

# Jailed balloon technique: Myth and Fact

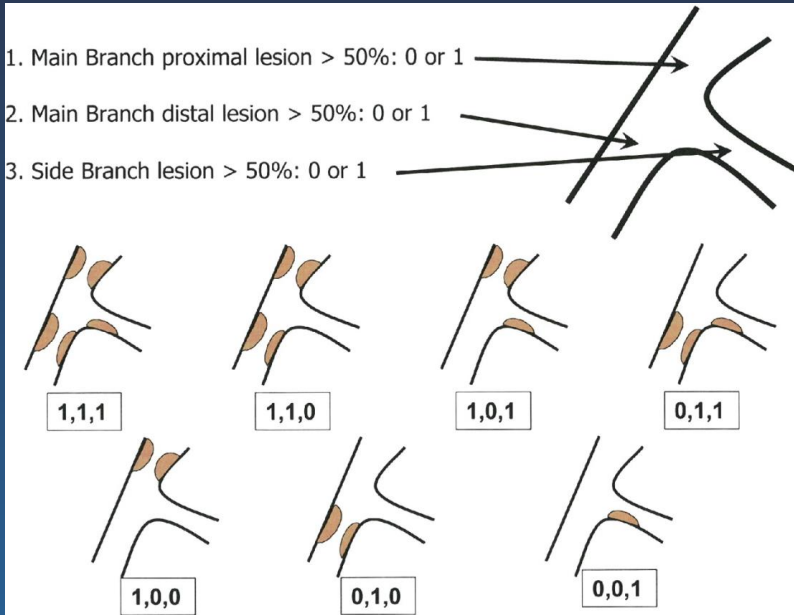
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Seoul National University Hospital

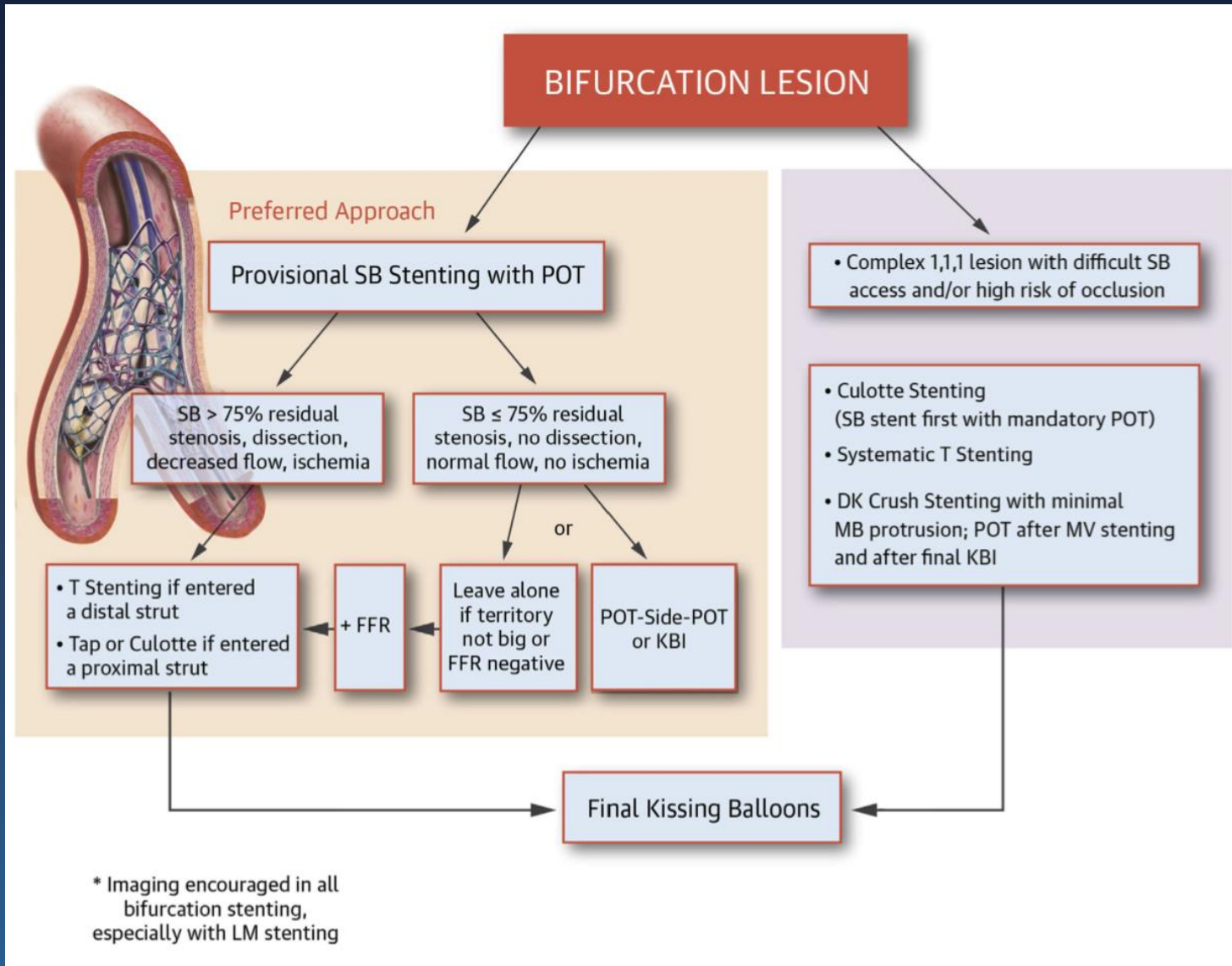
# Coronary bifurcation lesions

- Remain as one of the most **fascinating and challenging** lesion subsets in interventional cardiology
- Treatment of bifurcation lesions is still a controversial subject
  - *Lower procedural success rate*
  - *Increased rates of long-term adverse cardiac events*
  - *Multiple technical strategies have been proposed*



First Author/ Trial (Ref.#)	Complex MACE	Simple MACE	p Value	Number of Patients (Complex/Simple)	Follow-Up (Months)
Colombo et al. (9)	23%	22%	NS	63/22	6
Pan et al. (10)	8.5%	7%	NS	47/44	6
Nordic-I (1)	3.4%	2.9%	NS	207/206	6
Ferenc et al. (11)	12.9%	11.9%	NS	101/101	6
CACTUS (12)	15.8%	15%	NS	173/177	6
BBC-ONE (13)	15.2%	8.0%	0.009	249/248	9
Nordic-II (77)	21.8%	15.8%	NS	202/202	60
DK-Crush II (18)	10.3%	17.3%	NS	185/185	8
Nordic-Baltic IV (16)	8.3%	12.9%	NS	229/221	24
EBC TWO (17)	8%	10%	NS	97/103	24
BBK-1 (78)	16.3%	16.2%	NS	101/101	60
PERFECT (79)	17.9%	18.5	NS	213/206	12

# Coronary bifurcation lesions

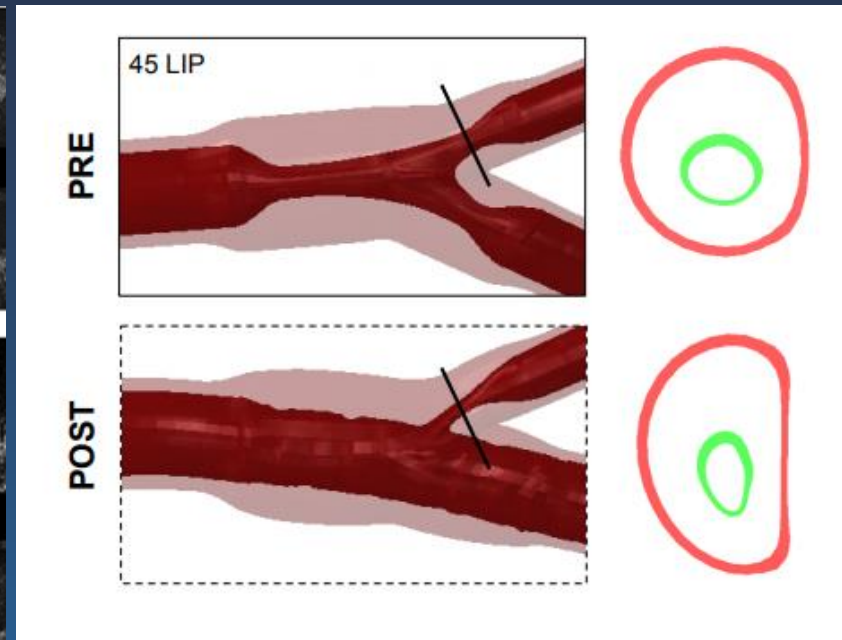
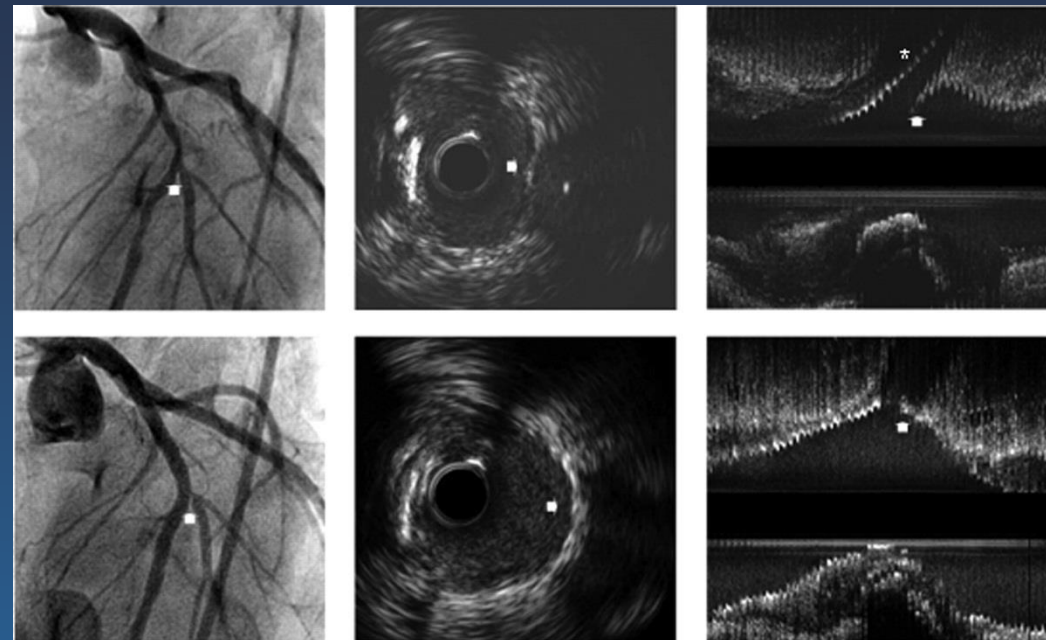


# Coronary bifurcation lesions

➤ SB preservation is a important issue

➤ Mechanisms of SB deterioration  
: *plaque shift* : *Snowplough effect*

: *carina shift* : *The carina is usually spared from atherosclerotic plaques*



# Jailed balloon technique

- SB preservation is an important issue

## Jailed balloon protection: a new technique to avoid acute side-branch occlusion during provisional stenting of bifurcated lesions. Bench test report and first clinical experience

Francesco Burzotta<sup>1\*</sup>, MD, PhD; Carlo Trani<sup>1</sup>, MD; Georgios Sianos<sup>2\*</sup>, MD, PhD

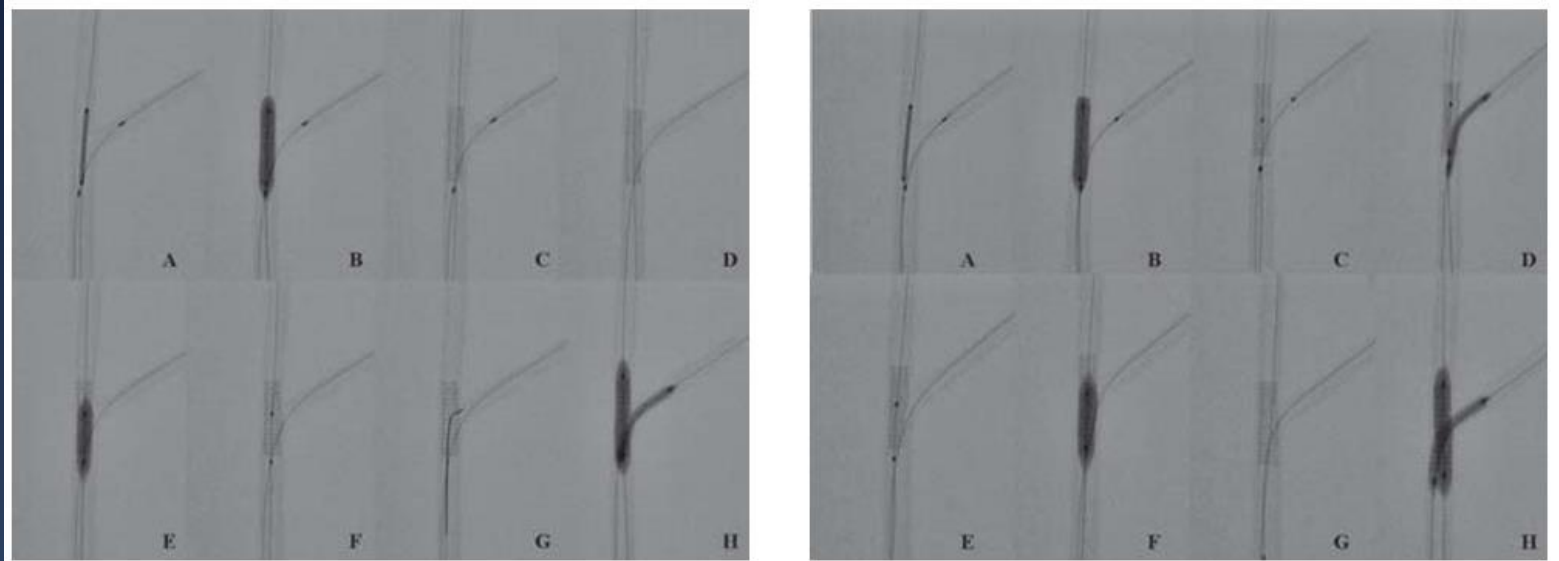
1. Institute of Cardiology, Catholic University of the Sacred Heart, Rome, Italy; 2. AHEPA University Hospital, Thessaloniki, Greece

- Mechanisms of SB deterioration
  - *plaque shift and carina shift*
- This may be prevented by the jailed balloon technique.

