Routine Imaging-guided Left Main PCI: What We Learned?

Yoshinobu MURASATO, MD, PhD

National Hospital Organization Kyushu Medical Center, Fukuoka, Japan

Disclosure

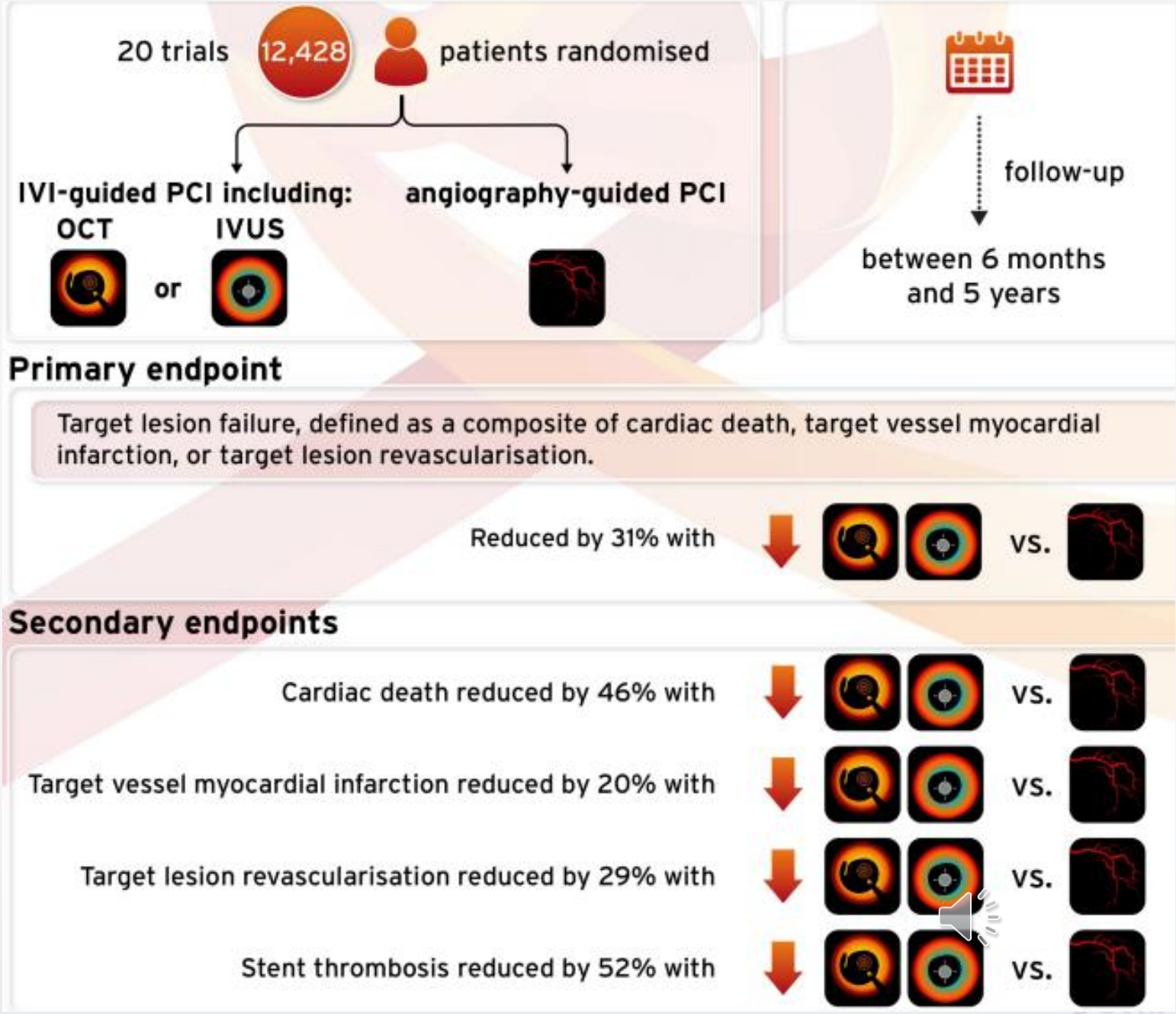
Speaker's name : Yoshinobu MURASATO

☑ I have the following potential conflicts of interest to report:

