

What Is Different for LM vs. with Non-LM Bifurcations

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Anatomic Difference of LM vs Non-LM Bifurcation

- **Bigger, greater, more frequent**
 - MB (LM) and SB (LCX)
 - Bifurcation angle
 - Myocardial territory
 - Downstream lesions
 - Multivessel involvement
 - Decreased LV function



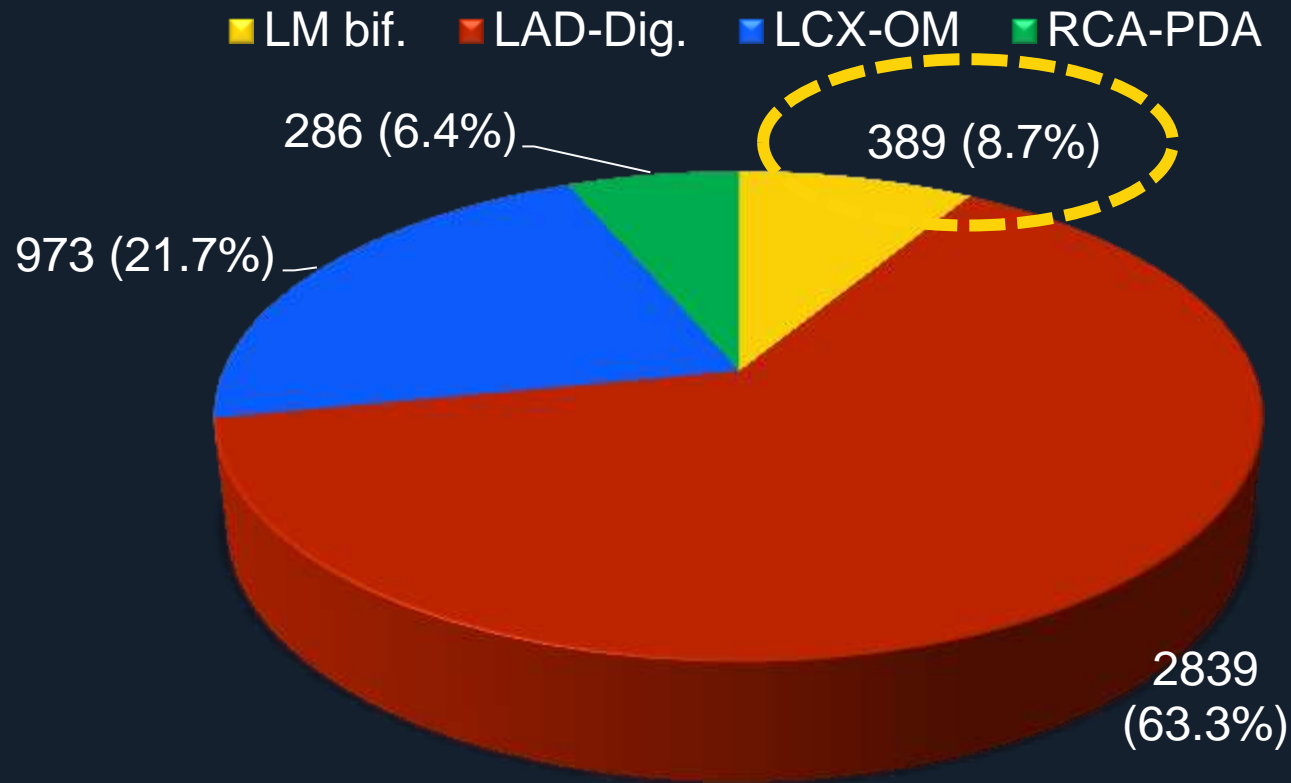
Guidelines for LM Bifurcation Disease

LM bifurcation PCI is not always a target of PCI

		2011 ACCF/AHA/SCAI	LOE	2014 ESC Guideline		LOE
CABG	I		B	I		B
PCI				I	LM with a SYNTAX score ≤ 22	B
	IIa	SIHD SYNTAX Score ≤ 22 , ostial or trunk LM STS score $\geq 5\%$ UA/NSTEMI if not a CABG candidate	B	B	IIa LM with a SYNTAX score 23-32	B
		STEMI	C			
	IIb	SIHD SYNTAX Score < 33 , bifurcation LM A increased risk of surgery (STS $> 2\%$)	B			
	III	Unfavorable anatomy for PCI	B	III	LM with a SYNTAX score > 32	B

Frequency Difference of PCI in Italian PCI Registry for LM vs. Non-LM Bifurcations

8.7 % vs. 91.3%



Procedural Difference of PCI for LM vs. Non-LM Bifurcation

- Need of SB protection during PCI
- Maintenance of hemodynamic stability
- Frequent use of double-stent technique
- Frequent need of multi-lesion intervention

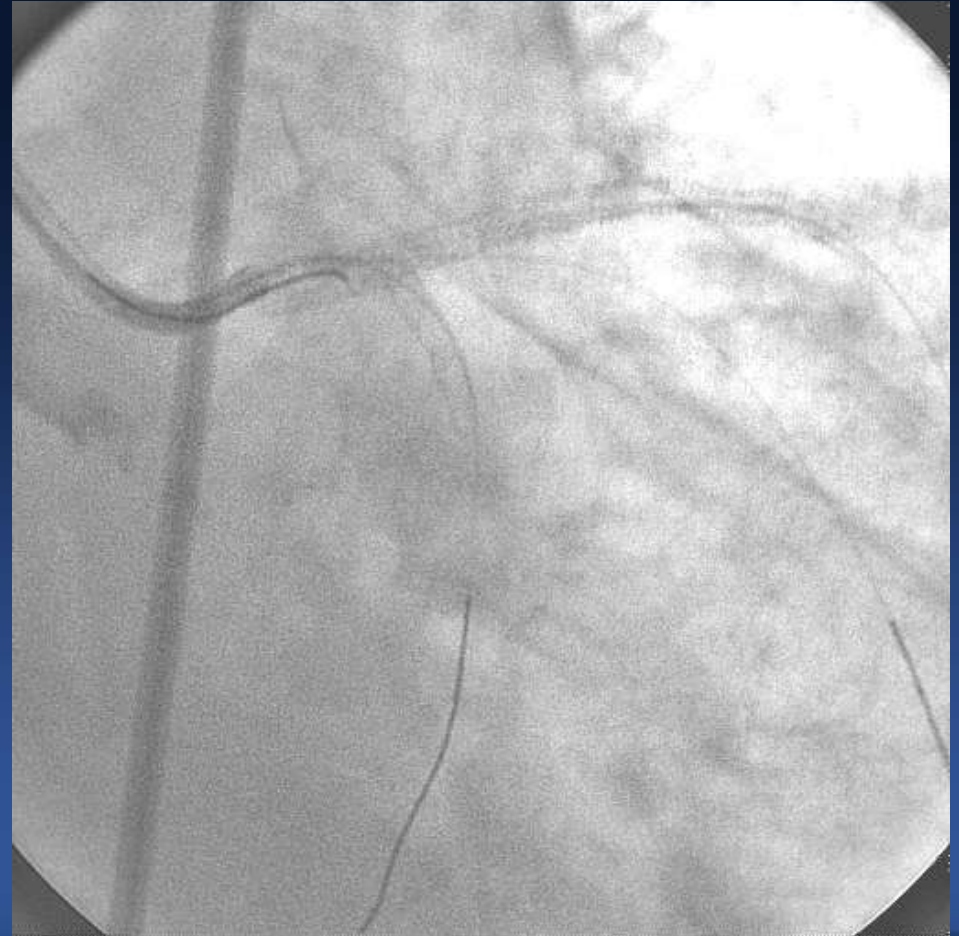
Technical Considerations of PCI for LM vs. Non-LM Bifurcation

- 1. Clinical judgement for SB treatment**
- 2. 1- vs. 2- stent techniques**
- 3. Final kissing balloon (FKB) inflation**

1. Clinical Judgment



AV block and Hemodynamic Compromise Big LCX should be protected.

