Differential Prognostic Impact of Treatment Strategies for LM versus Non-LM Bifurcation Lesion: Lessons from the COBIS Registries

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Coronary Bifurcation Stent (COBIS) Registries

- **Multi-center retrospective real-world registry of drug-eluting stenting in coronary bifurcation lesions in Korea**

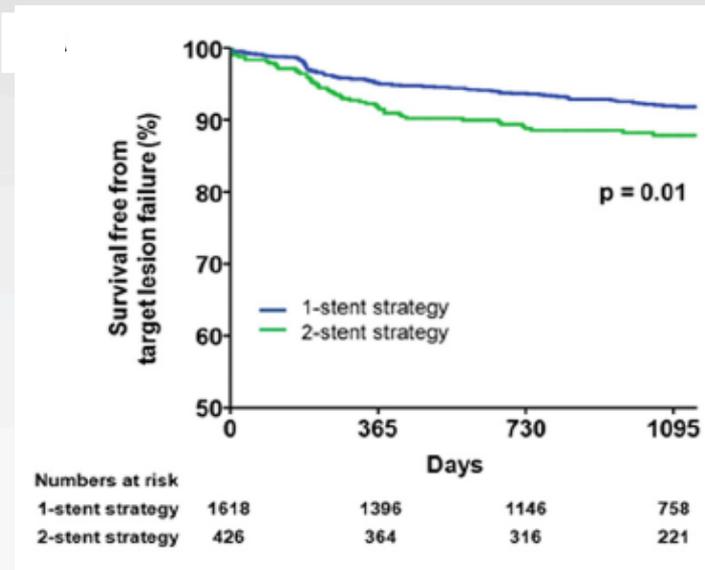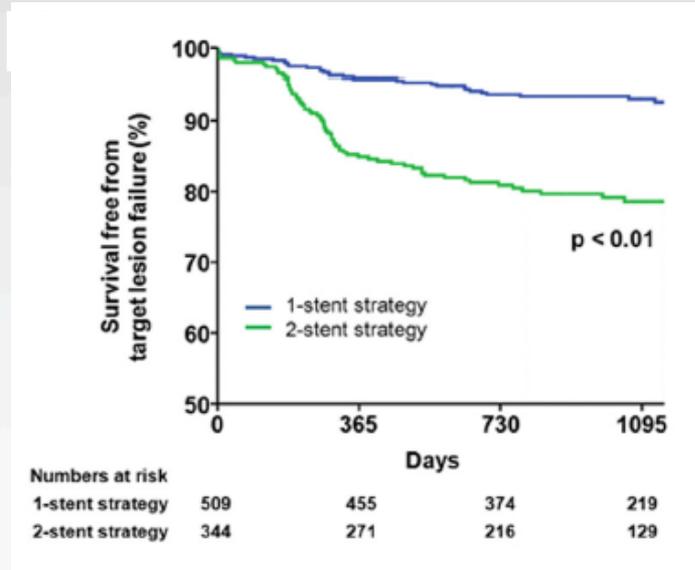|	COBIS I	COBIS II	COBIS III
