Challenges in LM PCI

Decision-making process for stenting

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Upgrade of Recommendation
for PCI at Unprotected Left Main Stenosis

Class IIb

1. PCI of the left main coronary artery with stents as an alternative to CABG may be considered in patients with anatomic conditions that are associated with a low risk of PCI procedural complications and clinical conditions that predict an increased risk of adverse surgical outcomes.*[21,138,139] (*Level of Evidence: B*)	New recommendation

Stenting is relatively more favorable for

- **Patients with isolated ULMCA lesions or 1-vessel disease,**
- **Patients with ostial or mid ULMCA,**
- **patients with factors for high-risk CABG.**

CABG may be relatively more favorable for

- **Patients with ULMCA plus multivessel disease,**
- **Distal/bifurcation ULMCA lesions, or**
- **Low surgical risk with a good chance of technical success.**

Still challenging in your decision-making

- Treat or not ?
- PCI vs. CABG ?
- Lesion preparation ?
- Stent type
- Stent optimization

Methods to help you make a decision in the Cath lab

- Angiography
- Intravascular ultrasound
- Fractional flow reserve

Angiography

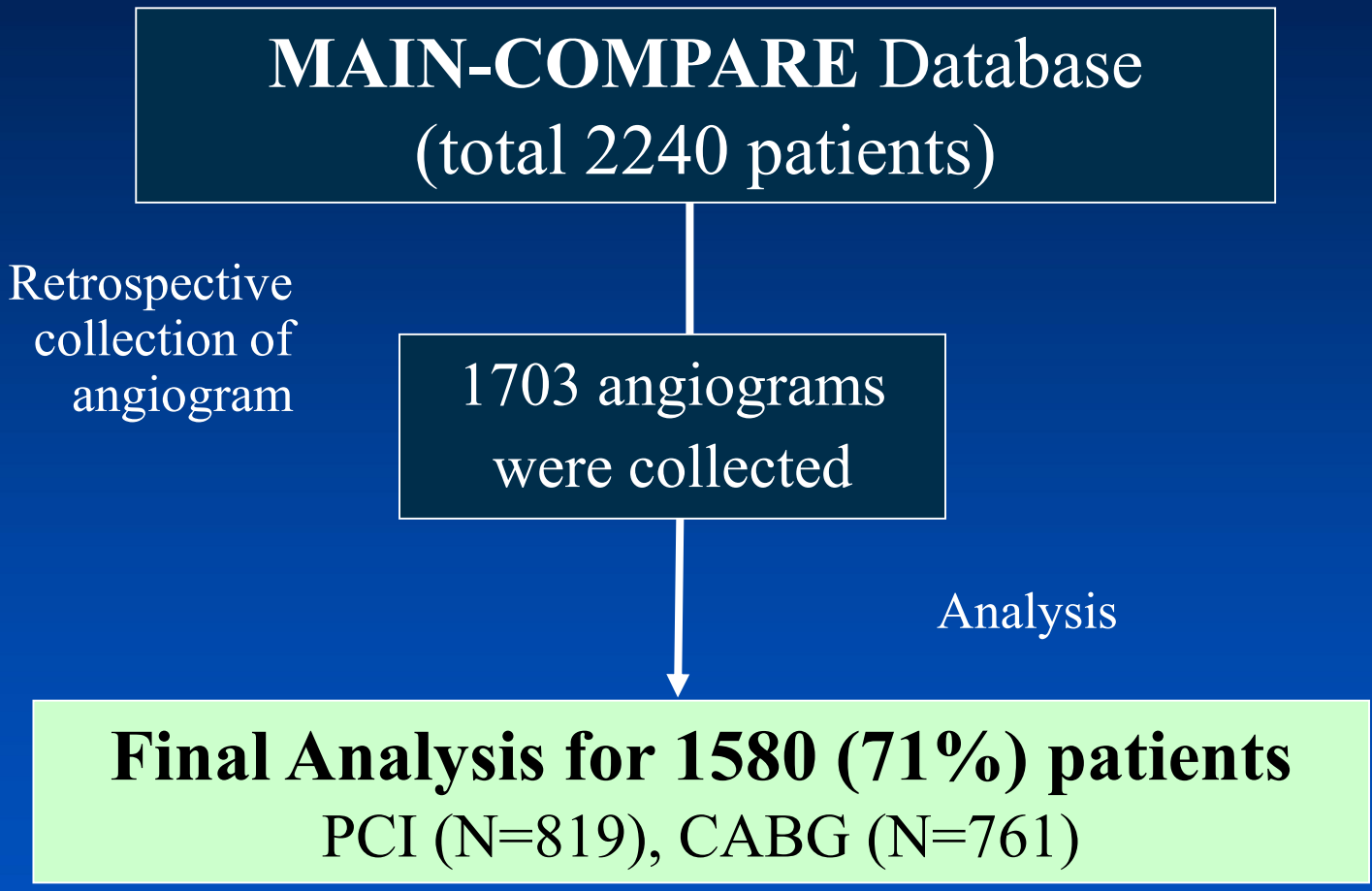
- The first step to determine the patient's need of revascularization
- A basis to decide your treatment plan between stenting vs. CABG
- Remains a standard imaging modality during coronary stenting

