

Practical Approach to the Calcified Lesion PCI

When Do We Have to Consider **Rotational Atherectomy?**

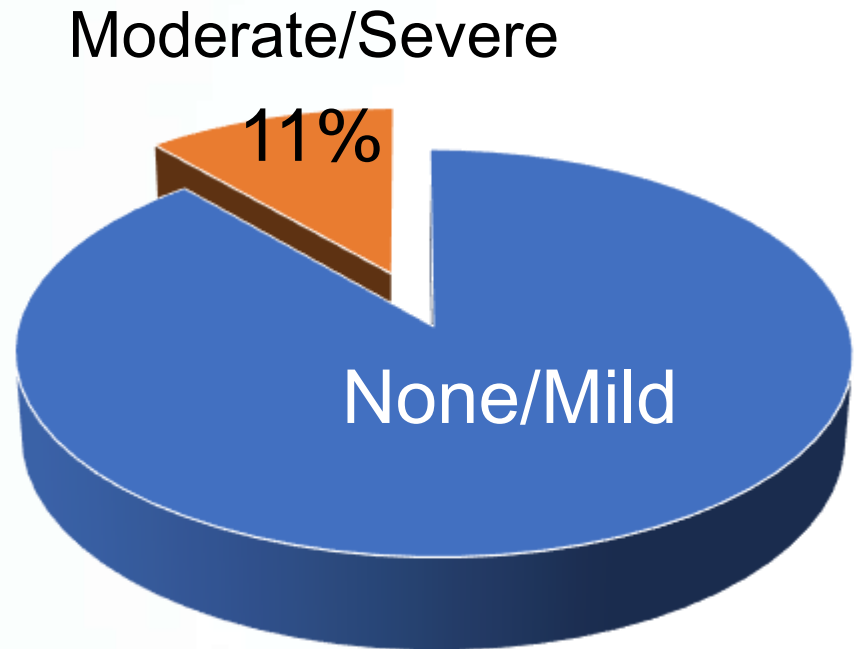
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Heart Institute, Asan Medical Center, Seoul, Korea**

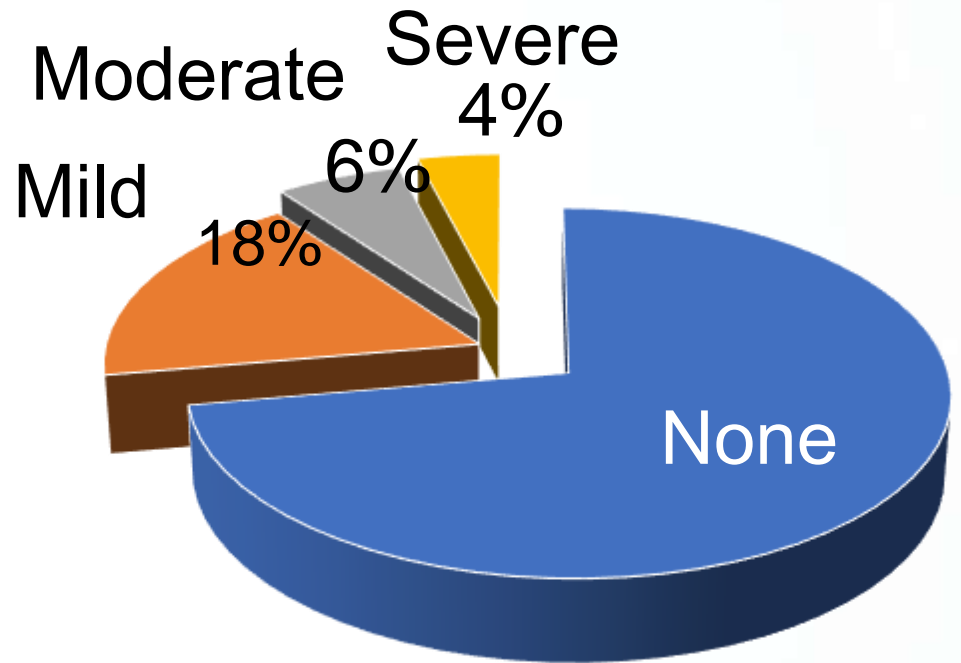
Disclosure

- I, Do-Yoon Kang, DO NOT have a conflict of interest related to this presentation.

Prevalence of Calcium by Angiographic severity from IRIS-DES Registry



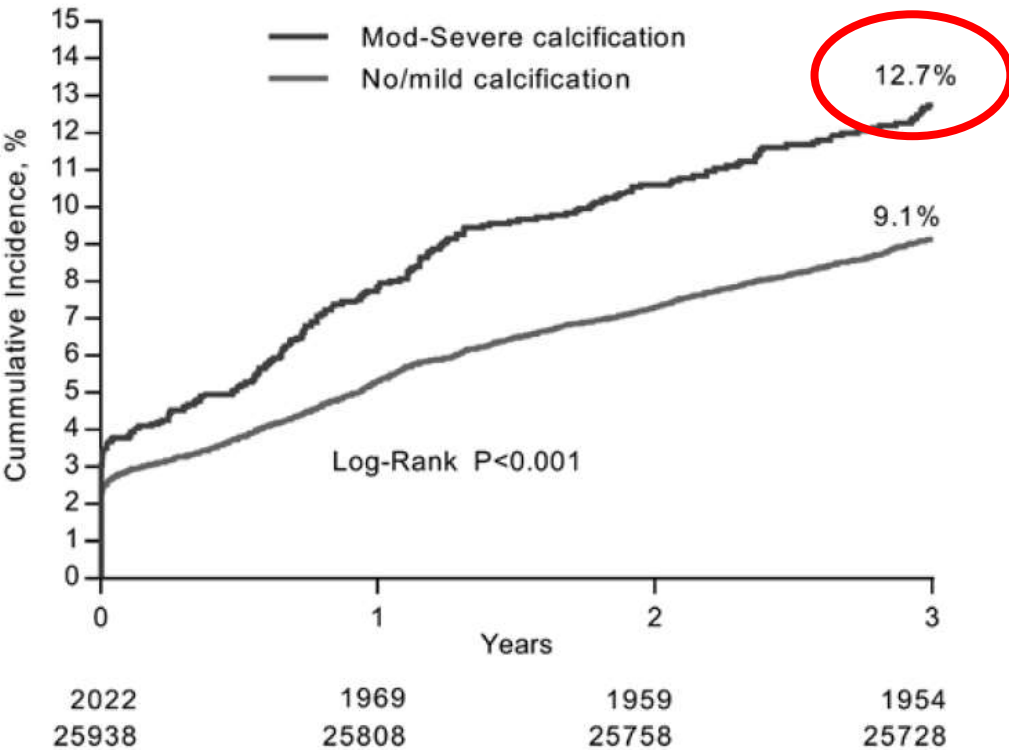
Number of Patient



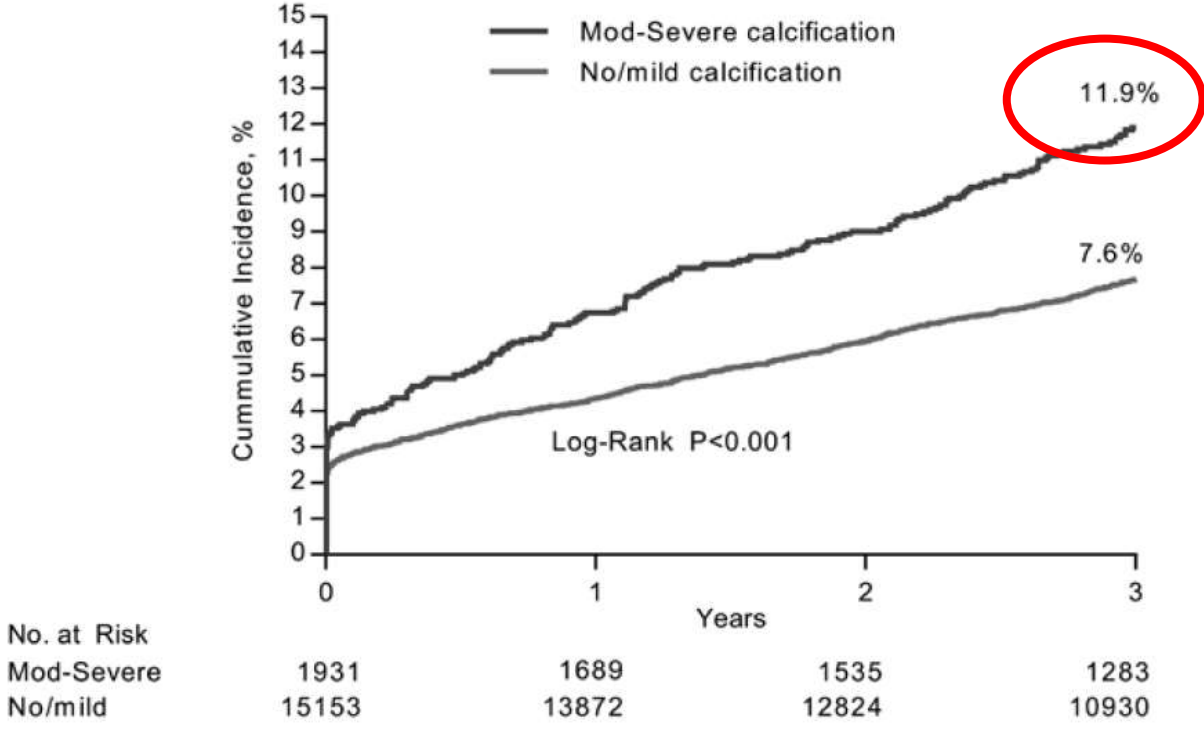
Number of Lesion

Clinical Outcome by Angiographic Calcium Severity from IRIS-DES Registry

Target-vessel failure



Death or Myocardial infarction



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*

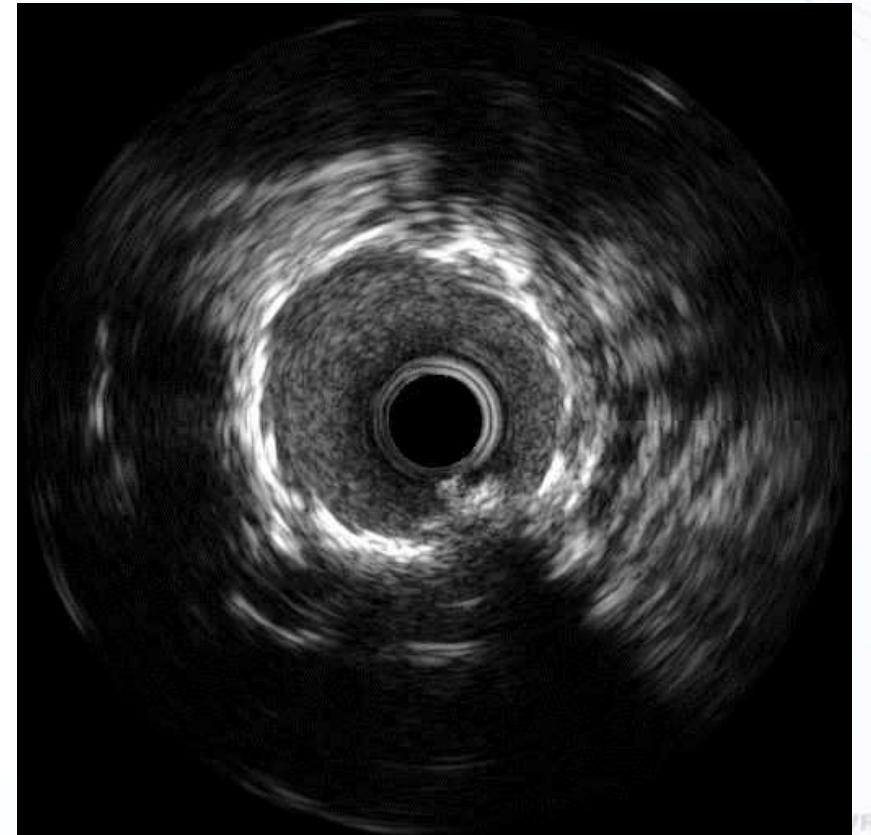
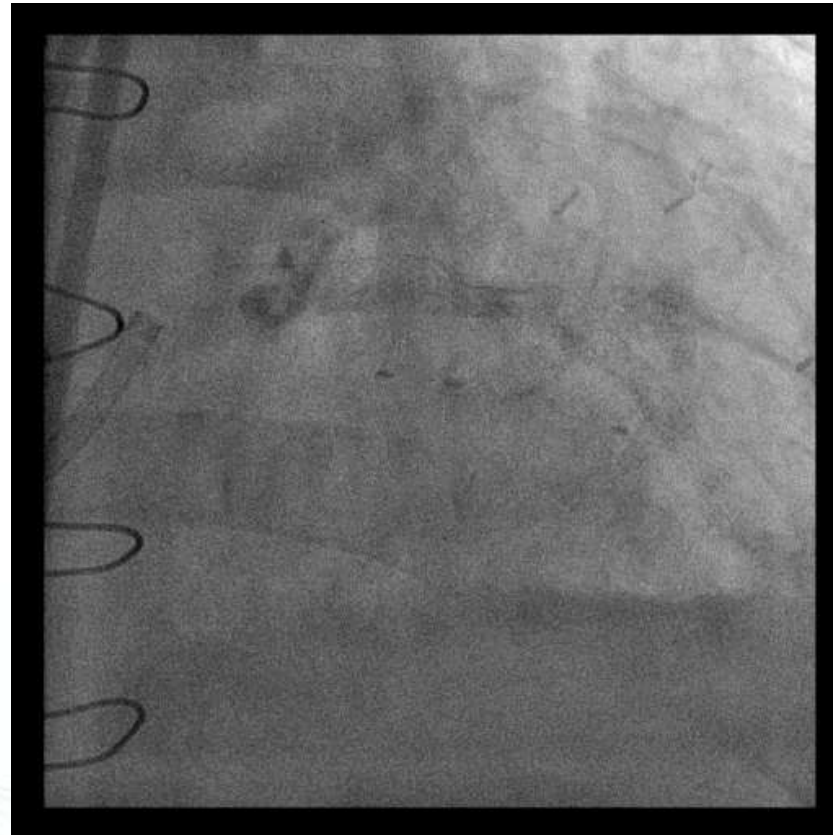
Always Prepare for the Worst Situation

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

PCI for Heavily Calcified Lesion

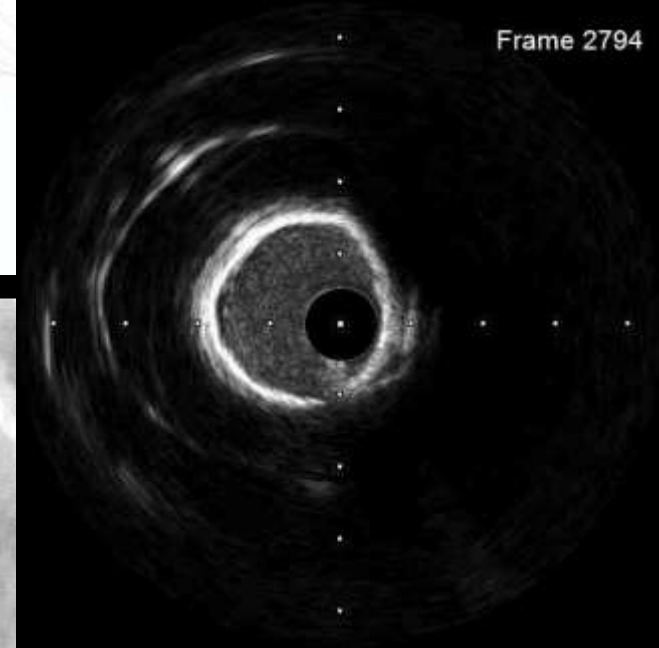
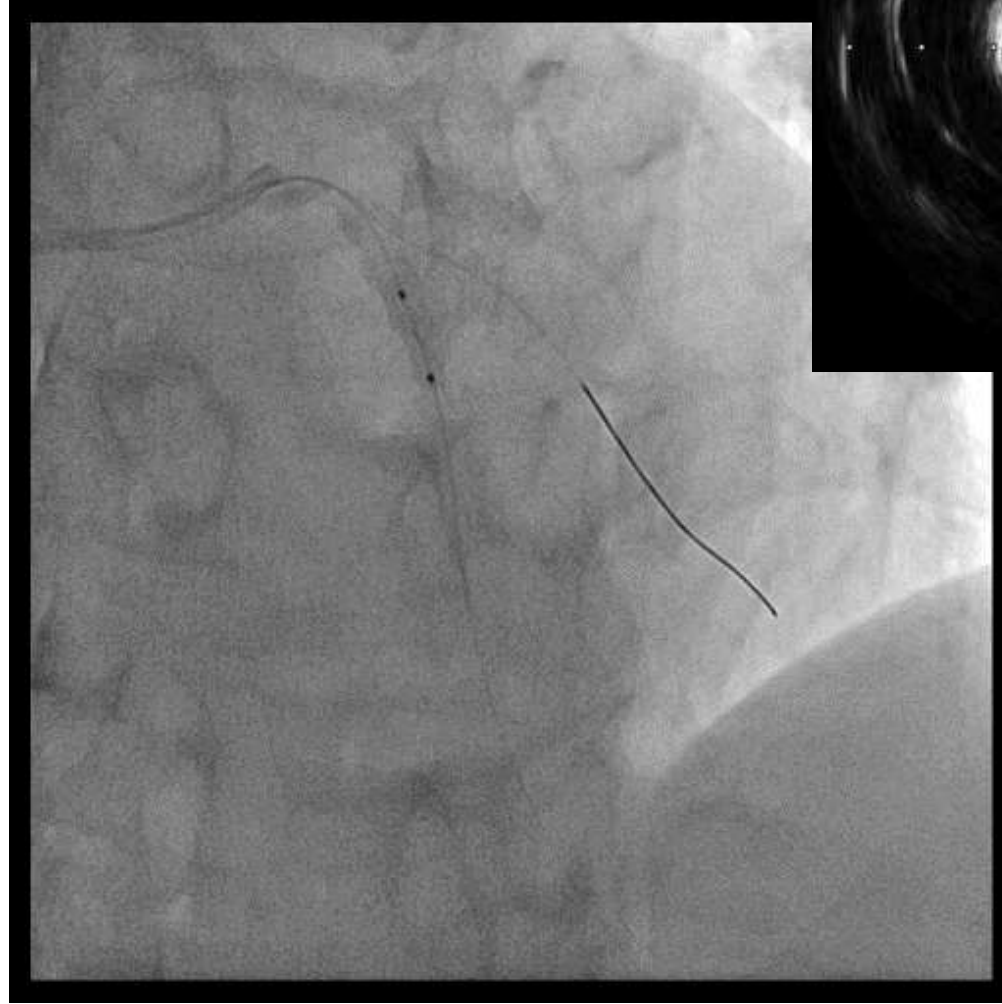
1. Lesion preparation
2. Lesion preparation
3. Lesion preparation

