

Revisited Debulking for Treatment of In-Stent Restenosis : ROTA-ISR Randomized Trial

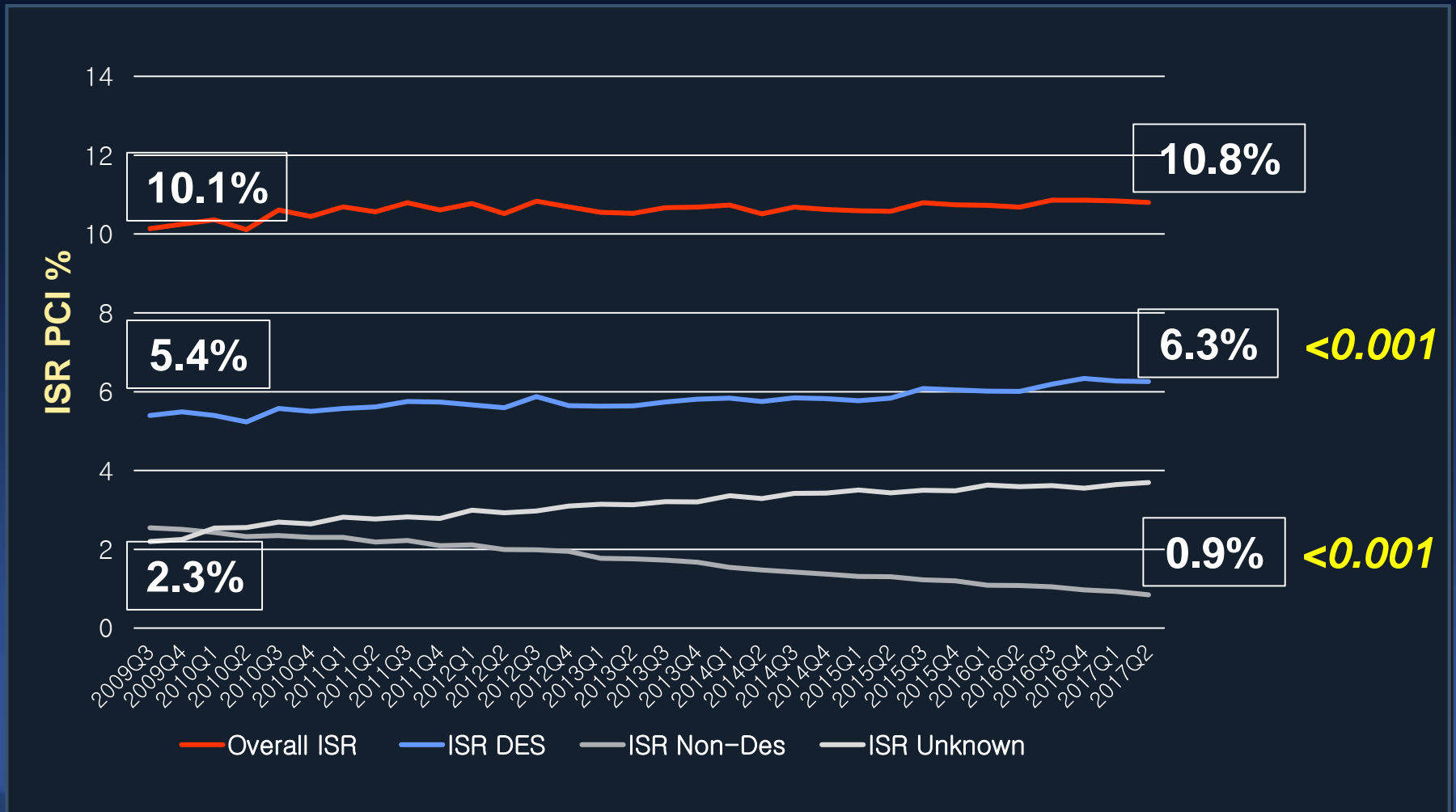
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Conflict of Interest Statement

- I have nothing to disclose
- No financial relationships

Temporal Trends of ISR PCI in the United States



Moses JW, presented at TCT 2018

Treatment Options of ISR

- Balloon PTCA (also Cutting, Scoring balloon)
- Athero-Ablation Modalities
 - Rotational atherectomy
 - Directional coronary atherectomy
 - Excimer laser coronary atherectomy
- Radiation Vascular Therapy
- Drug-Eluting Stents

Current Guideline Recommendation

2011 AHA/ACC, 2014 ESC guidelines

- **BMS ISR**
 - PCI with DES (IA)
- **DES ISR**
 - Balloon angioplasty or DES (IIB)
- **IVUS or OCT**
 - Reasonable to determine the mechanism of ISR (IIa, C)

Levine GN et al., Circulation, 2011.
Windecker S et al., Eur Heart J. 2014.

Meta-analysis favors EES or DEB

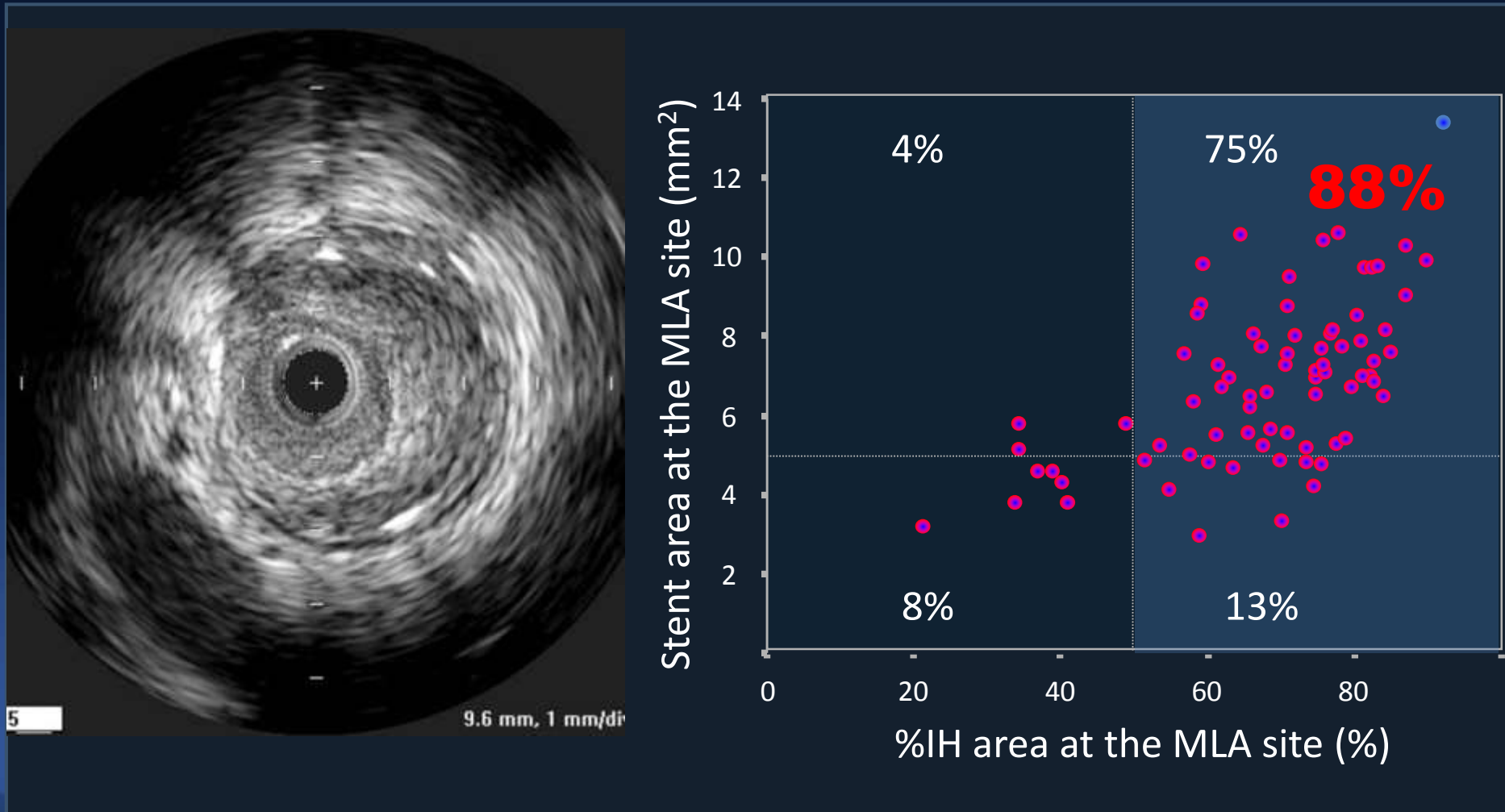
- EES : best
- DEB : comparable with DES

	EES	DCB	SES	PES	VBT	BMS	BA	ROTA
EES	98.5 (0.92)	0.60 (0.30-1.19)	0.44 (0.19-0.99)	0.42 (0.19-0.92)	0.20 (0.09-0.45)	0.11 (0.04-0.28)	0.10 (0.05-0.22)	0.06 (0.02-0.16)
DCB	..	84.2 (0.06)	0.72 (0.43-1.22)	0.69 (0.44-1.09)	0.33 (0.19-0.56)	0.18 (0.09-0.36)	0.17 (0.11-0.26)	0.09 (0.04-0.21)
SES	67.4 (0.01)	0.96 (0.64-1.45)	0.45 (0.30-0.69)	0.25 (0.12-0.49)	0.23 (0.16-0.34)	0.13 (0.06-0.29)
PES	64.3 (0.00)	0.47 (0.31-0.72)	0.26 (0.13-0.51)	0.24 (0.17-0.35)	0.14 (0.06-0.30)
VBT	42.3 (0.00)	0.14 (0.06-0.30)	0.14 (0.06-0.30)	0.29 (0.13-0.62)
BMS	22.2 (0.00)	0.93 (0.53-1.65)	0.53 (0.22-1.29)
BA	19.5 (0.00)	0.57 (0.29-1.13)
ROTA	1.9 (0.00)

Ranges in parentheses are 95% CIs. Odds ratios less than 1 show that the intervention listed in the left column is more beneficial than the one in the top row. Interventions are ordered according to efficacy ranking. Surface under the cumulative ranking curve values are given in the diagonal, with the probability of being the best treatment in parentheses. The larger the surface under the cumulative ranking curve value, the better the treatment. EES=everolimus-eluting stents. DCB=drug-coated balloons. SES=sirolimus-eluting stents. PES=paclitaxel-eluting stents. VBT=vascular brachytherapy. BMS=bare metal stents. BA=balloon angioplasty. ROTA=rotablation.

Table 3: Odds ratios of the effect of interventions for binary restenosis

Intimal Hyperplasia: General mechanism of ISR after DES



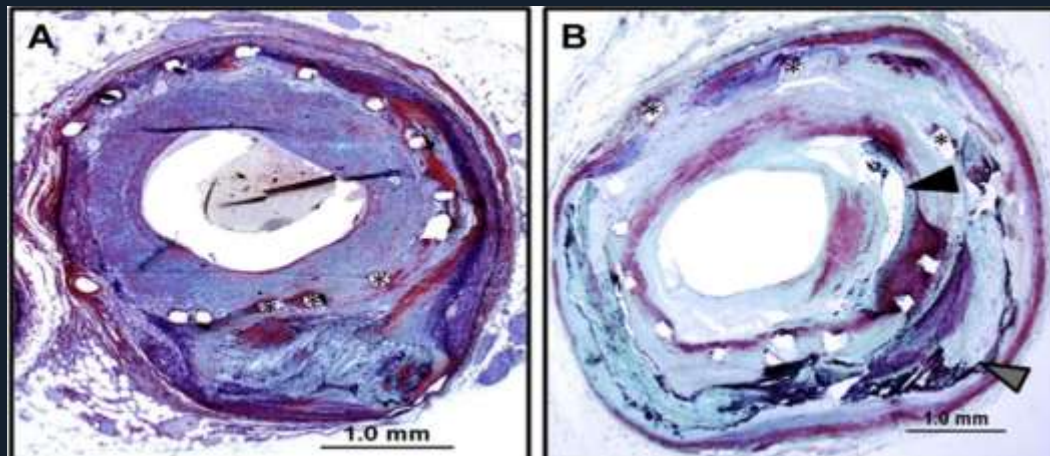
Kang SJ et al. Circ Cardiovasc Interv. 2011.

Neoathetsclerosis: Final common pathway of ISR?

