

Bifurcation PCI:

Why Imaging and Functional Guidance?

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Why Imaging Guidance?

- **Precise anatomical assessment**
- **Mechanism of side branch stenosis**
- **Complication assessment**
- **Procedural optimization**

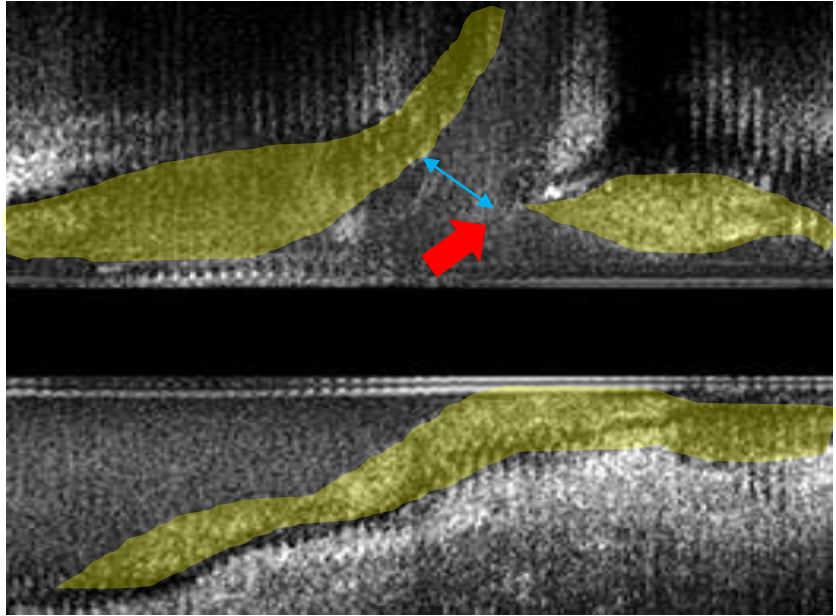
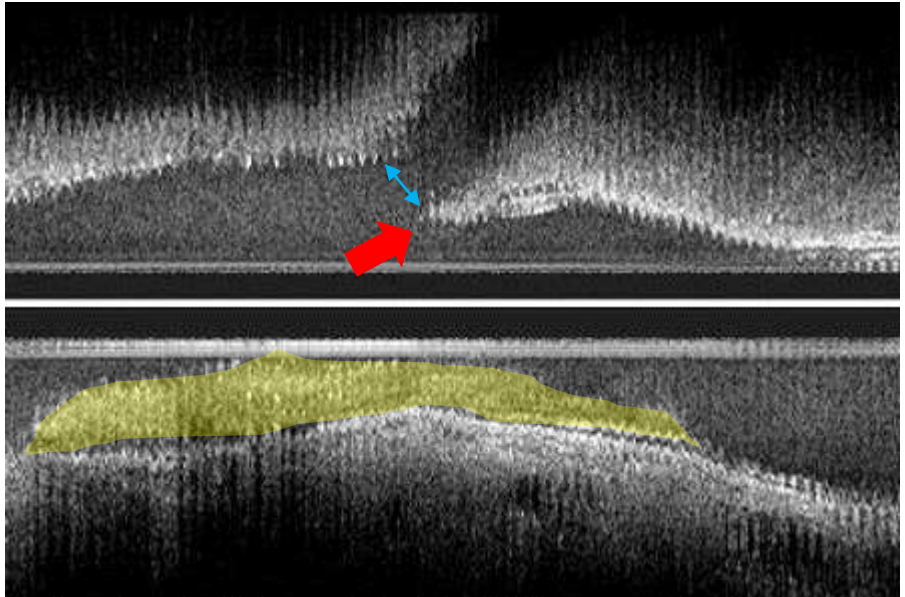


LAD:
MLD: 1.8mm
Lumen area: 2.8mm²
Vessel area: 9.0mm²
Plaque burden 69%



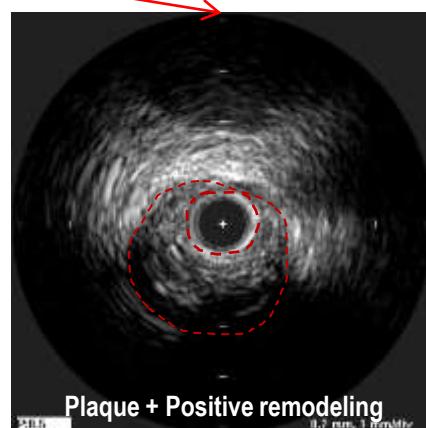
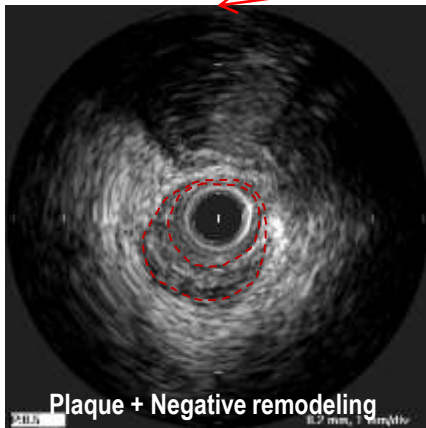
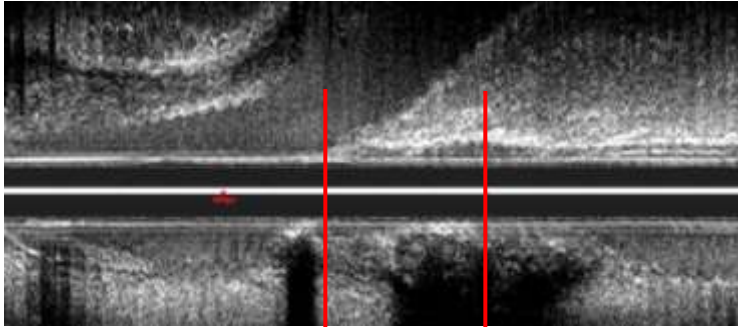
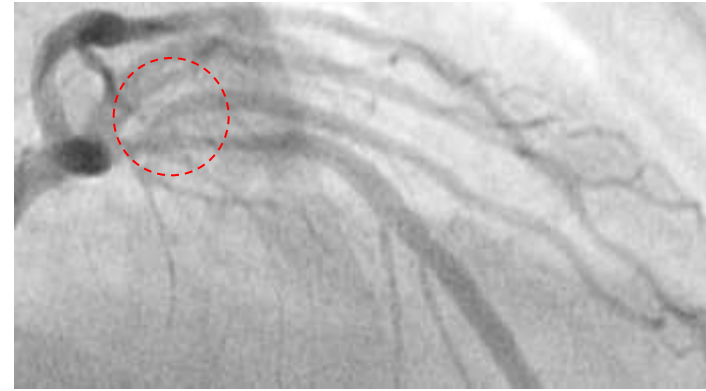
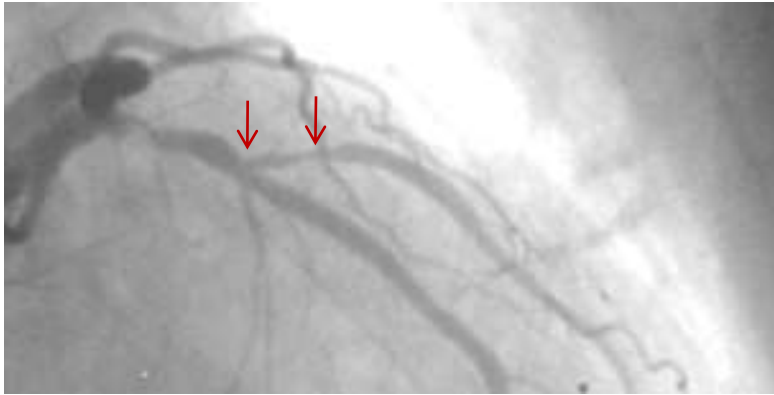
Diagonal branch:
MLD: 1.7mm
Lumen area: 2.7mm²
Vessel area: 5.0mm²

