

# Trends and Outcomes of Non-LM and LM Bifurcation PCI: Data from IRIS-DES and IRIS-MAIN Registry

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# Contemporary Non-LM Bifurcation PCI Approach

**Provisional Stenting  
Is Always Enough**

**Any 2 Stent Technique**

- Jailing Side Branch ?
- How to Treat ?

**It Would Be OK !**

## ***Conceptual Keep-in-Mind;***

1. Long-term clinical outcomes are determined mostly by the status of MB.
2. Ensuring optimal results in the MB may be more important than optimizing the angiographic appearance of the SB.

# Contemporary LM Bifurcation PCI



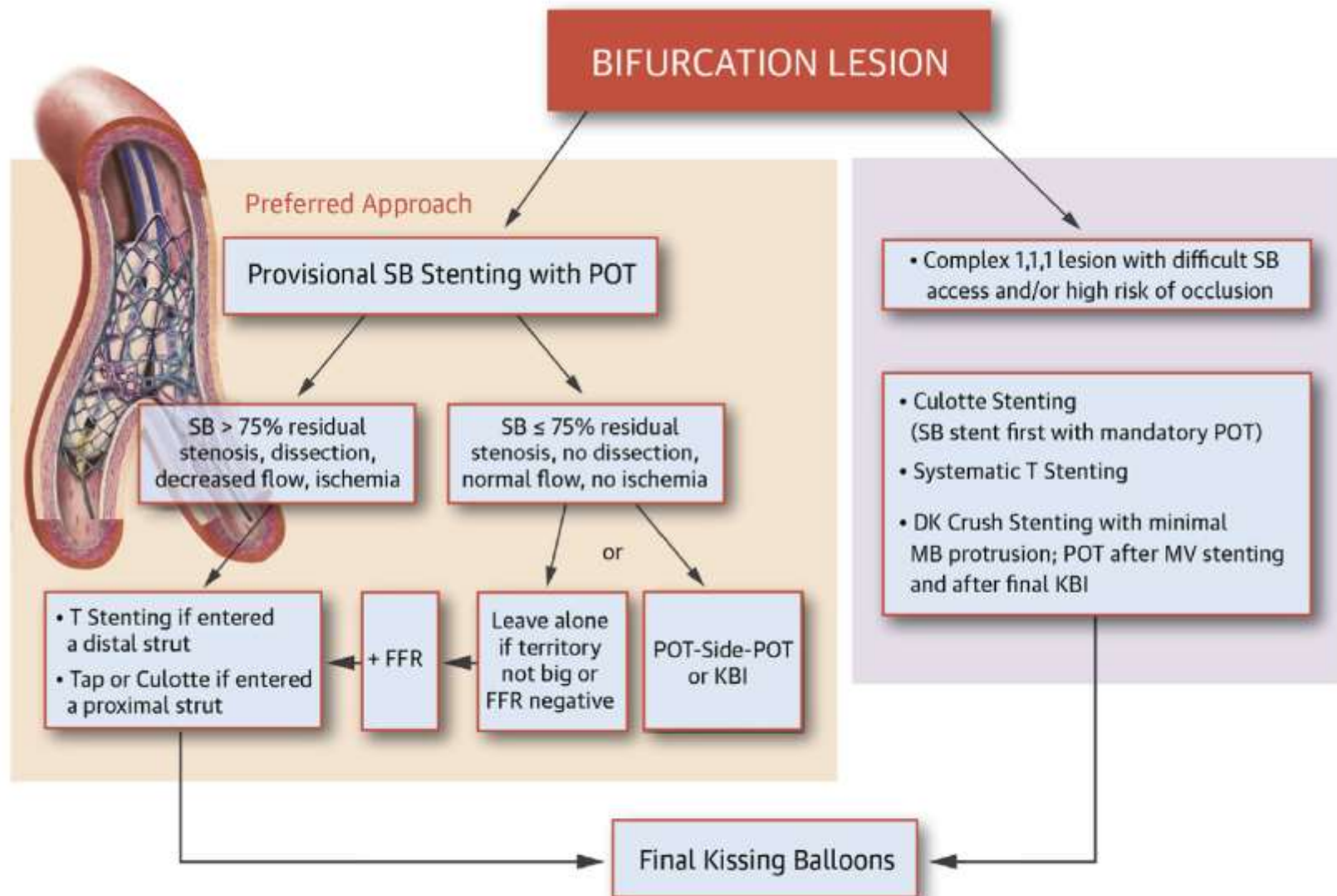
**After  
Stent Cross-Over**

**How to Optimize ?**

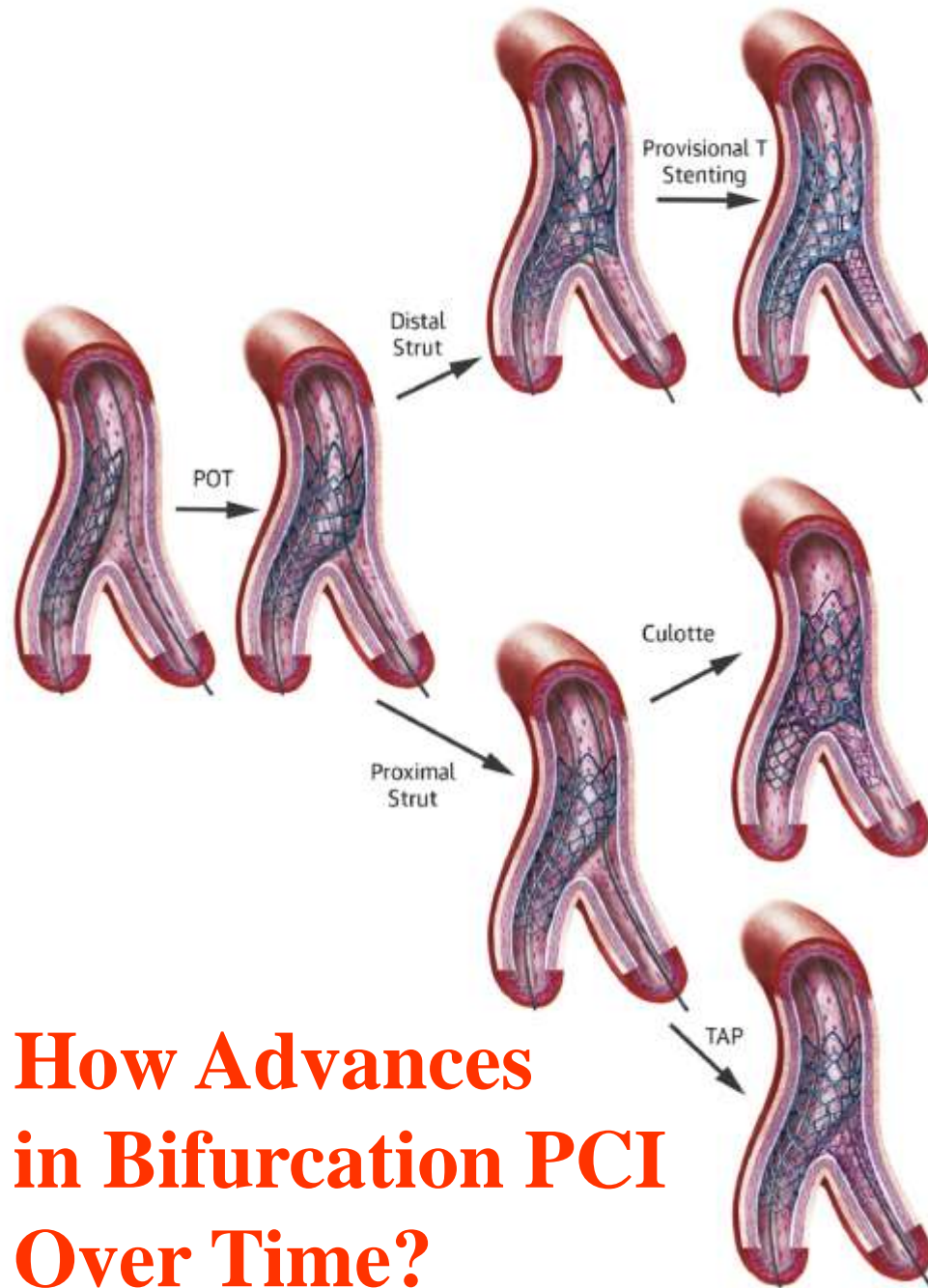
