

# Hidden stories behind the low FFR and high FFR

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# Case Description

58 / F

CC> Aggravating exertional chest pain, 1 month ago

- Location: anterior chest / Character: throbbing
- Duration: less than 5min.
- Aggravated by exercise and relieved by resting
- Associated symptom: dyspnea

Past Medical History>

Breast cancer s/p surgery and RTx 3yrs ago currently on Tamoxifen

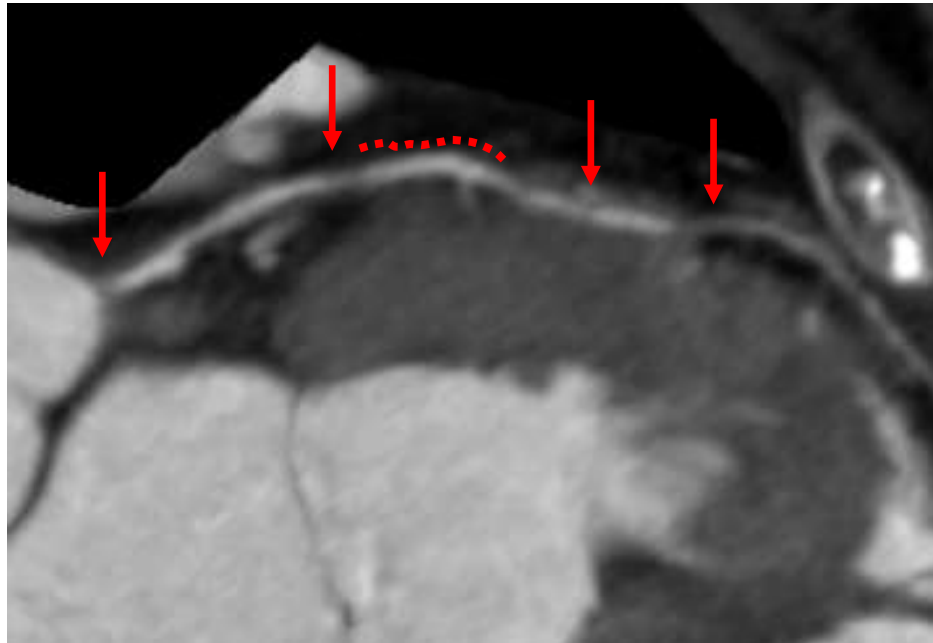
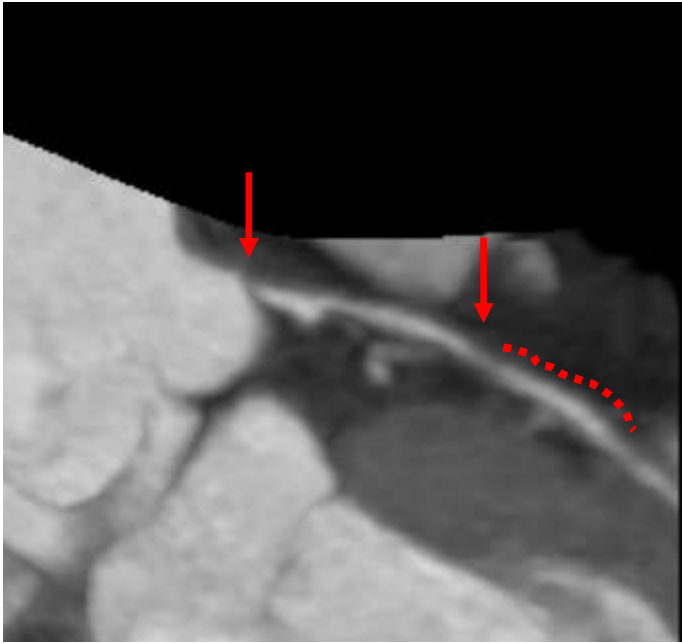
Social History> **Never smoker**

Family History> **None**

Medication before Admission> **none**

# CT Coronary Angiography

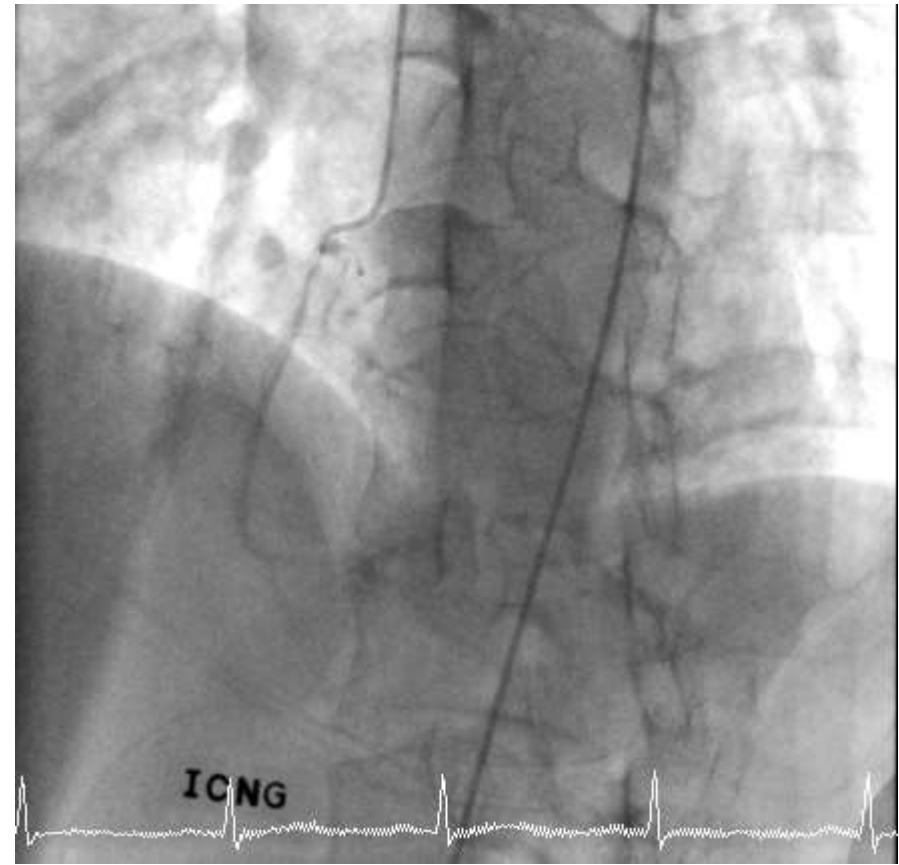
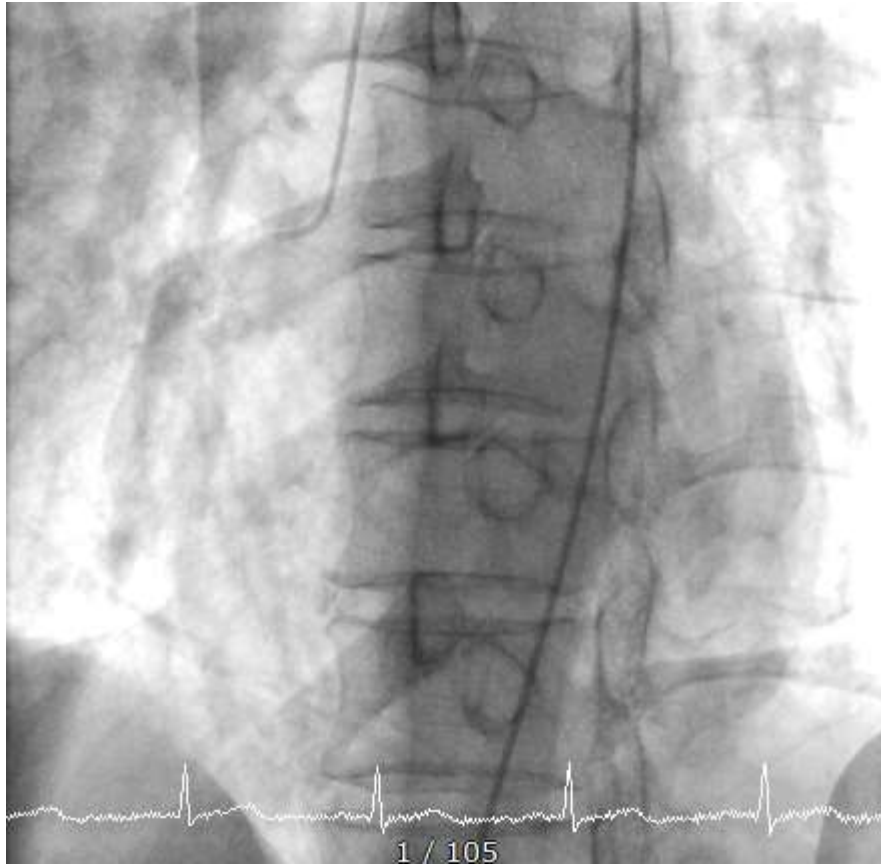
- At OPD, 5days ago