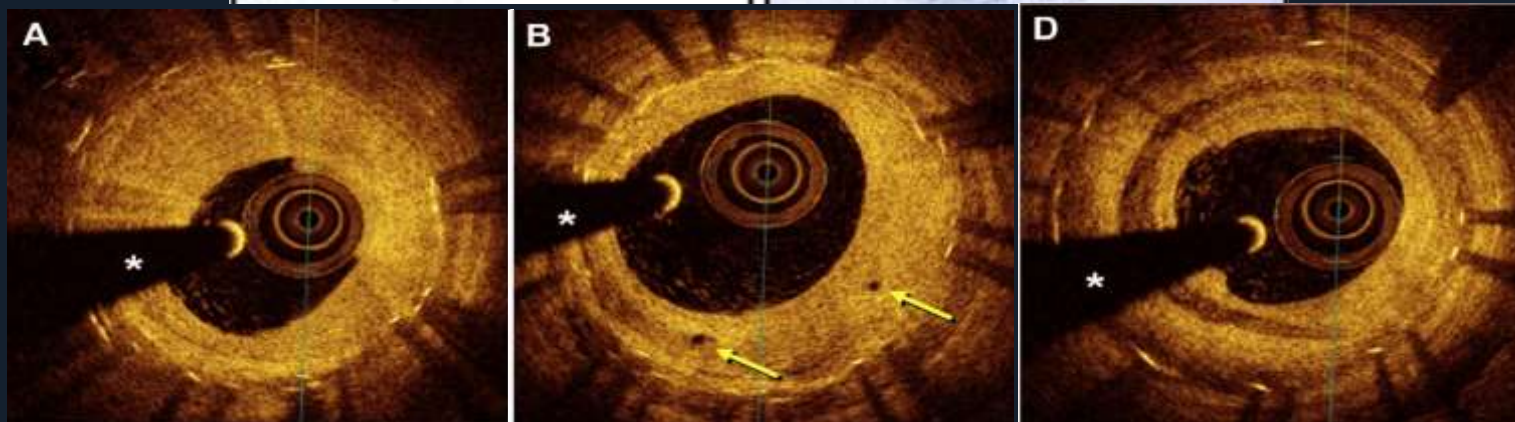
Early post PCI (BMS)
Homogeneous
Smooth muscle cell

Intimal hyperplasia

Neoathetsclerosis



Late post PCI (DES)
Heterogeneous
Athereroma
Neovascularization
Calcification

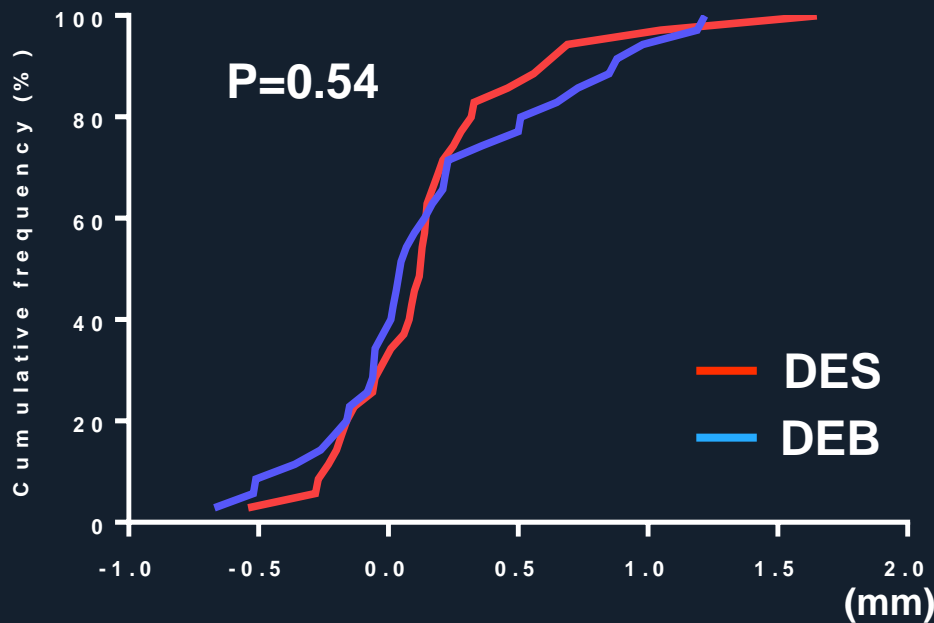


Alfonso F. J Am Coll Cardiol. 2014.

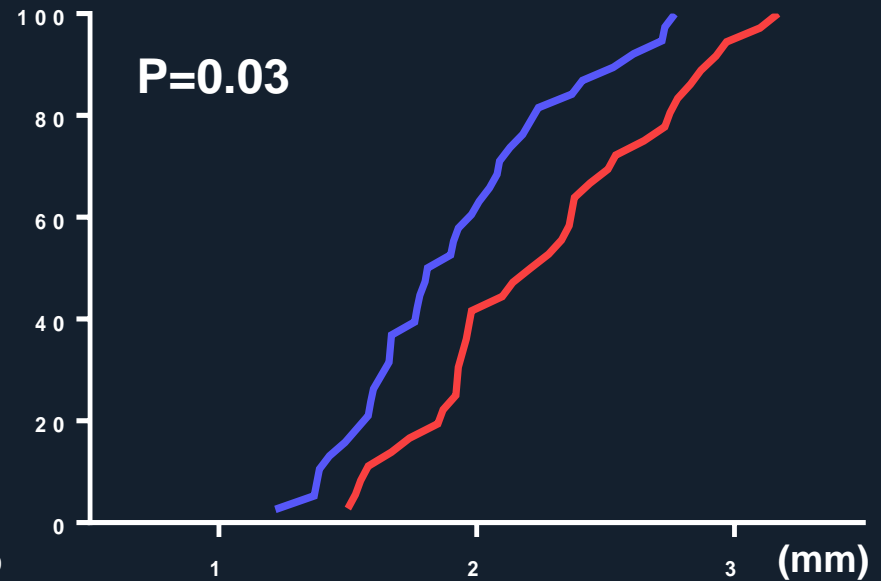
RESTORE Trial

: comparable outcomes between DEB & DES
But, smaller lumen area at DEB group

In-segment late lumen loss

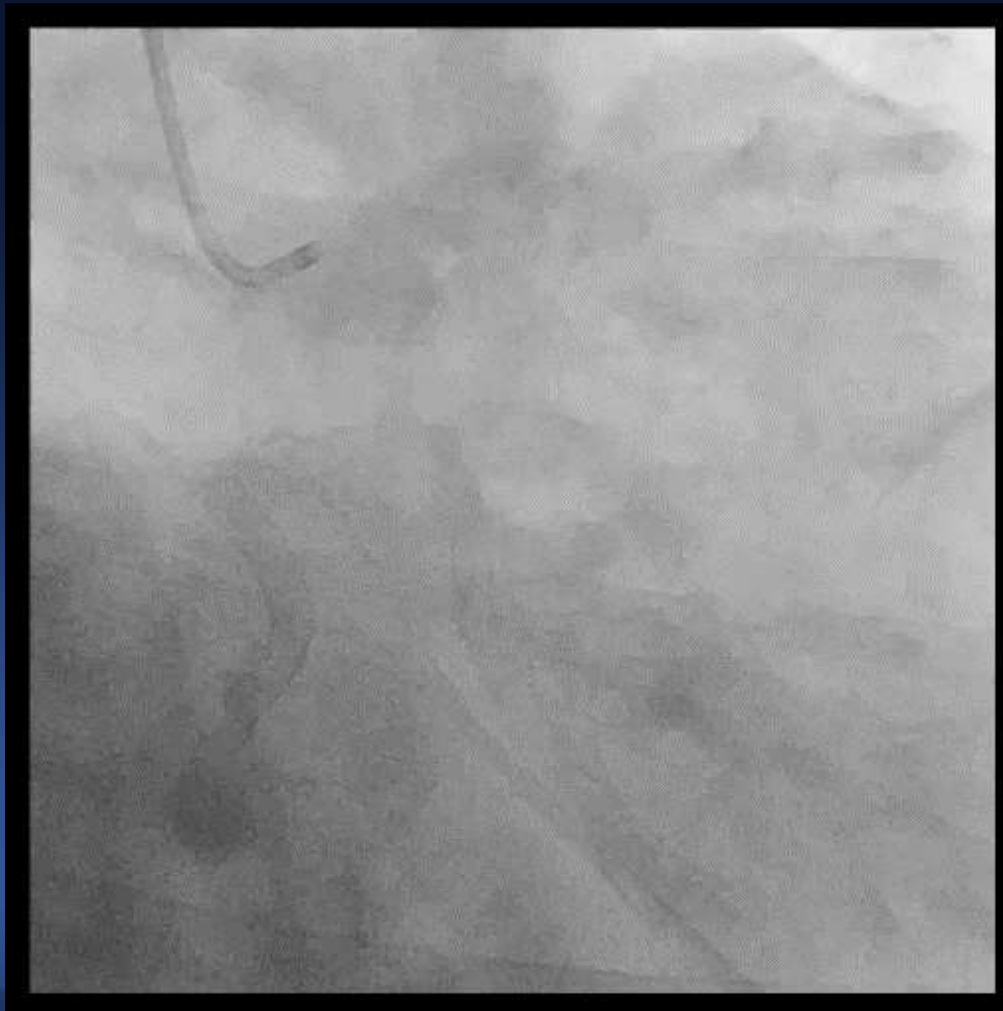


MLD at 9 month

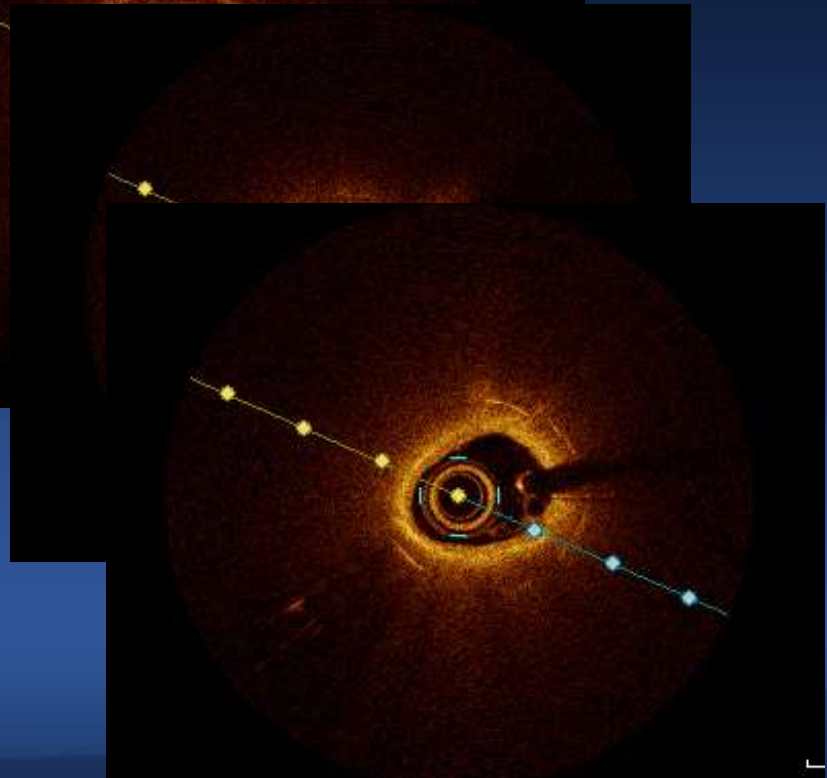
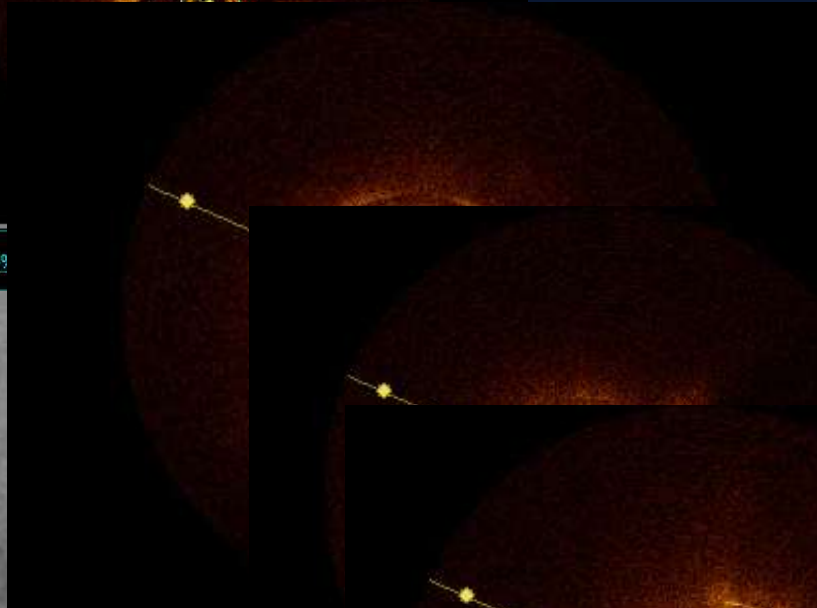
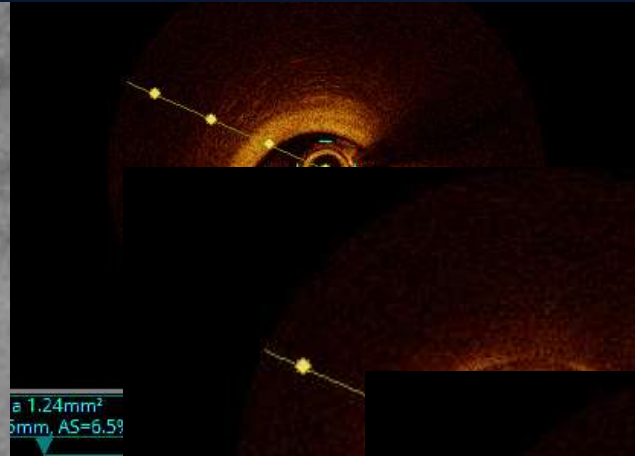


M/54,

LCX ISR at 10 year-old Taxus 3.0(24)+2.75(28)