- Do You Want to Treat the Jailed Side Branch ?
- How to Treat ?

**IVUS Minimal Stent CSA Criteria 5-6-7-8 mm<sup>2</sup>  
May Improve Long-term Clinical Outcomes.**

**CENTRAL ILLUSTRATION** Simplified Approach to Treatment of Bifurcation Lesions



\* Imaging encouraged in all bifurcation stenting, especially with LM stenting



## How Advances in Bifurcation PCI Over Time?

# Study Population

## *Study Inclusion Criteria*

- Patients with LM and non-LM coronary bifurcation lesions treated with PCI were included from **IRIS-DES** and **IRIS-MAIN** registries

## *Primary Outcome*

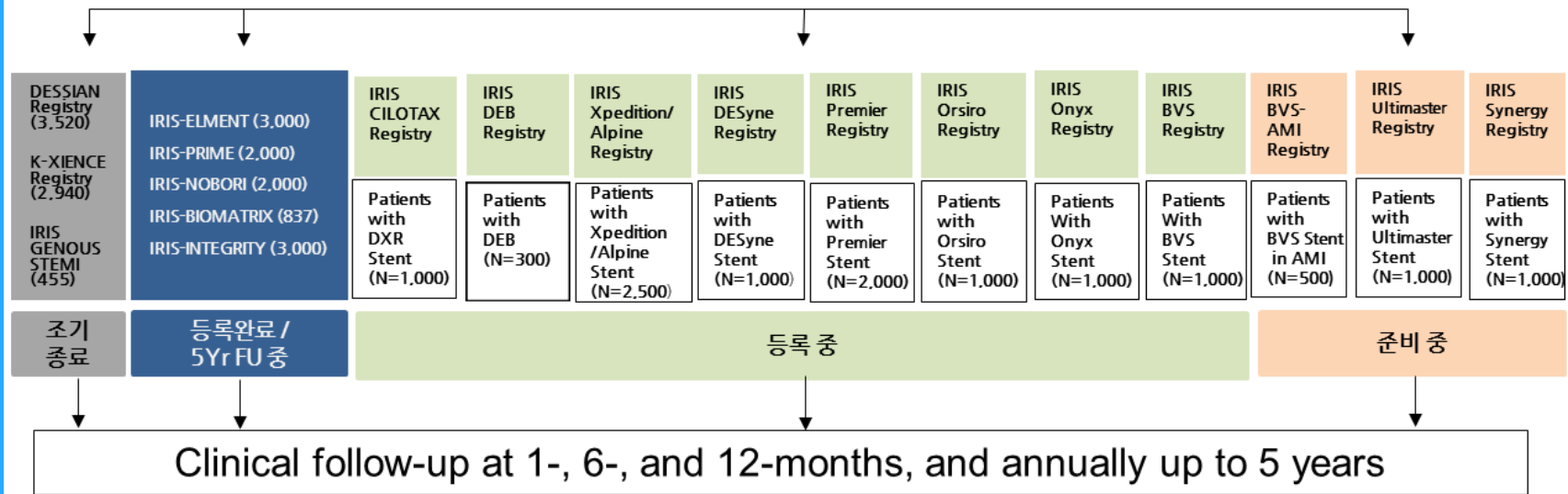
- **Target-vessel failure: a composite of cardiac death, target-vessel MI, clinical driven TVR**

