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Provisional stenting is suitable for all bifurcation lesions

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Provisional vs. Routine Two-stent

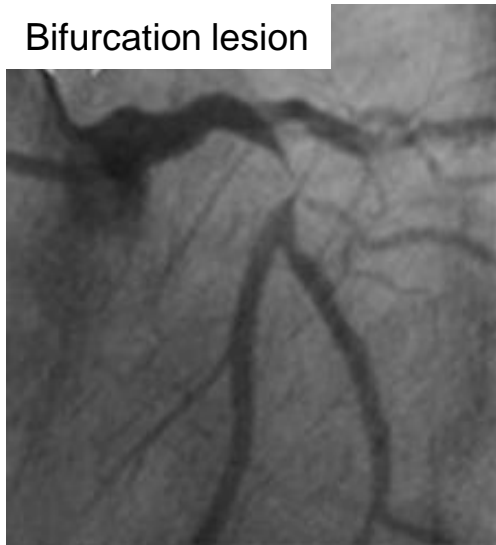
Provisional approach
One-stent technique
Simple technique

vs.

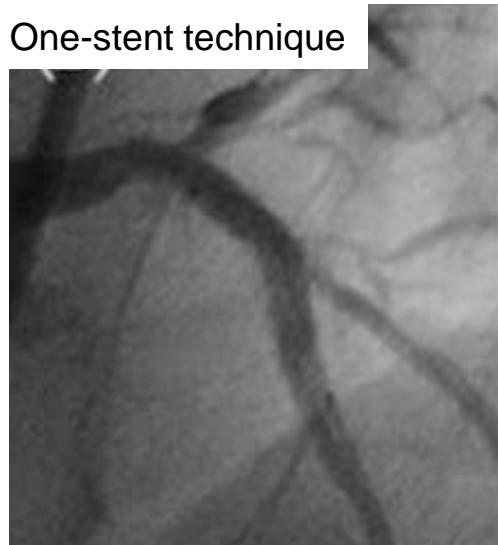
Routine two-stent approach
Two-stent technique
Complex technique

- The angiographic result of two-stent technique is obviously more beautiful.
- Does this beautiful picture guarantee a better long-term clinical outcome?