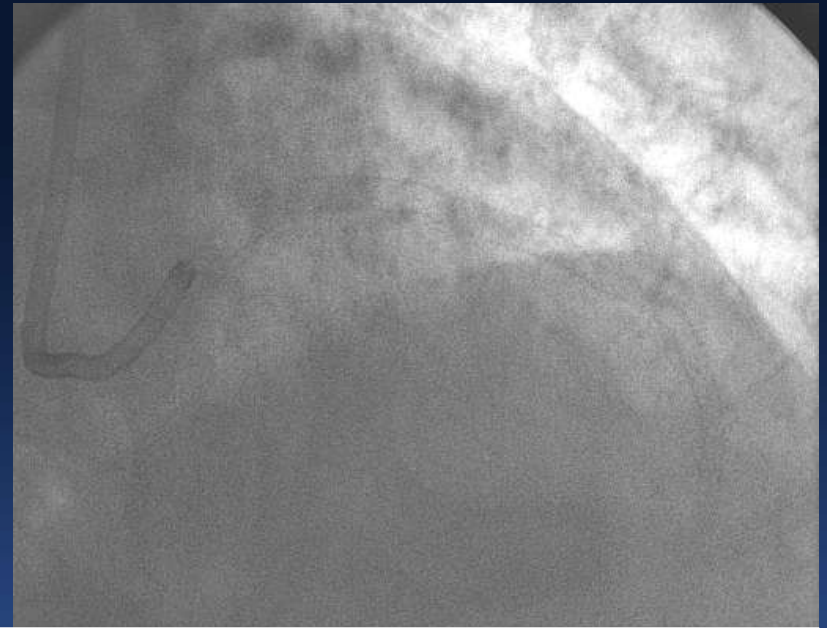


My decision: no need of SB protection independently from the morphology



- Old and fragile (77-yr)
- Stable angina
- Long MB lesion requiring multiple stents ≥ 3
- Tight stenosis in the downstream D2 segment
- Not very big myocardial territory

Tolerable symptom & stable hemodynamics SB was not treated after MB stenting (X3)



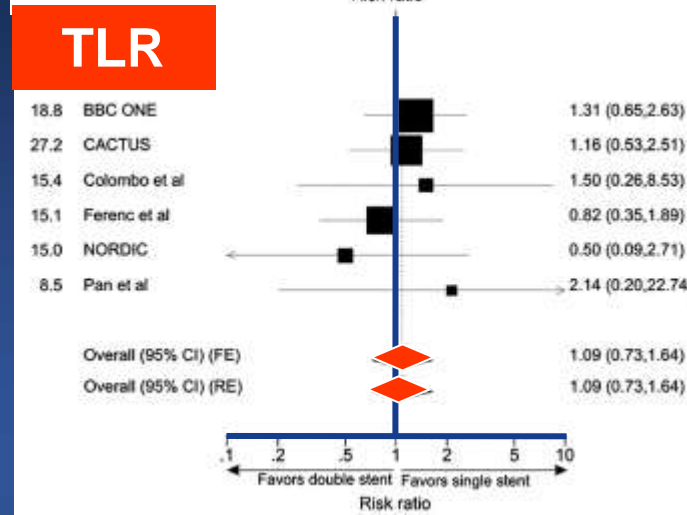
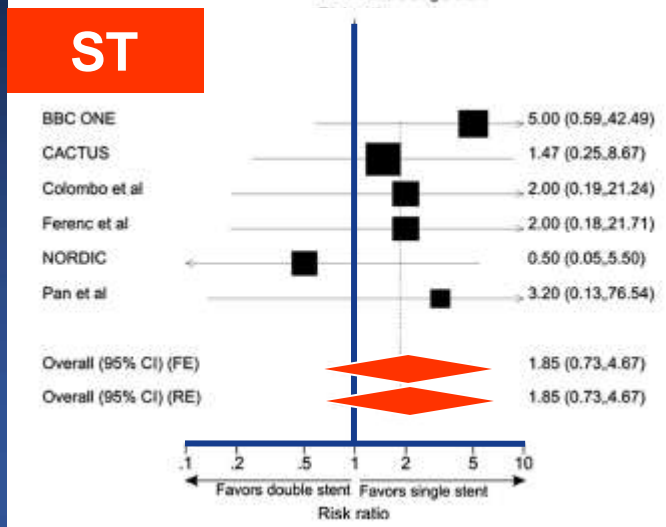
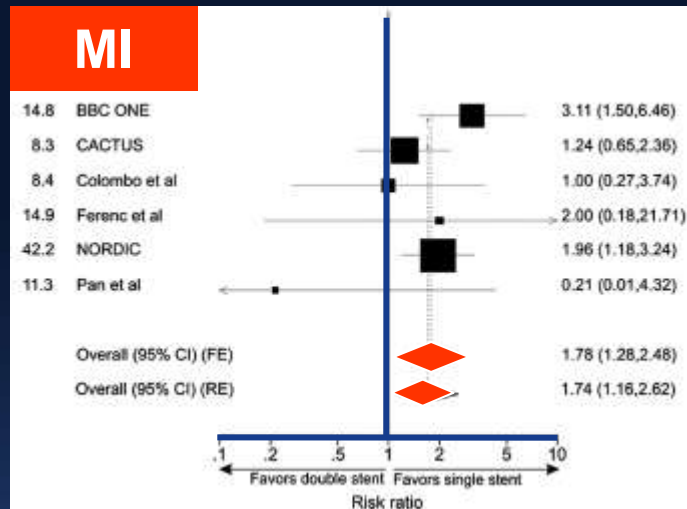
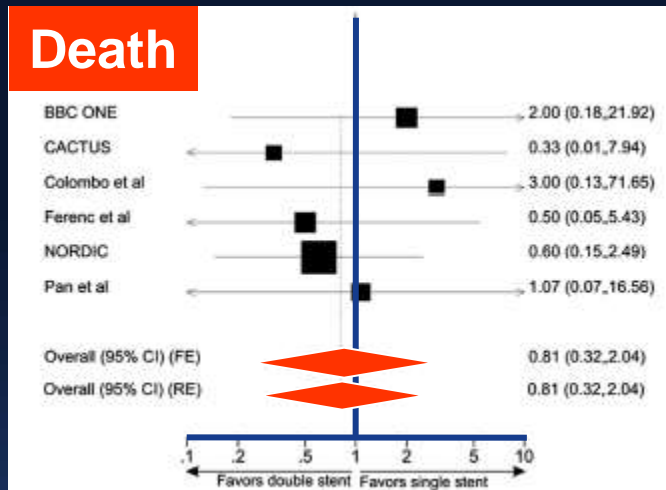
- ✓ Branches of LM bifurcation should be protected during PCIs.
- ✓ But, for non-LM bifurcations, decision is made with consideration of patient condition and clinical importance of SB.

2. 1- stent compared with 2- stent

- More standardized
- Easy to perform
- Less stent
- Less contrast agent
- Less radiation
- Less procedural complication
- Change to provisional SB treatment with simple kissing, T, Culotte, Crush..
- Comparable long-term outcomes to 2-stent

