Can BRS Stabilize Vulnerable Plaque ?
PREVENT Trial

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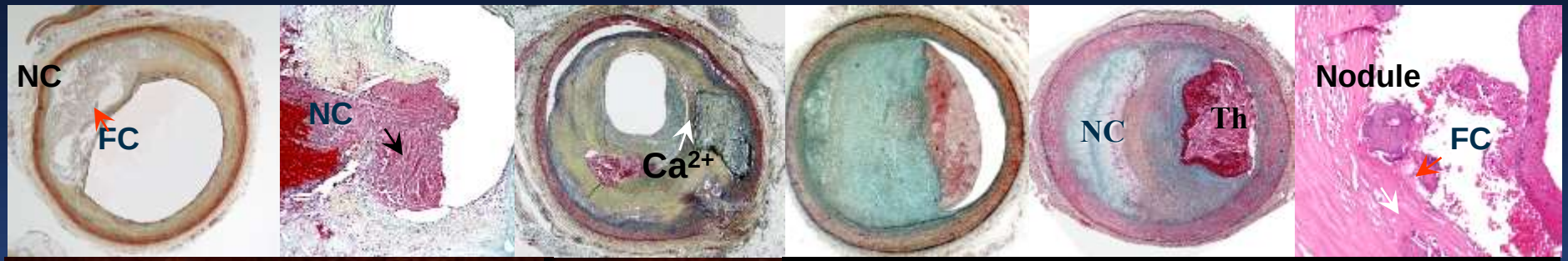
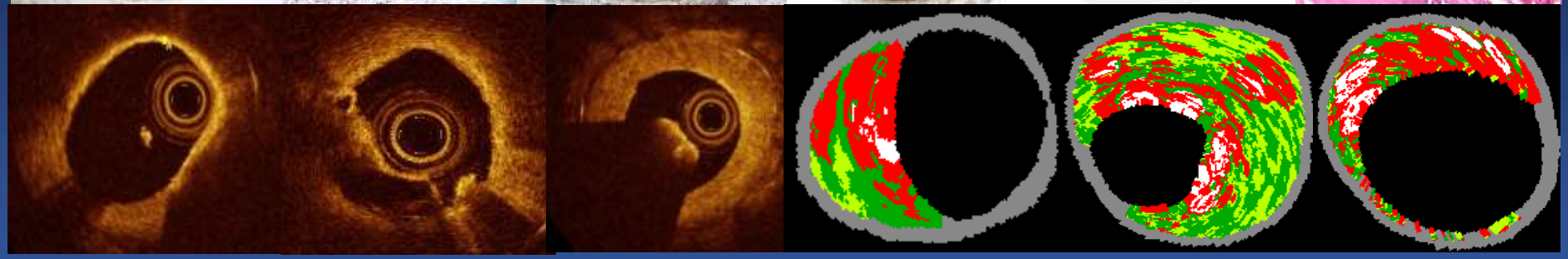
Vulnerable Plaque
To Treat or Not To Treat ?

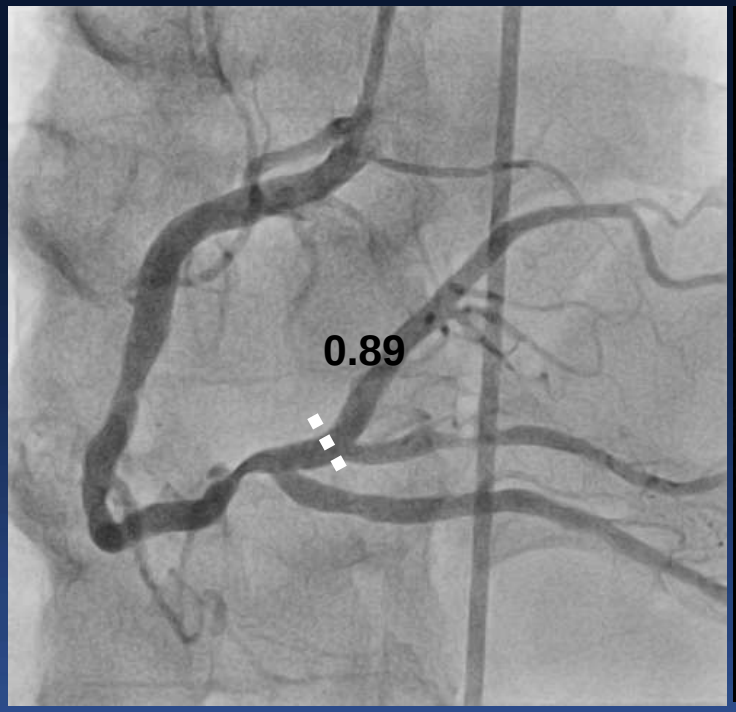
Thin-cap Fibroatheroma (TCFA) | Rupture/ Healed Rupture | Erosion | Erosion/ Thrombus | Calcific Nodule





Thin-cap Fibroatheroma (TCFA) | Rupture/ Healed Rupture | Confluent Necrotic Core | >50% Area Narrowing | Calcium >5%

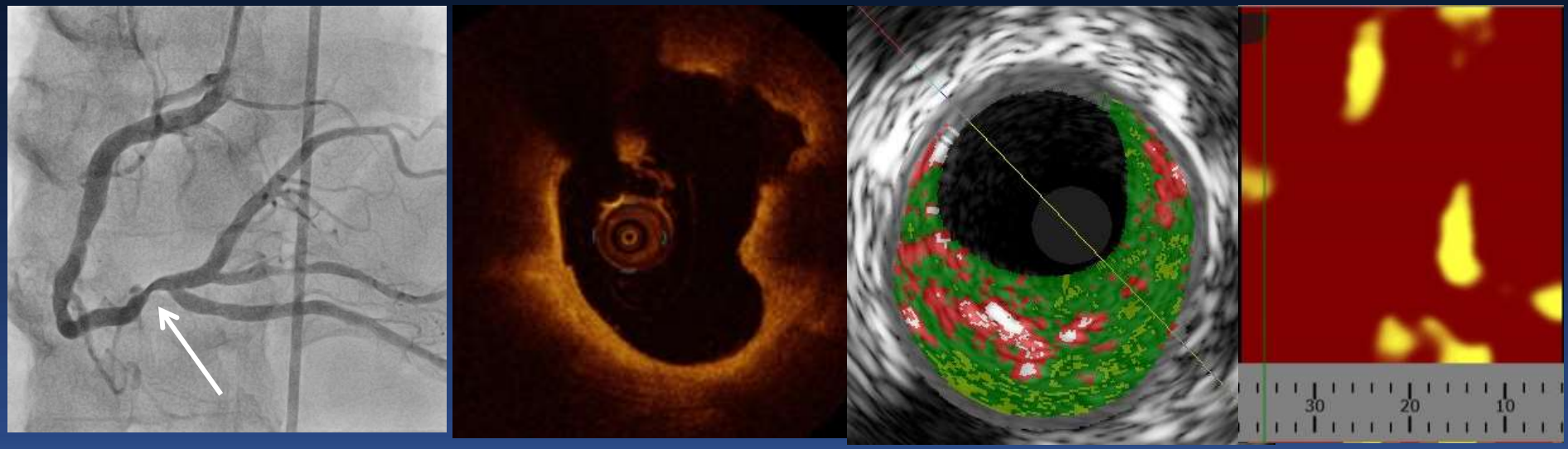
55 y/o male,
Effort Chest Pain



Plaque Characteristics
by OCT, VH-IVUS & NIRS

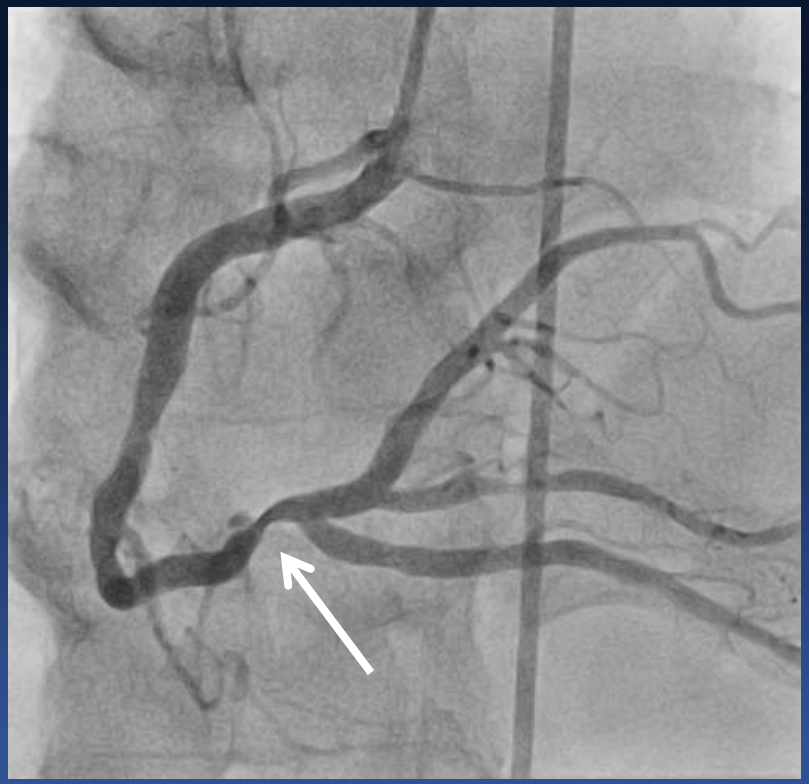
Rupture, TCFA

$_{max}LCBI_{4mm}$= 404



Necrotic Core 25%

Functionally Insignificant
Vulnerable Plaque
To Treat or Not To Treat ?



FFR : 0.89

Angiographic DS : 70%

IVUS MLA : 3.45 mm^2

Plaque burden : 73%

$_{max}LCBI_{4mm}$: 404

TCFA (+)

Not to Treat ?

Negative FFR (non-invasive stress tests) means *just excellent prognosis (0.6%/year, Cardiac Death and MI),* even in the presence of angiographically proven coronary artery disease.

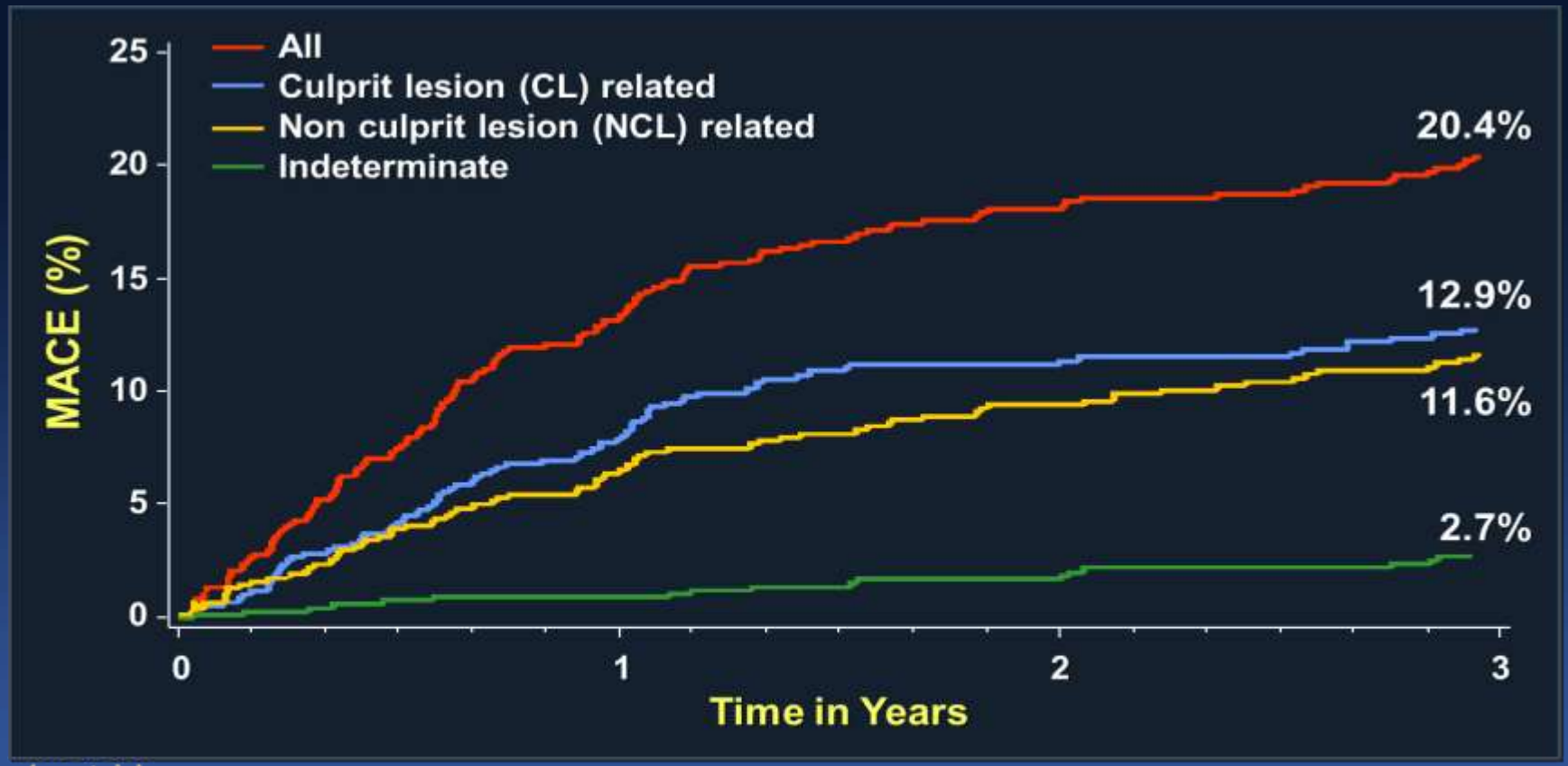
Shaw LJ, J Nucl Cardiol 2004;11:171-85 ,Prognostic value of gated myocardial perfusion SPECT. Very large meta-analysis (n=39,173 patients)

To Treat ?

