Be Provisional!

Optimal Provisional Strategy for LM PCI

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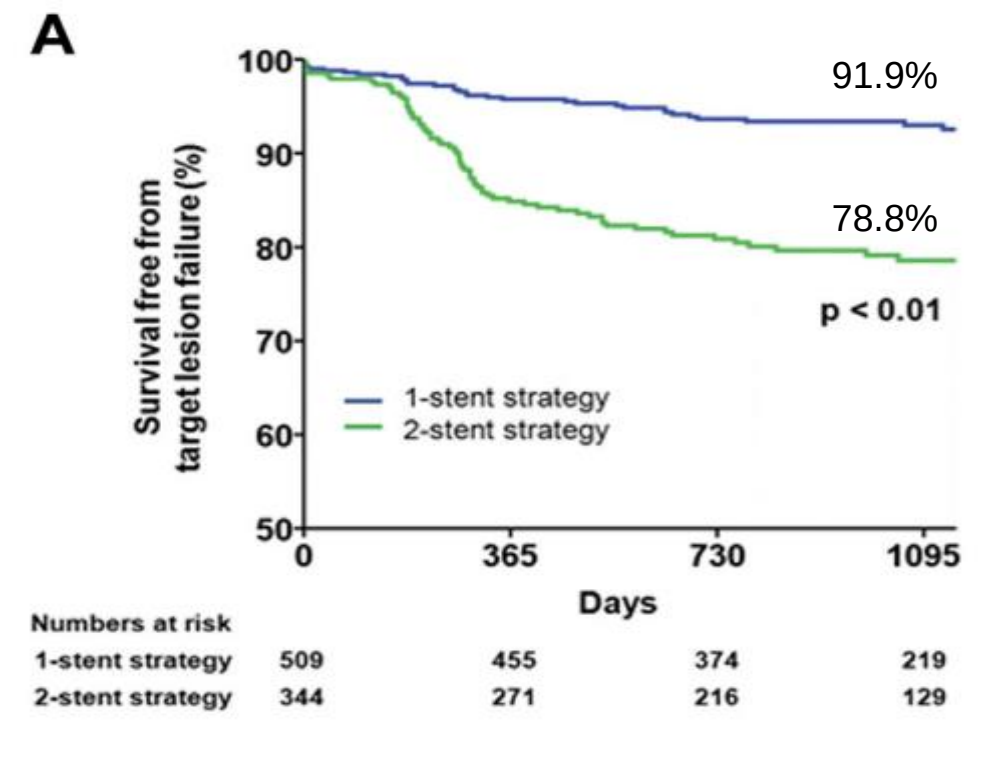
Disclosure

- I have nothing to disclose related to this presentation.

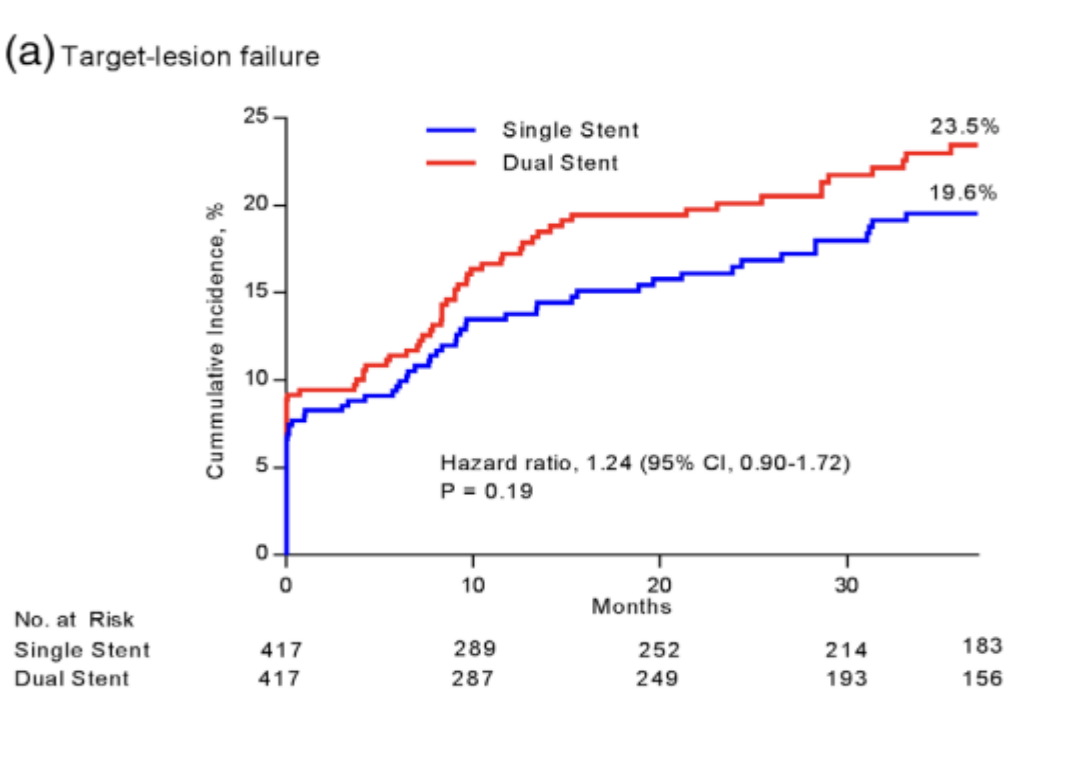
Provisional approach in left main(LM) bifurcation

COBIS II registry
N=853, LM bifurcation



Song YB, JACC CVI 2014

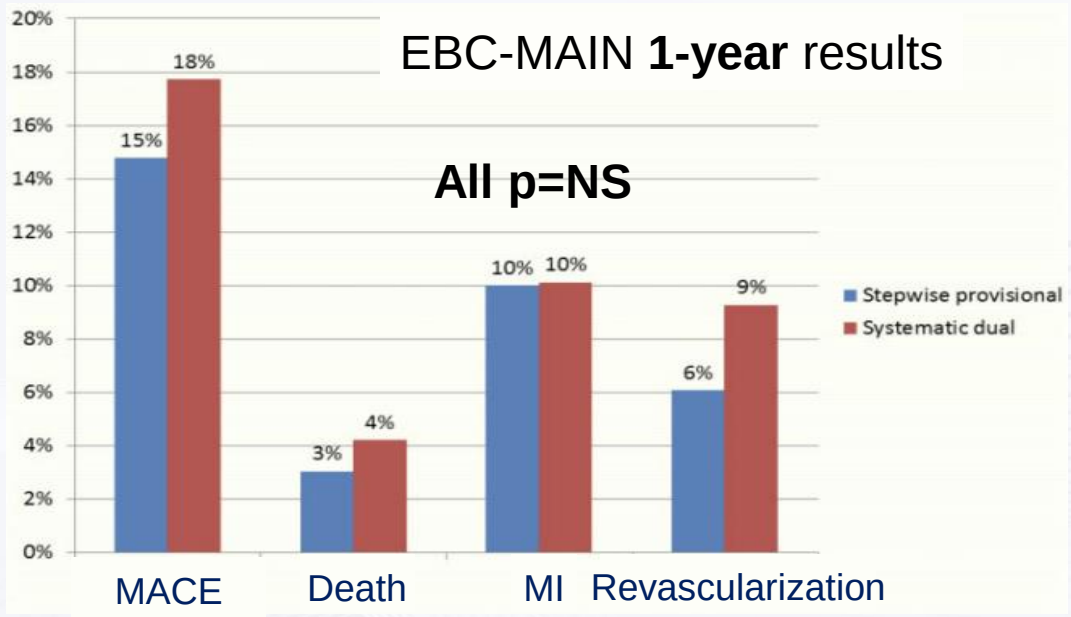
IRIS-MAIN registry
N=1,002, LM bifurcation



