

Incidence and Treatment for LM In-Stent Restenosis

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LM ISR incidence in registries

Study	N. Patients	DES type	Angio-FU (%)	FU lenght (yrs)	TLR (%)	TVR (%)
DELFT	358	SES/PES	71.2	3.5	5.8	14.2
Palmerini et al.	1,111	97% SES/PES	-	2	11.8	-
MAIN COMPARE	858	SES/PES	-	3	-	10.7
Tamburino et al.	334	SES/PES	69%	3	7.9	-
Lee et al.	509	97% SES/PES	80.1	3.4	10.0	-
ASAN-MAIN	176	SES/PES		5	13.2	16.2
LEMAX	173	EES	47	1	2.9	7
PRECOMBAT-2	334	EES	60.8	1.6	-	6.5



LM ISR incidence in RCT

Study	N. Patients	DES type	Angio-FU (%)	FU lenght (yrs)	TLR (%)	TVR (%)
ISAR-LEFT MAIN	607	SES/PES	87.1	2	7.2	-
SYNTAX LM	357	PES	-	1	-	11.8
Boudriot et al.	100	SES/PES	-	1	-	14.0
PRECOMBAT	300	SES/PES	75.3%	2	-	6.1



What do we know regarding LM ISR?

- Most cases (about 70%) occur within 1 year
- Most cases (80-90%) involve the LM bifurcation
- Around half of the cases occur at the LCX ostium
- In most cases (around 80%) the pattern of LM ISR is focal
- Most patients (70-90%) present with silent or stable ischemia.
- The strategy used for the index procedure (2-stent technique) might determine an increased risk of recurrent DES-ISR but only in the region of the LCX ostium.

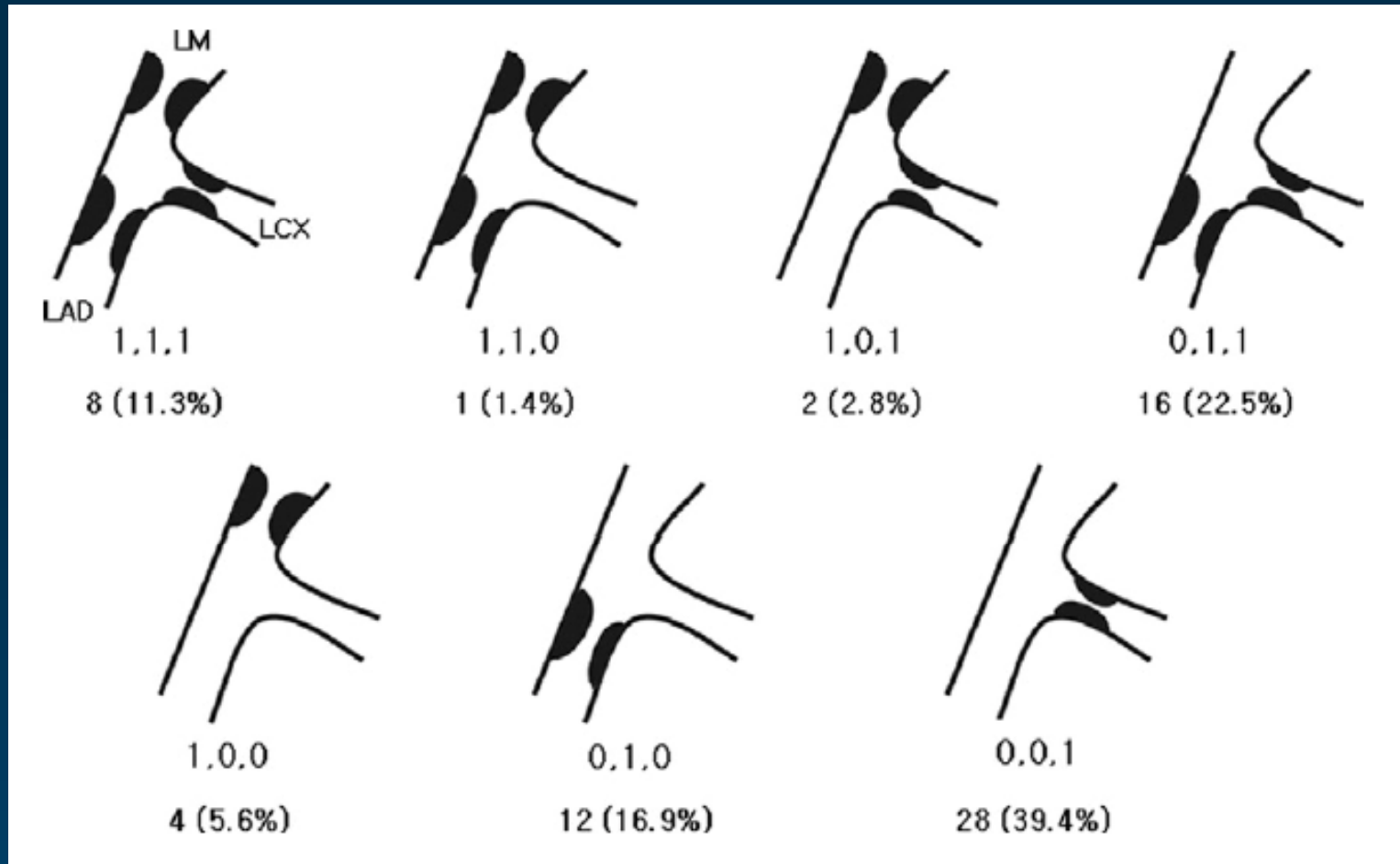
Sheiban et al. J Am Coll Cardiol 2009;54:1131-6

