



# Left Main Trifurcation and Its Percutaneous Treatment

**Hyo Won Shin, RT**

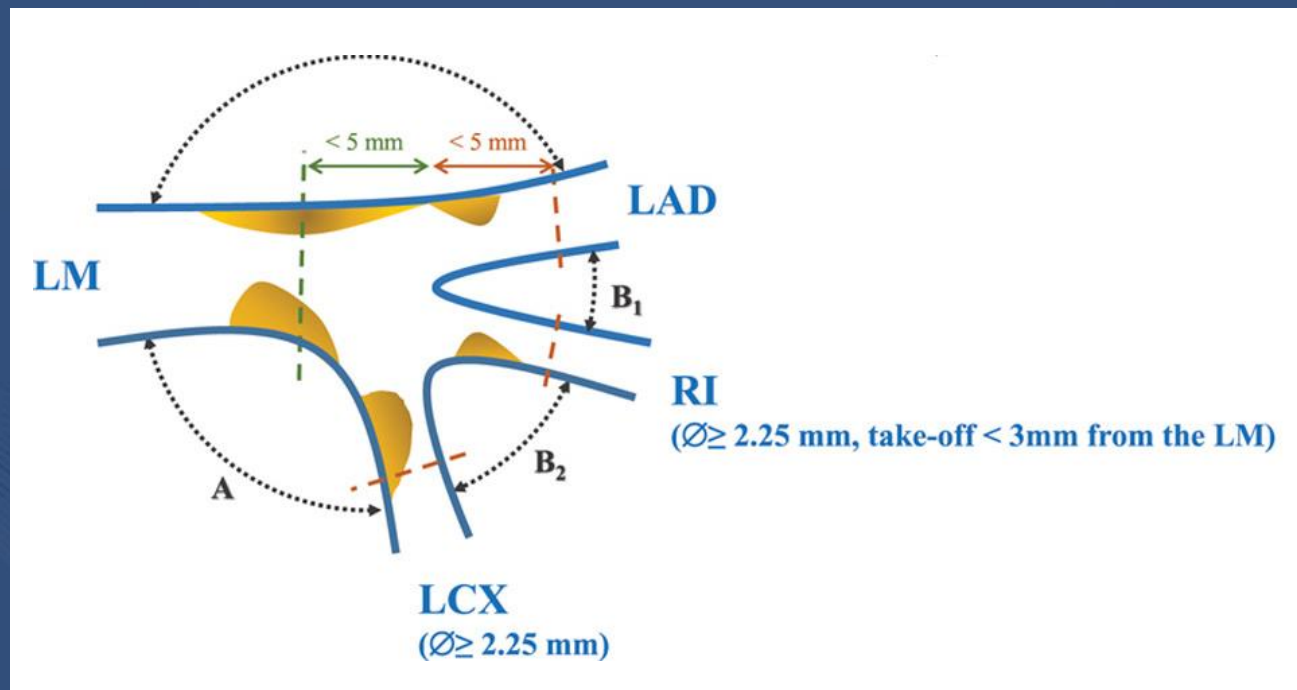
**Cardiovascular Intervention Room**

**Severance Cardiovascular Hospital**

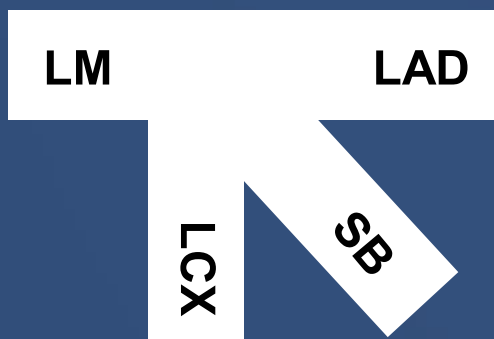
**Yonsei University Health System, Seoul, Korea**

# What is Left Main Trifurcation

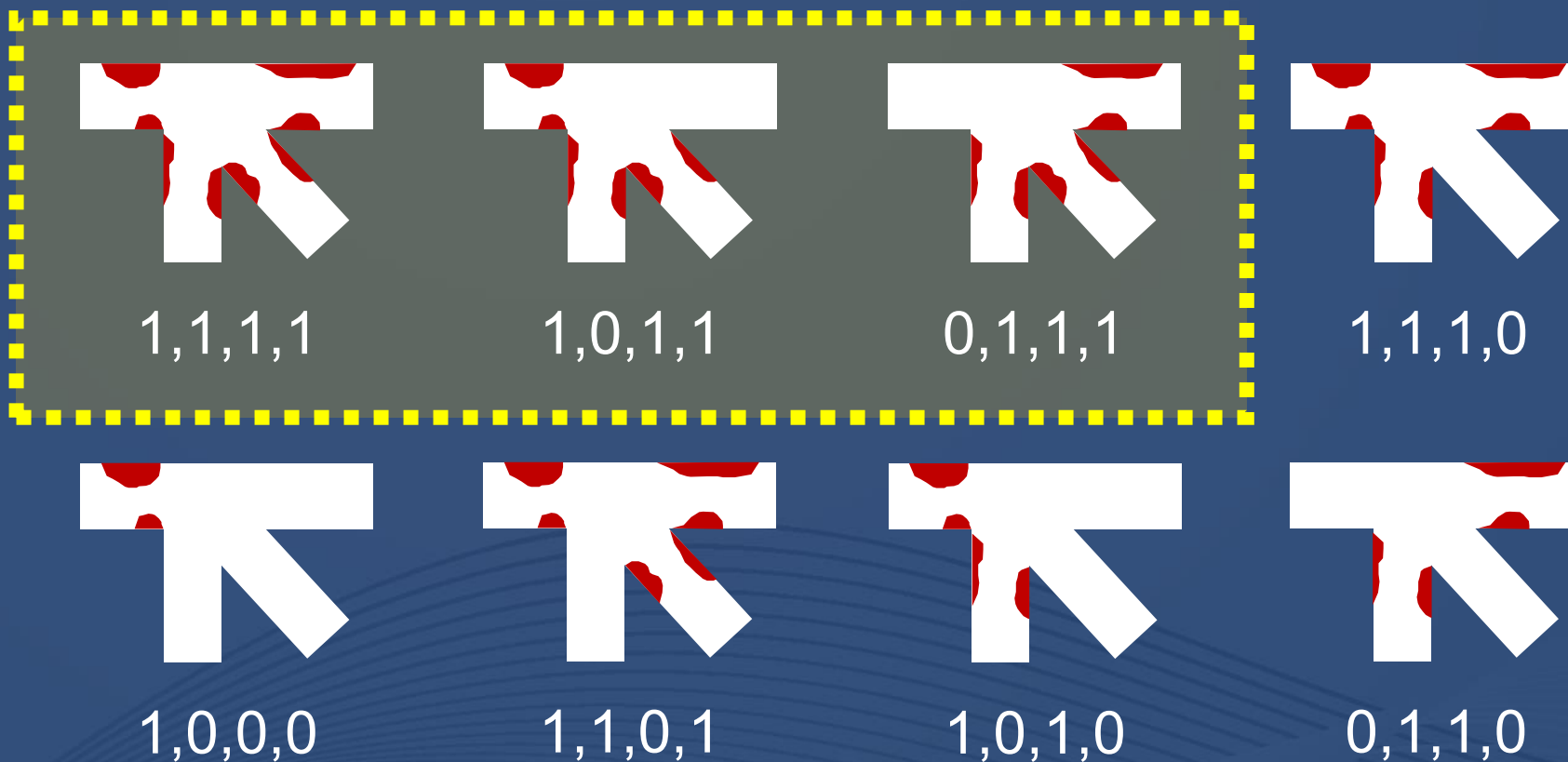
- Left Main and LAD, and 2 SBs: LCX and RI.
- RI should originate from the LM trunk.
- Close origin of 2 SBs: Distance of both the SB Take-off  $< 3$  mm.
- SB size  $\geq 2.25$  mm at baseline angio or after predilation.



# Modified Medina Classification



(LM, LAD, LCX, SB)



- A true LMT is defined as the condition where atherosclerosis significantly involves the MB (either proximal or distal MB or both) and both SBs.



Patient, n(%)	Overall n=92	True Trifurcation n=43	Non-true Trifurcation n=49	P-value
Age	60.59±9.319	61.67±9.242	59.63±9.376	0.297
Ejection Fraction(%)	56.21±11.09	56.14±10.311	56.26±11.837	0.957
Male	77 (83.7%)	34 (79.1%)	43 (87.8%)	0.261
Presentation				0.521
SAP	54	27	27	
UAP	19	10	9	
NSTEMI	3	1	2	
SI	16	5	11	
Previous MI	27	12	15	0.776
Previous PCI	20	10	10	0.741
Cholesterol	60	30	30	0.391
Hypertension	46	22	24	0.834
<b>SYNTAX Score</b>	<b>28.64±9.286</b>	<b>31.91±10.472</b>	<b>25.78±7.042</b>	<b>0.001</b>
<b>STNTAX &gt; 33</b>	<b>24 (26.1%)</b>	<b>21 (48.8%)</b>	<b>3 (6.1%)</b>	<b>0.000</b>

T.Santoso medistra hospital, Medistra LM Trifurcation Registry, tctMD 2019 Presentation



Recommendations according to extent of CAD	CABG		PCI	
	Class <sup>a</sup>	Level <sup>b</sup>	Class <sup>a</sup>	Level <sup>b</sup>
<b>Left main CAD</b>				
Left main disease with low SYNTAX score (0 - 22). <sup>69,121,122,124,145-148</sup>	I	A	I	A
Left main disease with intermediate SYNTAX score (23 - 32). <sup>69,121,122,124,145-148</sup>	I	A	IIa	A
Left main disease with high SYNTAX score ( $\geq 33$ ). <sup>c 69,121,122,124,146-148</sup>	I	A	III	B

Three-vessel CAD without diabetes mellitus				
Three-vessel disease with low SYNTAX score	Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	III	Is not recommended
Three-vessel disease with intermediate or high SYNTAX score				
<b>Three-vessel CAD with diabetes mellitus</b>				
Three-vessel disease with low SYNTAX score				
Three-vessel disease with intermediate or high SYNTAX score ( $>22$ ). <sup>c 102,105,121,123,124,135,150-157</sup>			I	A

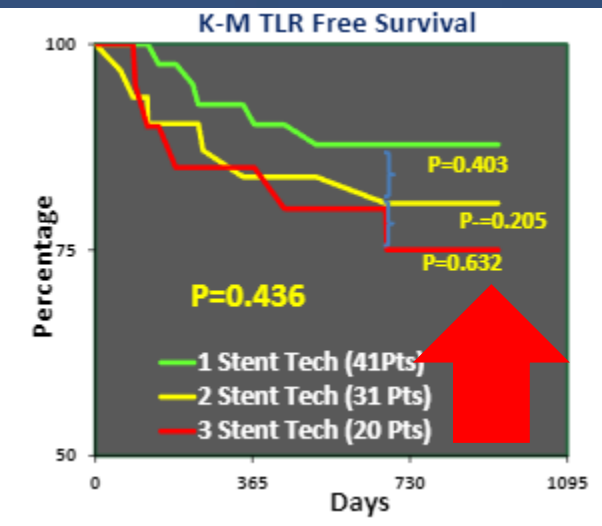
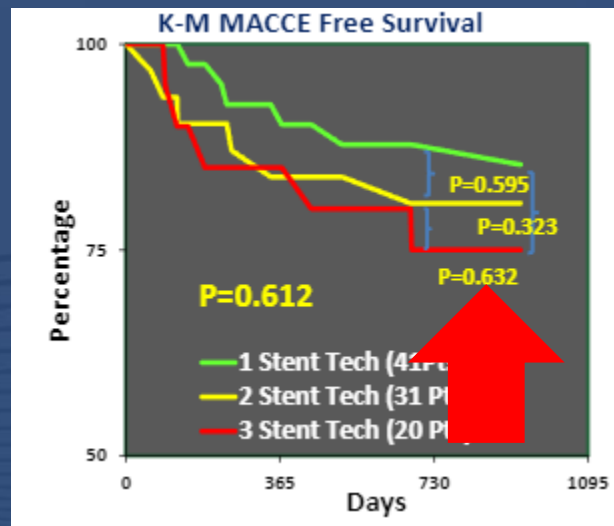
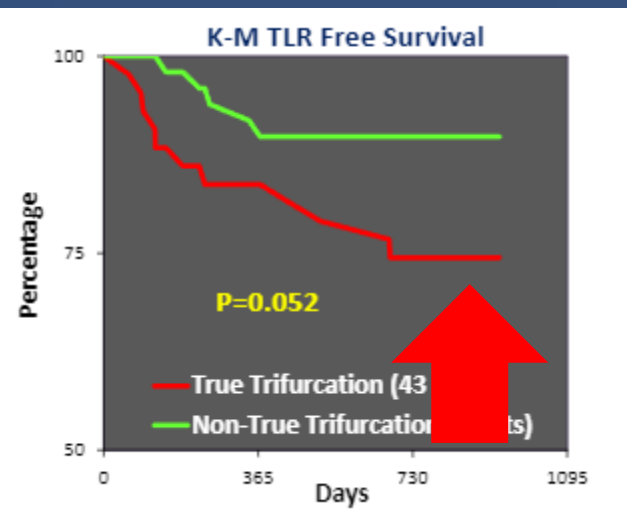
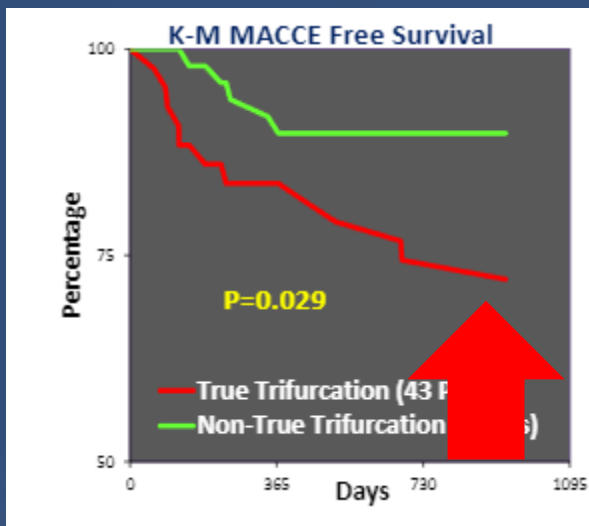
ESC/EACTS Guideline Myocardial Revascularization, 2018



# AS-37: Acute and Medium-Term Outcome of Drug-Eluting Stent Implantation in Left Main Trifurcation Stenosis Compared with Left Main Bifurcation Stenosis

Teguh Santoso • Linda Lison • Merry Wintery • Idrus Alwi

The  
American Journal  
of Cardiology.