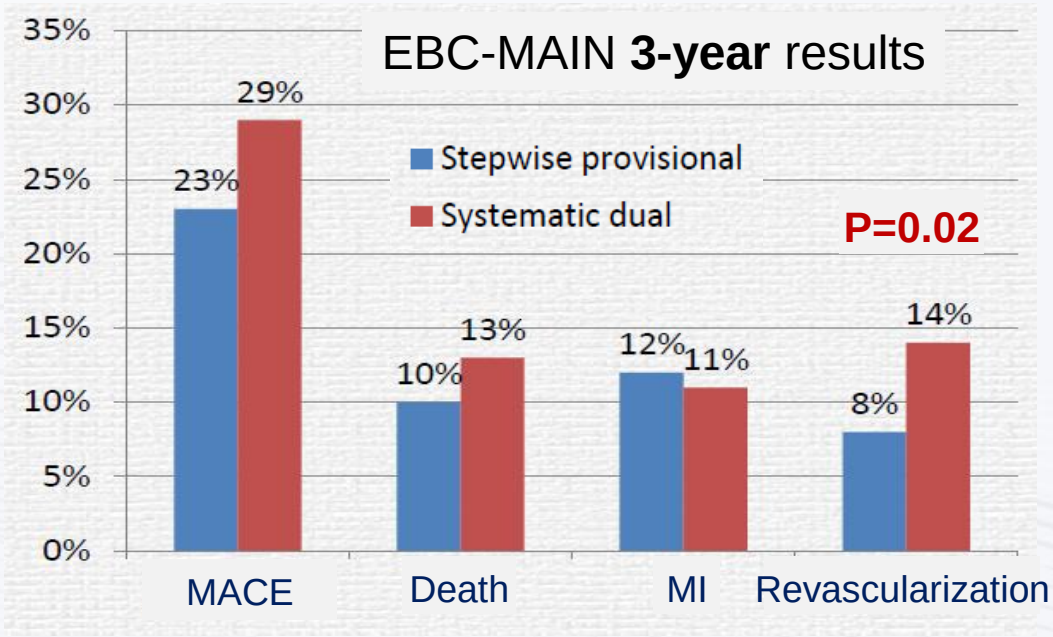
Lee CH, CCI 2021

Provisional approach in left main(LM) bifurcation

- **EBC Main trial**
- N=467, Provisional vs. systematic 2-stent for LM bifurcation (Medina 1,1,1 or 0,1,1)
- SB stenting 22% in provisional group vs. 94% in systemic 2-stent group



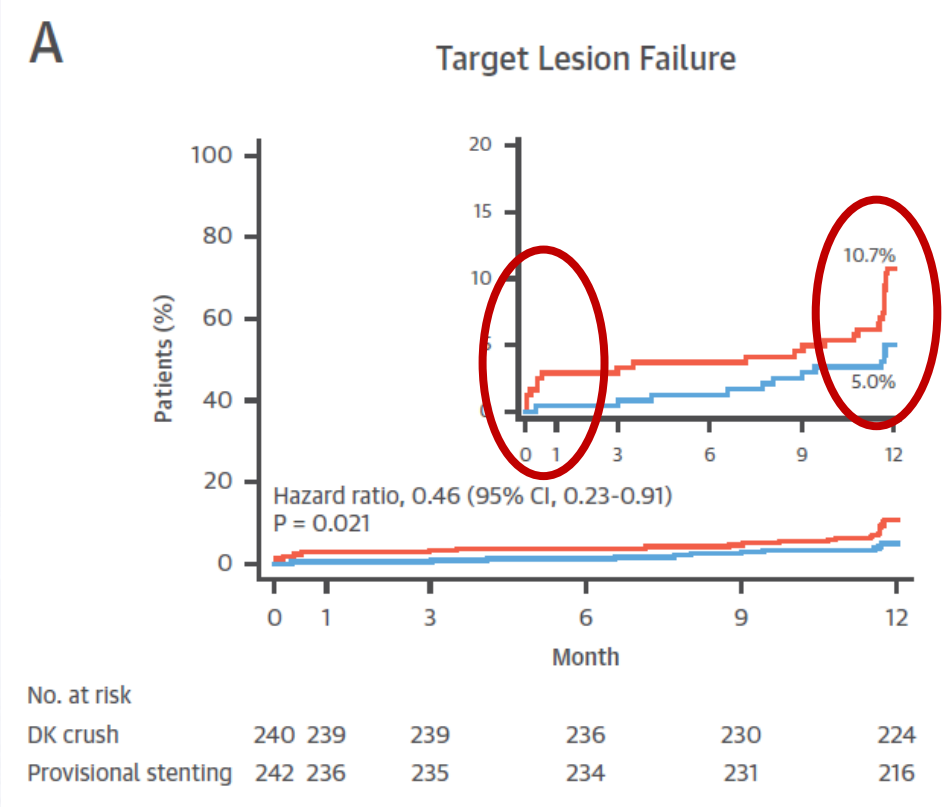
Hildick-Smith D, Eur Heart J 2021

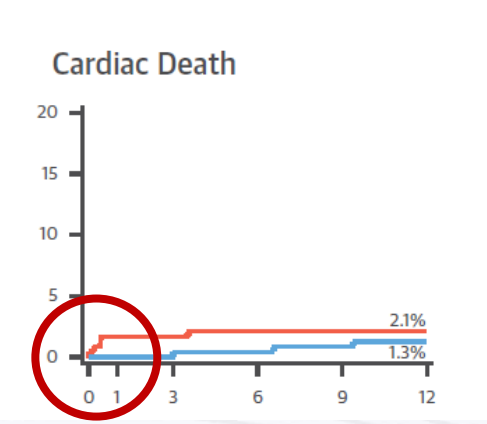


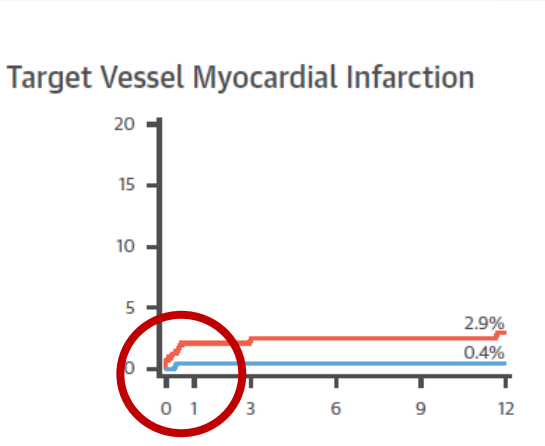
Arunothayaraj S, Eurointervention 2023

DK-crush is better than provisional approach?

- **DK-CRUSH V trial**
- N=482, DK-crush vs. provisional approach of LM bifurcation (Medina 1,1,1 or 0,1,1)

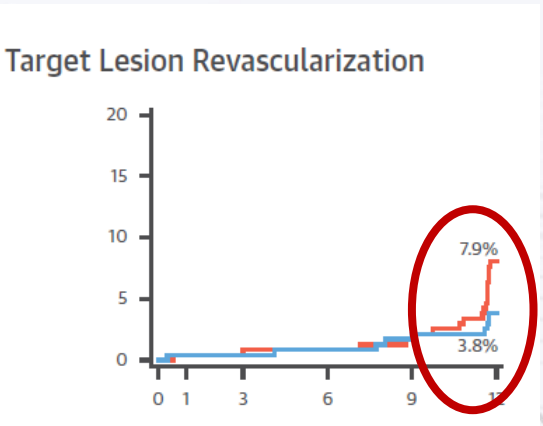






Clinical FU at 12 mo

Angiographic FU at 13 mo



Chen SL, J Am Coll Cardiol 2017

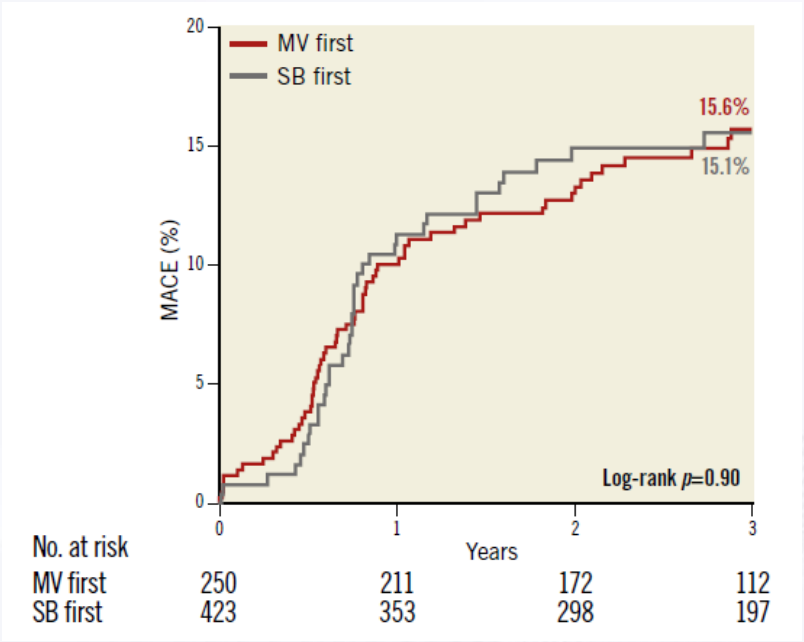
EBC 16th guideline part II: Implanting two-stents

- **Stepwise layered provisional stenting** is recommended by the European Bifurcation Club as the preferred strategy to treat coronary bifurcation lesions, with the intention to keep the procedure as simple as possible and aiming to minimize the number of stents needed in a bifurcation lesion.
- Implantation of the first stent in the provisional stenting influences the next steps in the procedure if SB stenting (such as T-stenting, TAP or culotte techniques) is needed. It is recommended to **stent the most diseased branch first** when PS is used as an upfront 2-stent strategy.