Lee JY et al. J Am Coll Cardiol 2011; 57:1349-58

Takagy K et al. Circ Cardiovasc Interv 2012;5:491-8



Incidence of different type of restenosis in 71 LM ISR from Asan Medical Center, Seoul



Differential Treatment



LM ISR treatment options

Medical therapy

Repeat-PCI

CABG



- **POBA**
- **Cutting balloon**
- **Scoring balloon**
- **DEB**
- **DES (same or different)**



Failure in Left Main Study (FAILS): 70 LM ISR

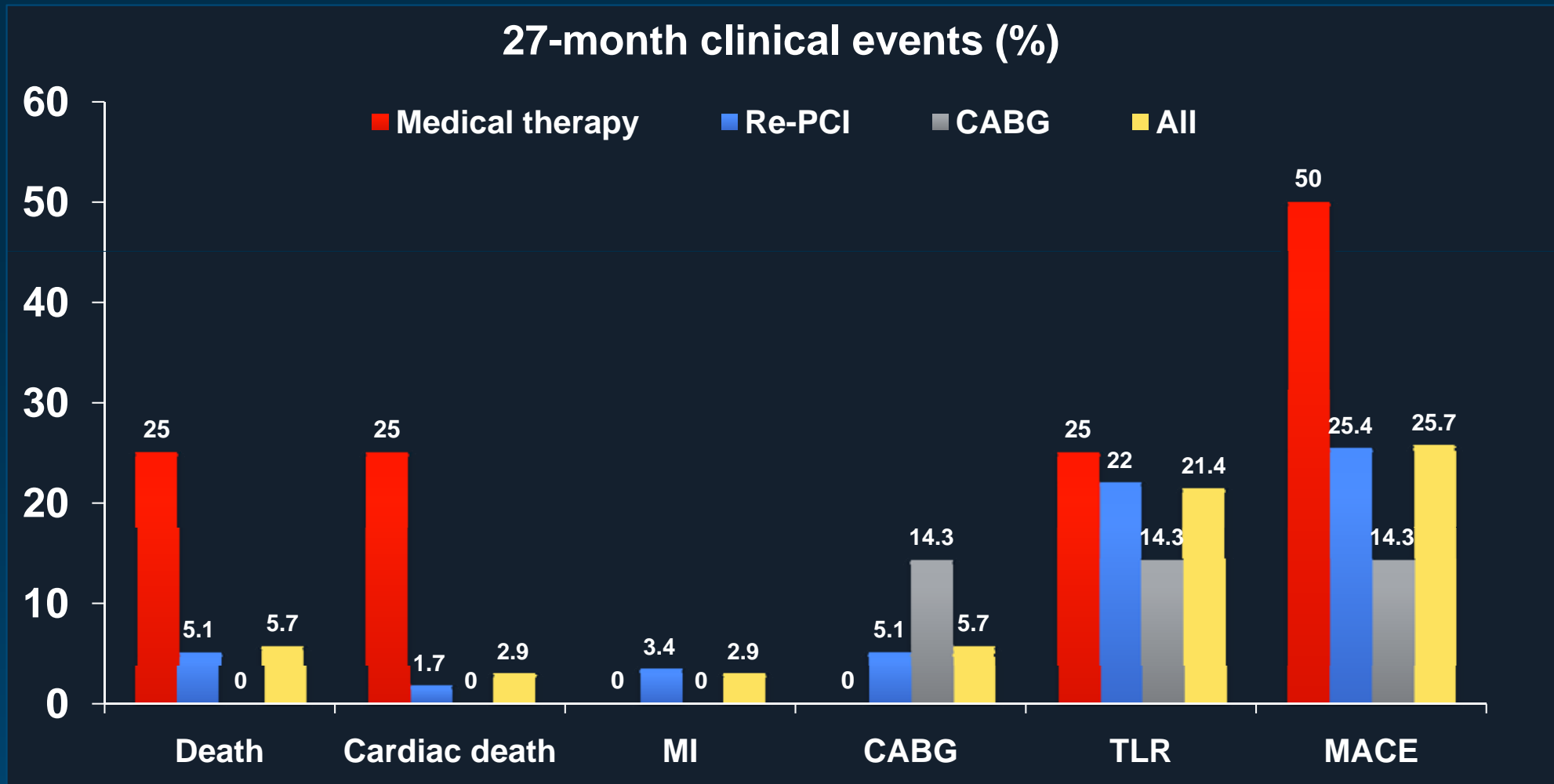
Treatment: 5.7% medical therapy; 84.3% re-PCI; 10% CABG

	All (n = 70)	Medical Therapy Only (n = 4)	Repeat PCI (n = 59)	CABG (n = 7)
Lesion characteristics				
Ostium only	12 (16.9)	1 (25.0)	10 (16.9)	1 (14.3)
Ostium and/or shaft	14 (20.0)	0	12 (20.3)	2 (28.6)
Distal and/or bifurcational	44 (62.9)	3 (75.0)	37 (62.7)	4 (57.1)
Restenosis involving ostial left anterior descending	22 (47.8)	0	19 (51.4)	3 (50.0)
Restenosis involving ostial left circumflex	35 (76.1)	3 (100)	30 (81.1)	2 (33.3)
Restenosis involving ramus	6 (13.0)	0	4 (10.8)	2 (33.3)
Diffuse restenosis	12 (17.1)	0	10 (16.9)	2 (28.6)



Failure in Left Main Study (FAILS): 70 LM ISR (62.9% involved the bifurcation and 17% were diffuse)