Simple main vessel (MV) stenting with “provisional” stenting of the side-branch (SB)<sup>1</sup> is the most commonly adopted strategy<sup>2-3</sup> to treat bifurcated lesions but is associated to the risk of SB closure after MV stent implantation. The placement of a second wire in the SB during MV stenting (“jailed wire”) is known to reduce the risk of transient or persistent SB occlusion<sup>4</sup>, but is not able to abolish it. In the present manuscript we present a new technique for SB protection during MV stenting based on the use of a “jailed balloon”.

# *Jailed balloon technique*

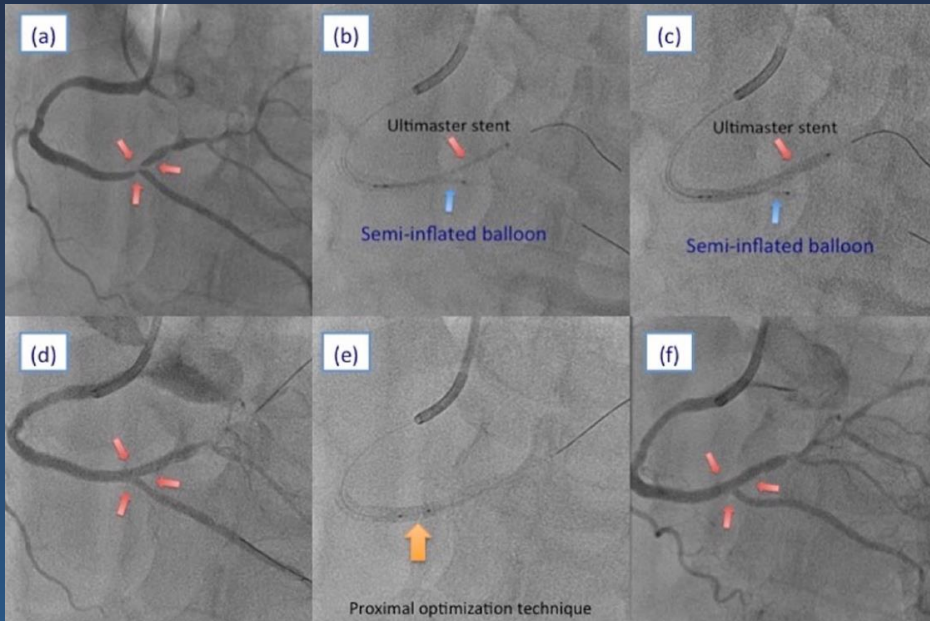
- SB preservation is a important issue



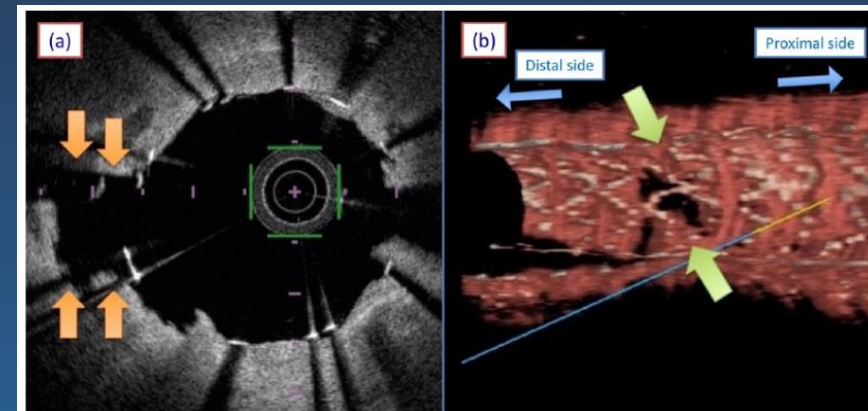
- Jailed balloon in the SB might provide a useful tool to reduce plaque/carin a shift due to its higher occupation of the SB ostium.
- If the jailed balloon inflation creates major dissection, the space created by SB balloon dilation may theoretically be used for an inverted “provisional crush” technique.
- Post-dilation of the proximal part of the MV stent and final kissing inflation are recommended.

# Jailed balloon technique

- SB preservation is a important issue
  - Reinsertion of the GW after stenting is oftenly needed
    - may induce stent distortion
    - Is a stressful procedure itself

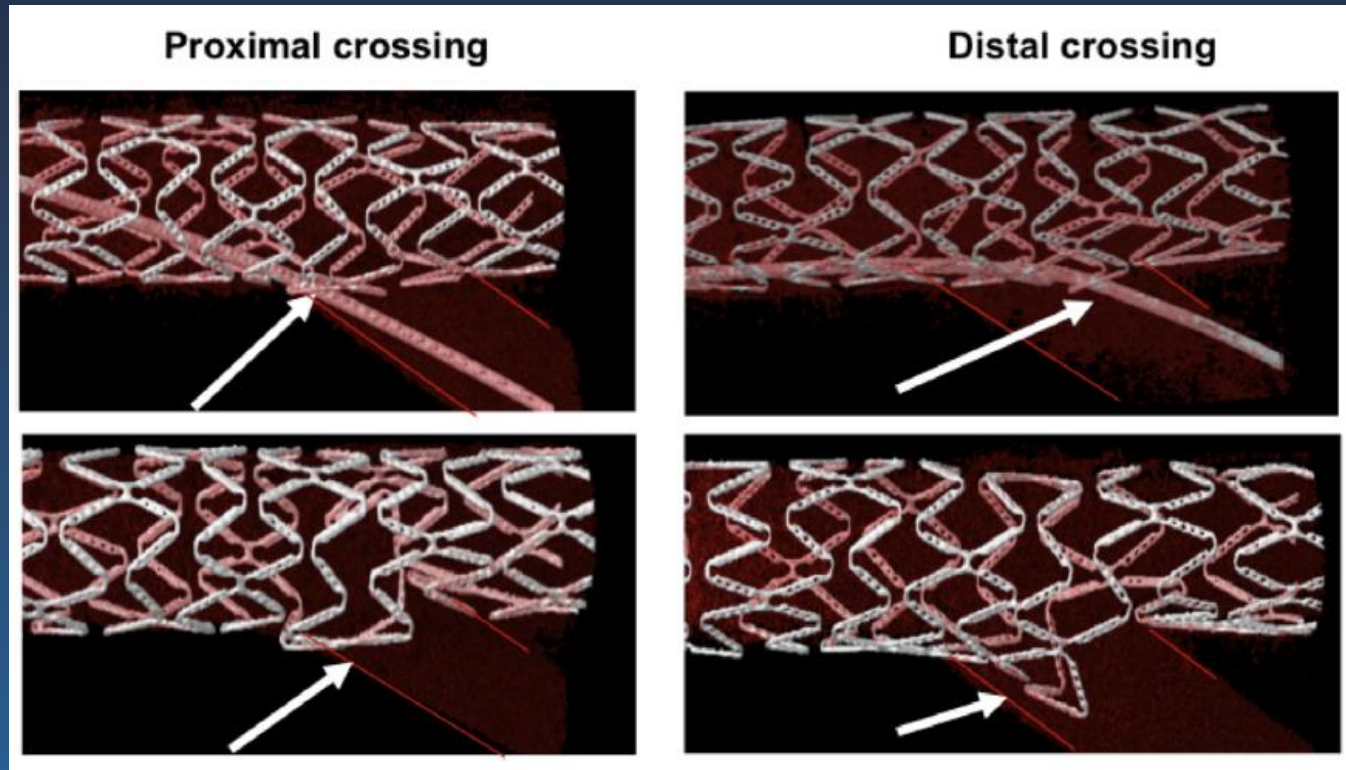


balloon inflation, it is necessary to reinsert a guidewire into the jailed side branch via stent struts. Because reinsertion of the guidewire after stenting is sometimes challenging and is also associated with the risk for side branch injury, the jailed semi-inflated balloon technique without final kissing balloon inflation is simpler and better than conventional provisional stenting techniques, especially in true bifurcation lesions.



# *Jailed balloon technique*

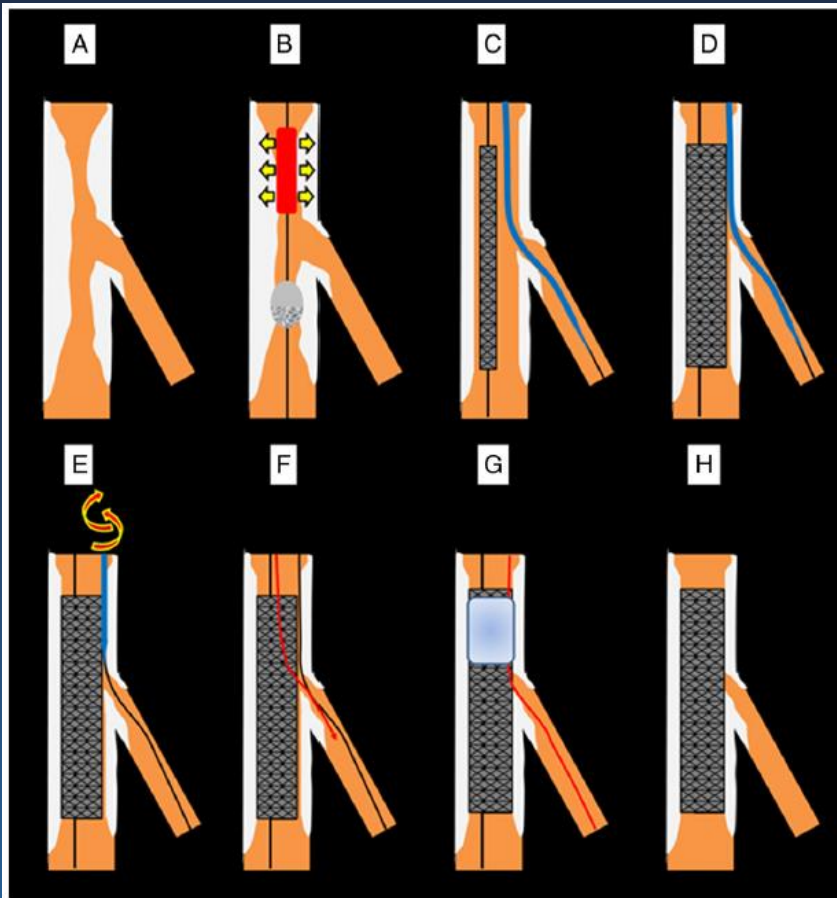
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# Jailed Cosair technique

- Jail a 'Cosair' instead a 'Balloon'
- Compared to the jailed balloon technique,
  - Risk of dissection is minimum at the SB ostium of SB
  - Easier removal of the jailed devices



	Jailed Corsair Technique	Jailed Balloon Technique
Purpose	Side branch protection	Side branch protection
Risk of dissection at the ostium of side branch	Minimum	Depends on the size of balloon and inflation pressure
Difficulty level of guidewire recross to the side branch	Easy	Depends on the dissection at the ostium of side branch
Inflation pressure of stent implantation	Nominal or less than nominal	Nominal. Should be greater than inflation pressure of the jailed balloon
Predilatation and/or lesion modification to main vessel before stent implantation	Critically important. Sufficient lesion preparation enables stent expansion with minimum inflation pressure.	Should be important.
Removal of the jailed device	Pull back with rotating Corsair	Pull back without rotating balloon
Advantage	Few risk of dissection at the ostium of side branch, which facilitates guide wire recross to side branch	There are several literatures supporting the efficacy and safety of this procedure.
Possible complications	Entrapment, Tip transection	Entrapment, Jailed balloon rupture

# *Jailing technique*

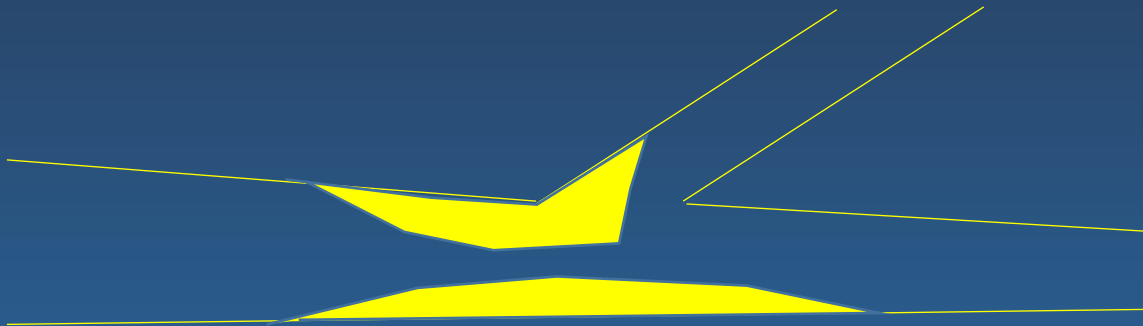
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- A Series of Complicated techniques to preserve the SB
- What are the realistic advantages?
- Does this really 'prevent' SB occlusion?
- **Is re-wiring and kissing ballooning needed?**