Lassen JF, Eurointervention 2022, 16th EBC guideline

When SB lesion is longer and more severe, SB-first elective 2-stenting technique may be preferred

- Bifurcation lesions treated with 2-stent techniques in COBIS II registry
- MV first (n=250) or SB first (n=423).

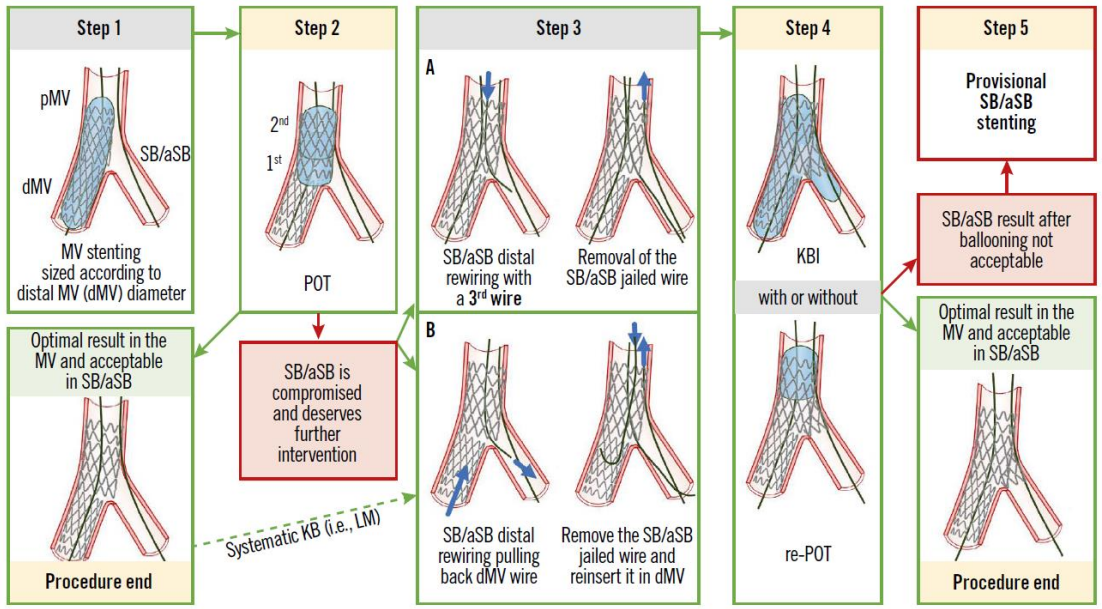


Subgroup	Patients	TLR (%) SB first	TLR (%) MV first	Favours SB first / Favours MV first	Hazard ratio (95% CI)	p-value	p for interaction
MV DS							0.04
≥70%	257	22/156 (14.1)	8/101 (7.9)		1.94 (0.86-4.36)	0.11	
<70%	416	30/267 (11.2)	23/149 (15.4)		0.71 (0.41-1.22)	0.22	
SB DS							0.27
≥70%	200	12/150 (8.0)	6/50 (12.0)		0.65 (0.24-1.73)	0.39	
<70%	472	40/273 (14.7)	25/199 (12.6)		1.20 (0.73-1.98)	0.47	
SB DS>MV DS							0.008
Yes	252	17/189 (9.0)	12/63 (19.0)		0.44 (0.21-0.92)	0.03	
No	420	35/234 (15.0)	19/186 (10.2)		1.54 (0.88-2.68)	0.13	
MV lesion length							0.01
≥18 mm	329	36/215 (16.7)	11/114 (9.7)		1.79 (0.91-3.53)	0.09	
<18 mm	344	16/208 (7.7)	20/136 (14.7)		0.53 (0.27-1.01)	0.05	
SB lesion length							0.15
≥7.5 mm	354	33/247 (13.4)	10/107 (9.4)		1.47 (0.72-2.98)	0.29	
<7.5 mm	319	19/176 (10.8)	21/143 (14.7)		0.73 (0.39-1.36)	0.32	

Park TK, Eurointervention 2017

Stepwise layered provisional stenting
Role of proximal optimization technique (POT)

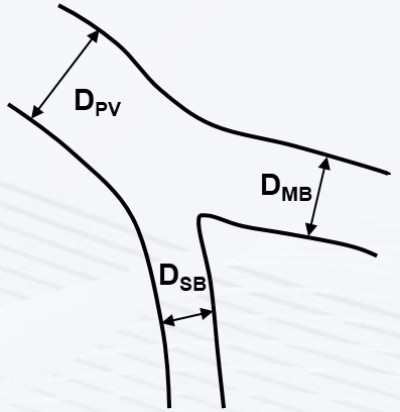
EBC strongly recommends POT as an essential part of stent optimization.



POT is more important in LM bifurcation, because the size discrepancy of PV and MB is a function of SB diameter, which is largest in this bifurcation.