Do not Stent on Poorly Prepared Calcification



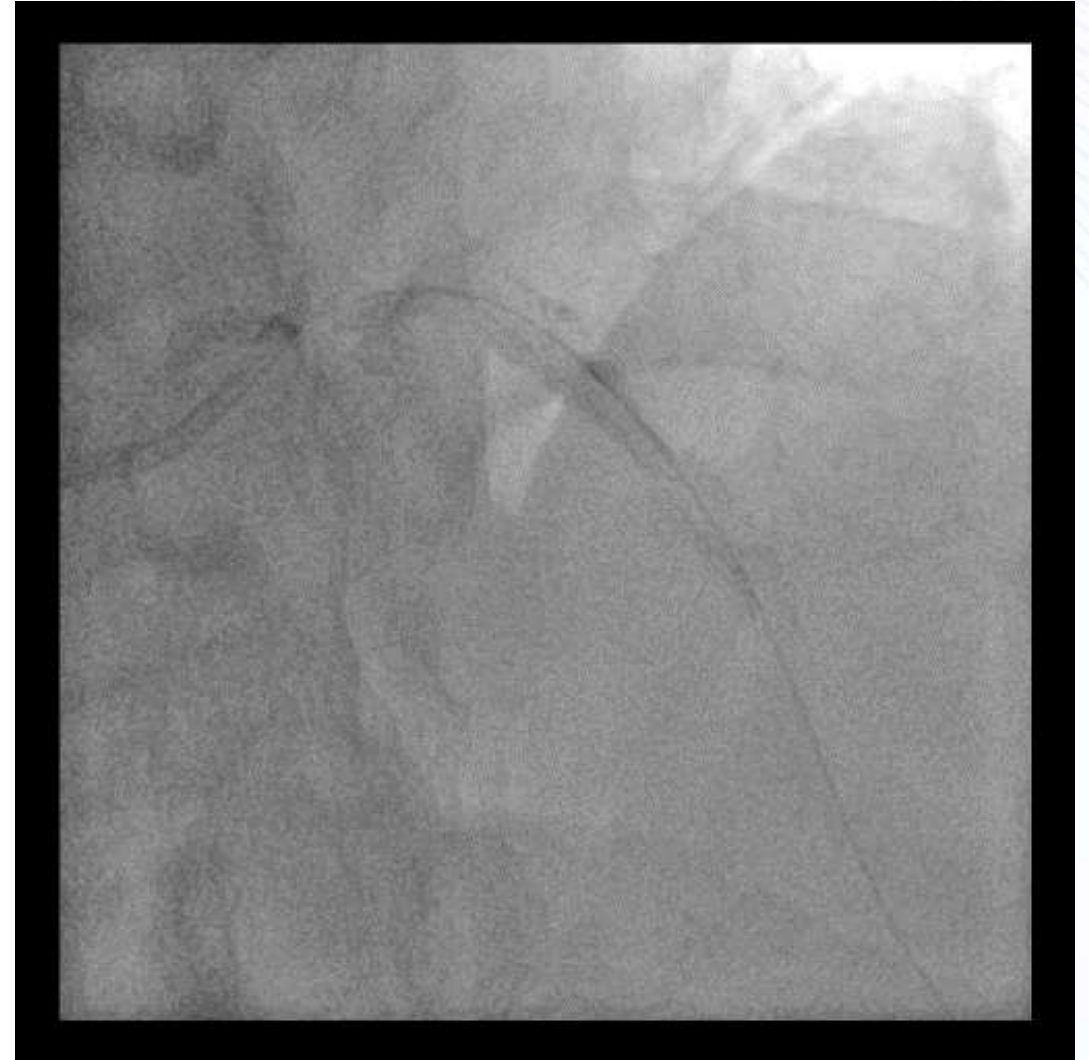
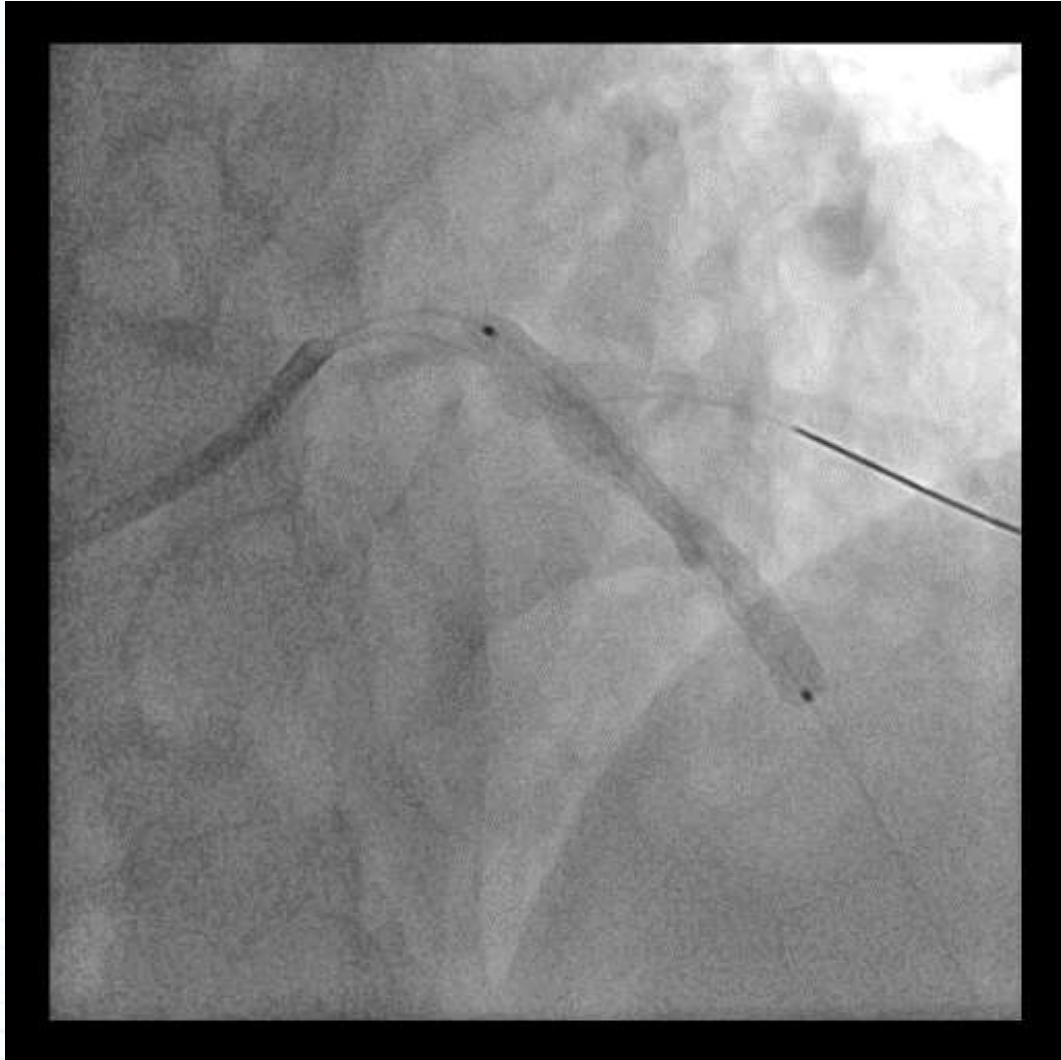
**Never Put the Stent
Before Optimal Lesion Preparation !**

65/M, Stable Angina, DM



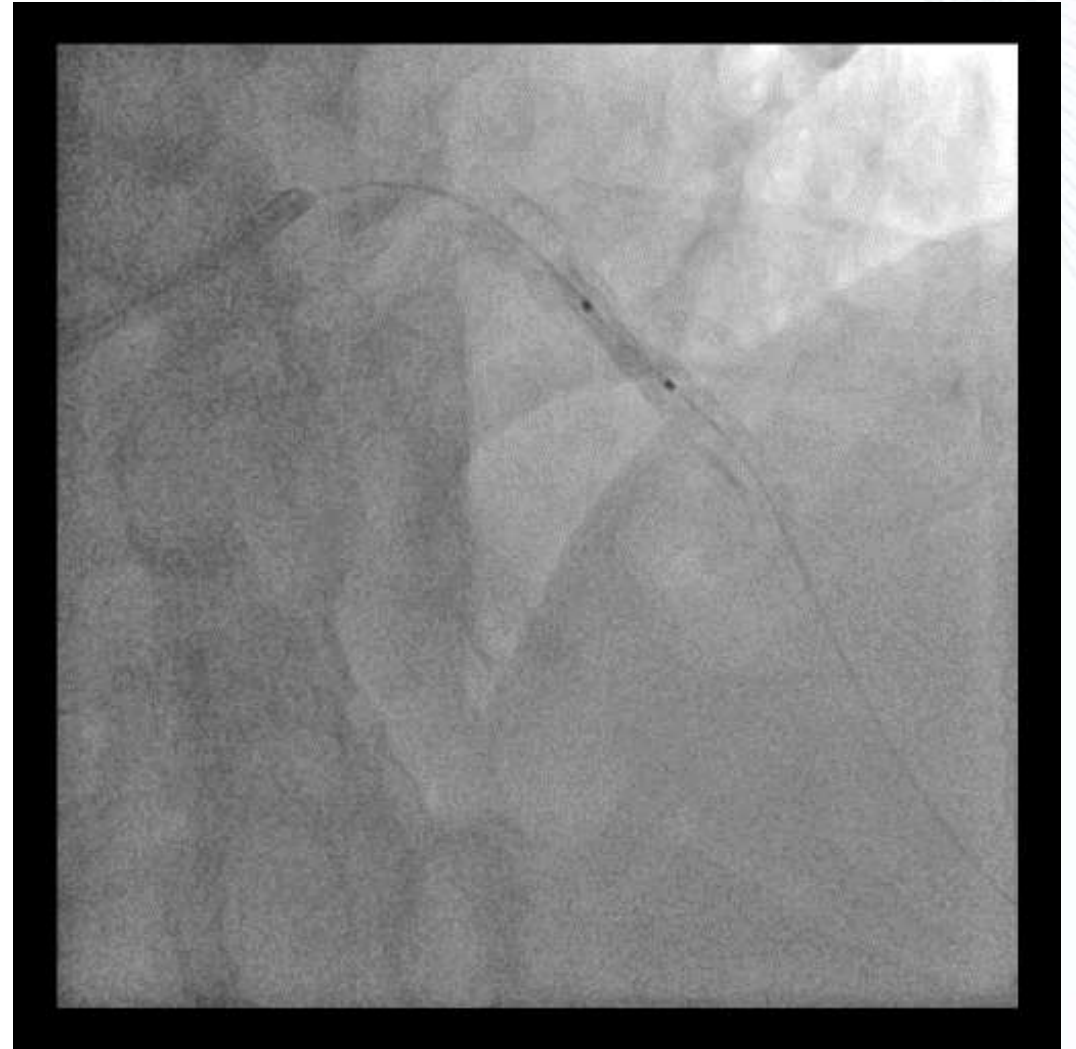
2.5 compliant balloon followed by Cutting 3(10) upto 16 atm

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



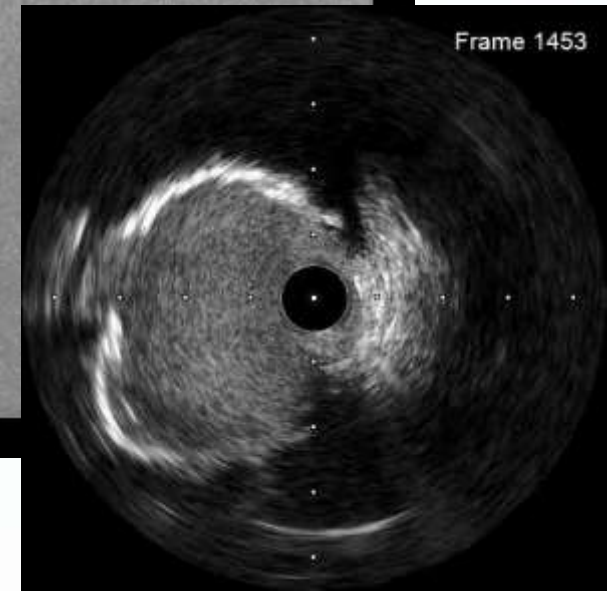
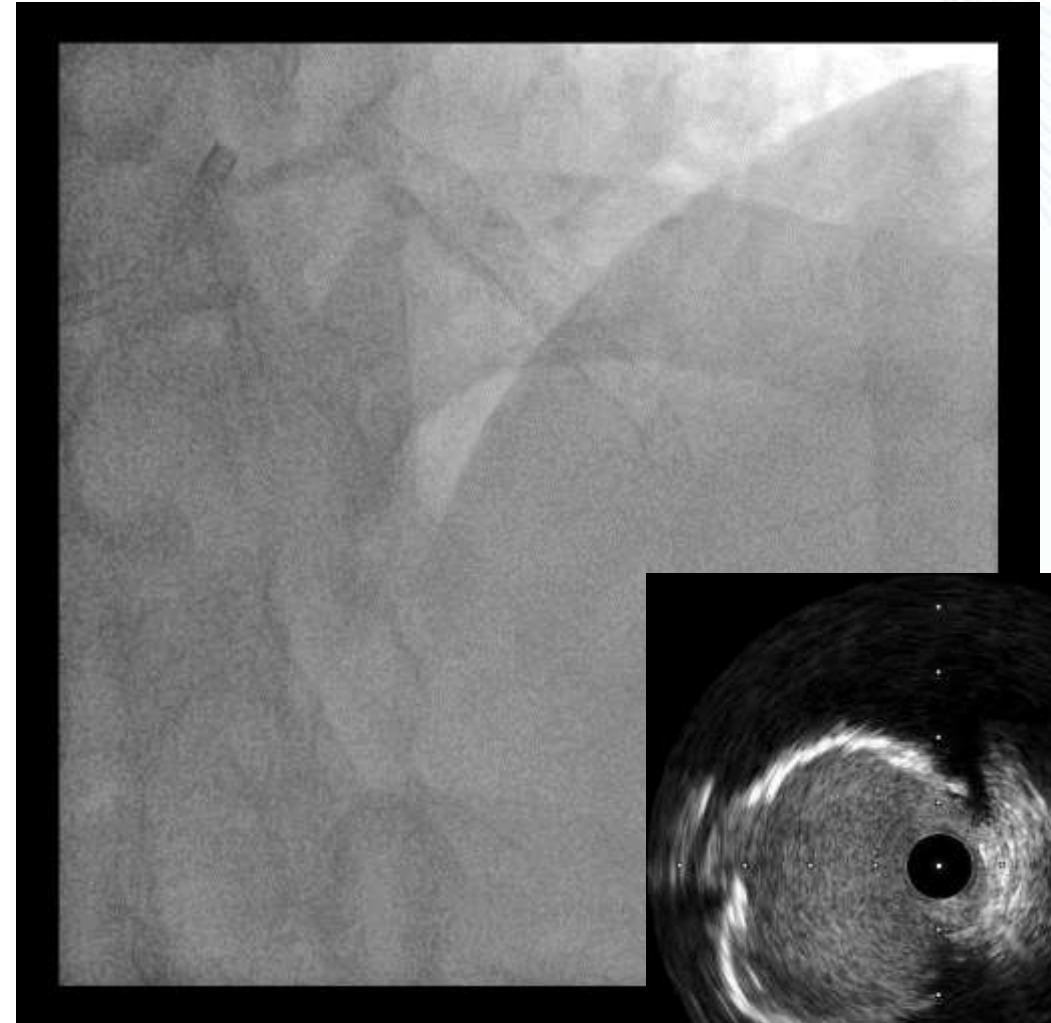
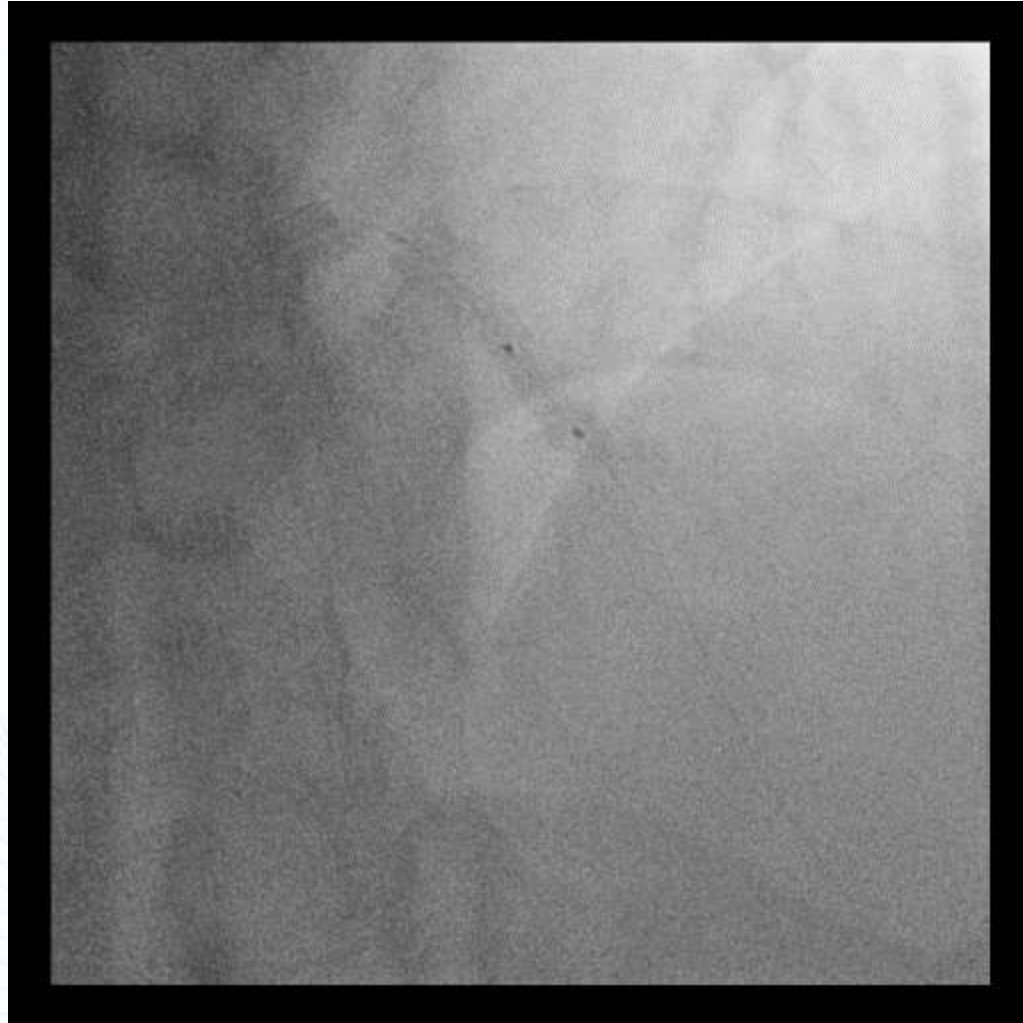
3.5(38) DES at 10 atm

