

How to Manage LM ISR?

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Heart Institute, Asan Medical Center, Seoul, Korea**

Disclosure

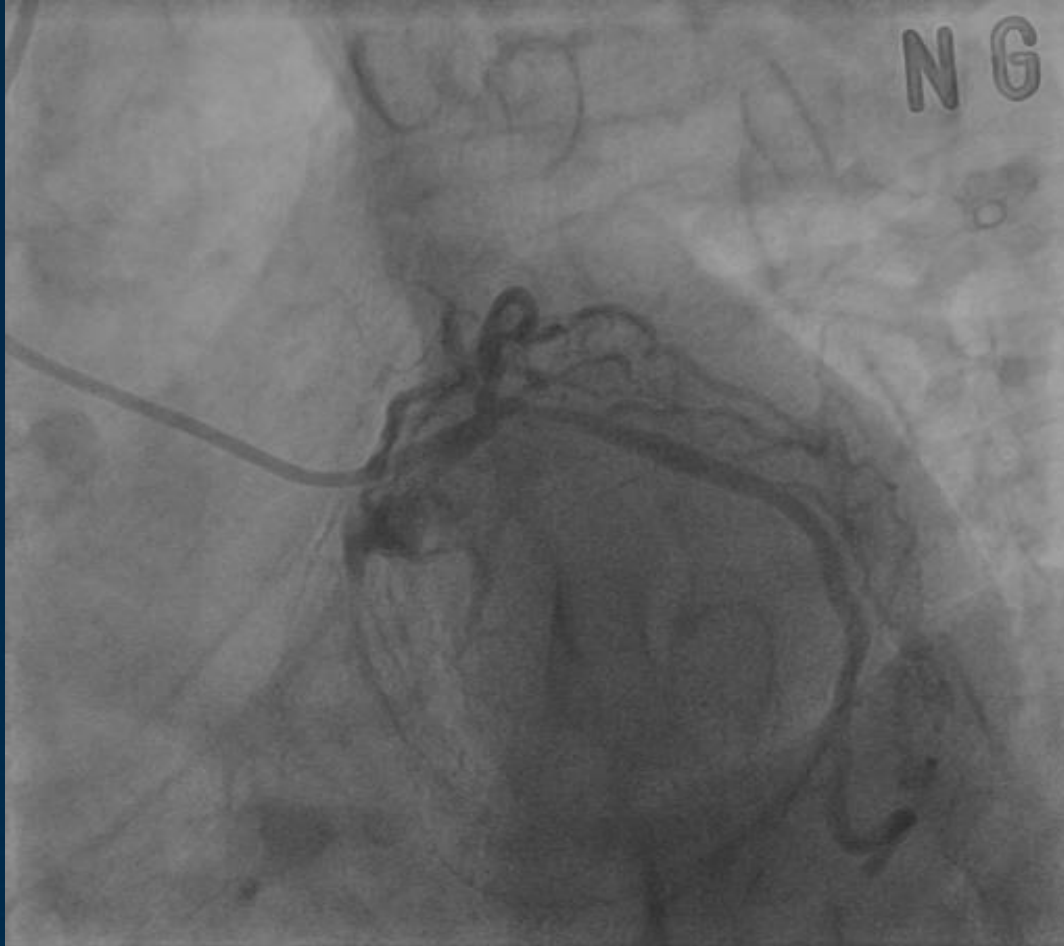
- I, Do-Yoon Kang, DO NOT have a conflict of interest related to this presentation.

Case

64 YO/Male

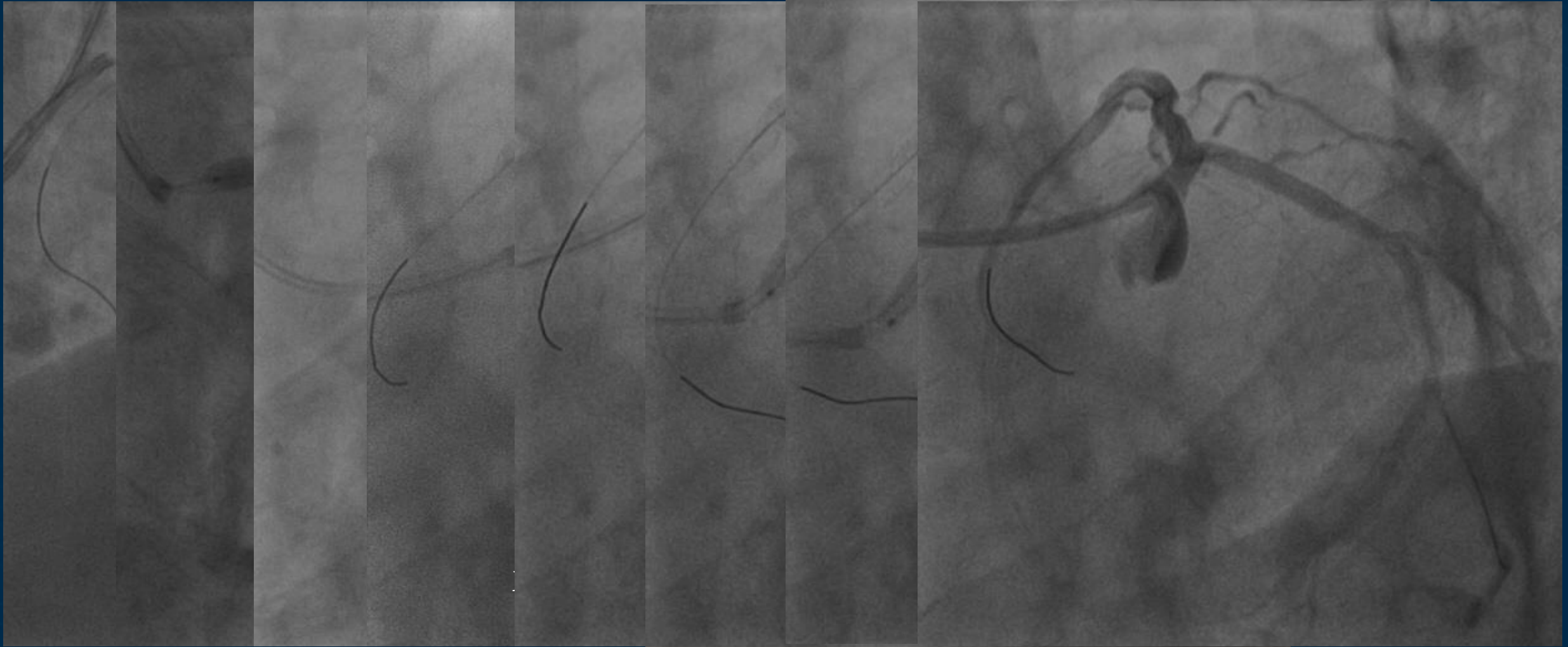
- **CC: Resting Chest Pain**
- **Previous PCI: distal LM bifurcation stenting, 1 yr ago at other hospital**
- **Risk factor: DM**
- **Cardiac enzyme: not elevated**
- **Normal EF without regional wall motion abnormality**

Initial CAG

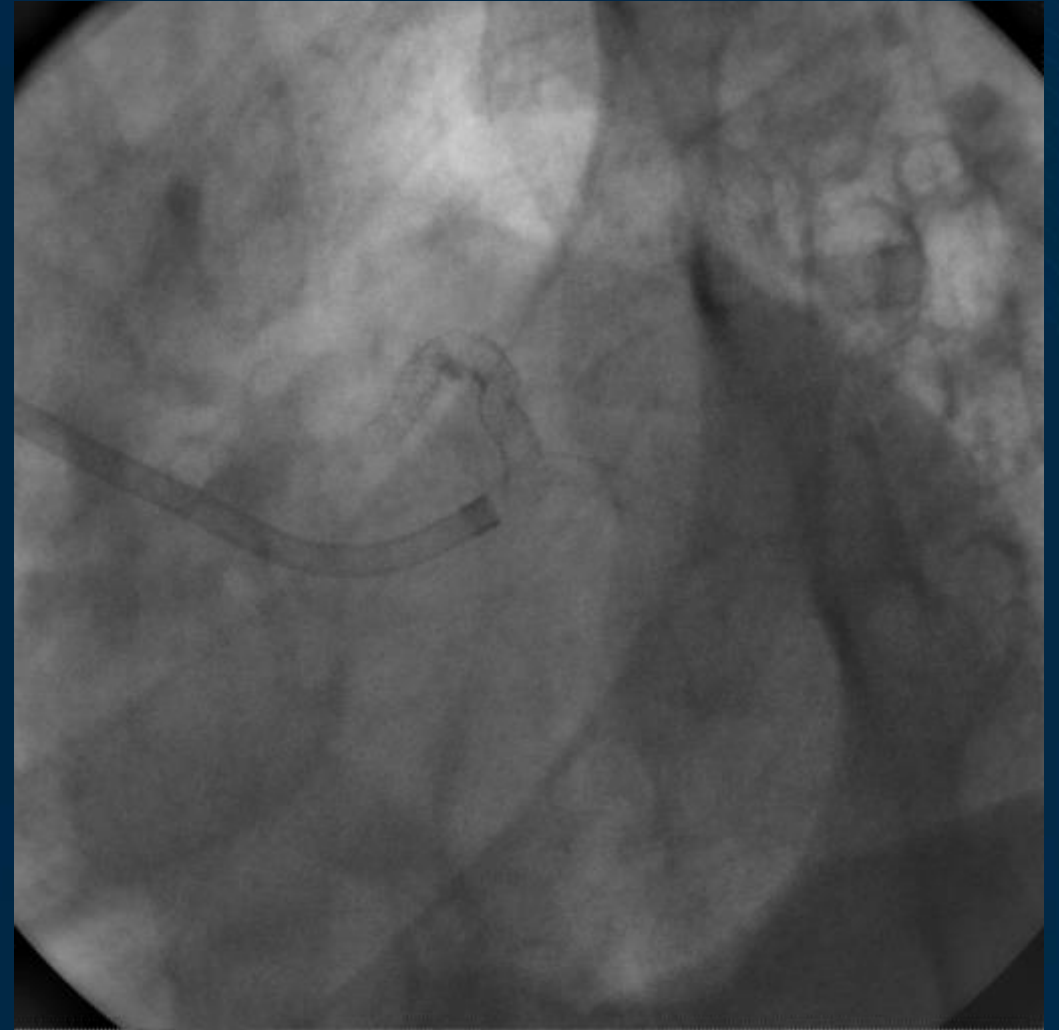
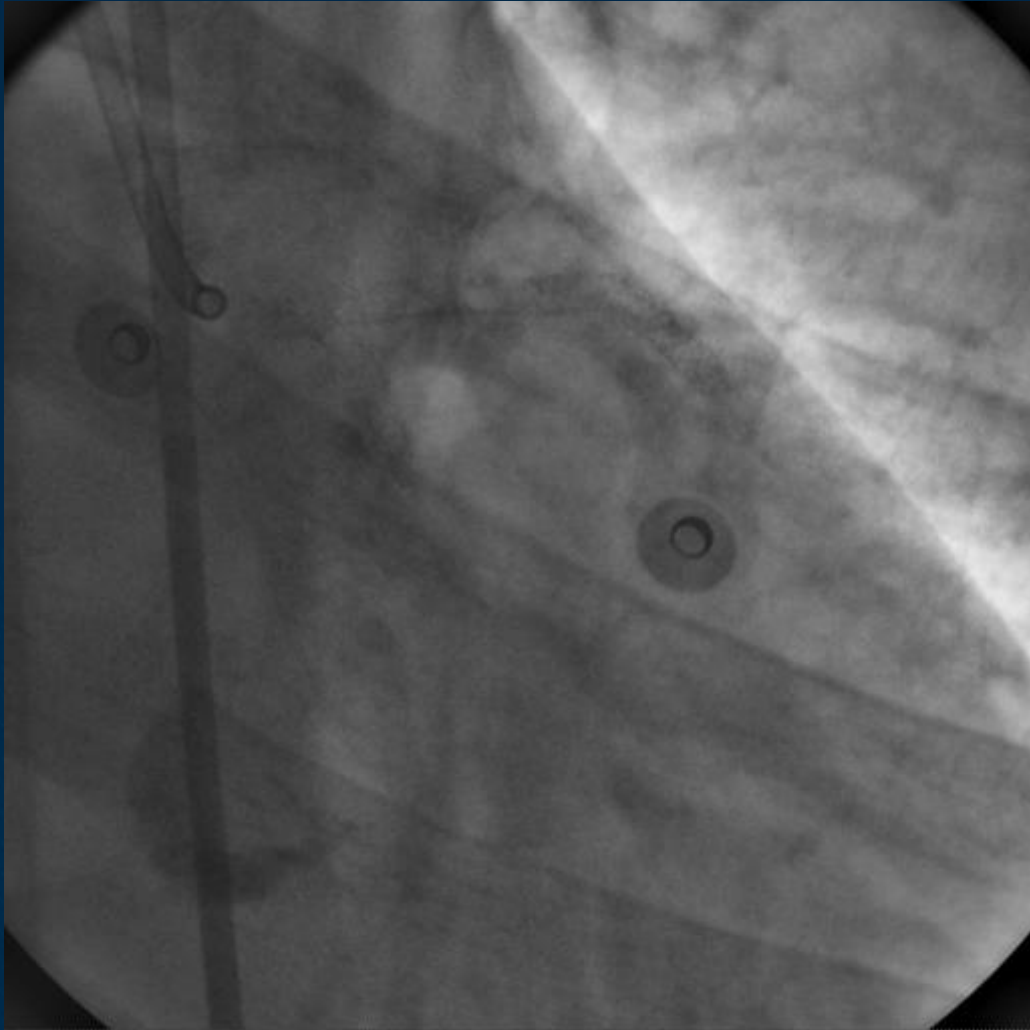


Distal Left Main Bifurcation Stenosis

Initial PCI Procedure

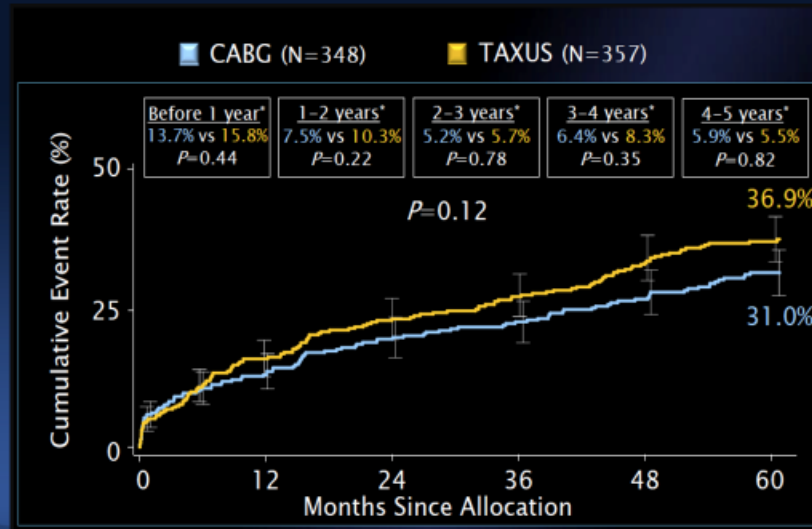


CAG after 1 year



LM Subgroup From SYNTAX (TAXUS)

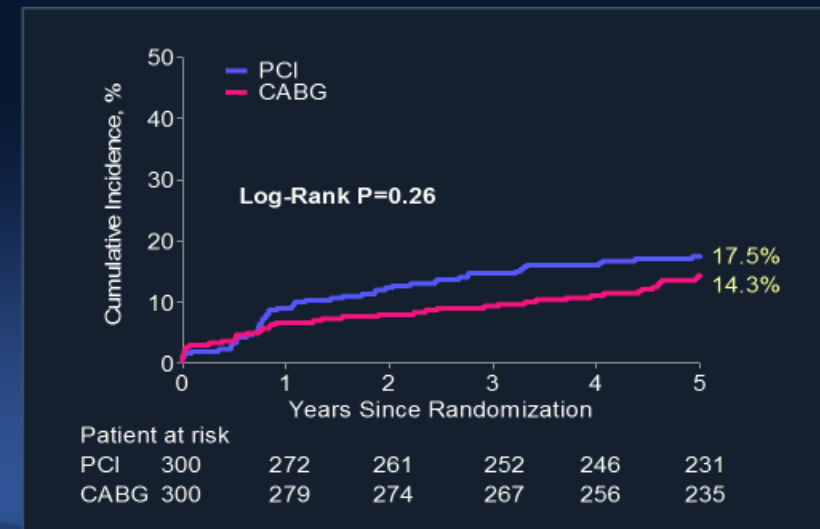
Primary End Point (Death, MI, Stroke, or RR)



Circulation. 2014 Jun 10;129(23):2388-94

PRECOMBAT (CYPHER)