## Five-year clinical outcomes following drug-eluting stent implantation in left main trifurcations

Robert J. Gil<sup>1</sup>, Jacek Bil<sup>1</sup>, Adam K. Kern<sup>2</sup>, Luis A. Inigo Garcia<sup>3</sup>, Radoslaw Formuszewicz<sup>4</sup>, Slawomir Dobrzycki<sup>5</sup>

Adv Interv Cardiol 2019; 15, 1 (55): 116–119  
DOI: <https://doi.org/10.5114/aic.2019.83777>

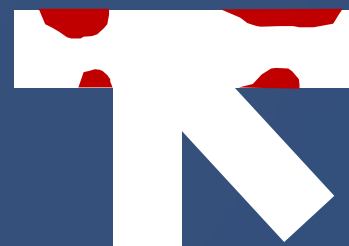
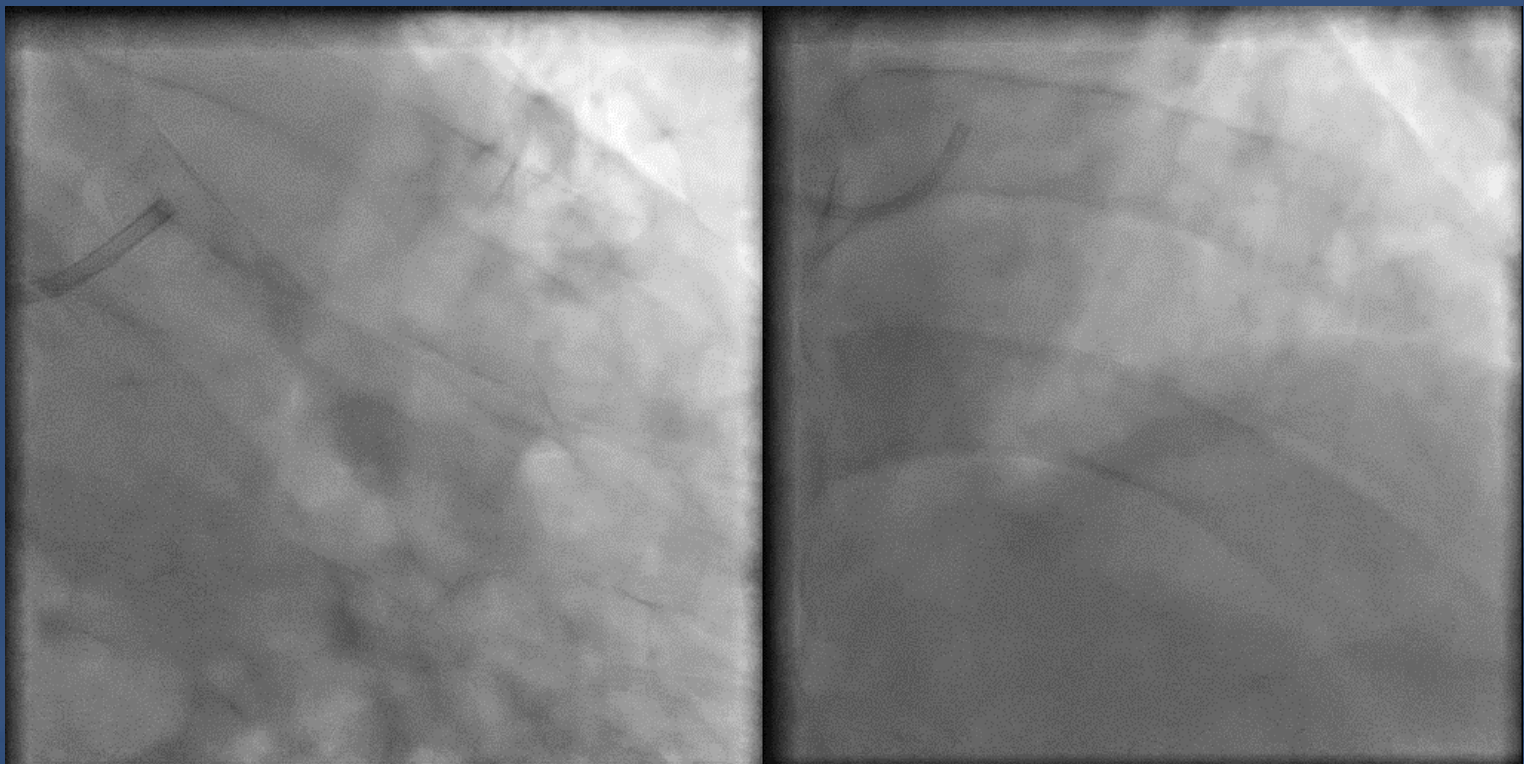


**Less complex techniques usually give the best result.**

	All Tri (n = 67)	Type 1 (n = 12)	Type 2 (n = 36)	Type 3 (n = 19)	P-value
	32 (17.9%)	13 (19.4%)	8 (22.2%)	4 (21.1%)	NS
MI	7 (3.9%)	2 (2.9%)	1 (2.8%)	1 (5.3%)	NS
Cardiac death	0	1 (1.5%)	1 (2.8%)	0	NS
TLR	25 (14.0%)	10 (14.9%)	6 (16.7%)	3 (10.5%)	NS



# Case 1 : Single Stent Technique



1,1,0,0

Syntax : **23**

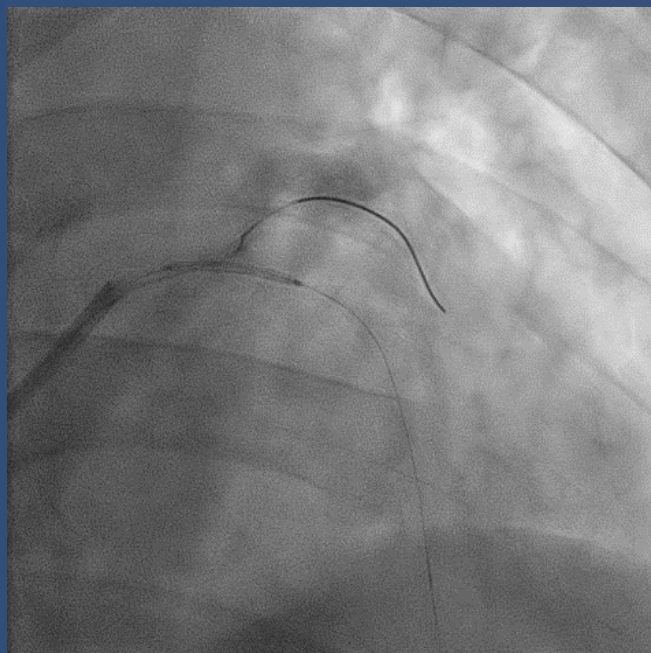
CABG		PCI	
Class <sup>a</sup>	Level <sup>b</sup>	Class <sup>a</sup>	Level <sup>b</sup>
I	A	IIa	A