Stent Does Not Expand



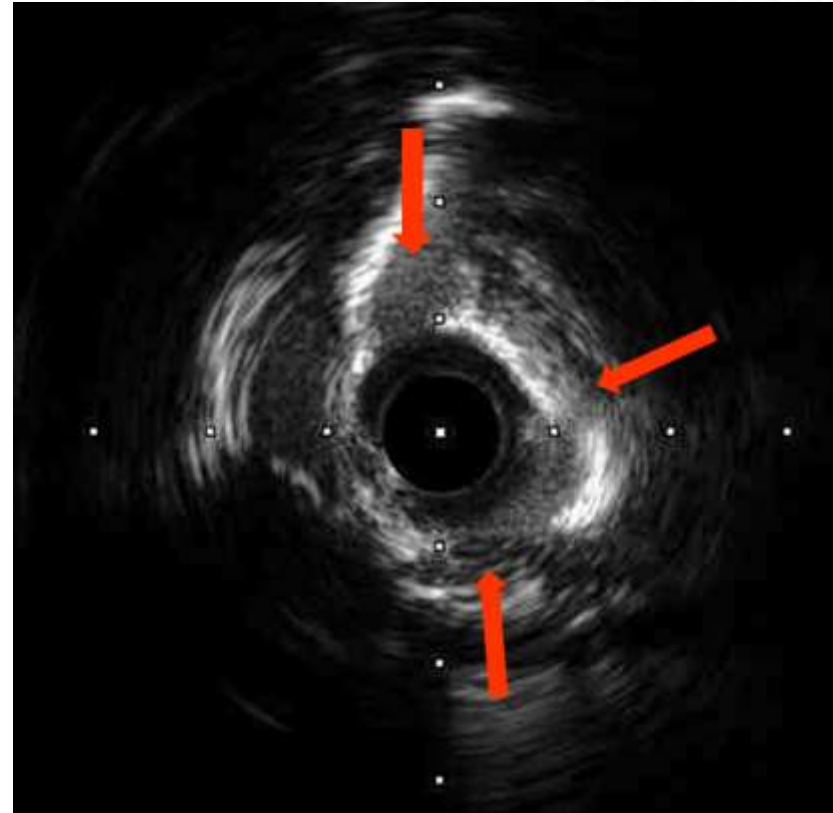
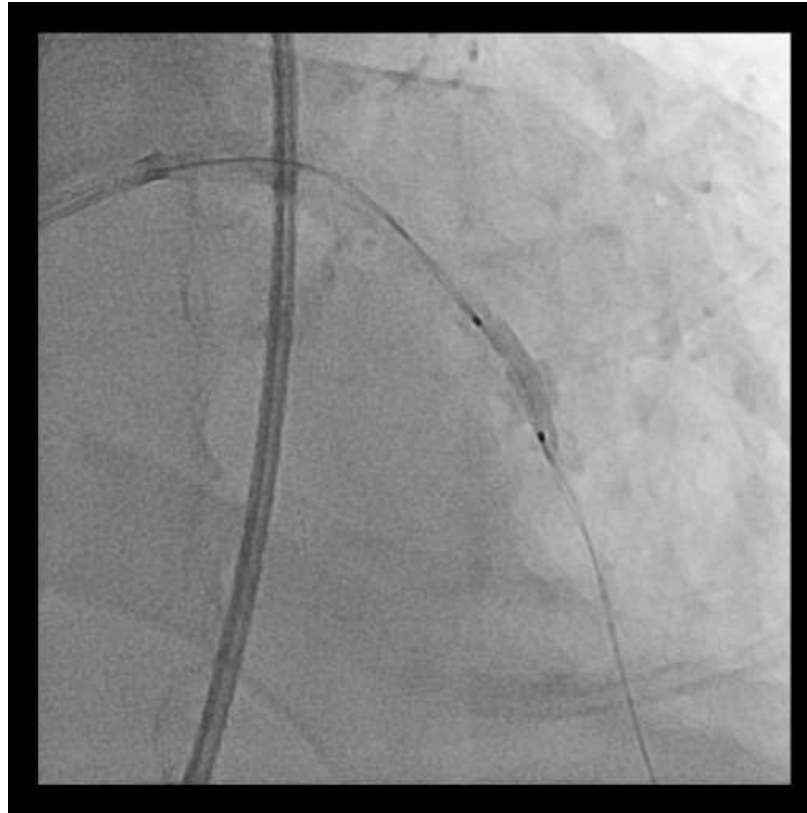
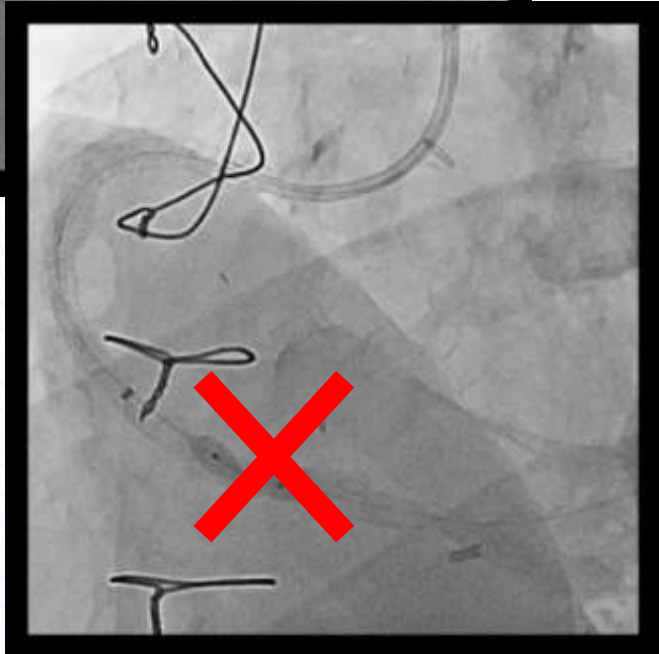
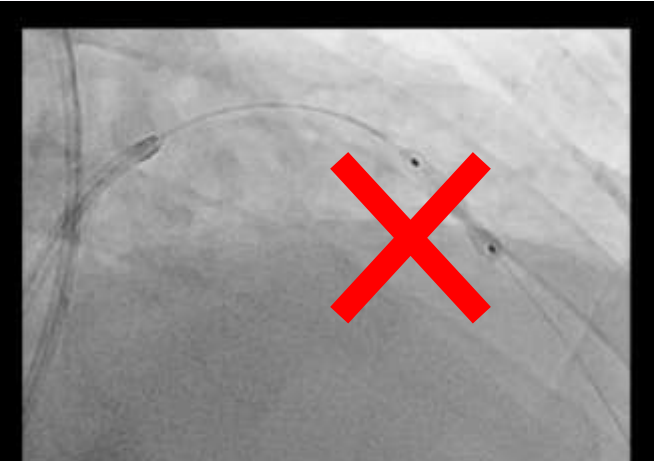
3.5(15), 3.75(10) NC Balloon at 30 atm 

Finally Expanded with Very High-pressure Balloon



Selectthru NC 4.0 (10) at 34 atm

Confirm the Calcium Breakage



Weapons for Calcified Lesions

- High-pressure balloon
- Cutting / Scoring balloon
- **Rotational Atherectomy**
- Orbital atherectomy
- Laser atherectomy
- Intravascular lithotripsy

When, **Rotational Atherectomy?**

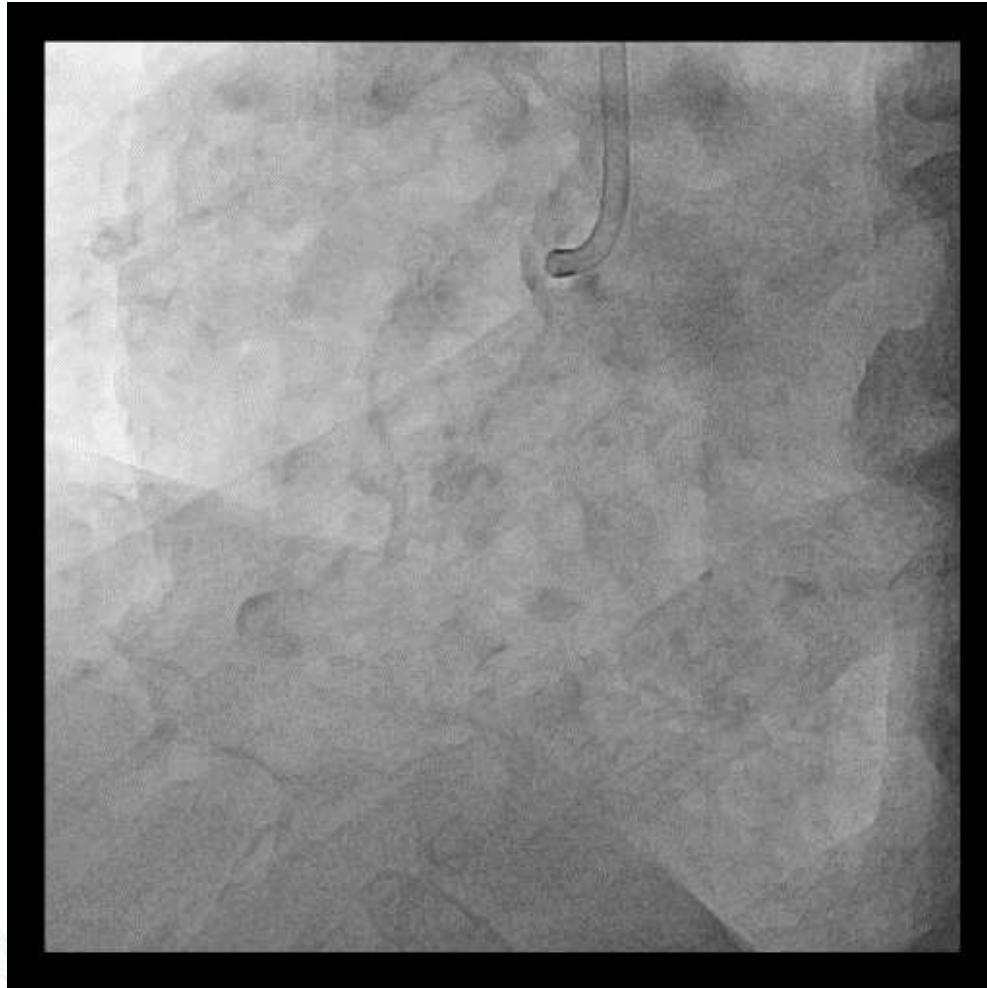
When, Rotational Atherectomy?

1. Balloon or IVUS Catheter Failure to Pass,

When, Rotational Atherectomy?

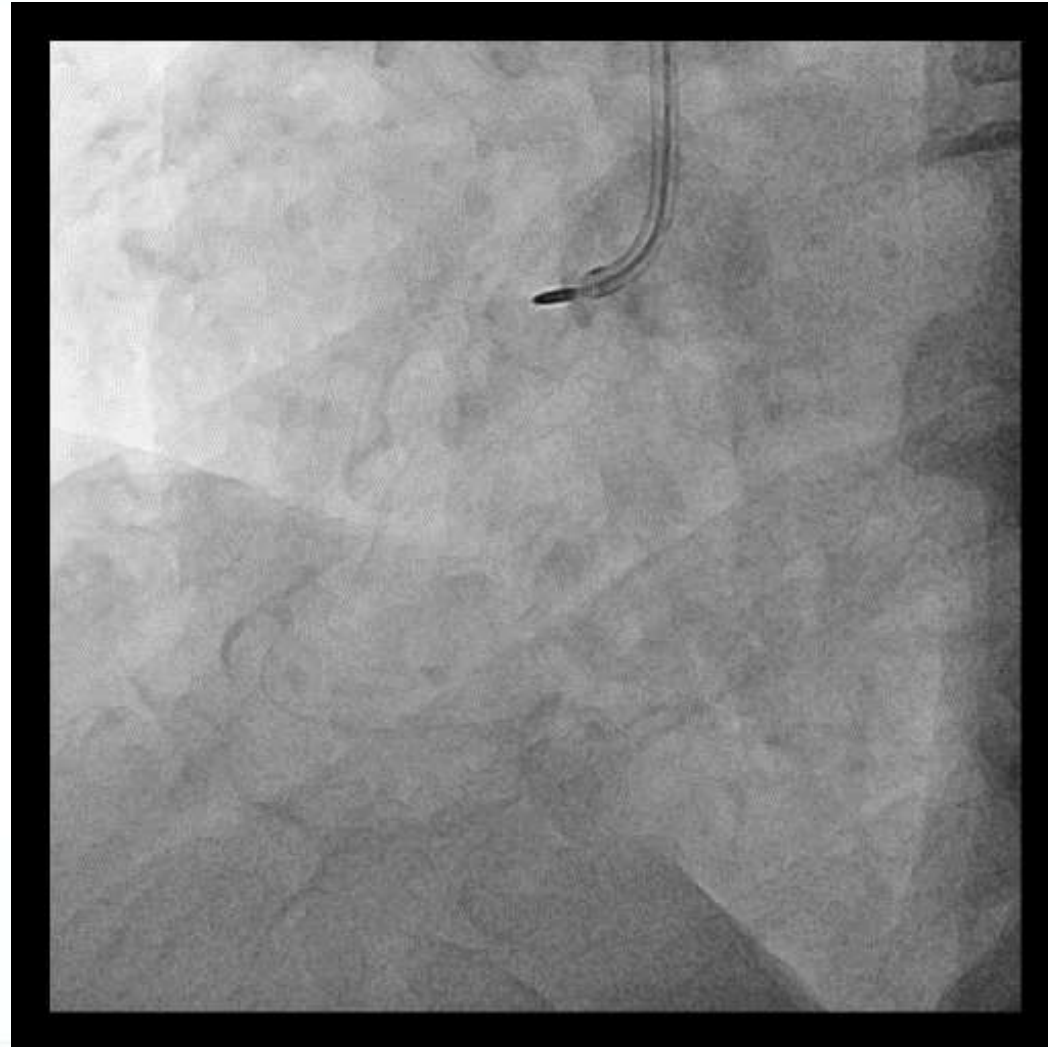
1. Balloon or IVUS Catheter Failure to Pass,
2. Undilatable Lesion,

75YO Woman with effort angina

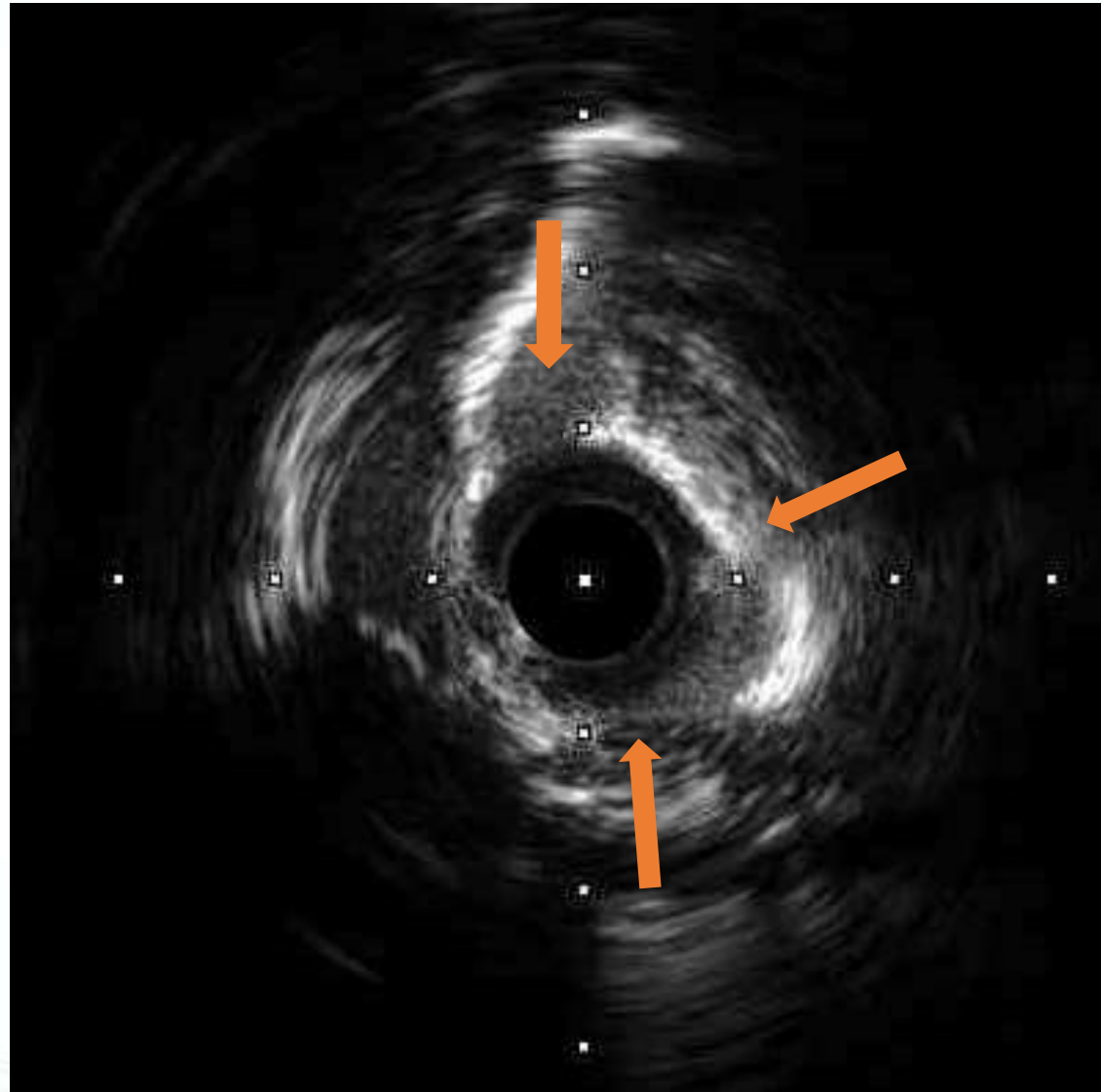


IVUS / Balloon catheter failed to pass severely calcified prox RCA lesion.