Enrolled Patients	1691	2897	2648
Term	2004.1~2006.6	2003.1 ~ 2009.12	2010.1 ~ 2014.12
Main vessel Diameter (mm)	≥ 2.5	≥ 2.5	≥ 2.5
Side branch Diameter (mm)	≥ 2.0	≥ 2.3	≥ 2.3
LM Bifurcation	X	O	O
DES generation	1st	1st + 2nd (14%)	2nd only
Publications	12	19	-

Stent Technique (1-Stent vs. 2-Stent)
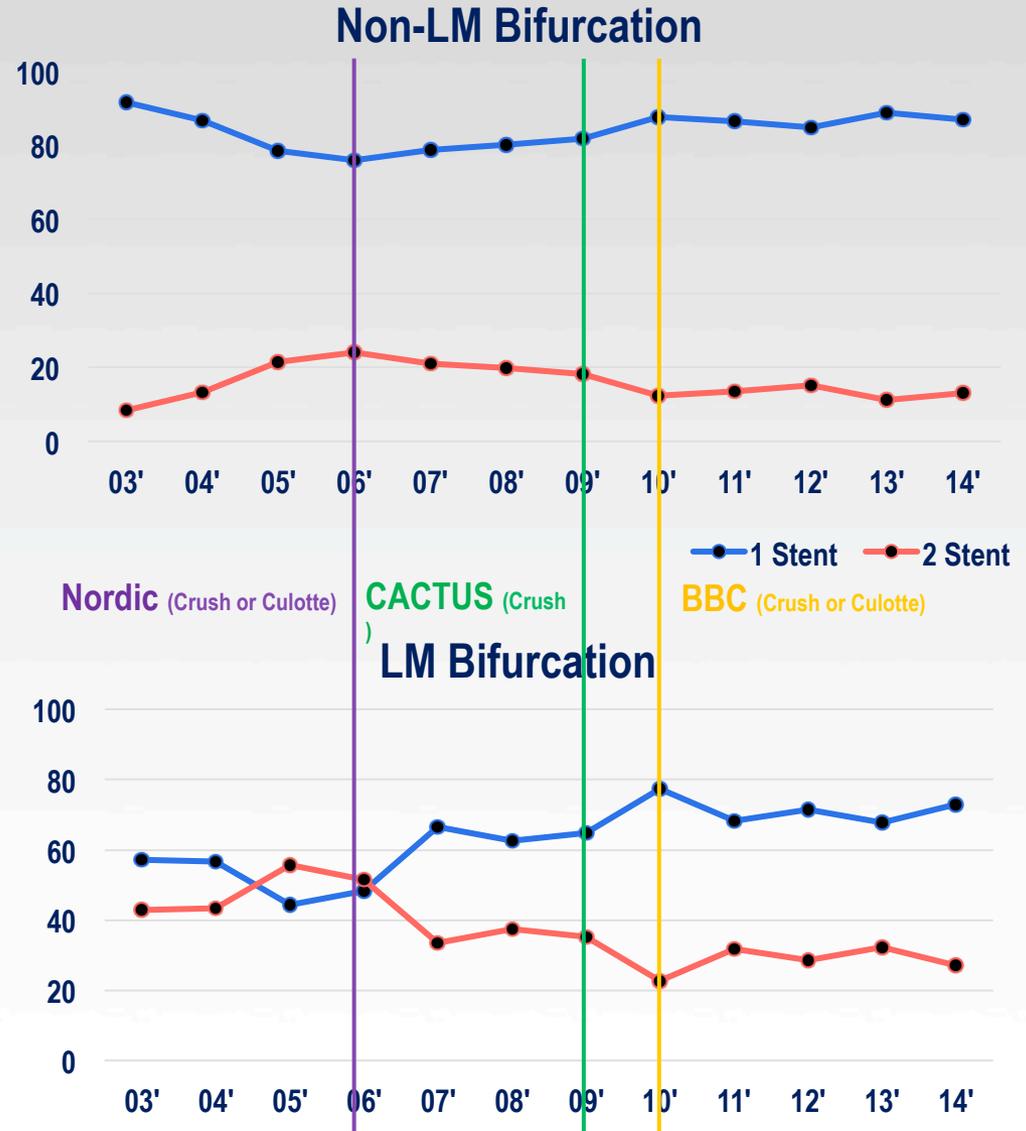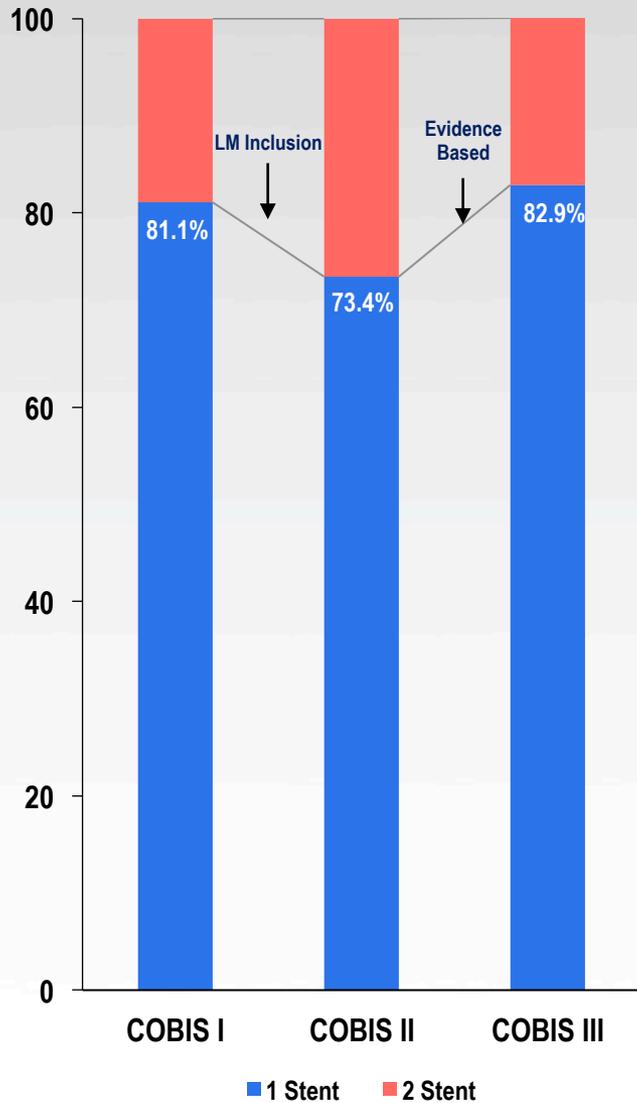
Stent Technique (1-Stent VS. 2-Stent)

