CASE

Bifurcation, Tandem and Diffuse disease

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SNUH *Seoul National University Hospital*
Cardiovascular Center

F/59 Exertional and resting chest discomfort for 1month
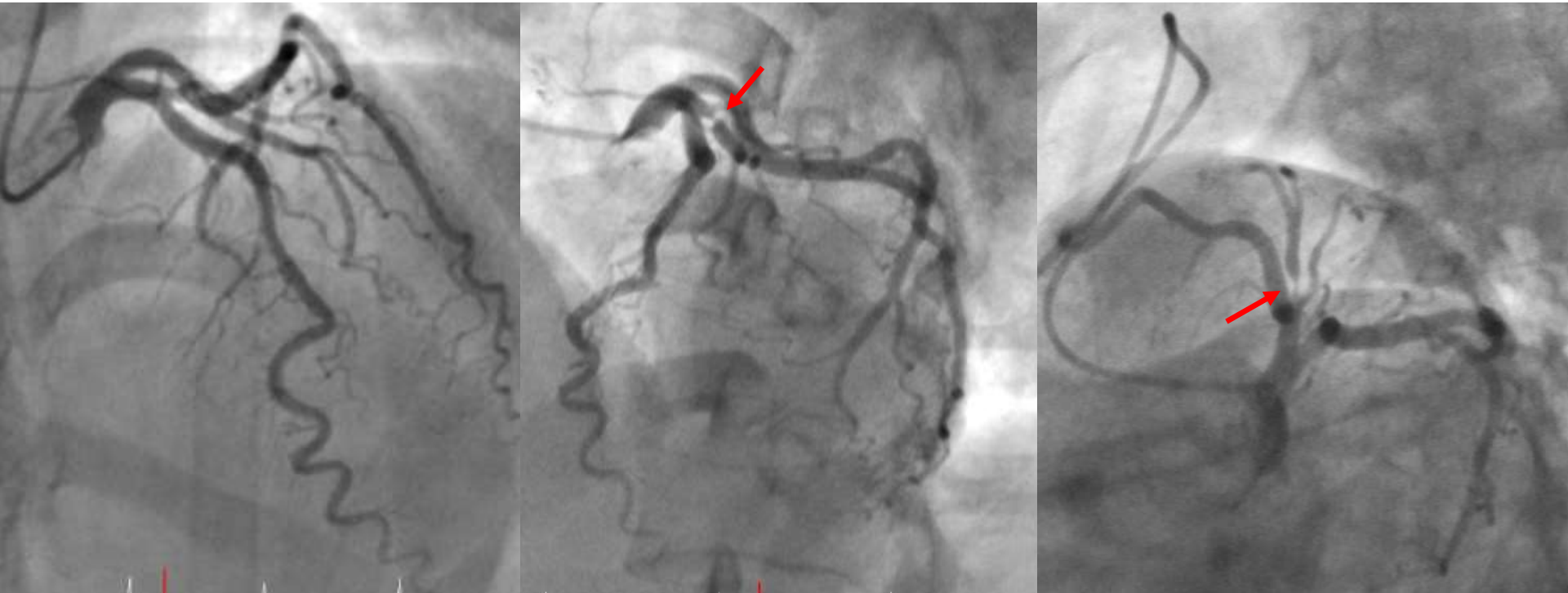
Risk factor: Hypertension

Exercise stress test: Stage 2

- Exercise terminated due to chest pain
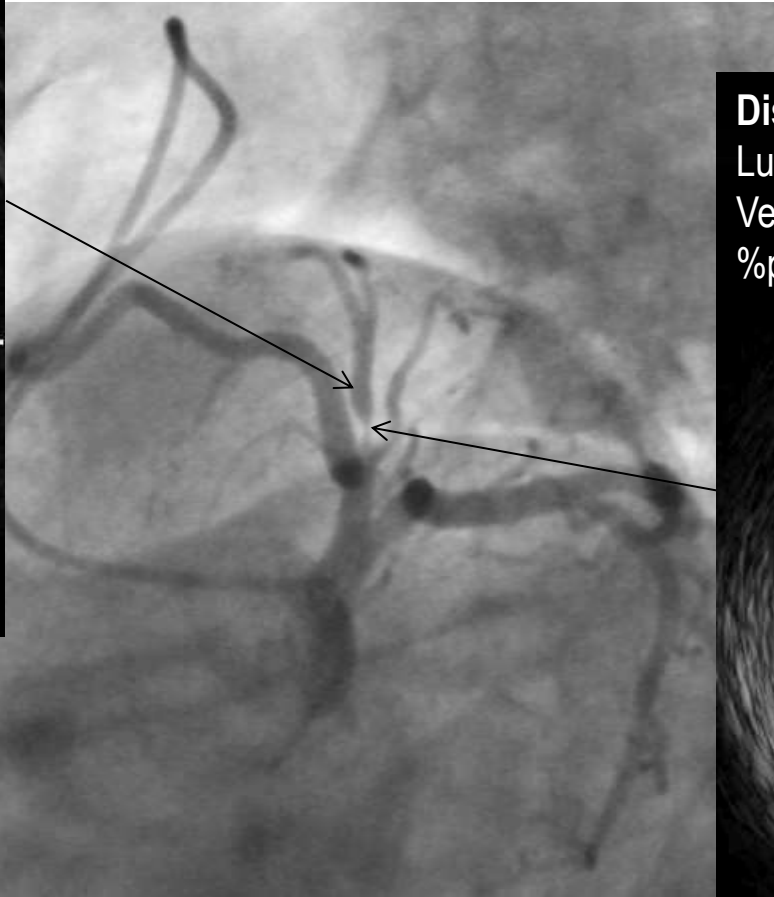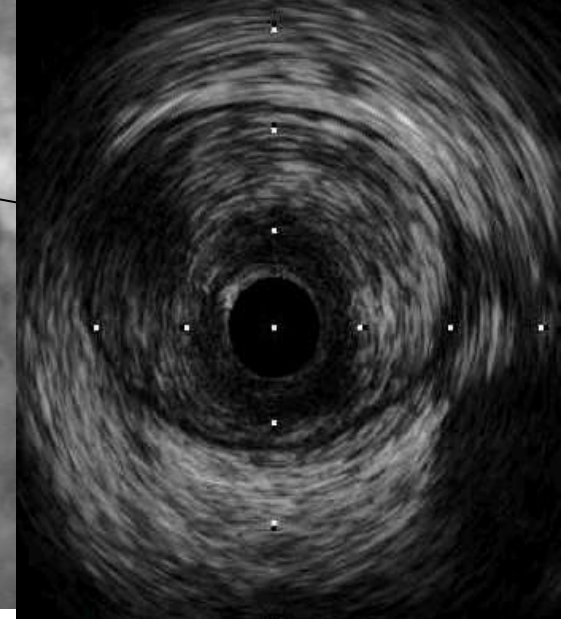- No significant ST change

Coronary Angiography

IVUS

Reference segment:
Lumen area: 7.3 mm^2
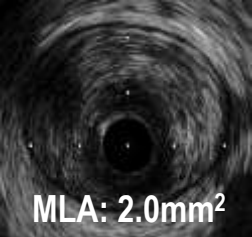Vessel area: 11.2 mm^2
%plaque burden: 34.7%