Baseline OCT

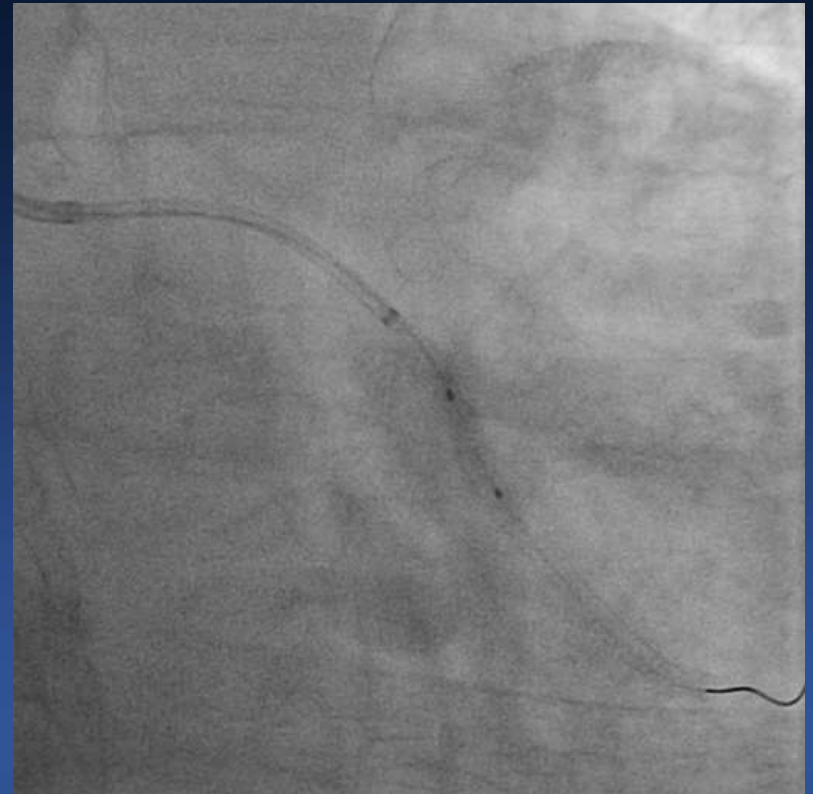


Balloon, balloon, balloon....

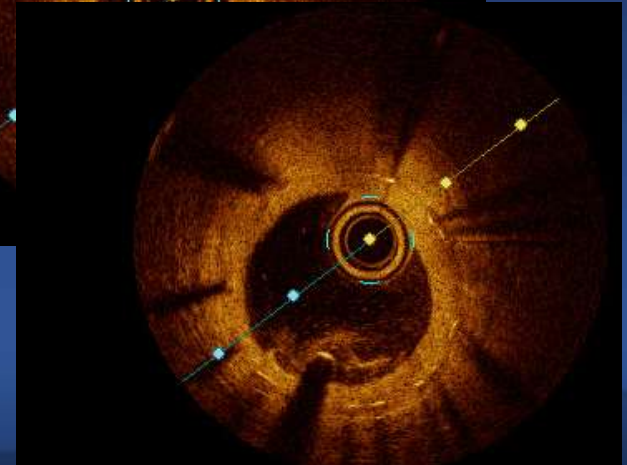
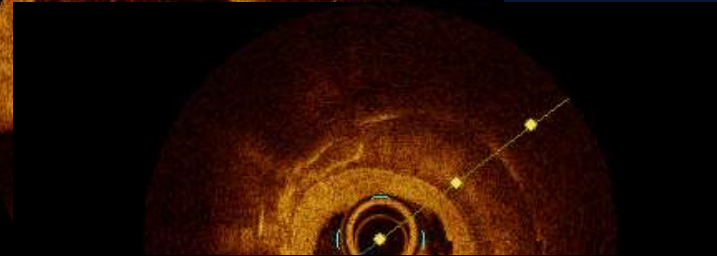
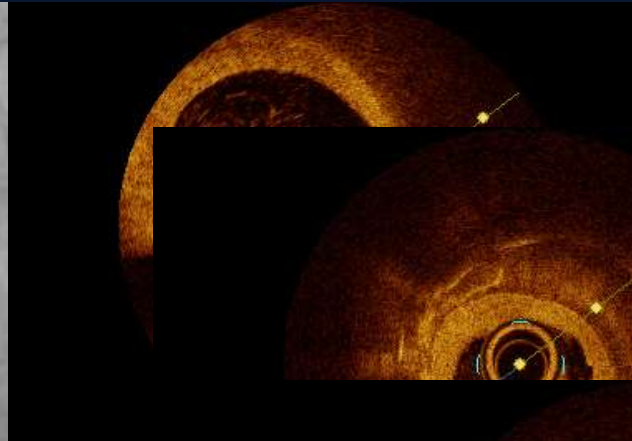
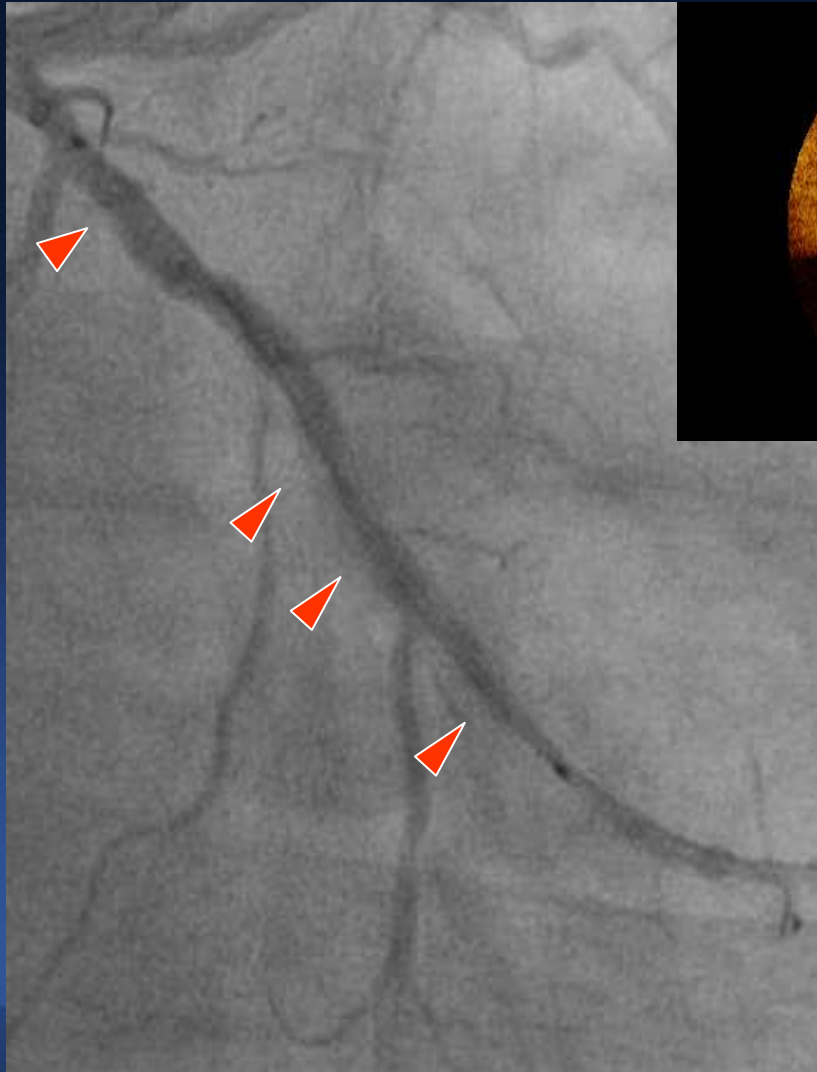
**NC Balloon 3.0(15)
upto 16 atm**



**Cutting Balloon 2.75 (10)
upto 14 atm**



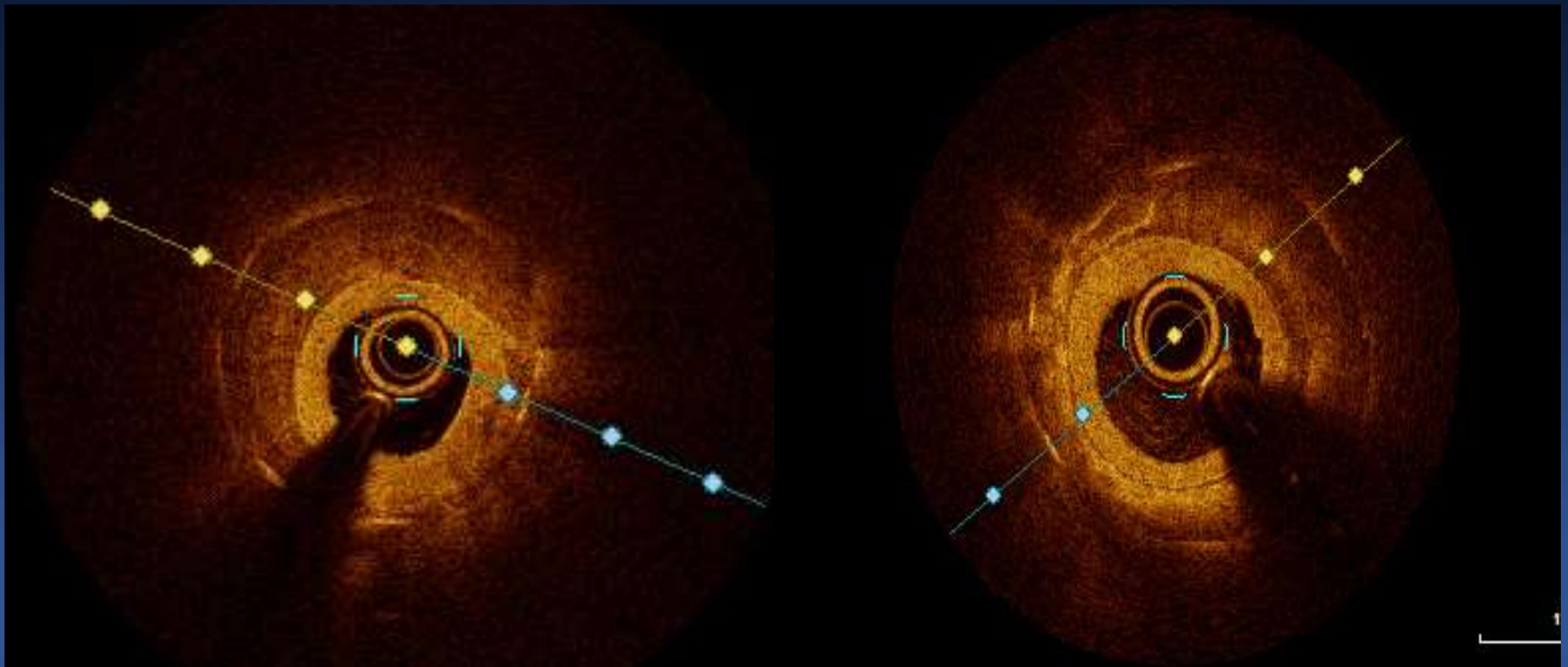
Post-balloon OCT



Not Fully Dilated even after High pressure & Cutting balloons !!

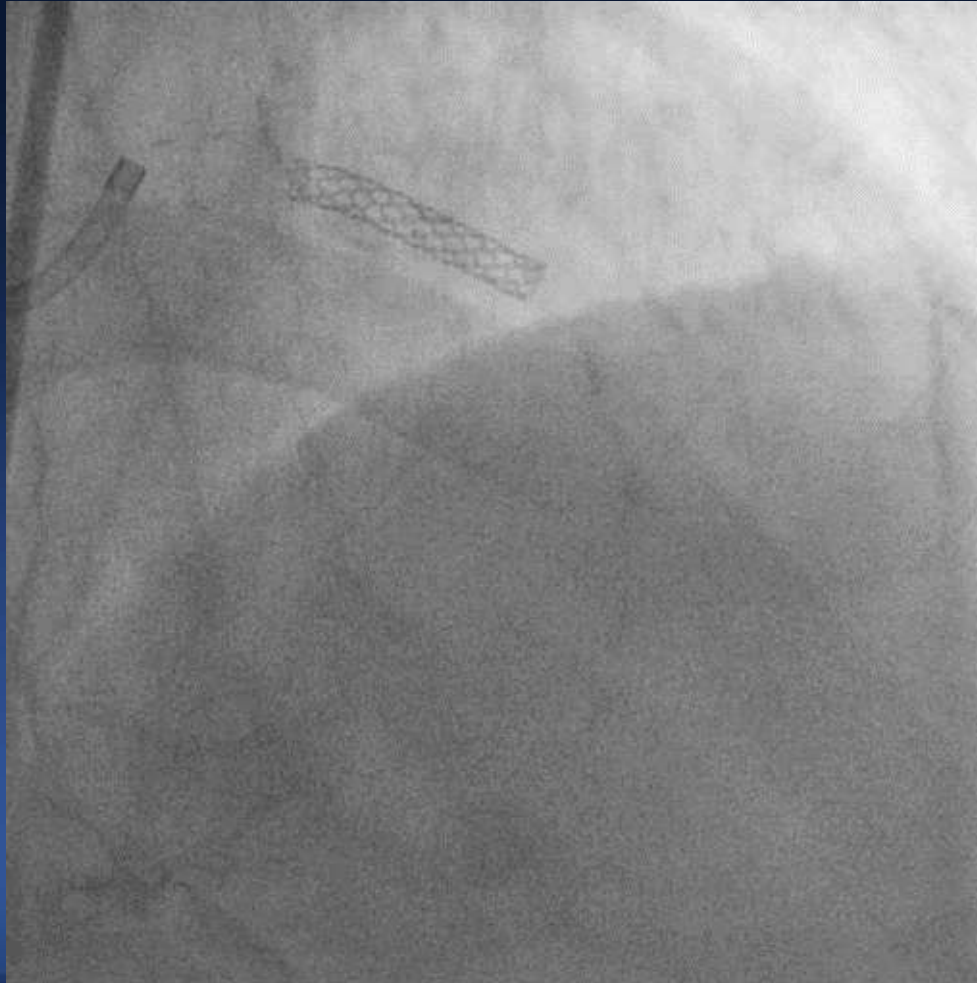
Before

After



What can we do?