Meta-analysis of 1- vs. 2-stent

9-Month Outcomes



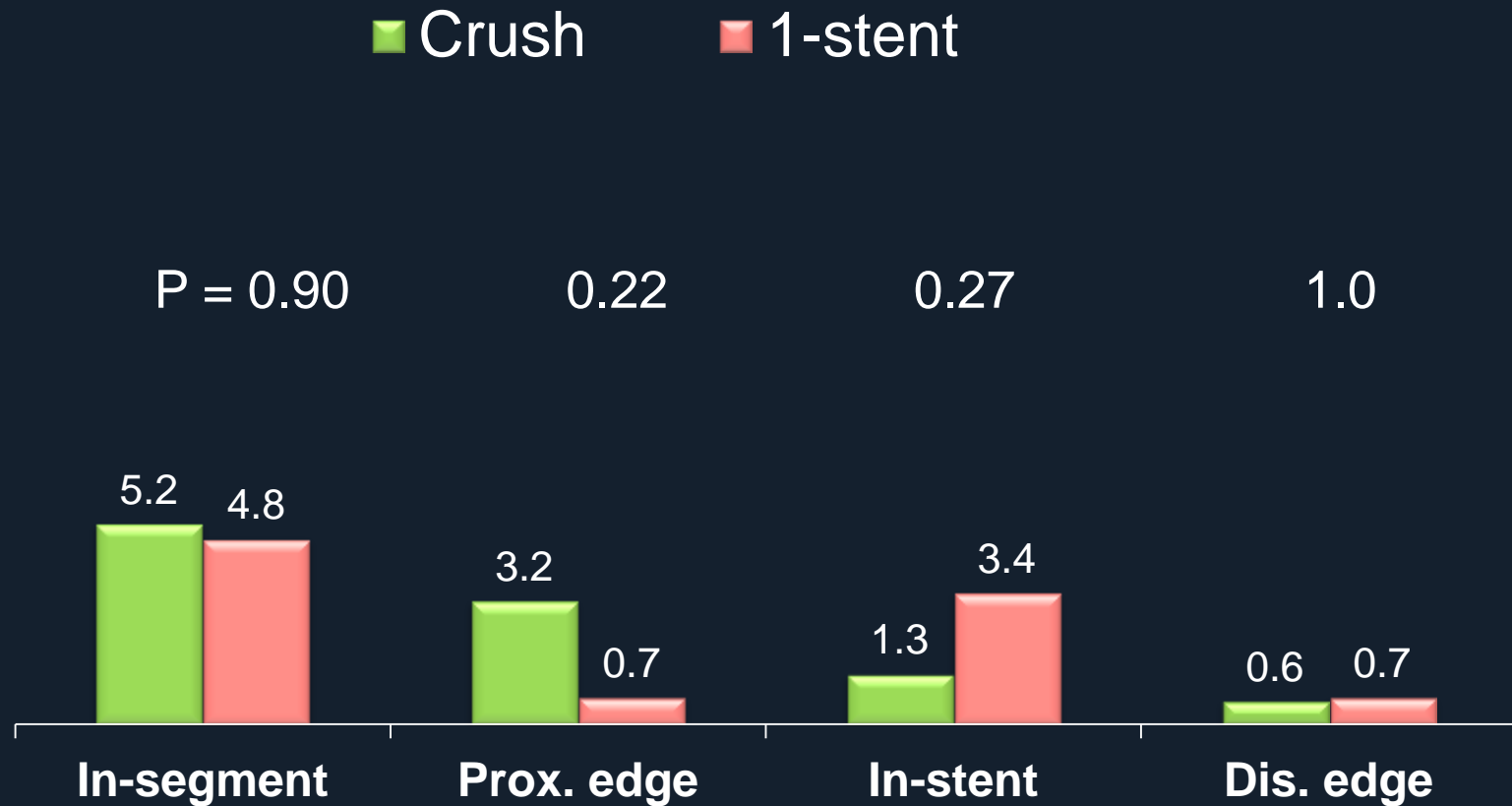
2-stent better

1-stent better

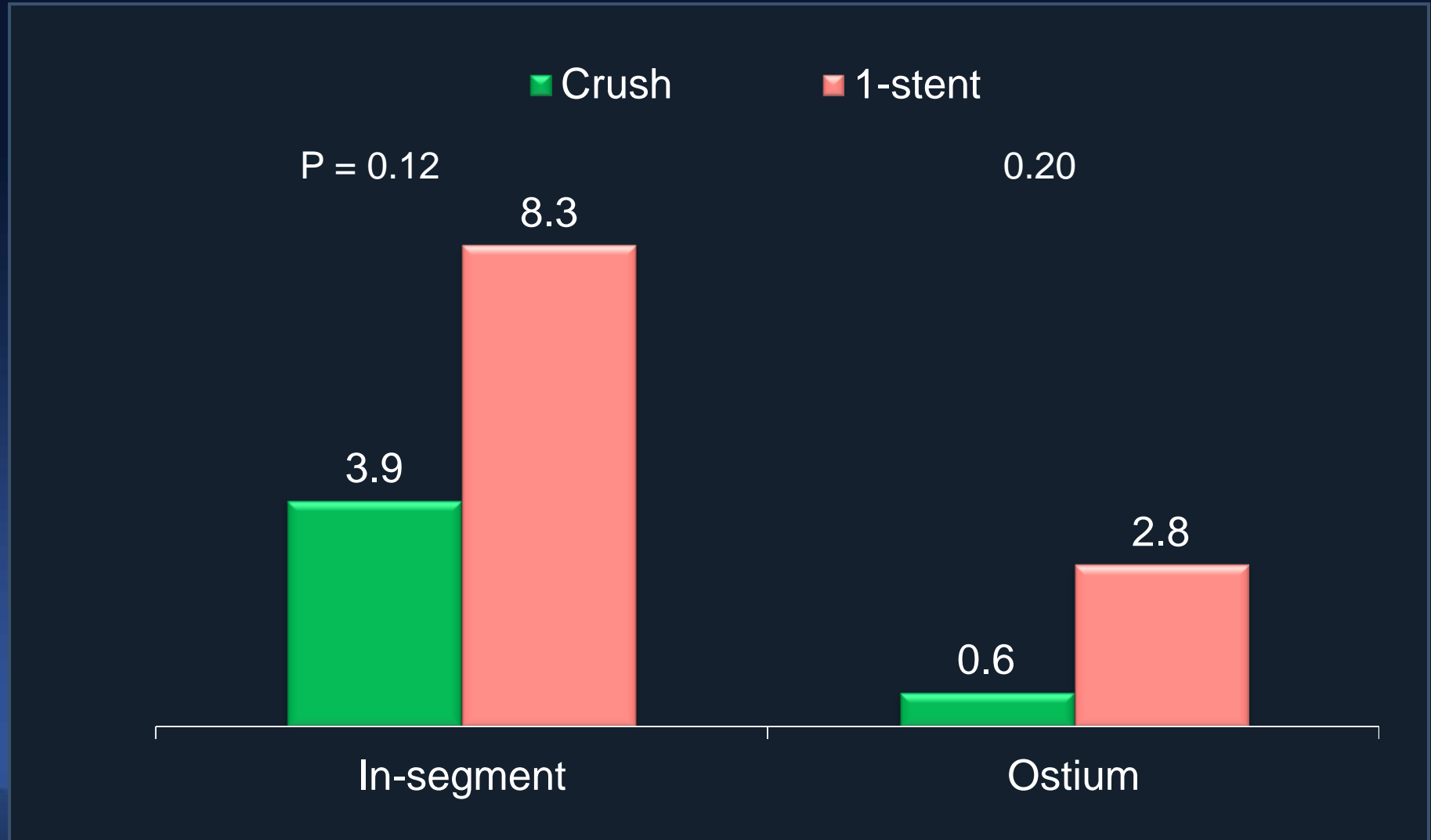
2-stent better

1-stent better

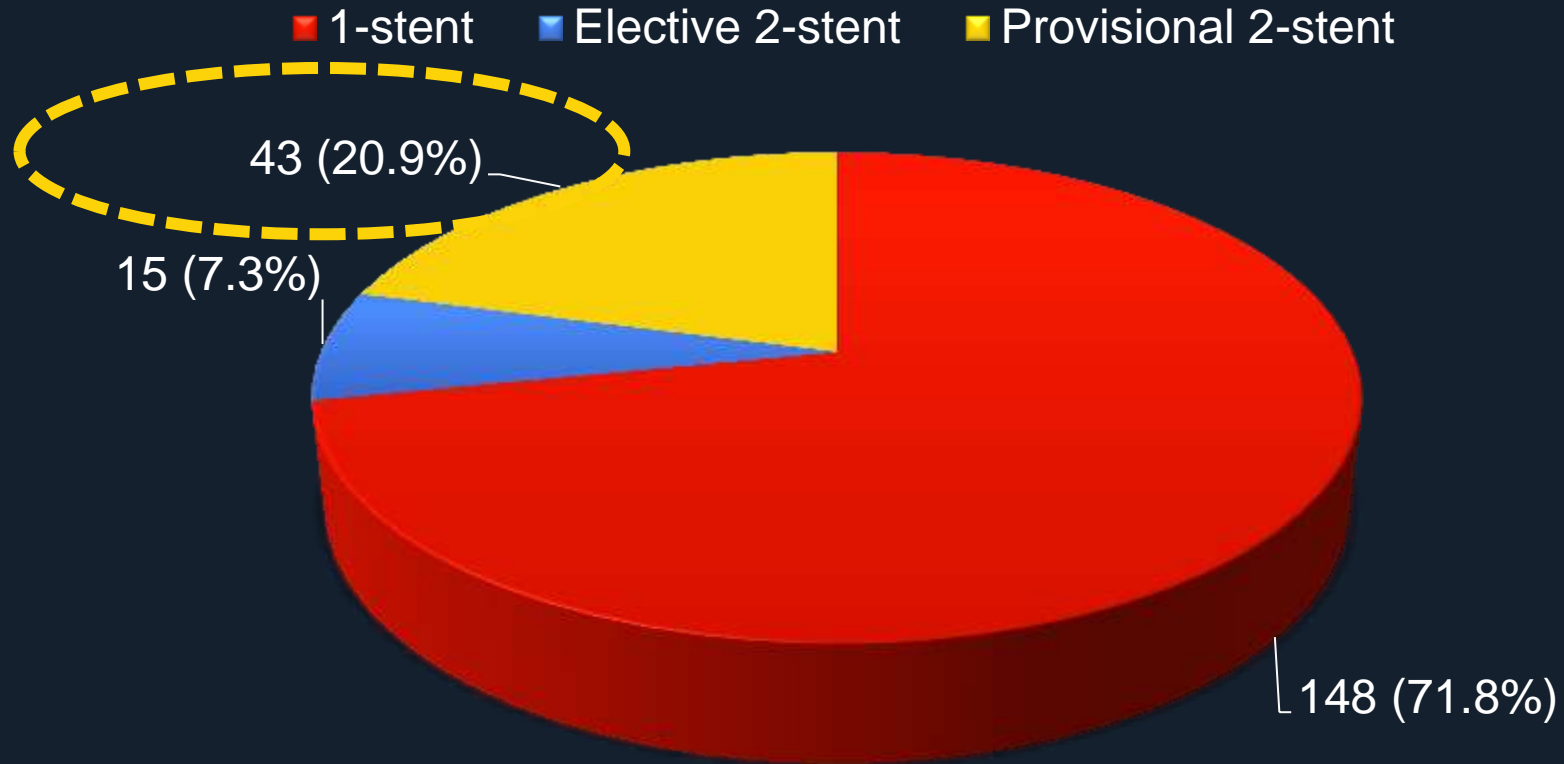
MB Restenosis in PERFECT Study for non-LM true bifurcations



SB Restenosis in PERFECT Study for non-LM true bifurcations



SB treatment in assigned 1-stent group in PERFECT Study for non-LM true bifurcations

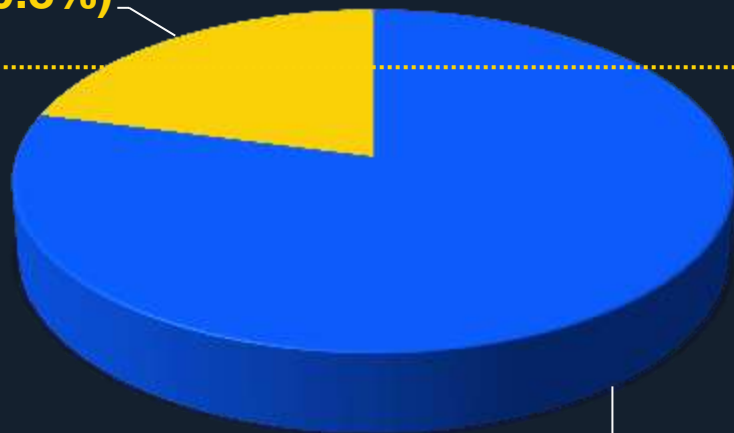


Frequent Use of 2-Stent Technique for LM than non-LM in Korean Registry

Non-LM Bifurcation

■ 1-stent ■ 2-stent

426
(20.8%)