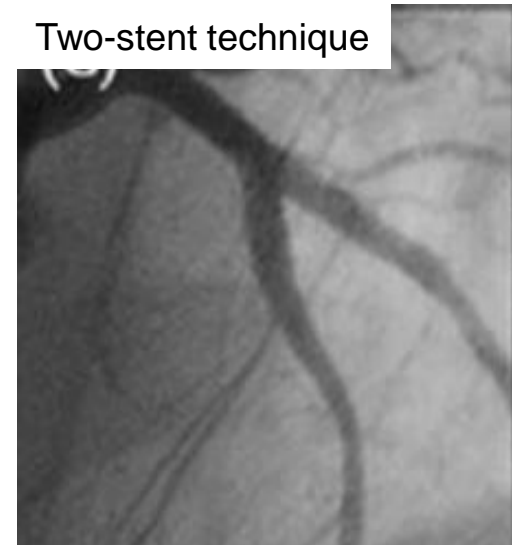
Bifurcation lesion



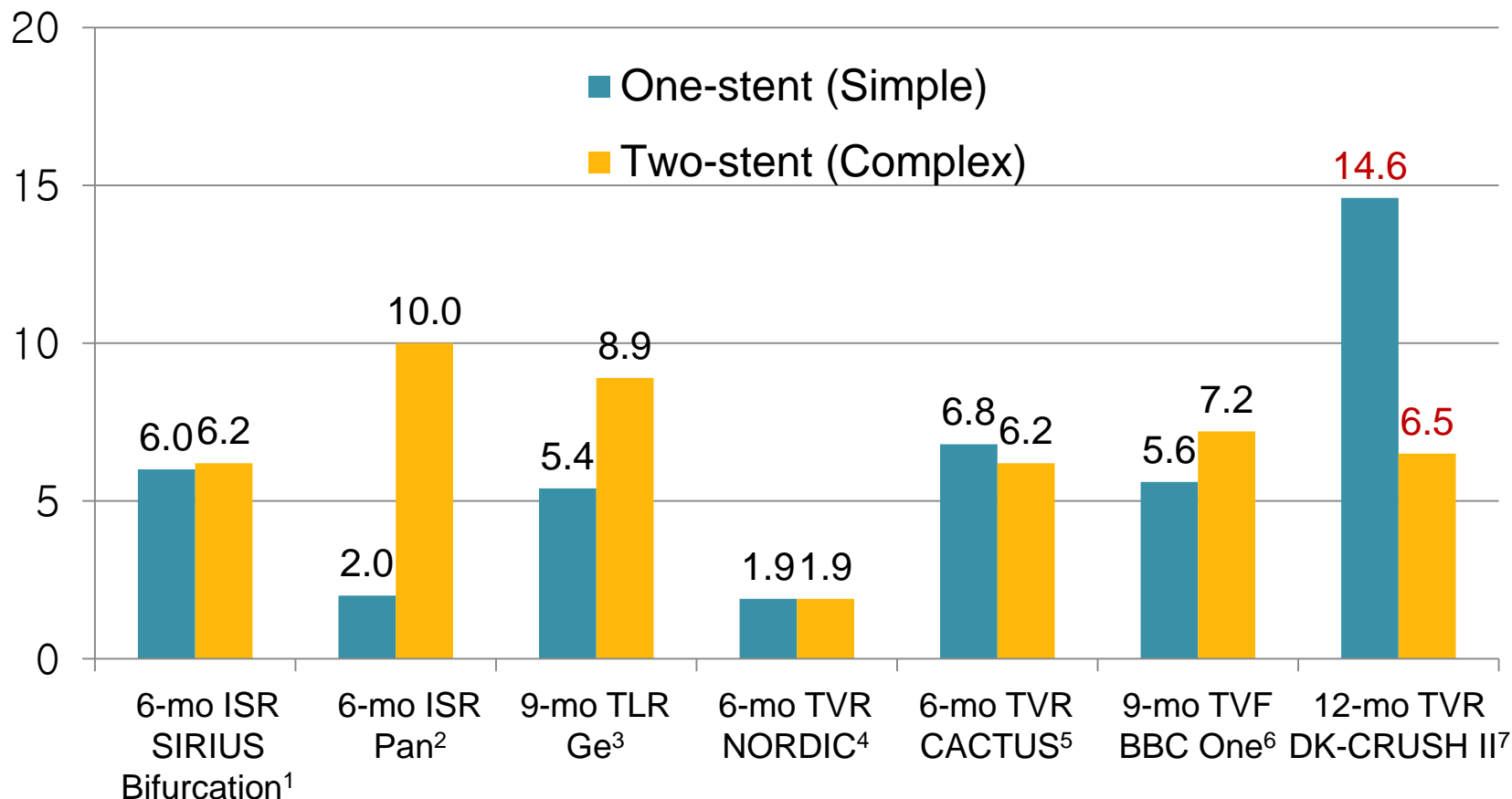
One-stent technique



Two-stent technique

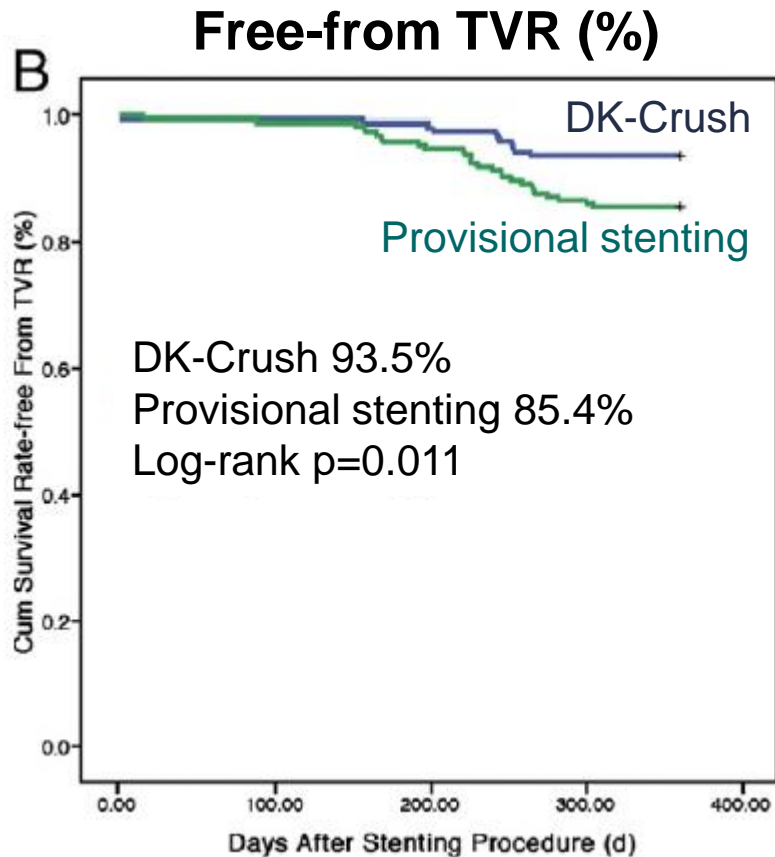


Routine 2-stent technique was clinically not better than provisional approach



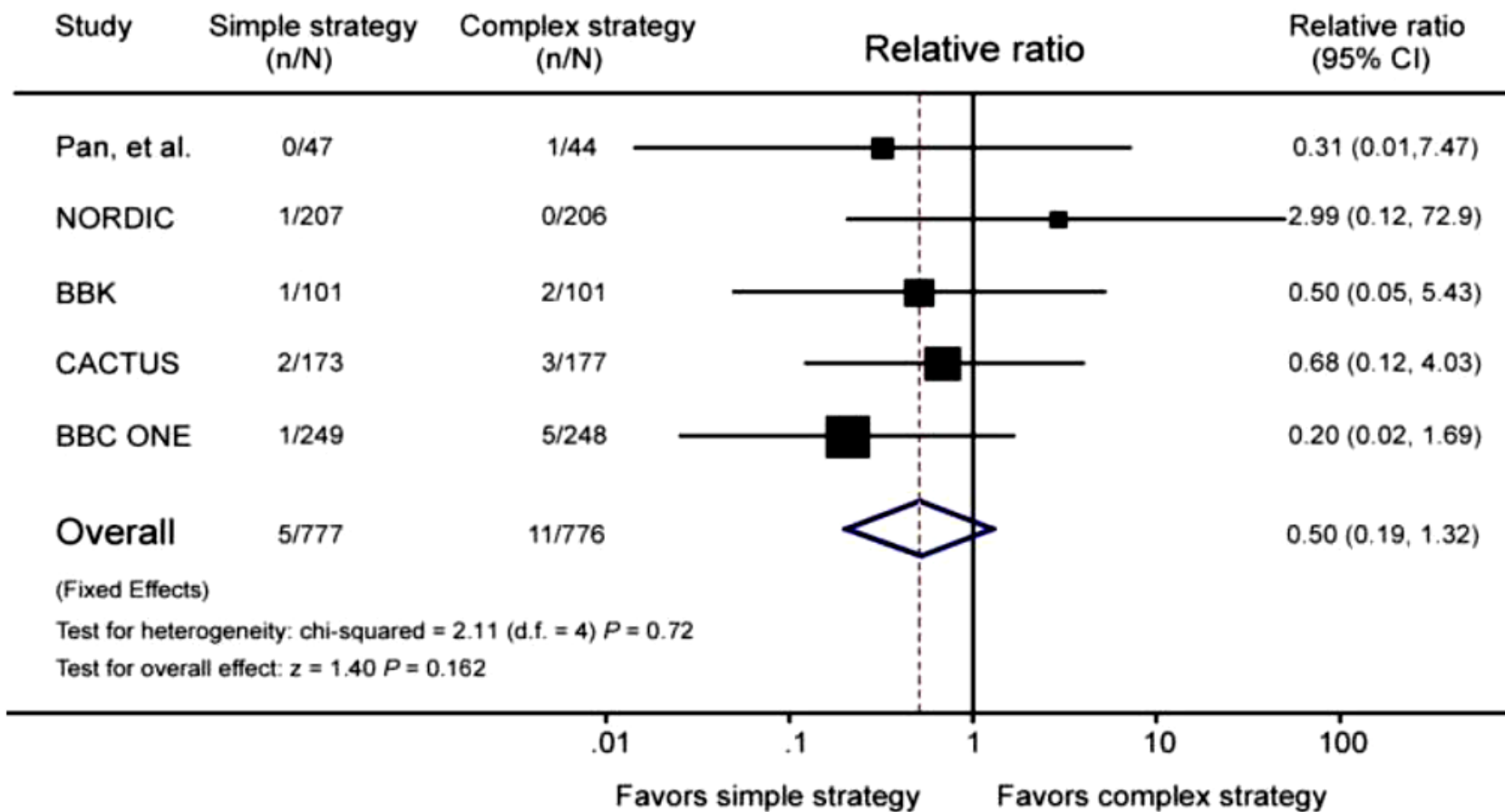
1. Colombo A, Circulation 2004	2. Pan M, AHJ 2004	7. Chen S, JACC 2011
3. Ge, Colombo, Heart 2005	4. Steigen, Circulation 2006	
5. Colombo A, Circulation 2009	6. Hildick-Smith D. Circulation 2010	

DK-CRUSH II: Why is it different?



- N=370
- Provisional stenting (PS) vs. DK-Crush (DK)
- High risk lesions
 - Medina class 1,1,1 and 0,1,1
- Better 2-stent technique?
- DK-crush experts?
 - Similar procedural time
 - Similar fluoroscopy time
 - Similar contrast volume

Two-stent technique may be associated with a higher risk of stent thrombosis





Two-stent technique needs more resources

	Complex	Simple	P-value
Procedure time (min)	78±1.9	57±1.6	<0.001
Fluoroscopy time (min)	22±0.8	15±0.7	<0.001
Diamentor (cGy.cm2)	7900±350	6140±300	<0.001
No. guidewire used	3.11±0.08	2.21±0.06	<0.001
No. balloons used	3.97±0.11	2.26±0.09	<0.001
No. stents used	2.21±0.07	1.17±0.04	<0.001

(mean±SE)

Two-stent technique is better for a large side branch?

- The **E**uropean **B**ifurcation **C**oronary study; a randomized comparison of provisional T-stenting versus a systematic **TWO** stent strategy in large caliber true bifurcations (**EBC TWO study**)
- Hypothesis
 - Large coronary bifurcation lesions (MV and SB ≥ 2.5 mm), are best treated with culotte stenting rather than a provisional T technique, with respect to death, MI and TVR at 12 months

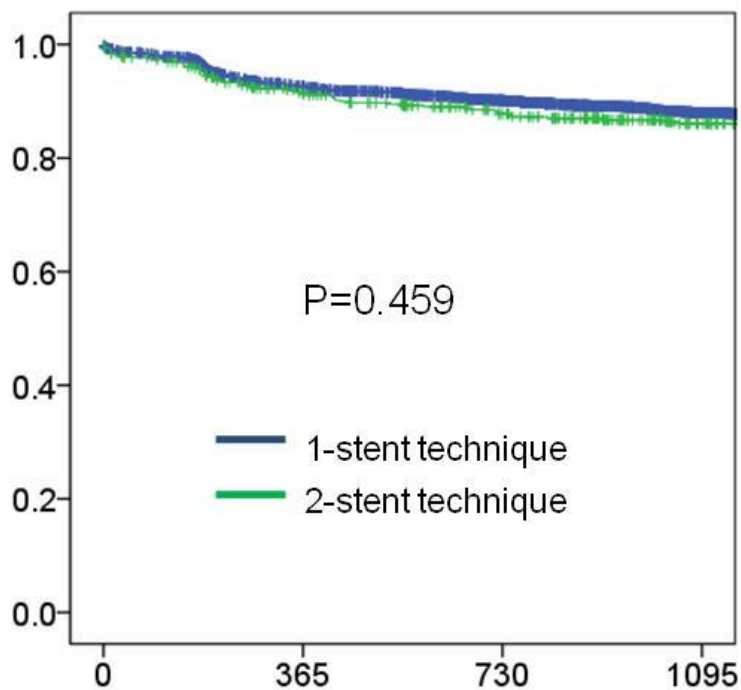


Two-stent technique may be worse in the left main bifurcation

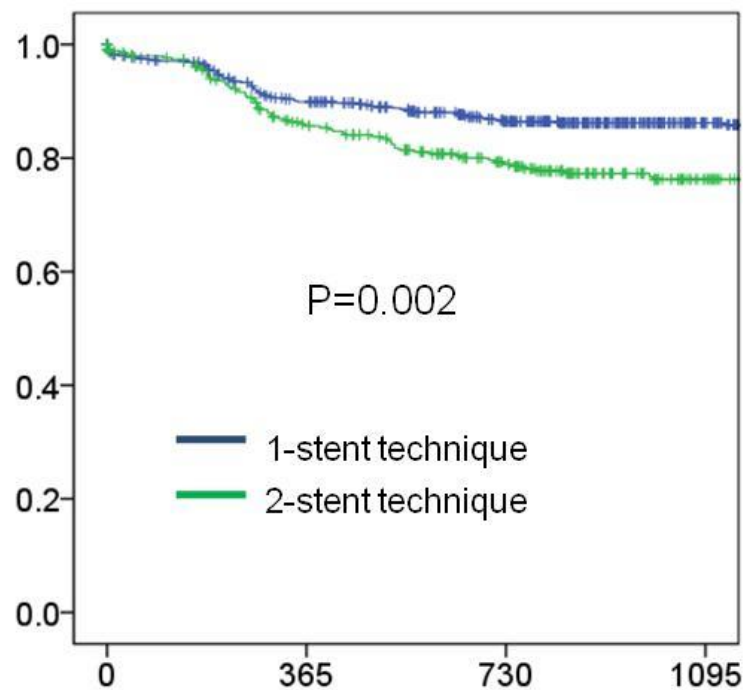
Target Vessel Failure

in the preliminary analysis of COBIS II Registry

Non-LM bifurcation (N=4026)



LM bifurcation (N=1067)