Honoria: Medtronic, Abbott Medical, Boston Scientific, Kaneka, Orbus Neich

Impact of Intracoronary Imaging on PCI outcome

Network Meta-Analysis: Angio- vs. Imaging-guidance

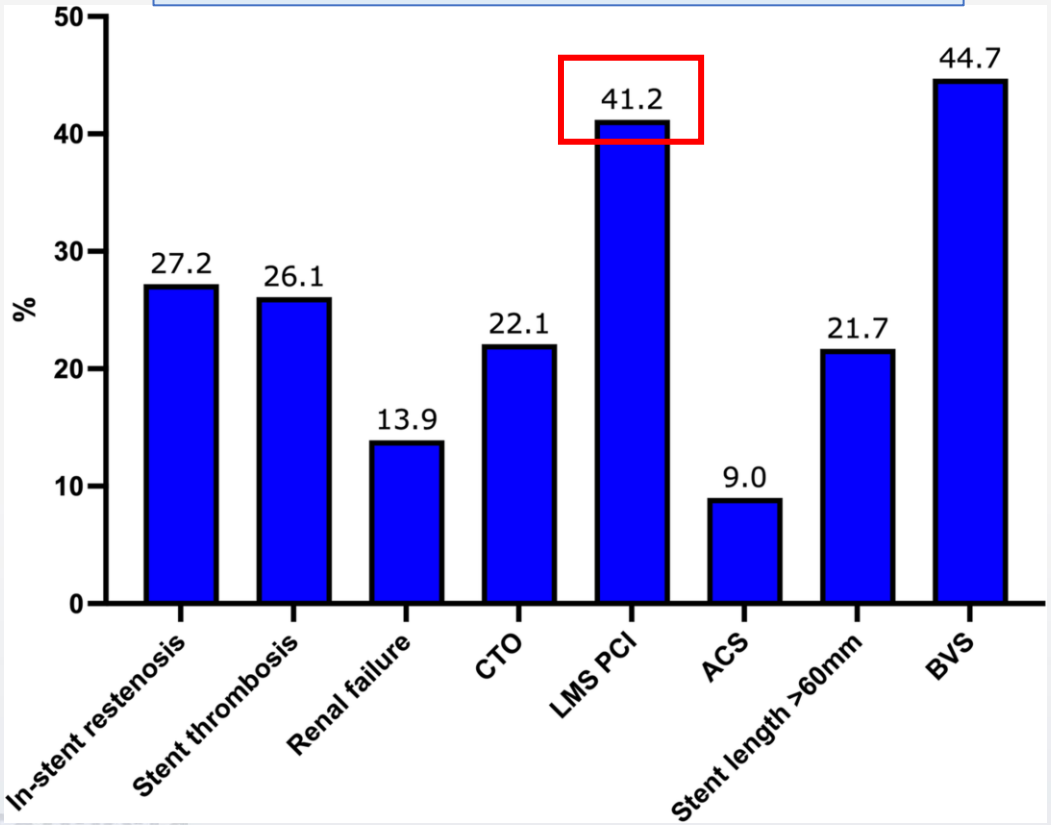


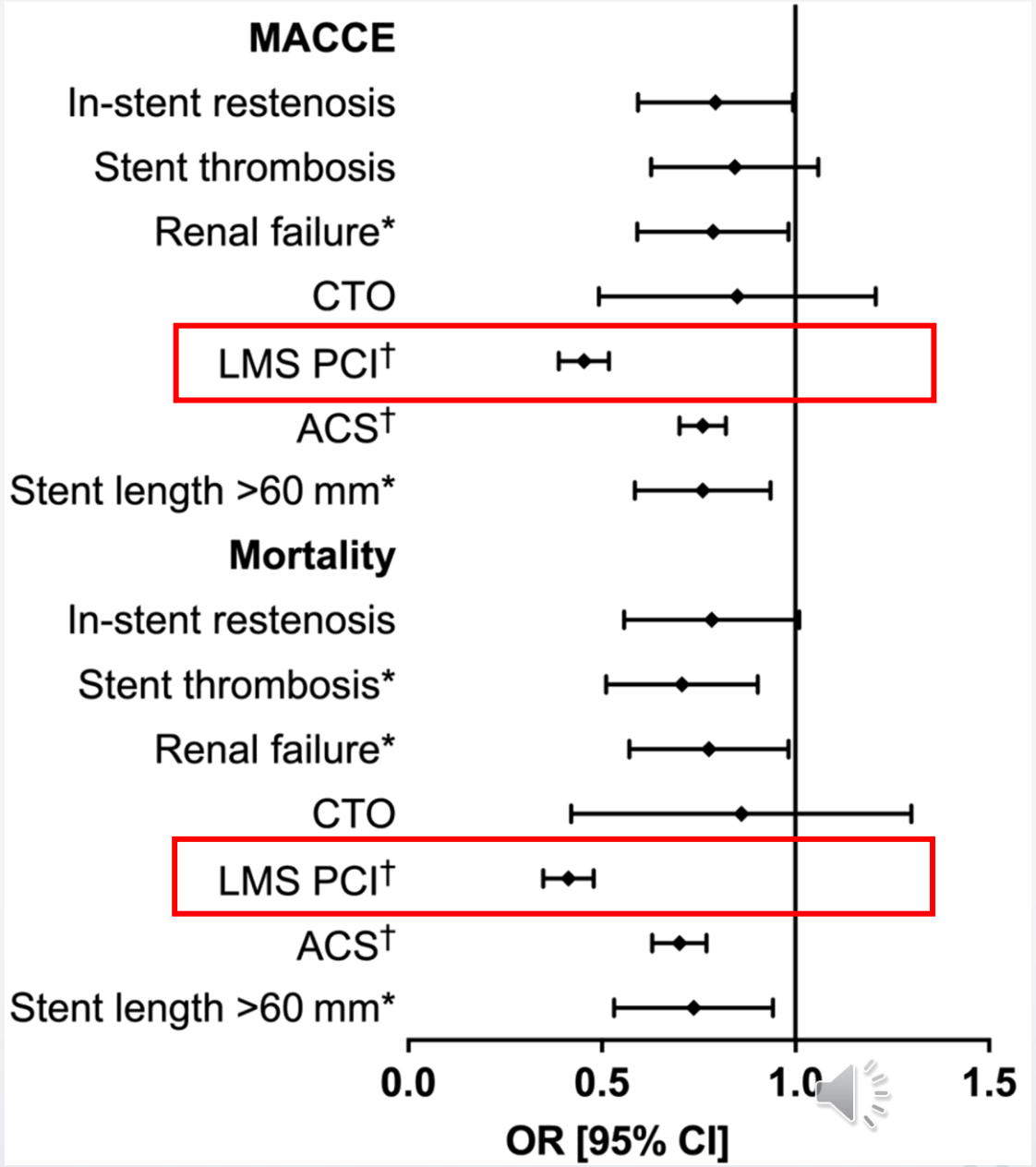
Stone G et al. Lancet. 2024 Mar 2;403(10429):824-837.

Impact of Intracoronary Imaging in complex PCI

555,398 PCI cases in UK

Frequency of Intracoronary imaging





Mohamed MO et al. J Am Heart Assoc. 2022;11(19):e026500.

Background

Intra-coronary imaging guidance in LM-PCI is recommended, however, the efficacy of its routine performance in every case has not yet been elucidated.

Aim

To investigate clinical outcome of LM-PCI in a cohort of Japanese National Hospital Organization (NHO), where intra-coronary imaging-guidance has been routinely performed.

Study flow

806 consecutive patients registered in 19 hospitals

36 patients excluded
- 26 patients: out of inclusion criteria
- 11 patients: lost to follow-up
- 1 patients: excluded by physician

768 patients were under 1-year follow-up

25 patients without data for 1-year follow-up
- 16 patients: completely deficit
- 7 patients: incompletely deficit

743 patients were analyzed

Inclusion criteria

- >20 years old
- Suitable lesion for DES implantation in the LM
- De novo lesion
- Tolerable for dual antiplatelet therapy for more than 6 months

Exclusion criteria

- In-stent restenotic lesion
- Chronic total occlusion
- LAD and/or LCX protected by prior CABG
- Female with possible or definite pregnancy
- Unsuitable candidate judged by the responsible doctor
- Rejection for the recruitment of personal information to the study after the notice of the study information according to the opt-out system