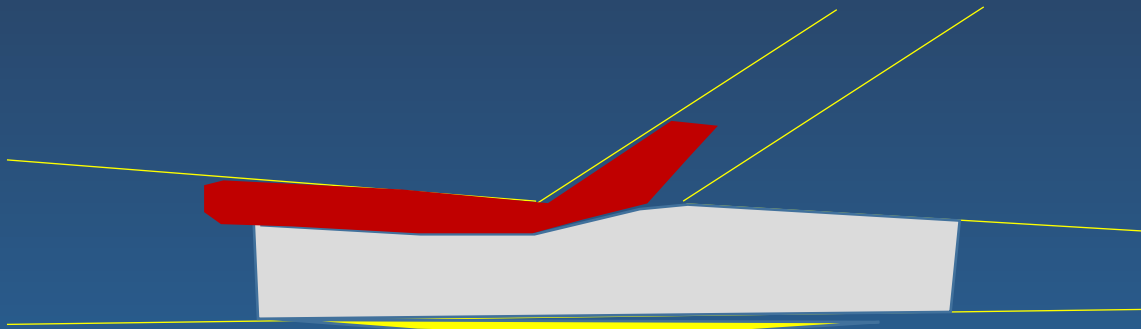
# Jailing technique

- Is re-wiring and kissing ballooning needed?
  - In regards of the mechanisms of SB occlusion
  - **Plaque shifting**
    - The balloon/cosair in the SB may prevent plaque shifting (the carina is usually free from plaques)
  - **Carina shifting**
    - still occurs during adjunctive ballooning (*and does not represent functional significance*)
- Rewiring to a dissected SB may be risky



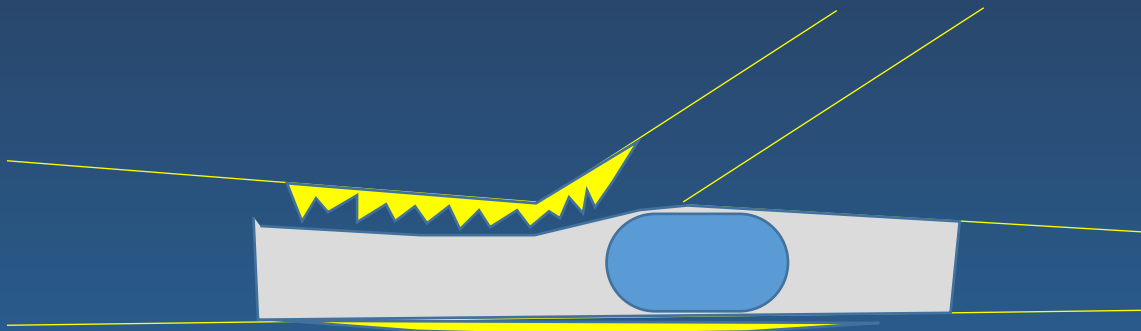
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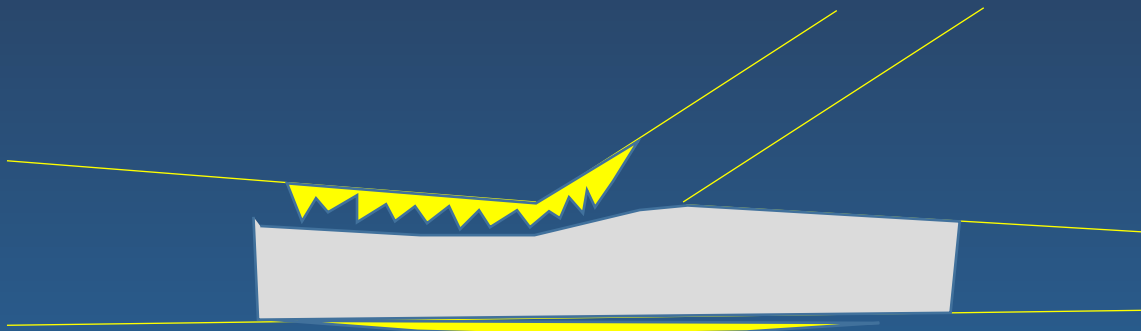
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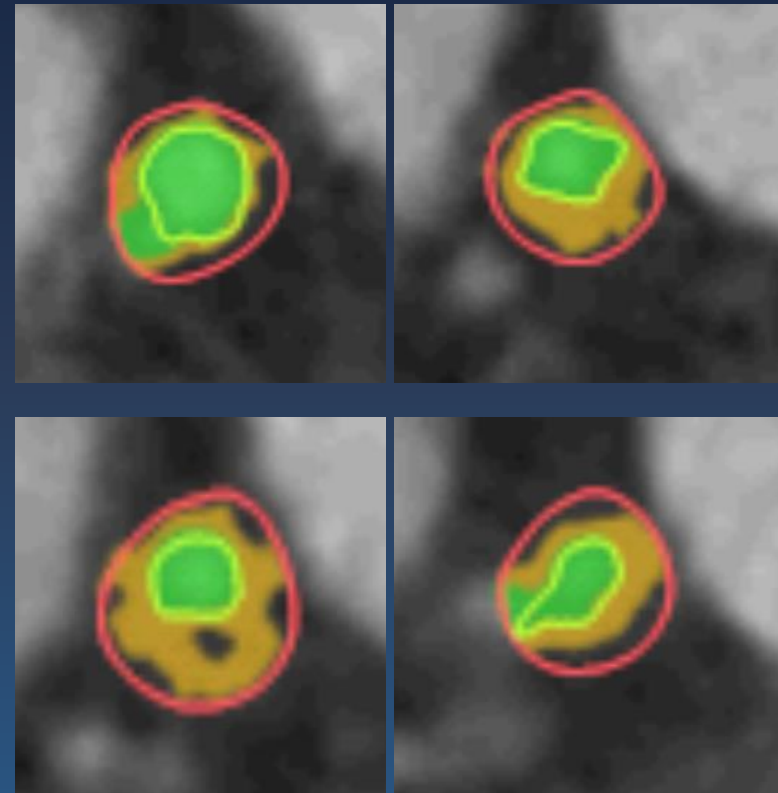
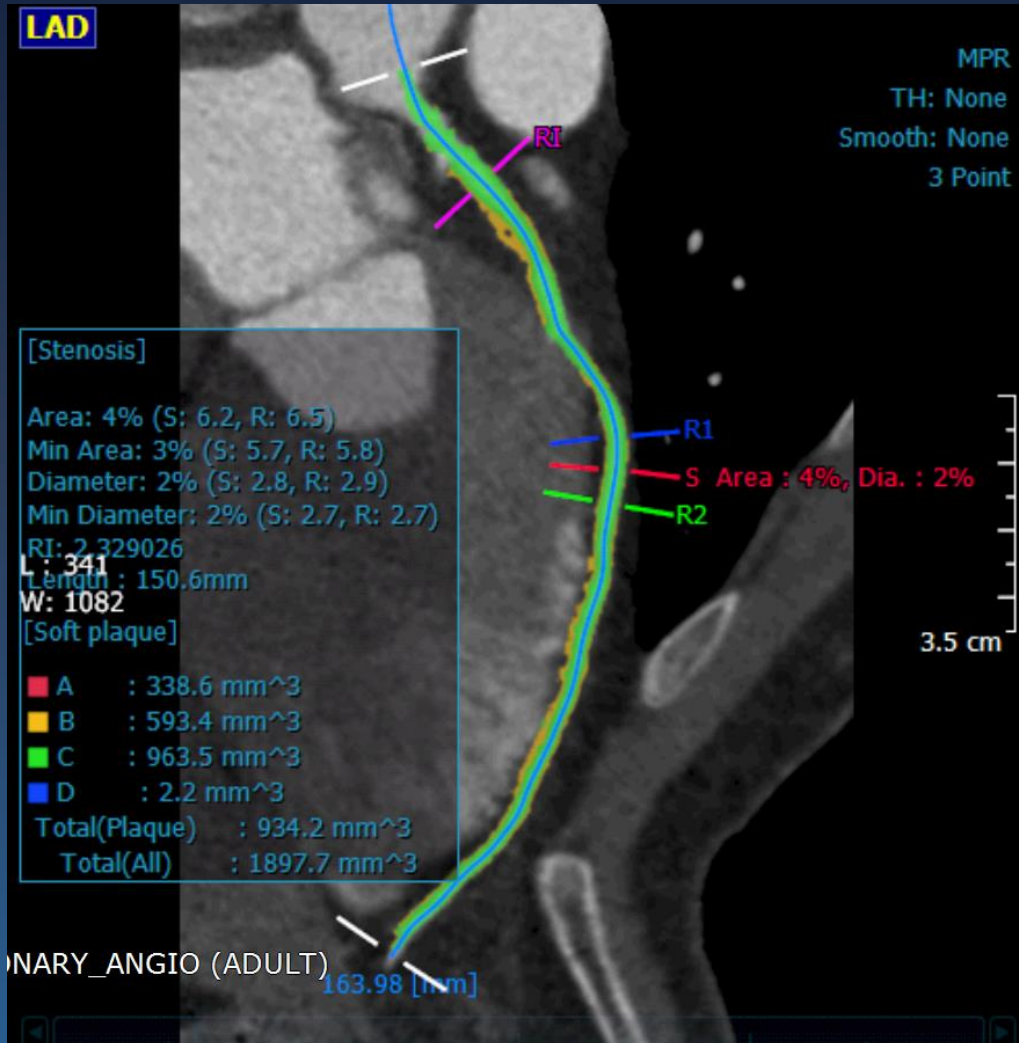
# Case Presentation

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- **47 year old Male**
- **Chief complaint**  
Exertional chest discomfort, aggravating
- **Risk factors**
  - HTN, dyslipidemia
- **Other findings**
  - EKG: NSR
  - EchoCG: LVEF 61%, RWMA (-)

# Case Presentation

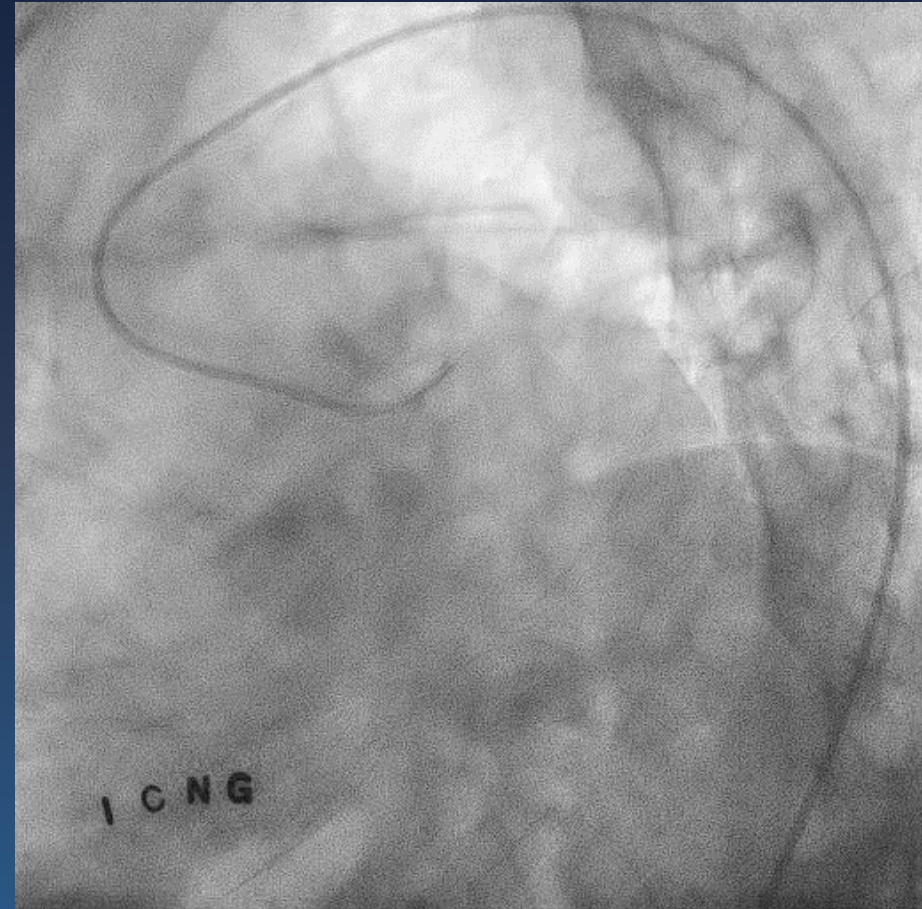
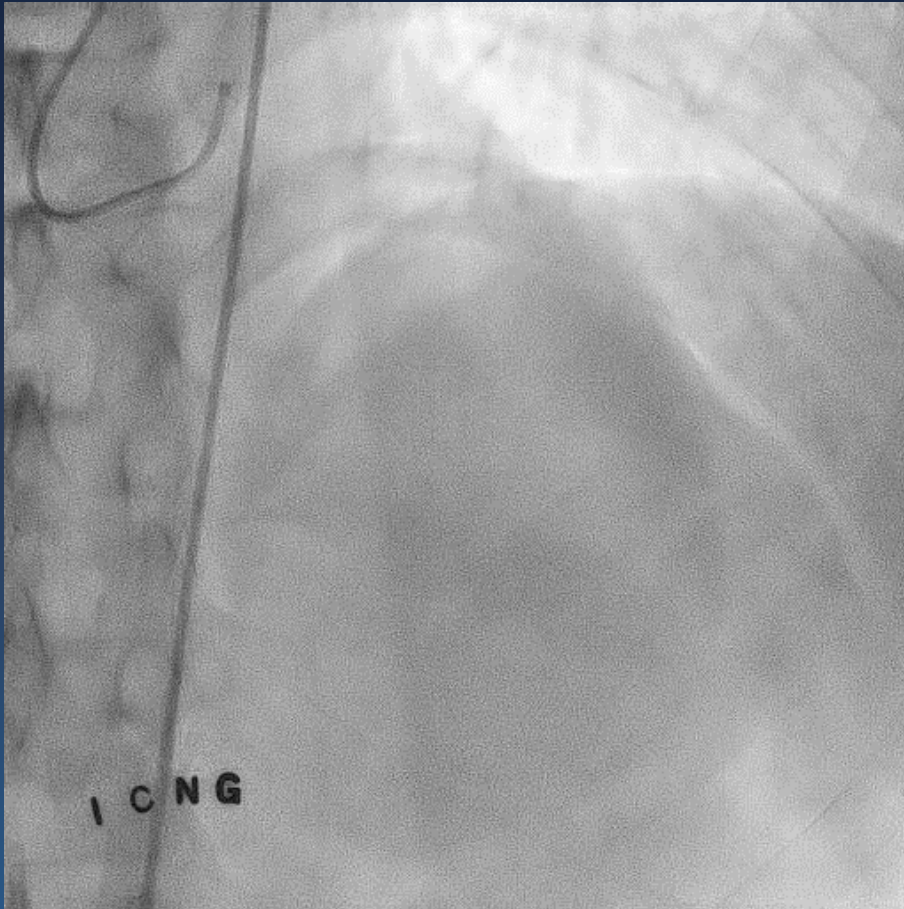
## ➤ CCTA