Syntax score
(newly developed system)

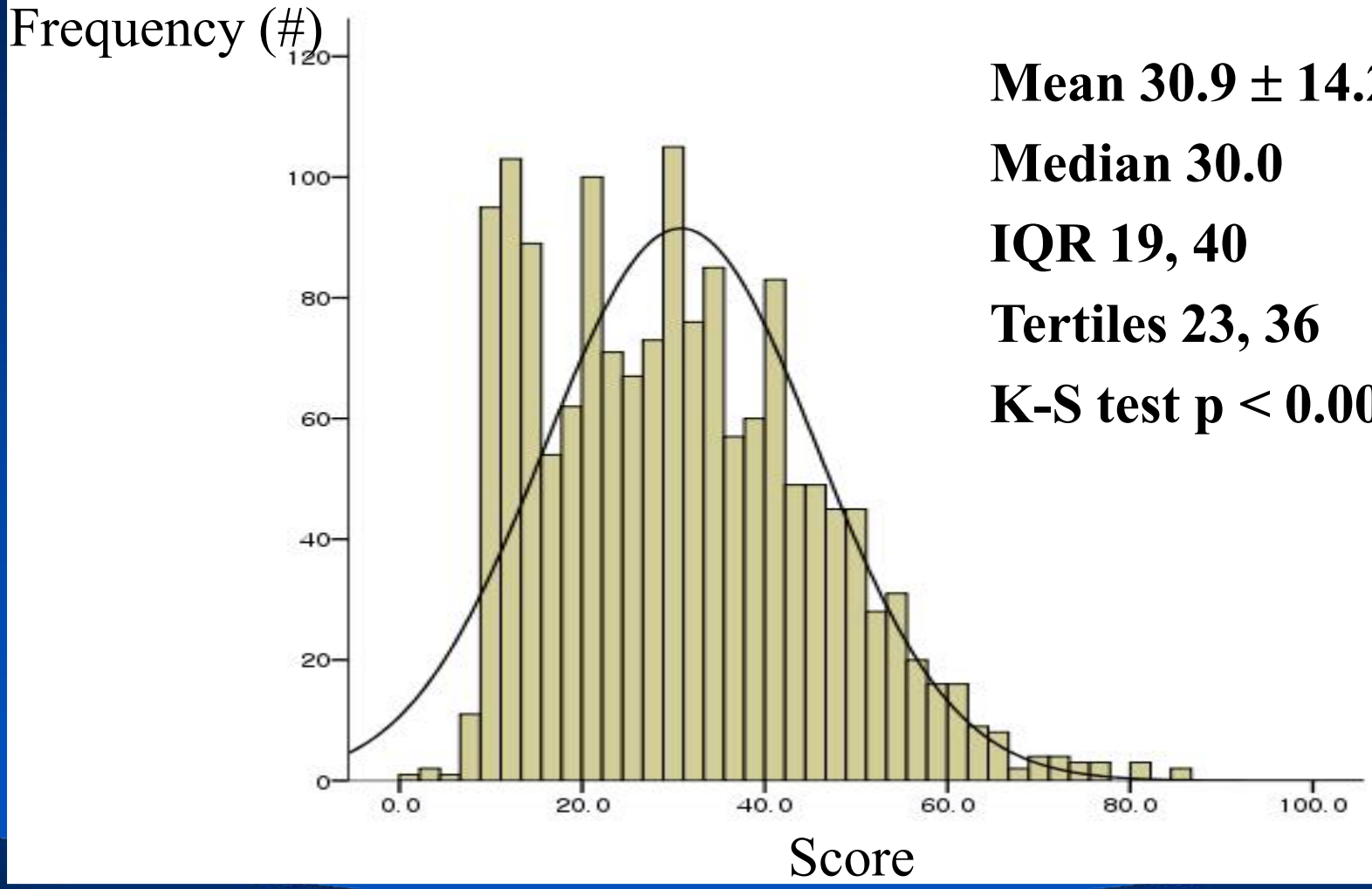
takes into account the heterogeneity of coronary ***angiographic complexity*** based on the lesion's characteristics .

