

# FFR Evaluation of Bifurcation Lesions

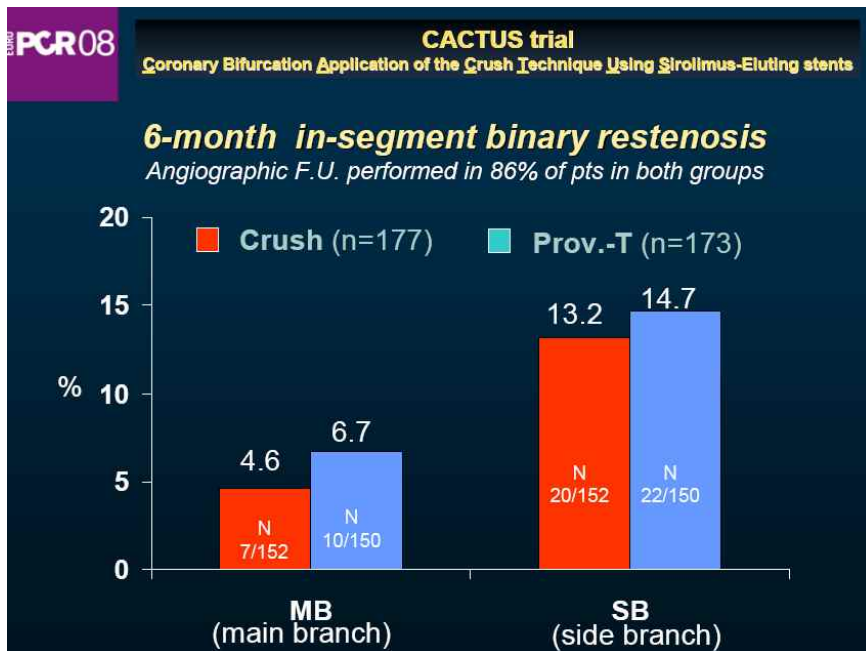
**Bon-Kwon Koo, MD, PhD, FACC**

*Seoul National University Hospital, Seoul, Korea*

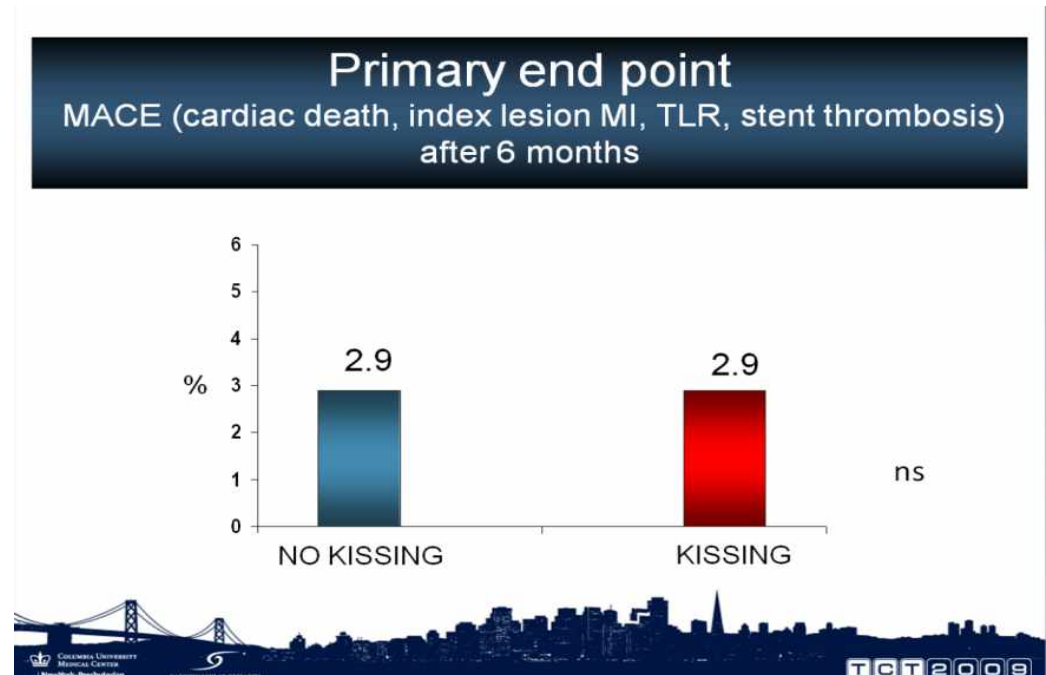


# Bifurcation (side branch lesion) is very unique in 30 years of PCI history.....

- Stenting is not better than angioplasty
- Angioplasty is not better than “leave it alone”



CACTUS: Crush vs. Provisional



NORDIC III: Leave it alone vs Kissing

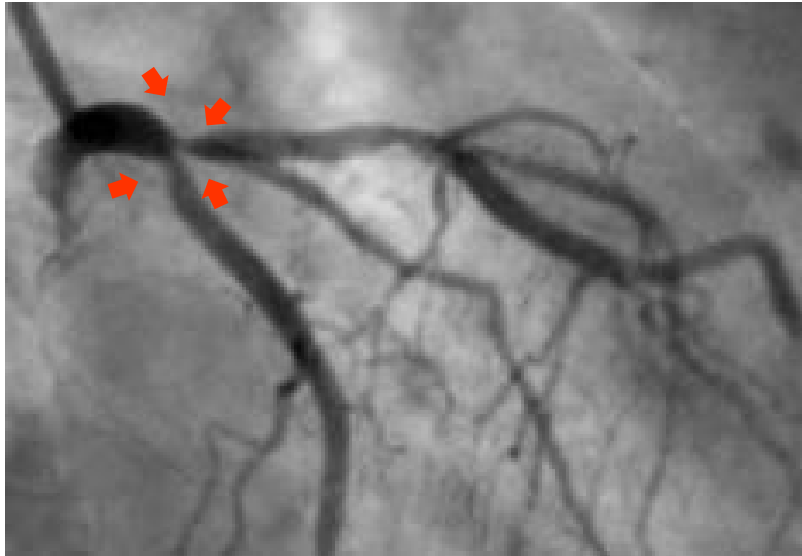
# Pitfalls of anatomical evaluation

- **Angiography**
  - Single directional assessment
  - Variability in stenosis assessment
  - No validated criteria for side branch intervention
- **IVUS/OCT**
  - Can not be performed in tight stenosis (ex. jailed SB)
  - No validated criteria for side branch intervention
  - Not physiologic

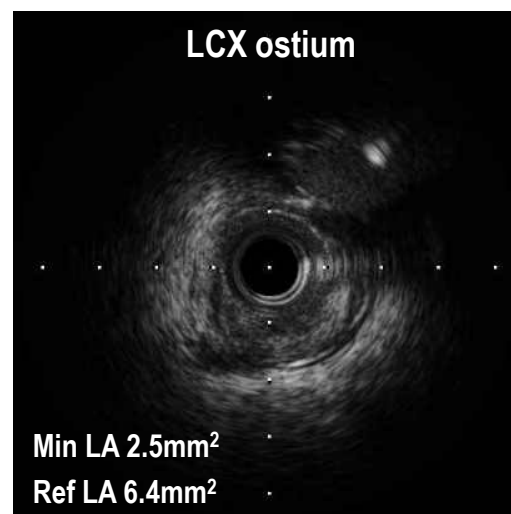
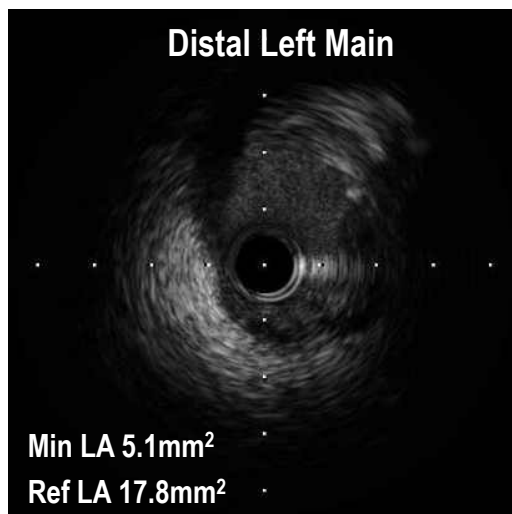
# Why “Physiologic evaluation”?