Anatomical information

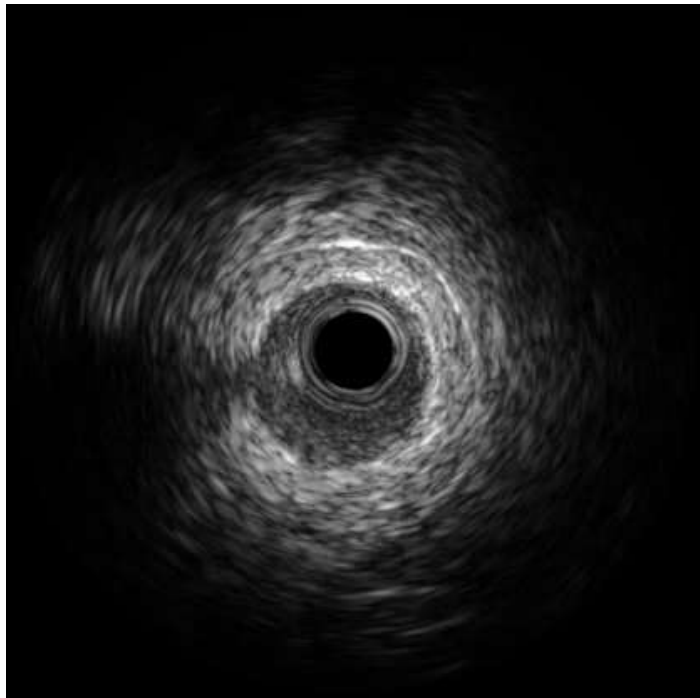
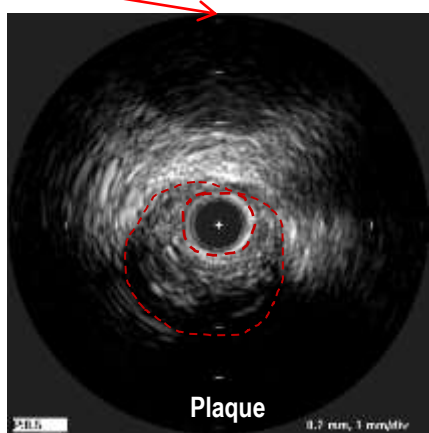
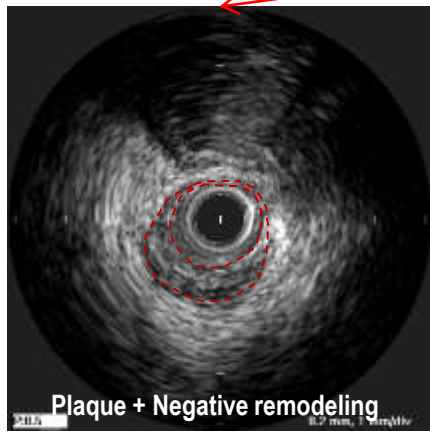
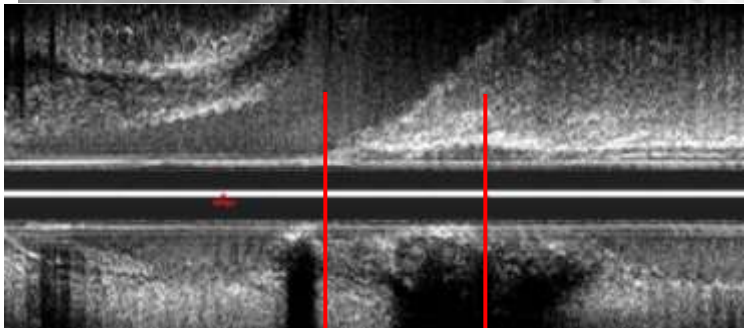
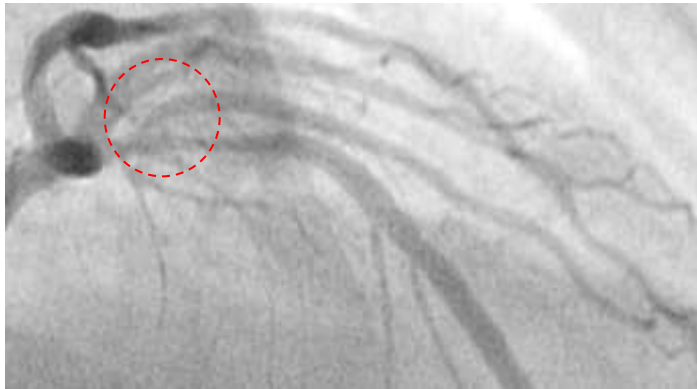
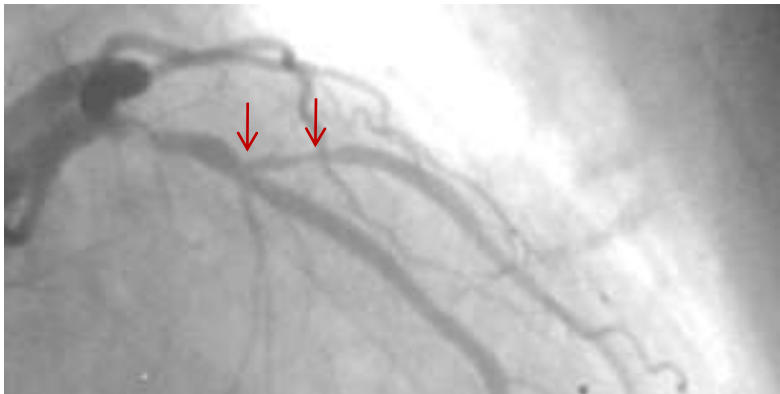


- Geometry of bifurcation lesion
- Amount, character and distribution of plaque
- Location, length of carina
- Distance between carina and outer lumen of a side branch