Can be used to (1) predict long-term outcomes and (2) help your decision-making

SYNTAX Score Application
for MAIN COMPARE registry



Distribution of SYNTAX Score
Non-normal distribution



Mean 30.9 ± 14.2

Median 30.0

IQR 19, 40

Tertiles 23, 36

K-S test p < 0.001

Distribution of SYNTAX Score

Comparison with the SYNTAX Trial

SYNTAX score tertiles in SYNTAX Study	SYNTAX score tertiles in MAIN-COMPARE
≤ 22	≤ 23
> 22 and ≤ 32	> 23 and ≤ 36
> 32	> 36

Discrimination and Calibration
For Death, MI, Stroke

Model	Discrimination		Calibration
	C-index (95% CI)	Akaike Information Criterion	Slope of the Linear Predictor
Overall patients			
SYNTAX score	0.59 (0.55-0.64)	1993.9	1.12
EuroSCORE	**0.67 (0.62-0.71)**	1949.6	1.02
SYNTAX score + EuroSCORE	**0.68 (0.63-0.72)**	1948.5	1.00
PCI patients			
SYNTAX score	**0.63 (0.57-0.70)**	765.4	1.07
EuroSCORE	**0.64 (0.56-0.72)**	752.5	1.06
SYNTAX score + EuroSCORE	**0.67 (0.59-0.74)**	750.2	1.02
CABG patients			
SYNTAX score	0.53 (0.47-0.59)	1040.2	0.78
EuroSCORE	**0.67 (0.61-0.73)**	1010.7	0.99
SYNTAX score + EuroSCORE	**0.68 (0.62-0.73)**	1012.7	0.99

Discrimination and Calibration
For Death, MI, Stroke, TVR

Model	Discrimination		Calibration
	C-index (95% CI)	Akaike Information Criterion	Slope of the Linear Predictor
Overall patients			
SYNTAX score	0.53 (0.48-0.55)	3511.0	0.93
EuroSCORE	0.57 (0.53-0.60)	3493.9	1.09
SYNTAX score + EuroSCORE	0.57 (0.53-0.60)	3495.7	1.02
PCI patients			
SYNTAX score	0.57 (0.52-0.61)	1874.3	1.00
EuroSCORE	0.53 (0.48-0.58)	1876.5	1.16
SYNTAX score + EuroSCORE	0.57 (0.52-0.61)	1874.6	0.97
CABG patients			
SYNTAX score	0.51 (0.46-0.57)	1301.3	0.89
EuroSCORE	**0.64 (0.58-0.69)**	1277.2	1.05
SYNTAX score + EuroSCORE	**0.64 (0.58-0.69)**	1279.1	1.01

Stratified According to Stent Type
For Death, MI, Stroke

Model	Discrimination		Calibration
	C-index (95% CI)	Akaike Information Criterion	Slope of the Linear Predictor
PCI patients receiving BMS			
SYNTAX score	**0.61 (0.50-0.71)**	163.7	0.81
EuroSCORE	0.52 (0.36-0.69)	164.1	0.41
SYNTAX score & EuroSCORE	0.59 (0.46-0.72)	165.3	0.46
PCI patients receiving DES			
SYNTAX score	**0.66 (0.58-0.74)**	532.3	1.15
EuroSCORE	**0.68 (0.60-0.77)**	517.5	1.05
SYNTAX score & EuroSCORE	**0.71 (0.63-0.79)**	515.7	0.96

Stratified According to Stent Type
For Death, MI, Stroke, TVR

Model	Discrimination		Calibration
	C-index (95% CI)	Akaike Information Criterion	Slope of the Linear Predictor
PCI patients receiving BMS			
SYNTAX score	0.48 (0.40-0.56)	374.9	0.34
EuroSCORE	0.53 (0.42-0.56)	373.6	1.35
SYNTAX score & EuroSCORE	0.53 (0.42-0.63)	375.5	0.59
PCI patients receiving DES			
SYNTAX score	**0.60 (0.55-0.65)**	1333.4	1.09
EuroSCORE	0.53 (0.47-0.58)	1340.1	0.88
SYNTAX score & EuroSCORE	**0.60 (0.55-0.65)**	1334.8	0.97

Death, MI, Stroke

- SYNTAX score was weakly predictive of a composite of safety endpoints, in patients undergoing PCI.
- However, the SYNTAX score lost the predictive ability for patients undergoing CABG.