Vulnerable Plaque (defined by PROSPECT study) *has more tendency to increase MACE.*

PROSPECT: MACE

(N=700, ACS, 3-Vessel Imaging after PCI)



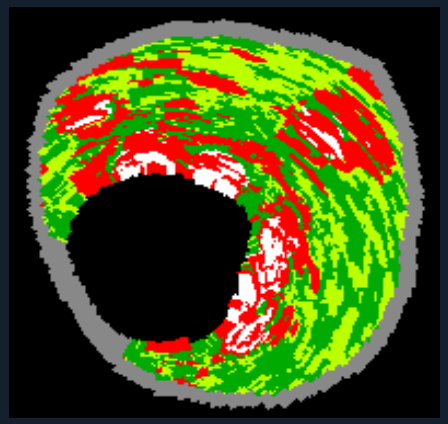
Number at risk

ALL	697	557	506	480
CL related	697	590	543	518
NCL related	697	595	553	521
Indeterminate	697	634	604	583

Stone GW et al. NEJM 2011;364:226-35

Vulnerable Plaque
Defined by VH-IVUS

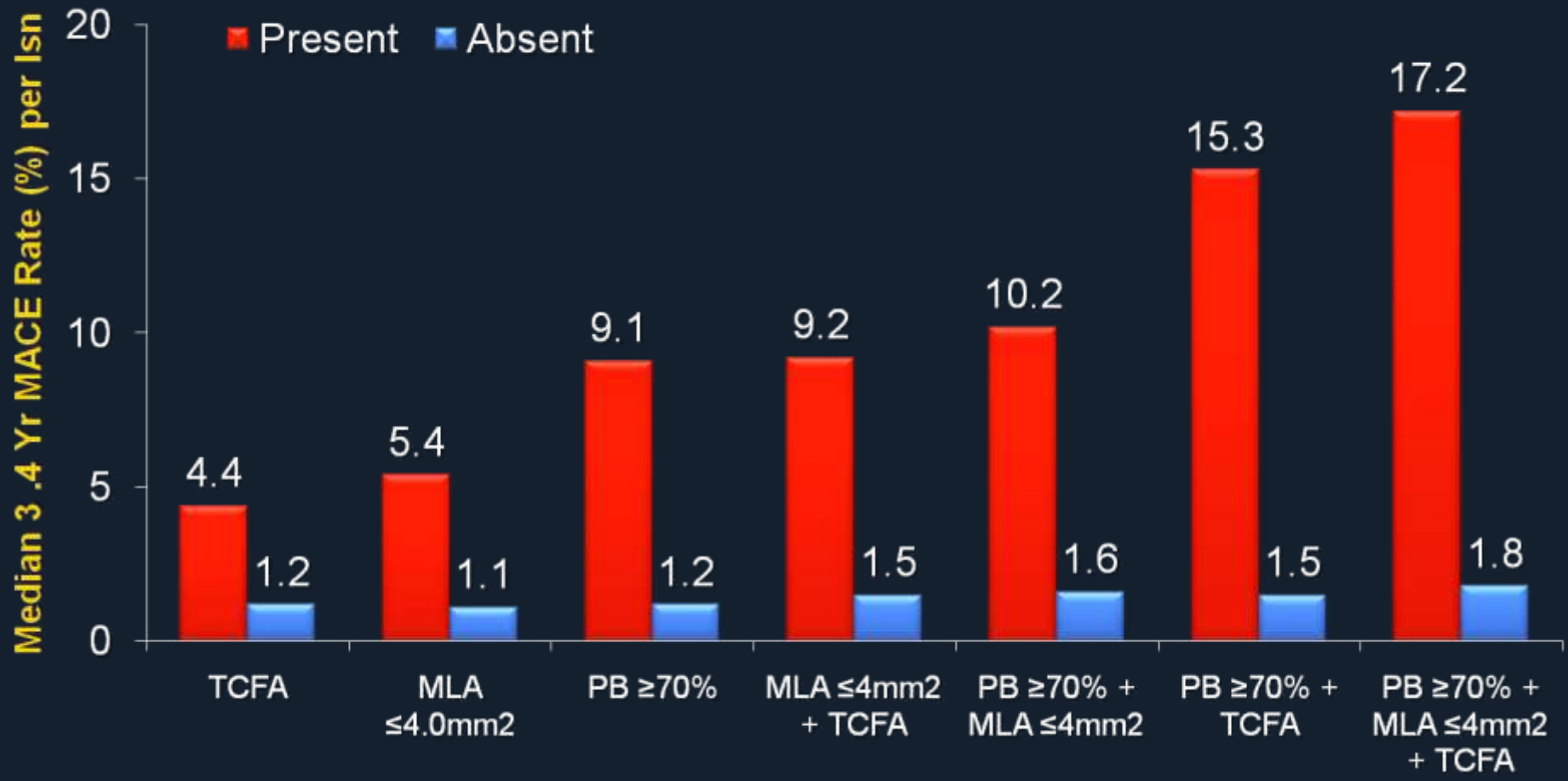
Independent Predictors of Non-Culprit Lesion Events



	HR [95% CI]	P value
PB_{MLA} ≥70%	5.03 [2.51, 10.11]	<0.0001
VH-TCFA	3.35 [1.77, 6.36]	0.0002
MLA ≤4.0 mm^2	3.21 [1.61, 6.42]	0.001

Stone GW et al. NEJM 2011;364:226-35

PROSPECT: Correlates of Non Culprit Lesion Related Events



	TCFA	MLA ≤4.0mm2	PB ≥70%	MLA ≤4mm2 + TCFA	PB ≥70% + MLA ≤4mm2	PB ≥70% + TCFA	PB ≥70% + MLA ≤4mm2 + TCFA
Prevalence*	51.2%	49.1%	30.7%	17.4%	15.4%	11.0%	4.6%
Lesion HR	3.8 (2.2, 6.6)	5.0 (2.9, 8.7)	7.9 (4.6, 13.8)	6.4 (3.4, 12.2)	6.7 (3.4, 13.0)	10.8 (5.5, 21.0)	10.8 (4.3, 27.2)
P value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

*Likelihood of one or more such lesions being present per patient. PB = plaque burden at the MLA

Q1,

Can Optimal Medical Treatment Stabilize Plaque Vulnerability ?

STABLE Trial

(*ST*atin and *A*theroma Vulnera*B*i*L*ity *E*valuation)
Double-blinded, Prospective, Randomized, Controlled Trial

290 patients with
Deferred native coronary artery lesion

2:1 randomization, double-blinded

Rosuvastatin 40mg

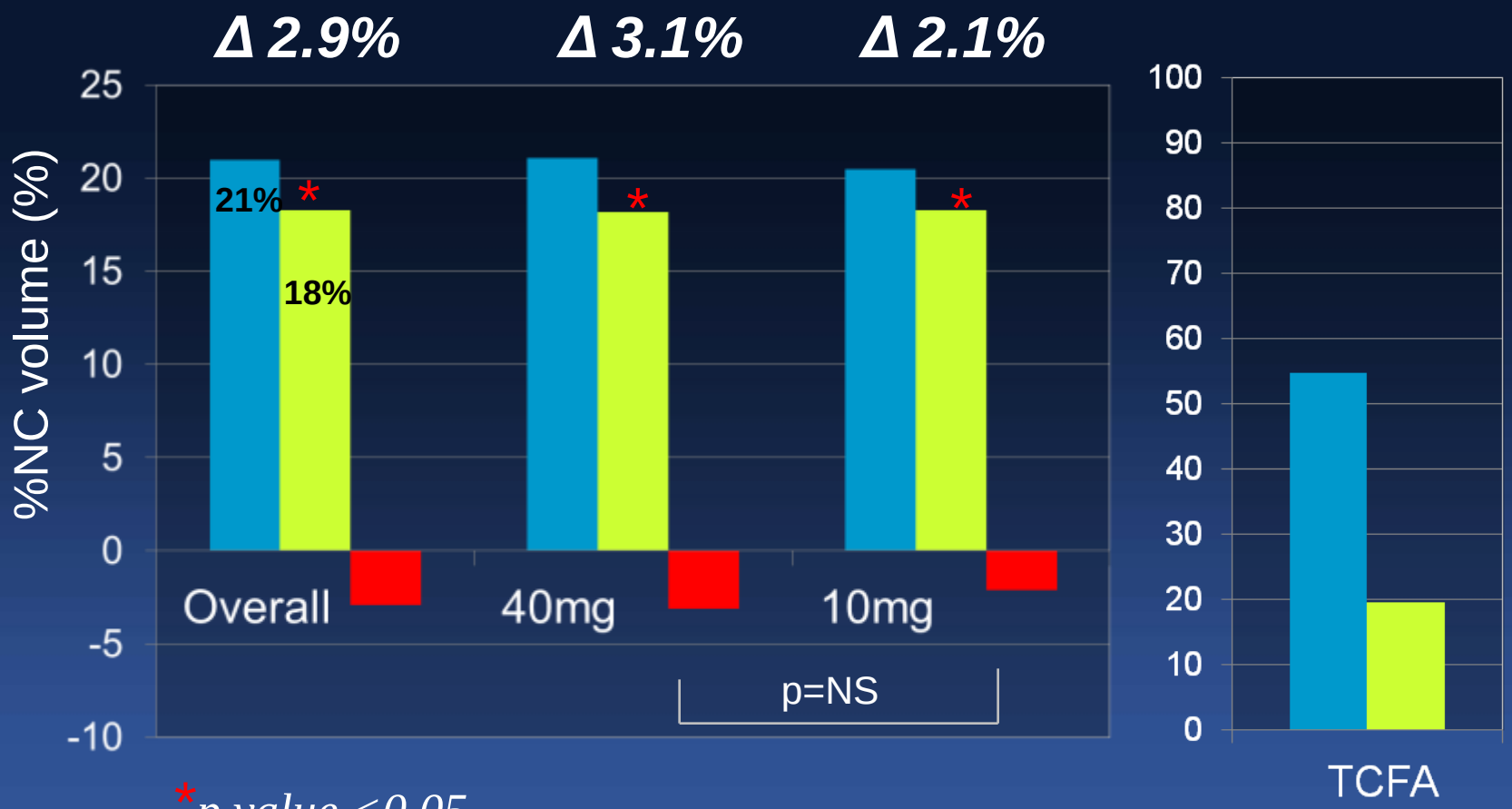
Rosuvastatin 10mg

Primary efficacy endpoint; Change in %NC volume within target segment by VH-IVUS at 1 year

Secondary endpoint: change in %NC volume comparing rosuvastatin 40mg vs. 10mg.

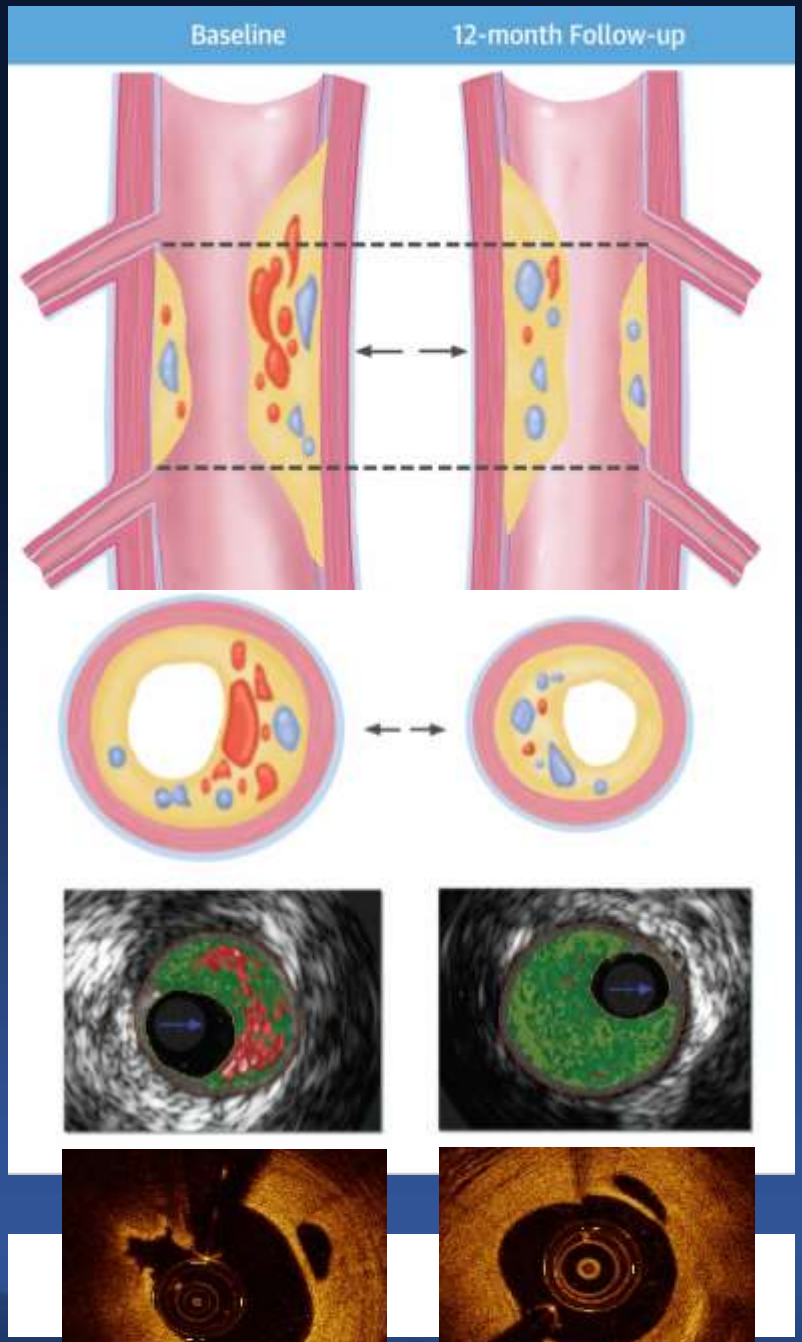
Park SJ, Kang SJ et al, JACC 2016;67(15):1772-1783

Primary Endpoint
%NC Volume Changes at 1 Year



*p value <0.05

Park SJ, Kang SJ et al, JACC 2016;67(15):1772-1783



	Baseline	1 year
EEM, mm^2	19.0	14.0
Plaque, mm^2	14.6	10.3
Lumen, mm^2	4.4	3.7
VH-%NC	30%	15%
VH-TCFA	+	–
OCT-TCFA	+	–

Rousvastatin Treatment Can Make A Plaque Regression and Stabilization

Park SJ, Kang SJ et al, JACC 2016;67(15):1772-1783

Clinical Outcomes at 1 Year

- No cardiac death
- Culprit-related MACE: 4 pts (2.3%).
- Non Culprit-related MACEs: 8 pts (3.6%).
- No Difference in Non Culprit-MACE between rosuvastatin 40 vs.10mg (3.9 vs. 2.7%, p=NS)

Park SJ, Kang SJ et al, JACC 2016;67(15):1772-1783

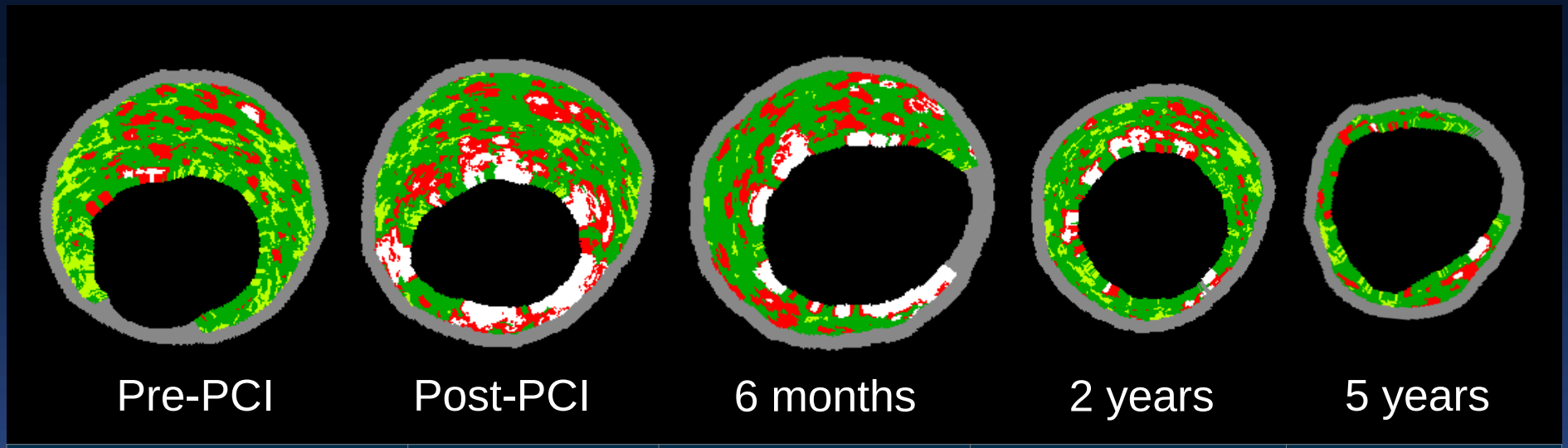
Can Optimal Medical Treatment Stabilize Plaque Vulnerability ?

