BVS for Non-LM Bifurcations

# How to Do: OCT- or IVUS-Guided Optimization

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# Potential conflicts of interest

**Speaker's name: Corrado Tamburino**

✓ **I have the following** potential conflicts of interest to report:

Research contracts
☑ Consulting Medtronic, Abbott v, Edwards, Boston Sc.
Employment in industry
Stockholder of a healthcare company
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Other(s)

**I do not have any potential conflict of interest**

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# Intravascular imaging-guided BVS Bifurcation PCI

1. Vessel diameters assessment
2. Calcium-distribution assessment to decide PCI strategy
3. Assessment after BVS+POT to guide further procedure steps

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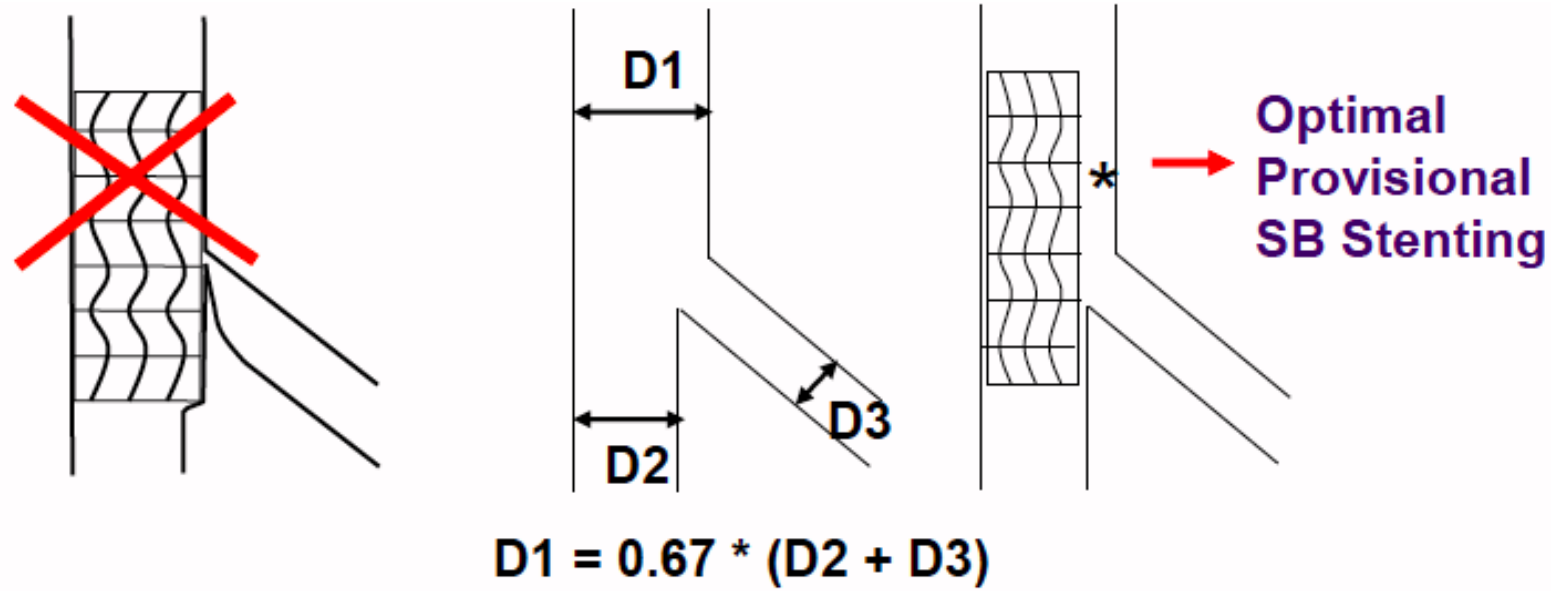
# Relations between vessel diameters




- In case of metallic DES, the MV stent should be sized according to the distal MV RVD, and should allow for expansion to the prox RVD.
- **In case of BVS, this latter could be sized according to the prox RVD and implanted at low pressure.**



Lassen J, et al. EuroIntervention 2014;10:545-560

# Relations between vessel diameters based on the Huo and Kassab relation

| Diameter of smaller daughter vessel | Diameter of larger daughter vessel (in terms of the main stent sizes in use) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (mm) | 2.25 | 2.50 | 2.75 | 3.00 | 3.25 | 3.50 | 3.75 | 4.00 |
| 2.25 | 3.03 | 3.20 | 3.39 | 3.58 | 3.78 | 3.99 | 4.20 | 4.42 |
| | Δ=0.78 | Δ=0.70 | Δ=0.64 | Δ=0.58 | Δ=0.53 | Δ=0.49 | Δ=0.45 | Δ=0.42 |
| 2.50 | | 3.36 | 3.54 | 3.72 | 3.91 | 4.11 | 4.32 | 4.53 |
| | | Δ=0.86 | Δ=0.79 | Δ=0.72 | Δ=0.66 | Δ=0.61 | Δ=0.57 | Δ=0.53 |
| 2.75 | | | 3.70 | 3.87 | 4.06 | 4.25 | 4.44 | 4.64 |
| | | | Δ=0.95 | Δ=0.87 | Δ=0.81 | Δ=0.75 | Δ=0.69 | Δ=0.64 |
| 3.00 | | | | 4.04 | 4.21 | 4.39 | 4.58 | 4.77 |
| | | | | Δ=1.04 | Δ=0.96 | Δ=0.89 | Δ=0.83 | Δ=0.77 |
| 3.25 | | | | | 4.37 | 4.55 | 4.73 | 4.91 |
| | | | | | Δ=1.12 | Δ=1.05 | Δ=0.98 | Δ=0.91 |
| 3.50 | | | | | | 4.71 | 4.88 | 5.06 |
| | | | | | | Δ=1.21 | Δ=1.13 | Δ=1.06 |
| 3.75 | | | | | | | 5.05 | 5.22 |
| | | | | | | | Δ=1.30 | Δ=1.22 |
| 4.00 | | | | | | | | 5.38 |
| | | | | | | | | Δ=1.38 |

The red and blue colours represent the diameter of mother segment and stepwise difference, respectively.



Lassen J, et al. EuroIntervention 2014;10:545-560

# Intravascular imaging-guided BVS Bifurcation PCI

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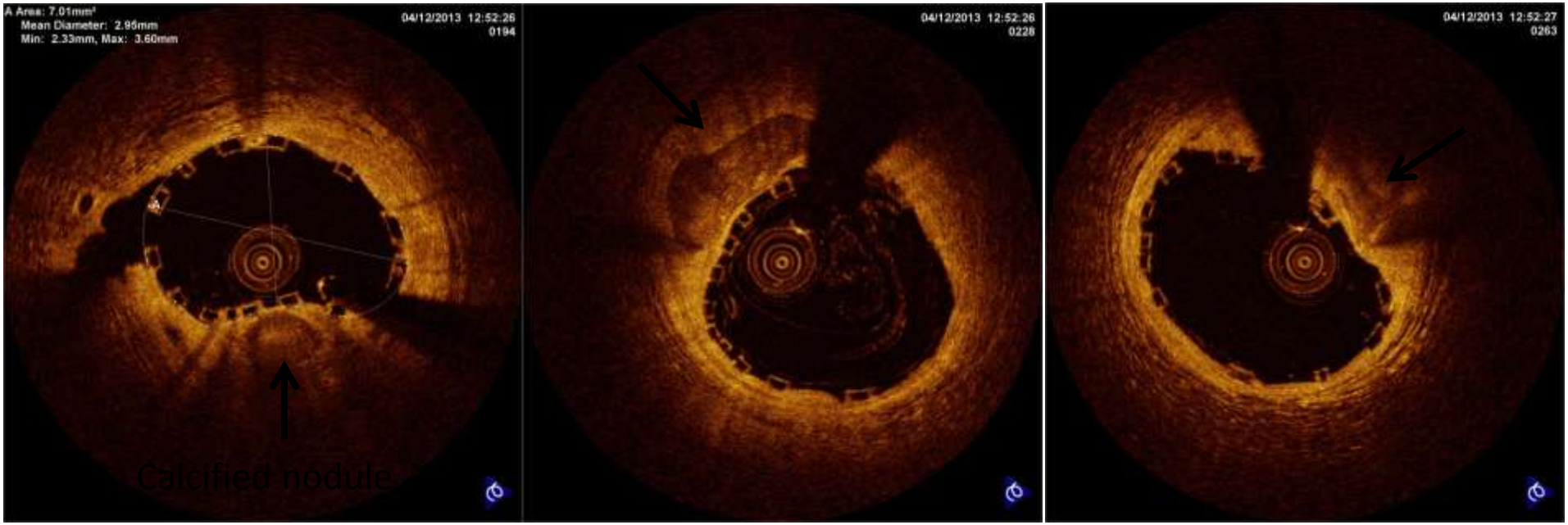
2. Calcium-distribution assessment to decide PCI strategy
3. Assessment after BVS+POT to guide further procedure steps

# Despite high pressure of implantation and post-dilation, calcified plaques pose an obstacle to proper scaffold expansion



# Intravascular imaging-guided BVS Bifurcation PCI

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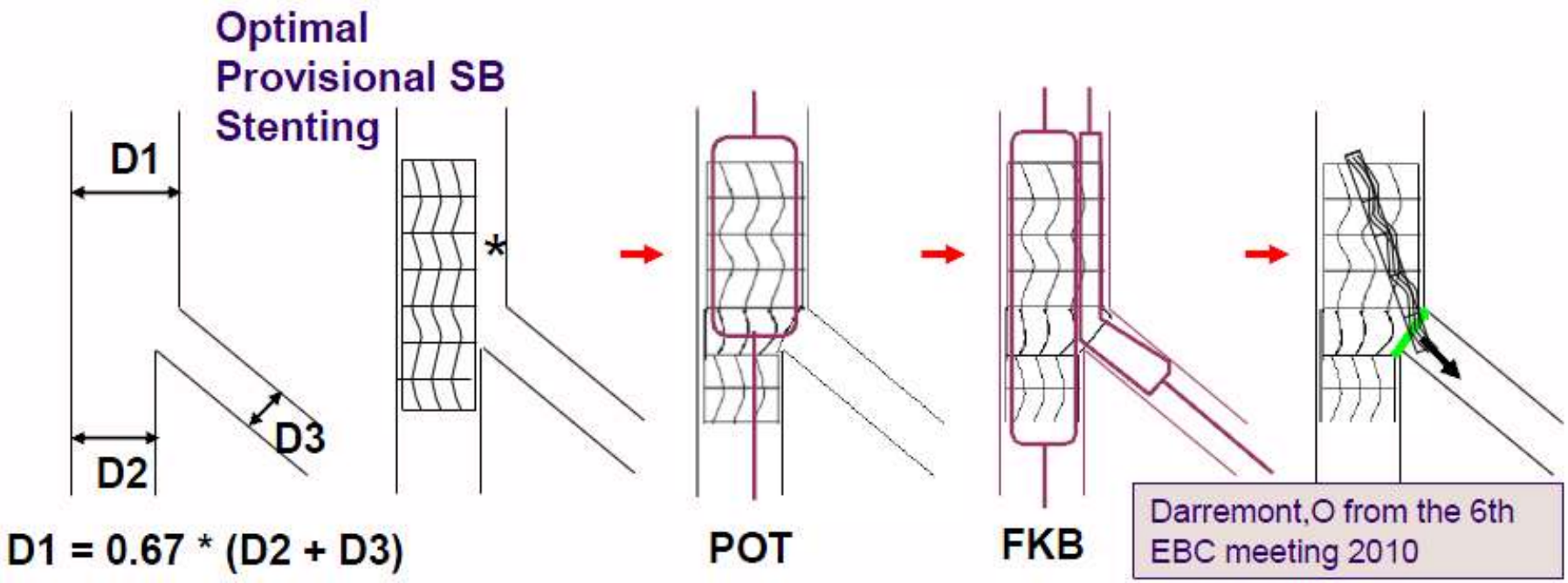
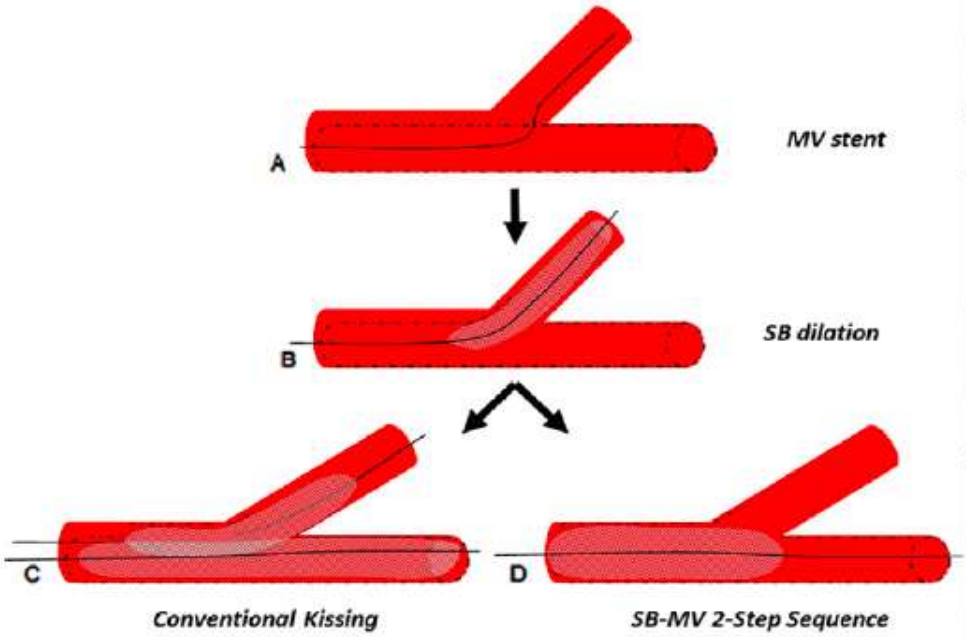
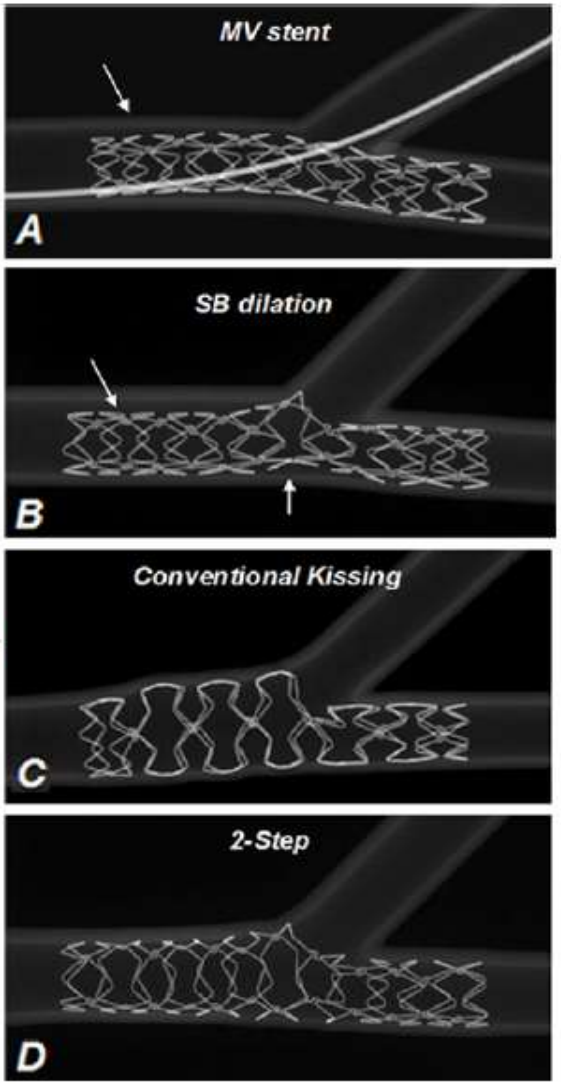
# Proximal optimisation technique (POT)




- Ensures adequate stent apposition in the proximal MV.
- Produces curved expansion of the stent at the carena and facilitates recrossing, distal recrossing, kissing inflations and ostial stent coverage of the SB.

# Alternatives to kissing balloon




This optimised sequence including POT showed favourable results compared to KBD in bench testing and modelling with metallic DES



Foin N et al. J Am Coll Cardiol Intv 2012;5:47–56

# BVS post-dilatation sequential strategy proposed by the EBC

- POT restricted to non-compliant (NC) balloon 0.5 mm larger than the reference using the Absorb BRS
- SB opening if compromised after the POT
- Final POT

GHOST

# Ferrarotto Population Bifurcations subgroup

**68 patients treated with BVS in bifurcation up to June 2014**
**6-months Follow-up available in 97.1%;**
**1-year follow-up available in 86.8%;**

# Ferrarotto Population
# Lesions and procedural characteristics of the bifurcations subgroup

| Variable | Lesions (N = 68) |
|---|---|
| True bifurcation | 35 (51.5%) |
| 2-BVS technique | 12 (17.6%) |
| Mini-crush | 7 |
| V-stenting | 3 |
| T-stenting | 1 |
| Culotte | 1 |
| 2-stent Hybrid | 5 (7.4%) |
| Provisional stenting | 51 (75%) |

| Variable | Lesions (N = 68) |
|---|---|
| Predilatation MB | 61 (89.7%) |
| Predilatation SB | 21 (30.9%) |
| Post-dilatation MB | 45 (66.2%) |
| Post-dilatation SB | 14 (20.6%) |
| Kissing balloon | 22 (32.4%) |
| OCT use | 20 (29.4%) |
| IVUS use | 5 (7.4%) |

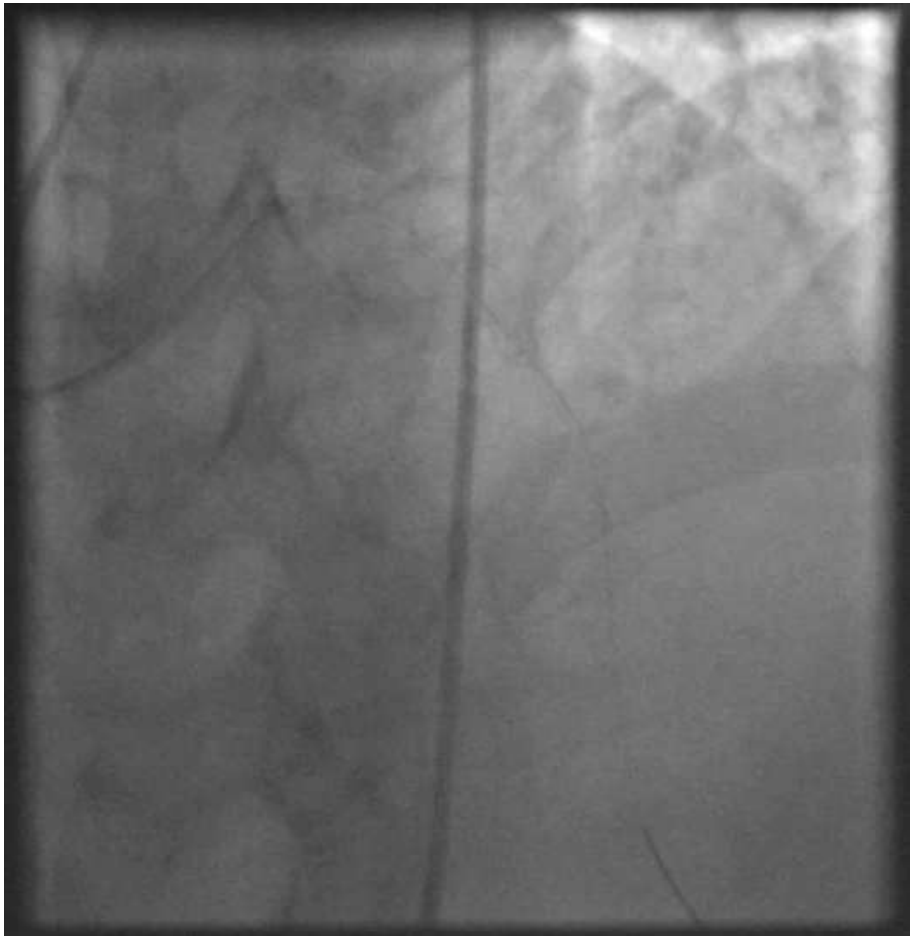
# Ferrarotto Population Outcomes the bifurcations subgroup

**Over 1 year:**

- 1 (1.5%) acute (1h after PCI) thrombosis in a patient with no periprocedural DAPT (no OCT/IVUS performed).
- 2 (2.9%) TLRs presenting with silent ischemia.
- No events occurred in those treated with 2-BVS technique.