Treatment: 5.7% (n=4) medical therapy; 84.3% (59) re-PCI; 10% (n=7) CABG



71 LM ISR from Asan Medical Center, Seoul

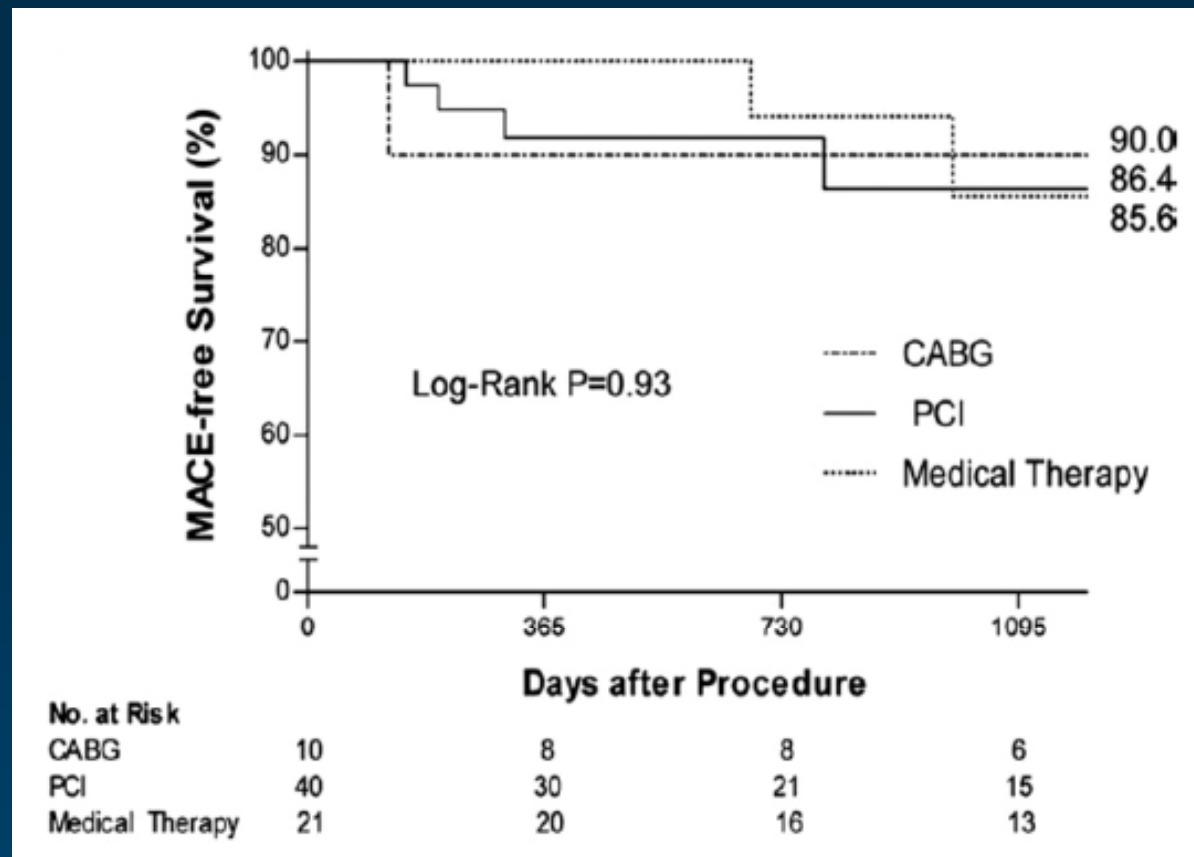
Treatment: 29.6% medical therapy; 56.3% re-PCI; 14.1% CABG

Variable	Medical Therapy (n = 21)	Repeated PCI (n = 40)	CABG (n = 10)	p Value
Location of ISR				0.87
LMCA only	1 (4.8)	3 (7.5)	0 (0)	
LAD ostium only	3 (14.3)	7 (17.5)	3 (30.0)	
LCX ostium only	10 (47.6)	15 (37.5)	3 (30.0)	
Multiple	7 (33.3)	15 (37.5)	4 (40.0)	
Type of ISR				0.14
Focal pattern	19 (90.5)	32 (80.0)	6 (60.0)	
Diffuse pattern	2 (9.5)	8 (20.0)	4 (40.0)	



71 LM ISR from Asan Medical Center, Seoul: outcomes at median of 31.7 months

No patient died; 1 (2.2%) suffered MI; 6 (11.1%) required repeat TLR



“The long-term clinical prognosis of patients with LMCA DES-ISR might be benign, given that these patients were optimally treated with the clinical judgment of the treating physician”