Yes, Rosuvastatin Therapy Can Make A Plaque Regression and Stabilization.

Q2,

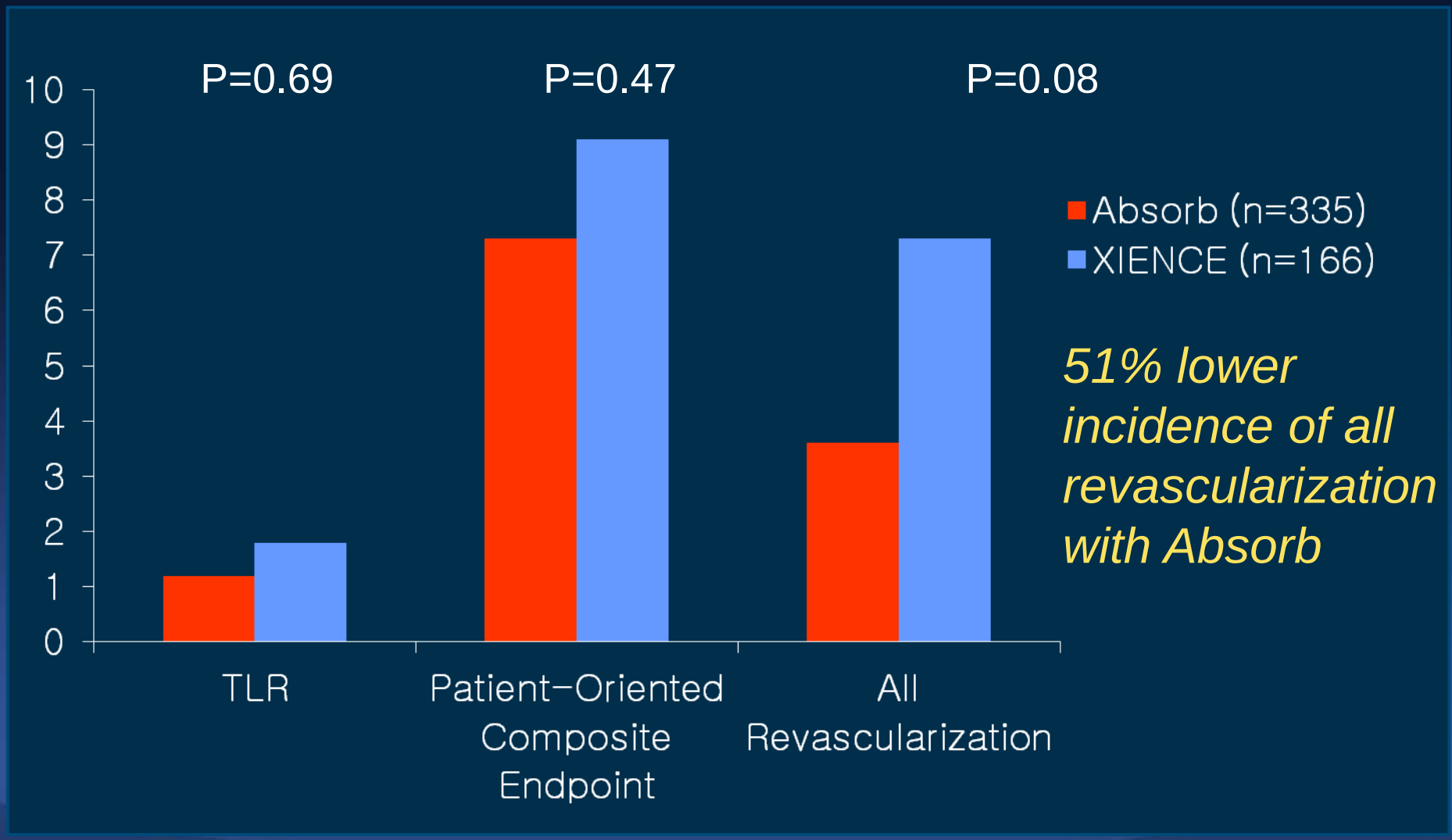
Can BVS
Stabilize Plaque Vulnerability and
Make an Any Difference ?

BVS Can Make Plaque Stabilization and Lumen Enlargement

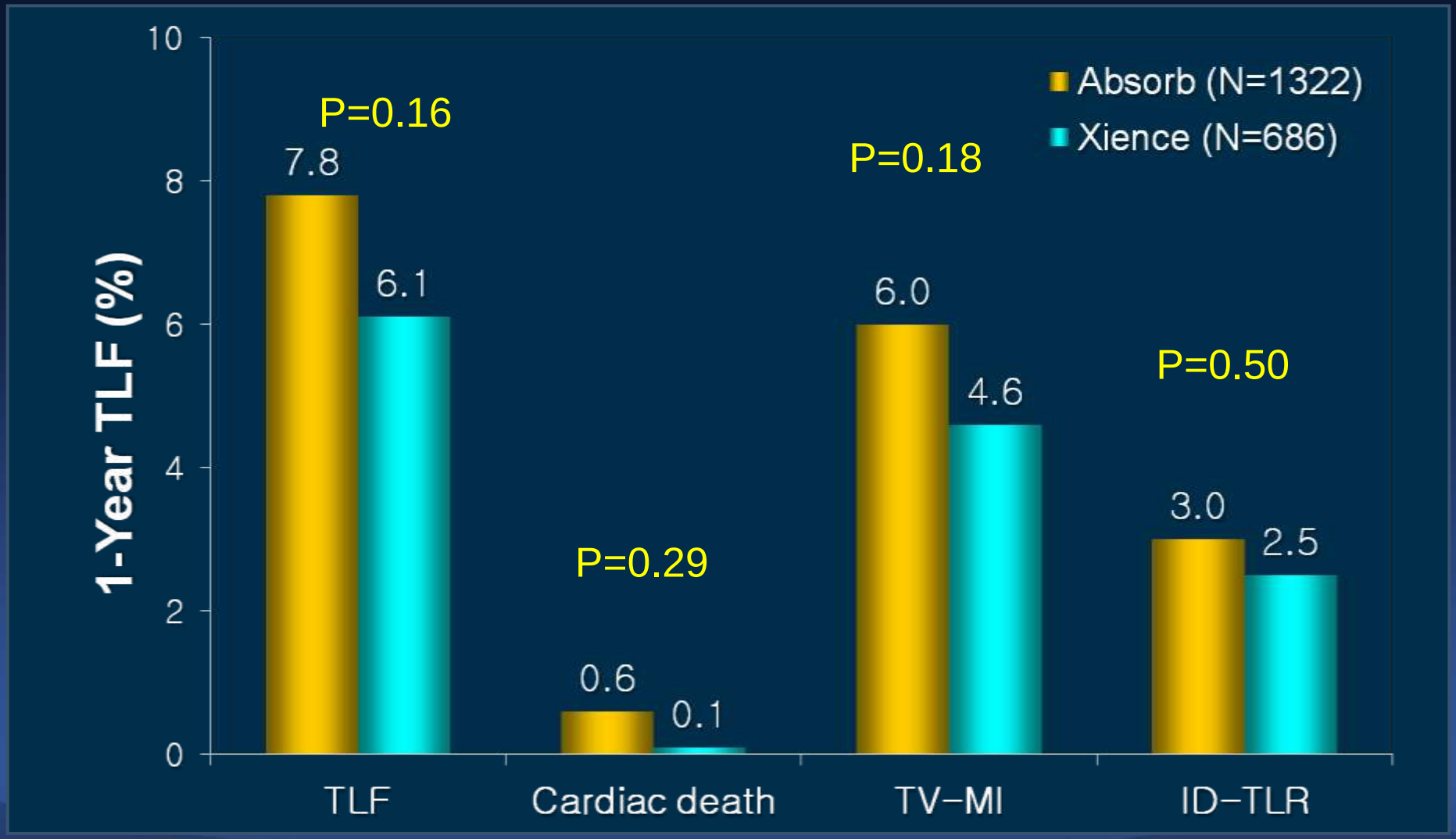


Vessel area (mm^2)	15.72	15.34 (3%)	14.09 (10%)	13.76 (12%)
Plaque area (mm^2)	8.78	9.17 (4%)	7.54 (14%)	7.07 (19%)
Mean LA (mm^2)	6.95	6.17 (11%)	6.56 (5.6%)	8.09 (16%)

ABSORB II, 1-year Results



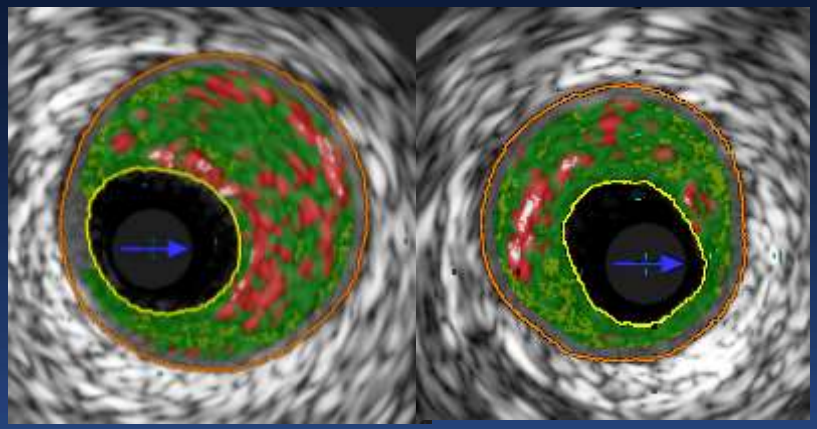
ABSORB III, 1-year Results



Stephan G Ellis, et al. NEJM 2015

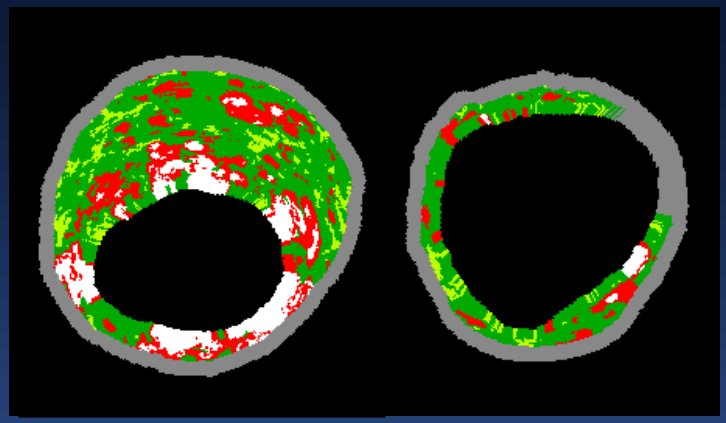
What's the Difference ?

Optimal Medical Treatment



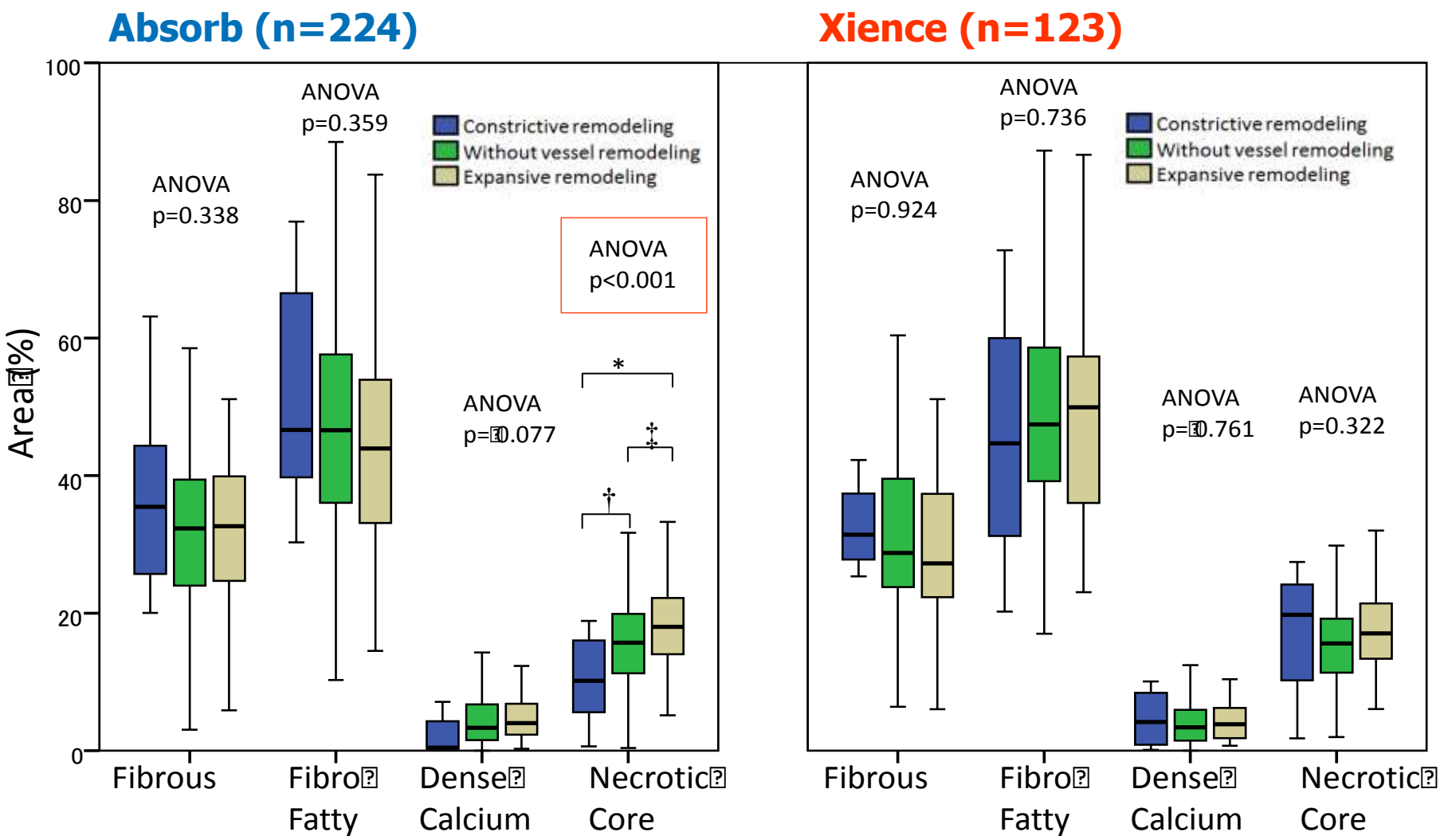
Stabilized Plaque Vulnerability
Decreased Plaque Volume
Decrease Vessel Size
Decreased Lumen