# Case Presentation

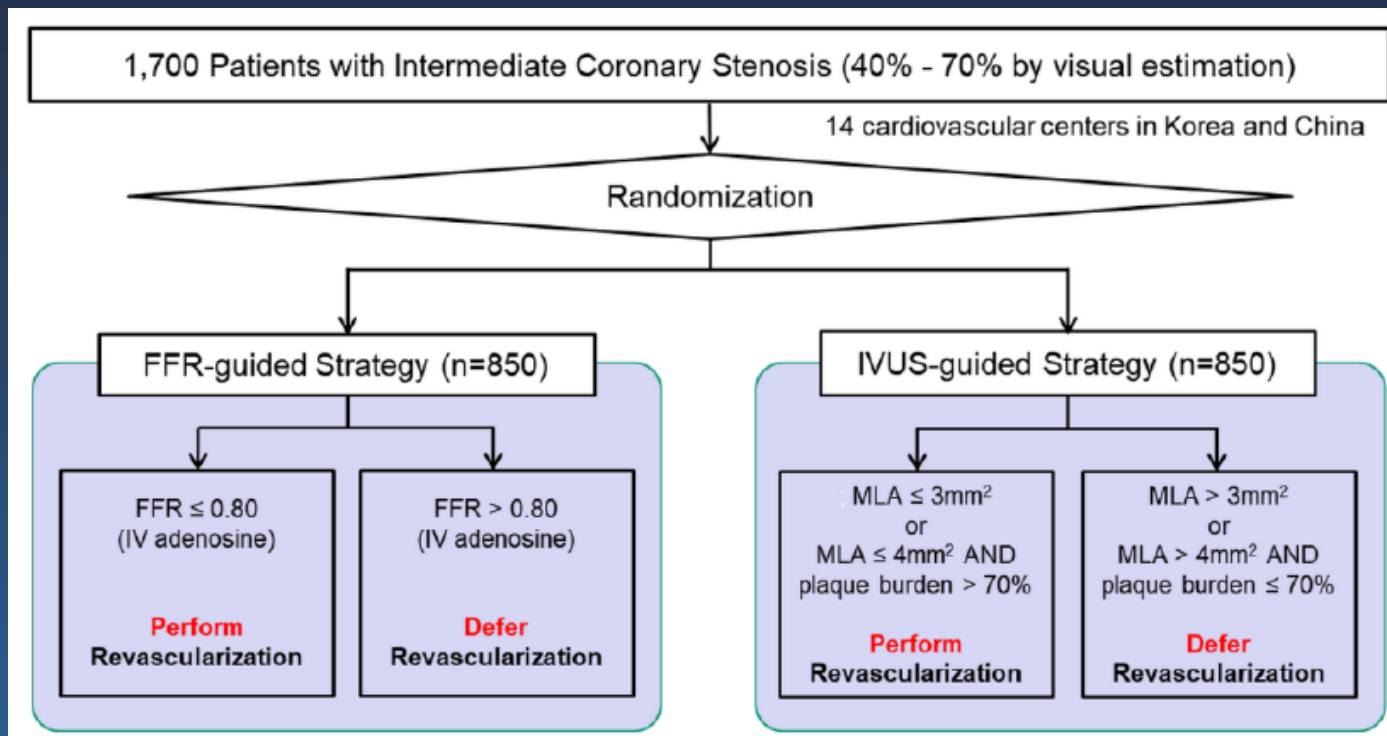
## ➤ Initial CAG



*pLAD tubular 70% luminal narrowing at Dg bifurcation site*

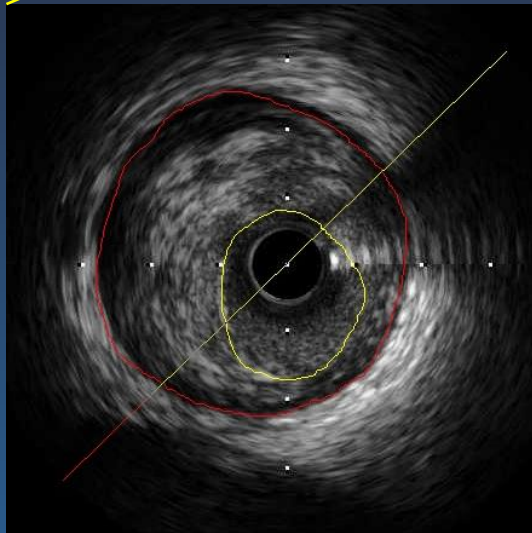
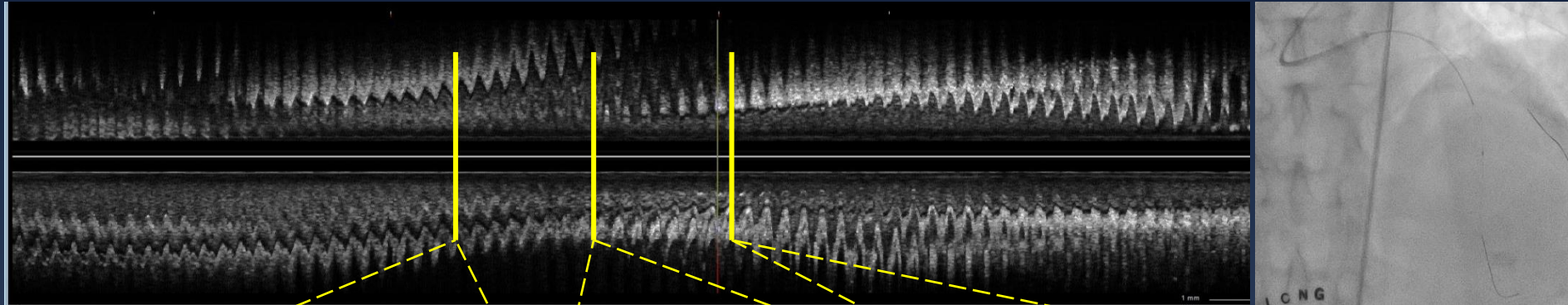
# Case Presentation

- FLAVOUR enrolled
  - Fractional Flow Reserve And IntraVascular Ultrasound for Clinical Outcomes in Patients with InteRmediate Stenosis
  - Primary objective
    - To compare the efficacy of FFR-guided PCI strategy with IVUS-guided PCI strategy in patients with intermediate coronary stenosis.

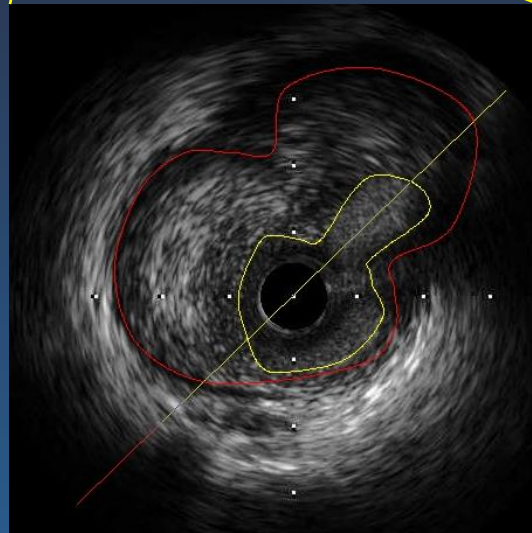


# Case Presentation

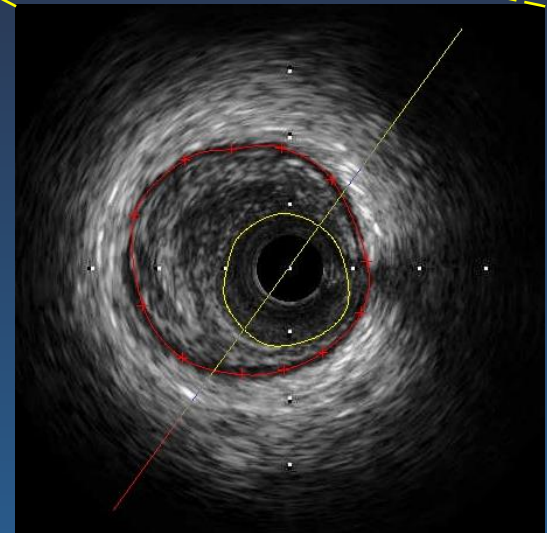
## ➤ IVUS to LAD



LA: 3.73mm<sup>2</sup>  
VA: 16.16mm<sup>2</sup>  
PB 76.9%



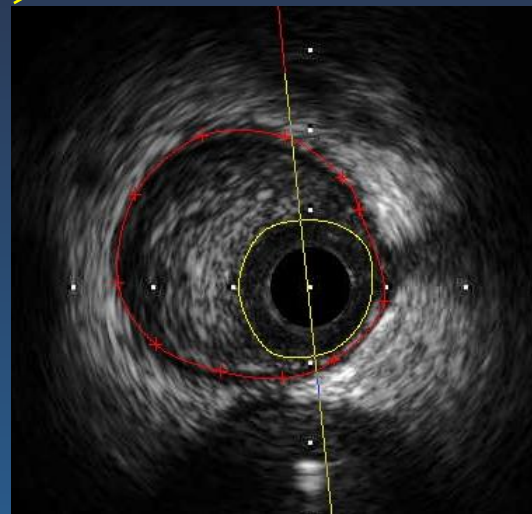
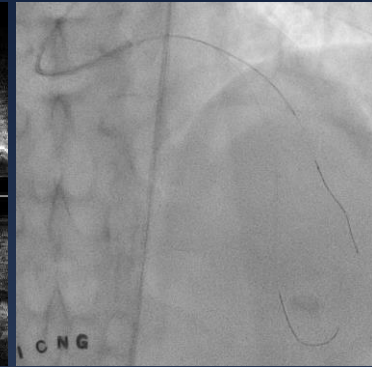
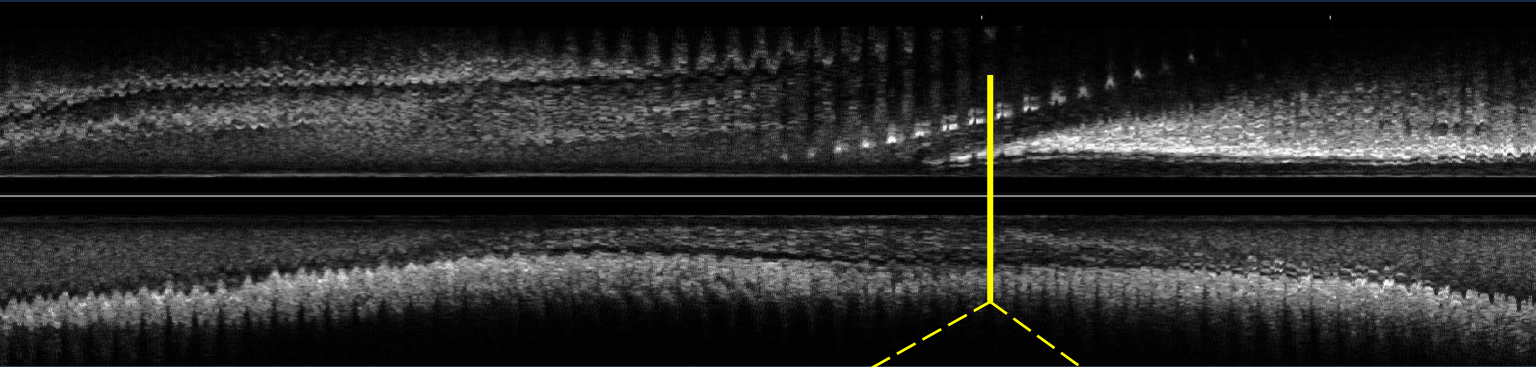
LA: 4.66mm<sup>2</sup>  
VA: 17.62mm<sup>2</sup>  
PB 73.5%