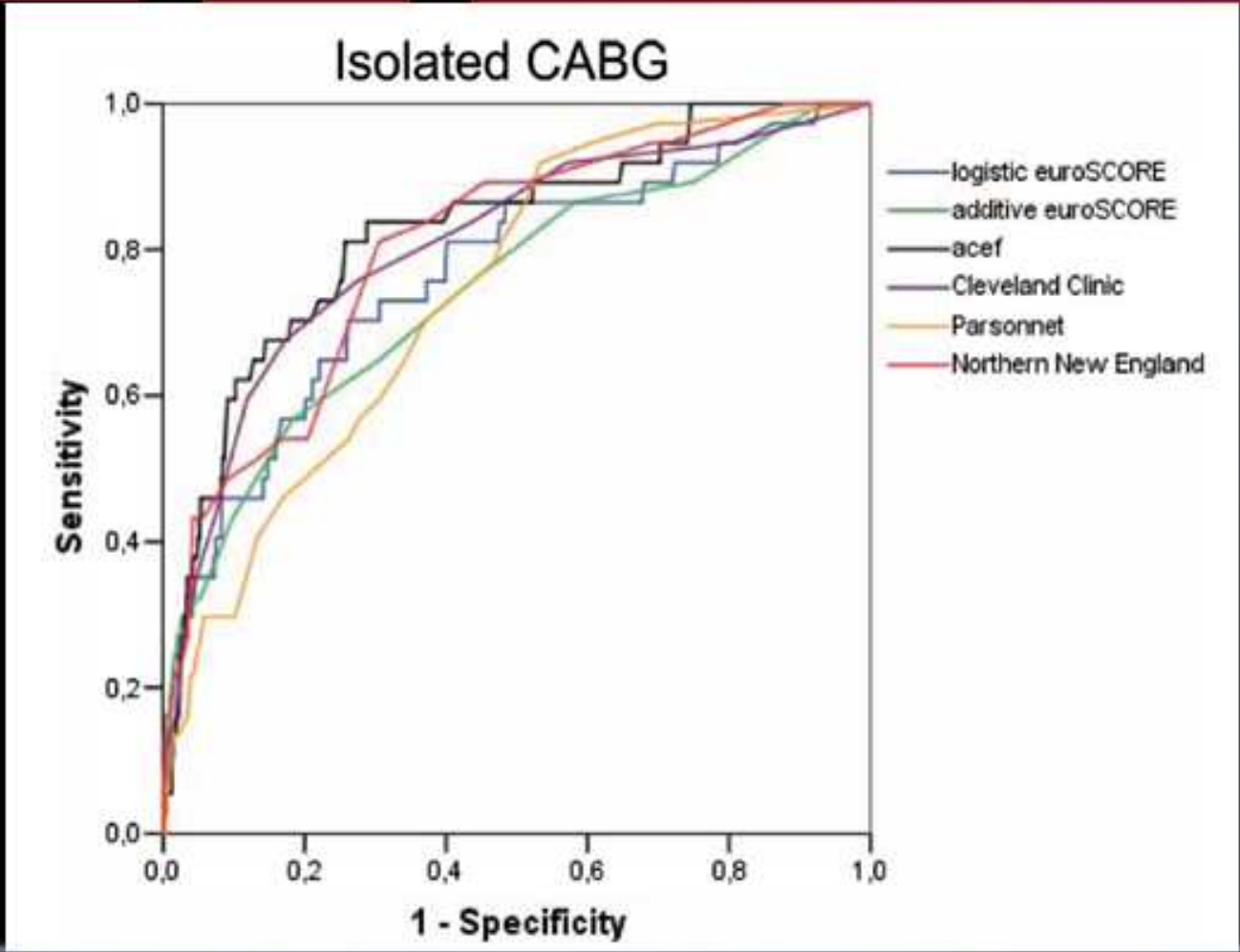
Death, MI, Stroke, TVR

- Neither the SYNTAX score nor the EuroSCORE showed good discriminatory power.
- In patients treated with DES, the predictabilities of events were improved by combination of SYNTAX score and EuroSCORE.

- **Will a SYNTAX score including clinical characteristics provide a better estimate of risk?**

SYNTAX

Clinical SYNTAX score = **SYNTAX score** X **Age/ ejection fraction + 1** (if Cr>2mg/dl)