68YO gentleman BMS Implantation 12 years ago

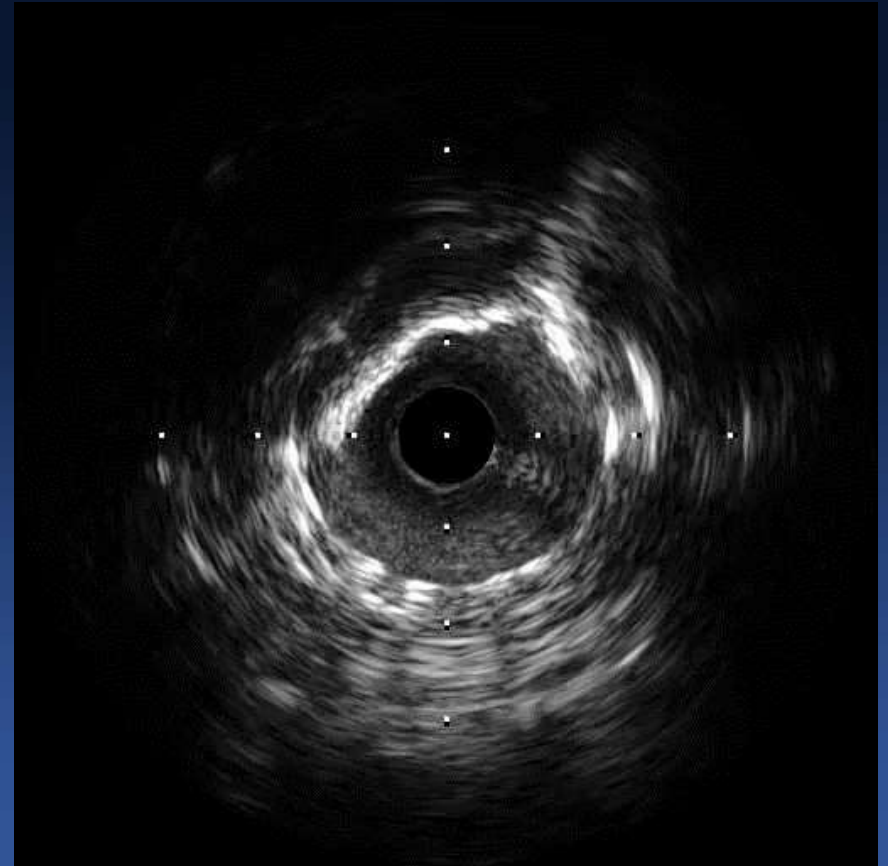
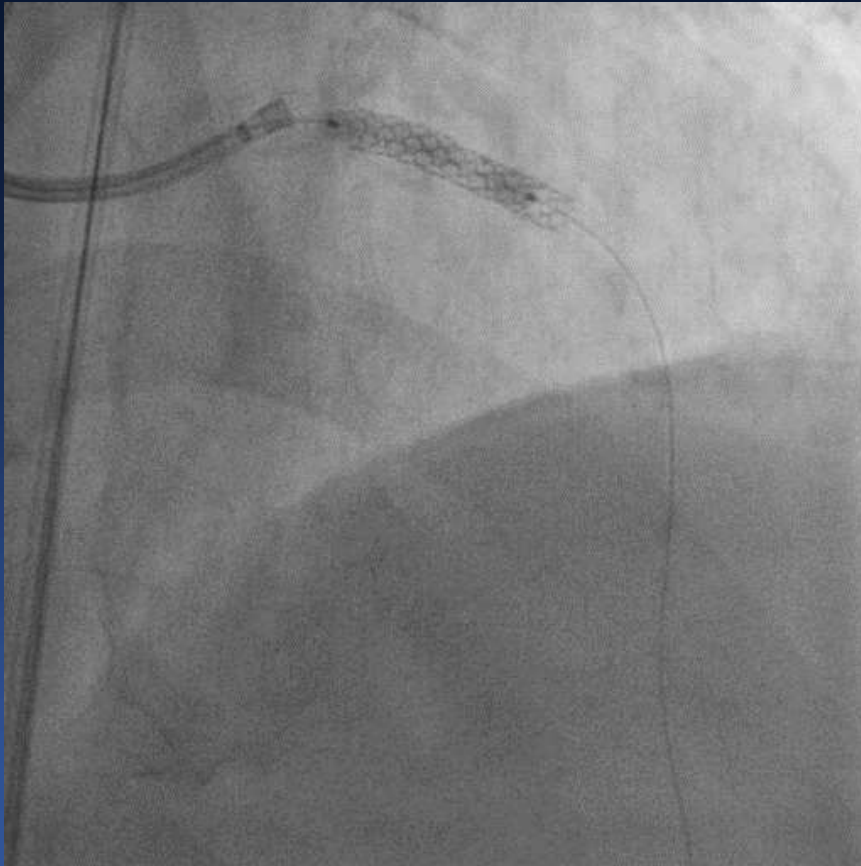