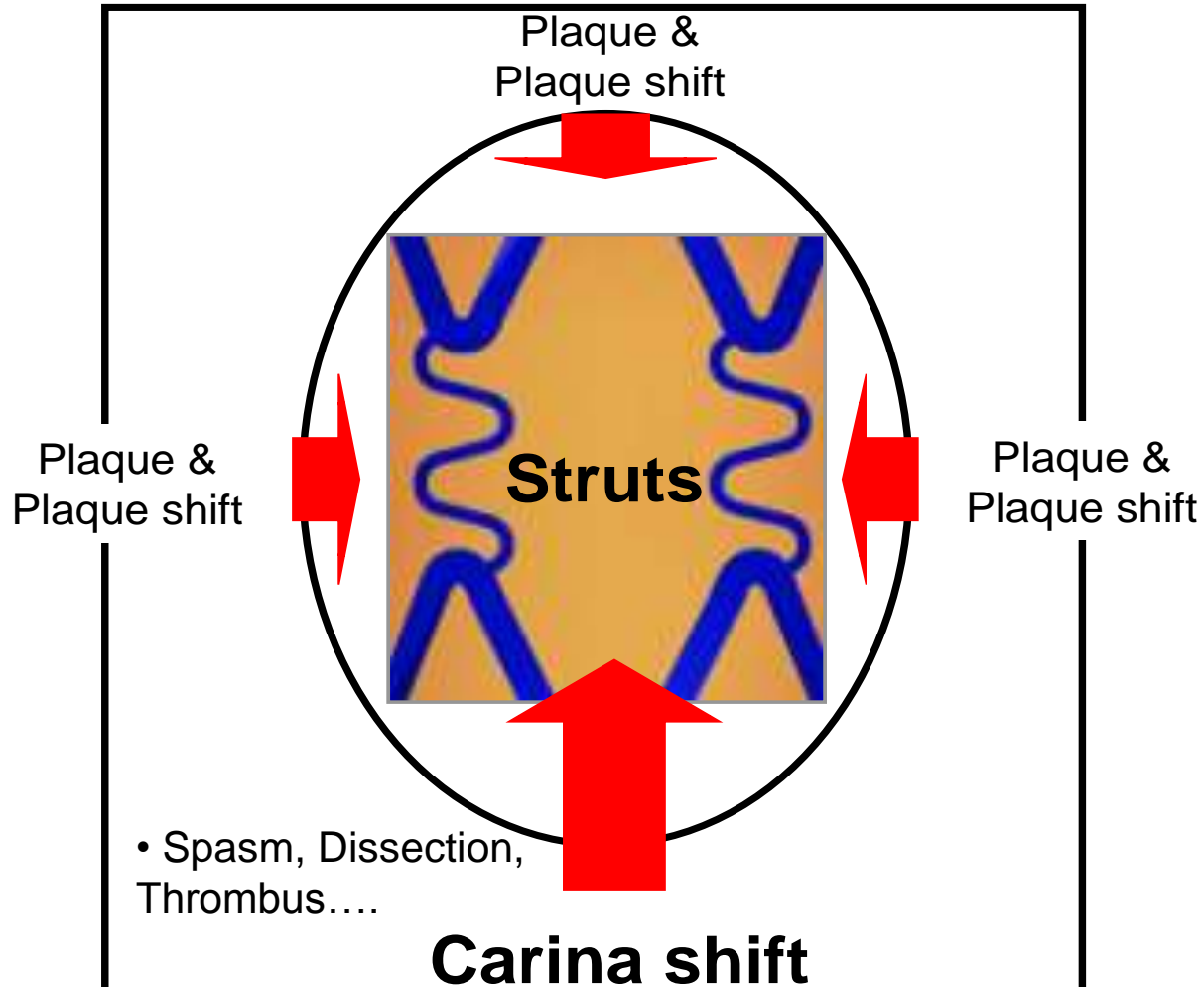
Mechanism of side branch stenosis



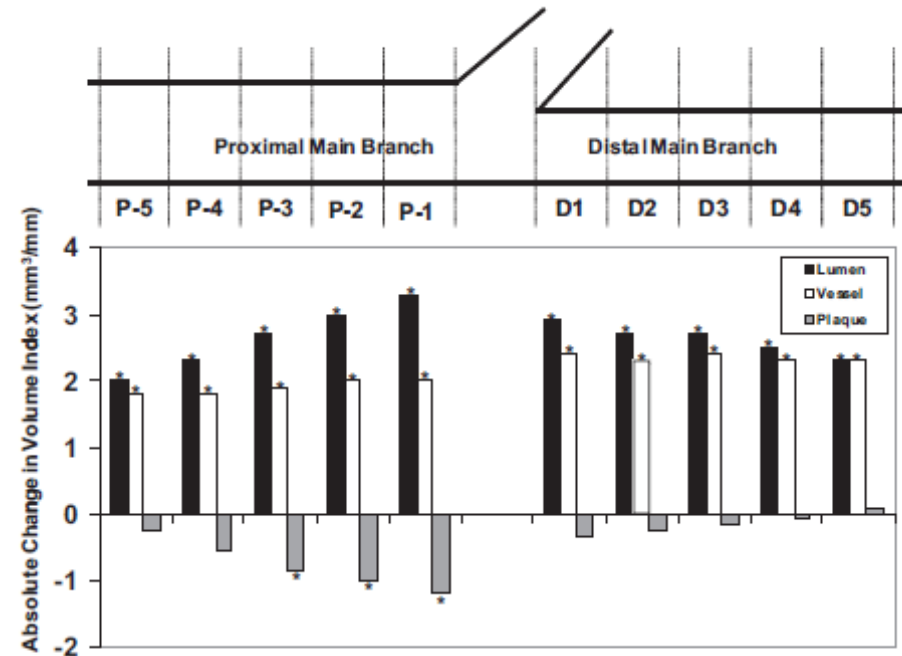
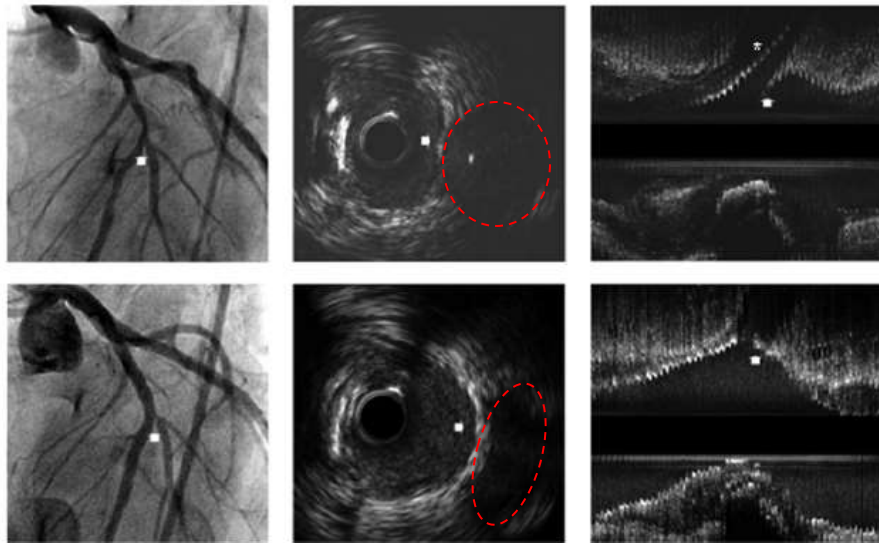
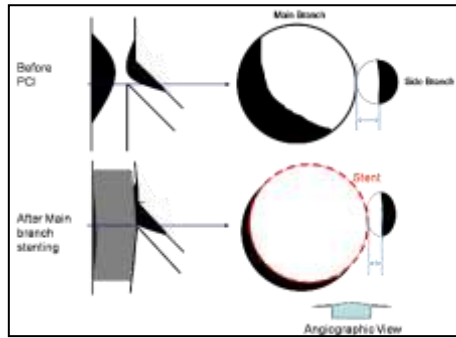
Mechanism of side branch stenosis