Target vessel failure= cardiac death, MI, or TVR

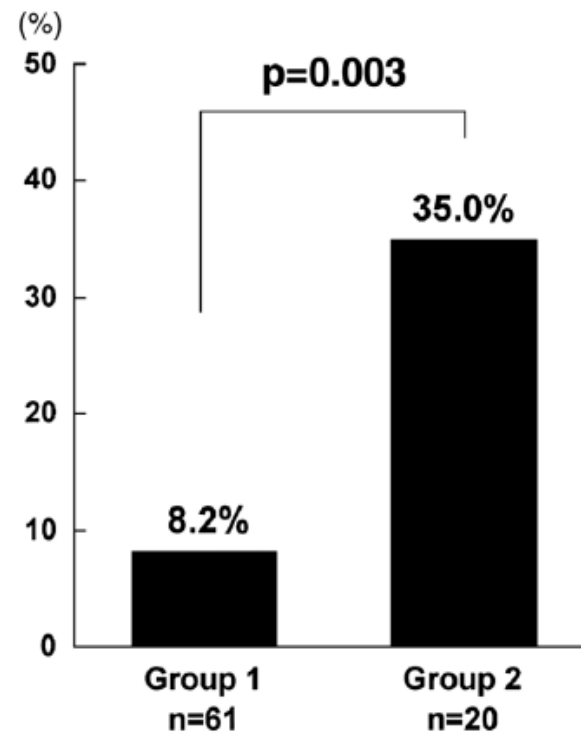
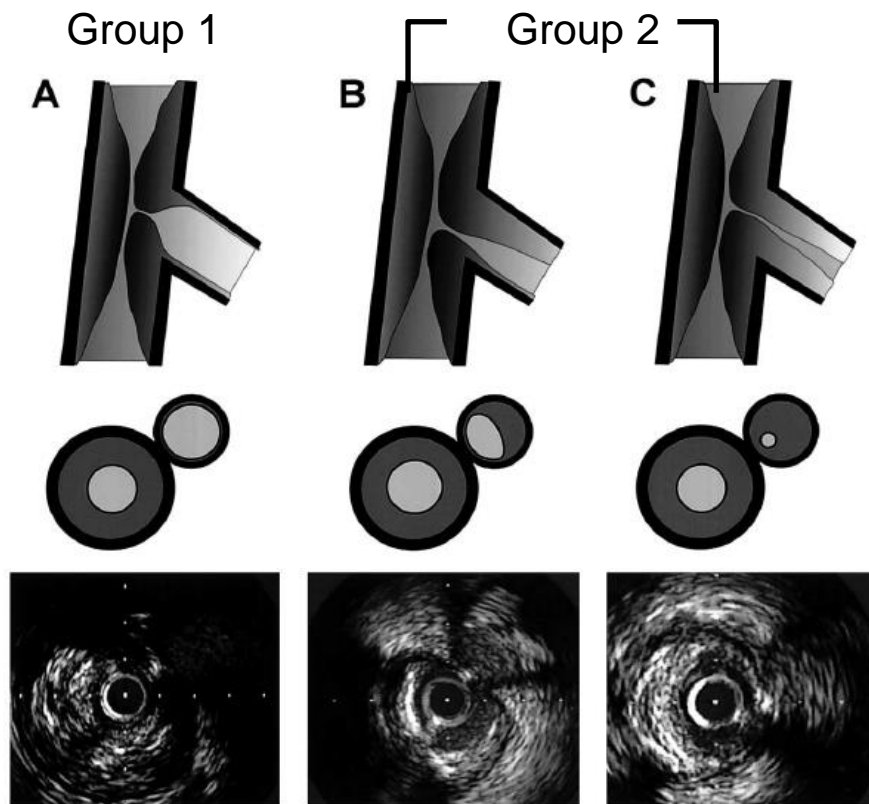
Is there any indication of routine two-stent technique?

- Indication of routine 2-stenting (EBC Consensus)
 - Large side branch with ostial disease extending > 5 mm from the carina are likely to require a two-stent strategy



- High risk of SB occlusion?

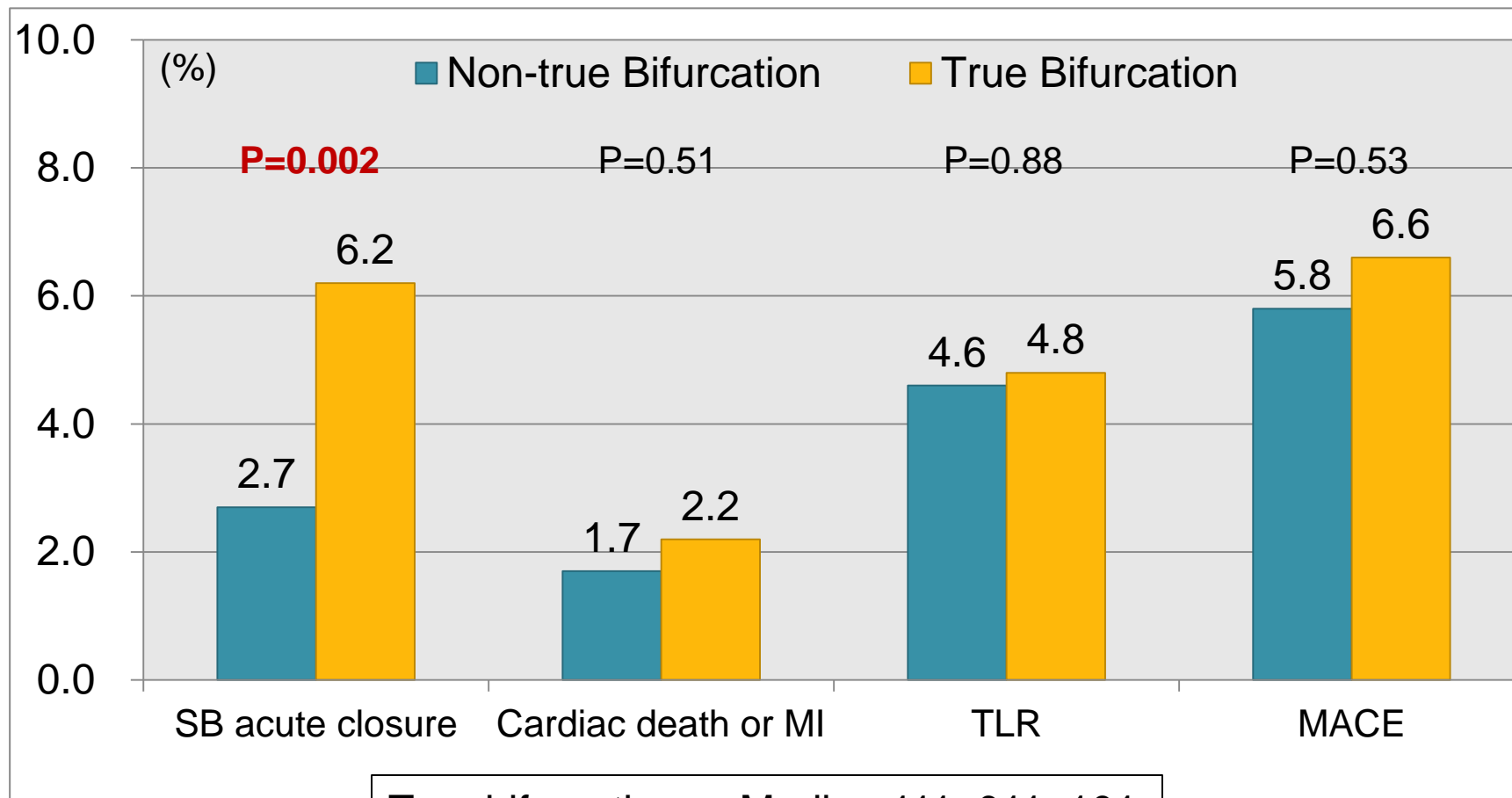
Can we always predict SB occlusion?



- 1) SB ostial disease is the most important predictor
- 2) Still we can not predict it in most of the cases

The risk of SB acute closure in the real world (COBIS Registry)

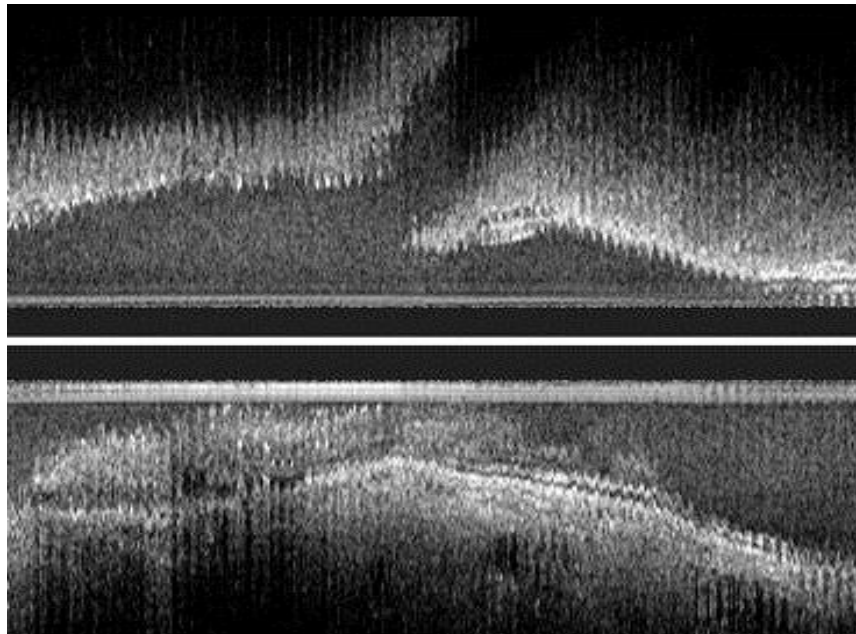
Impact of significant SB ostial disease



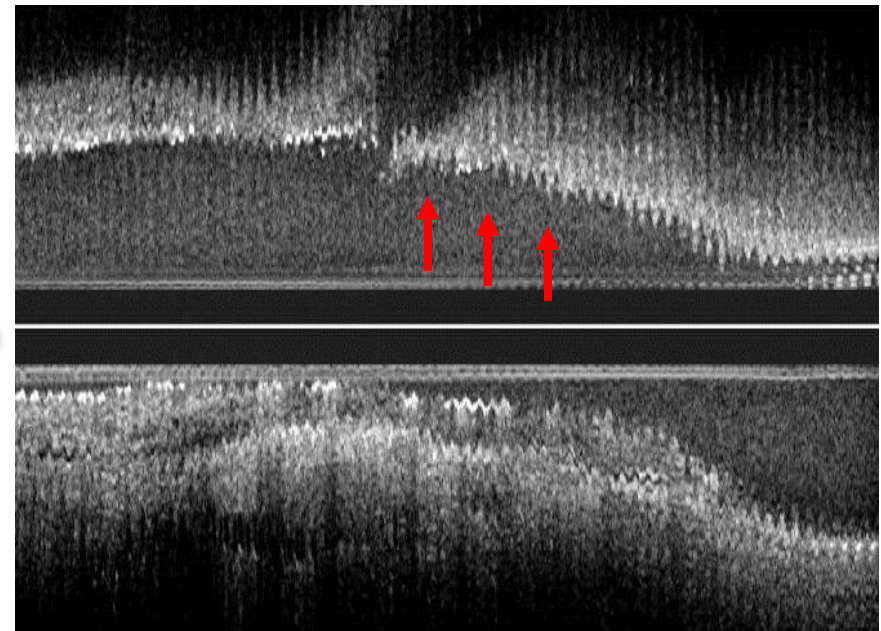
True bifurcation = Medina 111, 011, 101

How can we avoid SB acute closure?