Murray's law

$$D_{PV}^3 = D_{MB}^3 + D_{SB}^3$$



16th EBC consensus, Eurointervention 2022

POT may be hemodynamically better than FKB

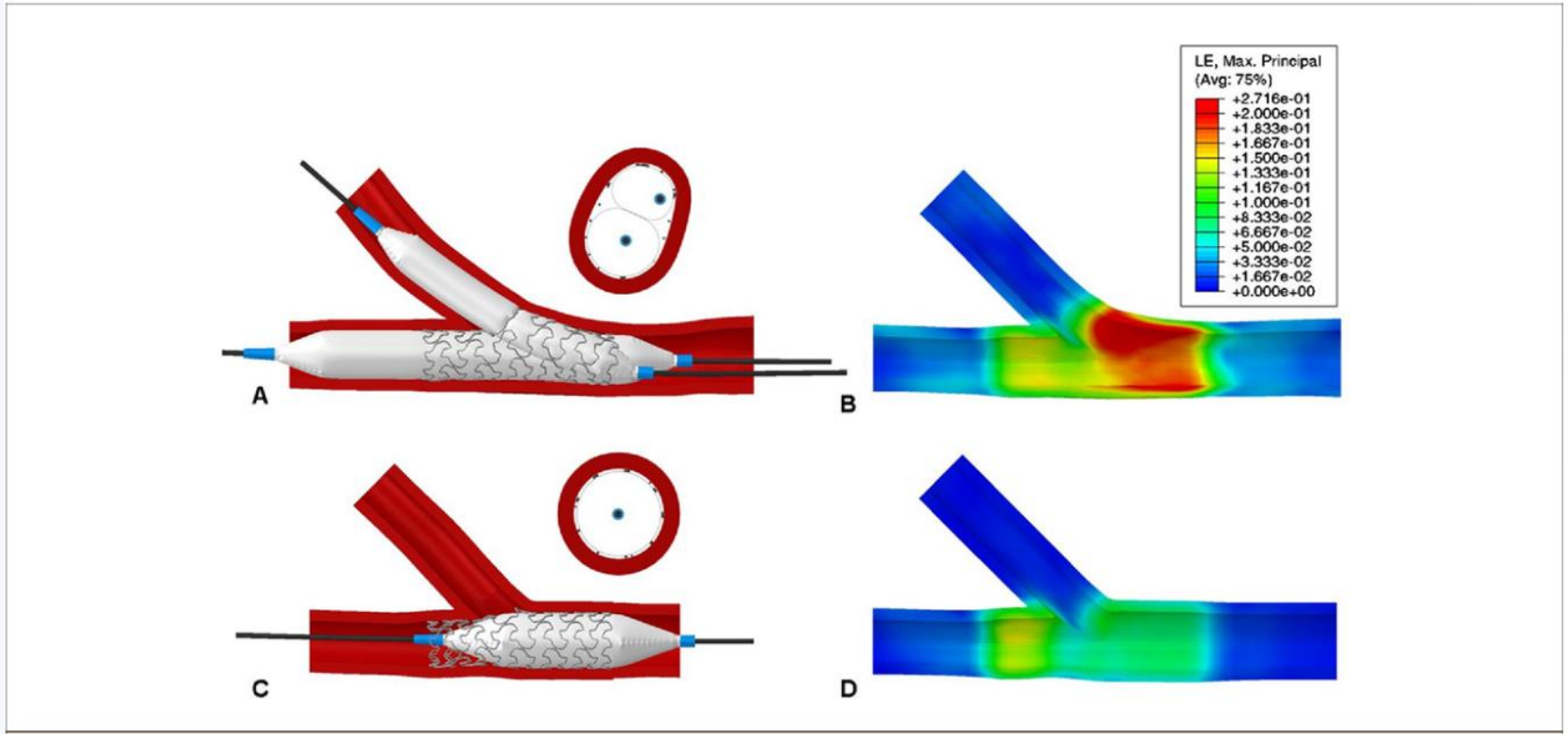


Figure 6. Finite Element Analysis in the Model Bifurcation

Simulation of post-dilation with KB **(A)** showing the resulting high strains proximal to the SB created by the 2 overlapping balloons simultaneously inflated **(B)**. Sequential SB-MV post-dilation **(C)** results in the circular expansion of the stent and significantly more homogeneous strain distribution proximal to the SB **(D)**. Abbreviations as in Figure 1.

POT = proximal optimization technique
FKB = final kissing ballooning

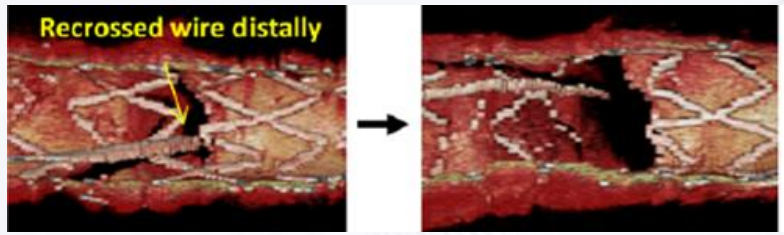
Foin N, JACC CVI 2012

The result of final kissing ballooning is quite variable

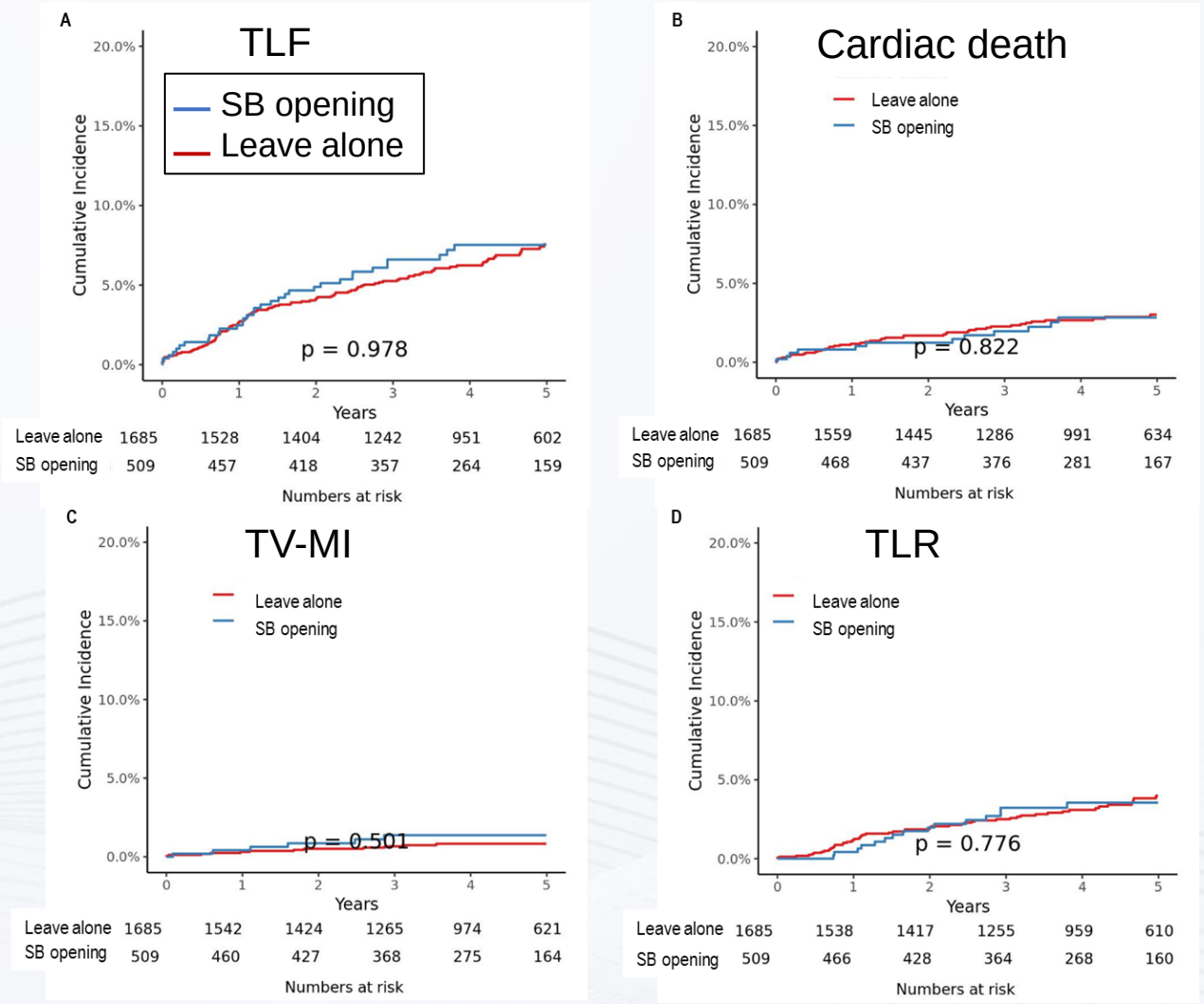
	Number Design	Primary endpoint	Outcomes	Results	Memo
Niemela M (NORDIC III) Circulation 2011	N=477 **RCT**	6-mo MACE	FKB 2.9%, non-FKB 2.9% P=NS	**Neutral**	
Gwon HC (COBIS I) Heart 2012	N=1,065 Registry	2-year MACE	FKB 9.5%, non-FKB 4.5% p=0.02	**Worse**	Higher MV TLR In FKB group
Yamawaki M Circ J 2014	N=253 Registry	3-year MACE	FKB 14.6% vs. non-FKB 6.9% p=0.07	**Worse**	Higher MV restenosis in FKB-group
Kim TH Int J Cardiol 2014	N=251 Registry	3-year MACE	FKB HR=0.40 (95% CI 0.19–0.84), p=0.015	**Better**	ACS patients
Biondi-Zoccai G Heart Vessels 2014	N=2,813 Registry	2-year MACE	HR=1.01 (0.80–1.23) p=0.91	**Neutral**	
Gao Z Chin Med J 2015	N=790 Registry	4-year MACE	FKB: 7.8%, non-FKB 10.0% p=0.33	**Neutral**	Left main bifurcation
Kim YH (CROSS) JACC CVI 2015	N=306 **RCT**	1-year MACE	FKB 14.0%, non-FKB 11.6% p=0.57	**Worse**	Higher MV restenosis in FKB group
Yu CW (COBIS II) JACC CVI 2015	N=1,901 Registry	3-year MACE	HR=0.50 (95% CI: 0.30-0.85),p = 0.01	**Better**	Lower MV TLR in FKB group
Lee CH (COBIS III) JACC Asia 2021	N=2,194 Registry	5-year TLF	SB open 6.7%, cross-over 7.0%, p=0.95	**Neutral**	Neutral in LM and true bifurcation

SB Strut Opening vs. Leave Alone

- N=2,194 patients treated with 1-stent strategy in COBIS III registry
- The long-term clinical outcome of the 1-stent strategy with simple crossover alone was comparable to those of additional SB-opening procedures.



