	●●●	●●●
Calcium thickness	✗	✗	●●●
Longitudinal calcium length	✗	●	●●●
Non-homogeneous plaque / Necrotic core	✗	●●●	●

●●● Optimal ●● Moderate ● Modest



De Maria GL et al. JACC Intervention 2019;12:1465-78.

Calcium Scoring System by Intrcoronary Imaging



OCT-based CVI Score	
Angle	≤ 180° ➡ 0 point > 180° ➡ 2 points
Thickness	≤ 0.5 mm ➡ 0 point > 0.5 mm ➡ 1 point
Length	≤ 5.0 mm ➡ 0 point > 5.0 mm ➡ 1 point
Total score: 0 to 4 points	

Fujino A et al. EuroIntervention. 2018;13:e2182-9.

Calcium Scoring System by Intrcoronary Imaging

Angiographic calcium ?

Yes ↓

IVUS: Maximum Calcium >270° ?

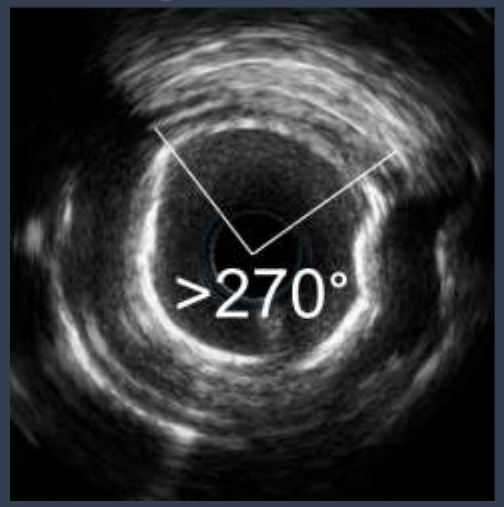
Yes ↓

Calcium Score Calculation: 0~4, if ≥2?

Yes = Point 1, No = Point 0 ↓

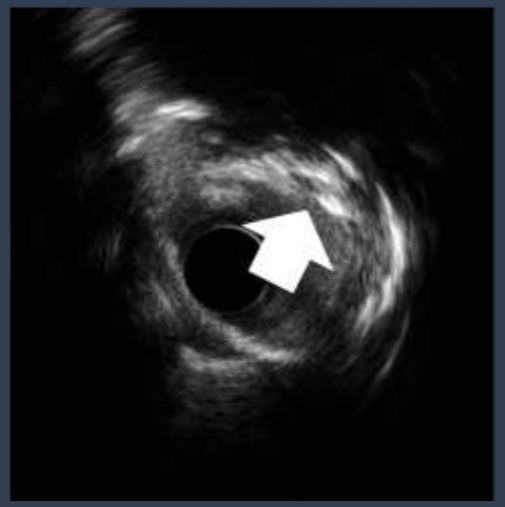
Consider atherectomy

Calcium >270° longer than 5mm?

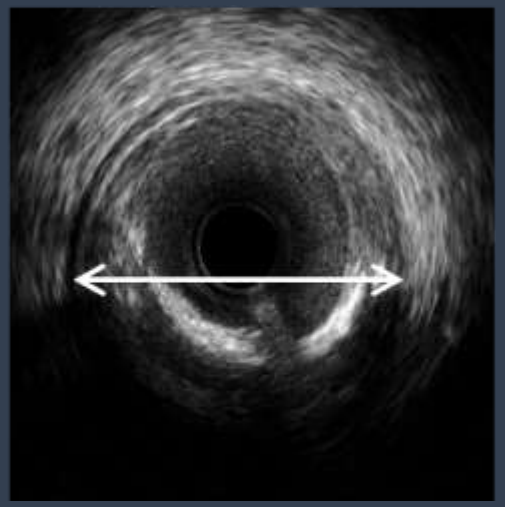


360° of calcium?

