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TCTAP 2017

Technical Uncertainties in Bifurcation PCI

Predilation, Kiss, POT (and RePOT)

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Potential conflicts of interest

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☑ I have the following potential conflicts of interest to report

Advisory board

Medtronic Asia Pacific

Research contracts

Abbott Korea

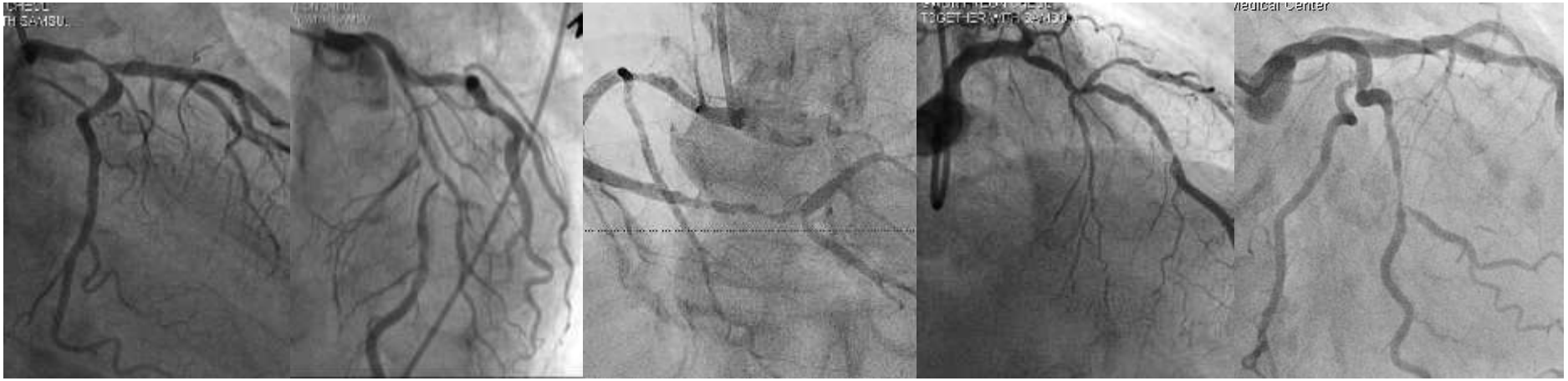
Boston Scientific Korea

Biosensors Korea

Biotronic Korea

Predilation of side branch (SB)

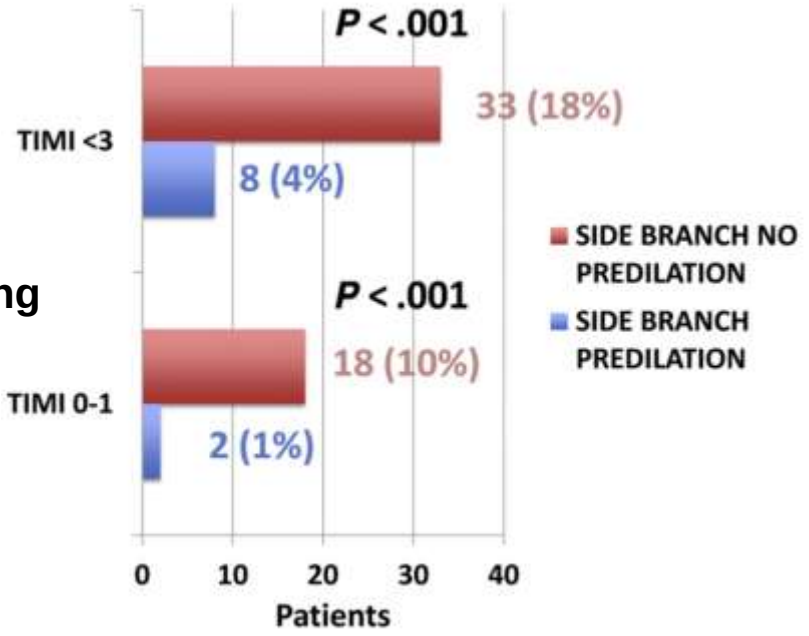
- Benefits
  - The lower risk of SB compromise after MV stenting
  - Relief of ischemia in the myocardial territory of SB
- Costs
  - Complicated procedure with the higher risk of peri-procedural MI
  - Increased risk of SB dissection