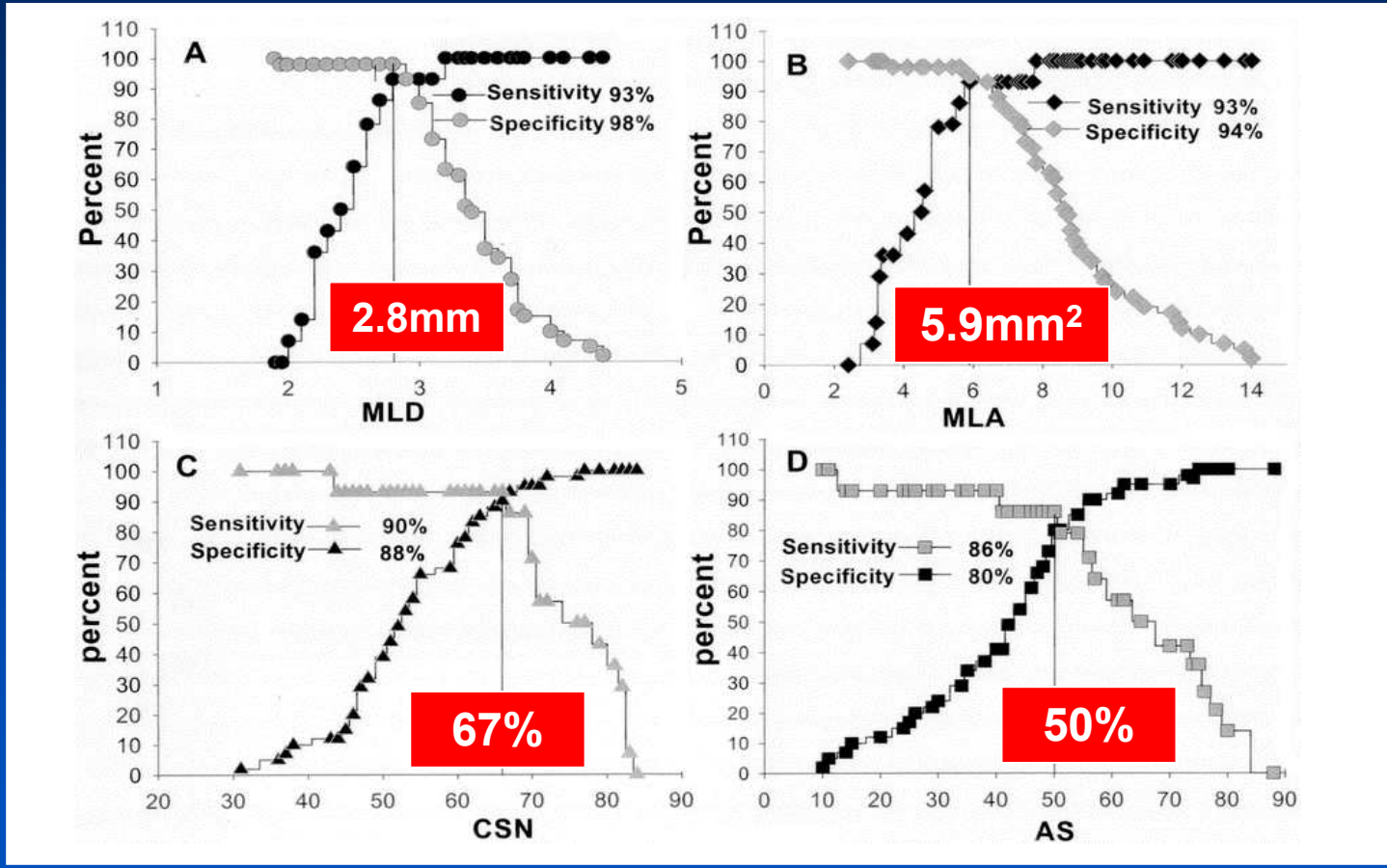


IVUS

- Lesion assessment
- Selection of PCI technique
- Selection of appropriate device
- Procedural optimization
- Assessment of DES failures

We can treat the LM disease in a case of MLA < 6.0 mm^2…

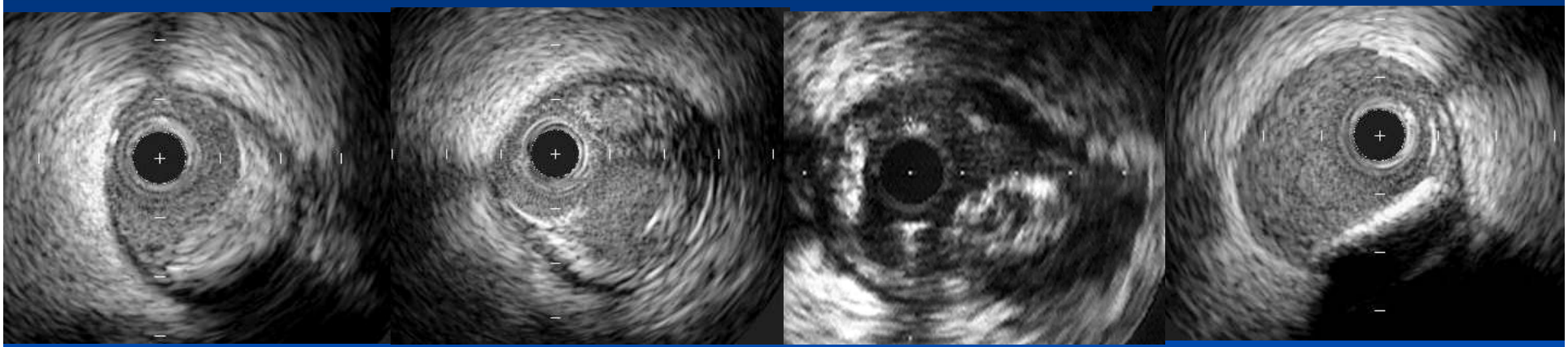
Prediction of FFR (0.75) with IVUS parameter