Pre-Balloon with NC 2.5mm

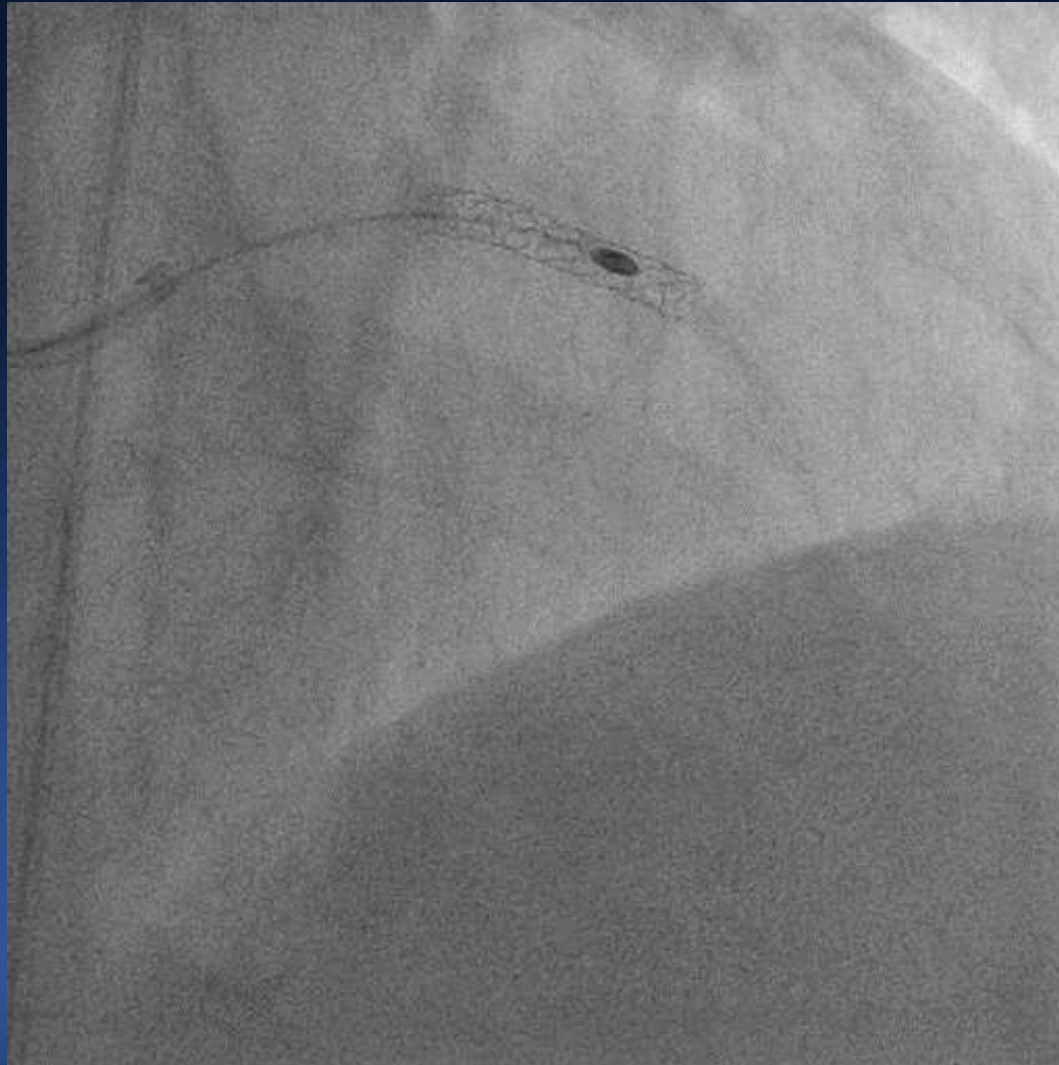


NC 3.0mm upto 28 atm

**Severely Calcified
Neoatherosclerosis**

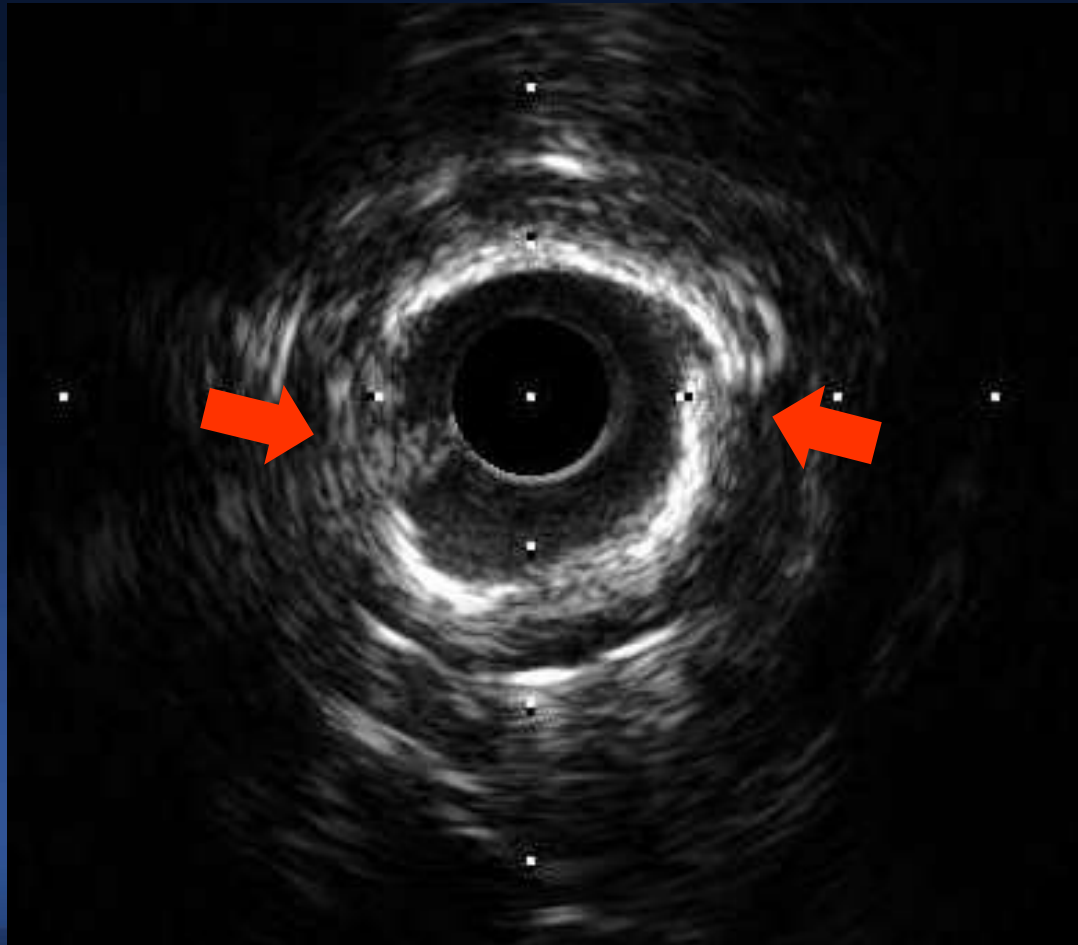


Rota with 1.5 and 1.75 Burr

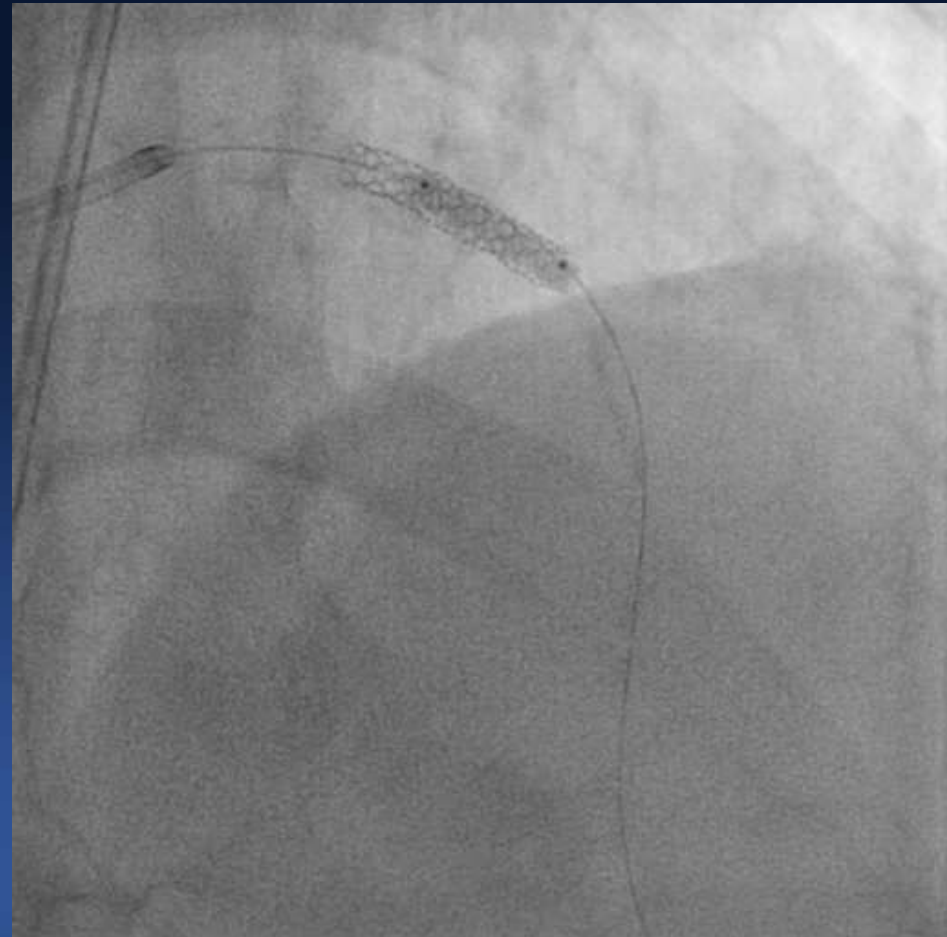
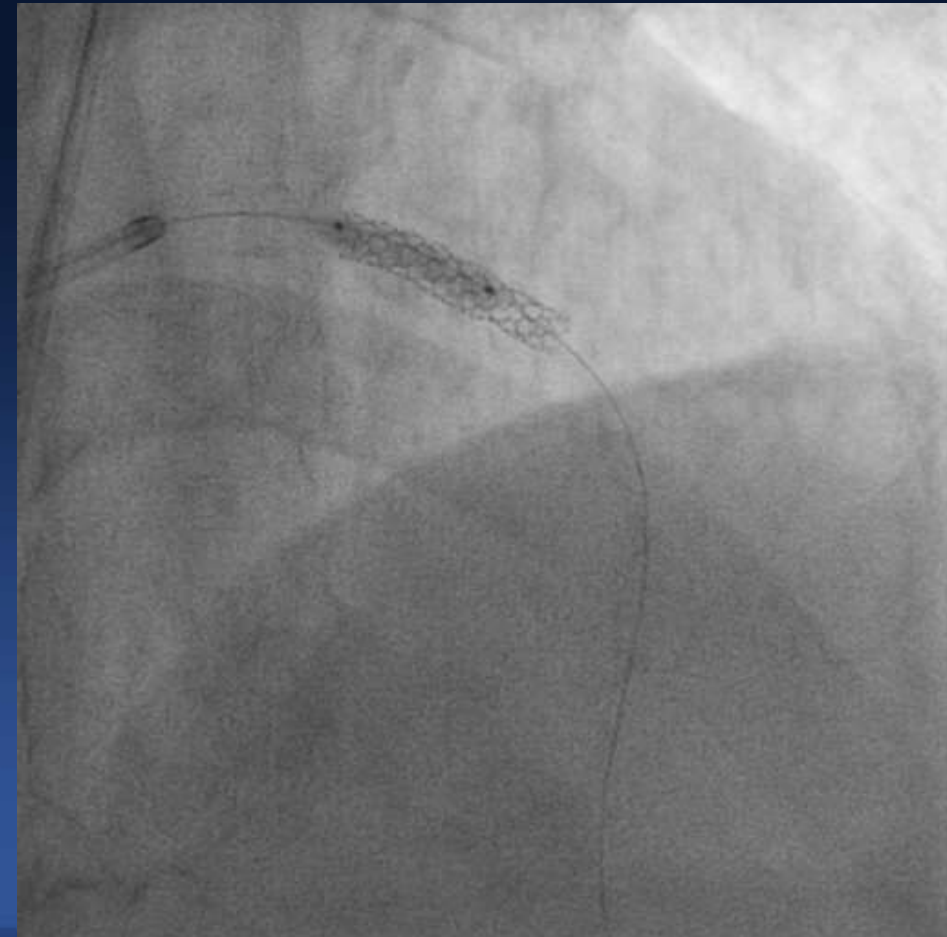