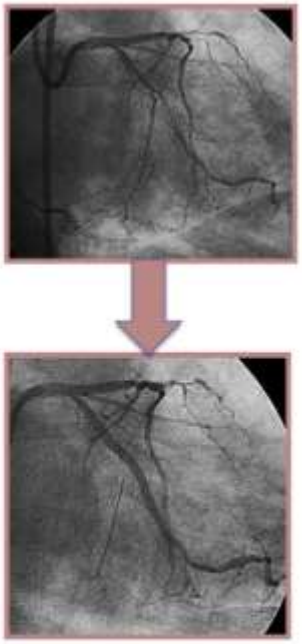


Pan M, et al.
The angiographic impact of predilation

- True bifurcation (N=372)
- Randomized to SB predilation vs. no predilation

TIMI flow of SB after MV stenting



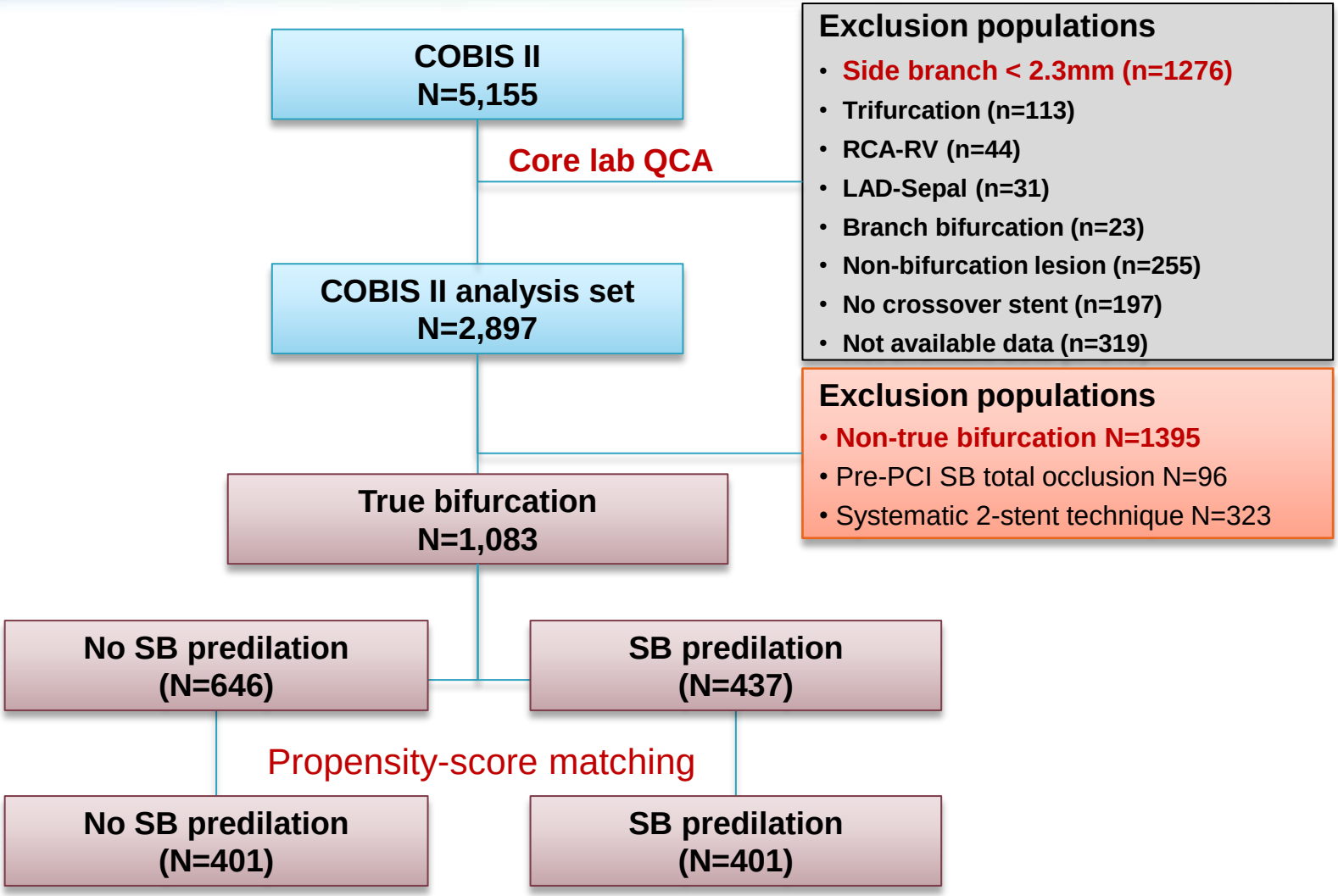


TIMI flow at the SB after main vessel stenting (primary end point).