- Various size, different myocardial territory
- Side branch ostial lesion is **unique**
  - Underlying plaque → **Eccentric plaque**
  - Remodeling → **Negative remodeling**
  - Mechanisms of luminal narrowing
    - **Stent struts**
    - **Shifted plaque**
    - **Shifted carina**

# Medina Classification?

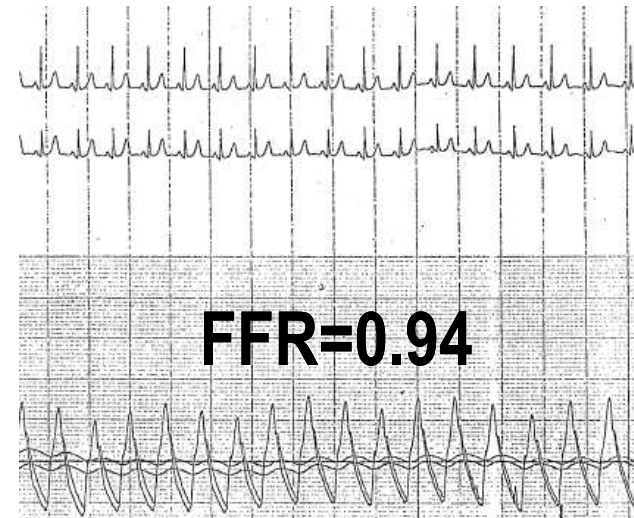


	Minimal Dm	Reference Dm	% diameter stenosis
Left Main	2.0	4.1	<b>53%</b>
LAD	0.63	3.28	<b>81%</b>
RI	0.6	2.16	<b>72%</b>
LCX	1.18	2.85	<b>58%</b>



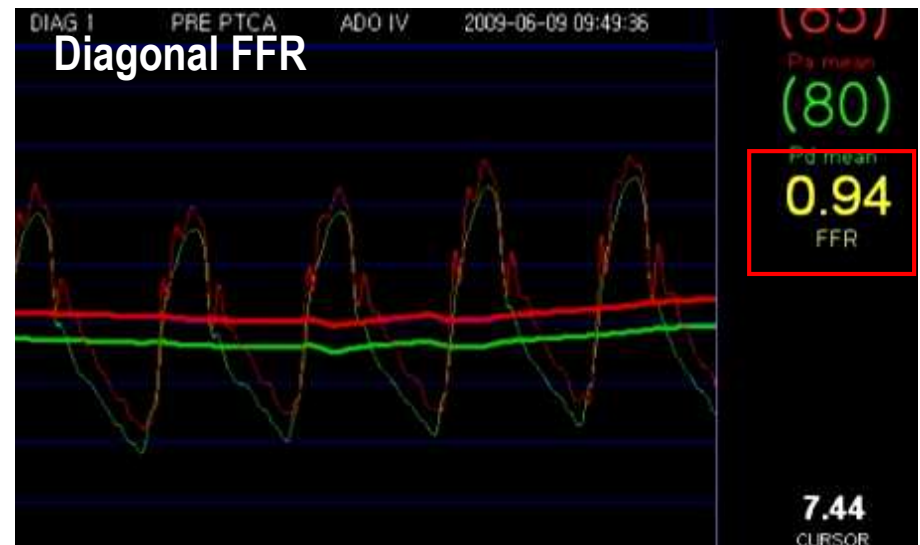
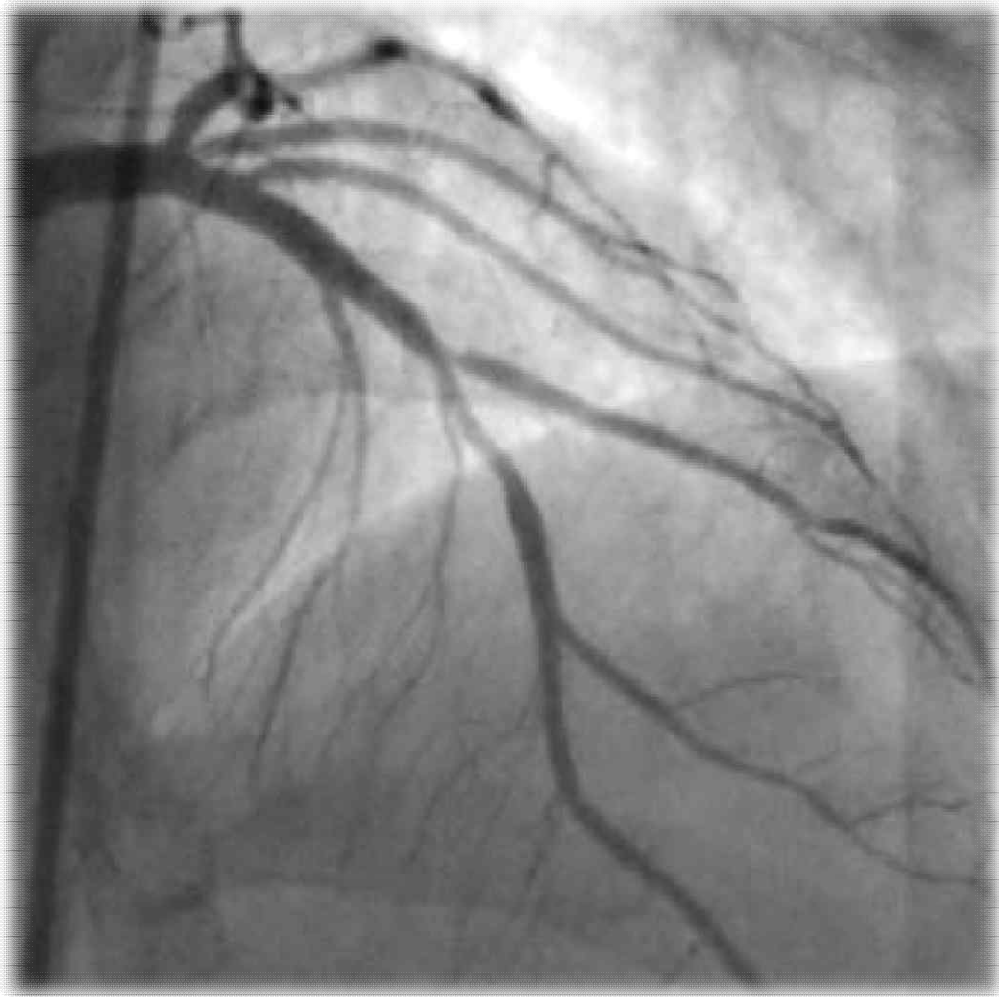
**1, 1, 1, 1**

## Angiographic severity vs. Functional significance



FFR	$\geq 70\%$ Angiographic Stenosis	50%–70% Angiographic Stenosis
$\geq 0.75$	20	30
$< 0.75$	5	0
Sensitivity 100%, specificity 55%, and test accuracy 60%.		