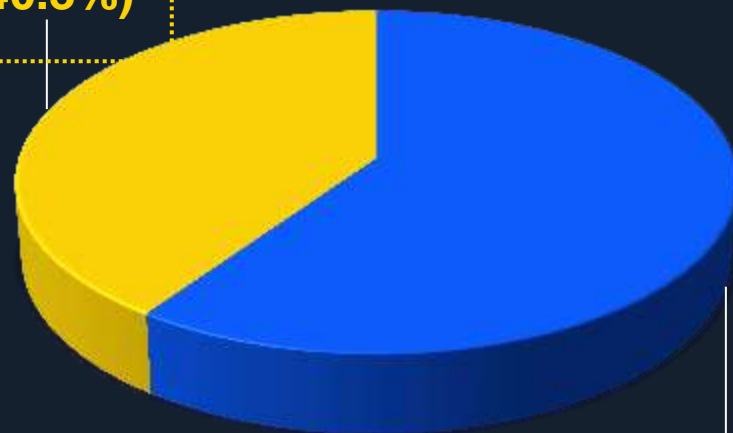


1618
(78.2%)

LM Bifurcation

■ 1-stent ■ 2-stent

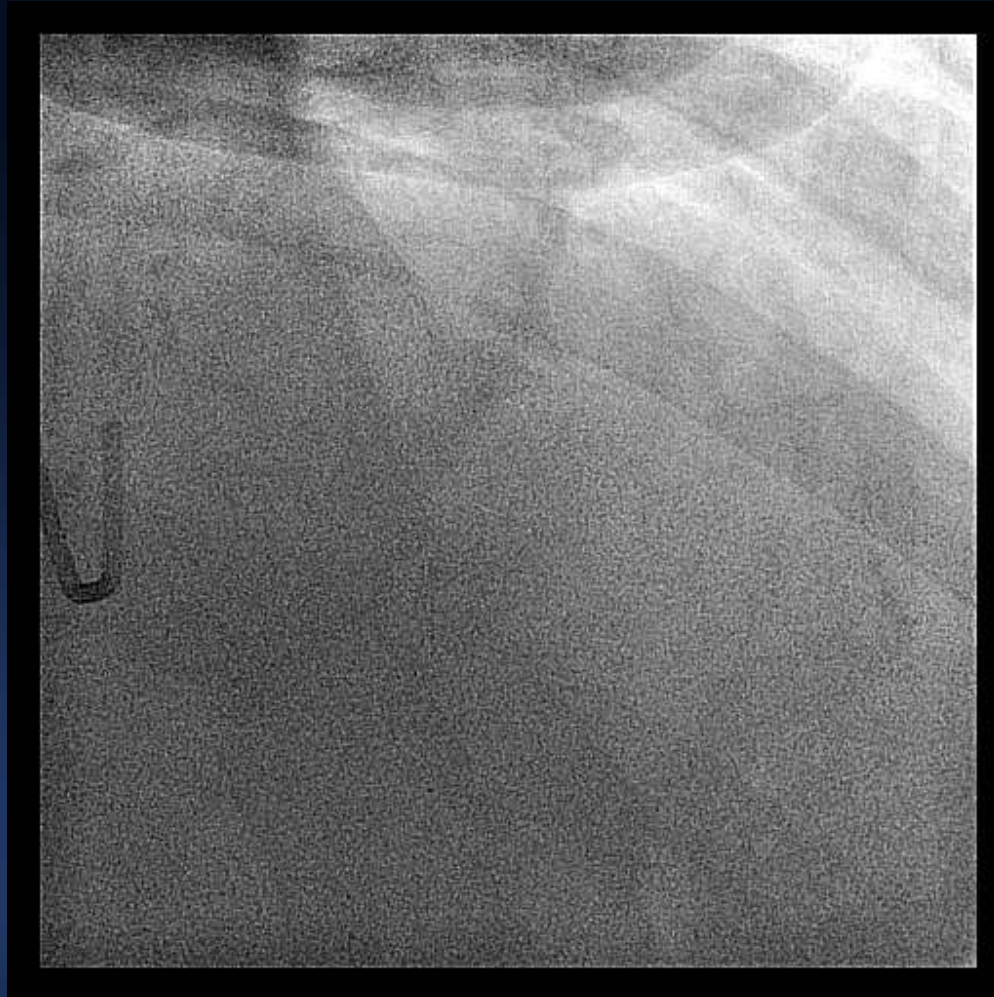
344
(40.3%)



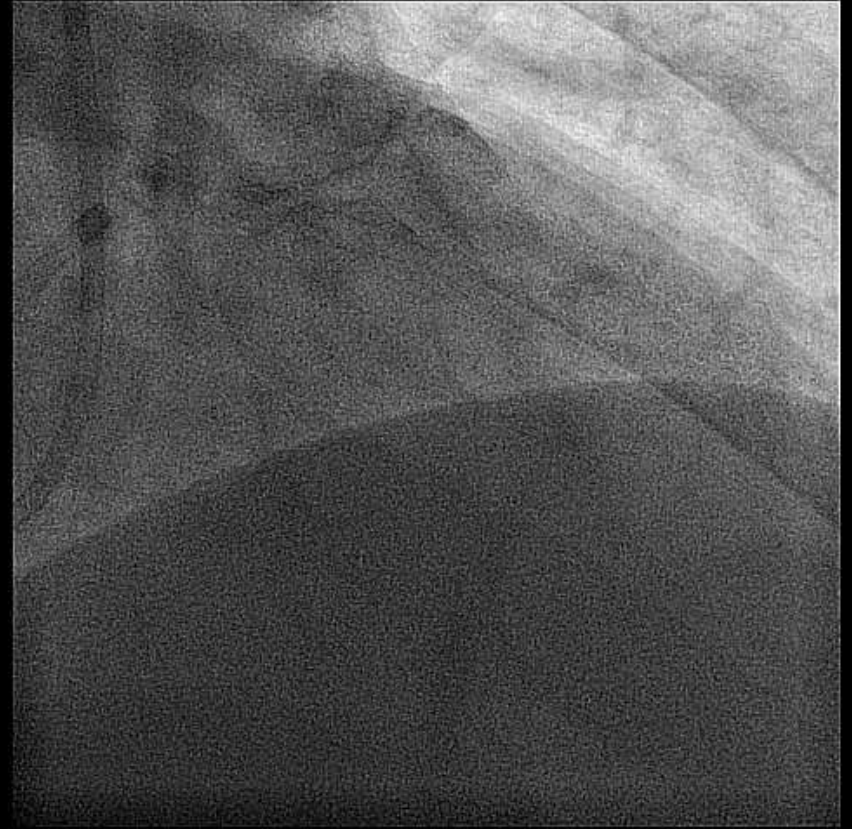
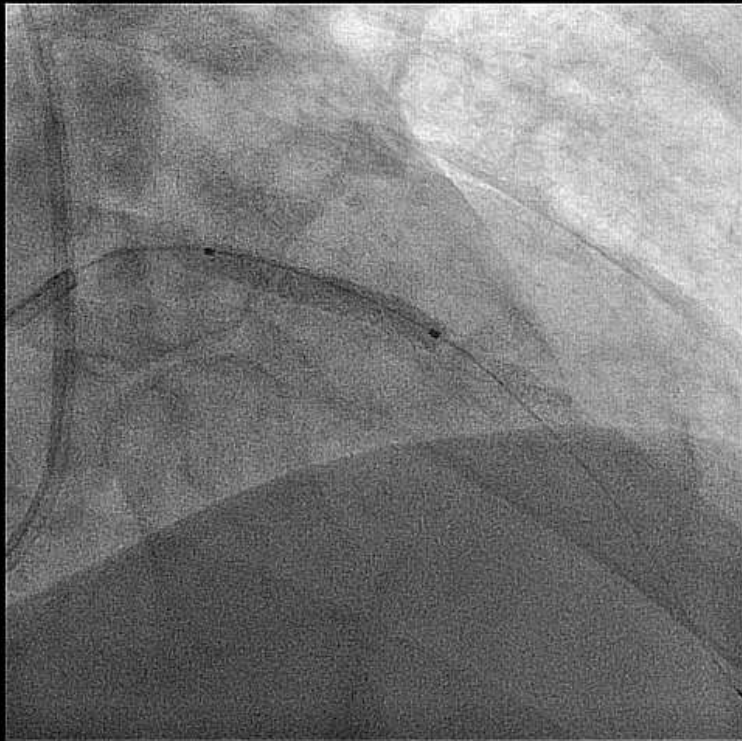
509
(59.7%)