Evaluation of Effectiveness and Safety of the First, Second, and New Drug-Eluting Stents in Routine Clinical Practice;

# IRIS-DES Registry

Consecutive PCI patients receiving New DES without a mixture of other DES

## Prospective Enrollment



**\*Primary end point: Composite of Death, MI, and TVR at 12-months**

# IRIS-MAIN Registry

A GLOBAL, MULTICENTER, PROSPECTIVE, REAL WORLD OBSERVATIONAL STUDY  
FOR UNPROTECTED LEFT MAIN DISEASE

All patients with LMCA disease: More than total 5,000 patients

PCI with any DES

CABG

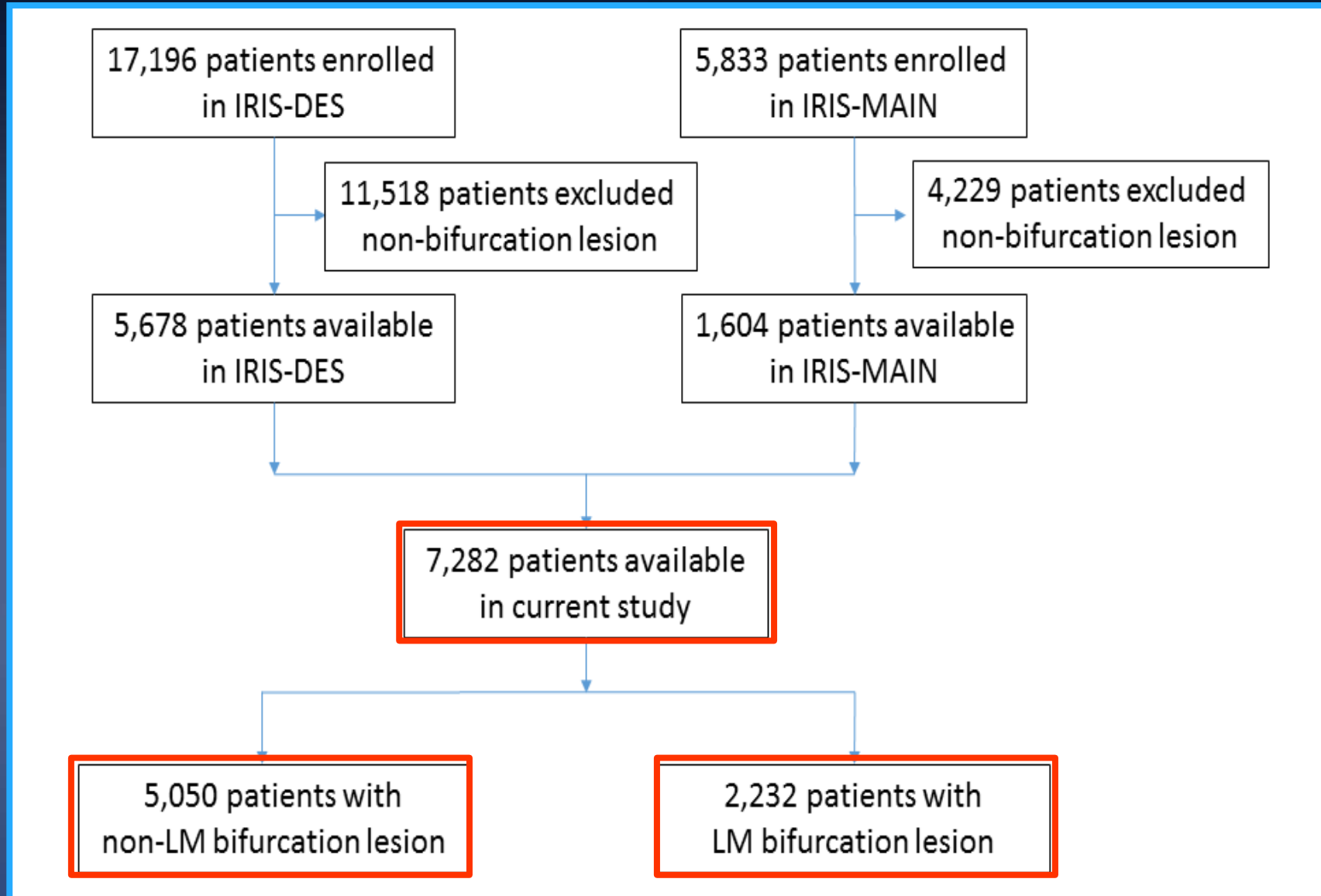
Medication  
Treatment

Clinical follow-up at 1-, 6-, 12-months, and up to 10 years

**\*Primary end point:** Composite of Death, MI, stroke and TVR at 2Year



# Flow Diagram of Study Population



# Baseline characteristics

Characteristic	Non-LM Bifurcations (N = 5050)			LM Bifurcations (N = 2232)		
	1 <sup>st</sup> -generation DES (N=929)	2 <sup>nd</sup> -generation DES (N=4121)	P	1 <sup>st</sup> -generation DES (N=451)	2 <sup>nd</sup> -generation DES (N=1781)	P
Age, years	62.9 ± 10.5	63.6 ± 10.7	0.050	62.6 ± 10.5	64.9 ± 10.2	<0.001
Male sex	636 (68.5)	2935 (71.2)	0.100	355 (78.7)	1390 (78.0%)	0.810
BMI, kg/m <sup>2</sup>	24.7 ± 2.9	24.7 ± 3.1	0.630	24.6 ± 2.7	24.4 ± 3.1	0.300
HTN	564 (60.7)	2523 (61.2)	0.800	265 (58.8)	1149 (64.5)	0.030
DM	306 (32.9)	1315 (31.9)	0.570	178 (39.5)	643 (36.1)	0.200
Requiring insulin	56 (6.0)	165 (4.0)	0.010	24 (5.3)	103 (5.8)	0.790
Current smoking	254 (27.3)	1219 (29.6)	0.190	125 (27.7)	436 (24.5)	0.180
Hyperlipidemia	402 (43.3)	1837 (44.6)	0.490	55 (53.4)	299 (57.2)	0.550
Previous MI	54 (5.8)	178 (4.3)	0.060	40 (8.9)	125 (7.0)	0.220
Previous PCI	130 (14.0)	353 (8.6)	<0.001	94 (20.8)	301 (16.9)	0.060
Previous stroke	74 (8.0)	293 (7.1)	0.400	34 (7.5)	142 (8.0)	0.840
Previous CHF	22 (2.4)	94 (2.3)	0.970	8 (1.8)	50 (2.8)	0.290

# Baseline characteristics

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Atrial fibrillation	36 (3.9)	125 (3.0)	0.220	12 (2.7)	46 (2.6)	>0.99
Family hx. of CAD	42 (4.5)	296 (7.2)	0.004	47 (10.4)	161 (9.1)	0.420
Chronic lung disease	22 (2.4)	99 (2.4)	>0.99	11 (2.4)	48 (2.7)	0.890
Chronic renal failure	35 (3.8)	143 (3.5)	0.730	11 (2.4)	81 (4.5)	0.060
Peripheral v. disease	7 (0.8)	106 (2.6)	0.001	9 (2.0)	75 (4.2)	0.040
Clinical presentation			<0.001			0.009
Stable angina	459 (49.4)	1715 (41.6)		243 (53.9)	820 (46.0)	
Unstable angina	283 (30.5)	1335 (32.4)		147 (32.6)	654 (36.7)	
MI	187 (20.1)	1071 (26.0)		61 (13.5)	307 (17.2)	
Ejection fraction						
Mean, %	58.6 ± 9.5	58.5 ± 9.9	0.910	60.4 ± 8.6	58.8 ± 10.3	0.002