LM vs. Non LM Bifurcation Lesions from COBIS II Registry
- Target Lesion Failure -

Non-LM

LM

	Non-LM Bifurcation (n = 2,044)		LM Bifurcation (n = 853)		
	HR (95% CI)	p Value	HR (95% CI)	p Value	Interaction p Value
Target lesion failure	1.39 (0.99–1.94)	0.06	2.38 (1.60–3.55)	<0.01	<0.01

Song YB et al, JACC: CVI 2014

Stent Technique (1-Stent vs. 2-Stent)

LM vs. Non LM Bifurcation Lesions from COBIS II Registry
- Cardiac Death or MI -

Non-LM
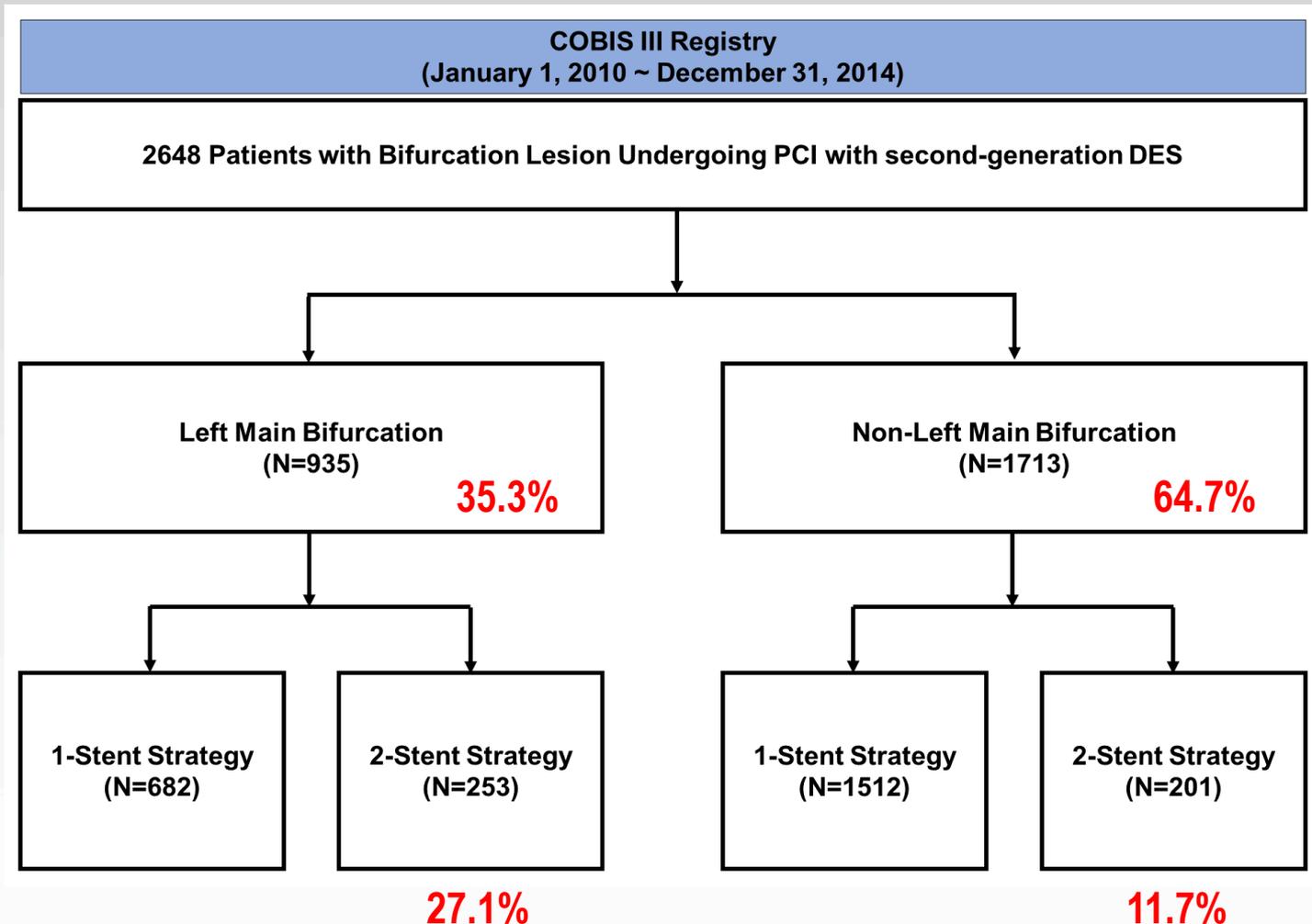
LM

	Non-LM Bifurcation (n = 2,044)		LM Bifurcation (n = 853)		
	HR (95% CI)	p Value	HR (95% CI)	p Value	Interaction p Value
Cardiac death or myocardial infarction	1.12 (0.58–2.19)	0.73	2.09 (1.08–4.04)	0.03	0.06
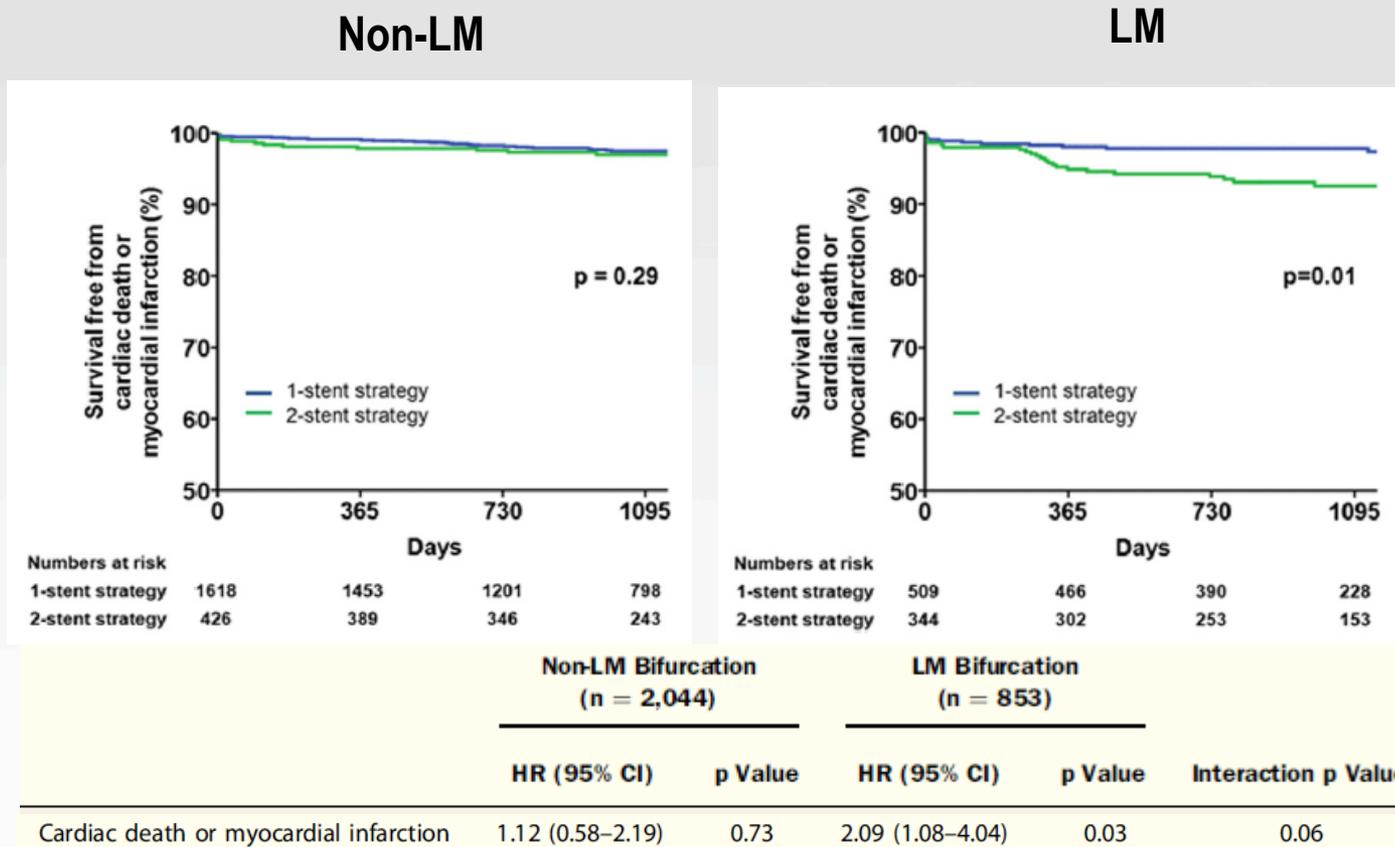
The 1-stent strategy, if possible, should initially be considered the preferred approach for the treatment of coronary bifurcation lesions, especially LM bifurcation lesions.

Song YB et al, JACC: CVI 2014

Study Flow

COBIS III Registry
(January 1, 2010 ~ December 31, 2014)

2648 Patients with Bifurcation Lesion Undergoing PCI with second-generation DES

Left Main Bifurcation
(N=935)   **35.3%**

Non-Left Main Bifurcation
(N=1713)   **64.7%**

1-Stent Strategy
(N=682)

2-Stent Strategy
(N=253)

1-Stent Strategy
(N=1512)

2-Stent Strategy
(N=201)

27.1%   **11.7%**

| Primary Endpoint	Target Lesion Failure, a composite of cardiac death, myocardial infarction, and target lesion revascularization