Before stenting



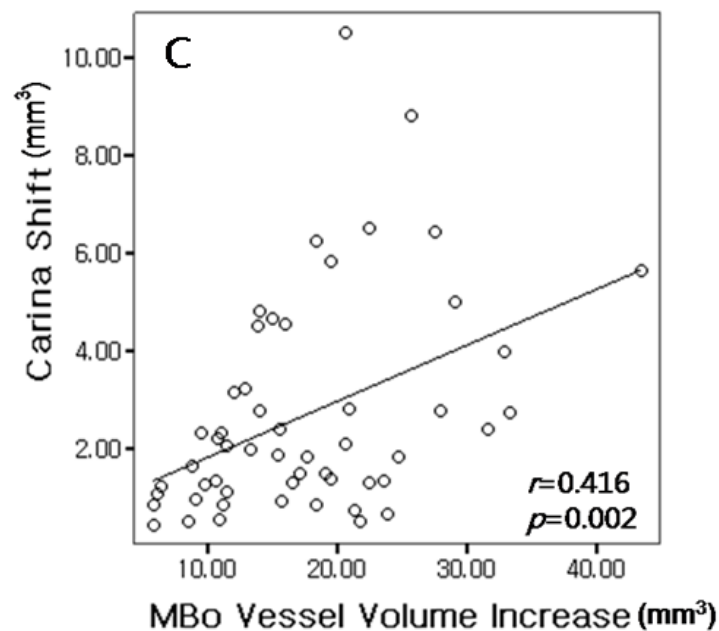
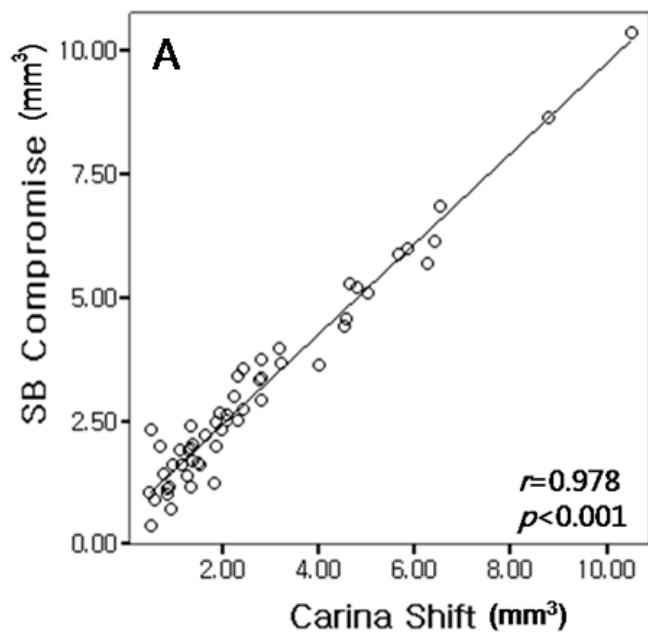
After stenting



Stent over-expansion in the main branch increases the risk of SB occlusion, which can be reduced by IVUS-guided stent size selection.

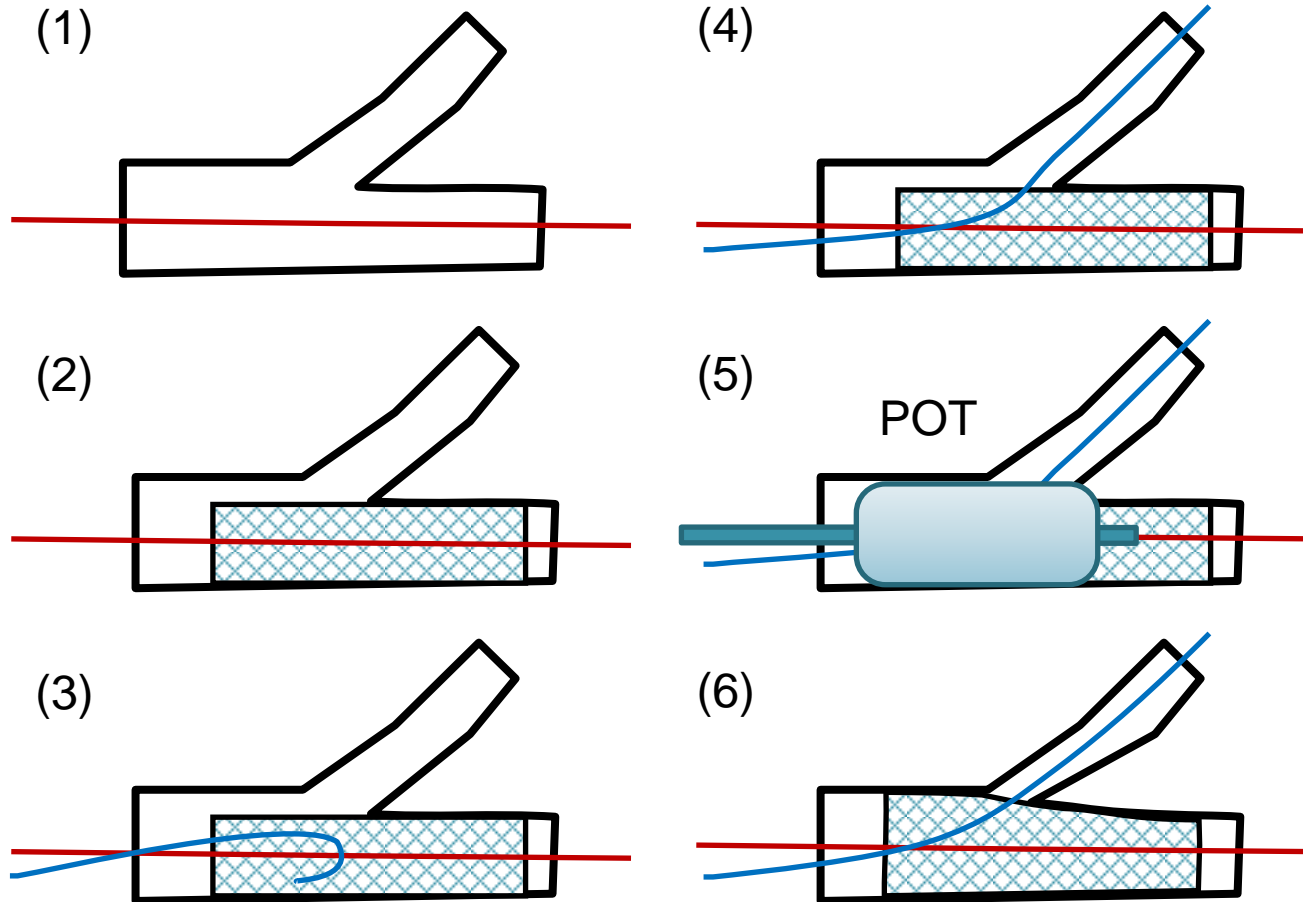
Stent overexpansion is an important predictor of SB compromise

- N=49, treated with cross-over stenting (IVUS study)
- Carina shift comprises **71%** of SB os compromise.
- Stent overexpansion was correlated with carina shift ($p=0.002$)