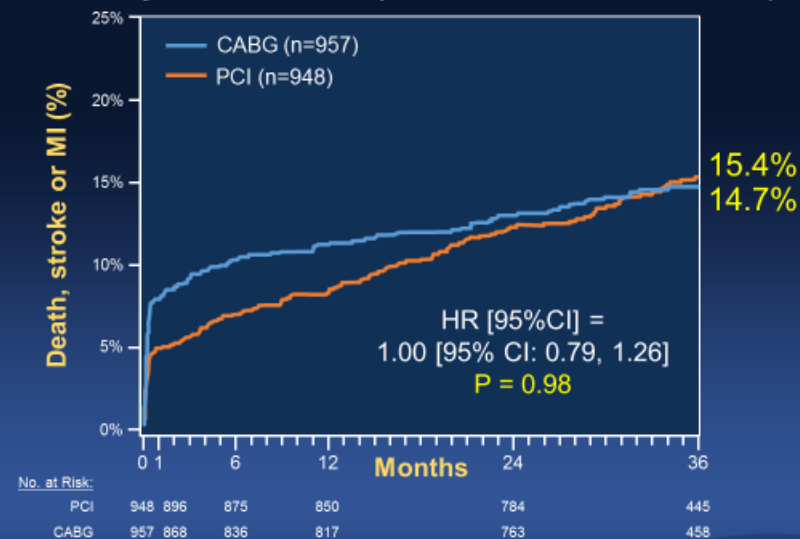
Primary End Point (Death, MI, Stroke, or iTVR)



Ahn JM, Roh JH, Park SJ et al. J Am Coll Cardiol. 2015;65(20):2198-206

EXCEL (XIENCE)

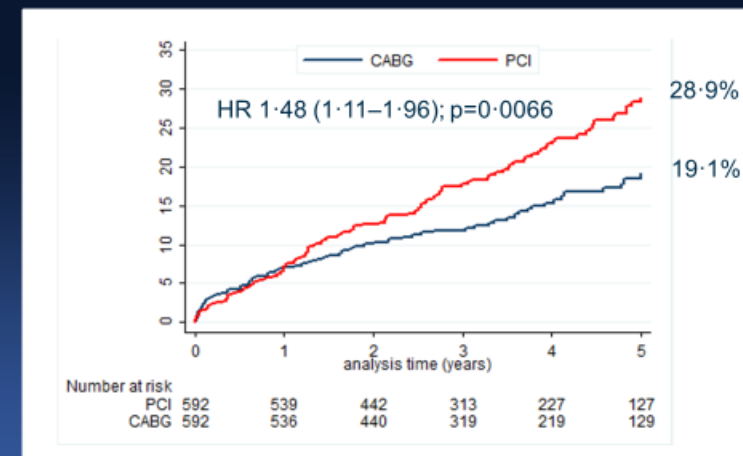
Primary End Point (Death, MI, or Stroke)



Stone GW et al. N Eng J Med 2016 ePub

NOBLE Trial

Primary End Point (Death, MI, Stroke, or RR)

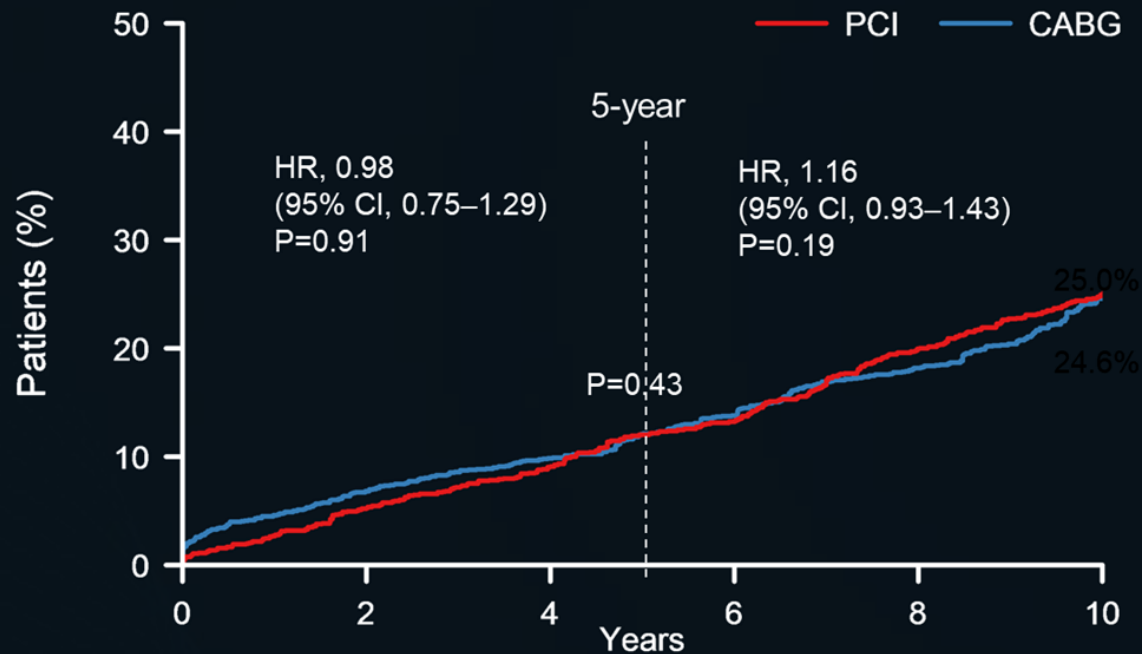


Makikallio T et al. Lancet 2016 ePub

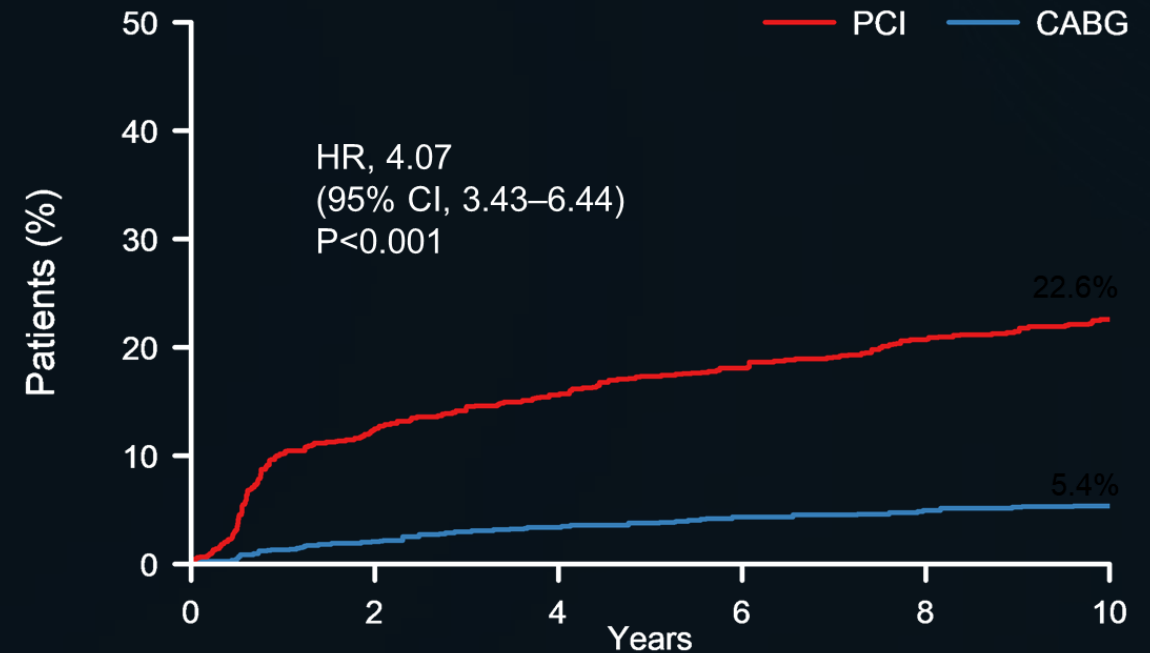
MAIN-COMPARE 10 Year Follow-up

Death, Q-MI, or Stroke

TVR



Number at risk						
PCI	1102	1044	1002	956	882	827
CABG	1138	1060	1026	981	931	857



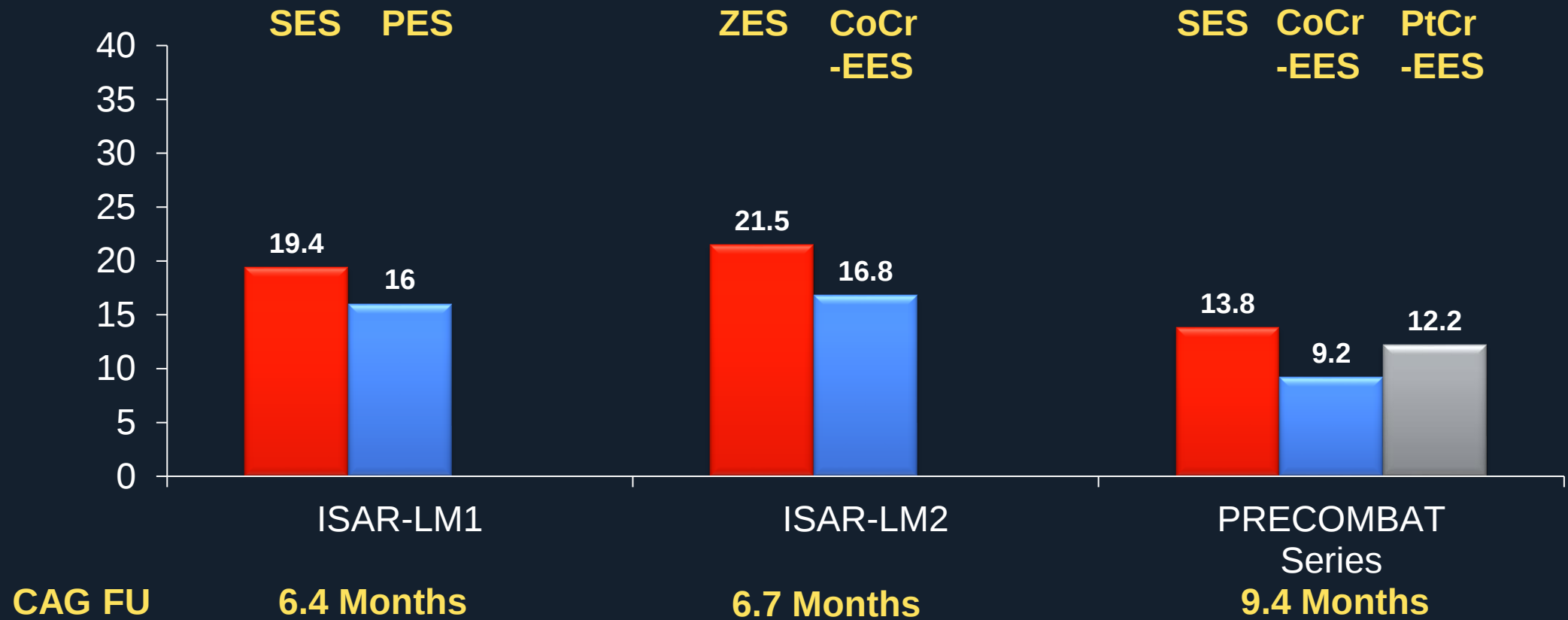
Number at risk						
PCI	1102	920	854	793	724	667
CABG	1138	1052	1011	958	910	840

Current Evidence of LM ISR : *Limited*

Study name or author Years	Numbers of ISR cases	Number of Total Patients	DES at the first procedure	Routine FU Angiography	Incidence of restenosis	Treatment of LM-ISR	Follow-up period (months)	Overall MACE
FAILS Imad Sheiban et al. JACC, 2009	70	718	SES PES ZES	46%	9.7%	Medical treatment 5.7% CABG 10% PCI 84.3% DES 48.6% BMS 1.4% POBA 31.4% Rotational Atherectomy 2.9%	27 ± 15	25.7% (CV death 6%)
JY Lee et al. JACC, 2011	71	402	SES PES ZES	100%	17.7%	Medical treatment 29.6% CABG 14.1% PCI 56.3% DES 25.9% POBA 30.4%	A median of 32	13.4% (CV death 0%)
MITO Kensuke Takagi et al. Circ Interv, 2012	92	474	SES PES ZES	100%	19.4%	CABG 8.7% PCI 91.3% DES 44.6%, POBA 46.7%	A median of 24	38.2% (CV death 5.1%)
CORPAL Soledad Ojeda et al. JACC Interv, 2014	79	1102	SES PES ZES EES	Not recommended	7%	CABG 5% PCI 95% DES 79% POBA 16%	46 ± 26	22%
Gianluca Rigatelli et al. Cardiovasc Revasc Med, 2014	14	89	ZES EES	100%	15.7%	PCI 100% DES 21% BMS 21.4% POBA 42.9% DEB 53.6%	39 ± 24	28.5%
Cardiogroup III Fabrizio D'Ascenzo et al. AJC, 2017	51	1270	BES ZES EES	50%	3.7%	Medical treatment 8% PCI 91% POBA & FKB 17% DES 60% (30% MV, 30% SB) DEB 14%	650 days	CV death 4%
WC Lee et al. Int Heart J, 2018	104		DES BMS			DES 28% DEB 72%	1 year	19.2%
ISAR-LEFT-MAIN 1/2 Jens Wiebe et al. JACC Interv, 2020	166	1001	SES PES ZES EES	100%	16.6%	CABG 10.3% PCI 89.7% POBA 41.6% DES 40.4% DEB 7.8%	5 years	All death 30.2%