# Case #1
# Treatment of coronary bifurcation with provisional BVS technique

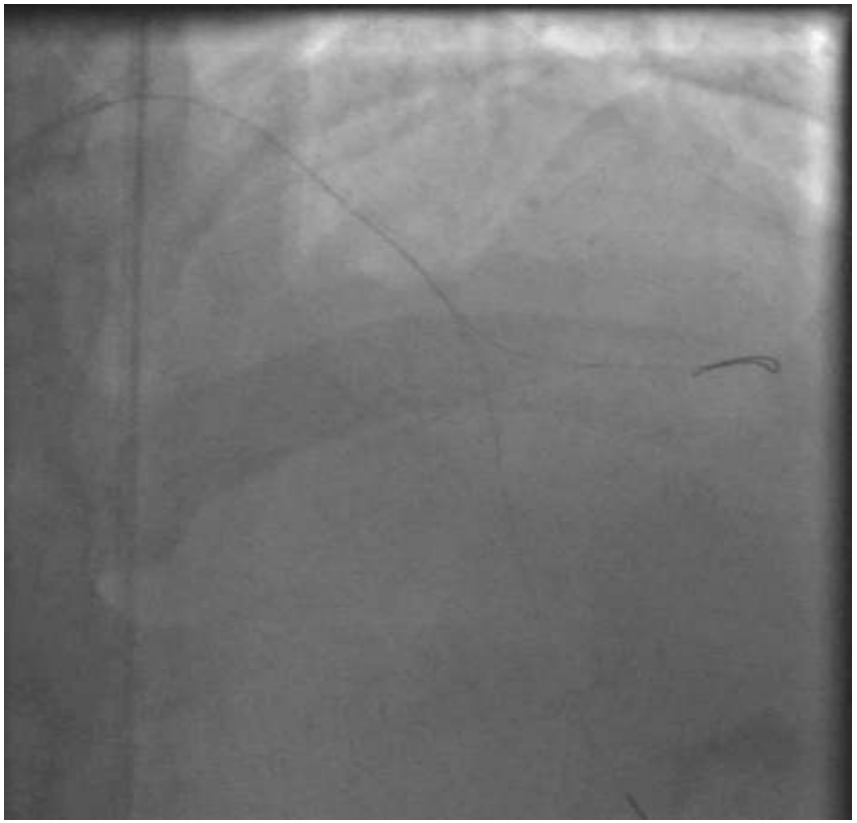
# Provisional stenting with BVS Baseline



# Provisional stenting with BVS
# Result post-implantation

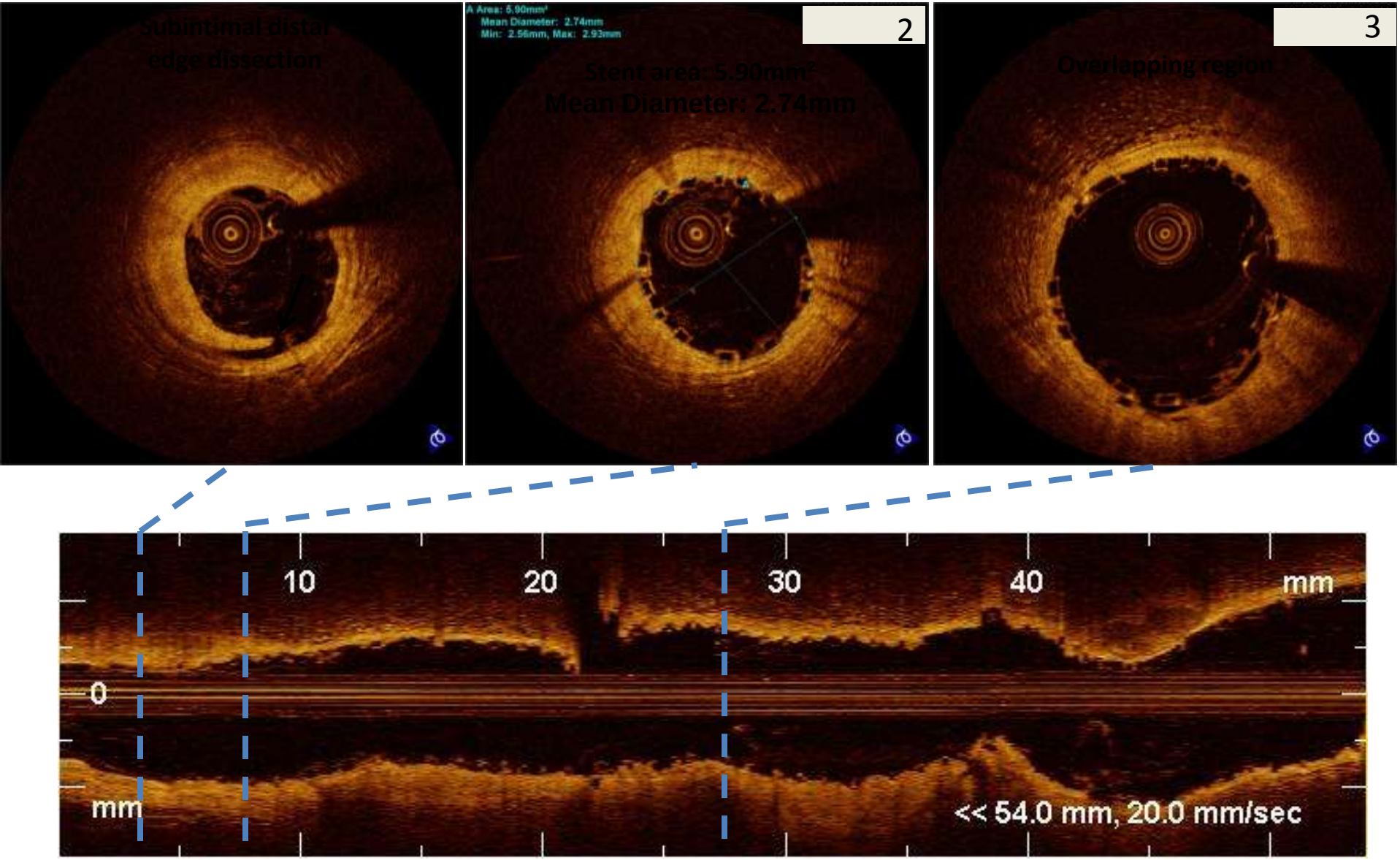
**Procedure steps:**

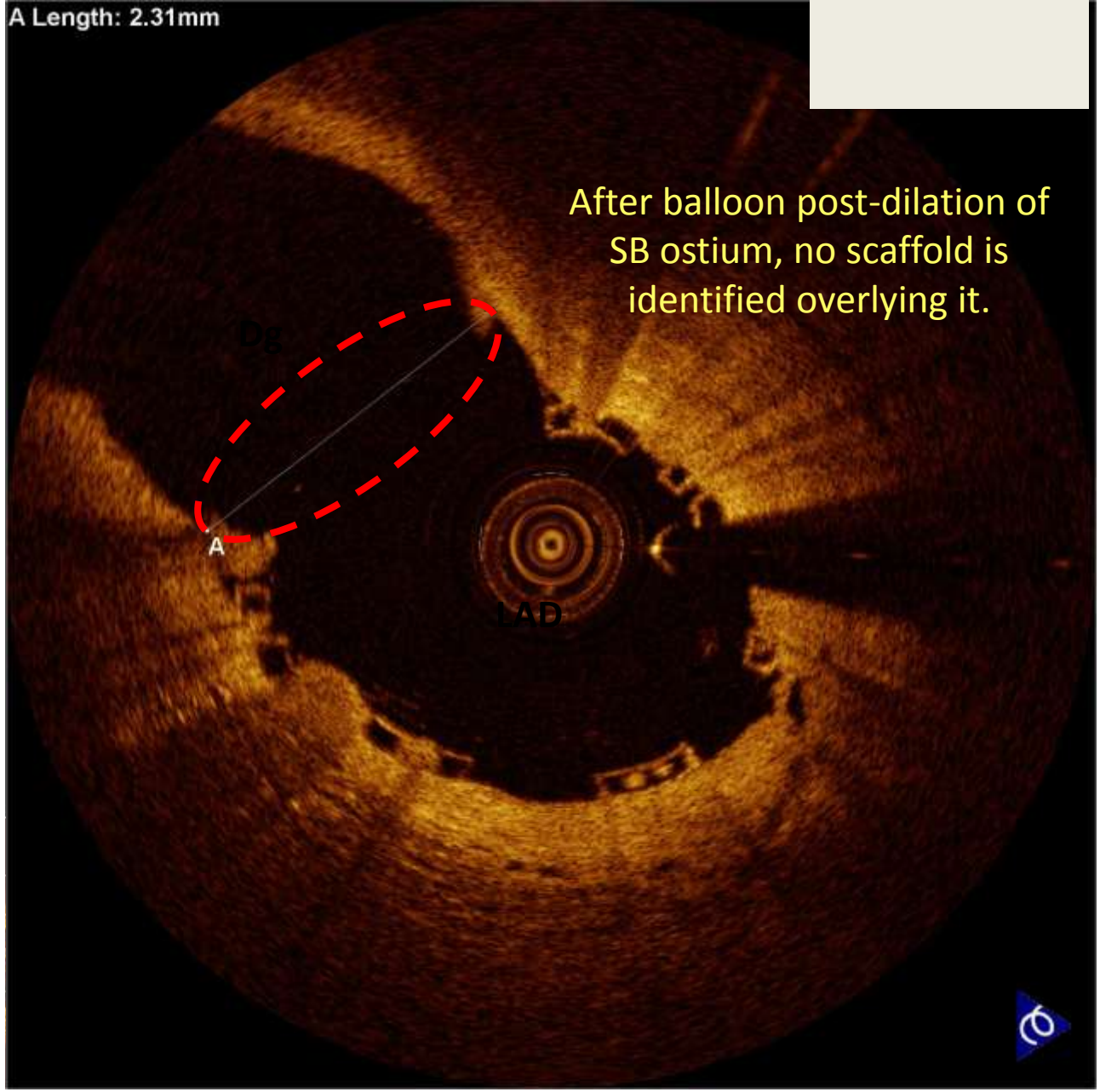
- Predilatation of MV and SB;
- Implantation of a MV 3.0/28 BVS at the bifurcation at 10 atm, and 3.5/18 mm more prox in OVL;
- SB post-dilatation with 2.0 balloon
- POT with 3.5 balloon
- OCT to assess SB opening, BVS expansion in the distal MV and apposition in the prox MV



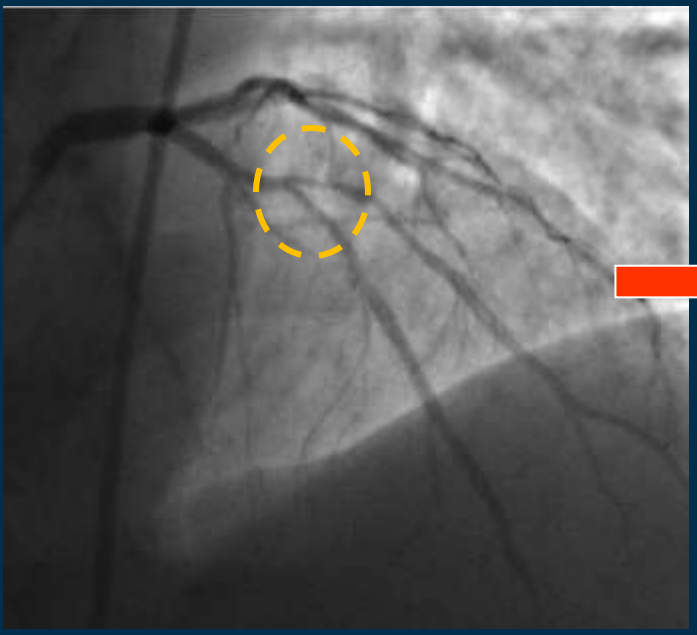
Routine Kissing balloon not recommended

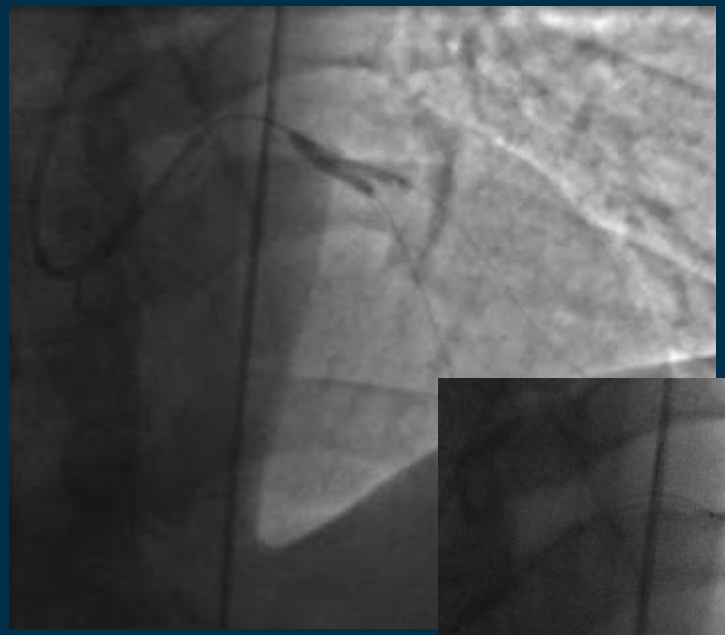
# Provisional stenting with BVS result post-implantation

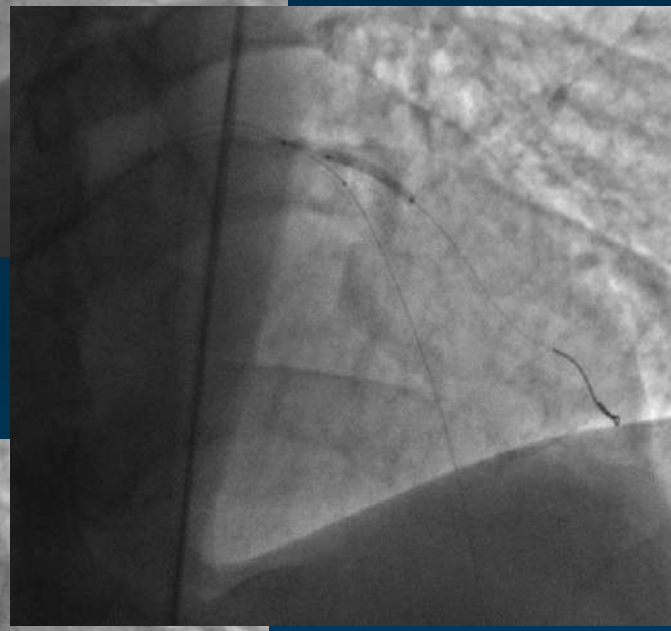



A Length: 2.31mm
After balloon post-dilation of SB ostium, no scaffold is identified overlying it.
Dg
A
LAD

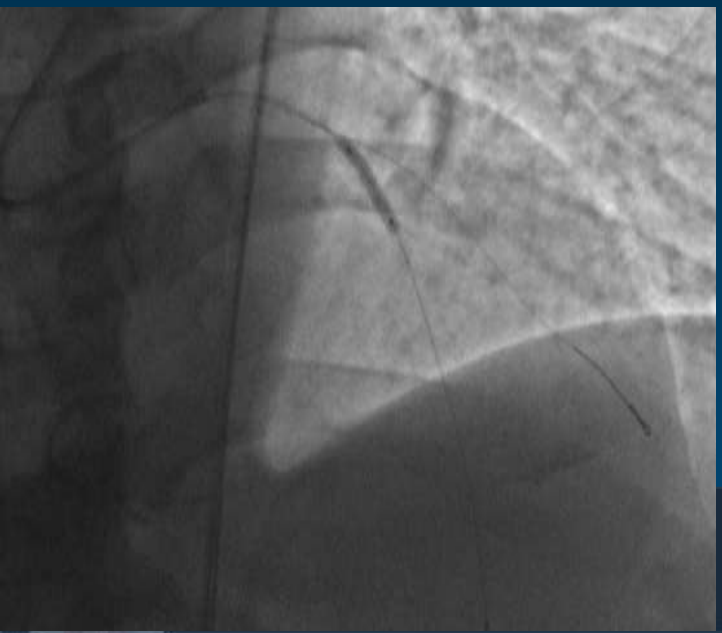
# Case #2
# Treatment of coronary bifurcation with mini-crush technique utilizing BVS.