Multiple Non-LM SB Stenosis

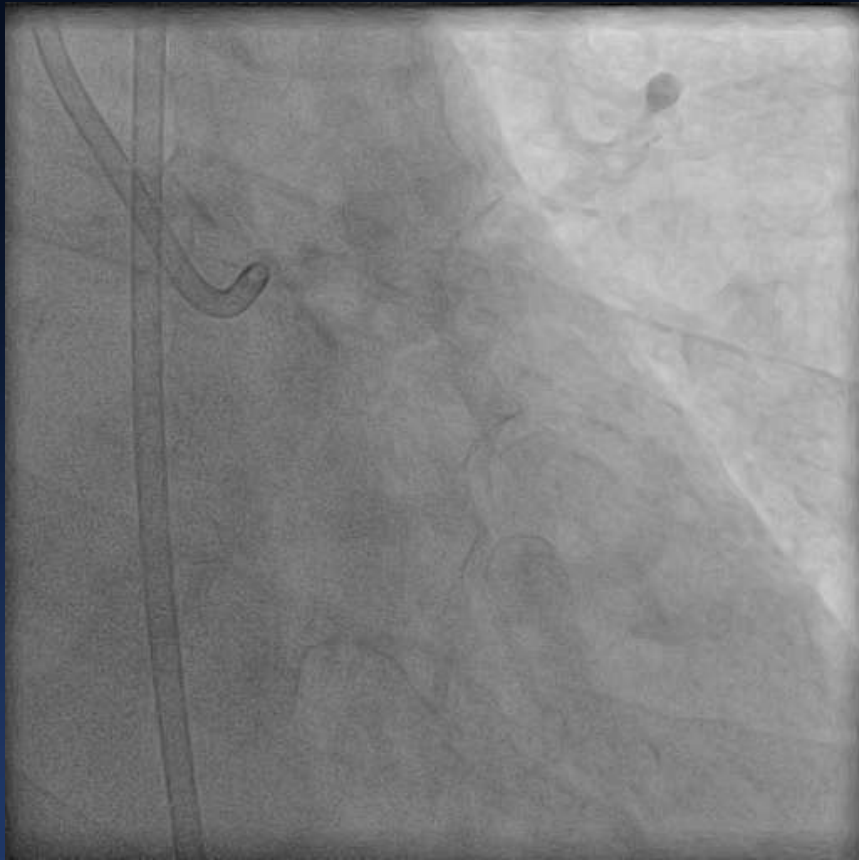
LAD: Rupture, area 2.1 mm², FFR 0.77



Stenting without SB Tx

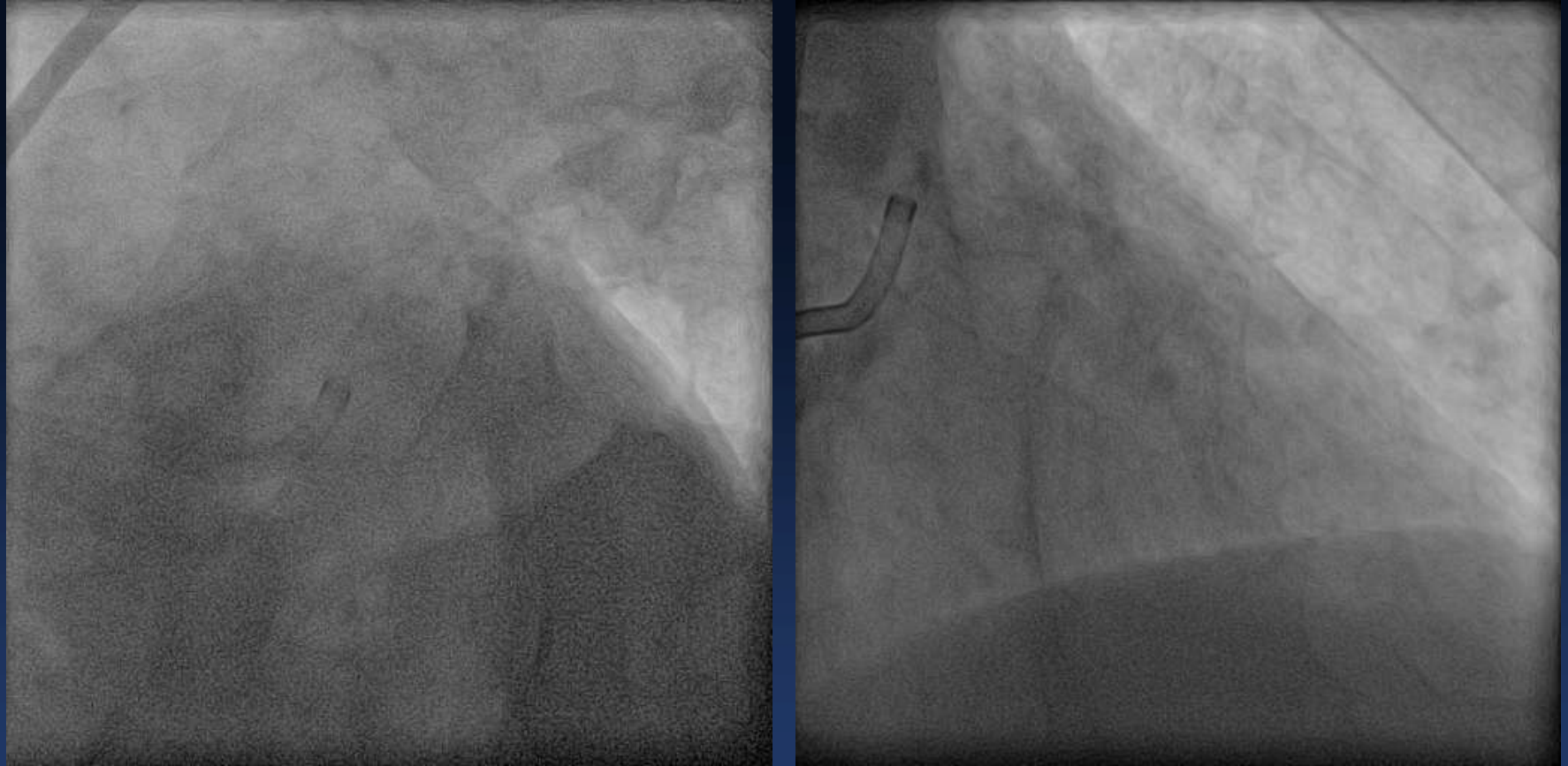


LM Bifurcation Stenosis



LM Bifurcation Stenosis

LCX: > 50%, diffuse, wide angle, big territory



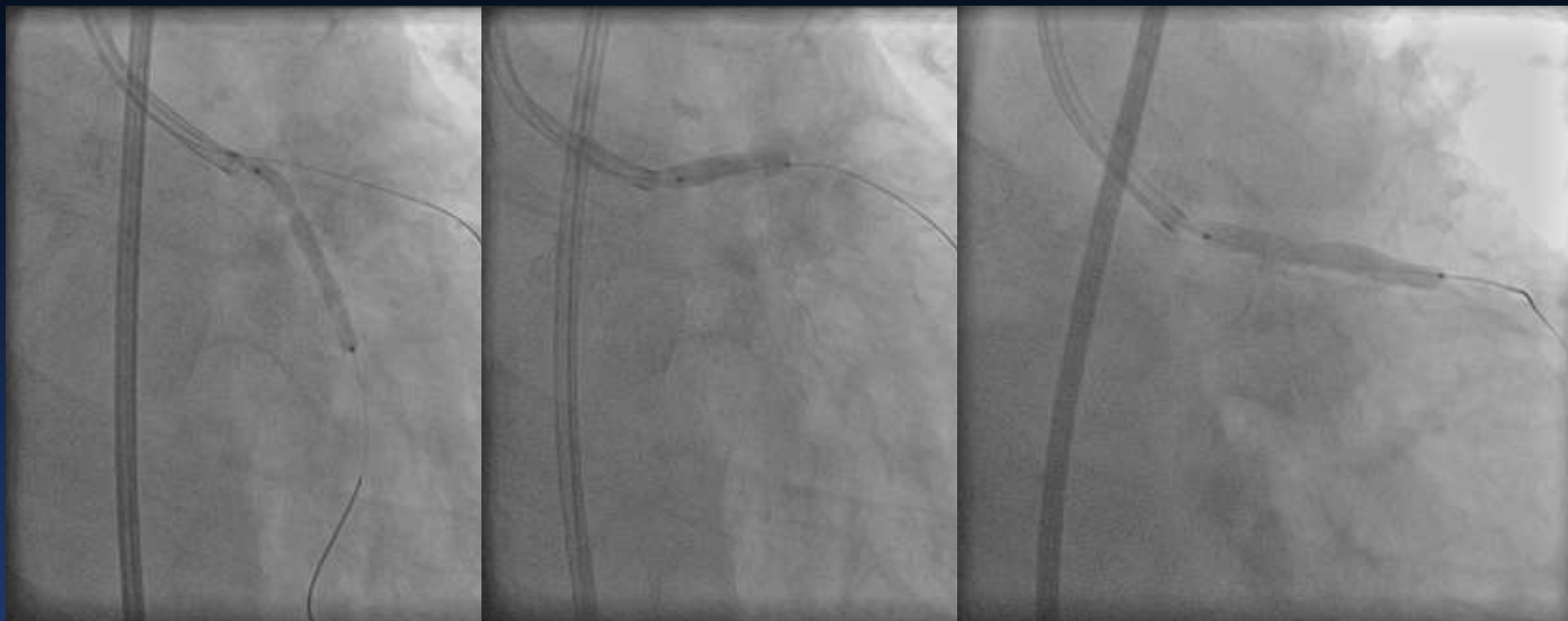
- **Provisional SB stenting seems to be complex**
- **SB stenting first may be better for safety**

