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Impact of Target Lesion Revascularization on Long-Term Mortality After Percutaneous Coronary Intervention for Left Main Disease

Tae Oh Kim, MD, Do-Yoon Kang, MD, Jung-Min Ahn, MD, Min Joo Kim, MSC, Pil Hyung Lee, MD, Hoyun Kim, MD, Yeonwoo Choi, MD, Jinho Lee, MD, Joong Min Lee, MD, Ha Hye Jo, MD, Young-Sun Park, MD, So-Min Lim, MD, Seung-Jung Park, MD, Duk-Woo Park, MD,

Using a pooled data from four multicenter observational registries (IRIS-DES, IRIS-MAIN, MAIN-COMPARE, and PRECOMBAT)

CVRF

Disclosure

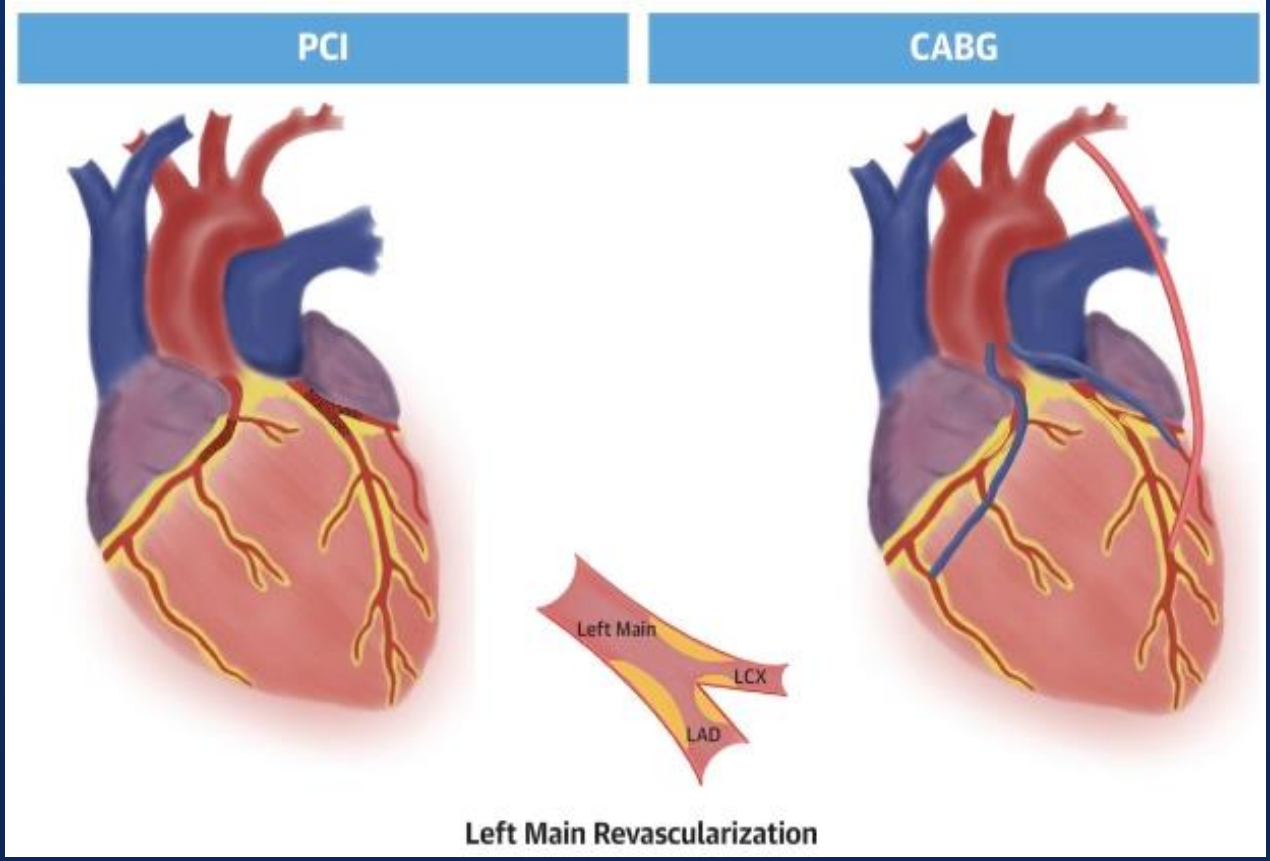
- There is nothing to disclose as a conflict of interest

Background

- Current clinical practice guidelines recommend **CABG as standard revascularization methods** in patients with unprotected LMCA disease.