Post Rota IVUS

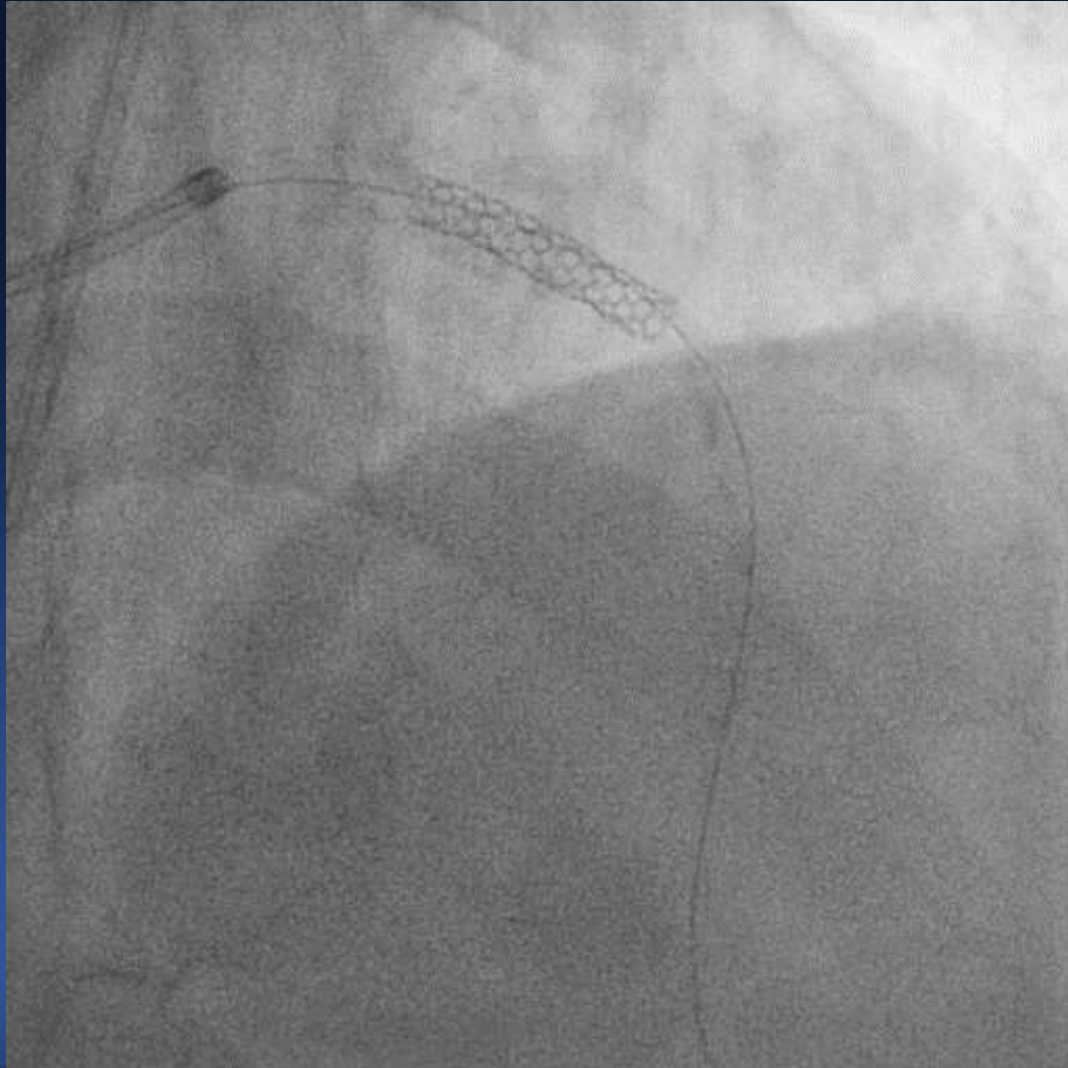
Disruption of the arc of calcification



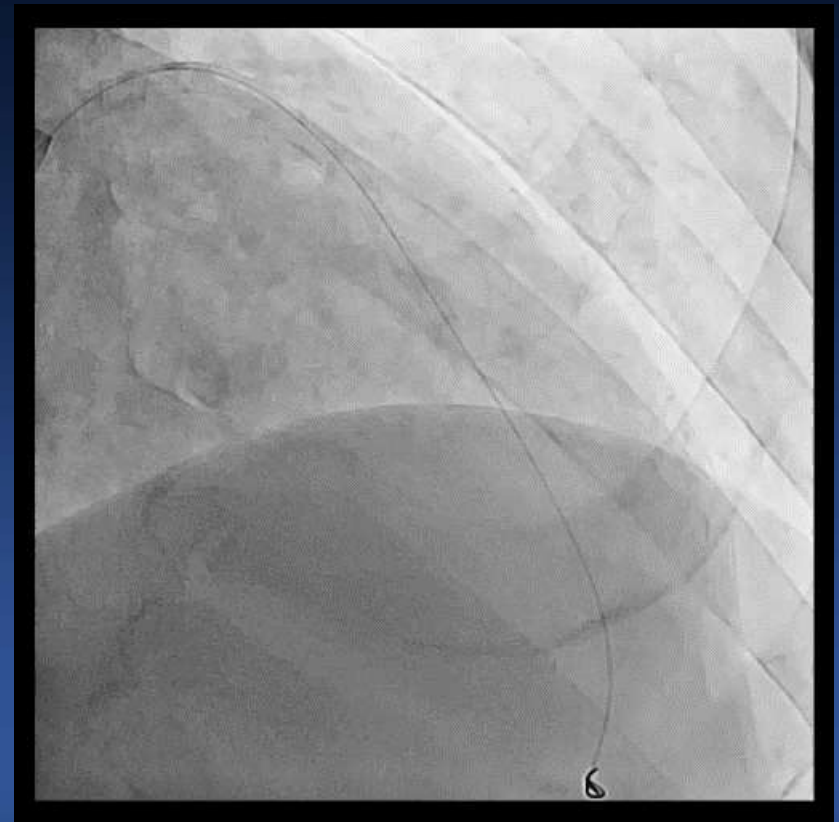
NC Balloon 3.5



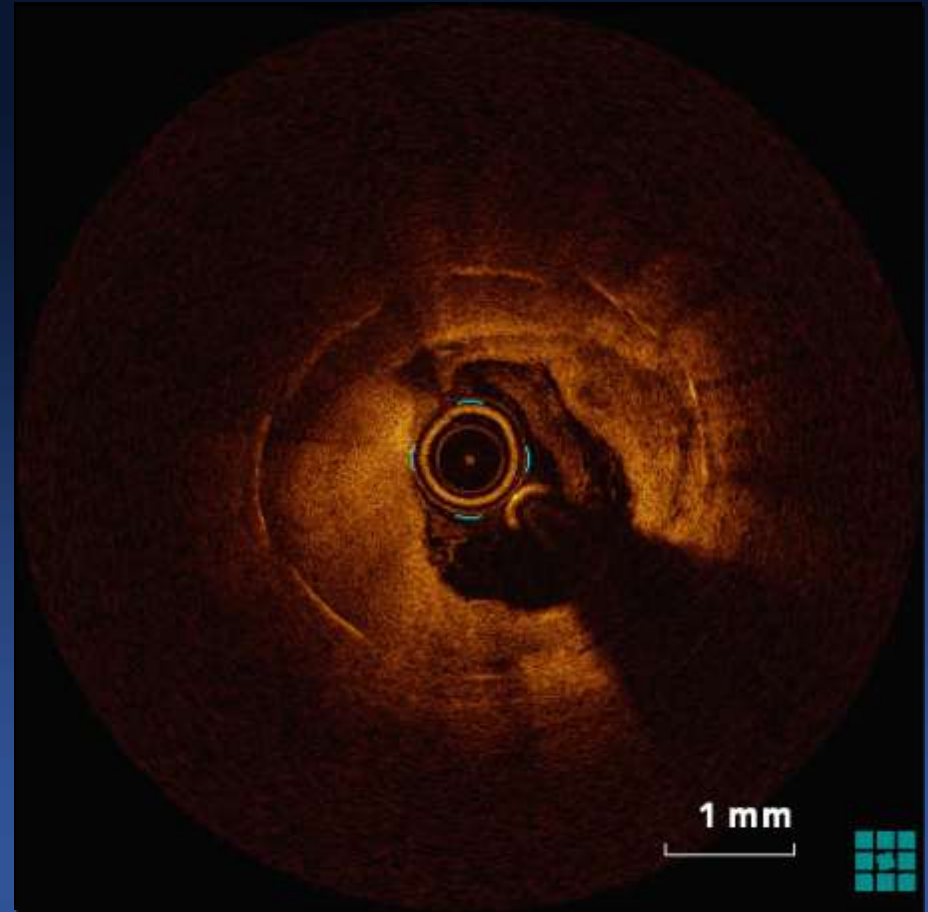
Post Rota and NC Balloon



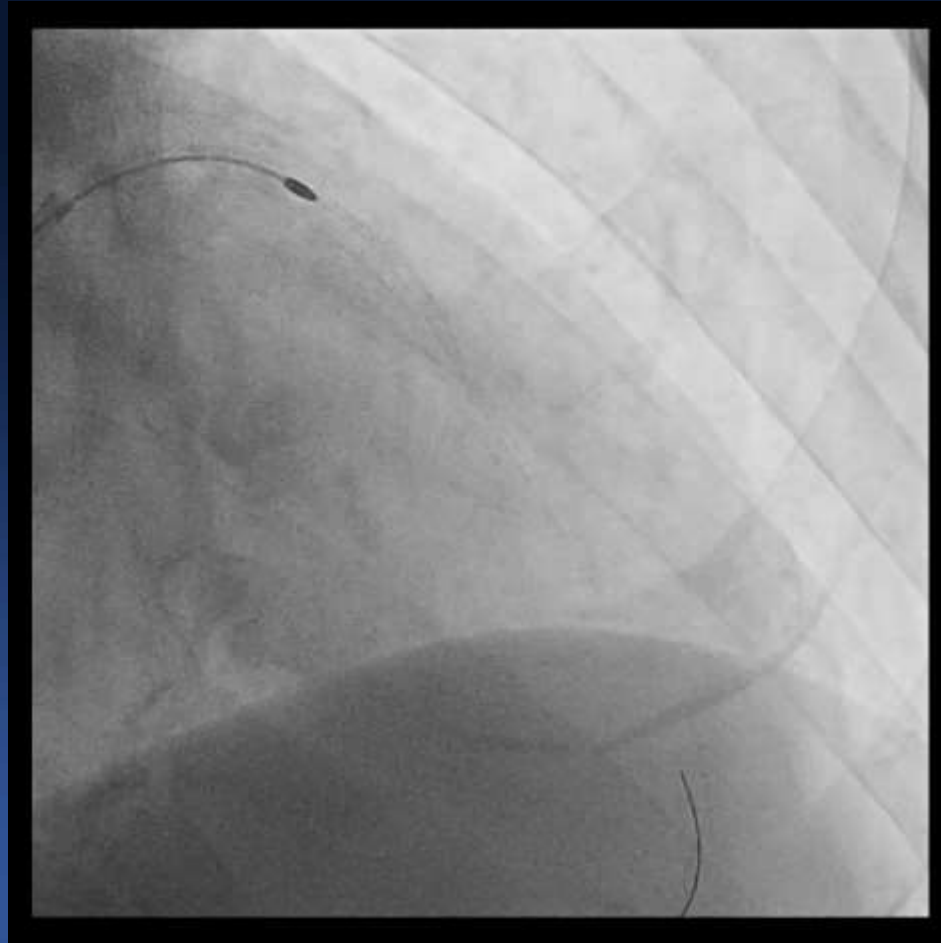
62YO gentleman
Taxus Implantation 12 years ago
DEB for ISR 2 years ago



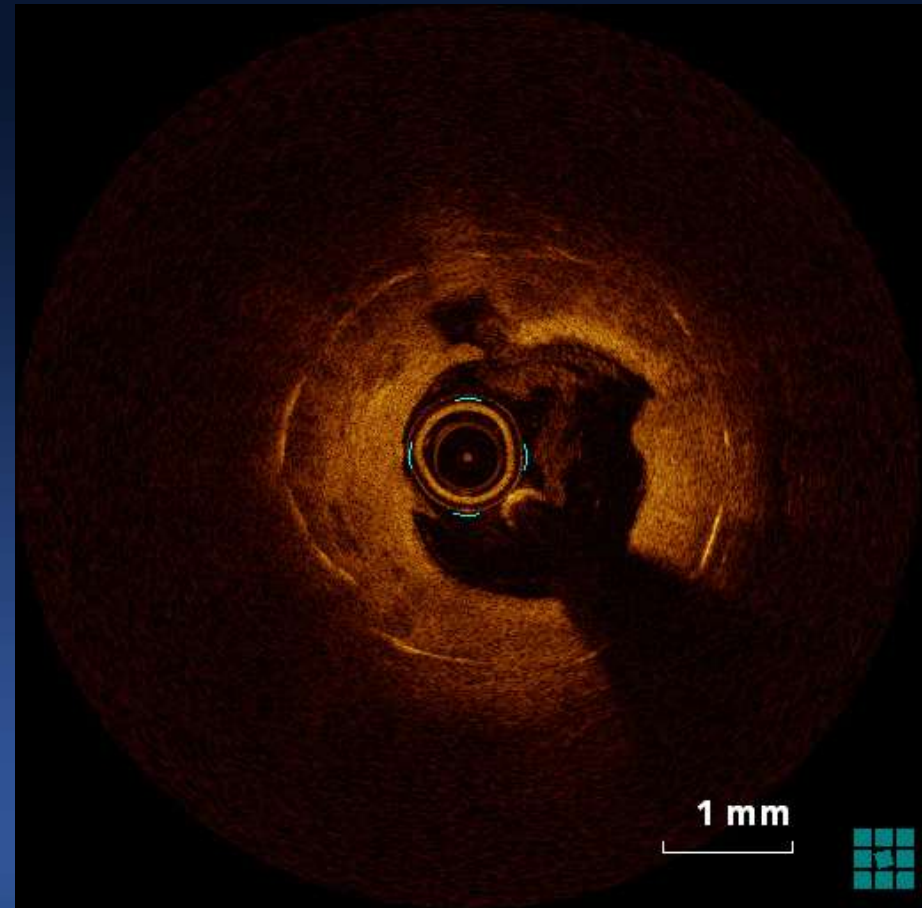
Calcified Neoatherosclerosis Not dilated with Balloons...



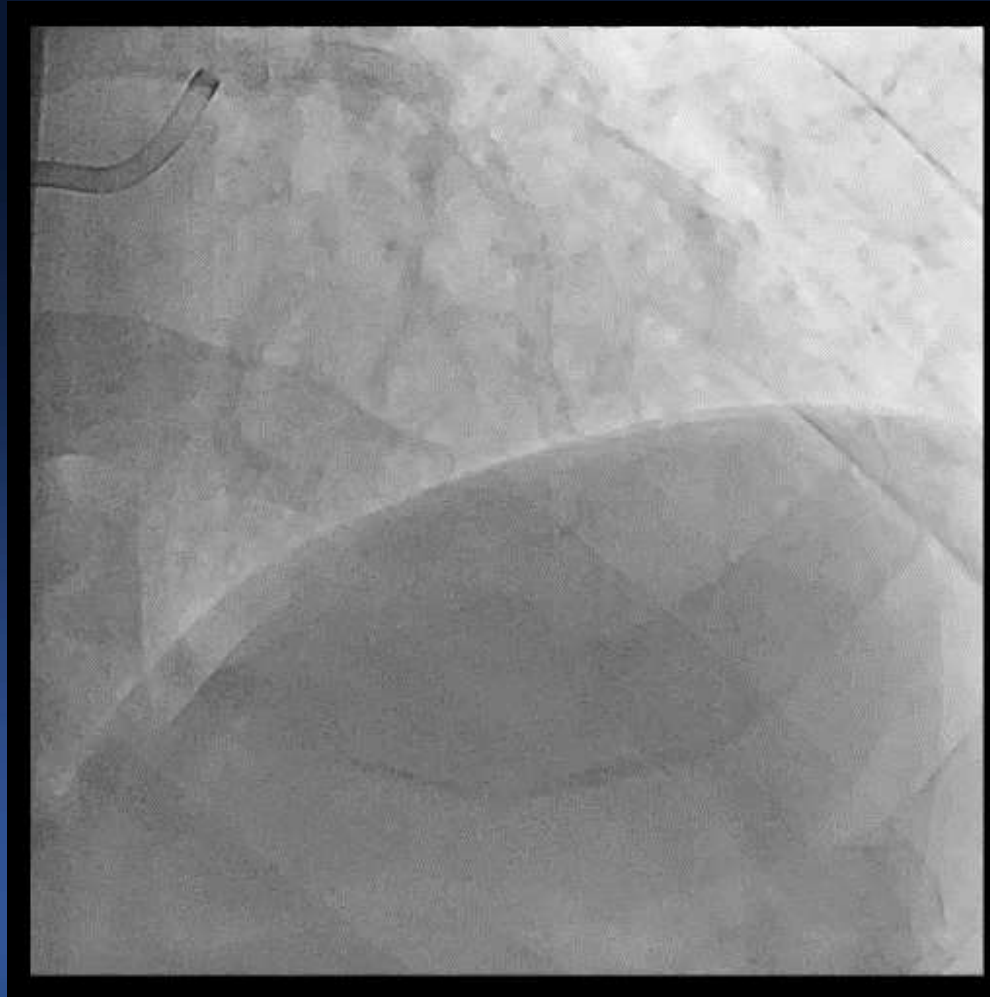
Rotablation with 1.25mm burr



Calcium is broken



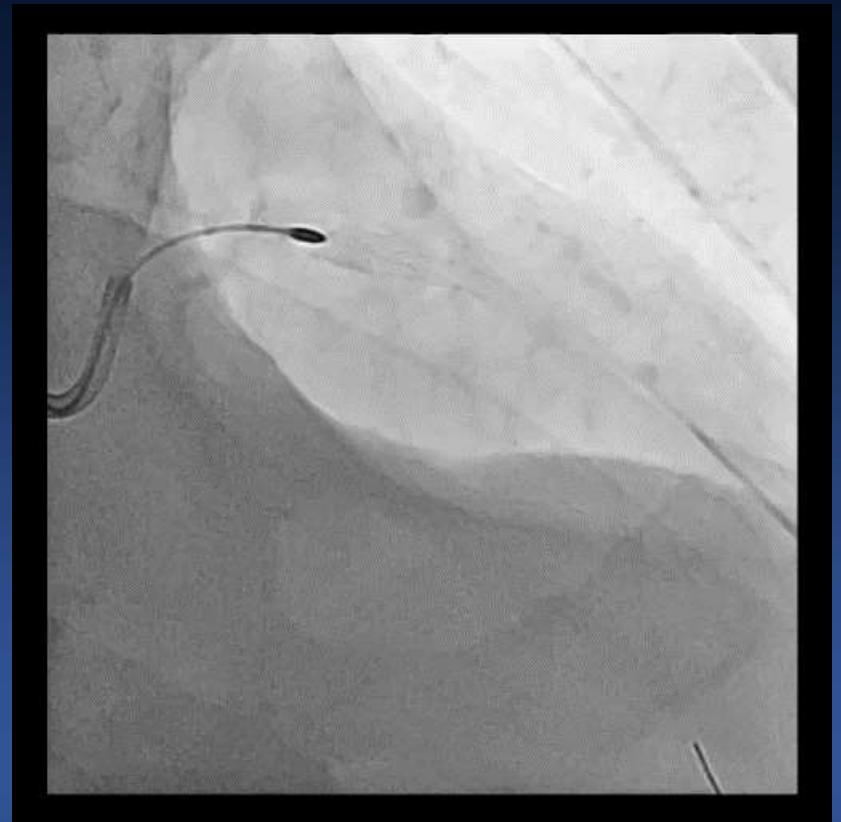
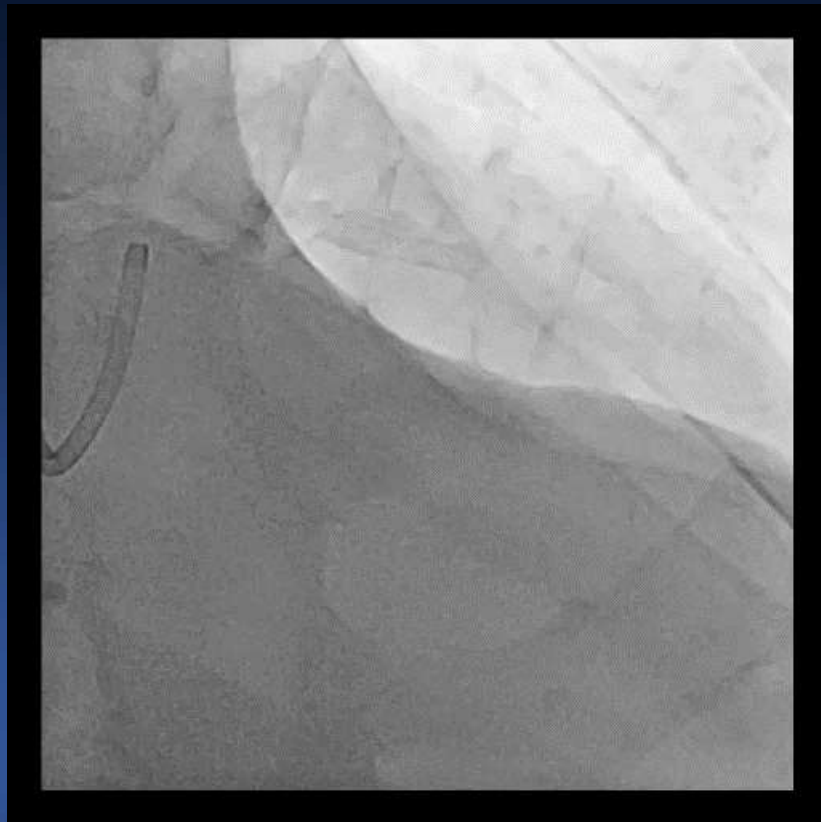
Scoring, NC balloons, then DEB