## CT coronary Angiography:

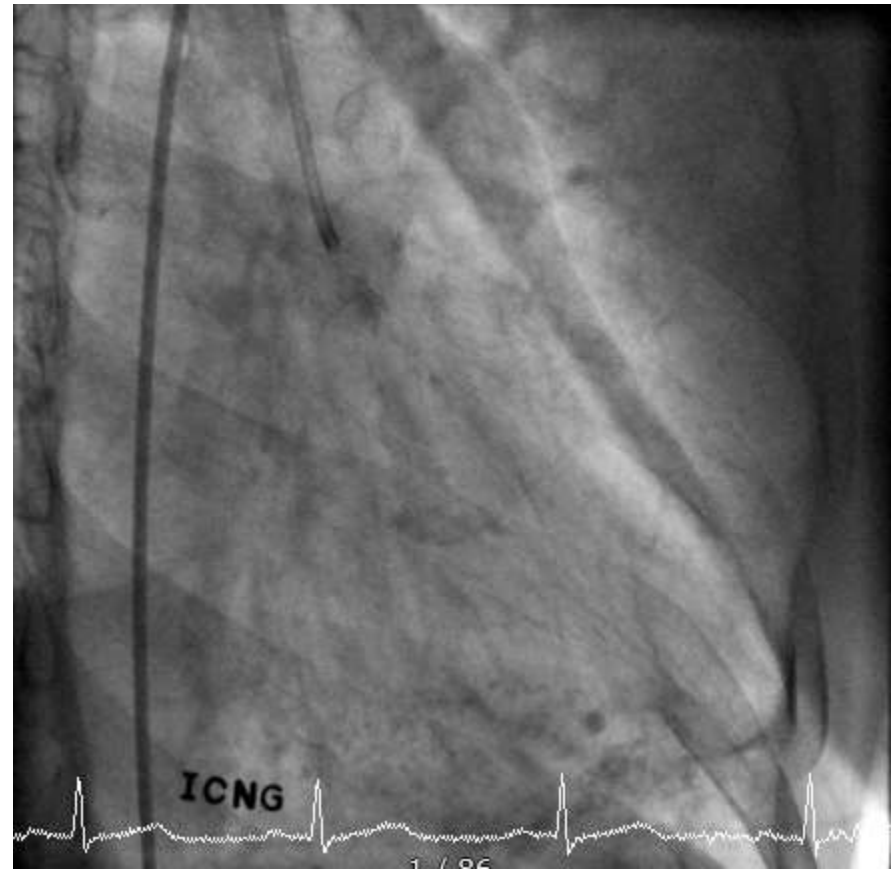
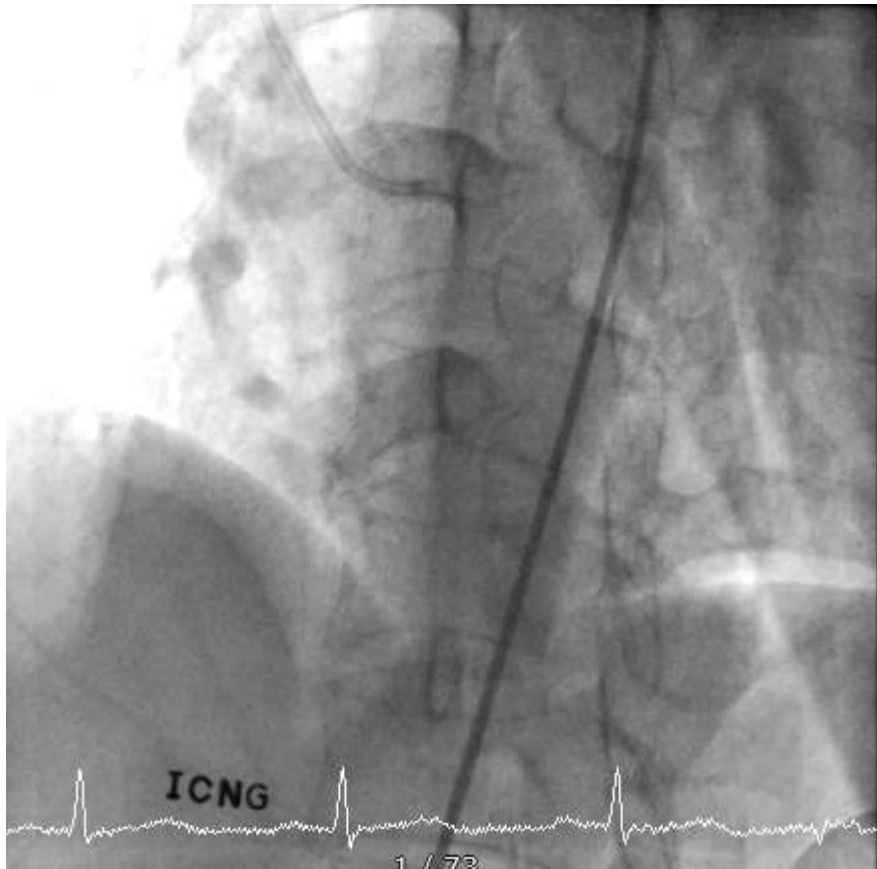
- **Left main os** : 70-80% stenosis with noncalcified plaque.
- **LAD proximal** : near total occlusion with noncalcified plaque and positive remodeling
- **LAD mid** : LAD mid, myocardial bridging
- **LAD distal** : near total occlusion with noncalcified plaque
- **LCX, RCA** : small caliber but no focal significant stenosis

# Invasive Coronary Angiography



**RCA : spastic coronary artery without significant coronary lesion**

# Invasive Coronary Angiography

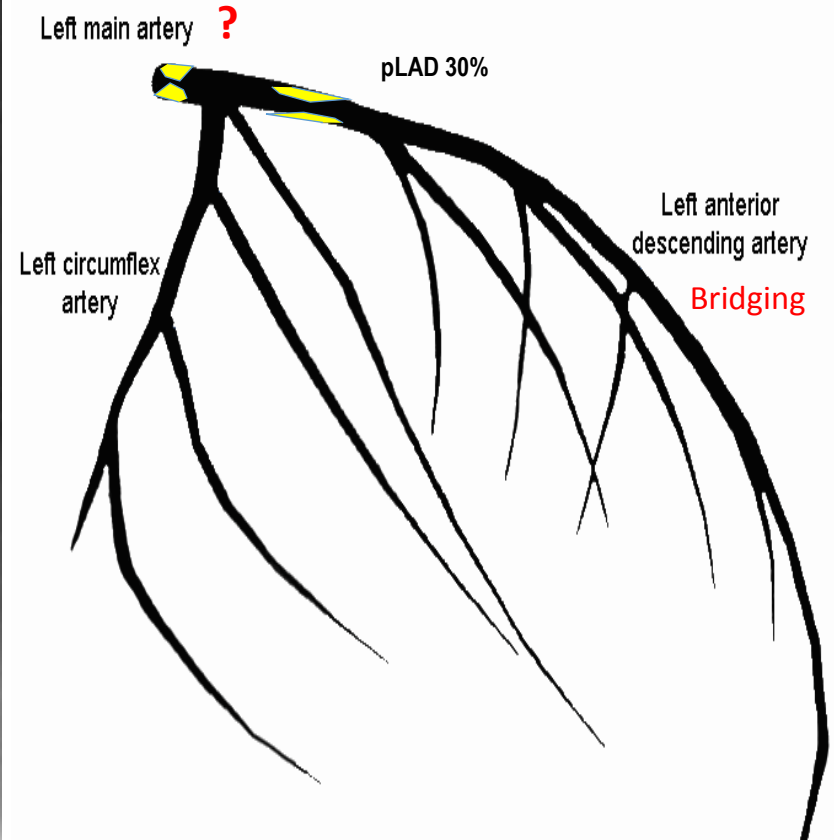
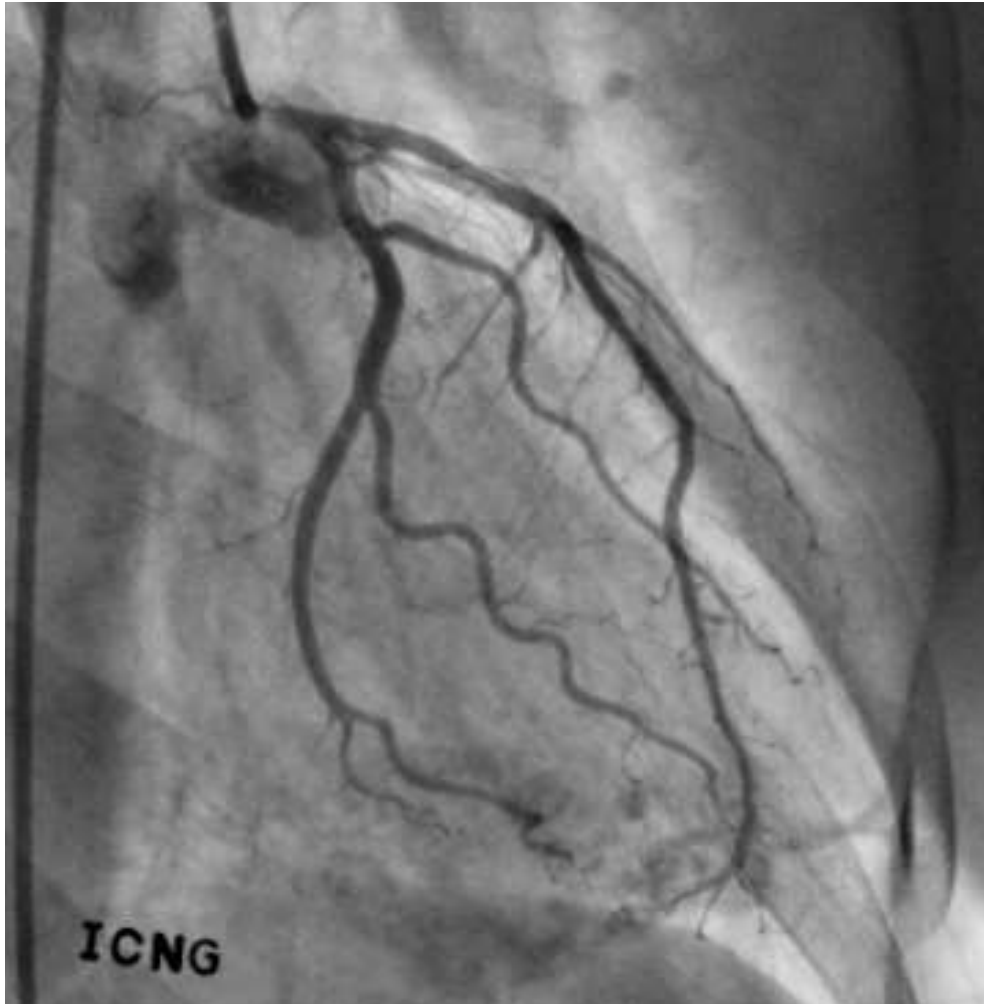


**LM : LM os focal 80% stenosis**

**LAD : pLAD tubular 30%**

**mLAD severe myocardial bridging**

# Evaluation of LM ostial lesion + LAD stenosis : How ?



# Evaluation of LM ostial lesion + LAD stenosis : How ?

## Left main coronary artery

: subject to *most significant degree of interobserver variability*  
when assessing the degree of lumen compromise

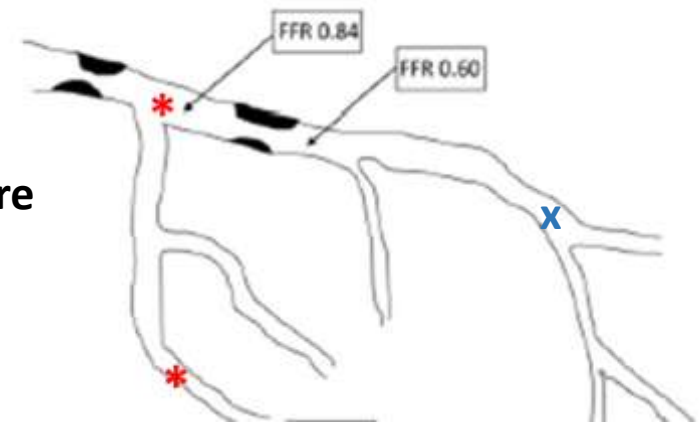
**FFR** provides a in vivo determination of the physiological significance of LMCA lesion

## Important caveats

### 1. Ostial disease may dampen the catheter pressure

(dampened Pa, therefore falsely raised FFR)

- >1) disengage guiding catheter
- 2) use i.v. adenosine rather than i.c.