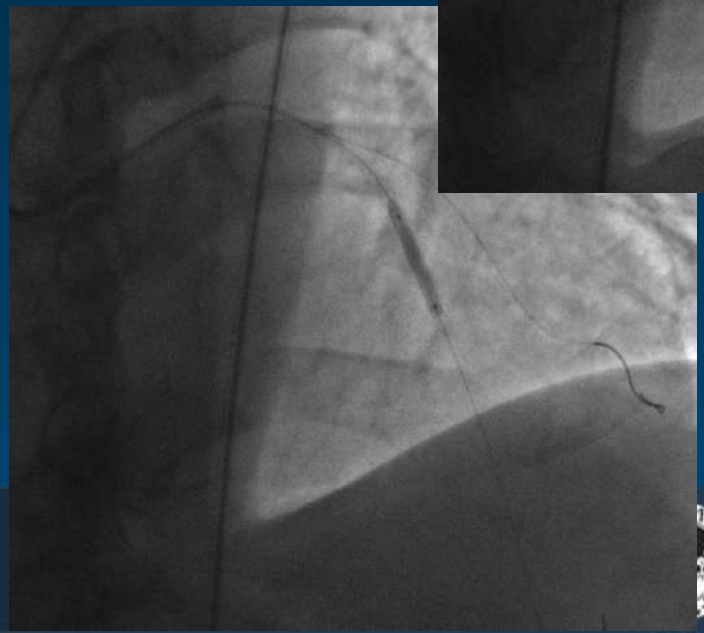


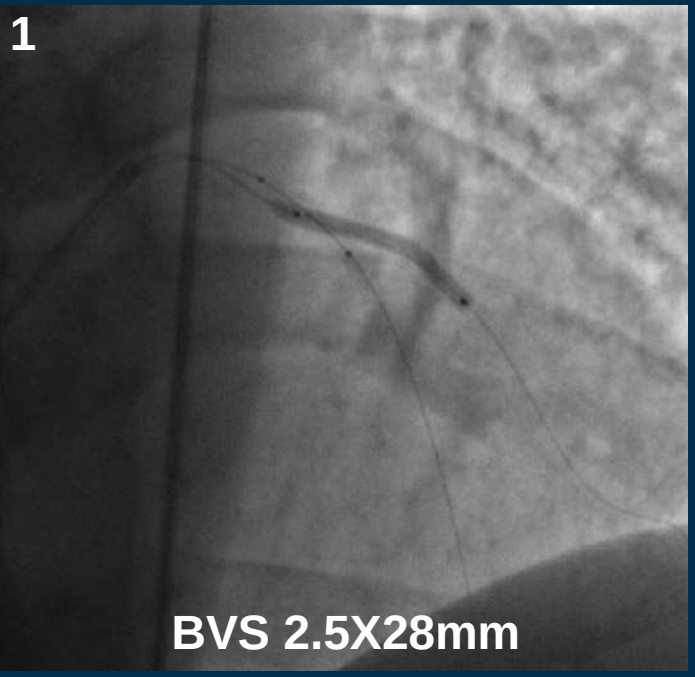




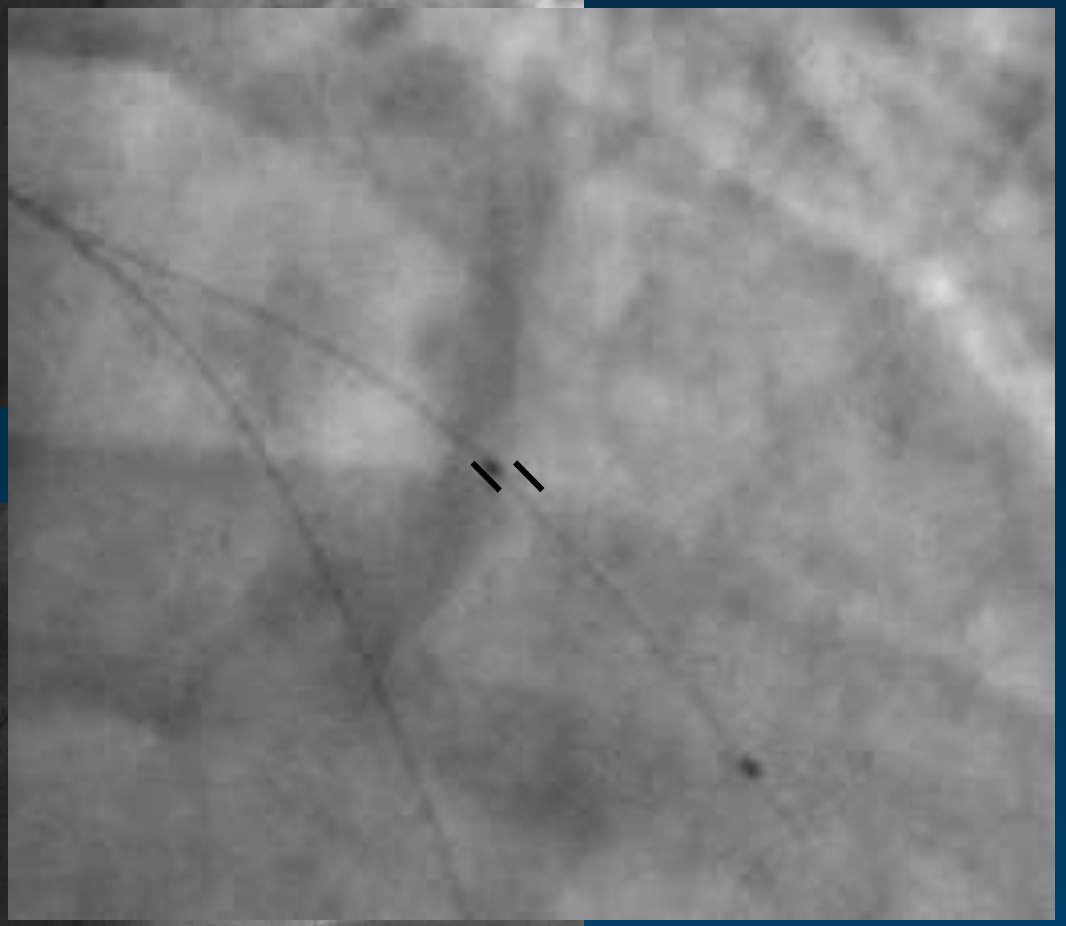
**Lesion Preparation: Sprinter SC**
**2.5 and 3.0 x 20 mm**