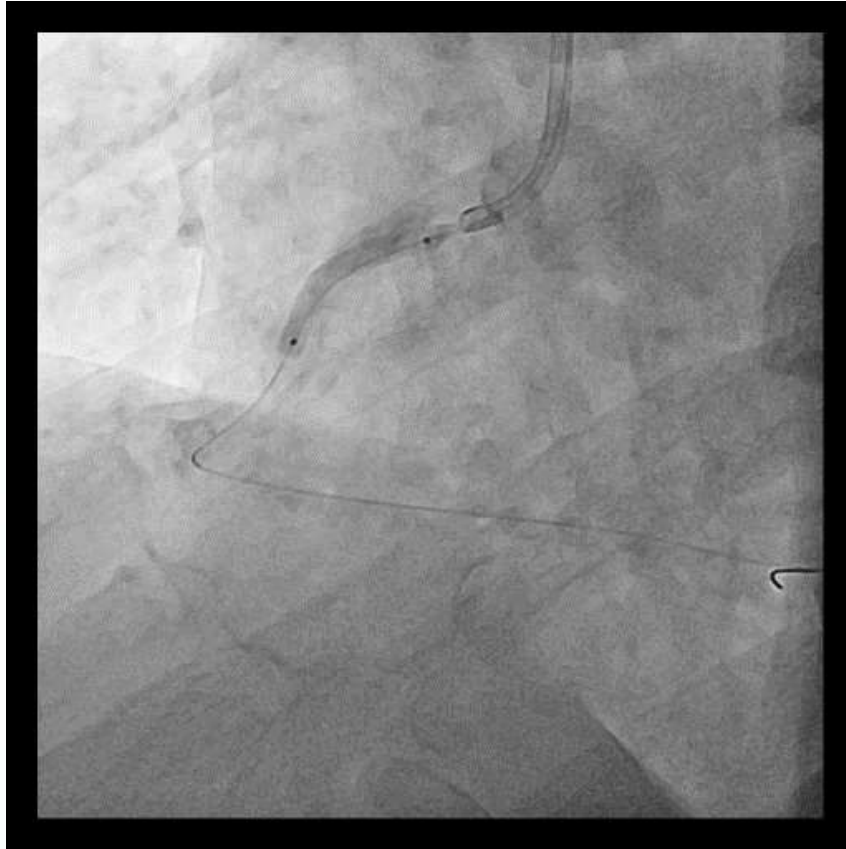
Rota with 1.25 and 1.5 mm Burr with Atropine Premedication



Calcium Fracture by Rotablation



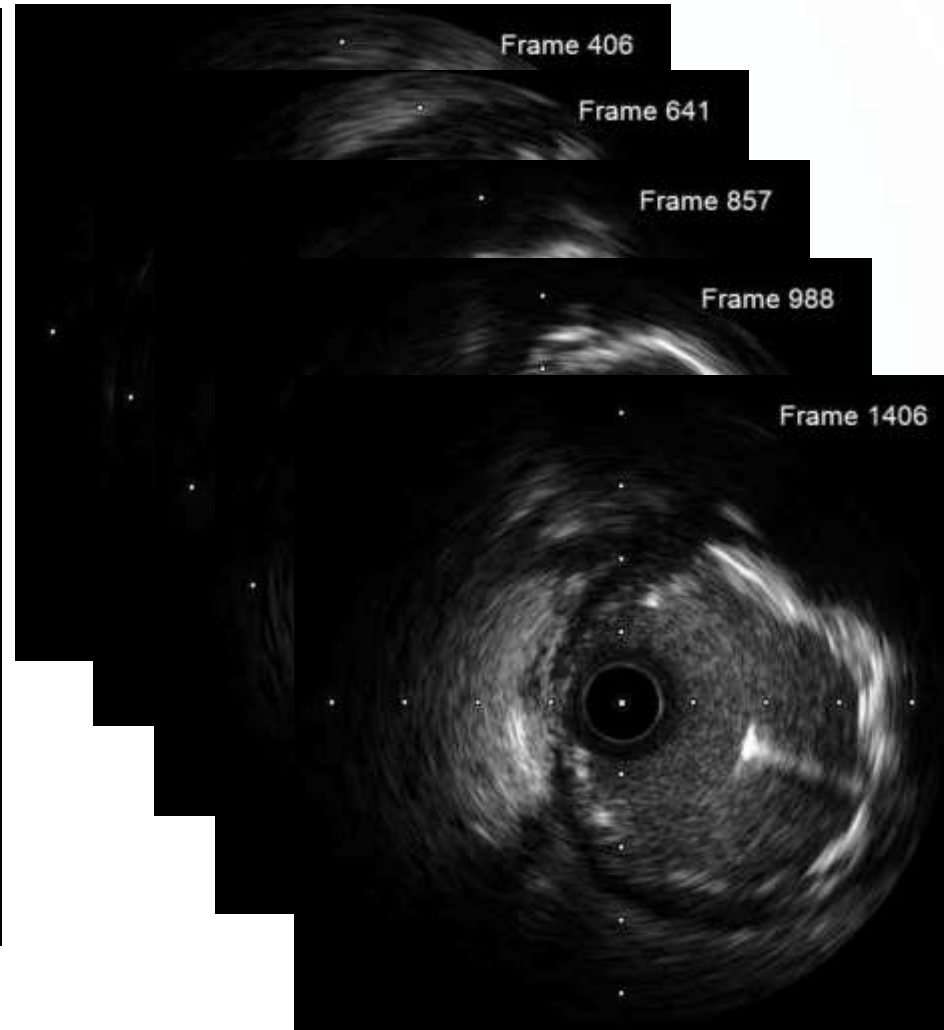
NC 3.0 (20mm)
upto 20 atm



DES 4.0 (28mm)
NC 4.0 upto 24 atm



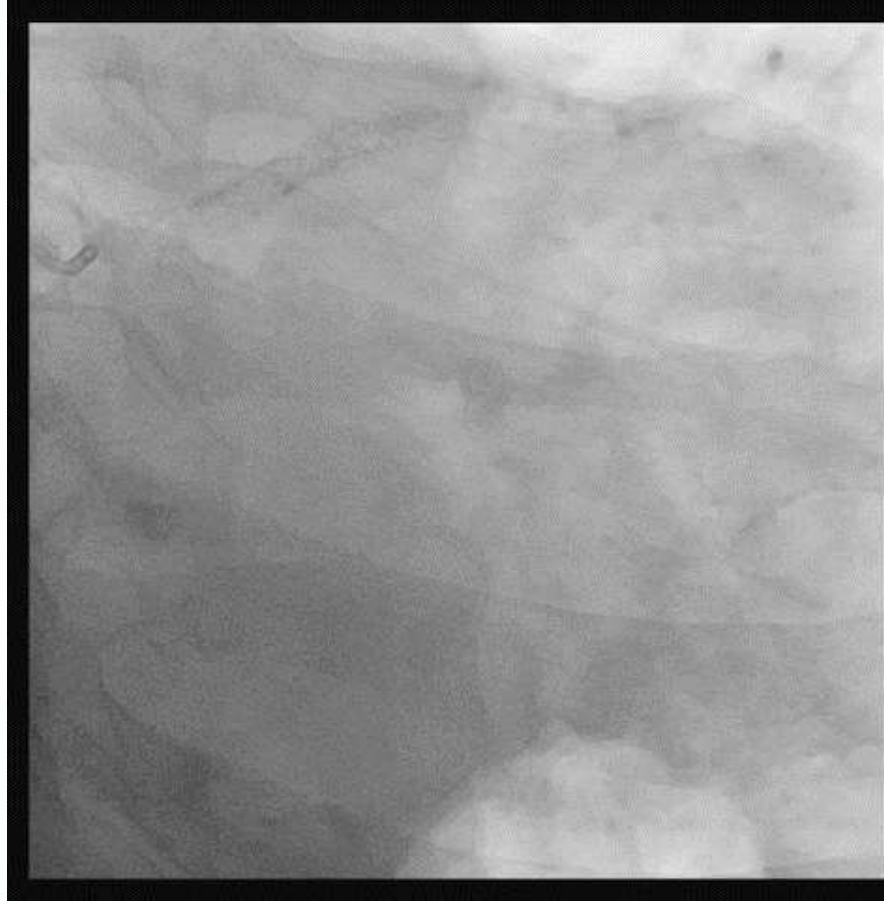
Final CAG



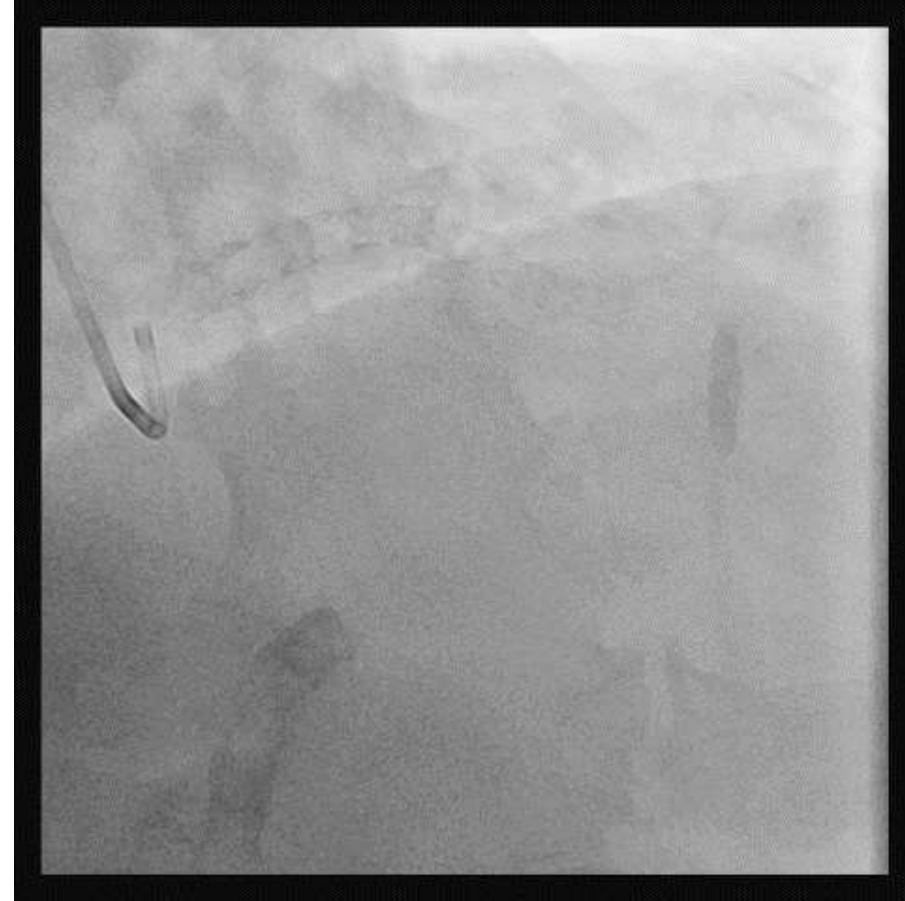
When, Rotational Atherectomy?

1. Balloon or IVUS Catheter Failure to Pass,
2. Undilatable Lesion,
3. High Degrees of Calcium / Calcium Nodule,

66yo Man with effort angina

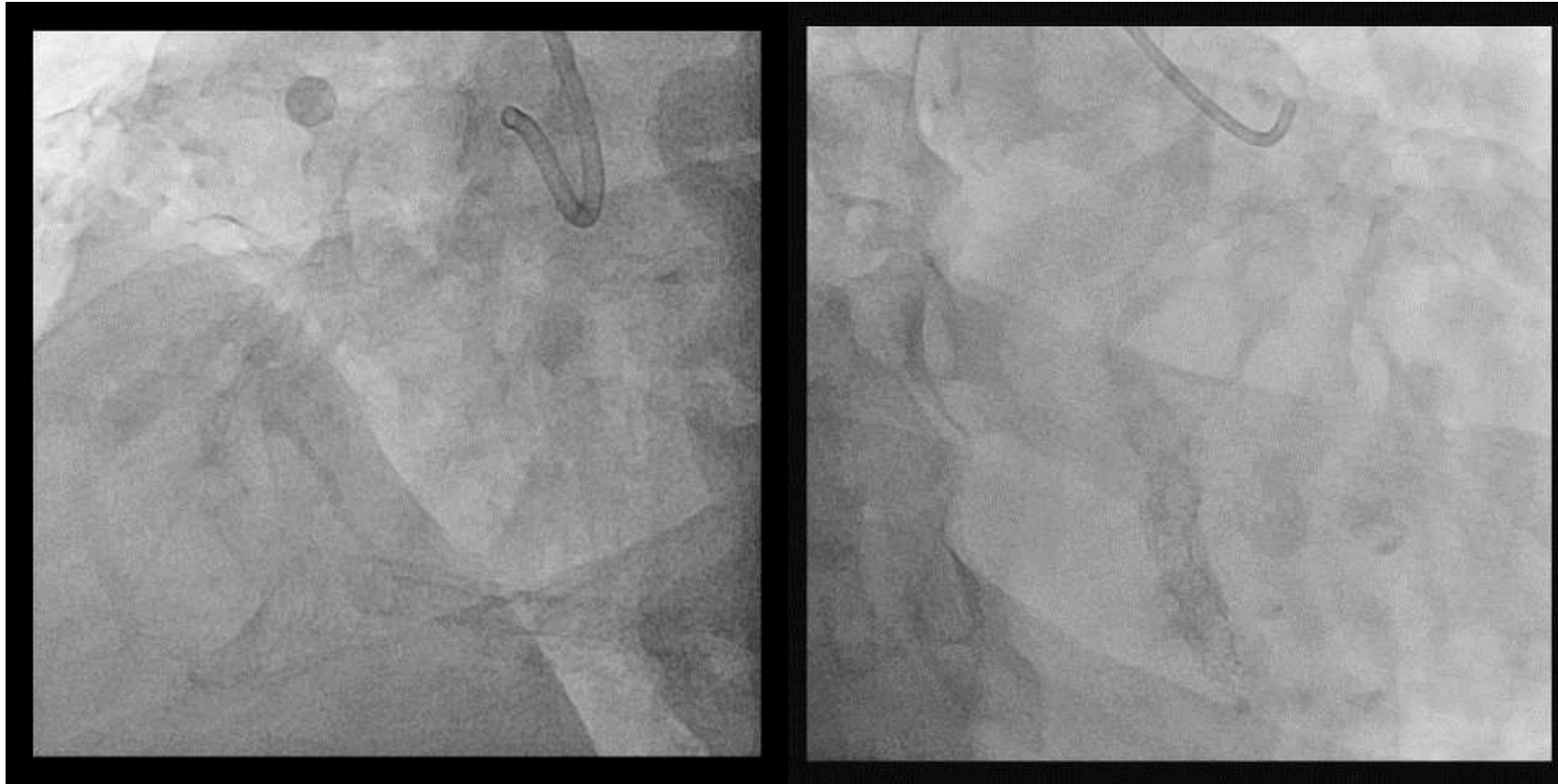


LAD, AP CAUDAL



AP CRANIAL

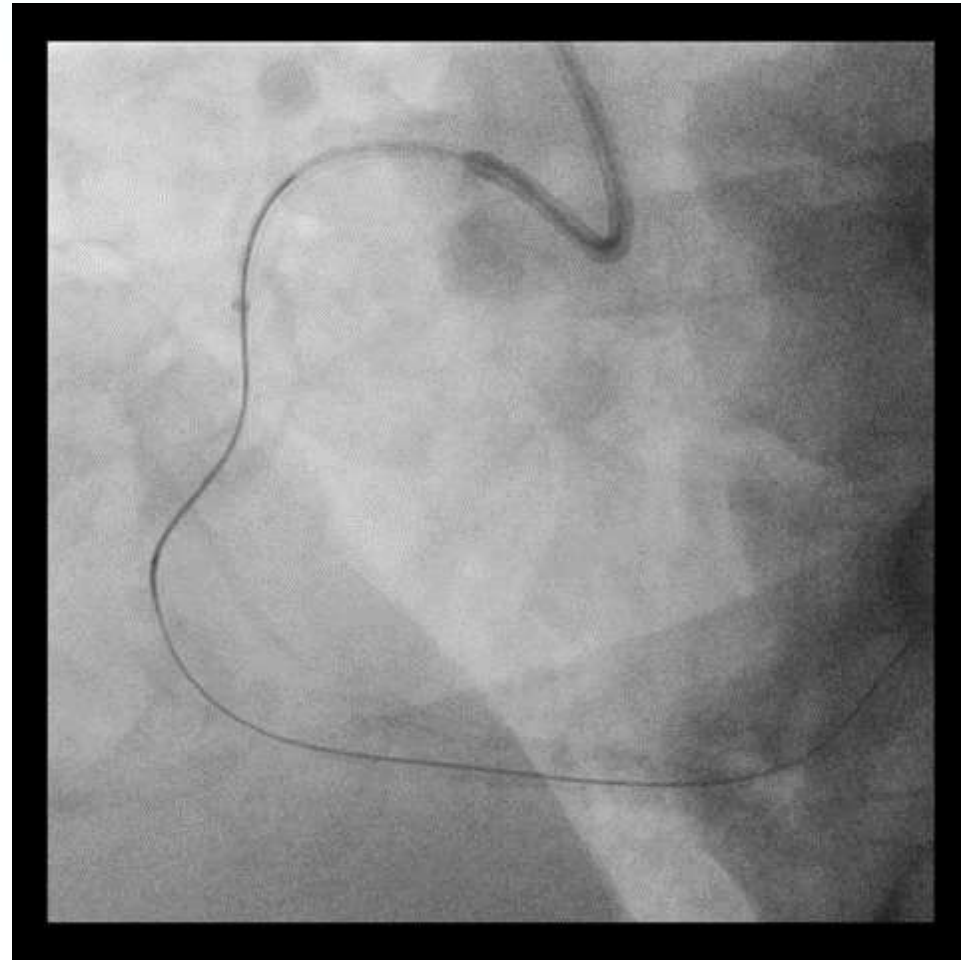
RCA



LAO

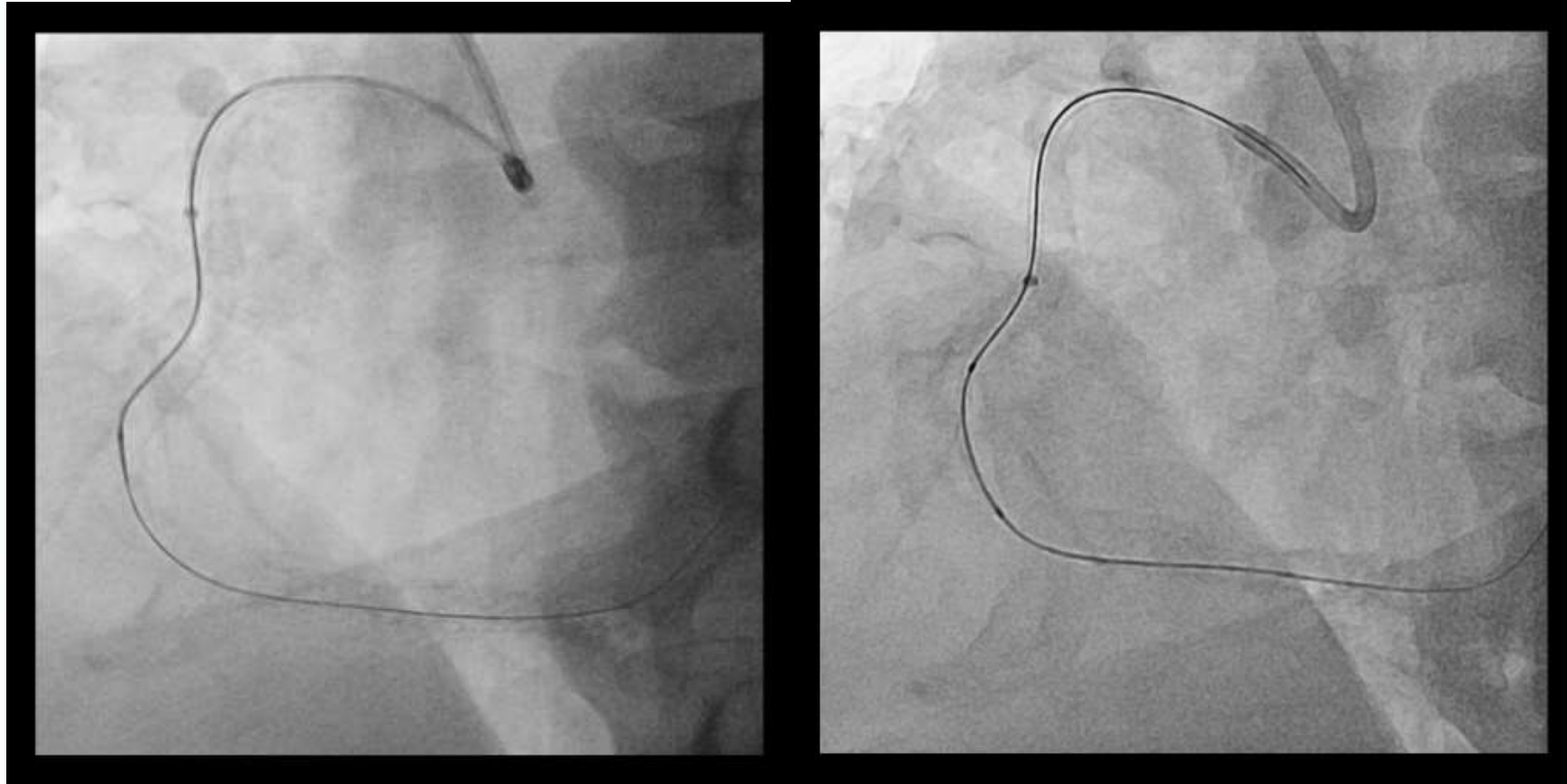
RAO

Wiring (mRCA)