Disease segment:
Lumen area: 2.0mm^2
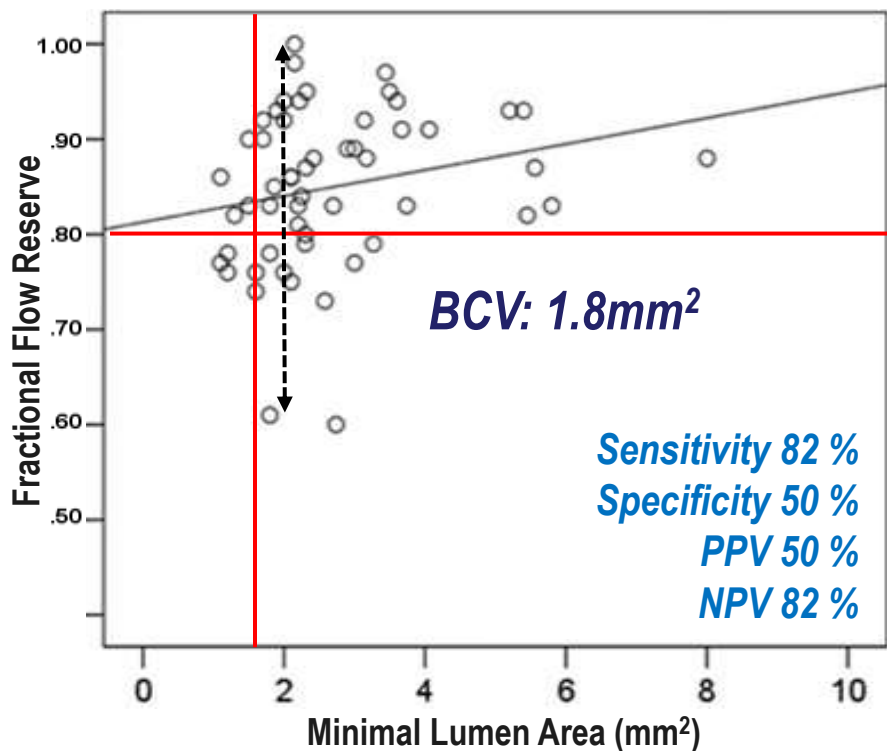Vessel area: 11.2mm^2
%plaque burden: 82.7%
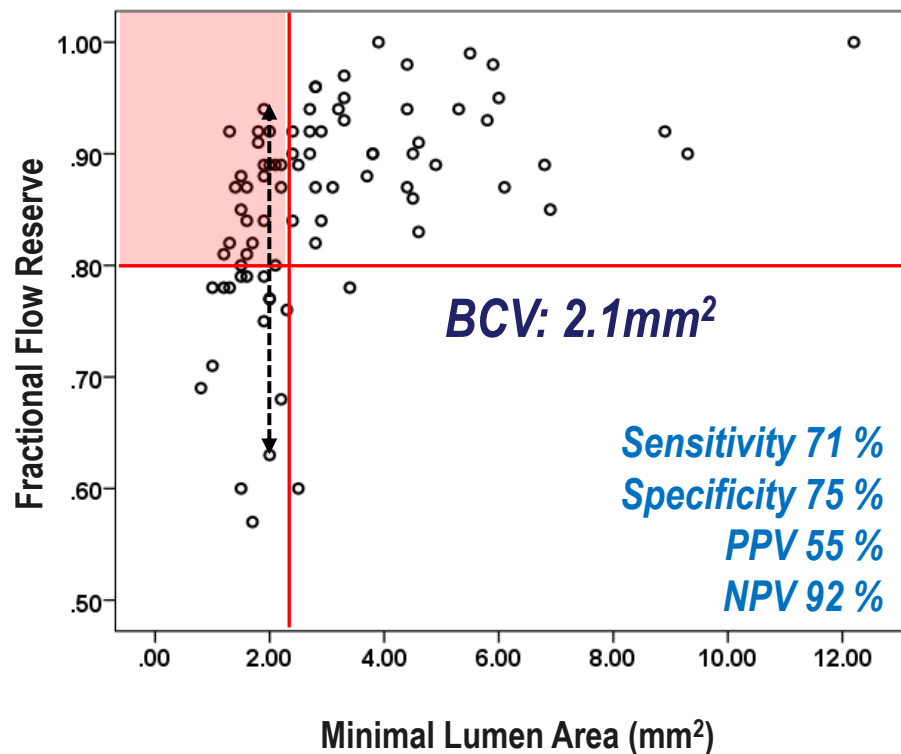
Anatomically significant stenosis!

FFR vs Lumen area in side branch lesions

IVUS

BCV: 1.8mm^2

Sensitivity 82 %
Specificity 50 %
PPV 50 %
NPV 82 %

OCT

BCV: 2.1mm^2

Sensitivity 71 %
Specificity 75 %
PPV 55 %
NPV 92 %
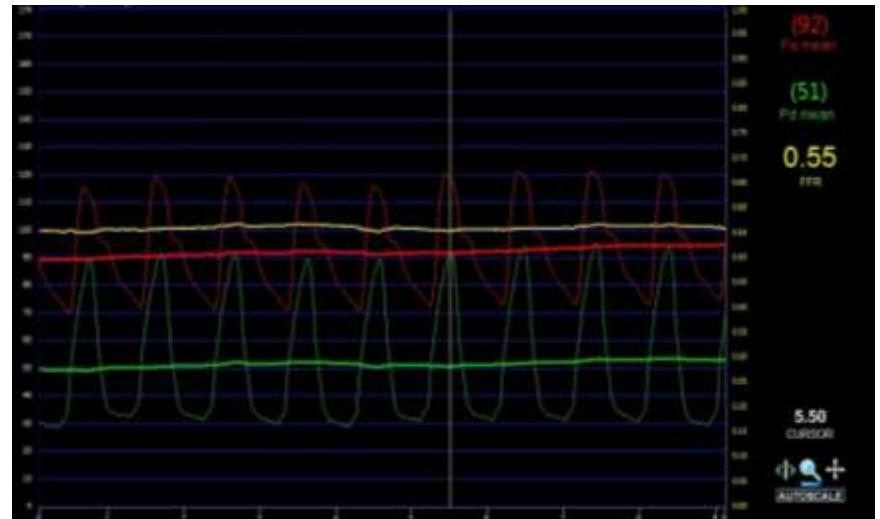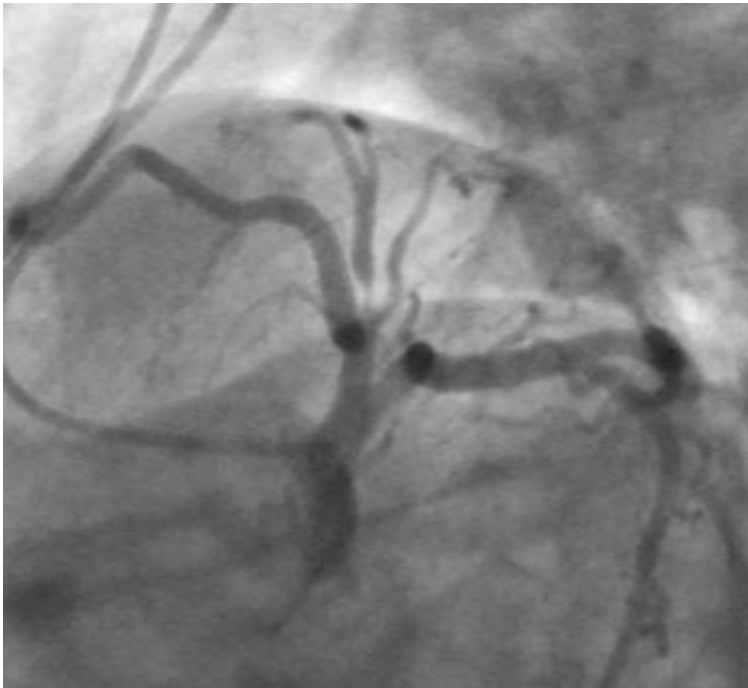
Koh JS, Koo BK, et al. JACC Interv 2012