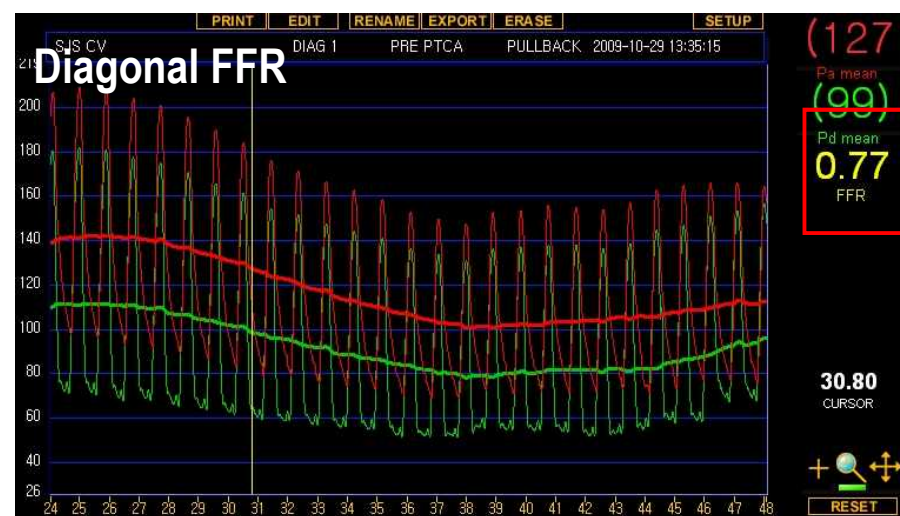
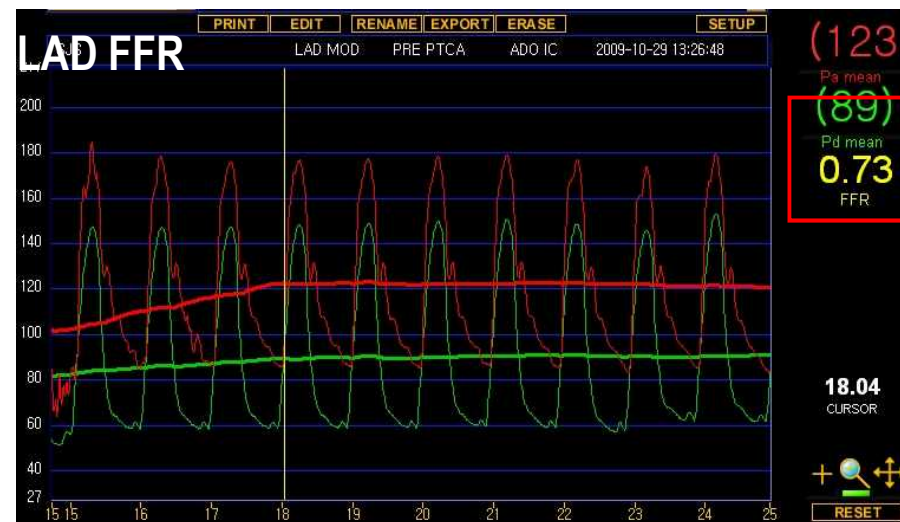
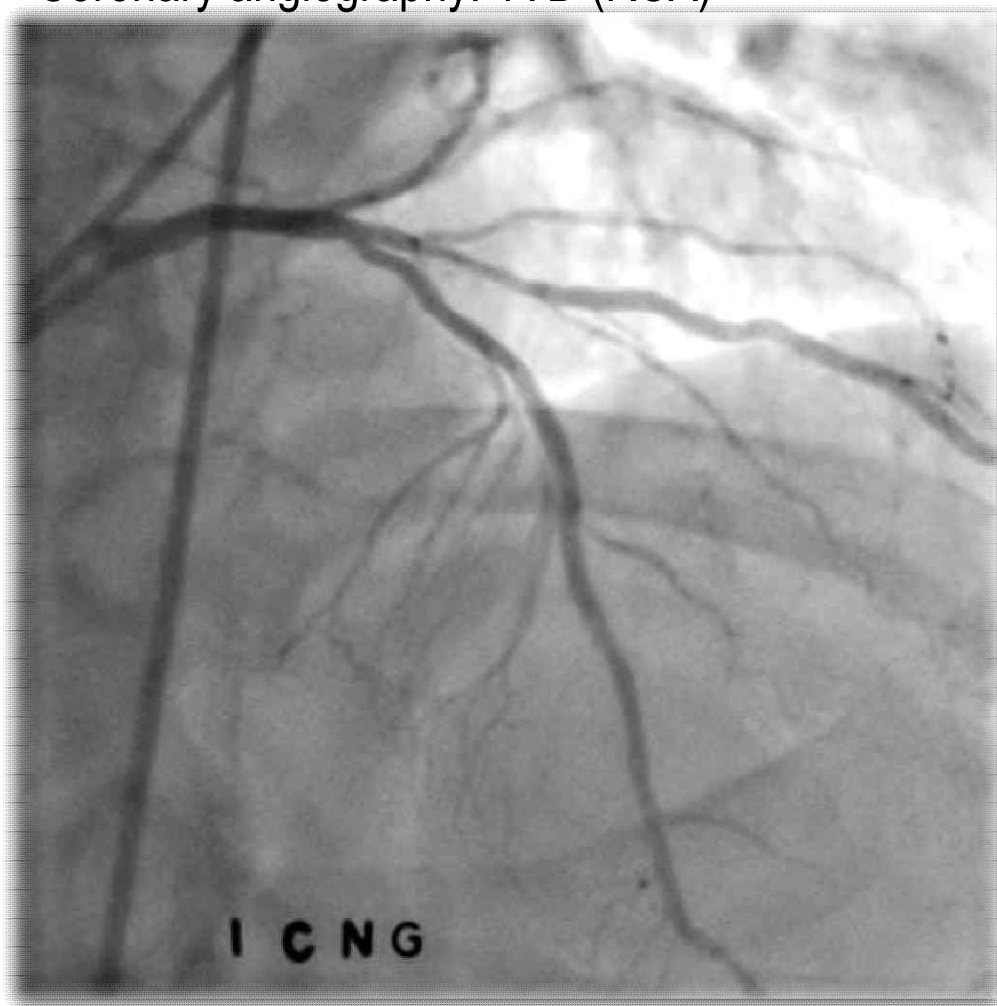
# Bifurcation lesion?



# Bifurcation lesion?

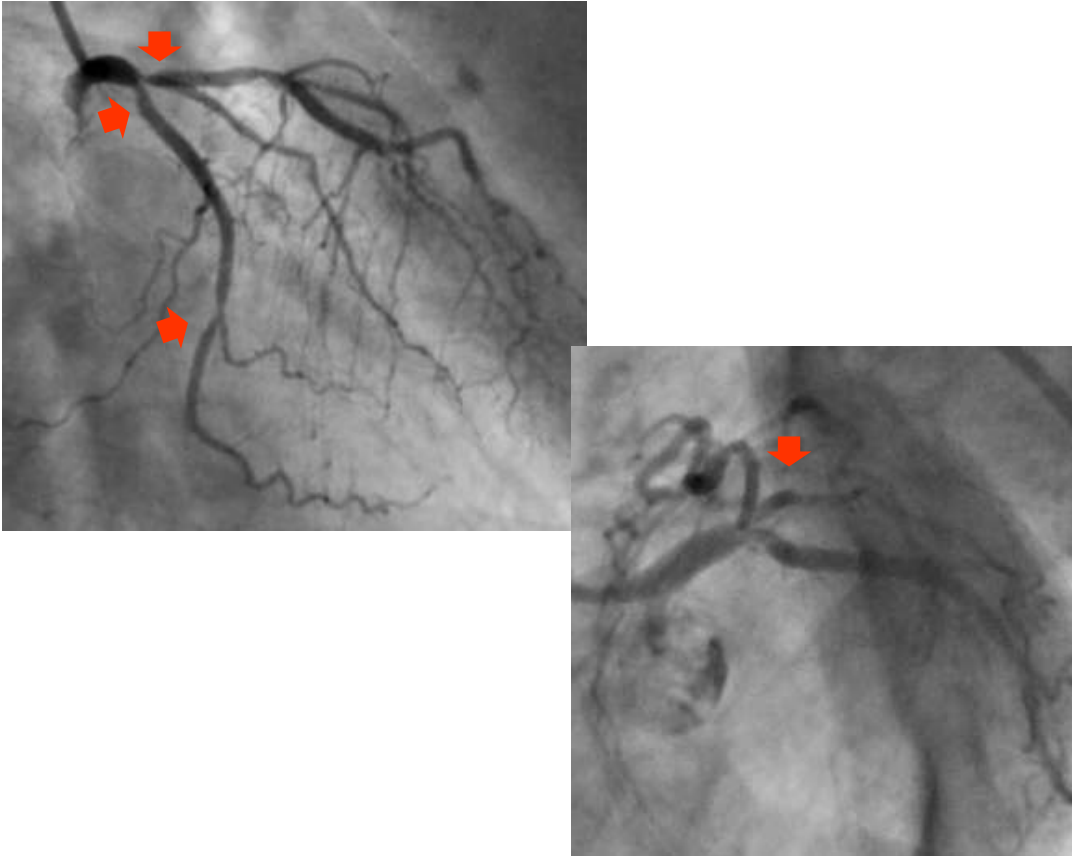
CT angiography: 1VD (RCA)

Coronary angiography: 1VD (RCA)

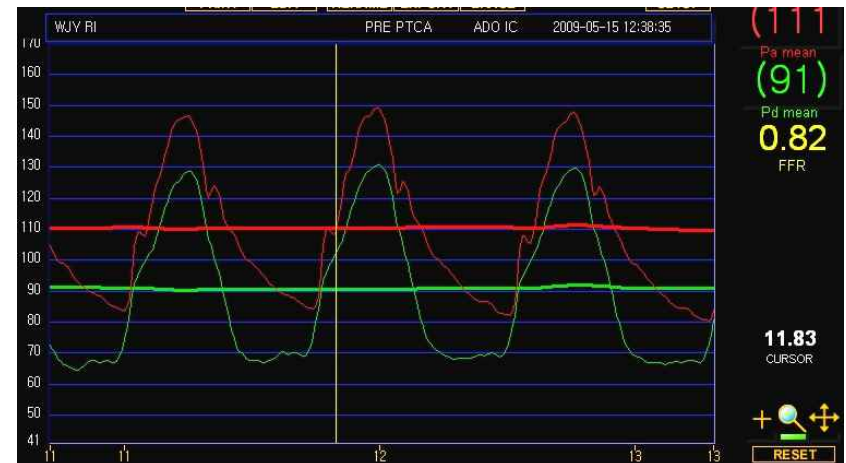
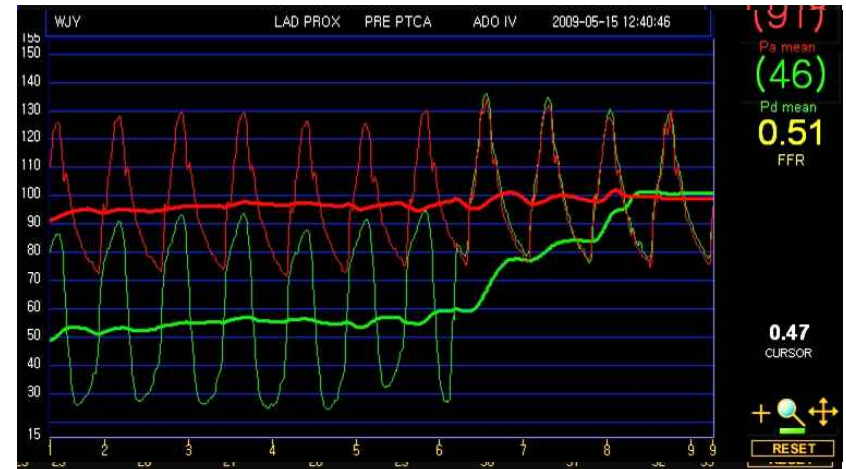