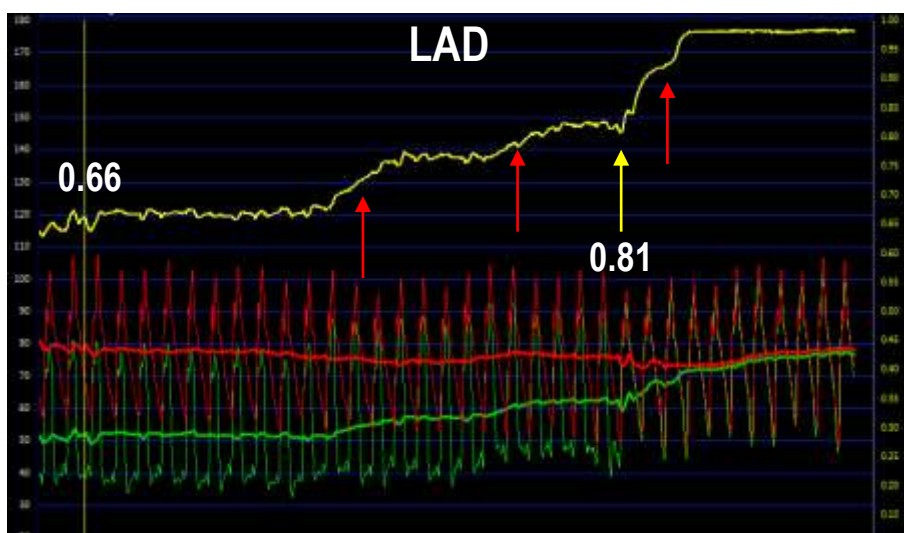
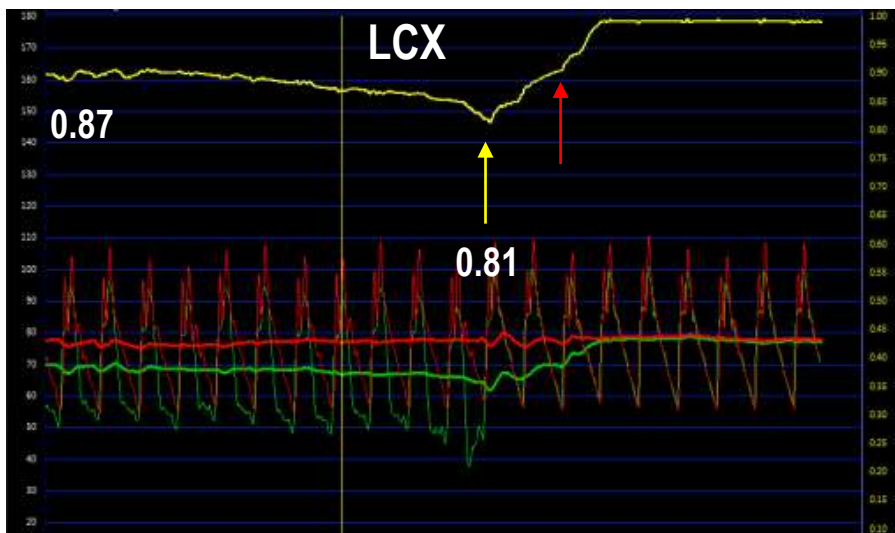
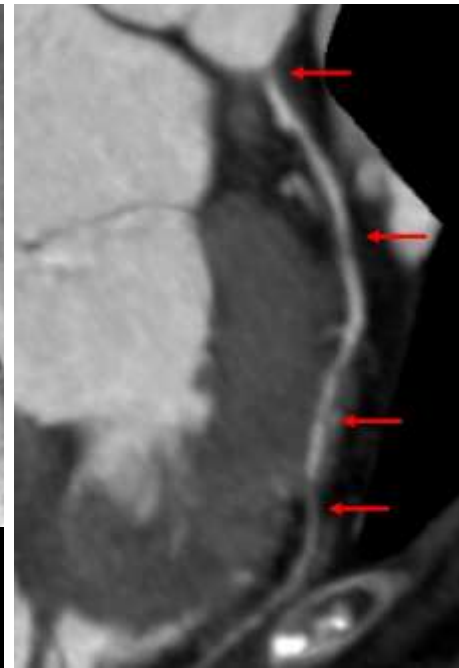
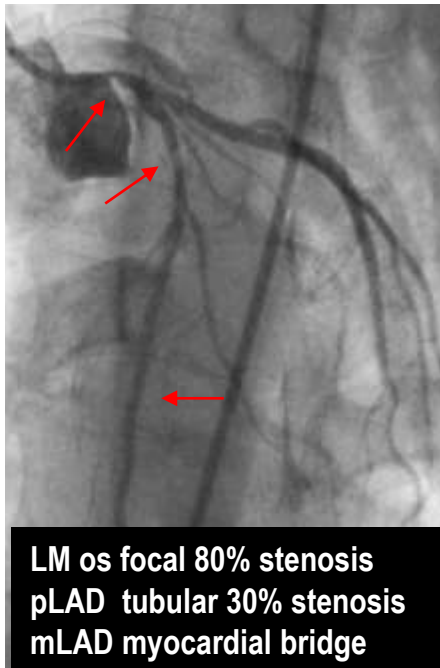
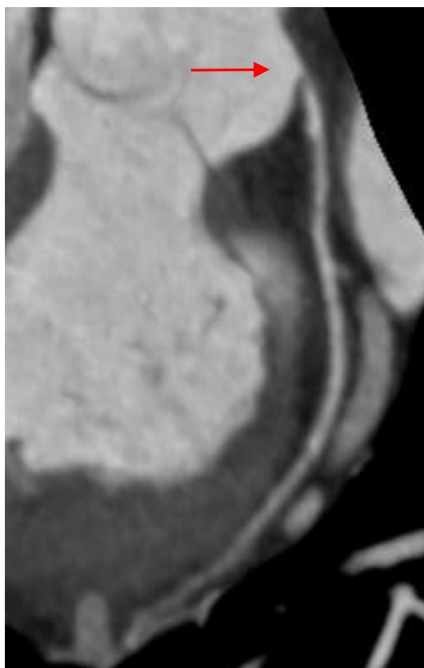


### 2. Presence of distal LAD or LCX lesion (50-60% involves distal bifurcation)

- > 1) **FFR pullback** should be undertaken starting within **both daughter branches**
- 2) FFR at the distal of **uninvolved branch** represents significance of LM stenosis