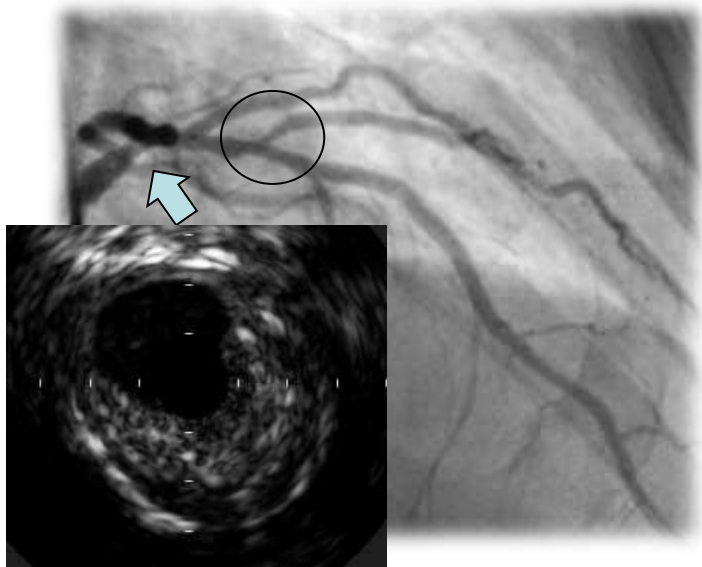*Ha J, Kim JS, et al. JACC Imaging 2013*

Diagonal branch FFR
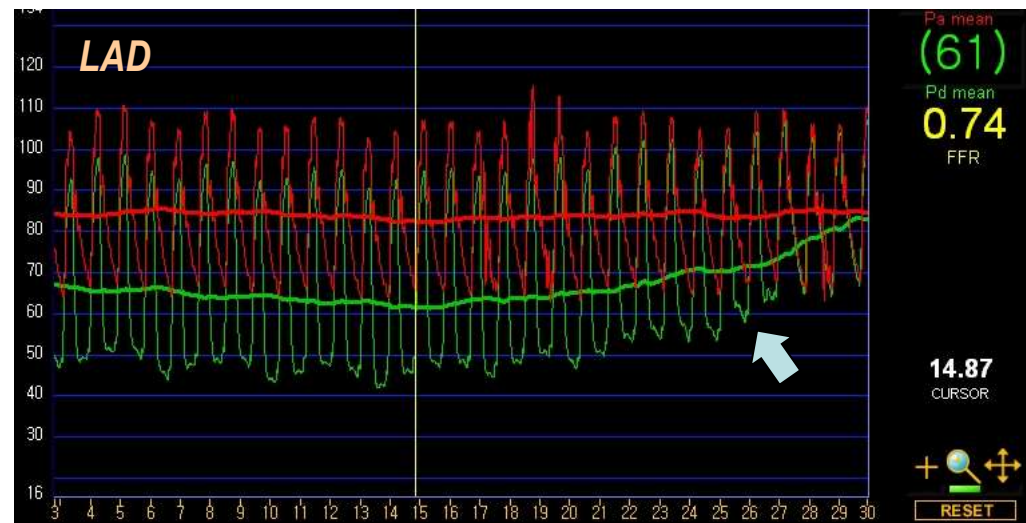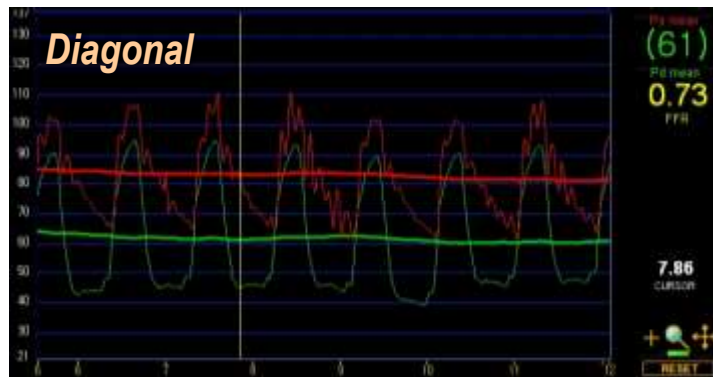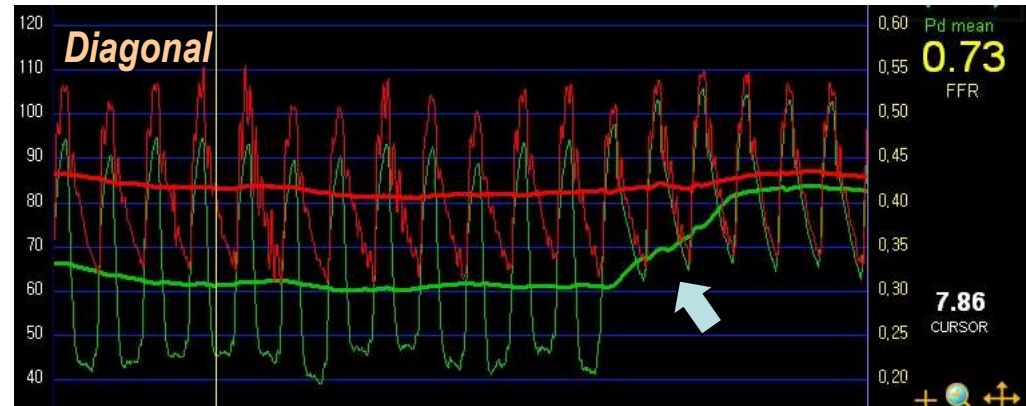## : Anatomically and Functionally Medina 0,0,1 lesion

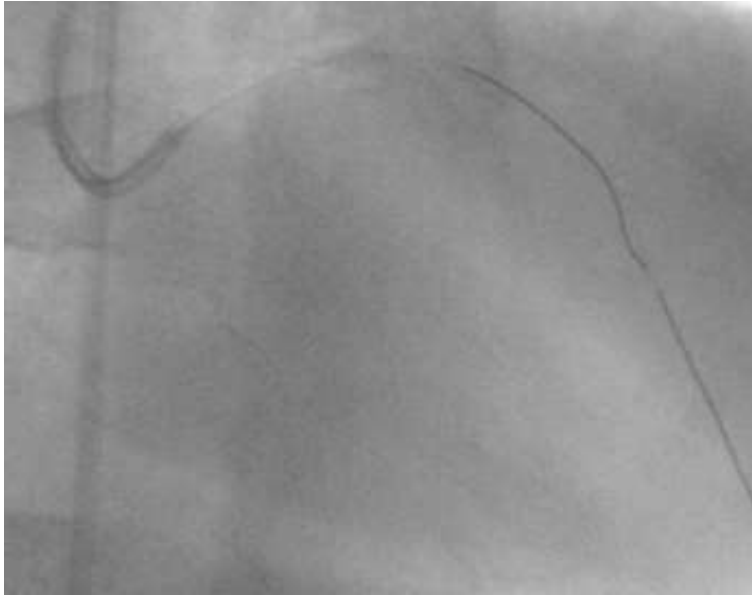# Side branch FFR before main branch PCI: Influence of MB stenosis

Anatomical & functional Medina 0,0,1 lesion?
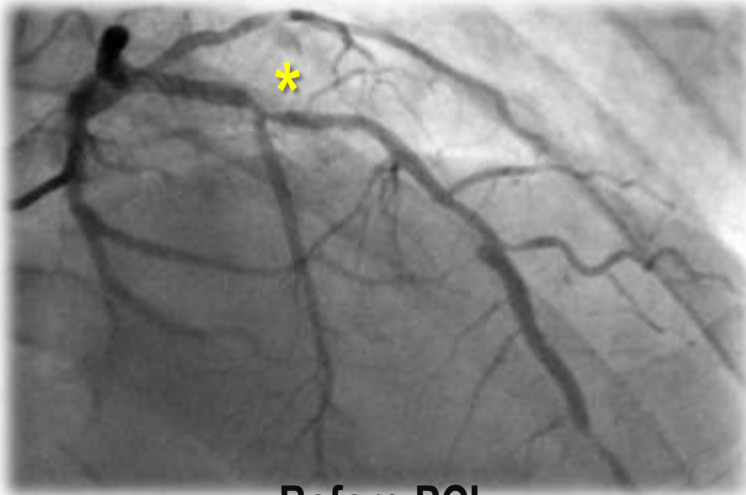