Q1. Incidence of LM ISR

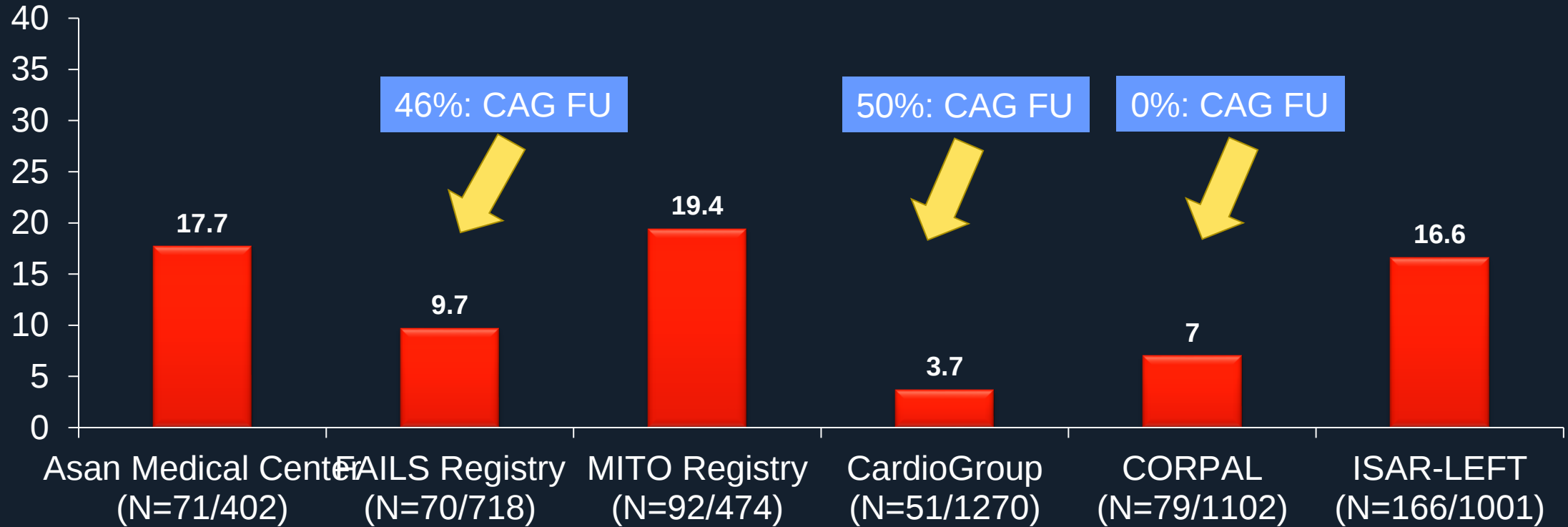
Routine Angiographic FU study



Q1. Incidence of LM ISR

10 ~20%

From LM ISR Registry



Sheiban et al. JACC 2009;54:1131-6

Tagaki et al. Circ Cardiovasc Interv. 2012;5:491-498

Lee JY et al. JACC 2011;57:1349-58

Fabrizio D'Ascenzo et al. Am J Cardiol 2017;119:978e982

Jens Wiebe et al. JACC Cardiovasc Interv. 2020;13(19):2266-2274

Current Evidence of LM ISR

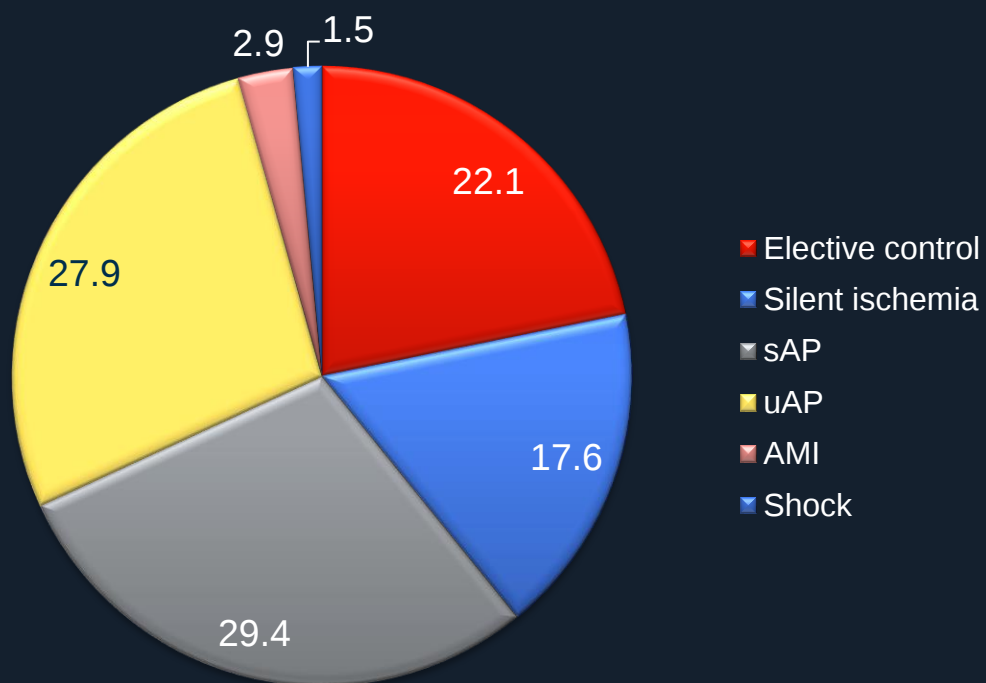
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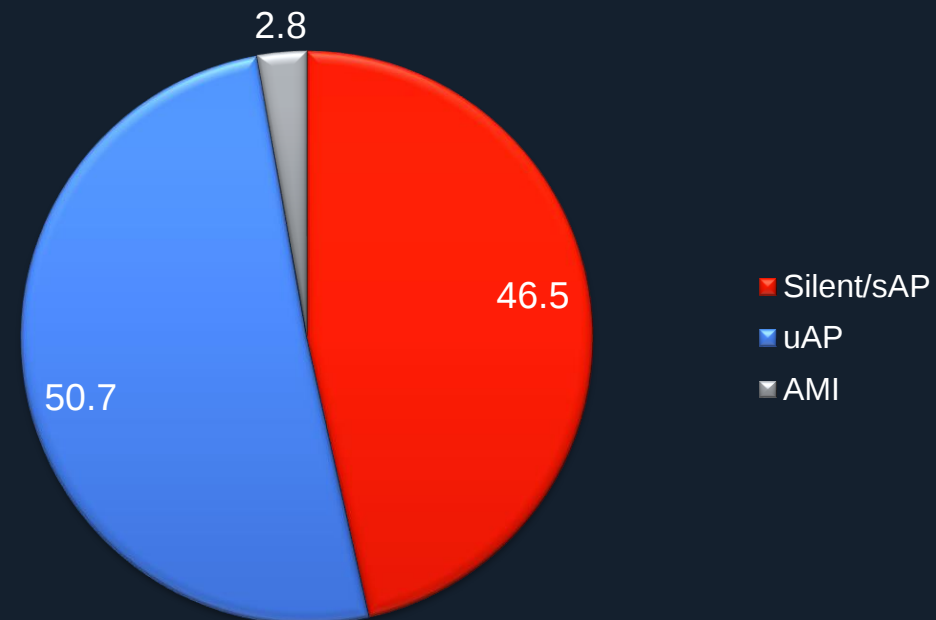
Q2. Clinical Presentation

FAILS Registry



Sheiban et al. JACC 2009;54:1131-6

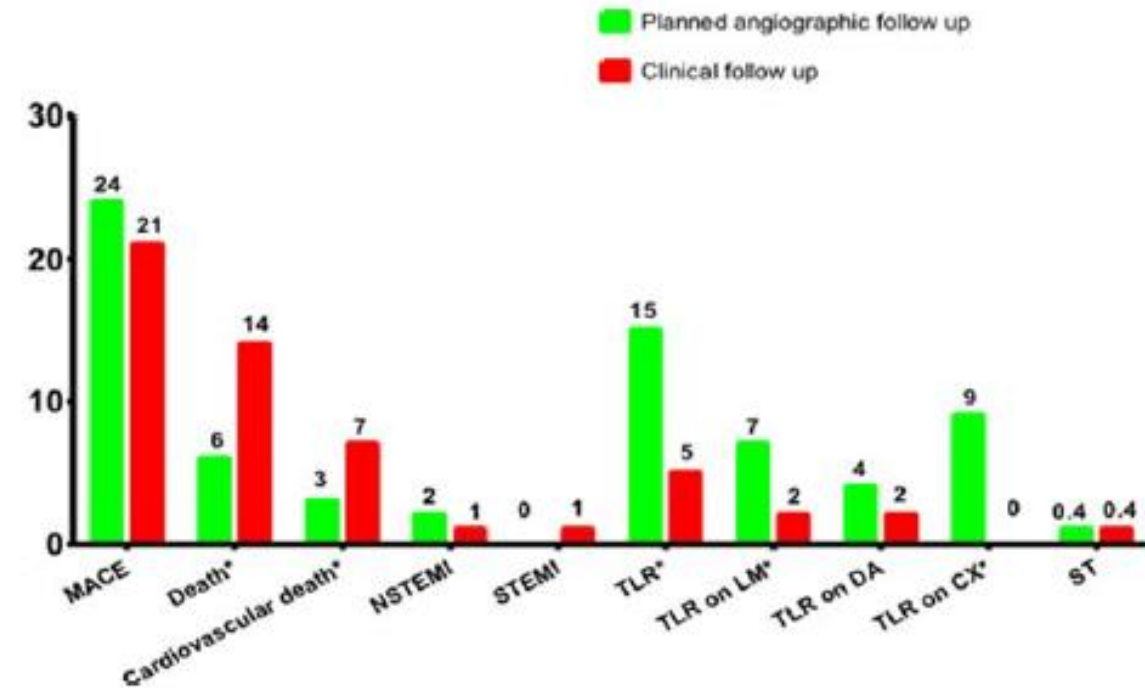
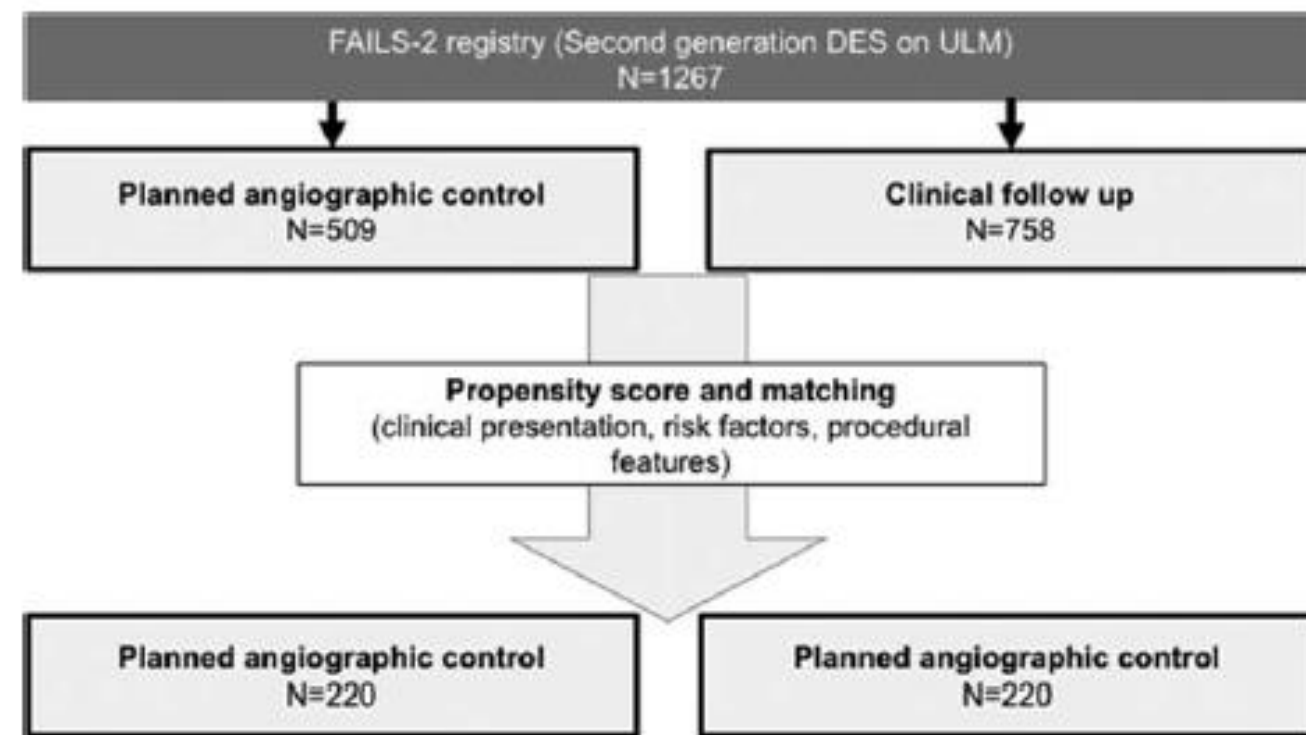
AMC Registry



Lee JY et al. JACC 2011;57:1349-58

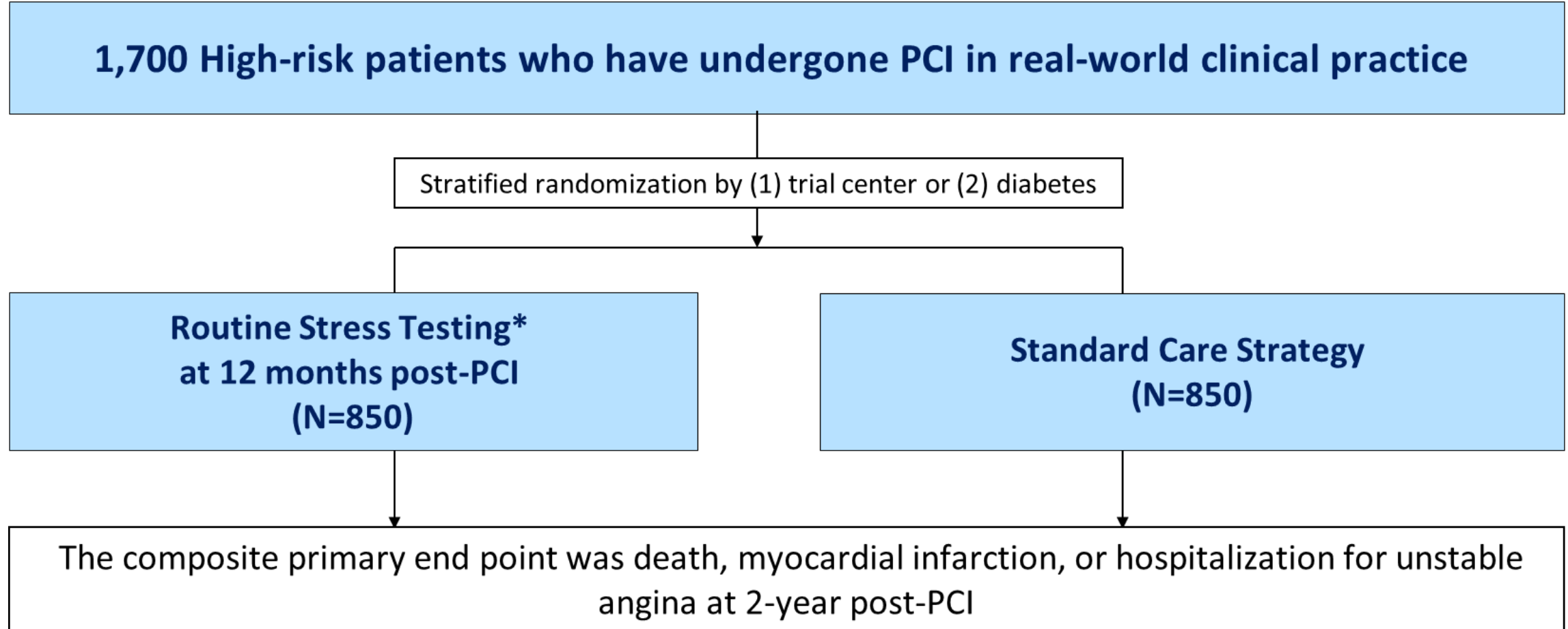
Do We Need Follow-up Angiography for LM PCI?

Angiographic FU vs. Clinical FU



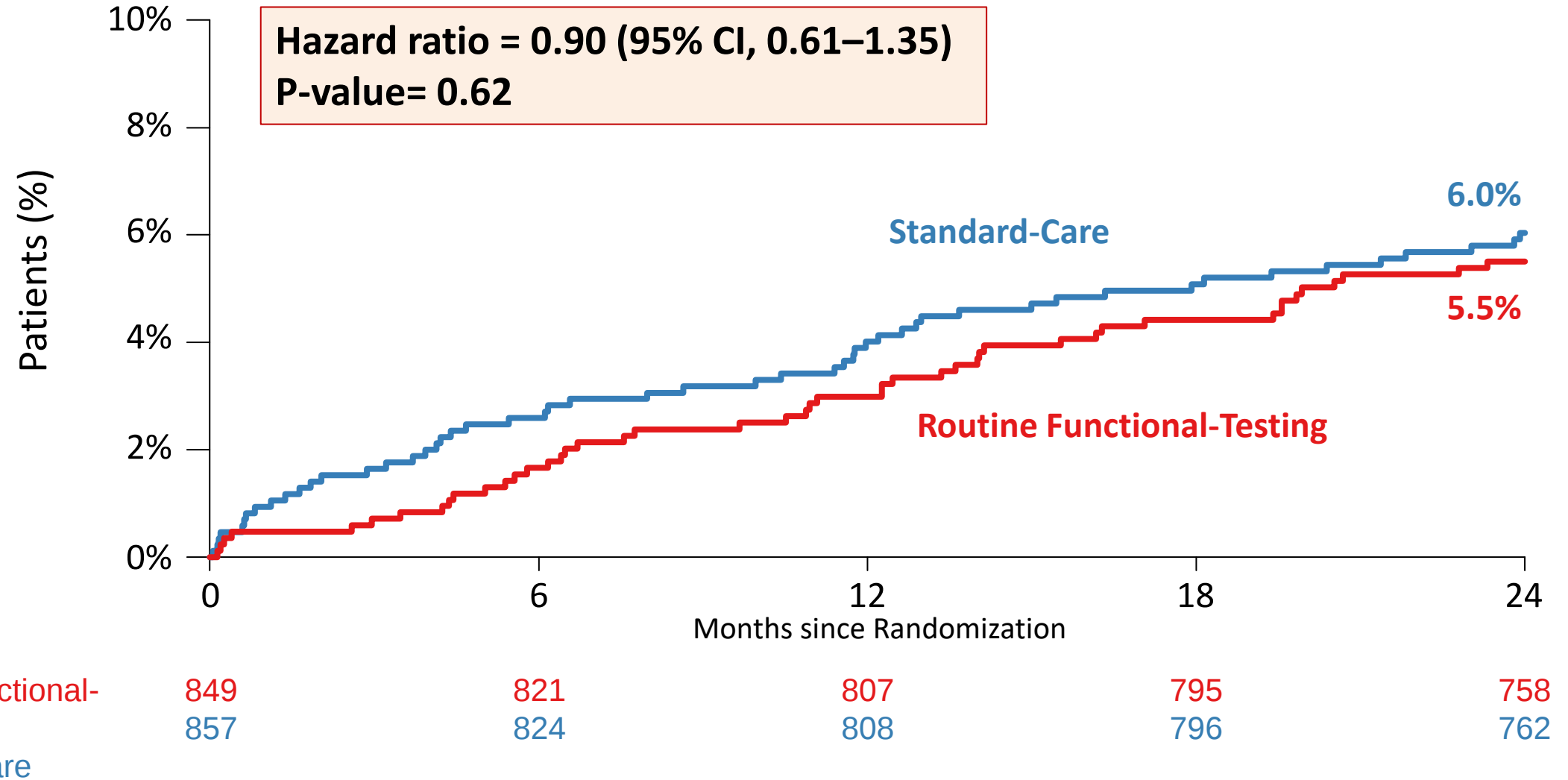
Pragmatic Trial Comparing Symptom-Oriented Versus Routine Stress Testing
in High-Risk Patients Undergoing Percutaneous Coronary Intervention