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

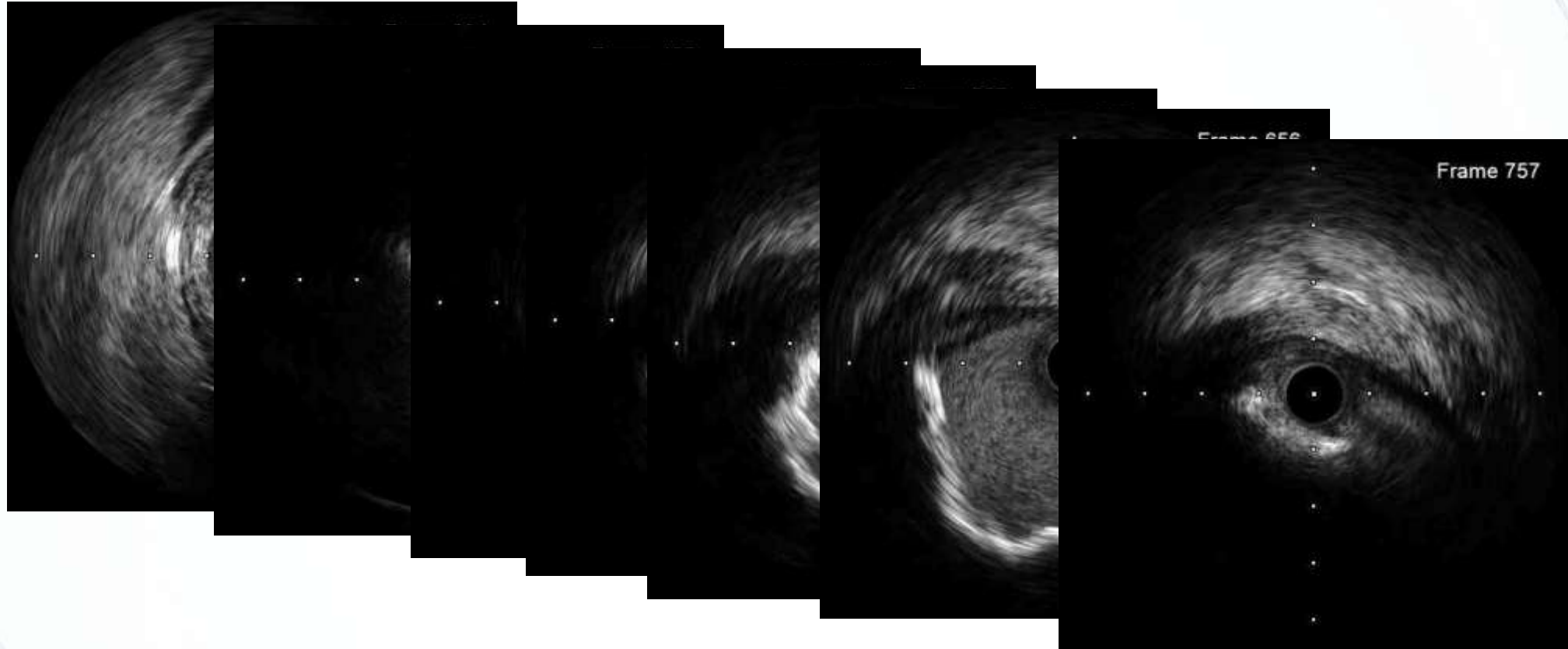
Pre-Balloon (mRCA)



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

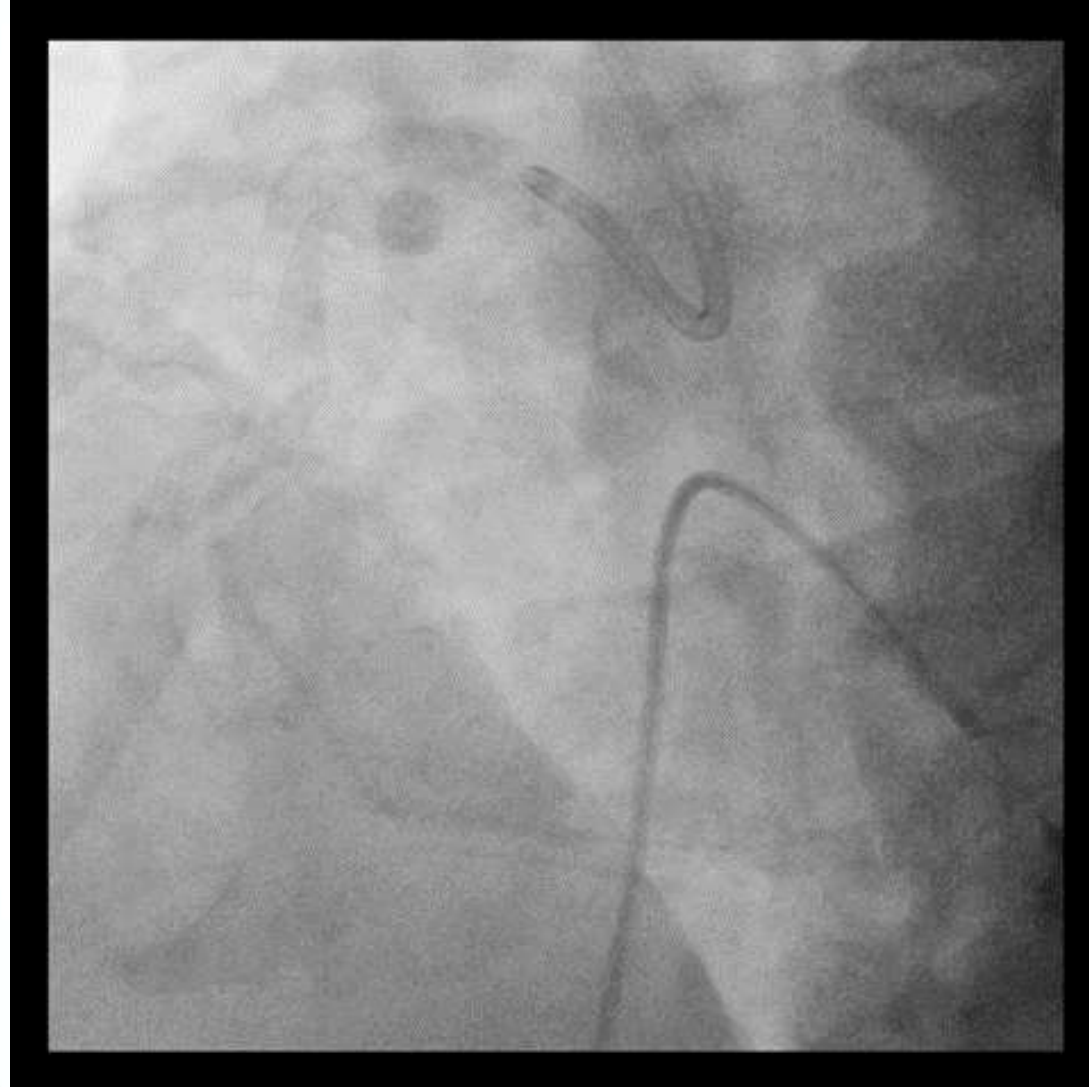
IVUS

Post balloon



Diffuse Multiple Heavy Calcified Nodule

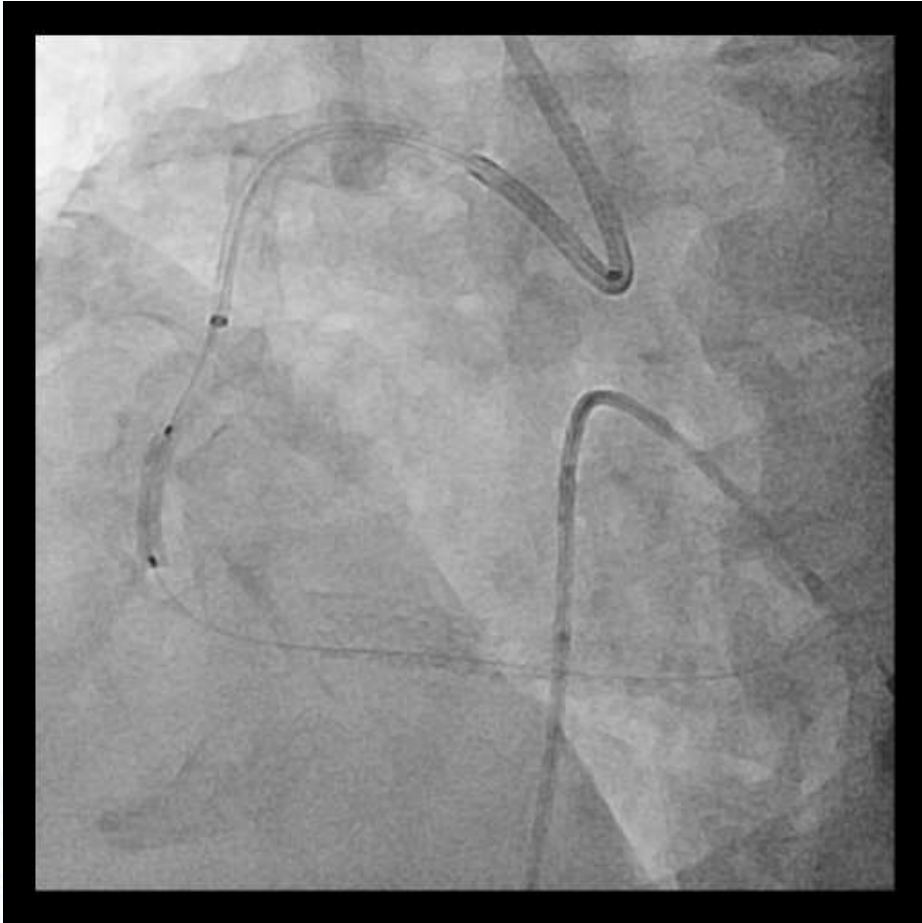
Rotablation using 1.5 mm burr



Post Rotablation

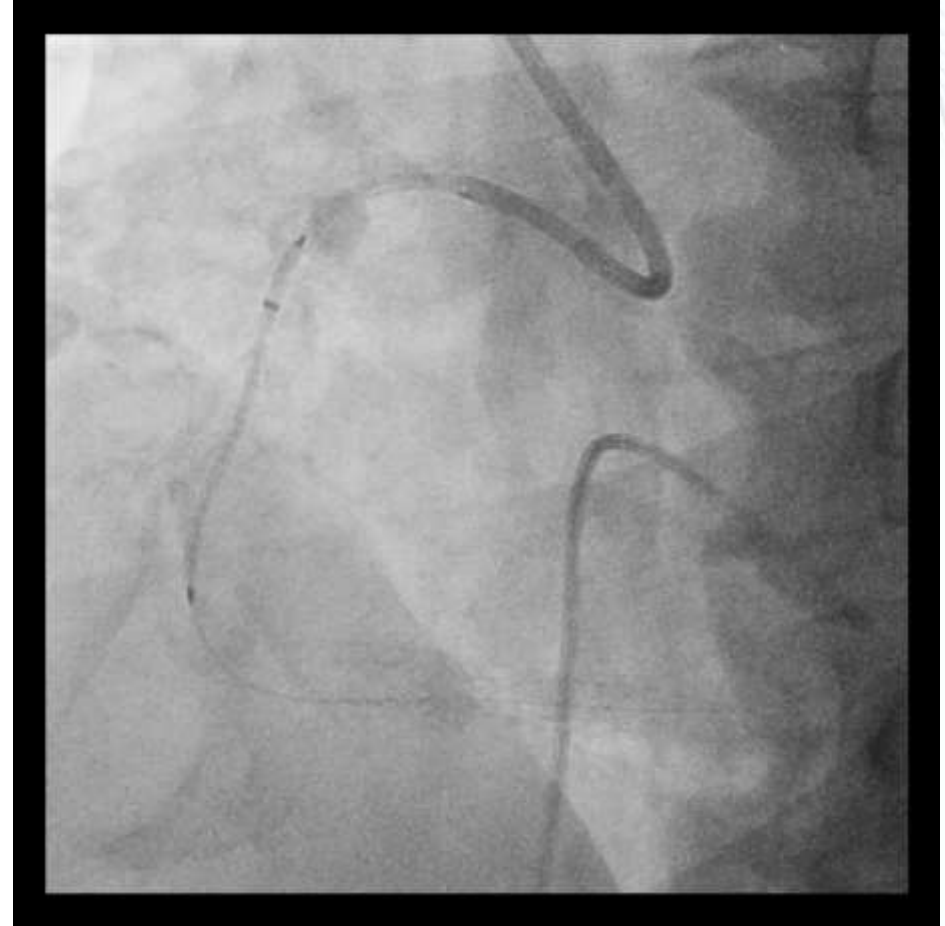


Pre-NC Balloon



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

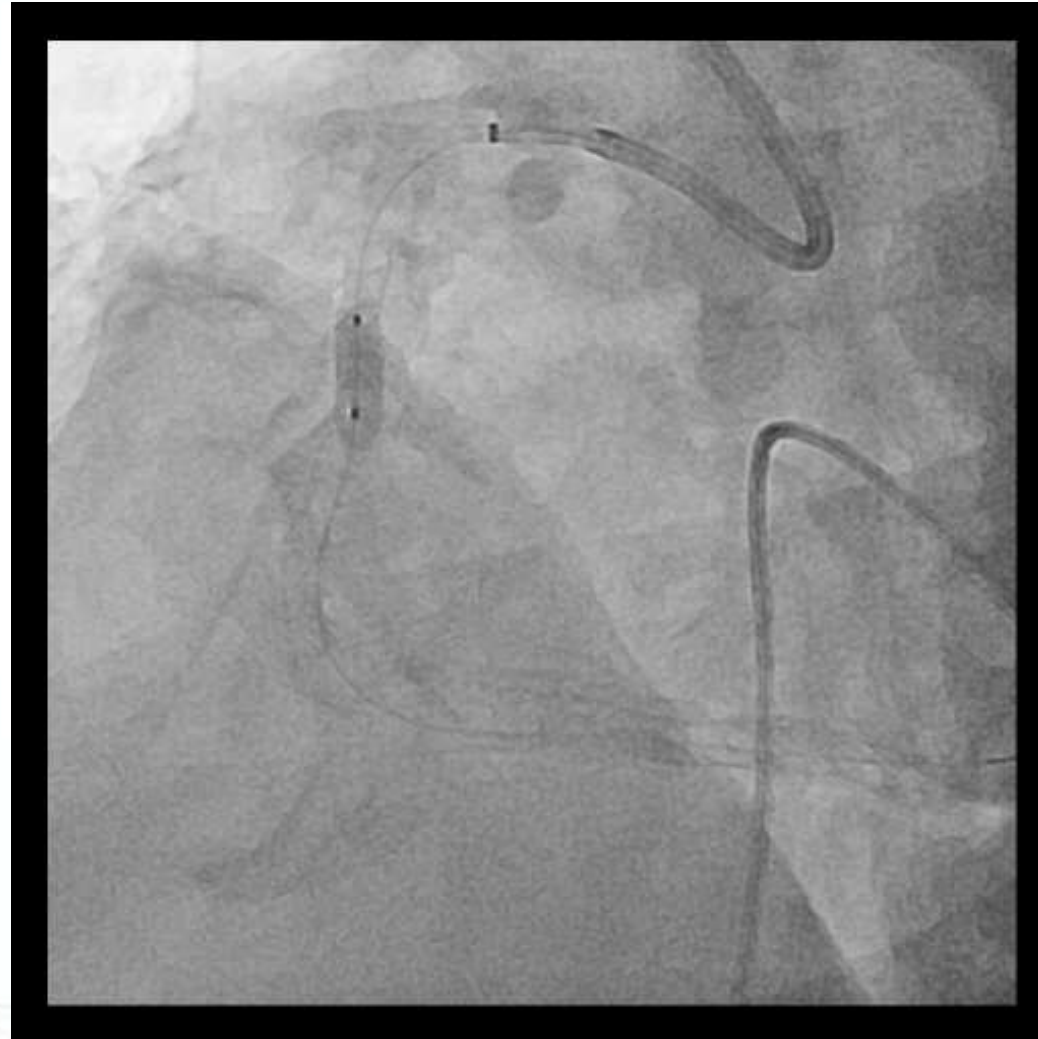
Stenting with GuideZilla Support



Xience 4.0 mm (38 mm)

High Pressure Post Dilation

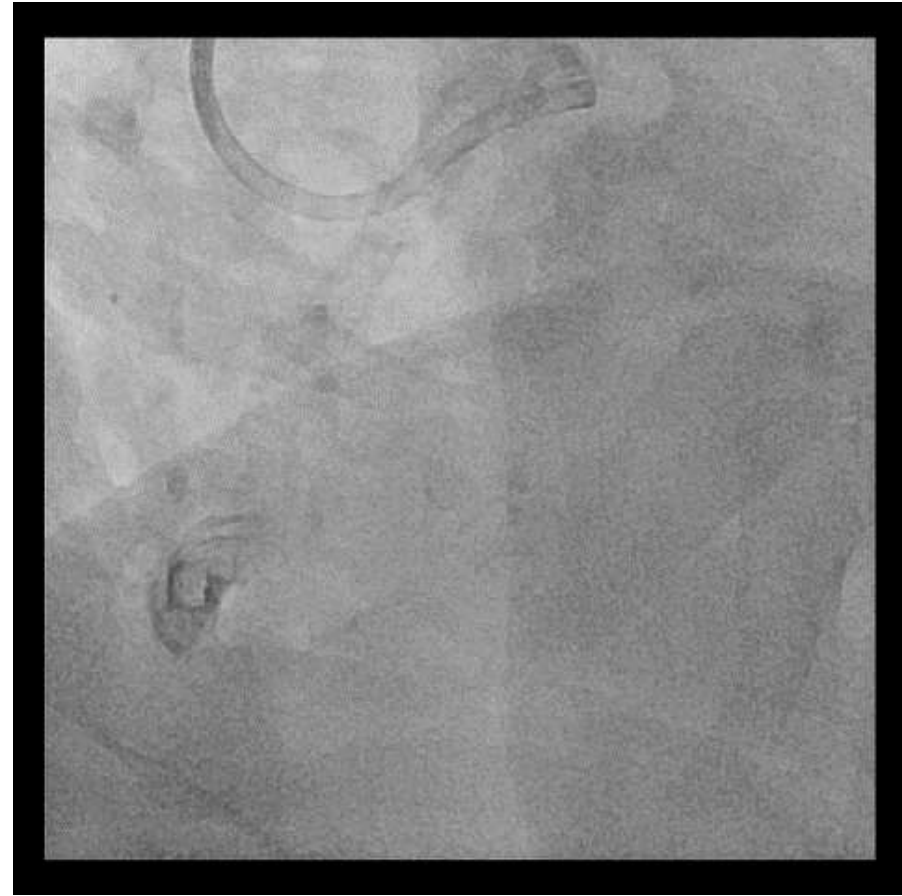
With Sapphire NC 4.0 up to 4.5 mm (28 atm)



Final Angiography



LAO

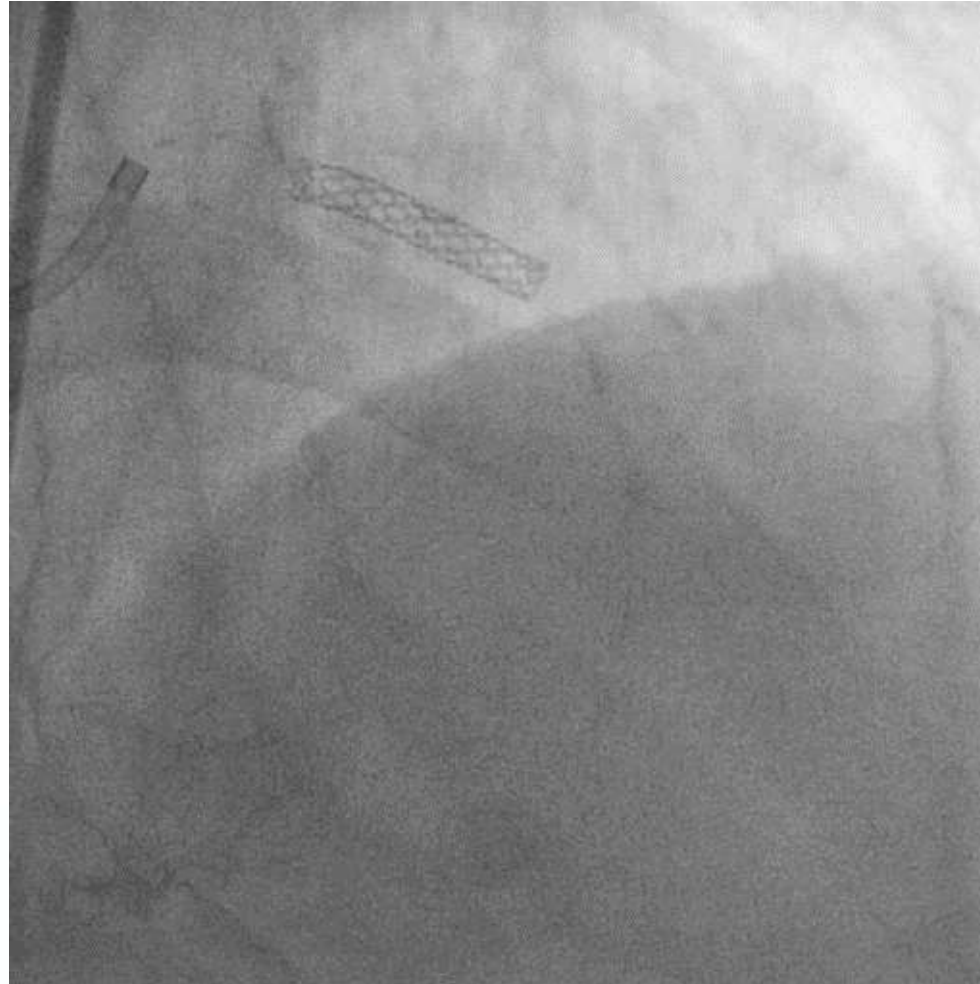


RAO

When, Rotational Atherectomy?