Pullback pressure tracing

Pressure pullback tracing in tandem lesions

- *Gently pull back the pressure wire under steady state hyperemia.*
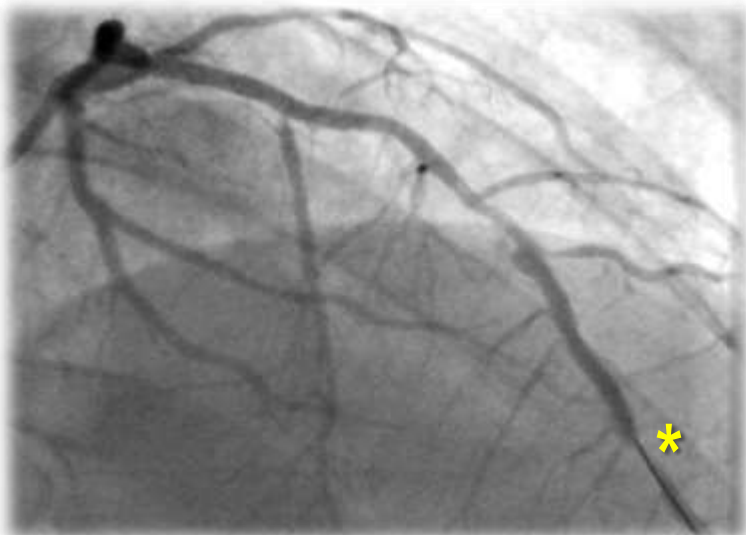
- *Maintain negative tension to the guiding catheter to prevent from ostial injury and pressure damping.*

- *Don't forget to repeat the pressure pullback tracing after fixing one lesion!*

Pressure pullback tracing in tandem lesions

Before PCI
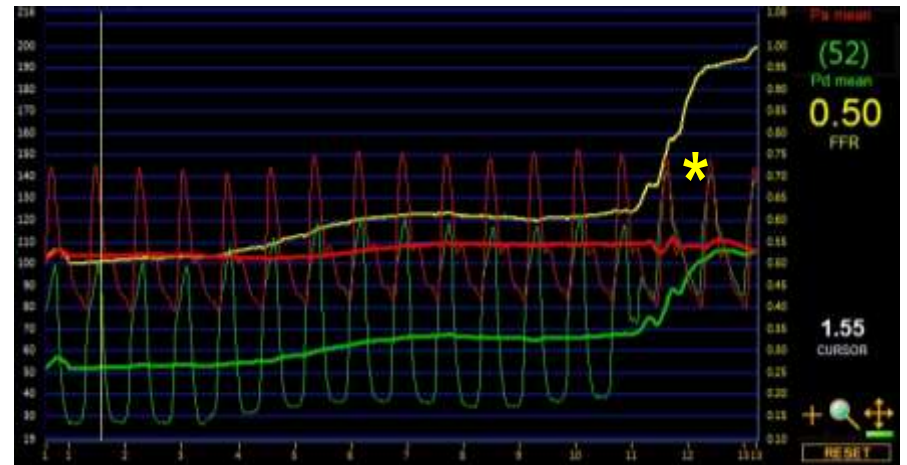
After proximal lesion PCI

Pressure pullback tracing in _diffuse lesion_

Automatic pullback (0.5mm/sec)

Pressure pullback tracing in _0,0,1 lesion_
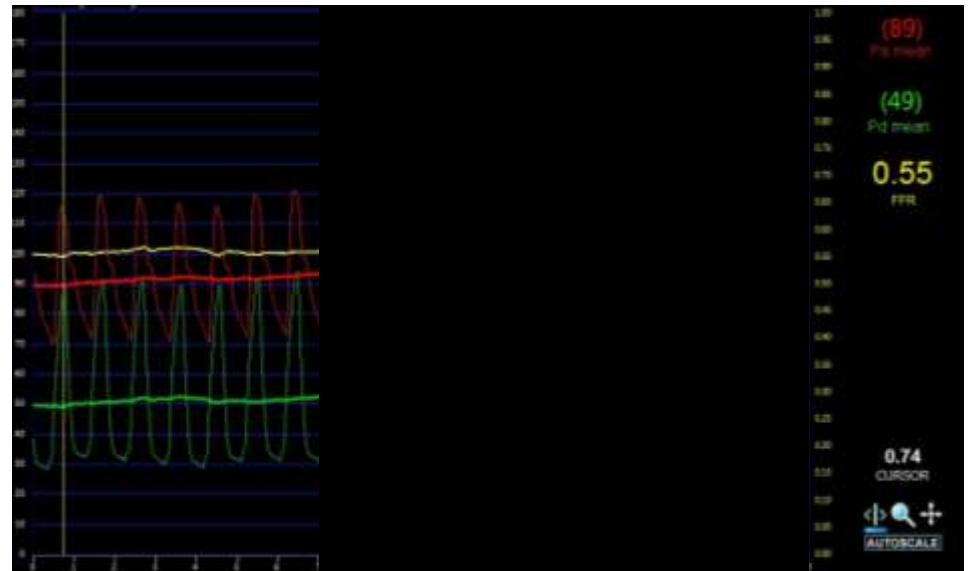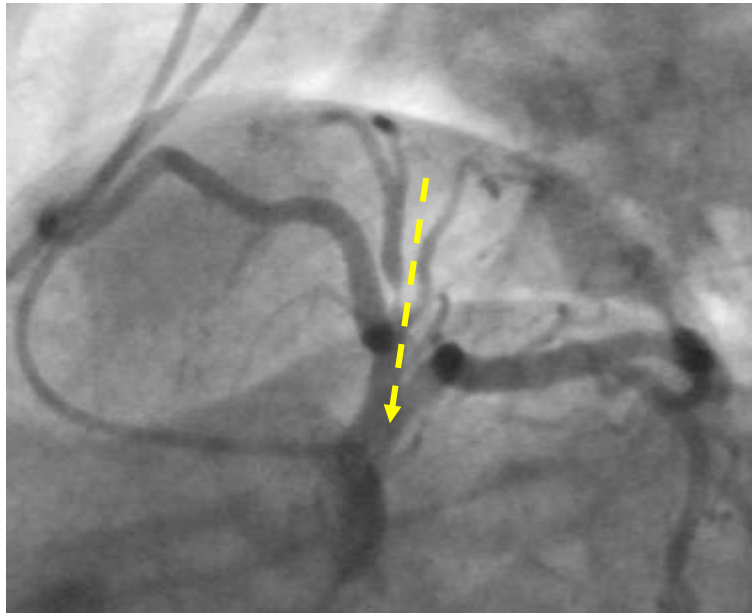
How to treat this 0,0,1 lesion?