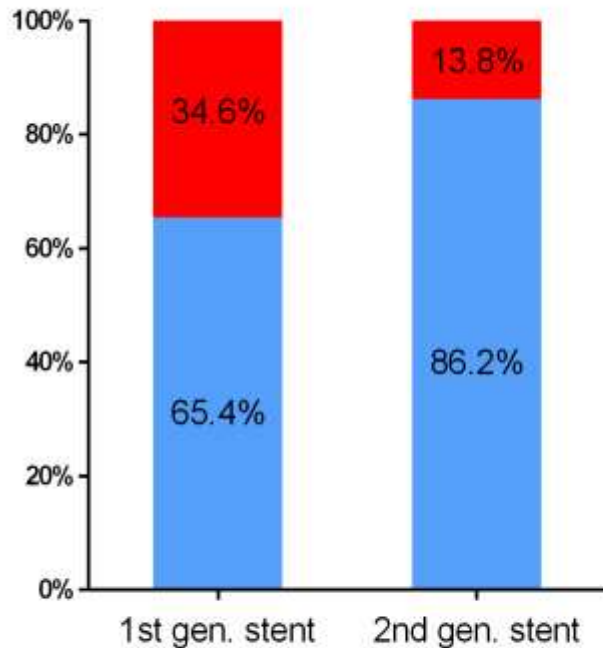
# Angiographic characteristics

Characteristic	Non-LM Bifurcations (N = 5050)			LM Bifurcations (N = 2232)		
	1 <sup>st</sup> -generation DES (N=929)	2 <sup>nd</sup> -generation DES (N=4121)	P	1 <sup>st</sup> -generation DES (N=451)	2 <sup>nd</sup> -generation DES (N=1781)	P
Bifurcation lesion			0.09			NA
LM	0	0		451 (100.0)	1781 (100.0)	
LAD	729 (78.5)	3099 (75.2)		0	0	
LCX	152 (16.4)	796 (19.3)		0	0	
RCA	48 (5.2)	226 (5.5)		0	0	
Disease extent			0.01			0.11
1-VD	585 (63.0)	2808 (68.1)		0	0	
2-VD	290 (31.2)	1113 (27.0)		334 (74.1)	1383 (77.7)	
3-VD	54 (5.8)	200 (4.9)		117 (25.9)	398 (22.3)	
Stenting strategy			<0.001			<0.001
Simple-crossover	624 (67.2)	3755 (91.1)		278 (61.6)	1335 (75.0)	
2-stent strategy	305 (32.8)	366 (8.9)		173 (38.4)	446 (25.0)	