Mechanism of side branch jailing



'Carina' shift: Lumen area loss << Angiographic diameter loss



Mechanism of SB jail

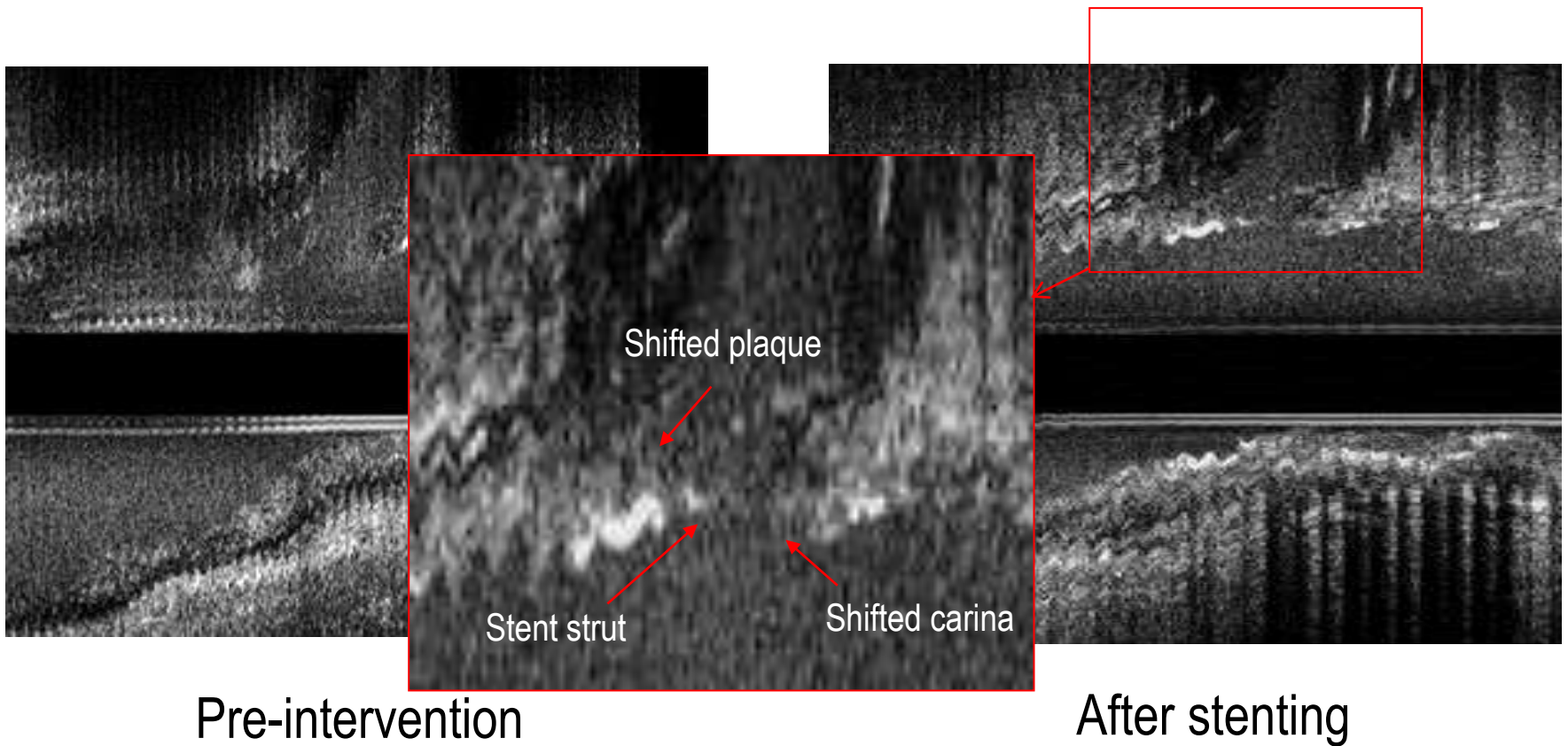
: Plaque shift from proximal MB + **Carina shift**

Carina shift accentuates lumen eccentricity and results in more angiographic diameter loss than lumen area loss.