Choi KH, Song YB, … Gwon HC et al, Under Review

Baseline Clinical Characteristics

Variables	Left Main Bifurcation (N=935)			Non-Left Main Bifurcation (N=1713)		
	1-Stent (N=682)	2-Stent (N=253)	P value	1-Stent (N=1512)	2-Stent (N=201)	P value
Demographics						
Age (years)	**65.0 ± 10.4**	**66.8 ± 11.3**	**0.022**	62.8 ± 11.2	62.8 ± 10.4	0.943
Male sex	524 (76.8%)	187 (73.9%)	0.399	1158 (76.6%)	144 (71.6%)	0.146
Cardiovascular risk factors						
Hypertension	419 (61.4%)	138 (54.5%)	0.067	831 (55.0%)	116 (57.7%)	0.508
Diabetes mellitus	262 (38.4%)	94 (37.2%)	0.782	**467 (30.9%)**	**82 (40.8%)**	**0.006**
Chronic kidney disease	38 (5.6%)	9 (3.6%)	0.278	45 (3.0%)	11 (5.5%)	0.097
Hyperlipidemia	**280 (41.1%)**	**81 (32.0%)**	**0.014**	**555 (36.7%)**	**93 (46.3%)**	**0.011**
Current smoking	172 (25.2%)	54 (21.3%)	0.253	507 (33.5%)	65 (32.3%)	0.797
Previous PCI	114 (16.7%)	45 (17.8%)	0.772	143 (9.5%)	21 (10.4%)	0.748
Previous myocardial infarction	35 (5.1%)	13 (5.1%)	>0.999	57 (3.8%)	8 (4.0%)	>0.999
Previous CVA	57 (8.4%)	19 (7.5%)	0.774	93 (6.2%)	8 (4.0%)	0.285
Initial presentation						
Clinical presentation			0.626			0.179
Stable ischemic heart disease	277 (40.6%)	100 (39.5%)		573 (37.9%)	79 (39.3%)	
Unstable angina or NSTEMI	351 (51.5%)	137 (54.2%)		733 (48.5%)	104 (51.7%)	
STEMI	54 (7.9%)	16 (6.3%)		206 (13.6%)	18 (9.0%)	
LVEF (%)	58.5 ± 10.2	57.6 ± 10.3	0.241	58.7 ± 9.7	59.5 ± 8.8	0.347
Medications at discharge						
Aspirin	667 (98.1%)	244 (96.8%)	0.365	1493 (98.7%)	198 (98.5%)	>0.999
P2Y12 inhibitors	672 (98.8%)	244 (96.8%)	0.072	1494 (98.8%)	198 (98.5%)	0.980
Beta-blocker	420 (61.6%)	173 (68.4%)	0.066	900 (59.5%)	127 (63.2%)	0.358
ACE inhibitor or ARB	407 (59.7%)	149 (58.9%)	0.887	940 (62.2%)	127 (63.2%)	0.840
Statin	600 (88.0%)	225 (88.9%)	0.773	1363 (90.1%)	181 (90.0%)	>0.999

Baseline Lesion Characteristics

| Variables	Left Main Bifurcation (N=935)			Non-Left Main Bifurcation (N=1713)		
	1-Stent (N=682)	2-Stent (N=253)	P value	1-Stent (N=1512)	2-Stent (N=201)	P value
Lesion characteristics						
Multi-vessel disease	532 (78.0%)	242 (95.7%)	<0.001	770 (50.9%)	103 (51.2%)	0.992
Bifurcation location						**<0.001**
LAD/diagonal				**1037 (68.6%)**	**171 (85.1%)**	
LCX/OM				326 (21.6%)	24 (11.9%)	
RCA (PL/PDA)				149 (9.9%)	6 (3.0%)	
Medina classification			<0.001			<0.001
1.1.1	93 (13.6%)	128 (50.6%)		514 (34.0%)	104 (51.7%)	
1.0.1	19 (2.8%)	19 (7.5%)		116 (7.7%)	14 (7.0%)	
0.1.1	29 (4.3%)	44 (17.4%)		126 (8.3%)	49 (24.4%)	
1.0.0	77 (11.3%)	7 (2.8%)		212 (14.0%)	0 (0%)	
1.1.0	164 (24.0%)	15 (5.9%)		241 (15.9%)	7 (3.5%)	
0.1.0	275 (40.3%)	9 (3.6%)		283 (18.7%)	8 (4.0%)	
0.0.1	25 (3.7%)	31 (12.3%)		20 (1.3%)	19 (9.5%)	
True bifurcation	**141 (20.7%)**	**191 (75.5%)**	**<0.001**	**756 (50.0%)**	**167 (83.1%)**	**<0.001**
Procedural characteristics						
No. of used stent	**1.7 ± 0.9**	**2.6 ± 1.0**	**<0.001**	**1.6 ± 0.9**	**2.3 ± 1.1**	**<0.001**
Stent type			0.161			0.011
Everolimus-eluting stents	367 (53.8%)	131 (51.8%)		668 (44.2%)	110 (54.7%)	
Zotarolimus-eluting stents	164 (24.0%)	69 (27.3%)		446 (29.5%)	57 (28.4%)	
Biolimus-eluting stents	132 (19.4%)	40 (15.8%)		317 (21.0%)	25 (12.4%)	
Mixed or other stents	19 (2.8%)	13 (5.1%)		81 (5.4%)	9 (4.5%)	
Trans-radial intervention	**366 (53.7%)**	**106 (41.9%)**	**0.002**	**963 (63.7%)**	**72 (35.8%)**	**<0.001**
IVUS guidance	427 (62.6%)	172 (68.0%)	0.148	**389 (25.7%)**	**75 (37.3%)**	**0.001**
Final kissing ballooning	**163 (23.9%)**	**233 (92.1%)**	**<0.001**	**228 (15.1%)**	**165 (82.1%)**	**<0.001**
POT	**237 (34.8%)**	**56 (22.1%)**	**<0.001**	394 (26.1%)	52 (25.9%)	>0.999
Re-POT	**25 (3.7%)**	**48 (19.0%)**	**<0.001**	**23 (1.5%)**	**27 (13.4%)**	**<0.001**
NC balloon use	**162 (23.8%)**	**87 (34.4%)**	**0.001**	**228 (15.1%)**	**57 (28.4%)**	**<0.001**