SB Stent First using Balloon Crush Delivery of LCX stent with 5-in-7 Catheters

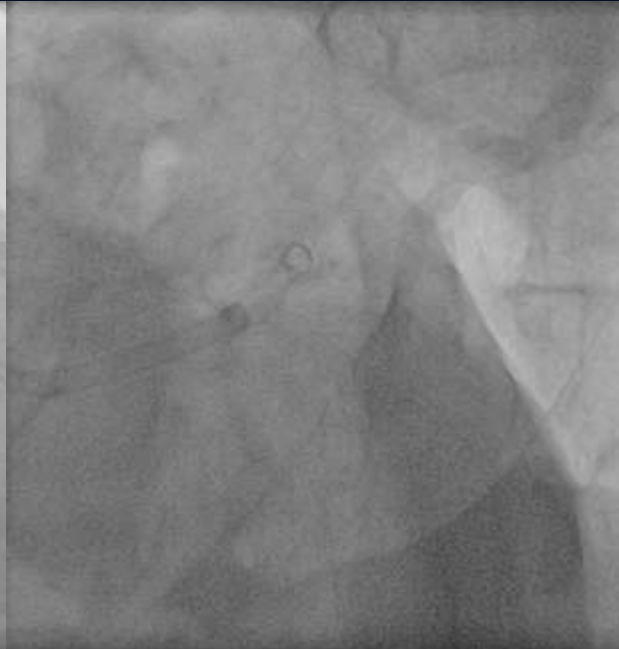
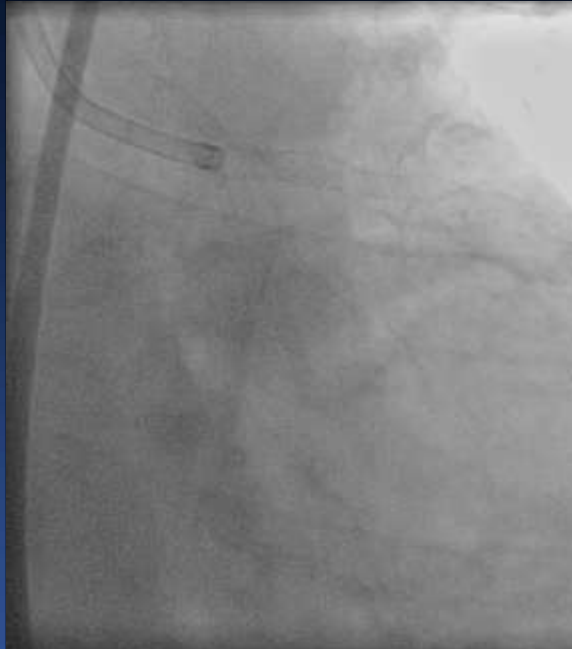
Orsiro stent 2.75 X 26 mm

NC balloon

Orsiro 3.0 X 30 mm



Final Kissing



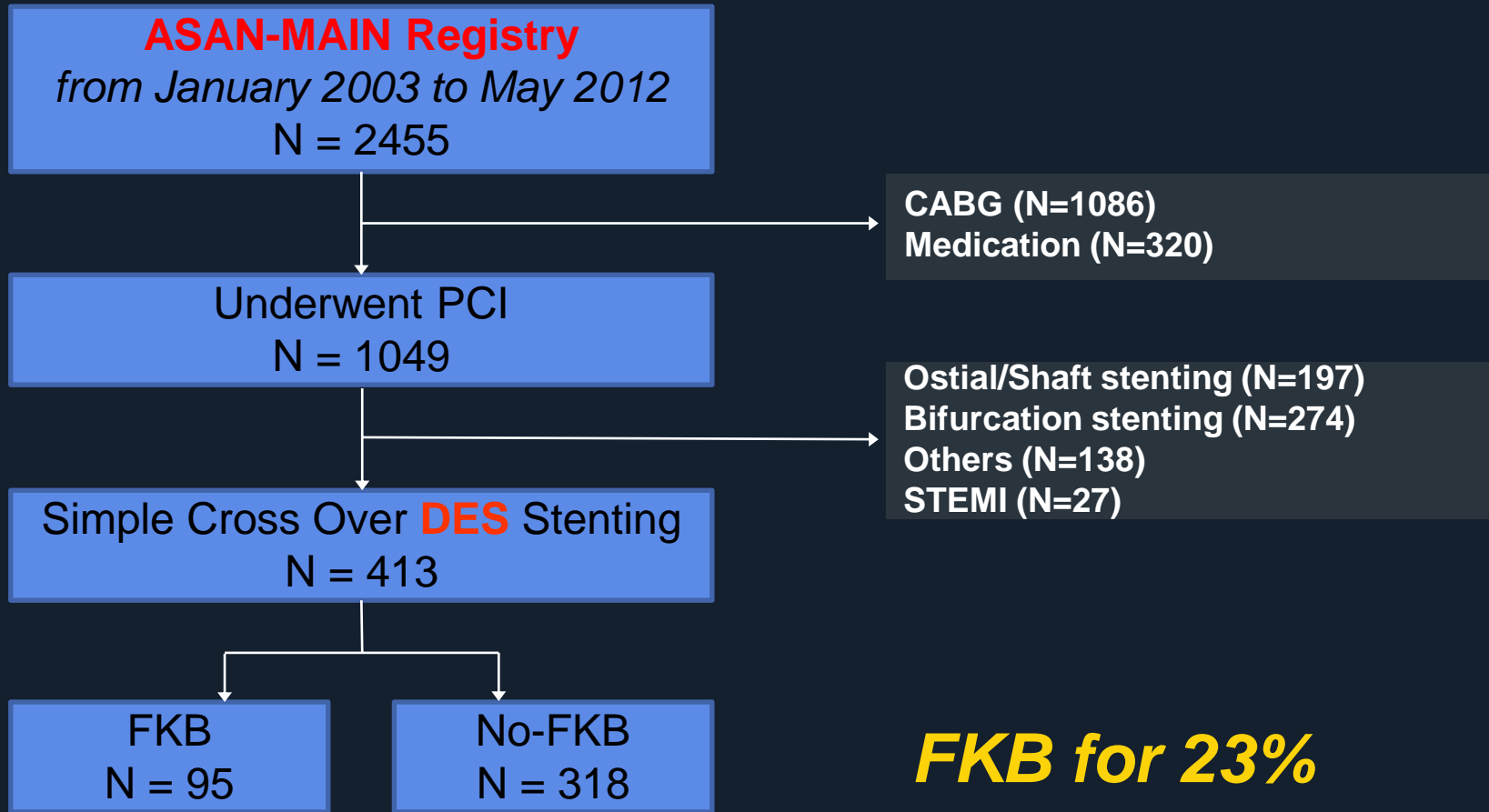
- ✓ Due to big jeopardized area and wide bifurcation angle, double-stent technique is not infrequently required for LM bifurcation disease with diseased LCX.

3. Final Kissing Balloon (FKB)

My indication during 1-stent technique is

- ✓ Significant SB jail
: > 80% for non-LM and > ~50 for LM
- ✓ TIMI flow \leq grade 2
- ✓ Dissection \geq NHLBI class C
- ✓ Low FFR < 0.80

For 413 LM Bifurcations in ASAN-MAIN Treated by Stent Crossover

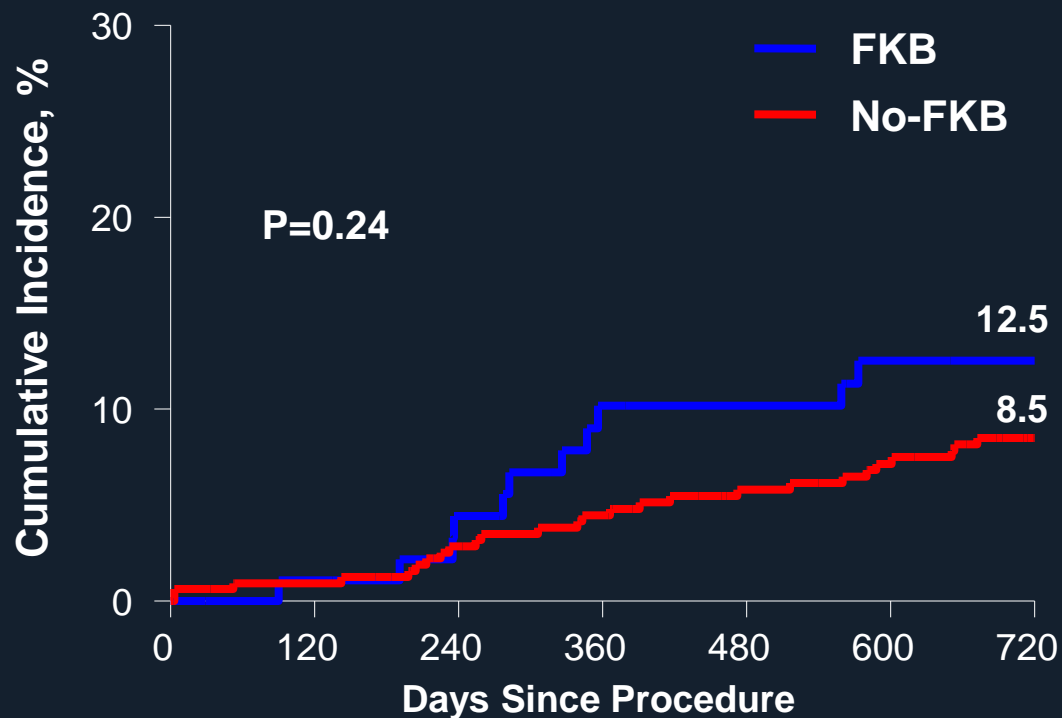


Lesion Characteristics

	FKB (N=95)	Non-FKB (N=318)	P value
Disease extent			0.68
LM only	4 (4%)	19 (6%)	
LM plus 1VD	30 (32%)	114 (36%)	
LM plus 2VD	32 (34%)	104 (33%)	
LM plus 3VD	29 (31%)	81 (26%)	
LCX osital DS ≥ 50%			
Before Cross-over stenting	29 (31%)	32 (10%)	<0.001
After Cross-over stenting	72 (76%)	74 (23%)	<0.001
TIMI <3 flow of LCX			
Before Cross-over stenting	0	0	>0.99
After Cross-over stenting	0	1 (0.2)*	>0.99
Intravascular ultrasound	93 (98%)	312 (98%)	>0.99
LM total stent number	1.59 ± 0.82	1.79 ± 0.82	0.36