POST-PCI Trial



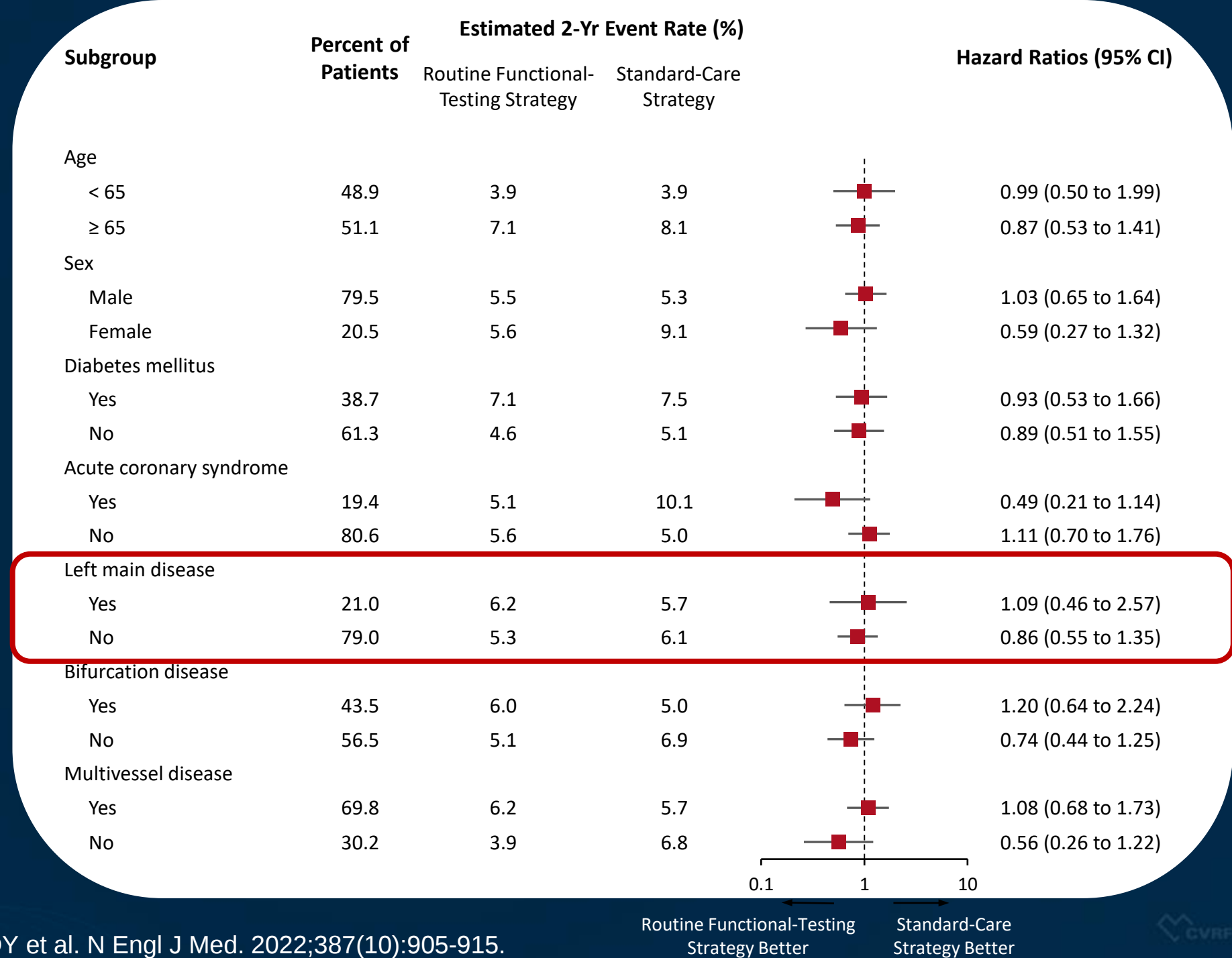
*Cardiac stress tests include exercise ECG, nuclear stress imaging, or stress echocardiography

Primary Outcome: Death, MI, Hospitalization for UA

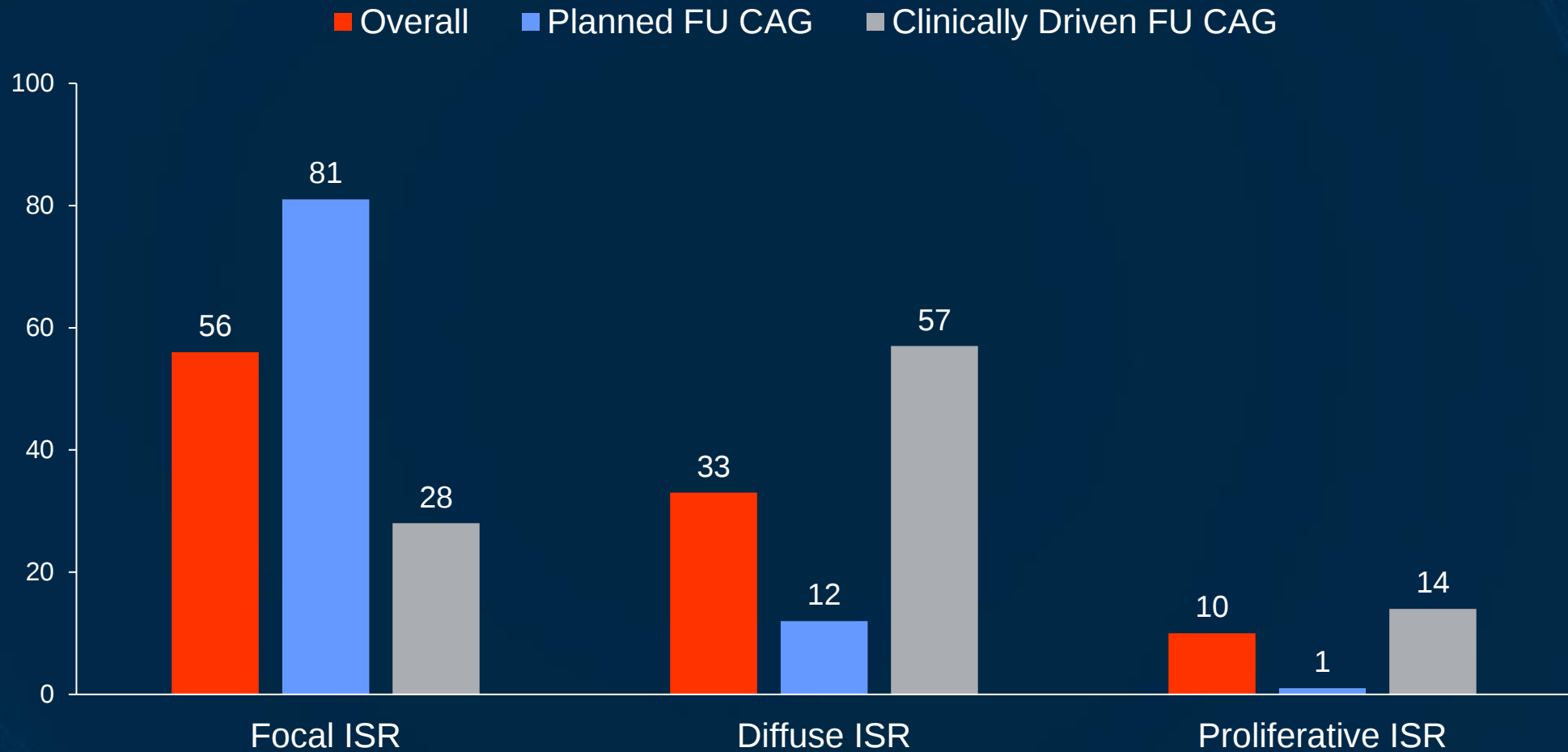


CI, confidence interval; UA, unstable angina

Prespecified Key Subgroups Analysis

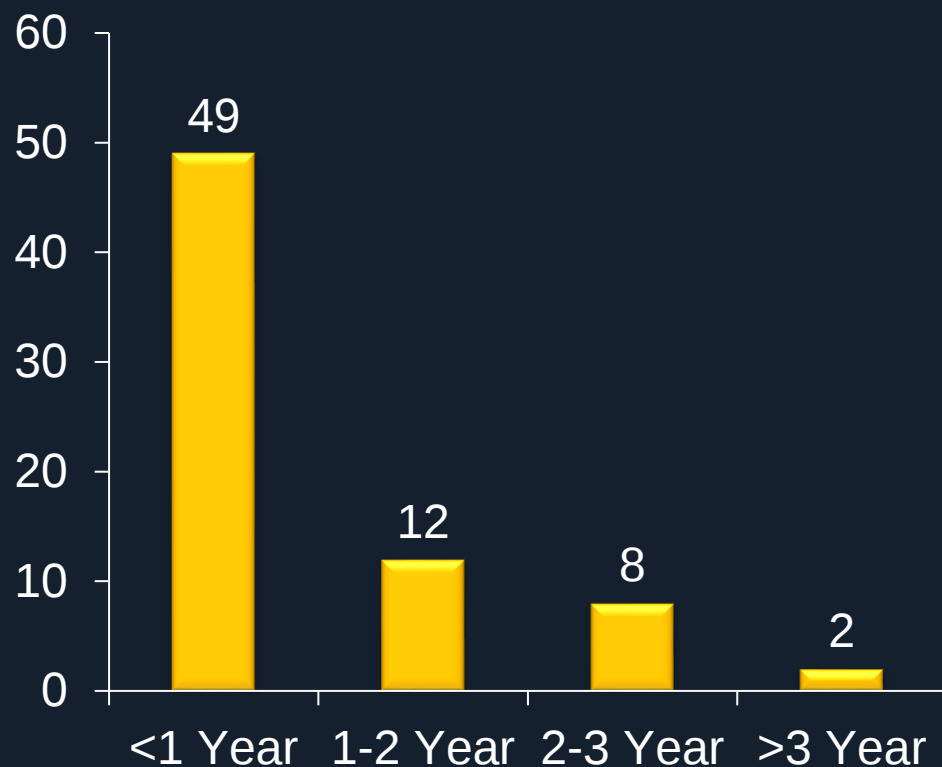


Q2. Angiographic Presentation

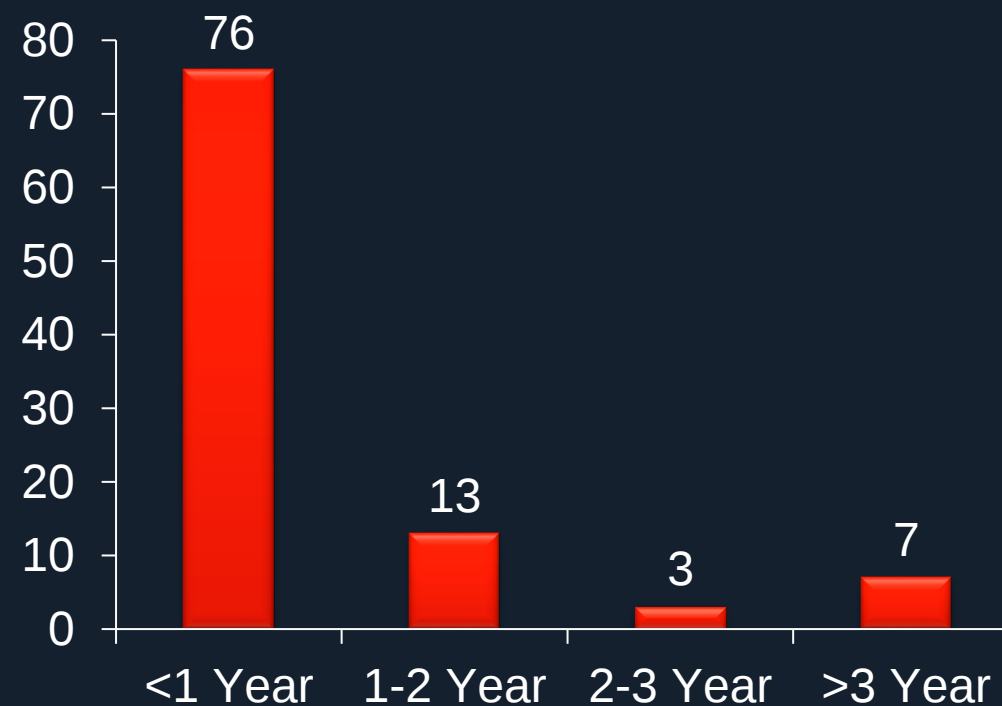


Q3. Timing of LM ISR

**AMC Registry
(N=71)**



**MITO Registry
(N=92)**



Lee JY et al. JACC 2011;57:1349-58

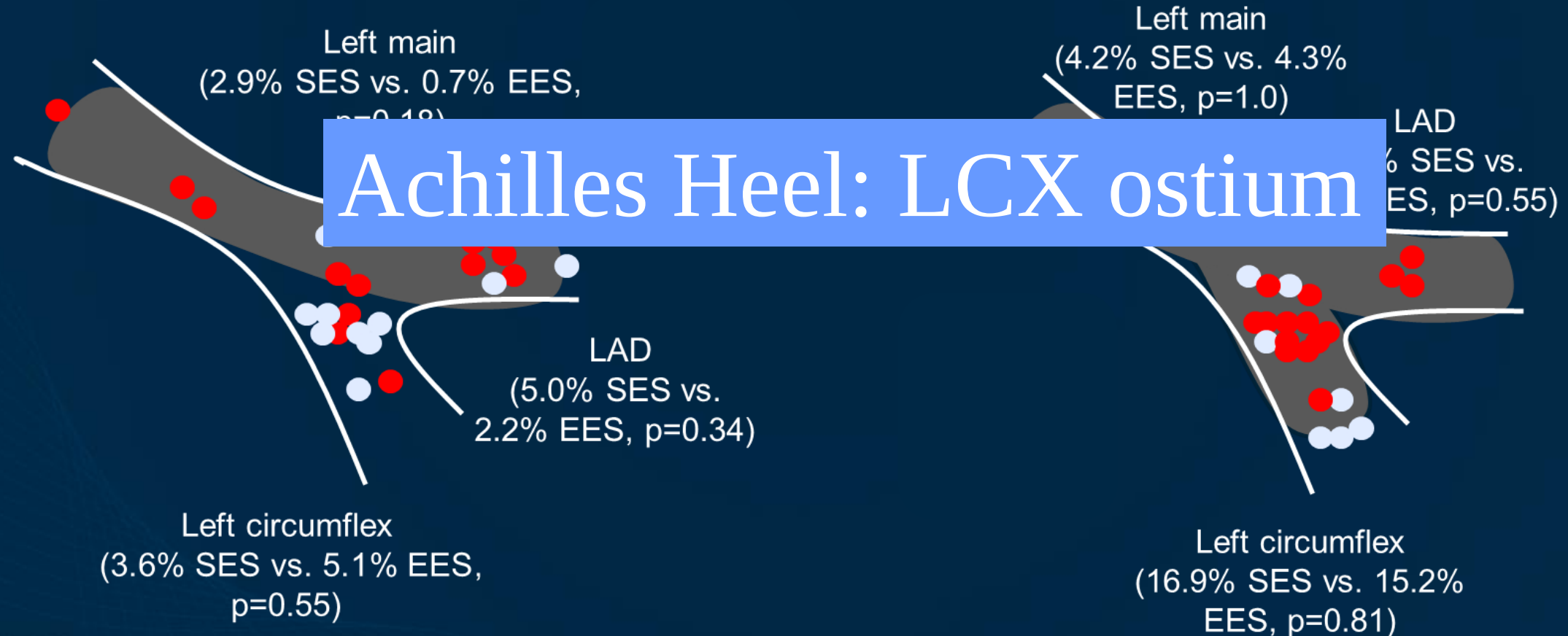
Tagaki et al. Circ Cardiovasc Interv. 2012;5:491-498