Procedural Characteristics
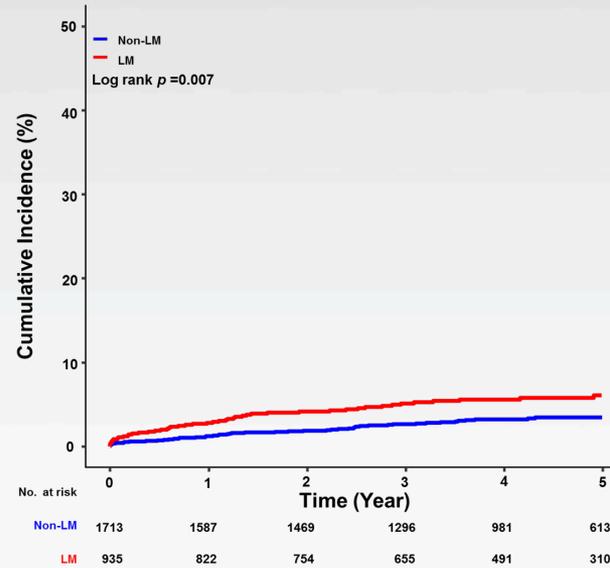## Stent Technique (Type of 2-Stent Strategy)
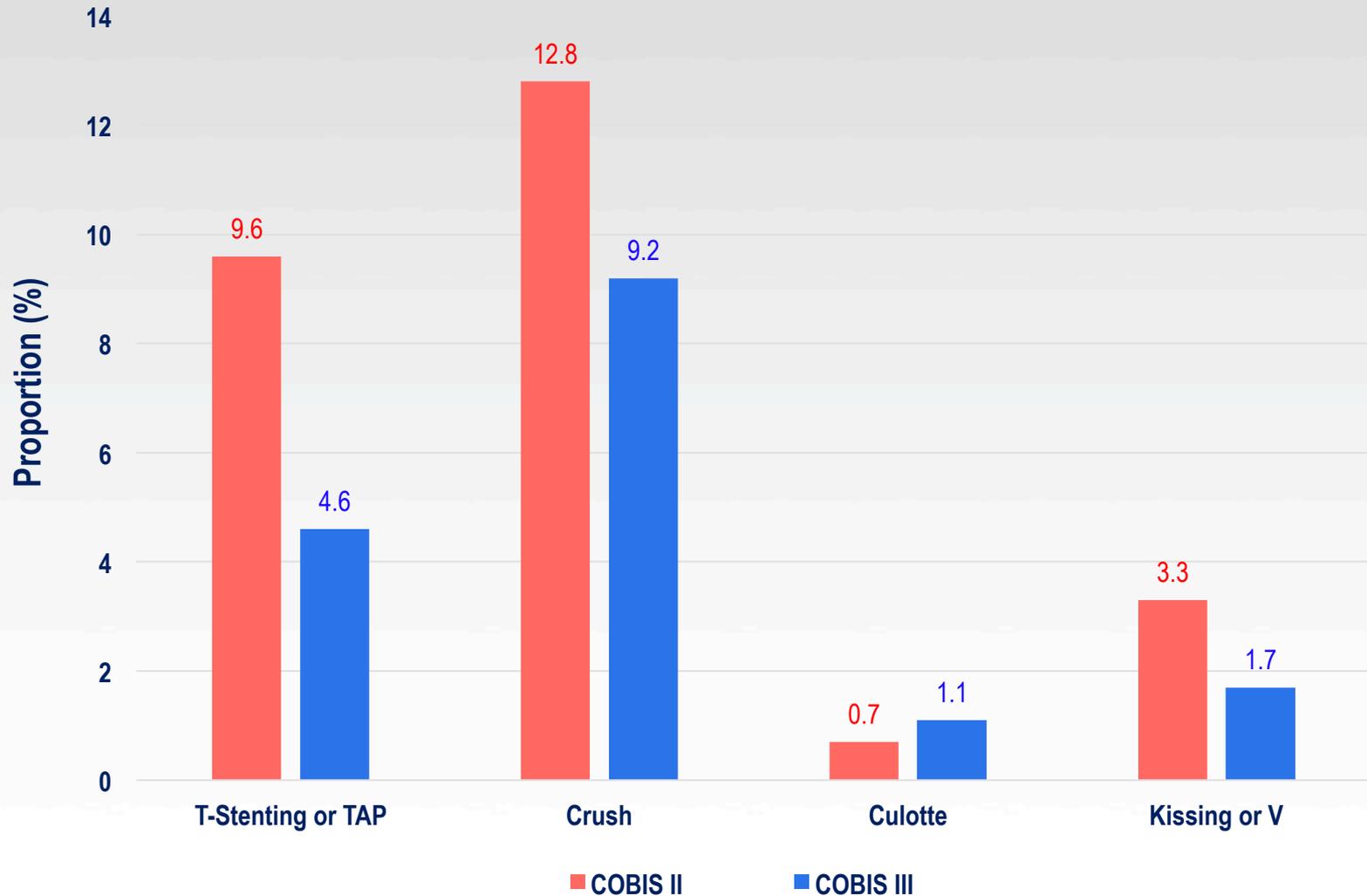
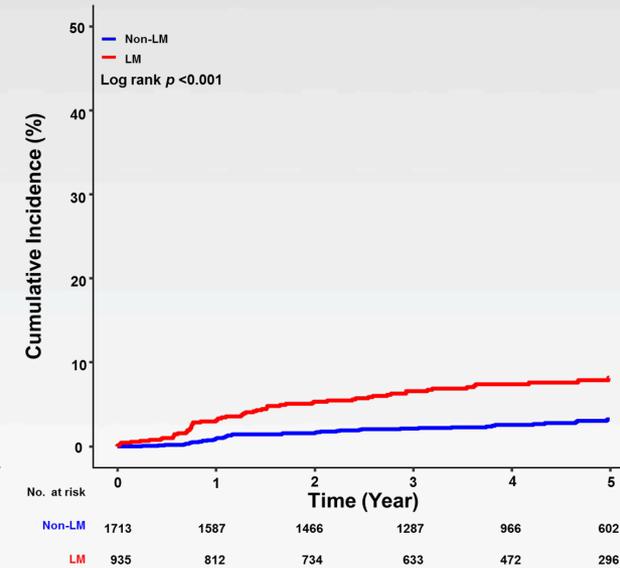# Clinical Outcomes Between LM VS Non-LM

A. Target Lesion Failure
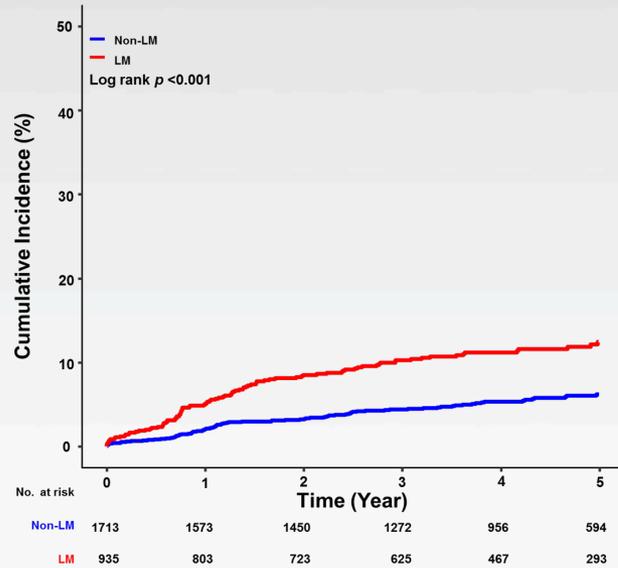
B. Cardiac Death or Myocardial Infarction
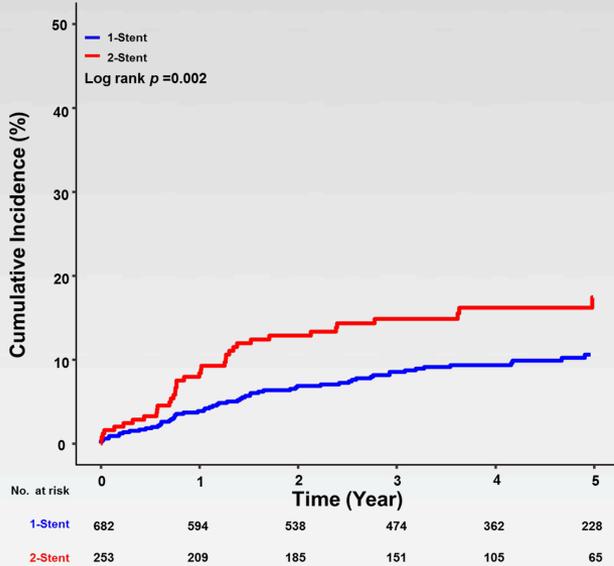
C. Target Lesion Revascularization