Jasti V et al. Circulation 2004;110:2831

Plaque Characterization

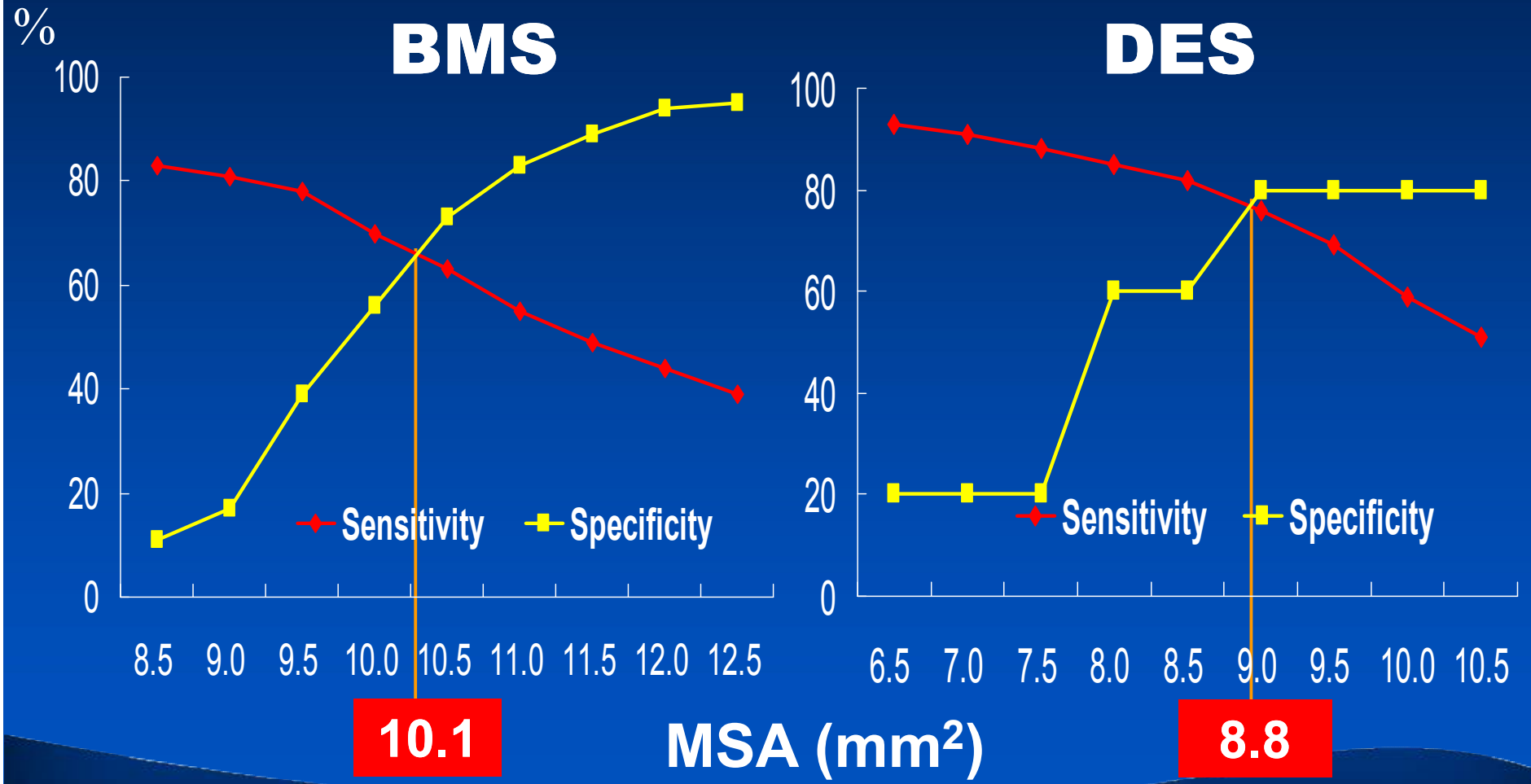
- Lesion preparation : need of rotablation, debulking
- Drug : need of IIb/IIIa, aggressive antiplatelets