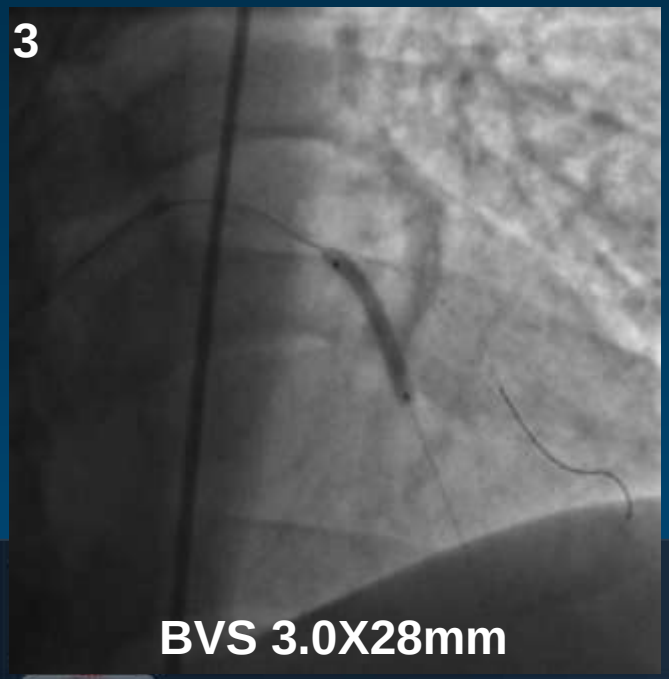





1
BVS 2.5X28mm

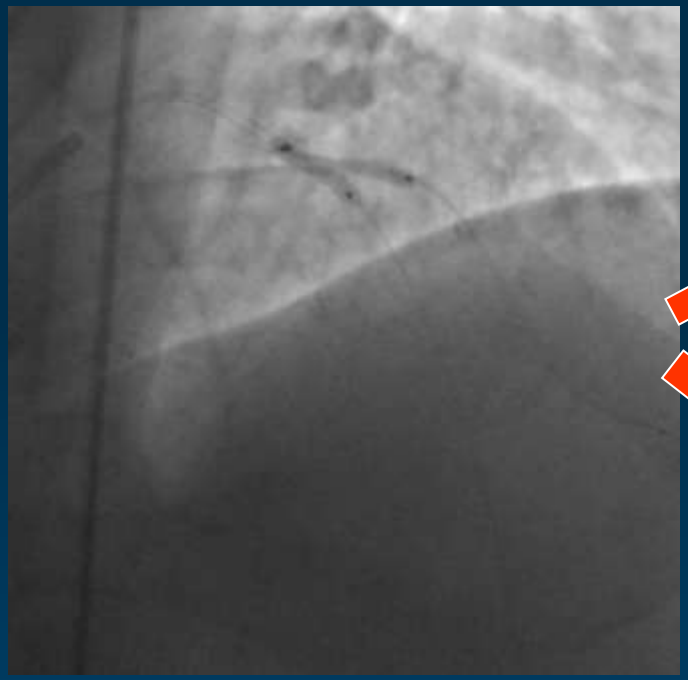

2



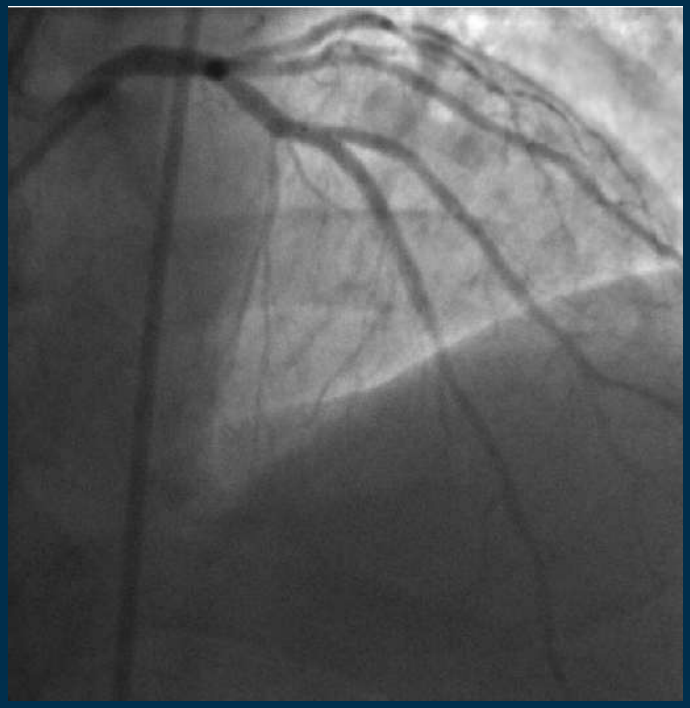

3
BVS 3.0X28mm


4
BVS 3.5X18mm

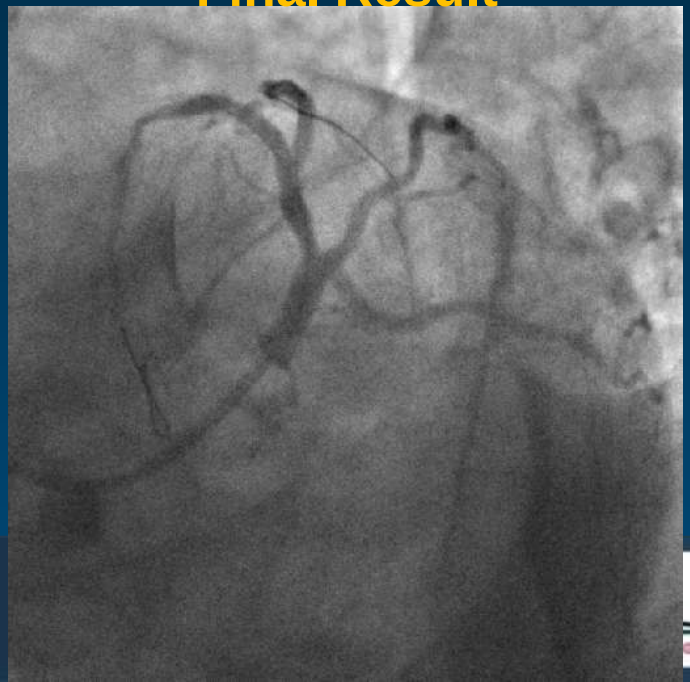
## Sprinter NC 3.0x12mm and 2.5x20mm

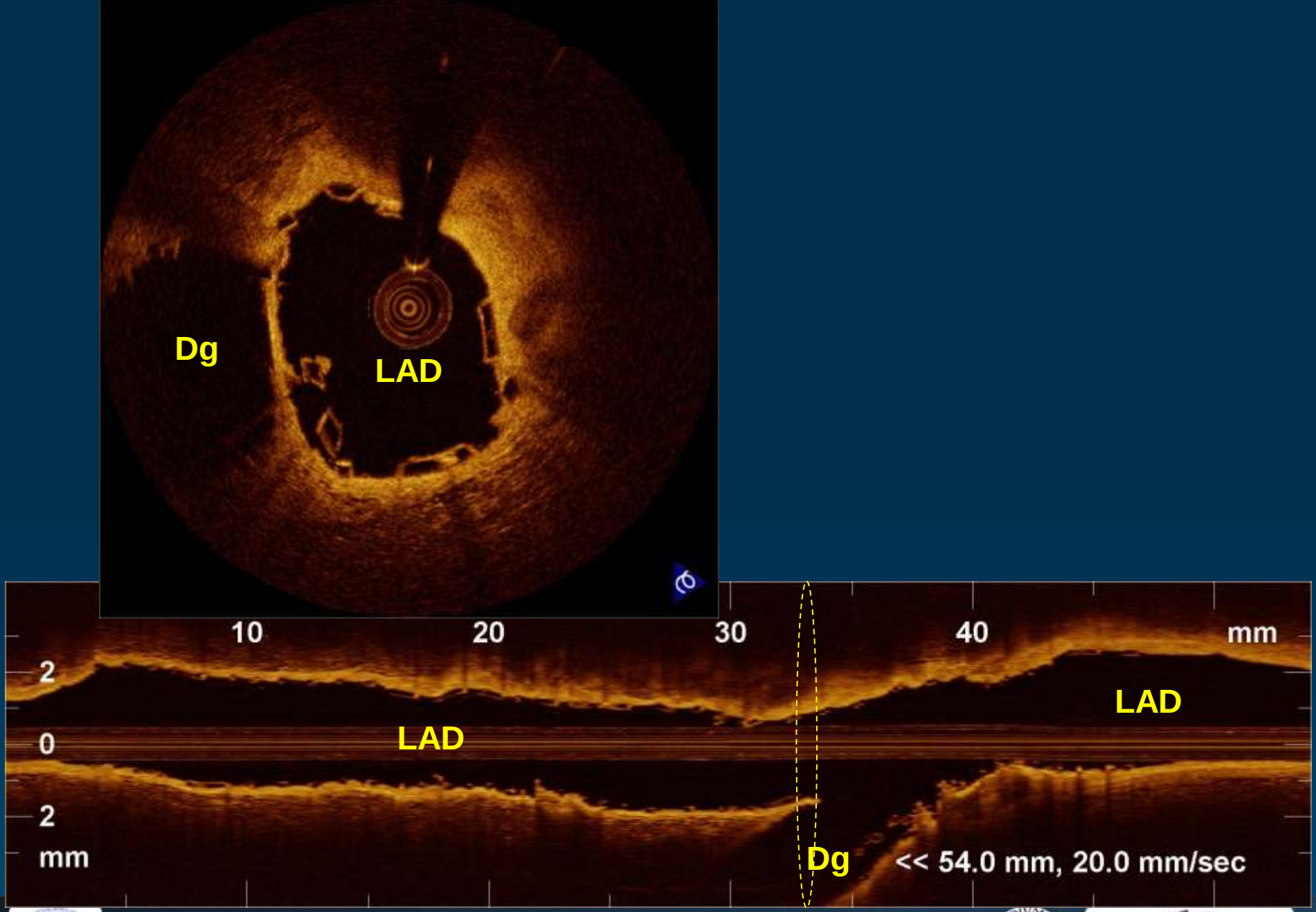


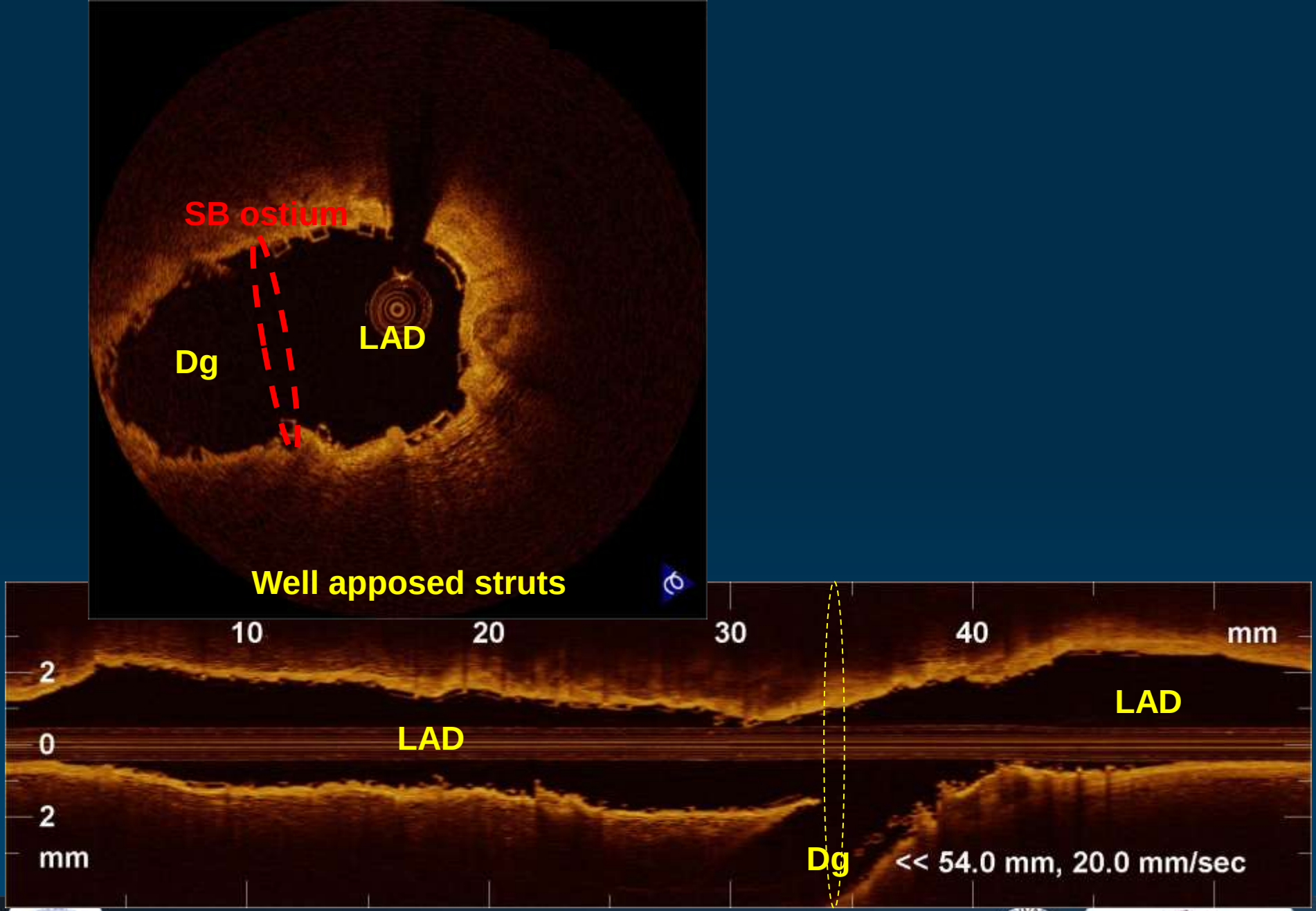
FKB

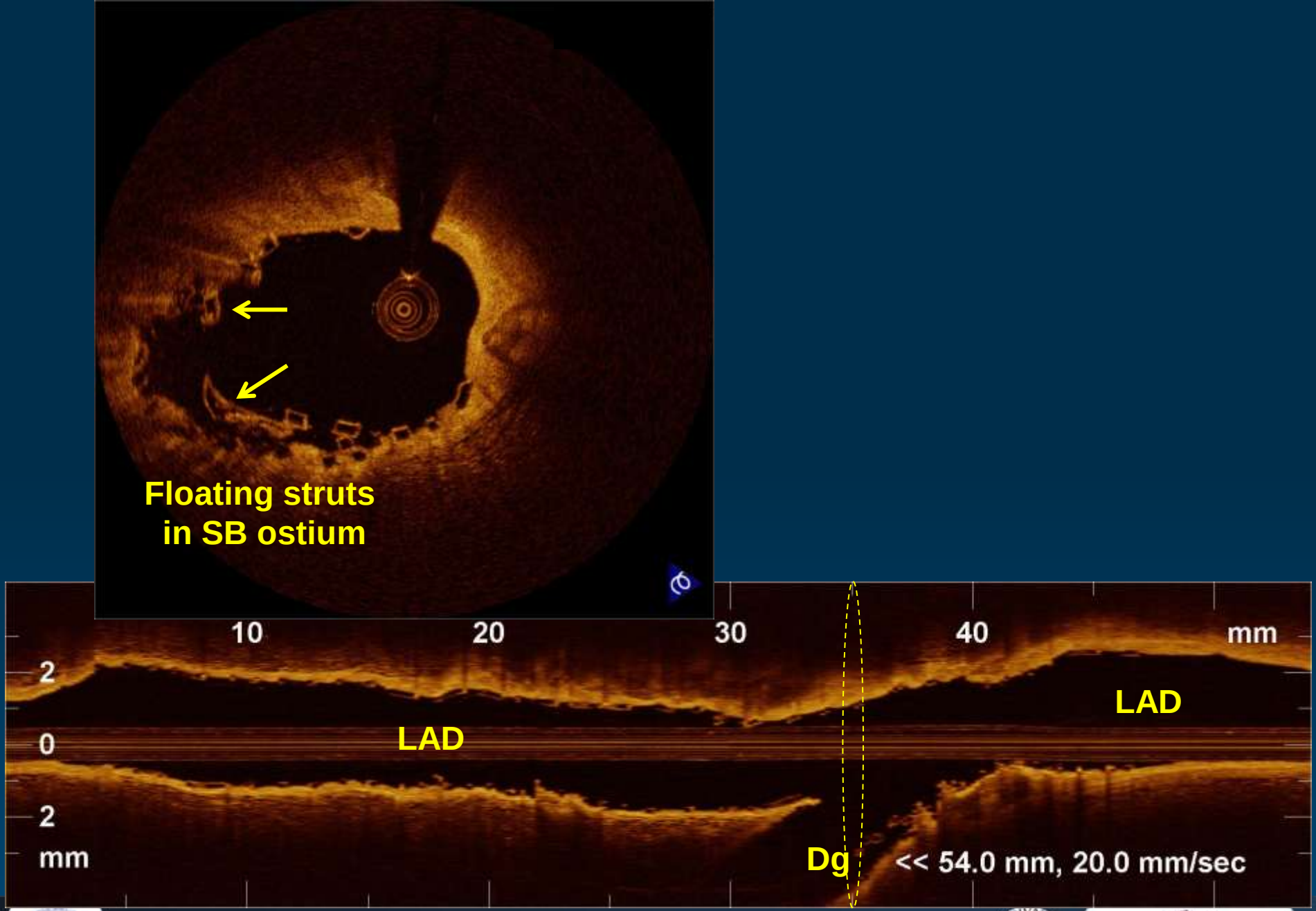


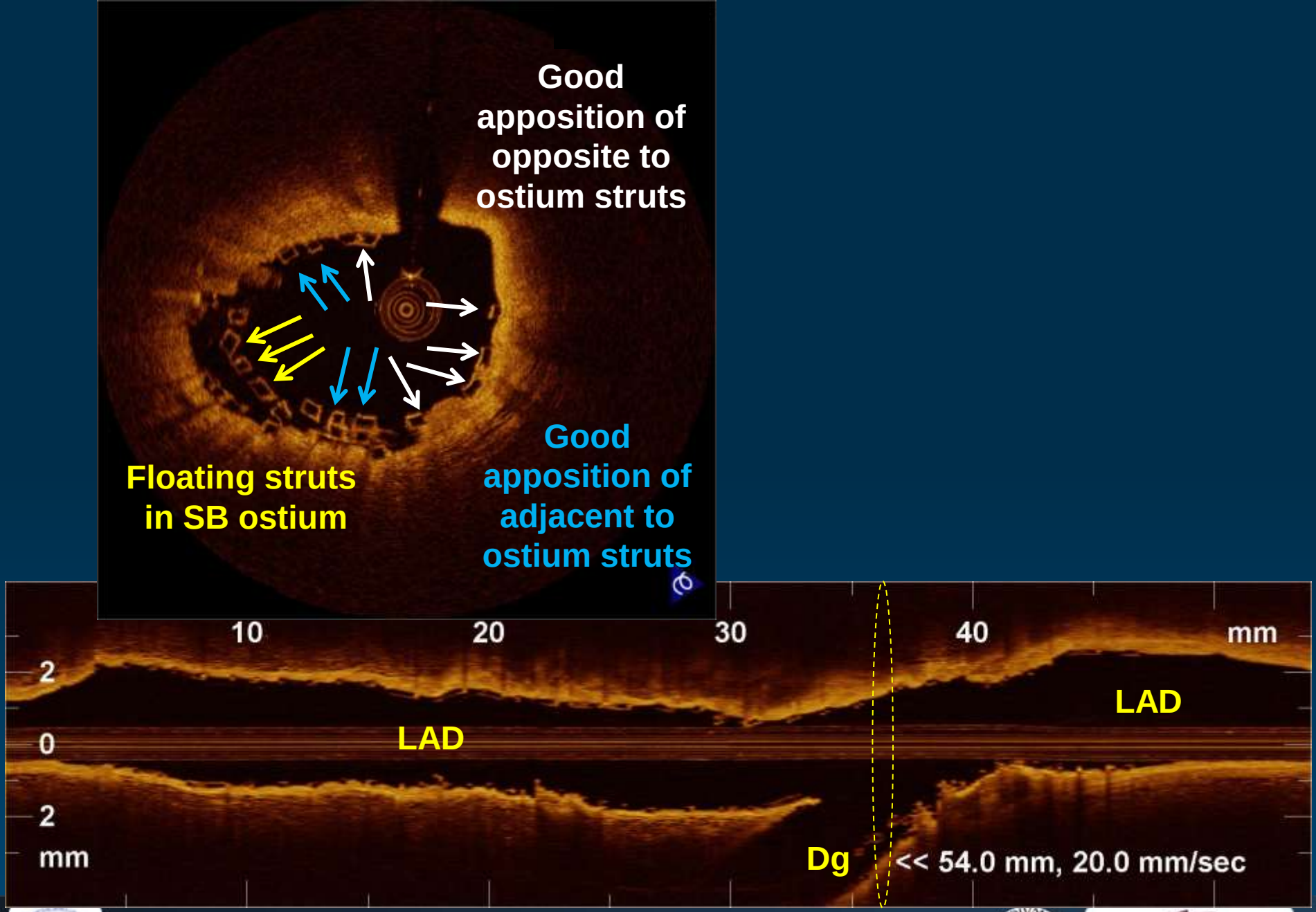
Final Result

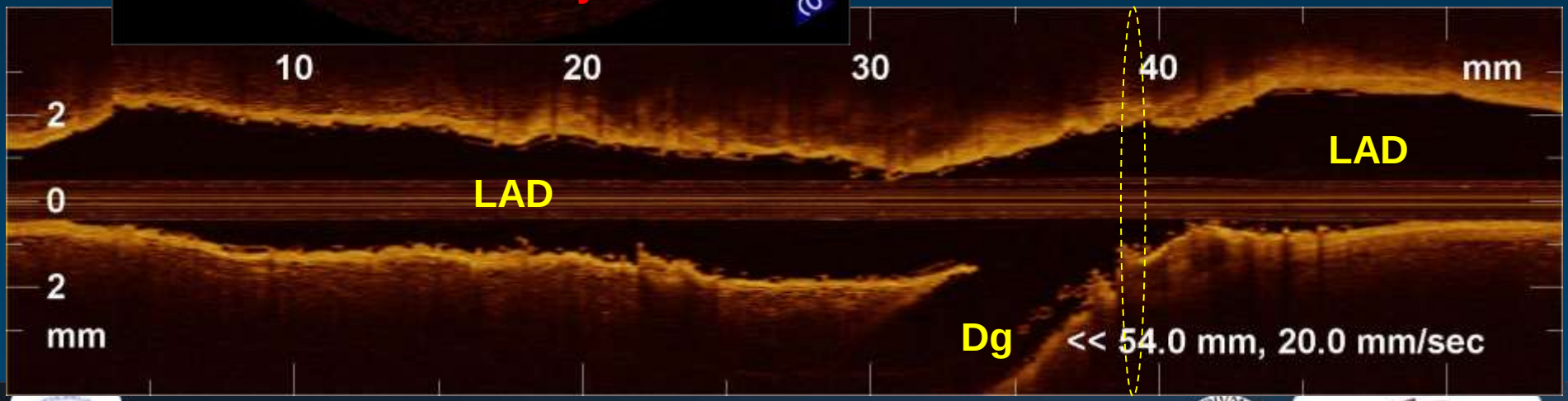



Dg
LAD
10
20
30
40
mm
2
0
2
mm
LAD
LAD
Dg
<< 54.0 mm, 20.0 mm/sec


SB ostium
Dg
LAD
Well apposed struts
10
20
30
40
mm
2
0
2
mm
LAD
LAD
Dg
<< 54.0 mm, 20.0 mm/sec


Floating struts
in SB ostium
10
20
30
40
mm
2
0
2
mm
LAD
LAD
Dg
<< 54.0 mm, 20.0 mm/sec


Good apposition of opposite to ostium struts
Floating struts in SB ostium
Good apposition of adjacent to ostium struts
10
20
30
40
mm
2
0
2
mm
LAD
LAD
Dg
<< 54.0 mm, 20.0 mm/sec

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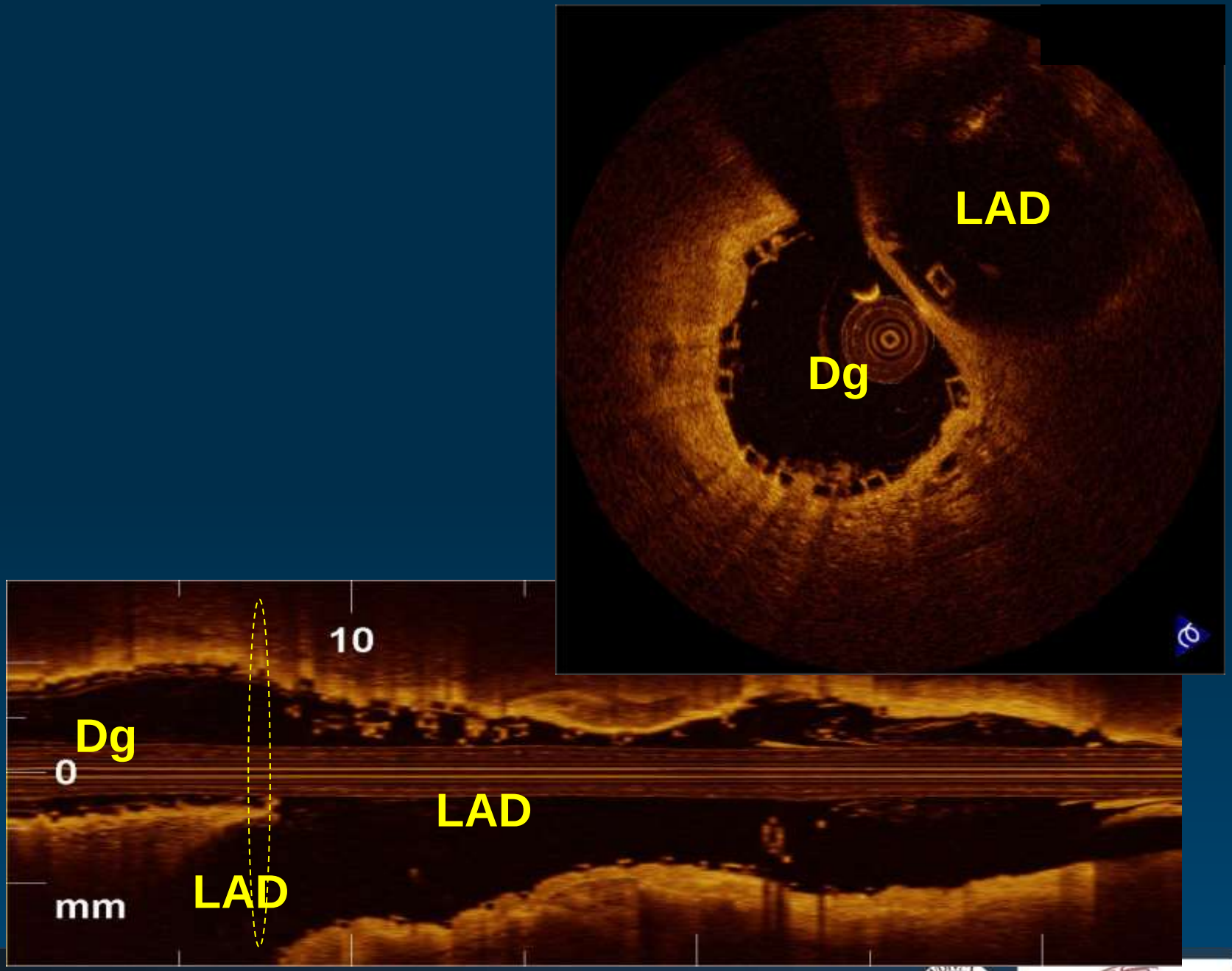
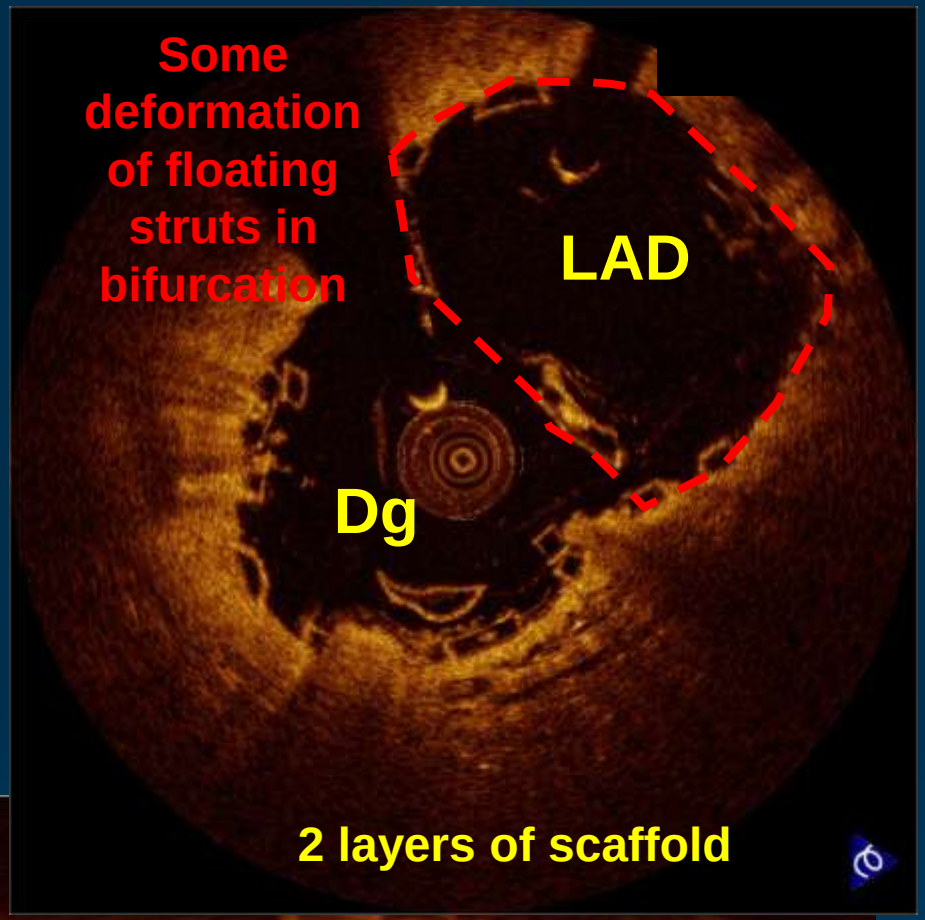
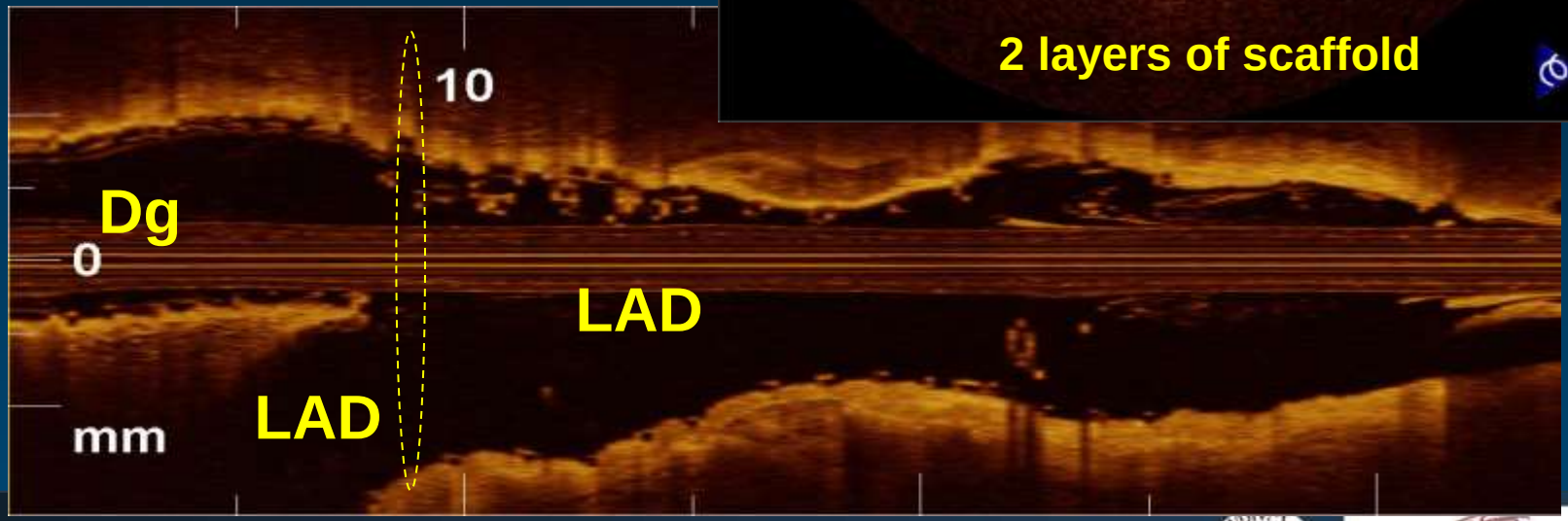
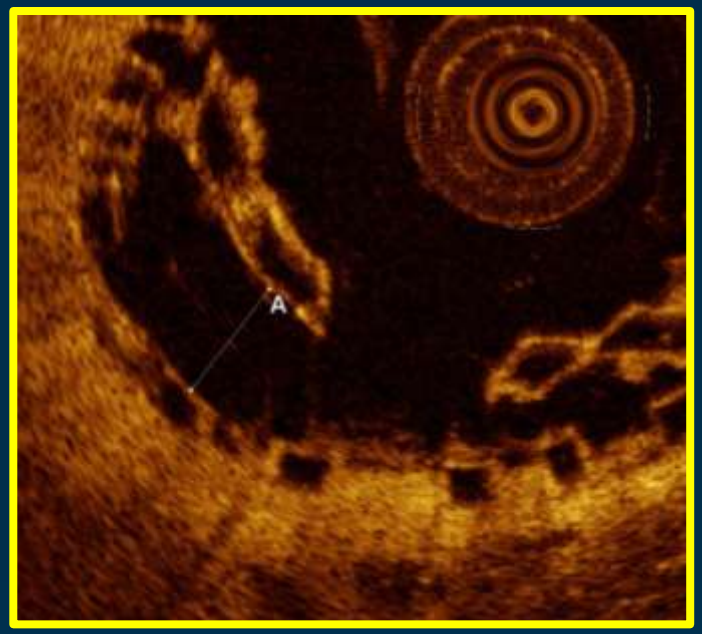
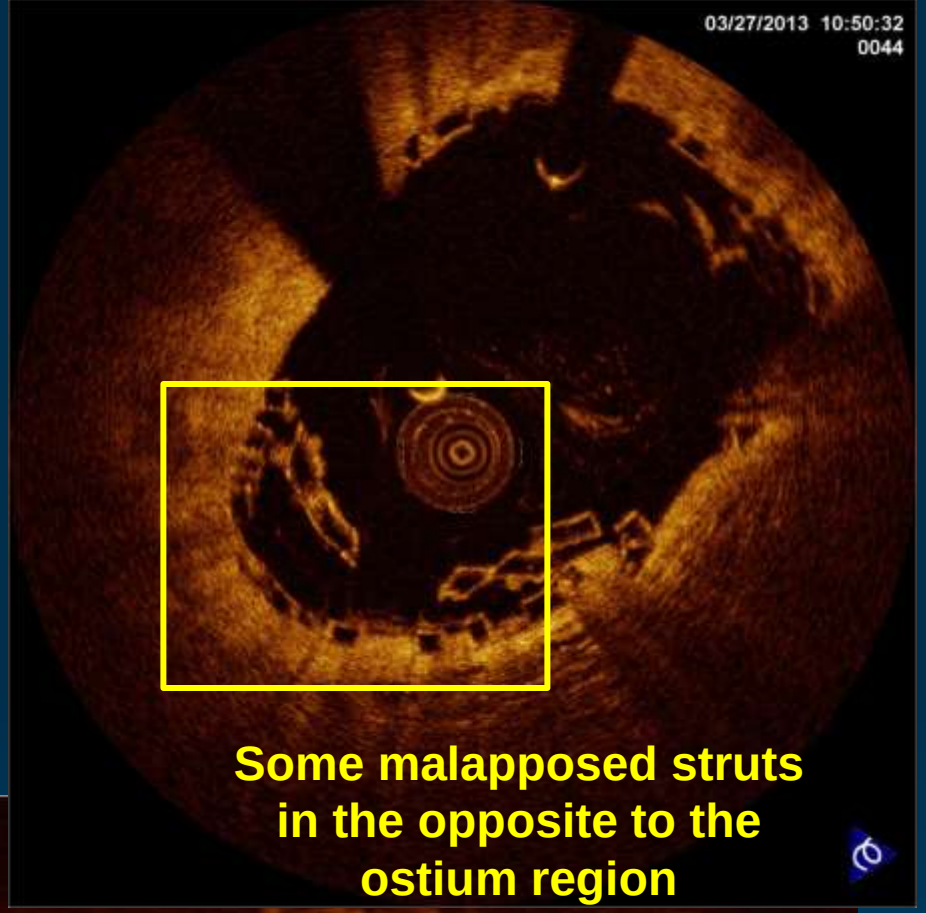
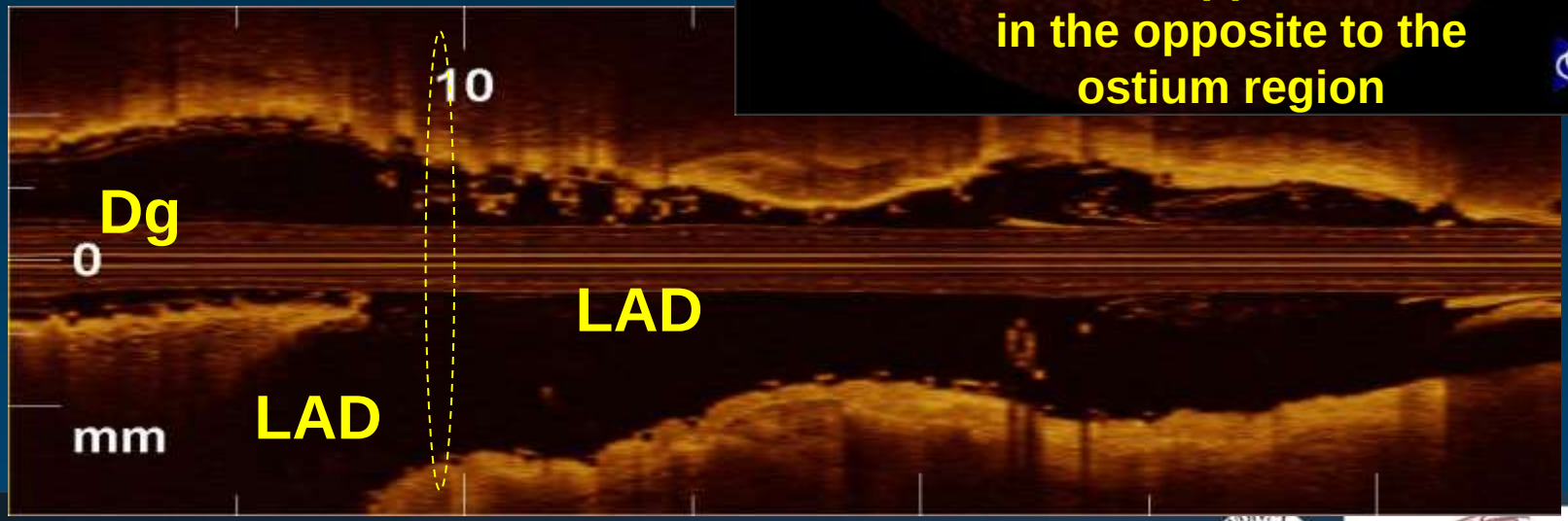