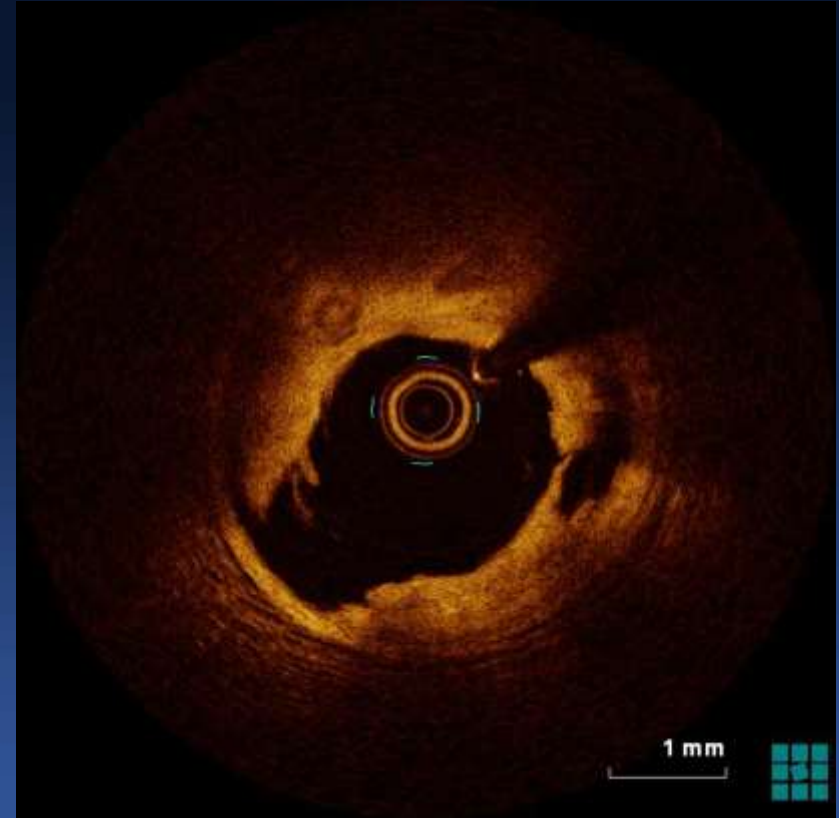
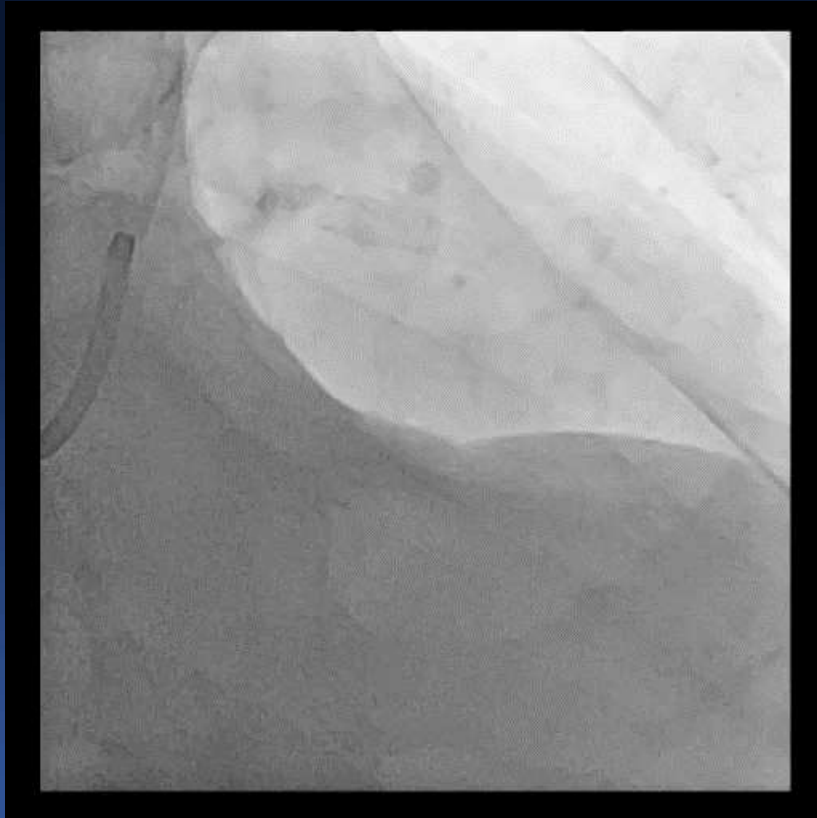
Be aware of...

70 YO Male

2-year-old Synergy 2.5 (20) stent with ISR



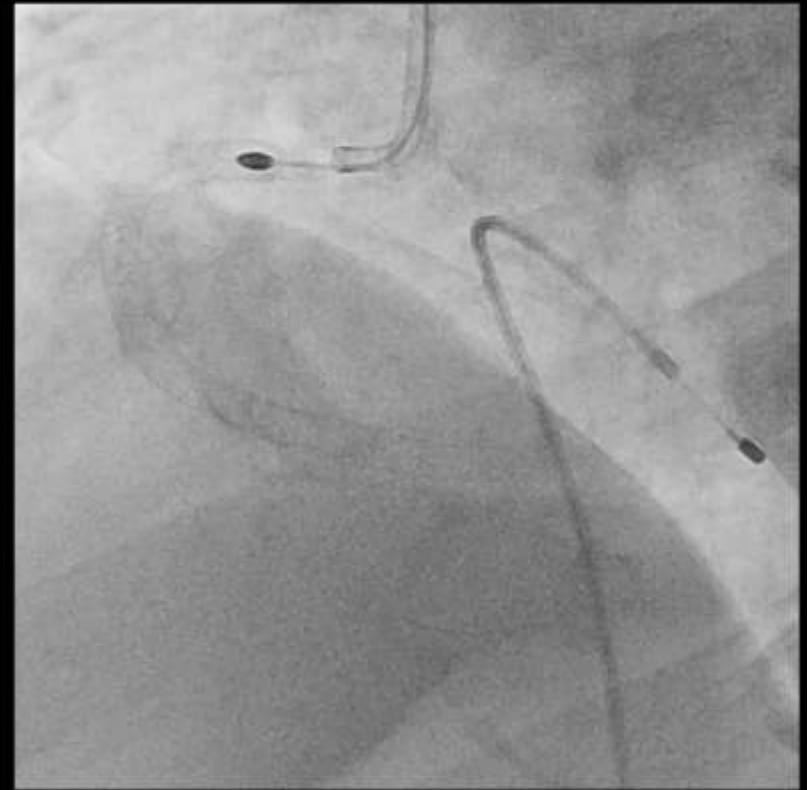
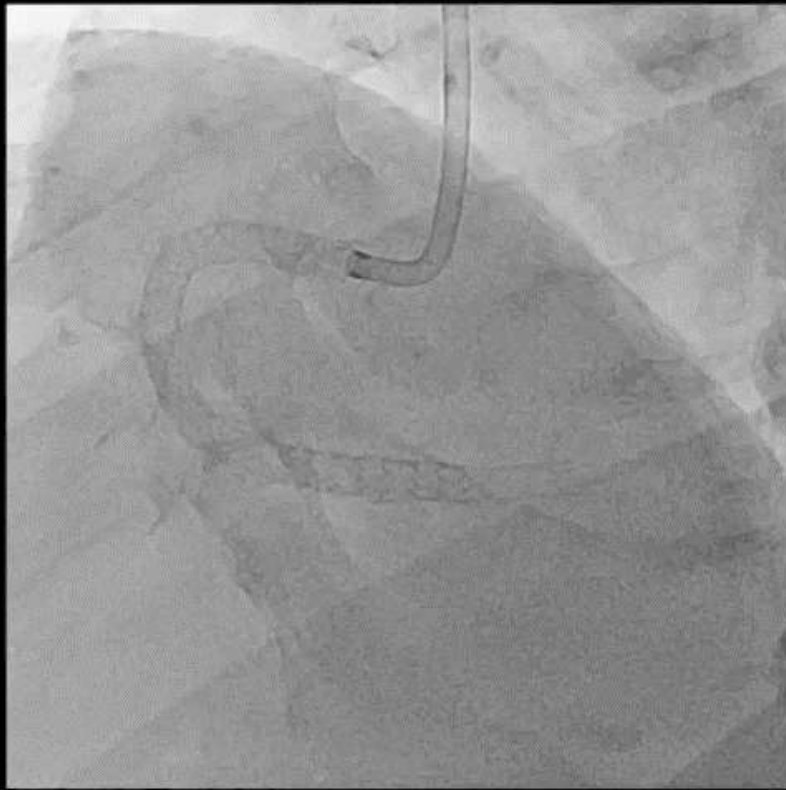
Be aware of Edge Dissection



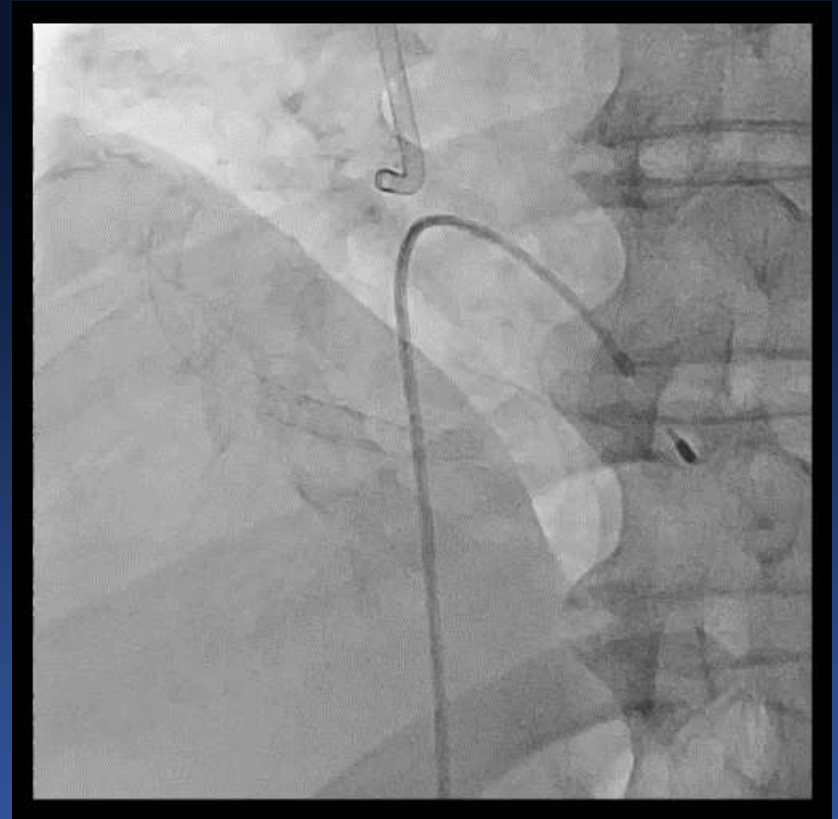
Be aware of...