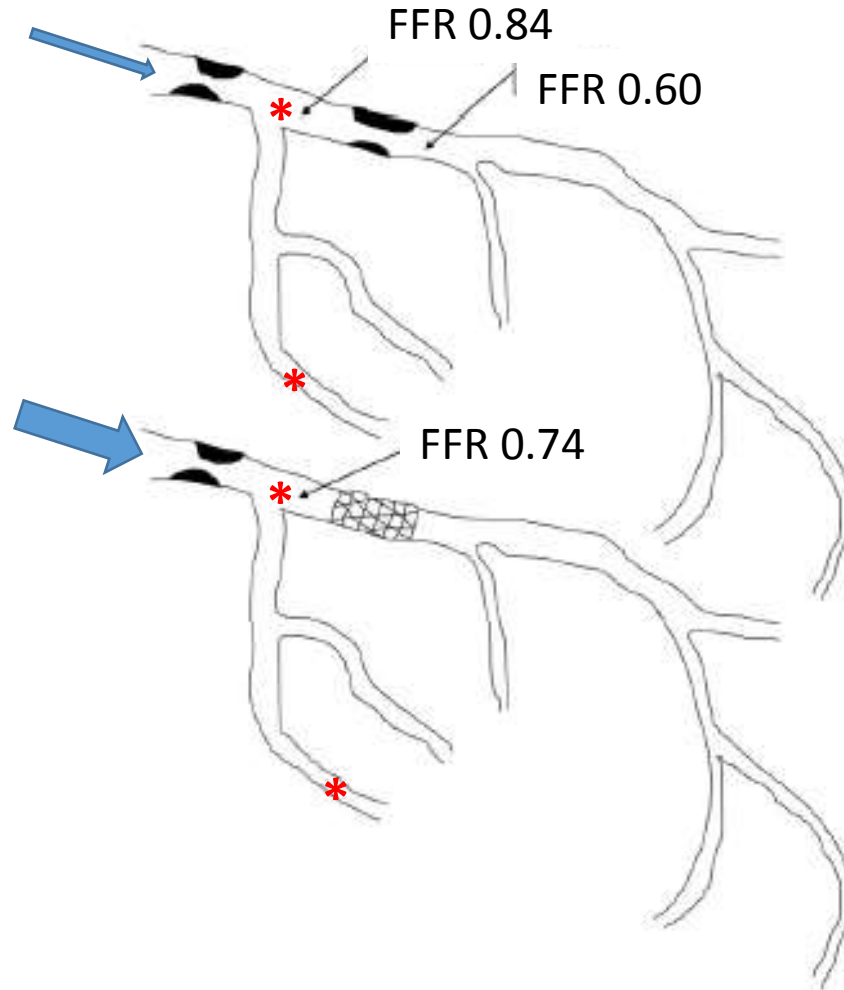


# FFR pull-back of LCX and LAD

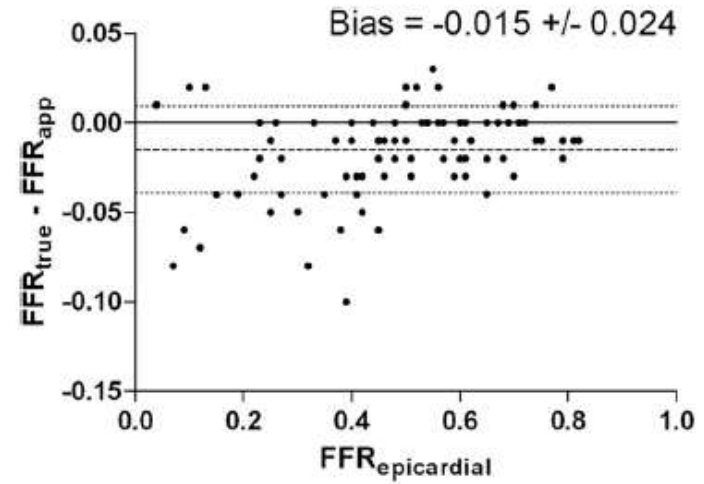
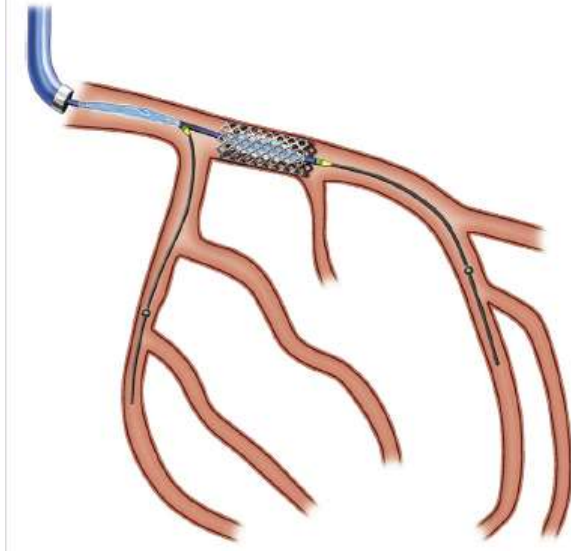




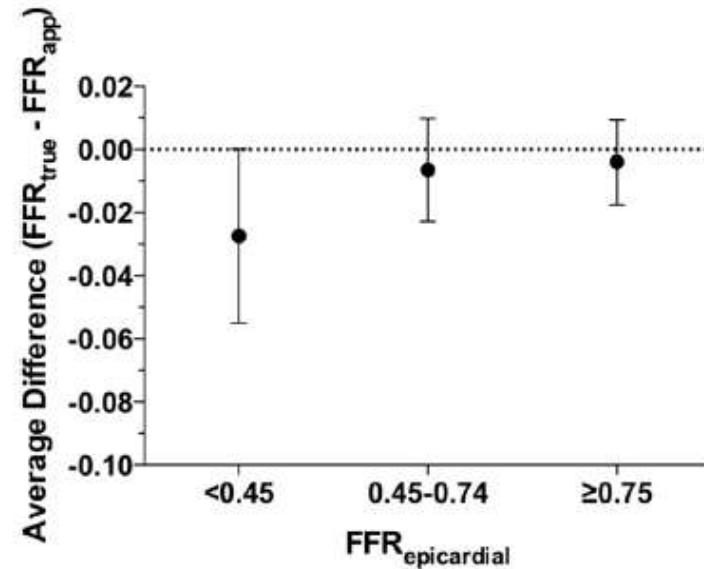
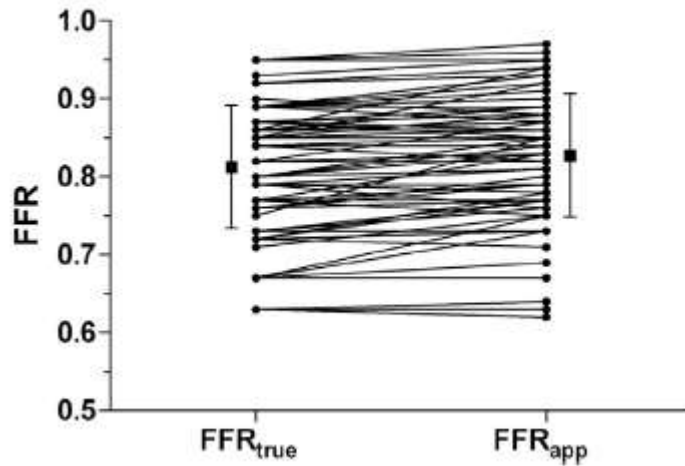
# Assessment of LM stenosis in the presence of Downstream coronary stenosis



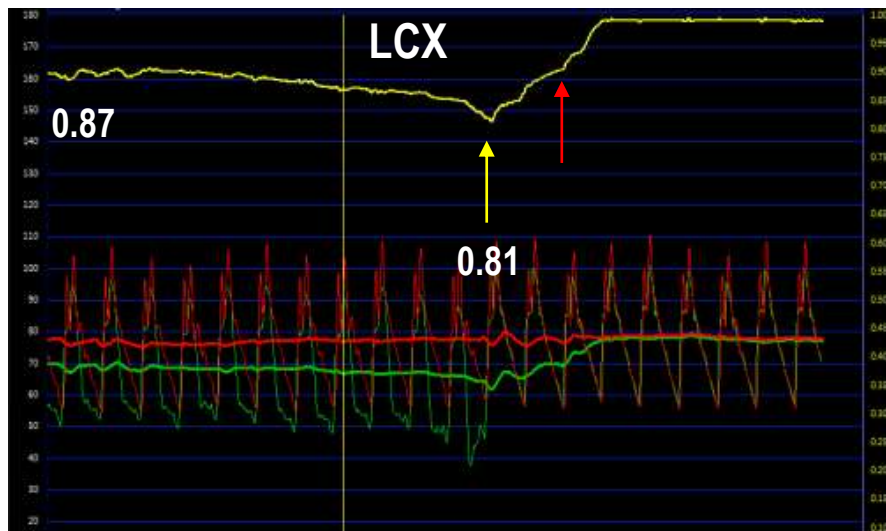
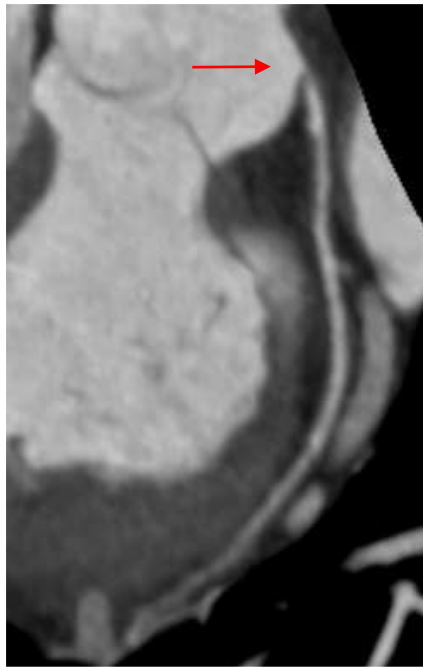
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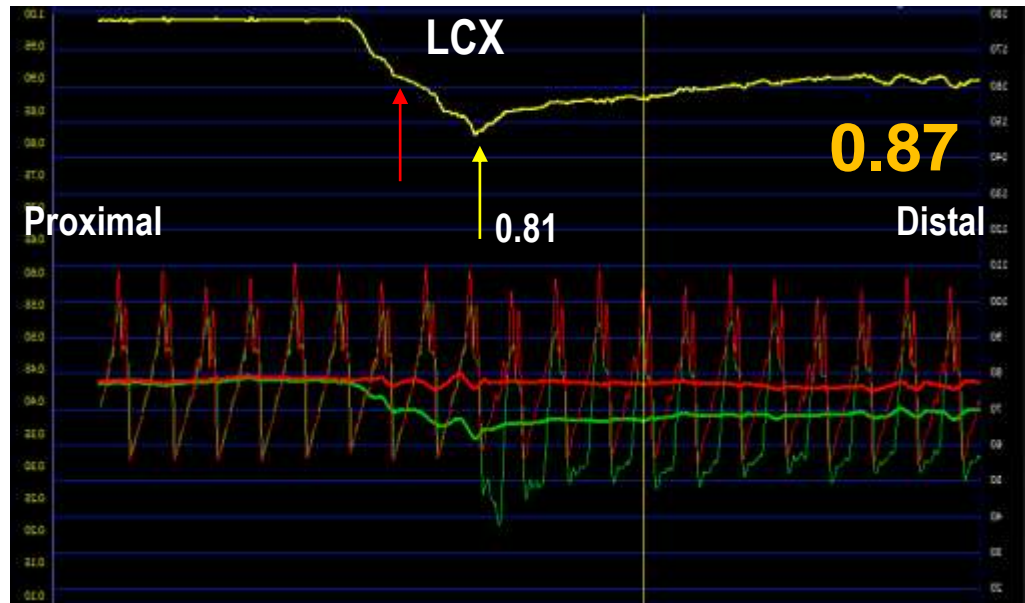
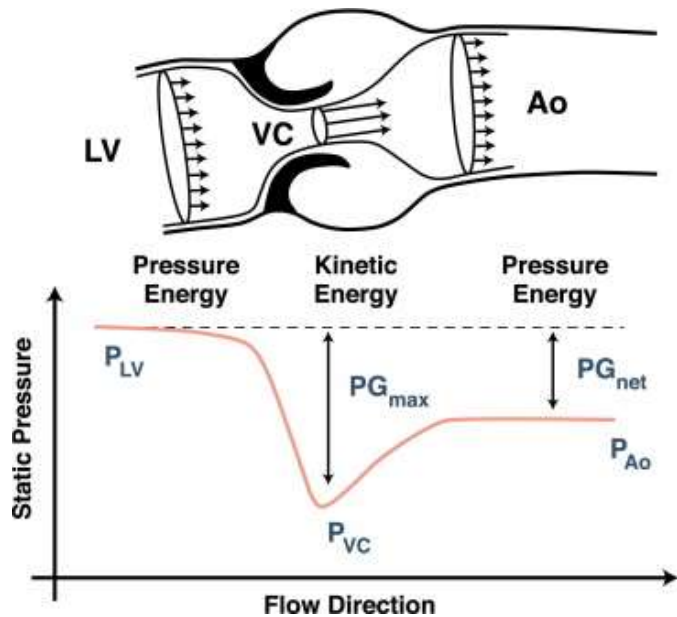
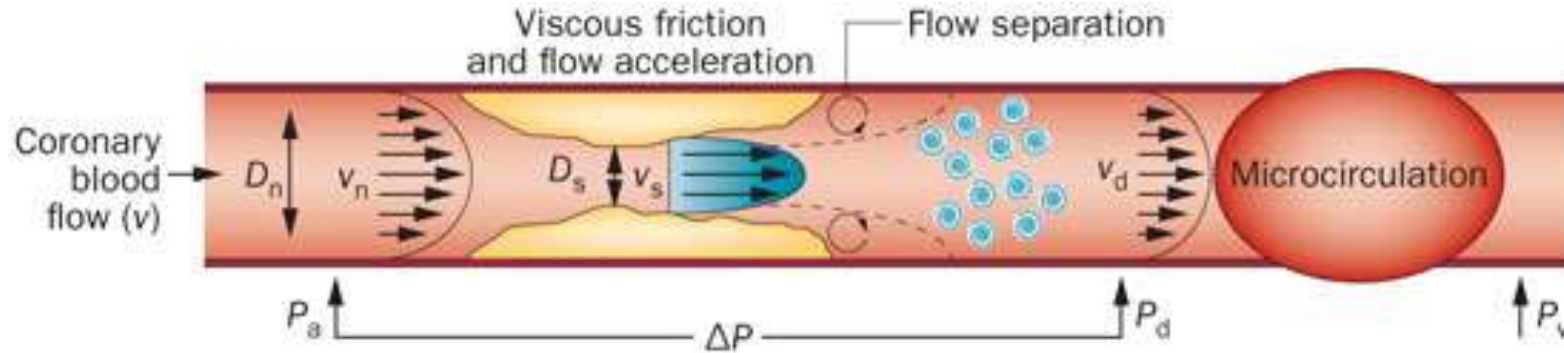
$0.81 \pm 0.08$  vs.  $0.83 \pm 0.08$ ,  $P < 0.001$  (n=91)