F/59 Symptom ±

Exercise stress test ±

Lumen area: 2.0mm²
%plaque burden: 82.7%
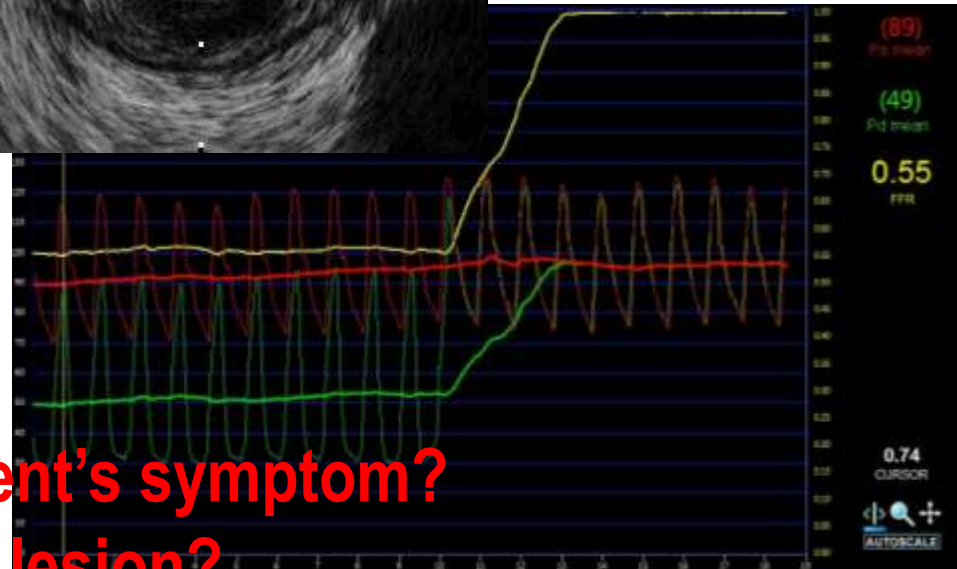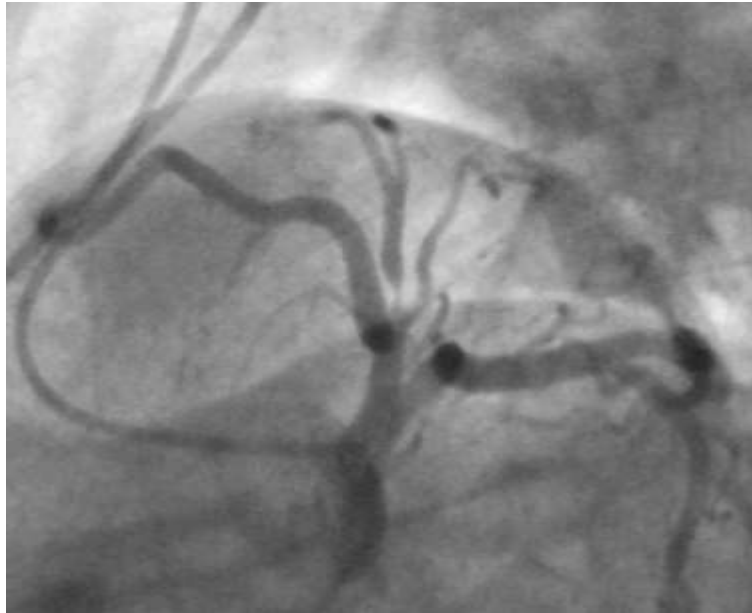
- **Is this lesion causing patient's symptom?**
- **Is this a clinically relevant lesion?**

Clinical significance: Main vs. Side branch

- Responses to 1-minute balloon occlusion -

	LAD	Diagonal	P value
Chest pain (VAS score)	5	2	<0.0001
ST elevation ≥ 1mm	92.3%	35.4%	0.001
QTc interval, msec	454.0±45.4	440.4±35.7	0.07
QTc dispersion, msec	83.8±39.2	70.7±28.5	<0.0001

Side branch has much less clinical relevance in terms of symptom, ischemia and arrhythmic potentials

Koo BK, et al., JACC Intv, 2012

Evaluation of side branch lesion

Focus more on "myocardial mass at risk" than other parameters

Risk of cardiac death vs. Amount of ischemia

Medical Rx

Revascularization

log Hazard Ratio

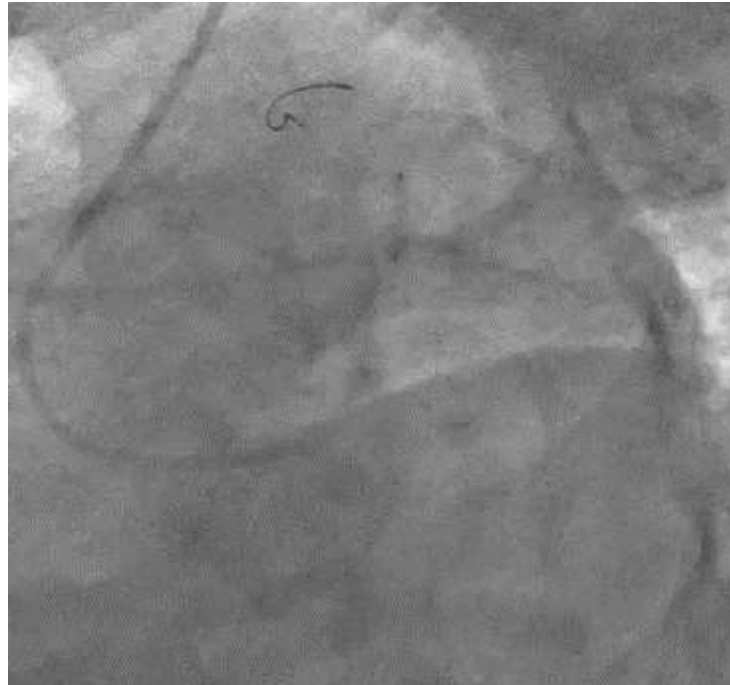% Myocardium Ischemic by *myocardial perfusion imaging*
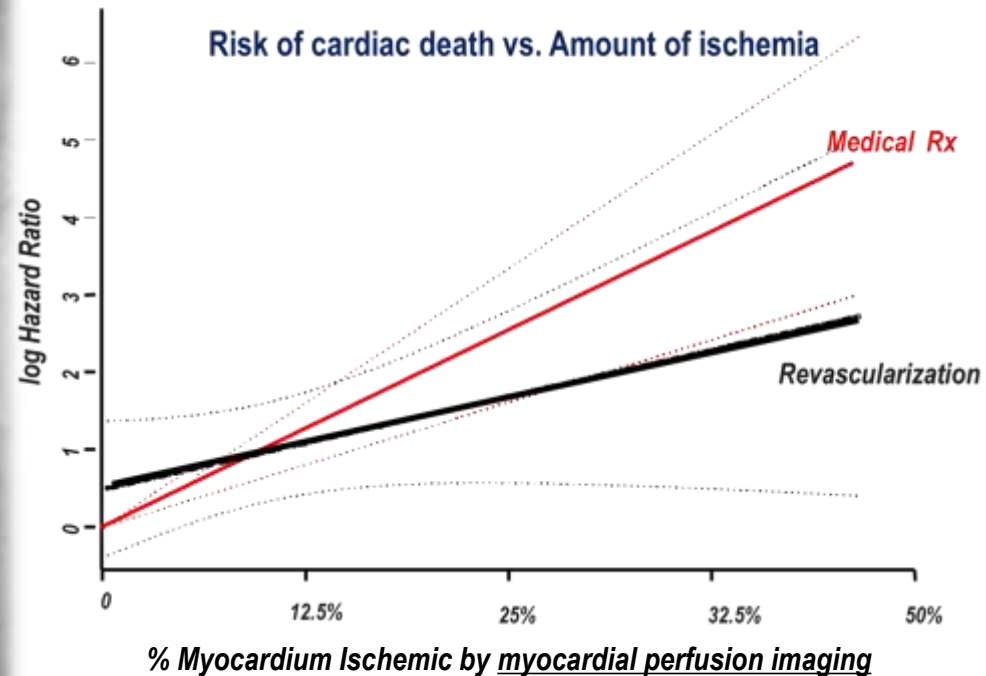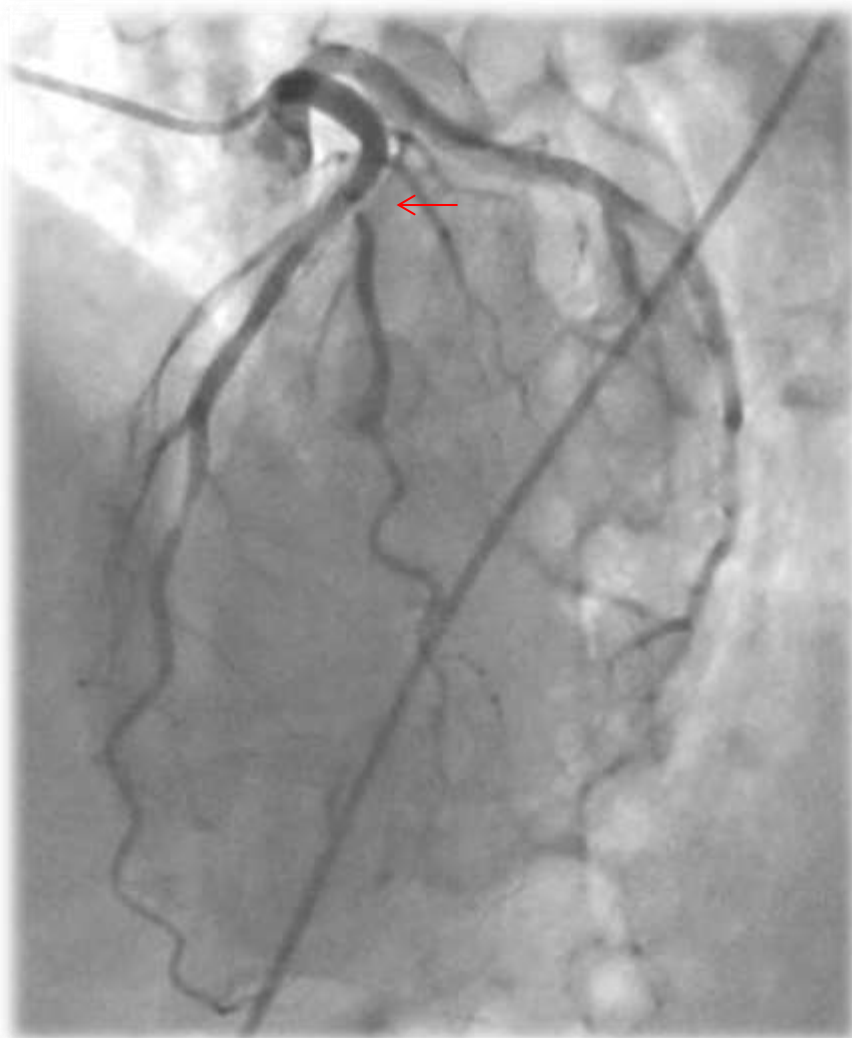
Hachamovitch, Circulation 2003