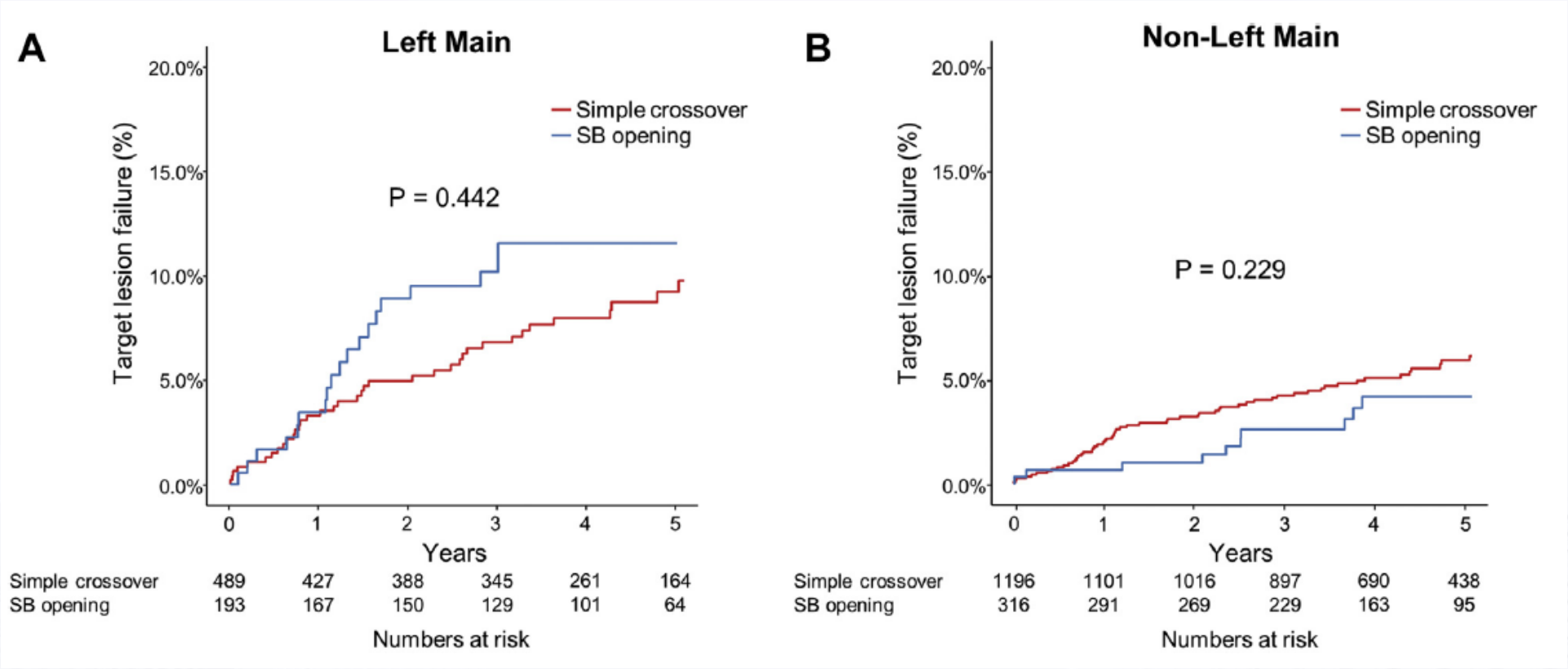
EuroIntervention. 2018;13:e1785-e1793



Nam CW, JACC Asia 2023

SB Strut Opening vs. Leave Alone in LM and non-LM bifurcation

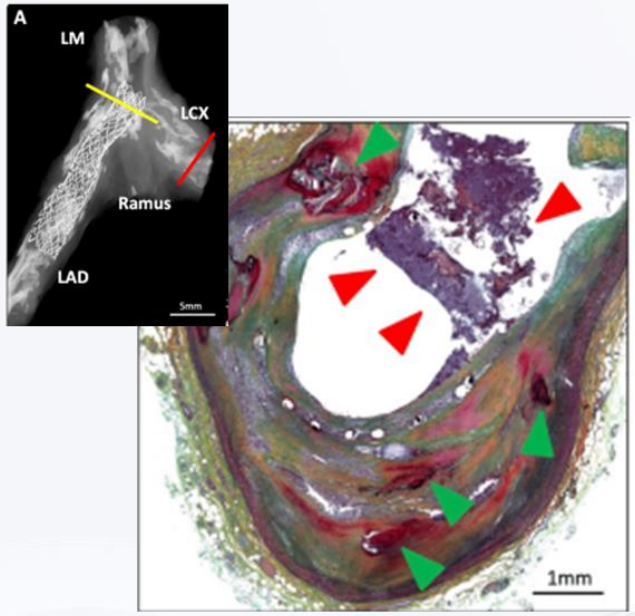
- N=2,194 patients treated with 1-stent strategy in COBIS III registry



Nam CW, JACC Asia 2023

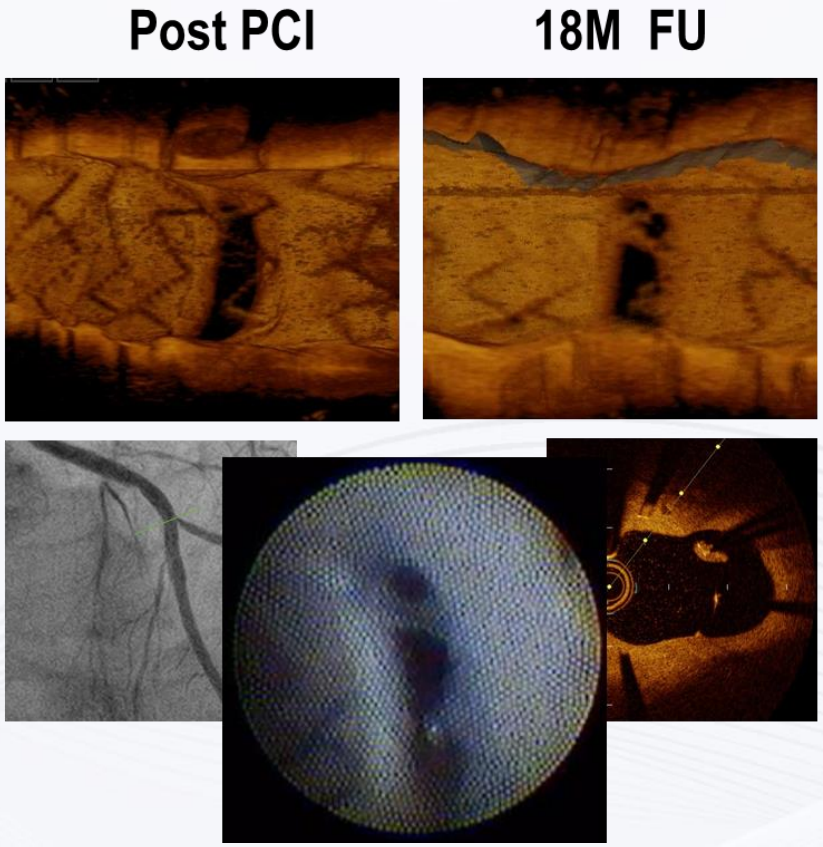
Are you afraid of floating struts of SB ostium?