BVS

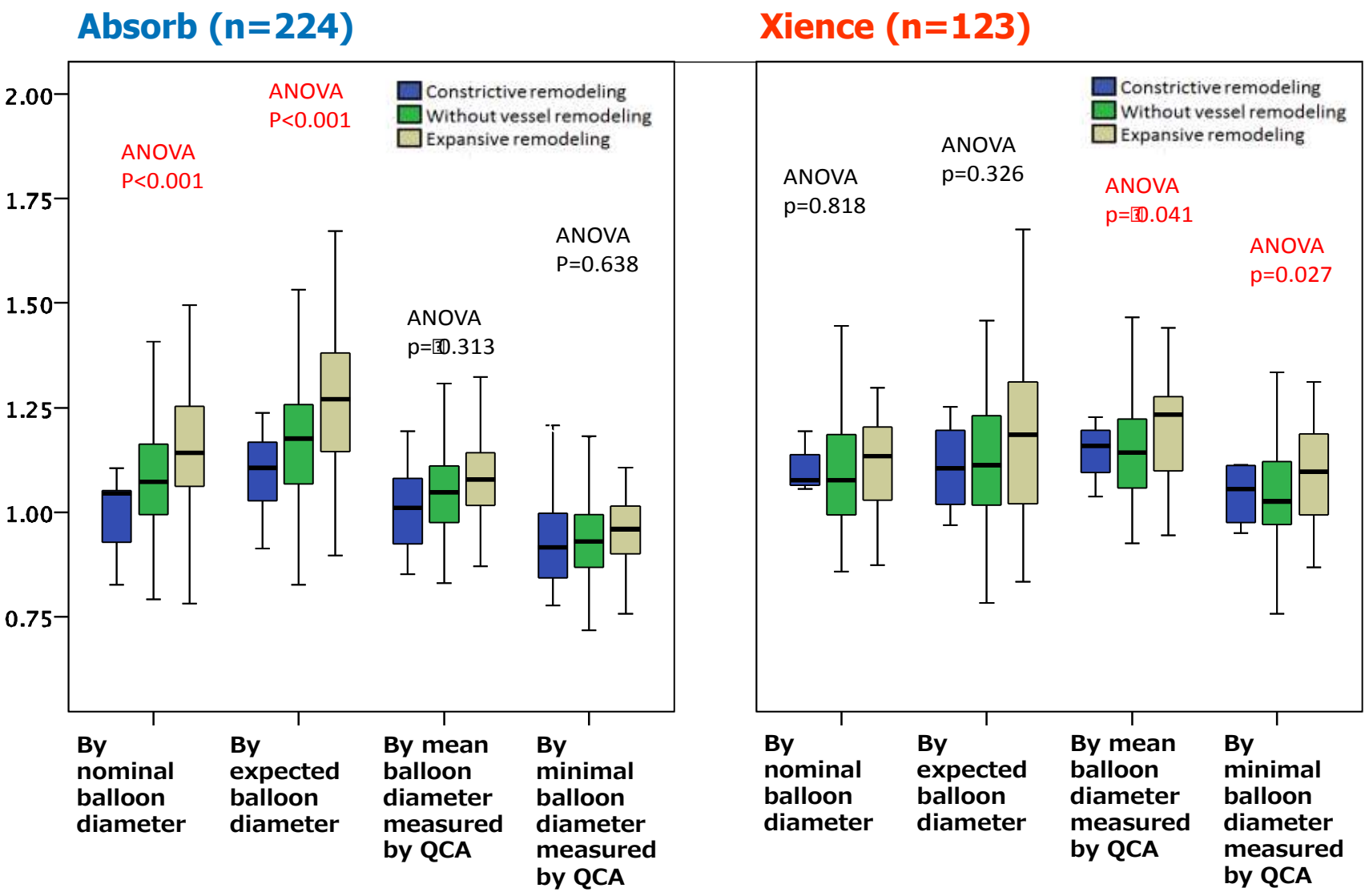


Stabilized Plaque Vulnerability
Decreased Plaque Volume
Decrease Vessel Size
Increased Lumen

Pre-procedural IVUS-VH and Vessel Remodeling over 3 years in ABSORB II



Various balloon-artery ratios and vessel remodeling



PREVENT Study,

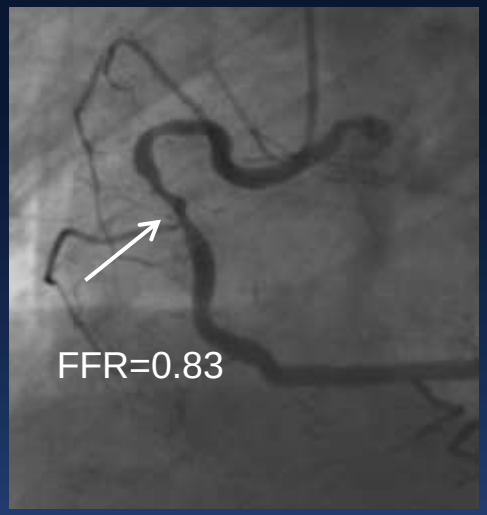
The ***PREVENT***ive Implantation of BVS on Stenosis With Functionally Insignificant Vulnerable Plaque Compared to Optimal Medical treatment.

Objective,

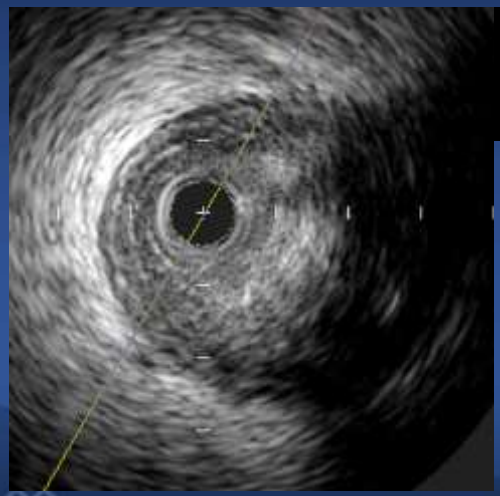
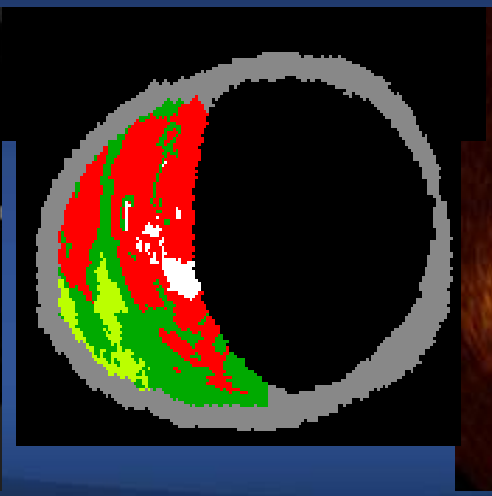
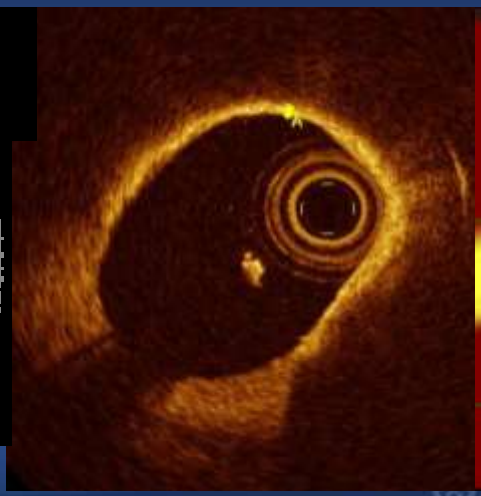
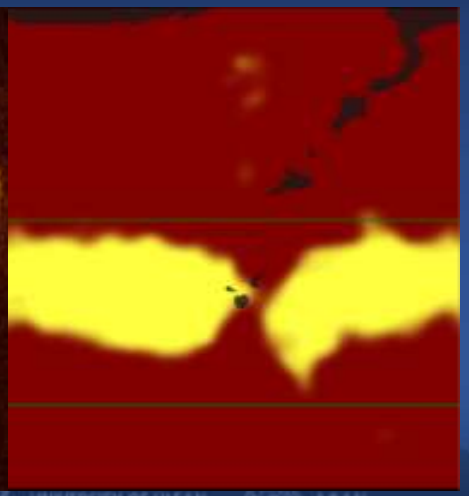
To determine whether BVS implantation on functionally insignificant vulnerable plaque, reduce the incidence of the composite of MACEs compared with optimal medical therapy alone.

A prospective, randomized, multicenter, clinical trial with ‘all comers’ design. Approximately 2,000 patients will be enrolled from international heart centers.

Defining, *Functionally Insignificant Vulnerable Plaque*



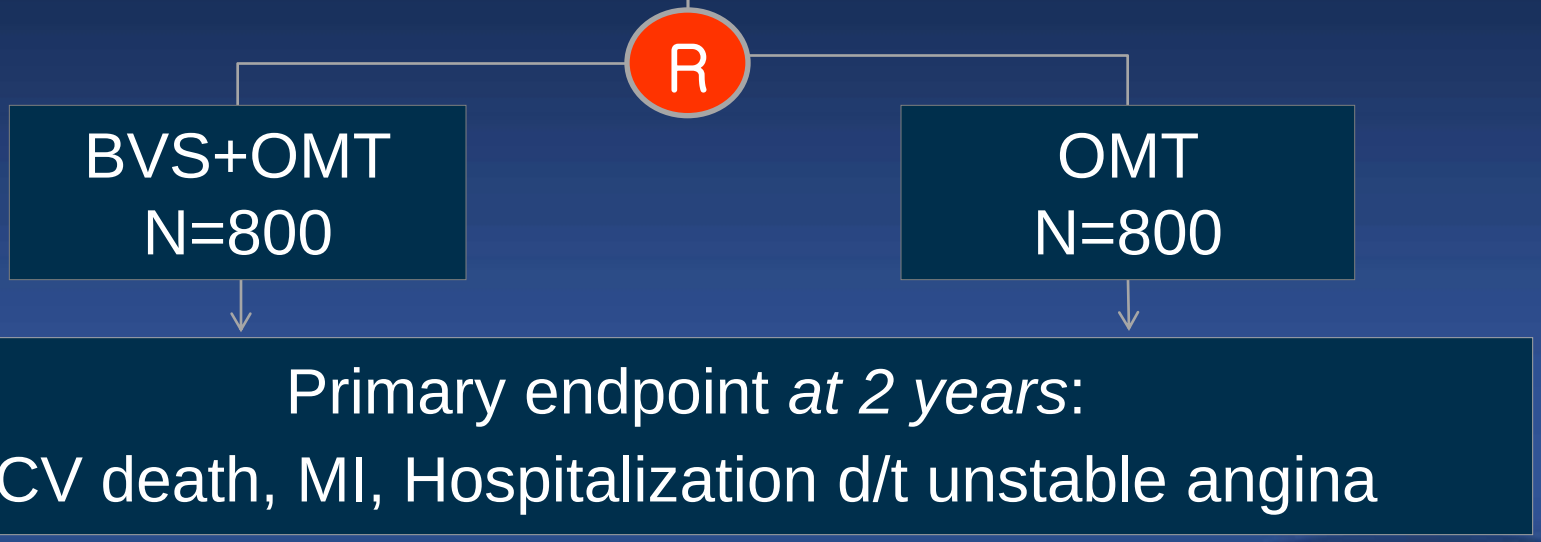
1. PB_{MLA} ≥70%
2. MLA ≤4.0 mm^2
3. TCFA by OCT or VH-IVUS
4. LRP on NIRS ($_{max}LCBI_{4mm}$>315)

PREVENT Trial

Any Epicardial Coronary Stenosis (≤ 40 mm) **with** ***FFR ≥0.80*** **and with** ***Two*** **of the following**

1. Plaque Burden >70%
2. MLA ≤4.0mm^2
3. TCFA by OCT or VH-IVUS
4. Lipid-Rich Plaque on NIRS ($_{max}LCBI_{4mm}$>315)



OCT sub-study/ NIRS sub-study, (300 patients in each arm at 2 years)

Inclusion Criteria

Age 18 years or older,
Symptomatic or asymptomatic coronary stenosis,
Eligible lesions for PCI (≤ 40 mm), with
FFR >0.80 and met the two of the following

1. Plaque burden>70%
2. MLA<4mm2
3. TCFA by OCT or VH-IVUS
4. Lipid-rich plaque on NIRS ($_{max}LCBI_{4mm}$>315)

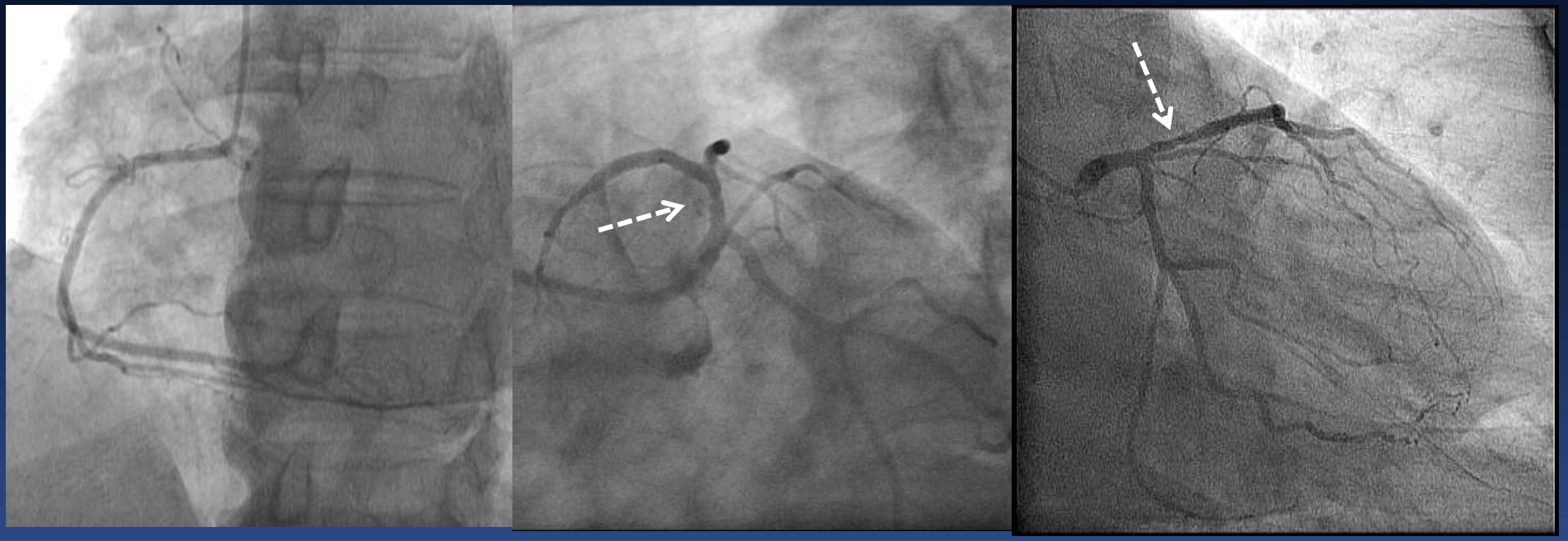
Primary and Major Secondary End Point,

The primary endpoint is the 2-year MACE (cardiovascular death, nonfatal MI, unplanned rehospitalization due to unstable angina).