2-year MACE rate was equivalent (predil 8% vs. no-predil 10%, p=0.56)

Pan M, Am Heart J 2014

COBIS II Registry
SB predilation



Gwon HC, submitted

COBIS II Registry
MACE: cardiac death, MI, TLR

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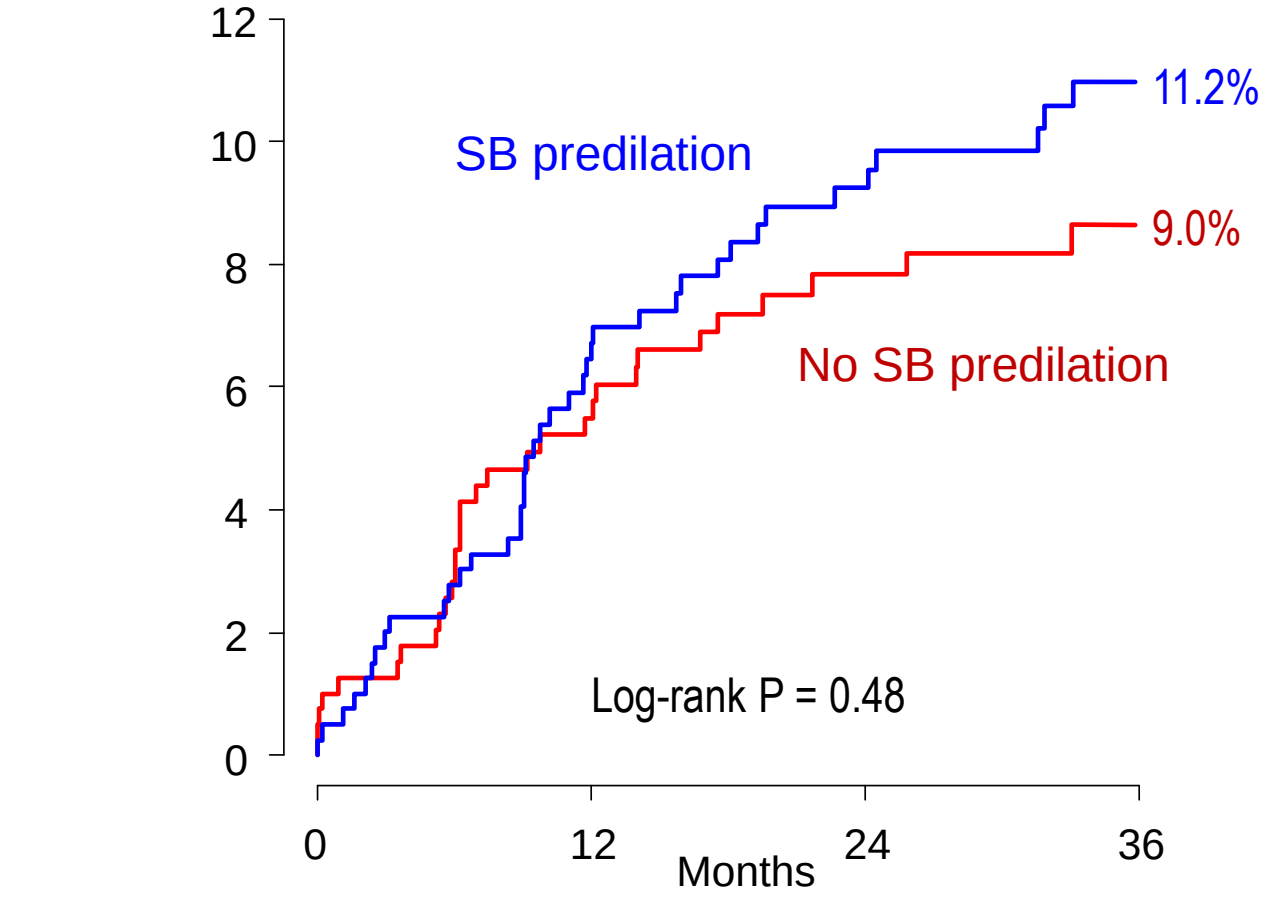
Median follow-up duration was 36 [24-51] months



Gwon HC, submitted

Comparison of 2 studies

	Pan M, et al.	COBIS II (PS-matched)
Design	RCT	Registry
Number of patients	N=372	N=802
SB diameter	≥ 2.25 mm	≥ 2.3 mm
SB TIMI flow < 3 after stenting*	**4% vs. 18%**	**10% vs. 13%**
Long-term clinical event*	**8% vs. 10%**	**11% vs. 9%**

SB predilation may reduce the risk of SB compromise after MV stenting, but it does not improve the long-term clinical outcomes.

It is reasonable to apply it for the bifurcation lesion with a high risk of SB occlusion.

* Predilation vs. non-predilation

Pan M, Am Heart J 2014, Song PS, Gwon HC, Rev Esp Cardiol 2014

SB occlusion is mostly unpredictable

- COBIS II registry, N=2,227
- SB TIMI < 3 after MV stent: N=187, 8.4%

Independent predictors of SB TIMI < 3 after MV stenting

Variables	Odds ratio [95% CI]	p Value
SB ostial disease (DS ≥50%)	2.34 [1.59-3.43]	<0.001
SB lesion length (by 1 mm)	1.03 [1.003-1.06]	<0.001
Proximal MV disease (DS ≥50%)	2.34 [1.57-3.50]	0.03
Acute coronary syndrome	1.53 [1.06-2.19]	0.02
Left main lesions (vs. non-left main lesions)	0.34 [0.16-0.72]	0.005