Endpoint

Primary endpoint

Major adverse cardiovascular and cerebrovascular events (MACCE) defined as composite endpoints of followings @1-year follow up

- All cause of death
- Cerebrovascular disorder
- Clinical driven revascularization
- Myocardial infarction

Secondary endpoint

Risk factors of 1-year MACCE

Patient and lesion background

Patient background		
Age	years old	73.0 ±10.1
Male	n, (%)	583 (78.7)
Hypertension	n, (%)	553 (74.6)
Dyslipidemia	n, (%)	526 (71,0)
Diabetes	n, (%)	365 (49.3)
Smoking	n, (%)	237 (32,0)
Hemodialysis	n, (%)	34 (4.6)
COPD	n, (%)	17 (2.3)
Peripheral artery disease	n, (%)	86 (11.6)
Prior myocardial infarction	n, (%)	187 (25.2)
Prior PCI/CABG	n, (%)	323 (43.6)
Family history	n, (%)	95 (12.8)
Left ventricular ejection fraction	%	56±15
Clinical presentation		
Stable angina	n, (%)	290 (39.2)
Old myocardial infarction	n, (%)	38 (5.1)
Silent myocardial ischemia	n, (%)	145 (19.6)
Acute coronary syndrome	n, (%)	231 (31.2)
Cardiogenic shock	n, (%)	45 (6.1)
Cardio-pulmonary arrest	n, (%)	18 (2.4)
Pulmonary edema	n, (%)	45 (6.1)

CCS classification		
I	n, (%)	288 (39.1)
II	n, (%)	158 (21.5)
III	n, (%)	100 (13.6)
IV	n, (%)	189 (25.7)
Pre-PCI		
Total cholesterol	mg/dl	169.4±42.5
Trigriceride	mg/dl	130.7±82.6
HDL	mg/dl	49.0±13.7
LDL	mg/dl	98.6±36.8
Hemoglobin A1C	%	6.6±1.2
eGFR		58±23
Lesion background		
Bifurcation lesion	n, (%)	573 (78.0)
Medina 1-0-0	n, (%)	54 (9.4)
Medina 1-1-0	n, (%)	173 (30.1)
Medina 1-1-1	n, (%)	139 (24.2)
Medina 1-0-1	n, (%)	31 (5.4)
Medina 0-1-0	n, (%)	136 (23.7)
Medina 0-1-1	n, (%)	29 (5.1)
Medina 0-0-1	n, (%)	12 (2.1)
Medina 0-x-x	n, (%)	177 (30.9)
True bifurcation lesion	n, (%)	199 (34.7)

PCI procedure

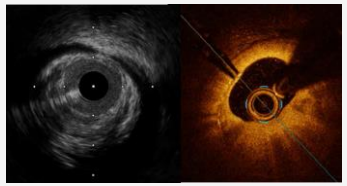
Access		
Radial	n, (%)	519 (70.1)
Femoral	n, (%)	198 (26.8)
Brachial	n, (%)	23 (3.1)
System		
6Fr	n, (%)	383 (51.9)
7Fr	n, (%)	309 (41.8)
8Fr	n, (%)	47 (6.4)
Imaging-guide	n, (%)	740 (97.7)
Intravascular ultrasound	n, (%)	640 (86.5)
Optical coherence tomography	n, (%)	90 (12.2)
Drug-eluting stent		
First generation	n, (%)	0 (0)
Current generation	n, (%)	742 (99.9)
2-stent	n, (%)	65 (8.8)
Elective	n, (%)	14 (21.5)
Culotte	n, (%)	26 (40.0)
Crush	n, (%)	16 (24.6)
T-stenting	n, (%)	21 (32.3)
Proximal optimization technique	n, (%)	333 (53.1)
Side branch dilation in 1-stent	n, (%)	472 (75.0)
Kissing balloon inflation	n, (%)	390 (62,0)
Side branch dilation alone	n, (%)	82 (13.0)