*Class IIa*

*Weight of evidence/opinion is in favour of usefulness/efficacy.*

Should be considered





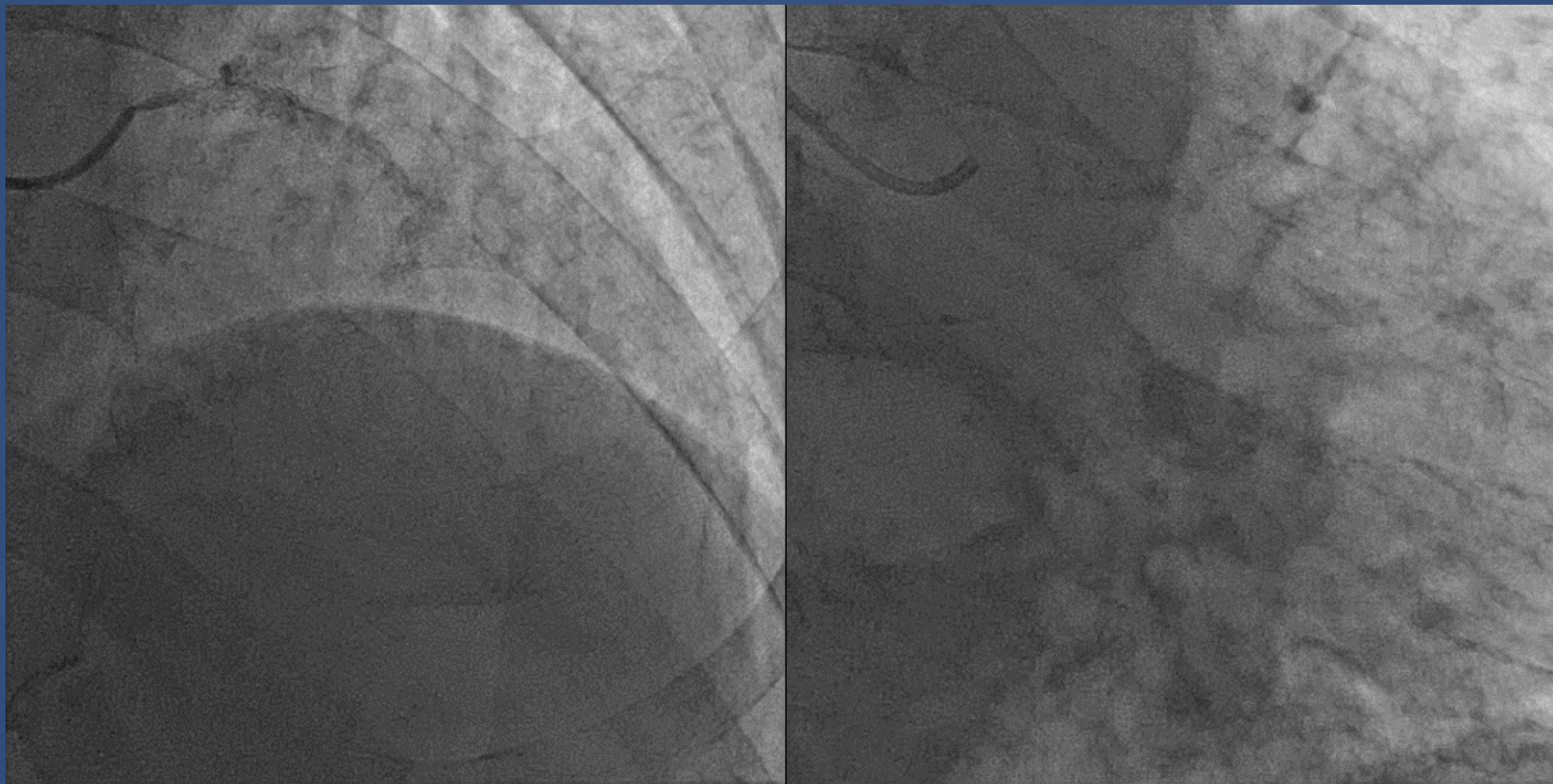
**Single Stent  
Technique**



**Final Angio**

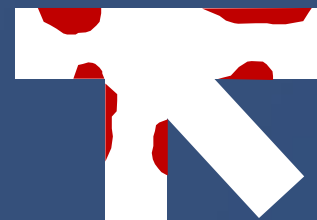
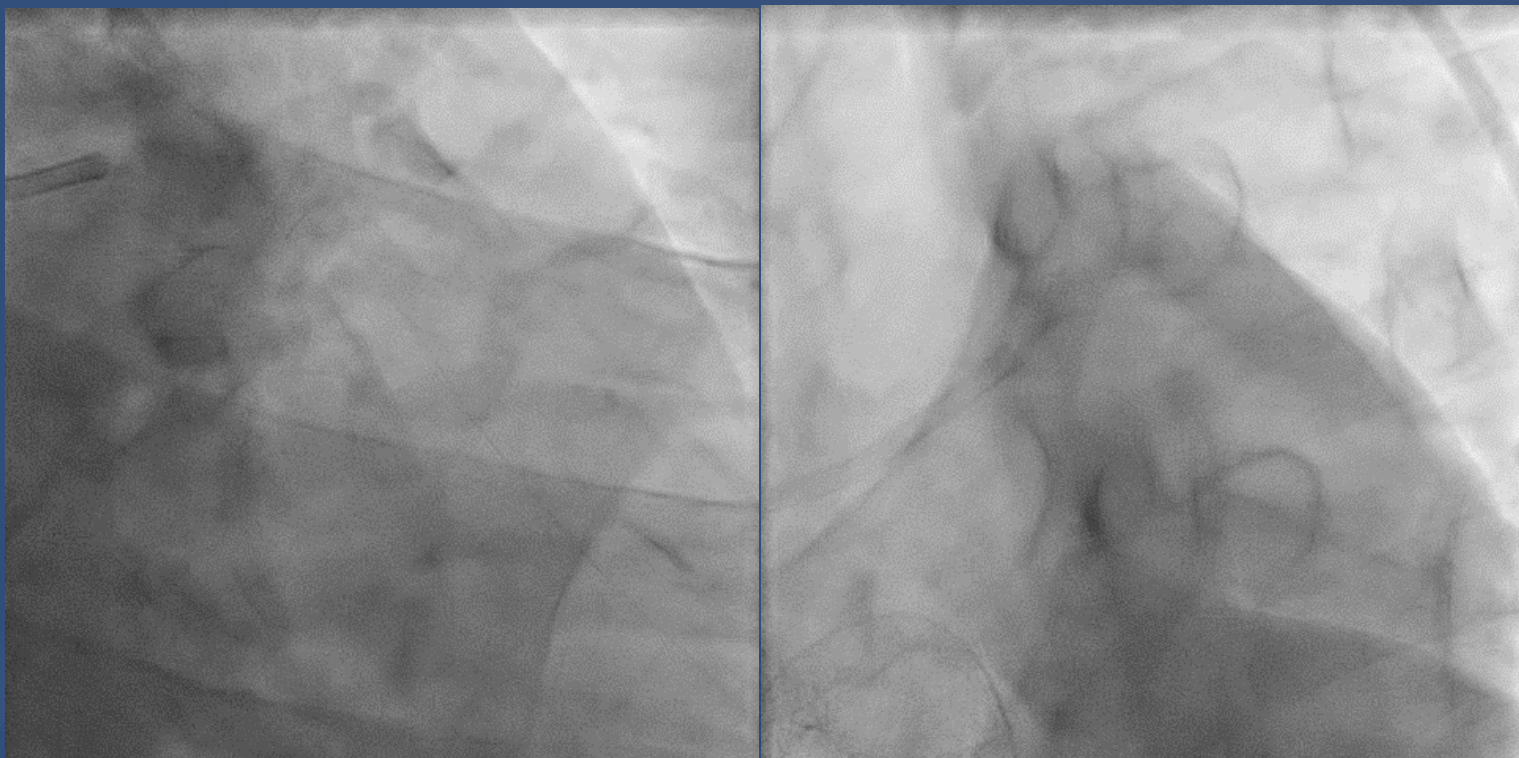


# Single Stent Technique 1y F/U





# Case 2 : Two Stent Technique



1,1,1,0

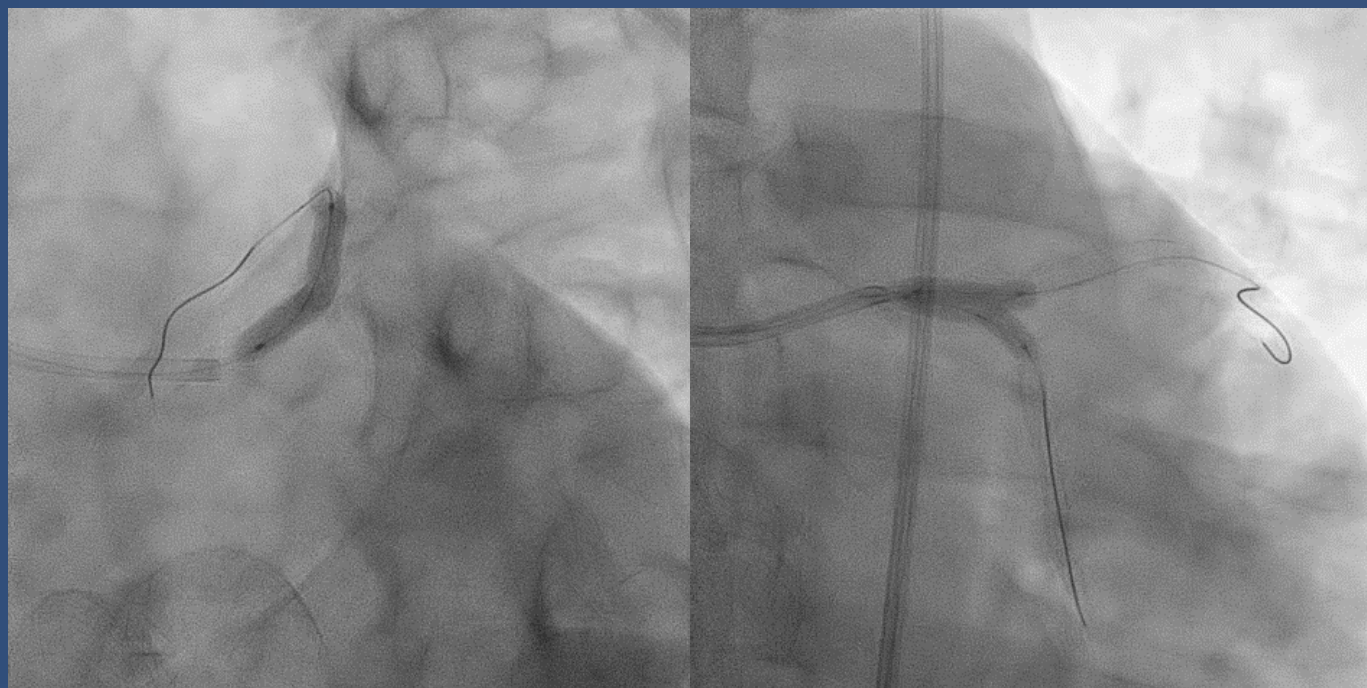
Syntax : 32

CABG		PCI	
Class <sup>a</sup>	Level <sup>b</sup>	Class <sup>a</sup>	Level <sup>b</sup>
I	A	IIa	A

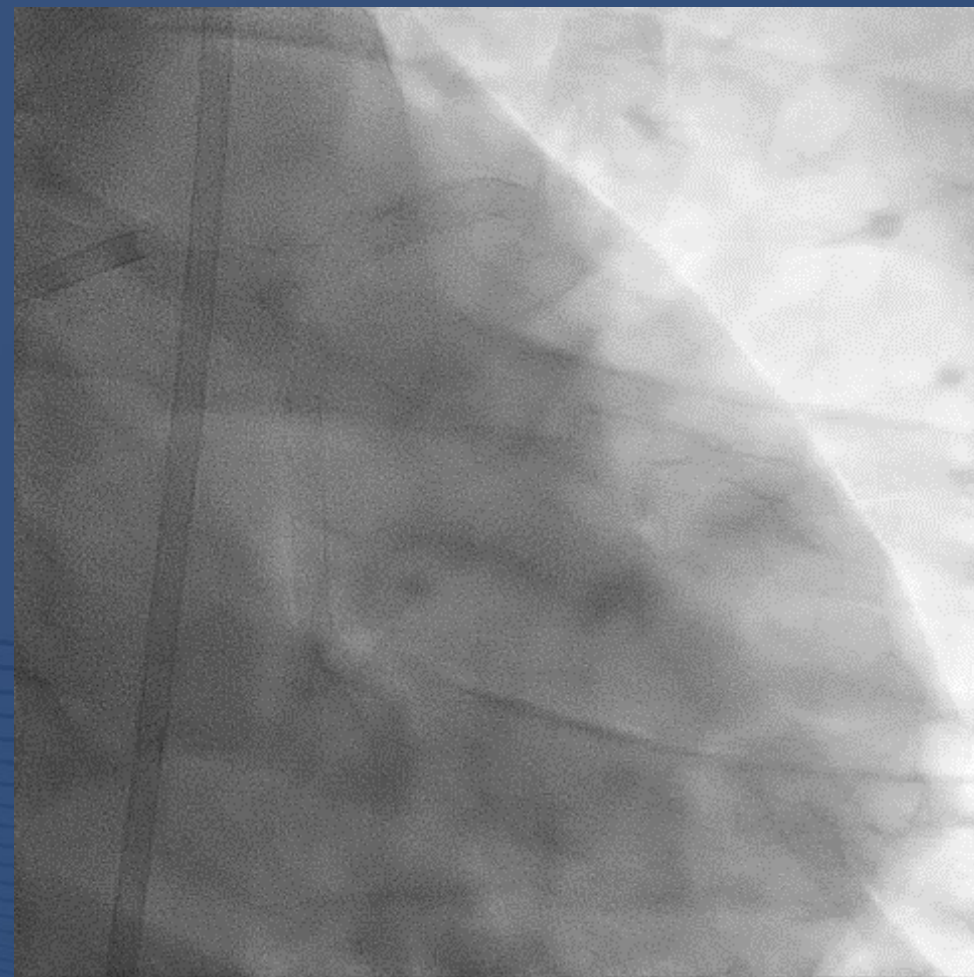
*Class IIa*

*Weight of evidence/opinion is in favour of usefulness/efficacy.*

Should be considered



## Crush Two Stent Technique



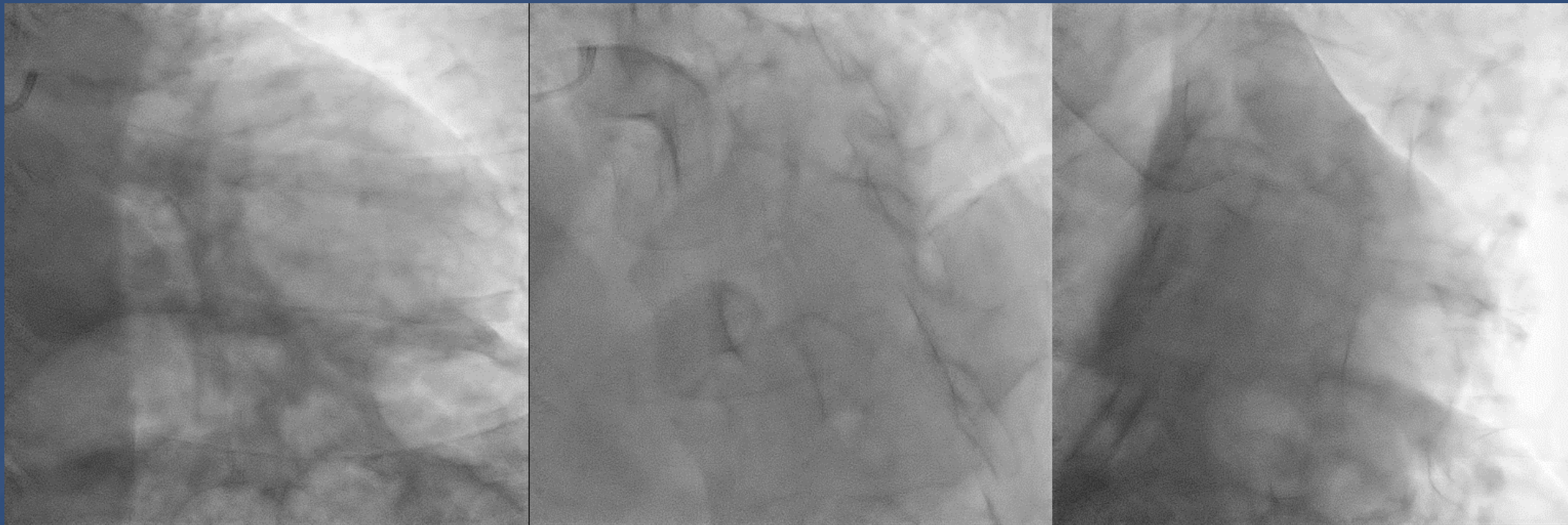


# Two Stent Technique 1y F/U



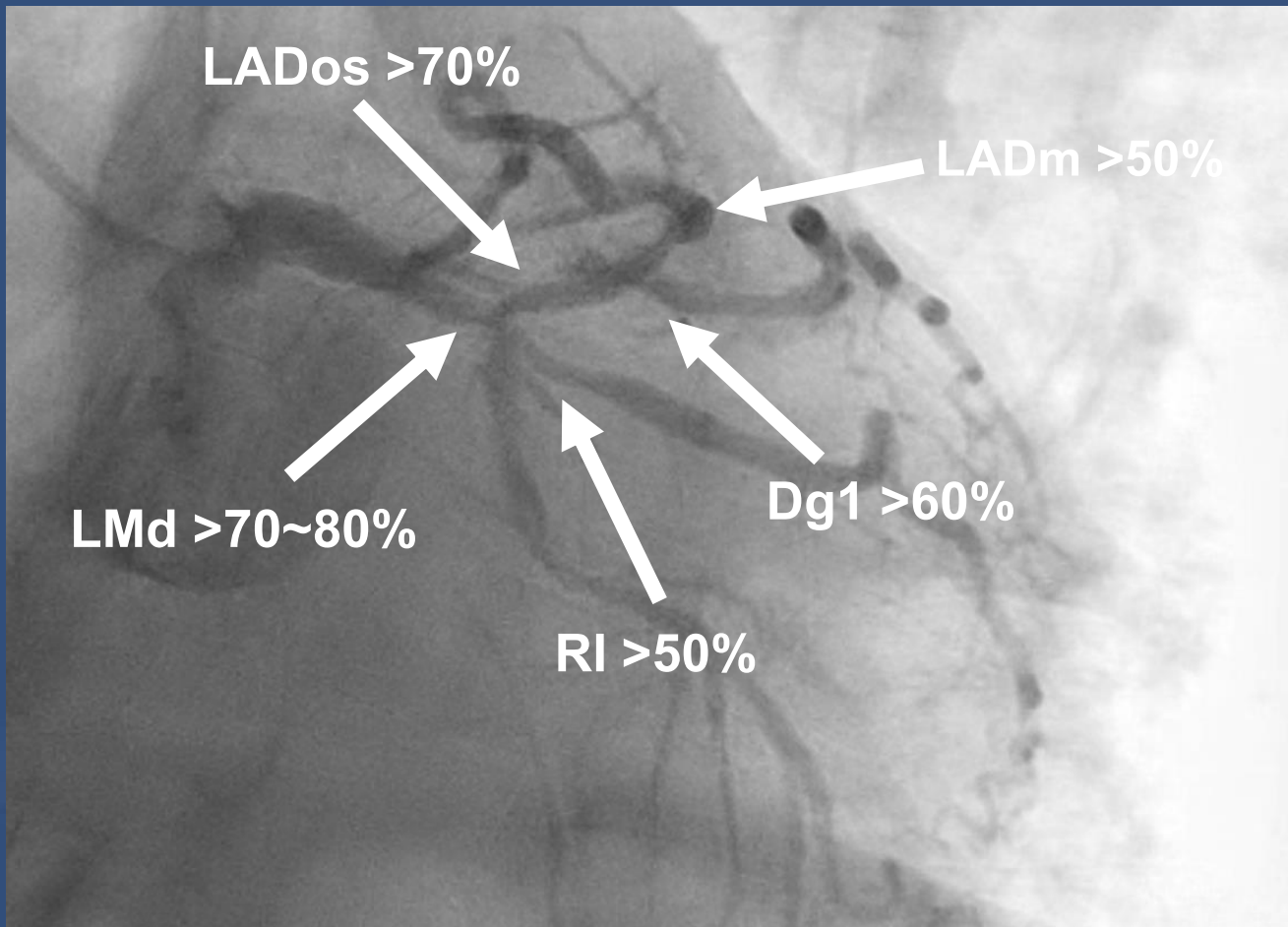


# Case 3 : Two Bifurcation Lesion





# Case 3 : Two Bifurcation Lesion



Syntax : **39**

CABG		PCI	
Class <sup>a</sup>	Level <sup>b</sup>	Class <sup>a</sup>	Level <sup>b</sup>
I	A	III	B

**Class III**

Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.