LA: 2.87mm<sup>2</sup>  
VA: 9.68mm<sup>2</sup>  
PB 70.3%

# Case Presentation

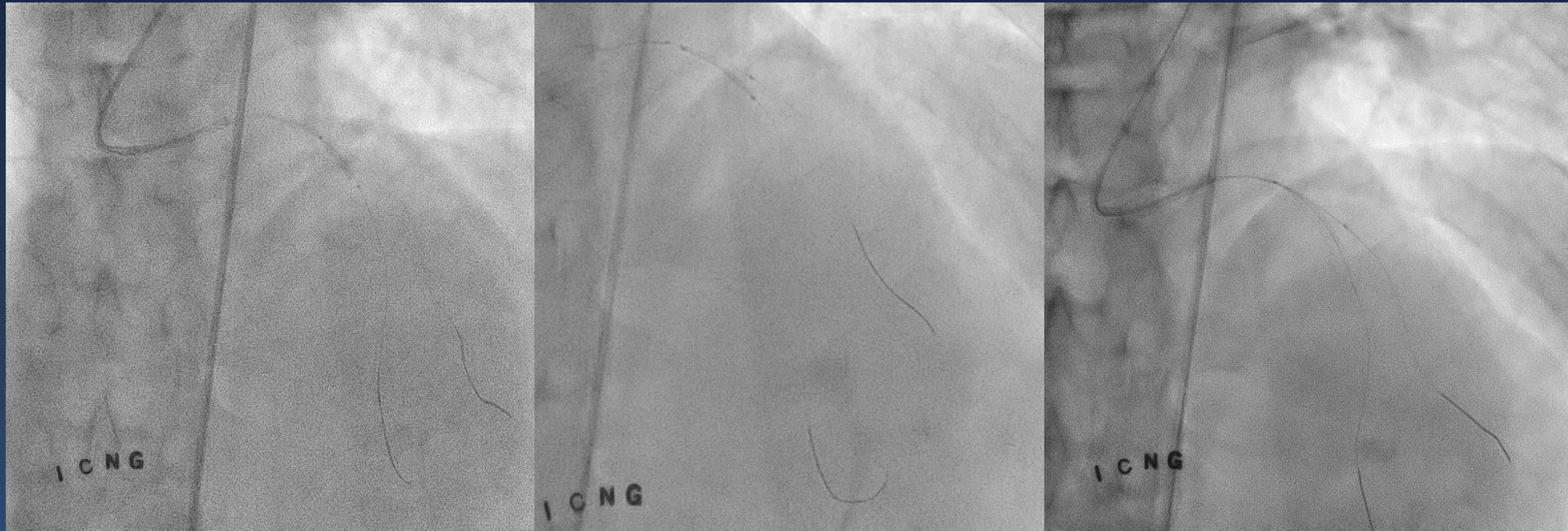
## ➤ IVUS to Dg



LA:  $2.28\text{mm}^2$   
VA:  $8.01\text{mm}^2$   
PB 71.6%

# Case Presentation

## ➤ PCI to LAD

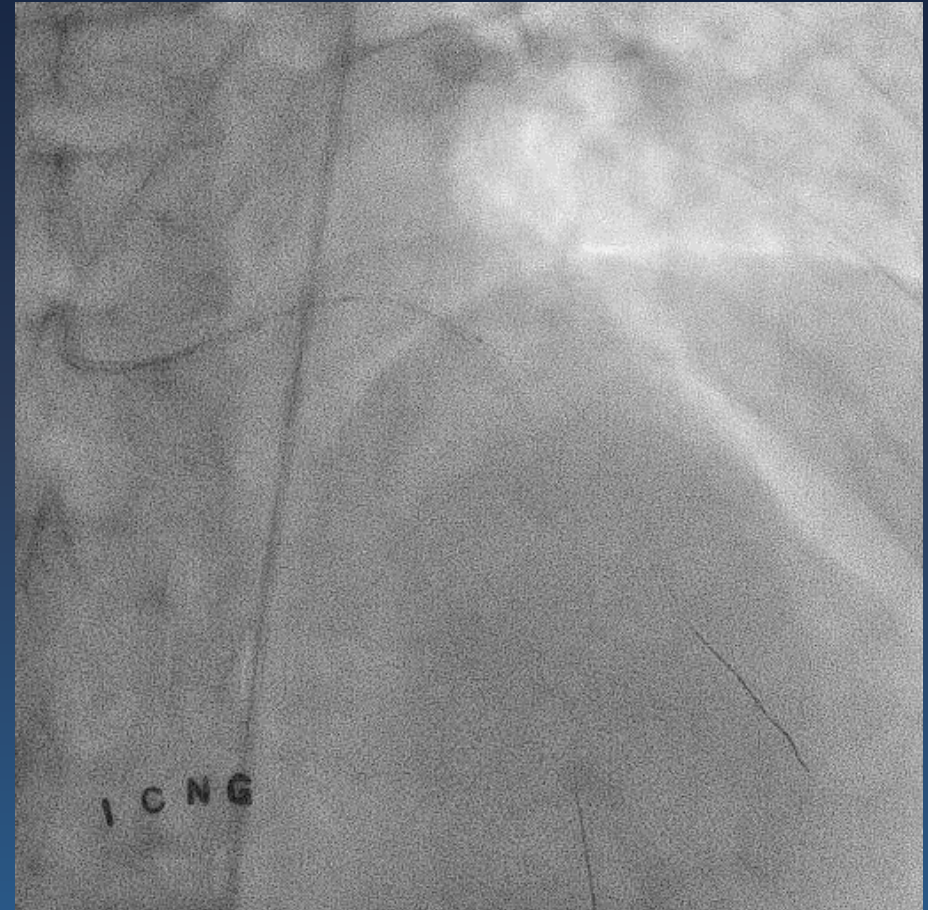
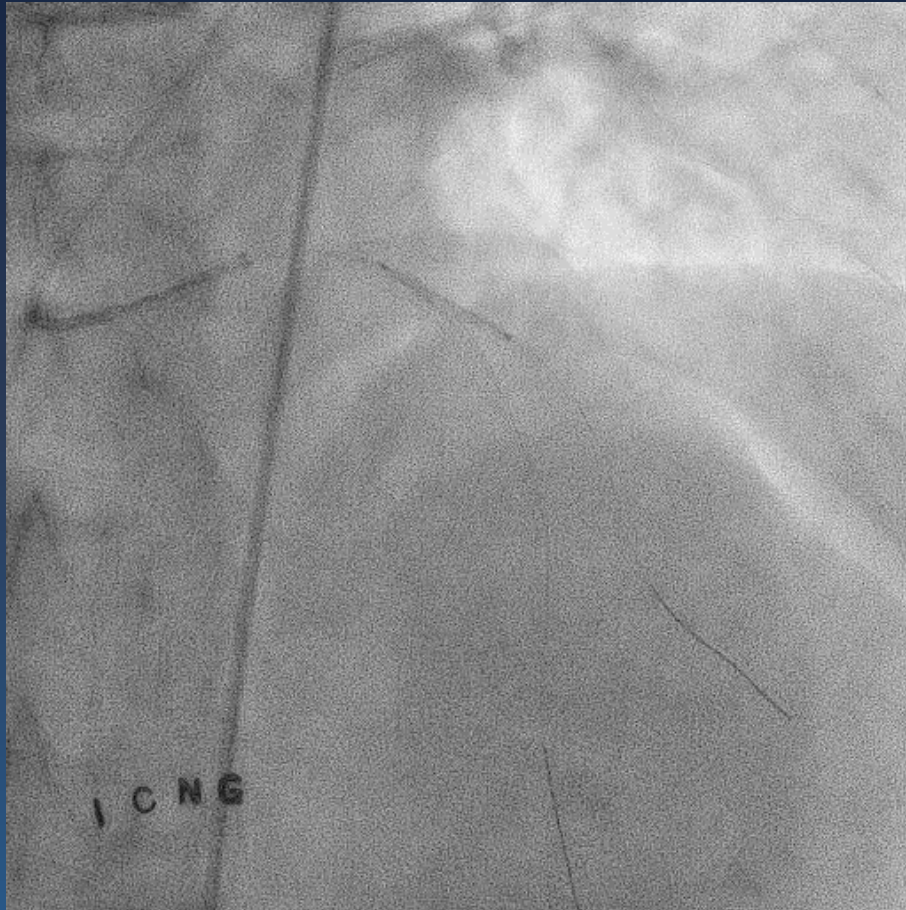


POBA to pLAD with Angiosculpt 2.5x15mm

DES implantation to pLAD with Xience Alpine 3.5x18mm upto 10atm(3.37)