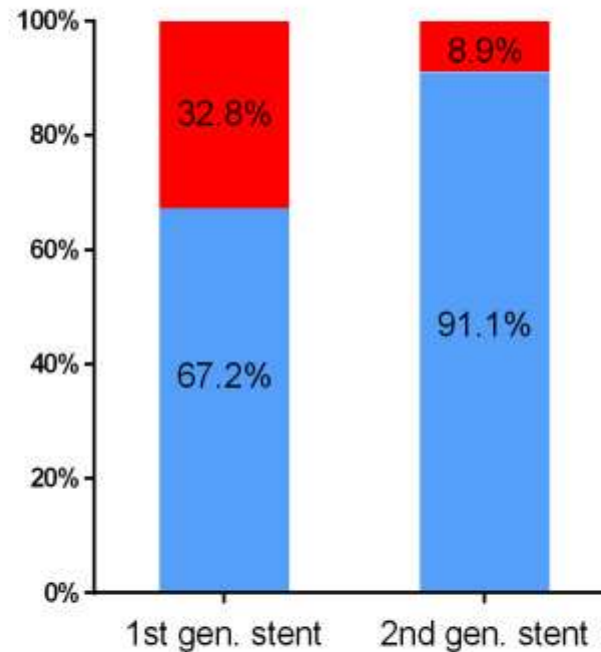
# Simple vs. complex stent strategy

## Over time from 1<sup>st</sup>-DES to 2<sup>nd</sup>-DES

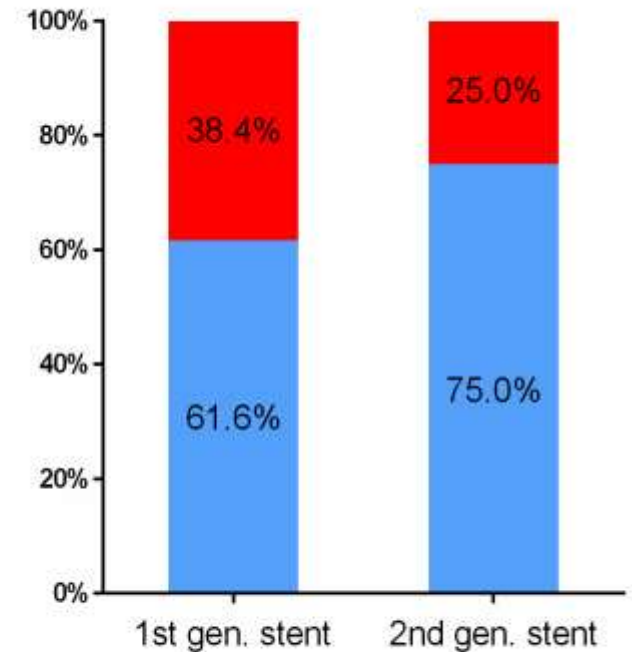
A All Bifurcations



B Non-LM Bifurcations



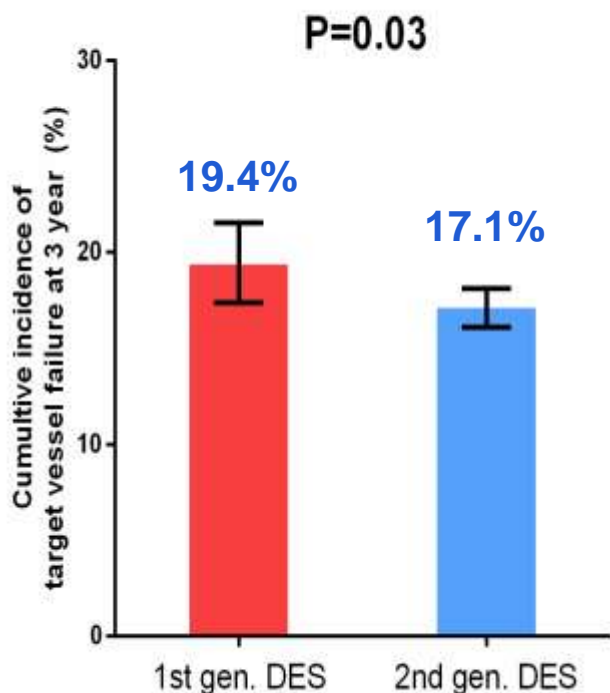
C LM Bifurcations



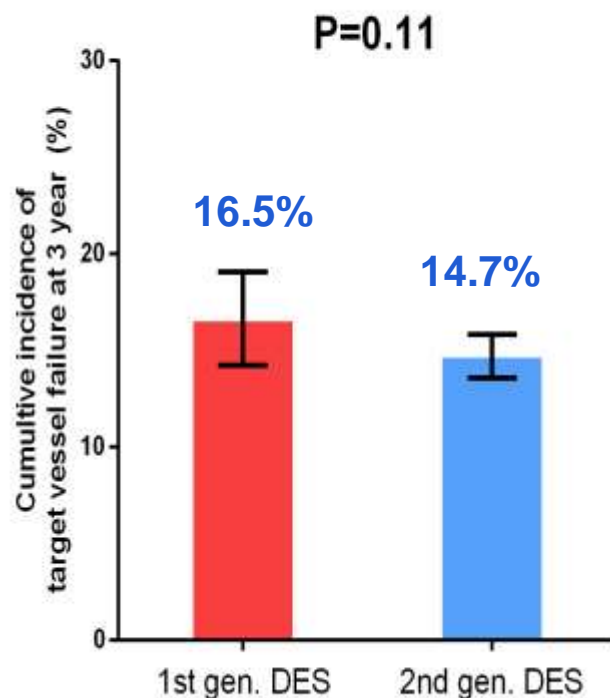
Two-stent strategy  