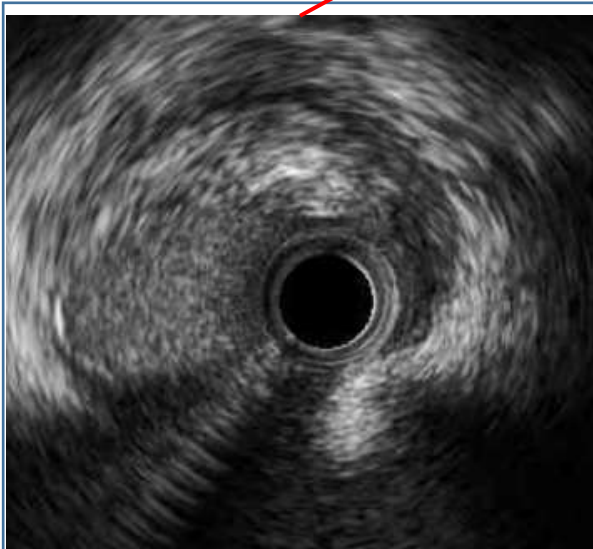
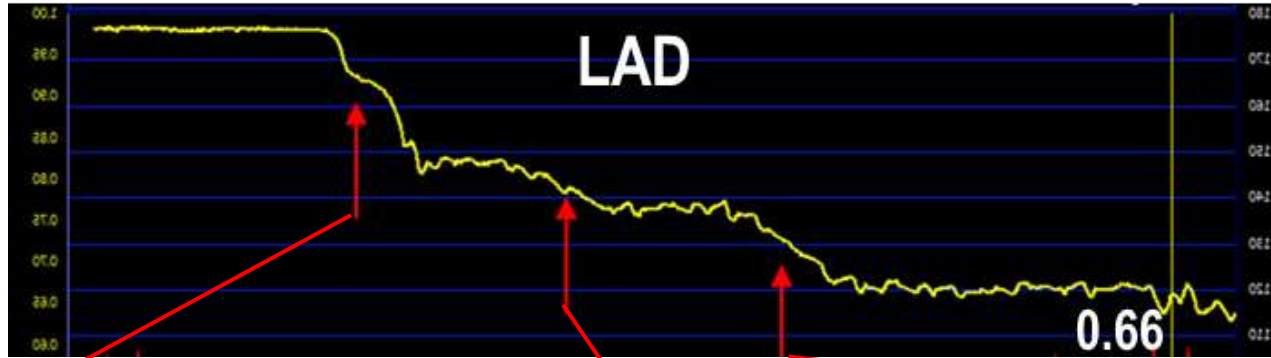
# FFR pull-back of LCX



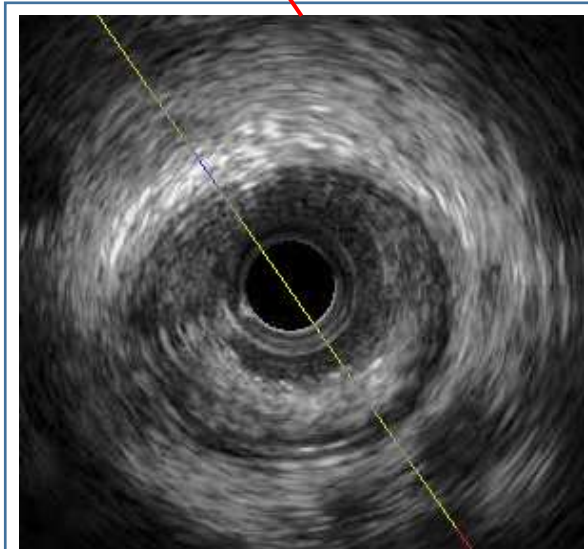
# Assessment of LM stenosis: FFR with pressure recovery phenomenon



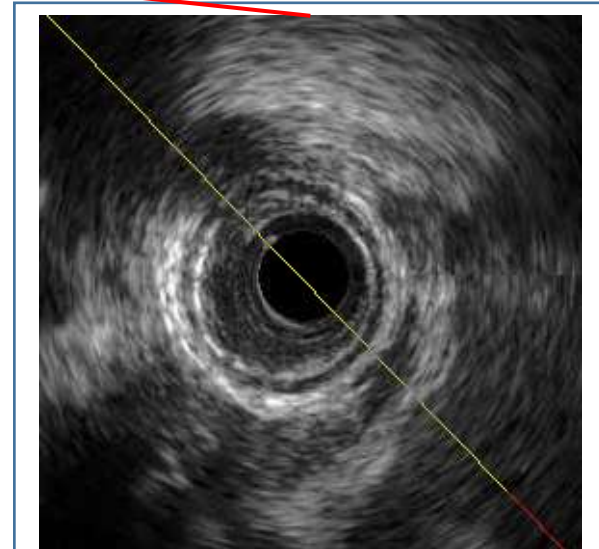
# Assessment of LM os and pLAD stenosis with IVUS



**MLA 7.61mm<sup>2</sup>**  
**MLA EEM 16.47mm<sup>2</sup>**  
**Plaque burden 46.2%**



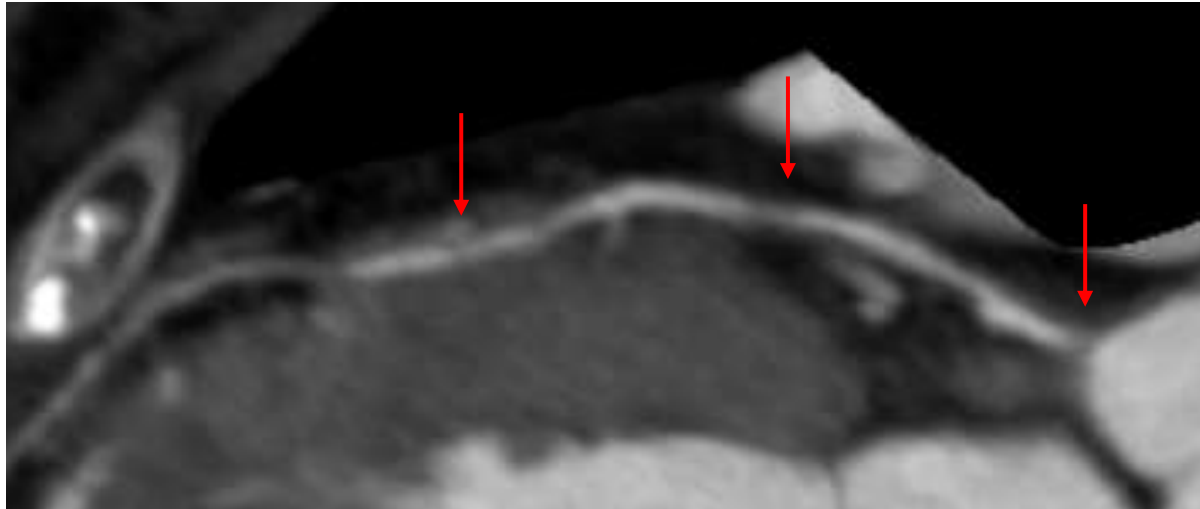
**MLA 3.71mm<sup>2</sup>**  
**MLA EEM 8.05mm<sup>2</sup>**  
**Plaque burden 64.5%**  
**Reference EEM 7.04mm<sup>2</sup>**  
**Remodeling index 1.14**



**MLA 2.82mm<sup>2</sup>**  
**MLA EEM 3.71mm<sup>2</sup>**  
**Plaque burden 24.1%**  
**Reference EEM 6.98mm<sup>2</sup>**  
**Remodeling index 0.53**