*TIMI 2 in only 1 patient after simple cross over stenting

2-Y Death, MI and LM-TLR



No. at Risk

FKB

95

79

74

No-FKB

318

293

265

Adjusted Hazard Ratio for Clinical Outcomes at 2 years

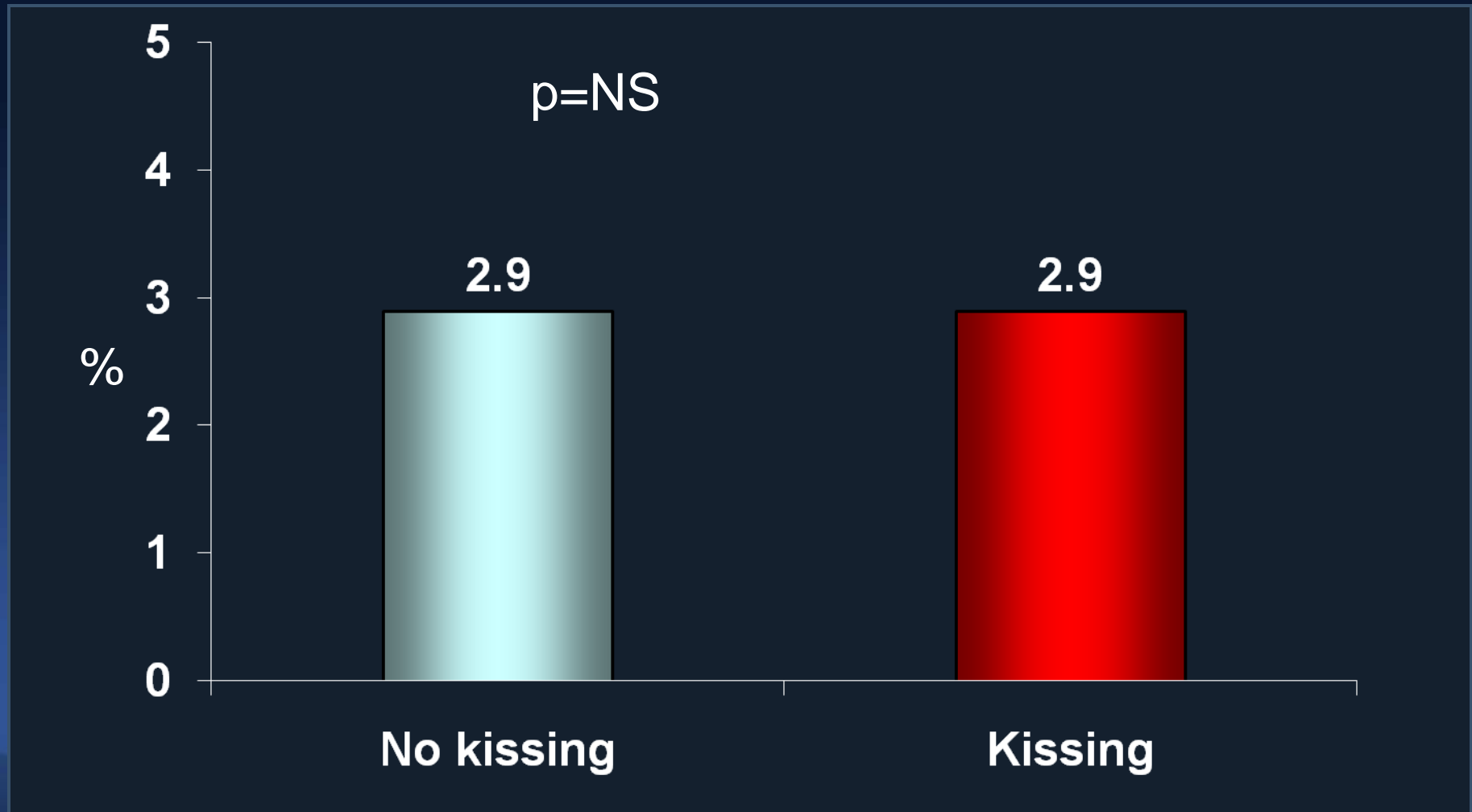
	FKB (N=95)	Non-FKB (N=318)	Adjusted HR (95% CI)[†]	P value
Death	4 (4.6%)*	12 (3.9%)	1.03 (0.28-3.82)	0.97
MI	0	2 (0.7%)	-	0.96
Death or MI	4 (4.6%)	13 (4.2%)	0.95 (0.26-3.51)	0.96
Any RR	9 (10.5%)	20 (6.7%)	0.99 (0.41-2.38)	0.98
TVR	7 (8.1%)	14 (4.8%)	1.12 (0.40-3.11)	0.83
LM-TLR	7 (8.1%)	13 (4.4%)	1.32 (0.46-3.75)	0.60
Definite ST	0	0	-	-
MACE‡	11(12.5%)	26(8.5%)	1.10 (0.49-2.49)	0.82

* Derived from Kaplan-Meier estimate

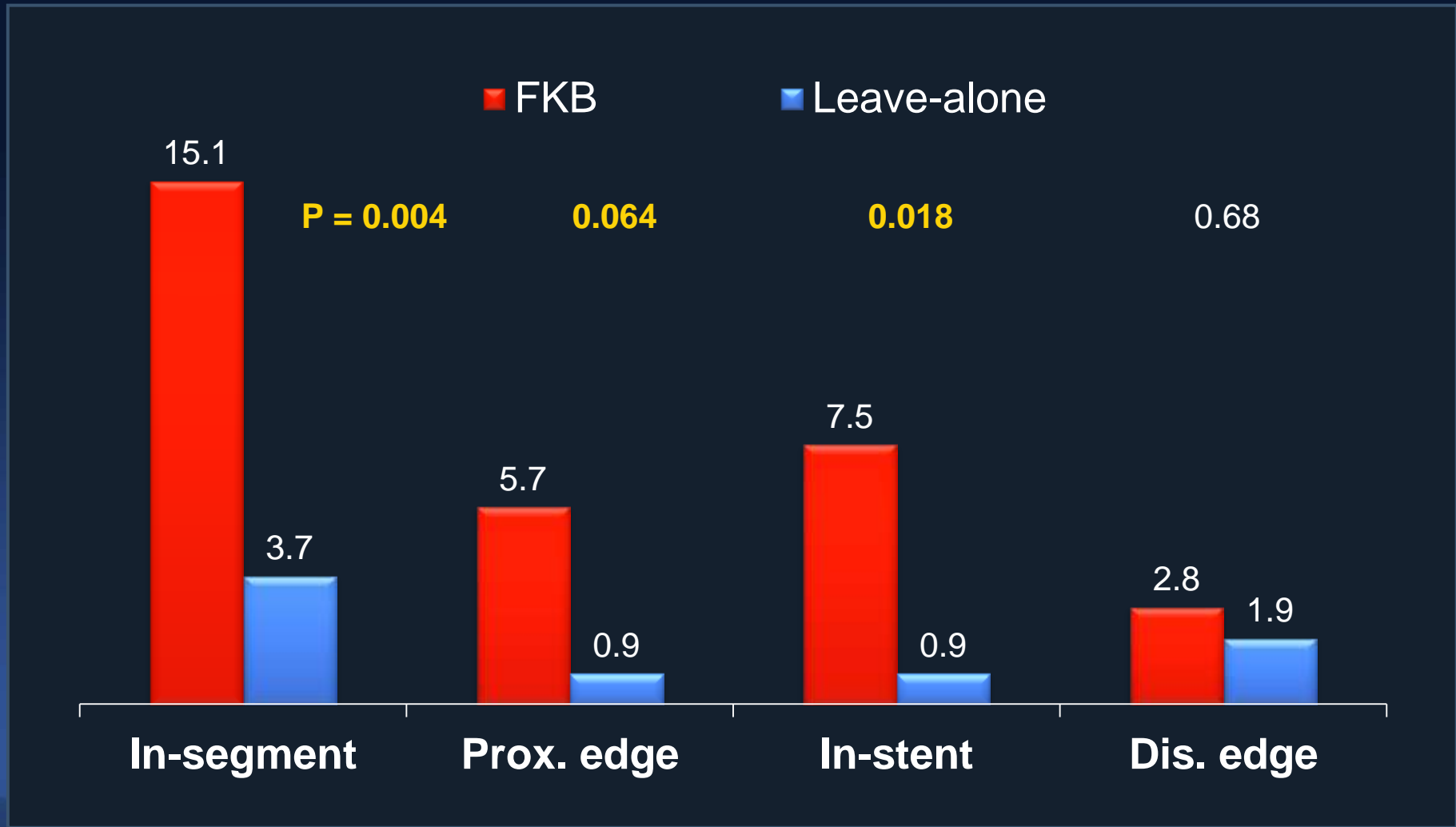
† Adjusted for age, DM, clinical presentation, stent number, preprocedural LCX DS, post-stenting LCX DS