Coronary Angiography
: the most important tool for side branch assessment

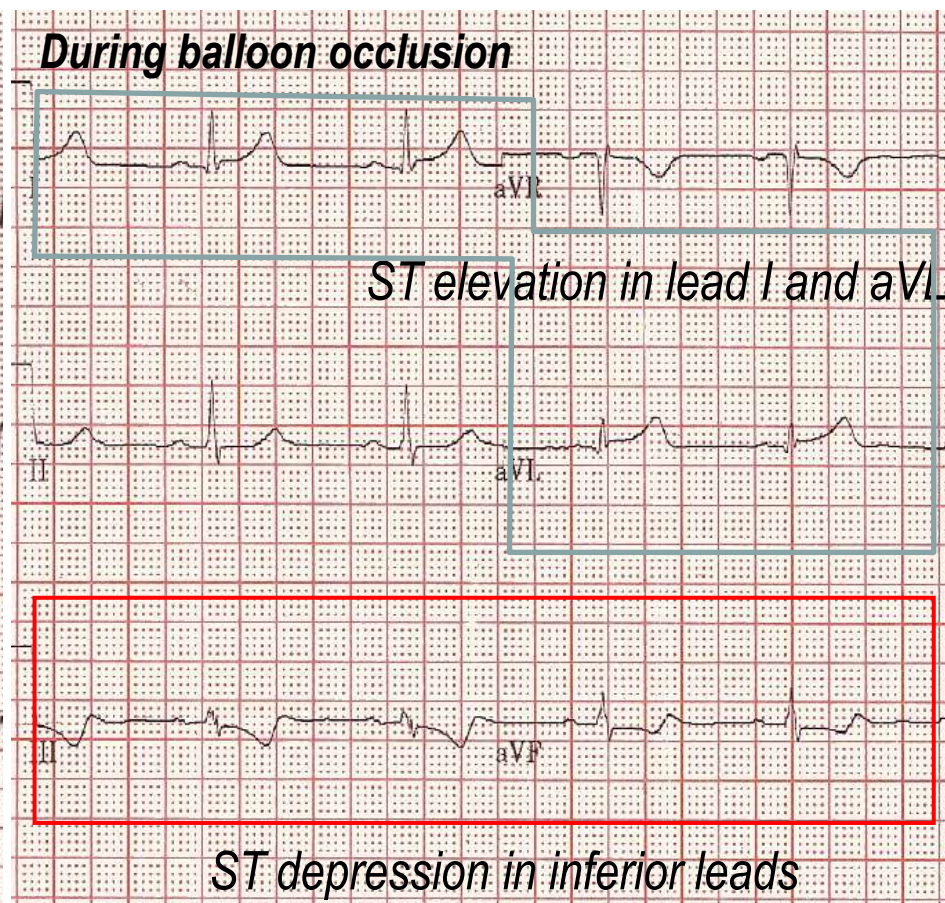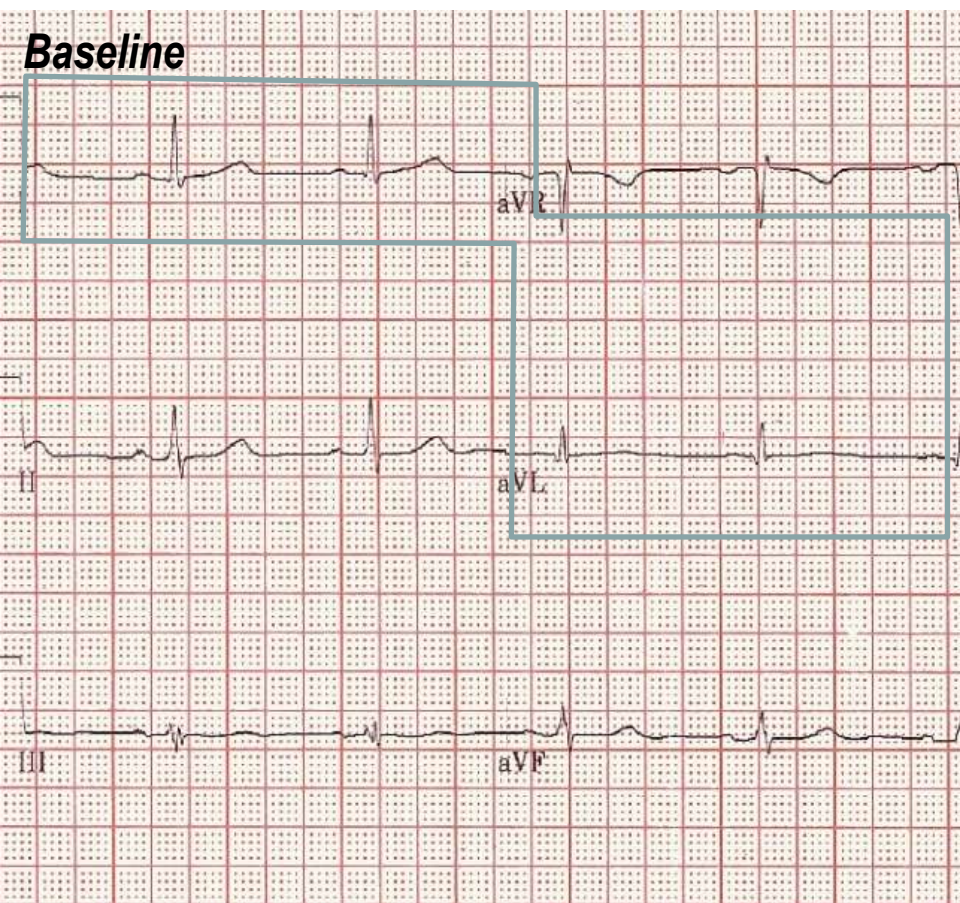# *Plain old* balloon angioplasty (POBA)