Fibrous plaque **Plaque rupture** **Thrombi** **Calcification**

Goal of LM Stent Area
≥ 9 mm²

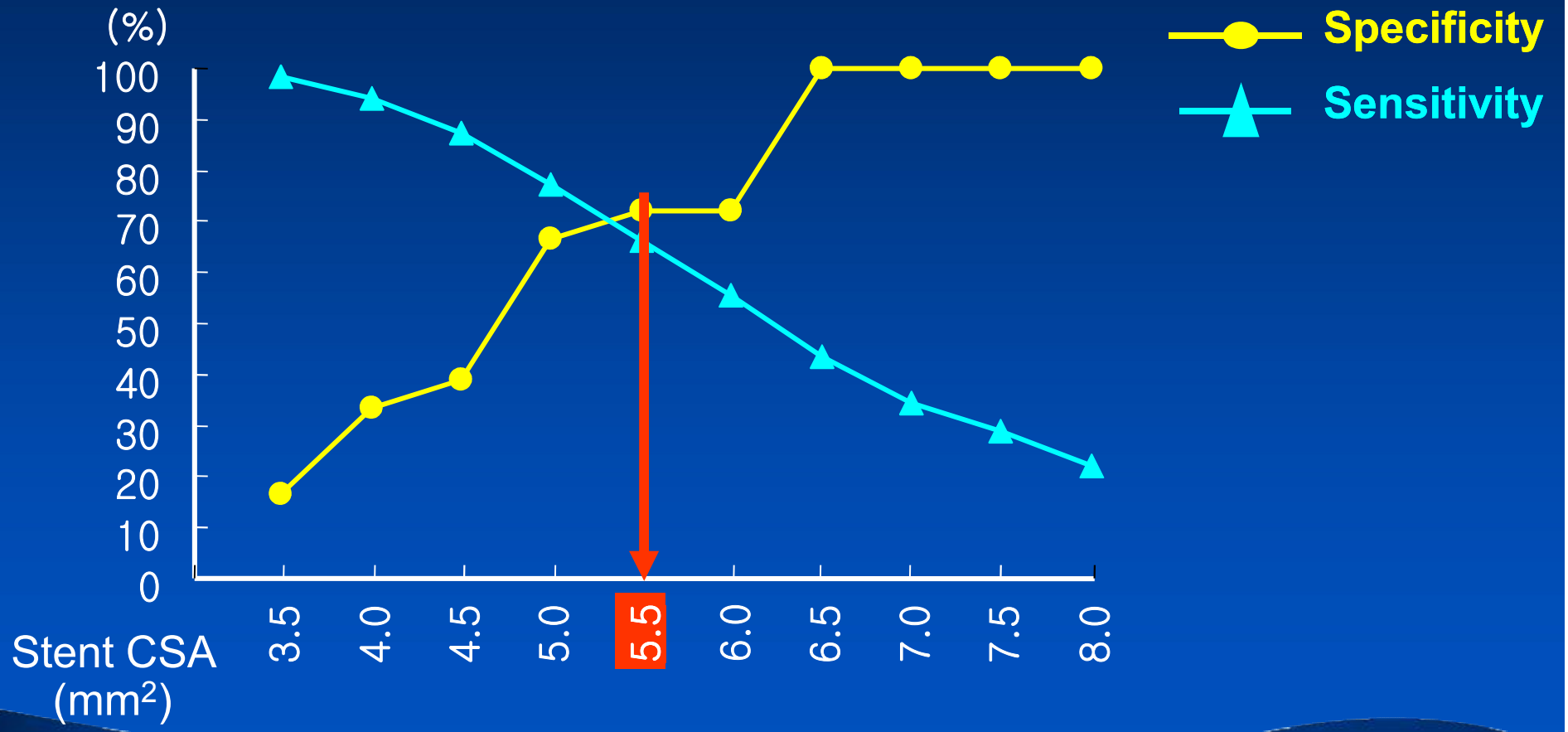
"Optimal" SCA and Restenosis



Park SJ et al, Circ Cardiovasc Intervent. 2009;2:167-177

Goal of LAD & LCX Stent Area
≥ 5 mm²

"Optimal" SCA and Restenosis



Hong MK, Eur Heart J, 2006:27:1305, **AMC data**

Angiography and IVUS
Lesion-specific

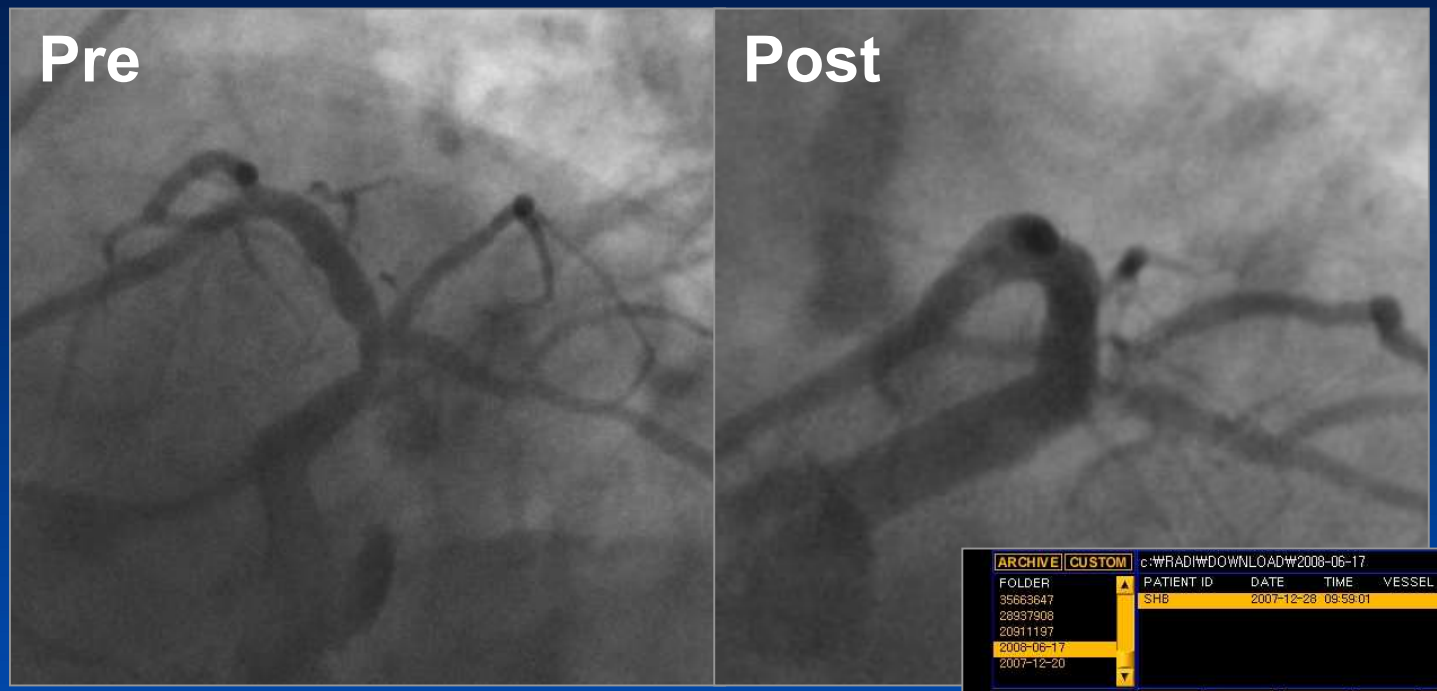
Single stent	• Normal ostial LCX with MEDINA 1.1.0. or 1.0.0. • Small LCX with < 2.5 mm in diameter • Ostial LCX area ≥ 4 mm^2 by IVUS • Diminutive LCX • Normal or focal disease in distal LCX
Two stent	• Diseased LCX with MEDINA 1.1.1., 1.0.1., or 0.1.1 • Large LCX with ≥ 2.5 mm in diameter • Ostial LCX area < 4 mm^2 by IVUS • Diseased left dominant coronary system • Concomitant diffuse disease in distal LCX