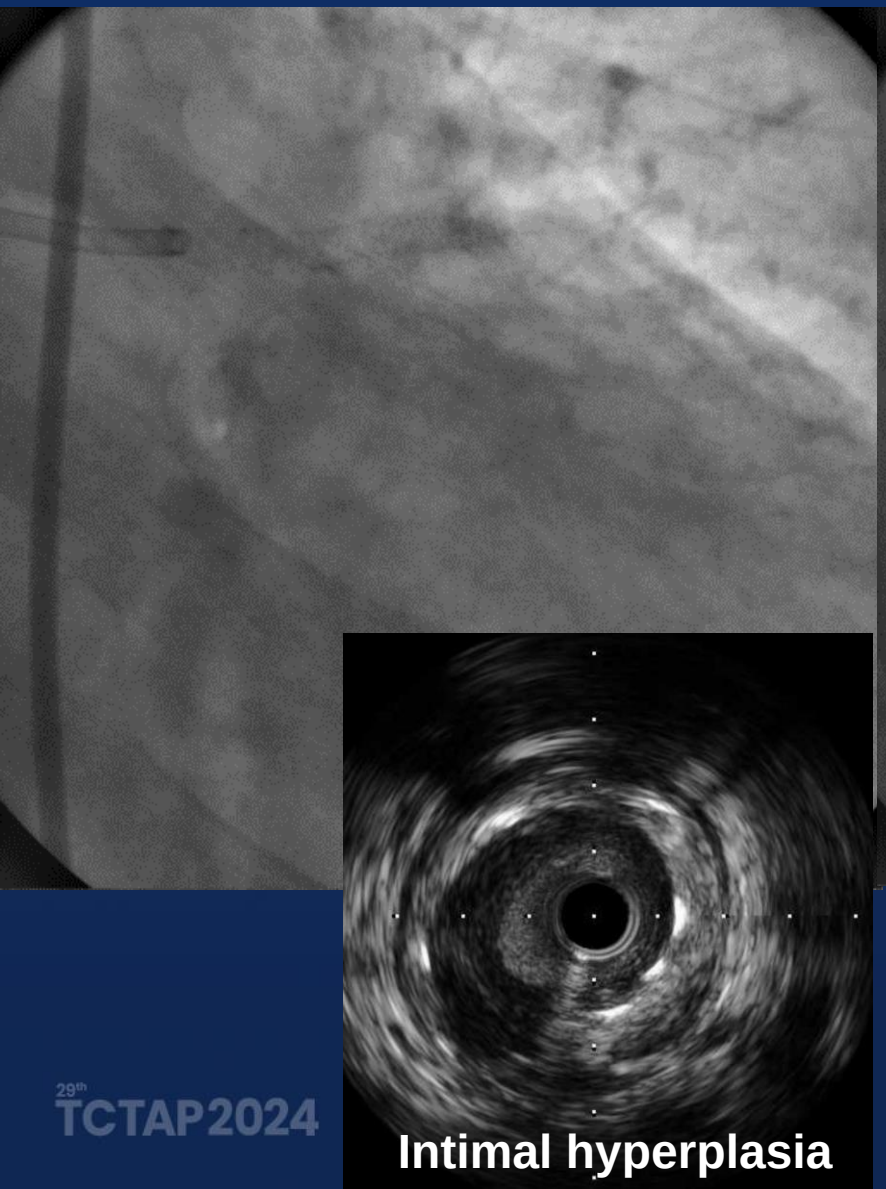
Advantage of CABG

- **More CR in high anatomical complexity**
- **Less spontaneous MI**
- **Lower risk of RR**



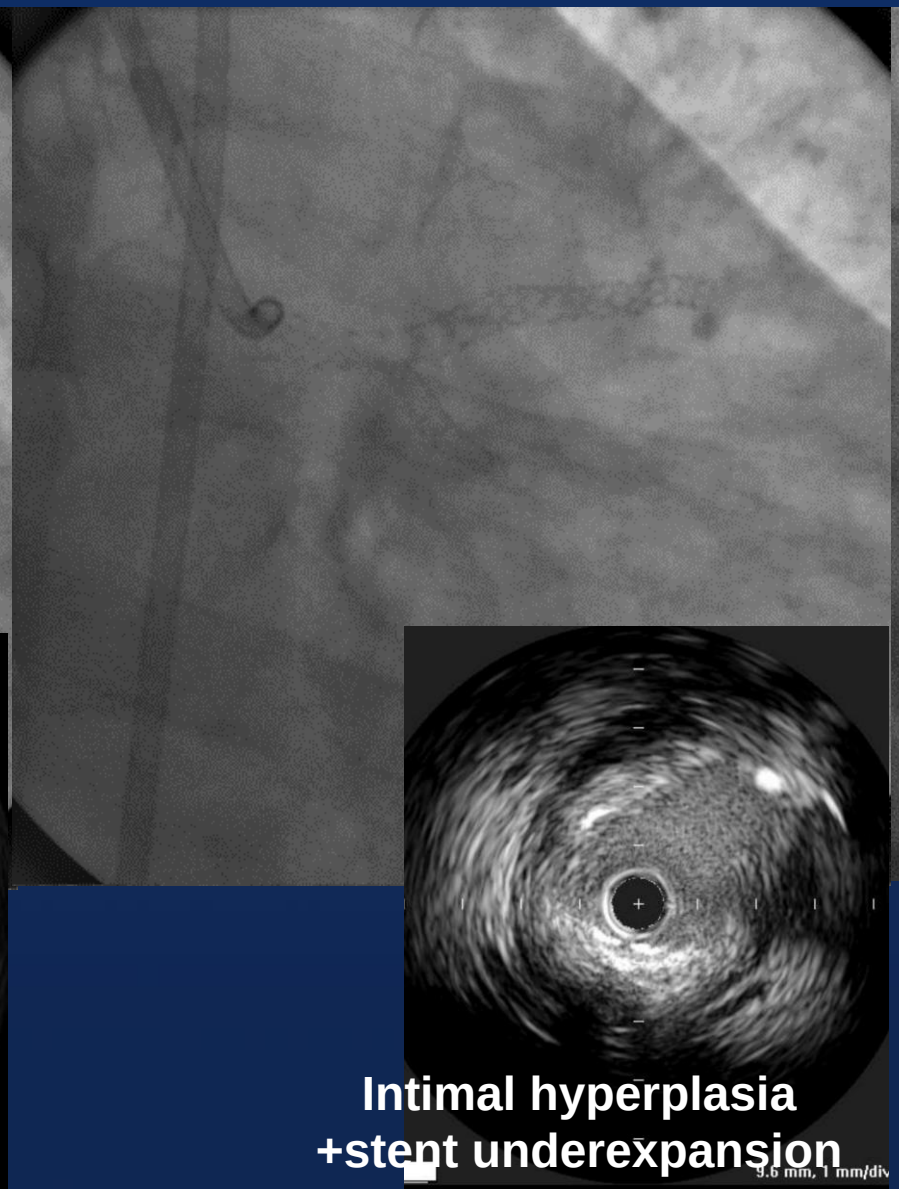
Ref) Park S et al, JACC: Asia. 2022;2(2):119-138

1-0-1 TLF (1 year after index PCI)