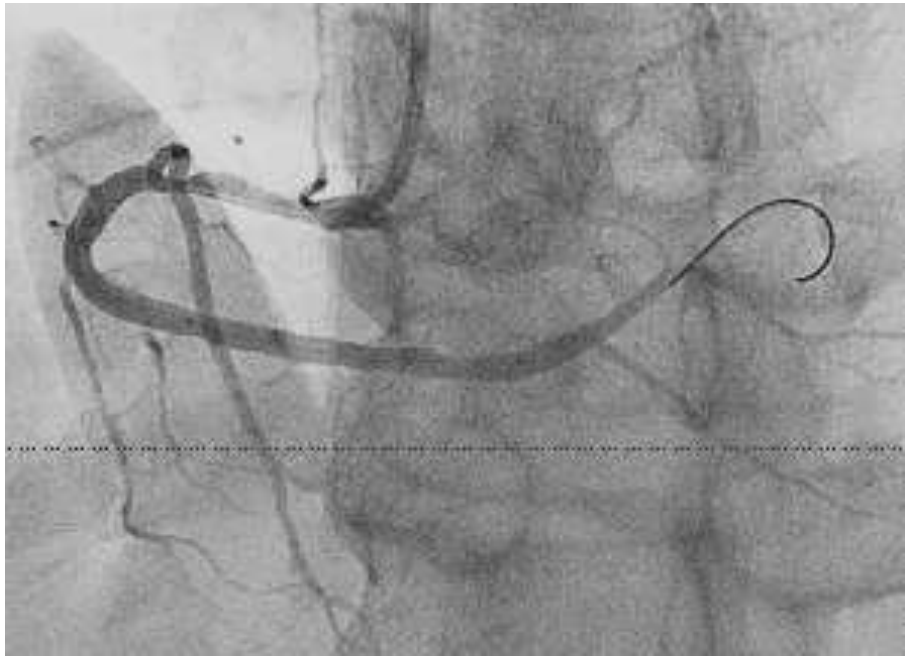
SB plaque burden

MV plaque burden

Important non-predictors: bifurcation angle, jailed wire technique, SB predilation

Case 1

- What do you expect after MV stenting?



MV plaque burden is a risk factor of SB compromise!

Final kissing ballooning (FKB) in 2-stent technique is crucial.

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- Predictors of TVF (Korean Bifurcation Pooled Cohorts)
- N=951, treated with 2-stent strategy

	Adjusted HR*	95% CI	p Value
Treated bifurcation in LM	2.09	1.43 – 3.03	<0.001
High SYNTAX score >32	2.00	1.28 – 3.14	0.002
Diabetes mellitus	1.41	1.00 – 1.99	0.05
Second-generation DES	0.26	0.12 – 0.57	0.001
Non-compliant balloon	0.53	0.36 – 0.79	0.002
Final kissing ballooning	0.44	0.29 – 0.68	<0.001

Final kissing ballooning in 1-stent technique

	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

FKB vs. non-FKB in COBIS I and COBIS II

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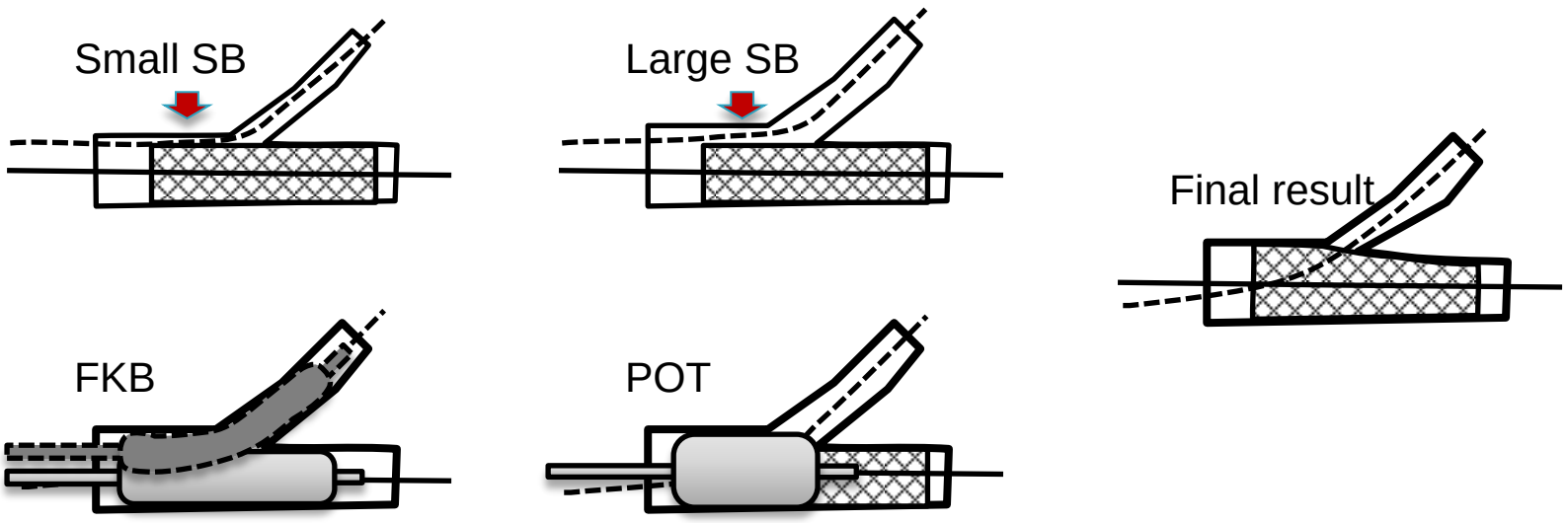
	COBIS I			COBIS II		
Included case	1,065			1,901		
Inclusion	SB ≥ 2.0 mm			SB ≥ 2.3 mm (QCA-confirmed)		
LM bifurcation	Excluded			Included		
	FKB	**No FKB**	**p-value**	**FKB**	**No FKB**	**p-value**
MACE (%)	9.5	4.5	0.02	6.8	9.7	0.02
TLR MV (%)	8.6	3.4	0.004	5.7	7.3	0.04
TLR SB (%)	1.8	0.0	-	2.2	3.3	0.21
MV proximal MLD (mm)	2.8±0.5	2.7±0.5	0.001	3.3±0.6	3.0±0.6	<0.001
MV distal MLD (mm)	2.5±0.5	2.5±0.5	0.39	2.8±0.5	2.7±0.6	0.04
SB os MLD (mm)	1.4±0.4	1.0±0.5	<0.001	1.9±0.6	1.4±0.7	<0.001
SB distal MLD (mm)	1.7±0.5	1.5±0.6	<0.001	2.2±0.6	2.0±0.7	0.04