POBA vs DES for LM ISR: the Milan and New-Tokyo (MITO) registry

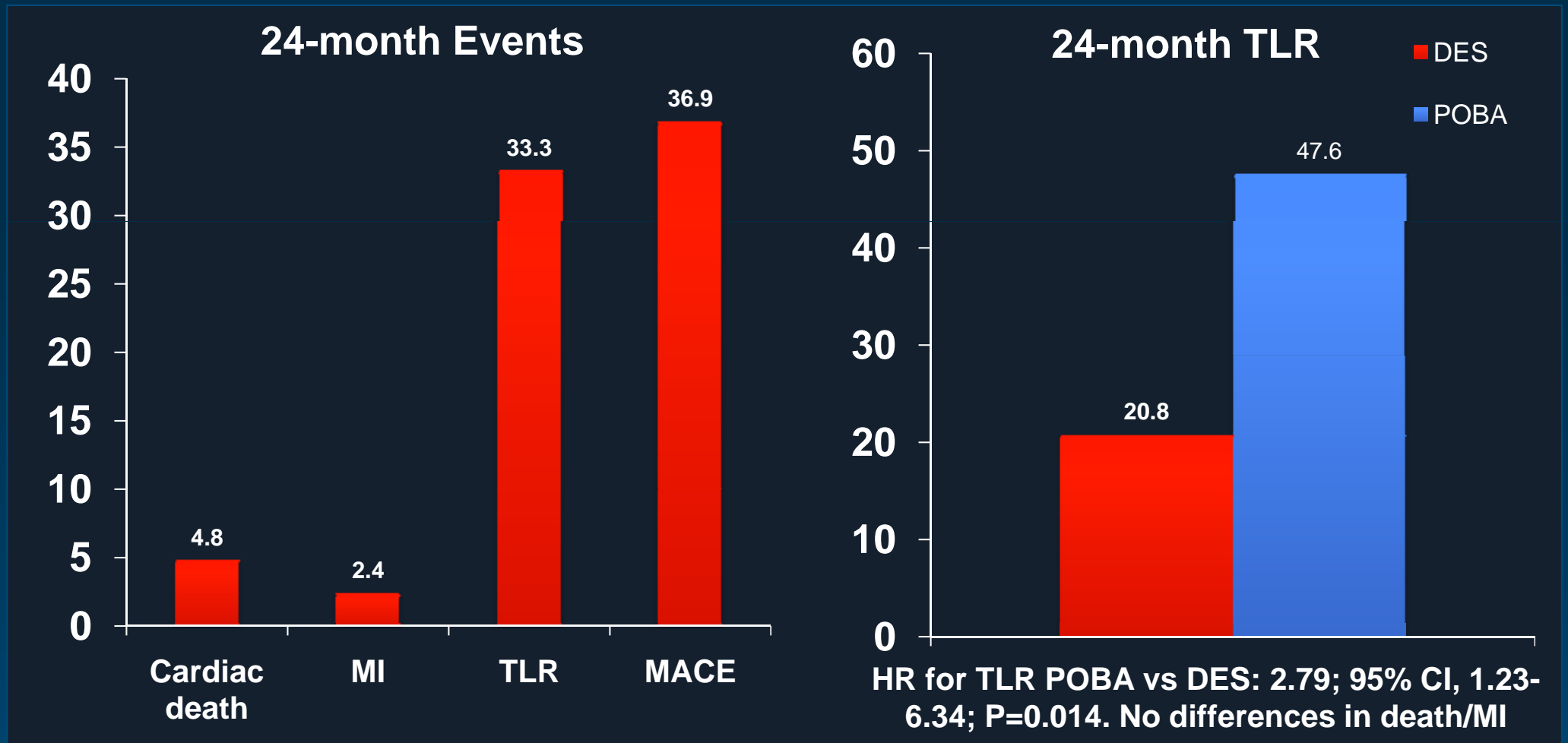
84 patients undergoing PCI: 43 POBA and 41 DES

Patients	Overall UDLM DES-ISR That Underwent PCI (n=84)	UDLM DES-ISR Treated With POBA (n=43)	UDLM DES-ISR (n=41)	<i>P</i> Value
Isolated ostial LAD	8 (9.5)	5 (11.6)	3 (7.3)	0.01
Isolated ostial LCX	41 (48.8)	28 (65.1)	13 (31.7)	
Both ostial LAD and LCX	7 (8.3)	4 (9.3)	3 (7.3)	
LAD or LCX	6 (7.2)	3 (7.0)	3 (7.3)	
Left main stem	5 (6.0)	0	5 (12.2)	
Focal restenosis	55 (65.5)	33 (76.7)	22 (53.7)	0.03
Diffuse restenosis	29 (34.5)	10 (23.3)	19 (46.3)	