Support device	n, (%)	122 (16.4)
IABP	n, (%)	117 (15.8)
PCPS	n, (%)	20 (2.7)
Lesion modification		
RAS/OAS	n, (%)	68 (9.2)
DCA	n, (%)	10 (1.4)
Scoring balloon	n, (%)	145 (19.7)
Main vessel stent		
Size: >4.0mm	n, (%)	0 (0)
3.5-4.0	n, (%)	383 (63.0)
3.0-3.5	n, (%)	187 (30.8)
2.5-3.0	n, (%)	33 (5.4)
<2.5	n, (%)	5 (0.8)
Length	mm	23.0±8.5
Side branch		
Size: >4.0mm	n, (%)	4 (4.8)
3.5-4.0	n, (%)	7 (8.4)
3.0-3.5	n, (%)	34 (41.0)
2.5-3.0	n, (%)	29 (34.9)
<2.5	n, (%)	9 (10.8)
Length	mm	21.6±7.8
PCI success	n, (%)	730 (98.6)

Routine Intracoronary Imaging-guided Left Main Coronary Intervention

743 consecutive patients treated with PCI for unprotected de novo left main (LM) coronary lesions in 19 Japanese NHO hospitals.

Imaging guidance: 97.7%



Features

Acute coronary syndrome: 31.2% ↑

Canadian Cardiovascular Society functional angina (CCS) ≥III: 39.3% ↑

LM bifurcation lesions: 78.0%

Medina 0-x-x lesion: 30.9% ↑

Two-stent implantation: 8.8% ↓

1-year Major adverse cardiovascular & cerebrovascular events (MACCE): 17.5%

All-cause death	Clinically driven revascularization	Myocardial infarction	Cerebrovascular disorder
8.9%	8.2%	1.9%	1.2%

Cardiac death	Target vessel	Stent thrombosis	LM-PCI site related events
3.4% ↓	4.6%	0.3%	

Target lesion 2.0% ↓

Hazard ratio for MACCE

↑			
2.49	2.17	2.07	
Two-stent implantation	Mechanical cardiac support device	CCS ≥ class III	

↓	
0.72	0.62
LVEF 10% increase	Radial access

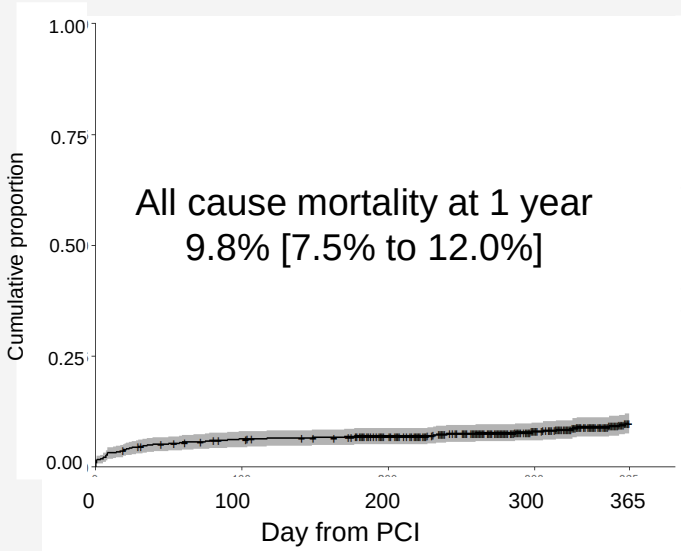
Conclusion

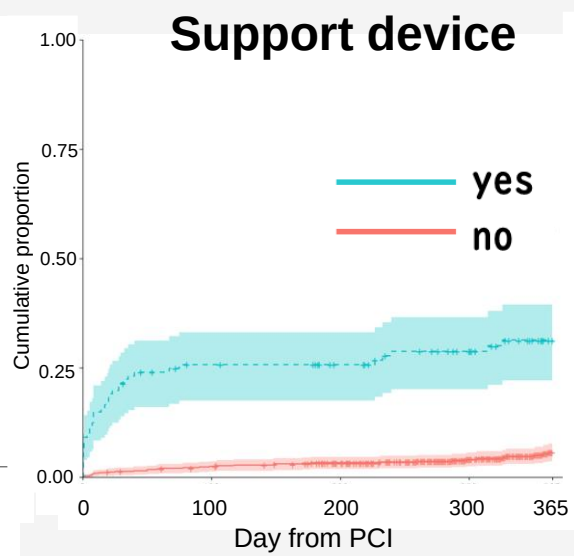
Routine imaging-guided LM-PCI enhanced local efficacy of PCI-treated site, however, severe left ventricular dysfunction and multiple-vessel involvement are associated with higher mortality and revascularization risks.