The secondary endpoints include overall MACE, non-urgent revascularization, and rate of cerebrovascular event.

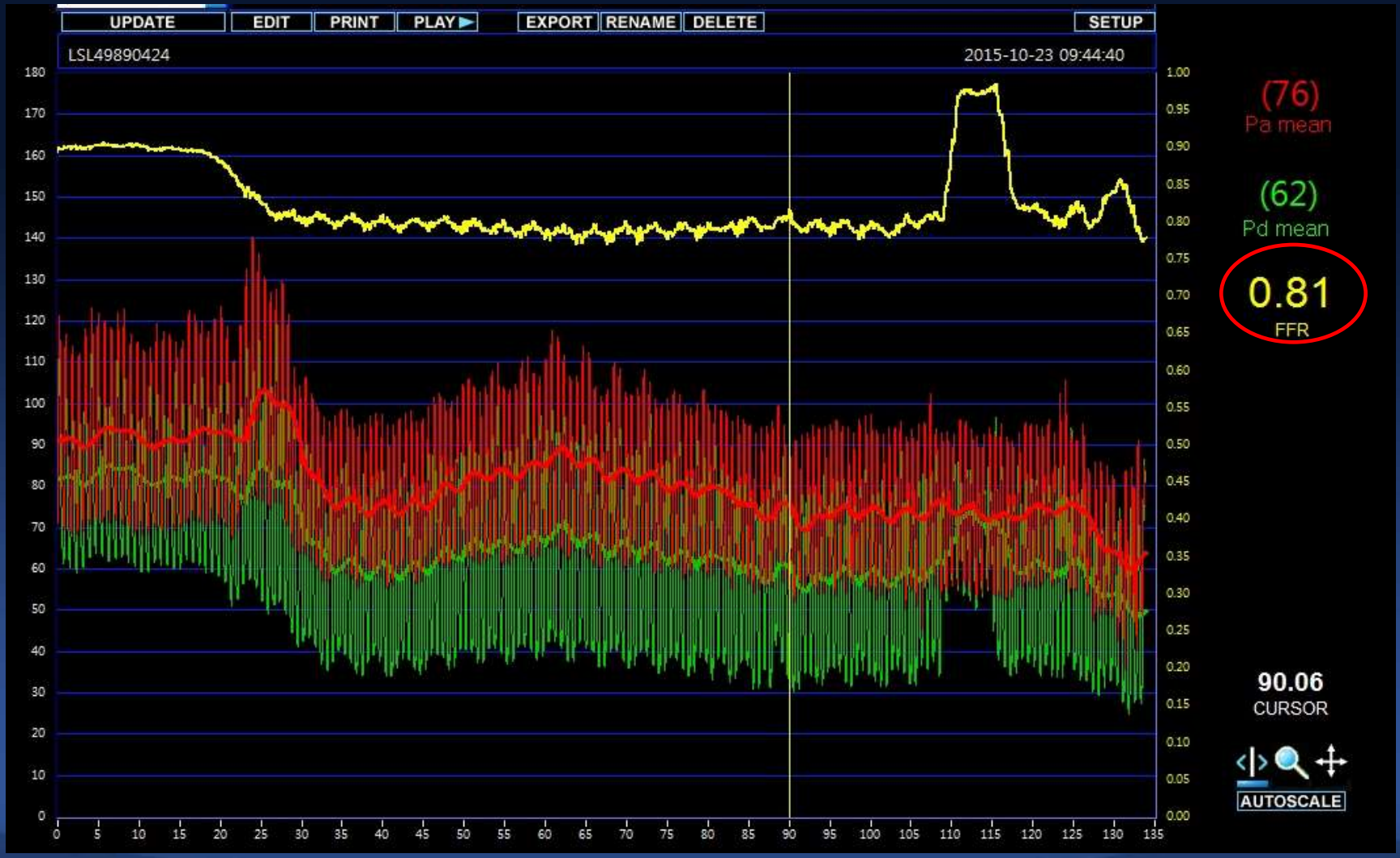
BVS cases

M/58,
Unstable Angina

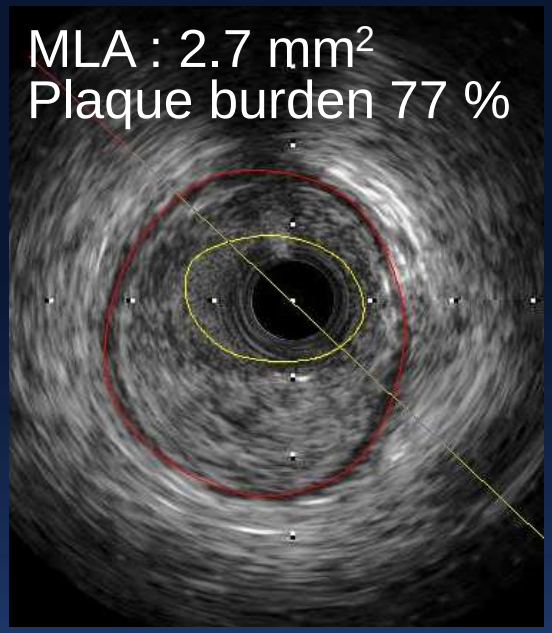


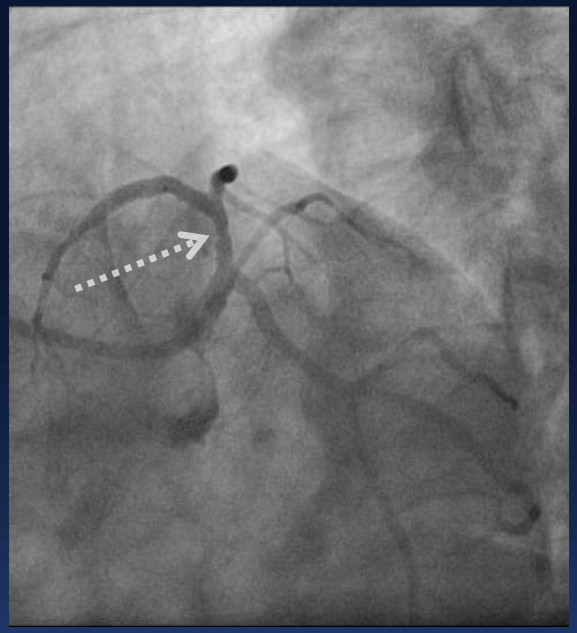
FFR

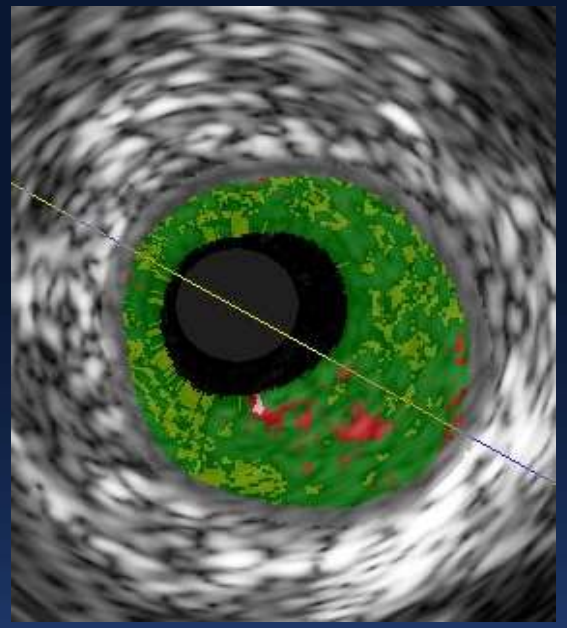
Intravenous adenosine, 140 μg/kg/min

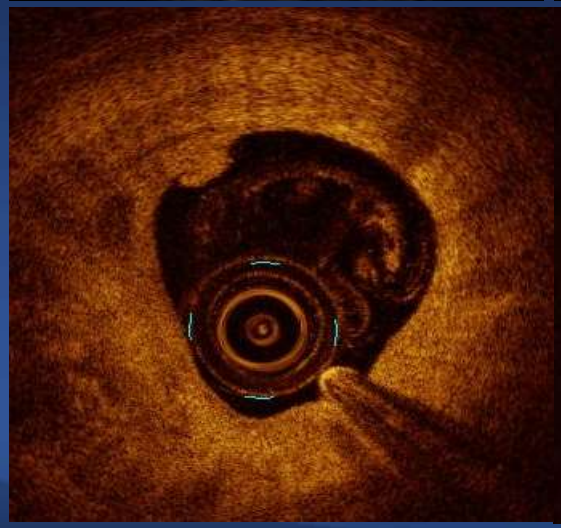


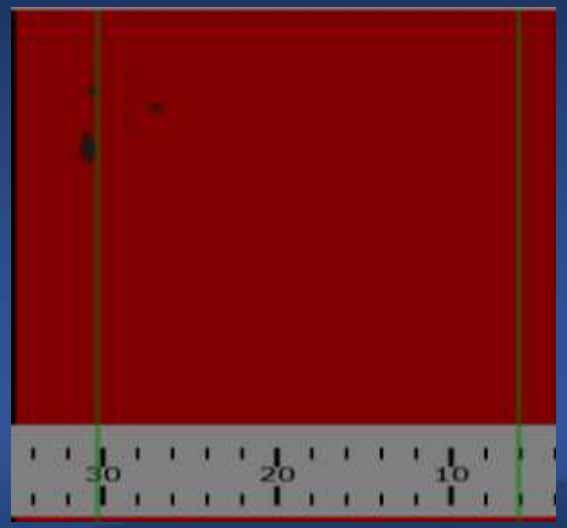
Imaging