Q4. Location of LM ISR

PRECOMBAT-2

**Single-Stent Technique
(N= 139SES, 138EES)**

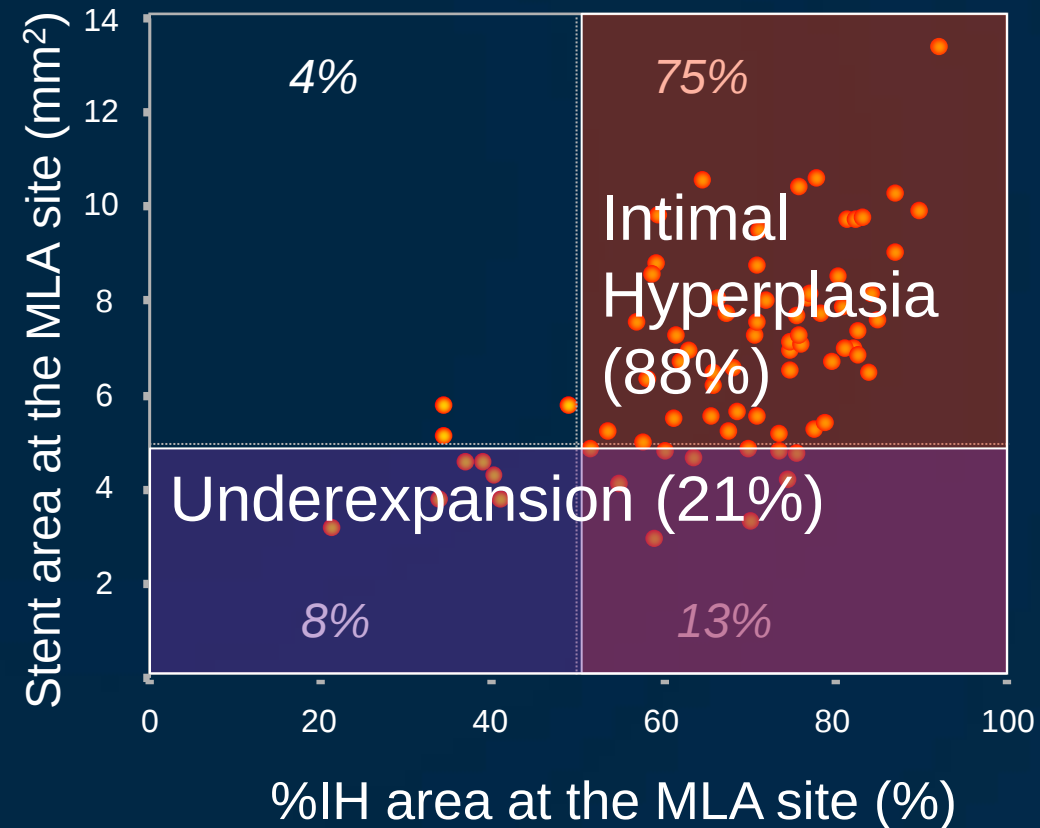
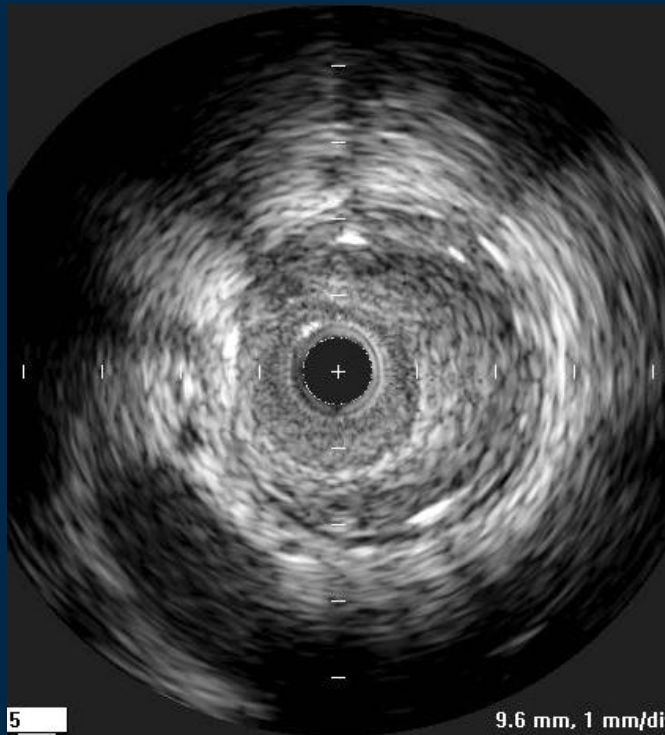
**Two-Stent Technique
(N= 71SES, 46EES)**



Q5. Mechanism of LM ISR **Not Well Evaluated, Yet**

Intimal Hyperplasia and Underexpansion

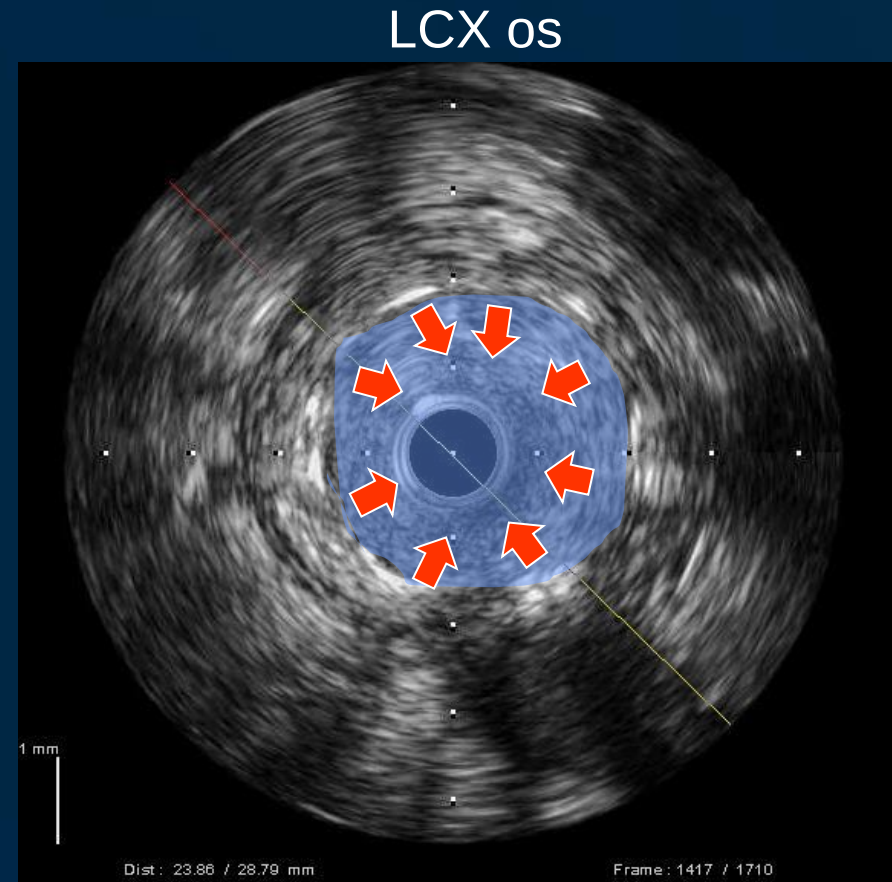
General Mechanism of ISR after DES Implantation



Q5. Mechanism of LM ISR

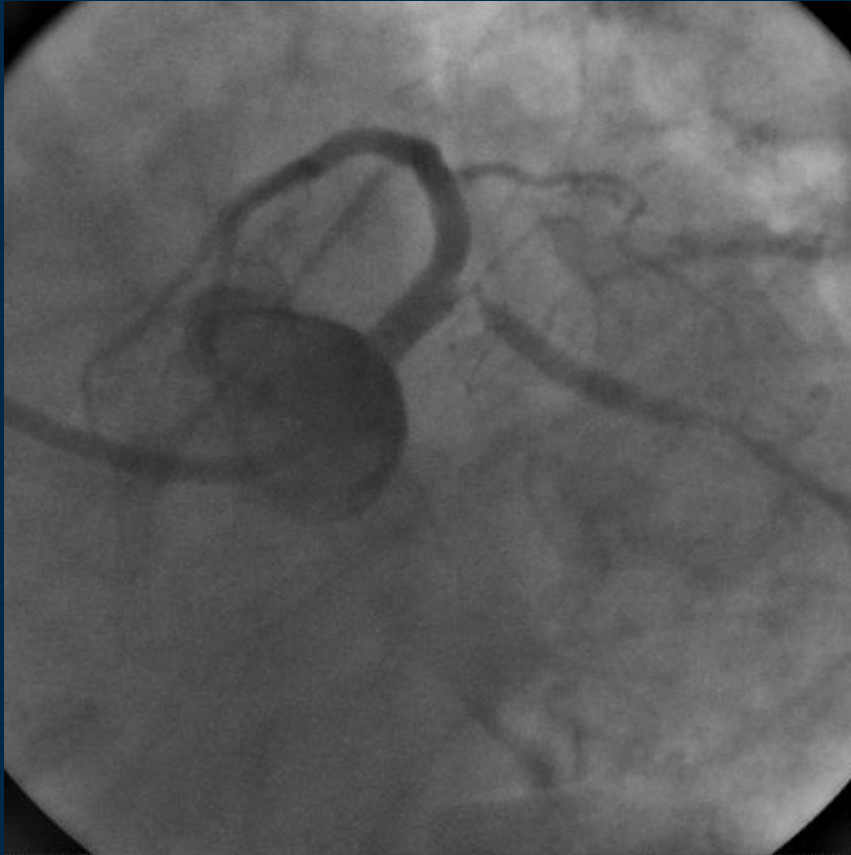


dLM bifurcation: Crushing Technique

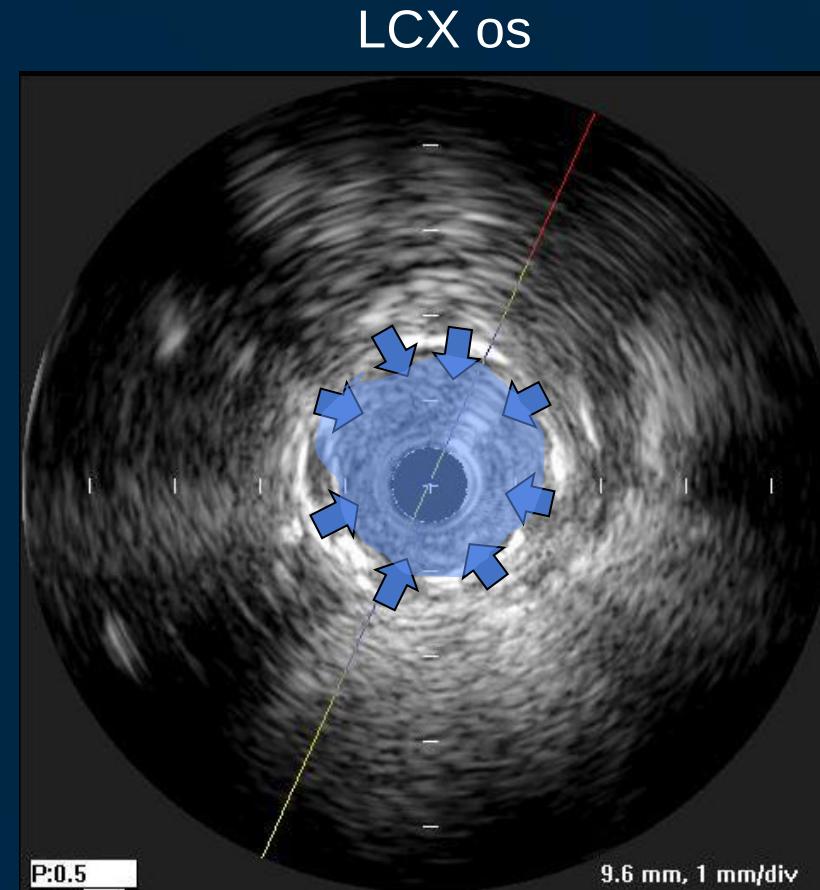


MSA: 9.8mm^2

Q5. Mechanism of LM ISR

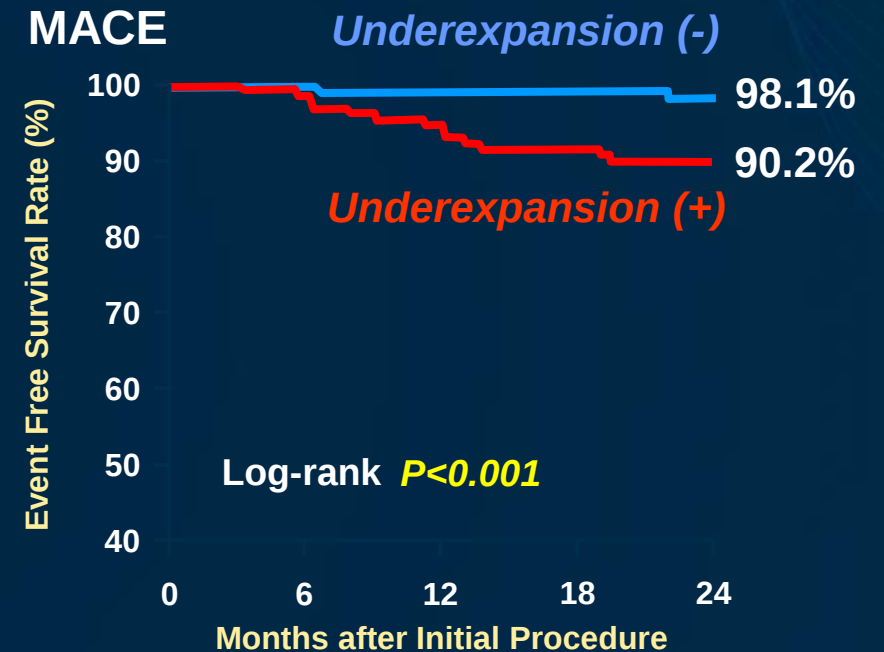
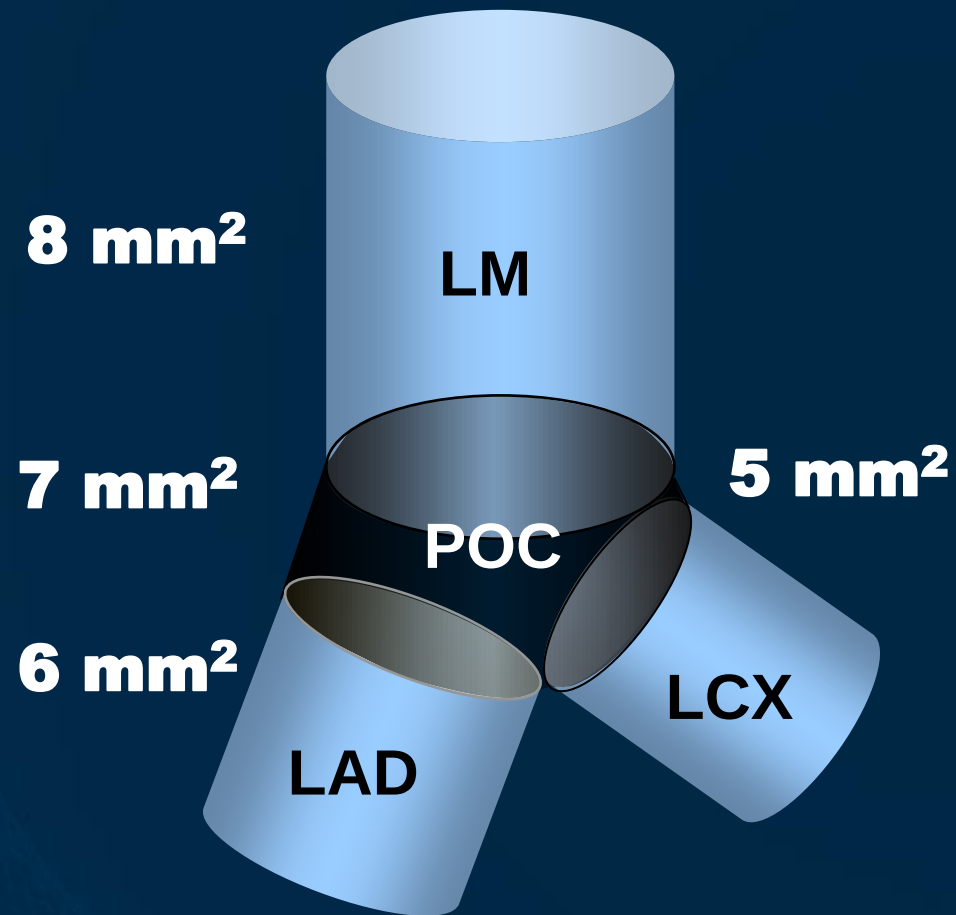