1. Balloon or IVUS Catheter Failure to Pass,
2. Undilatable Lesion,
3. High Degrees of Calcium / Calcium Nodule,
4. Debulking for In-stent restenosis

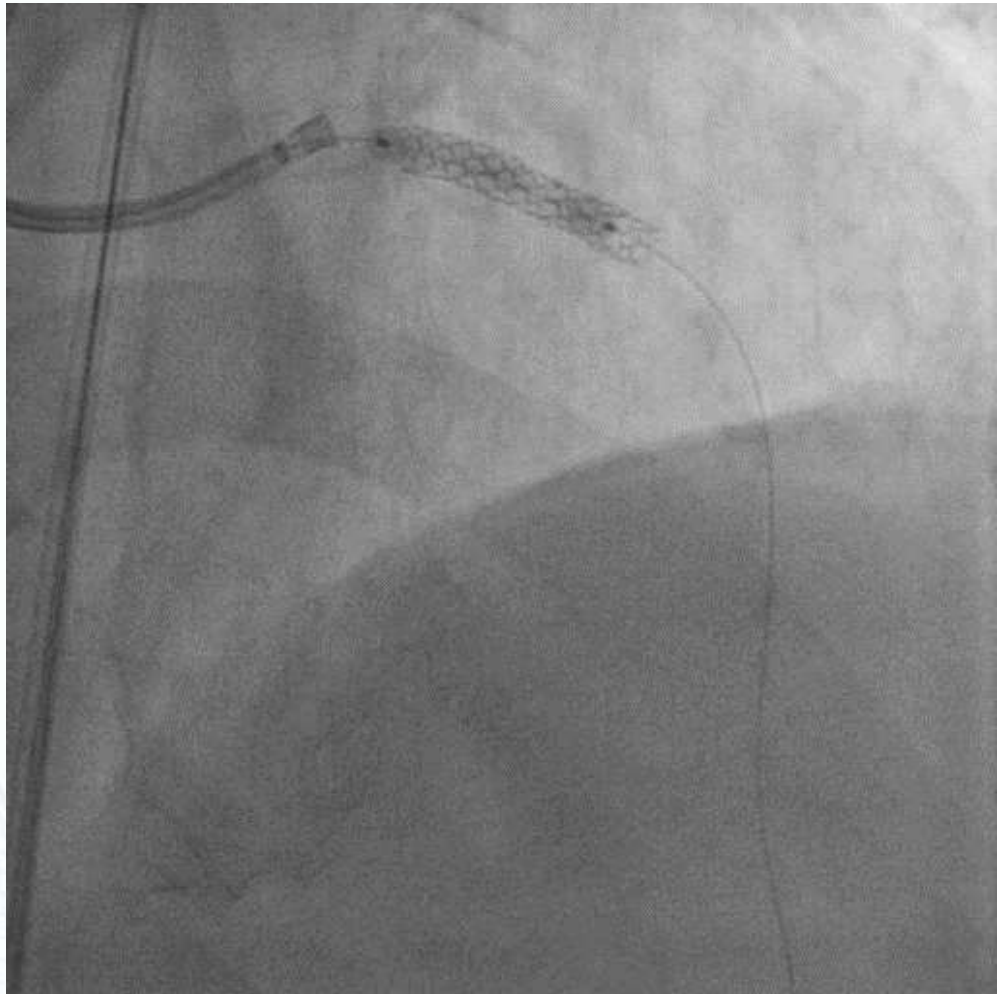
68YO gentleman BMS Implantation 12 years ago