Simple crossover

# Primary Outcome (Target-Vessel Failure) Over time from 1<sup>st</sup>-DES to 2<sup>nd</sup>-DES

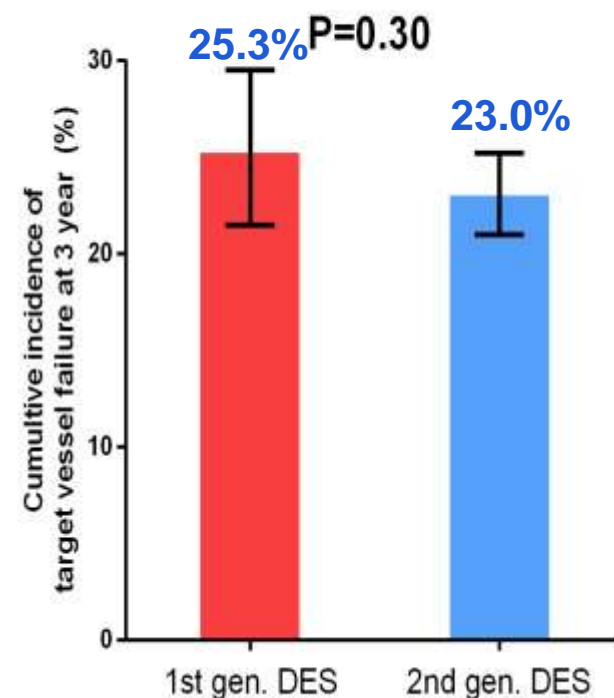
A All Bifurcations



B Non-LM Bifurcations



C LM Bifurcations



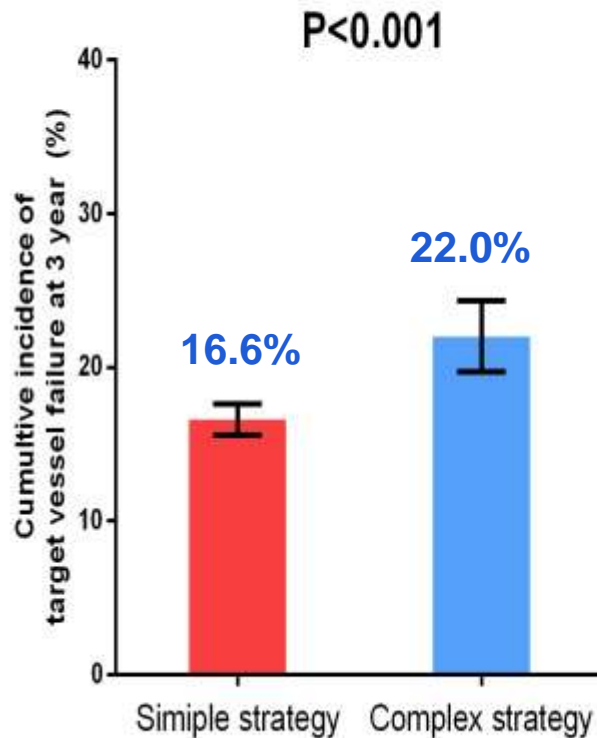
TVR: composite of cardiac death, target-vessel MI, clinical driven TVR