POBA vs DES for LM ISR: the Milan and New-Tokyo (MITO) registry

84 patients undergoing PCI: 43 POBA and 41 DES



Factors to consider In selecting LM restenosis treatment options

- **Timing of restenosis**
- **Pattern of restenosis**
- **Technical factors involvement**
- **Location of restenosis**



Predictors of MACE after DES-ISR: timing of restenosis

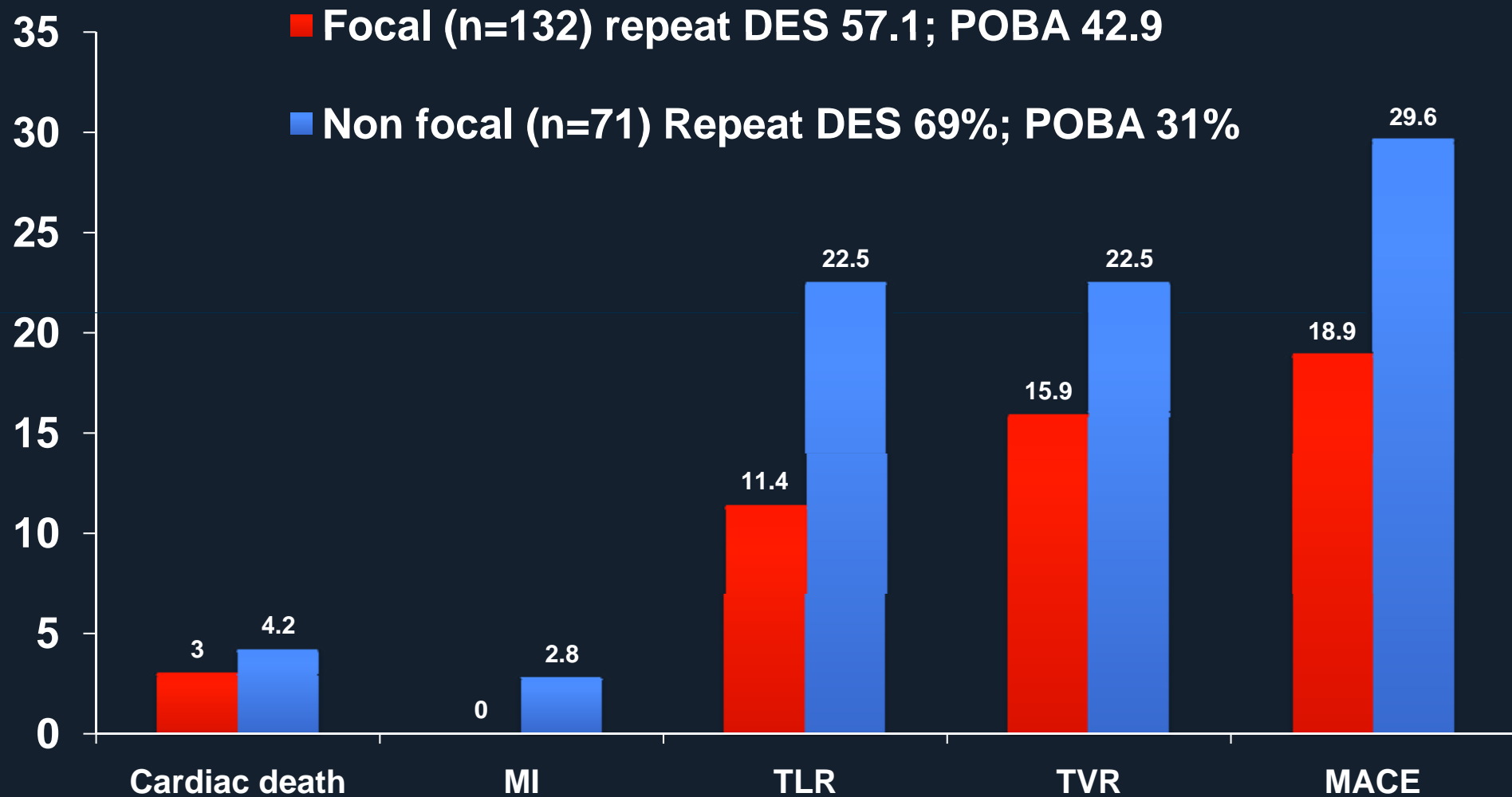
213 patients undergoing re-PCI for DES restenosis:
119 with balloon and 94 with additional DES