LAD
Dg
10
Dg
0
LAD
mm
LAD


Some deformation of floating struts in bifurcation
LAD
Dg
2 layers of scaffold


10
Dg
0
LAD
mm
LAD


A


03/27/2013 10:50:32
0044
Some malapposed struts
in the opposite to the
ostium region

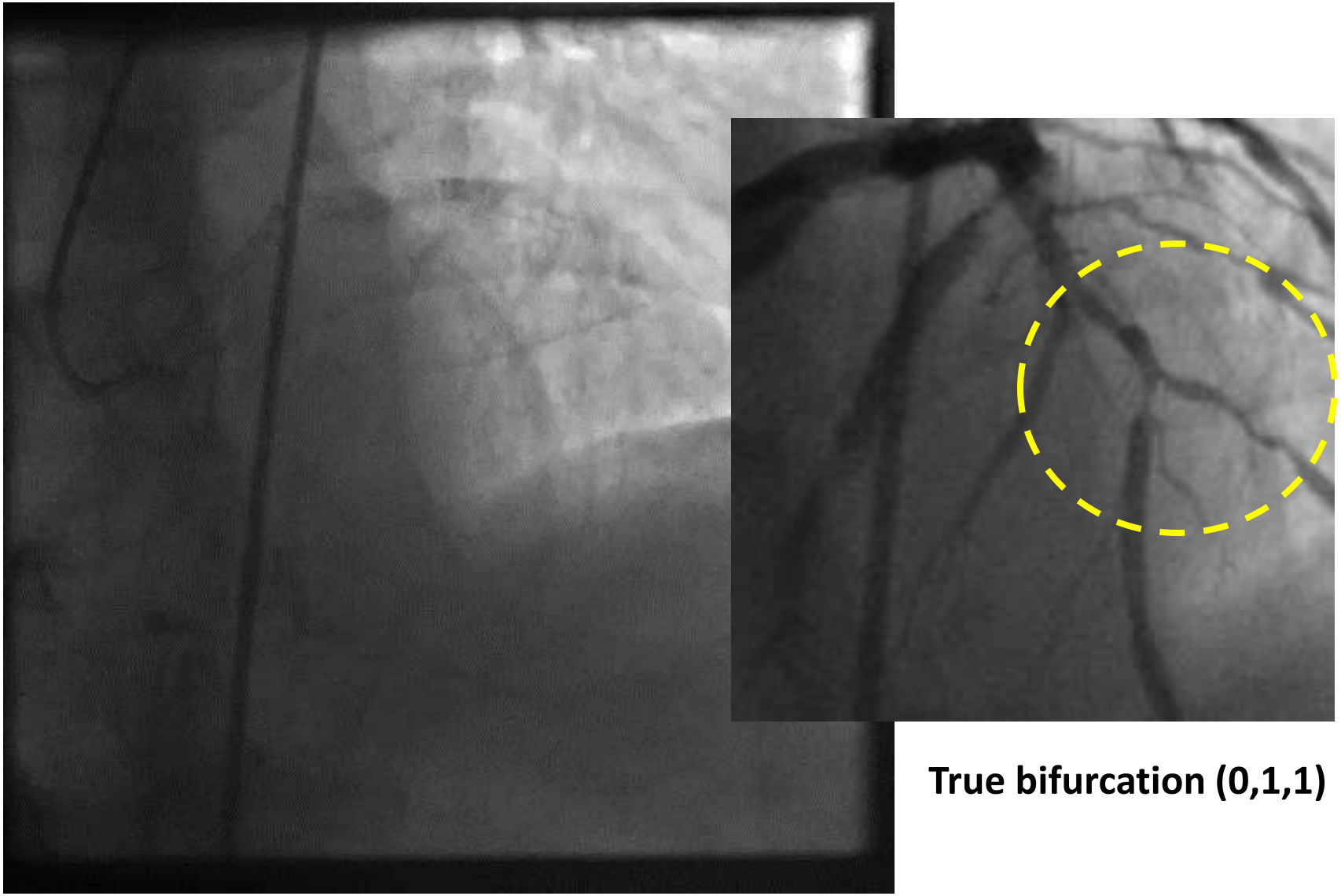

10
Dg
0
LAD
mm
LAD

Patient asymptomatic at 700 days follow-up.

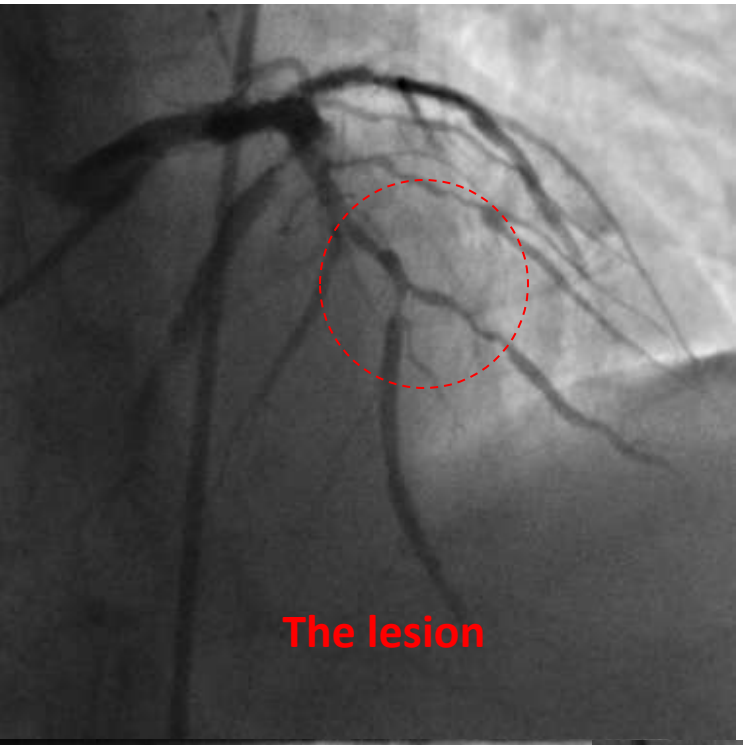
To date, BVS implantation in bifurcations, especially utilizing two-scaffold technique and post procedure kissing-balloon dilation is an off label indication.

# Case #3
# Treatment of coronary bifurcation with mini-crush technique utilizing BVS.
# 2y OCT F-U

# Baseline Angiography

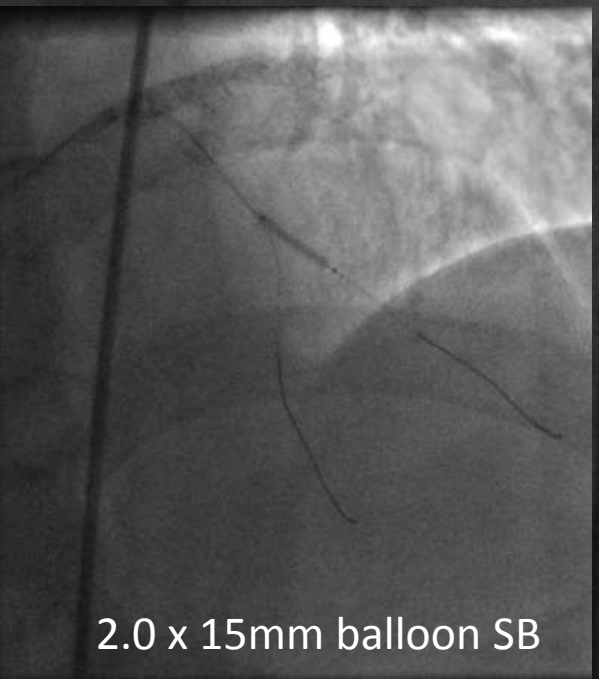


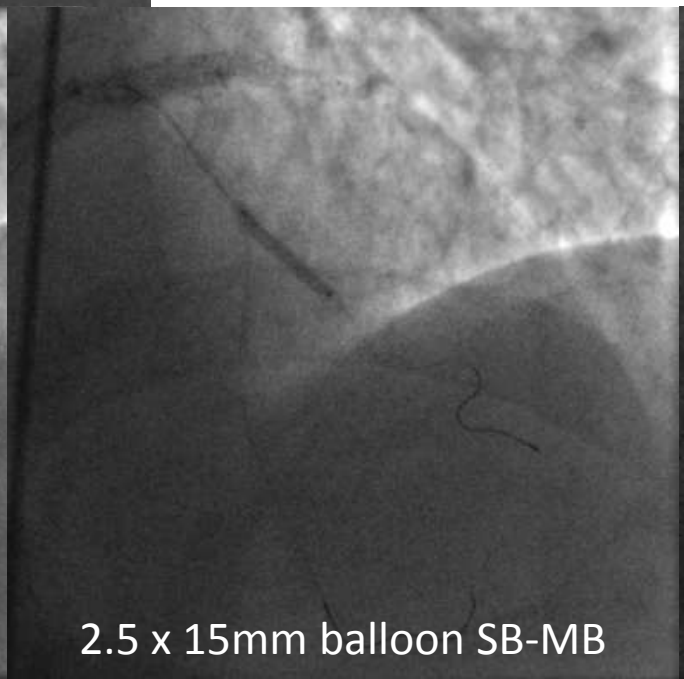
True bifurcation (0,1,1)