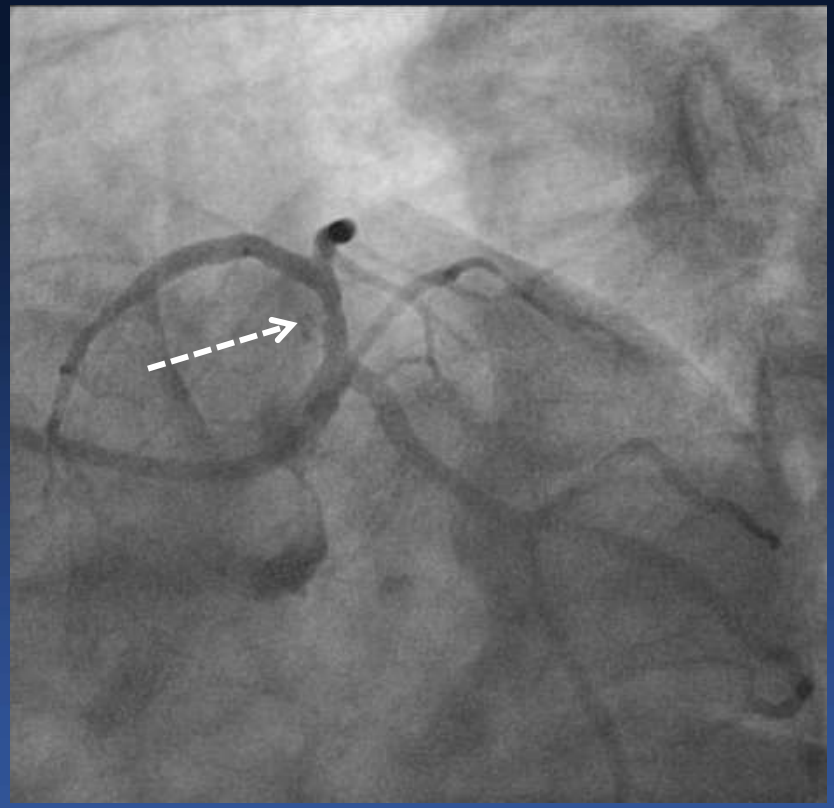




$_{max}LCBI_{4mm} = 0$

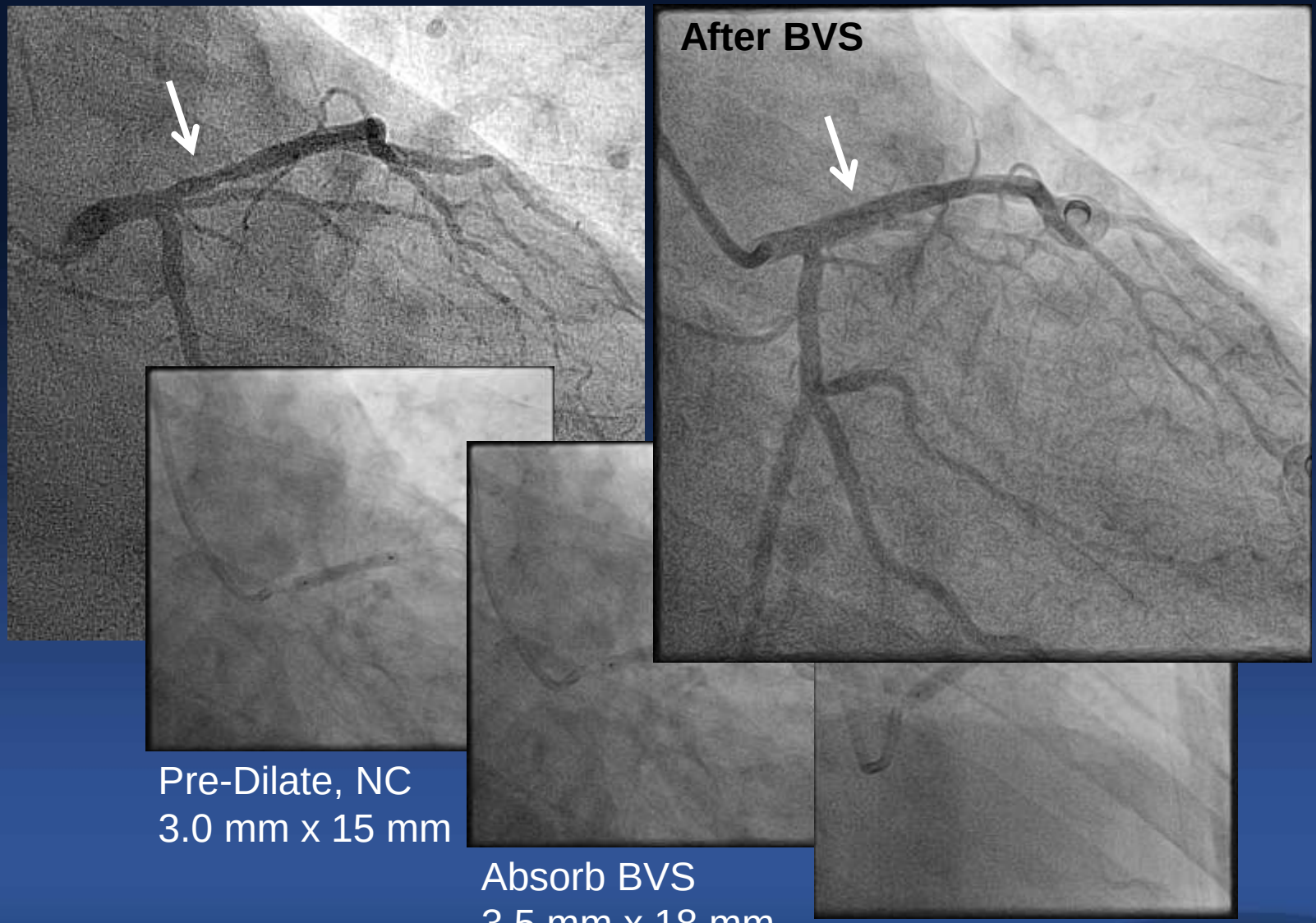
Randomized to BVS

58 y/o male, Unstable Angina

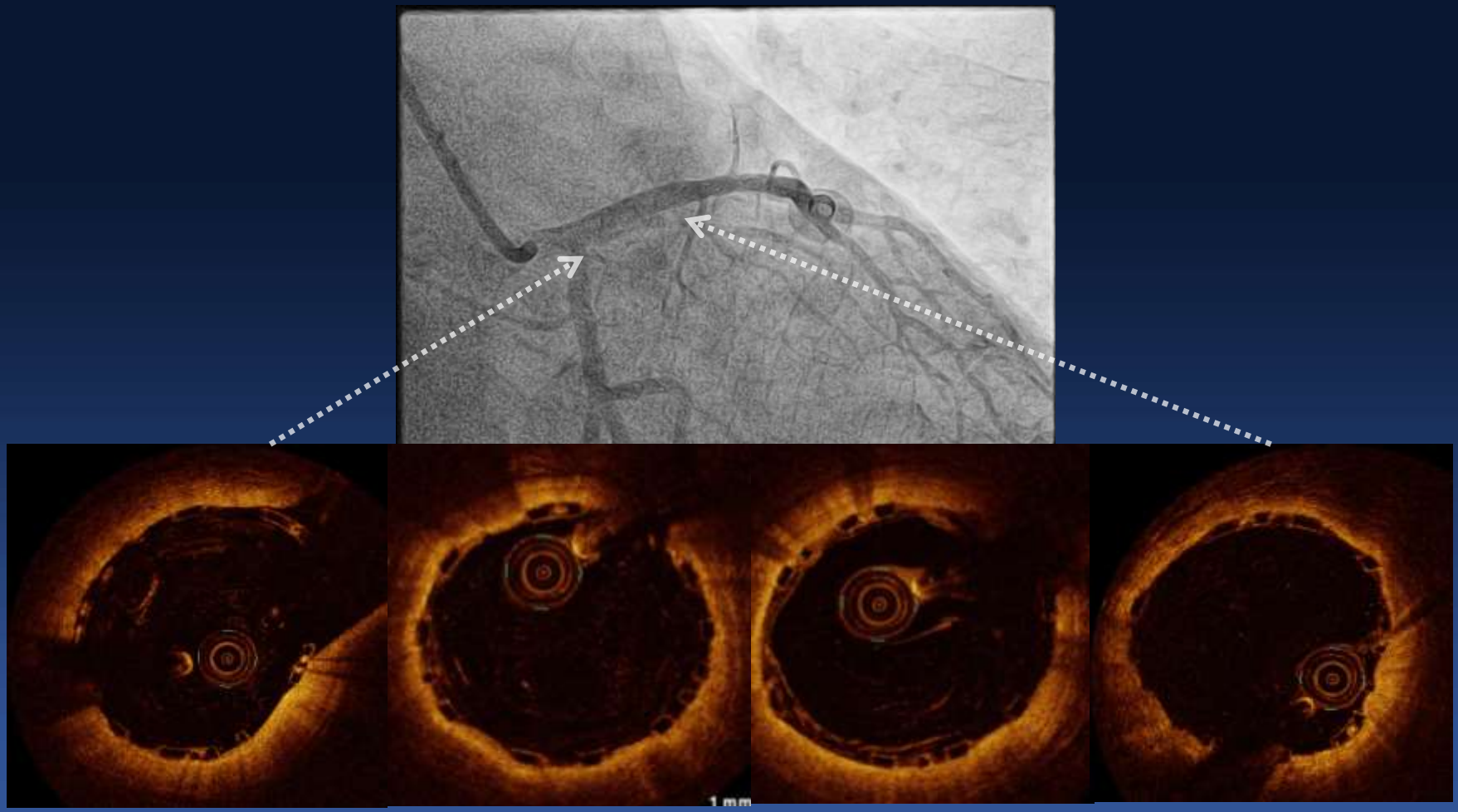


Angiographic DS : 50%
FFR : 0.81
IVUS MLA : 2.7 mm^2
Plaque burden : 77 %
Erosion (+)
$_{max}LCBI_{4mm}$: 0

BVS

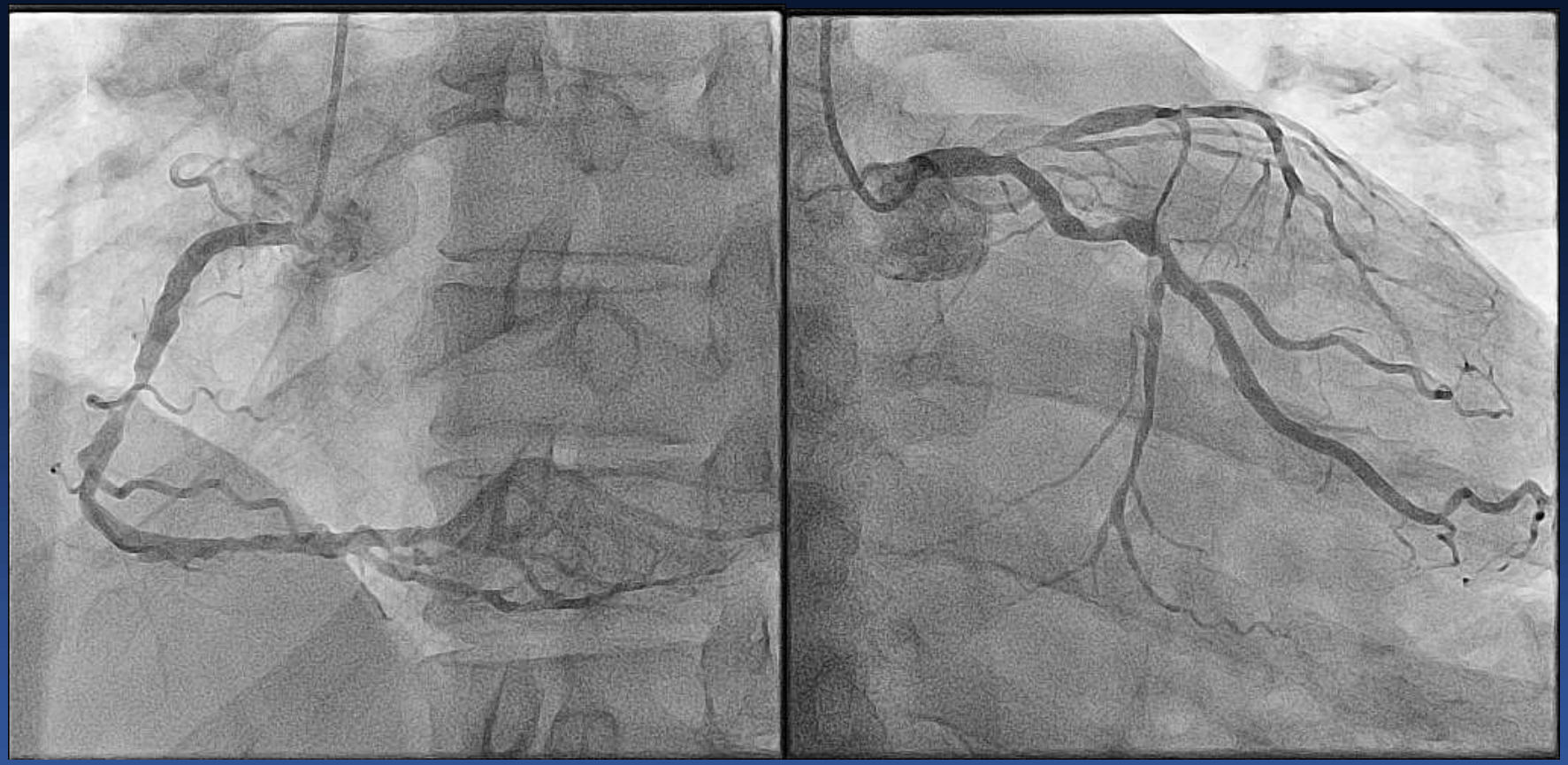

After BVS
Pre-Dilate, NC
3.0 mm x 15 mm
Absorb BVS
3.5 mm x 18 mm
NC Balloon,
4.0 mm x 13 mm