Is not recommended



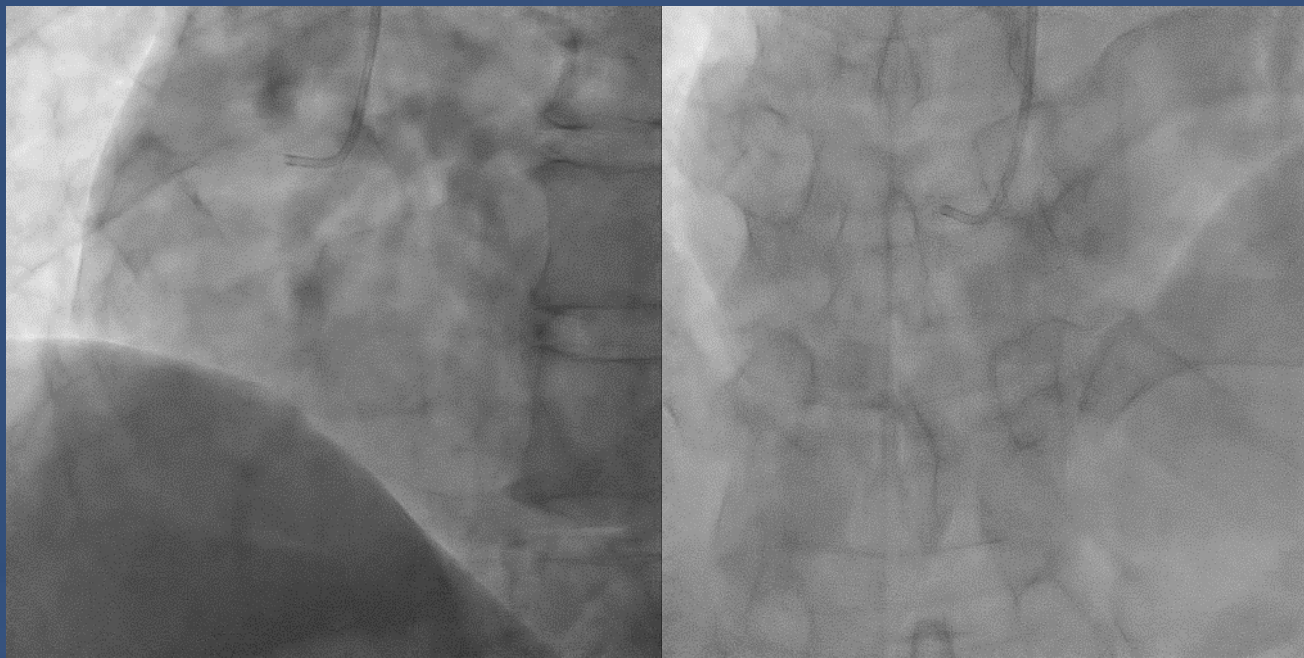
# Planning

- Hemodynamic Support : RCA status, LV function
- Imaging IVUS
- LAD – Dg1 Bifurcation : Provisional or Two Stent Strategy
- LM-LAD-LCX-RI Trifurcation : Provisional or Two Stent Strategy



# Hemodynamic Support

- RCA status

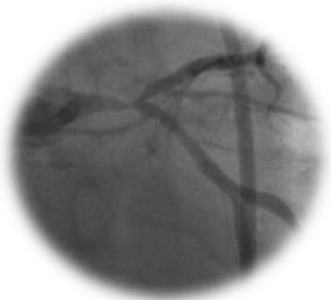


- LV function : **78%**

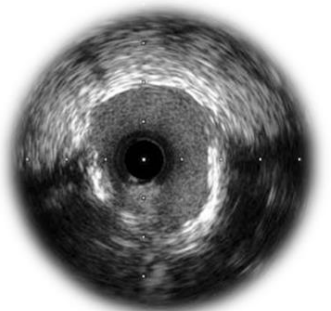
# Imaging IVUS

## Long-term (10-year) Impact of IVUS-guidance for Left Main PCI

### Left Main Disease



### IVUS-guided PCI



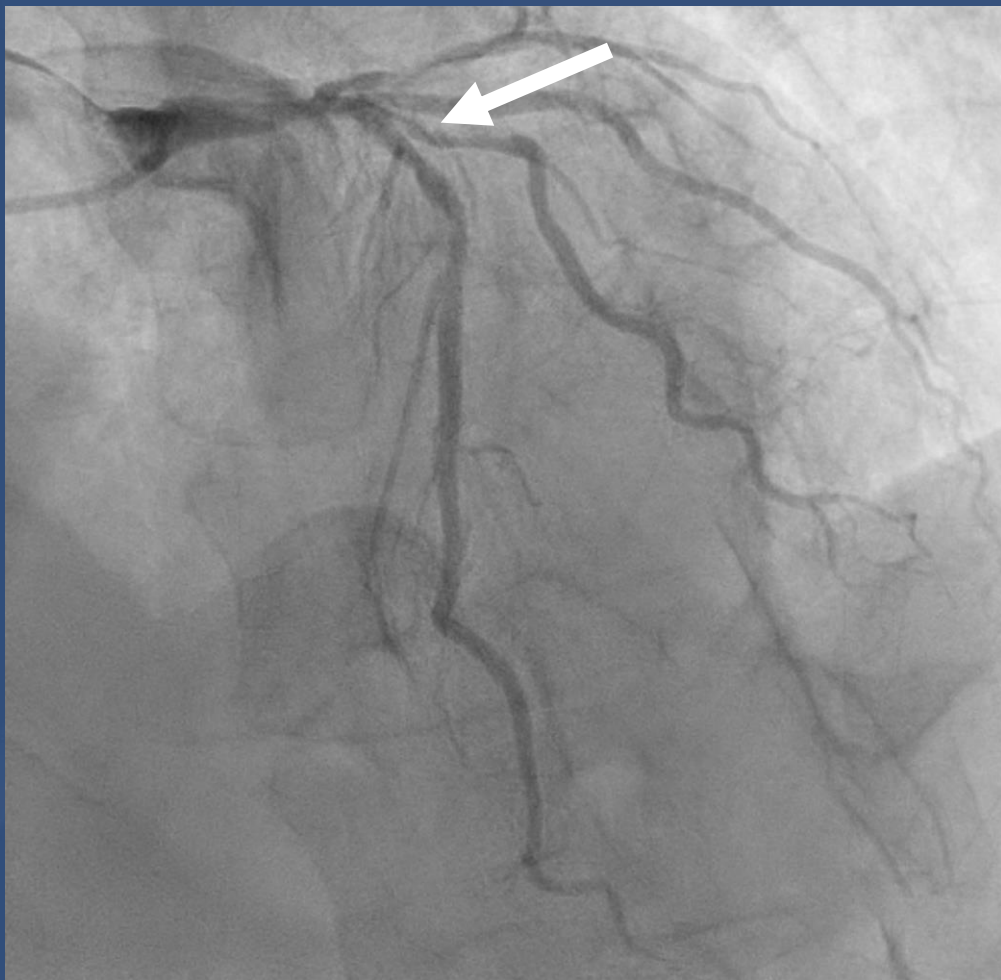
10-Year  
Follow-up



Long-Term Clinical Impact of Intravascular Ultrasound Guidance in Stenting for Left Main Coronary Artery Disease

Circulation: Cardiovascular Interventions. 2021;14

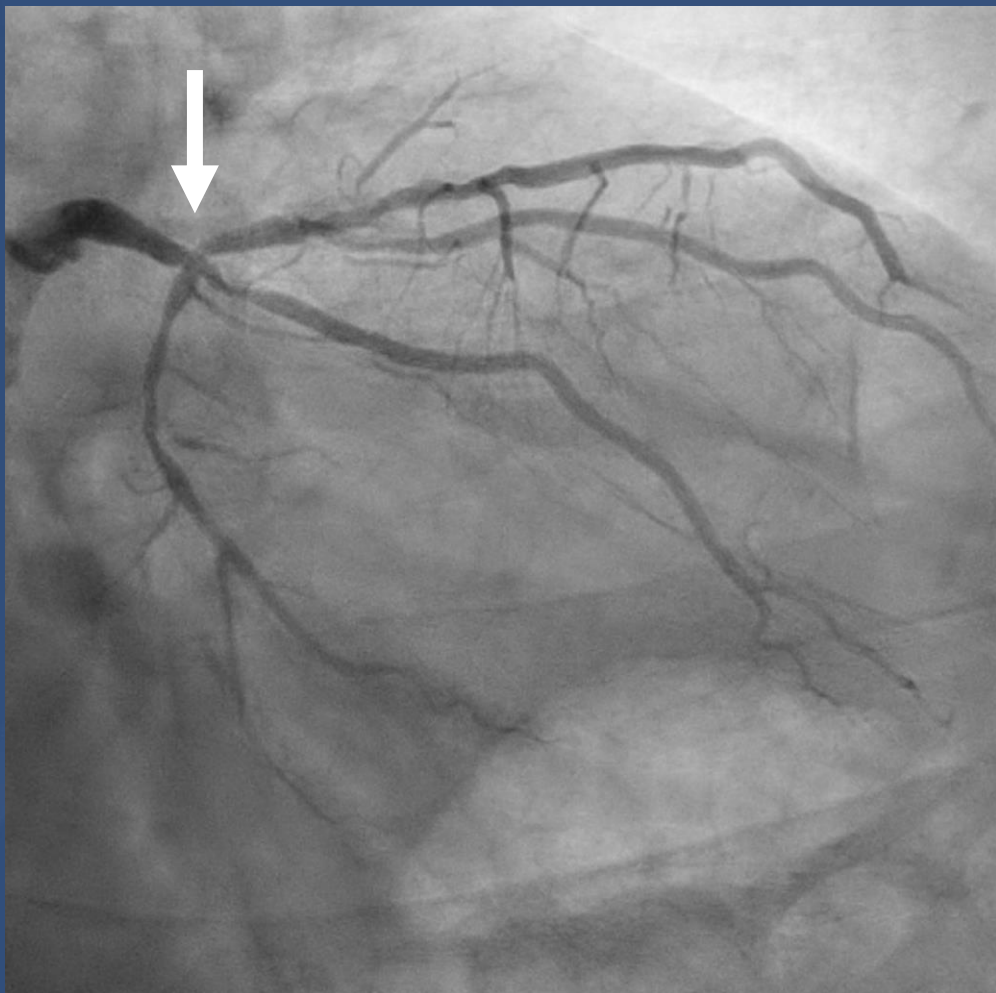
# LAD – Dg1 Bifurcation Strategy



- ✓ SB needs to be preserved? **Yes**
- ✓ Likelihood of SB occlusion? **High**
- ✓ Medina 0,1,1 ? **No**