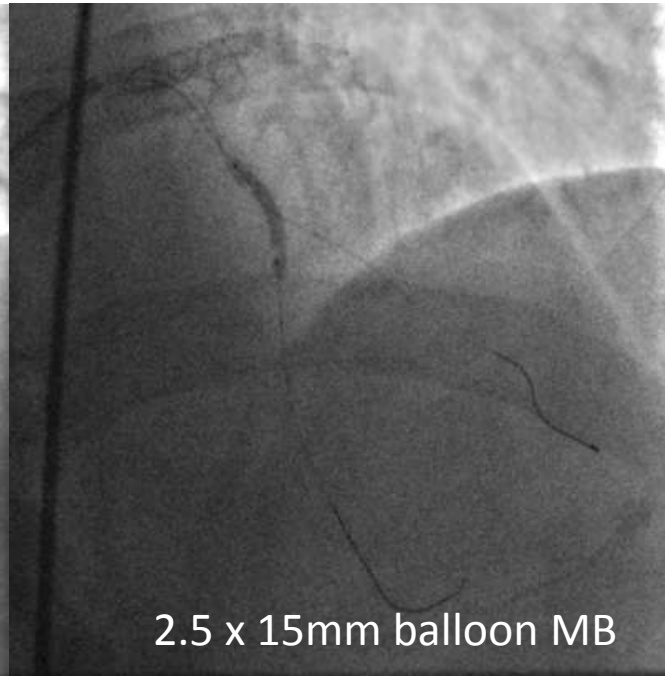



# Lesion preparation

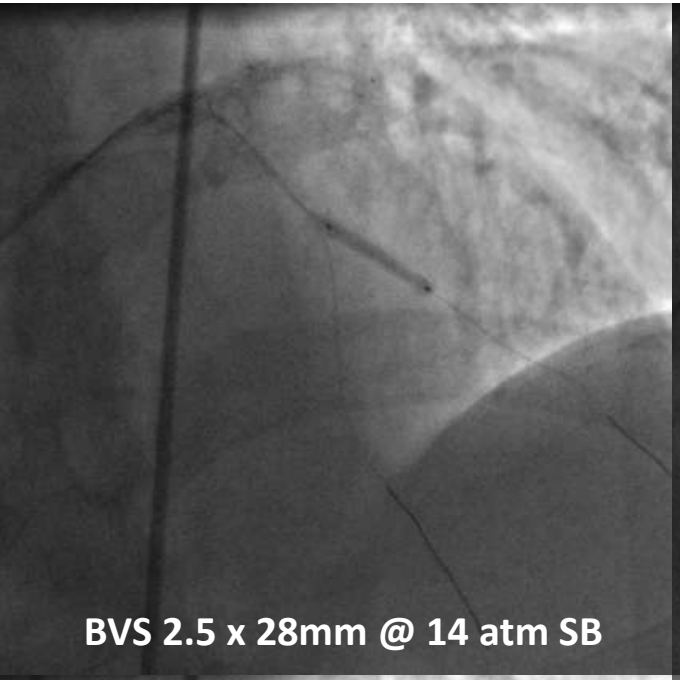
## A key step during BVS implantation



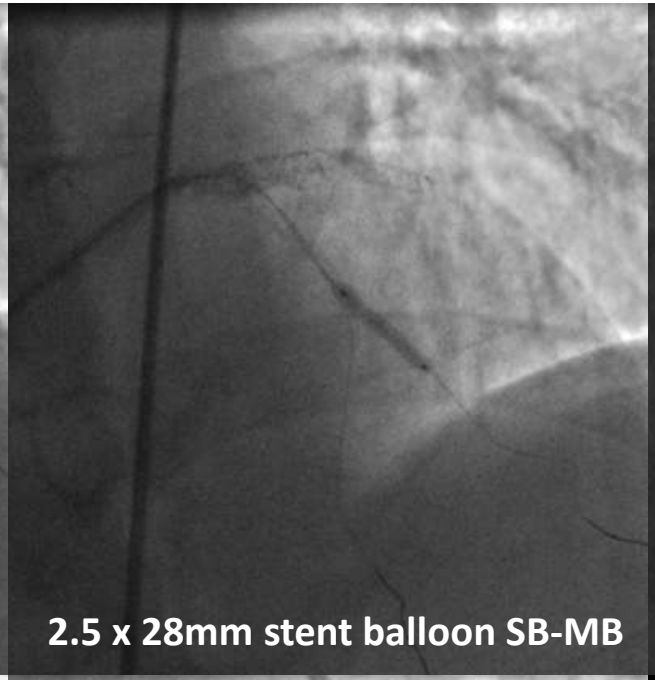



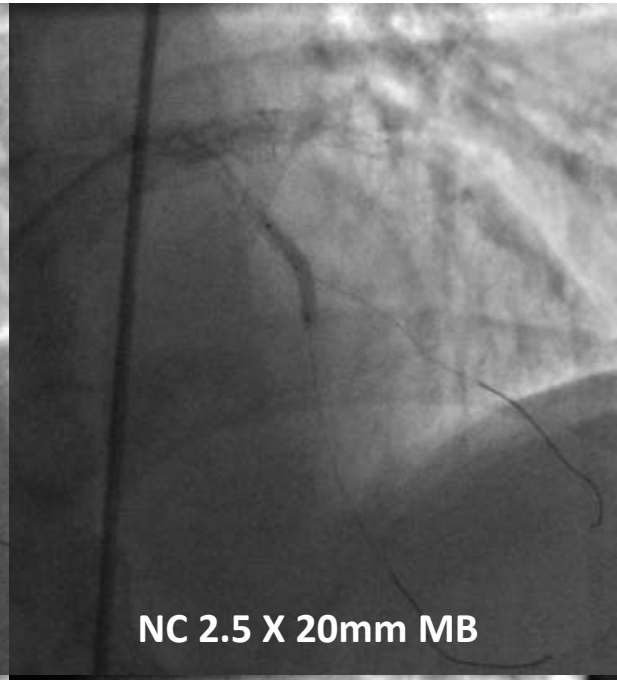
# BVS implantation



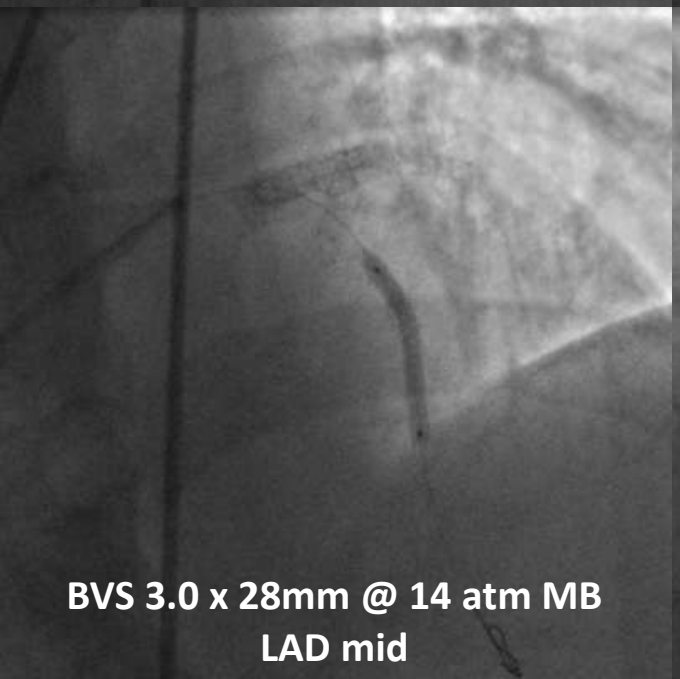
BVS 2.5 x 28mm @ 14 atm SB



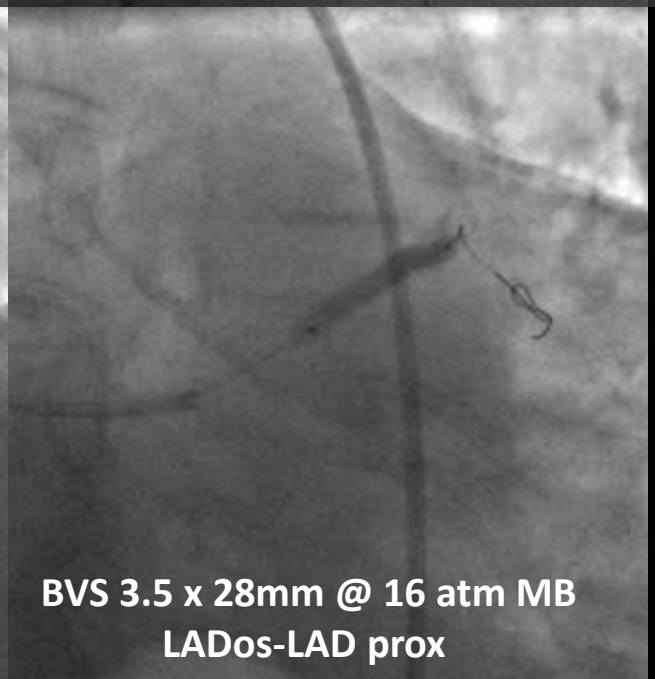
2.5 x 28mm stent balloon SB-MB



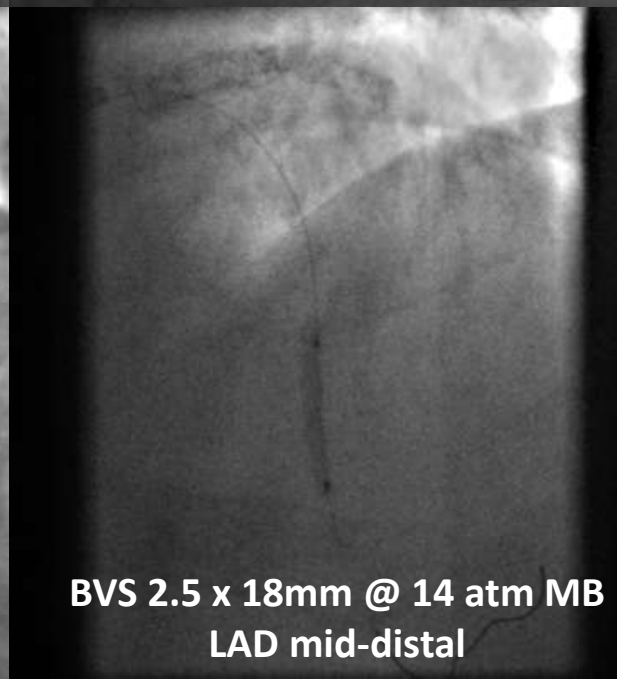
NC 2.5 X 20mm MB



BVS 3.0 x 28mm @ 14 atm MB
LAD mid



BVS 3.5 x 28mm @ 16 atm MB
LADos-LAD prox

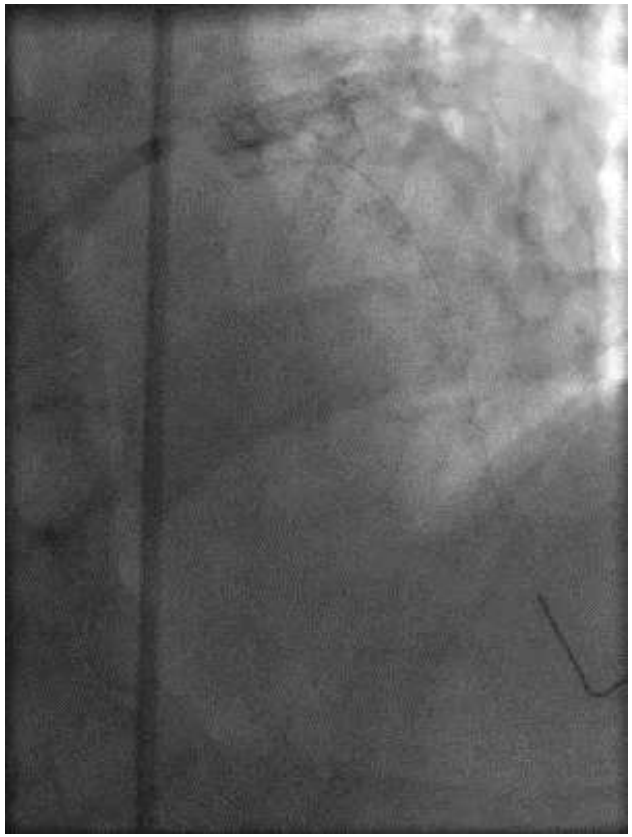


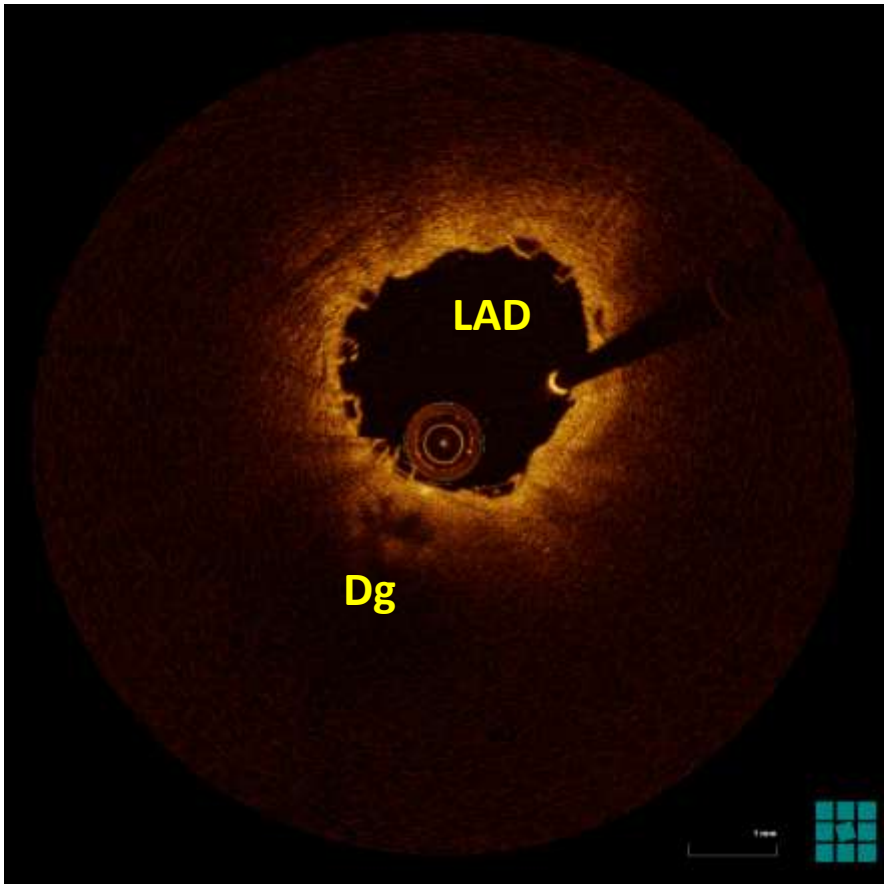
BVS 2.5 x 18mm @ 14 atm MB
LAD mid-distal

# 2-stent strategy with BVS
# Result post-implantation

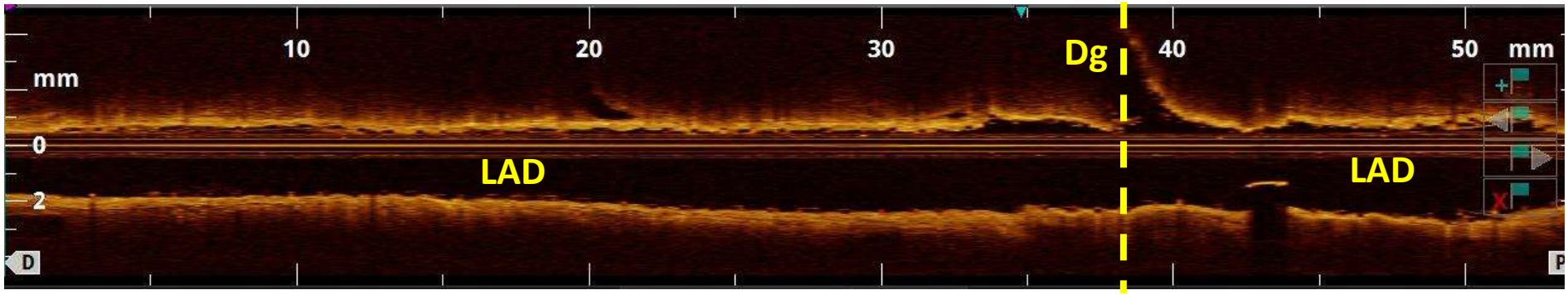
**Procedure steps:**

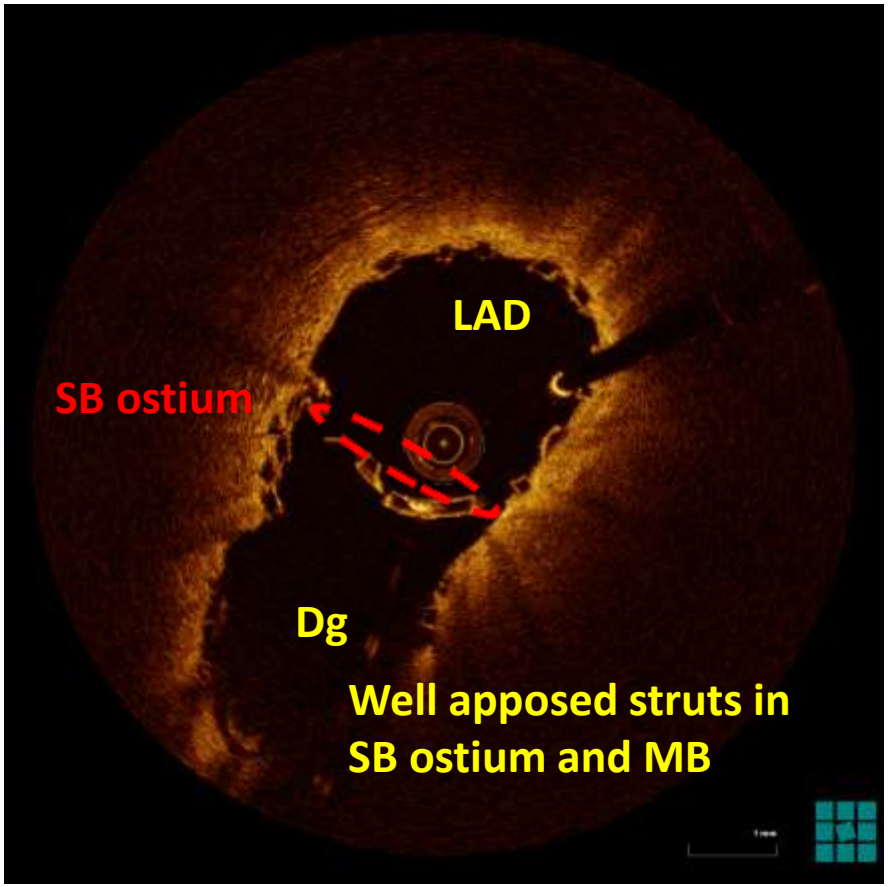
- Minicrush 2.5/28 (D); 3.0/28 (LAD)
- SB opening 2.0 SCB
- Final POT on LAD 3.5 NCB
- OCT to assess results and guiding further steps