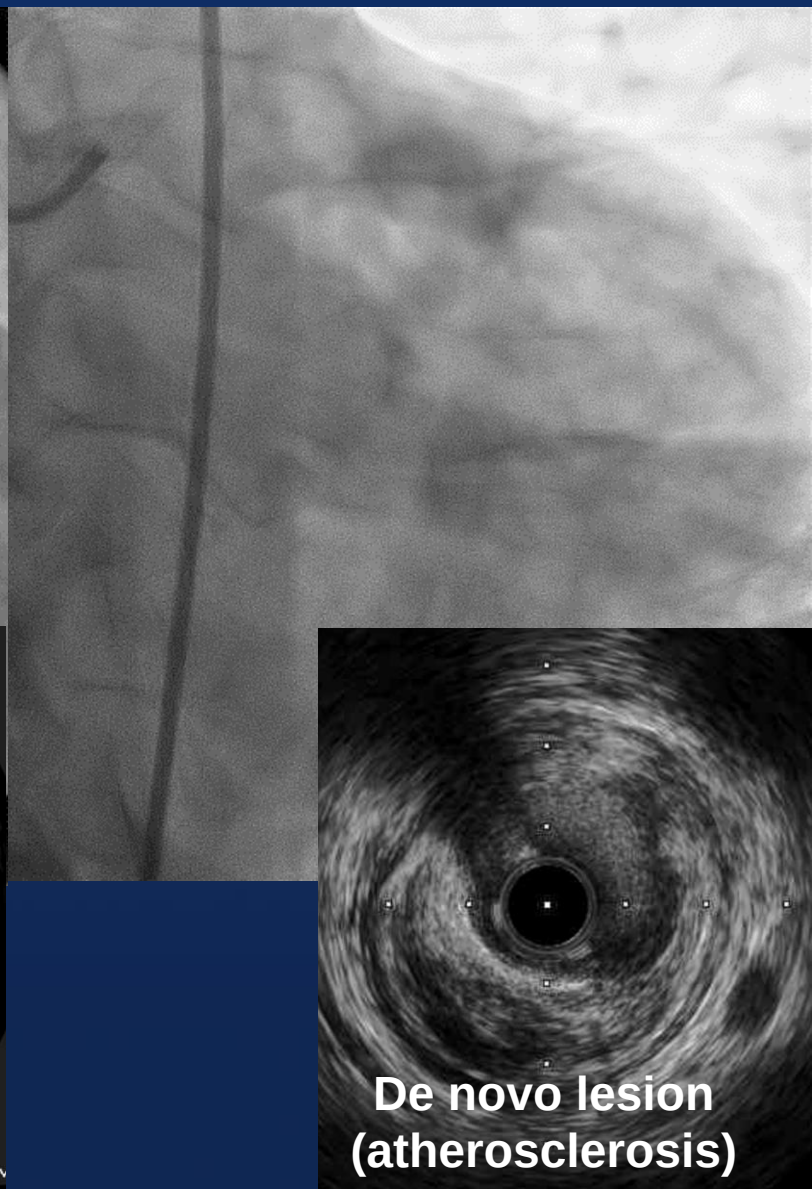
Intimal hyperplasia

1-1-1 TLF (1 year after index PCI)



Intimal hyperplasia +stent underexpansion

0-0-1 TLF (1 year after index PCI)



De novo lesion (atherosclerosis)

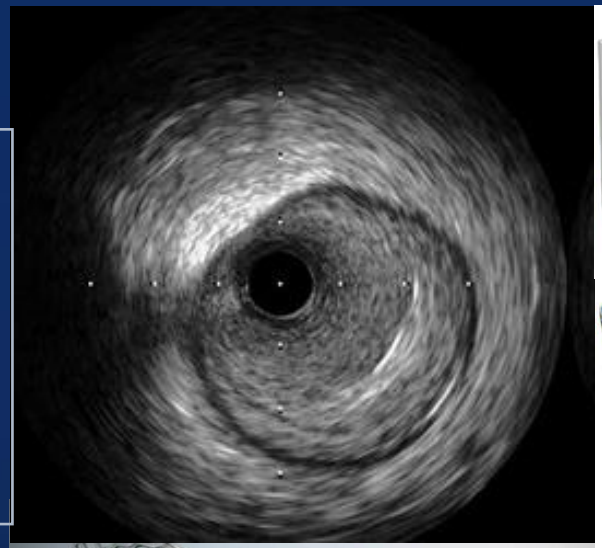
Background

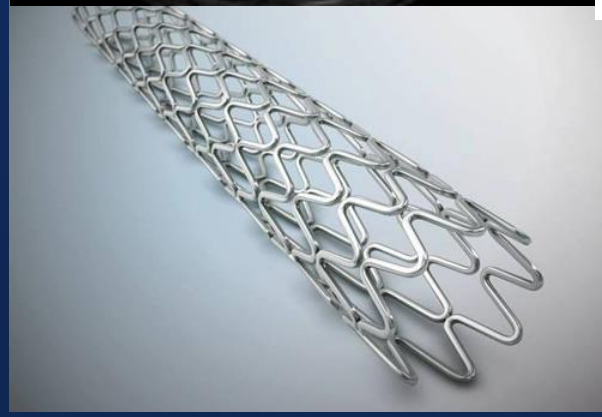
- Remarkable improvement in interventional technique & medication

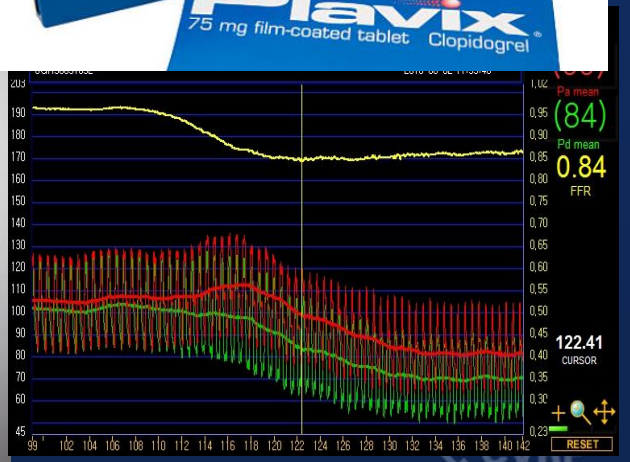
**** After DES implantation for significant LMCA****

The secular trend of TLR over time

Its long-term prognostic impact on mortality







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Study population and data source

- Patients who underwent DES implantation at AMC (Seoul, Korea) for significant LMCA disease between Jan 2003 & and Dec. 2016

4 independent multicenter observational registry

- IRIS-DES
- IRIS-MAIN
- MAIN-COMPARE
- IRIS-MAIN

1,397 patients with long-term mortality data.