Gwon HC, Heart 2012, Yu CW, JACC CVI 2015

FKB, POT, and Final-POT

FKB may be more beneficial for large SB

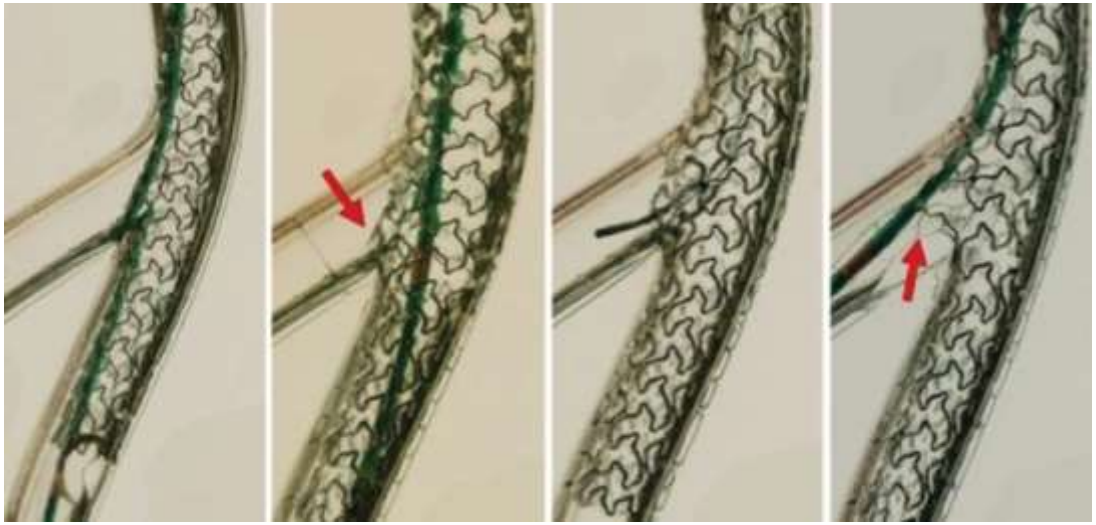
- The major benefit of FKB is the optimal expansion of MV stent, which seems to be more remarkable when the SB is bigger.
- Proximal optimization technique (POT) may replace FKB for this purpose, and it is also much simpler.