# Treatment Decision for the LM-LAD stenosis



## Clinical Information

58/Female without known risk factor

Stable angina with typical symptom

## Anatomic evaluation

LM : LM os focal 80% stenosis

LAD: pLAD tubular 30%

mLAD severe myocardial bridging

## Physiologic evaluation

From LCX (non-diseased) FFR 0.87

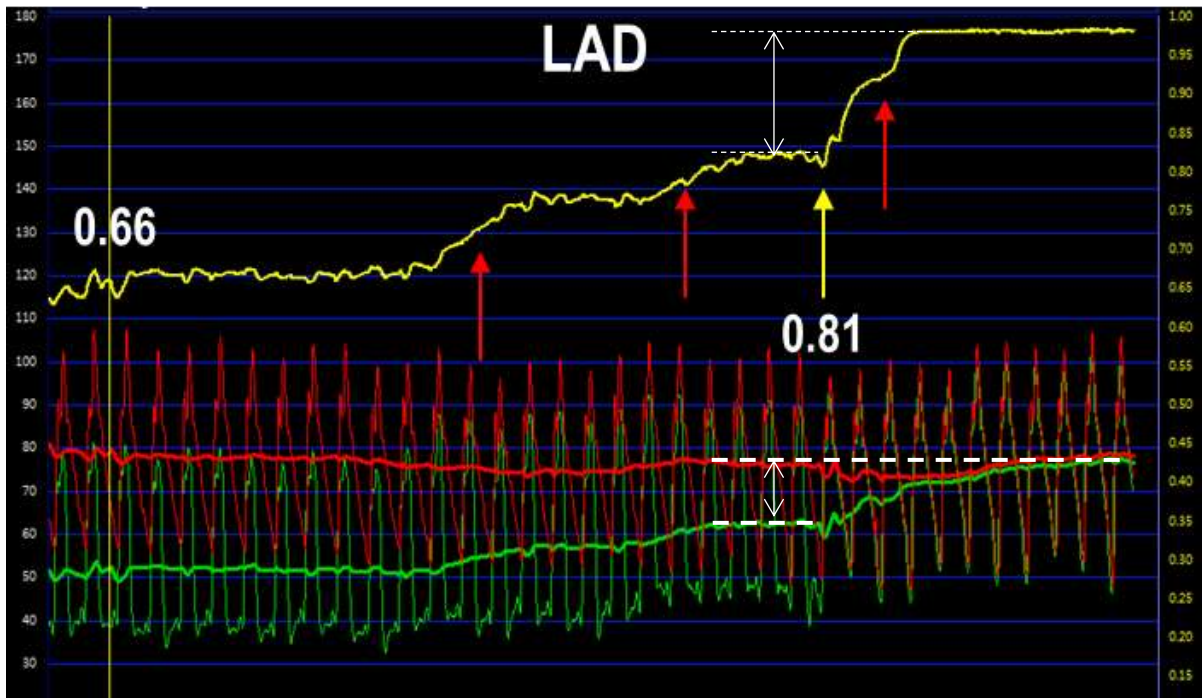
From LAD (diseased)