Non TLR group : 1279

TLR group: 118

Endpoints

- The primary outcome of interest of the study
  : ***all-cause mortality*** after TLR following initial left main PCI.

TLR was defined

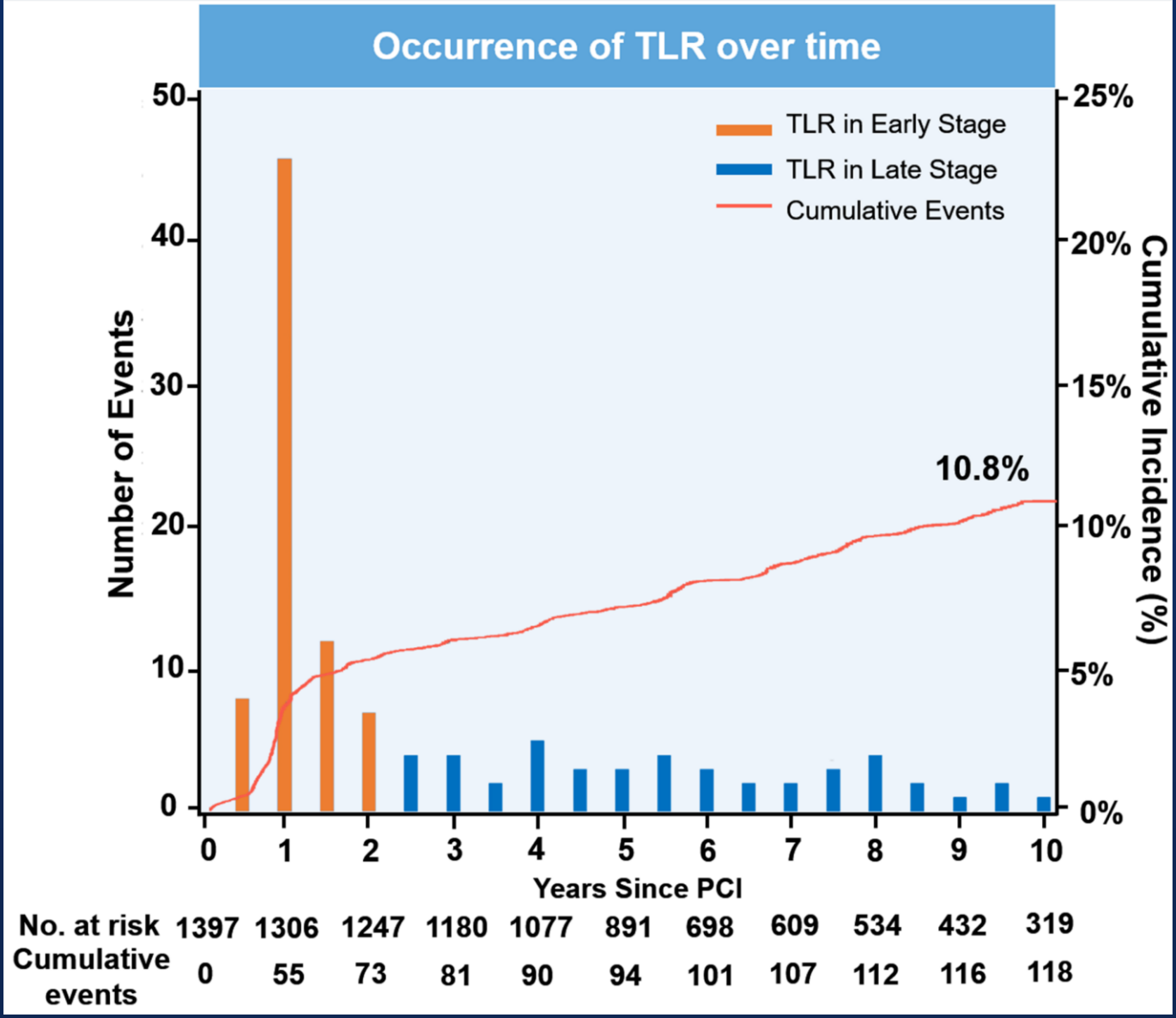
- RR within the stent of the LMCA or the 5 mm borders proximal or distal to the stent
- Ischemia-driven

[Ischemia driven]

1. Typical ischemic symptoms,
2. Ischemic electrocardiography changes
3. Positive functional study (FFR +, thallium)
4. IVUS (minimal lumen area ≤ 6 mm^2)

TLR incidence over time

LMCA related TLR occurred steadily over the 10-year f/u period



10-yr cumulative incidence : 10.8 %

- 0~2 years (early stage)
  : 2.5 per 100 person-years
- 2~10 years (late stage)
  : 0.6 per 100 person-years