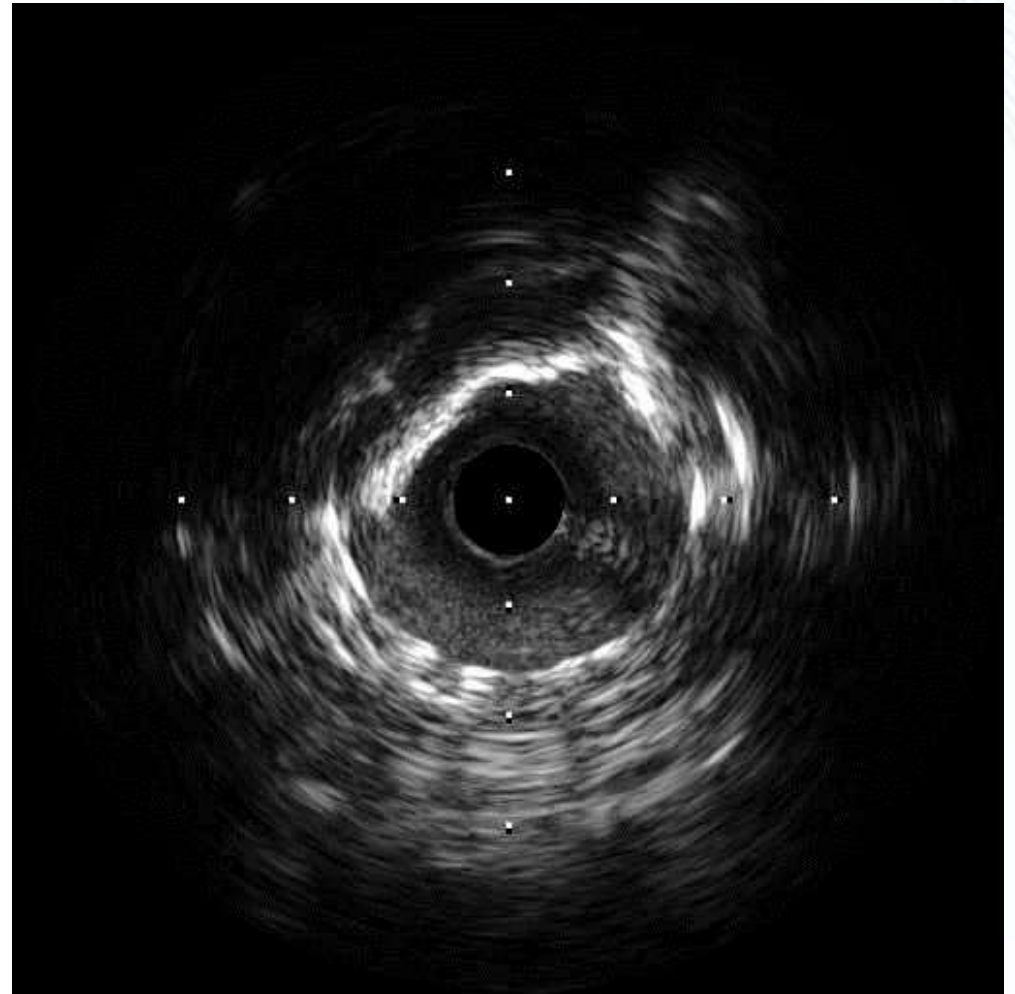
Pre-Balloon with NC 2.5mm



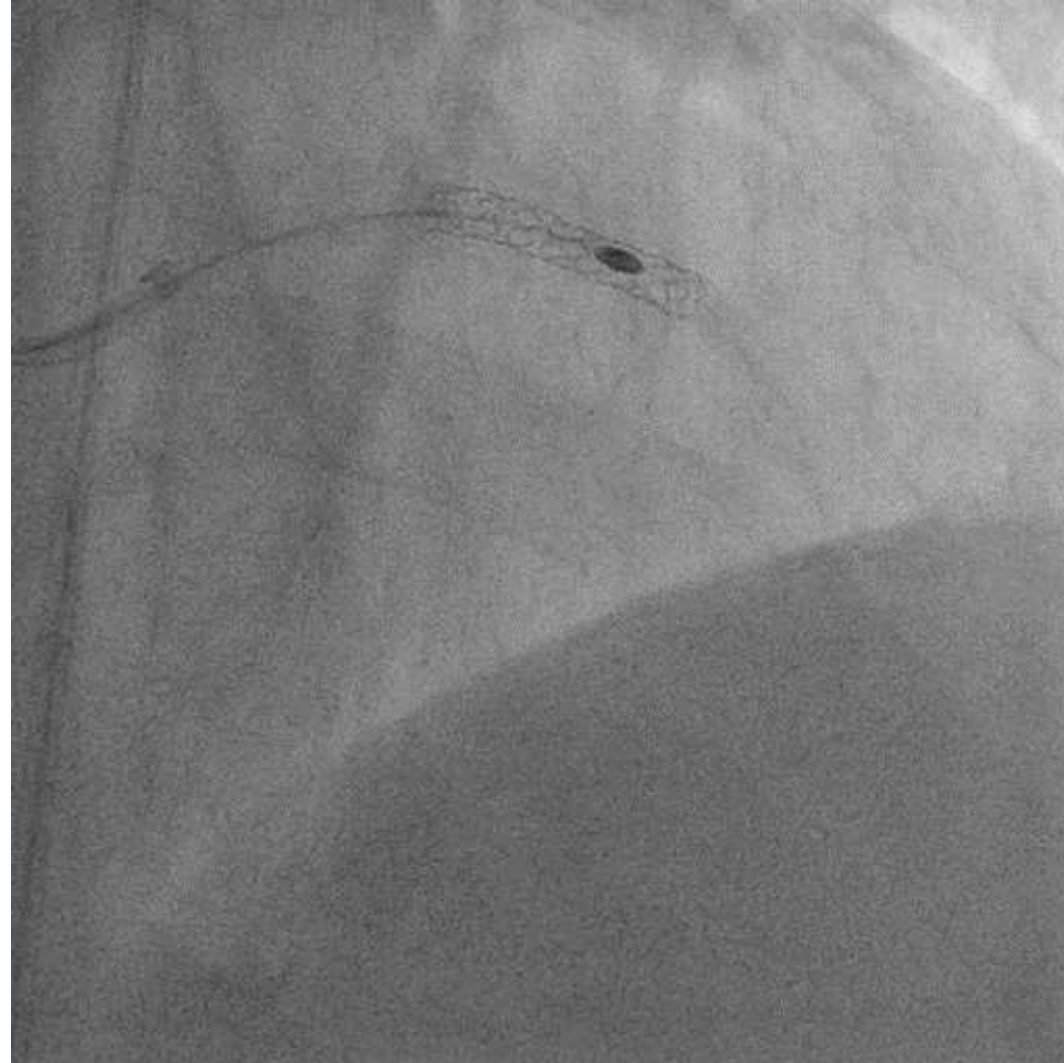
NC 3.0mm upto 28 atm



Severely Calcified Neoatherosclerosis

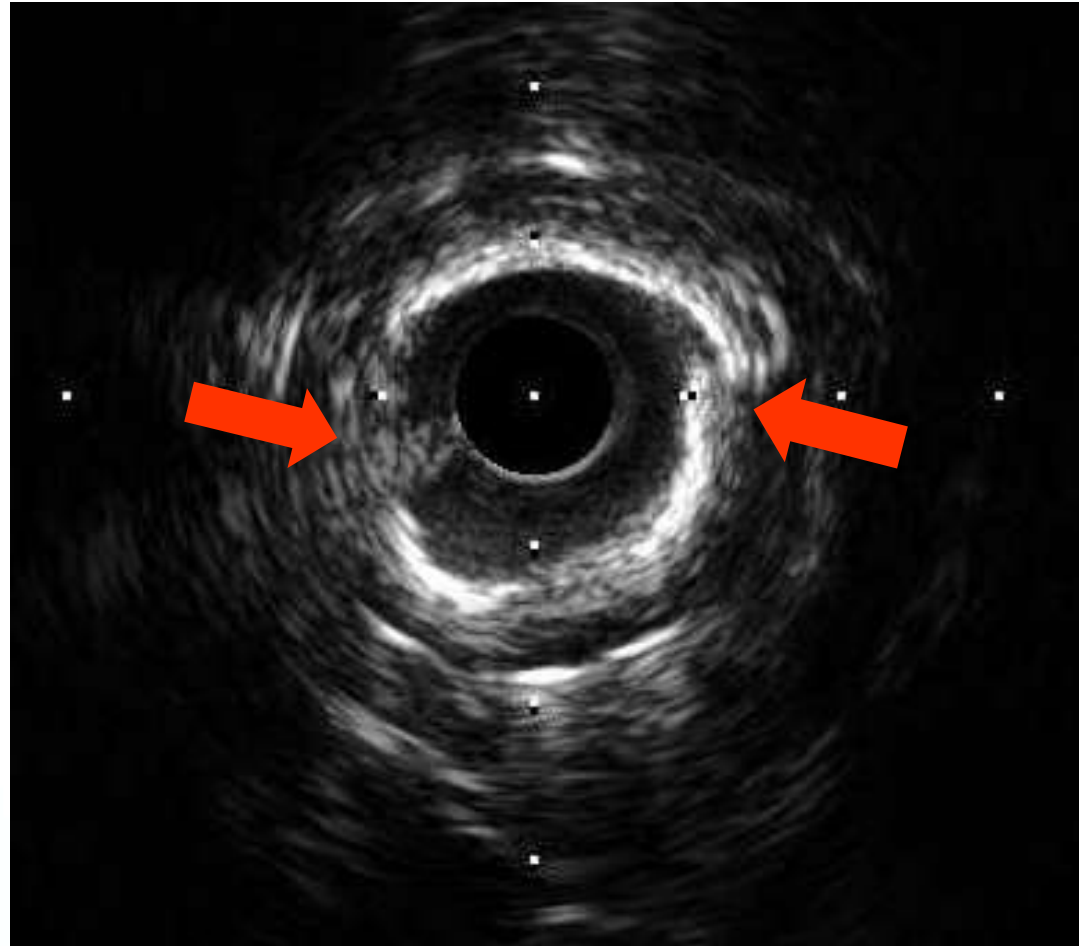


Rota with 1.5 and 1.75 Burr

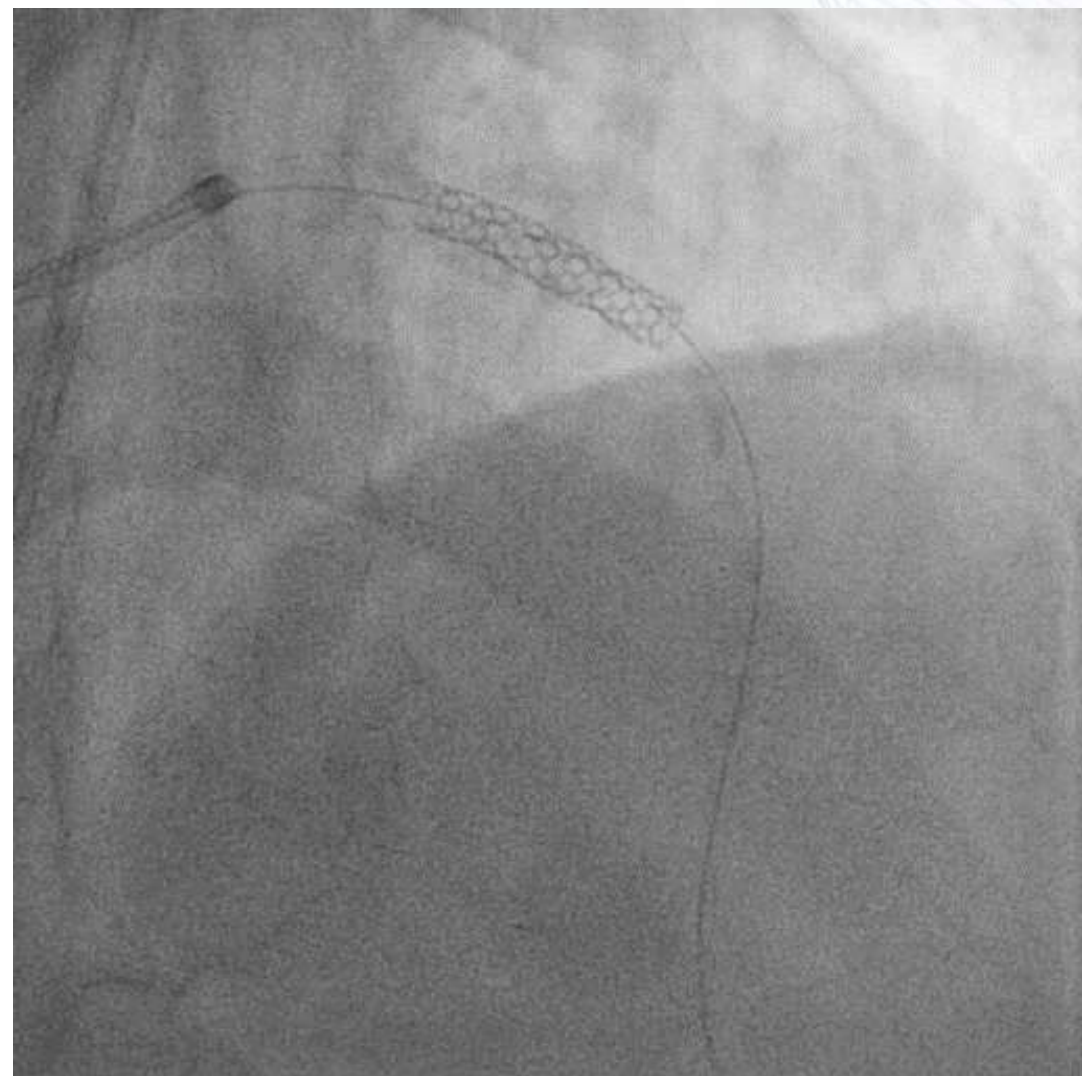
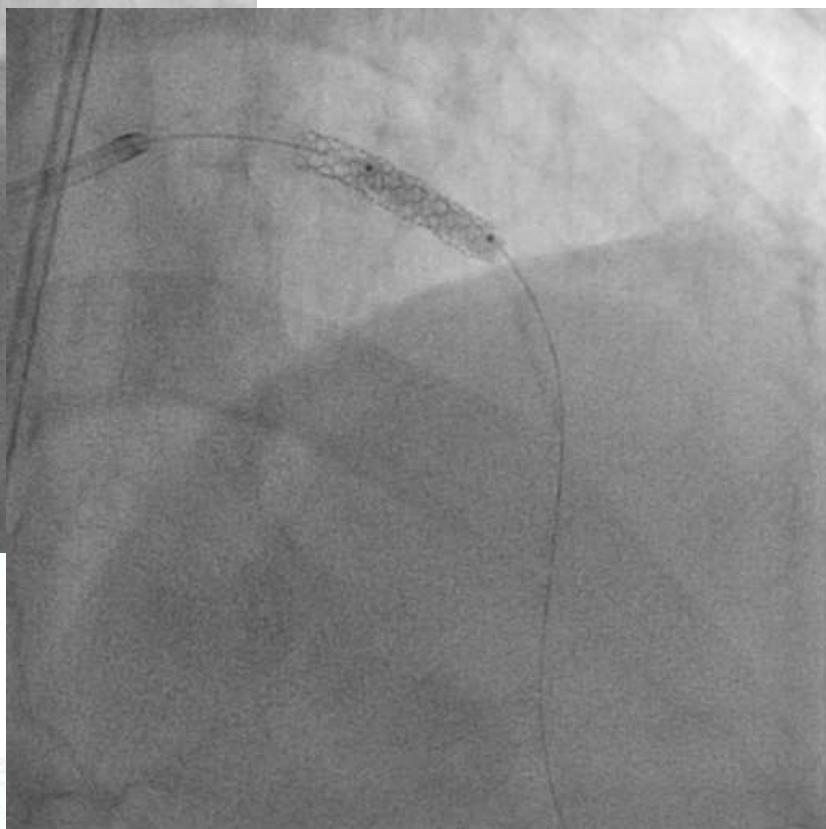
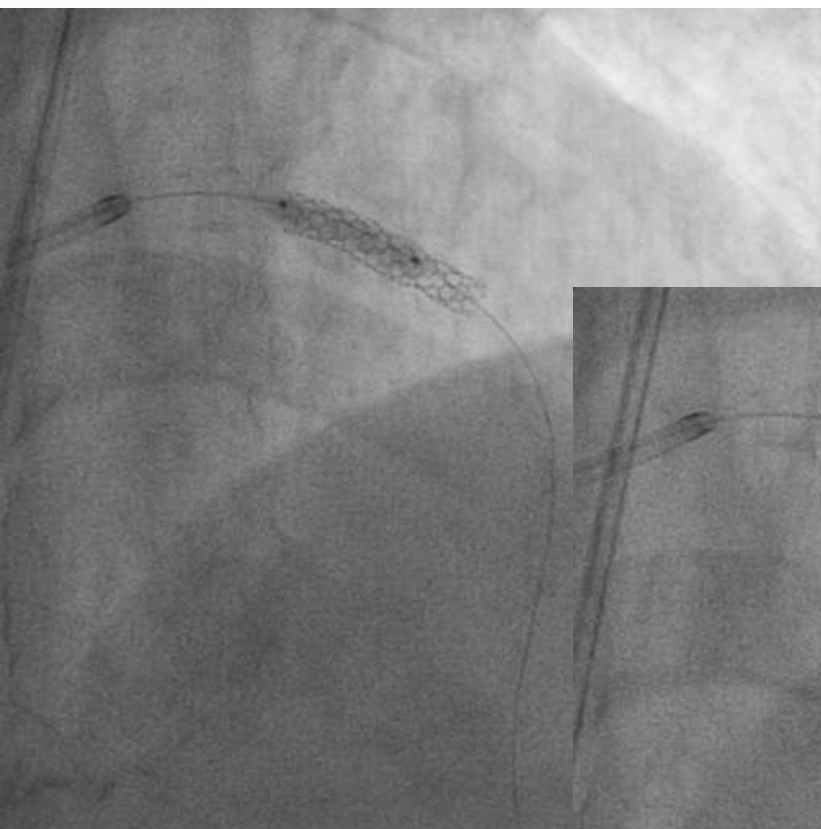


Post Rota IVUS

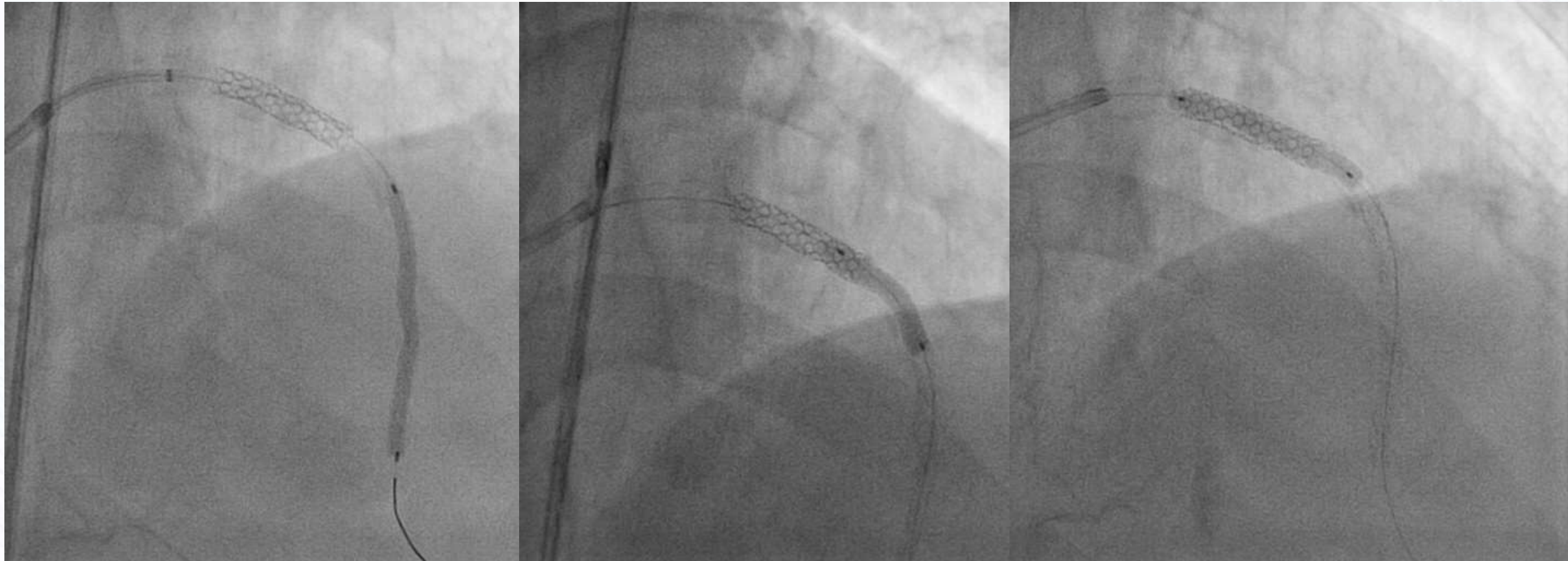
Disruption of the arc of calcification



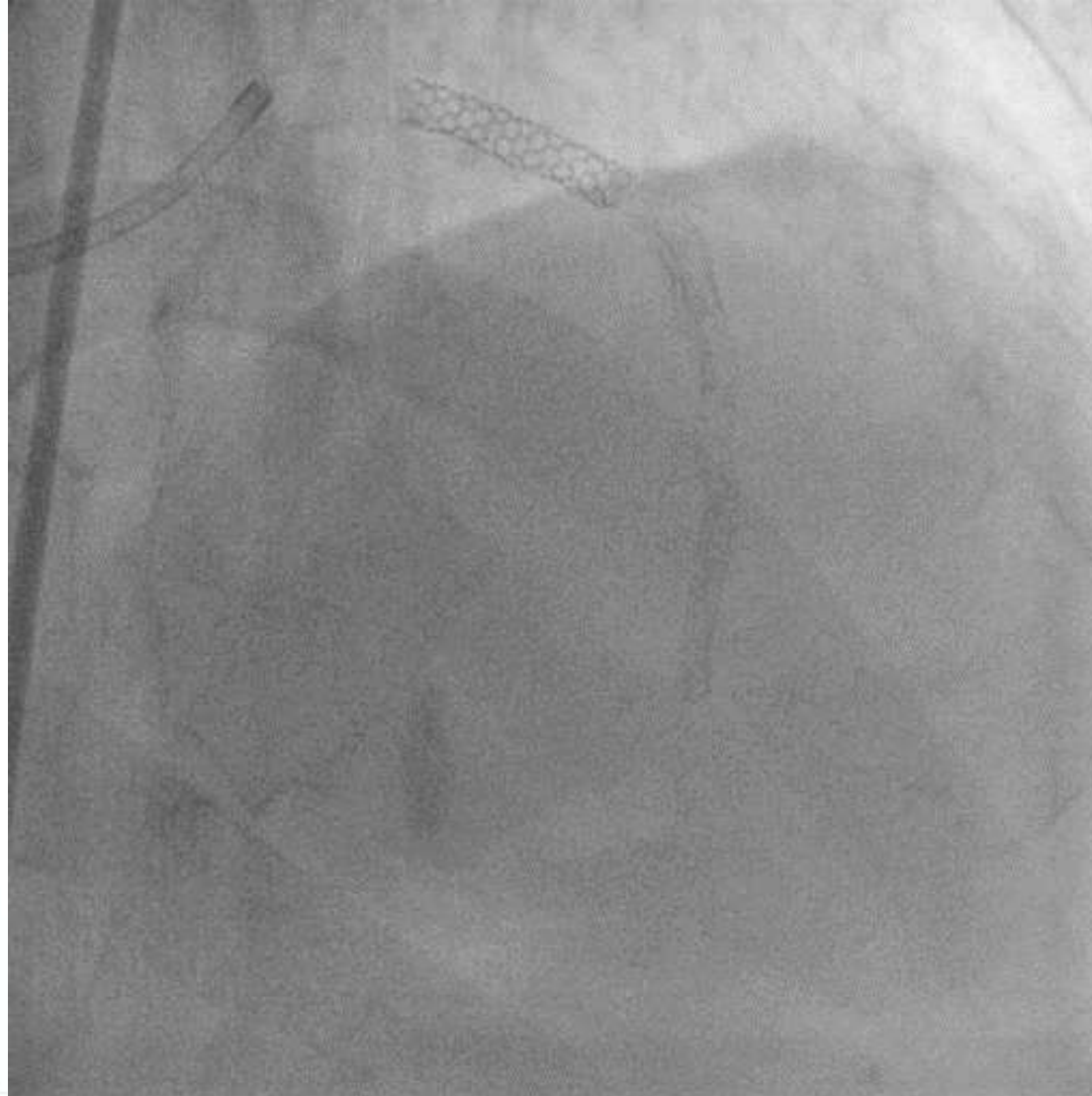
NC Balloon 3.5



DES 2.5(38) + 3.5(18) + DEB for ISR Post NC Ballooning



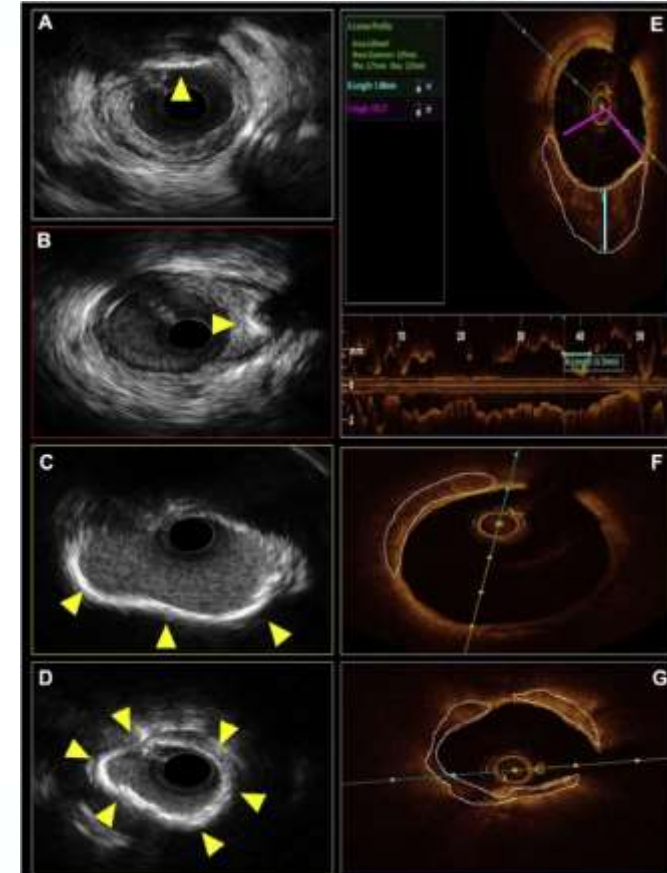
Final CAG



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	✗	● ● ●	●

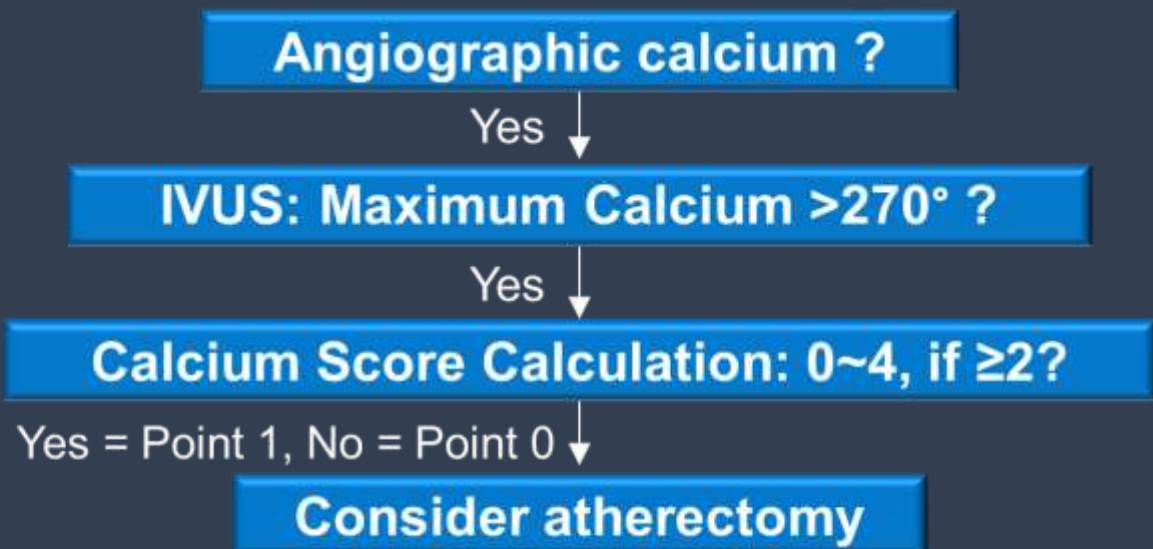
● ● ● Optimal ● ● Moderate ● Modest



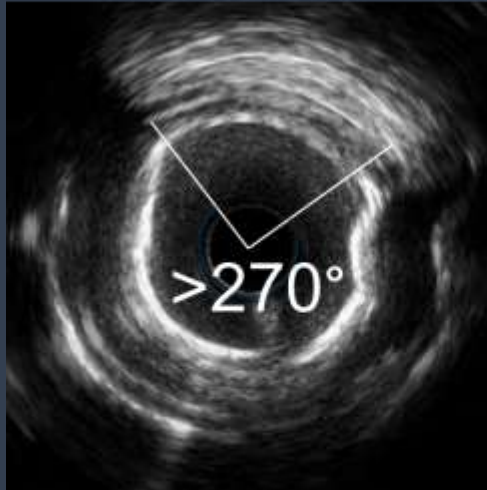
Calcium Scoring System by Intracoronary Imaging

OCT-based CVI Score	
Angle	$\leq 180^\circ$ → 0 point
	$> 180^\circ$ → 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	

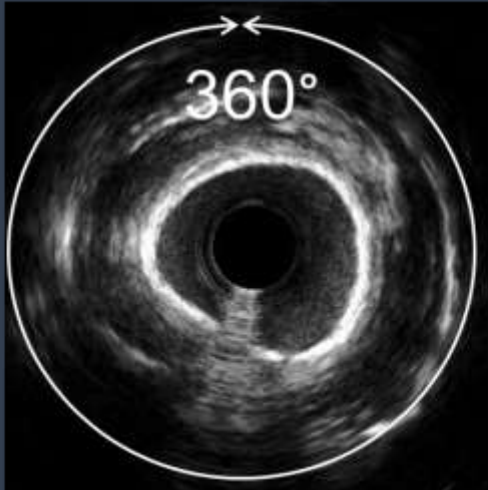
Calcium Scoring System by Intracoronary Imaging



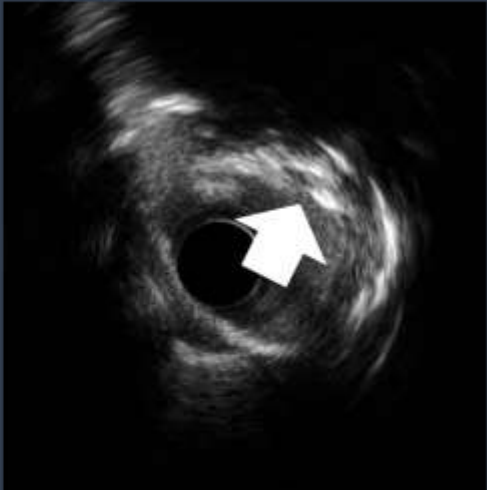
Calcium >270° longer than 5mm?



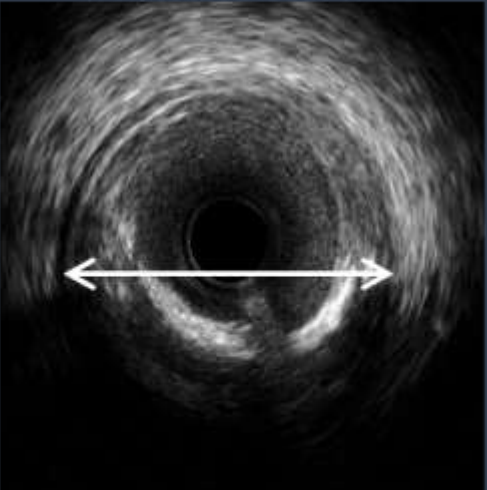
360° of calcium?