**Planned Two Stent Strategy!**

# LM-LAD-LCX-RI Trifurcation Strategy



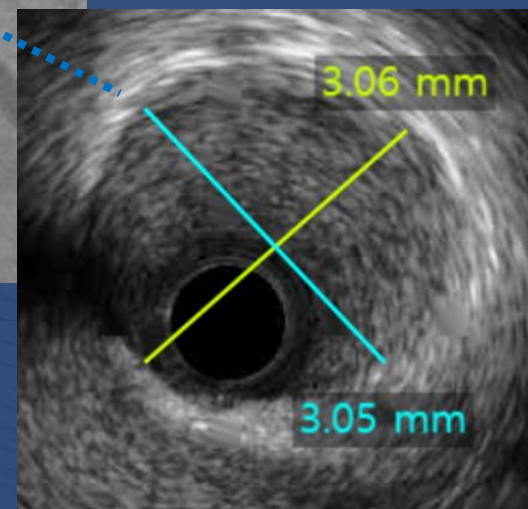
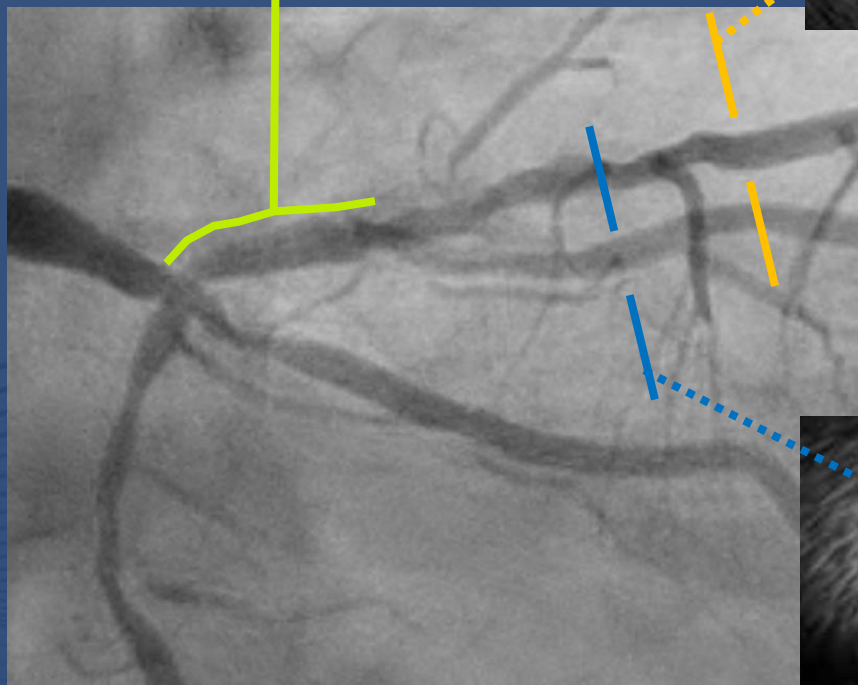
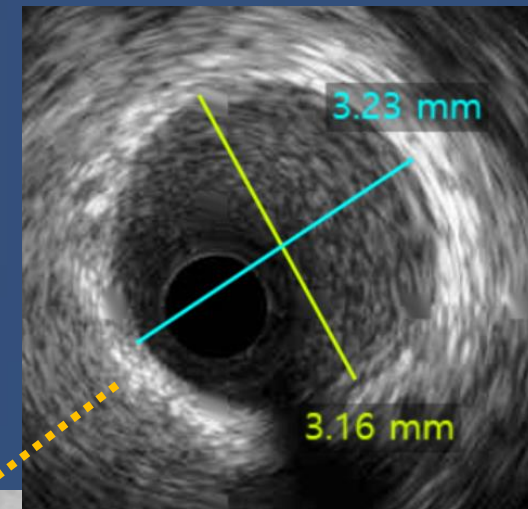
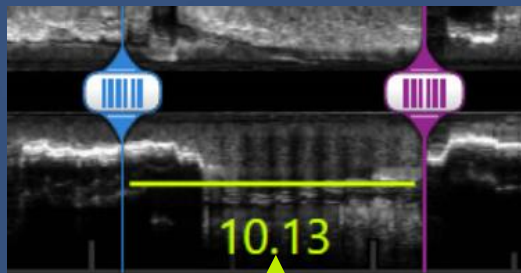
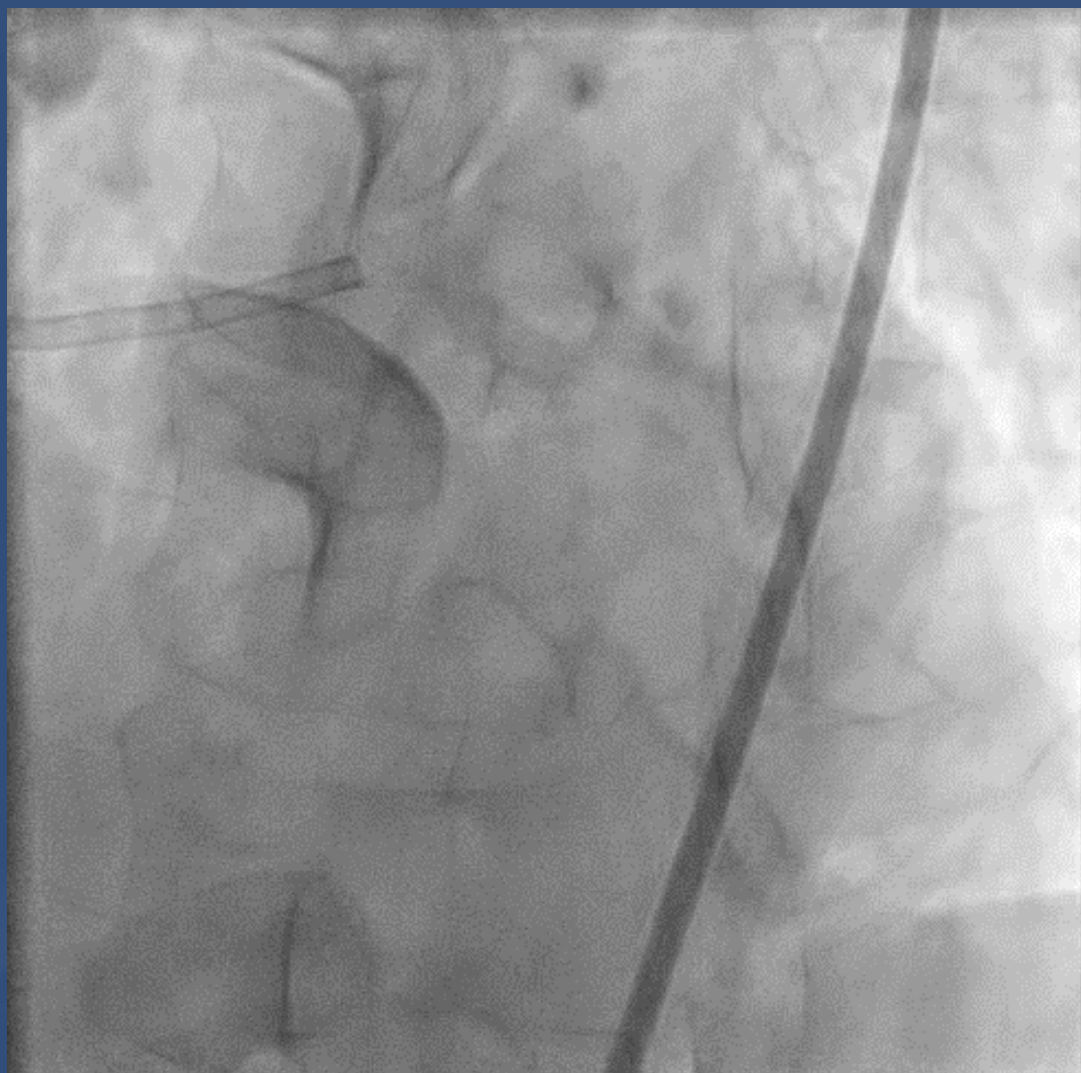
- ✓ SB needs to be preserved? **Yes**
- ✓ Likelihood of SB occlusion? **Low**

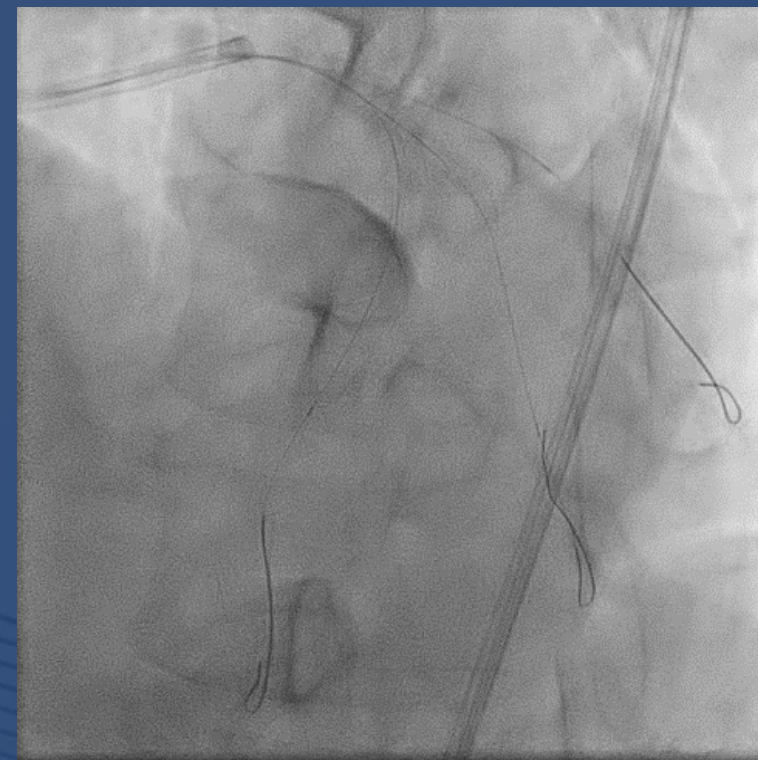
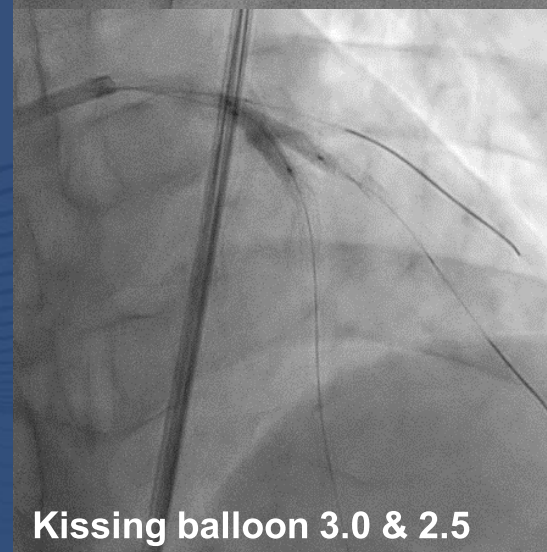
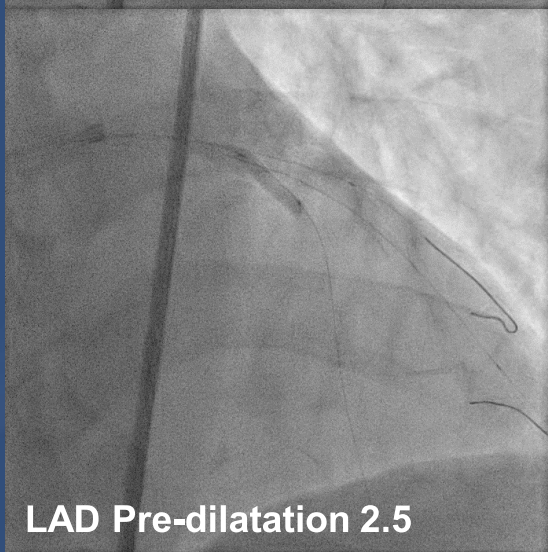
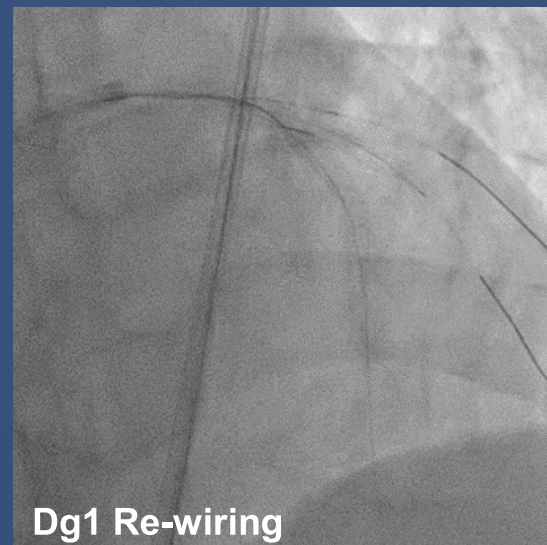
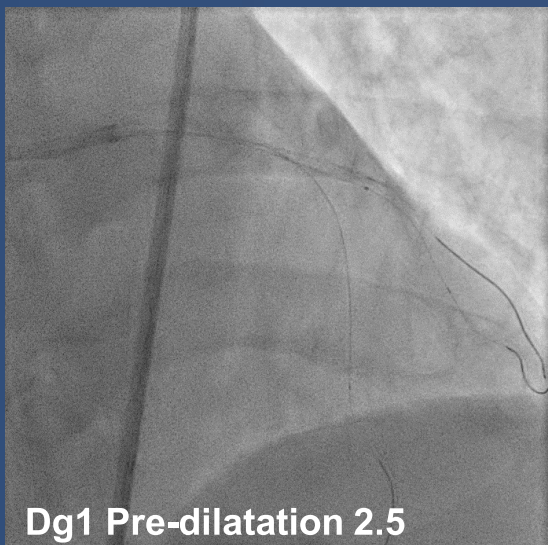
**Provisional stenting strategy**