CVRF

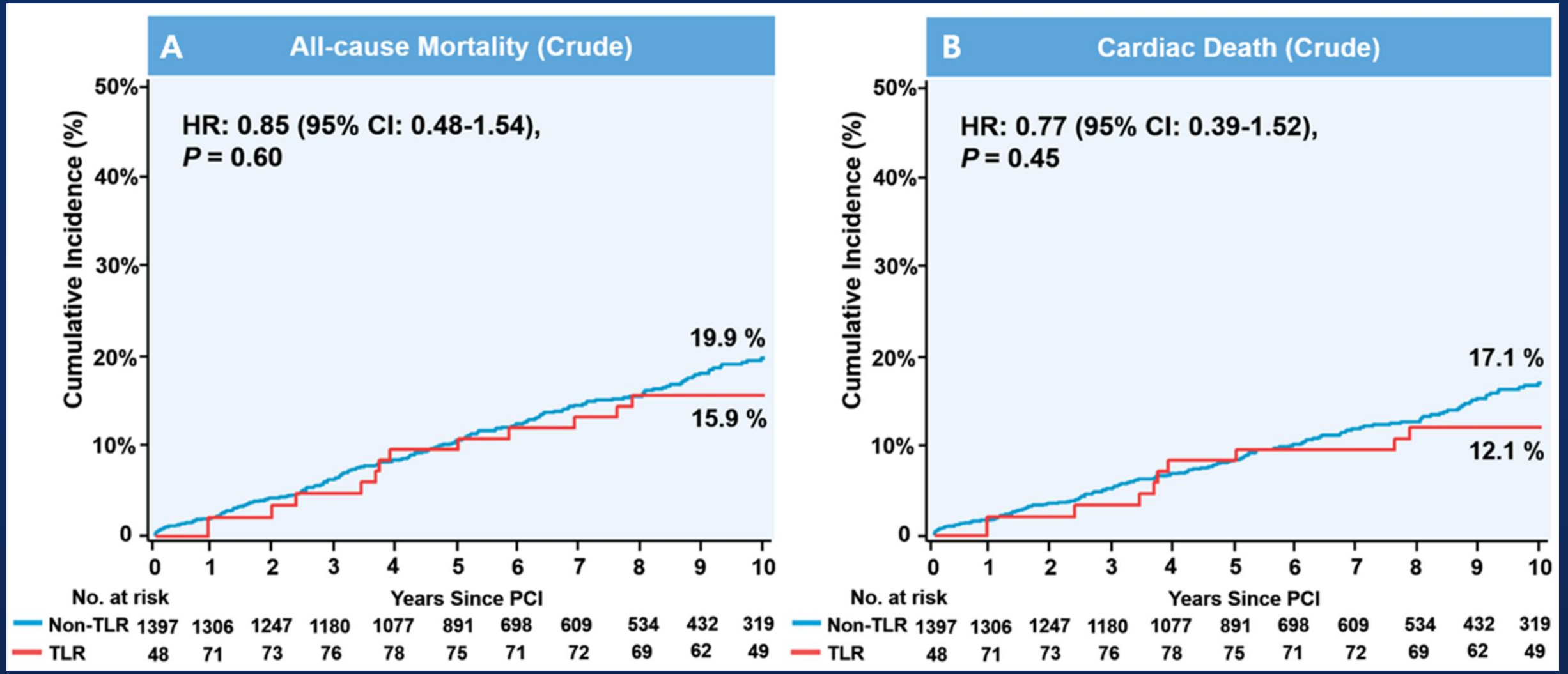
Baseline Clinical Characteristics

	Overall (n=1397)	No TLR (n=1279)	TLR (n=118)	P value
Age, years	63.2 ± 10.8	63.3 ± 10.8	62.6 ± 10.3	0.43
Male	1045 (74.8%)	959 (75.0%)	86 (72.9%)	0.70
BMI	24.6 ± 2.8	24.7 ± 2.9	24.2 ± 2.7	0.07
Risk factors				
Diabetes mellitus	484 (34.6%)	446 (34.9%)	38 (32.2%)	>0.99
Hypertension	898 (64.3%)	822 (64.3%)	76 (64.4%)	>0.99
Hyperlipidemia	859 (61.5%)	792 (61.9%)	67 (56.8%)	0.32
Current smoker	334 (23.9%)	307 (24.0%)	27 (22.9%)	0.87
Chronic renal disease	49 (3.5%)	44 (3.4%)	5 (4.2%)	0.85
LVEF	59.9 ± 7.9	59.9 ± 8.0	59.9 ± 7.3	0.99
Location involved				
Distal bifurcation	1271 (91.0%)	1156 (90.4%)	115 (97.5%)	**0.02**
Ostium, shaft, or both	126 (9.0%)	123 (9.6%)	3 (2.5%)	
Syntax score				
High to intermediate				0.43
Low	678 (48.5%)	614 (48.0%)	64 (54.2%)	

Baseline Clinical Characteristics

	Overall (n=1397)	No TLR (n=1279)	TLR (n=118)	P value
Procedural characteristics				
1st generation DES	572 (40.9%)	515 (40.3%)	57 (48.3%)	0.11
2nd generation DES	825 (59.1%)	764 (59.7%)	61 (51.7%)	
Total number of stents	2.4 ± 1.3	2.4 ± 1.3	2.2 ± 1.2	0.12
Length of stents	58.0 ± 35.4	58.5 ± 35.5	52.8 ± 34.0	0.09
Complete revascularization	916 (65.6%)	838 (65.5%)	78 (66.1%)	0.98
IVUS use	1247 (89.3%)	**1150 (89.9%)**	**97 (82.2%)**	**0.02**
1 stent	1035 (74.1%)	**966 (75.5%)**	**69 (58.5%)**	**<0.001**
2 stents	362 (25.9%)	313 (24.5%)	49 (41.5%)	
Final kissing balloon	475 (34.0%)	414 (32.4%)	61 (51.7%)	**<0.001**
Medication at discharge				
Aspirin	1374 (98.4%)	1257 (98.3%)	117 (99.2%)	0.74
Clopidogrel	1353 (96.9%)	1237 (96.7%)	116 (98.3%)	0.50
OAC	55 (3.9%)	50 (3.9%)	5 (4.2%)	>0.99
Statin	1317 (94.3%)	1203 (94.1%)	114 (96.6%)	0.35
ACEi/ARB	362 (25.9%)	335 (26.2%)	27 (22.9%)	0.50