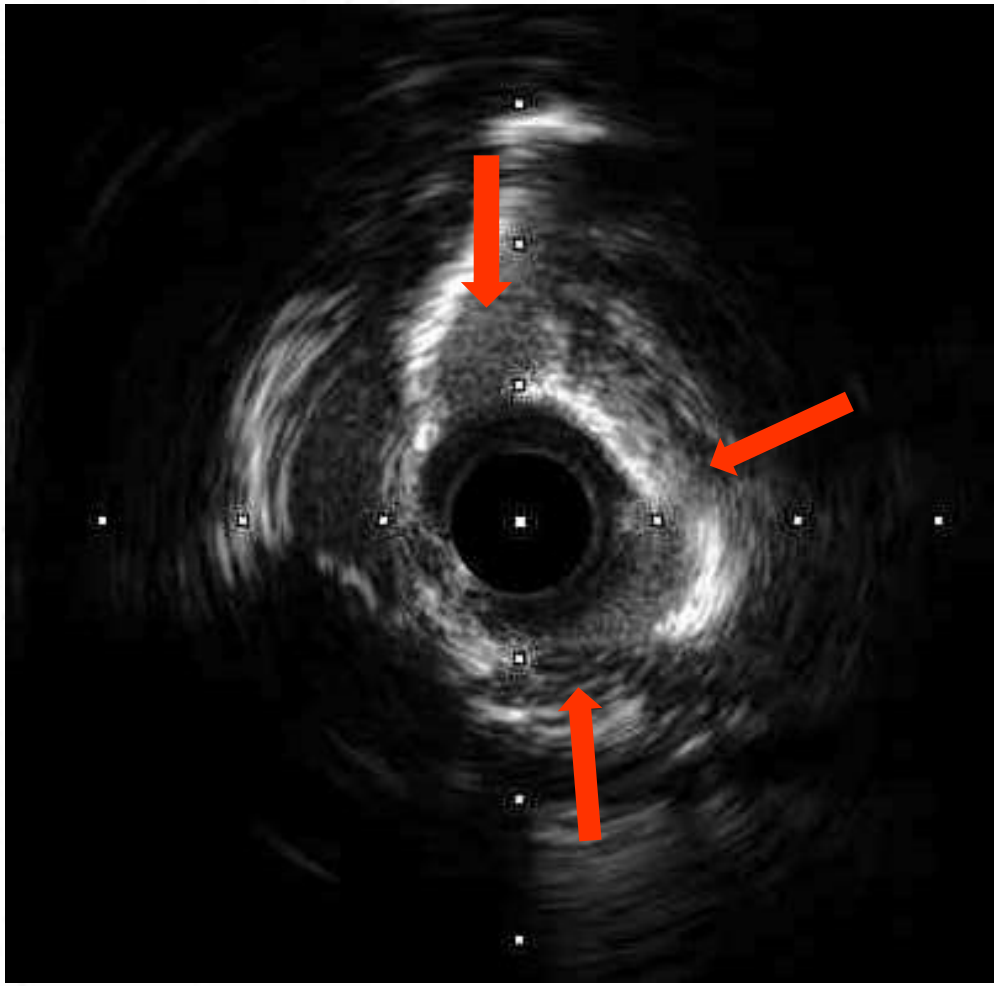
Calcified nodule?