# Functional Medina Classification?

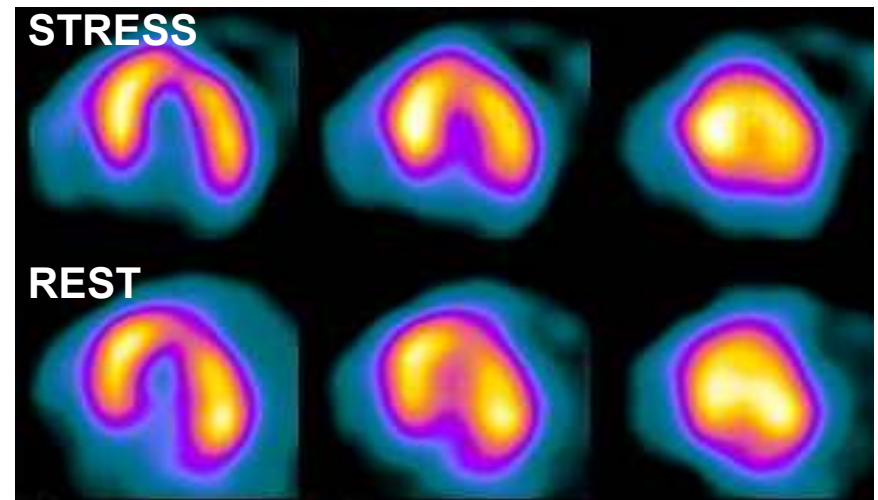
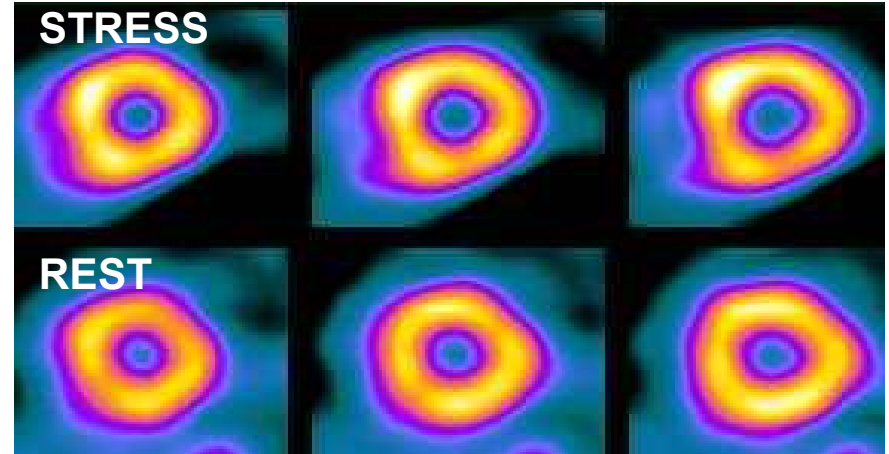
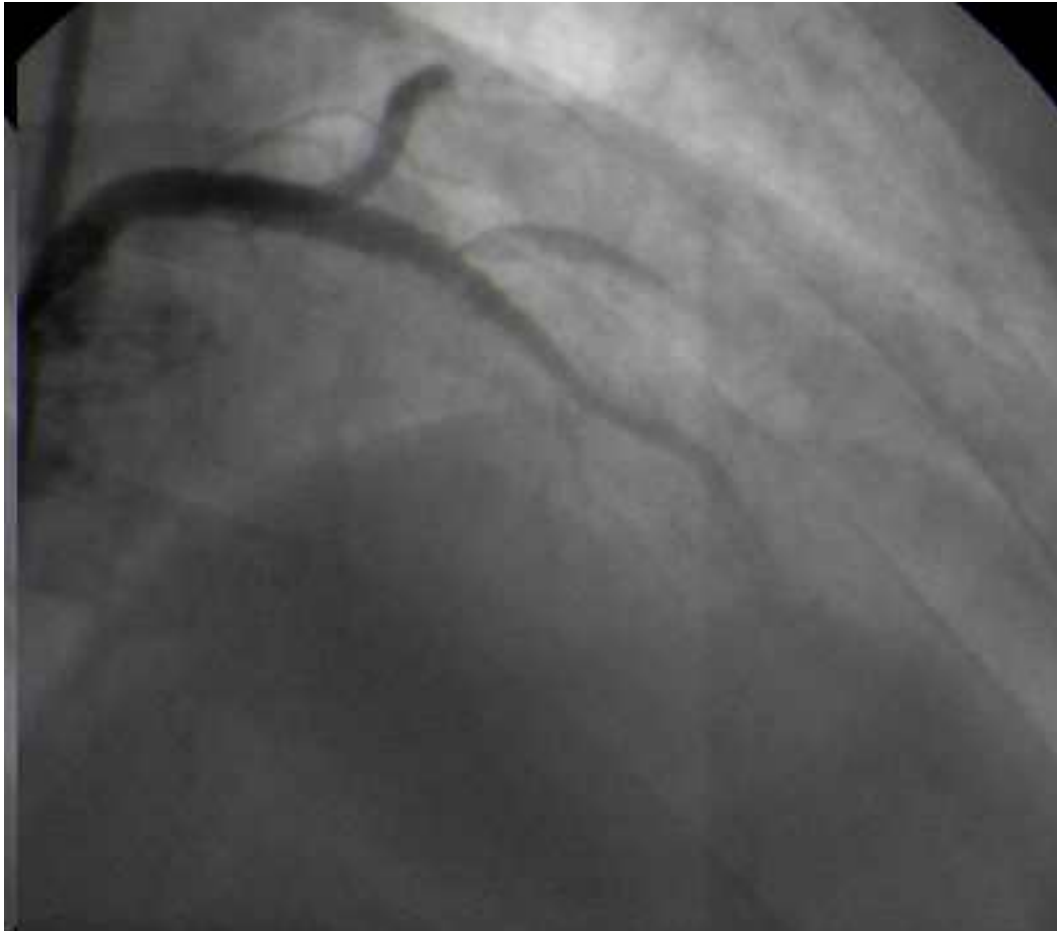


**0, 1, 0, 0**



# Jailed Side Branches

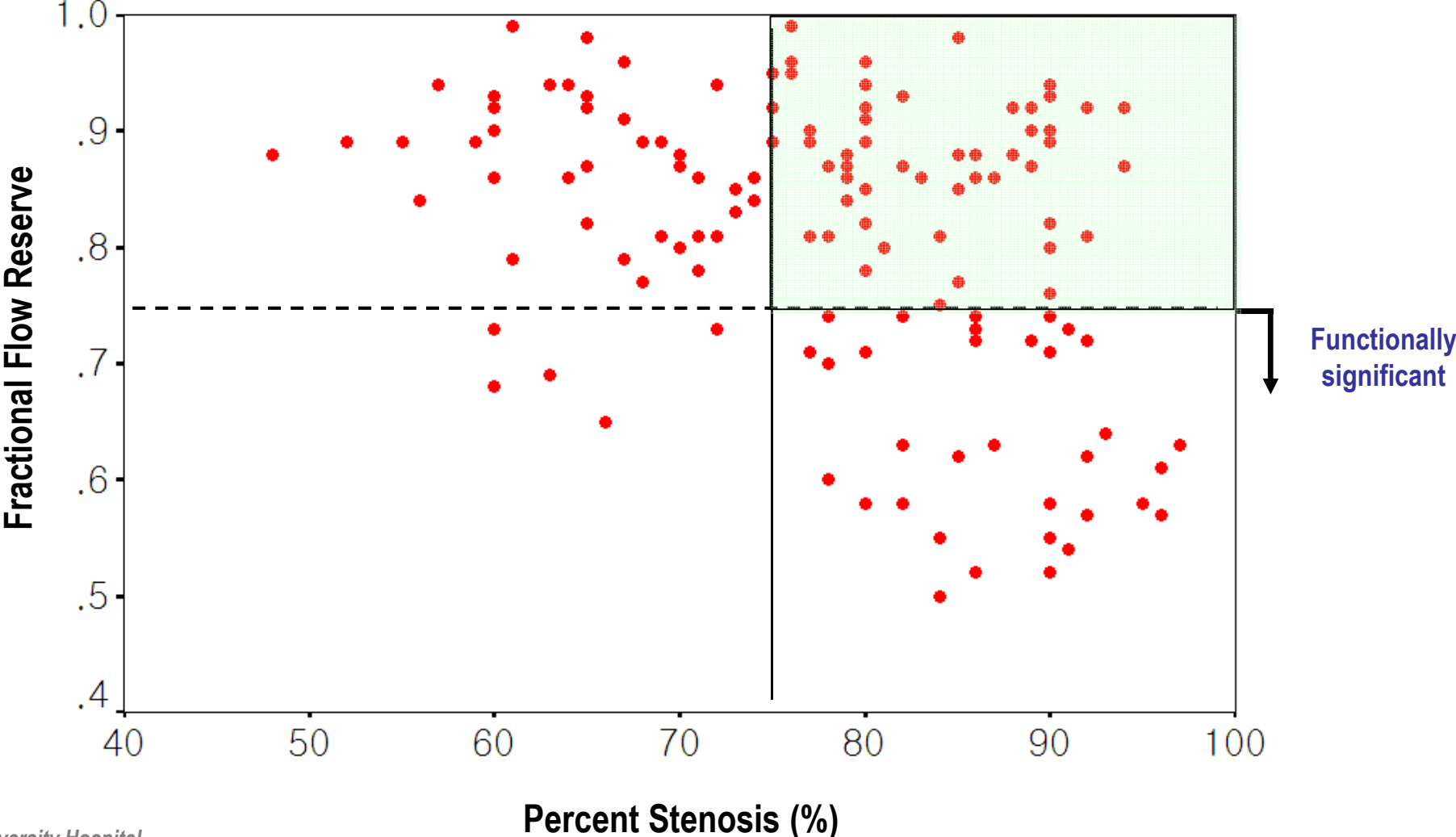
Angiographic severity vs. Presence of Ischemia