FKB, POT, and Final-POT

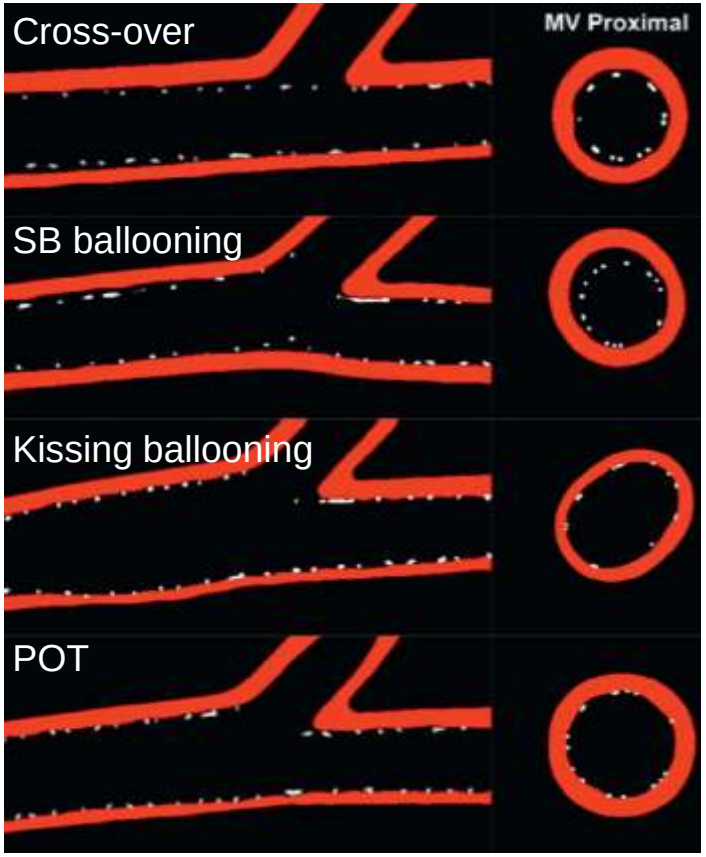
Proximal optimization technique (POT)

The POT is performed by postdilating the MV stent just proximal to the carina, with a short NC balloon sized for the proximal MV reference diameter.



* Originally it was invented to facilitate the wire passage into the distal struts on MV stent.

It also improves a proximal MV stent apposition and eccentricity



Mylotte D, Lefevre T, CCI 2013

COBIS II POT Study
Clinical outcomes

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- Patients with **SB diameter ≥ 2.5 mm in core-lab QCA (N=1,191)**
- Propensity score-matching population

	POT (n=204)	No POT (n=665)	HR (95% CI)	p value
MACE	**6 (2.9)**	**78 (11.7)**	**0.25 (0.11-0.60)**	**0.002**
All-cause death	7 (3.4)	25 (3.8)	0.97 (0.41-2.33)	0.95
Cardiac death	1 (0.5)	9 (1.4)	0.37 (0.05-2.97)	0.35
Myocardial infarction	0	12 (1.8)	-	-
Stent thrombosis	2 (1.0)	8 (1.2)	0.98 (0.20-4.77)	0.98
TLR	5 (2.5)	61 (9.2)	0.27 (0.10-0.69)	0.006
MV, proximal	**3 (1.5)**	**40 (6.0)**	**0.25 (0.07-0.82)**	**0.02**
MV, distal	**4 (2.0)**	**47 (7.1)**	**0.28 (0.10-0.80)**	**0.02**
SB	4 (2.0)	35 (5.3)	0.37 (0.13-1.09)	0.07
Both vessels	5 (2.5)	48 (7.2)	0.34 (0.13-0.88)	0.03