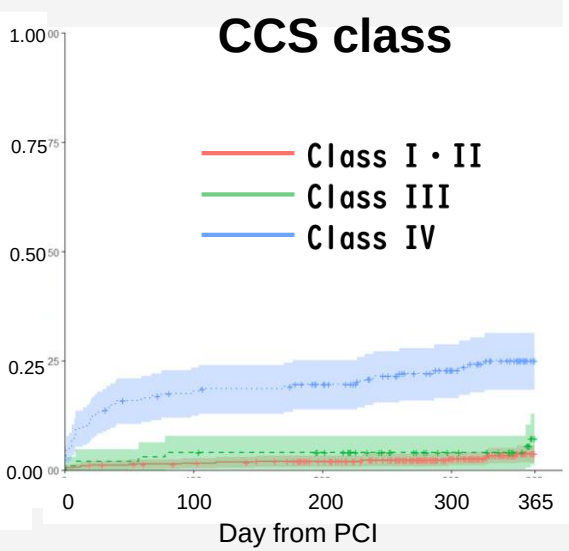
LM-JANHO

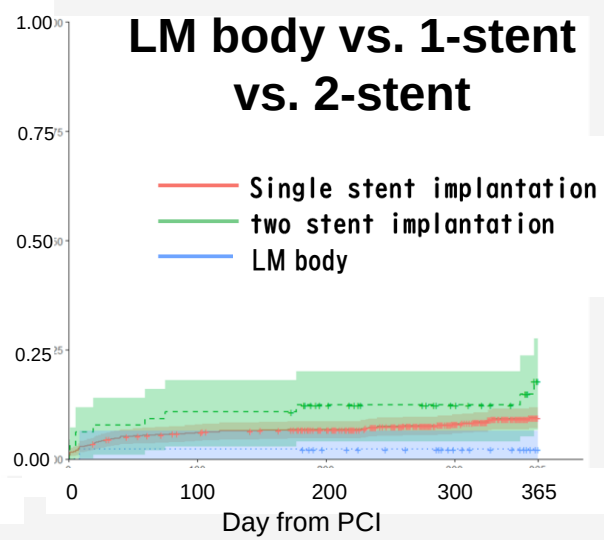
All cause mortality

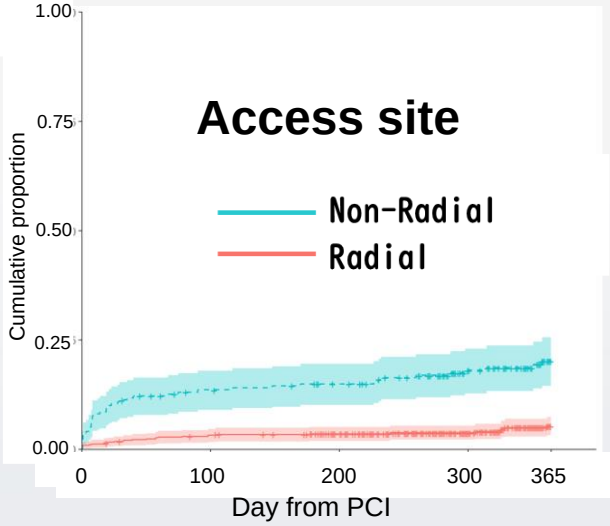
Support device using, CCS class IV, and non-radial access had significant impact in early phase.