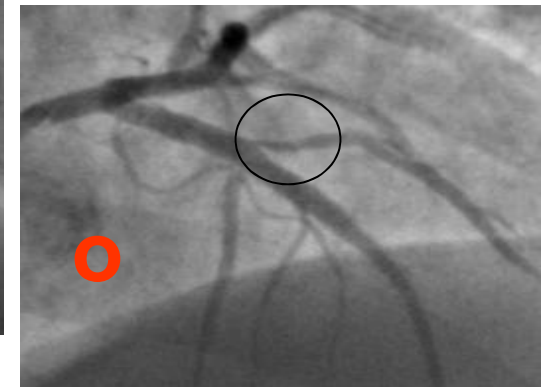
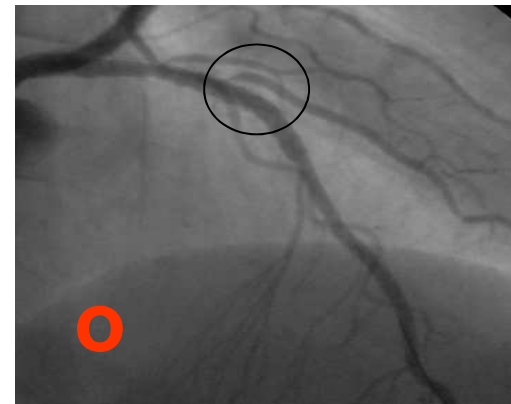
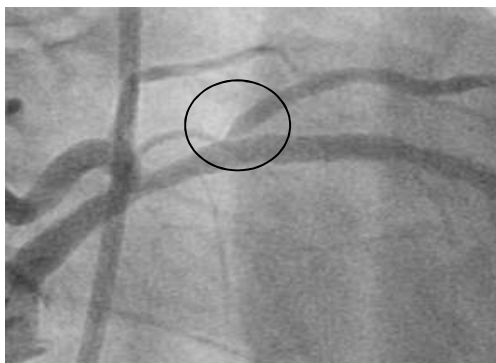
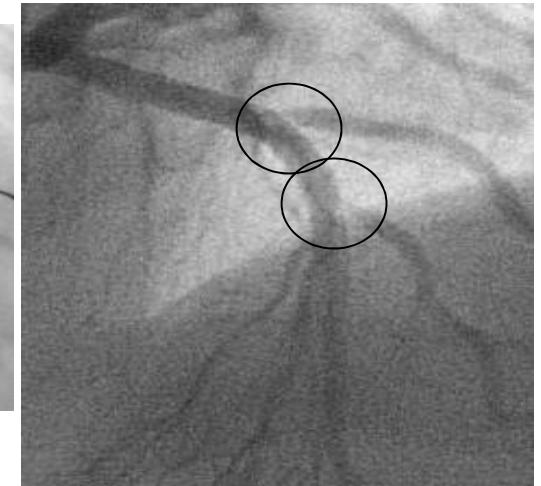
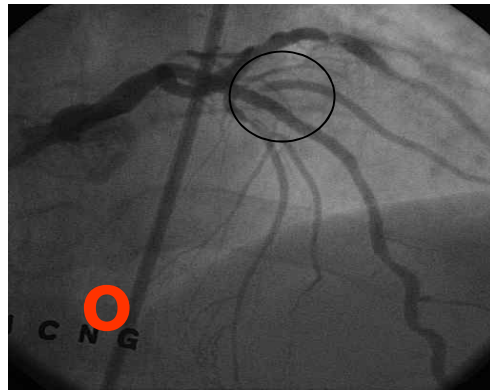
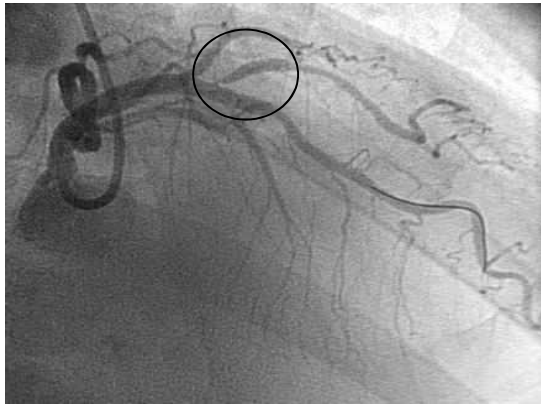
Severe stenosis, but no perfusion defect!

# FFR vs. % diameter stenosis in Jailed side branches

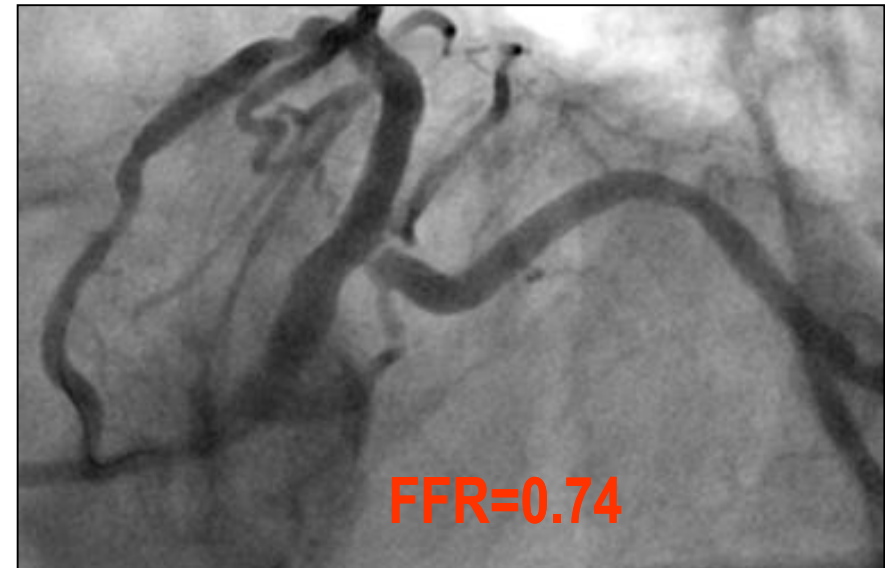
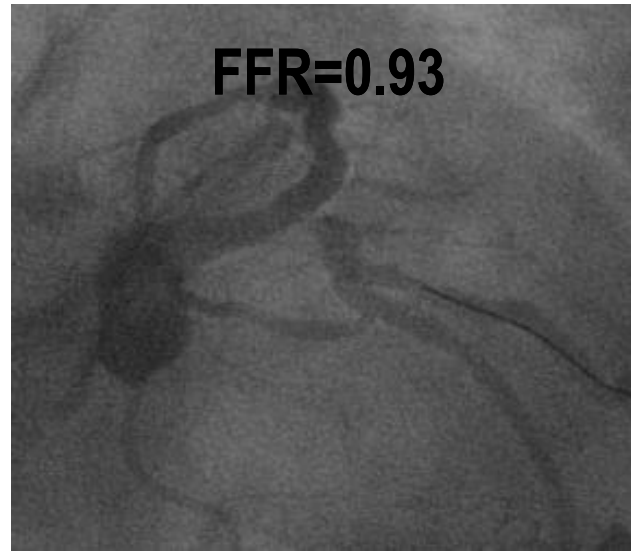
SNUH SB-FFR registry, N=153