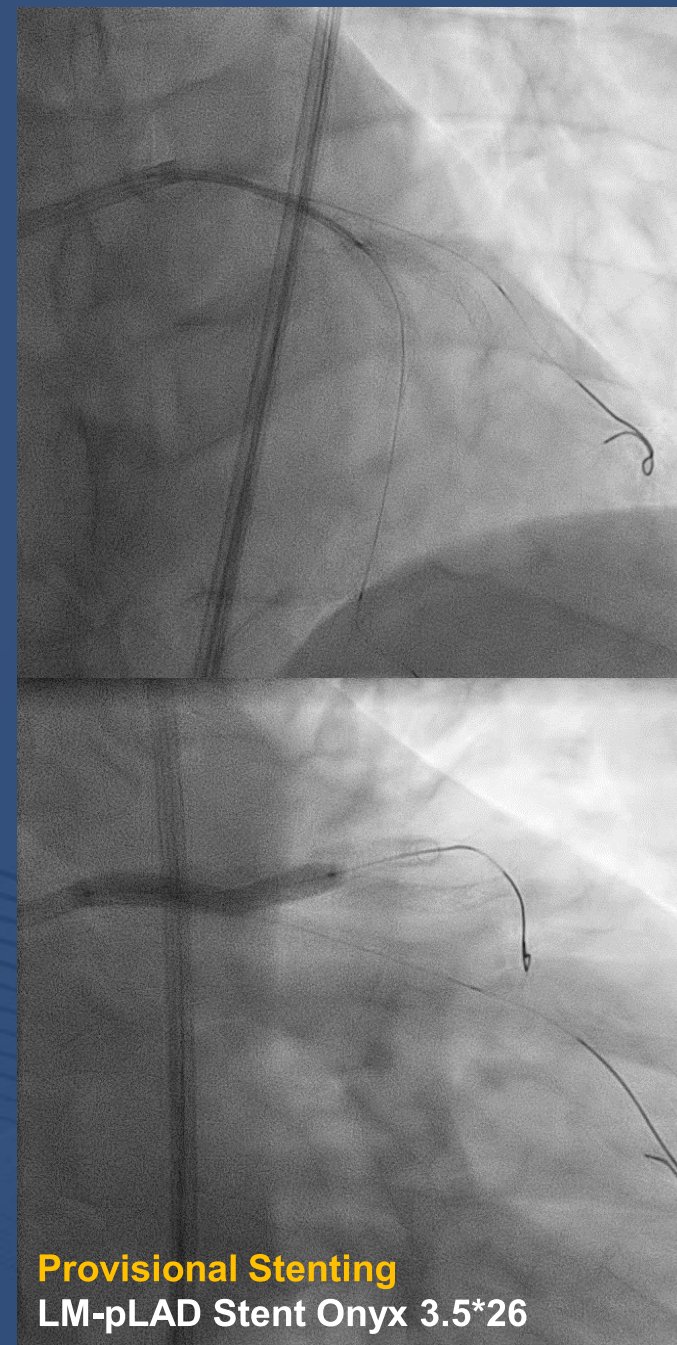
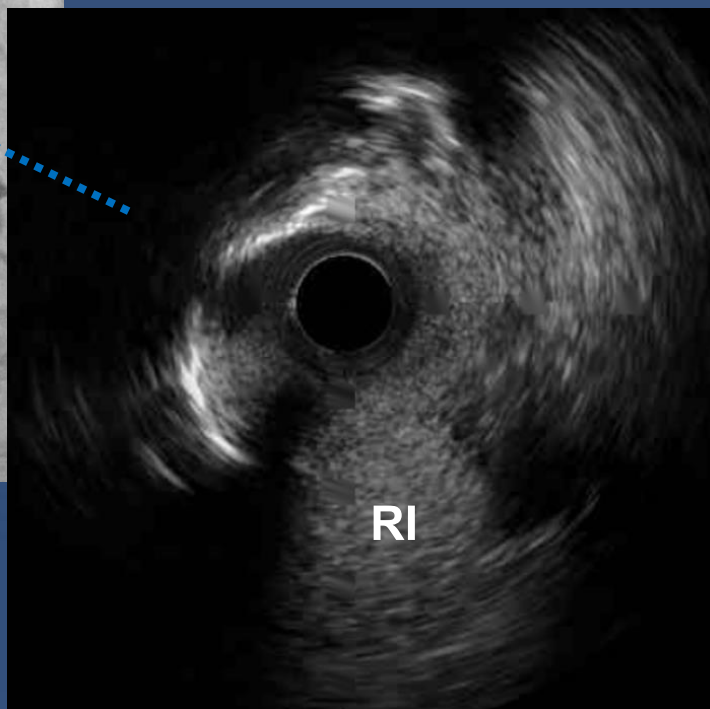
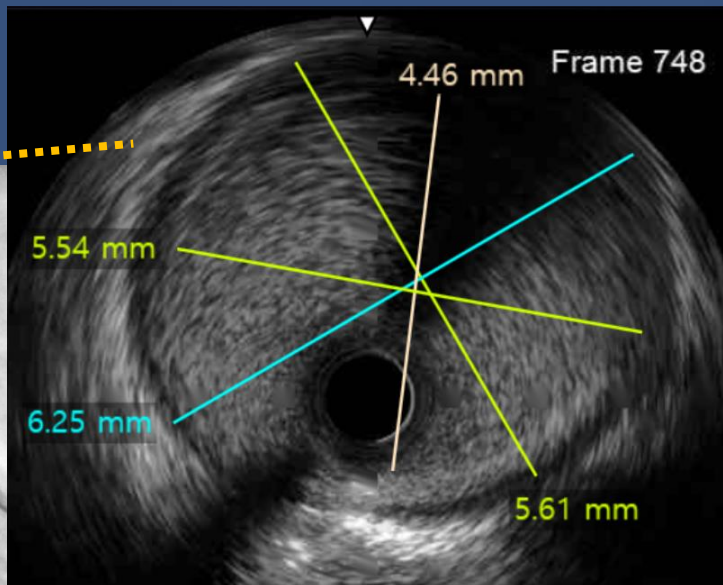
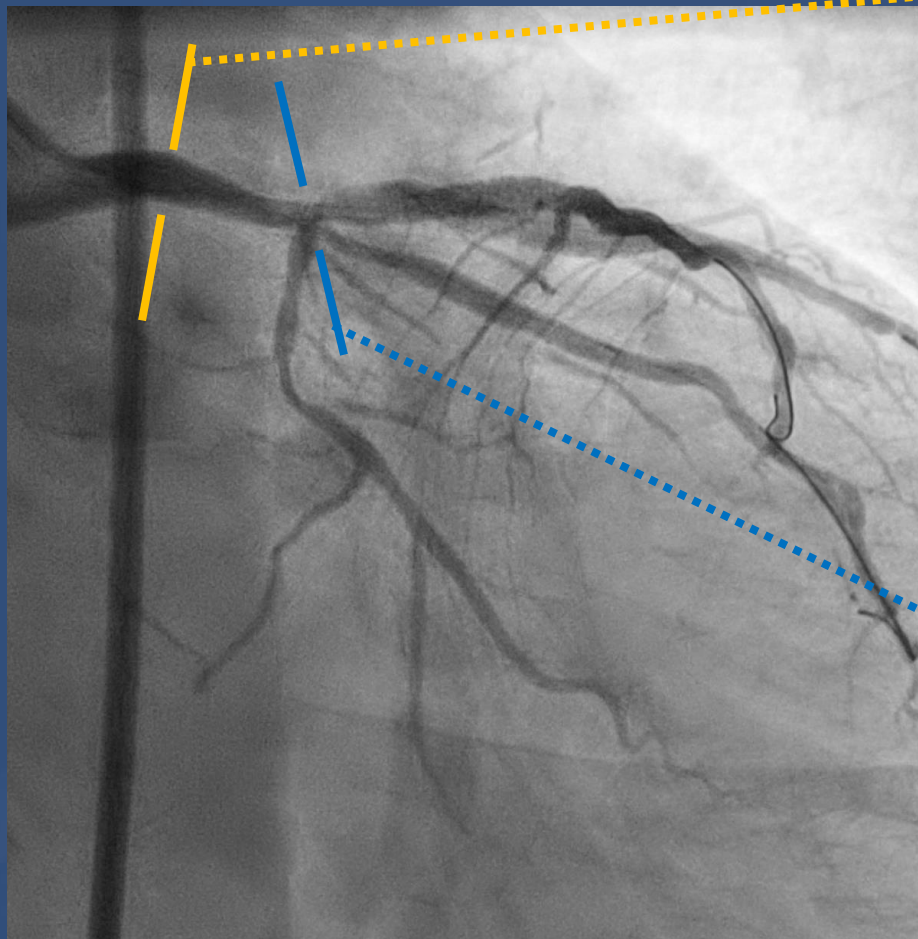
Crossover stent

- ✓ SB compromised?  
= Provisional Stent? Two Stent?