BVS



OCT Confirmed Good Apposition of BVS

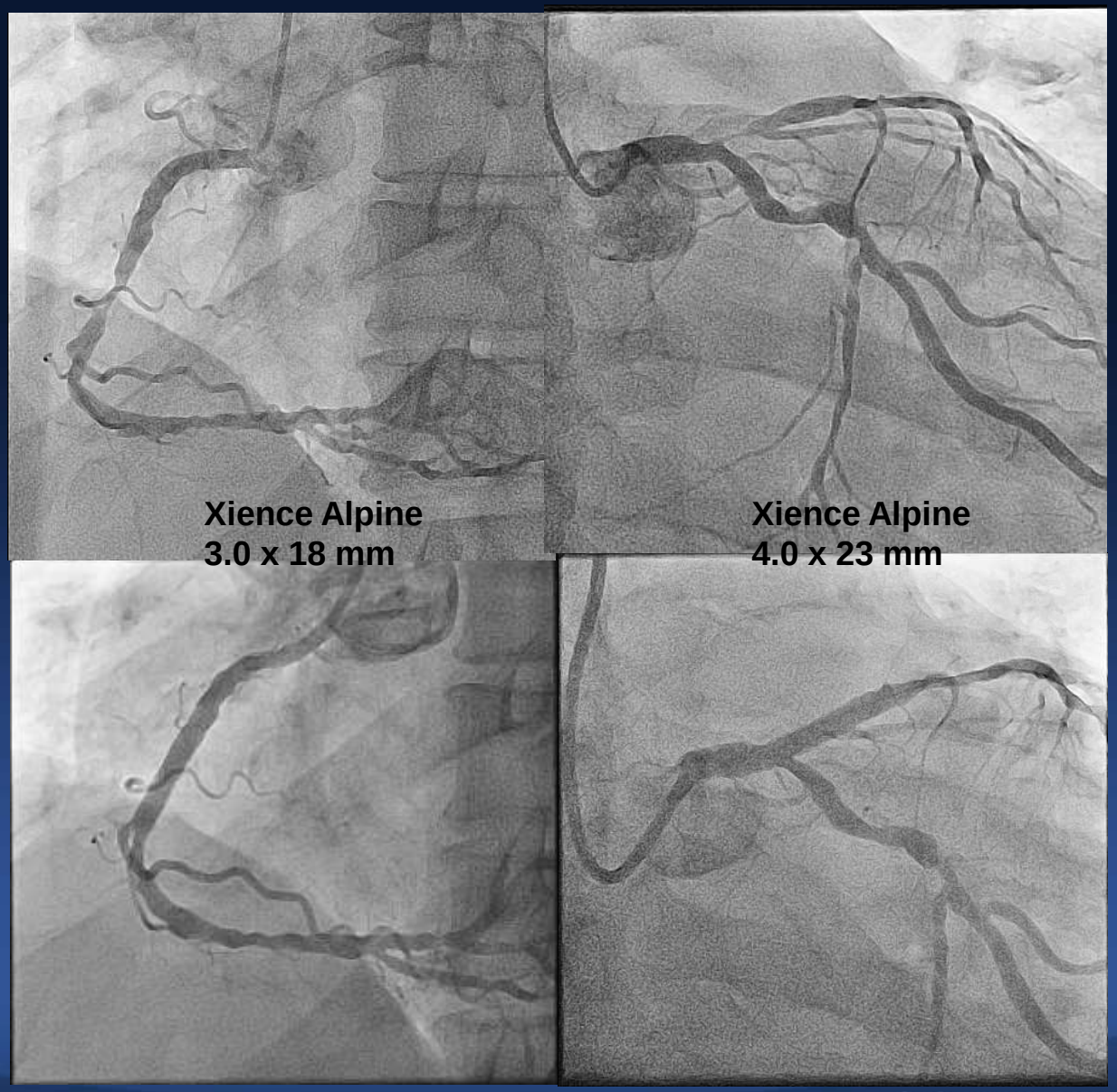
55 y/o male,
Unstable Angina



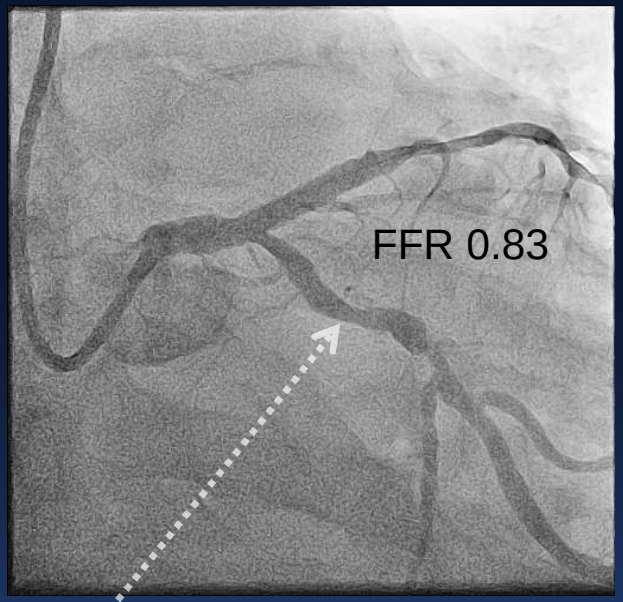
Culprit PCI for RCA and LM-pLAD

Pre

Post PCI

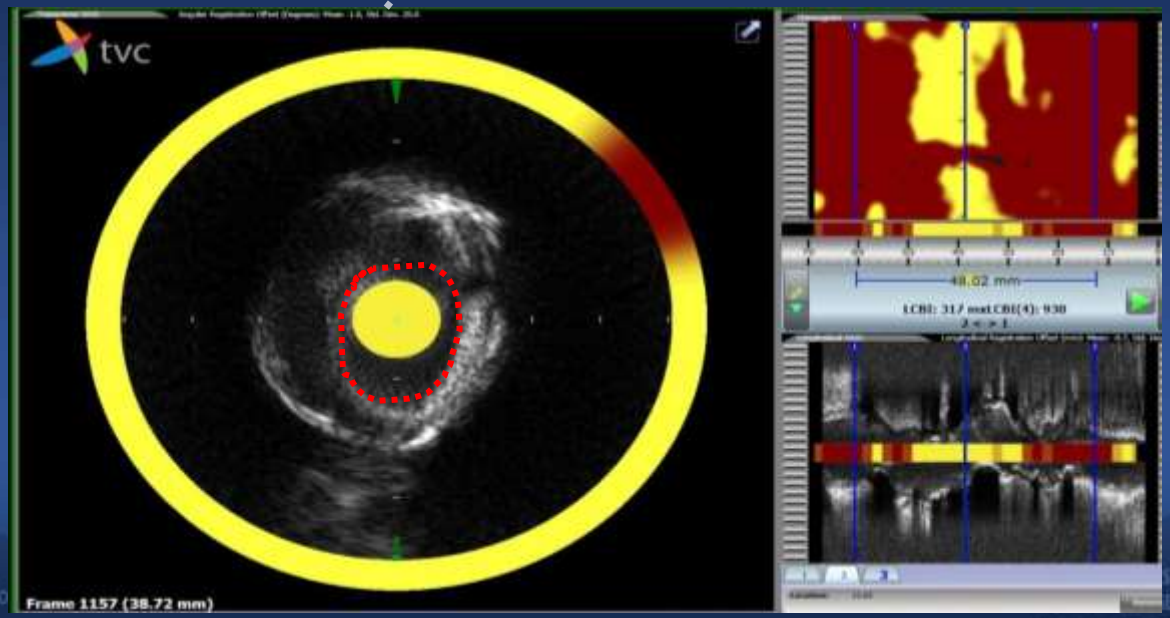


Non-Culprit LCX, Randomized to OMT Group

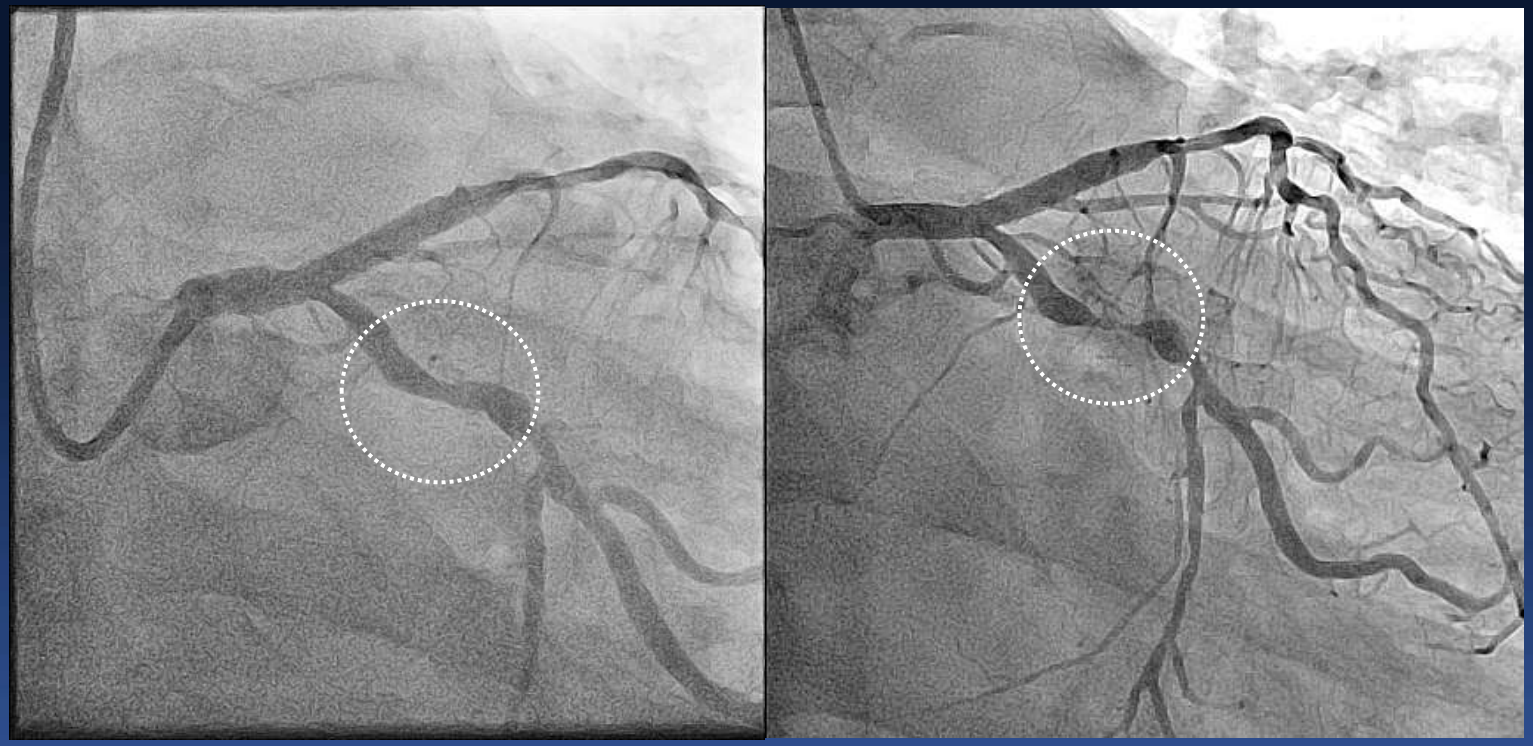


MLA 2.8 mm^2
Plaque burden 81%

max$LCBI_{4mm}$: 930

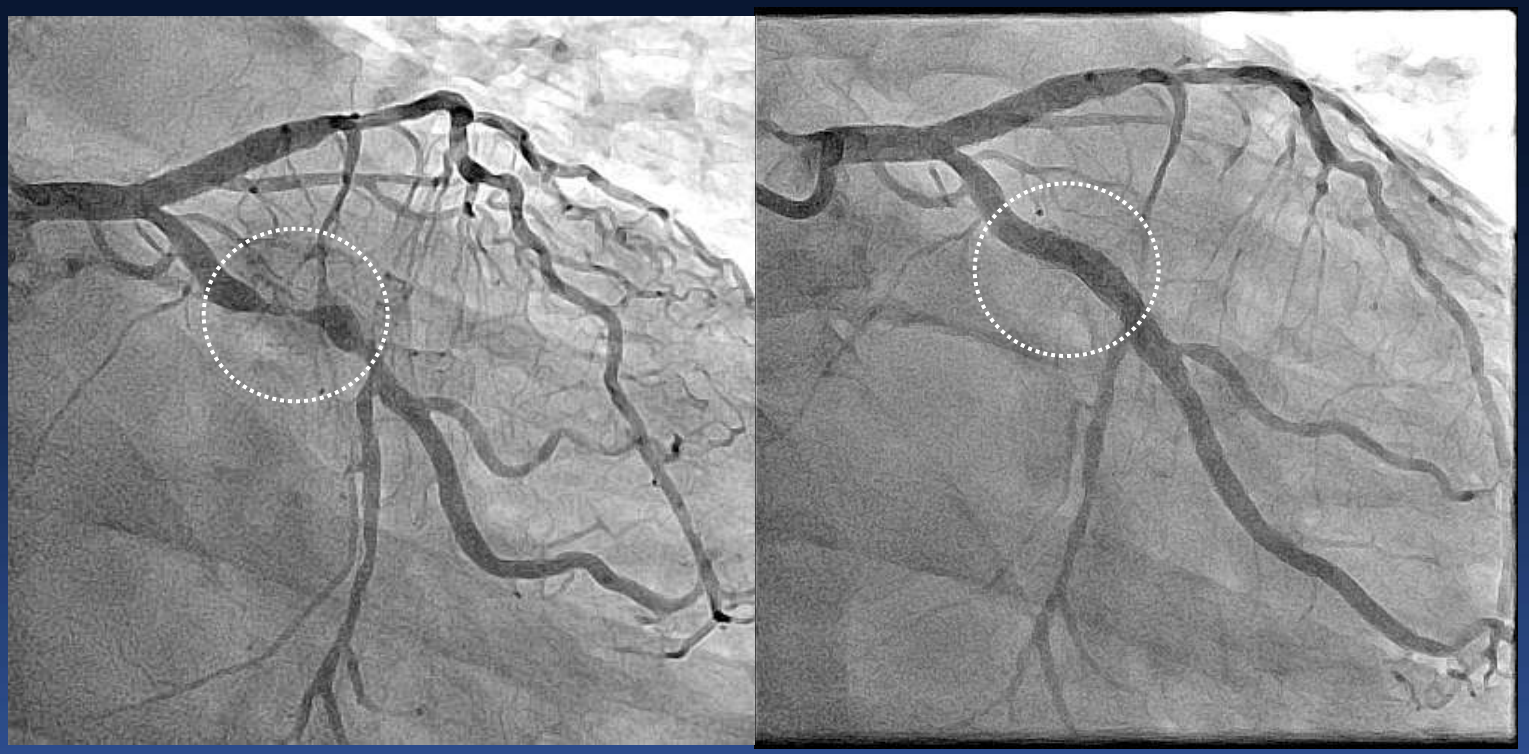


11 months later,
Recurred Chest Pain



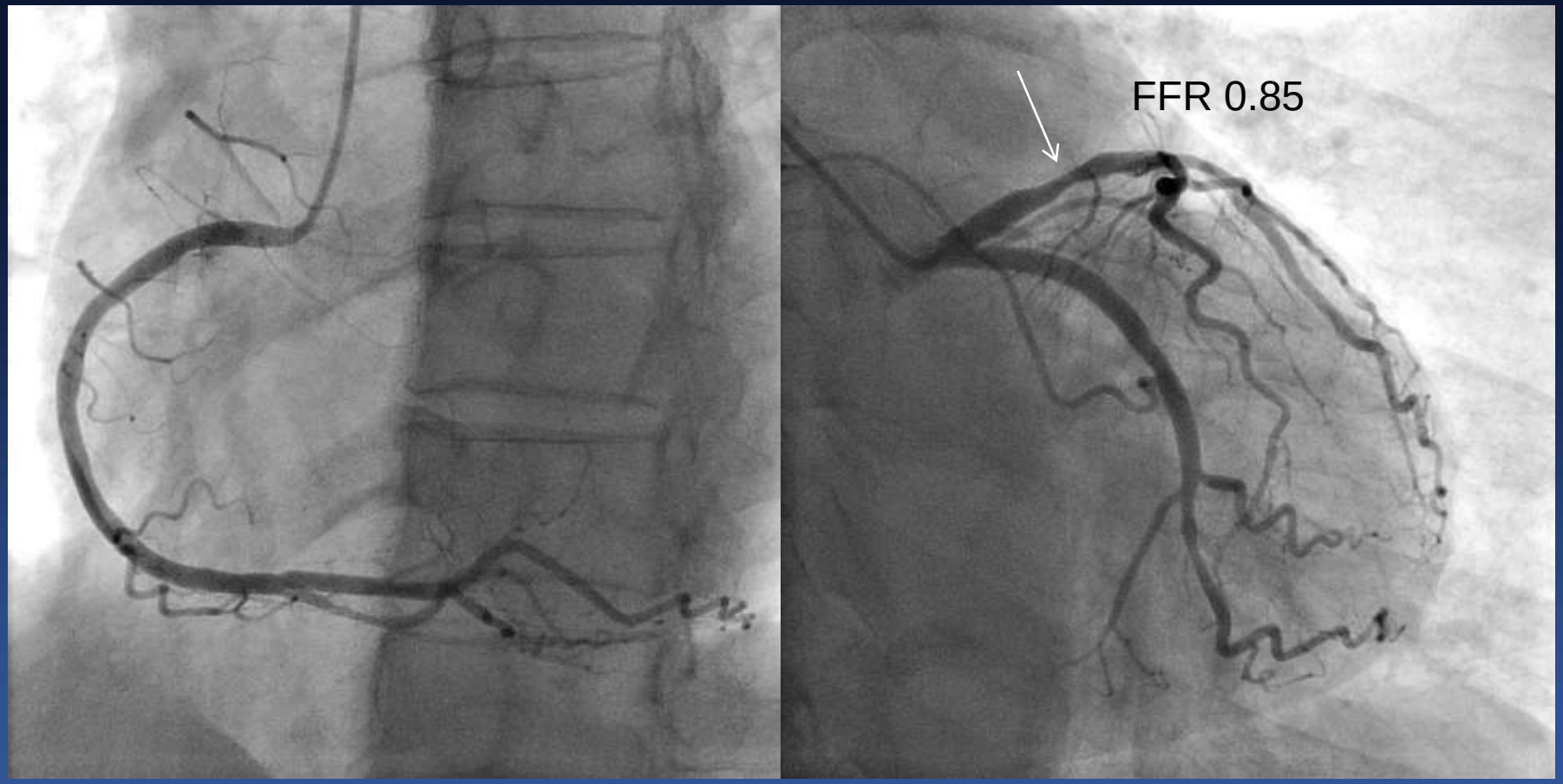
Disease Progression !