# Which one is functionally significant?

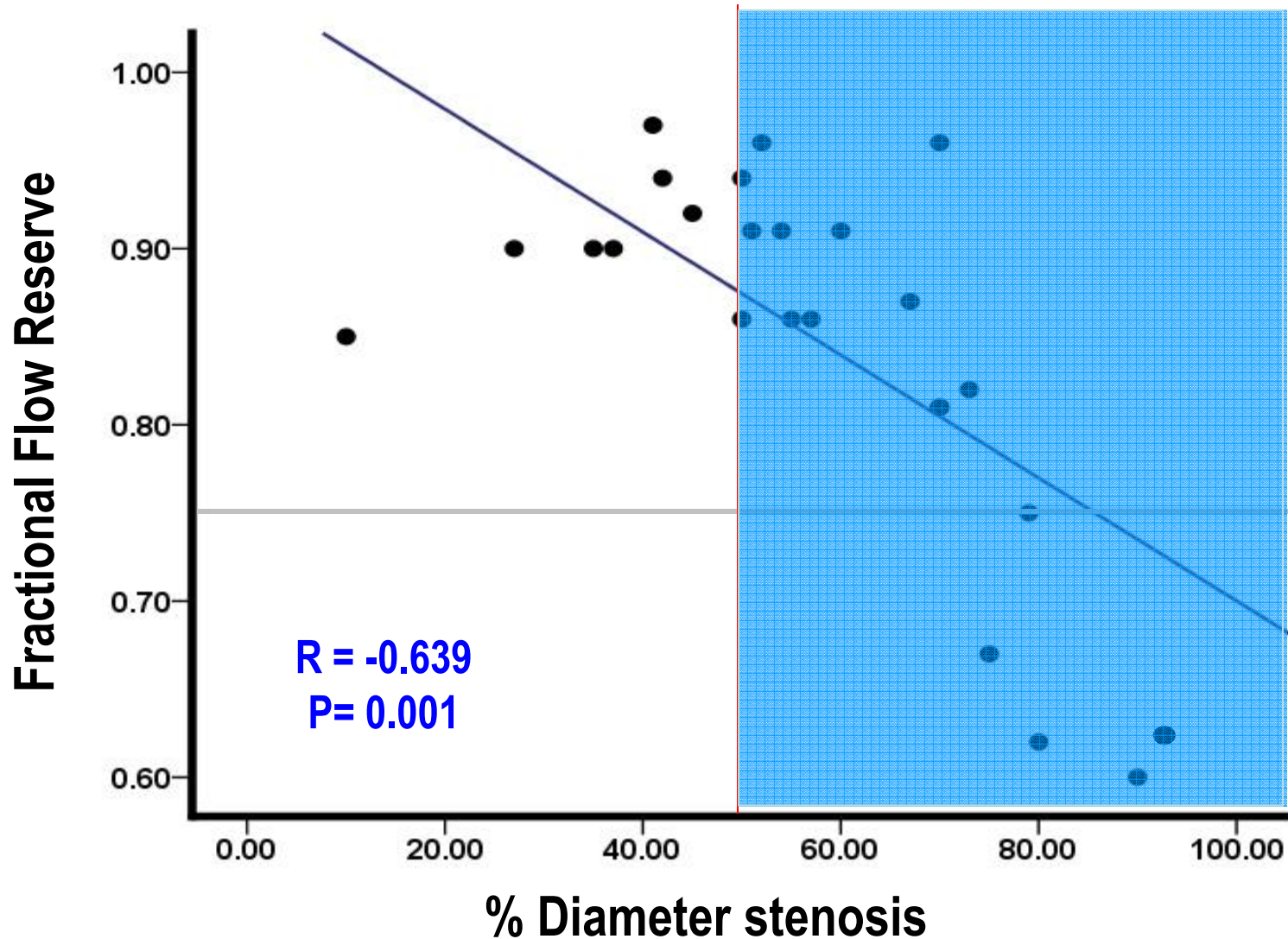


# Should we measure FFR in these lesions?



# Anatomical severity vs. Functional significance

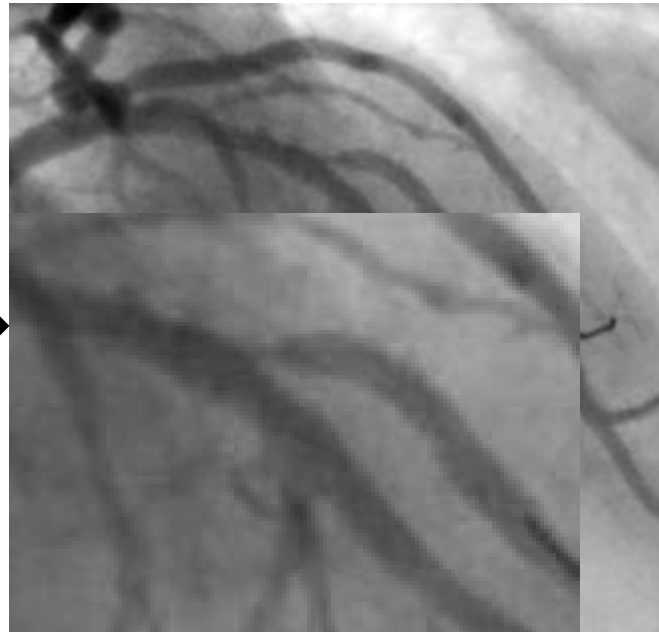
- Jailed LCX ostial disease (N=25) -



# FFR in Bifurcation intervention



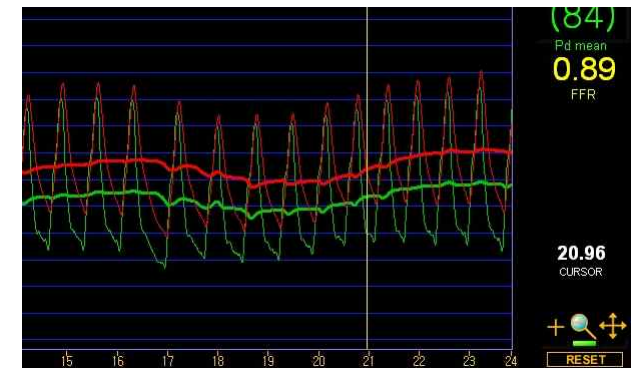
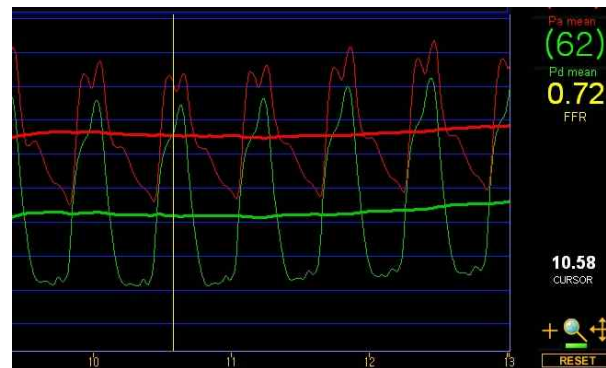
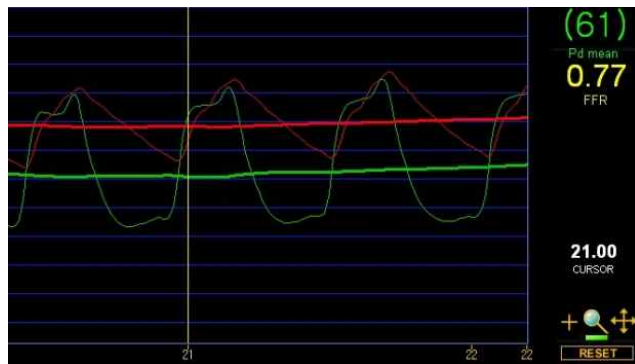
Before PCI



After MB stenting

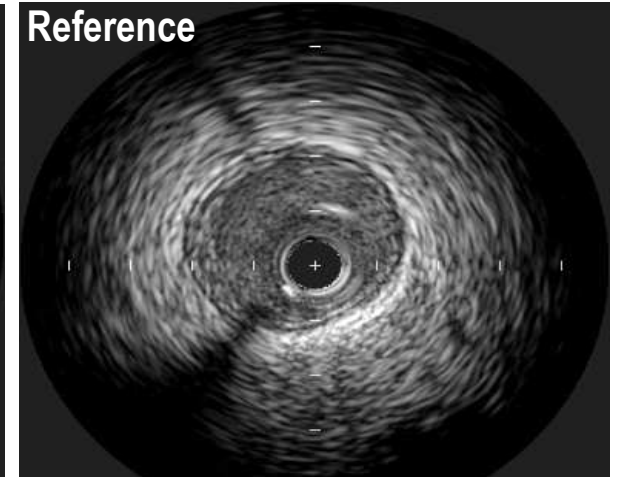
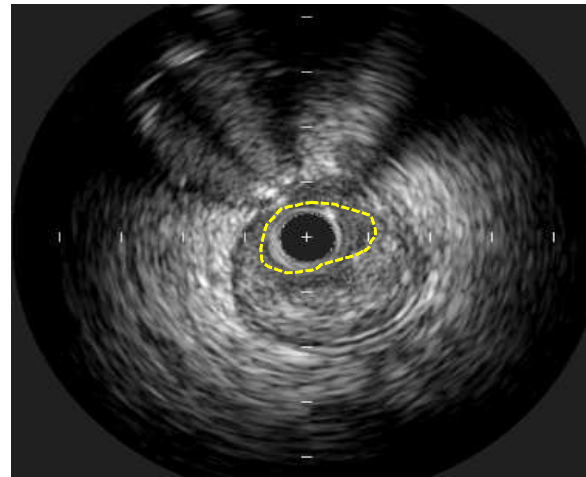