Neon 2x20mm at Dg

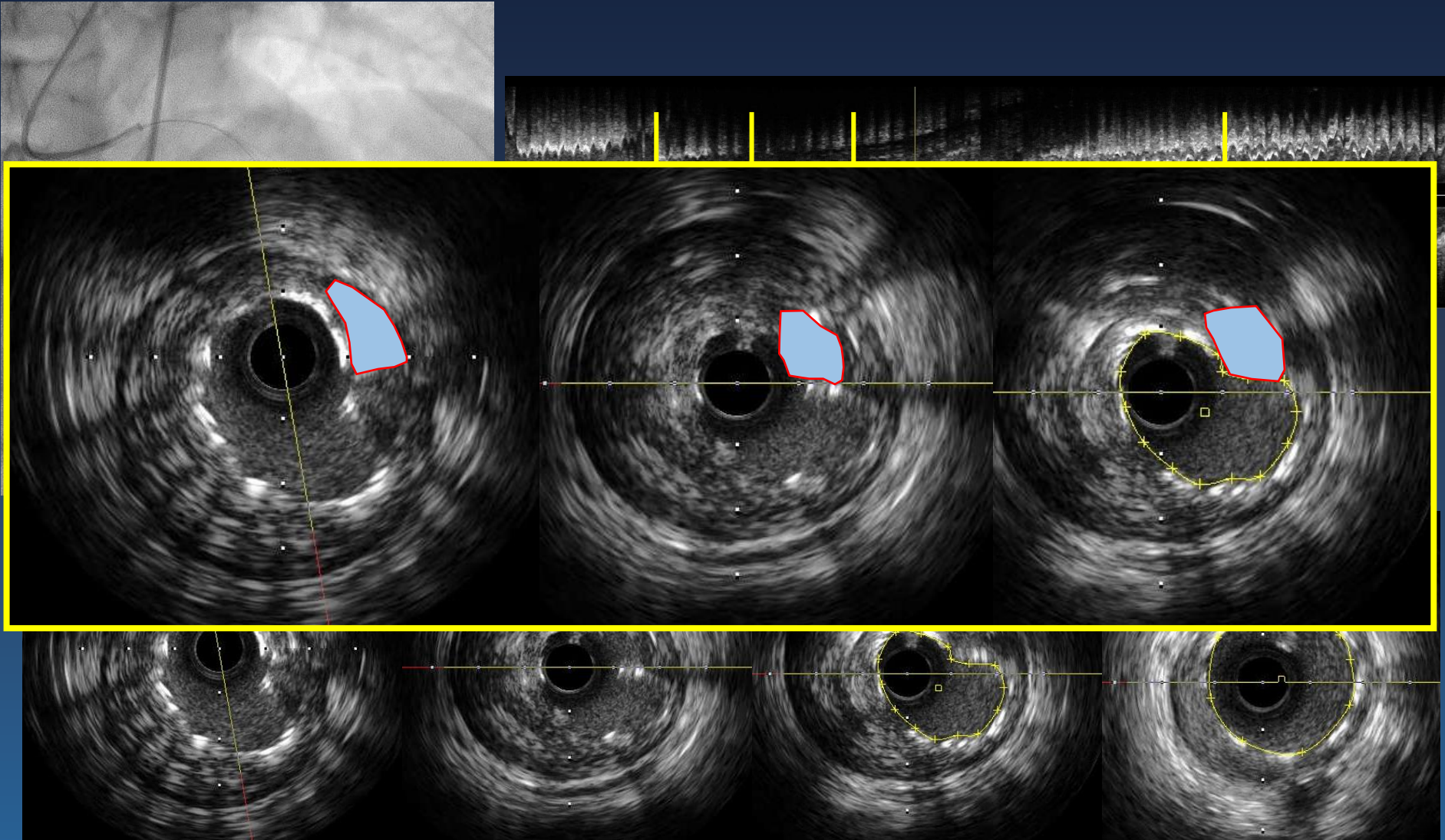
➤ PCI to LAD



Extraction of Neon 2x20mm at Dg after ballooning to nominal pressure

# Case Presentation

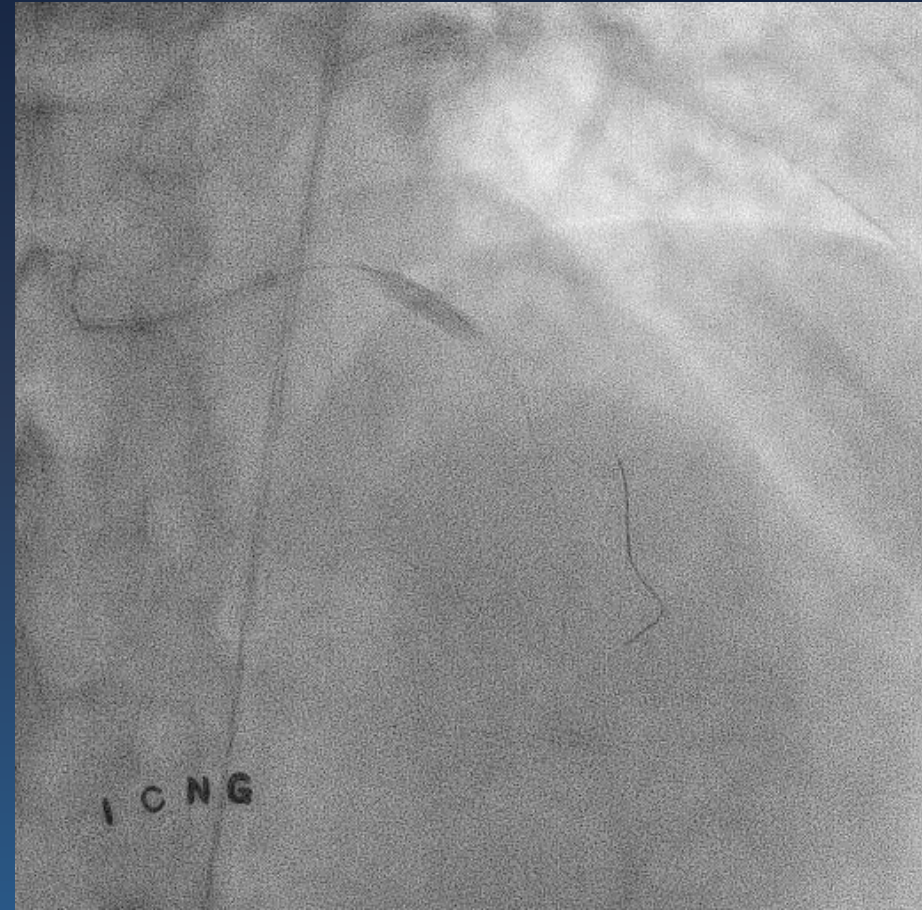
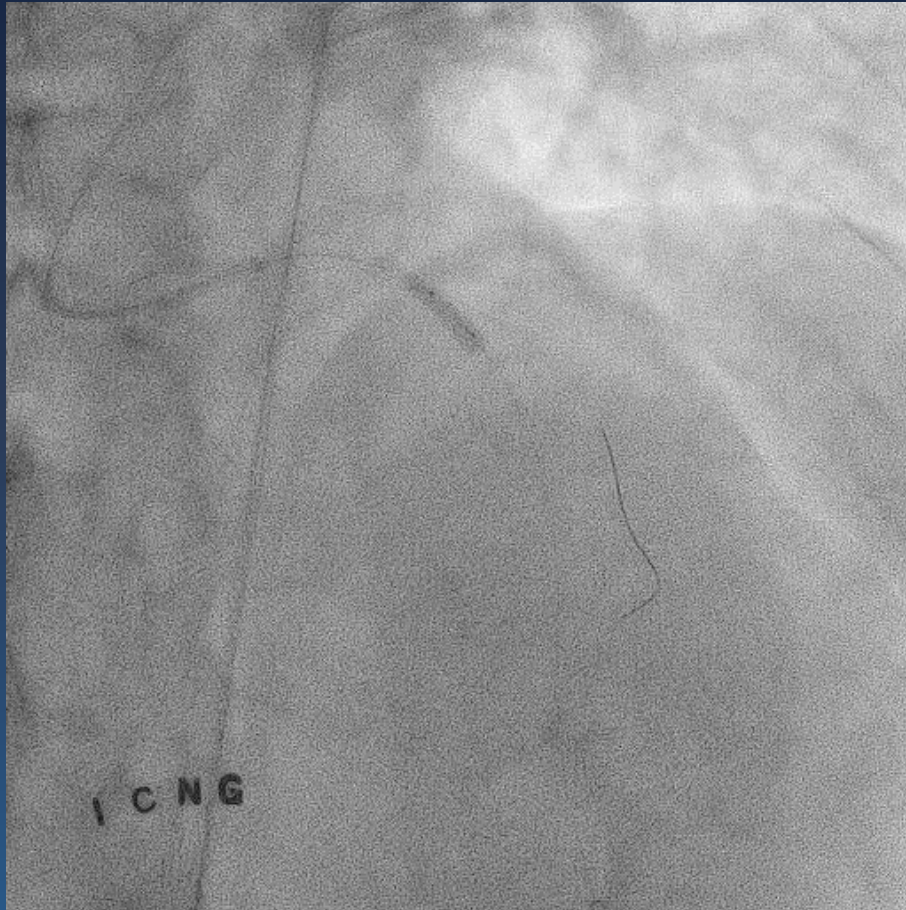
## ➤ Mid results with IVUS images



LA: 6.64mm<sup>2</sup>

# Case Presentation

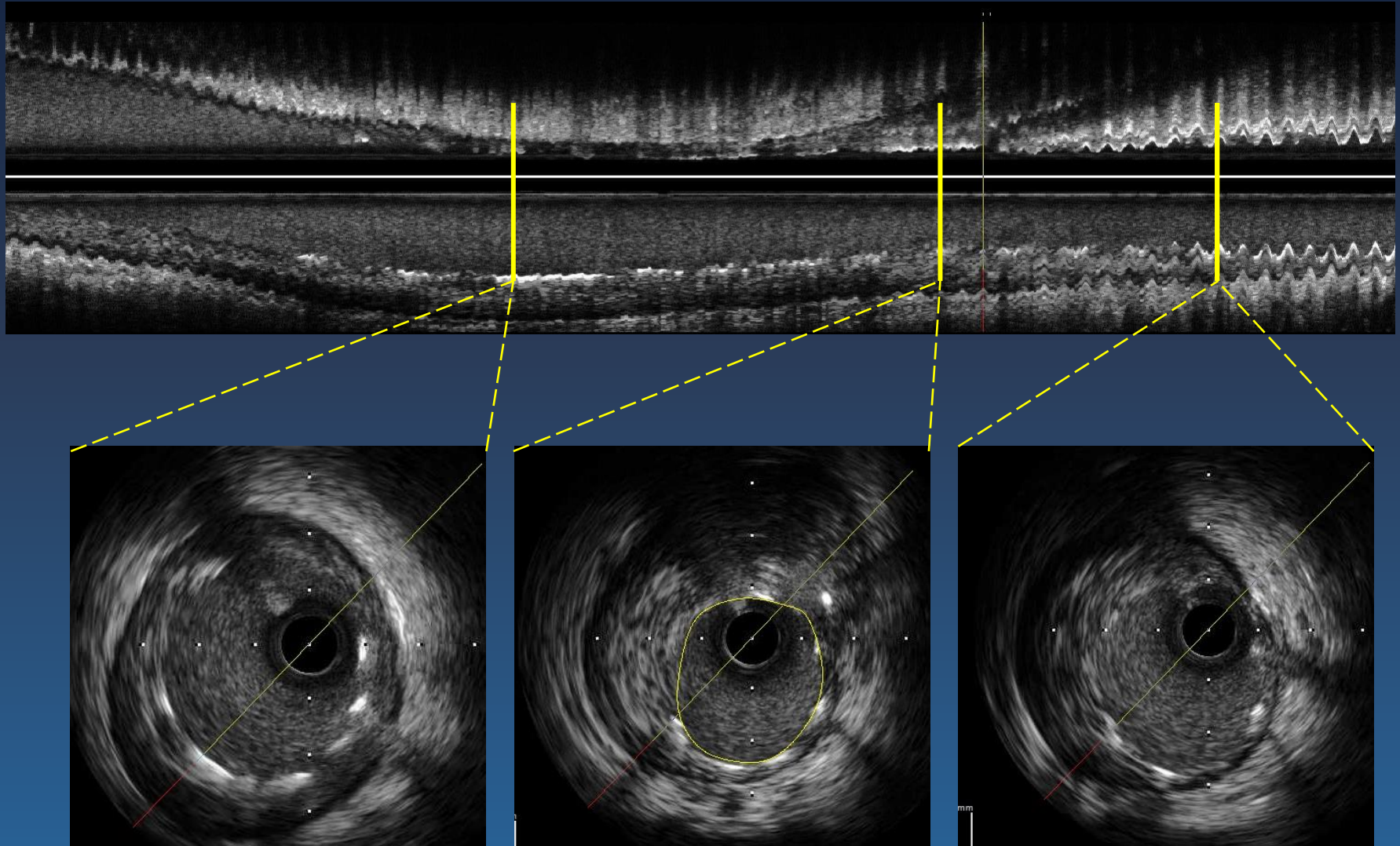
- Adjunctive ballooning to the LAD stent



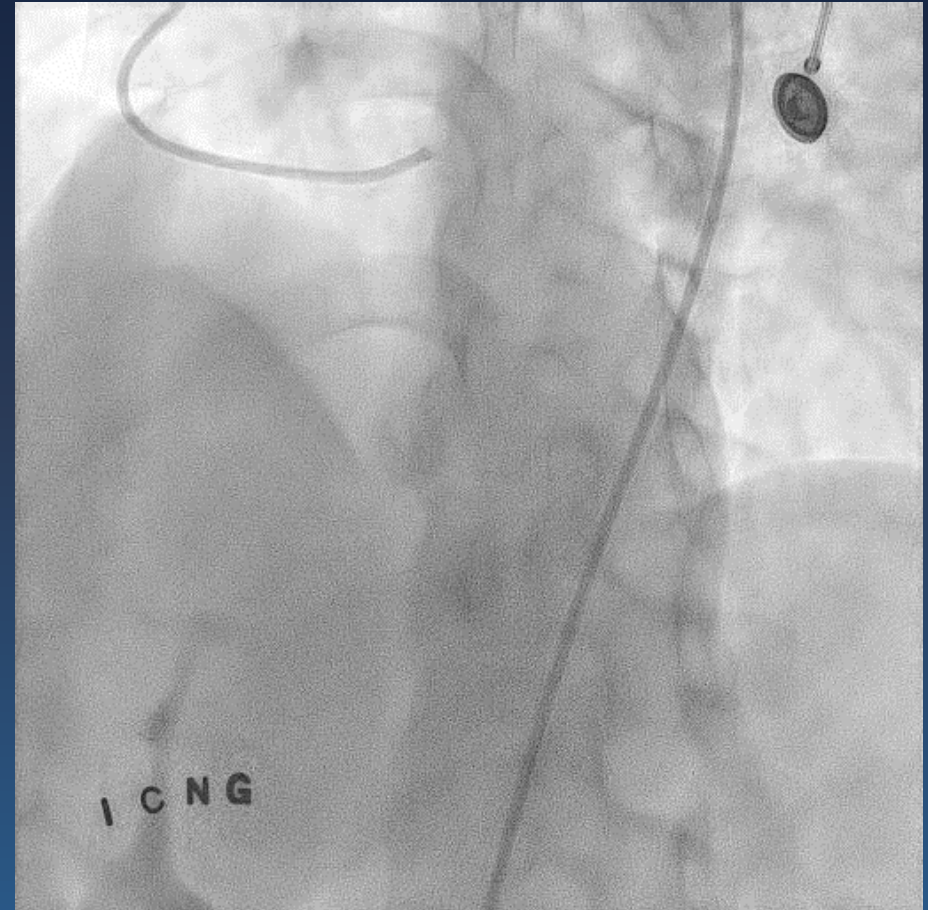
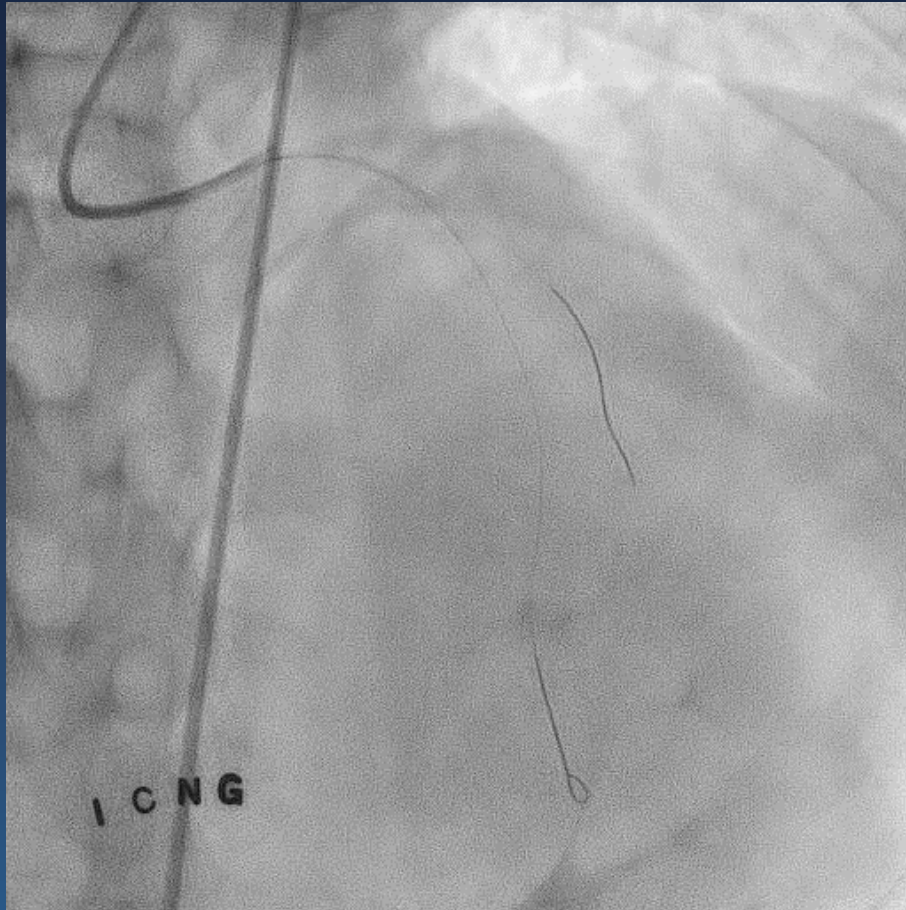
Adjunctive ballooning to pLAD with Genoss 3.5x10mm