OMT group, PCI

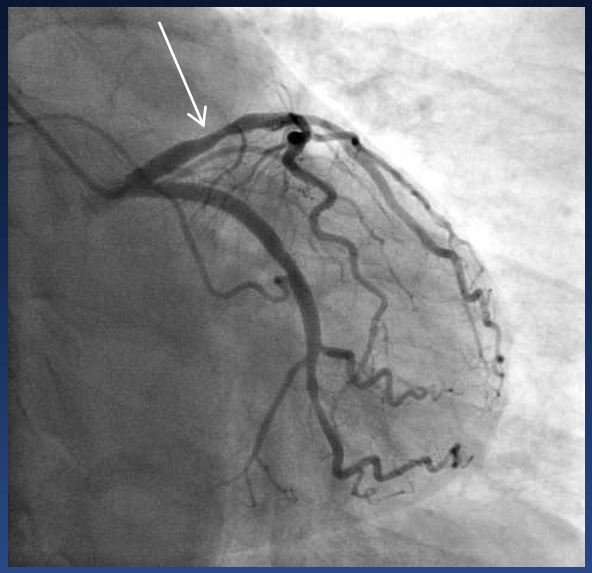


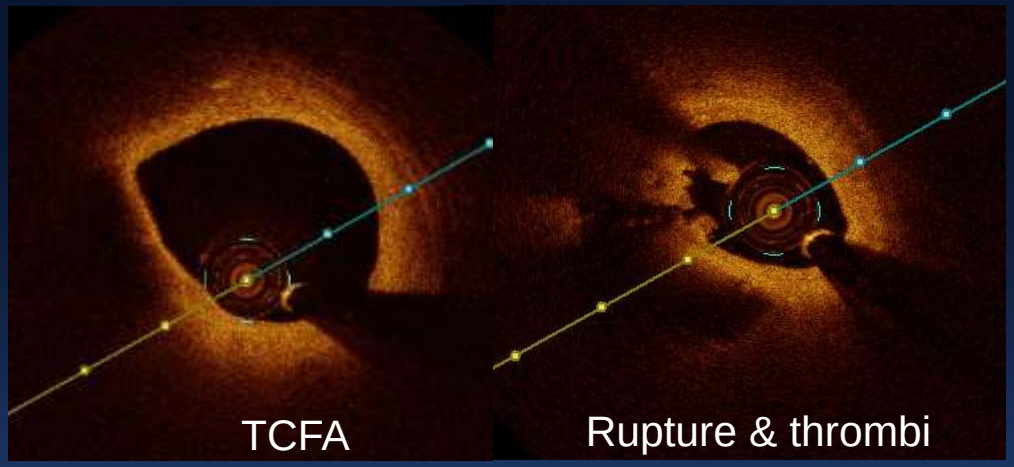
Xience Alpine
3.5 x 23mm

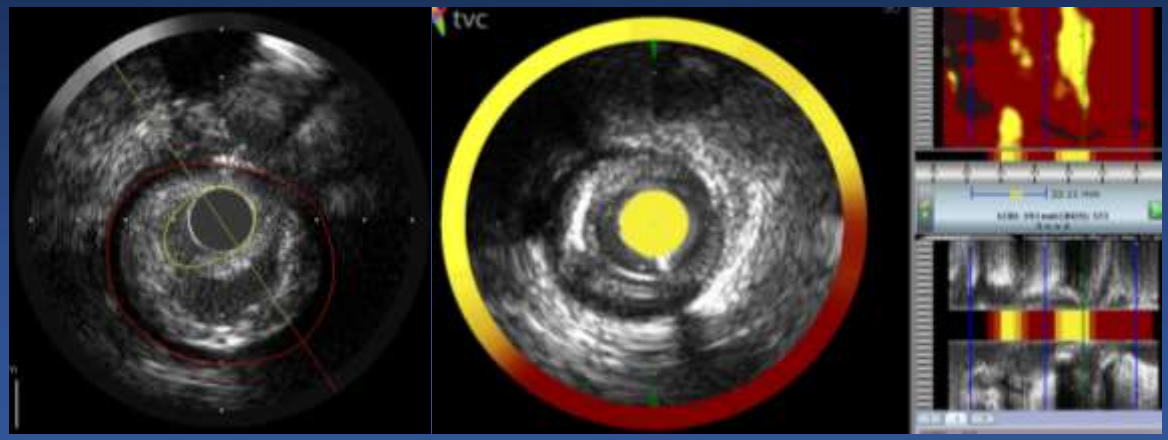
57 y/o Female,
Atypical Chest Pain



Vulnerable Plaque
by OCT & NIRS



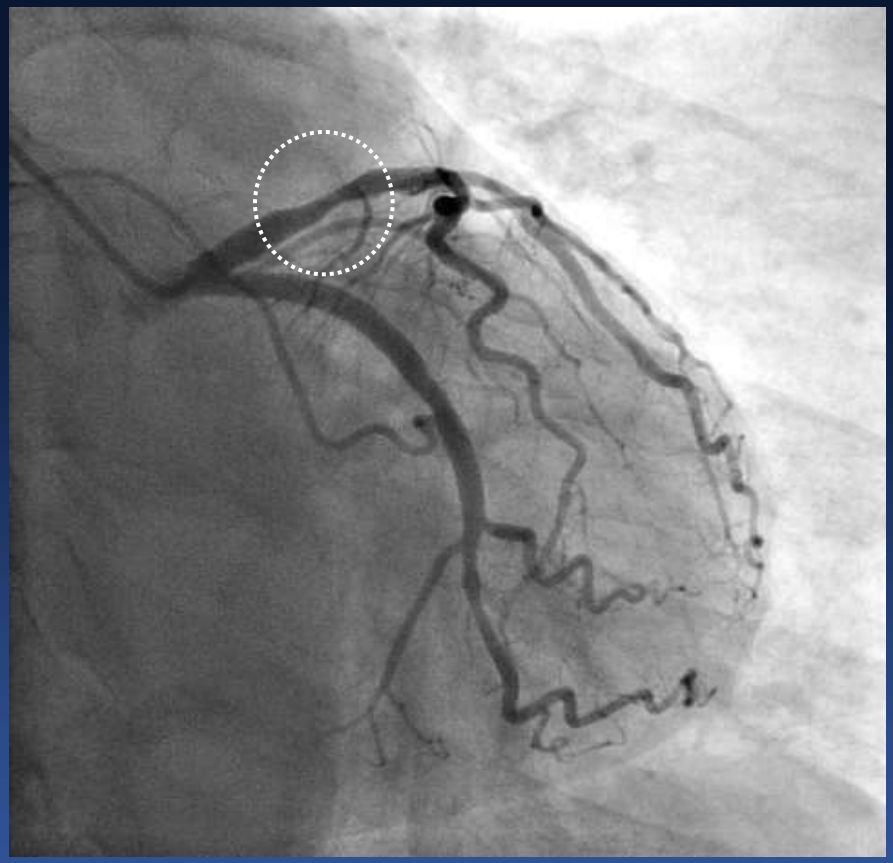




MLA 2.7 mm^2
Plaque burden 73%

maxLCBI 4mm : 571

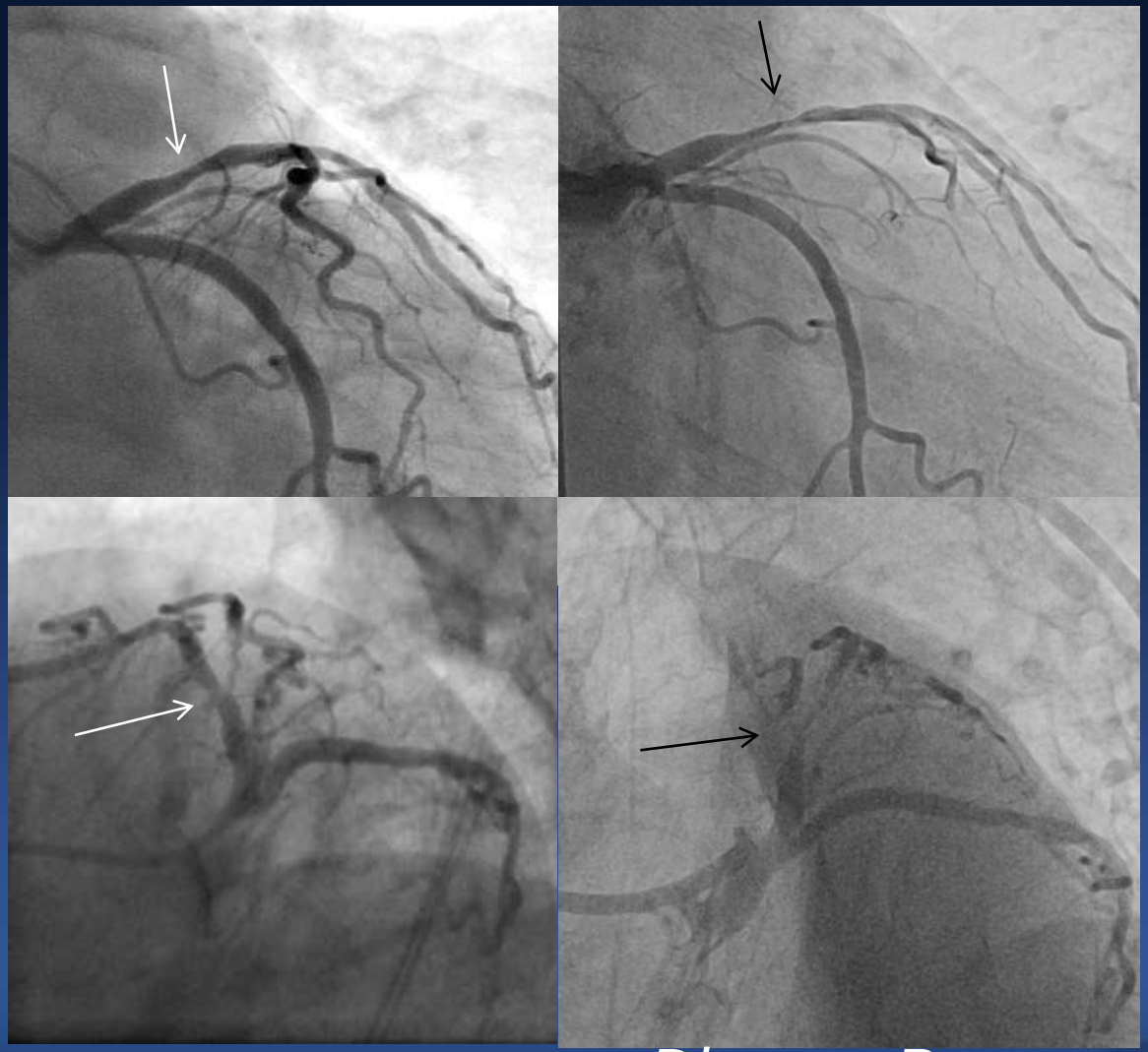
Randomized to OMT



FFR : 0.85
Angiographic DS : 50%
IVUS MLA : 2.7 mm^2
Plaque burden : 73%
$_{max}LCBI_{4mm}$: 571
TCFA (+)

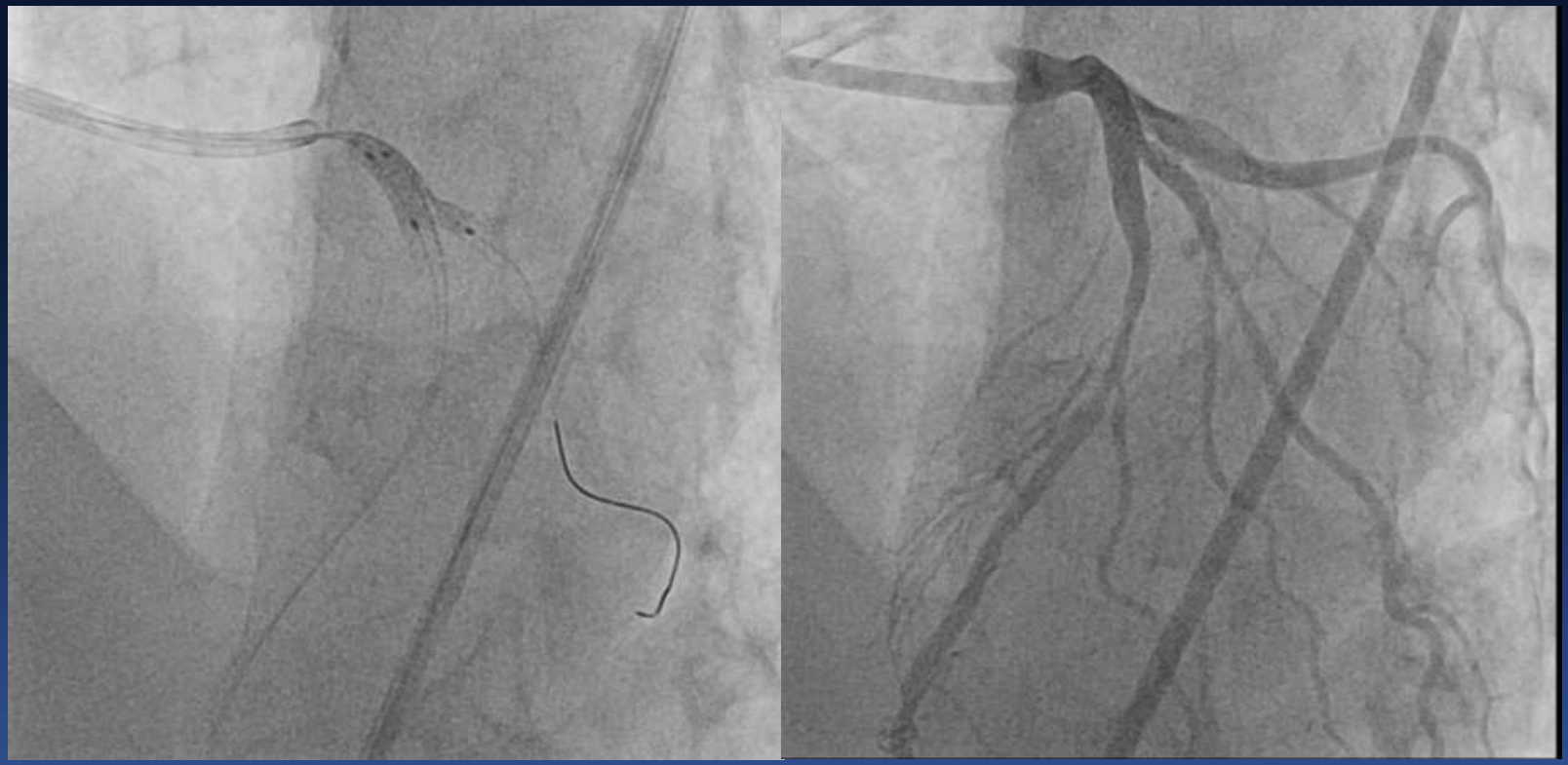
Functionally Insignificant Vulnerable Plaque

7 months later, Rest Chest Pain



Disease Progression !

OMT group, PCI



Resolute Onyx
3.5 x 18 mm
2.5 x 15 mm

Current Patients Enrollment 2017 Mar.