distal FFR 0.66

Just after LM FFR 0.82

$\Delta P$  along LM  $\geq 15\text{mmHg}$

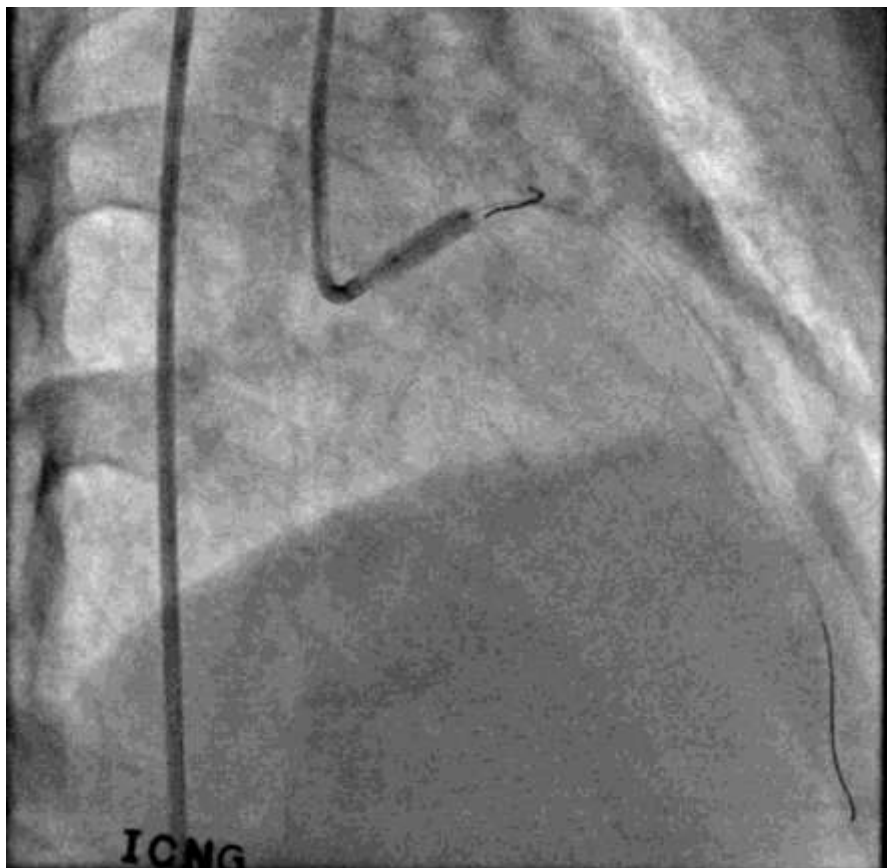
Pressure recovery at LM lesion



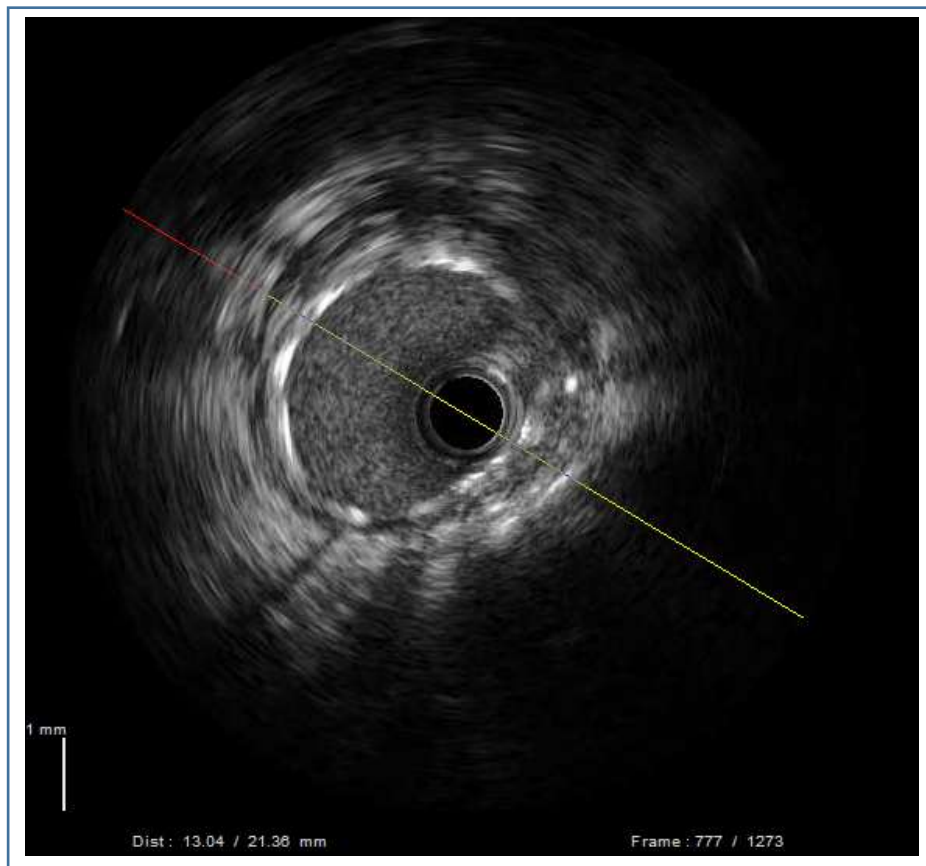
Intervention for Left Main Stenosis



# Intervention for Left main os stenosis

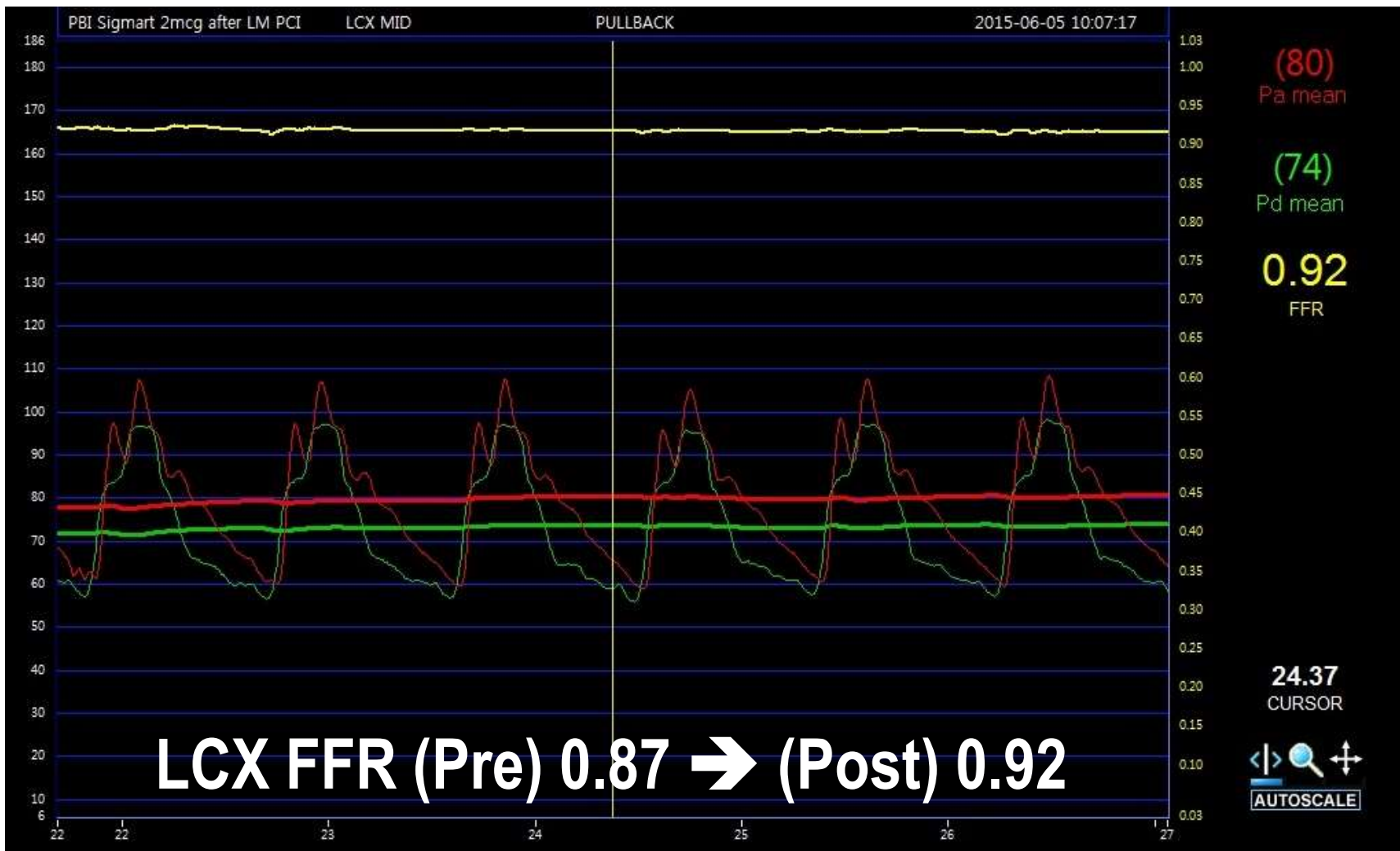


**Stenting with  
Xience Xpedition 3.5 x 12 mm**

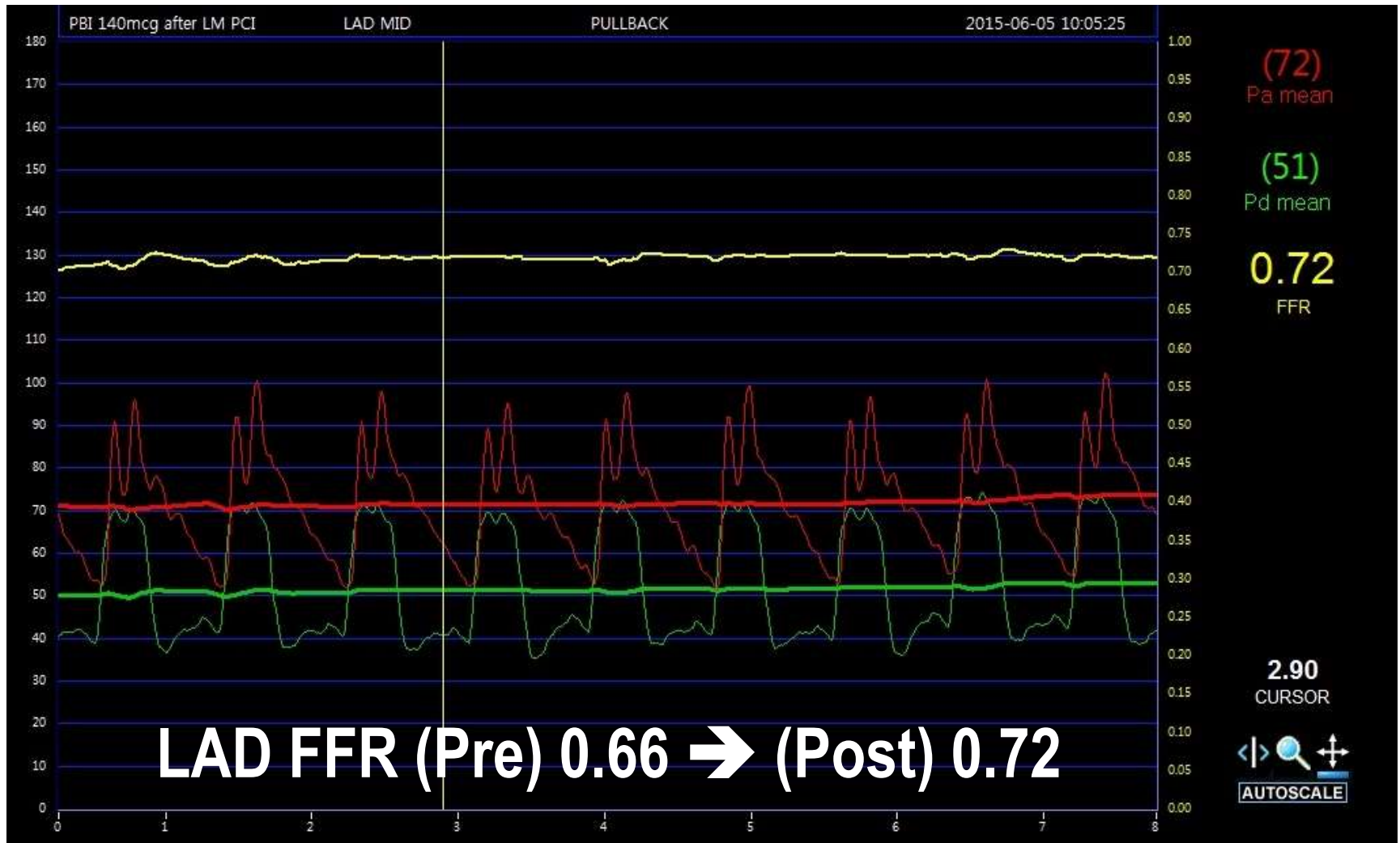


**MSA 8.96mm<sup>2</sup>  
Well Expanded Stent  
Complete Stent Apposition**

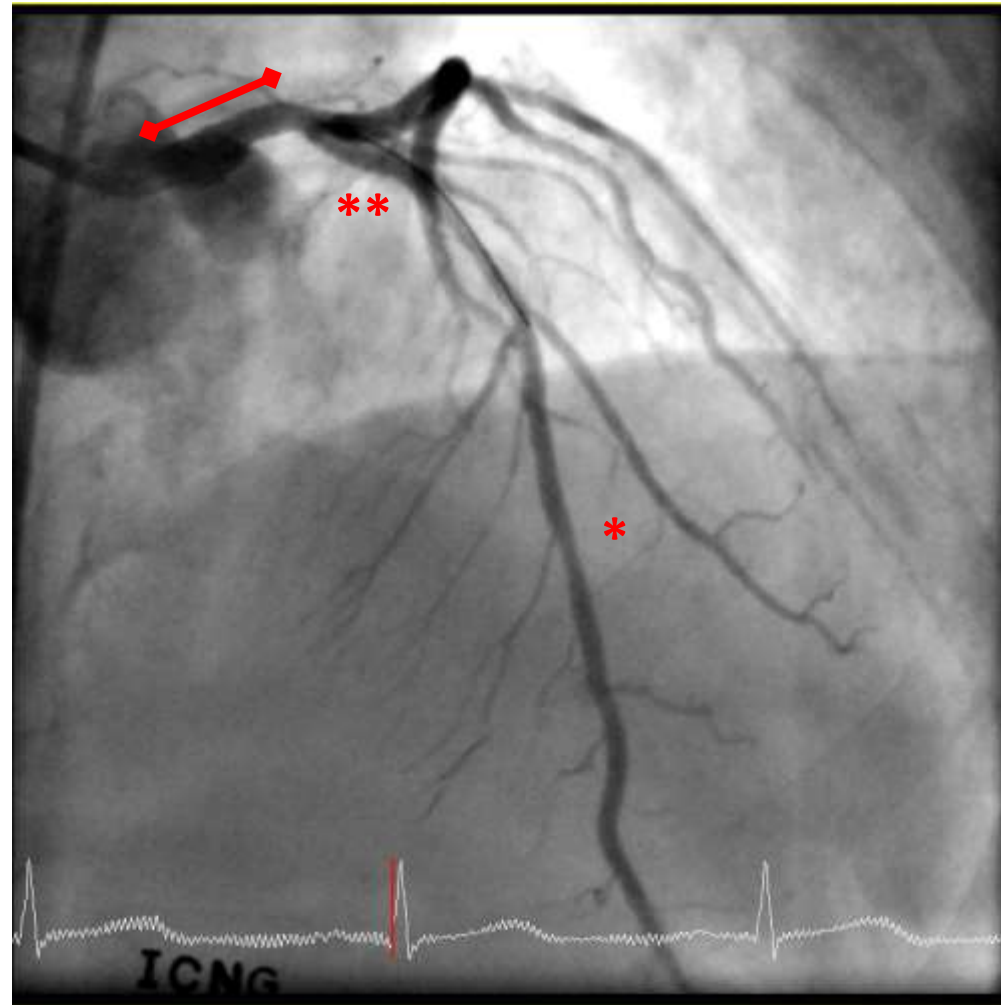
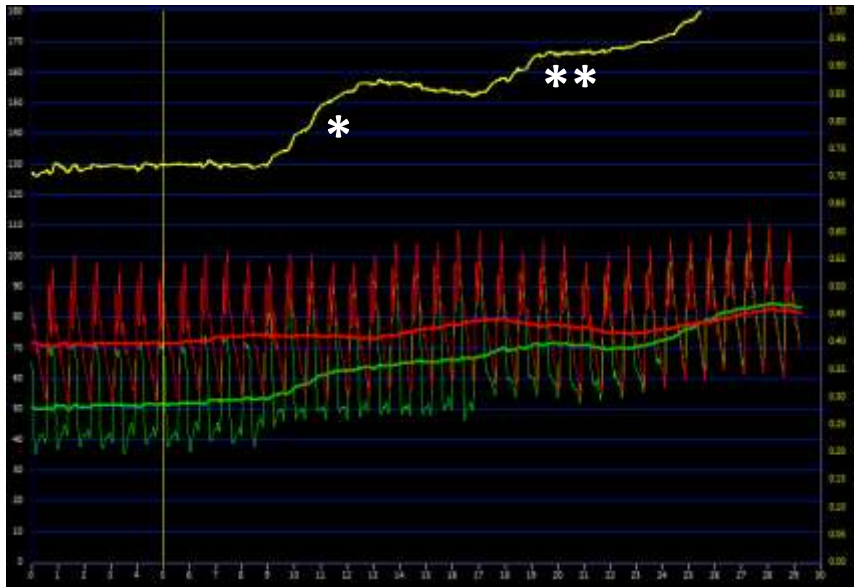
# Assessment of post-PCI result with IVUS and FFR in LCX



# Assessment of post-PCI result with FFR in LAD



# Assessment of post-PCI result with FFR in LAD



**NO Pressure Step-up Across LM Stent**

# Assessment of post-PCI result with FFR in LAD

Why is the FFR value lower than expected?

[0] Edge dissection ? -> post PCI IVUS good apposition

[1] Residual Ischemia unmasked after LM PCI ?