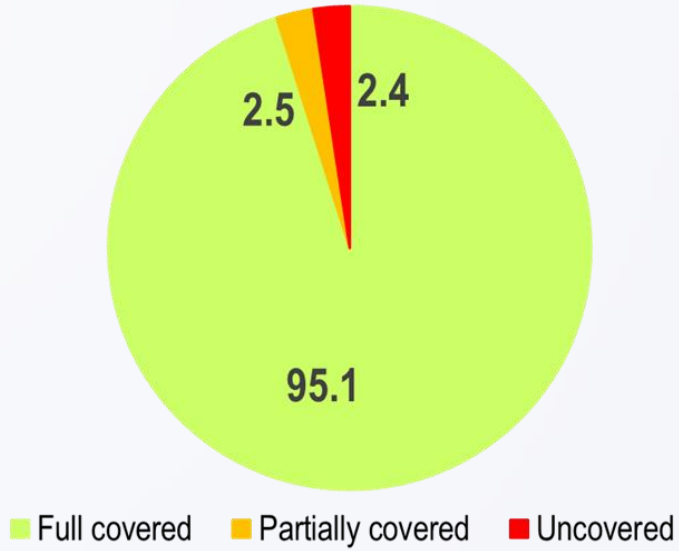
Stent thrombosis on the protruded stent



Images in Cardiovascular Intervention 2020

70 YO/M, Angina
SYNERGY™ to LAD/Diag bifurcation

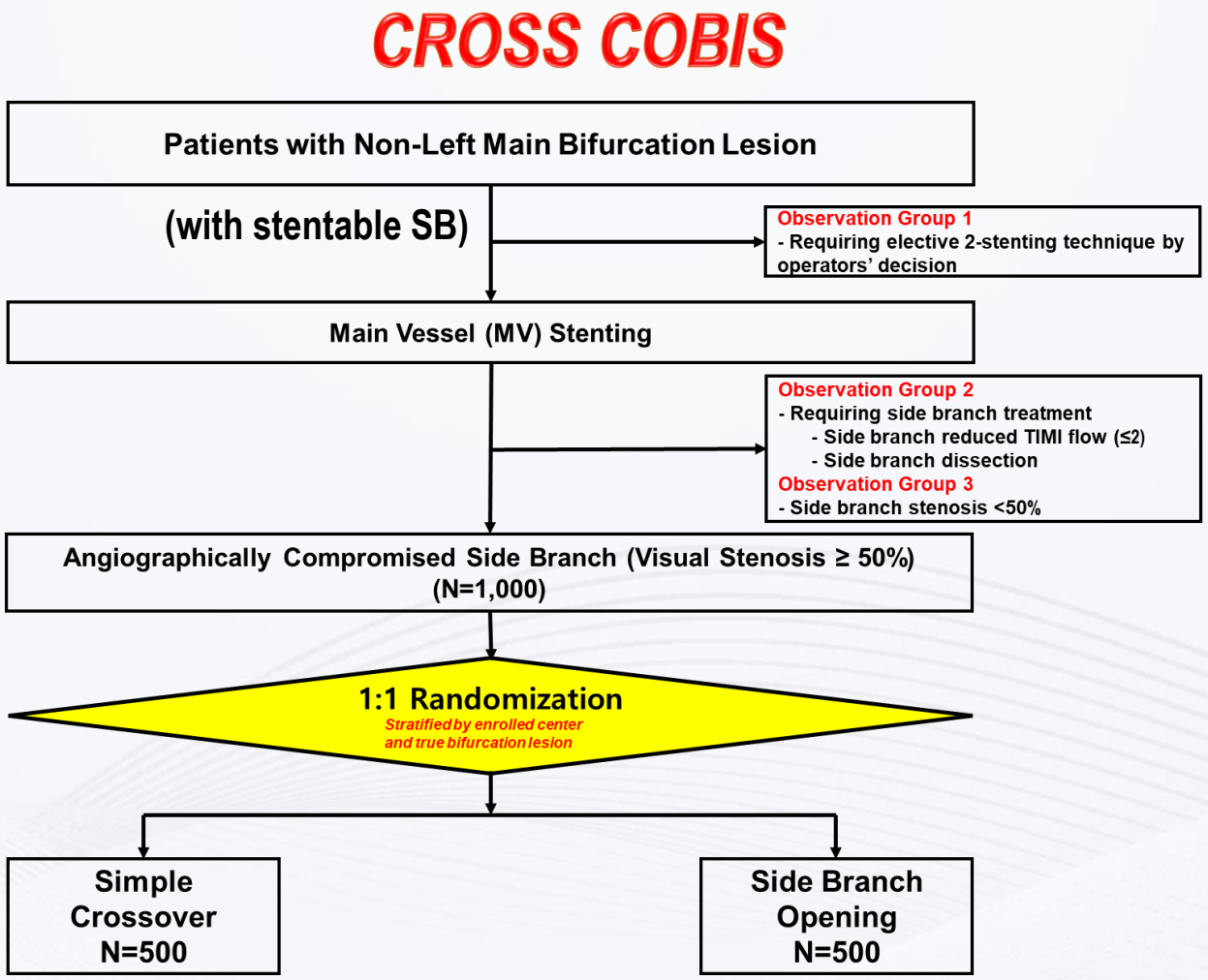




In 99 SBs (42 pts, 825 struts), ***95.1% of floating struts were fully covered*** *after 12-month*

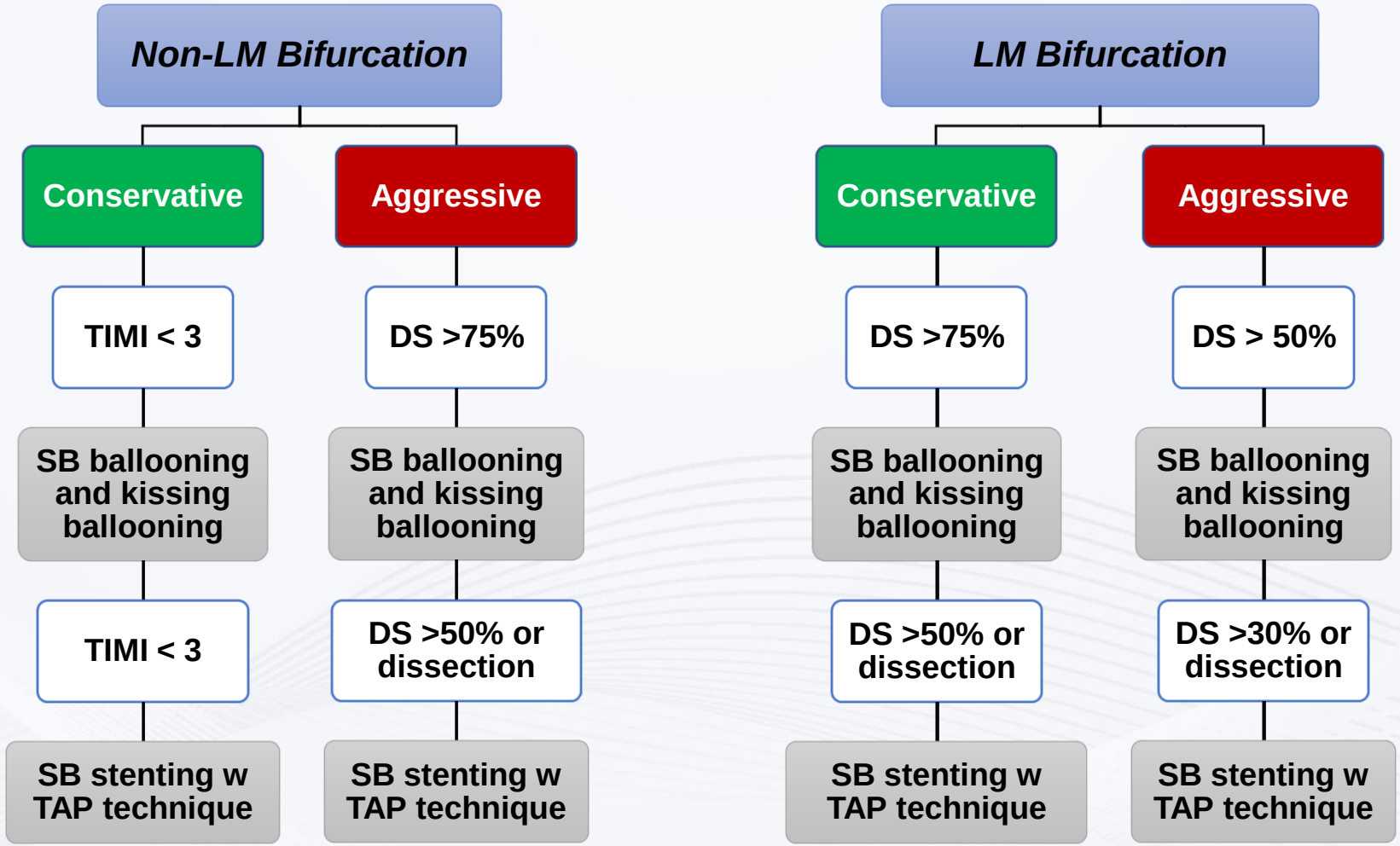
As a courtesy of Dr. Nam CW

CROSS-COBIS trial underway in Korea
Comparing SB Stent Treatment or NOT after MV Stenting