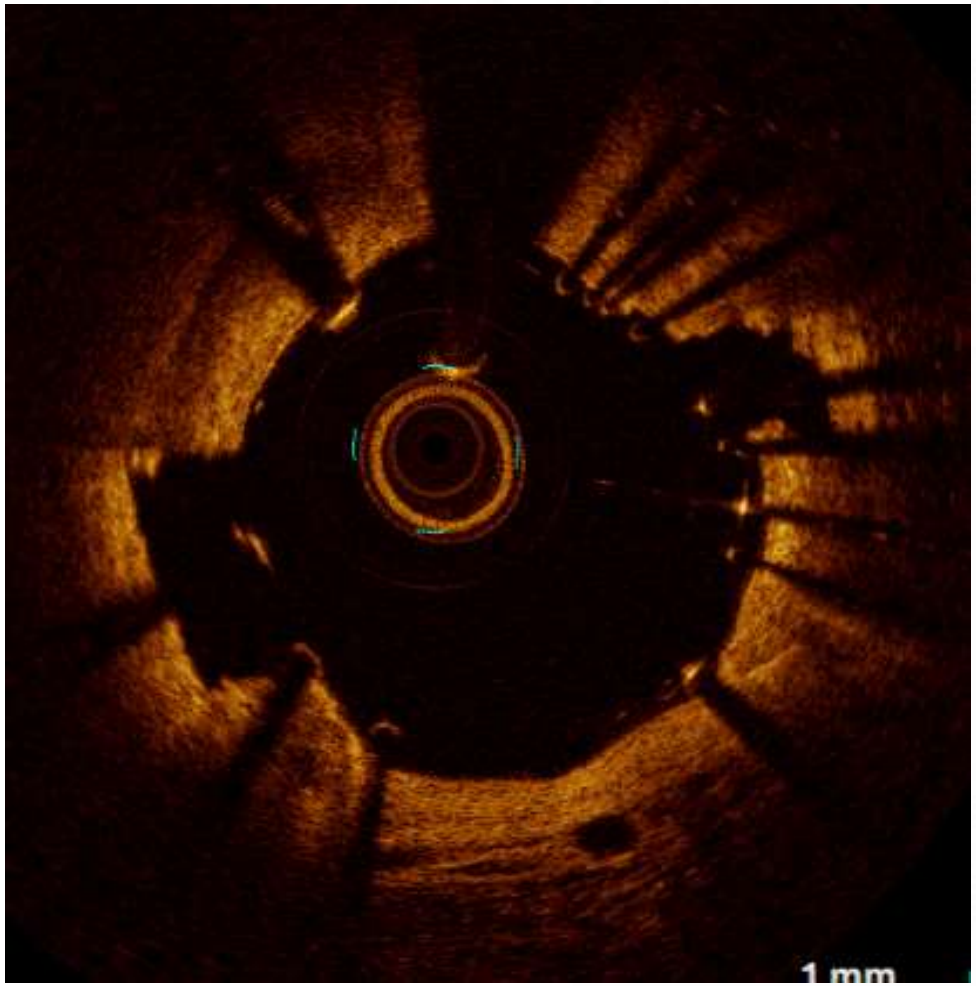


Vessel diameter <3.5mm ?