Mortality Impact of TLR After Left Main PCI

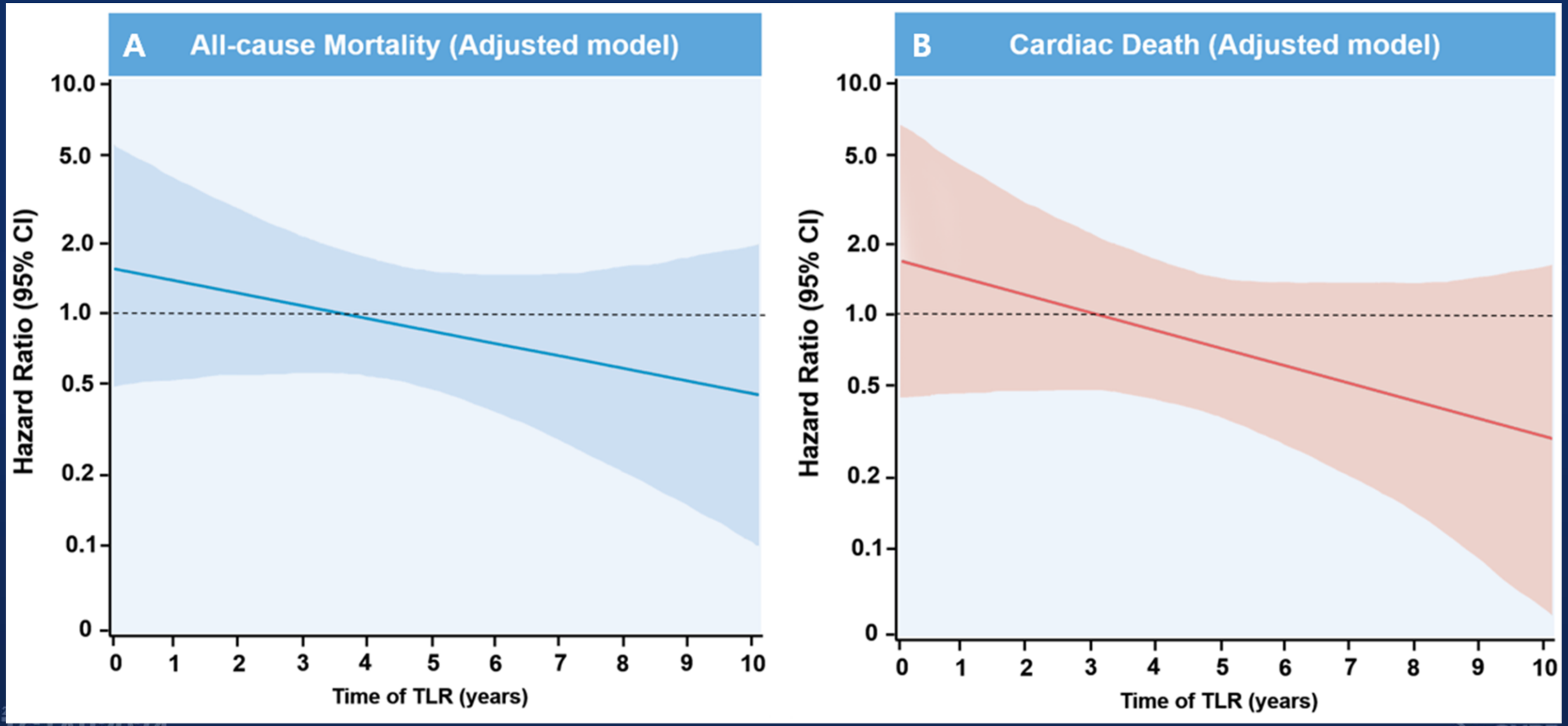


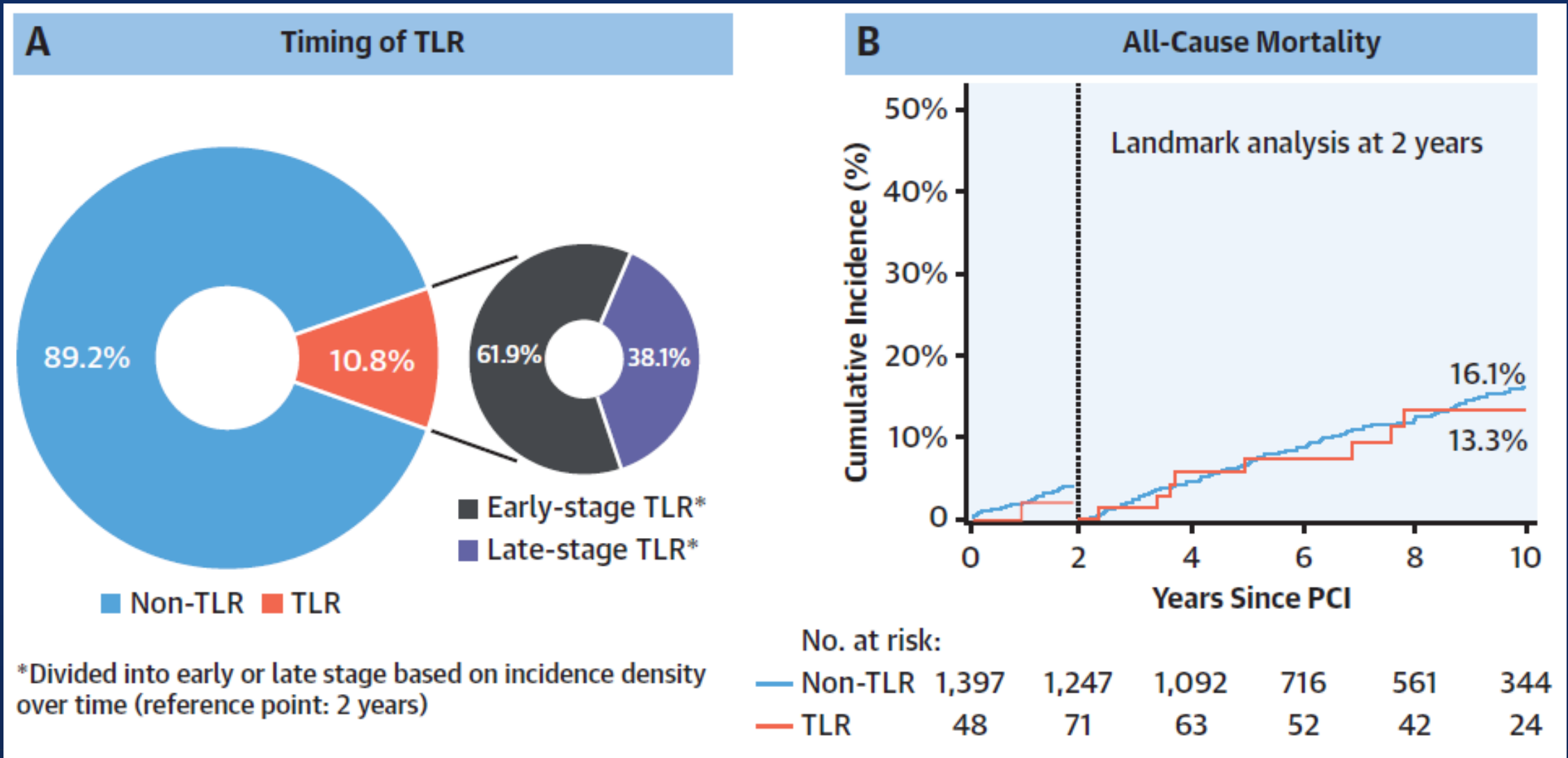
* TLR as a time-varying covariate

Adjusted HR of Covariates of Mortality After LM PCI

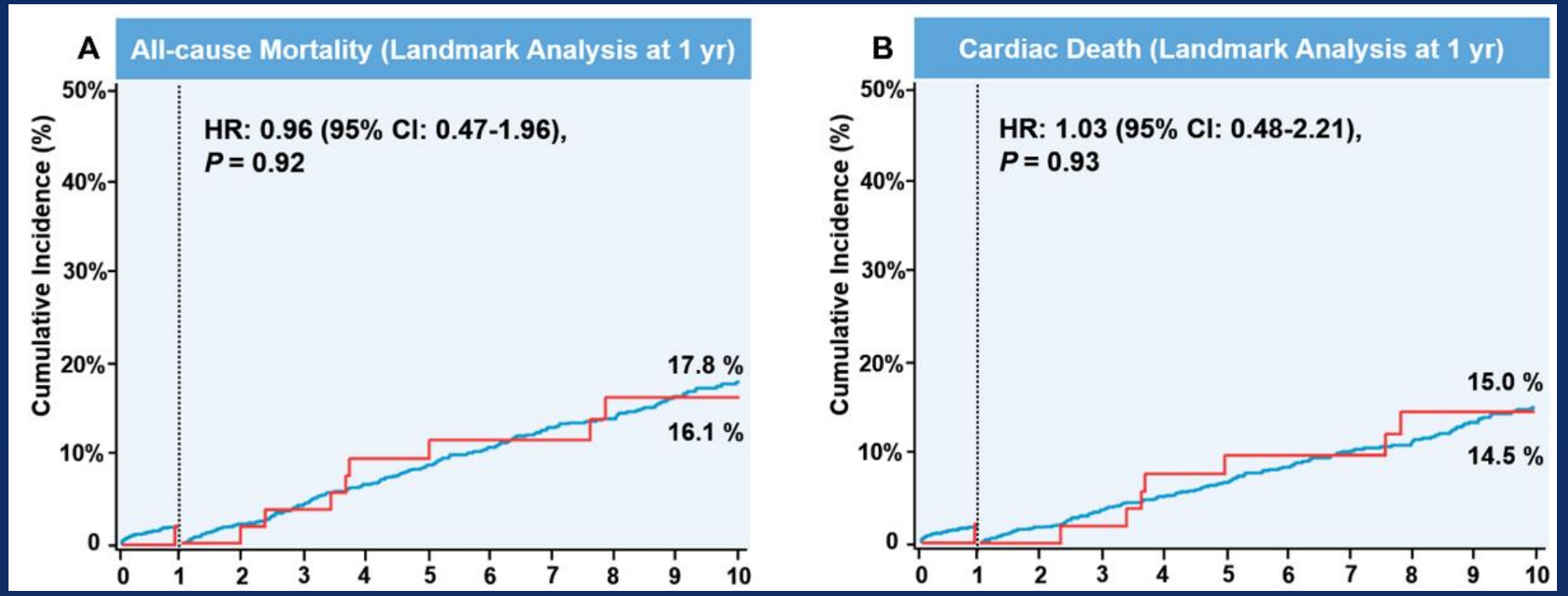
	Adjusted Model			
	All-cause Mortality		Cardiac Death	
Time-varying covariate	HR (95% CI)	P value	HR (95% CI)	P value
First TLR	**0.90 (0.50-1.63)**	**0.73**	**0.80 (0.41-1.59)**	**0.53**
TLR with CABG	**0.43 (0.05-3.46)**	**0.43**	**0.51 (0.06-4.24)**	**0.53**
Clinical characteristics				
Age ≥ 65 y	1.04 (0.76-1.42)	0.80	1.11 (0.79-1.57)	0.56
Male	1.21 (0.86-1.71)	0.27	1.03 (0.71-1.48)	0.88
Diabetes	1.05 (0.79-1.41)	0.73	0.97 (0.70-1.35)	0.86
Chronic renal failure	1.17 (0.51-2.69)	0.72	1.31 (0.48-3.53)	0.60
LVEF < 40%	1.80 (0.92-3.54)	0.09	1.99 (0.95-4.17)	0.07
Extent of diseased vessels	1.23 (0.23-6.54)	0.81	1.54 (0.29-8.08)	0.61
Syntax score risk (High)	1.21 (0.77-1.91)	0.40	1.43 (0.87-2.34)	0.16
Complete revascularization	1.00 (0.71-1.39)	0.98	1.00 (0.61-1.64)	0.80
IVUS use	1.00 (0.64-1.55)	0.99	1.00 (0.61-1.64)	0.99