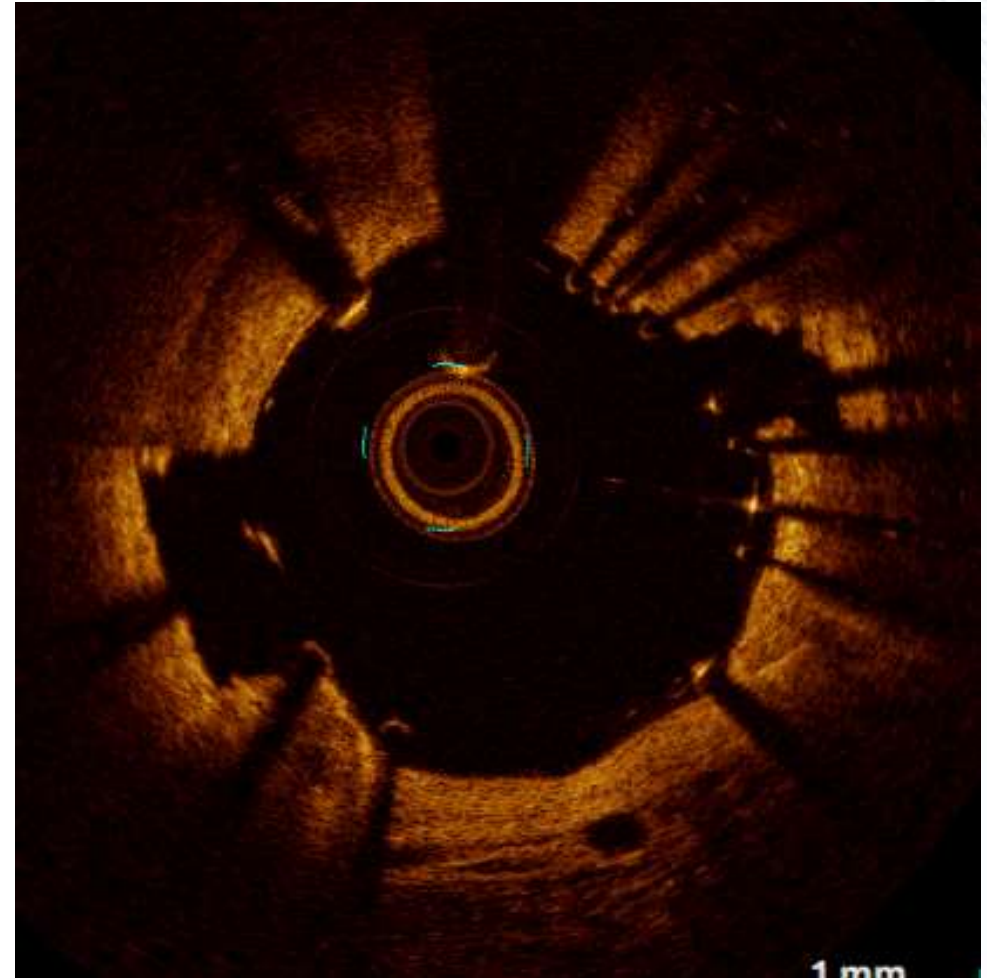
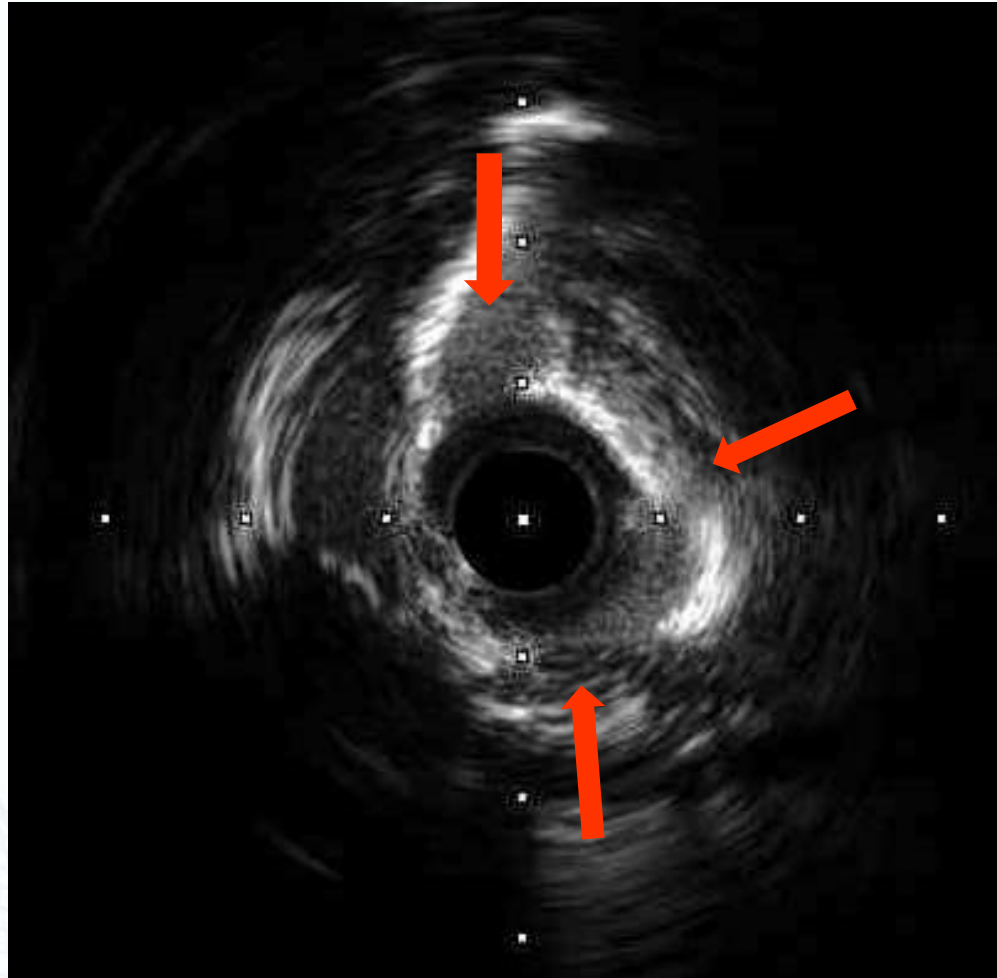
Calcified nodule?



Vessel diameter <3.5mm?

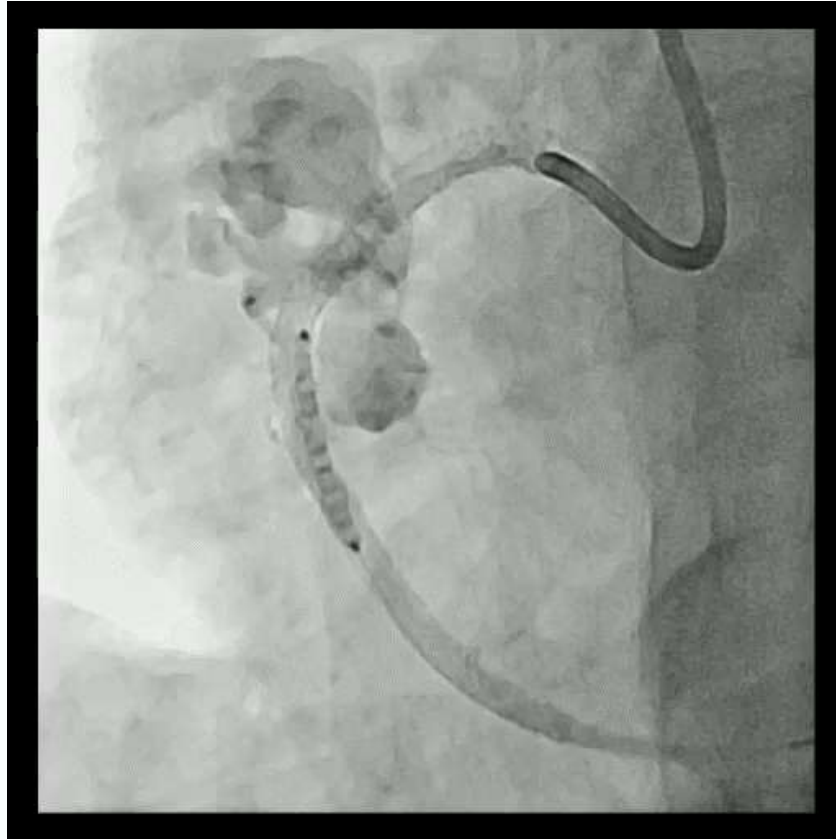


Check the Calcium Breakage at Imaging

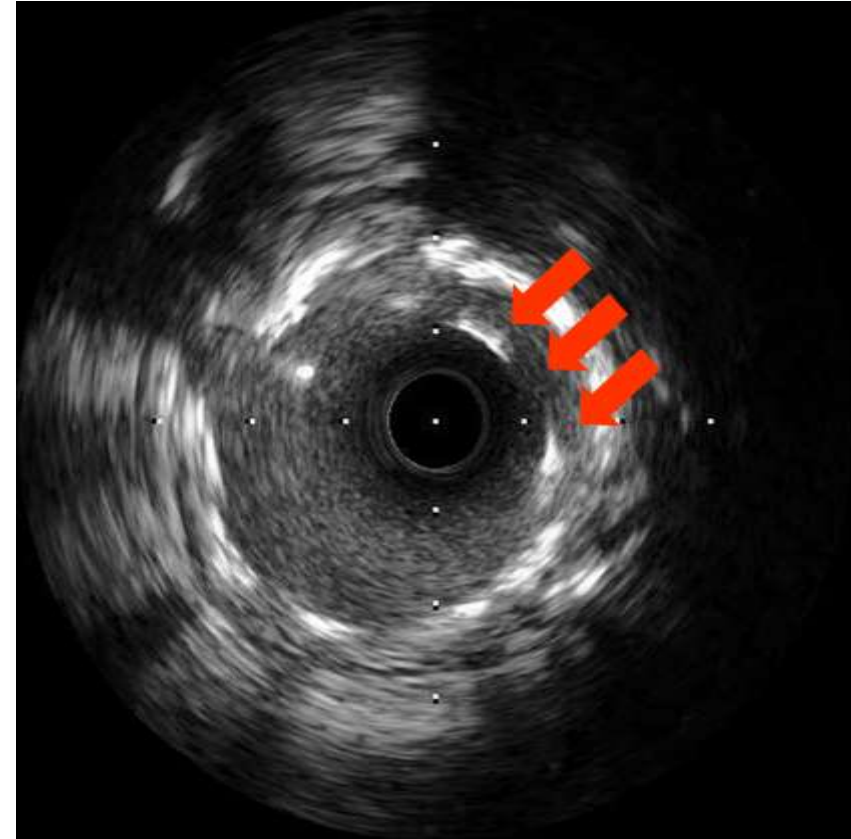


Vessel Size by Imaging

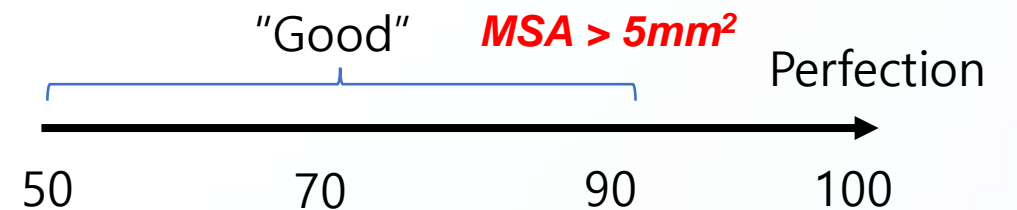
Perforation



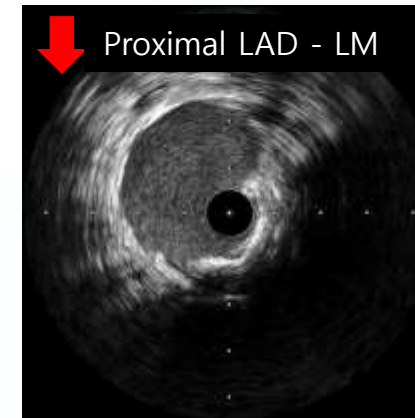
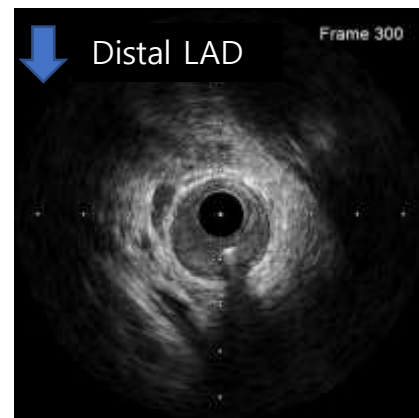
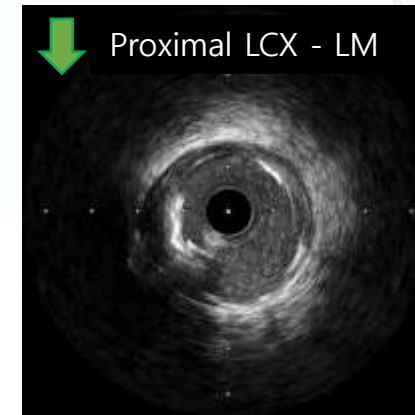
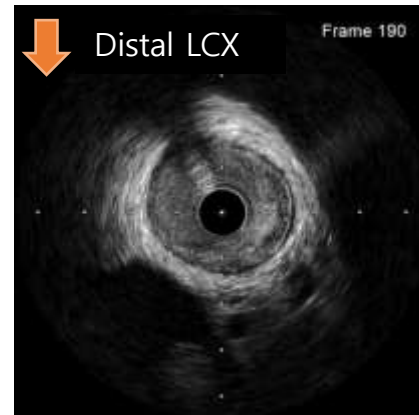
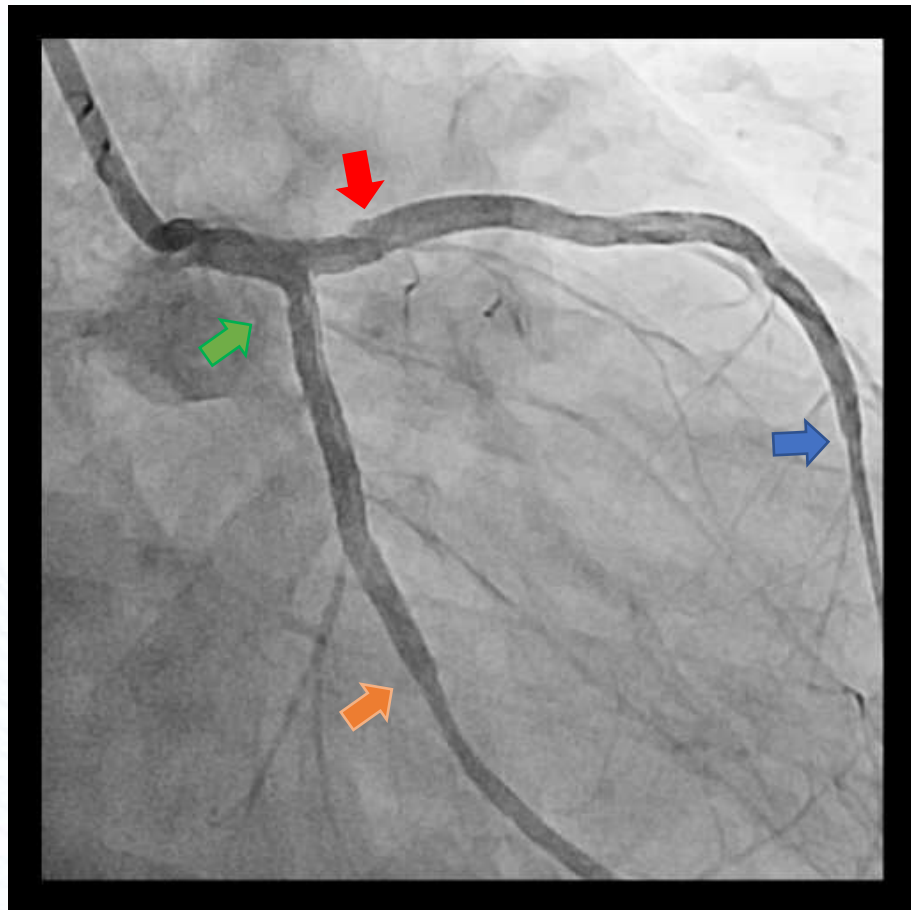
Underexpansion or Malapposition



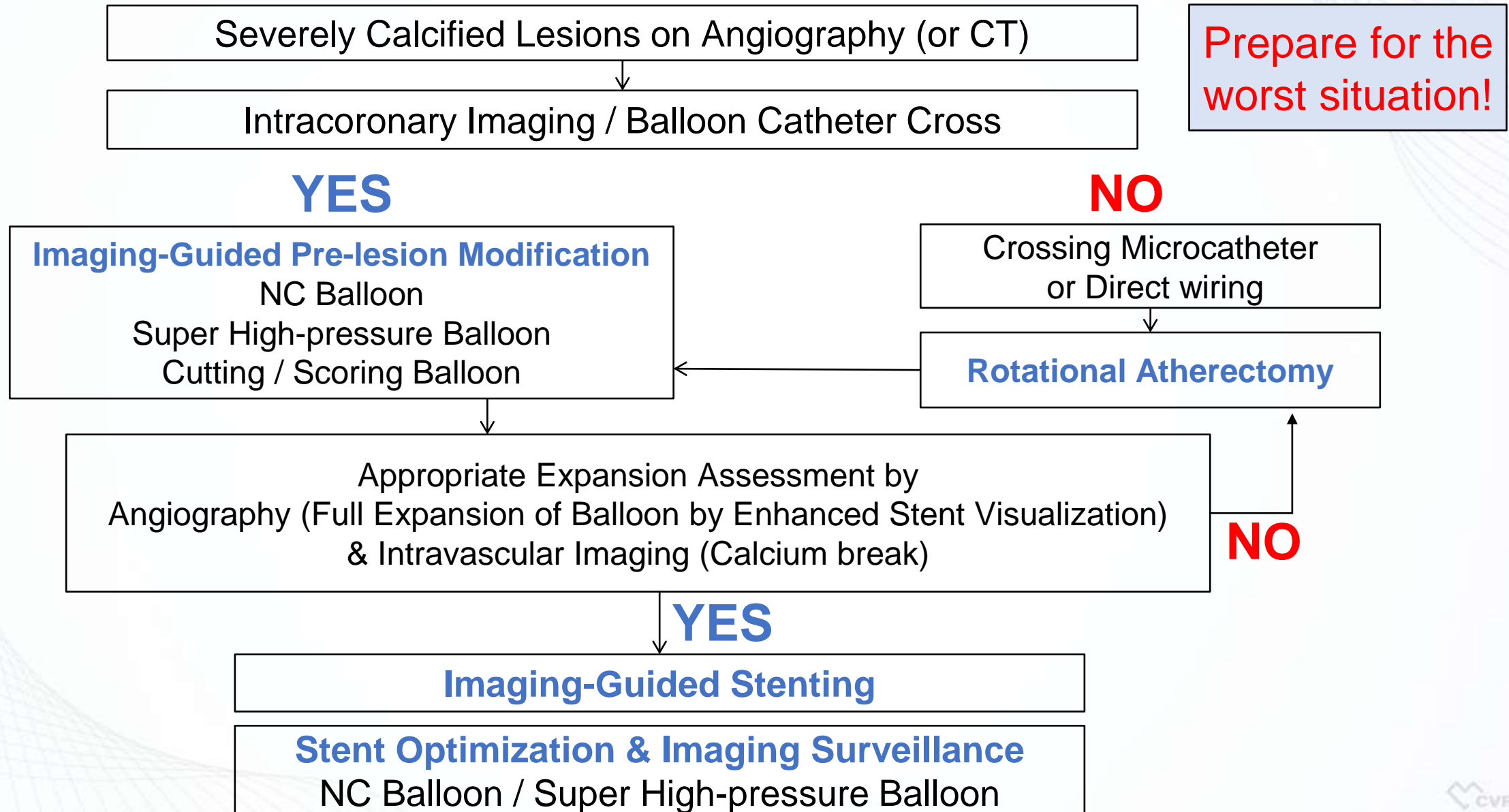
Perfection is the Enemy of Good



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.