As a courtesy of Dr. Nam CW

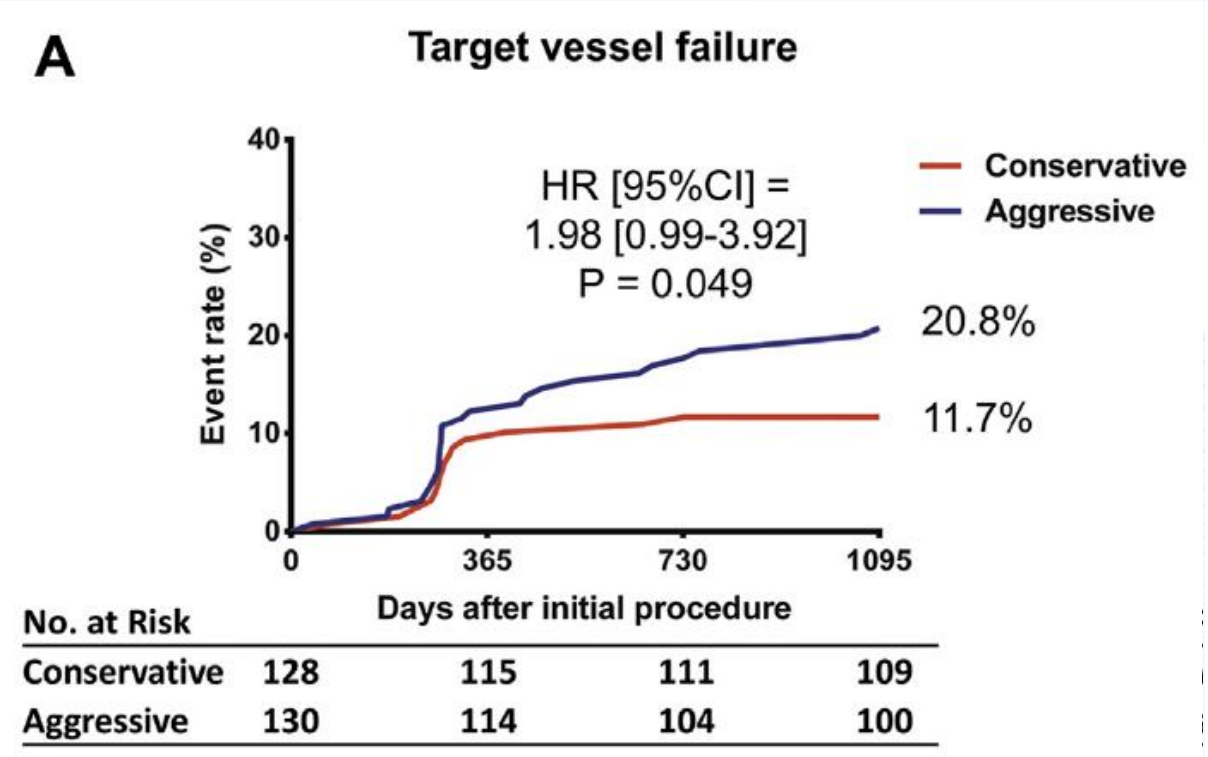
What is the indication to treat LCX os?
SMART-STRATEGY Trial

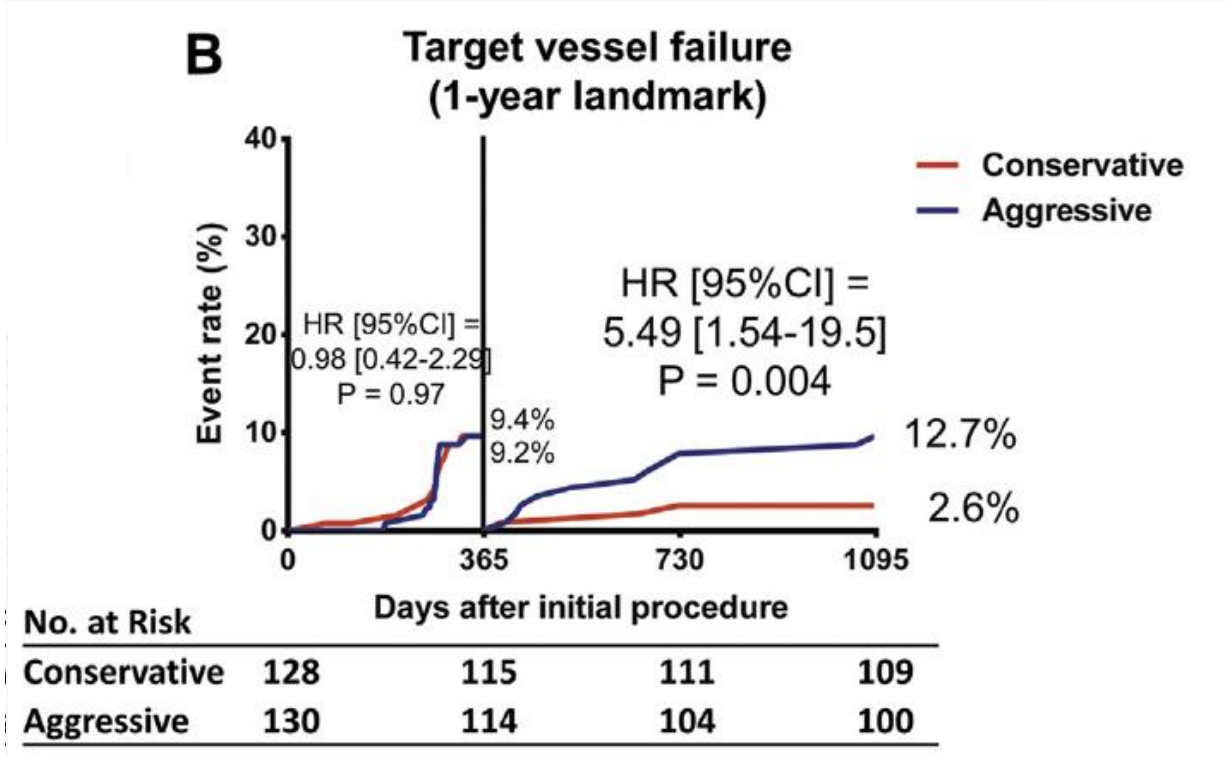


Song YB, Gwon HC, JACC CVI 2012

What is the indication to treat LCX os?
SMART-STRATEGY Trial

- N=258, bifurcation with a large SB
- SB stenting 13% in conservative, 36% in aggressive strategies



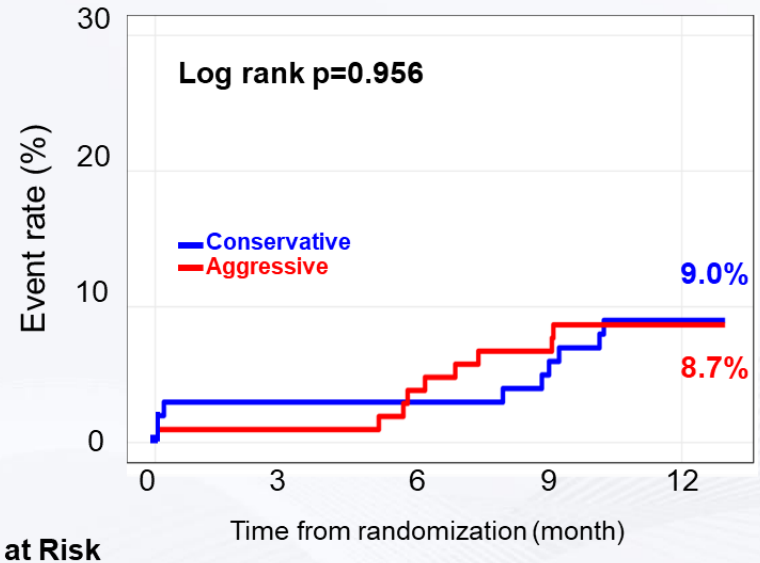


Song YB, Gwon HC, JACC CVI 2012

What is the indication to treat LCX os?
SMART-STRATEGY II Trial

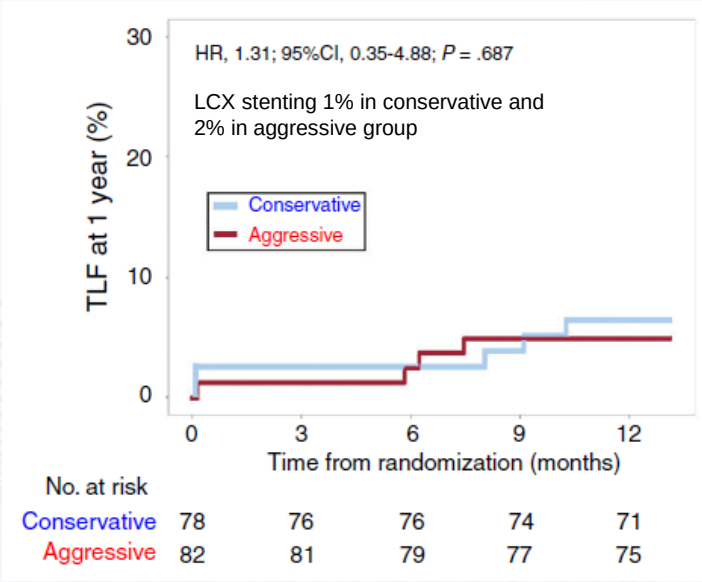
- N=160, left main bifurcation
- LCX stenting 9.5% in conservative and 24% in aggressive group