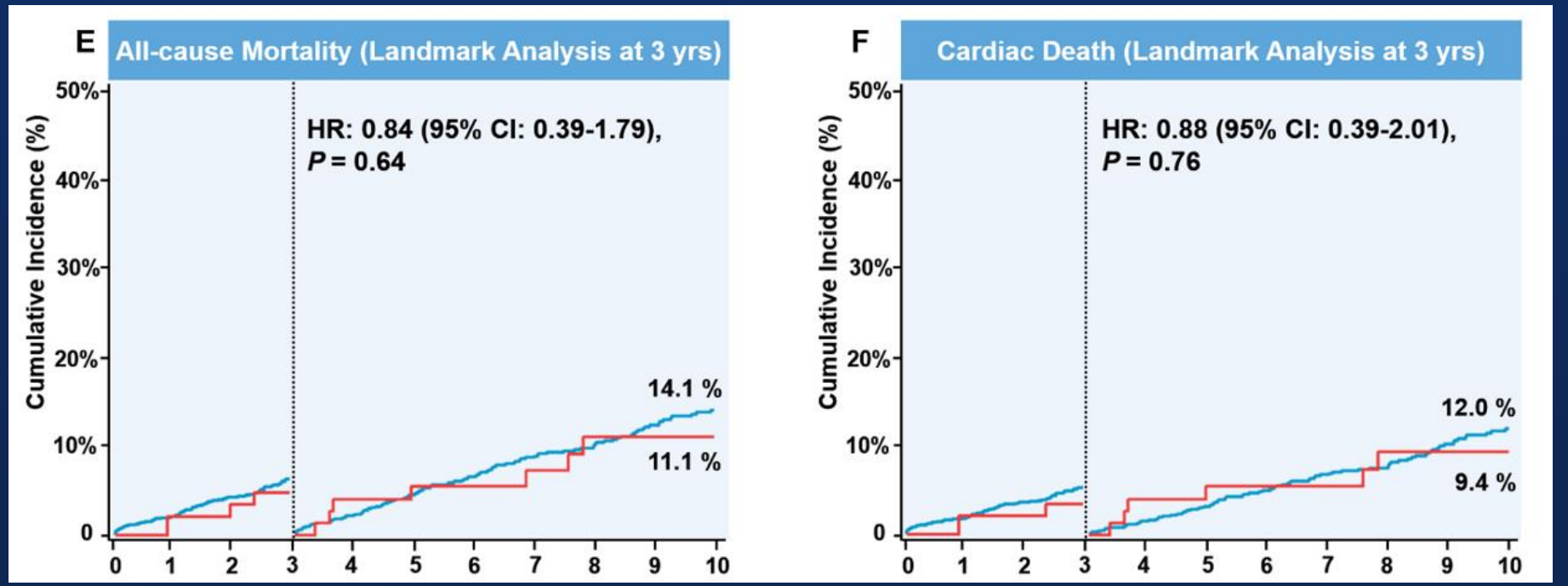
Adjusted Risk of Mortality According to Timing of TLR After Left Main PCI





- TLR presentation (soft outcome)
- With optimal subsequent treatment, an impact of TLR on mortality was not observed.


A
All-cause Mortality (Landmark Analysis at 1 yr)
HR: 0.96 (95% CI: 0.47-1.96),
P = 0.92
17.8 %
16.1 %
Cumulative Incidence (%)
B
Cardiac Death (Landmark Analysis at 1 yr)
HR: 1.03 (95% CI: 0.48-2.21),
P = 0.93
15.0 %
14.5 %
Cumulative Incidence (%)


E
All-cause Mortality (Landmark Analysis at 3 yrs)
HR: 0.84 (95% CI: 0.39-1.79),
P = 0.64
14.1 %
11.1 %
Cumulative Incidence (%)
F
Cardiac Death (Landmark Analysis at 3 yrs)
HR: 0.88 (95% CI: 0.39-2.01),
P = 0.76
12.0 %
9.4 %
Cumulative Incidence (%)

Revascularization Strategies and Presentation

	Total population (n=1397)	Presentation of TLR
Subjects with more than 1 TLR		
1 event	118 (8.4%)	
2 events	31 (2.2%)	
3 events	4 (0.3%)	
4 events	1 (0.1%)	
Strategies of 1st TLR		**SA (47, 39.8%)** UA (41, 34.7%) NSTEMI (4, 3.4%) **Positive thallium (25, 21.2%)**
With PCI	**95 (80.5%) ***	
With CABG	23 (19.5%) *	
Strategies of 2nd TLR		
With PCI	**24 (77.4%) ***	
PCI (1st TLR) → PCI (2nd TLR) †	24	**SA (13, 41.9%)** UA (10, 32.3%) NSTEMI (0, 0.0%) **Positive thallium (8, 25.8%)**
CABG (1st TLR) → PCI (2nd TLR) †	0	
With CABG	7 (22.6%) *	
PCI (1st TLR) → CABG (2nd TLR) ‡	7	
CABG (1st TLR) → CABG (2nd TLR) ‡	0	

Location and Mechanism of TLF event

Number of TLR episode	
Single	88 (74.6%)
Multiple	30 (25.4%)
Mechanism of 1st TLF	
Intimal hyperplasia	**82 (69.5%)**
Combined stent underexpansion and IH	36 (30.5%)
Medina classification of 1st TLF	
0-0-1	**60 (50.8%)**
0-1-0	18 (15.3%)
1-1-1	17 (14.4%)
0-1-1	8 (6.8%)
1-0-0	6 (5.1%)
1-1-0	6 (5.1%)
1-0-1	3 (2.5%)
Revascularization strategies for 1st TLR	
CABG	23 (19.5%)
PCI	95 (80.5%)

Key Messages

- LMCA-related TLR events occur steadily over a 10-year period, although there are differences in incidence density depending on the timing.

- The occurrence of TLR was not significantly associated with an increased risk of long-term all-cause or cardiac mortality, given that these patients were optimally revascularized.

- The prognostic impact of TLR on mortality was consistent irrespective of its timing.