Early (<6 months) DES restenosis:
adjusted OR 4.5; 95% CI 2.2-9.3, $p < 0.0001$



Do ISR pattern predict outcomes in the DES era?

Events at median of 13.7 months



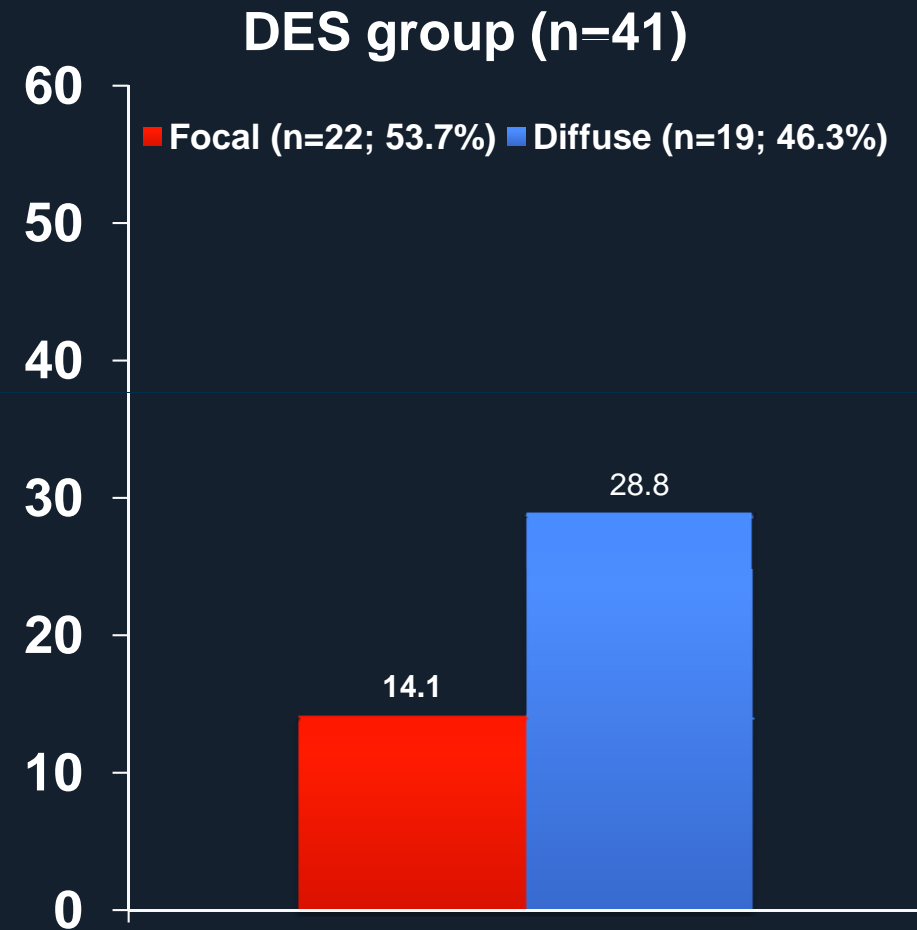
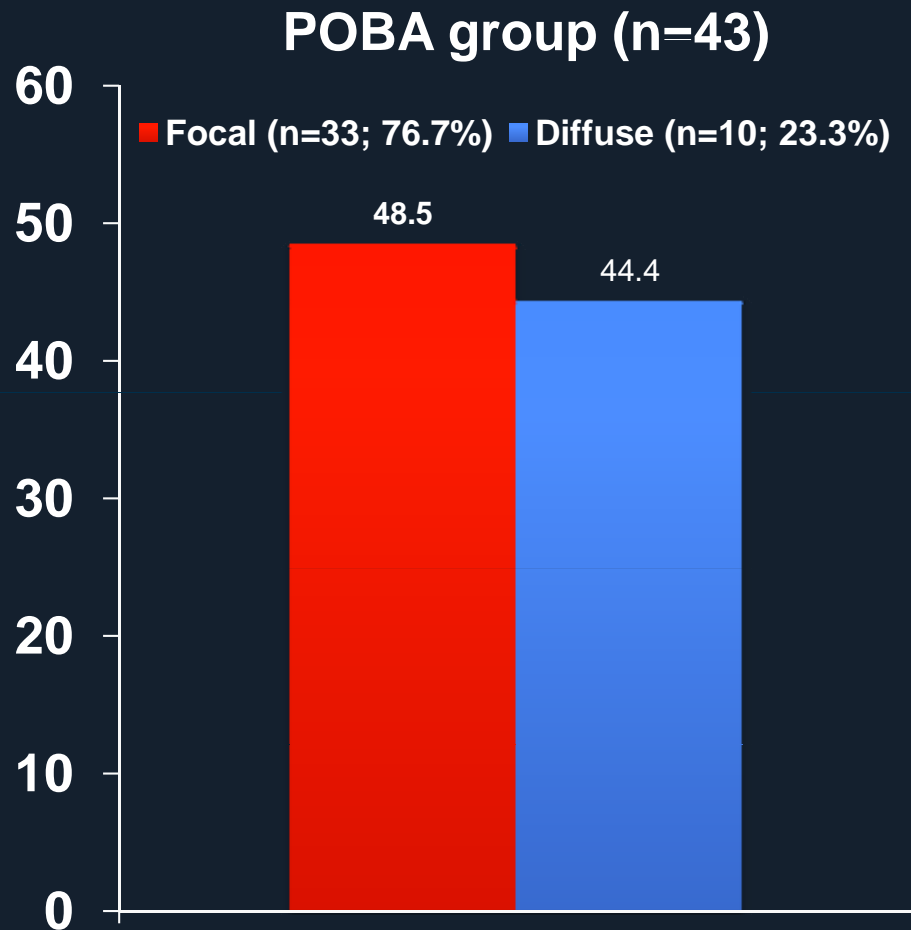
Predictors of MACE after ISR-PCI: restenosis pattern