Preliminary analysis

COBIS II POT Study
Subgroup analysis

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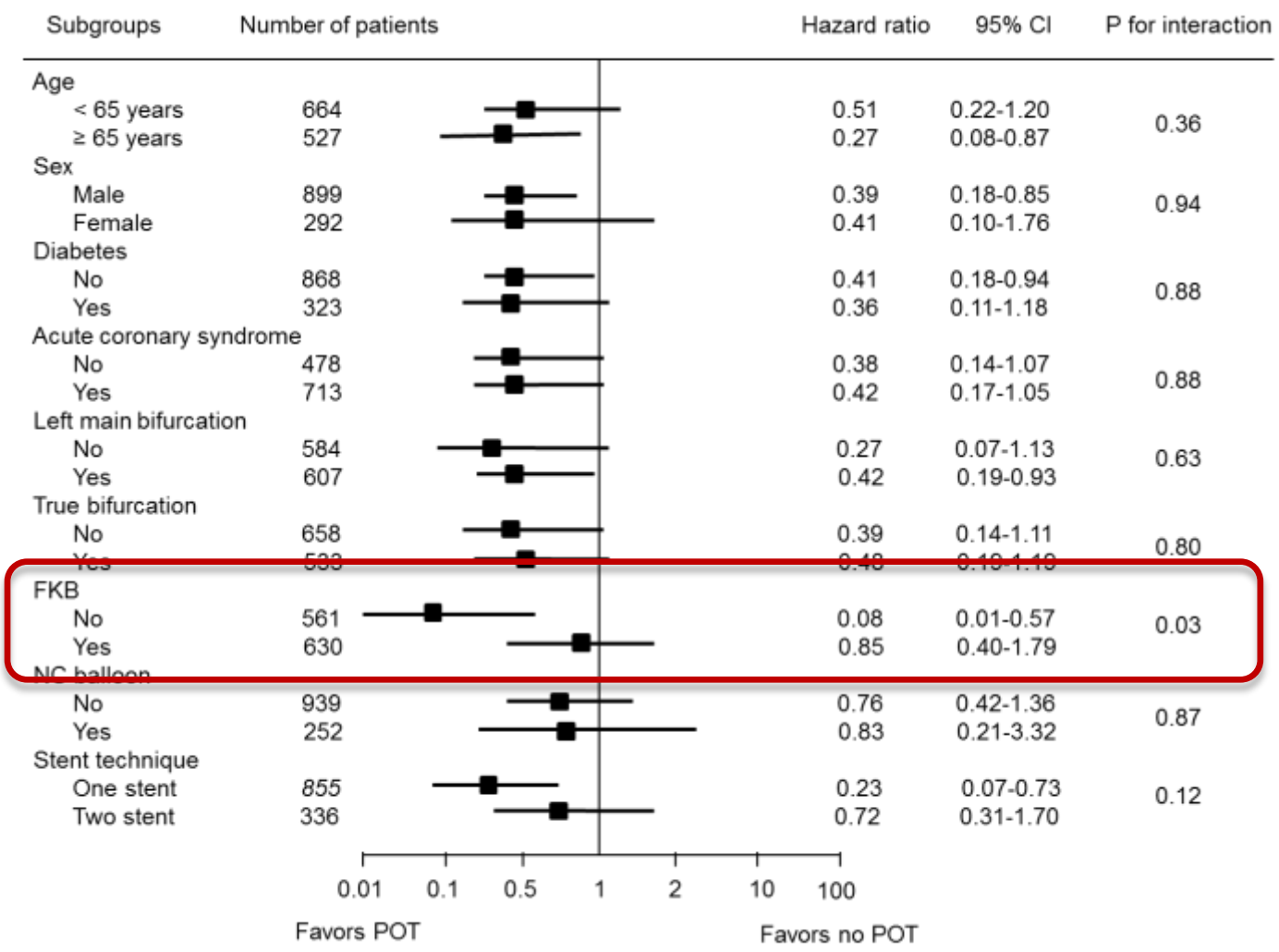
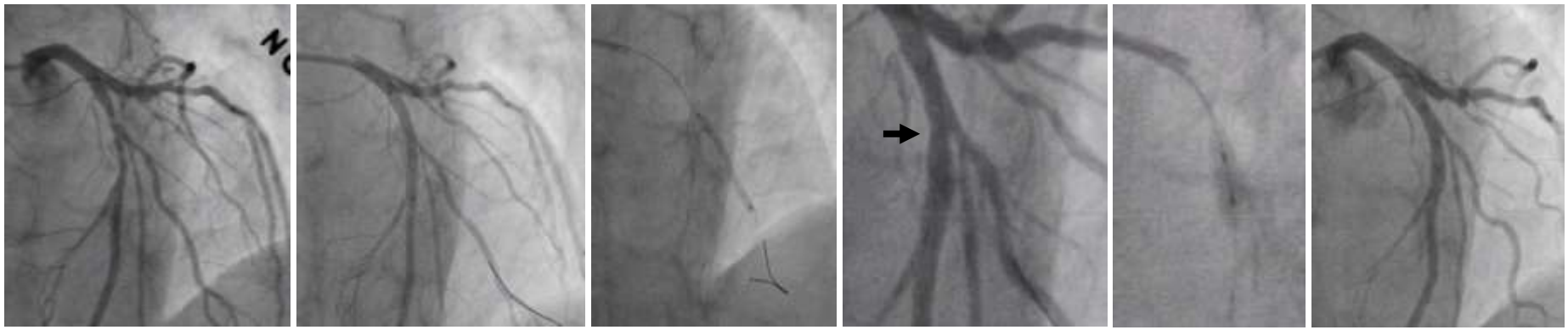