dLM bifurcation: Crushing Technique



MSA: 4.6mm²

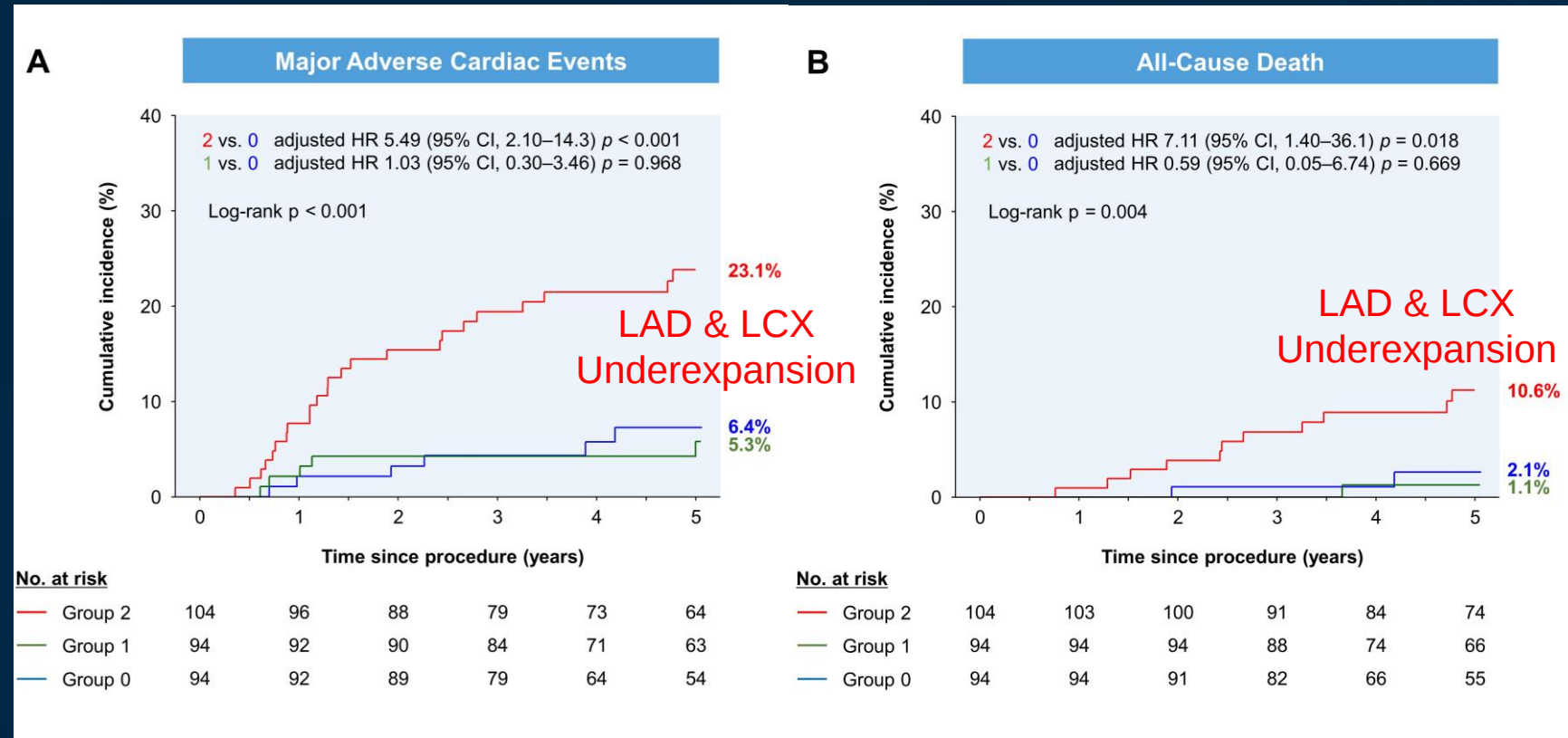
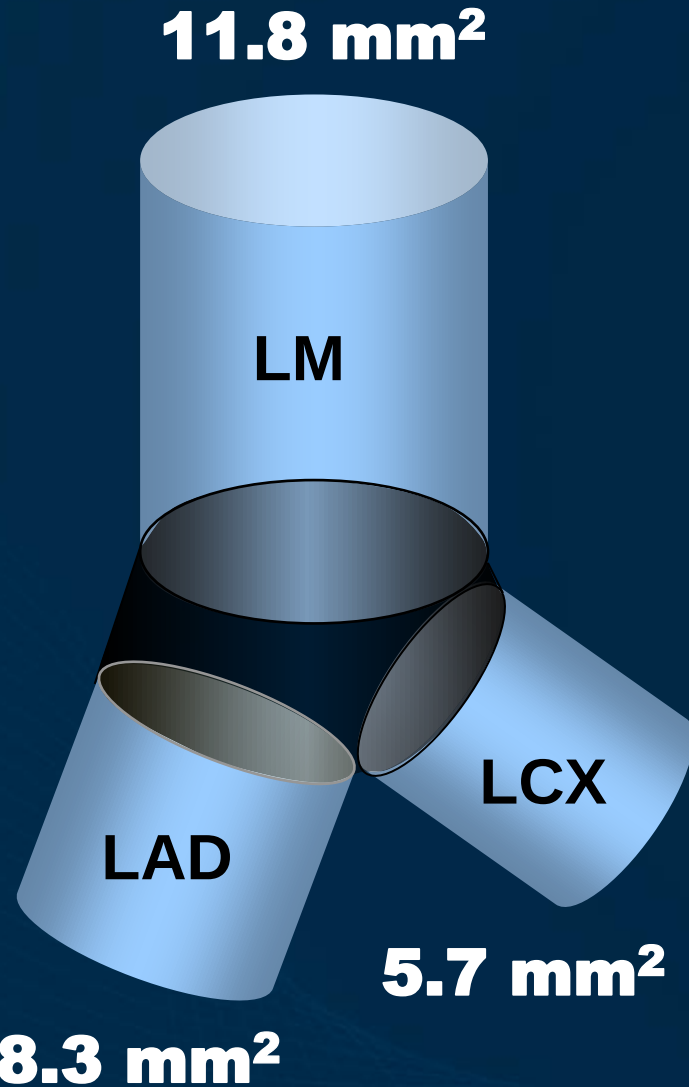
Q5. Mechanism of LM ISR



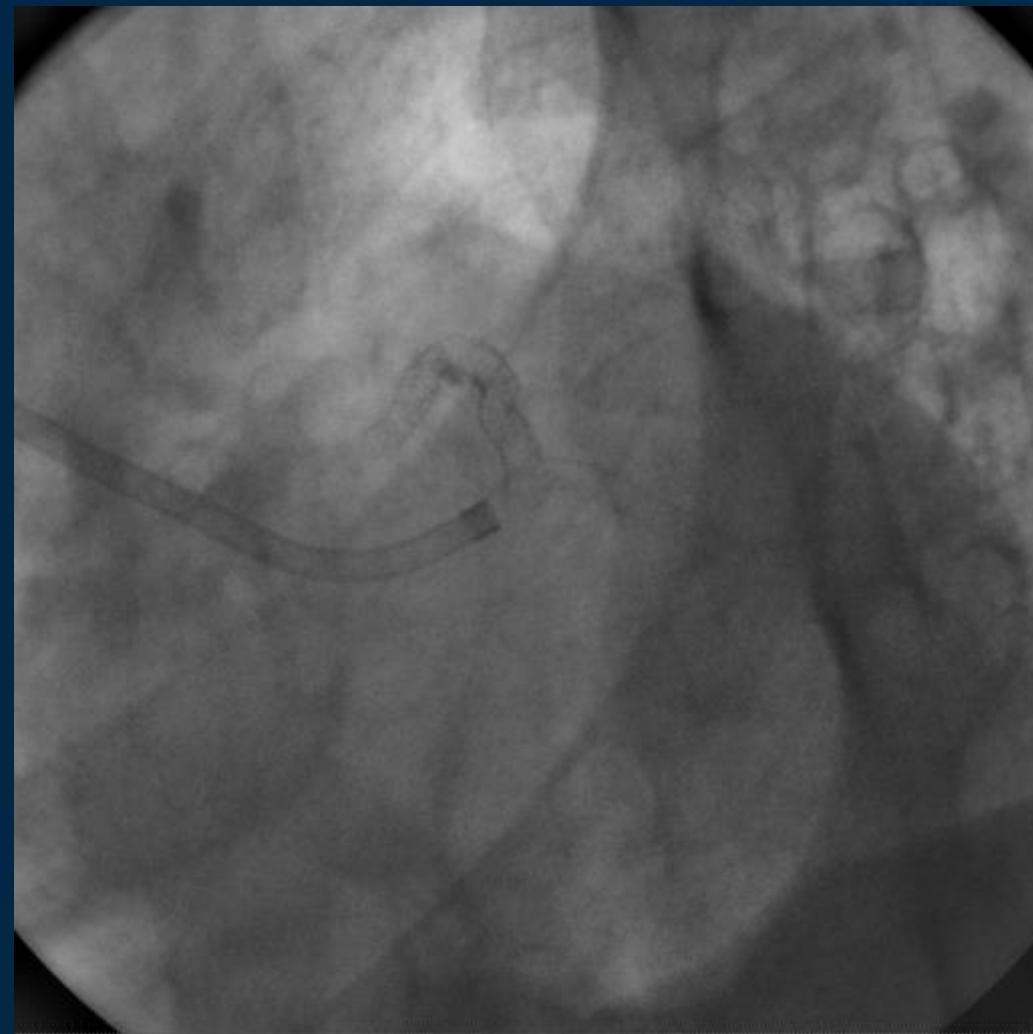
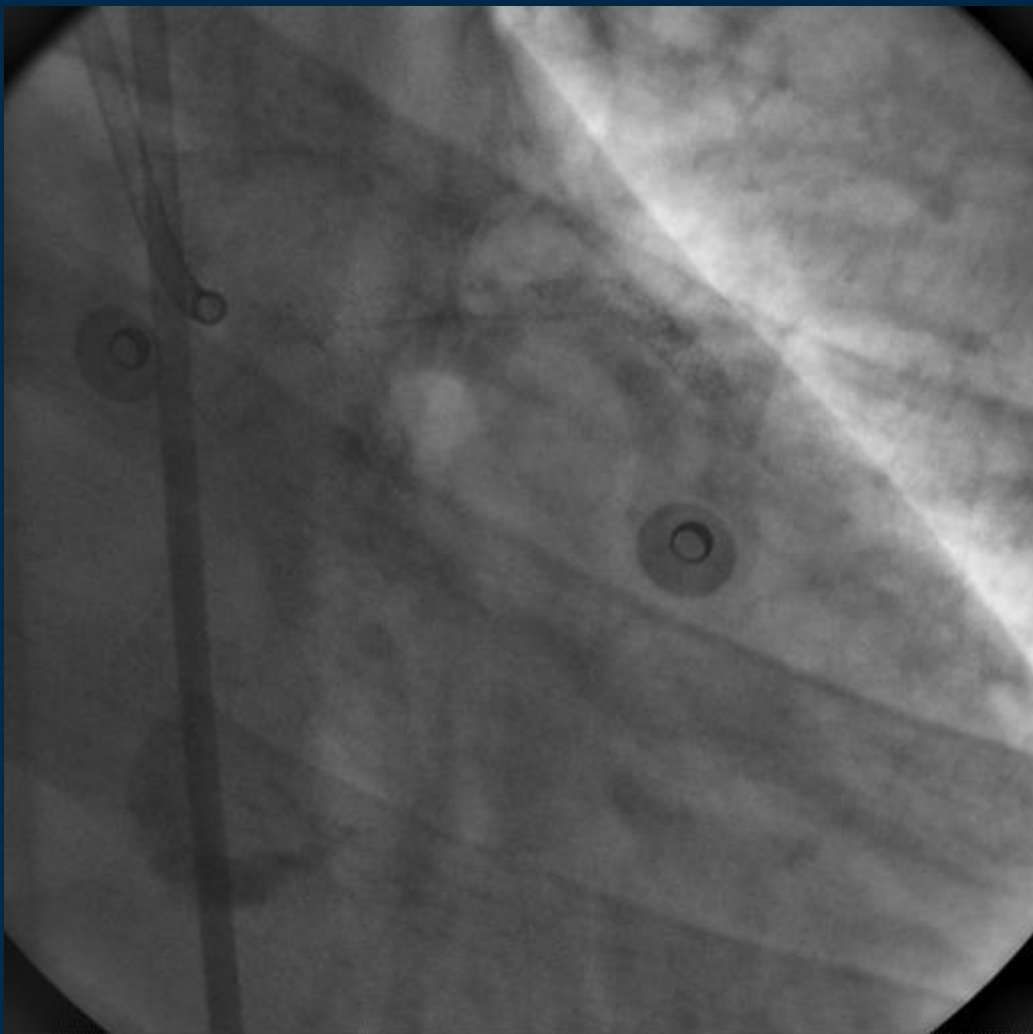
No. at risk

Underexpansion (+)	133	131	126	121	75
Underexpansion (-)	260	260	255	246	129

Q5. Mechanism of LM ISR



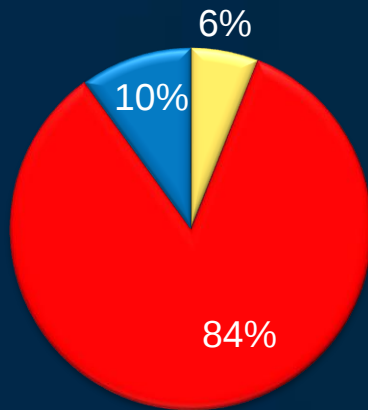
How to Treat ?



Q6. Treatment of LM ISR

FAILS Registry (N=70)

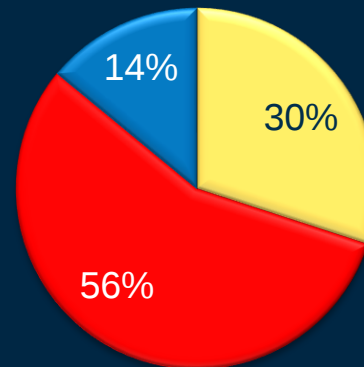
■ Medication ■ PCI ■ CABG



DES: 58%
POBA: 42%

AMC Registry (N=71)

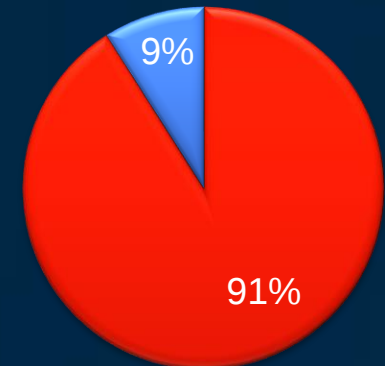
■ Medication ■ PCI ■ CABG



DES: 45%
POBA: 55%

MITO Registry (N=92)

■ PCI ■ CABG



DES: 49%
POBA: 51%

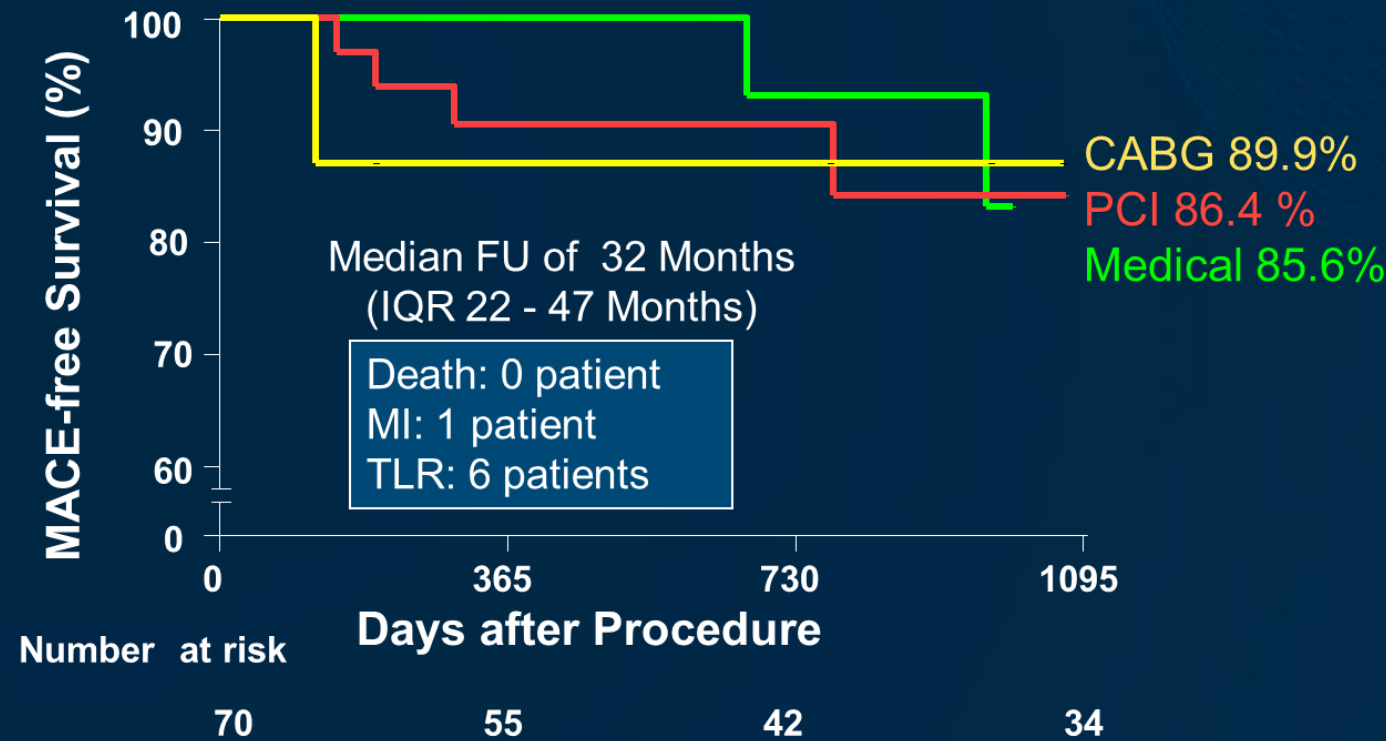
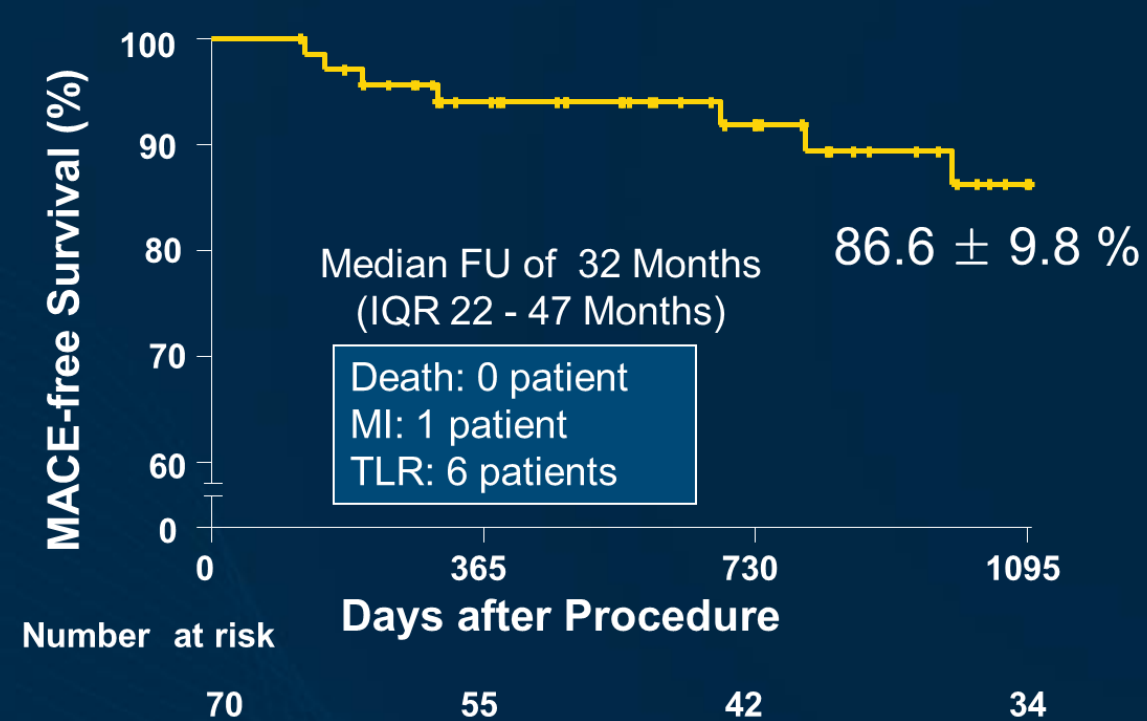
CABG was <10 % as an Initial Treatment of LM ISR