My Strategy to avoid SB compromise

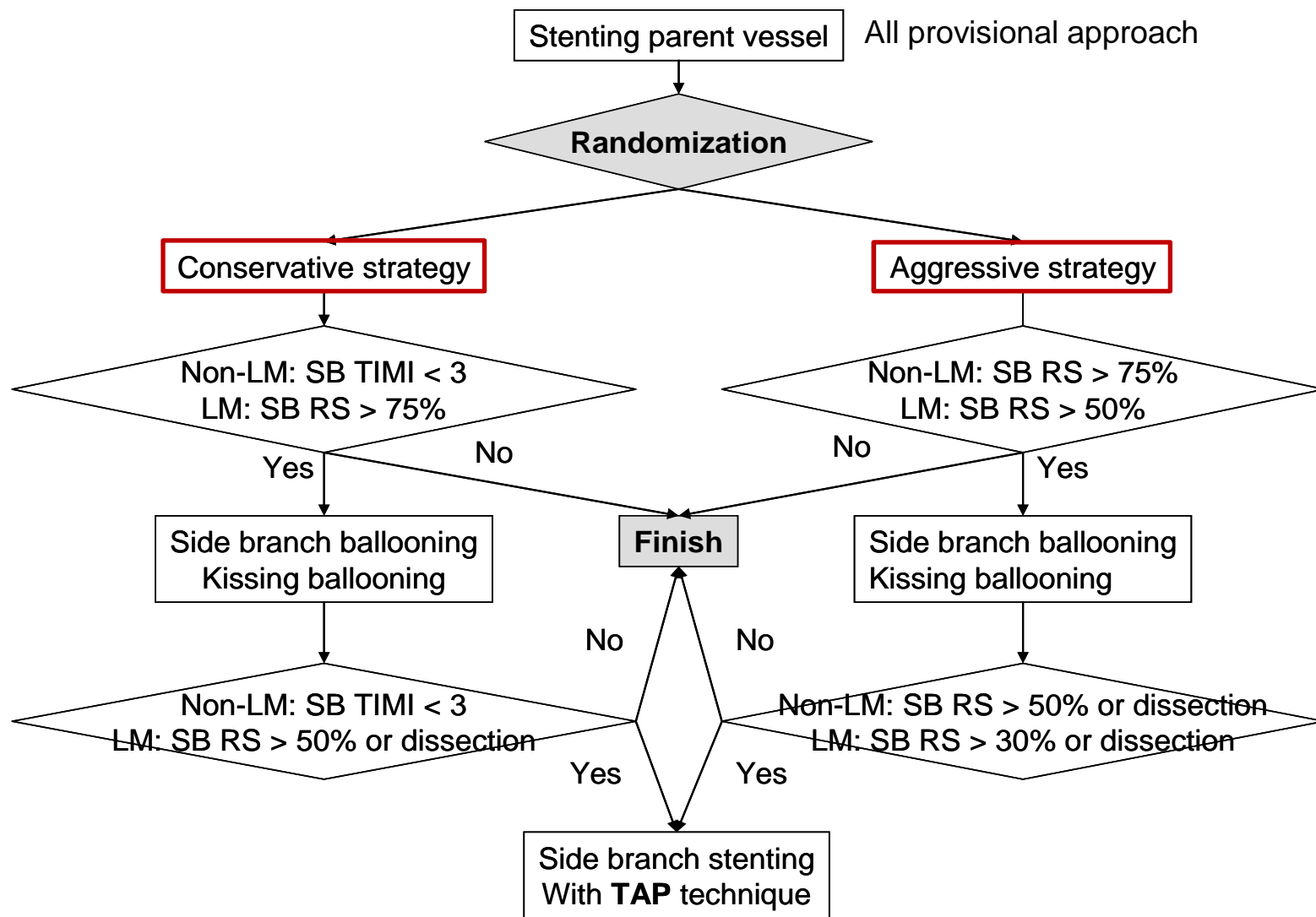
To try to avoid MB os stent overexpansion before SB rewiring.



In the provisional approach, when do you treat side branch?

	Ix of SB Stenting	SB stenting in 1-stent group
SIRIUS Bifurcation (Colombo)	Residual stenosis > 50%	52%
NORDIC (Steigen)	TIMI 0 after ballooning	4.3%
CACTUS (Colombo)	TIMI < 3 Residual stenosis > 50% Dissection > type B	31%
TULIPE (Lefevre)	Residual stenosis > 50%	34%
TICO (Gwon)	Residual stenosis > 50% Any dissection	51%

Single center prospective randomized trial

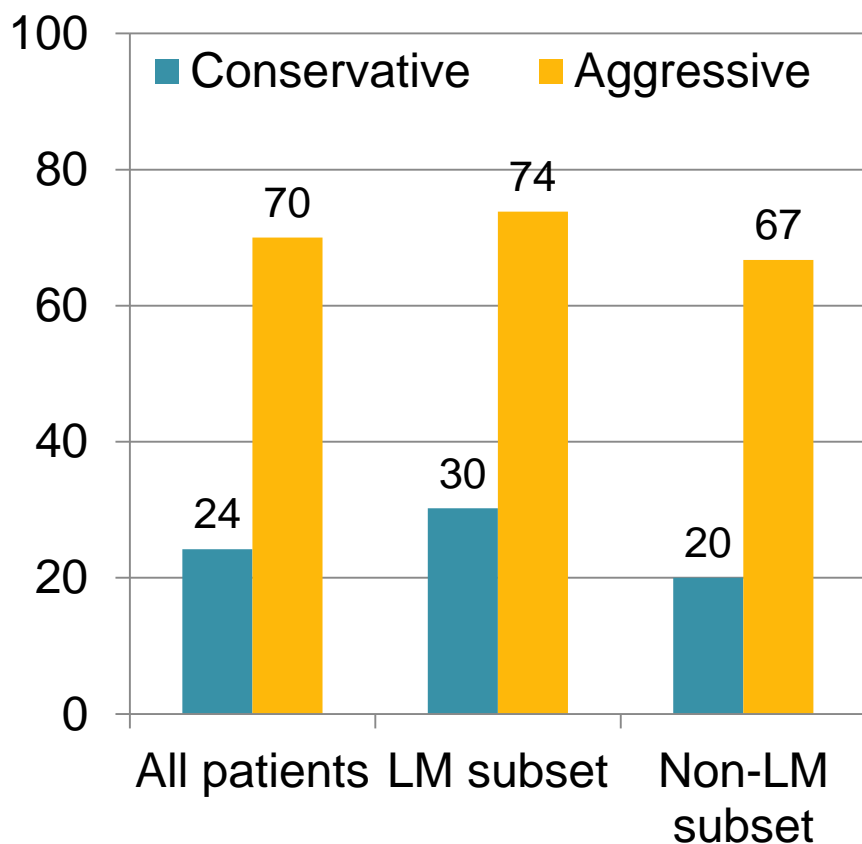


STRATEGY Study

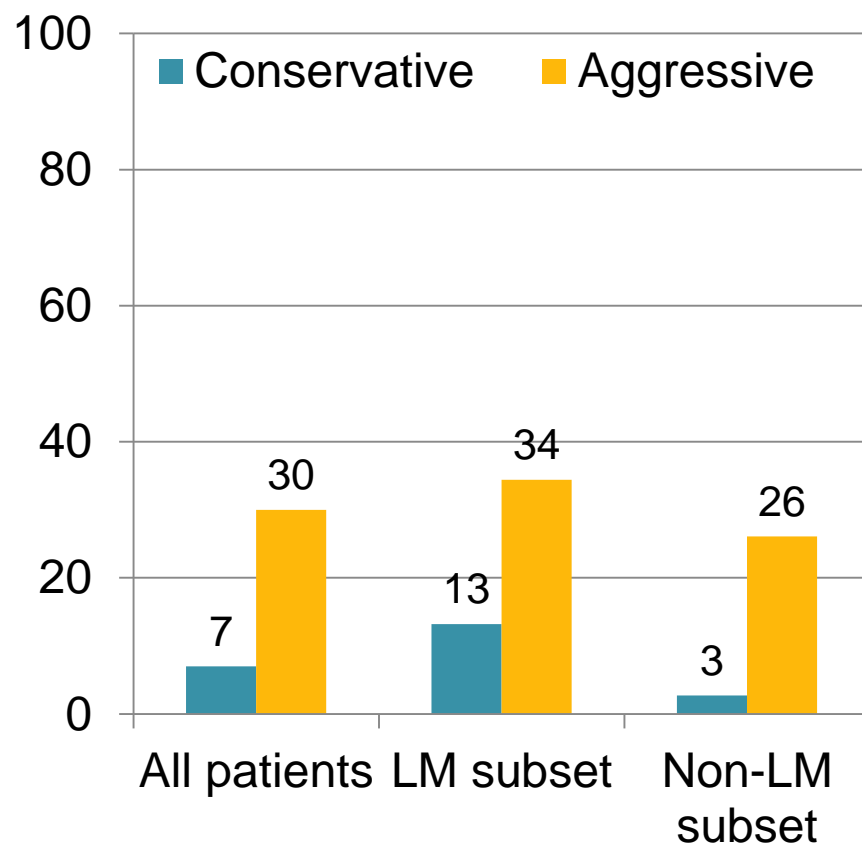
Single center prospective randomized trial

(N=258)

SB Ballooning



SB Stenting



Single center prospective randomized trial

(N=258)

	Conservative (n=128)	Aggressive (n=130)	p Value
Total death	1 (0.8%)	3 (2.3%)	0.62
Cardiac death	0 (0.0%)	1 (0.8%)	0.99
Spontaneous MI	0 (0.0%)	0 (0.0%)	-
Periprocedural MI	10 (7.8%)	21 (16.2%)	0.039
TLR	9 (7.0%)	5 (3.8%)	0.26
TBR	7 (5.5%)	3 (2.3%)	0.19
TVR	11 (8.6%)	9 (6.9%)	0.65
Stent thrombosis	0 (0.0%)	1 (0.8%)	0.99
TVF	11 (8.6%)	10 (7.7%)	0.79

(TVF = cardiac death, MI, TVR)

FKB did not improve outcome in 1-stent technique

	No Kissing (N=239)	Kissing (N=238)	P-value
Procedure time (min)	47±22	61±28	0.0001
Fluoroscopy time (min)	11±10	16±12	0.0001
Contrast volume (ml)	200±92	235±97	0.0001
6-mo MACE (%)	2.9	2.9	NS
6-mo Index lesion MI (%)	2.2	0.0	NS
6-mo TLR (%)	2.1	1.3	NS
6-mo Stent thrombosis (%)	0.4	0.4	NS