SNUH

Smart angioplasty

Check symptom and EKG during balloon occlusion

- *Similar chest pain (+)*
- *ST-T change (+)*
- *QTc change: 457 → 466 sec*

Baseline

During balloon occlusion

ST elevation in lead I and aVL

ST depression in inferior leads

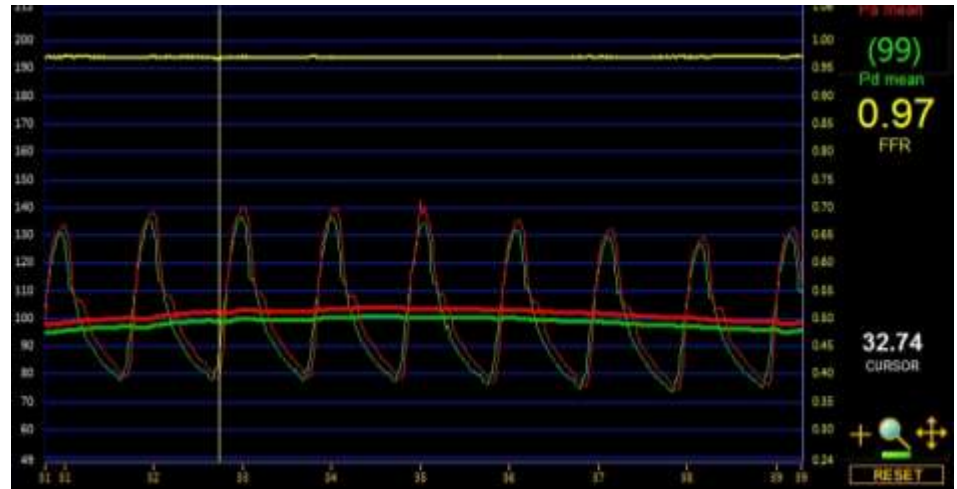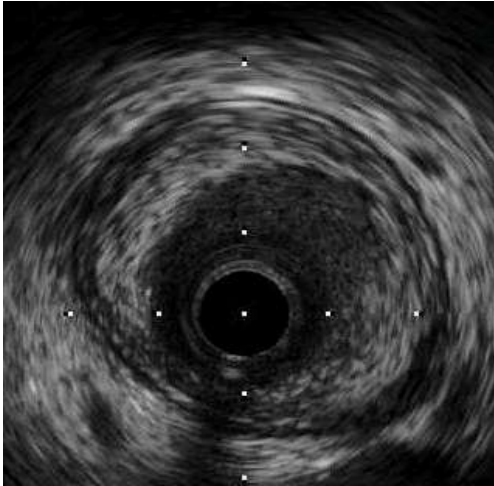# Plain old balloon angioplasty (POBA)
→ *Smart angioplasty*

- Is this lesion causing patient's symptom? YES
- Is this a clinically relevant lesion? YES
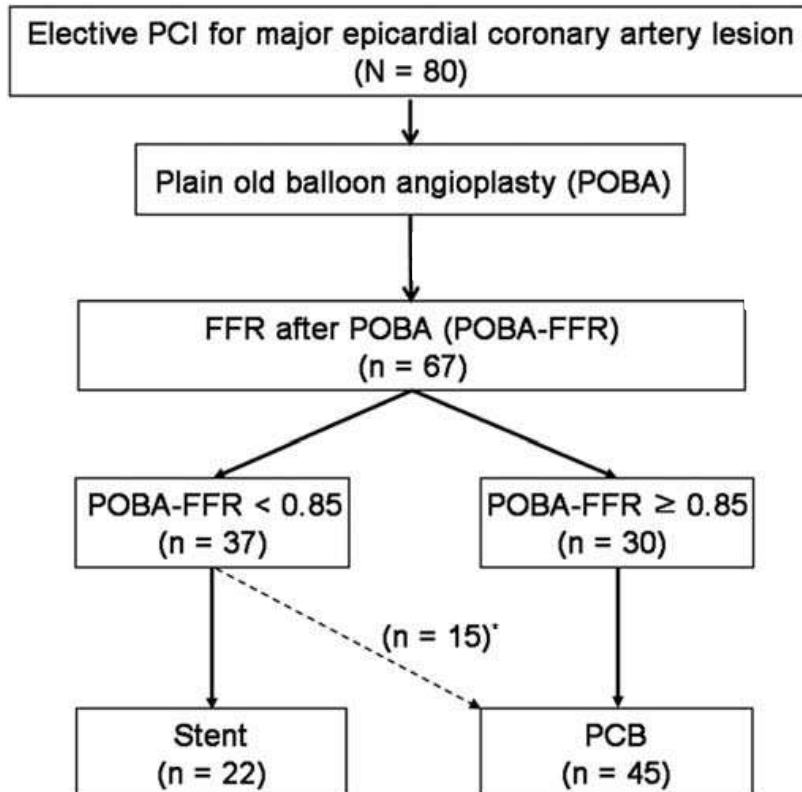- Collateral protection? Good
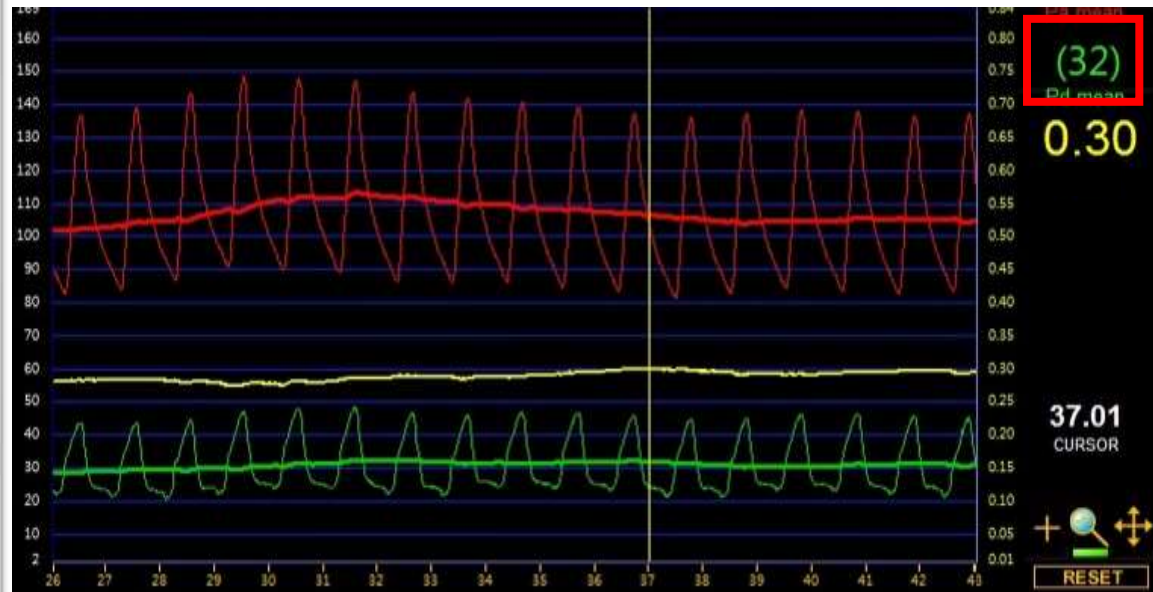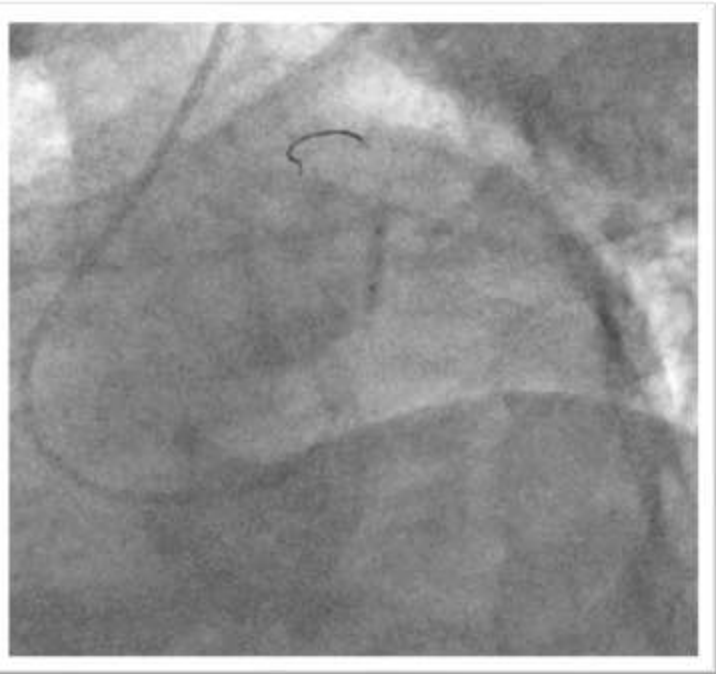
Coronary wedge pressure (32mmHg)