68 YO Male

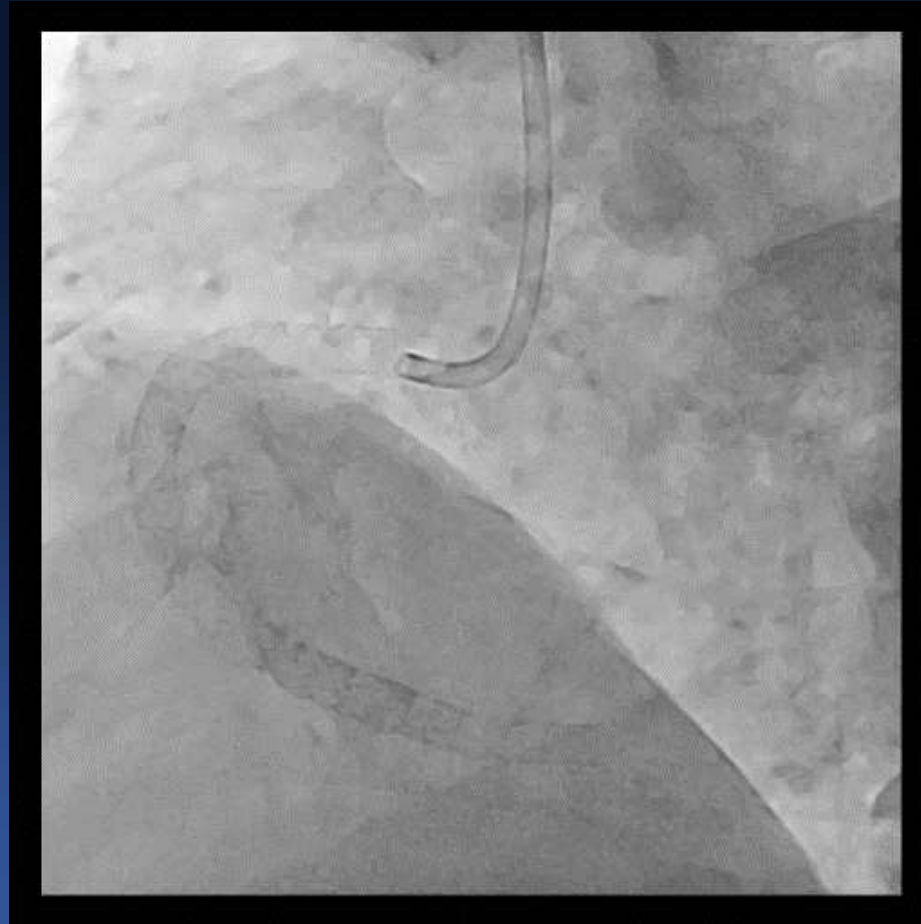
Cypher 11 YA, three Endeavor stents 2 YA



Be aware of No Reflow Phenomenon



Be aware of No Reflow Phenomenon



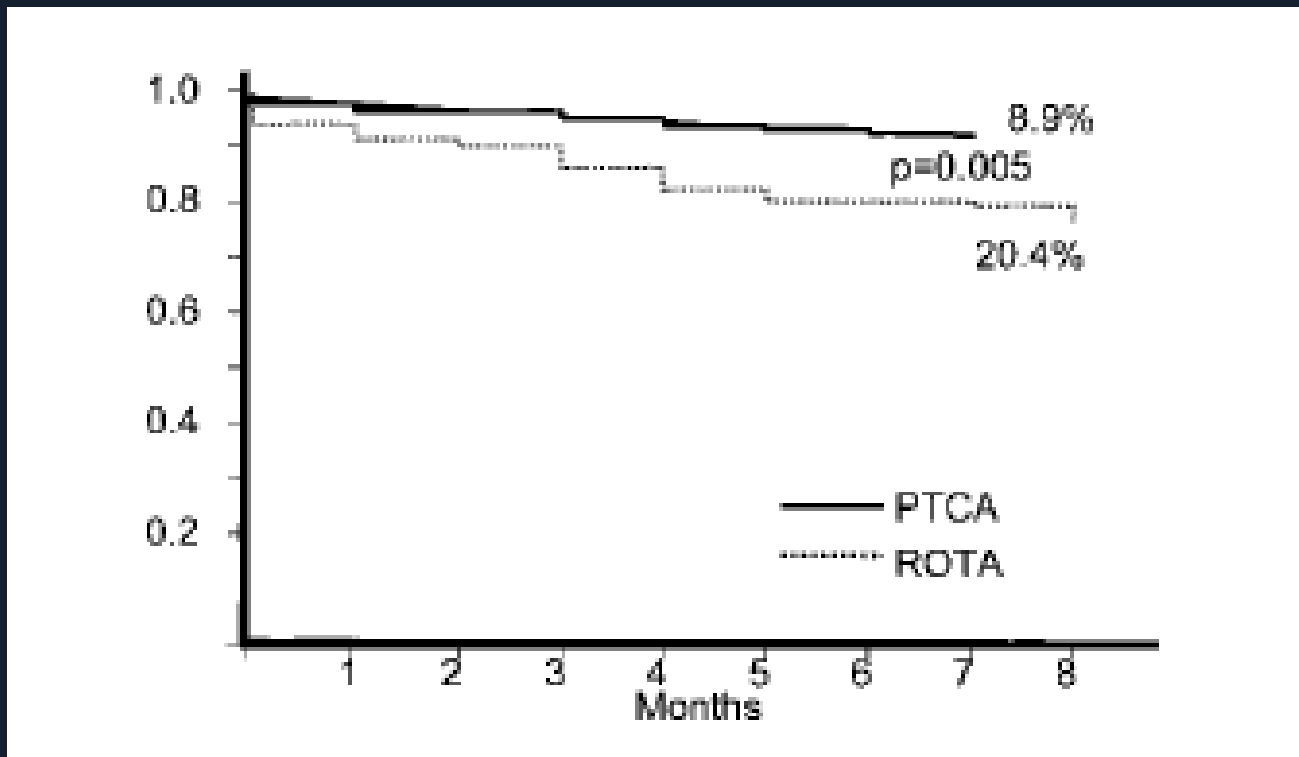
**Previous RCTs
investigated the role Rotablation
for In-stent Restenosis**

ARTIST Trial

: ROTA+BA vs POBA in ISR (n=152 vs. 146)

Worse CV events at 1 year in ROTA+BA group

Freedom from death, MI, or TLR



ARTIST Trial

: ROTA+BA vs POBA in ISR

TABLE 6. IVUS Results

	PTCA (n=37)	ROTA (n=41)	P
Before intervention, mm ²			
Reference lumen CSA	7.3±2.6	6.3±3.2	0.43
Minimal lumen CSA	1.3±0.5	1.2±0.5	0.72
Minimal stent CSA	5.6±1.5	5.1±1.9	0.58
Neointima CSA	3.7±1.5	3.2±1.2	0.27
After rotablation, mm ²			
Minimal lumen CSA	...	2.6±0.9	...
Minimal stent CSA	...	5.0±1.8	...
Neointima CSA	...	2.2±1.3	...
After PTCA, mm ²			
Minimal lumen CSA	4.6±1.4	3.9±1.1	<0.05
Minimal stent CSA	6.7±1.7	5.3±1.7	<0.01
Neointima CSA	2.0±0.8	1.7±1.0	<0.05
Follow-up, mm ²			
Minimal lumen CSA	2.7±1.7	2.6±1.3	0.72
Minimal stent CSA	6.6±1.6	5.5±2.1	<0.005
Neointima CSA	3.4±1.4	2.4±1.0	<0.01

Values are mean±SD.

- Similar MSA at 6 months (2.6 vs. 2.7 mm², p=0.72)
- Lower maximal balloon pressure in ROTA group (6.1 vs. 12.7 atm, p<0.001)
→ lower MLA, MSA after PTCA

ROSTER Trial

:ROTA+BA vs POBA in ISR by IVUS guidance

- ROTA+BA (low pressure, 4-6 atm, n=100)
vs. POBA (high-pressure, >12 atm, n=100)
- **TLR at 9 month**: 32% in ROTA+BA, 45% in POBA (p=.042)
- IVUS result (Residual intimal hyperplasia)
: 2.1 vs 3.3 mm² (P =.005)

Limitations of Prior RCTs

- Low pressure balloon angioplasty after rotablation
→ Smaller minimal stent area after PTCA
- No evidence in DEB era

ROTA-ISR Trial

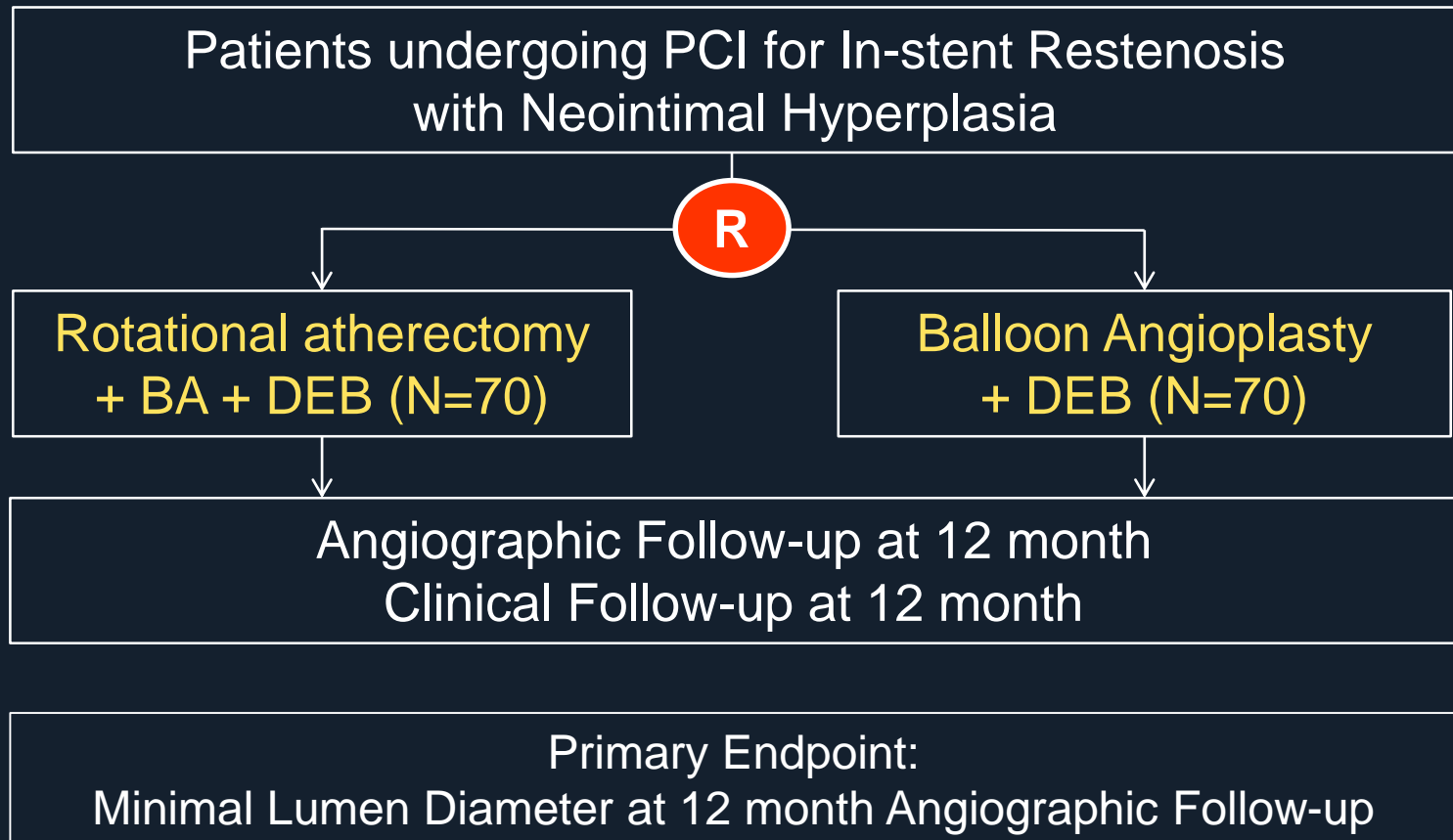
Debulking with **ROT**ational Atherectomy
versus Balloon Angioplasty
In Patients with **In-S**tent **R**estenosis

Hypothesis

- Debulking with rotational atherectomy will be superior to only balloon angioplasty after PCI for in-stent restenosis with neointimal hyperplasia regarding minimal lumen area at 1 year

Debulking with Rotational Atherectomy versus Balloon Angioplasty
In Patients with In-stent Restenosis

ROTA-ISR Trial



Study Population

- Inclusion Criteria

- Age 19 years or older
- Subjects with coronary in-stent restenosis eligible for PCI
- Neointimal hyperplasia in previous coronary stents is identified as a mechanism of ISR

Study Population

- Exclusion Criteria

- Complex anatomy that rotational atherectomy is not feasible
- If there is expectation that abnormal clinical or laboratory findings of the subjects to be related with subsequent adverse outcomes after rotational atherectomy
- Life expectancy < 1 year

Primary Endpoint

- In-segment minimal lumen diameter at 1 year
 - The principal analyses will be by intention to treat

Randomization

- Patients with neointimal hyperplasia-related ISR detected by intravascular imaging (OCT preferred) is enrolled.
- Patients are randomly assigned to ROTA or Balloon group as 1:1 ratio.
- The randomization is stratified by the diameter of previous stents (\leq or $>$ 3.0mm).

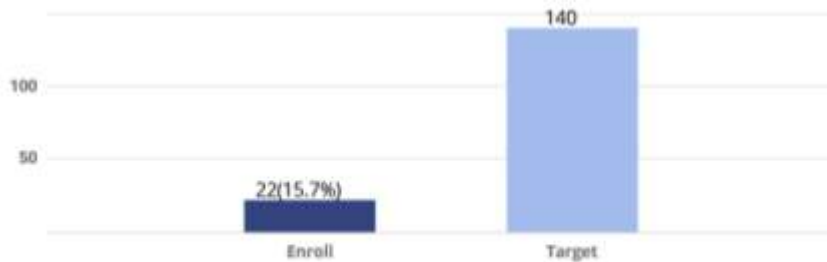
Index Procedure

- ROTA group :
Rotablation + Balloon angioplasty + Drug-eluting balloon
- Balloon group :
Balloon angioplasty + Drug-eluting balloon
- Recommended size of burrs during rotablation is based on burr/stent diameter ratio of 0.6.
- All subjects will be underwent DEB angioplasty at final step of procedure.
- F/U coronary angiography will be performed at 1 year.

22 Patients Enrolled (since May 2018) From 6 centers in South Korea

overview **current status** paper

목표대비 등록현황



월별 등록현황



Conclusion

- Neointimal hyperplasia, especially the calcified neoatherosclerosis interferes fully dilation of In-stent restenosis.
- Rotational atherectomy is a good option to reduce the neointimal burden in the stent.
- An ongoing ROTA-ISR randomized trial will reveal the role of debulking for the treatment of ISR with neointimal hyperplasia.



Thank You !!

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