Target lesion failure



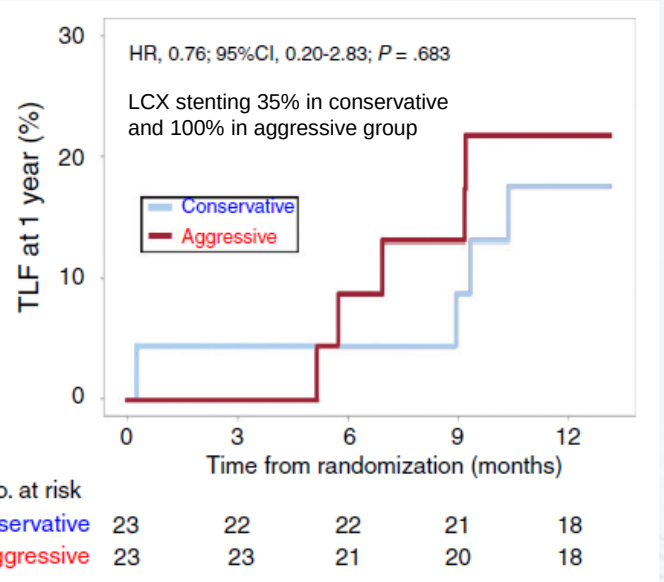
No. at Risk					
Conservative	101	98	98	95	89
Aggressive	105	104	100	97	93

Non-true bifurcation



No. at risk					
Conservative	78	76	76	74	71
Aggressive	82	81	79	77	75

True bifurcation



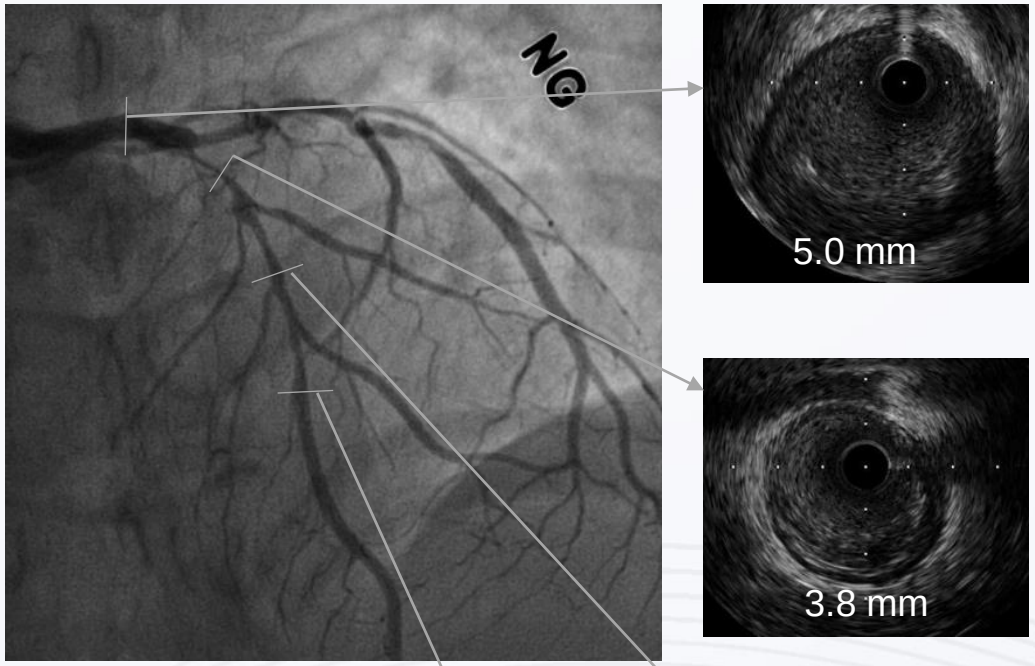
No. at risk					
Conservative	23	22	22	21	18
Aggressive	23	23	21	20	18

The indication of LCX treatment is better to be conservative.

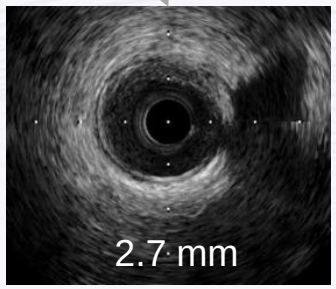
Kim JH, Rev Esp Cardiol 2020

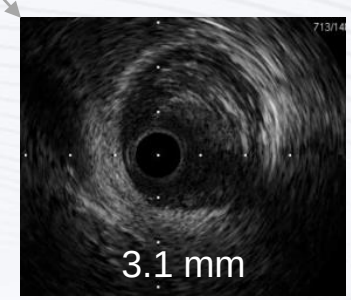
How to treat this lesion?

LM bifurcation and 2 LAD-diagonal bifurcations



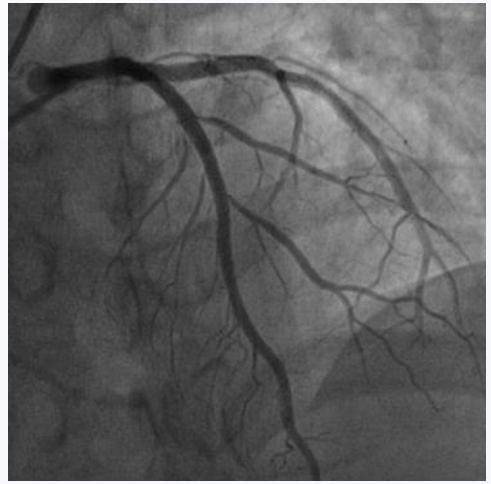
IVUS is crucial to determine the vessel size



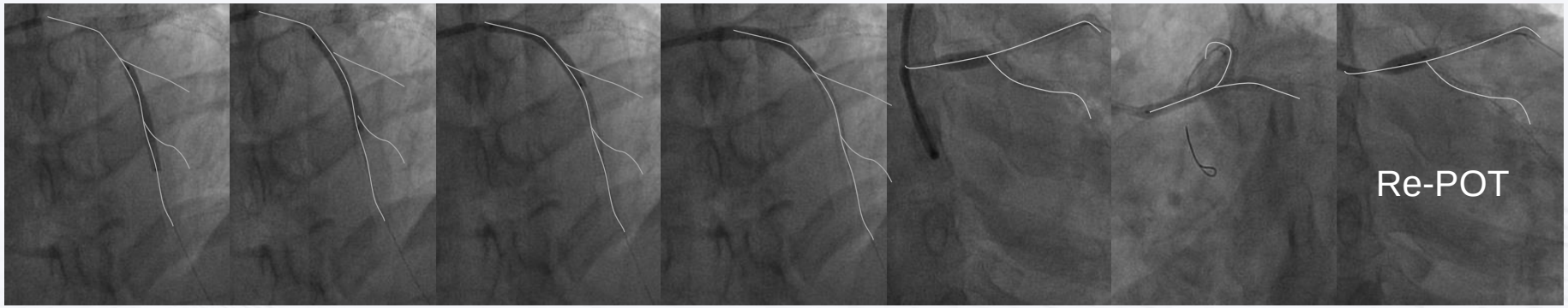


How did I treat this lesion?

Tailored sequential POTs



3 bifurcations, 2 stents, 3 balloons, no kiss, 4 POTs



2.75X28 mm 12 atm	2.75X28 mm 18 atm POT	3.5X32 mm 12 atm	3.5X32 mm 18 atm POT	5.0X8 mm 14 atm POT	3.5X32 mm 8 atm	5.0X8 mm 8 atm POT

You may have noticed that I did not wire 2 diagonals.

Conclusion

- Stepwise layered provisional stenting is recommended as the preferred strategy to treat left main coronary bifurcation lesion.
- Proximal optimization technique is key to stent optimization.
- LCX os opening is not better than simple cross-over in 1-stent technique in term of long-term outcome.
- The indication of LCX treatment is better to be conservative.
- Bifurcation lesion may be the only lesion which is associated with a better outcome when treated conservatively.