# Clinical outcomes according to stent generation

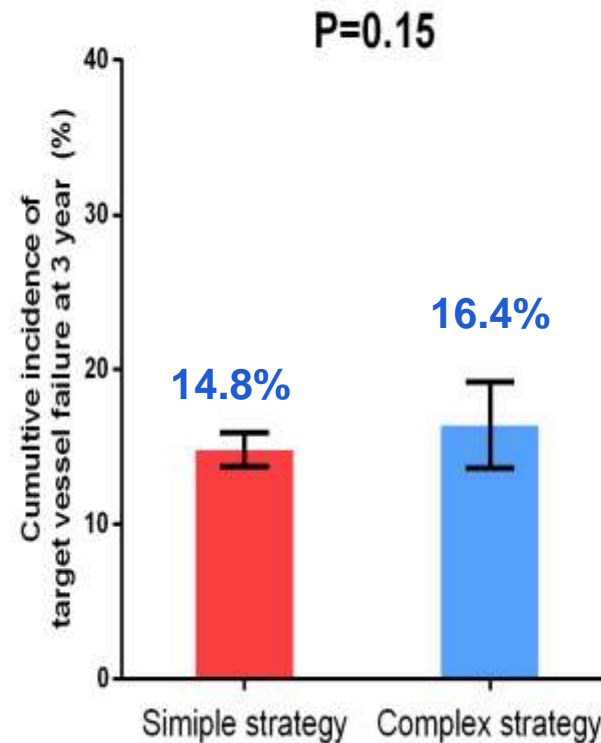
Characteristic	Non-LM Bifurcations (N = 5050)			LM Bifurcations (N = 2232)		
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<b>Primary outcome</b>						
Target-vessel failure	16.5 (14.1–18.9)	14.7 (13.5–15.8)	0.11	25.3 (21.2–29.3)	23.0 (19.3–26.7)	0.30
<b>Secondary outcomes</b>						
Death from any cause	5.4 (3.9–6.8)	4.6 (3.9–5.3)	0.37	4.7 (2.8–6.7)	7.9 (6.5–9.4)	0.02
Cardiac	3.7 (2.5–5.0)	3.3 (2.7–3.9)	0.55	3.4 (1.7–5.1)	6.1 (4.8–7.4)	0.03
Non-cardiac	1.7 (0.8–2.5)	1.4 (1.0–1.7)	0.46	1.4 (0.3–2.5)	2.0 (1.2–2.7)	0.38
MI	11.3 (9.3–13.3)	8.9 (8–9.8)	0.02	19.2 (15.5–22.8)	15.0 (13.3–16.7)	0.04
Any revascularization	8.1 (6.3–9.9)	9.3 (8.3–10.2)	0.32	13.7 (10.5–16.9)	9.6 (8.0–11.1)	0.02
Stent thrombosis	0.2 (-0.1–0.6)	0.4 (0.2–0.6)	0.53	0.7 (-0.1–1.4)	0.4 (0.1–0.6)	0.35