Q7. Clinical Outcomes of LM ISR

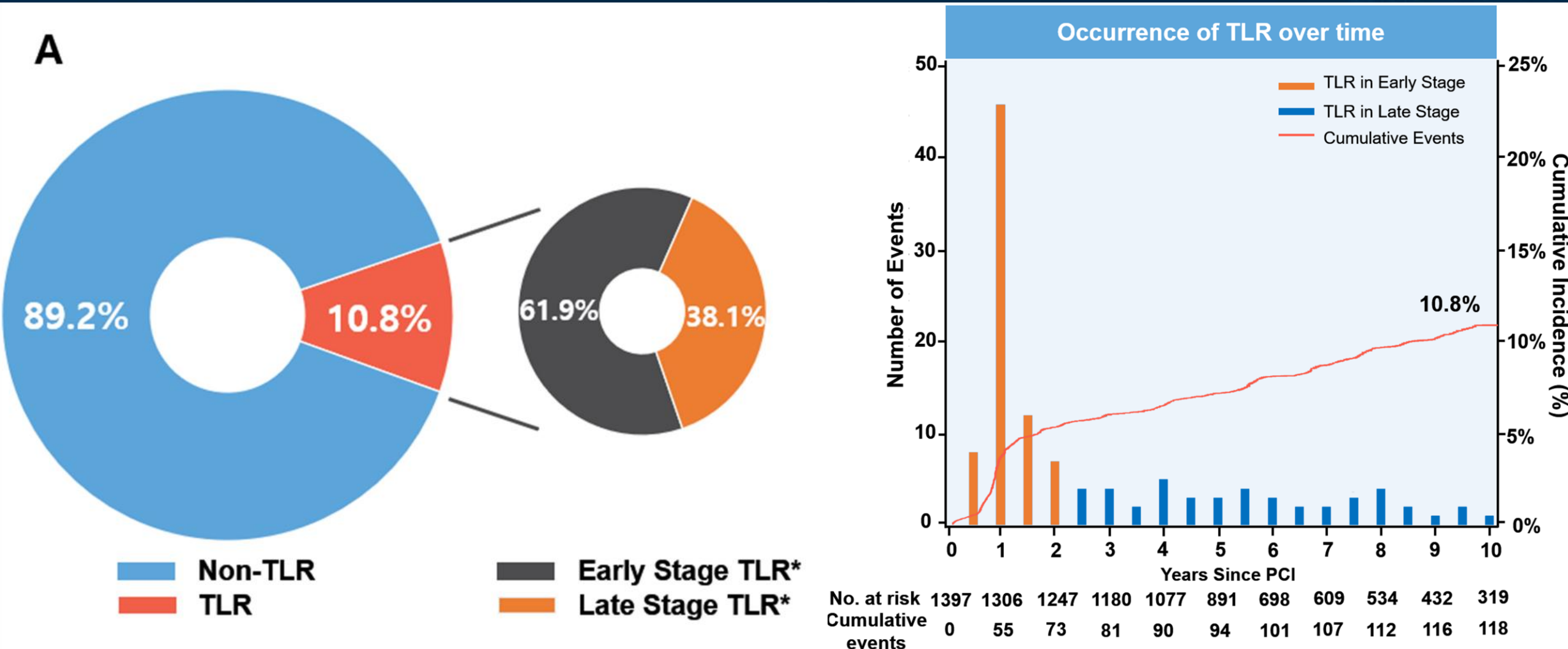
Q7. Clinical Outcomes of LM ISR								Follow-up period (months)	Overall MACE
Study	Imad Sheiban et al. JACC, 2009			PES ZES			CABG 10% PCI 84.3% DES 48.6% BMS 1.4% POBA 31.4% Rotational Atherectomy 2.9%	27 ± 15	25.7% (CV death 6%)
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Q7. Clinical Outcomes of LM ISR

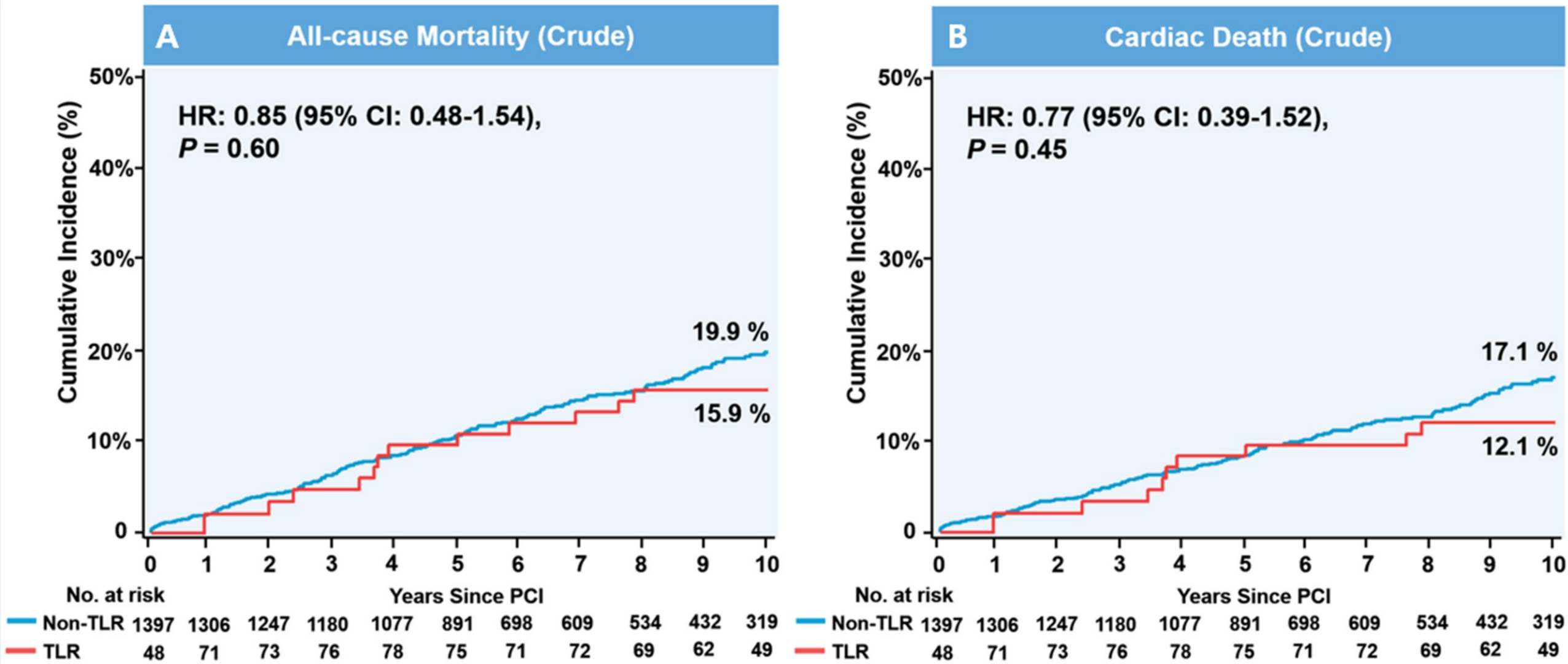
MACE free Survival



Impact of LM TLR : Updated Data from IRIS-LM Registry



Impact of LM TLR in Clinical Outcome



Impact of LM TLR in Clinical Outcome

Adjusted Risk of Death According to Stages of TLR

By time from index PCI to 1st TLR

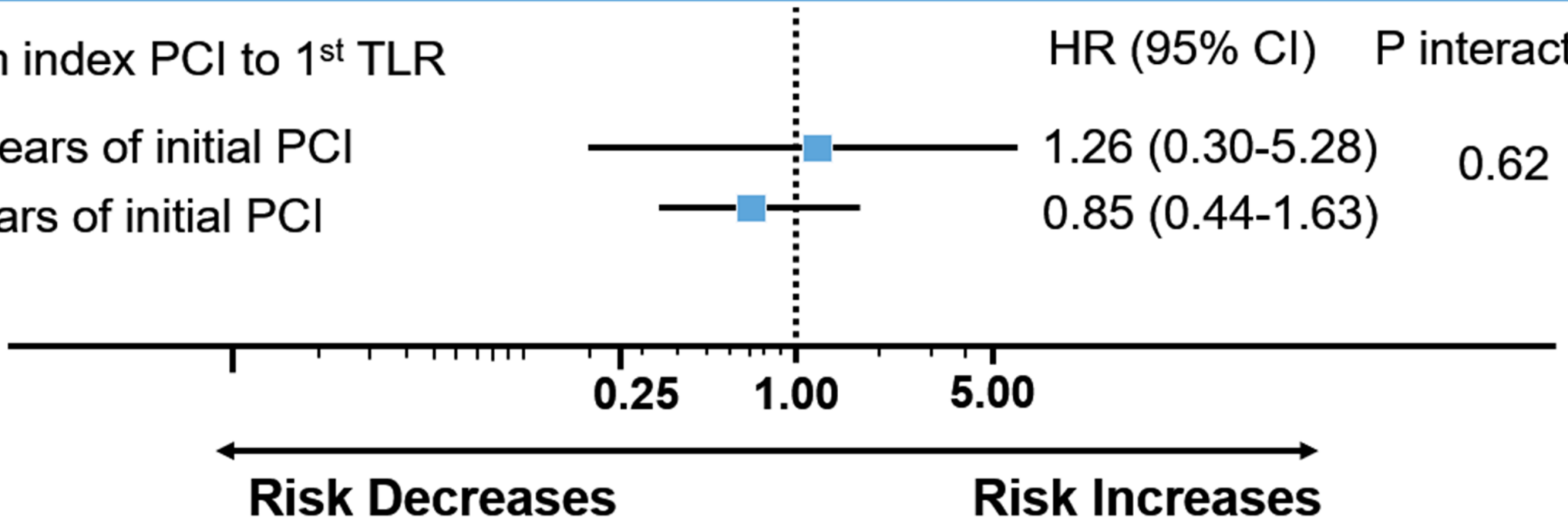
Within 2 years of initial PCI

After 2 years of initial PCI

HR (95% CI) P interaction

1.26 (0.30-5.28) 0.62

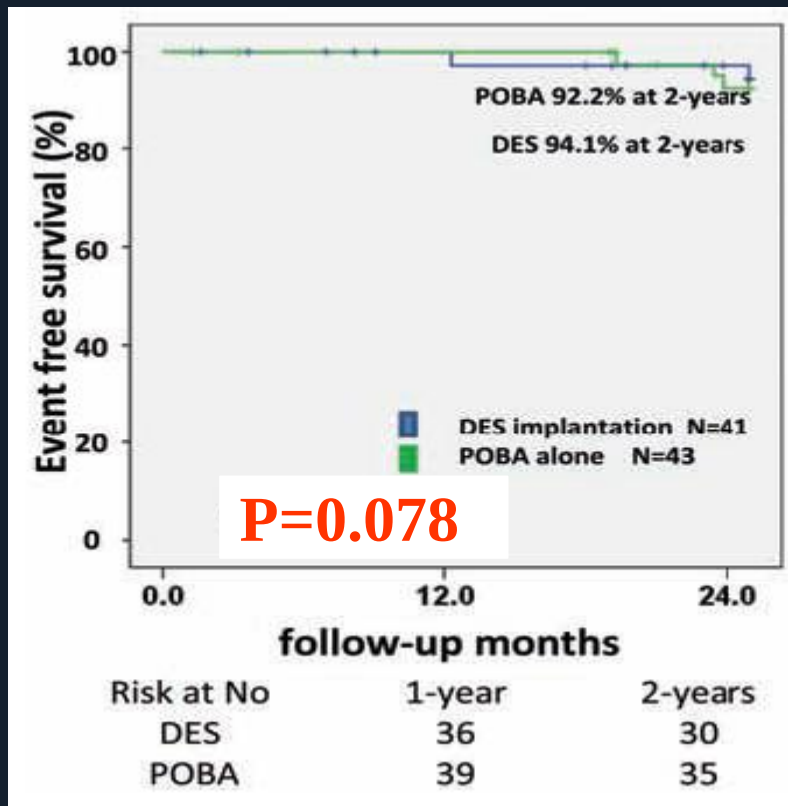
0.85 (0.44-1.63)