Patients with LM bifurcation showed significantly higher risks of target lesion failure, cardiac death or myocardial infarction, and target lesion revascularization compared to those with non-LM bifurcation.
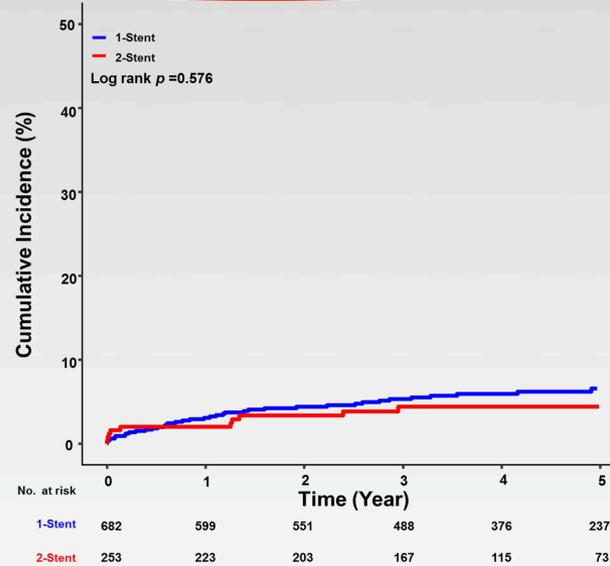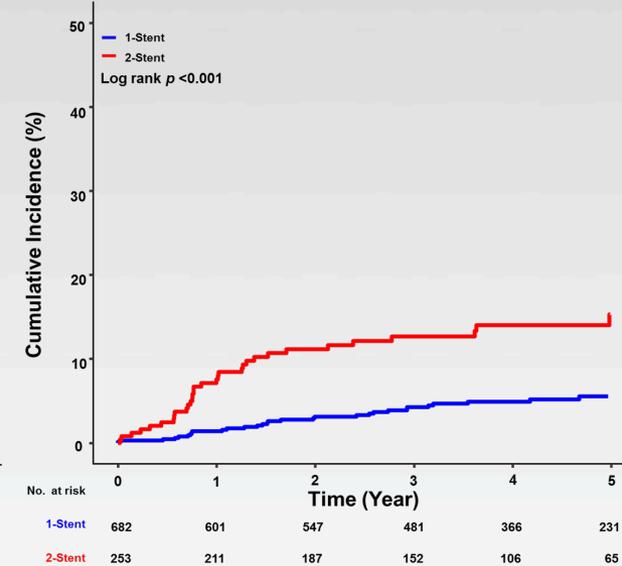
Clinical Outcomes Between 1-Stent vs 2-Stent in LM Bifurcation

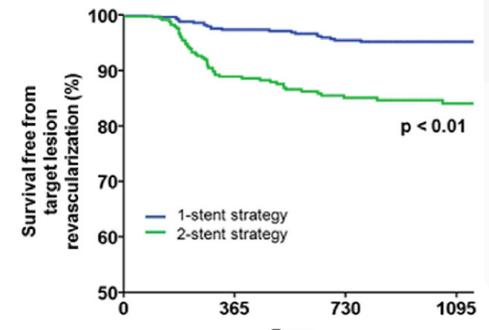**A. Target Lesion Failure**

B. Cardiac Death or Myocardial Infarction

C. Target Lesion Revascularization

No. at risk	0	1	2	3	4	5
1-Stent	682	594	538	474	362	228
2-Stent	253	209	185	151	105	65

No. at risk	0	1	2	3	4	5
1-Stent	682	599	551	488	376	237
2-Stent	253	223	203	167	115	73

No. at risk	0	1	2	3	4	5
1-Stent	682	601	547	481	366	231
2-Stent	253	211	187	152	106	65

Comparison with COBIS II Registry

Numbers at risk				
1-stent strategy	509	455	374	219
2-stent strategy	344	271	216	129

Numbers at risk				
1-stent strategy	509	466	390	228
2-stent strategy	344	302	253	153

Numbers at risk				
1-stent strategy	509	457	376	218
2-stent strategy	344	277	220	132

Clinical Outcomes Between 1-Stent vs 2-Stent in <u>Non-LM Bifurcation</u>
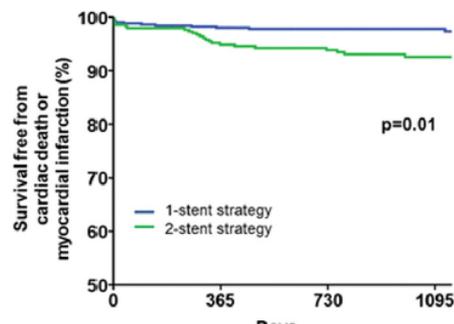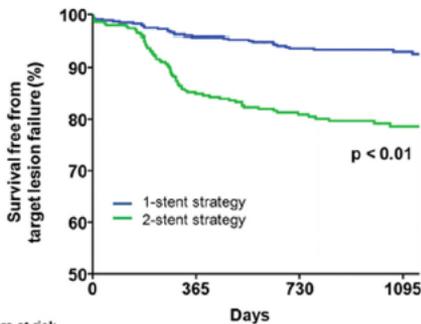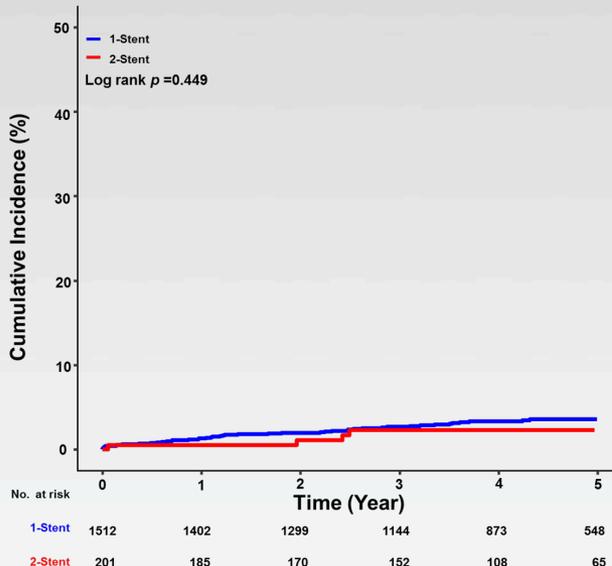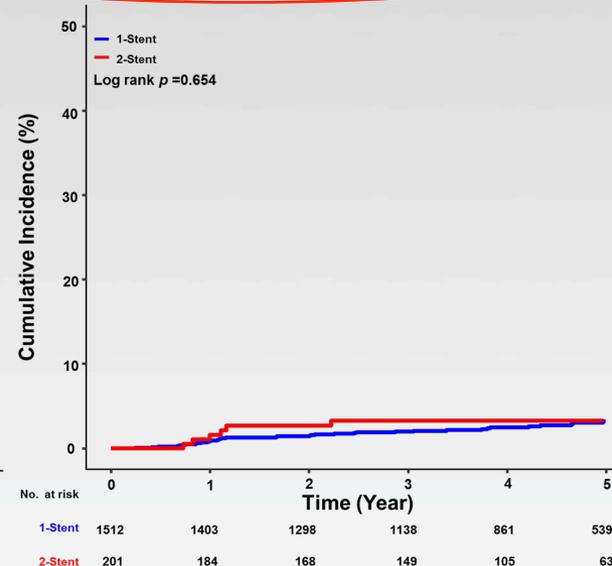