Park SJ, Kim YH. Colombo A, Issam D. Moussa et al. Textbook of Bifurcation Stenting

FFR

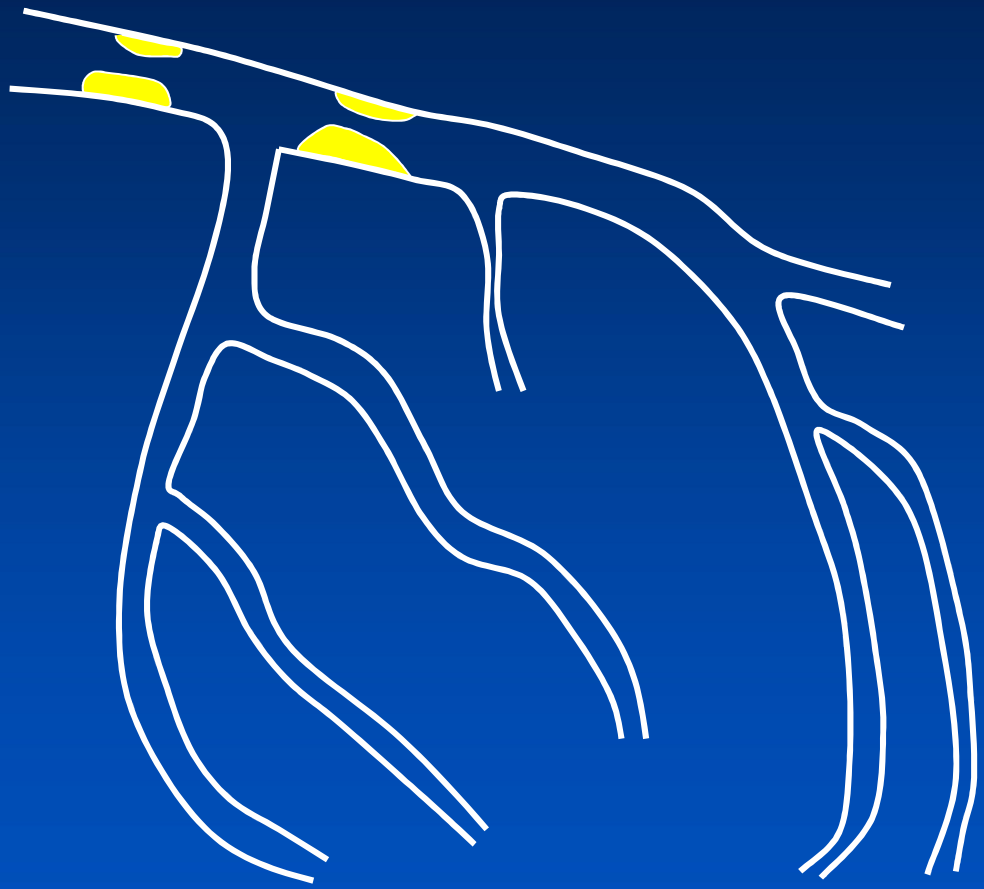
- Assessment of ischemia in LM and side branch

LM Bifurcation Treated with Cross-over



But, LM Stenoses are rarely isolated

LM ischemia cannnot be evaluated well with FFR



Nothing is complete alone.

- We still need an integrated approach with clinical manifestation, angiography, IVUS and FFR in making your decision for unprotected LM stenosis.

- We need further researches to test the inter-relationship across the diagnostic devices.