213 patients undergoing re-PCI for DES restenosis:
119 with balloon and 94 with additional DES

Diffuse pattern: adjusted OR 2.5; 95% CI
1.1-5.3, $p=0.017$



The Milan and New-Tokyo (MITO) registry: impact of restenosis pattern on LM ISR-PCI outcomes



Patients with LM ISR undergoing PCI do worse with POBA regardless of restenosis pattern



If technical factors underlying restenosis are present, ISR can be treated by PCI

Technical factors	PCI Strategy
Stent underexpansion	Balloon
Stent gaps or “misses”	DES
Stent fractures	DES/balloon

The role of intracoronary imaging in defining mechanism of restenosis and selecting ISR treatment



Impact of LM location of restenosis

- It has been demonstrated that that the majority of patients with focal LCX-ISR are asymptomatic, it remains to be seen whether these lesions, often found at follow-up angiography, should be treated, especially if this is a small vessel. A physiological approach often is applied to the assessment and treatment of LCX-ISR.
- However further studies combining anatomic and physiological assessment, in addition to longer-term follow-up, are necessary to answer this important question.



Closing remarks

- LM PCI, restenosis is still a concern, especially in critical anatomic position and thus it has a potentially relevant clinical impact.
- Limited Data on optimal management and outcomes of patients with LM ISR.
- Benign long-term prognosis of overall patients with LM DES-ISR. In this regard, the clinical judgement in choosing the best management for each single case is of importance.
- Re-PCI, provides favorable and acceptable outcomes, especially when considering the high intrinsic risk of this challenging subset. A greater benefit from further DES implantation than from POBA alone has been shown.
- Intravascular imaging underlying restenosis mechanism could have a role in strategy selection.
- Probably some patients (i.e early restenosis, complex diffuse disease) would benefit more from switching to CABG.