‡ MACE defined as the composite of death, MI, or LM TLR

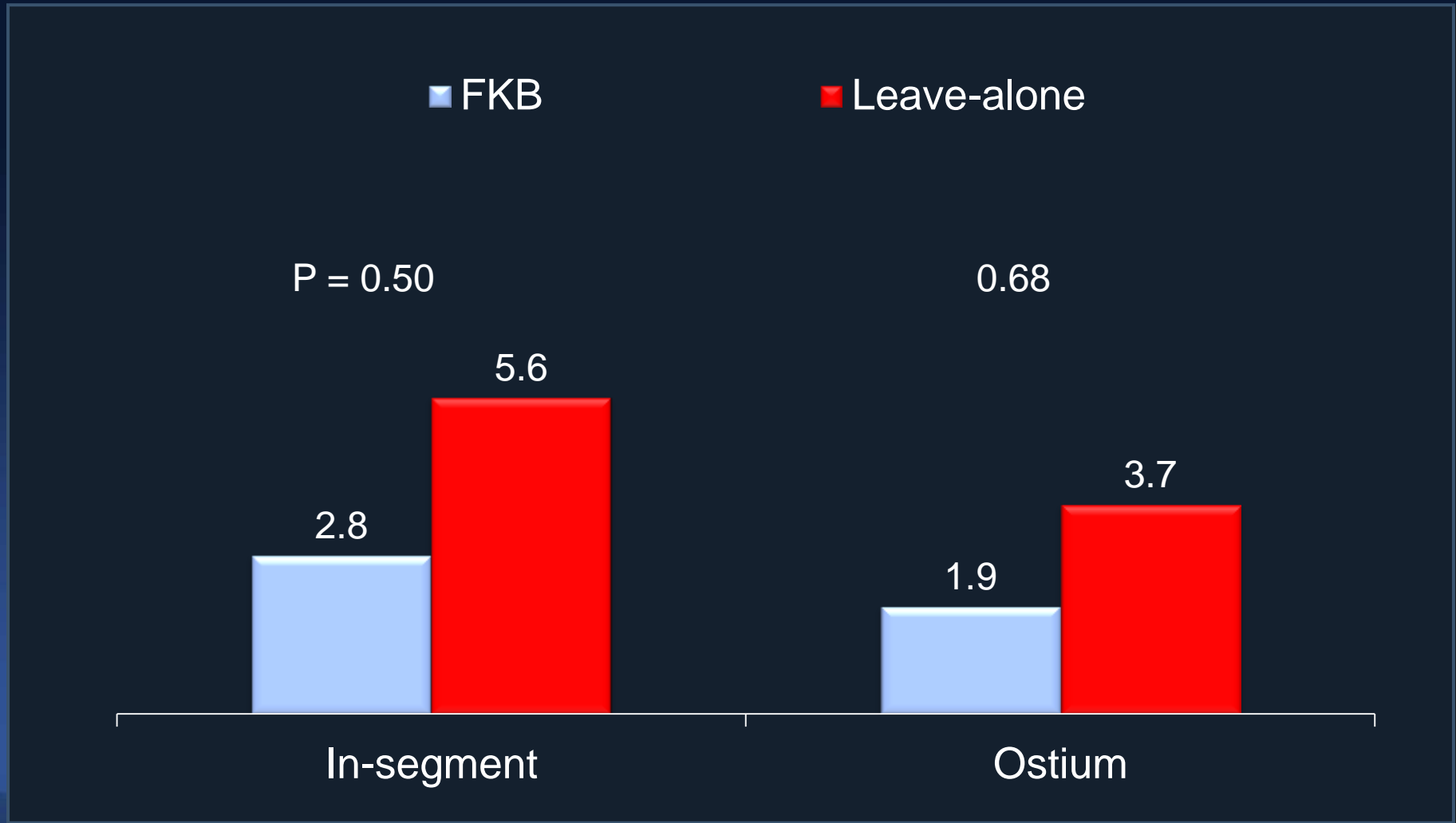
NORDIC 3 for 477 Bifurcation (92% non-LM) 6-Mo death, MI, TLR, or ST



MB Restenosis in CROSS Study for non-LM and not-diseased SB

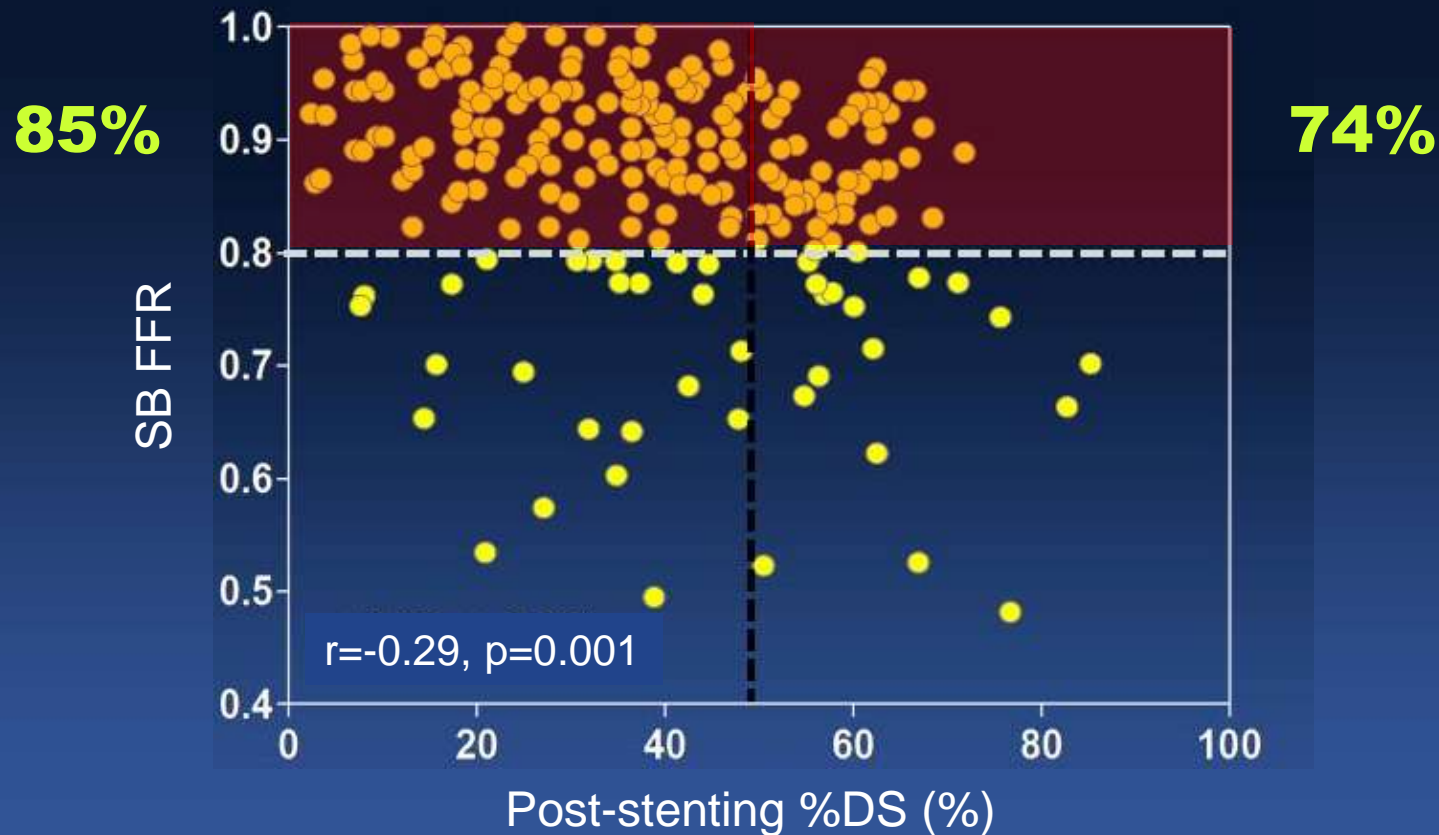


SB Restenosis in CROSS Study for non-LM and not-diseased SB



Kim YH, Park SJ et al. J Am Coll Cardiol Intv 2015;8:550

Post-PCI SB %DS vs. SB FFR in SB (6% LM) with TIMI 3 Flow



Angiography is not infrequently lying in both LM and non-LM bifurcation PCI

	Baseline	Hyperemia
SB FFR	0.93	0.88



PCI for LM vs. Non-LM Bifurcation

- ✓ SB (often LCX) should be protected to maintain hemodynamic stability
- ✓ Double-stent technique is more frequently adopted
- ✓ FKB is also more frequently performed
- ✓ However, the concept of bifurcation stenting regarding evaluation of lesions and selection of stenting strategy is basically similar between LM and non-LM PCI.