Koo BK. EBC 2008

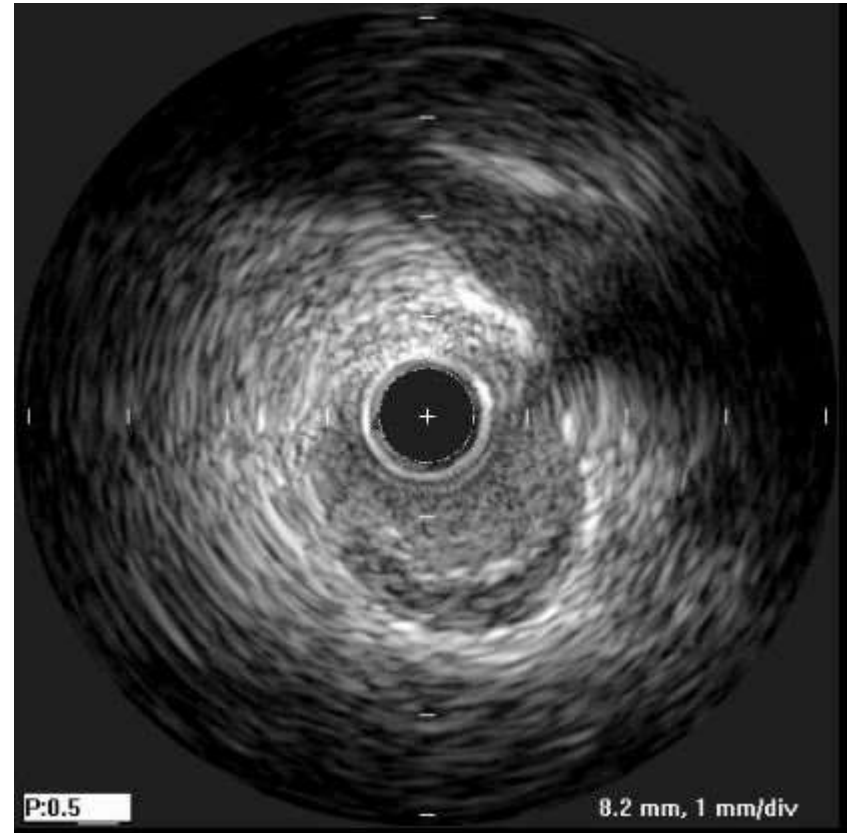
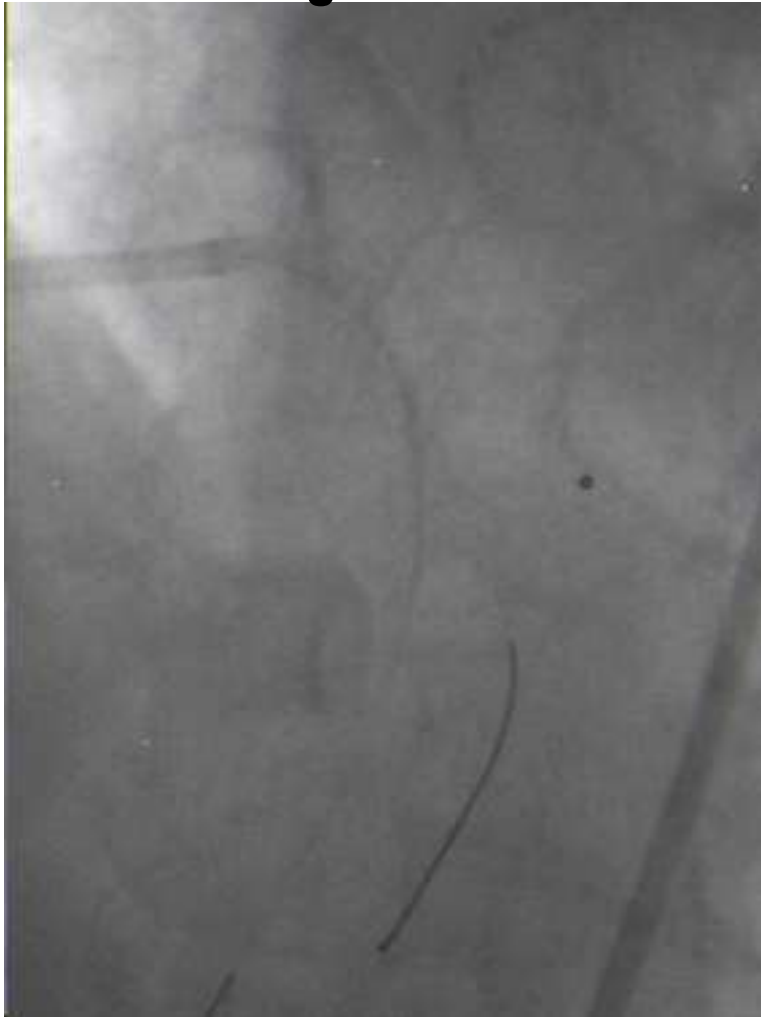
Koo BK, et al. Circ Cardiovasc Interv 2010;3:113

IVUS for Mechanism of SB jailing



What happened?

After Kissing balloon inflation



Assessment of procedural results after 2 stenting

Angiographically excellent, but.....

604 Costa et al.
Crush Stenting for Bifurcation Lesions

JACC Vol. 46, No. 4, 2005
August 16, 2005:599-605

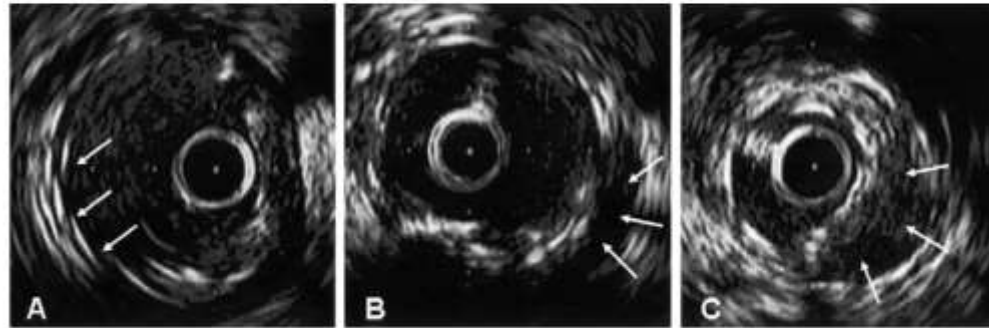
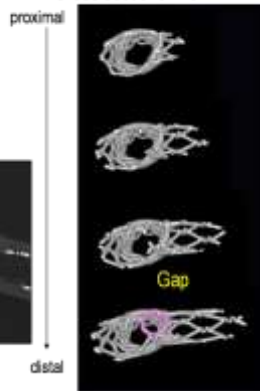


Figure 4. (A) Intravascular ultrasound image showing complete crush (apposition) of the side branch (SB) stent; arrows indicate the three layers of stent struts. (B, C) Intravascular ultrasound images showing incomplete crush (apposition) of the SB stent struts (arrows).