## ➤ IVUS to LAD

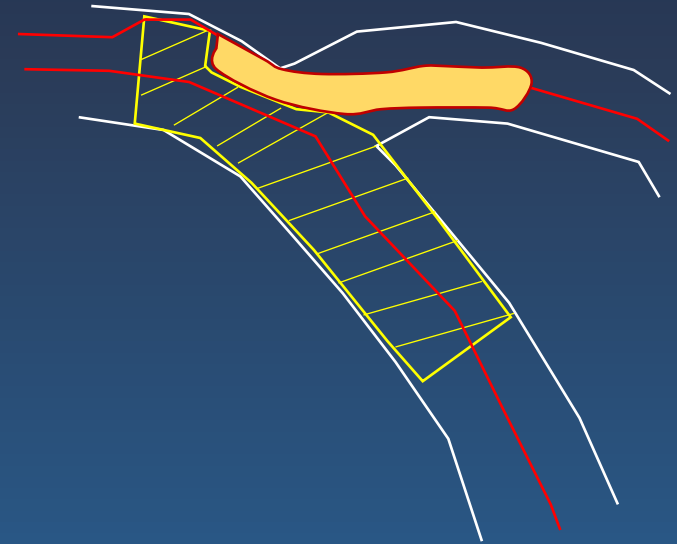


➤ Final CAG



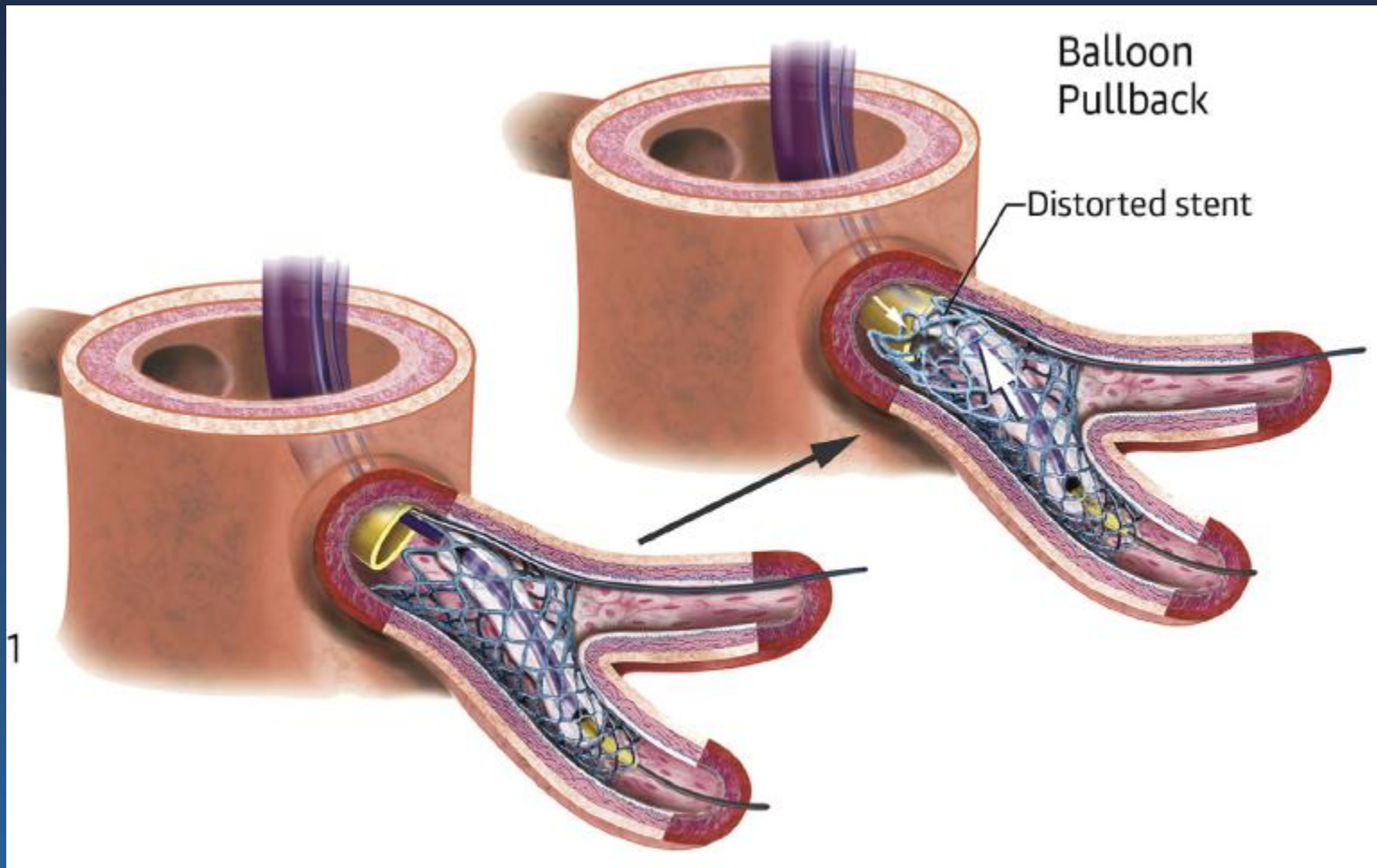
# Tips for the jailed balloon technique

- Jailed balloon location
  - The position of JB should be carefully adjusted as its proximal end is attaching to the main branch stent.
  - Less injury to the vessel and stent during balloon removal



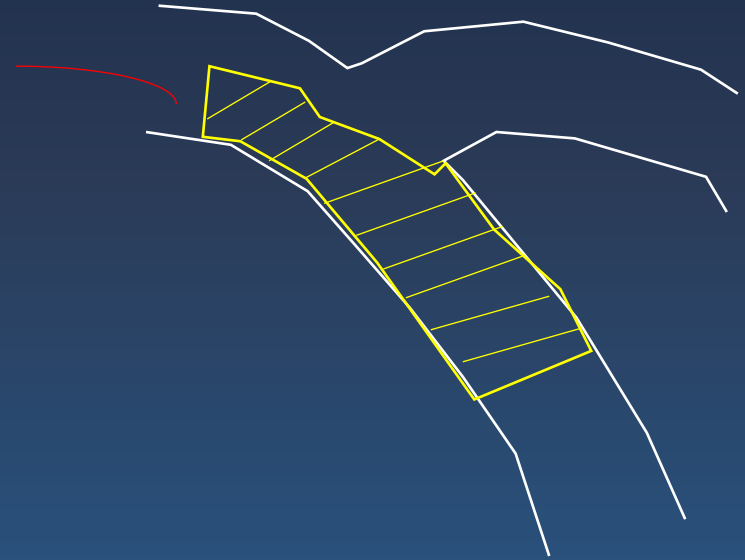
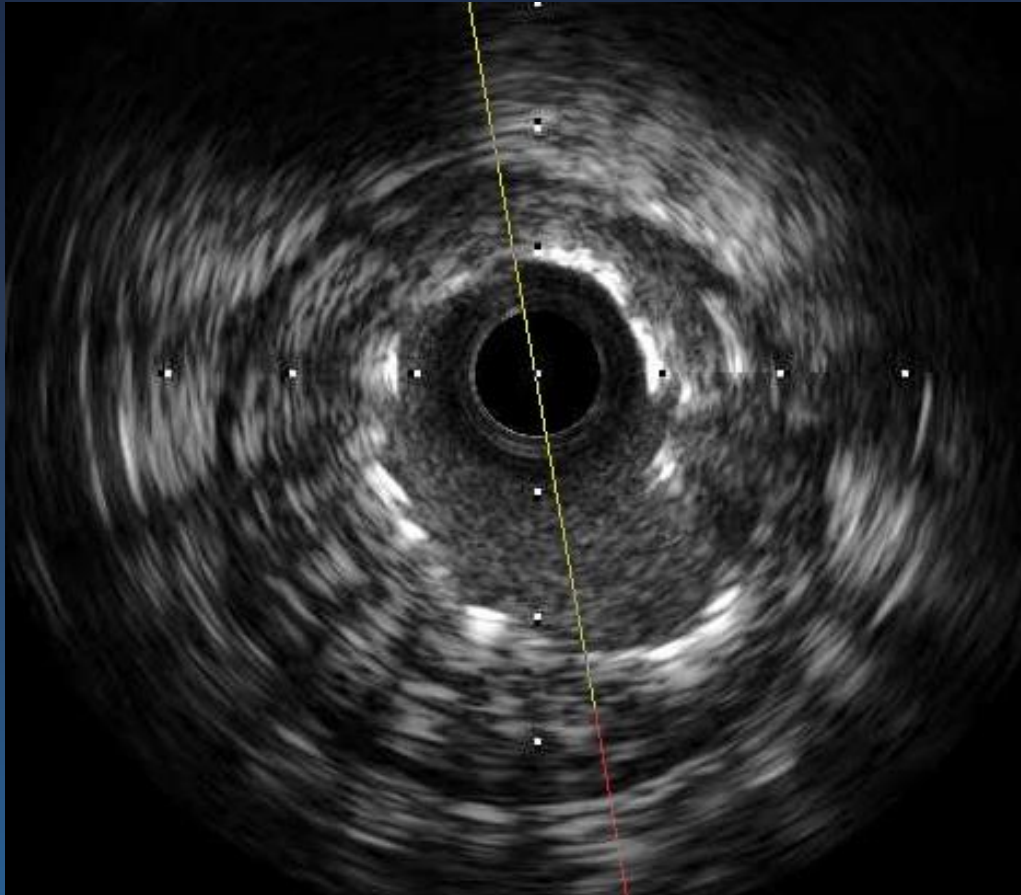
# Tips for the jailed balloon technique

- Cautious Jailed balloon removal
  - Pullback of the JB may attract the guiding catheter and damage the stent. Optimal control of the guide with the left hand is crucial.



# Tips for the jailed balloon technique

- Wire control
  - Once the MB stent is distorted rewiring may be risky



## Conclusion

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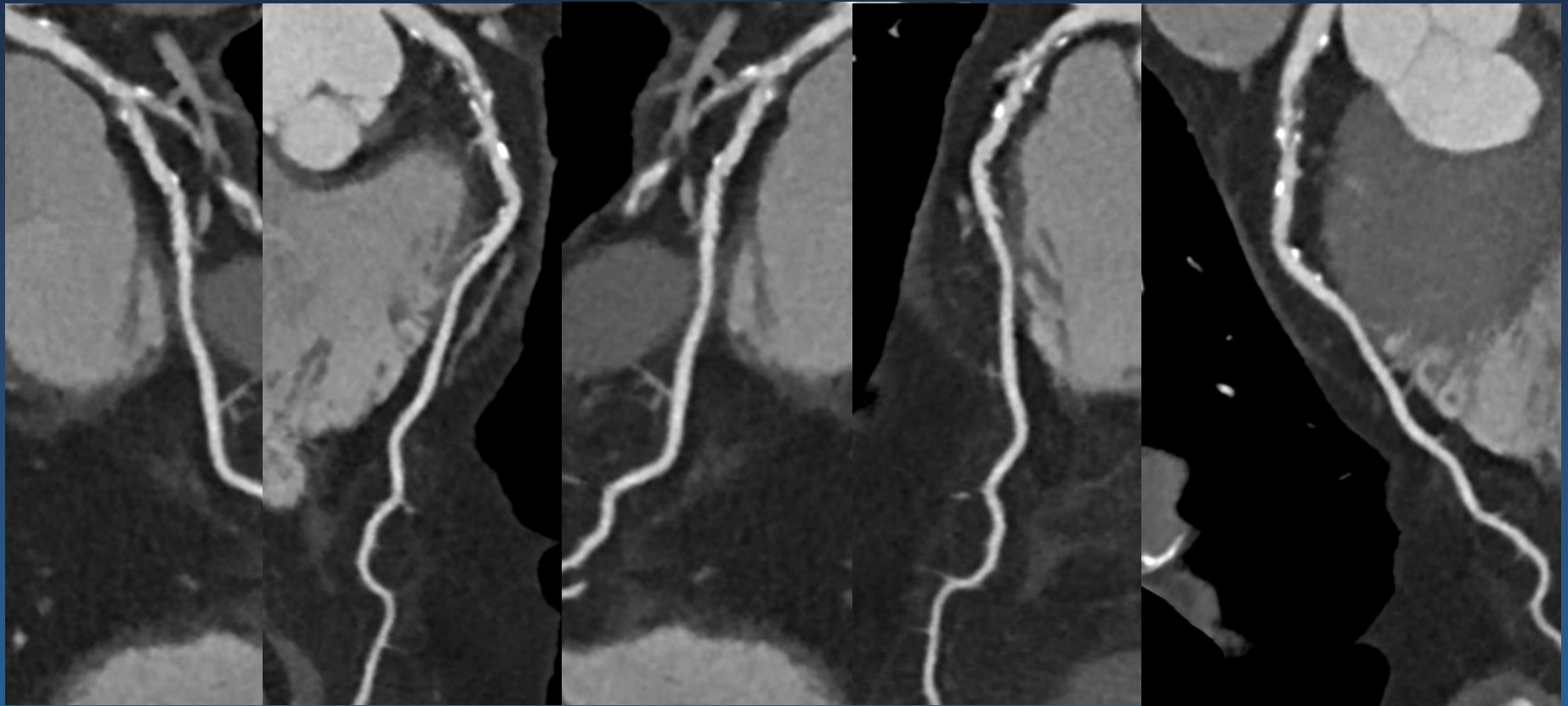
- Jailed techniques may be useful for preserving the SB
  - In relatively *small* bifurcation lesions  
(*not LM-LAD/LCX bifurcation lesions*)
  - Controlling the plaque shifting in the *anti-carina side* may be sufficient in these lesions. Carina shifting may not be so worrisome.
  - Rewiring may *not be needed*, or may be risky in these lesions
  - *Technical tips* should be remembered, and imaging device can help.