Check the Calcium Breakage

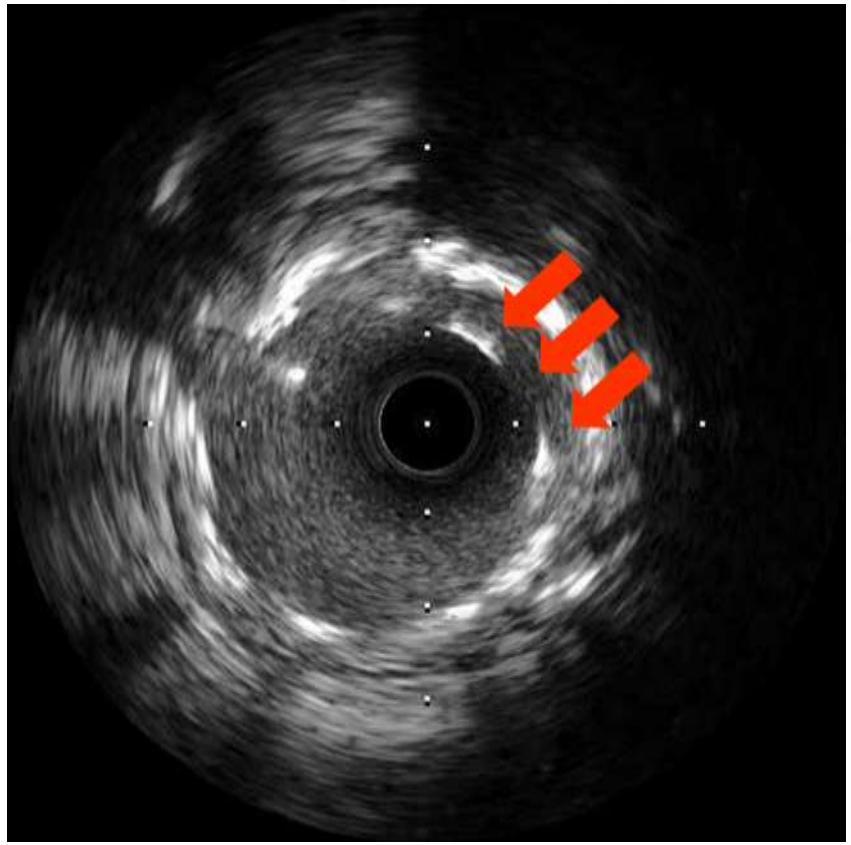




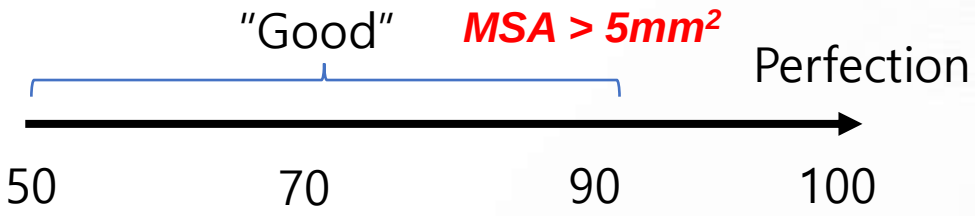
Vessel Size by Imaging

Perforation

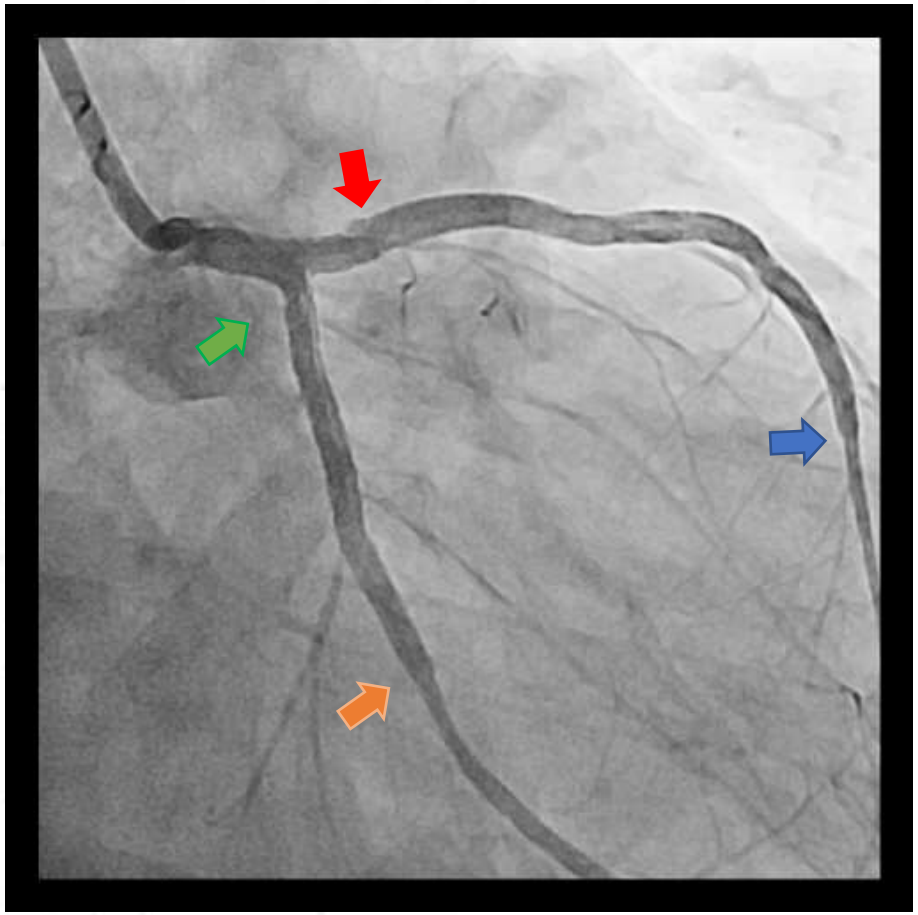
Underexpansion or Malapposition

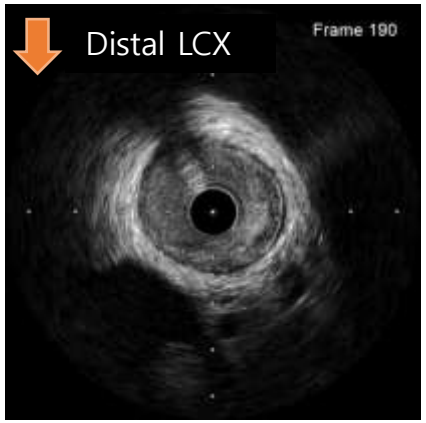


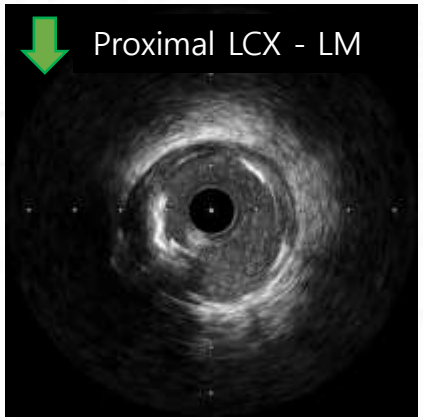