: pLAD stenosis or mLAD bridging

[2] “Super hyperemic flow” through LAD after LM stenting

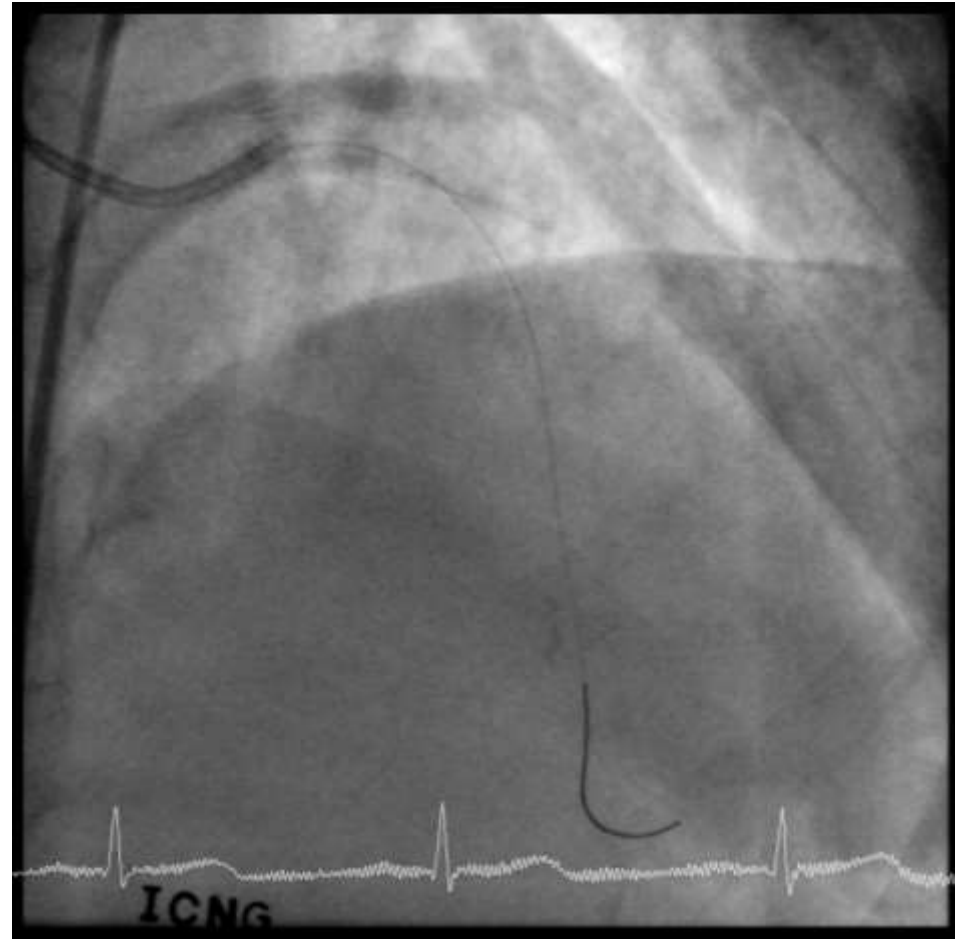
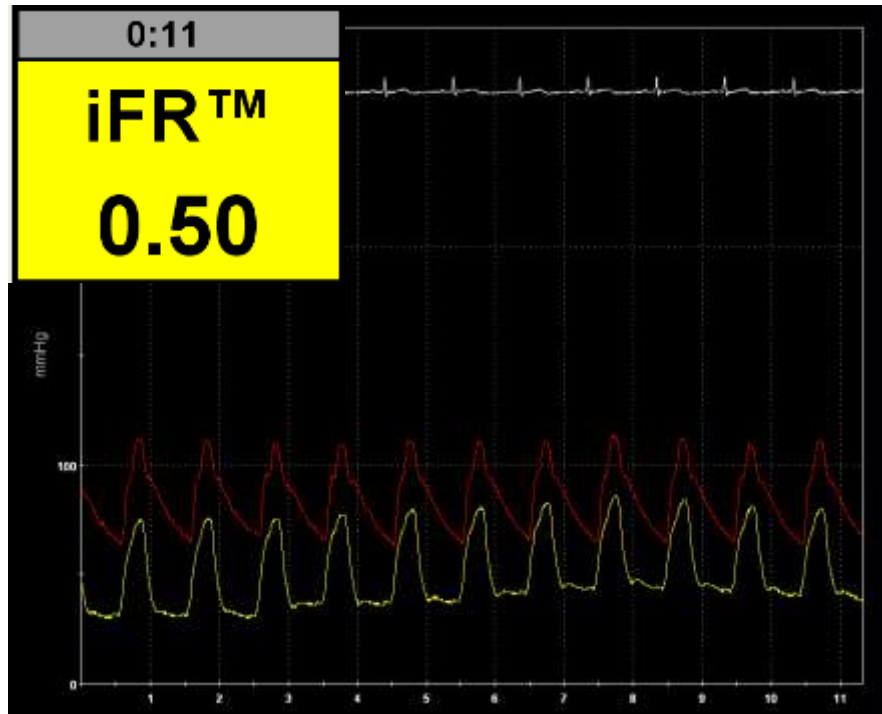
: Reverse mismatch

; iFR-FFR discordance → iFR may help

[3] Vasospasm?



# Assessment of post-PCI result in LAD



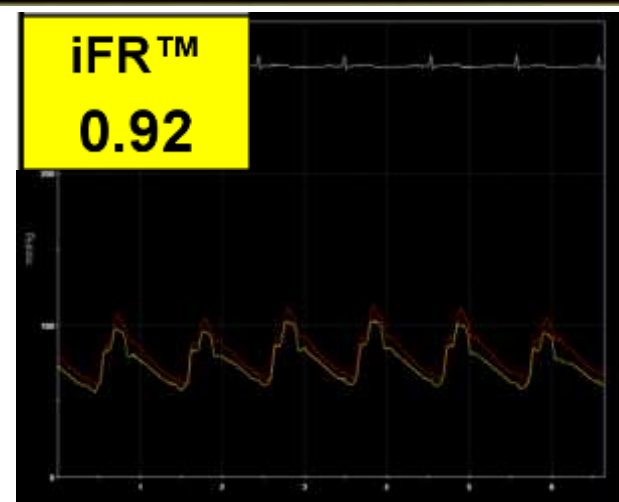
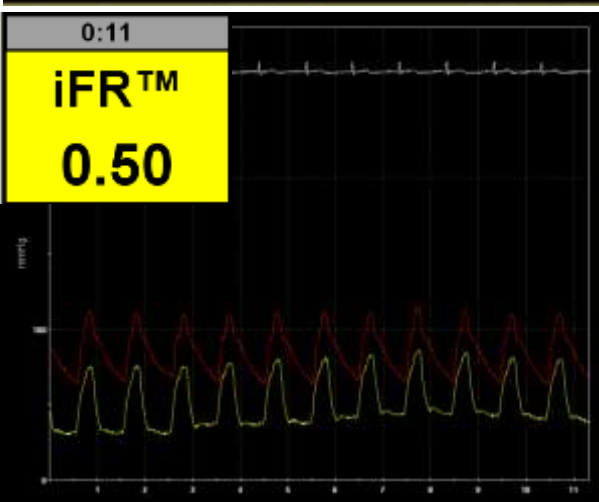
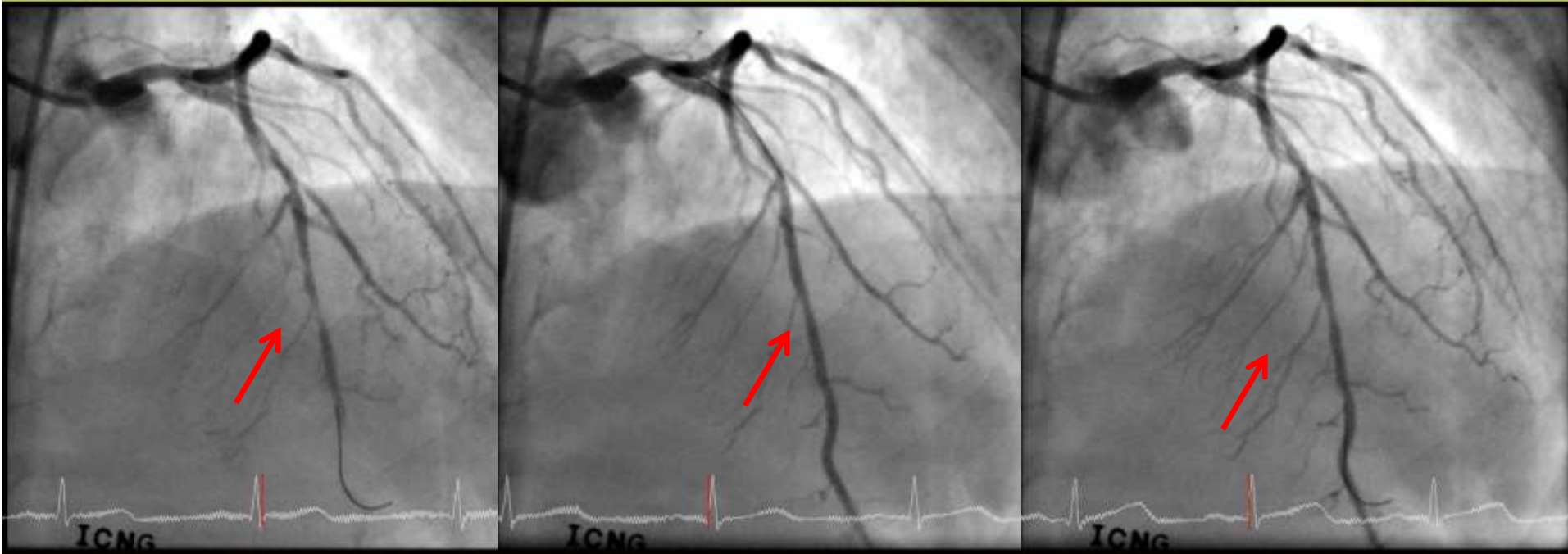


# Spontaneous Wire-induced Spasm

Spasm (+++)  
TIMI 2 flow

Relieved spasm  
after wire withdrawal

Further relieved spasm  
with IC NG injection



**Stable angina,  
Left main ostium and tandem pLAD stenosis  
mLAD myocardial bridge with coronary spasm**

**PCI done for Left main stenosis**

## **Lessons from the case**

**[1] Left main ostial stenosis with distal lesion**

**[2] Evaluation of tandem stenosis**

; ***FFR pull-back*** may help to identify the most significant lesion

; FFR at the ***distal end of the uninvolved branch***

**[3] FFR value can be misleading sometimes**

; Vasospasm, Pressure recovery phenomenon, microvascular disease, etc.

**Thank you for your attention**