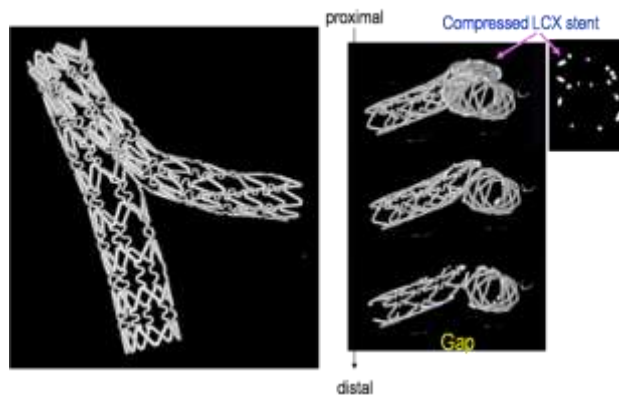
Modified T-stenting

Cross sectional view



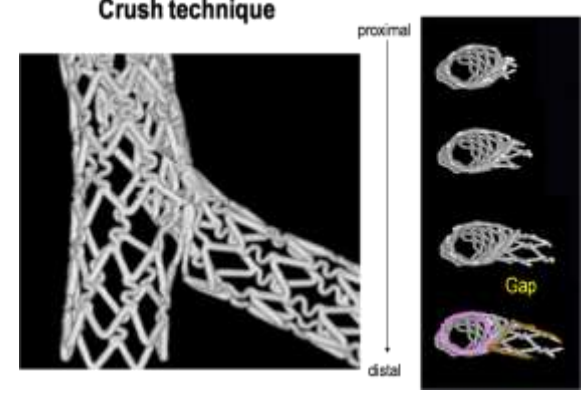
Kissing stenting

Cross sectional view



Crush technique

Cross sectional view



Courtesy of Dr. Murasato

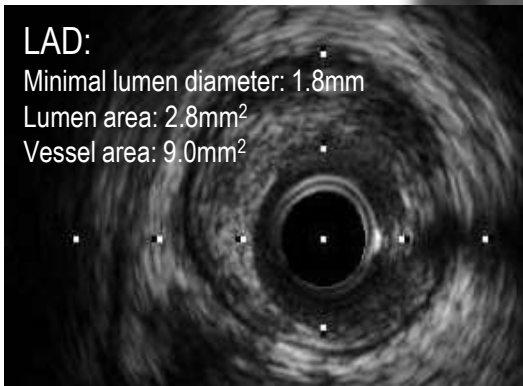
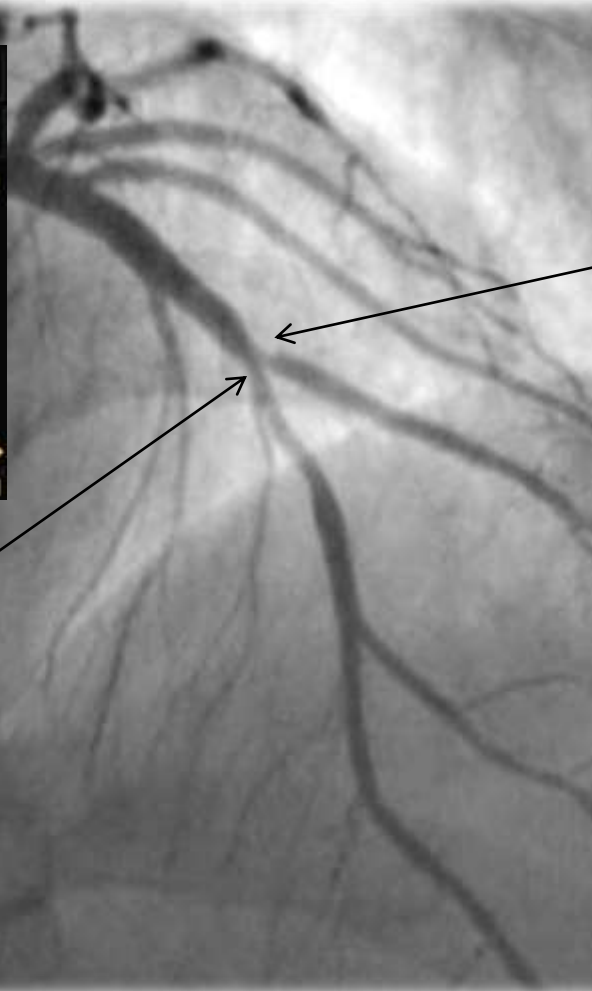
Why Functional Guidance?

- **Limitations of anatomical assessment**
- **Functional assessment for main branch**
- **Functional assessment for jailed side branch**
- **Functional assessment after side branch PCI**

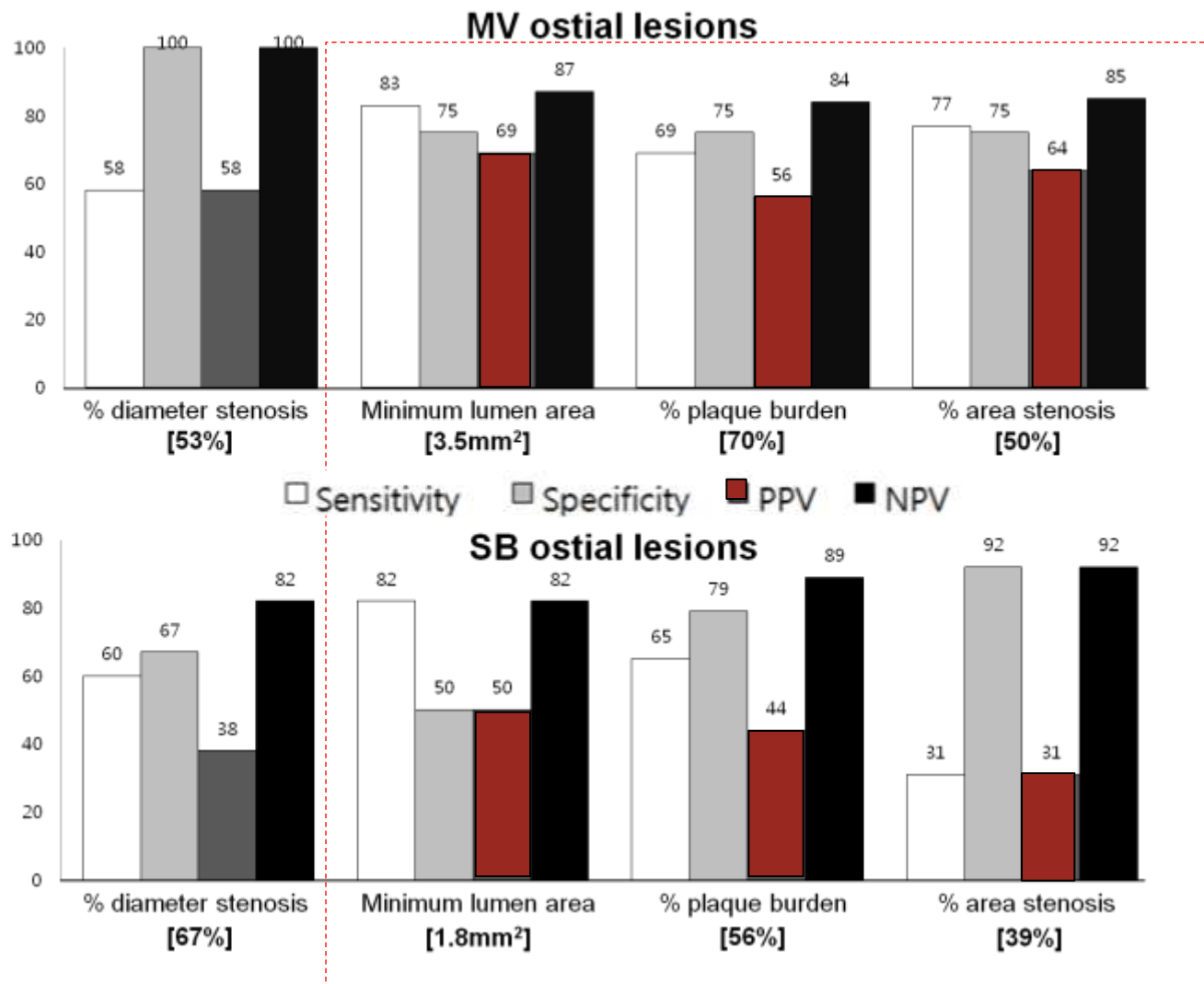
Pitfalls of anatomical evaluation

- **Angiography**
 - **Single directional analysis**
 - **Variability in stenosis assessment**
 - **No validated criteria for side branch intervention**
- **IVUS/OCT**
 - **Can not be performed in tight stenosis or complex anatomy**
 - **Does not reflect the amount of supplying myocardium**
 - **No validated criteria for side branch intervention**

Anatomical information, is it enough?