After kissing balloon



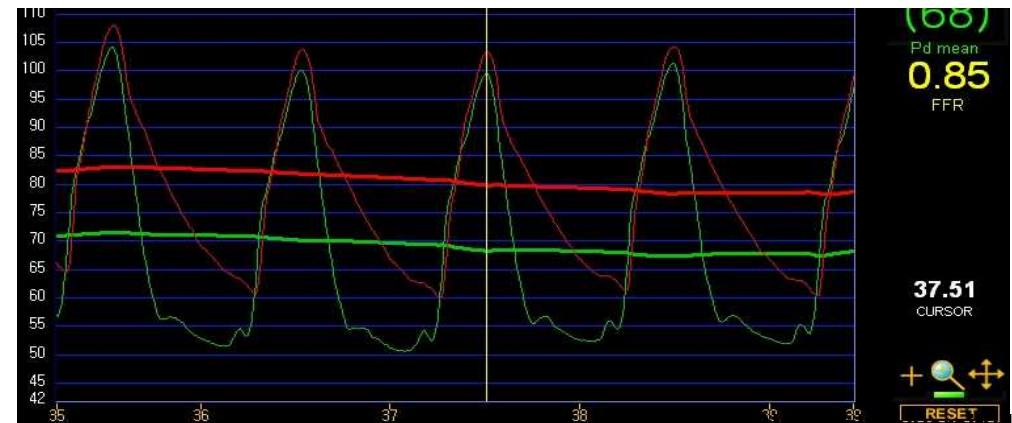
# Anatomical severity vs. Functional significance

## - Lumen area vs. FFR in SB after angioplasty -



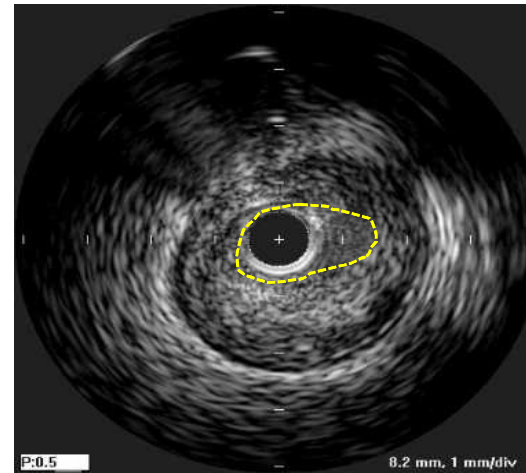
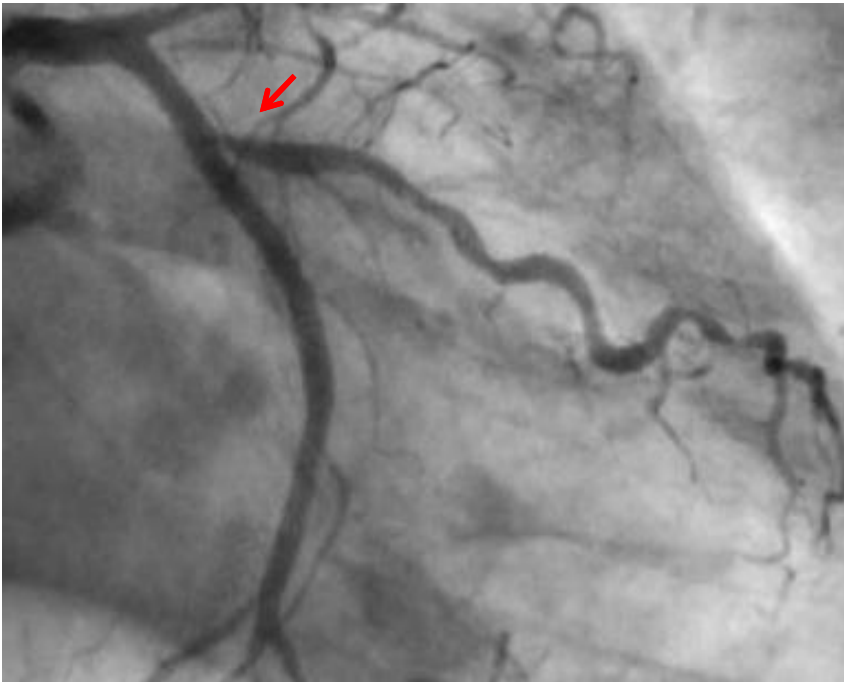
Lumen Area: 2.0mm<sup>2</sup>  
MLD: 1.2mm

Lumen Area: 6.5mm<sup>2</sup>

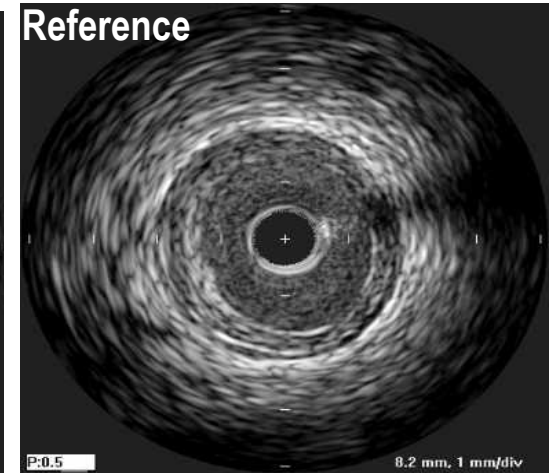




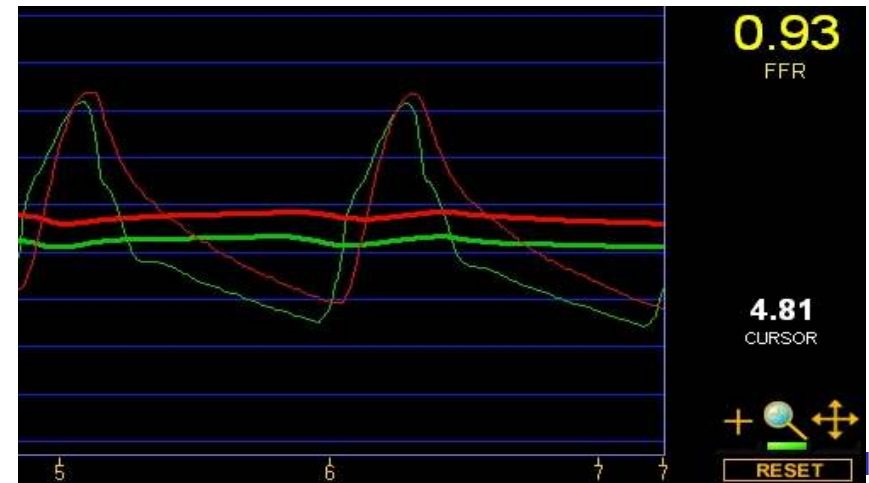
# Lumen area vs. FFR in Jailed SB after angioplasty