A. Target Lesion Failure
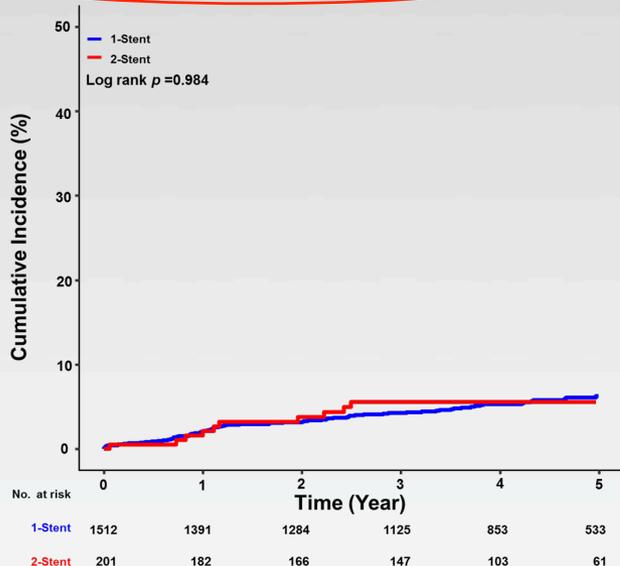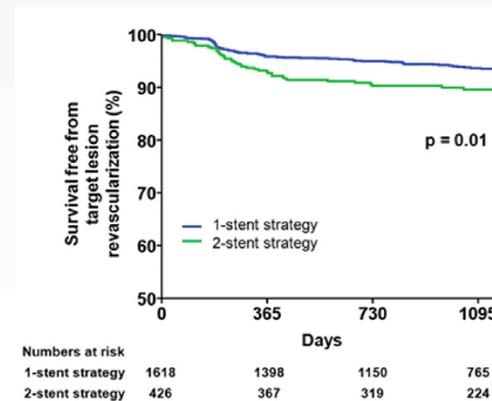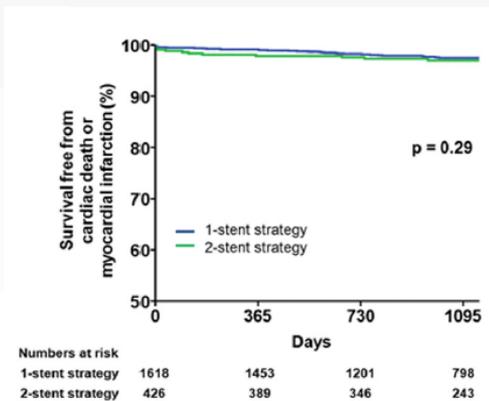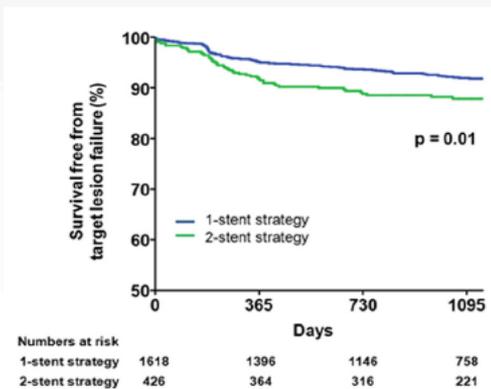
B. Cardiac Death or Myocardial Infarction

C. Target Lesion Revascularization

Comparison with COBIS II Registry

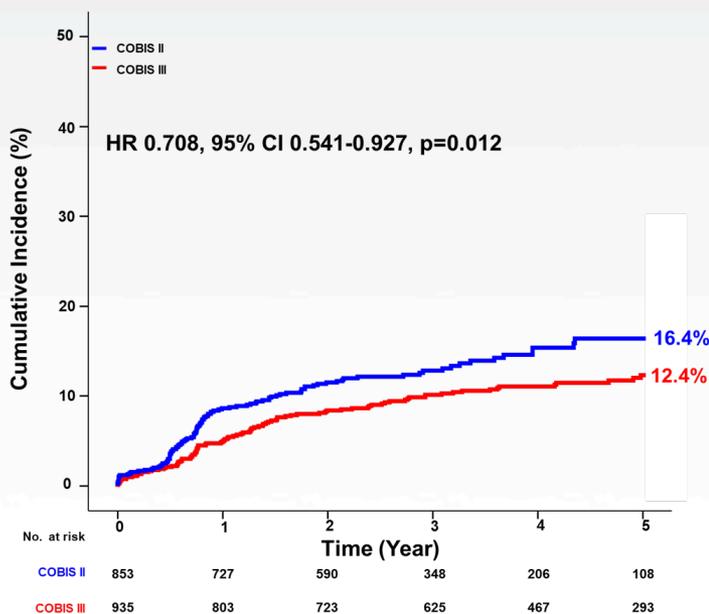# Association Between Treatment Strategy and Bifurcation Location

Outcomes	Groups	Multivariable Adjustment[*]				IPW Analysis[†]			
		HR	95% CI	P value	Interaction P	HR	95% CI	P value	Interaction P
TLF[‡]	All	1.368	0.888-2.107	0.156	**0.045**	1.531	1.007-2.328	0.046	**0.020**
	LM	**1.848**	**1.045-3.266**	**0.035**		**2.332**	**1.388-3.918**	**0.001**	
	Non-LM	0.925	0.428-2.001	0.843		0.730	0.319-1.670	0.456	
Cardiac Death or MI	All	0.687	0.361-1.310	0.255	0.885	0.672	0.328-1.380	0.279	0.933
	LM	0.991	0.413-2.379	0.984		0.656	0.306-1.407	0.279	
	Non-LM	0.588	0.203-1.705	0.329		0.700	0.216-2.265	0.551	
All-cause Death	All	1.033	0.565-1.888	0.917	0.271	0.962	0.494-1.872	0.908	0.405
	LM	1.645	0.639-4.231	0.302		0.711	0.303-1.669	0.433	
	Non-LM	0.928	0.404-2.134	0.860		1.193	0.488-2.917	0.699	
Cardiac Death	All	0.727	0.315-1.679	0.455	0.185	0.755	0.296-1.926	0.556	0.276
	LM	1.001	0.280-3.584	0.999		0.433	0.144-1.301	0.136	
	Non-LM	0.856	0.271-2.708	0.791		1.051	0.319-3.460	0.934	
MI	All	0.703	0.270-1.834	0.472	0.297	0.627	0.261-1.503	0.295	0.421
	LM	0.709	0.212-2.374	0.577		0.848	0.304-2.363	0.752	
	Non-LM	0.399	0.044-3.669	0.417		0.343	0.046-2.551	0.296	
TLR	All	2.333	1.307-4.165	0.004	**0.015**	2.305	1.395-3.800	0.001	**0.007**
	LM	**3.062**	**1.448-6.477**	**0.003**		**3.596**	**1.954-6.619**	**<0.001**	
	Non-LM	1.214	0.404-3.642	0.730		0.655	0.226-1.902	0.437	