Preliminary analysis

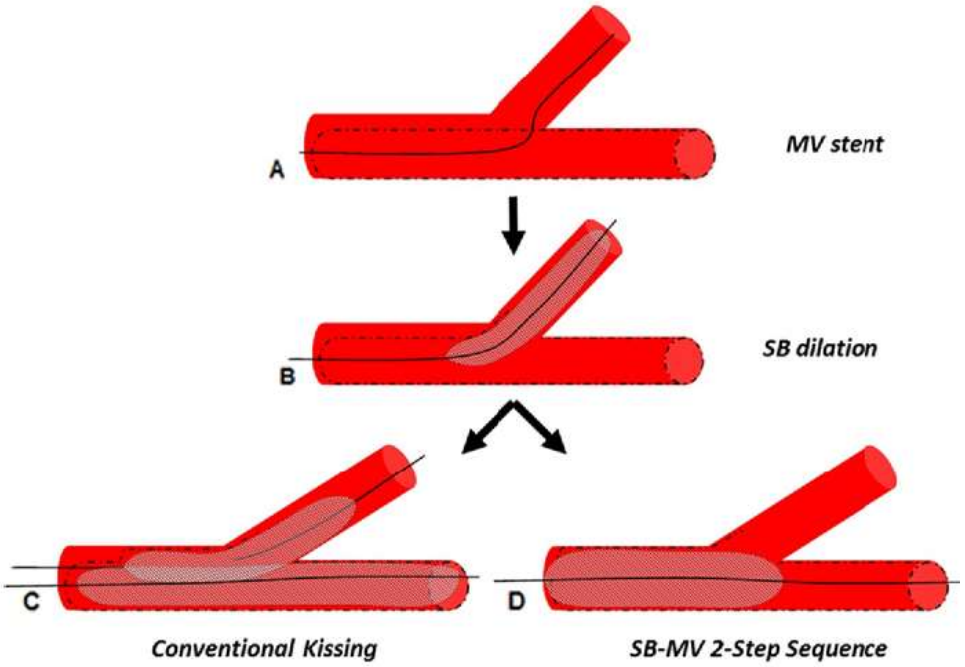
FKB and POT
Lessons learned

- Final kissing ballooning reduces the risk of TLR in the main vessel, mostly by MV stent expansion, particularly in the bifurcation with a large side branch, which is also true with proximal optimization technique (POT)
- The optimal MV stent expansion is the key for the long-term clinical outcomes in the bifurcation lesion.

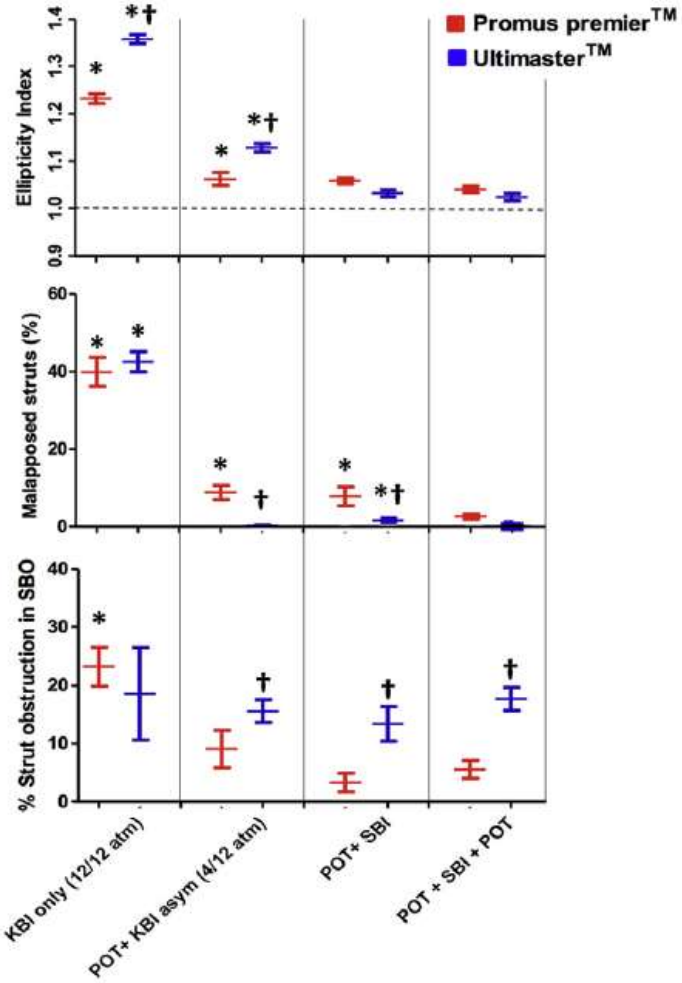


Re-POT was the best
in terms of ellipticity, malapposition, SB obstruction

Re-POT: POT-Side-POT



FKB Re-POT



Foin JACC CVI 2014, Finet G, JACC CVI 2015

Re-POT is useful after BVS implantation

It can replace final kissing ballooning

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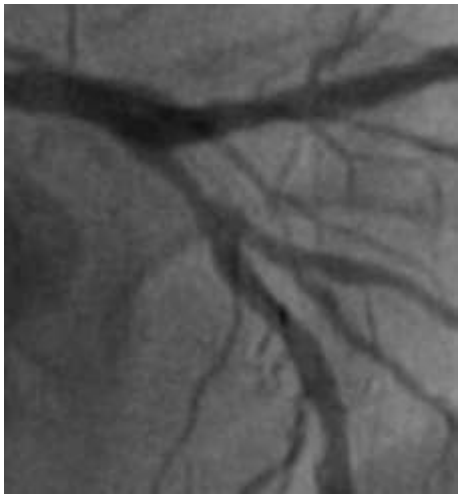
M/64, stable angina, treated with BVS



Baseline

After LAD BVS
Two 3.0x18 mm

After POT(BVS balloon) and D1 balloon (2.5x20 mm)

After Re-POT
3.5x8 mm 18 atm