FKB: Final kissing ballooning

By inexperienced hands, SB ballooning even can be hazardous

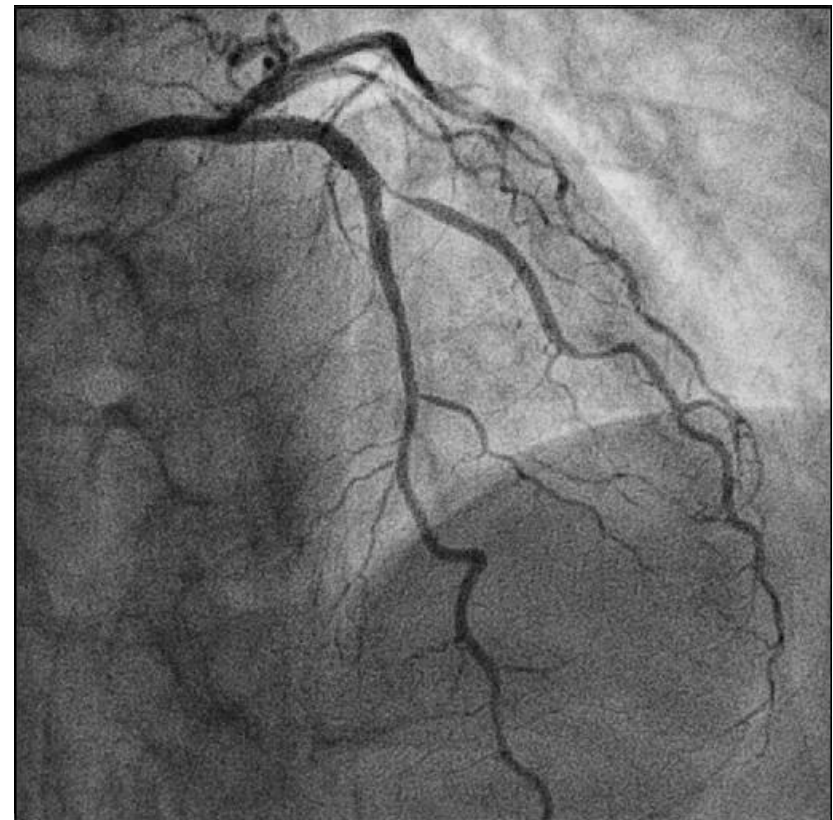
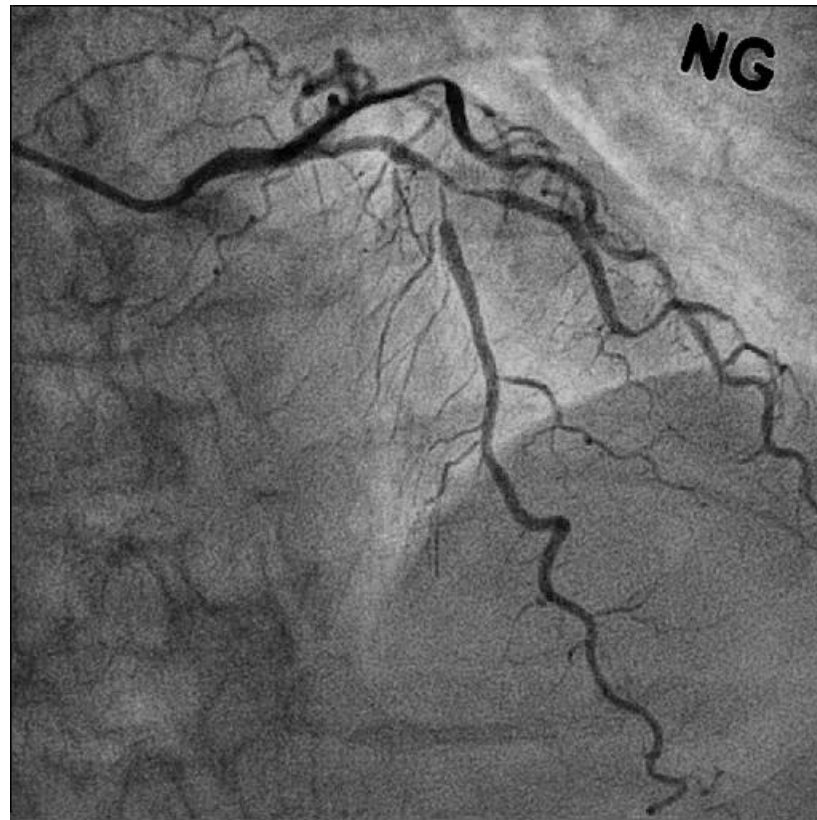
Propensity score-matched analysis from COBIS Registry

	No SBB (N=444)	SBB (N=222)	Adjusted HR (95% CI)	p-value
Cardiac death or MI	8 (1.8)	2 (0.9)	-	0.99
TLR	15 (3.4)	21 (9.5)	2.35 (1.38-4.01)	0.002
TLR for MV	15 (3.4)	19 (8.6)	2.38 (1.38-4.09)	0.002
TLR for SB	0 (0.0)	4 (1.8)	-	0.94
TVR	24 (5.4)	24 (10.8)	2.12 (1.33-3.38)	0.002
MACE	20 (4.5)	21 (9.5)	2.12 (1.33-3.39)	0.002

(SBB = side branch ballooning ± final kissing ballooning)

Case 1. F/71 Unstable angina

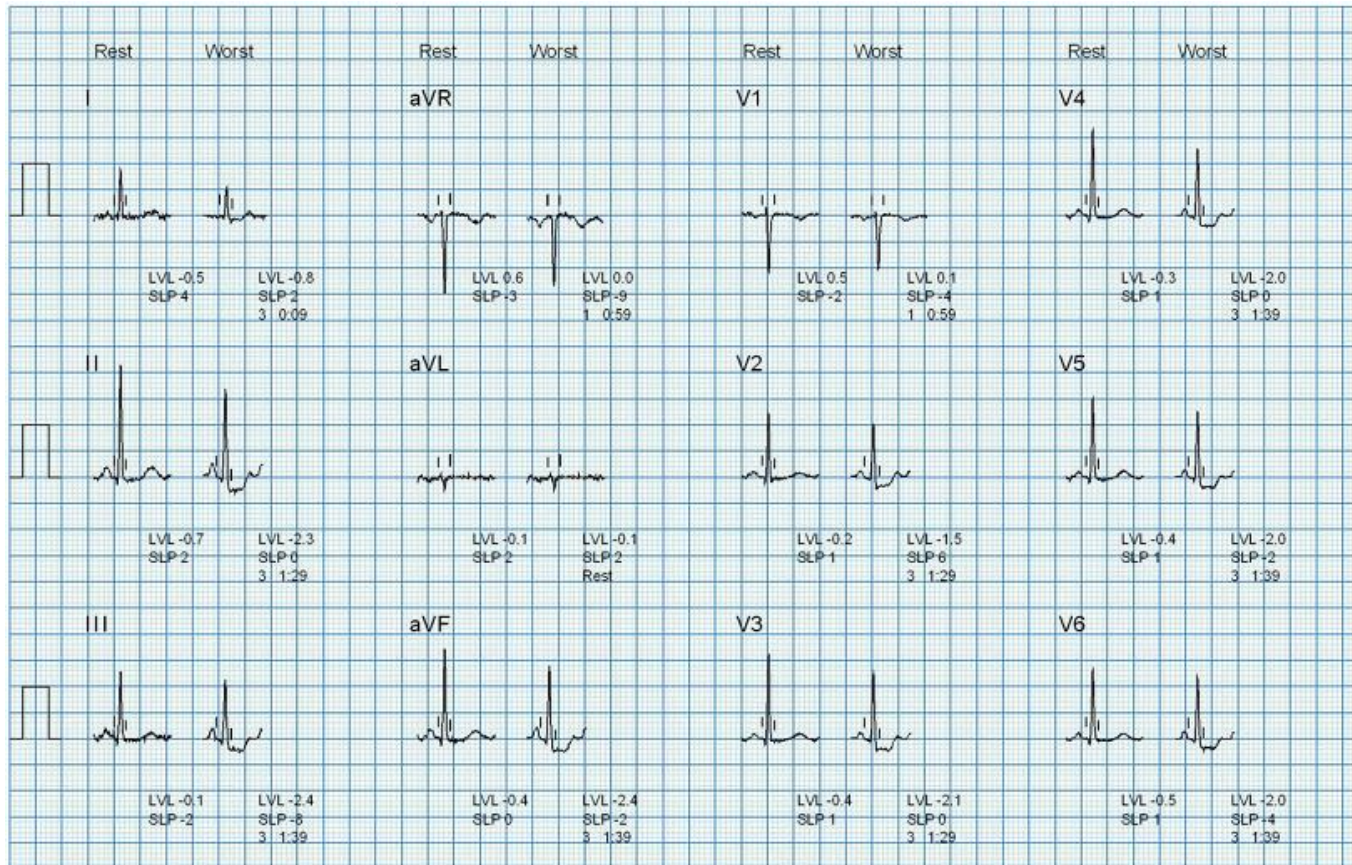
- Echo: normal LV function, anterior wall hypokinesia



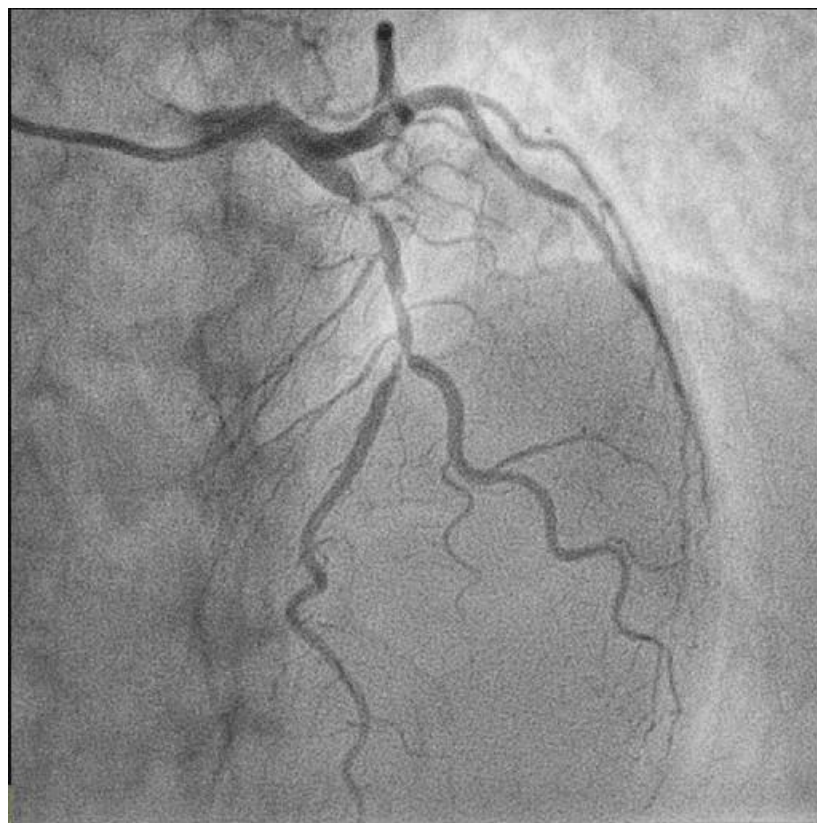
Base **No chest pain, no event for 1 year after PCI** '5X28 mm