# Primary Outcome (Target-Vessel Failure) According to Stenting Strategy

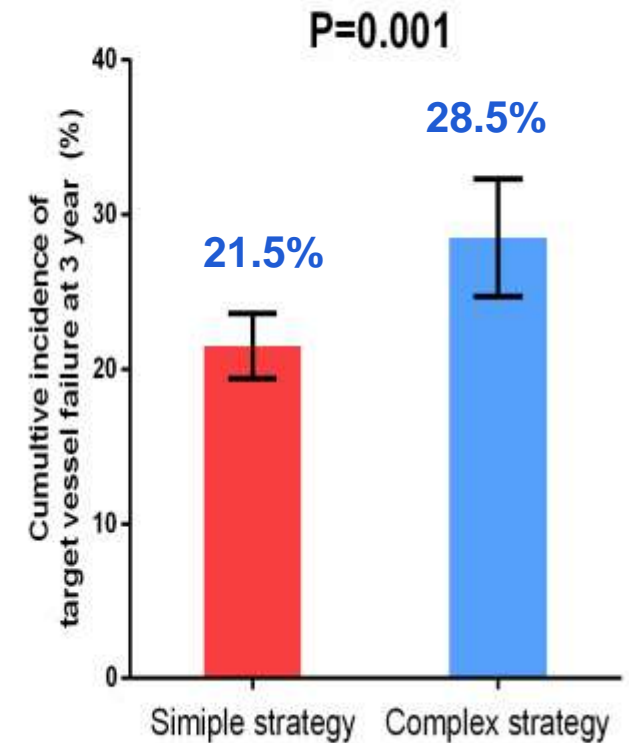
All Bifurcations



Non-LM Bifurcations



LM Bifurcations

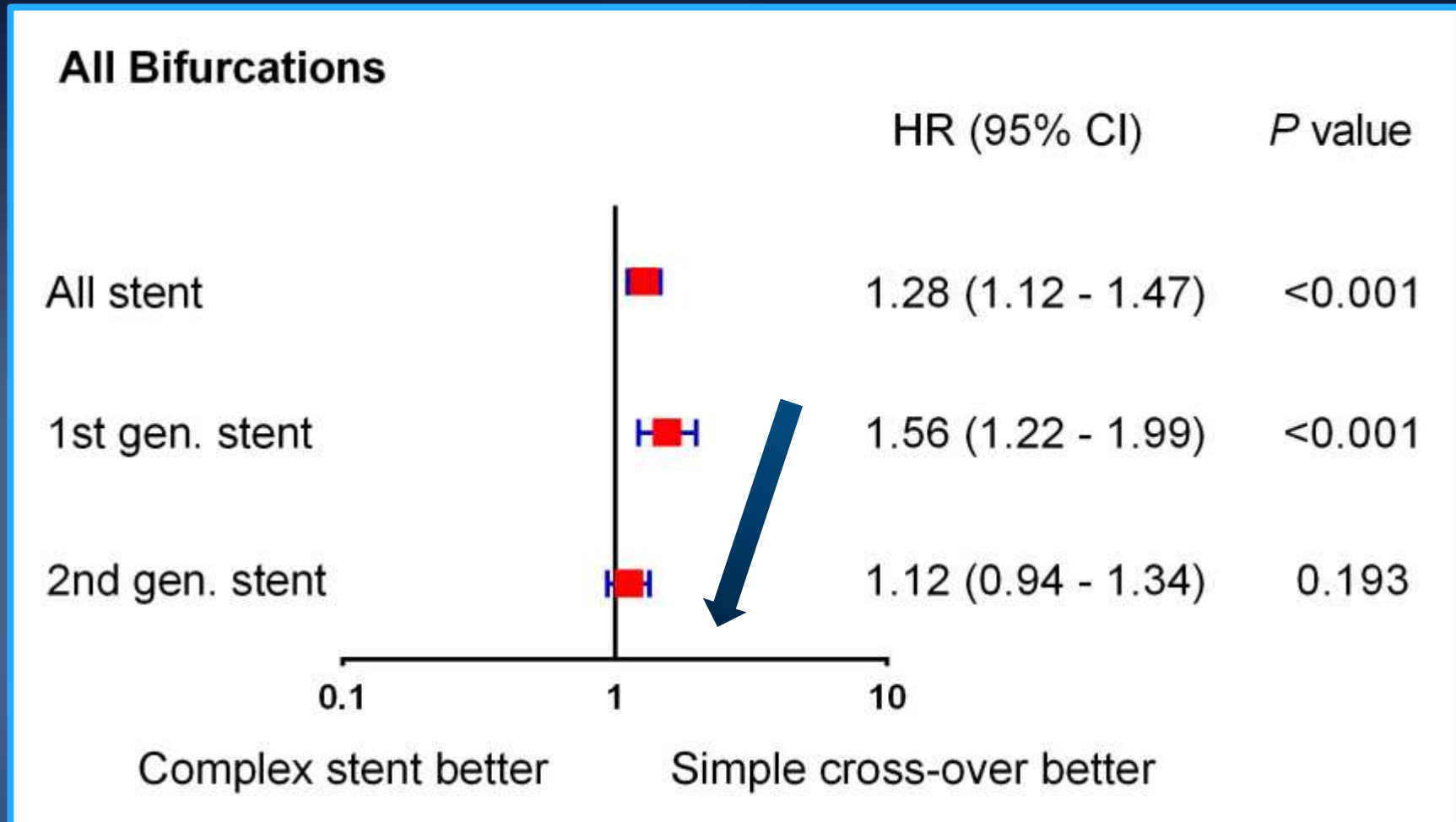




# Clinical outcomes according to stent strategy

Characteristic	Non-LM Bifurcations (N = 5050)			LM Bifurcations (N = 2232)		
	Simple Strategy (N=4379)	Complex strategy (N=671)	P	Simple Strategy (N=1613)	Complex strategy (N=619)	P
<b>Primary outcome</b>						
TVF	14.8 (13.7–15.9)	16.4 (13.6–19.2)	0.15	21.5 (19.4–23.6)	28.5 (24.7–32.3)	0.001
<b>Secondary outcomes</b>						
Death	5.0 (4.3–5.7)	3.7 (2.2–5.2)	0.17	7.2 (5.8–8.6)	6.7 (4.5–8.9)	0.53
Cardiac	3.6 (3–4.2)	2.3 (1.1–3.5)	0.10	5.5 (4.2–6.8)	5.0 (3.1–6.9)	0.54
Non-cardiac	1.4 (1.0–1.8)	1.4 (0.5–2.3)	0.98	1.9 (1.2–2.6)	1.8 (0.6–3.0)	0.85
MI	12.7 (10.2–15.2)	8.9 (8.0–9.8)	0.001	19.1 (16.0–22.2)	14.6 (12.9–16.3)	0.007
Any revascularization	9.0 (8.0–10.0)	9.2 (6.9–11.5)	0.79	9.2 (7.6–10.8)	14.0 (11.0–17.0)	0.004
Stent thrombosis	0.4 (0.2–0.6)	0.0 (0.0-0.0)	0.12	0.4 (0.1–0.7)	0.5 (-0.1–1.1)	0.79

# Adjusted HR for Target-Vessel Failure According to stent strategy over time



\*\*Multivariable Cox regression models are adjusted for age, sex, diabetes, previous MI, previous PCI, chronic renal failure, clinical presentation, ejection fraction, bifurcation location, disease extent, and use of intravascular ultrasound.

# Adjusted HR for Target-Vessel Failure According to stent strategy over time

## Non-LM Bifurcation



## LM Bifurcation



\*\*Multivariable Cox regression models are adjusted for age, sex, diabetes, previous MI, previous PCI, chronic renal failure, clinical presentation, ejection fraction, bifurcation location, disease extent, and use of intravascular ultrasound.

# In Summary...

- Over the last decade, patients with bifurcation lesions, patient characteristics, stenting strategy, and PCI outcomes have substantially changed.
- Simple stenting strategy has been more frequently used and clinical outcomes have been improved from 1<sup>st</sup> generation DES to 2<sup>nd</sup> generation DES.

# In Summary...

- Although simple strategy was associated with a lower rate of target-vessel failure, the treatment gap between 1<sup>st</sup> and 2<sup>nd</sup> gen-DES has progressively narrowed over time.
- This trend might be due to improved stent device, technique, clinical concept and increasing experience and expertise for bifurcation PCI.