Perfection is the Enemy of Good

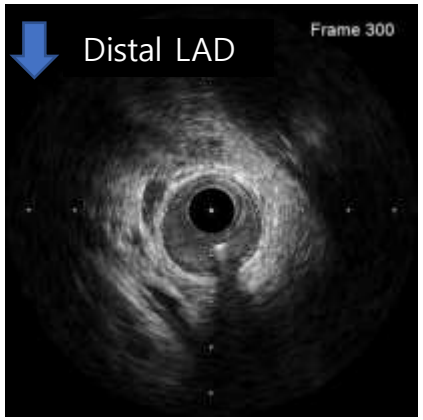


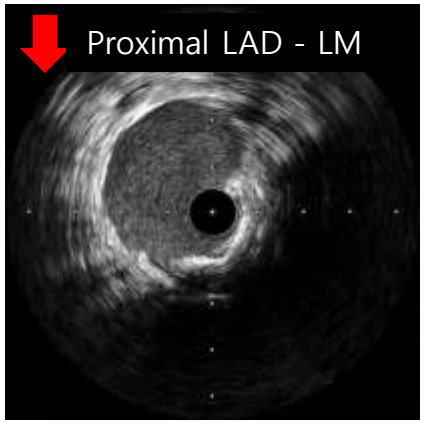
Post-IVUS Surveillance



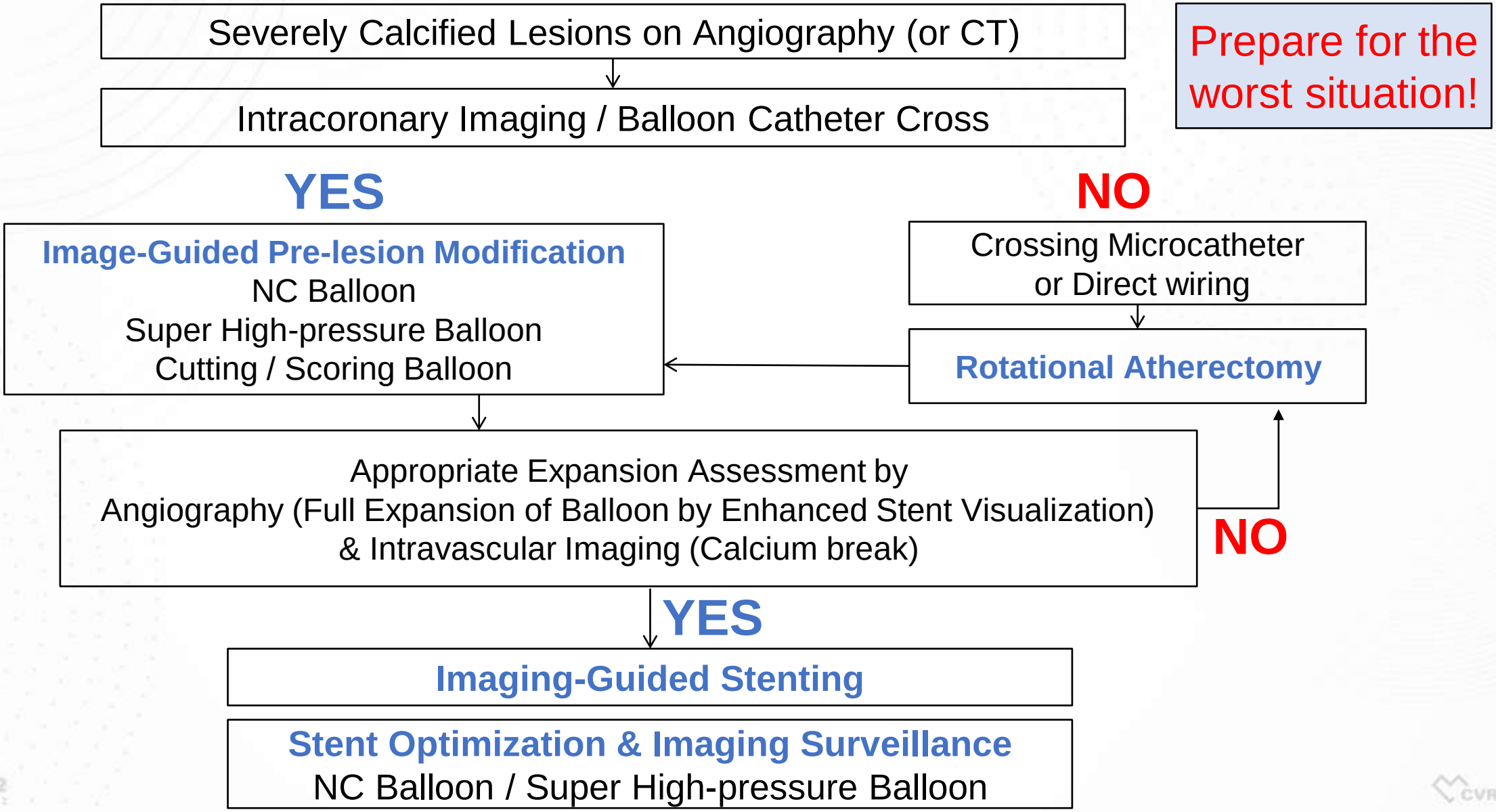








My Practical Approach to Calcified Lesions



Summary : Practical Approach to the Calcified Lesion PCI

- Always, Prepare for the Worst Situation.
- Intracoronary Imaging is helpful to plan the strategy, guide the procedure, and finalize the result.
- Prepare the lesion before stenting with every effort you can.
- Please take care of post-stent optimization, also.
- Safety is the first. Do Not Oversize too much.