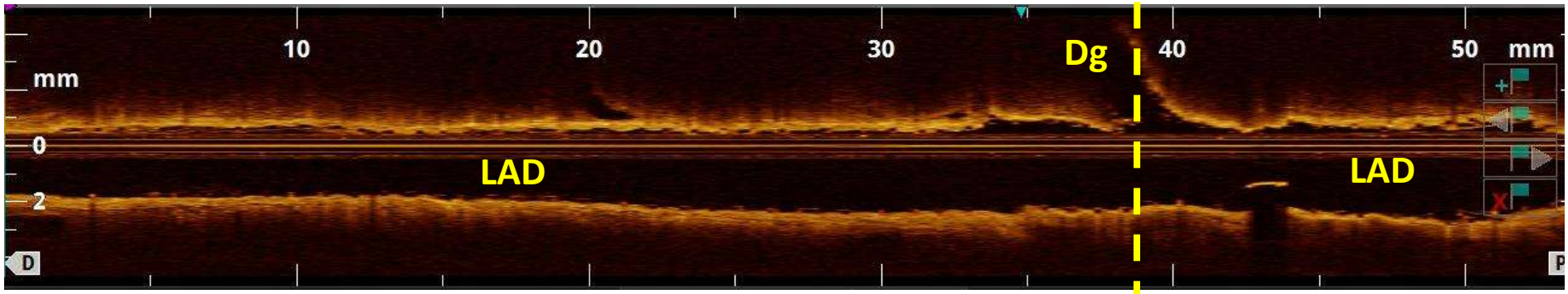


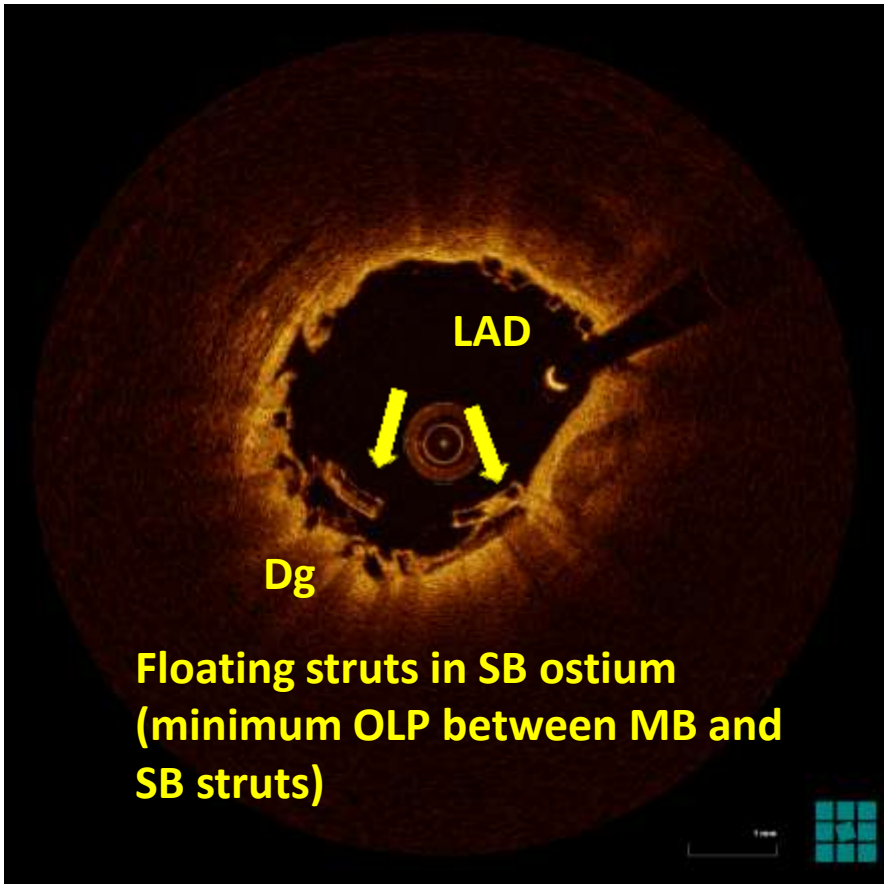

# Bifurcation Assessment by OCT (Pullback from LAD)



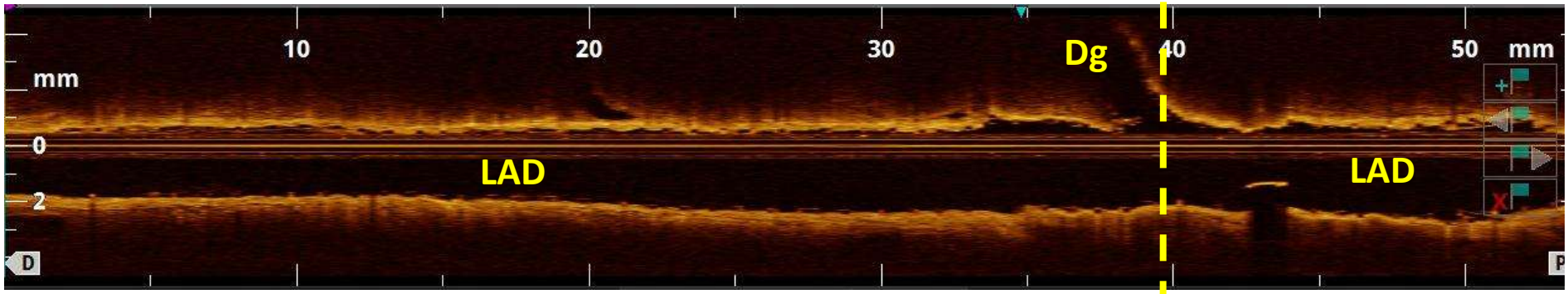



# Bifurcation Assessment by OCT (Pullback from LAD)

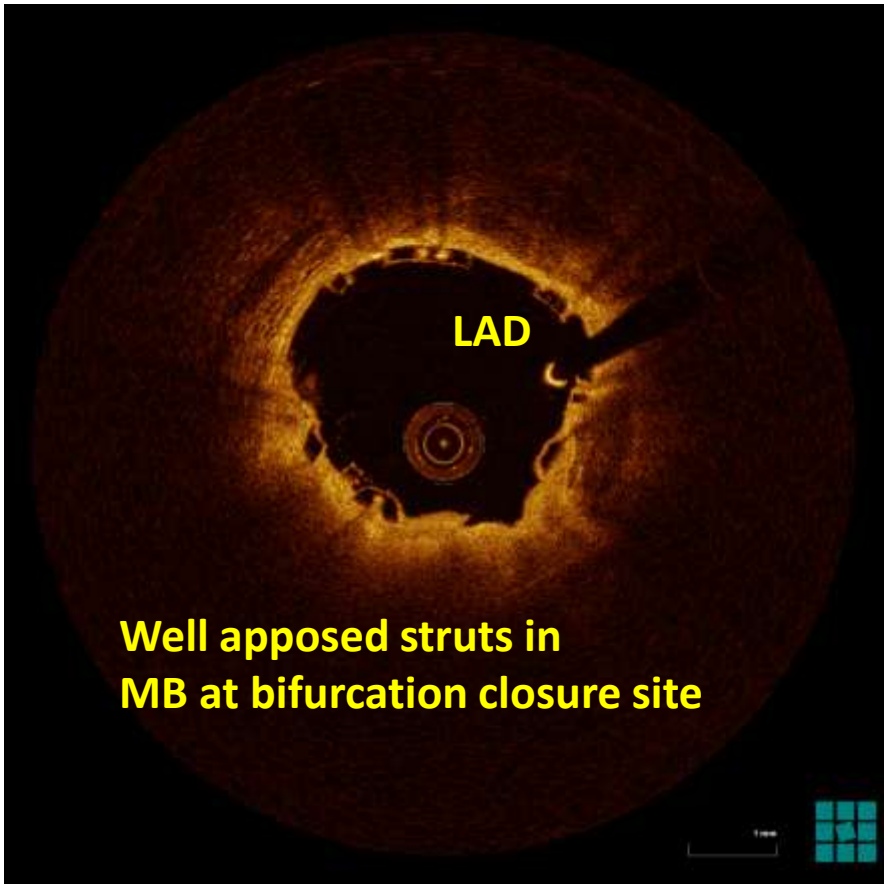




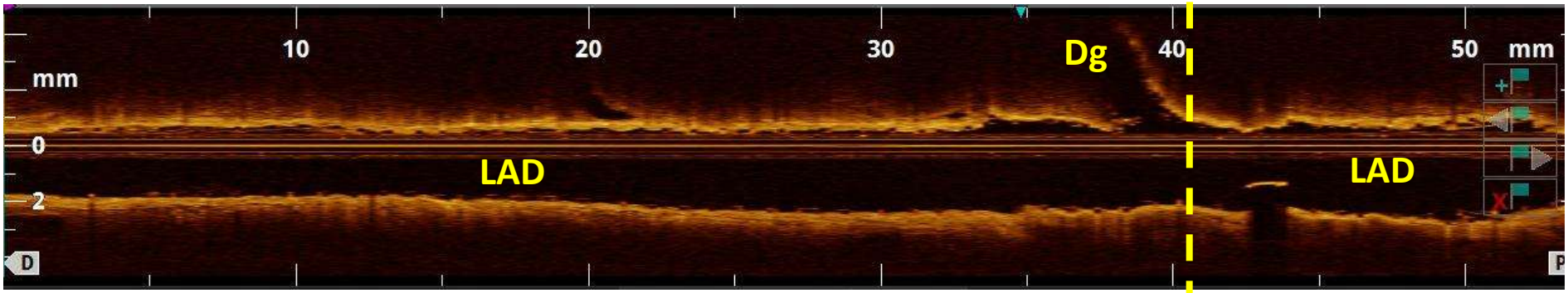

# Bifurcation Assessment by OCT (Pullback from LAD)



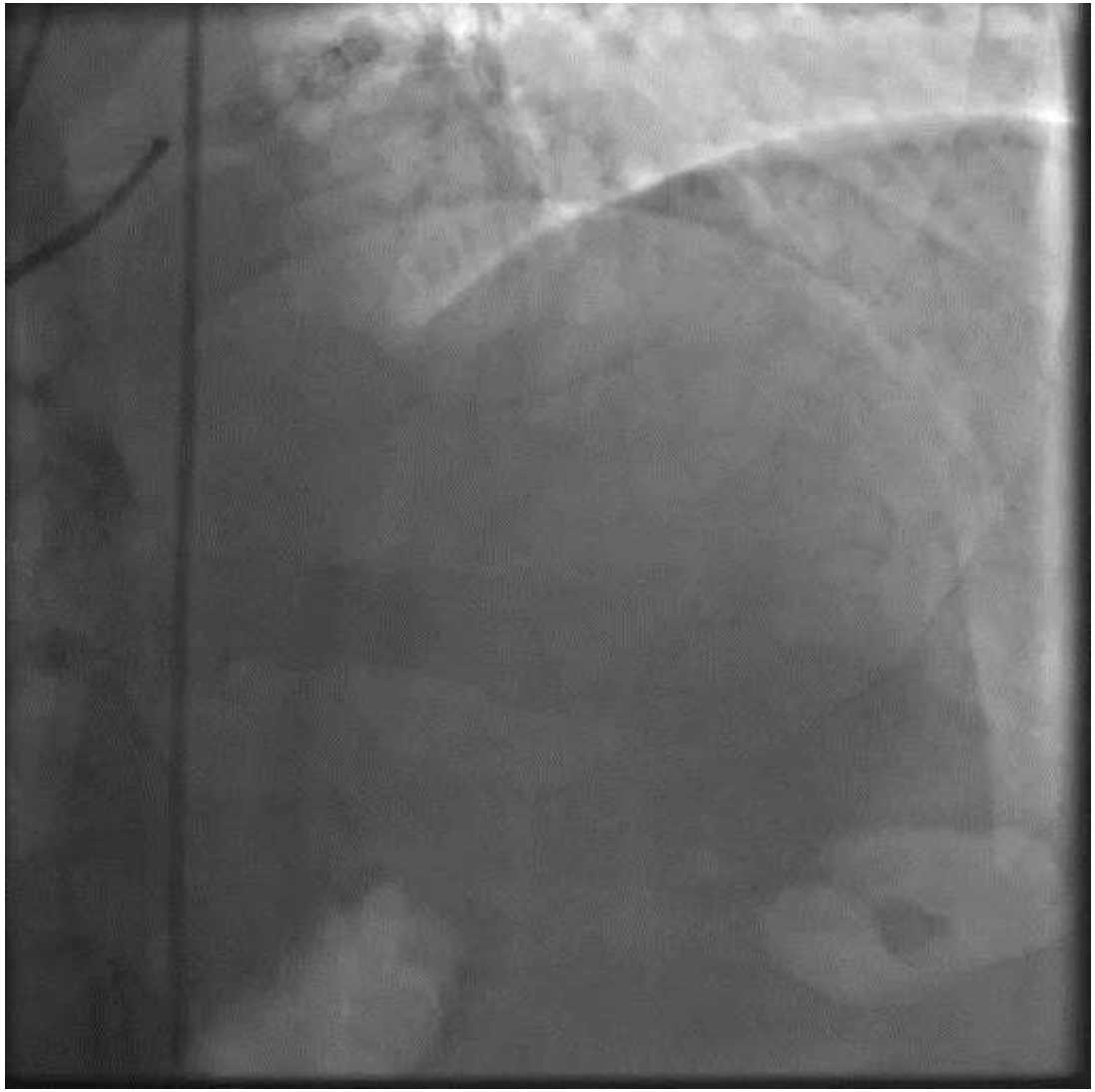
CASE #6



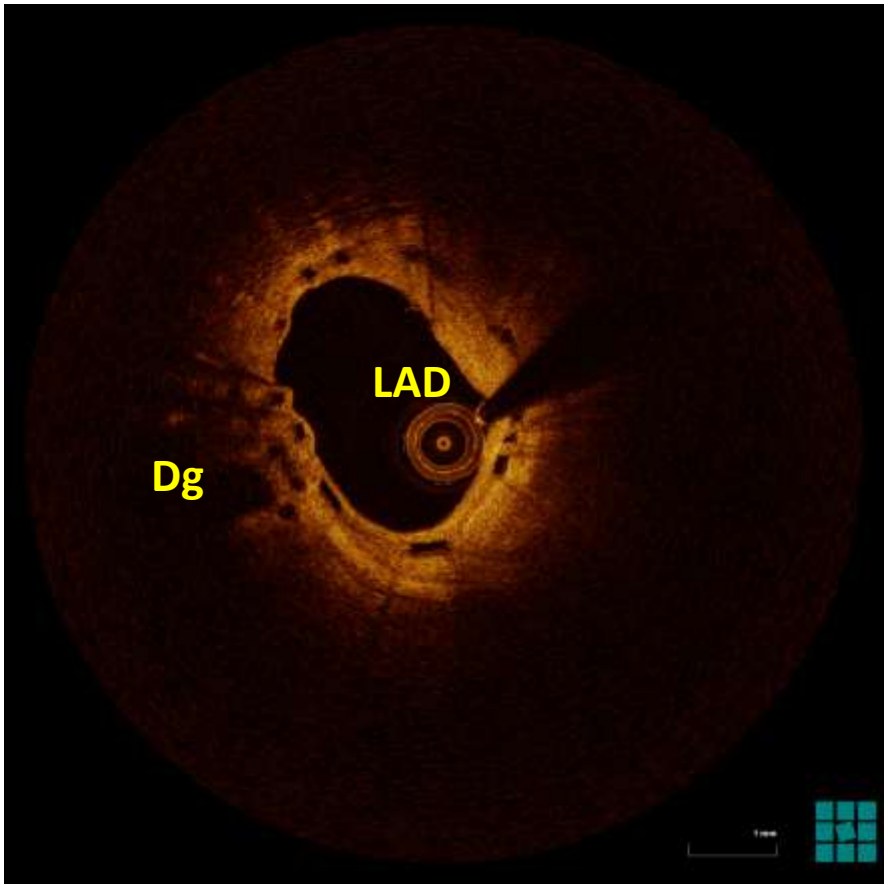

# Bifurcation Assessment by OCT (Pullback from LAD)



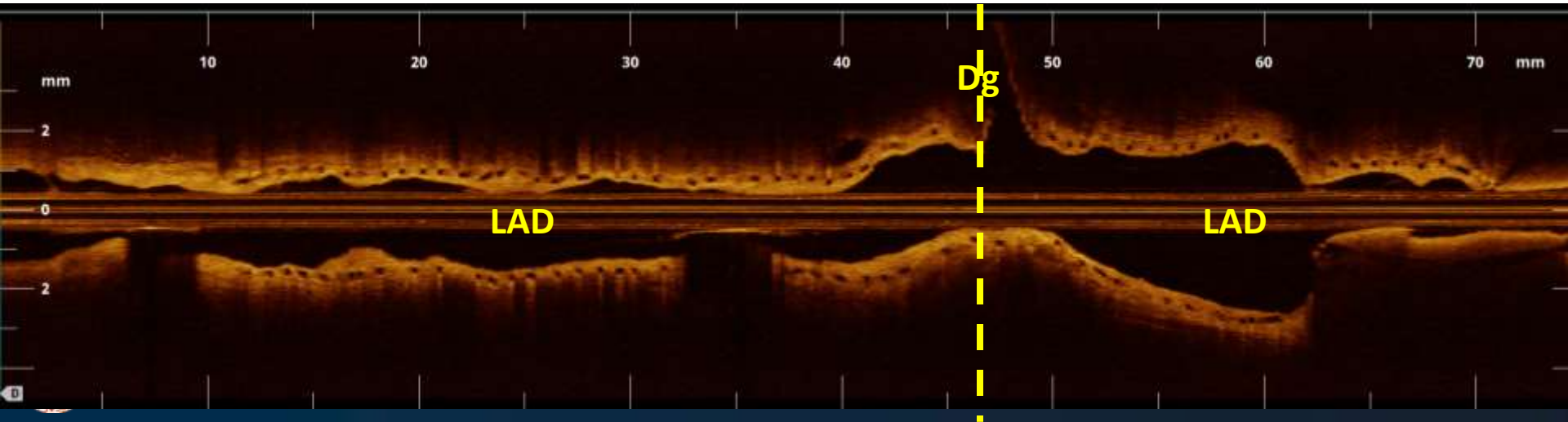
# Angiography at 2 years



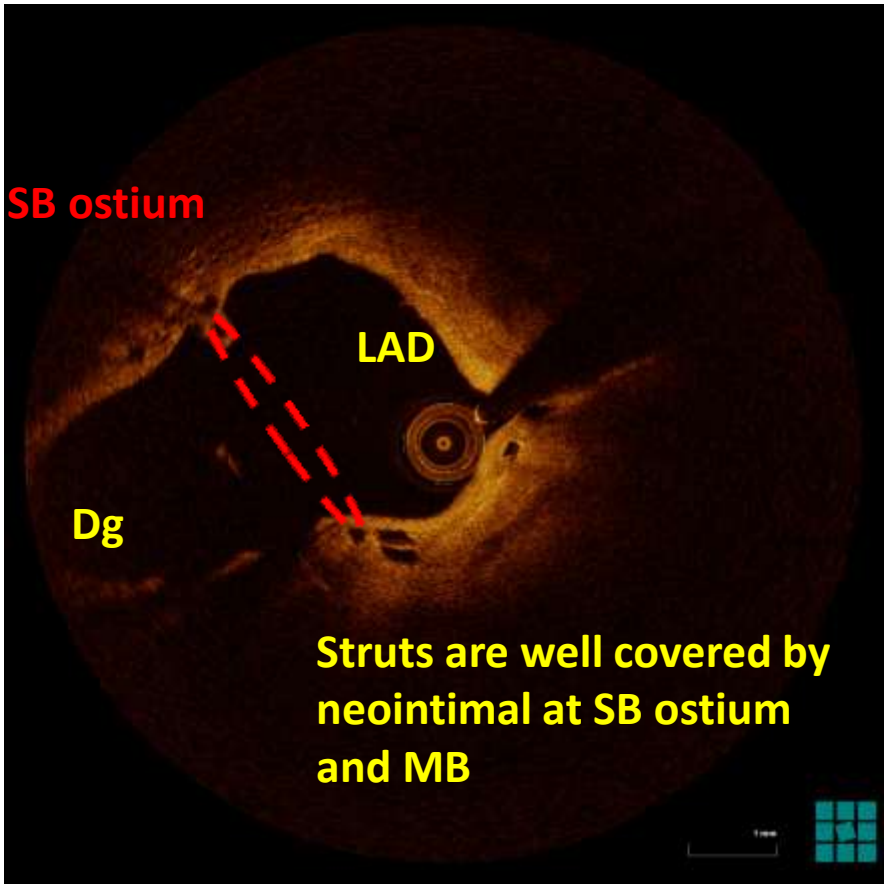
CASE #6



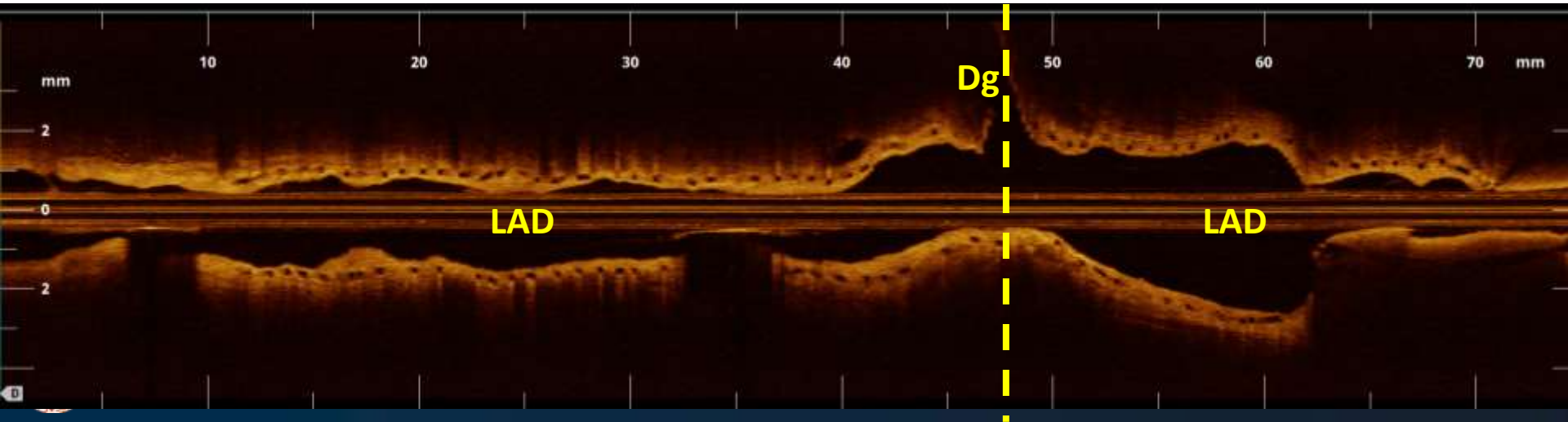

# Bifurcation Assessment by OCT (Pullback from LAD)



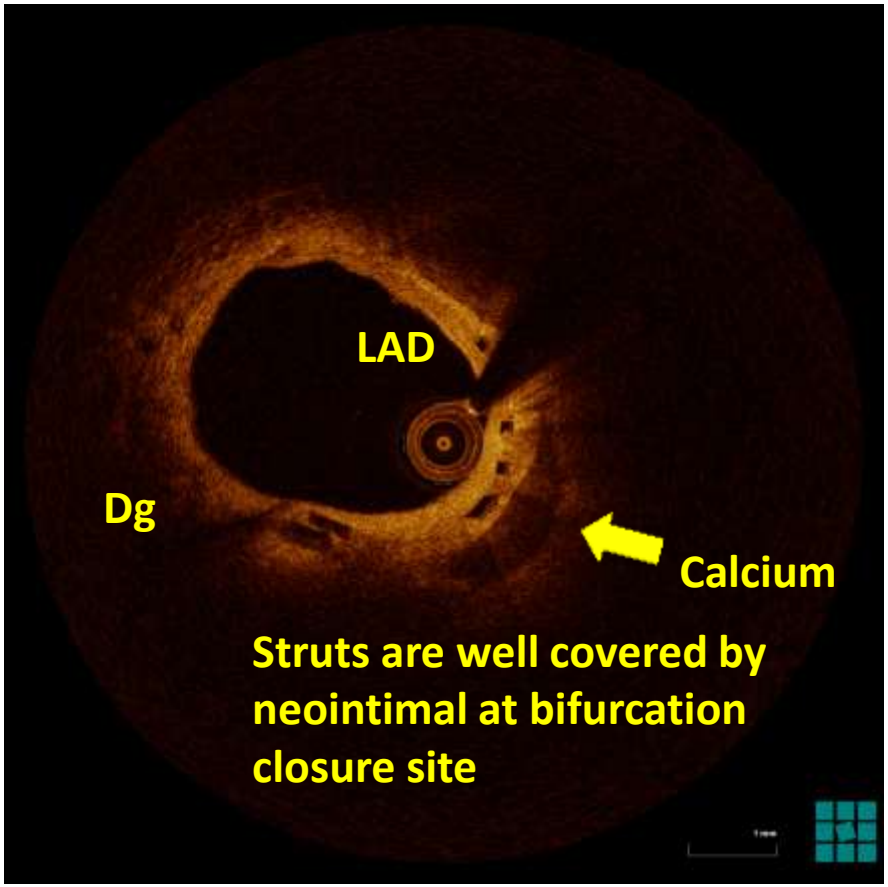
CASE #6



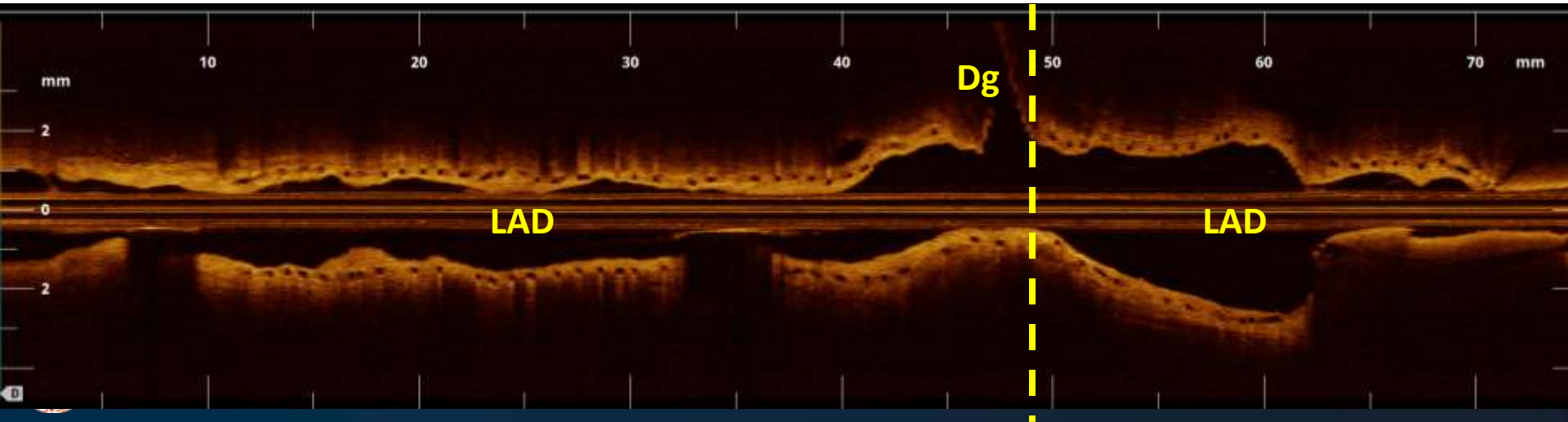

# Bifurcation Assessment by OCT (Pullback from LAD)



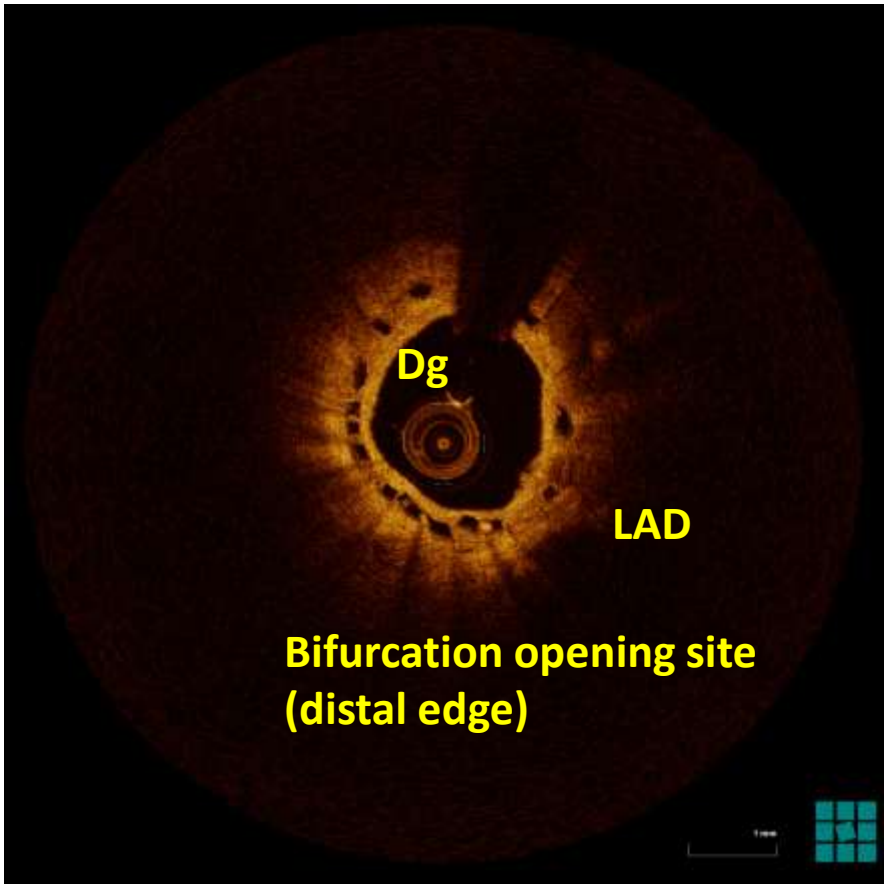