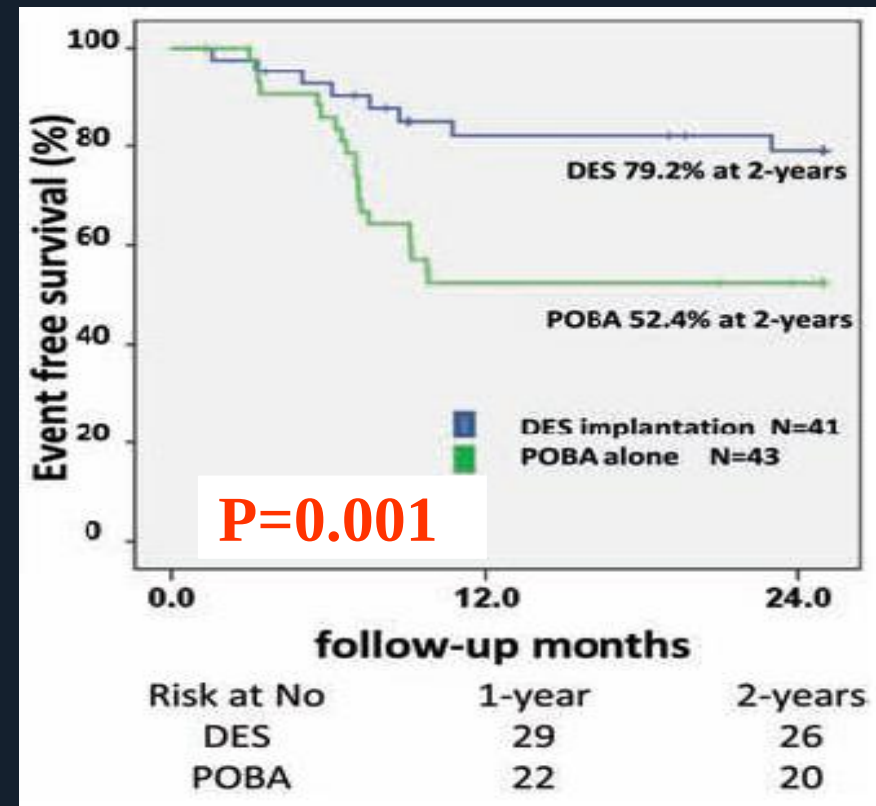
Q7. Clinical Outcomes of LM ISR

DES vs. POBA

Cardiac Death and MI

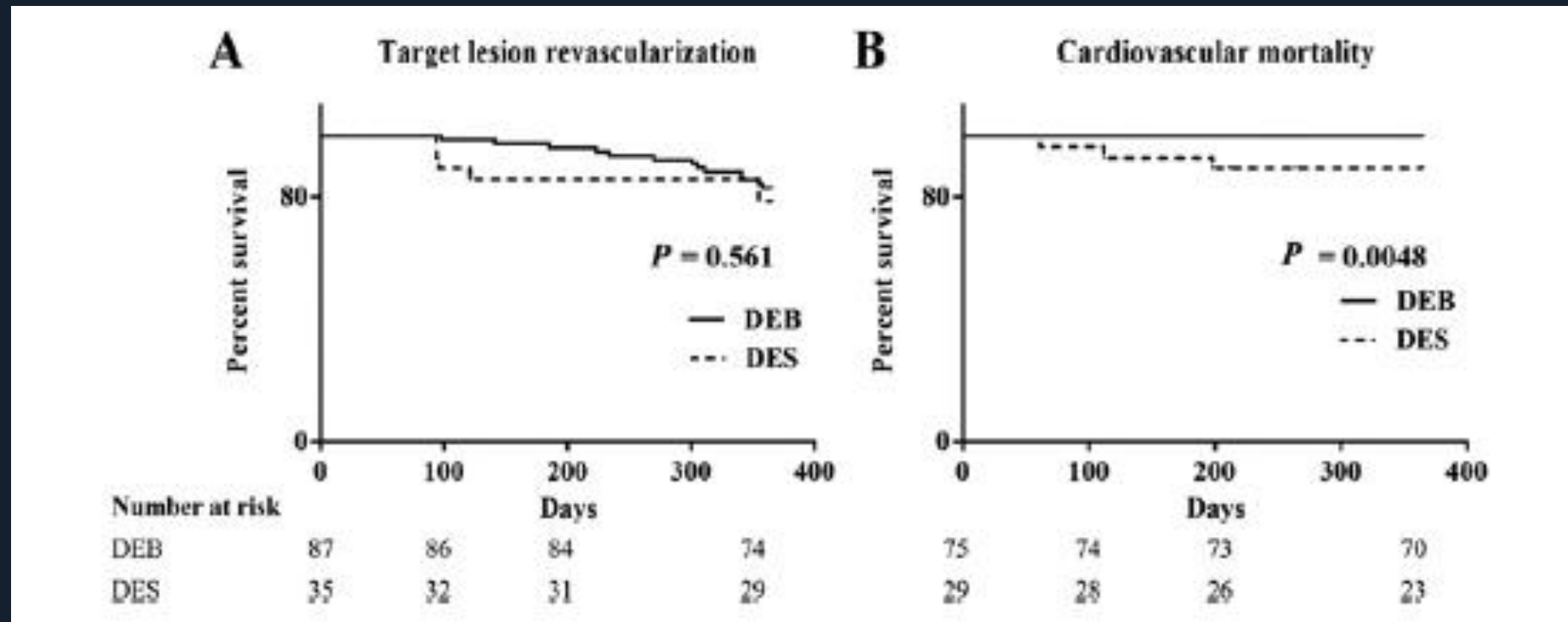


TLR



Q7. Clinical Outcomes of LM ISR

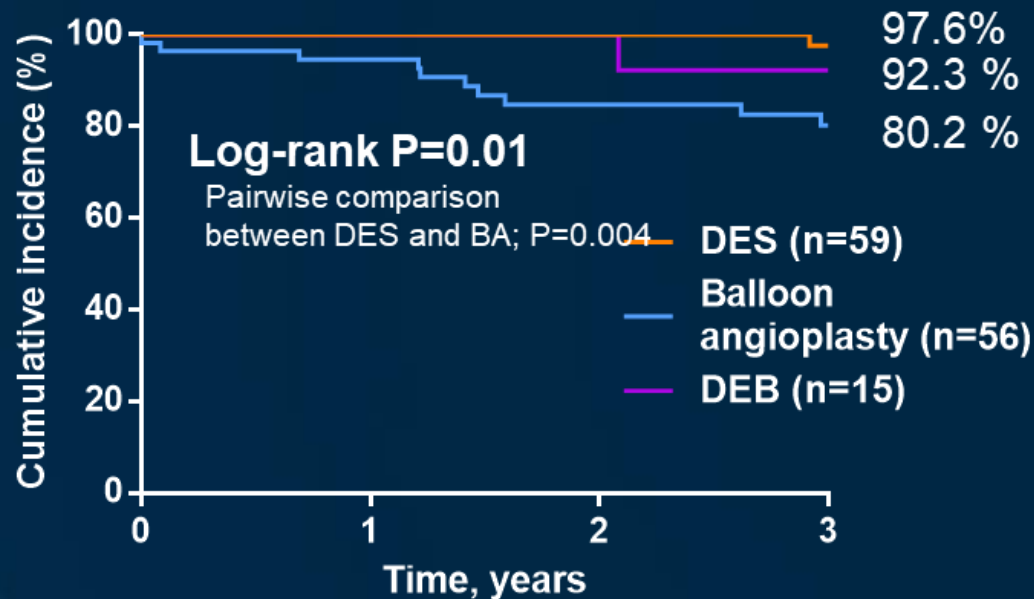
DES vs DEB



When comparing DEB with DES, similar TLR rates were found, but lower recurrent MI and lower cardiovascular death were noted for DEB treatment in 123 LM ISR patients

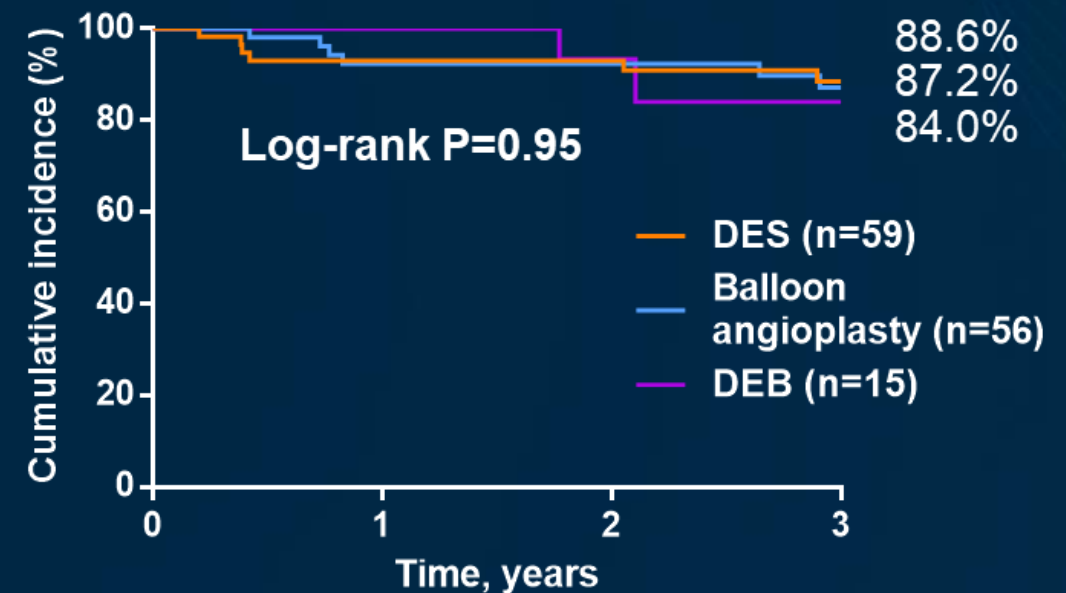
PCI strategy and Clinical outcomes in IRIS-LM

Cardiac Death and MI



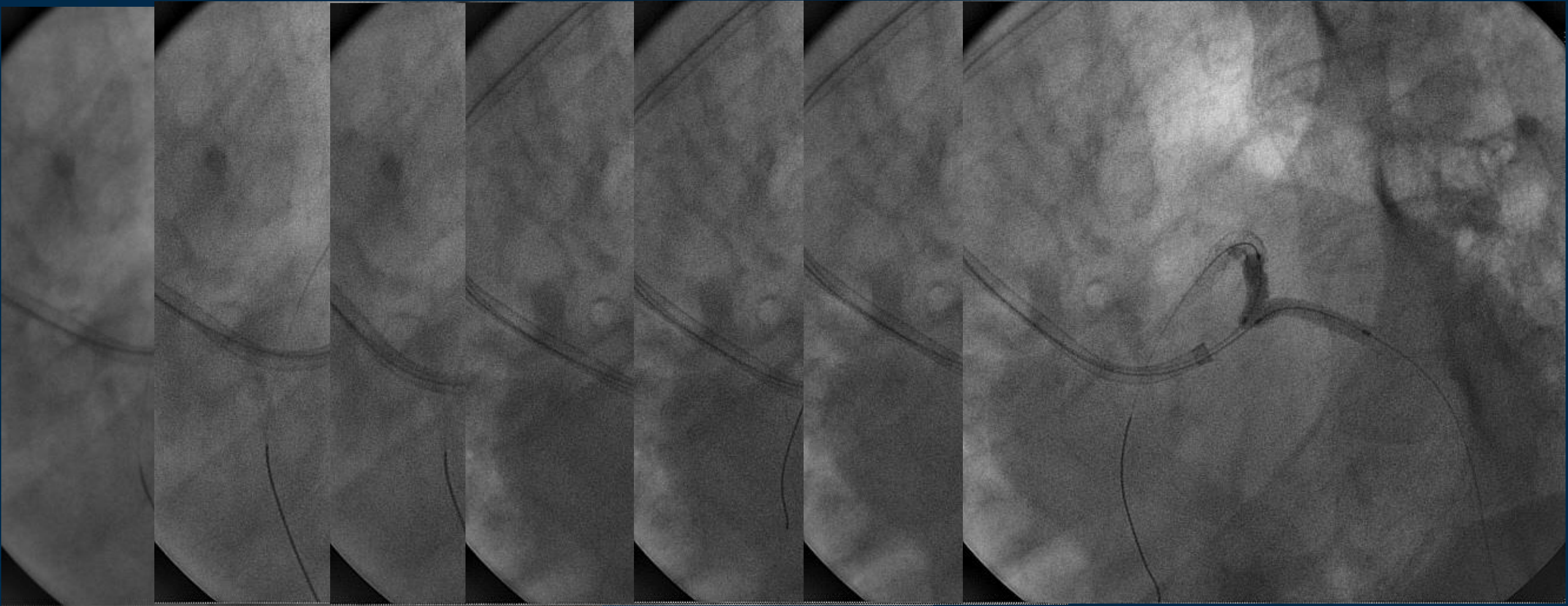
No. at risk				
DES	59	57	50	41
BA	56	53	40	35
DEB	15	15	14	7

TLR

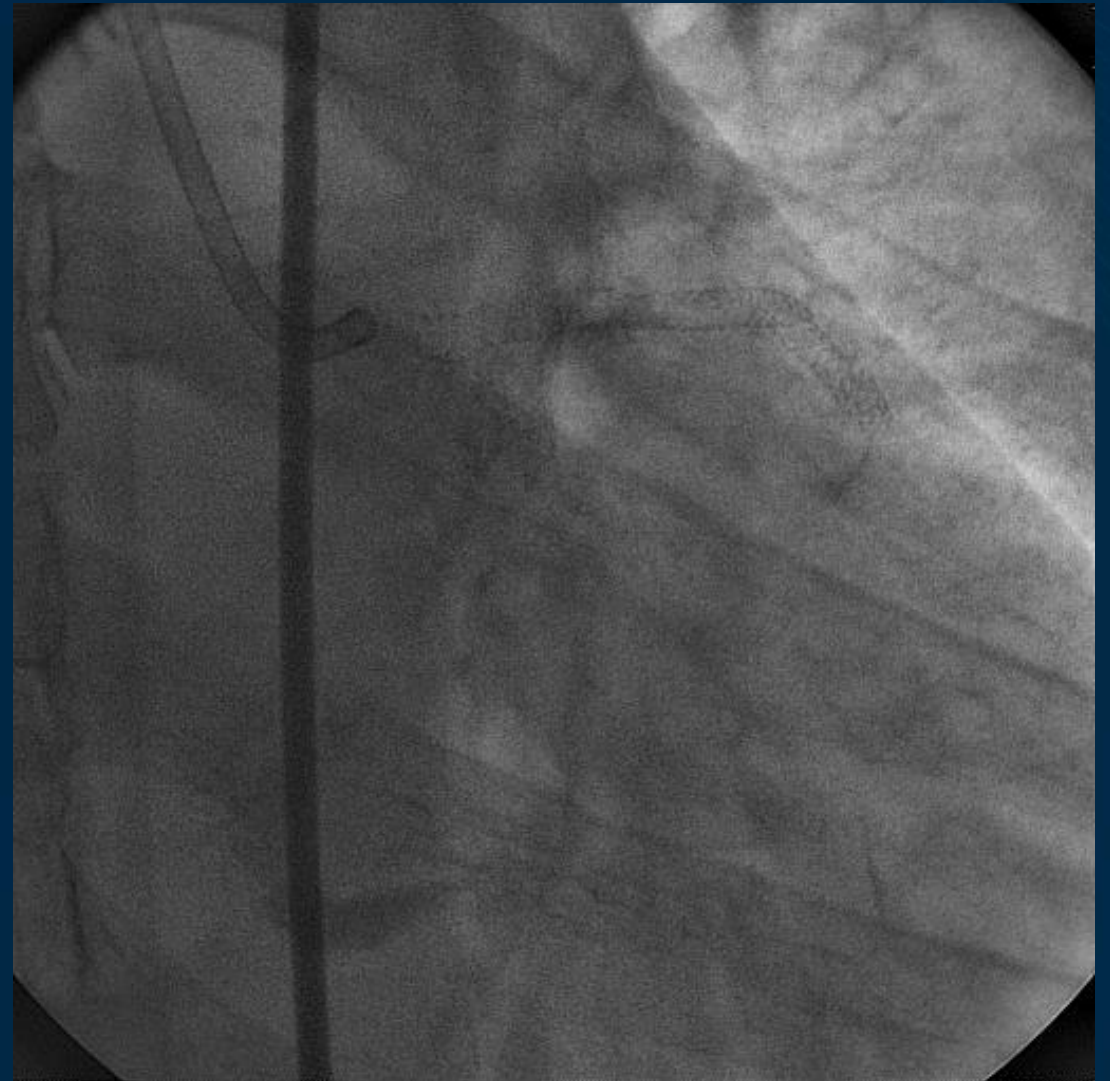
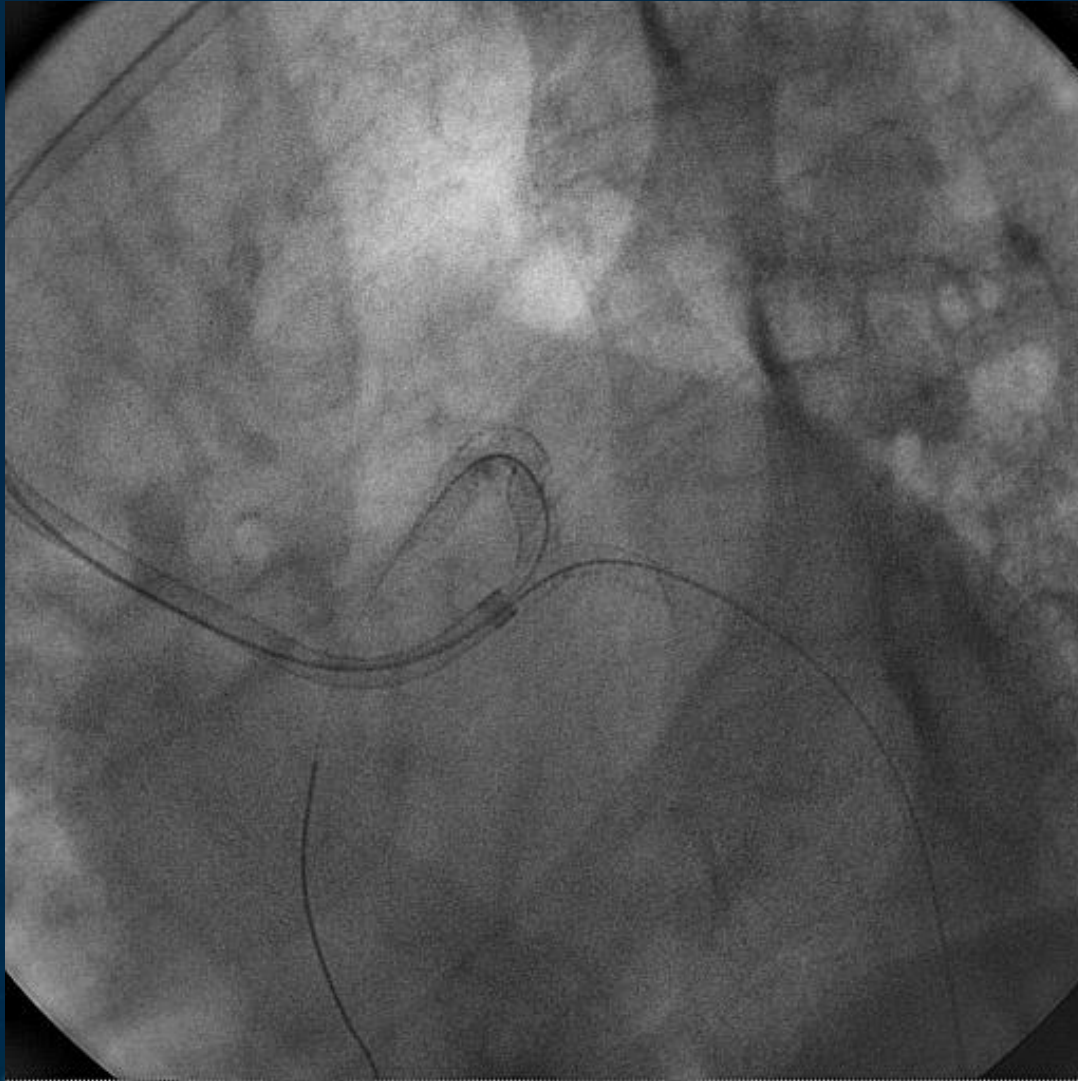


No. at risk				
DES	59	53	47	36
BA	56	49	39	32
DEB	15	15	13	6

My Solution: **PCI using Drug-Eluting Balloon**



Final CAG



Conclusion

- I do not need routine angiographic follow-up in after LM PCI.
- DEB for ISR, DES for de novo SB or MV downstream disease
- CABG for Recurrent ISR.
- Prevention is better than cure. Optimizing stent result at index LM PCI will prevent LM ISR.