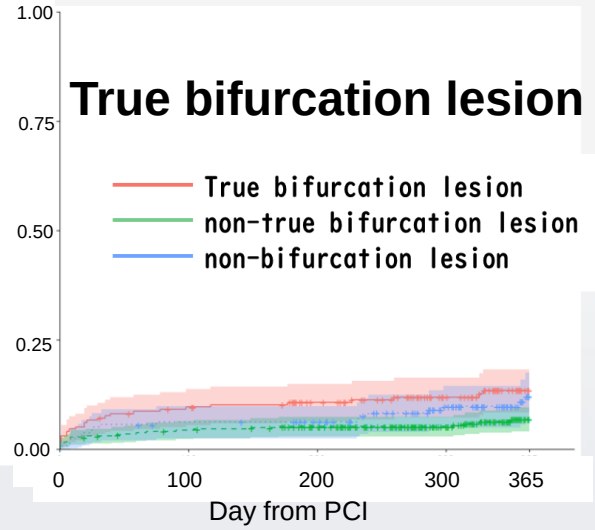












Change in LM-PCI according to the penetration of imaging-guidance in Japan

		J-Cypher[1]	AOI[2]	LM-JANHO
Study period		2004-2006	2004-2012	2016-2020
Patient number		582	1607	743
PCI				
Imaging-guide	%	63.4	69	97.7
IVUS	%	63.4	66	86.5
OCT	%	0	3	12.2
Stent				
BMS	%	0	20	0
G1-DES	%	100	48	0
G2-DES	%	0	33	100
2-stent	%	29.6	19	8.8
POT	%	ND	ND	53.1
SB dilation (KBT/SBD)	%	75.8	ND	74.3
1-year follow-up				
All-cause death	%	13.9	ND	8.9
Cardiovascular death	%	4.0	ND	3.4
Target lesion revascularization	%	10.3	ND	2.0
Stent thrombosis	%	0.4	ND	0.3
Myocardial infarction	%	0.7	ND	1.9

1. JACC Cardiovasc Interv. 2013;6(7):654-63. , 2. Am J Cardiol. 2017;119(3):355-364.

Comparison between previous studies of imaging guided LM-PCI

Adverse events		Present study (LM-JANHO)	de la Torre Hernández et al.[1]	EBC MAIN[2] Imaging-guide	ROCK III[3]	Metaanaysis; IVUS- vs. angio-guide[4]	British Cardiovascular Intervention Society[5]
All cause of death	n (%)	66 (8.9)	4 (3.2)	5 (2.8)	16 (4.2)	342/7151 (4.8)	335 (9.0)
Cardiac death	n (%)	25 (3.4)	3 (2.4)	4 (2.2)	6 (1.6)	72/8648 (0.8)	
Target vessel revascularization	n (%)	34 (4.6)		12 (6.7)		342/8073 (4.2)	
Target lesion revascularization	n (%)	15 (2.0)	8 (6.4)		29 (7.7)	195/7211 (2.7)	
Stent thrombosis	n (%)	2 (0.3)	1 (0.8)	3 (1.7)	5 (1.3)	40/7889 (0.5)	
Myocardial infarction	n (%)	14 (1.9)	5 (4.0)	20 (11.2)	16 (4.2)	211/8773 (2.4)	
Total case number	n	743	124	179	377	7151-8773	5056
Imaging-guidance	%	98	100	100	100	100	100
Imaging device		IVUS/OCT	IVUS	IVUS/OCT	IVUS/OCT	IVUS	IVUS/OCT

1. EuroInterv 2020;16:210-217, 2. Catheter Cardiovasc Interv 2023;102:415-429. 3. Catheter Cardiovasc Interv. 2022;99:664-673.
4. J Interv Cardiol. 2021 Oct 15;6082581. 5. J Am Coll Cardiol Intv 2020;13:346–57

Role of imaging-guidance in LM-PCI

- Reduction of 2-stent deployment
  - ✓Accurate diagnosis of angiographically hazy SB lesion: less true CBL than angio-assessment
  - ✓Optimal SB pretreatment: balloon sizing, plaque modification
  - ✓Accurate assessment of SB residual stenosis and dissection after pretreatment
- Identification of LM plaque in angio-negative LM lesion (Medina 0-x-x)
  - ✓Optimal proximal stent landing zone
- More frequent POT: less stent malapposition in LM
- Detection of LM stent deformation (6-18%): optimal correction
- Optimal GW recrossing: optimal branch dilation, less stent deformation

Conclusion

- Routine imaging-guidance promoted optimal LM-PCI without overtreatment of LCX, which enhanced local efficacy of PCI-treated site.
- However, severe left ventricular dysfunction and multiple-vessel involvement are still associated with higher mortality and revascularization risks.

Thank you for your attention!