Case 2. F/65 Stable Angina

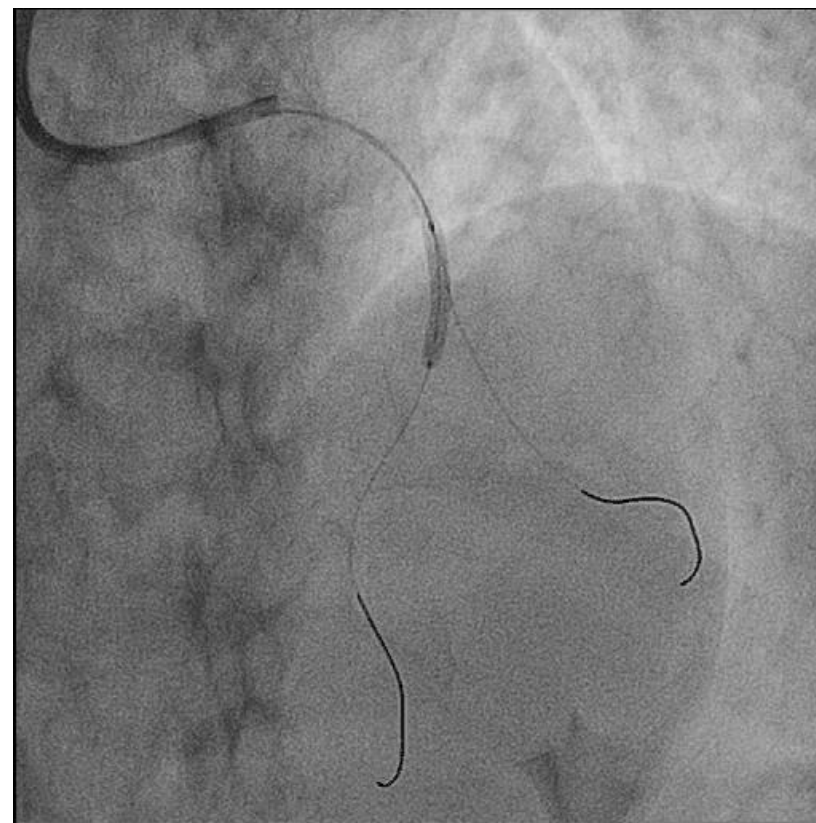
- Hypertension (+), diabetes (+) for 10Y, smoking (-)
- Treadmill test: 7 min 52 sec, positive, chest pain (+)