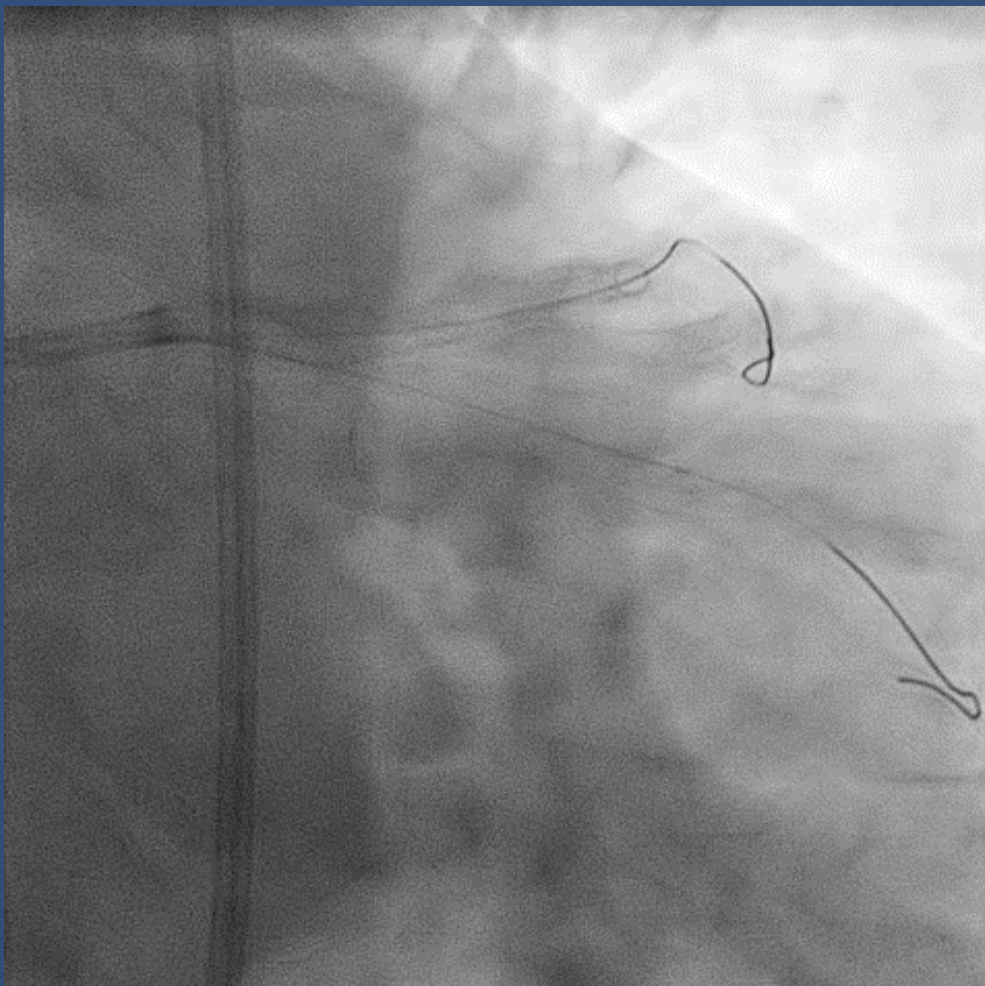


**Mini-Crush Two Stent Technique**

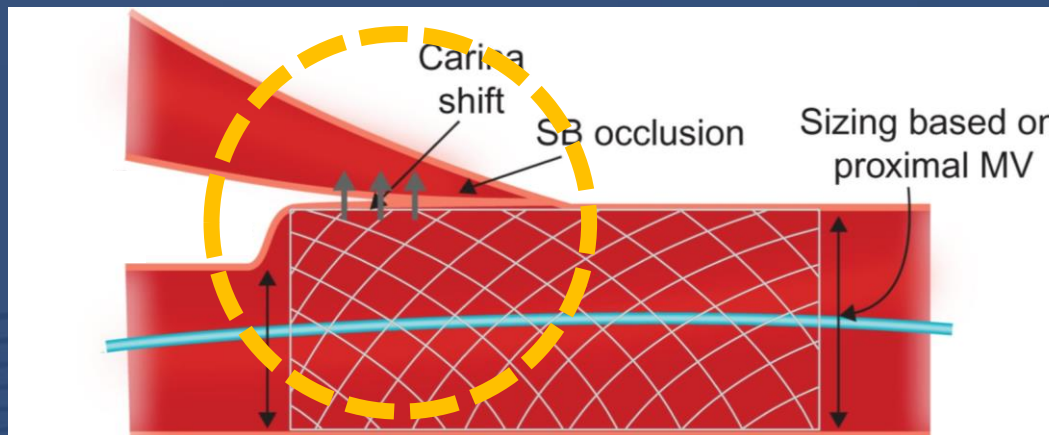


**Provisional Stenting**  
LM-pLAD Stent Onyx 3.5\*26

# POST LM-LAD Crossover stent

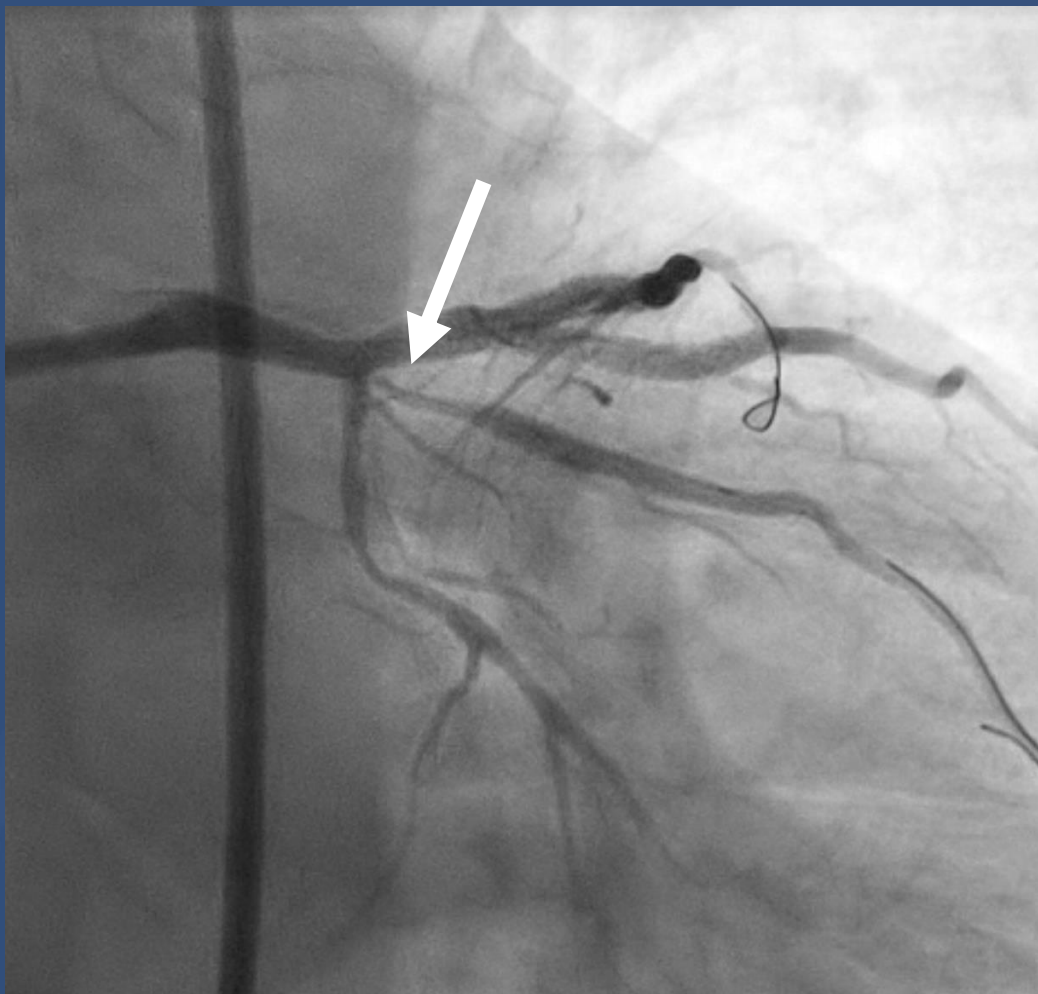


- RI – Carina Shift **>70%**
- Flow - **TIMI II**





# LM-LAD-LCX-RI Trifurcation Strategy



✓ SB needs to be preserved? **Yes**

✓ Likelihood of SB occlusion? **Low**

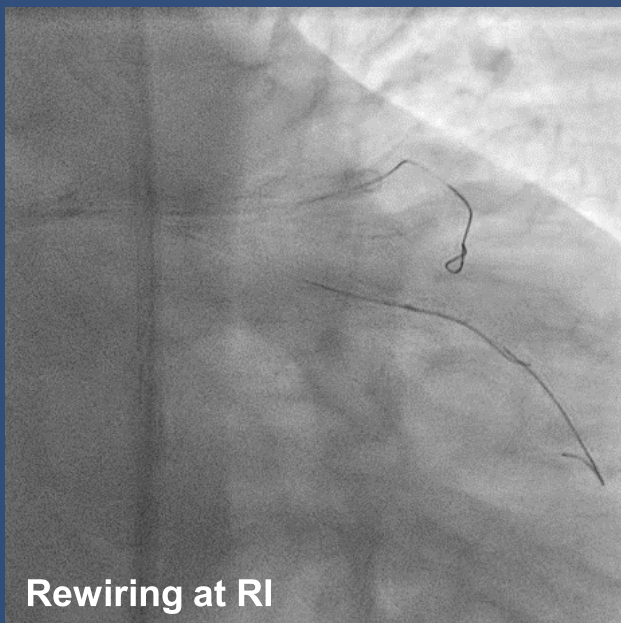
**Provisional stenting strategy**



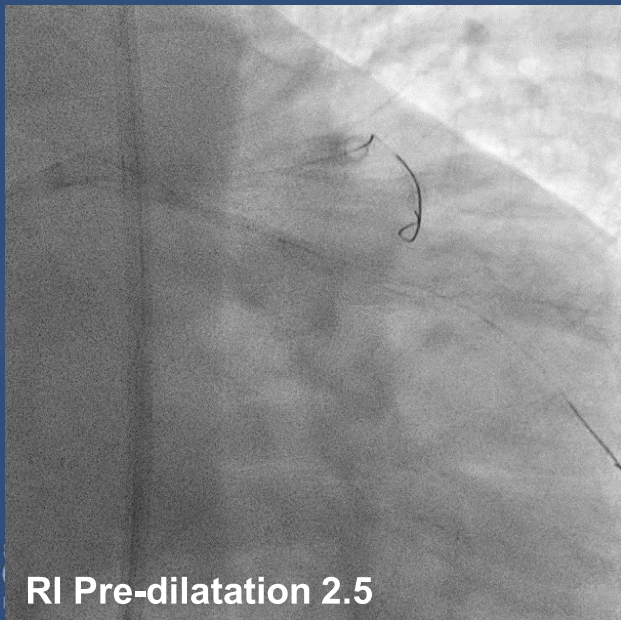
Crossover stent

✓ SB compromised? **Yes**

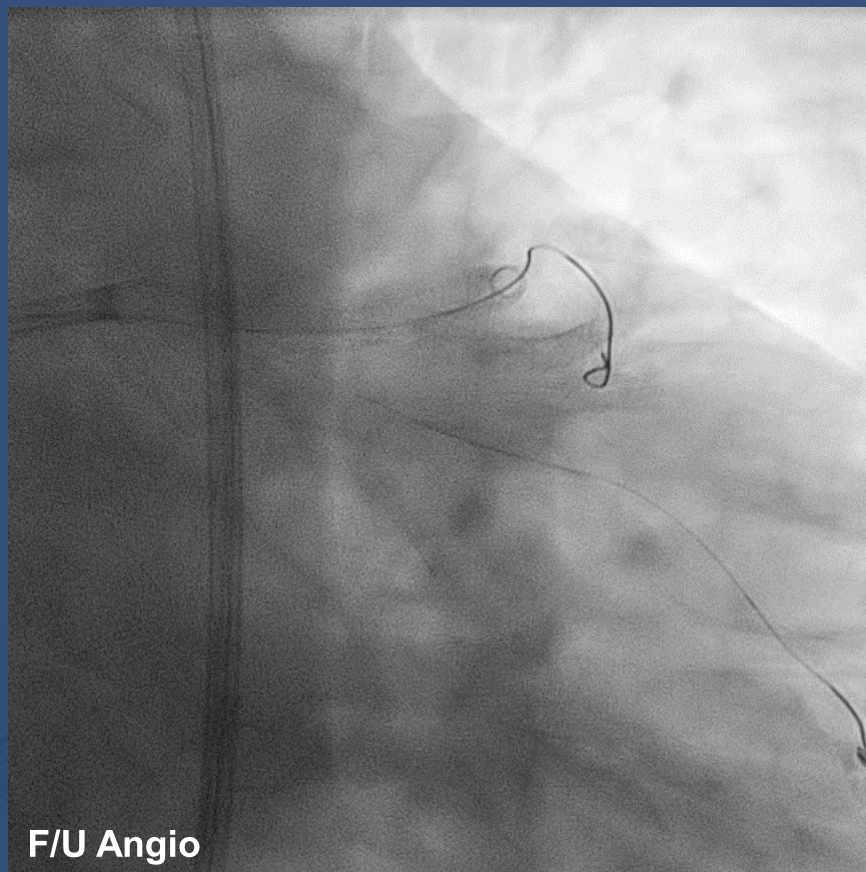
**Two stenting strategy!!**



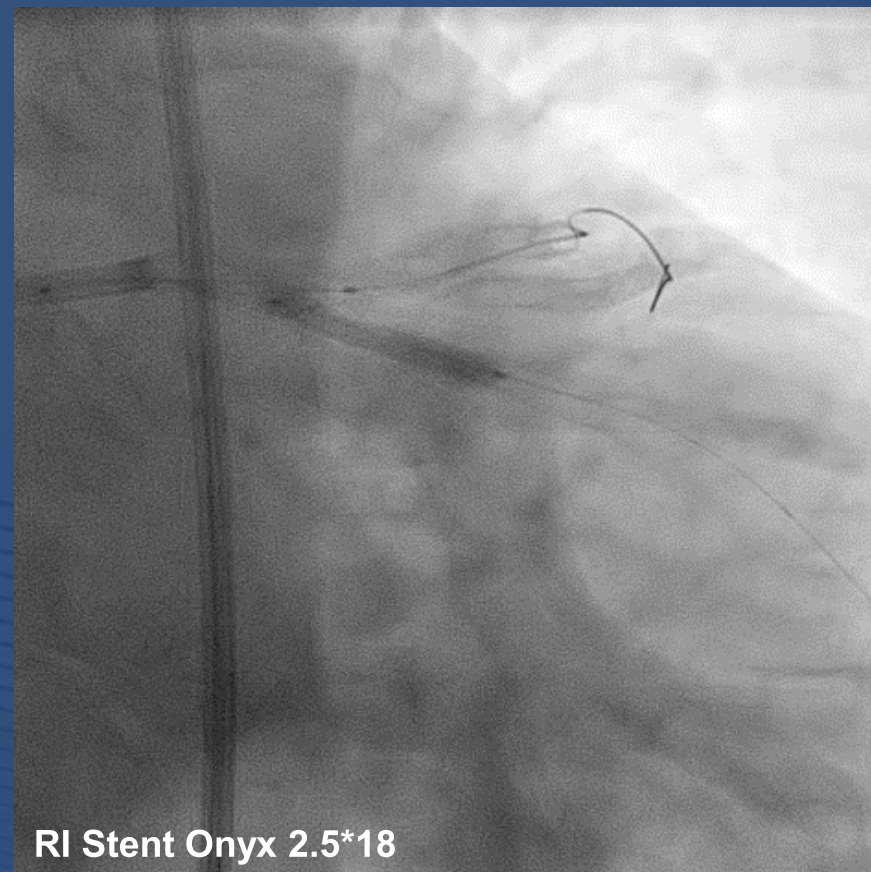
Rewiring at RI



RI Pre-dilatation 2.5



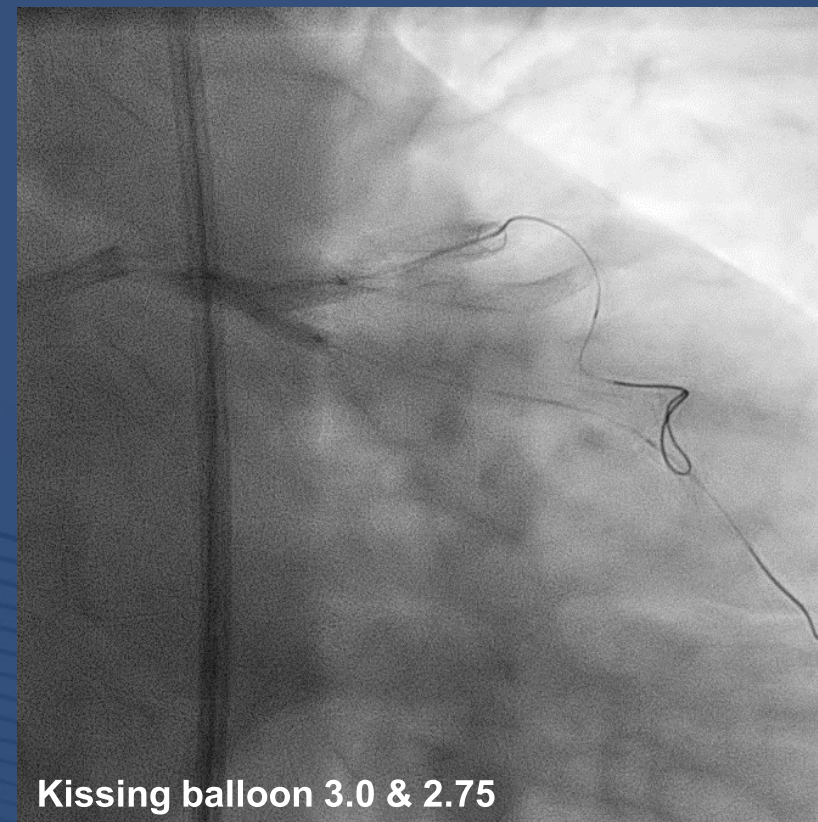
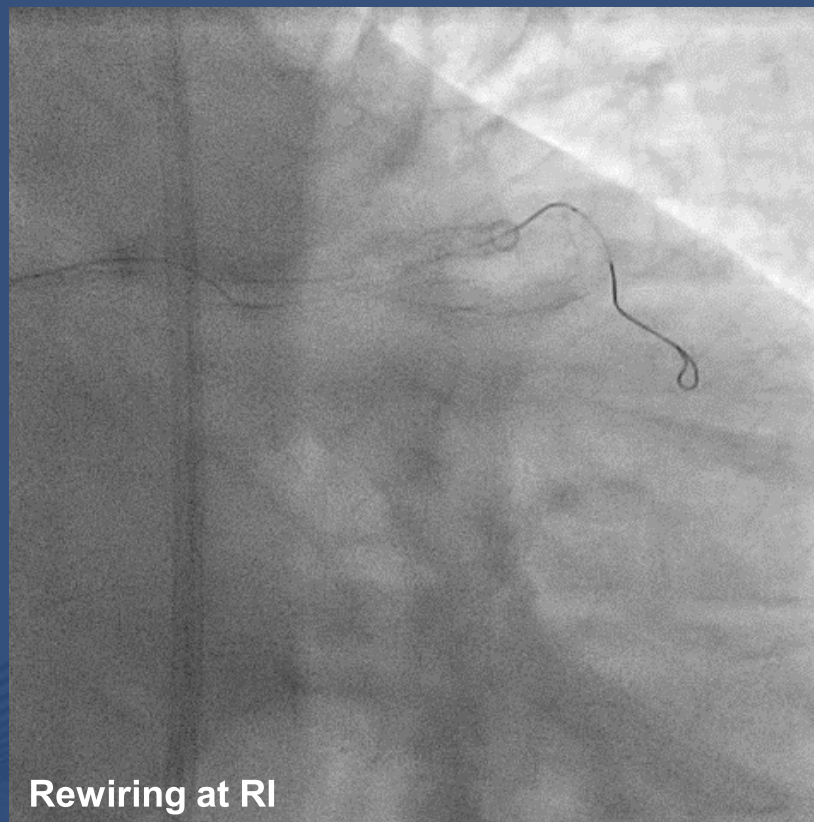
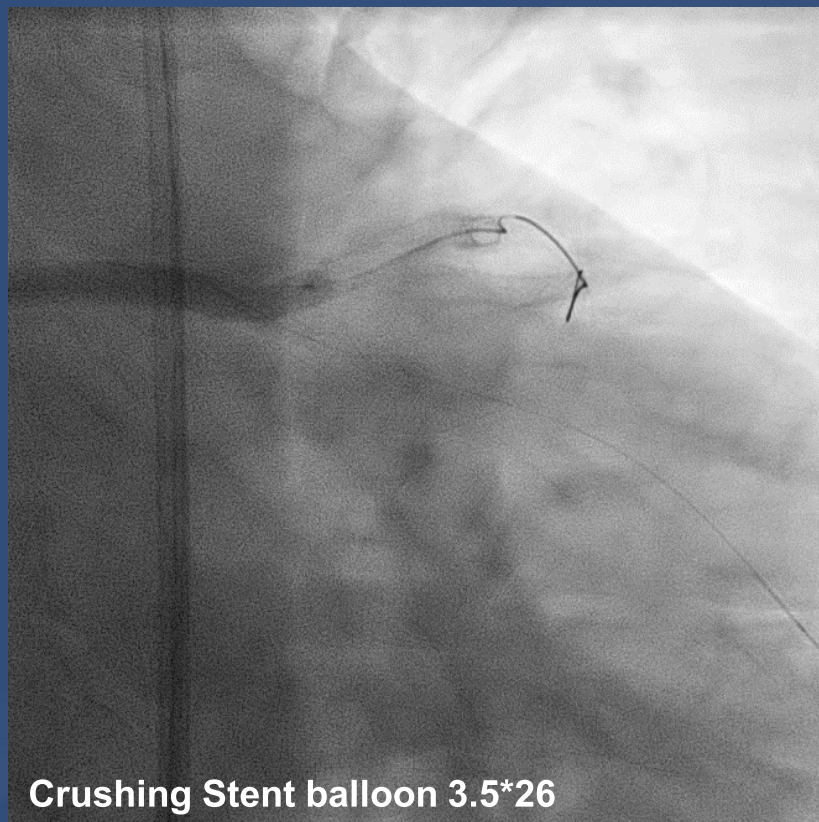
F/U Angio