# Thank You For Your Attention

For any comments, questions, suggestions, please contact  
[medikang@gmail.com](mailto:medikang@gmail.com)

# Case Presentation – Other cases

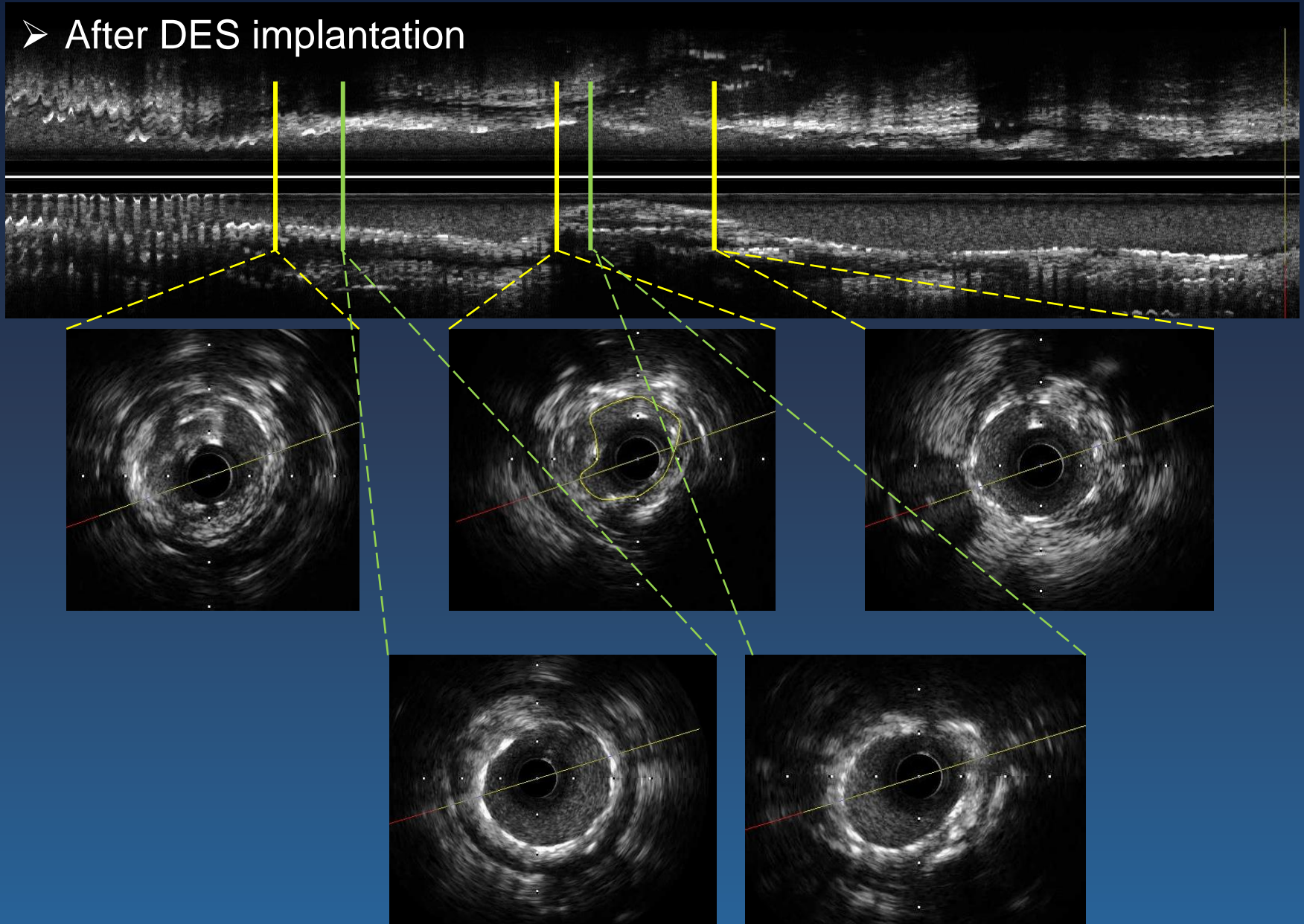
- Patient info
  - 47/M, exertional chest discomfort
  - CCTA: pLAD 70% stenosis with mixed plaque
  - EchoCG: LVEF 59%, RWMA (-)



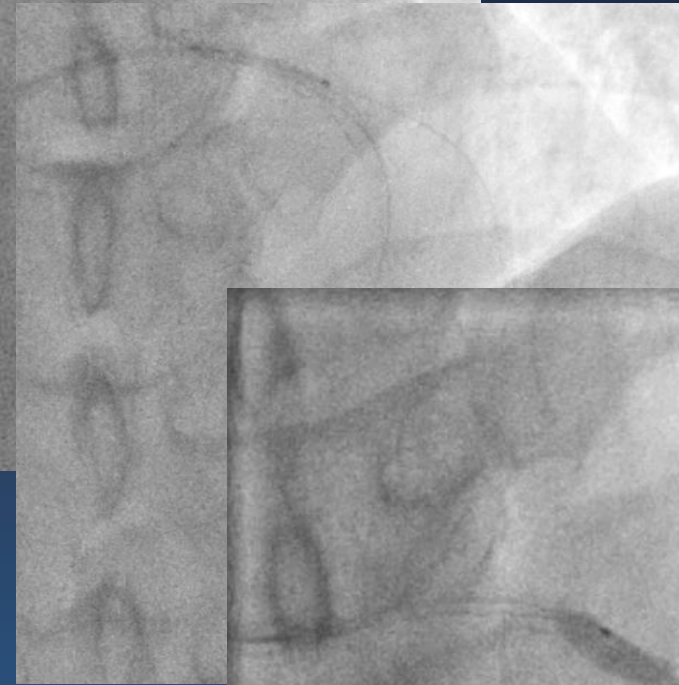
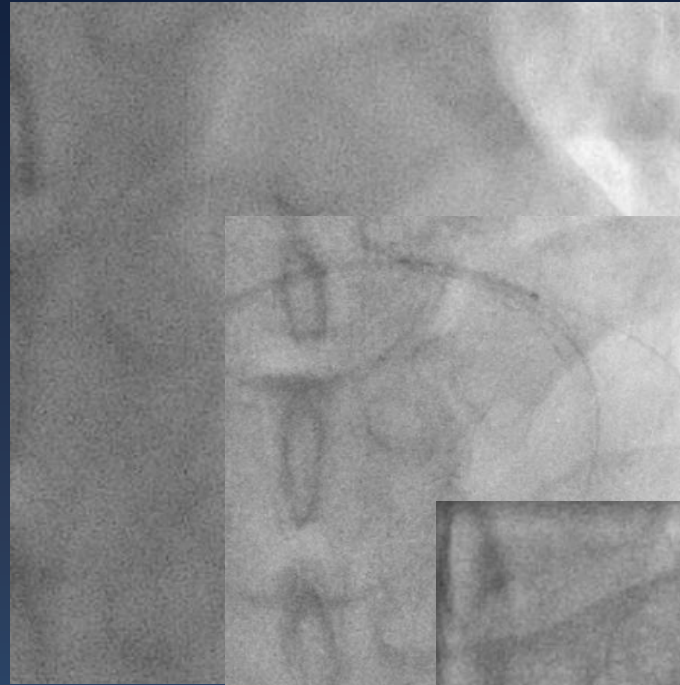
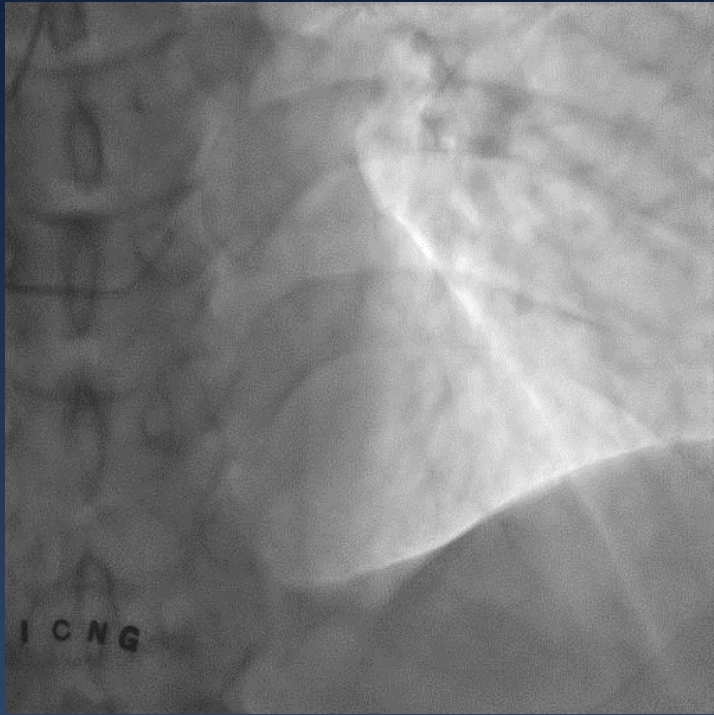


# Case Presentation – Other cases

➤ After DES implantation

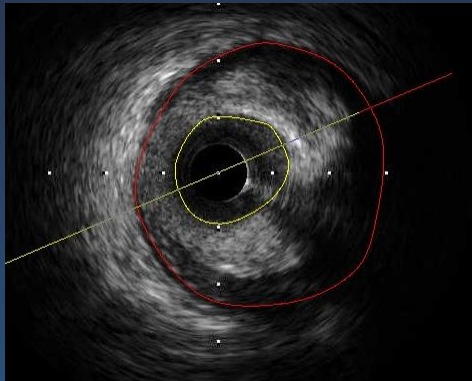
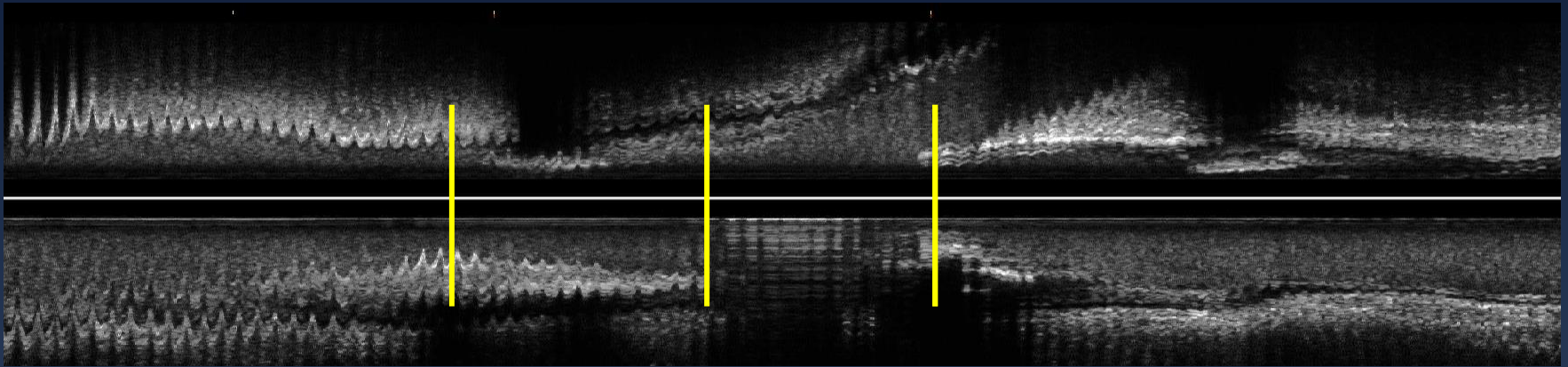


# Case Presentation – Other cases

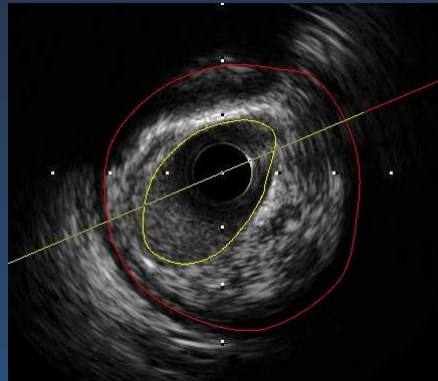


POBA to pLAD with Angiosculpt 2.5x15mm  
DES implantation to pLAD: Xience Alpine 3.5x28mm (10atm)  
Trek 2x20mm ballooning to Dg  
Adjunctive ballooning with Genoss 3.5\*22mm to LAD

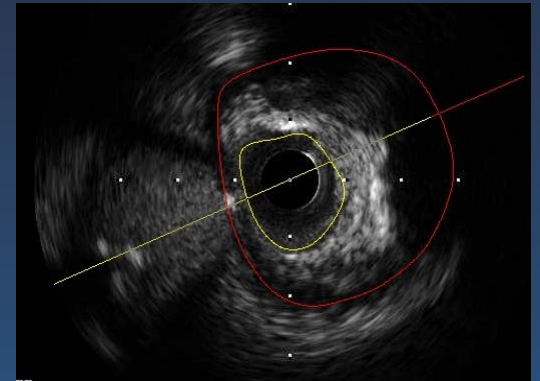
# Case Presentation – Other cases



LA: 2.84mm<sup>2</sup>  
VA: 15.67mm<sup>2</sup>  
PB 81.9%



LA: 4.05mm<sup>2</sup>  
VA: 16.53mm<sup>2</sup>  
PB 75.5%



LA: 2.59mm<sup>2</sup>  
VA: 13.98mm<sup>2</sup>  
PB 81.5%

- Mechanisms of SB deterioration: plaque shift and carina shift.
- impaired SB salvage is not successful in all the cases as testified by the 1.1% rate of SB occlusion observed in a recent trial
- jailed balloon in the SB during MV stenting might provide a useful tool to reduce plaque/carina shift due to its higher occupation of the SB ostium.
- MV post-dilation should be prepared before jailed balloon inflation to promptly re-appose the proximal MV stent struts. Furthermore, if jailed balloon inflation is not able to reopen the SB or creates major dissection, the space created by SB balloon dilation may theoretically be used for SB stenting according to an inverted “provisional crush” technique. All these possibilities should actually be considered speculative, as in our case series, jailed balloon inflation was performed only once. The major concerns about the jailed balloon technique are related to both the possible risk of balloon entrapment into the SB and to distortion/malapposition to the MV stent struts.

- if one eventually encounters difficulty in removing the balloon, we recommend not using force to avoid balloon damage, but to dilate the balloon in order to allow easier removal after deflation. To facilitate this rescue manoeuvre of disengaging the jailed balloon with a single inflation, we recommend a SB balloon length which is sufficient to exceed the proximal edge of the MV stent.
- post-dilation of the proximal part of the MV stent and final kissing inflation are recommended to ensure appropriate apposition of the stent struts to the vessel wall.
- maximal attention should be paid to the post-dilation phase and, in the case of any doubt of proximal edge dissection or incomplete stent expansion, IVUS evaluation is recommended

- The balloon inflation in SB can induce MB stent deformation in
- the proximal part of bifurcation. This deformation may lead to malapposition
- of stent strut to the arterial wall and difficulty in recrossing
- of a guidewire and/or balloon into SB.