Lumen Area: 2.3mm<sup>2</sup>  
MLD: 1.2mm

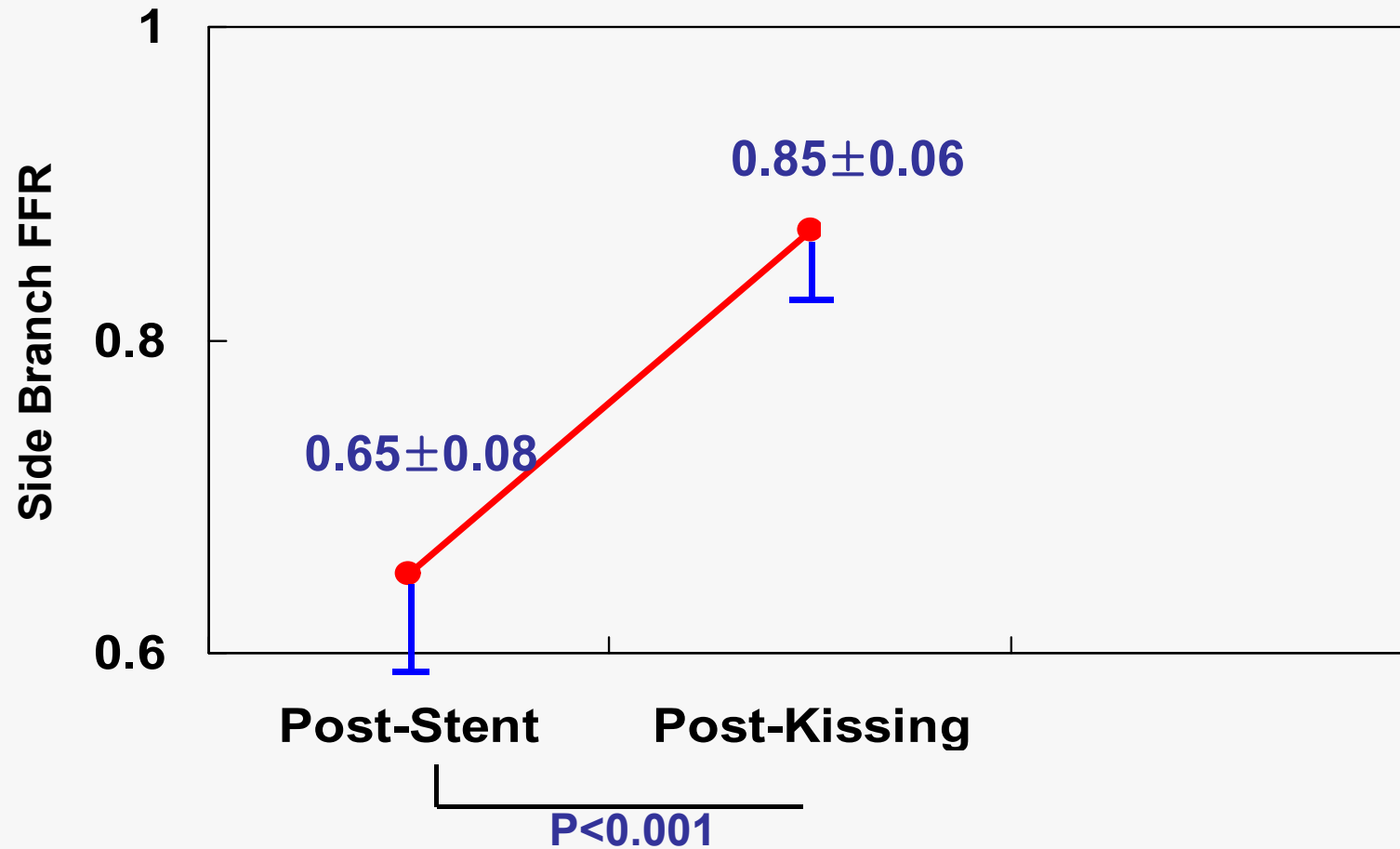


Lumen Area: 6.5mm<sup>2</sup>



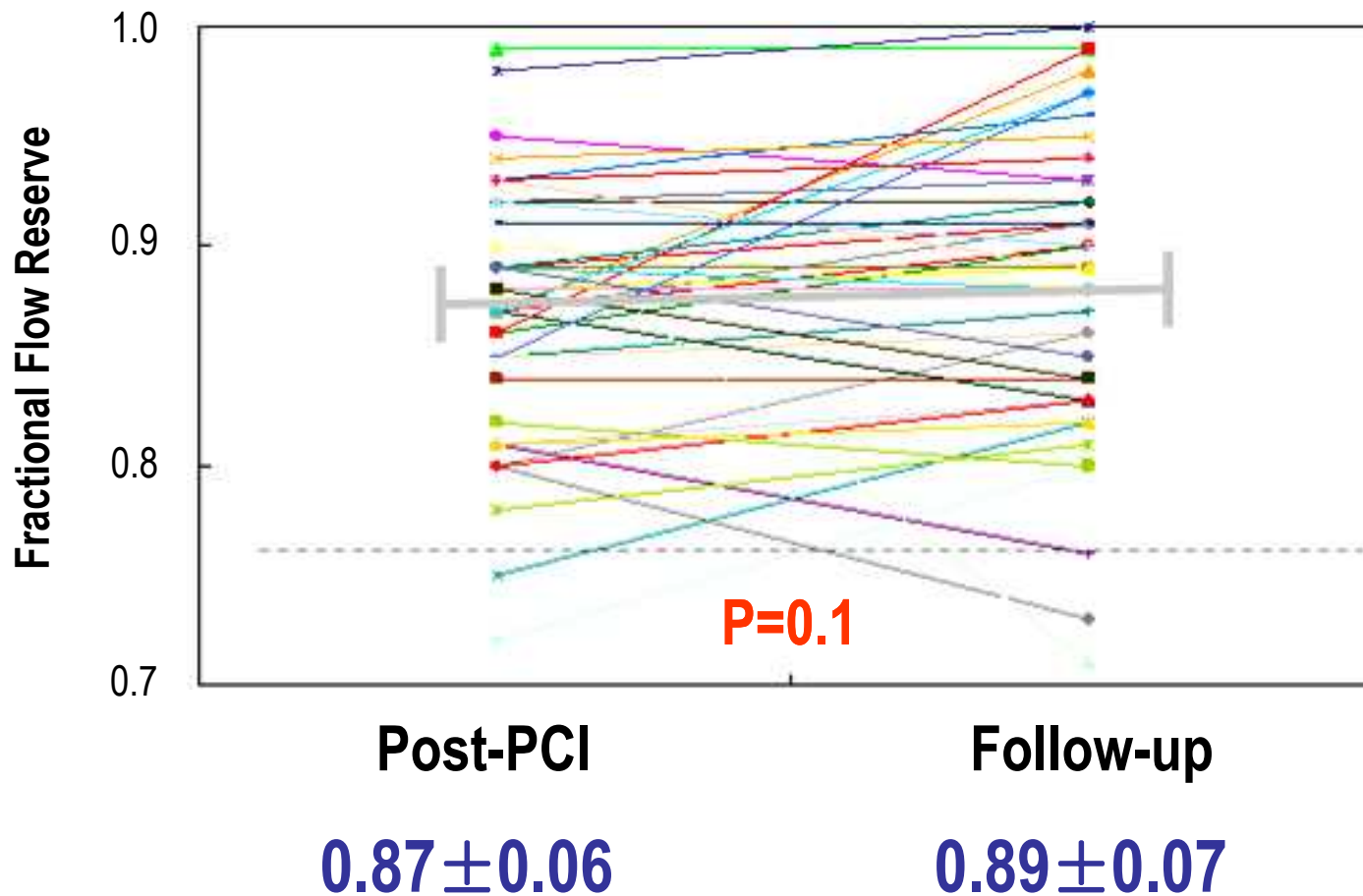
# Changes of side branch FFR after kissing ballooning

(Side branch balloon/artery ratio:  $0.85 \pm 0.14$ )



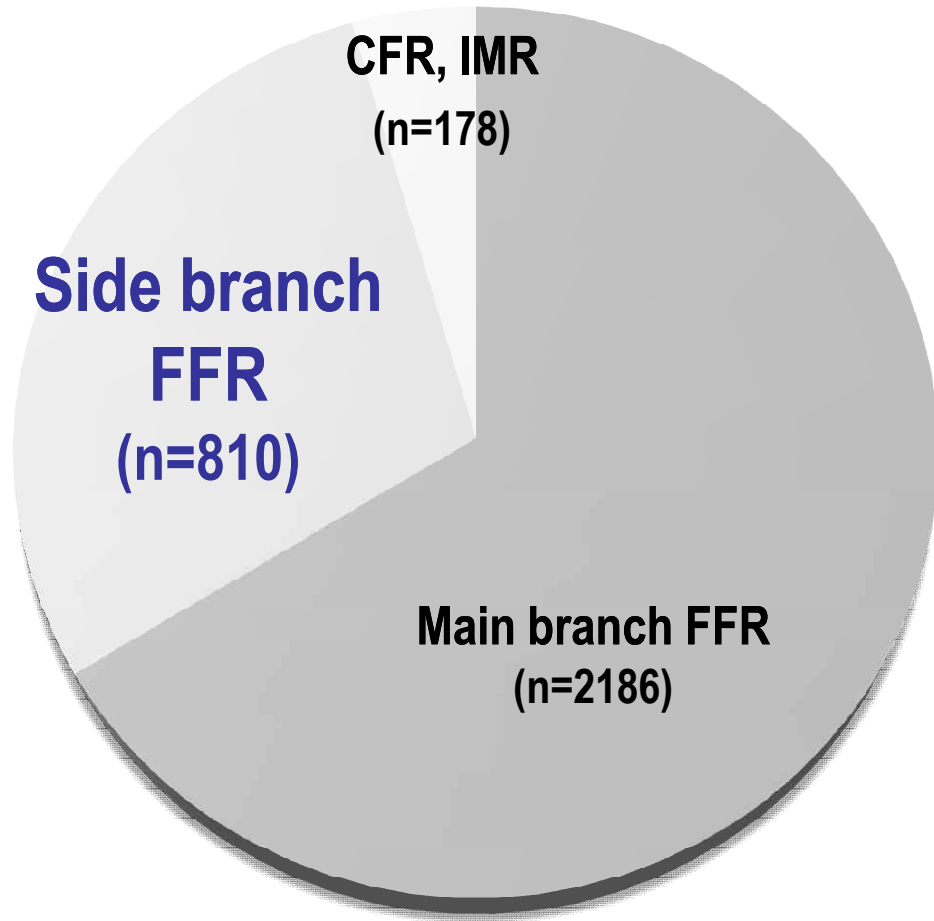
# Functional outcome of Jailed side branches

## Not-treated jailed side branches



# Safety?

## SNUH experience



**Death: 0**

**MI: 0**

**Major dissection: 1**

**Dissection requiring stenting: 0**

# FFR in Bifurcation lesion

- FFR-guided PCI for bifurcation lesion is safe and feasible.
- FFR is helpful from the beginning to the “fine tuning” of PCI procedures in bifurcation lesions.