RI Stent Onyx 2.5\*18

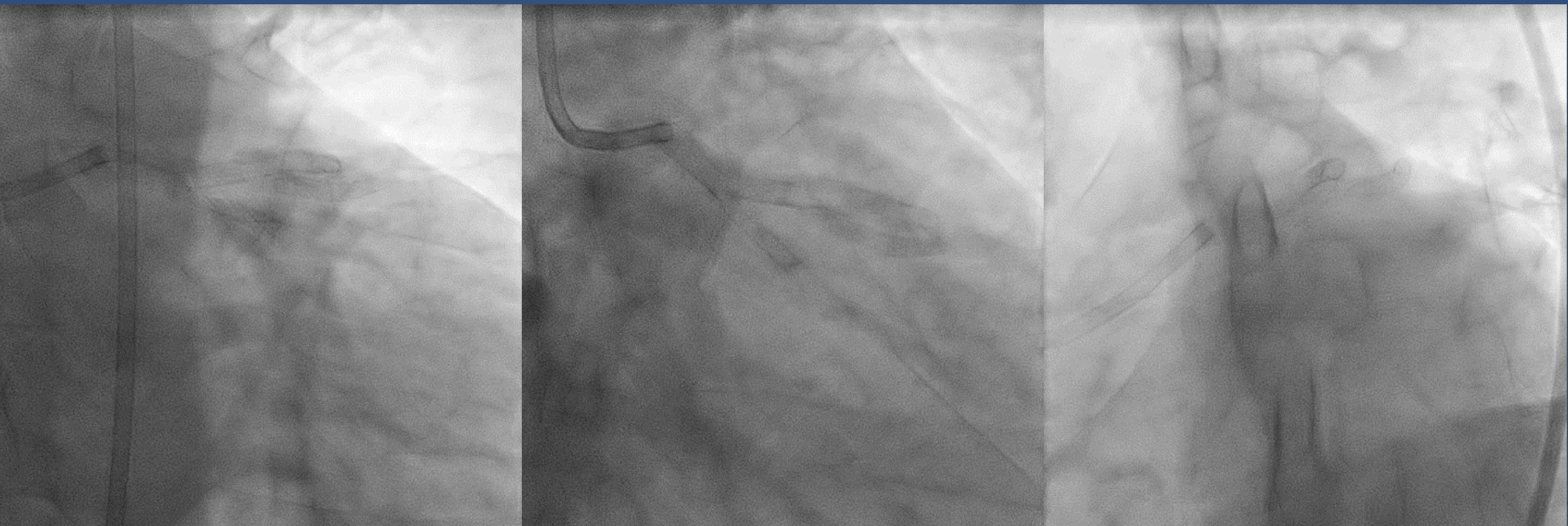


# Reverse Crush Two Stent Technique



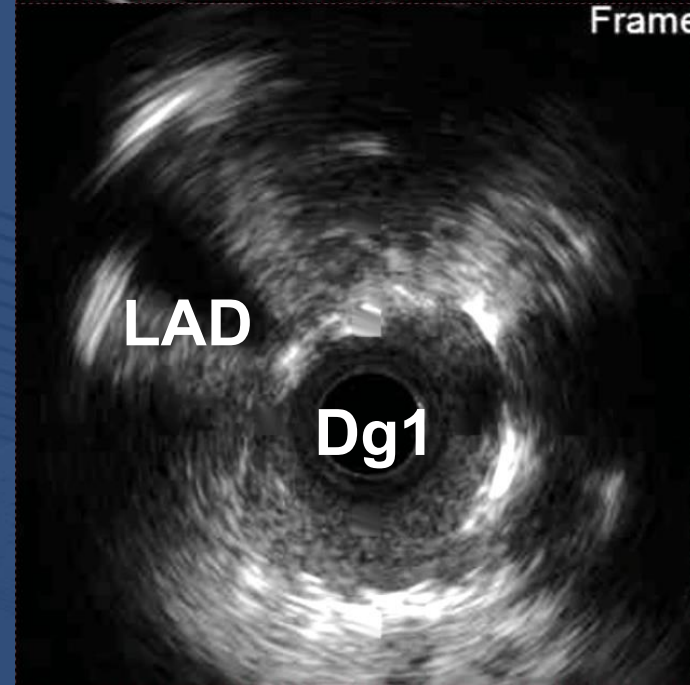
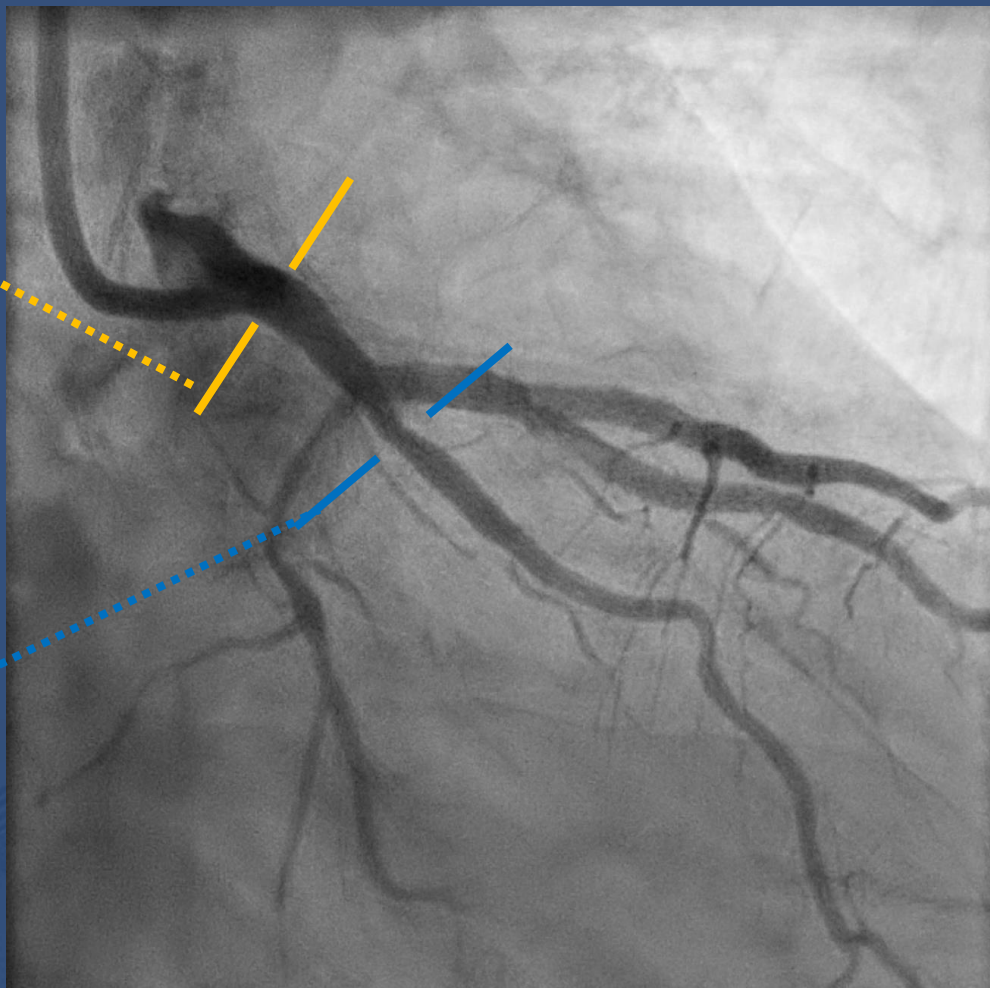
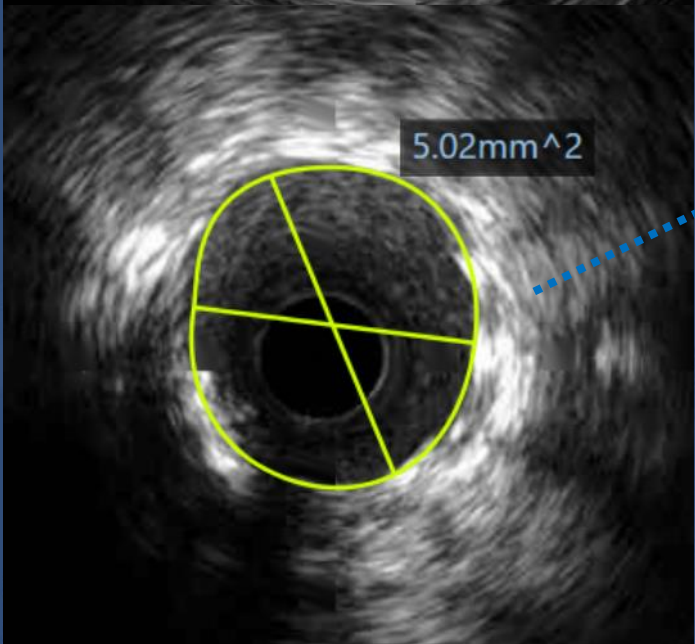
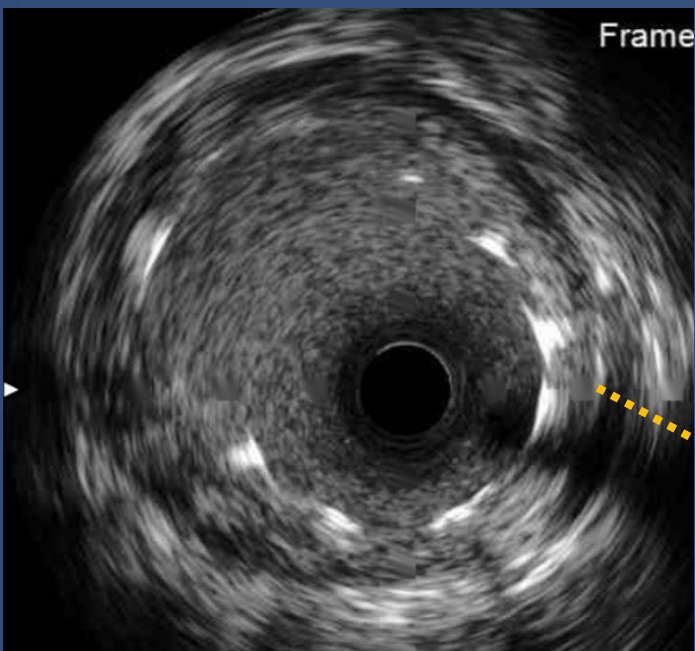


# FINAL Angio





# FINAL IVUS





# Conclusisions

- **Less complex techniques** usually give the **best result**.  
But! This is **not always possible** in LM trifurcation stenosis.
- If possible, the lesser stent, the better  
**Single stent → Double stent → Triple stent**
- Must have **IVUS!**
- **SYNTAX > 33 & True LM Trifurcaiton** stenosis has **worse** outcome compared to Non-true LM Trifurcation stenosis.