Diagnostic accuracy of IVUS parameters in pure ostial lesions

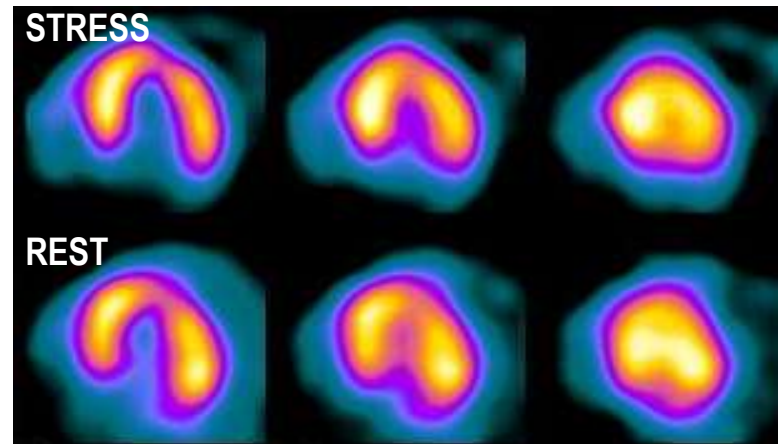
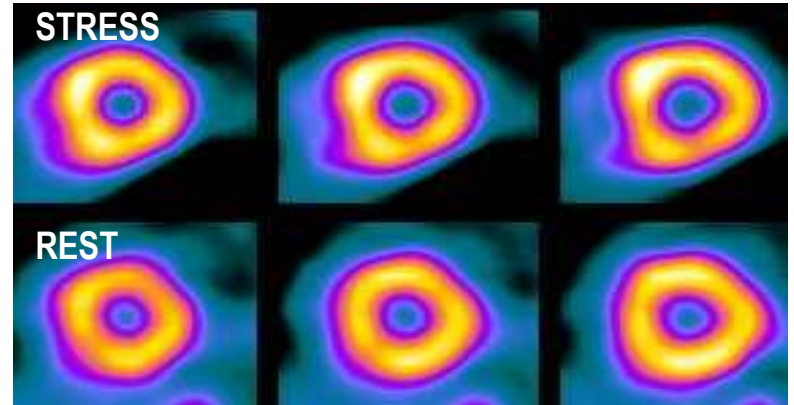


Jailed Side Branches

Angiographic severity \neq Functional significance

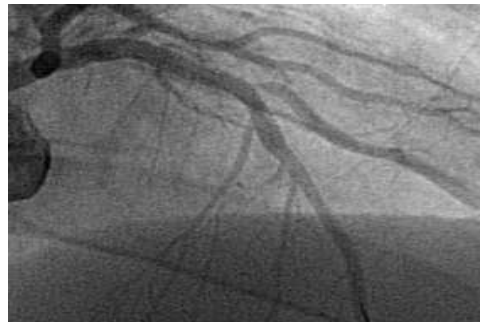


FFR >0.80

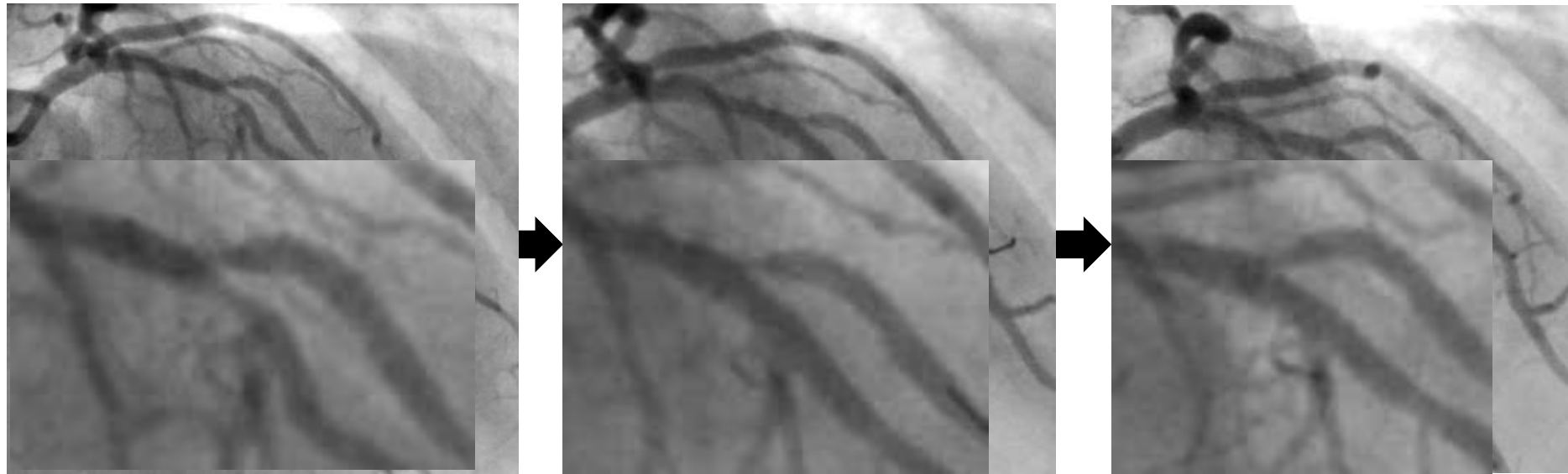


Severe stenosis, but no perfusion defect!

Which one is functionally significant?



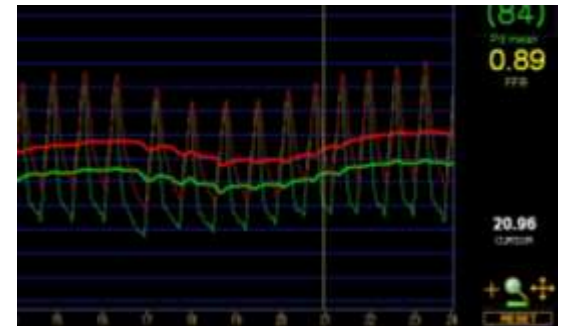
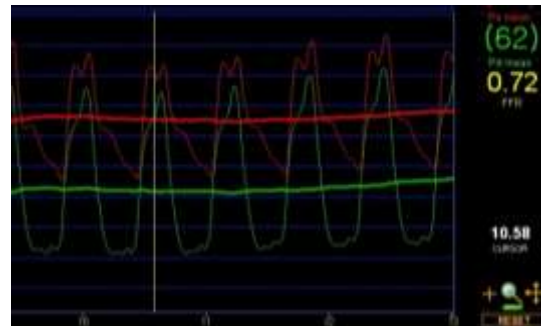
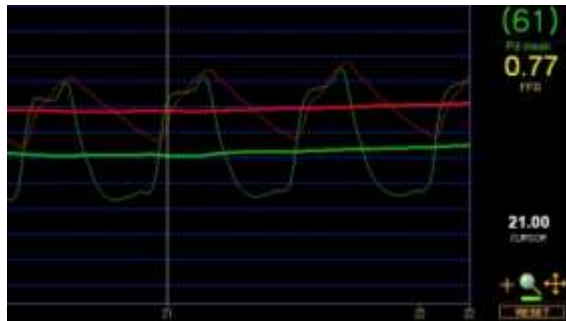
Assessment of procedural results: FFR