Case 2. F/65 Stable Angina

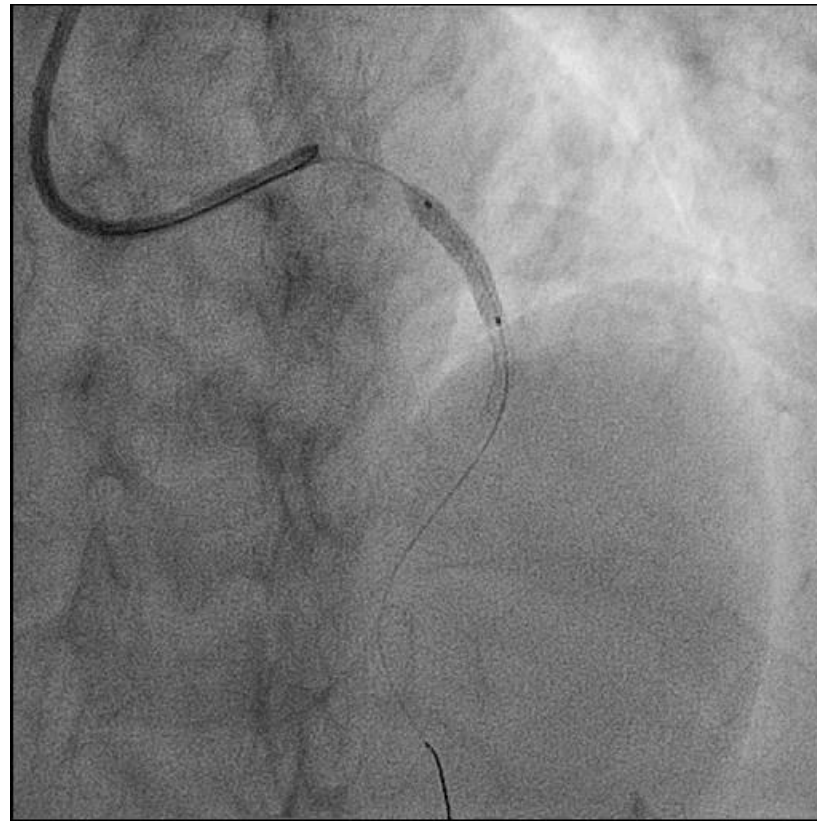


Baseline CAG

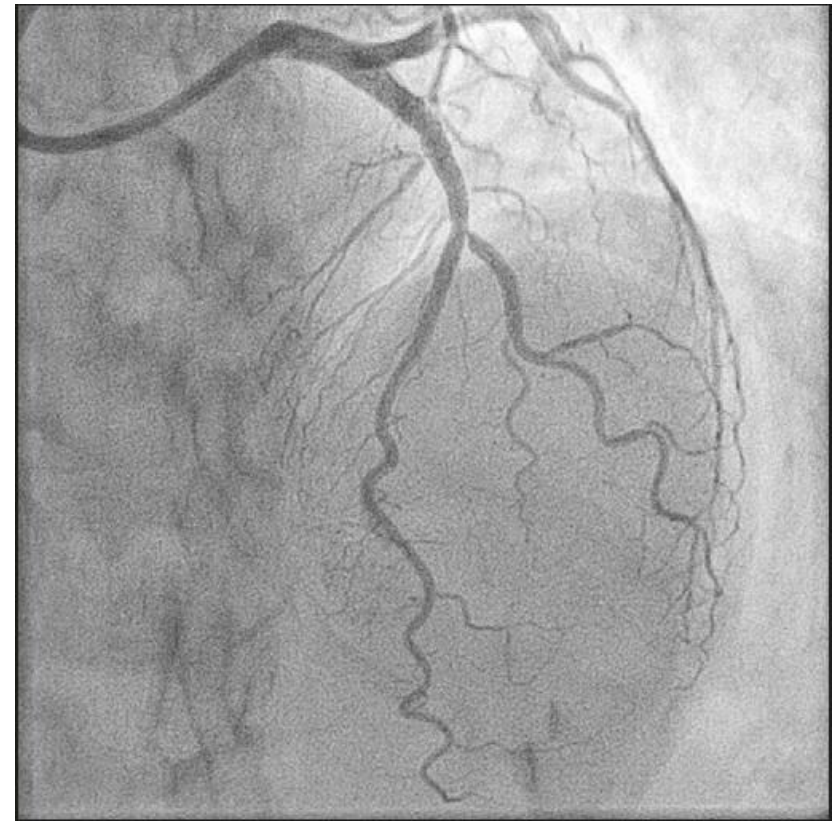


2.5 x 18 mm Promus Element

Case 2. F/65 Stable Angina

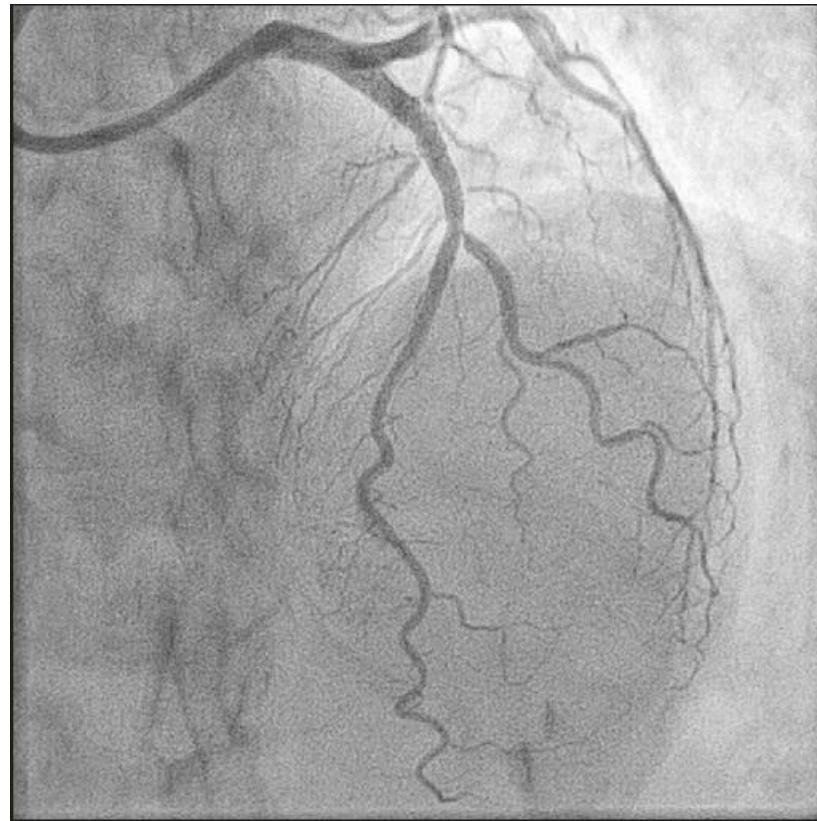


3.5 x 18 mm Promus element

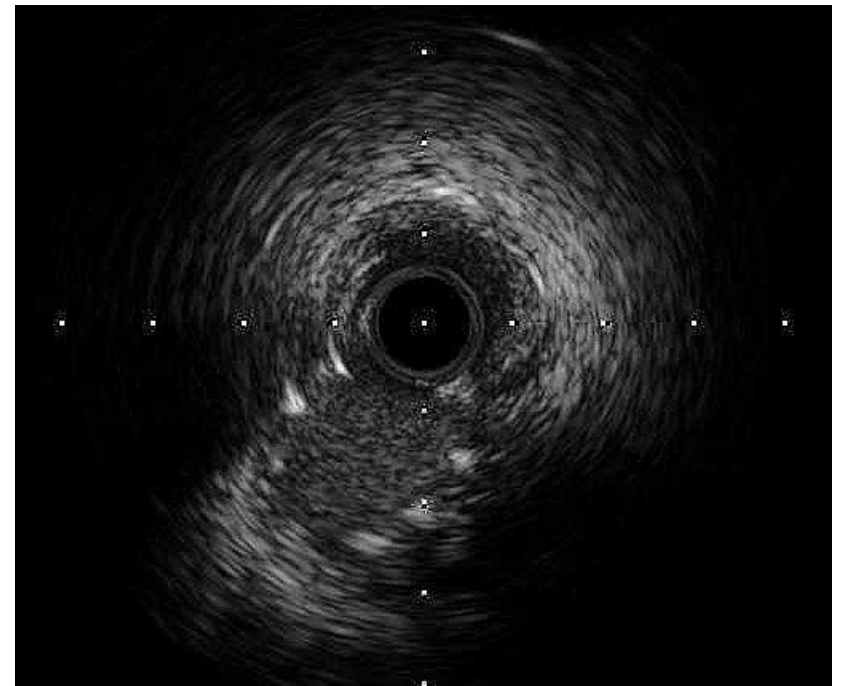


Final CAG

Case 2. F/65 Stable Angina



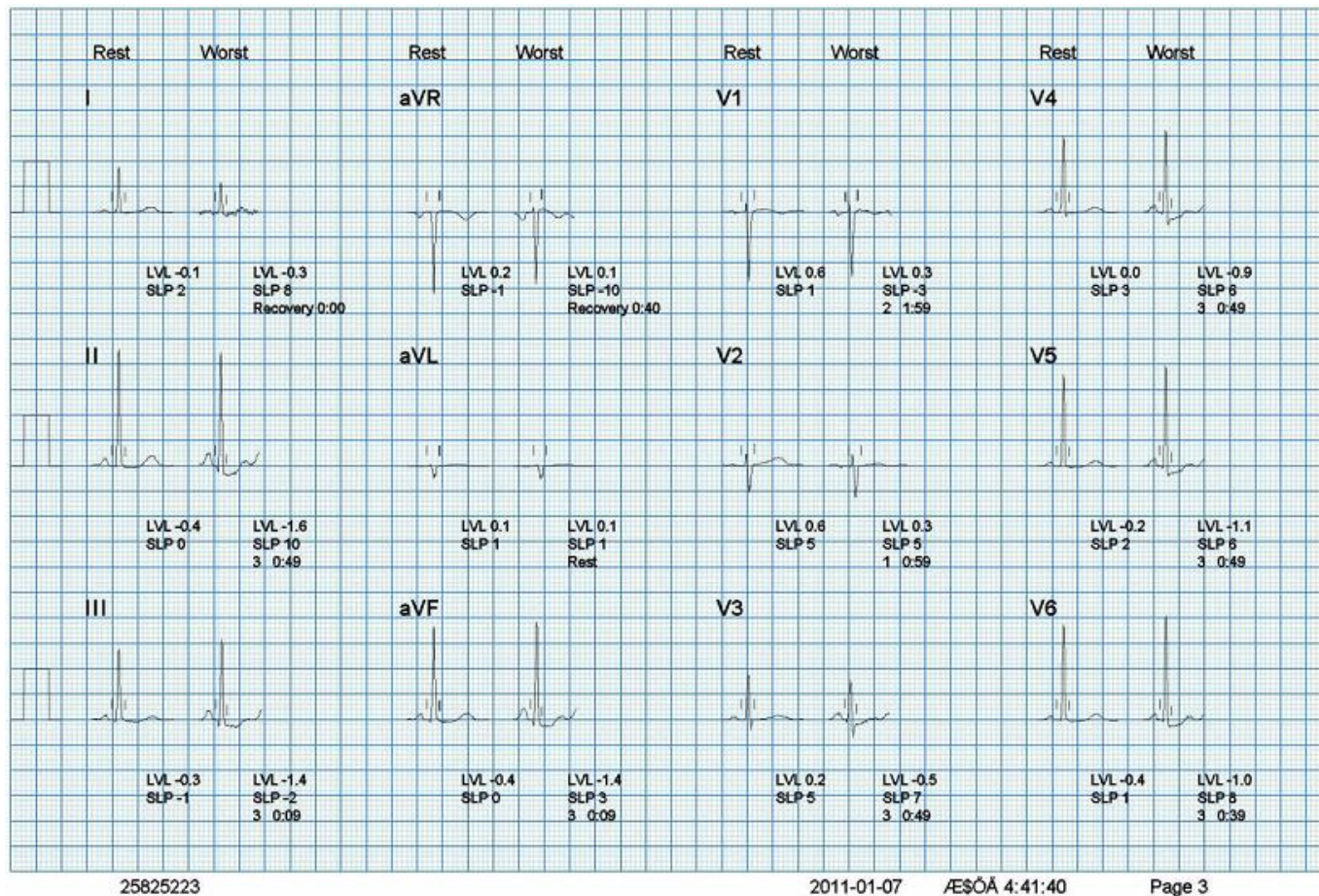
- FFR for SB: 0.74



IVUS from diagonal artery

Case 2. F/65 Stable Angina

- Treadmill test: 8 min 50 sec, equivocal, chest pain (-)



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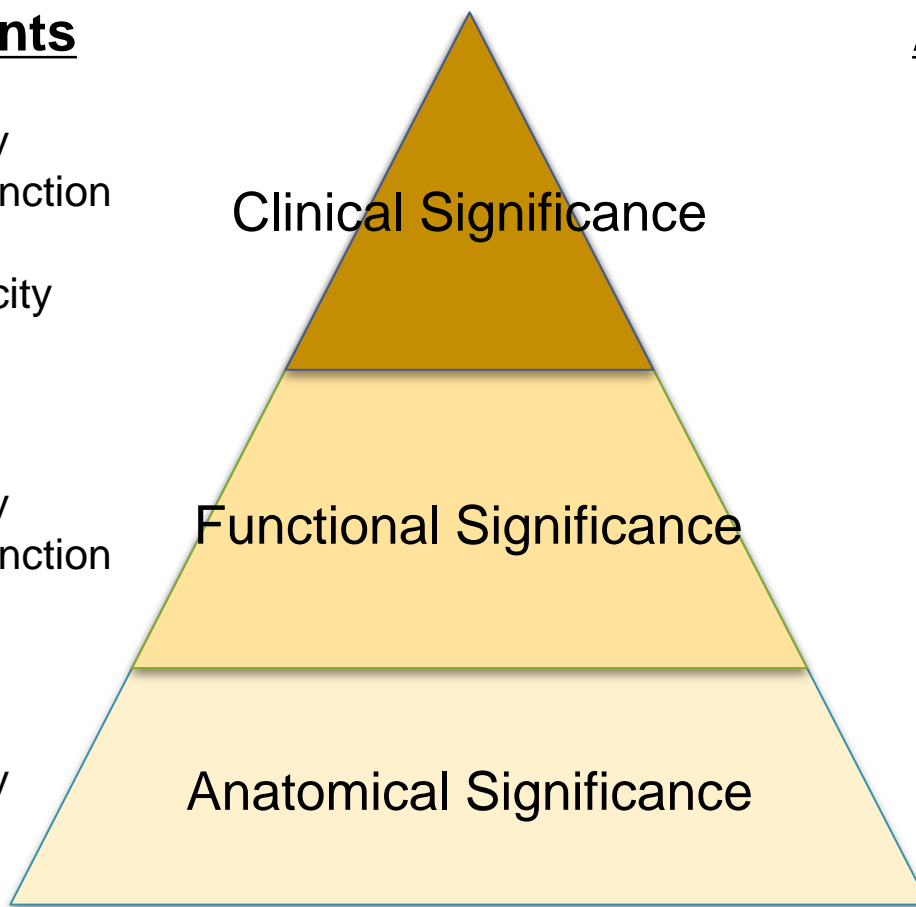
Functionally significant SB stenosis is frequently clinically insignificant

Determinants

Stenosis severity
Microvascular function
Ischemic area
Functional capacity

Stenosis severity
Microvascular function

Stenosis severity



Assessment

Symptoms
Treadmill test

FFR
CFR
SPECT
Dobutamine echo

CAG
IVUS/OCT
CT angiography

Summary and Conclusion

- Compared to a provisional approach, a routine 2-stenting
 - Is more complex and more resource-consuming
 - Is not associated with a better long-term outcome
 - May be associated with a higher risk of stent thrombosis
- Most of the bifurcation lesions can be effectively treated with a provisional conservative strategy.
- Only indication of routine 2-stenting may be a long significant lesion in a very large side branch, which I am still not sure of.