# After angioplasty

Efficacy of FFR-guided DCB treatment

|	PCB ($n = 45$)	Stent ($n = 22$)	P value
Before procedure			
Lesion length (mm)	21.5 ± 5.6	24.9 ± 7.2	0.064
Reference diameter (mm)	2.55 ± 0.41	2.70 ± 0.42	0.188
Minimal lumen diameter (mm)	1.02 ± 0.42	0.94 ± 0.36	0.430
Diameter stenosis (%)	60.0 ± 14.4	65.1 ± 11.8	0.123
Pre-procedural FFR*	0.69 ± 0.16	0.60 ± 0.11	**0.015**
After procedure			
Minimal lumen diameter (mm)	1.92 ± 0.42	2.65 ± 0.35	**<0.001**
Diameter stenosis (%)	28.3 ± 11.2	9.6 ± 5.2	**<0.001**
Acute gain (mm)	0.90 ± 0.51	1.71 ± 0.46	**<0.001**
Post-procedural FFR	0.86 ± 0.06	0.83 ± 0.08	0.105
9-months follow up	PCB ($n = 36$)	Stent ($n = 17$)	P value
Minimal lumen diameter (mm)	1.91 ± 0.57	2.23 ± 0.66	0.068
Diameter stenosis (%)	25.9 ± 13.1	21.2 ± 19.3	0.295
Late luminal loss (mm)	0.05 ± 0.27	0.40 ± 0.54	**0.022**
Net gain (mm)	0.88 ± 0.61	1.28 ± 0.72	**0.038**
9 months-FFR	0.85 ± 0.08	0.85 ± 0.05	0.973

Shin et al. Cathet cardiovasc interv. 2015

After angioplasty
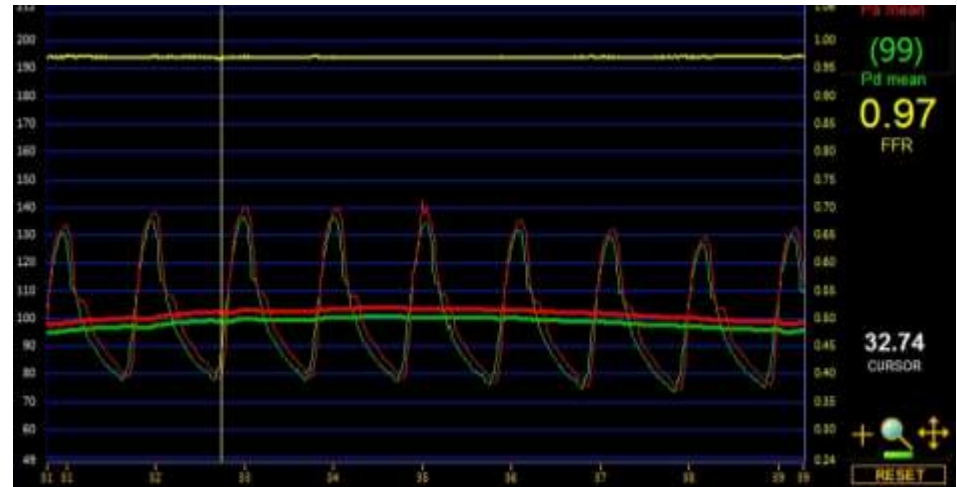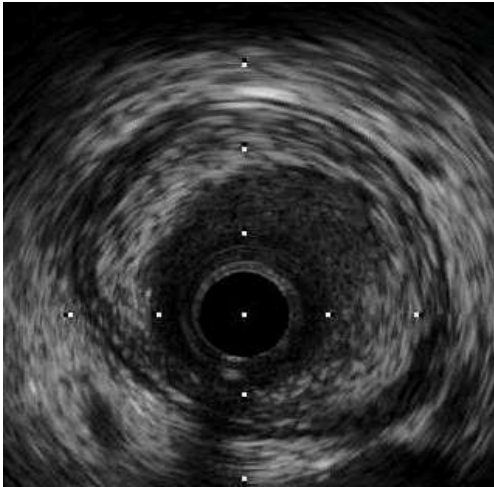
After drug-coated balloon treatment
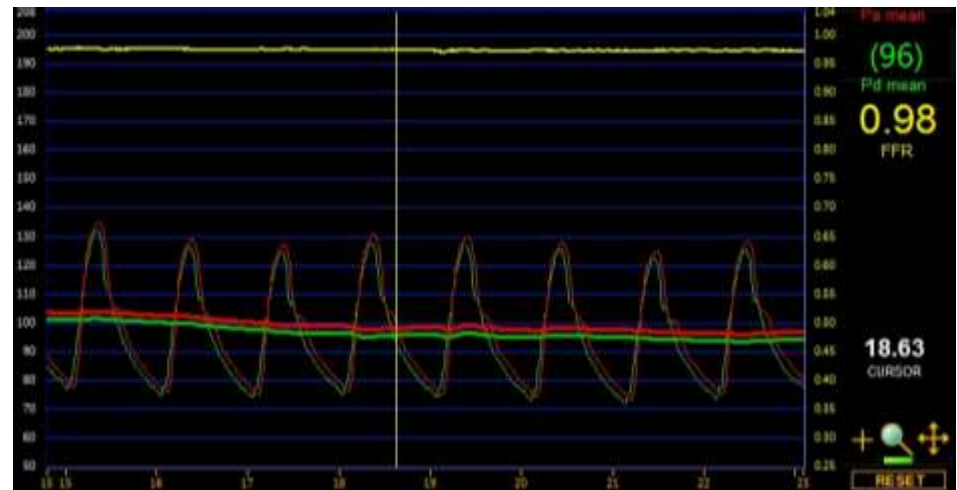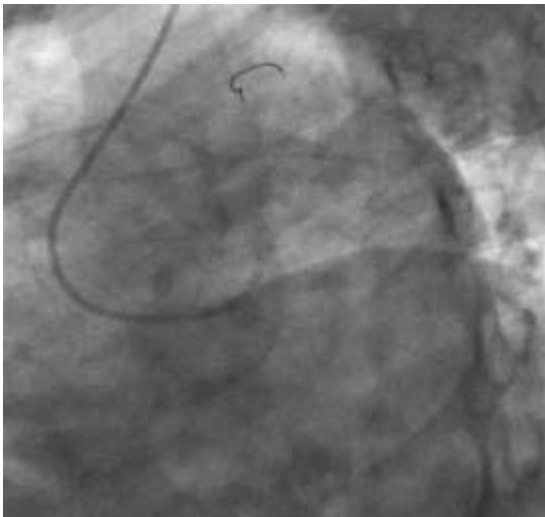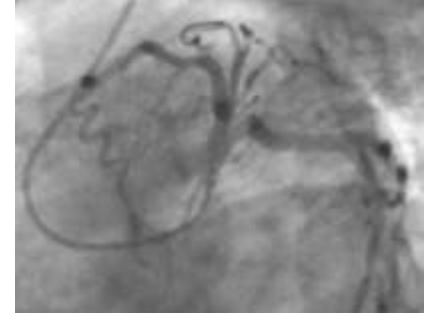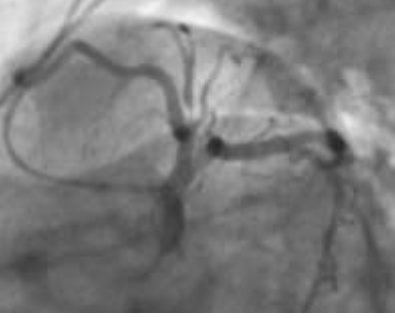
Take home message

Integrated use of IVUS and FFR can reveal hidden pathophysiology of coronary artery disease and help to select the proper treatment for *the patient* and to avoid unnecessary procedure.