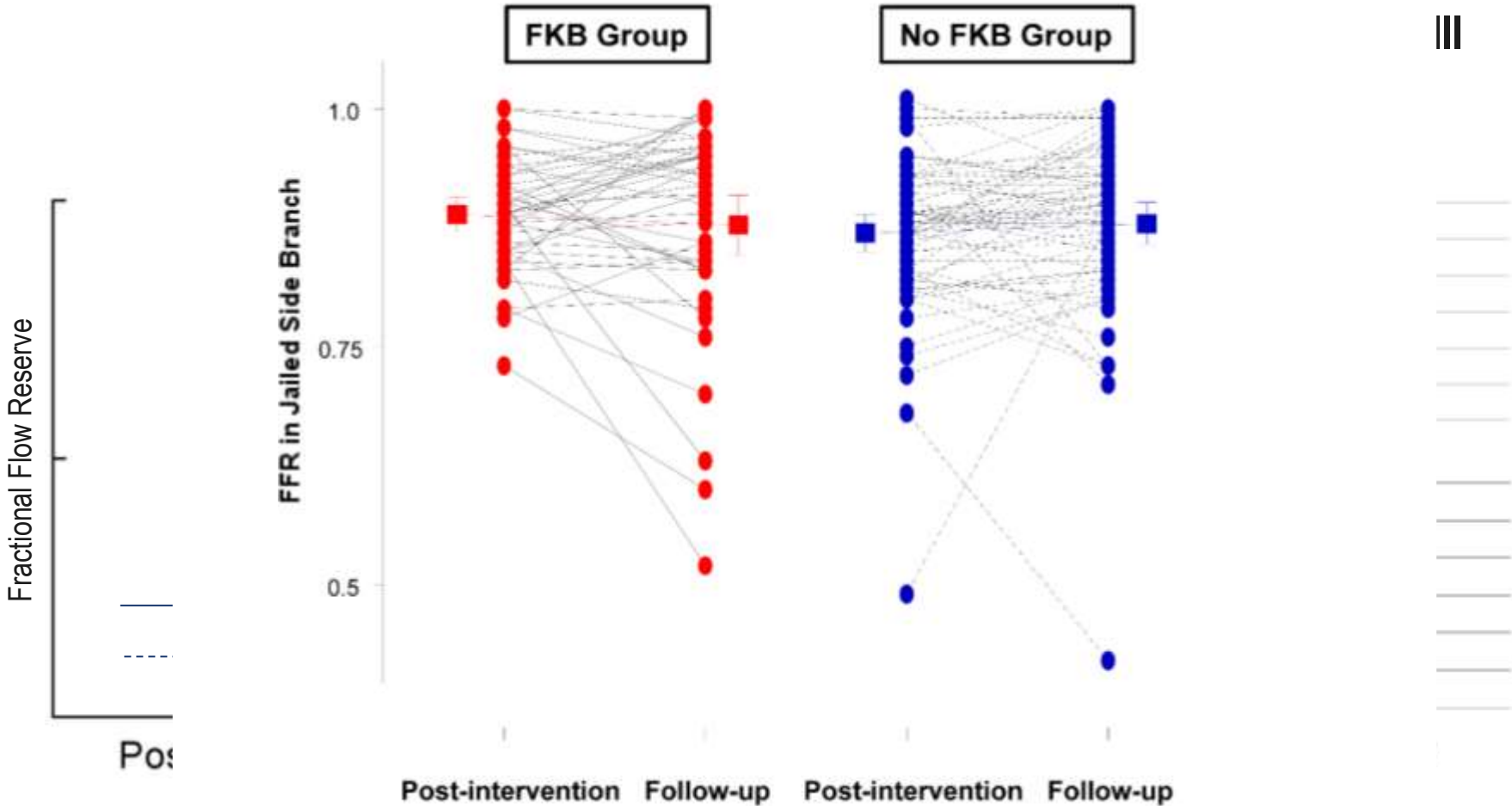
Before PCI

After MB stenting

After kissing balloon



Functional outcome of Jailed side branches



Lee JM..... Koo BK, Eurointervention 2015

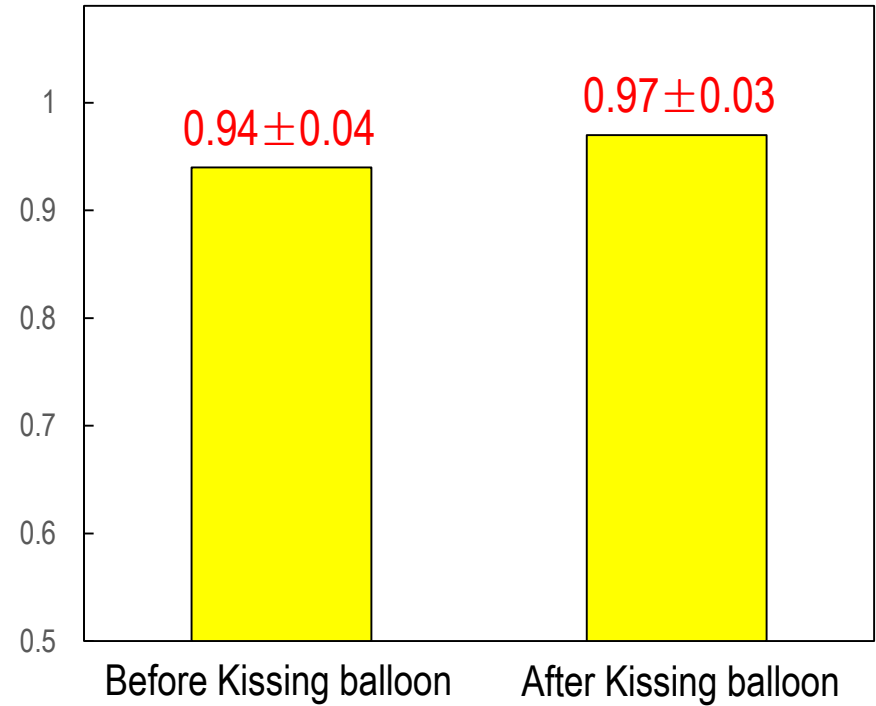
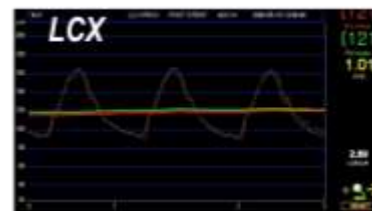
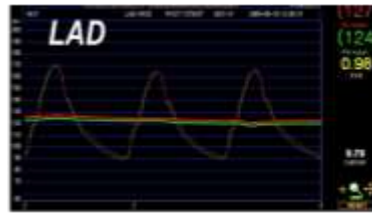
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FFR and IVUS after 2 stenting

SB FFR after Crush stenting



**Functionally complete
revascularization**



Lee BK, et al. Clinical Cardiol 2010

- After 2 stenting, high FFR does not guarantee the procedural success. Therefore, IVUS is recommended more than FFR in case of 2 stenting.

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