Comparison Between COBIS II and COBIS III Registries

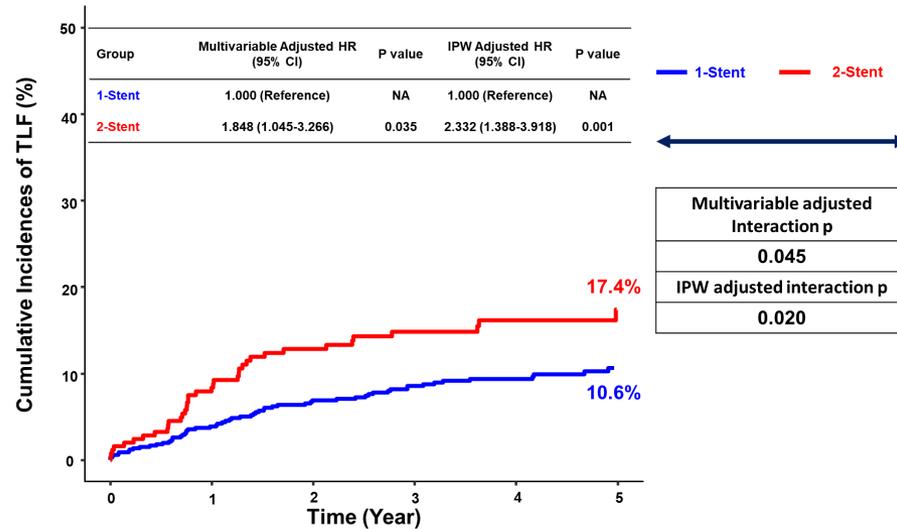|	COBIS II (2003-2009)	COBIS III (2010-2014)
Enrolled Patients	2897	2648
Median Follow-up, Months	36 (25-52)	53 (37-68)
LM Bifurcation	853 (29.4%)	935 (35.3%)
Second-generation DES	422 (14.6%)	2648 (100%)
2-Stent Strategy	770 (26.6%)	454 (17.1%)
Cumulative Incidence of Target Lesion Failure at 5 years	286 (12.6%)	184 (8.4%)

A. Target Lesion Failure in LM Bifurcation

B. Target Lesion Failure in Non-LM Bifurcation

HR 0.708, 95% CI 0.541-0.927, p=0.012

16.4%
12.4%

No. at risk

COBIS II	853	727	590	348	206	108
COBIS III	935	803	723	625	467	293

HR 0.506, 95% CI 0.394-0.650, p<0.001

11.1%
6.2%

No. at risk

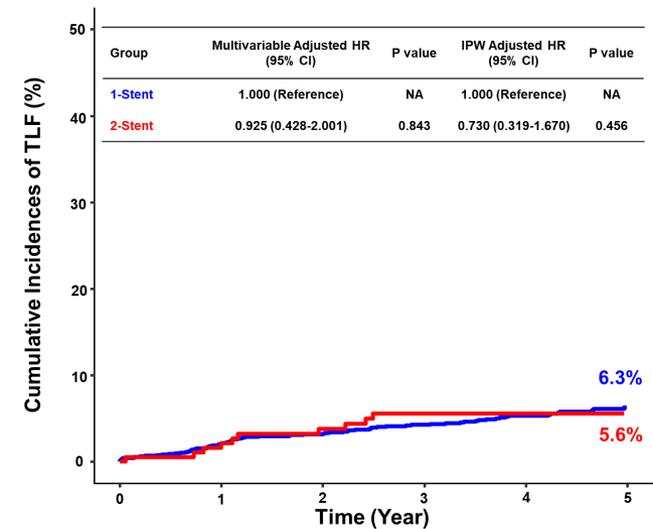|						
COBIS II	2044	1761	1462	979	557	219
COBIS III	1713	1573	1450	1272	956	594
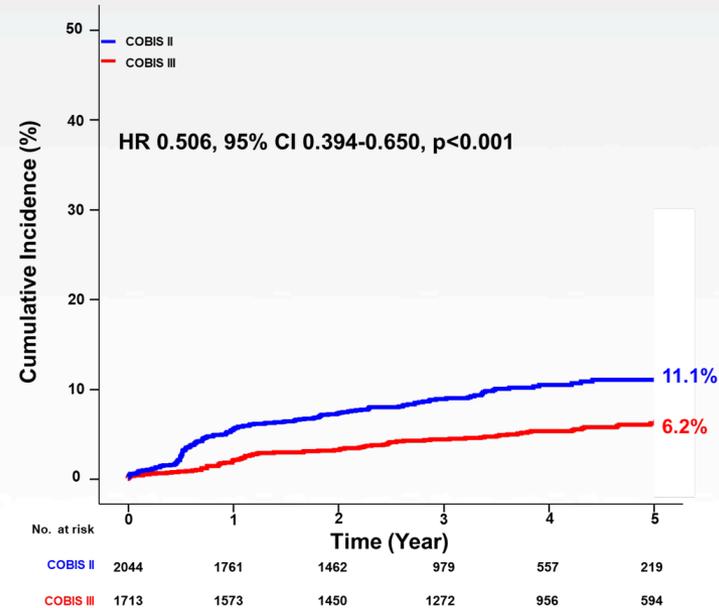
Conclusion and Summary

A. Left Main Bifurcation

B. Non-Left Main Bifurcation

1. Patients treated with PCI for an **LM bifurcation lesion had poorer outcomes** than those with a non-LM bifurcation lesion in the era of second-generation DES.

2. In the treatment of LM bifurcation, the **2-stent strategy** was associated with a **higher risk of TLF** than the 1-stent strategy, mainly driven by higher risk of TLR; however, **incidence of cardiac death or MI was not different between the strategies**, unlike previous results from the COBIS II registry.

3. In the treatment of a **non-LM bifurcation**, there were **no significant differences in TLF, cardiac death or MI, and TLR** between the 1-stent and 2-stent strategy groups.

Thank You For Your Attention !

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