CASE #6



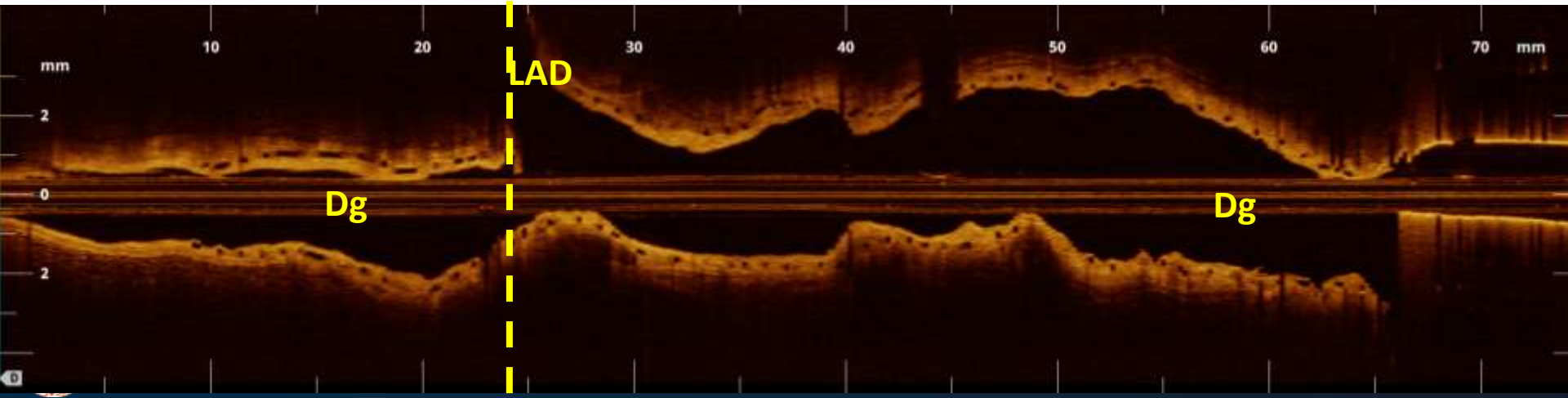

# Bifurcation Assessment by OCT (Pullback from LAD)



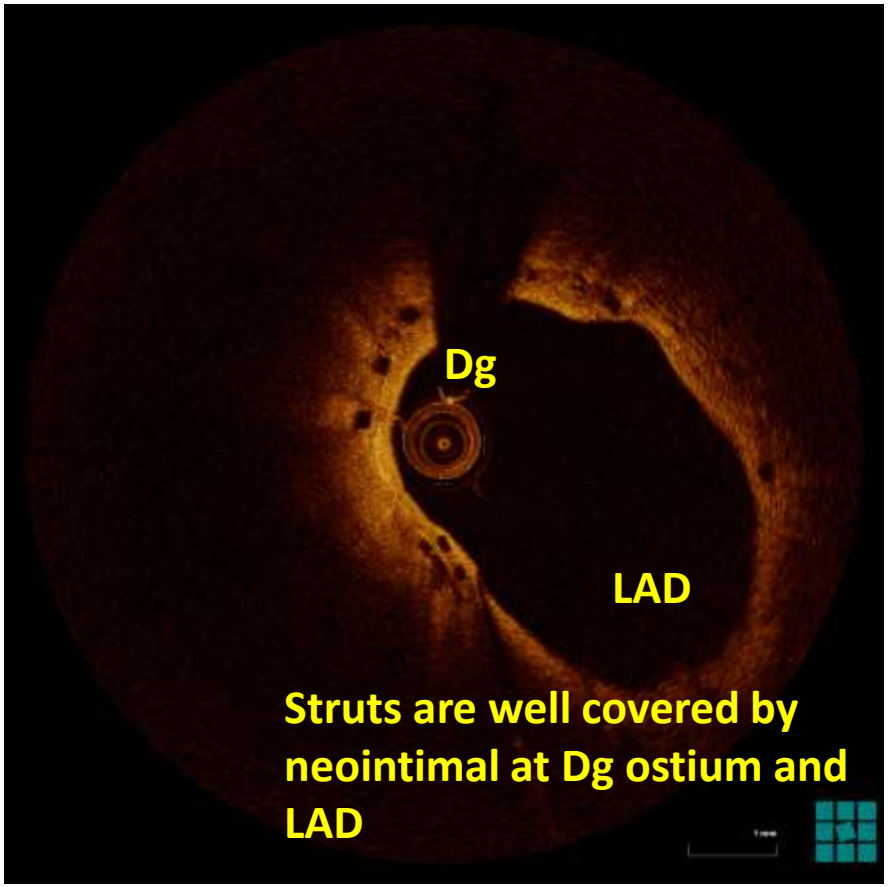
CASE #6



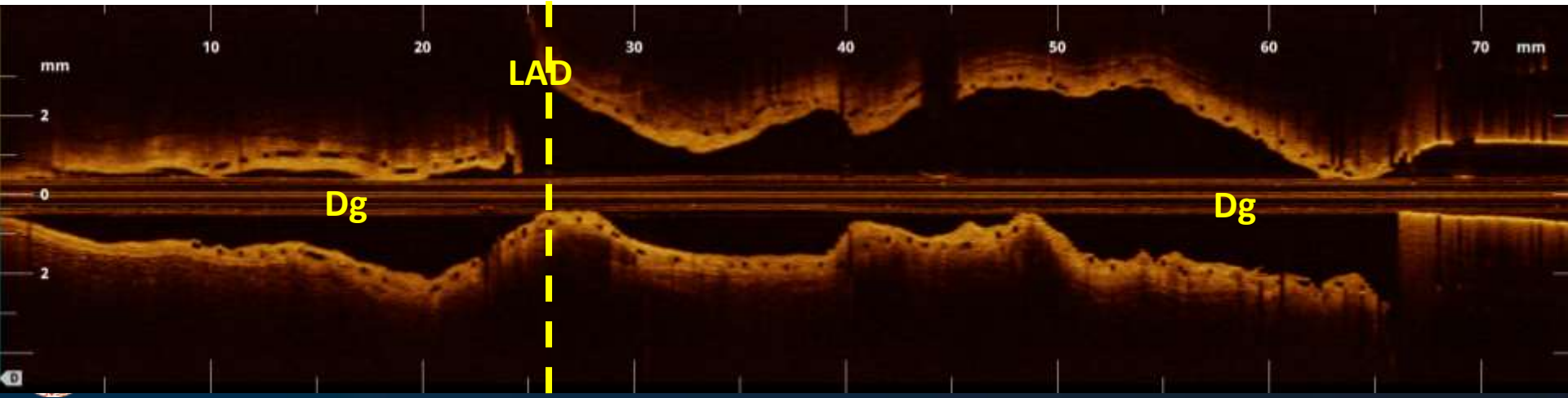

# Bifurcation Assessment by OCT (Pullback from Dg)



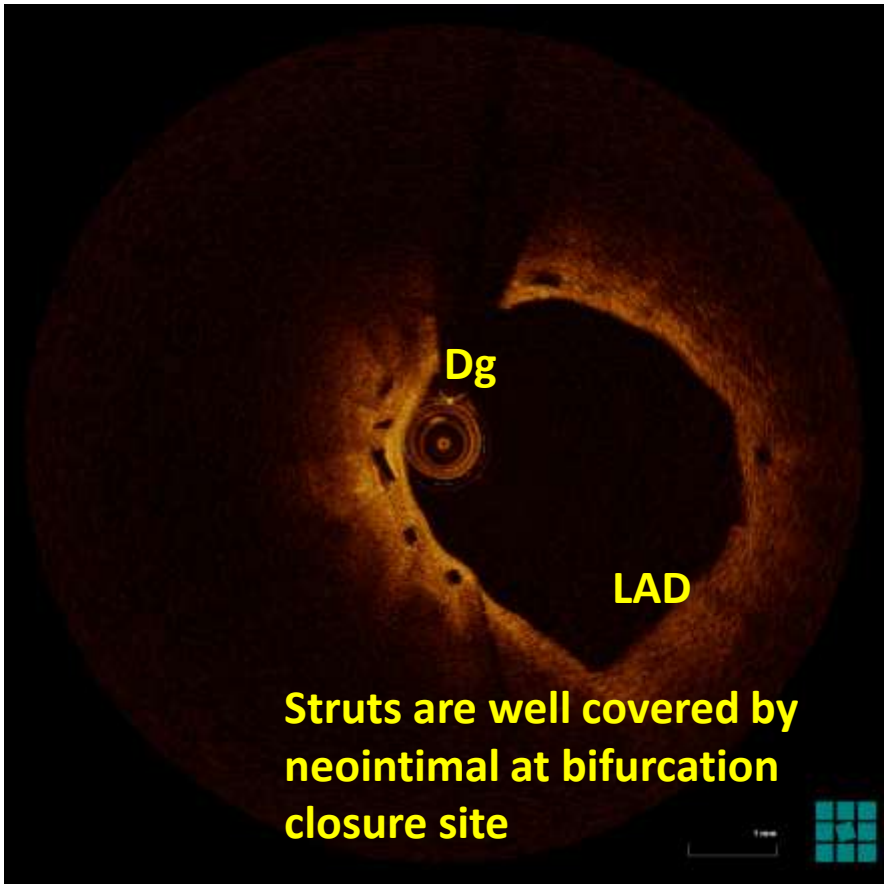
CASE #6



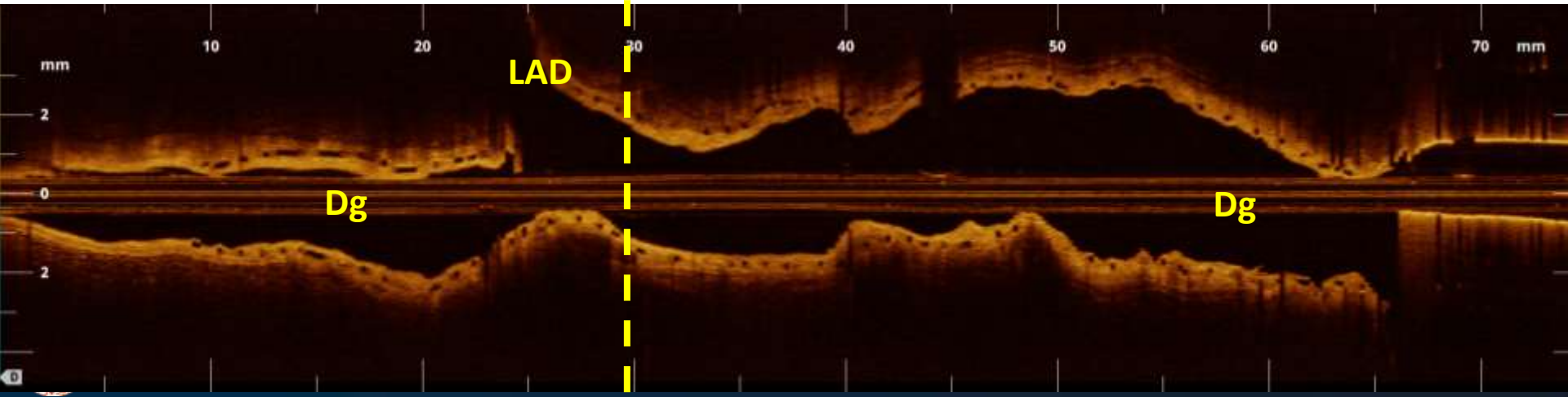

# Bifurcation Assessment by OCT (Pullback from Dg)



CASE #6




# Bifurcation Assessment by OCT (Pullback from Dg)



# Closing remarks

1. Accurate sizing with BRS in bifurcation is needed; OCT/IVUS have a pivotal role in case of doubts or of diameters close to the expansion limits of available BRS size.
2. Calcium can impact on BRS performance. IVUS/OCT evaluation of plaque distribution can guide proper bifurcation PCI strategy.
3. POT is a mandatory step in BRS bifurcation PCI. OCT after POT can guide further necessary steps to optimize the procedure.